# 6600A SERIES PROGRAMMABLE SWEEP GENERATORS, MULTIBAND MODELS OPERATION AND MAINTENANCE MANUAL

IVIO	DELS COVERE	U
6609A	6629A-40	6647A
6617A	6637A	6648A
6621A	6637A-40	6653A
6621A-40	6638A	6659A
6629A	6642A	



## WARRANTY

All products are warranted against defects in materials and workmanship for one year from the date of shipment except YIG-tuned oscillators, which have a two-year warranty period. Our obligation covers repairing or replacing products which prove to be defective during the warranty period and which shall be returned with transportation charges prepaid to WILTRON. Obligation is limited to the original purchaser. We are not liable for consequential damages.

#### MANUAL CHANGES

MANUAL: 6600A Series Multiband Sweep Generators

MANUAL PRINT DATE: October 1982

CHANGE DATE: May 15, 1983

## **INSTRUCTIONS:**

1. Make all errata changes. Errata changes are listed in numerical order by page and paragraph number. Errata that has surfaced since January 15, 1982, the date of the last change notice, are indicated with the symbol.

2. Make the "Change #" changes if they have an applicable serial number. Each 6600A series instrument has two serial numbers: one for the RF deck and another for the basic frame. If all models are affected, the change is usually to the basic frame itself or one of its PCBs (A1 thru A5 or A10 thru A14). If the change is to one or more model numbers (e.g., 6609A, 6647A, 6647A-50), however, the change is to the RF deck or one of its PCBs (A6 thru A9). The serial numbers are imprinted on labels. For the basic frame, the label is affixed to the inside surface of the rear panel; for the RF deck, the label is affixed to the outside surface of the rear panel.

#### ERRATA

## 1. Page 1-2, Paragraph 1-5, Option 13

- a. Change the first two lines to read, "Option 13, Hardware Interface to HP 5343 Microwave Counter."
- b. Add:

#### "NOTE

Option 13 does not provide an interface with the HP 5342A Microwave Counter."

#### ▶ 2. Page 2-3, paragraph 2-4.3

Change the 3rd sentence to read: "This cable — WILTRON Part No. 2100-1, -2, or -4...."

## 3. Page 5-11, Paragraph 5-6d, step 2(a)(3)

Change the frequency to read, "400 MHz."

## 4. Page 5-17, Paragraph 5-8

a. Change the 6th and 7th lines to read: "There are two field-level adjustments on each YIG Driver PCB (see note):

b. Add below the paragraph:

#### NOTE

The 660-D-12868-3 YIG Driver PCB used in the Models 6609A-50, 6617A-40, 6637A-40, and 6647A-40, and the 660-D-12868-99-91 YIG Driver PCB used in the Model 6621A-40, contain three field-level adjustments: the two mentioned above, plus a +15V bias adjustment for the RF amplifier that follows the YIG 1 oscillator (RF deck). This adjustment is described in paragraph 5-8.3.

## 5. Page 5-23

a. Add the following paragraph between step(g)(2) and paragraph 5-9:

#### "5-8.3 RF Amplifier Bias Adjustment

This paragraph provides instructions for adjusting the bias to the RF amplifier that follows the YIG 1 oscillator (RF deck) on Models 6609A-50, 6617A-40, 6621A-40, 6647A-40, and 6659A-40.

- a. Set up the equipment as shown in Figure 5-22, and turn the equipment on.
- b. Remove the top cover from the sweep generator, refer to paragraph 7-3.1, if necessary.
- c. Connect the multimeter leads between TP1 (-) and TP3 (+) (Figure 5-20A).
- d. Adjust A6R94 for 15 ±0.5 volts."
- b. Add Figure 5-20A, below.

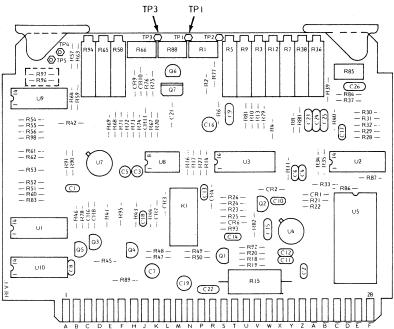


Figure 5-20A. A6 PCB RF Amplifier Bias Badjustment, Models 6609A-50, 6617A-40, 6621A-40, 6637A-40, and 6647A-40

## 6. Page 5-23, Paragraph 5-9

Add the following note between paragraph 5-9 and Table 5-6:

## "NOTE

Recheck the frequency-band overlap adjustments (paragraph 5-6d) following frequency calibration."

## ▶ 7. Page 6-5, Figure 6-2, "Coupler Assembly (No RF OUTPUT Options)"

Add item b.1 as follows, between items b. and c.

INDEX NO.	NAME	PART NO.
	b.1 6653A/6650A	660-B-8125-6

## 8. Pages 6-50 thru 6-52, Table 6-24

## a. Add:

REF. DES.	DESCRIPTION	WILTRON PART NO.			
	CAPACITORS				
C37 C38 C39 C40 C41	Disc, Ceramic, 1 kV, 0.001 $\mu F$ Disc, Ceramic, 1 kV, 0.01 $\mu F$ Tantalum, 35V, 1 $\mu F$ Monolithic, 100V, 0.1 $\mu F$ Monolithic, 100V, 0.1 $\mu F$	230-3 230-40 250-19 230-37 230-37			
	CONNECTORS				
P40 P41 P42 P43 P44	3-Pin, Right Angle 3-Pin, Right Angle 3-Pin, Right Angle 3-Pin, Right Angle 3-Pin, Right Angle	551-238 551-238 551-238 551-238 551-238			
	RESISTORS				
R109 R110 R111 R112 R113 R114 R115 R116	MF, $1/4$ W, $0.1\%$ , $10 \text{ k}\Omega$ MF, $1/4$ W, $0.1\%$ , $10 \text{ k}\Omega$	113-10k1 113-10k1 113-10k1 113-10k1 113-10k1 113-10k1 113-10k1			

#### INTEGRATED CIRCUITS

U11 U12	Op Amp, LF356N Op Amp, LF356N <b>MISCELLANEOUS</b>	50-9 50-9
T1	Transformer Assembly Transformer Assembly	SPEC-A-11773 SPEC-A-11773

#### b. Delete:

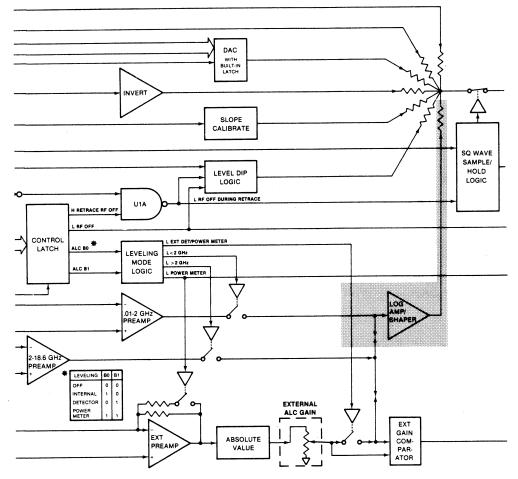
- (1) From the "DIODES AND BRIDGE RECTIFIER" grouping: CR10.
- (2) From the "CONNECTORS" grouping: P8, P33, and P38.
- (3) From the "MISCELLANEOUS" grouping: L1 and L2.

## 9. Page 7-27, Paragraph 7-6.2, 4th paragraph, 11th line

Starting with the sentence reading "Note that Table 7-5 signatures...," delete the remaining lines.

## 10. Page 7-85, Figure 7-43

Add the "LOG AMP/SHAPER" circuit as show below.



## ▶ 11. Page 7-114, Table 7-17, lines 28 and 29 (2nd and 3rd lines from the bottom)

Change the entry in the "Schematic Fig. No." column to read, "7-82A."

## 12. Page 7-123

Copy Figure 1 and affix to page 7-124, on top of the existing "A6 PCB Parts Locator Diagram."

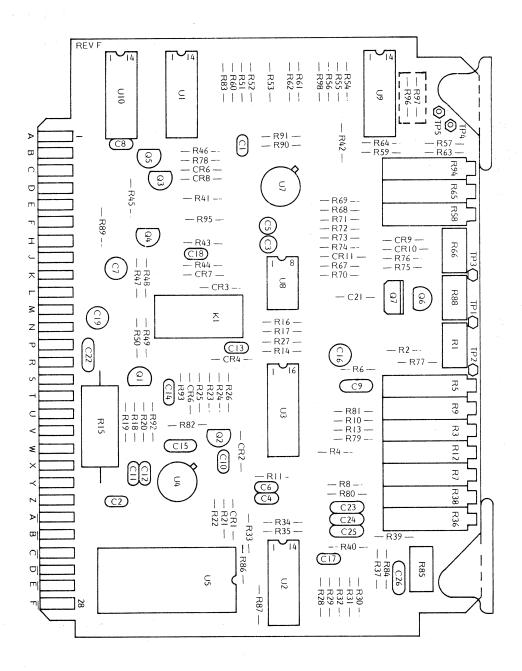


Figure 1. Corrected A6 PCB Parts Locator Diagram

## 13. Page 7-155, Figure 7-77, Sheet 3

- a. In the section labeled, "A14 MOTHERBOARD":
  - (1) Change "P15-5" to read, "P15-4."
  - (2) Change "P15-9" to read, "P15-8."
- b. In the section labeled, "RF COMPONENTS DECK":
  - (1) Change "J15-5" to read, "J15-4."
  - (2) Change "J15-9" to read, "J15-8."
  - (3) Change the block labeled, "OSC 3 YIG," to read, "OSC 2 YIG"; change the frequency to read, "8-12.4 GHz."
  - (4) In the block labeled, "AMP," change the frequency to read, "8-12.4 GHz."

## ▶14. Page 7-164, Figure 7-80, Sheet 3

- a. In the section labeled, "A14 MOTHERBOARD":
  - (1) Change "CR20" to read, "CR22."
  - (2) Change "R32" to read, "R45."
  - (3) Change "Q7" to read, "Q16."
  - (4) Change "R33" to read, "R44."
  - (5) Change "Q12" to read, "Q15."
  - (6) Change "R42" to read, "R43."
  - (7) Change "Q13" to read, "Q14."

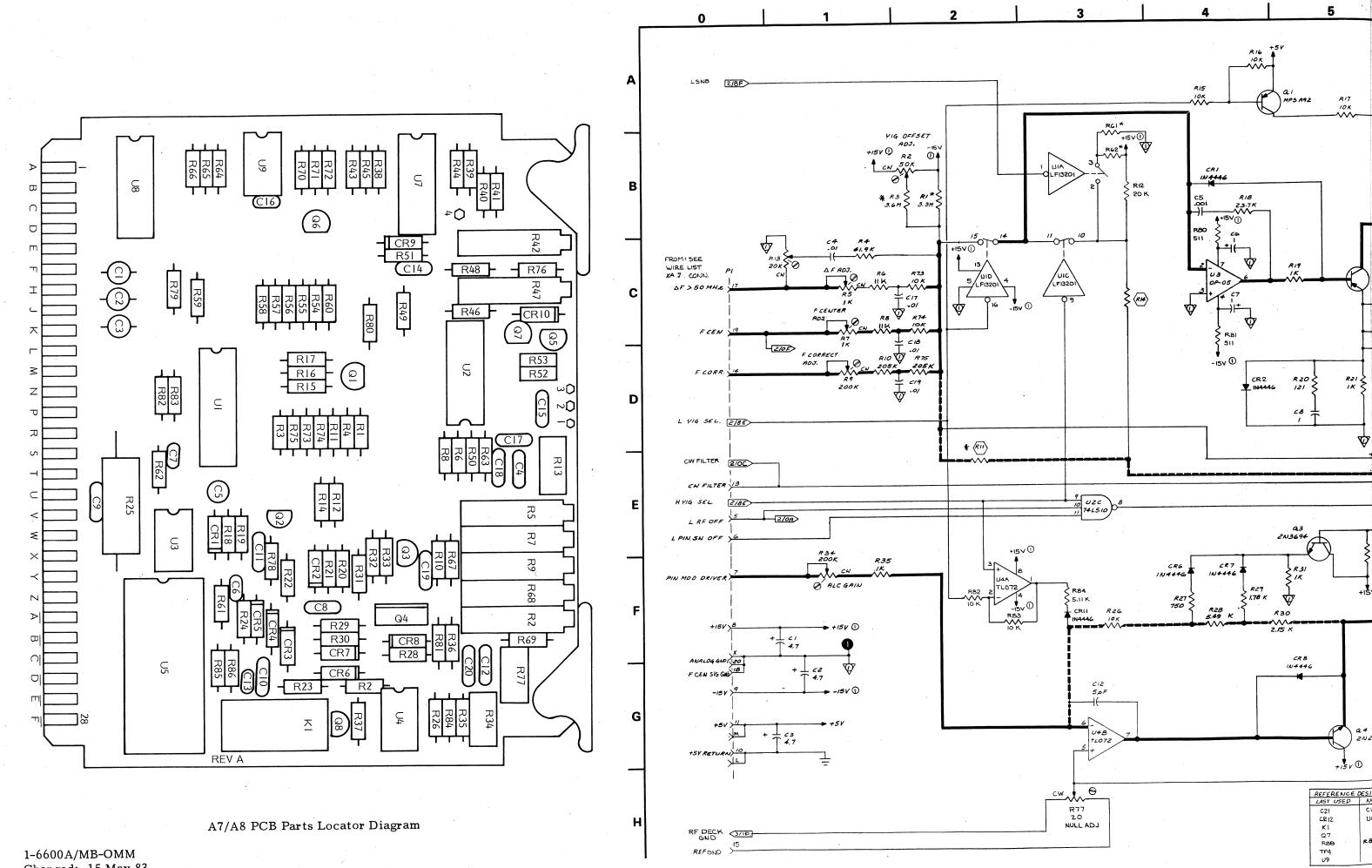
  - (8) Change "R37" to read, "R50."
- b. In the section labeled, "RF COMPONENTS DECK":
  - (1) Change "A7L1" to read, "A8L1."
  - (2) Change "A7C1" to read, "A8C1."

## ▶15. Page 7-167, Figure 7-81, Sheet 3

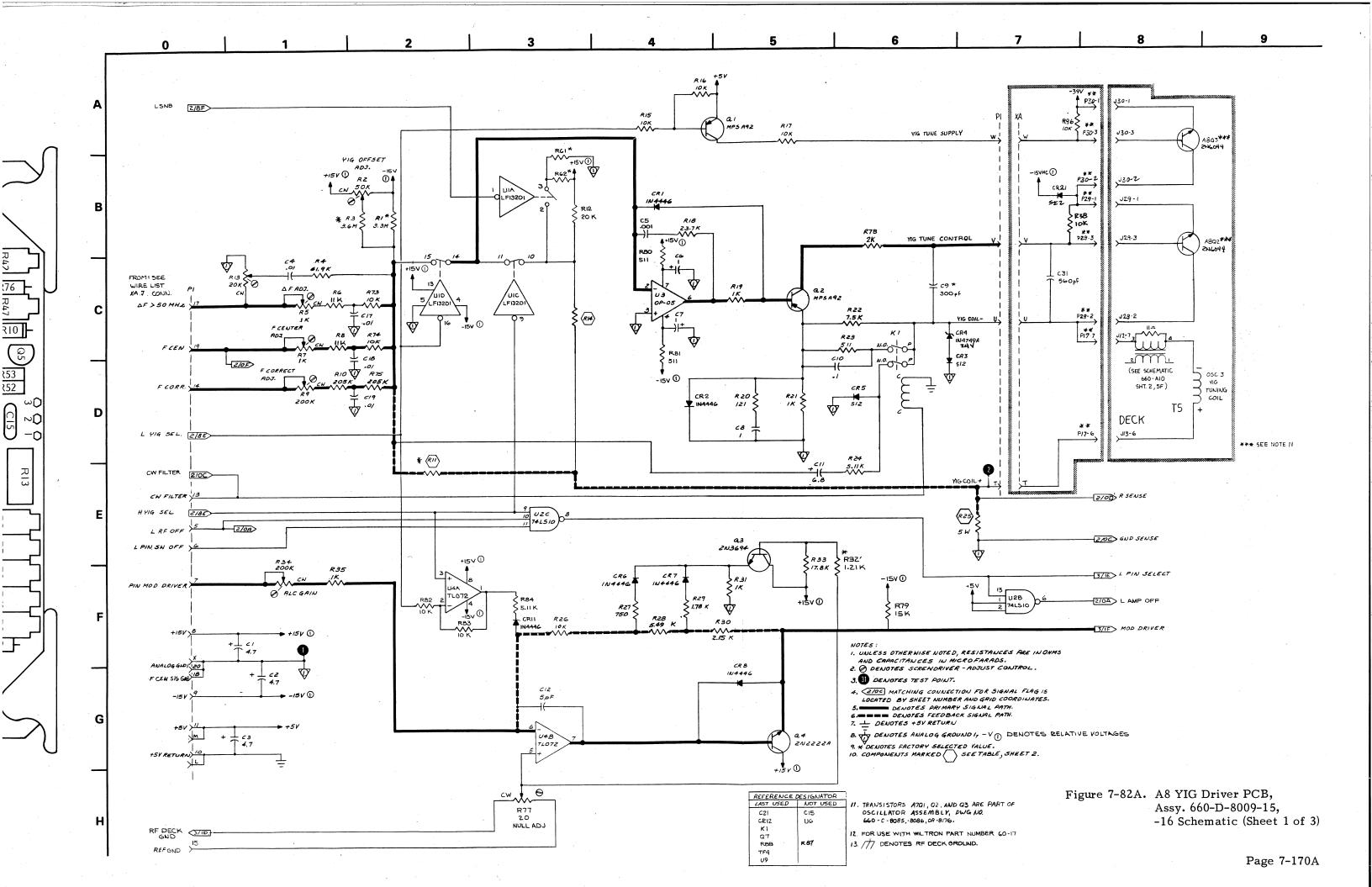
- a. In the section labeled, "A14 MOTHERBOARD":
  - (1) Change "CR20" to read, "CR34."
  - (2) change "R32" to read, "R47."
  - (3) Change "Q7" to read, "Q19."
  - (4) Change "R33" to read, "R46."
  - (5) Change "Q12" to read, "Q18."
  - (6) Change "R42" to read, "R48."
  - (7) Change "Q13" to read, "Q17."
  - (8) Change "R37" to read, "R68."
- b. In the section labeled, "RF COMPONENTS DECK":
  - (1) Change "A7L1" to read, "A9L1."
  - (2) Change "A7C1" to read, "A9C1."

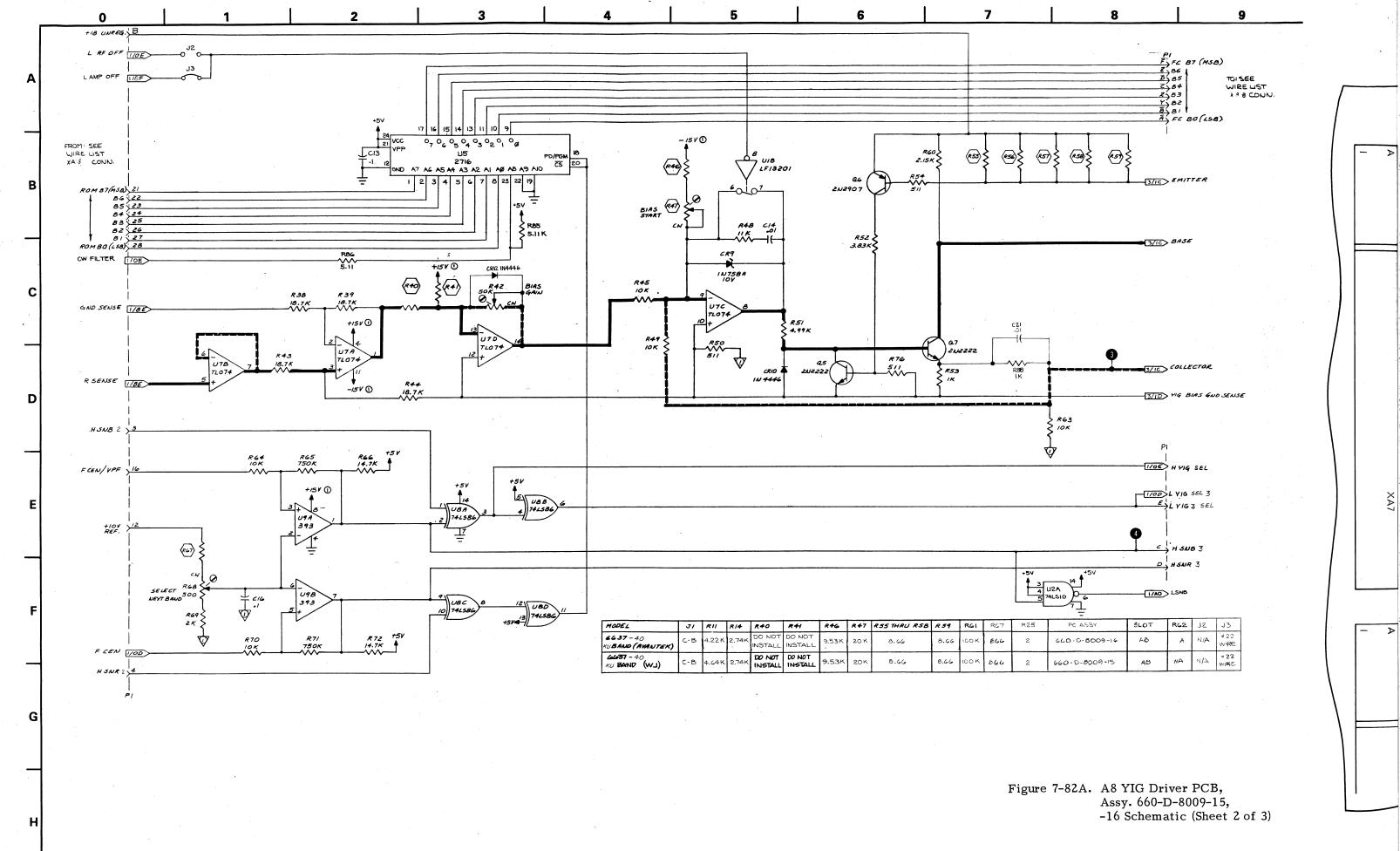
## 16. Page 7-170

Add pages 7-170A, 7-170B, and 7-170C/7-170D; Figure 7-82A, Sheets 1 thru 3; following.



Changed: 15 May 83





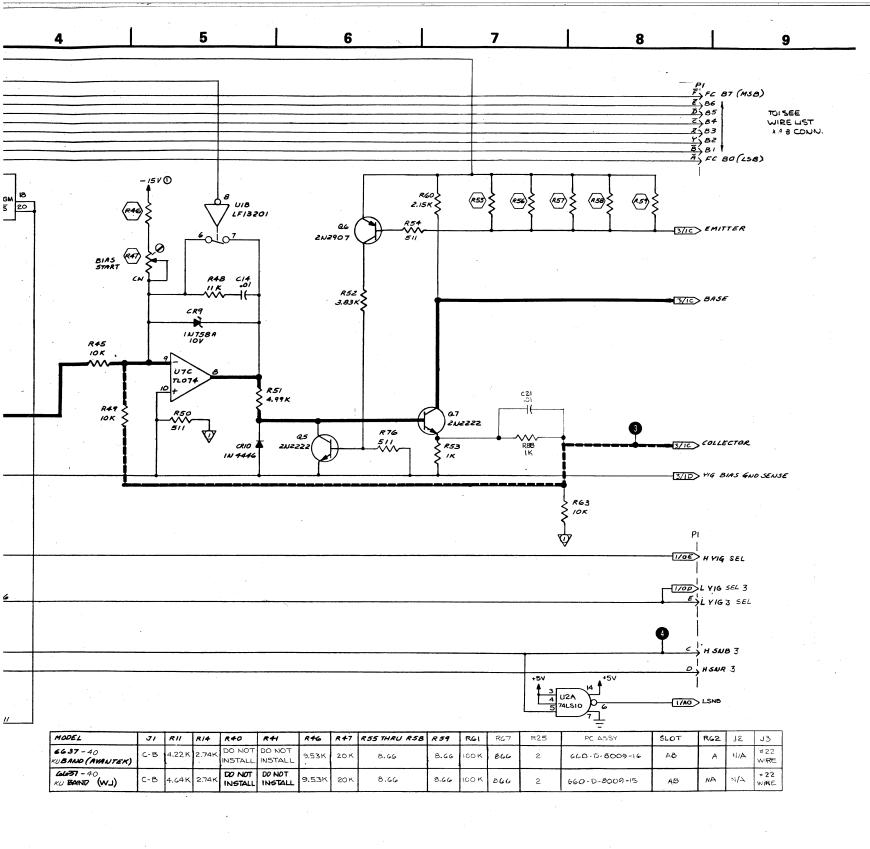
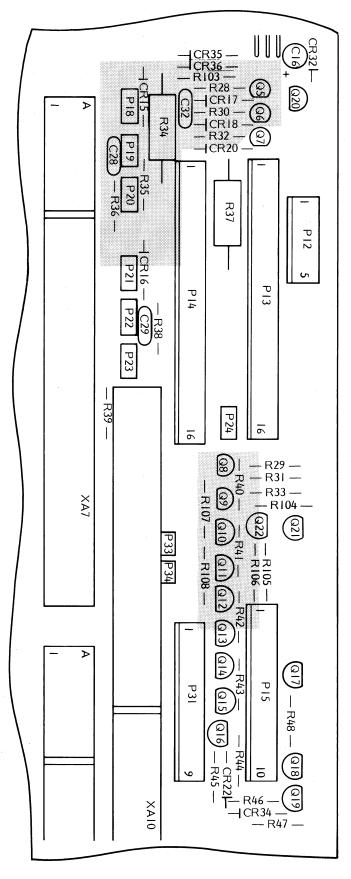
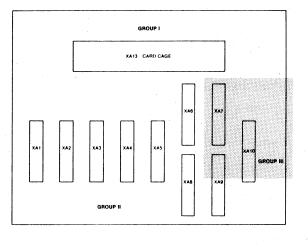


Figure 7-82A. A8 YIG Driver PCB, Assy. 660-D-8009-15, -16 Schematic (Sheet 2 of 3)





Osc 1 YIG, PIN Drive, and PIN/Modulator Parts Locator Diagram

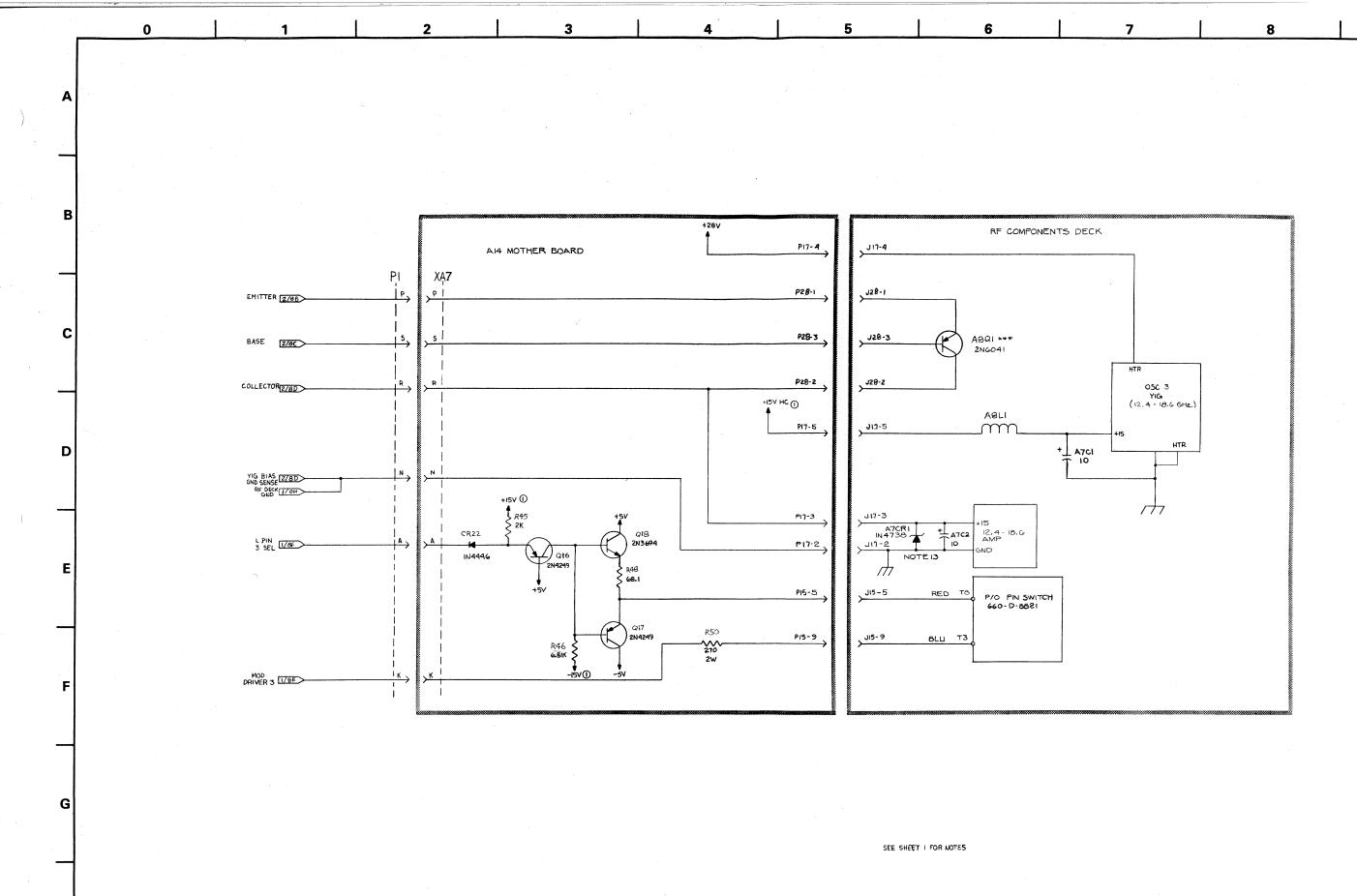


Figure 7-82A. A8 YIG Driver PCB,
Assy. 660-D-8009-15,
-16 Schematic (Sheet 3 of 3)

## ▶17. Page 7-199, paragraph 7-15.2

- a. Change heading to read "A14 Motherboard PCB, Wire Lists and Service Data and Rear Panel Wiring Diagram."
- b. To the listing introduced by the words, "This paragraph contains the following service data," add the following:
  - A rear panel drawing showing the wiring of the Voltage Selector Module, BNC connectors, and AUX I/O connectors.

## 18. Page 7-227, Figure 7-125

Remove and replace with revised Figure 7-125A, following.

## ▶19. Following Page 7-227/7-228

Add page 7-227A/7-228A, following.

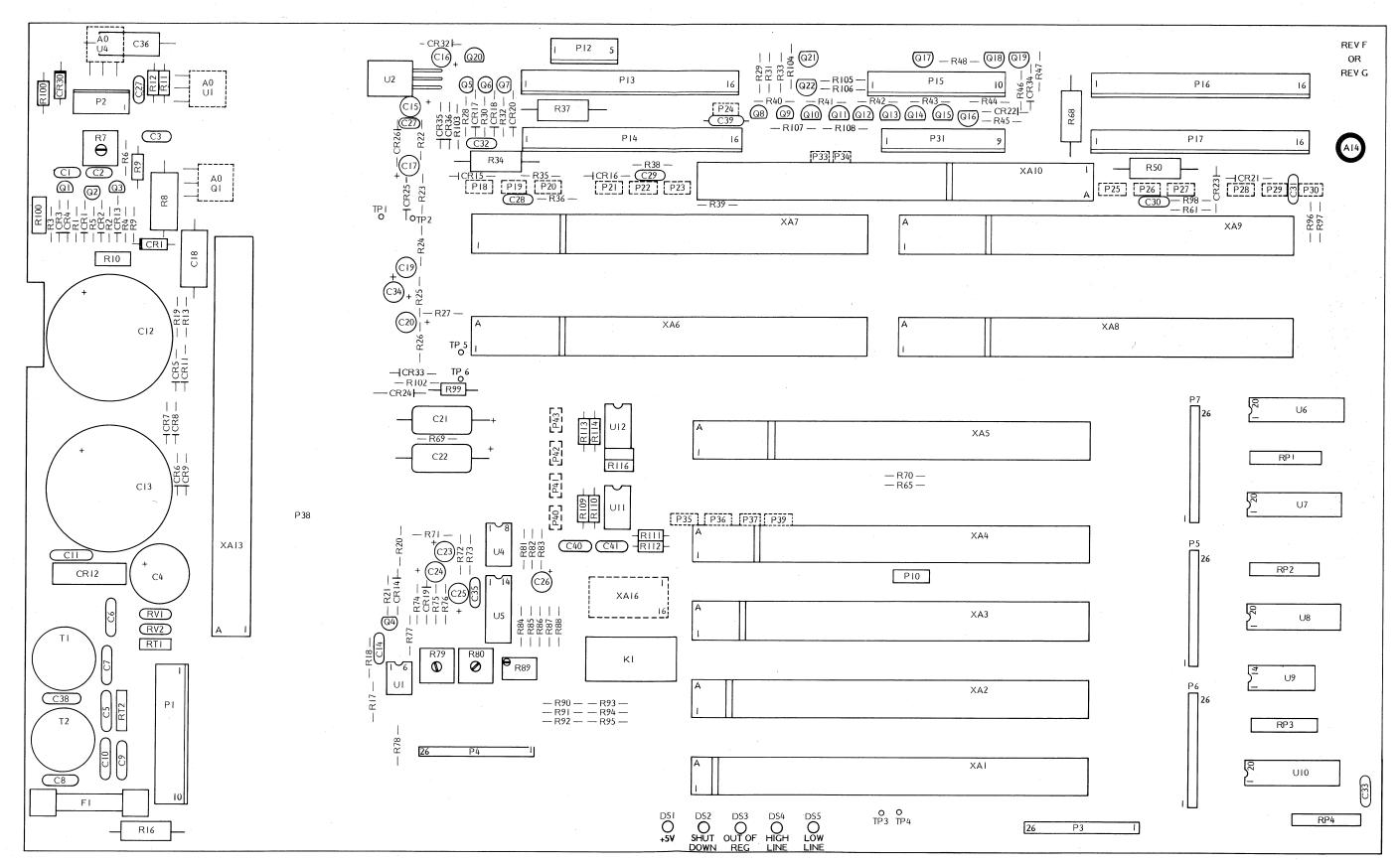
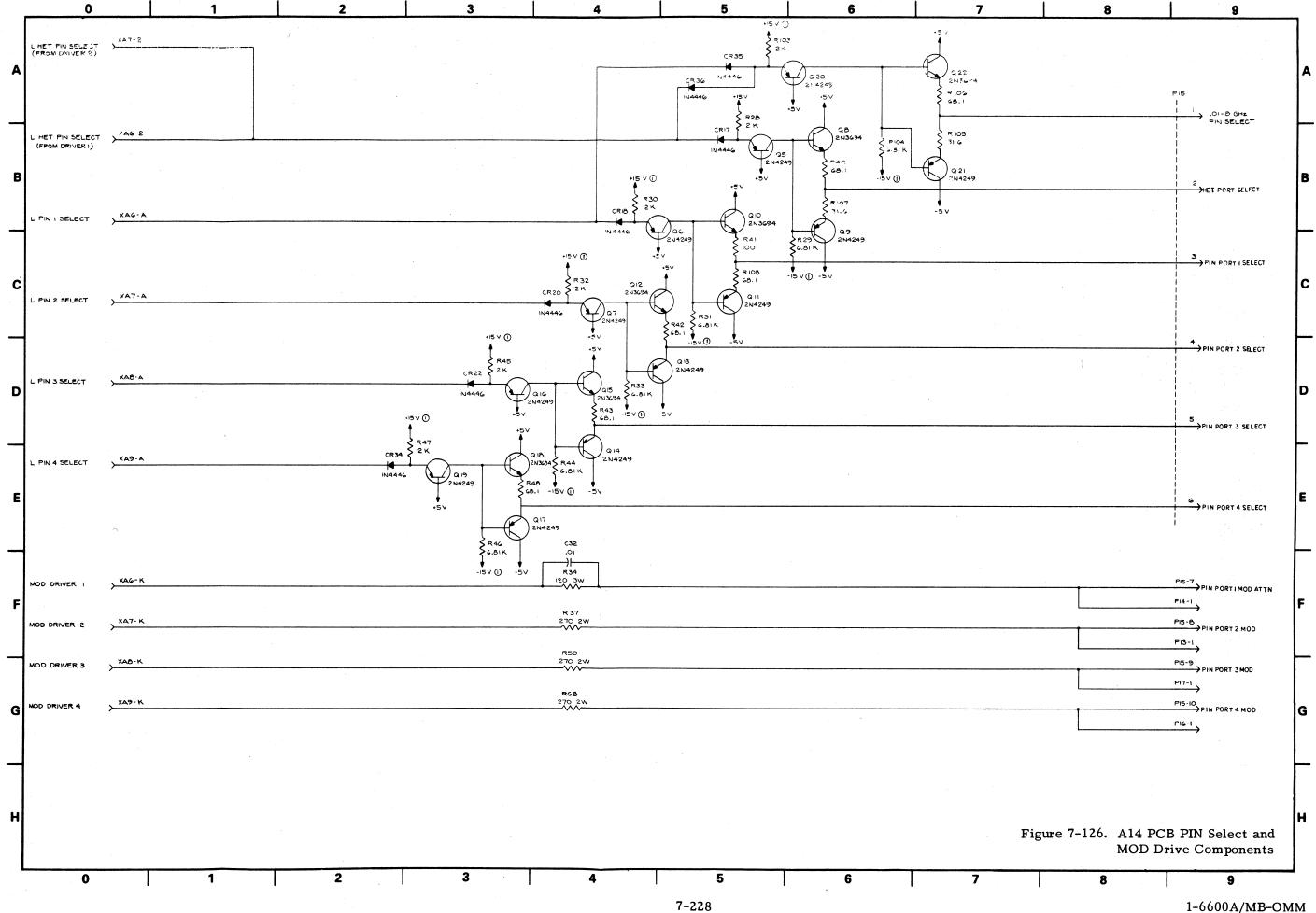


Figure 7-125. A14 Motherboard PCB Parts Locator Diagram



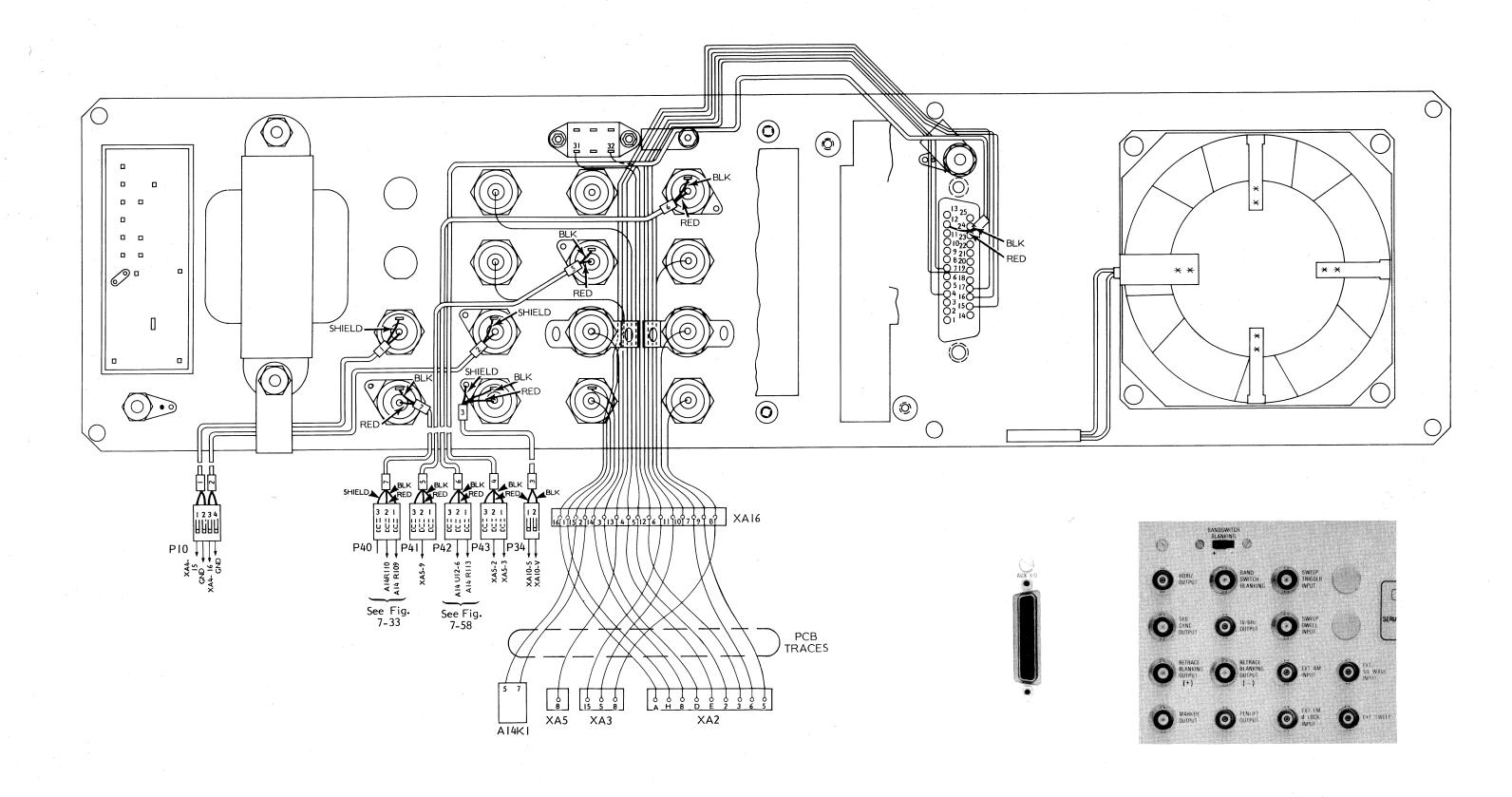


Figure 7-126A. Rear Panel Wiring (Sheet 1 of 2)

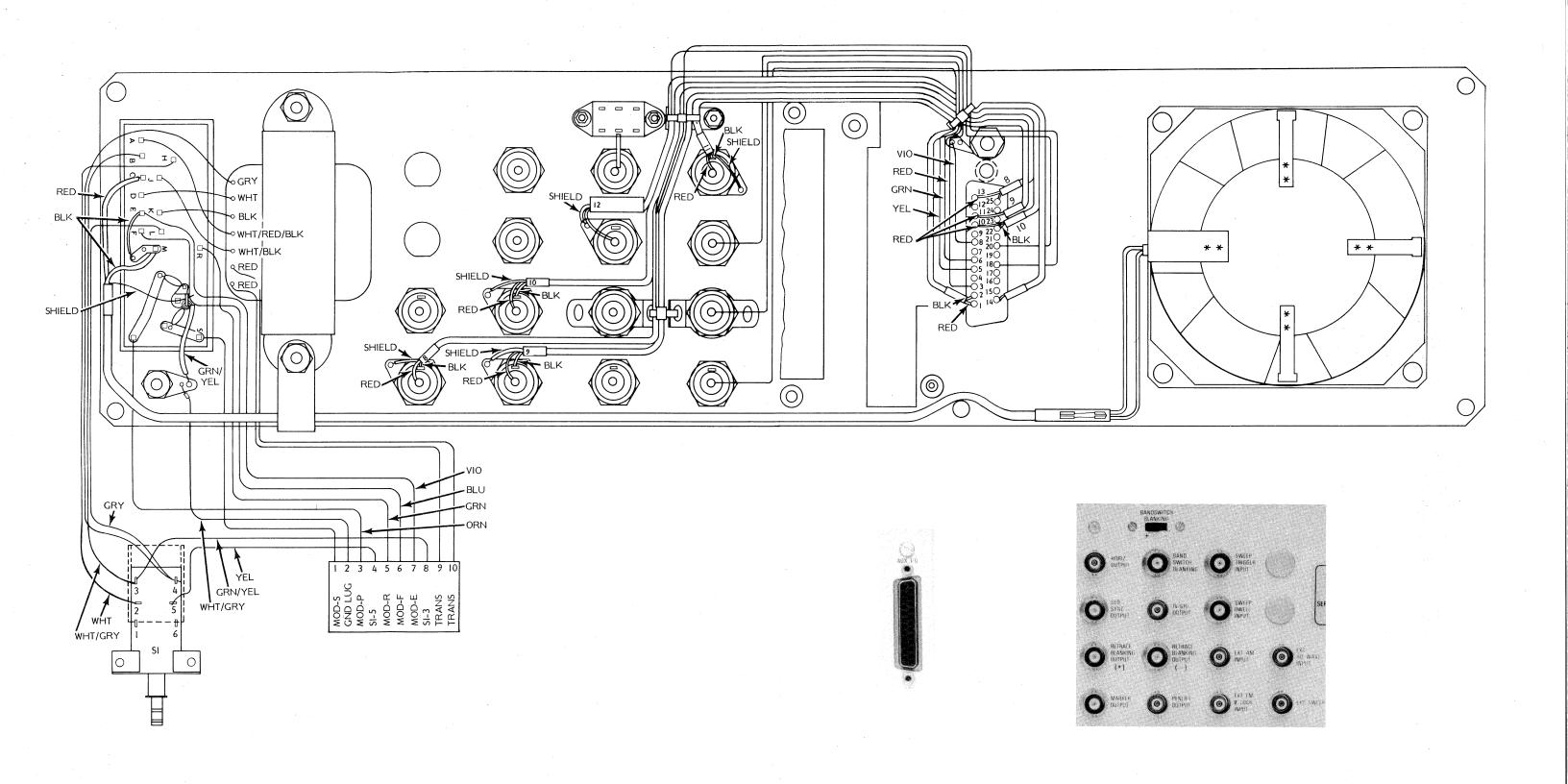


Figure 7-126B. Rear Panel Wiring (Sheet 2 of 2)

CHANGE #1

MODELS AFFECTED: All

BASIC FRAME SN: 210001 and up

## Page 6-50, Table 6-24, "CAPACITORS" Grouping

Change to read:

REF. DES.	DESCRIPTION	WILTRON PART NO.
C9 C10	Disc, Ceramic, 3 kV, 0.0047 $\mu F$ Disc, Ceramic, 3 kV, 0.0047 $\mu F$	250-97 250-97
		700 25/0 0/02

PCO 2569 8/82

CHANGE #2

MODELS AFFECTED: All

RF DECK SN: All

## 1. Pages 6-23 thru 6-32, Tables 6-6, 6-7, 6-8, 6-9, 6-11, and 6-12

Change "CAPACITORS" grouping to read:

DESCRIPTION	WILTRON PART NO.
Mylar, 0.01 μF	227-50
Mylar, 0.01 μF	227-50
Mylar, $0.01 \mu F$	227-50
Mylar, 0.01 μF	227-50
Mylar, 0.01 μF	227-50
	Mylar, 0.01 μF Mylar, 0.01 μF Mylar, 0.01 μF Mylar, 0.01 μF

## 2. Pages 6-29 thru 6-42, Tables 6-10, 6-13, 6-14, 6-15, 6-16, 6-17, 6-18, and 6-19

Change "CAPACITORS" grouping to read:

REF. DES.	DESCRIPTION	WILTRON PART NO.
C4	Mylar, 0.01 μF	227-50
C14	Mylar, 0.01 μF	227-50
C17	Mylar, 0.01 uF	227-50
C18	Mylar, 0.01 µF	227-50
C19	Mylar, 0.01 µF	227-50

PCO 2577 9/82

CHANGE #3

MODELS AND SERIAL

NUMBERS AFFECTED: 6637A-40, 202001 & up

6647A-40, 201001 & up

## 1. Page 6-36, Table 6-14, "RESISTORS" Grouping

Change to read:

REF. DES.	DESCRIPTION	WILTRON PART NO.
R67 <sup>1</sup> R67 <sup>2</sup>	MF, $1/4W$ , $1\%$ , $\frac{511}{511}$	110- <u>511</u> -1 110- <u>511</u> -1

#### 2. Page 7-154, Figure 7-77

In the resistor matrix, change the value of "R67" to read "511."

PCO 2581 8/82

CHANGE #4

MODELS AFFECTED: All

BASIC FRAME SN: 208001 & up

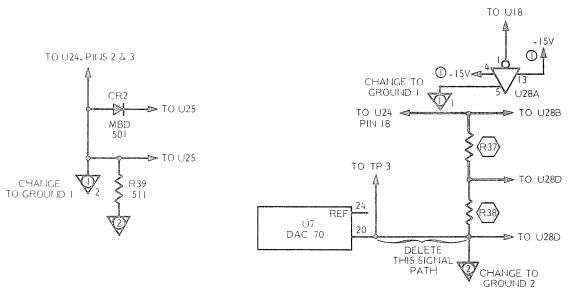
## 1. Page 5-9, paragraph 5-6

a. Step a.3.: Change "A5TP3" to "A5TP10."

b. Step b.3.: Change "A5TP3" to "A5TP10" in two places.

## 2. Page 7-110, Figure 7-58

Change the schematic as shown below.



PCO 2596 9/82

CHANGE #5

MODELS AFFECTED: 6637A, 6637A-40, 6647A, 6647A-40, 6653A,

6659A

RF DECK SN: All

## 1. Page 6-11, Index No. 4b

Change part number to 320-63.

## 2. Page 6-13, Index No. 15b

Change part number to 320-63.

PCO 2599 10/82

CHANGE #6

MODEL AFFECTED: 6609A RF DECK SN: 203001 & up

## 1. Page 6-10, Figure 6-5

Add to the parts list:

INDEX

NO.

NAME

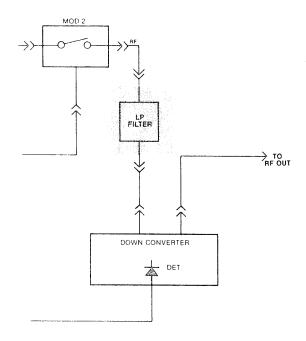
PART NO.

- Filter (6609A)

1030-26

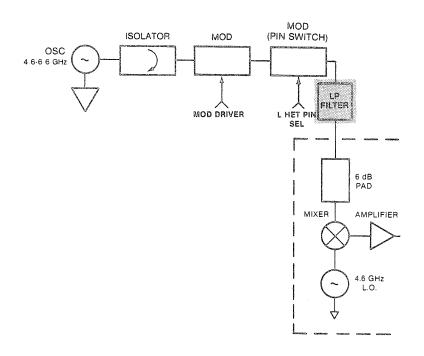
## 2. Page 7-95, Figure 7-48

Add a block labeled "LP FILTER" as shown below.



## 3. Page 7-184, Figure 7-94

Add a block labeled "LP FILTER" as shown below.



PCO 2656 12/82

CHANGE #7

MODELS AFFECTED: All

BASIC FRAME SN: 319001 & up

## 1. Pages 6-20 and 6-21, Table 6-4

Change to read:

REF DES.	DESCRIPTION	WILTRON PART NO.
	CAPACITORS	
C26	Ceramic Disc, 0.1 μF	230-37
	RESISTORS	
R6	Variable, Multiturn, 10 kΩ	156-10k
R <b>7</b>	MF, $1/4W$ , $1\%$ , $64.9 \text{ k}\Omega$	110-64.9k-1
R12	Variable, Multiturn, 10 kΩ	156-10k
R13	MF, $1/4W$ , 1%, 64.9 k $\Omega$	110-64.9k-1

C-4

1-6600A/MB-OMM

R116 MF, 1/4W, 1%, 8.25 k $\Omega$  110-8.25k-1 R149 MF, 1/4W, 1%, 8.25 k $\Omega$  110-8.25k-1

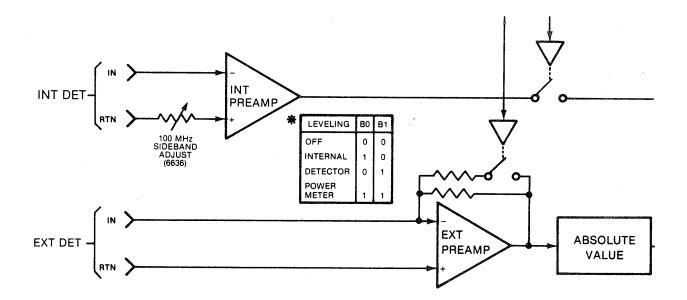
#### 2. Page 7-84, Paragraph 7-11.1

Change the 4th paragraph to read:

"The A4 PCB leveling circuit (Figure 7-43) provides overall control of the RF output power. The A4 PCB has two preamplifiers for internal leveling, U4 and U6. U4 is for the .01 to 2 GHz Het Band and U6 is for the >2 GHz YIG bands. Both U4 and U6 are differential amplifiers that remove any common-mode noise between the 'IN' and 'RTN' inputs. Potentiometers R12 and R6 in the respective U4 and U6 'RTN' inputs aid in cancelling 100 MHz sidebands in the 6636 single band model. These sidebands are not usually a problem in the other models."

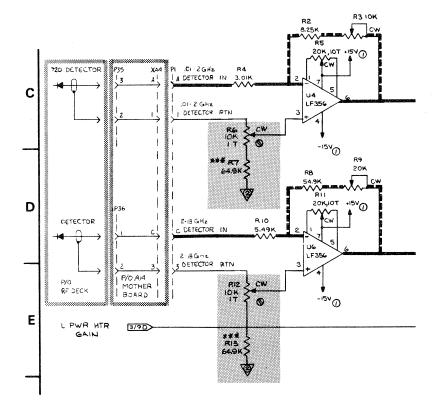
## 3. Page 7-85, Figure 7-43

Add a potentiometer to the "RTN" input of the "INT PREAMP," as shown below.



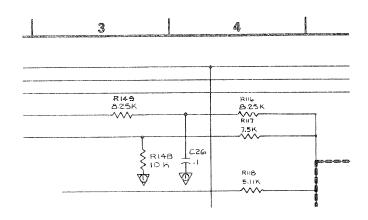
## 4. Page 7-86, Figure 7-44, Sheet 1, Coordinates 1C

Change the "DETECTOR RTN" inputs circuits on U4 and U6 as shown below.



## 5. Page 7-88, Figure 7-44, Sheet 3, Coordinates 3A

Change the value on R116 and add C26 and R149 as shown below.



PCO 2668 11/82

CHANGE #8

MODELS AFFECTED: All

BASIC FRAME SN: 311001 thru 312040

## 1. Page 6-19, Table 6-3, "RESISTORS" Grouping

Change to read:

REF DES.	DESCRIPTION	WILTRON PART NO.
R17	MF, $1/4W$ , 1%, 261 k $\Omega$	110-261k-1
R18	MF, $1/4W$ , $1\%$ , $261 \text{ k}\Omega$	110-261k-1
R24	MF, $1/4W$ , $1\%$ , $261 \text{ k}\Omega$	110-261k-1
R25	MF, $1/4W$ , $1\%$ , $261 \text{ k}\Omega$	110-261k-1
R31	MF, $1/4W$ , 1%, 261 k $\Omega$	110-261k-1
R32	MF, $1/4W$ , $1\%$ , $261 \text{ k}\Omega$	110-261k-1
R58	MF, $1/4W$ , $1\%$ , $30.1 \text{ k}\Omega$	110-30.1k-1
R60	MF, $1/4W$ , $1\%$ , 2.49 k $\Omega$	110-2 <b>.</b> 49k-1

TECO G914 1/83

CHANGE #9

MODELS AFFECTED: 6609A-50, 6617A-40, 6647A-40

RF DECK SN: All

Instructions for updating the manual to cover the three affected models are listed in Change Addendum #1, which follows this change notice.

CHANGE #10

MODEL AFFECTED: 6609A

RF DECK SN: 303004 & up

#### 1. Page 5-21, paragraph 5-8.2c

a. Change step 1 to read:

"For all models except 6609A, 6629A, 6629A-40, and 6642A:"

b. Add the following between steps 1.(a) and 2:

"1a. For the 6609A, connect multimeter as described in step 1(a) above. Adjust
A6R47 for 5 ±0.2 Vdc."

2. Page 5-24, paragraph 5-9d.

In step 4. 3rd line, change the words in parentheses to read "(A6R87 for 6609A).

#### 3. Page 6-23, Table 6-6

Delete this table entirely. The 660-D-8007-4 assembly has been replaced by the 660-D-8008-8 assembly, Table 6-15.

## 4. Pages 6-37 and 6-38, Table 6-15

a. Change the caption to read "A6, A7, A8 YIG Driver PCB, 6609A/6629A/6637A/6638A/6647A/6648A (660-D-8008-4, -7, -8, -99-90).

b. Add:

REF DES.			MON MALASSI	WILTRON PART NO.
e se di que das	fellation Father by	O111 11 01 1	ORS	
C20	1-2705-01 1-2705-01	Disc, Ceramic, .01 μF	i saik di wal Geberara	M
	7 - 110 (1-51) 1 - 4185 - 11	RESISTO	TTO SELECTION OF THE	100
R87 R88	i-xi.Di-sit I-xiba.L-fi	MF, 1/4W, 9.53 kΩ MF, 1/4W, 1 kΩ	- 14 (2.4 %) (2.4 %) WW\[P   13 (2.5 %) (7.5 )	

## 5. Page 7-114, Table 7-17, 2nd row

Change the entry in the first column to read "660-D-8008-8."

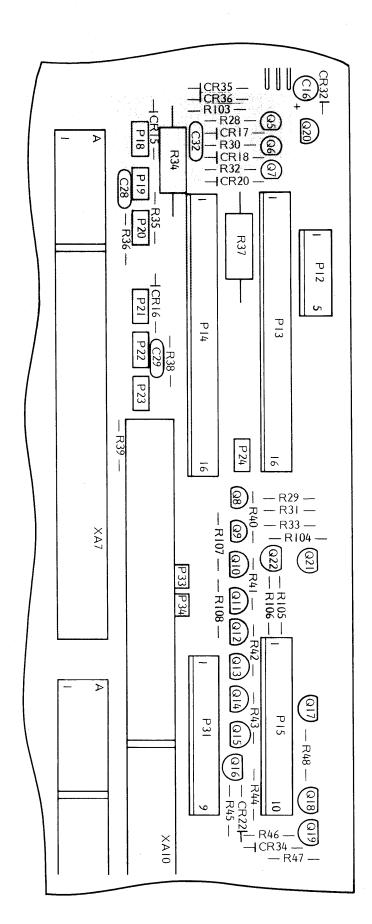
# 6. Pages 7-128 thru 7-132- spring to the second set assert as the second set as a second as the second seco

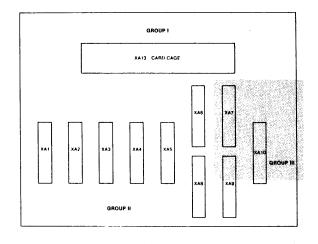
Remove and replace with revised pages 7-128 thru 7-132, following.

PCO 2634 11/82

THE WAR STORY

在2.37 第2.37 42.31





Osc 1 YIG, PIN Driver, and PIN/Modulator Parts Locator Diagram

# 7-12.4 Assy 660-D-8008-8 YIG Driver PCB, Circuit Description

The Het/YIG Driver PCB provides the drive current and bias voltage for the 4.61 to 6.6 GHz YIG oscillator, which is heterodyned with a 4.6 GHz fixed oscillator to generate the .01 to 2 GHz output frequency. The A6 PCB also provides the following:

- A modulating current for the MOD 1 (Modulator) component.
- A switching current for the MOD 2 (PIN Switch) component.
- Linearizing ROM output data. (A linearizing ROM, if installed, provides frequency correction data for making the frequency characteristics of the YIG oscillator linear.)

A block diagram for the YIG Driver PCB is shown in Figure 7-65. A simplified schematic of the E/I (voltage to current) Converter circuit is shown in Figure 7-66. And the PCB schematic (3 sheets) is provided in Figure 7-67.

The F CEN, ΔF>50 MHz, and F CORR signals generated on the A5 PCB are summed together at the E/I Converter (Figure 7-65) and used to generate the YIG tuning coil current. The output of this YIG is a sweeping frequency, 4.61 to 6.6 GHz. This sweeping output is applied to the Down Converter Assembly, where it is beat with a 4.6 GHz oscillator. The product, a sweep .01 to 2 GHz, is amplified and applied to the RF output circuit (paragraph 7-14).

As shown in Figure 7-66, the three A5 voltage signals — along with a heterodyne offset voltage via R87 — are applied to U3. The output from U3 controls the current through the YIG tuning coil, via transistor A6Q2 (located on the RF Deck). (-38V is applied to the emitter of A6Q2 via A6Q3, which is used as a voltage switch in other 6600A Series models.) The current through the YIG coil develops a proportional voltage drop across sense resistor (R SENSE) R25.

The remaining input to the E/I Converter is the CW FILTER line. When the microproc-

essor commands that the CW filter be inserted, relay K1 is activated. (The CW filter is inserted when the sweep width is ≤50 MHz or when a CW mode has been selected from the front panel.) When K1 is activated, the R23-C10 network creates an alternate negative-feedback path around the YIG oscillator. This path reduces the noise current flowing through the coil; thereby quieting the YIG oscillator frequency output.

As shown in Figure 7-65, the voltage developed across R25 provides the input for the A7 Sweeping Bias Supply. This circuit is not used with the 6609A.

The inputs to U2C, the PIN Switch control gate, are the L RF OFF and L PIN SW OFF lines from the A4 PCB and the H YIG SEL line from the Bandswitch Logic. When all three of these inputs are HIGH, the L PIN SELECT line is TRUE. The RF OFF line is HIGH when the front panel RF ON switch is depressed (On). The PIN SW OFF line is HIGH during the forward sweep and goes LOW at the start of the sweep retrace (provided RETRACE RF is not On). The YIG SEL line is always HIGH.

When the **L PIN SELECT** line is FALSE, it reverse-biases A14CR18 (Figure 7-67, Sheet 3). Reverse-biasing CR18 causes A14Q6 to turn on, A14Q10 to turn on, and A14Q11 to turn off. When on, Q10 sources current into the MOD (PIN Switch).

Conversely, when the **L PIN SELECT** line is TRUE, CR18 is forward-biased. Forward-biasing CR18 causes Q6 to turn off, Q10 to turn off, and Q11 to turn on. When on, Q11 sinks current from the MOD (PIN Switch).

Sourcing current into MOD 2 (PIN Switch) effectively opens the RF output circuit. Conversely, sinking current from the switch closes the circuit. This switch is used to apply square-wave modulation to the RF output energy.

The inputs to the Linearizer ROM (U5) are the ROM Bus lines from the microprocessor, via the A14U6 latch on the motherboard. The Linearizer ROM is enabled by the TRUE state of the L ROM SEL line from the

Para. 7-12.4 (cont'd.)

Bandswitch Logic circuit. This ROM outputs eight bits of data to the A5 PCB. This circuitry is not presently used with the 6609A.

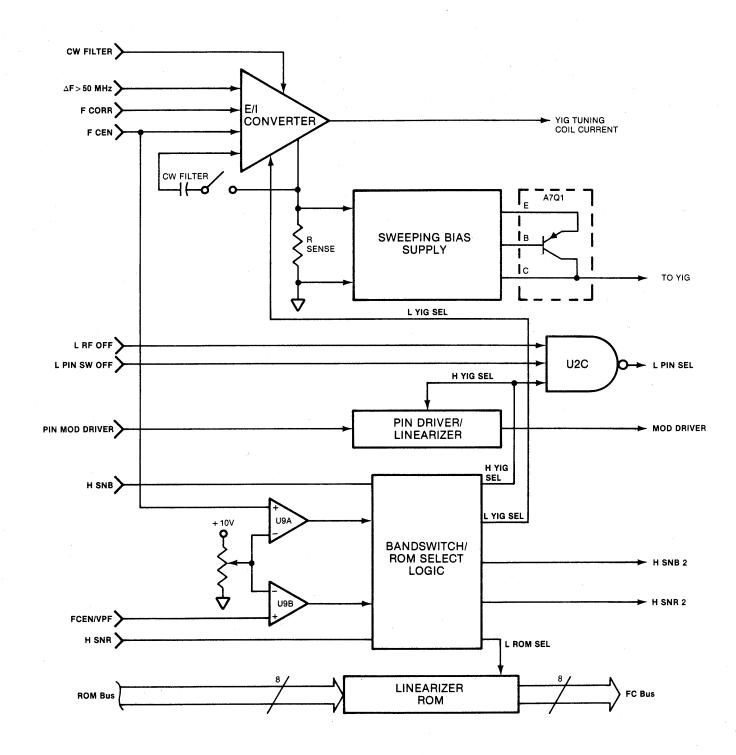
The input to the PIN Driver/Linearizer (U4A, U4B, Q3, Q4) is the PIN MOD DRIVER voltage signal from the A4 PCB. This circuit has two functions: (1) It provides the ALC-loop-gain adjustment, and (2) it makes linear the relationship between the A4 PCB Level Amp output in Vdc (paragraph 7-11.1) and the RF power output in dBm. The output from this circuit is a current: MOD DRIVER. This current is supplied to MOD 1 on the RF Deck, via A14R34 (Figure 7-67, Sheet 3).

The input to the -5V Bias Supply (U1B, U7C, Q5, Q7) is the control line, L RF OFF. When the front panel RF ON switch is disengaged (out), the microprocessor sets this line TRUE. When L RF OFF is TRUE, the -5V Bias Supply is turned off, thus turning off the YIG oscillator.

The Bandswitch/ROM Select Logic circuit (U8A-U8D), along with its input comparators U9A and U9B, provide bandswitching voltages in multiband models using two or more YIG oscillators. In the 6609A, this circuit is configured such that the H SNB and H SNR output lines are always FALSE, and the H YIG SEL and L YIG SEL output lines are always TRUE.

(U1B, U7C, OFF. When disengaged; line TRUE. e -5V Bias off the YIG

ogic circuit comparators ing voltages r more YIG circuit is and H SNR and the H it lines are



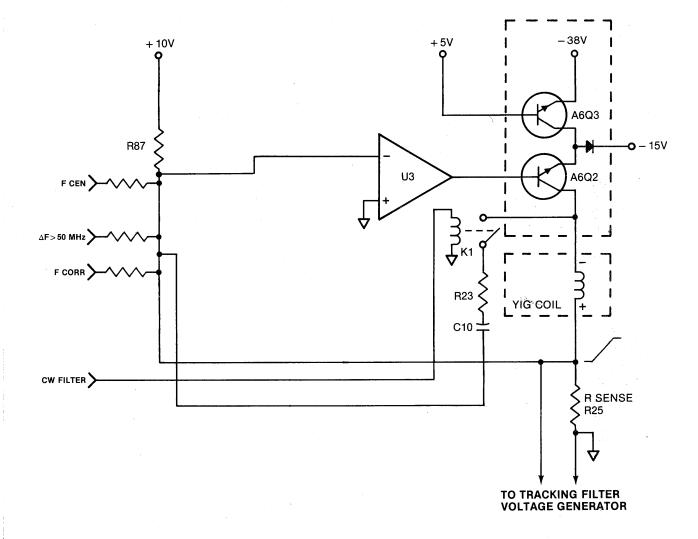
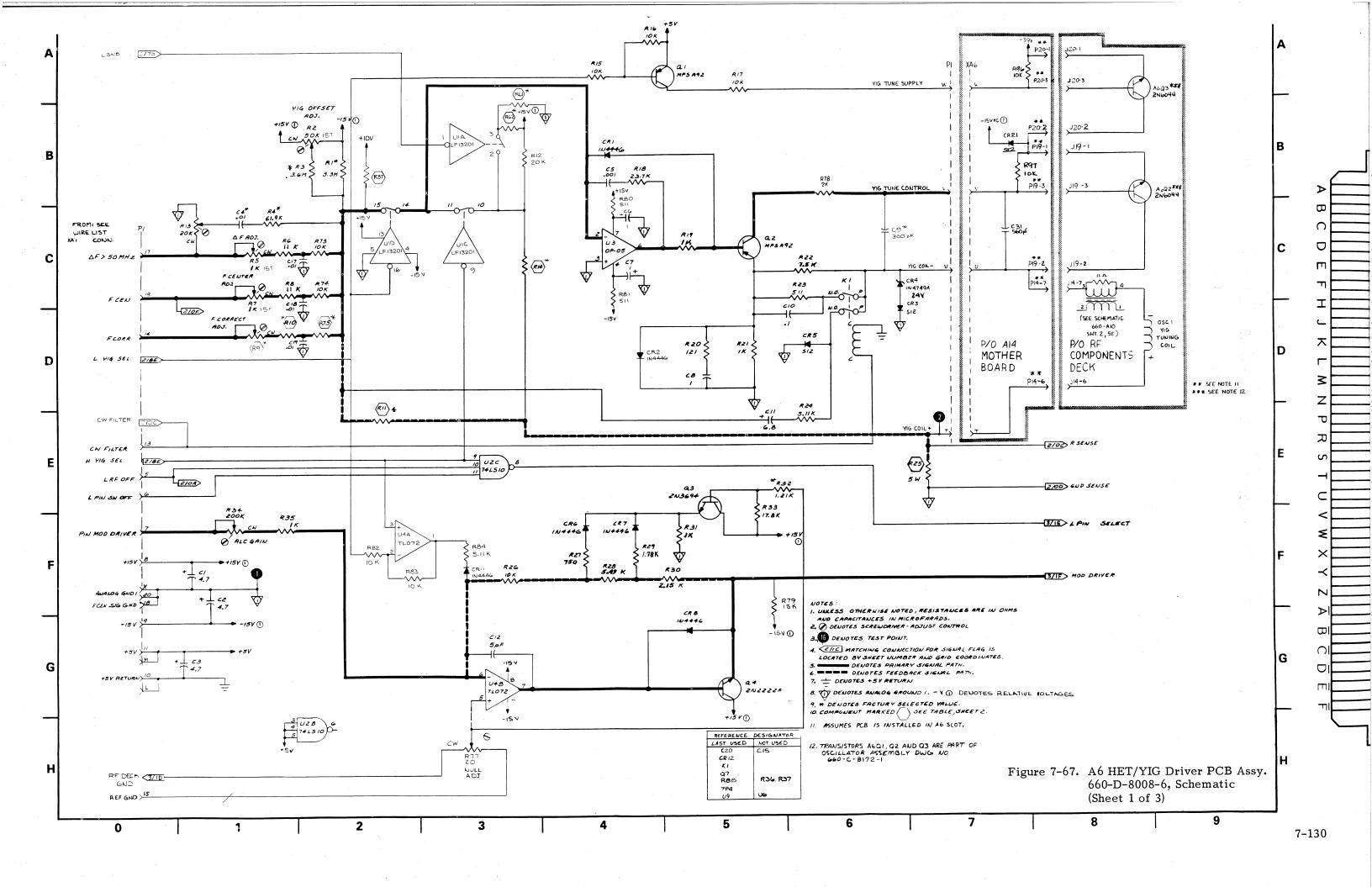


Figure 7-65

Figure 7-65. A6 YIG Driver PCB (Assy 660-D-8008-8) Block Diagram

Figure 7-66. Assy. 8008-8 E/I Converter Simplified Schematic



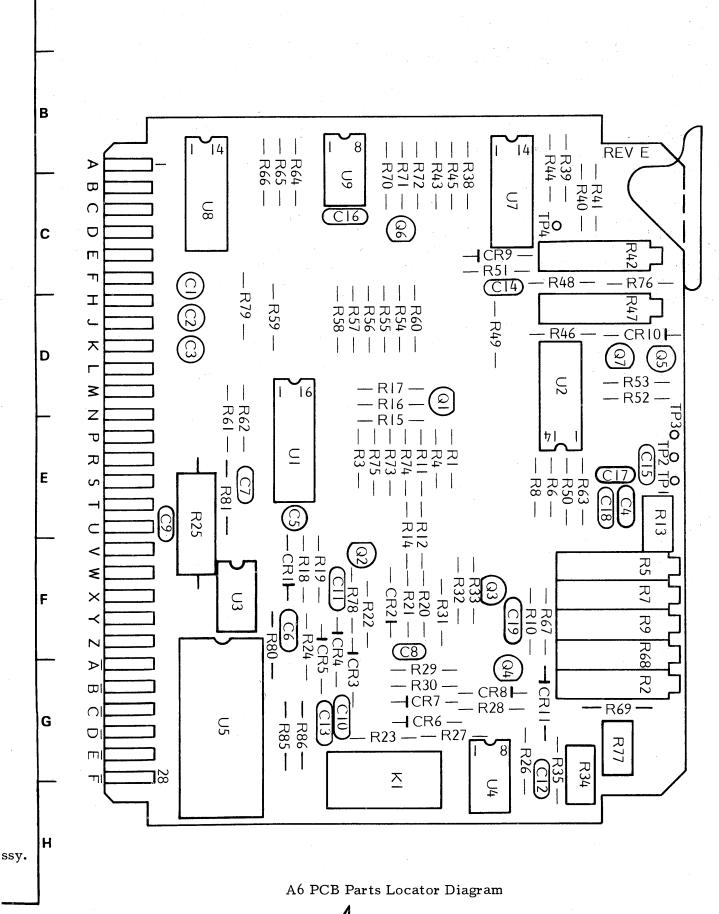
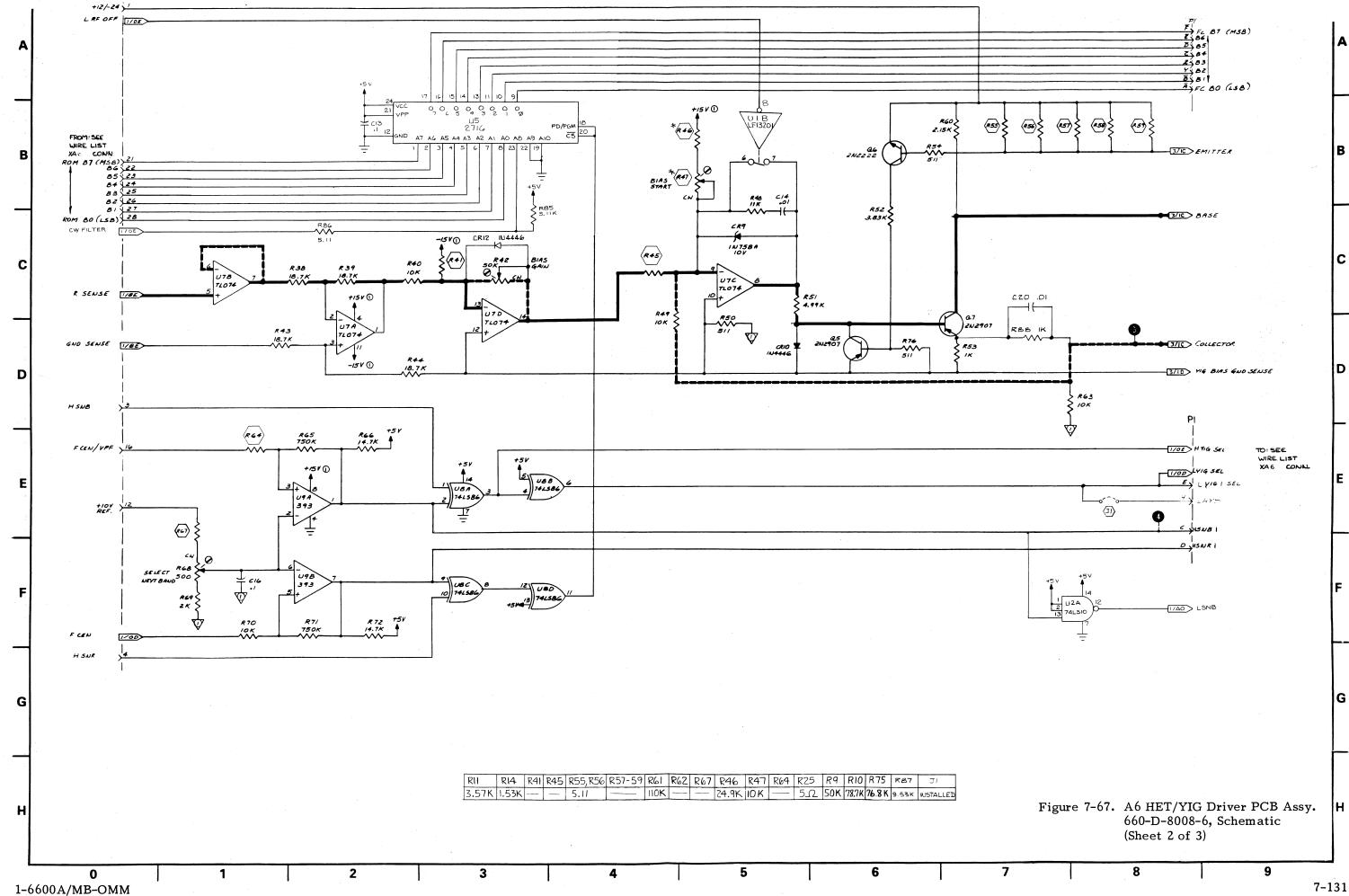
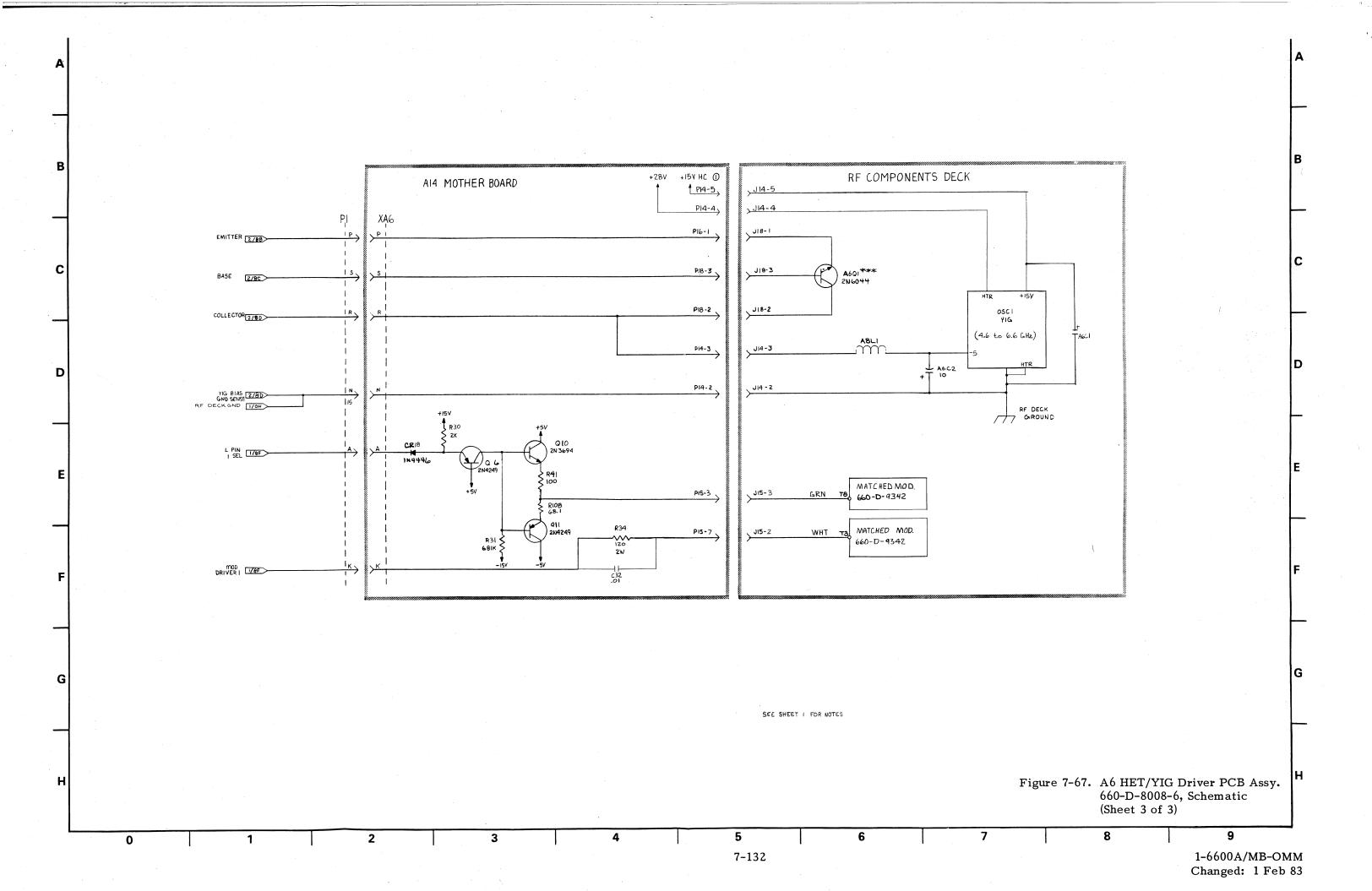


Figure 7-67 (Sheet 1 of 3)

1-6600A/MB-OMM Changed: 1 Feb 83





CHANGE #11

MODELS AFFECTED: All

BASIC FRAME SN: 312001 & up

1. Page 5-8, paragraph 5-5b

Delete steps 8 thru 12 and the "NOTE."

2. Pages 5-9 and 5-10, paragraph 5-6

Perform the following steps a. thru b.3., then proceed to page 5-10 and continue the procedure with step c.

## a. Bandswitch Reference Voltage Adjustment

1. Set up the test equipment as shown in Figure 5-8 and turn the equipment on.

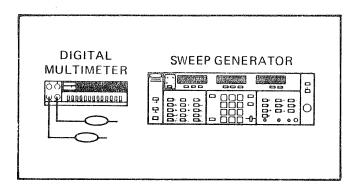


Figure 5-8. Setup for A5 Frequency Instruction Adjustments

- 2. Remove the top cover from the sweep generator (sweeper). Refer to paragraph 7-3.1 for instructions, if necessary.
- 3. Connect the common lead on the digital multimeter (DMM) to A5TP10 (Figure 5-9) and the test lead to A5TP9.
- 4. Adjust A5R55 for  $+10V \pm 1.0 \text{ mV}$ .
- 5. Move the DMM test lead to A5TP8 and adjust A5R49 for  $-10 \pm 1.0$  mV.

# b. Sweep Width ( $\Delta F$ ) Signal Path Adjustments

- 1. Press RESET.
- 2. Press SHIFT, then EXT SWEEP.
- 3. Remove the DMM leads from A5TP8 and A5TP10. Connect a BNC-to-clip-lead jumper between the rear panel EXT SWEEP connector and A5TP9 and A5TP10 (center conductor to A5TP9).
- 4. Connect the DMM test lead to A5TP5 and the common lead to A5TP10. Note the voltage level at A5TP5.
- 5. Disconnect the BNC connector from EXT SWEEP; note the voltage value at A5TP5.
- 6. Alternately connect and disconnect the BNC connector at the EXT SWEEP connector, and adjust A5R29 for equal TP5 voltages ±1.0 mV. Record both voltage values.
- 7. Press MANUAL SWEEP, and rotate its associated control fully clockwise.
- 8. Adjust A5R69 for the "-" voltage value recorded in step 6  $\pm 1.0$  mV.
- 9. Rotate the MANUAL SWEEP control fully counterclockwise, and verify that the "+" voltage at A5TP5 is the same as that recorded in step 6 ±25.0 mV.

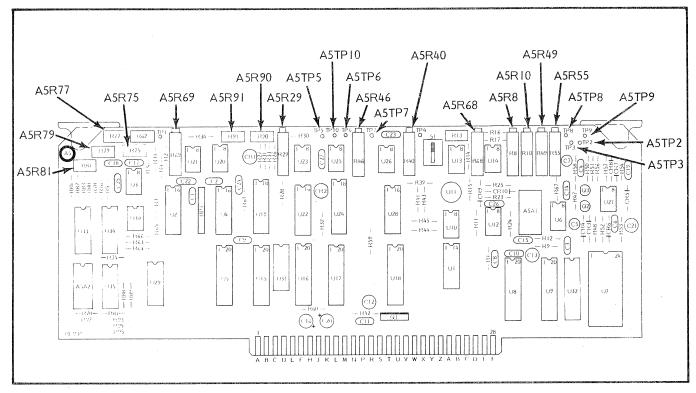


Figure 5-9. A5 Frequency Instruction Adjustments

- 10. Remove the BNC connector from the EXT SWEEP connector.
- 11. Press SHIFT, then EXT SWEEP.
- 12. Move the DMM test lead to A5TP6.
- 13. Connect a jumper between A5TP5 and A5TP10.
- 14. Press  $\Delta F F 0$ .
- 15. Press  $\Delta F$  and set for 0 MHz.
- 16. Adjust A5R46 for  $0V \pm 1.0 \text{ mV}$ .
- 17. Move the DMM test lead to A5TP7.
- 18. Adjust A5R40 for  $0V \pm 1.0 \text{ mV}$ .
- 19. Remove the jumper from between A5TP5 and A5TP10.
- b.1. Step DAC Output-Voltage
  Adjustment, Version 06 Software
  (Disregard this step if Option 3 is not installed)

#### NOTE

The two-digit software version number appears on the F1-F0-M1 LED display when the POWER pushbutton is pressed to on.

- 1. Connect the 85 Controller to the GPIB Interface.
- 2. On the 85, type OUTPUT 705; "FUL STP STS4095E". Press END LINE.

#### NOTE

The front panel GPIB RE-MOTE indicator should light.

- 3. Move the DMM test lead to A5TP5.
- 4. Adjust A5R90 for the "-" voltage value recorded in step b.6 ±1.0 mV.
- 5. Press RETURN TO LOCAL.

#### b.2. Step DAC Output-Voltage Adjustment, Version 07 Software

- Move the test lead to A5TP5. 7
- 2. Press SHIFT, then RF ON.
- 3. Ajust A5R90 for the "-" voltage value recorded in step b.6 ±1.0 mV.
- Press SHIFT to return the front panel 4. to normal operation.

#### b.3. Ramp Output Adjustments

Connect the DVM to the rear panel HORIZ OUTPUT connector.

- Ground the center conductor on the EXT SWEEP connector.
- Rotate the MANUAL SWEEP control 3. fully clockwise.
- 4. Press SHIFT, then EXT SWEEP.
- 5. Adjust A5R62 for 0V ±1.0 mV.
- 6. Press MANUAL SWEEP and adjust A5R91 for  $10V \pm 1.0 \text{ mV}$ .
- Repeat steps 5 and 6 as necessary to obtain the OV and 10V ±1.0 mV values.

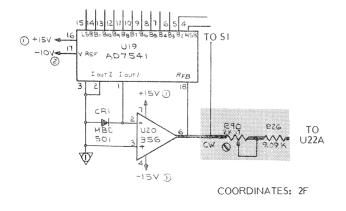
# 3. Page 6-22, Table 6-5, "RESISTORS" Grouping

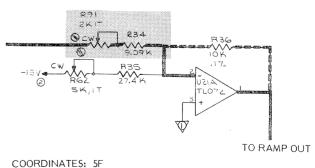
1. Change to read:

REF DES.	DESCRIPTION	WILTRON PART NO.
"R26	MF, $1/4W$ , $1\%$ , $9.09 \text{ k}\Omega$	110- <u>9.09k</u> -1
R34	MF, $1/4W$ , $1\%$ , $9.09 \text{ k}\Omega$	110- <u>9.09k</u> -1"
2. Add:		
R90	Variable, single turn, $2 \text{ k}\Omega$	156-2k
R91	Variable, single turn, $2 \text{ k}\Omega$	156-2k
R92	MF, $1/4\text{W}$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R93	MF, $1/4\text{W}$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R94	MF, $1/4\text{W}$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R95	MF, $1/4\text{W}$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1

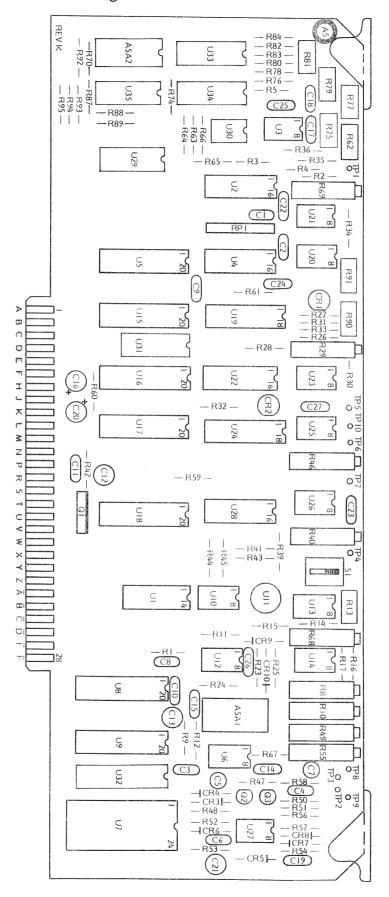
### 4. Page 7-110, Figure 7-58

a. Add R90 and R91, and change the value of R26 and R34, as shown below.

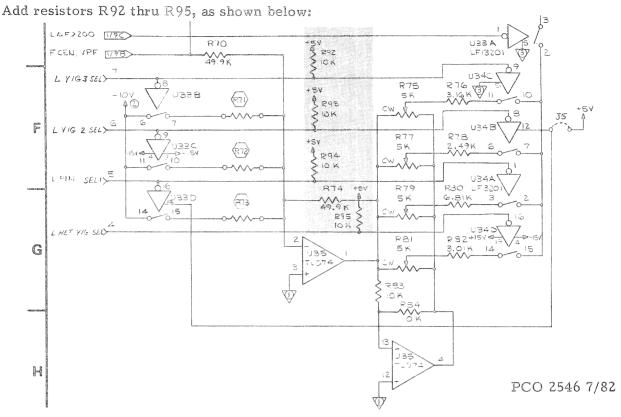




1-6600A-MB/OMM C-11 b. Copy the following revised A5 PCB Parts Locator, and tape or glue it over the existing "A5 PCB Parts Locator Diagram."



## 5. Page 7-111, Figure 7-58, Sheet 2



CHANGE #12

MODELS AND SERIAL NUMBERS AFFECTED:

6621A, 316001 & up 6629A, 316001 & up 6637A, 316001 & up 6638A, 303001 & up 6647A, 316001 & up 6647A-40, 305001 & up 6647A-40, 305001 & up 6648A, 303001 & up 6653A, 307001 & up 6659A, 307001 & up

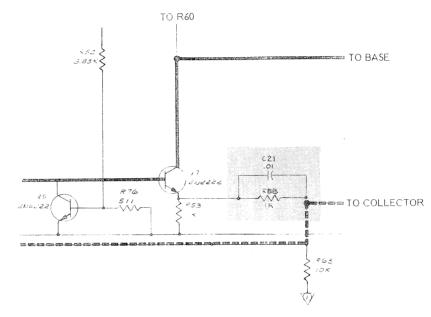
# 1. Pages 6-32 thru 6-43, Tables 6-12, 6-13, 6-14, 6-17, 6-18, and 6-19

Add:

1-6600A-MB/OMM

## 2. Pages 7-157 thru 7-170, Figures 7-78 thru 7-82, Sheet 2

Add C21 and R88, as shown below.



CGORDINATES: 7D

PCO 2681 11/82

CHANGE #13

MODELS AND SERIAL NUMBERS AFFECTED:

6629A, 316001 & up 6637A, 316001 & up 6638A, 303001 & up 6647A, 316001 & up 6648A, 303001 & up

## 1. Page 6-37, Table 6-15

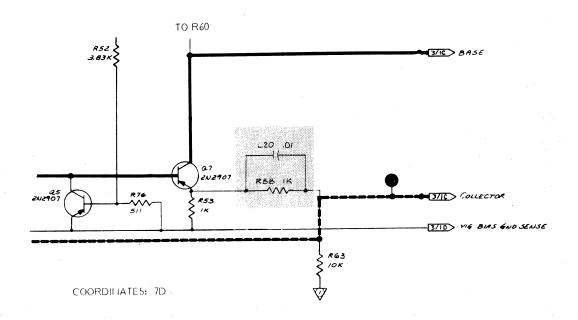
Add:

REF DES.	DESCRIPTION	WILTRON PART NO.
	CAPACITORS	
C20	Disc , Ceramic, .01 μF	230-11
	RESISTORS	
R88	MF, $1/4$ W, $1\%$ , $1$ k $\Omega$	110-1k-1

C-14 1-6600A-MB/OMM

# 2. Page 7-151, Figure 7-56, Sheet 2

Add C20 and R88, as shown below.



PCO 2680 11/82

CHANGE #14

MODELS AND SERIAL NUMBERS AFFECTED:

6617A, 306001 & up 6617A-40, 300001 6637A, 315001 & up 6637A-40, 304001 & up 6638A, 306001 & up 6647A-40, 304001 & up 6648A, 306001 & up 6653A, 306001 & up 6659A, 306001 & up

# 1. Pages 6-25 thru 6-28, 6-31, and 6-32; Tables 6-7 thru 6-9 and 6-11

Delete these tables, and replace them with Table 6-11A following.

## 2. Page 7-114, Table 7-17

Change as shown below.

YIG DRIVER ASSY NO.	PCB SLOT	YIG OSCILLATOR PART NO.	MODEL(\$)	CIRCUIT DESCRIPTION PARAGRAPH NO.	SCHEMATIC FIG. NO.
660-D-8006-4	A6	1005-47	6637A, 6647A	7-12.3	7-62
660-D-8008-8	A6,	1005-45	6609A	7-12.4	7-67
660-D-8006-8	A6	1005-47	6638A, 6648A	7-12.3	7-62
660-D-8006-7	A6	1005-47	6617A	7-12.3	7-62
660-D-8006-6	A6	1005-47	6653A, 6659A	7-12.3	7-62
660-D-8006-99-91	A6	1005-47	6621A	7-12.3	7-62
660-D-8190-99-96	A6	1005-35	6642A	7-12.6	7–73
660-D-8006-5	A6	1005-47	6637A-40	7-12.3	7-63
660-D-8006-5-99 -91	<b>A</b> 6	1005-47	6621A-40	7-12.3	7-63

# 3. Pages 7-115 and 7-116, paragraph 7-12.3

a. Change the paragraph heading to read:

"Assy 660-D-8006-3, -4, -5, -6, -7, -8, and -99-91 Het/YIG Driver PCB, Circuit Description"

Table 6-11A. A6 HET/YIG Driver, 2-8 GHz, 6617A/6617A-40/6637A/6637A-40/6638A/6647A/6647A-40/6648A/6653A/6659A (660-D-8006-3, -4, -5, -6, -8, -99-91)

	CAPACITORS			RESISTORS	·
REF. DES.	DESCRIPTION	WILTRON PART NO.	REF. DES.	DESCRIPTION	WILTRON PART NO.
C1	Monolithic, .1 μF	230-37	R1	Variable, 1-Turn, 20 k $\Omega$	156-20K
C2 C3	Monolithic, .1 μF Tantalum, 6.8 μF	230-37 250-41	R2	MF, 1/4W, 1%, 61.9 kΩ	110-61.9k-1
C4	Monolithic, .1 µF	230-37	R3 R4	Variable, 15-Turn, 1 k $\Omega$ MF, 1/4W, 1%, 11 k $\Omega$	157-1k 110-11k-1
C5	Tantalum, 6.8 µF	250-41	R5	Variable, 15-Turn, 50 k $\Omega$	157-50k
C6	Monolithic, .1 μF	230-37	R6	CC, $1/4$ W, 5%, 3.6 M $\Omega$	101-3.6M-5
C7	Tantalum, 6.8 μF	250-41	R7	Variable, 15-Turn, 1 kΩ	157-1k
C8	Monolithic, .1 μF	230-37	R8	MF, $1/4W$ , 1%, 11 k $\Omega$	110-11k-1
C9	Mylar, .01 μF	227-50	R9	Variable, 15-Turn, 200 k $\Omega$	157-200k
C10 C11	Ceramic, .001 µF Tantalum, 4.7 µF, 35V	230-30 250-19	R10 R11	MF, 1/4W, 1%, 205 kΩ MF, 1/4W, 1%, 100 kΩ	110-205k-1 110-100k-1
C12	Tantalum, 4.7 μF, 35V	250-19	R12	Variable, 15T, $5 \text{ k}\Omega$	157-5k
C13	Monolithic, 1 µF	230-41	R12	Variable, 15-Turn, 20 k $\Omega$	157-20k
C14	Monolithic, .1 μF	230-37	R13	MF, $1/4$ W, $1\%$ , $110$ kΩ	110-110k-1
C15	Mica, 300 pF	220-300	R13	MF, 1/4W, 1%, 75 kΩ	110-75k-1
C16	Tantalum, 6.8 µF	250-41	R13 R14	MF, $1/4$ W, $1\%$ , $56.3 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $14 \text{ k}\Omega$	110-56.3k-1
C17 C18	Ceramic, .001 μF Mylar, .01 μF	230-30 227-50	R14	MF, $1/4W$ , $1\%$ , $14KM$ MF, $1/4W$ , $1\%$ , $9.76 k\Omega$	110-14k-1 110-9.76k-1
C19	Tantalum, 6.8 µF	250-41	R14	MF, $1/4W$ , $1\%$ , 4.22 k $\Omega$	110-4.22k-1
C21	Mica, 8.2 pF	221-8.2	R14	MF, $1/4W$ , 1%, 6.65 k $\Omega$	110-6.65k-1
C22	Mica, 820 pF	220-820	R15	<b>WW</b> , 5 <b>W</b> , 5Ω	131-3
C 23	Mylar, .01 μF	227-50	R16	MF, $1/4$ W, $1\%$ , $100$ kΩ	110-100k-1
C 24	Mylar, .01 μF	227-50	R17	MF, $1/4$ W, $1\%$ , $13.3 k\Omega$	110-13.3k-1
C25 C26	Mylar, .01 μF Monolithic, .1μF	227-50 230-37	R18 R19	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ	110-10k-1 110-10k-1
C27	Mica, 15 pF	220-15	R20	MF, $1/4W$ , $1\%$ , $10 \text{ k}$ MF, $1/4W$ , $1\%$ , $10 \text{ k}$ $\Omega$	110-10k-1 110-10k-1
02.	mica, ro pr	220 13	R21	MF, $1/4$ W, $1\%$ , 23.7 k $\Omega$	110-23.7k-1
			R22	MF, $1/4$ W, $1\%$ , $1$ k $\Omega$	110-1k-1
			R23	MF, $1/4W$ , 1%, $121\Omega$	110-121-1
	DIODES		R24 R25	MF, $1/4$ W, $1\%$ , $1$ k $\Omega$ MF, $1/4$ W, $1\%$ , $7.5$ k $\Omega$	110-1k-1 110-7.5k-1
REF.	<b>*</b>	WIII TROM	R26	MF, $1/4W$ , 1%, 5.11 $\Omega$	110-5.11-1
DES.	DESCRIPTION	WILTRON PART NO.	R27	MF, $1/4W$ , 1%, $5.11 \text{ k}\Omega$	110-5.11k-1
222.	======================================		R28	MF, $1/4W$ , 1%, $18.7 \text{ k}\Omega$	110-18.7k-1
CR1	Silicon, 1N4446	10-1N4446	R29	MF, 1/4W, 1%, 536 kΩ	110-536k-1
CR2	Silicon, 1N4446	10-1N4446	R30 R31	MF, $1/4$ W, $1\%$ , $18.7 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1
CR3	Silicon, 1N4446	10-1N4446	R32	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1 110-18.7k-1
CR4 CR5	Silicon, SI2 Zener, 24V, 1W, 1N4749A	10-SI2	R33	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1
CR6	Silicon, 1N4446	10-1N4749A 10-1N4446	R34	MF, $1/4$ W, $1\%$ , $18.7$ k $Ω$	110-18.7k-1
CR7	Silicon, 1N4446	10-1N4446	R35	MF, 1/4W, 1%, 536 kΩ	110-536k-1
CR8	Zener, 6.8V, 1W, 1N4736A	10-1N4736A	R36 R37	Variable, 15-Turn, 2 k $\Omega$ MF, 1/4W, 1%, 20 k $\Omega$	157-2k
CR9	Silicon, 1N4446	10-1N4446	R38	Variable, 15-Turn, 50 k $\Omega$	110-20k-1 157-50k
CR10	Silicon, 1N4446	10-1N4446	R39	MF, $1/4W$ , 1%, 205 k $\Omega$	110-205k-1
CR11	Silicon, 1N4446	10-1N4446	R40	MF, $1/4W$ , $1\%$ , $75 k\Omega$	110-75k-1
			R41	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
	TO A MOTOTOD C		R42	MF, 1/4W, 1%, 9.53 kΩ	110-9.53k-1
	TRANSISTORS		R43 R44	MF, $1/4$ W, $1\%$ , $11$ k $\Omega$ MF, $1/4$ W, $1\%$ , $3.24$ k $\Omega$	110-11k-1 110-3.24k-1
REF.		WILTRON	R45	MF, $1/4W$ , $1\%$ , $3.24 k\Omega$	110-3.24k-1
DES.	DESCRIPTION	PART NO.	R46	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1
01	DND MDCA02	20	R47	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
Q1 Q2	PNP, MPSA92 PNP, MPSA92	20-MPSA92	R48	MF, $1/4$ W, 1%, $5.11\Omega$	110-5.11-1
Q2 Q3	NPN, 2N2222	20-MPSA 92 20-2N 2222	R49	MF, $1/4$ W, $1\%$ , $5.11\Omega$	110-5.11-1
Q4	NPN, 2N2907	20-2N 2907	R50 R51	MF, $1/4$ W, $1\%$ , $2.74$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$	110-2.74k-1 110-10k-1
Q5	NPN, 2N2222	20-2N2222	R 52	MF, $1/4W$ , $1\%$ , $750 \text{ k}\Omega$	110-10k-1 110-750k-1
Q6	NPN, 2N3694	20-2N3694	R53	MF, $1/4W$ , $1\%$ , $14.7 k\Omega$	110-14.7k-1
Q7	NPN, MPSU04	20-MPSU04	R54	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1

1-6600A/MB-OMM

Changed: February 1983

R 55	MF, $1/4W$ , $1\%$ , $750 \text{ k}\Omega$	110-750k-1	7000	77	15/ 20
R56	MF, $1/4W$ , $1\%$ , $14.7 \text{ k}\Omega$	110-14.7k-1	R88	Variable, 1-Turn, 20Ω	156-20
R57	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$	110-14.7k=1 110-5.11k-1	R89	MF, $1/4$ W, $1\%$ , $15 \text{ k}\Omega$	110-15k-1
R57	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$	110-5.11k-1	R90	Not Used	
R57	MF, $1/4W$ , $1\%$ , $3.11 \text{ k}$ MF, $1/4W$ , $1\%$ , $2.74 \text{ k}$ $\Omega$	110-3.11k-1 110-2.74k-1	R91	Not Used	
R57	MF, $1/4W$ , $1\%$ , $3.16 \text{ k}\Omega$	110-2.74k-1 110-3.16k-1	R92	MF, $1/4W$ , 1%, $511\Omega$	110-511-1
R57	MF, $1/4W$ , $1\%$ , $976\Omega$	110-3.168-1	R93	MF, $1/4W$ , 1%, $511\Omega$	110-511-1
R58	Variable, 15-Turn, $500 \Omega$		R94	Variable, 15-Turn, 1 kΩ	157-1k
R 59	MF, $1/4$ W, $1\%$ , $2 k\Omega$	157-500 110-2k-1	R95	MF, $1/4W$ , 1%, 5.11 k $\Omega$	110-5.11k-1
R60	MF, $1/4W$ , $1\%$ , $2KM$ MF, $1/4W$ , $1\%$ , $10 k\Omega$		R96	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R61	MF, $1/4W$ , $1\%$ , $10 \text{ km}$ MF, $1/4W$ , $1\%$ , $750 \text{ k}\Omega$	110-10k-1	R97	MF, $1/4$ W, $1\%$ , $750$ kΩ	110-750k-1
R62	MF, $1/4W$ , $1\%$ , $730 \text{ k}$ ? MF, $1/4W$ , $1\%$ , $14.7 \text{ k}$	110-750k-1	R98	MF, $1/4$ W, $1\%$ , $14.7$ kΩ	110-14.7k-1
R63	MF, $1/4W$ , $1\%$ , $14.7 \text{ kM}$ MF, $1/4W$ , $1\%$ , $27.4 \text{ k}\Omega$	110-14.7k-1			
R63	MF, $1/4W$ , $1\%$ , $27.4 \text{ k}$ MF, $1/4W$ , $1\%$ , $18.2 \text{ k}$ $\Omega$	110-27.4k-1		INTEGRATED CIRCUITS	
R63		110-18.2k-1			
R63	MF, 1/4W, 1%, 20 kΩ	110-20k-1	REF.		WILTRON
R64	MF, $1/4$ W, $1\%$ , $6.49$ k $\Omega$ MF, $1/4$ W, $1\%$ , $2$ k $\Omega$	110-6.49k-1	DES.	DESCRIPTION	PART NO.
R65		110-2k-1			
R66	Variable, 15-Turn, 500Ω	157-500	U1	Quad EX-OR Gate, 74LS86	54-125
R67	Variable, 1-Turn, 200 kΩ	156-200k	U2	Quad Op Amp, TL074	54-132
R68	MF, 1/4W, 1%, 20 kΩ	110-20k-1	Ū3	Quad Analog Switch, LF13201	54-20
R69	MF, 1/4W, 1%, 10 kΩ	110-10k-1	U4	Op-Amp, OP05	54-87
R70	MF, 1/4W, 1%, 10 kΩ	110-10k-1	Ū5	2k x 8 EPROM	Not Field-
R71	MF, 1/4W, 1%, 15 kΩ	110-15k-1			Replaceable
R72	MF, 1/4W, 1%, 1.30 kΩ	110-1.30k-1	บ7	Dual Analog Switch, DG 200	50-DG 200BA
R73	MF, 1/4W, 1%, 8.87 kΩ	110-8.87k-1	U8	Dual Op-Amp, TL072	54-53
R74	MF, 1/4W, 1%, 3.40 kΩ	110-3.40k-1	U9	Quad Volt Comparator, MC3302P	54-MC3302P
	MF, 1/4W, 1%, 5.11 kΩ	110-5.11k-1	U10	Input NAND Gate, 74LS10	54-42
R75	MF, 1/4W, 1%, 301Ω	110-301-1			01 12
R76	MF, 1/4W, 1%, 1.21 kΩ	110-1.21k-1			
R77	MF, 1/4W, 1%, 17.8 kΩ	110-17.8k-1		MISCELLANEOUS	
R78	MF, 1/4W, 1%, 511Ω	110-511-1			
R79 R80	MF, 1/4W, 1%, 10 kΩ	110-10k-1	REF.		WILTRON
	MF, 1/4W, 1%, 10 kΩ	110-10k-1	DES.	DESCRIPTION	PART NO.
R81	MF, $1/4$ W, $1\%$ , $205 k\Omega$	110-205k-1			
R82	MF, 1/4W, 1%, 2 kΩ	110-2k-1		Ejector, P.C. Board	553-96
R83	MF, 1/4W, 1%, 5.11 kΩ	110-5.11k-1	TP1		
R84	MF, 1/4W, 1%, 1M	110-1M-1	thru		
R85	MF, $1/4$ W, $1\%$ , $100 \text{ k}\Omega$	110-100k-1	TP5	Pin, Test Point	706- <del>44</del>
R86	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1	K1	Relay, 2 Form C	690-28
R87	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$	110-5.11k-1		Socket, I.C., 24-Pin	553-67

b. Opposite the 4th bullet (black dot), change the text to read:

"An adjustable +15-volt bias for the RF Amplifier that follows Osc. 1 in the 6617A-40, 6621A-40, 6637A-40, and 6647A-40."

c. In the last paragraph on page 7-116, change the 1st sentence to read:

"The input to the +15V Bias Supply...."

## 4. Pages 7-117 thru 7-124

Remove these pages, and replace them with changed pages 7-117 thru 7-124 containing changed Figures 7-62 and 7-63, following.

## 5. Pages 7-125 and 7-126, Figure 7-64

Delete these pages, and remove them from the manual.

## 6. Pages 7-134 thru 7-138, paragraph 7-12.5 and Figure 7-70

Delete these pages, and remove them from the manual.

### 7. Page 7-220, Figure 7-112

- a. Replace this figure with the changed Figure 7-112, following.
- b. Add Figure 7-112A, following.

PCOs 2697 and 2698 11/82 2703 and 2704 2/83

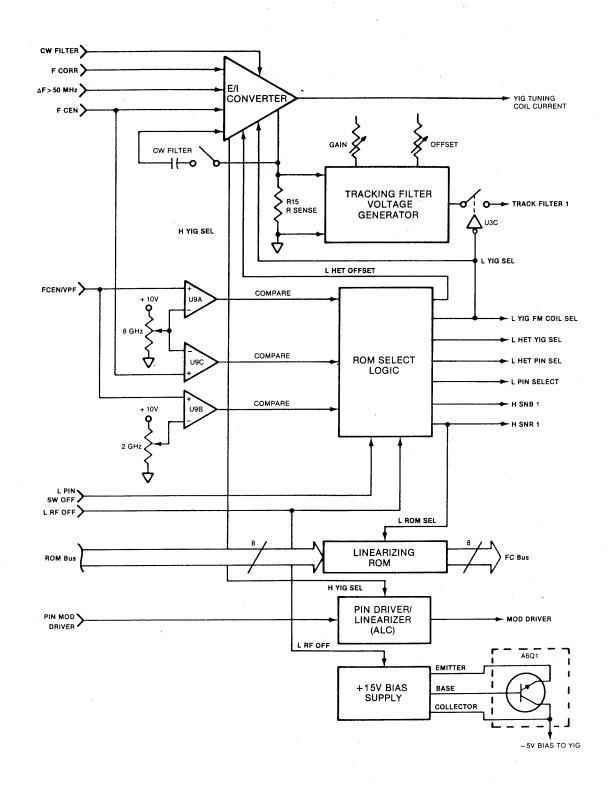


Figure 7-60. A6 Het/YIG Driver PCB (Assy. 660-D-8007 (Block Diagram)

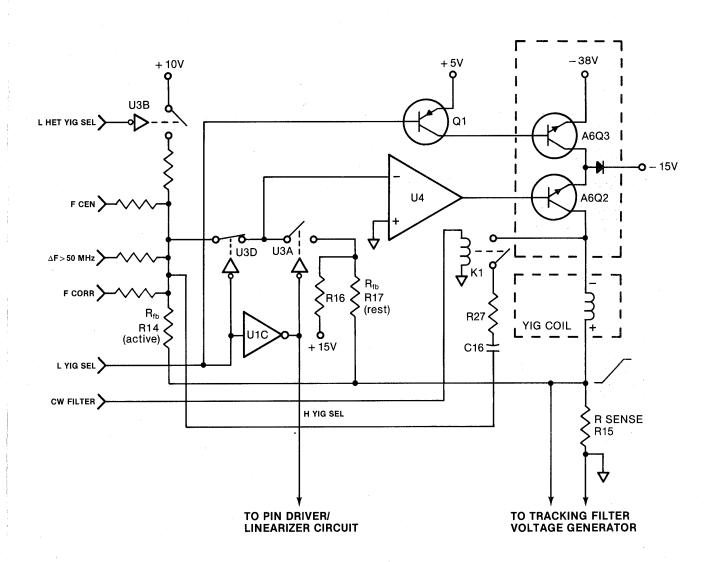
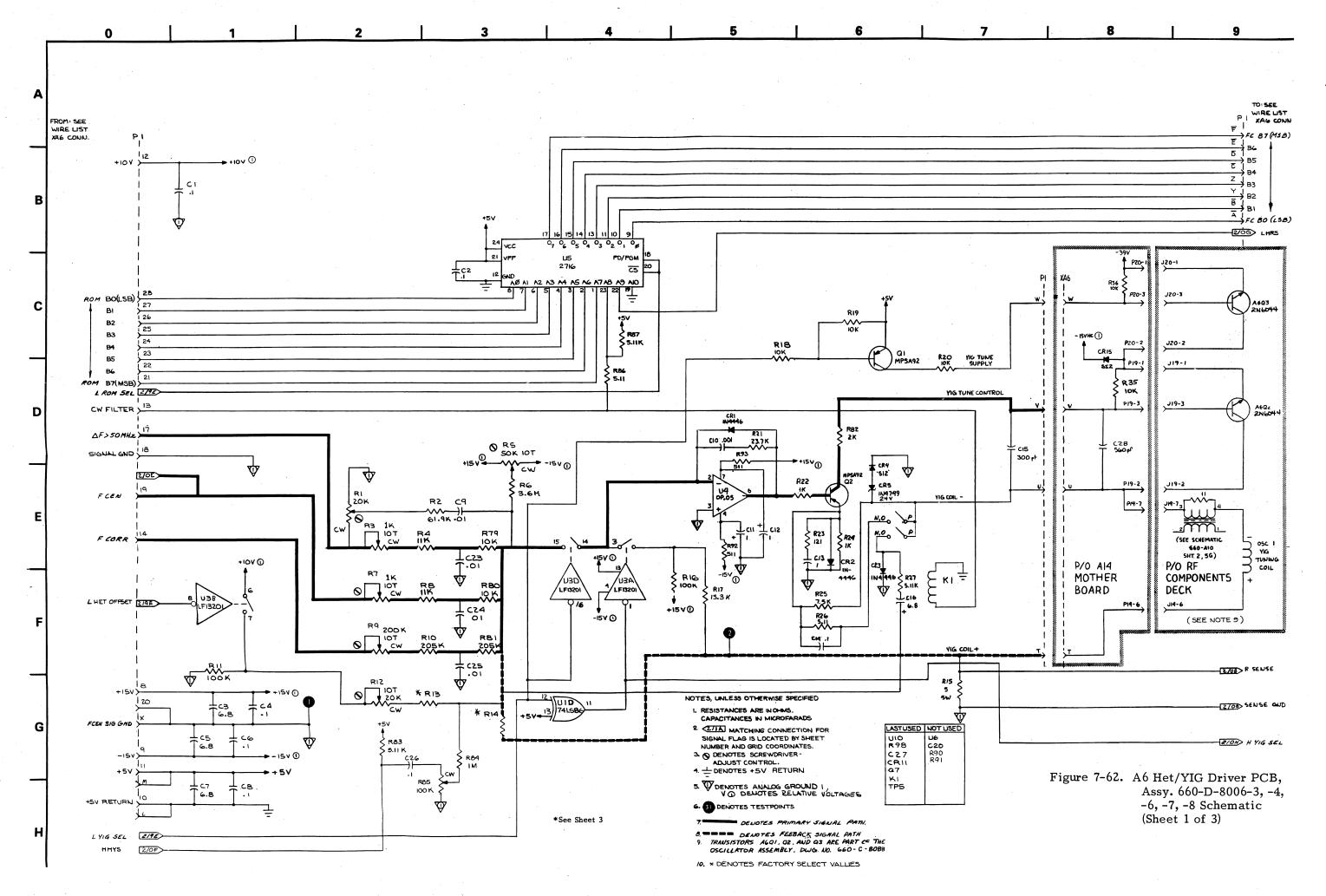


Figure 7-61. A6 Het/YIG Driver PCB
E/I Converter Circuit
Simplified Schematic



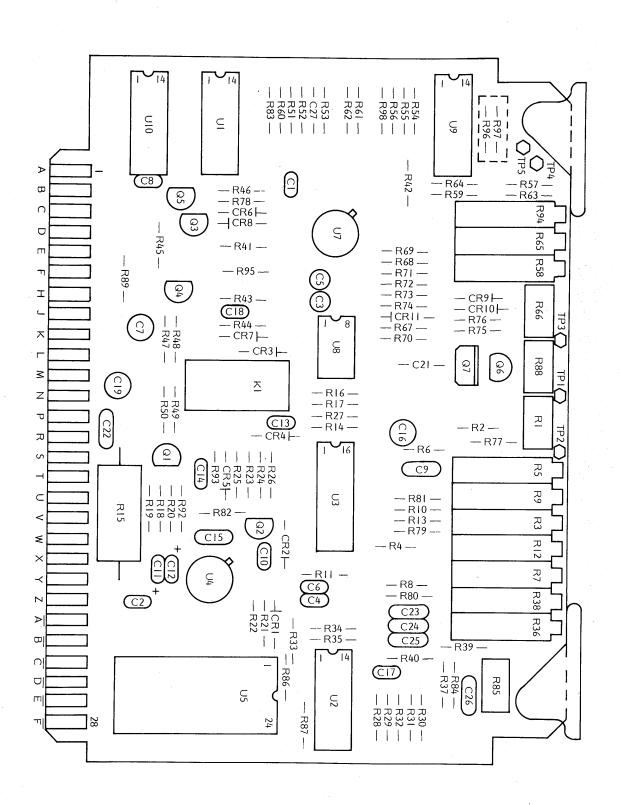
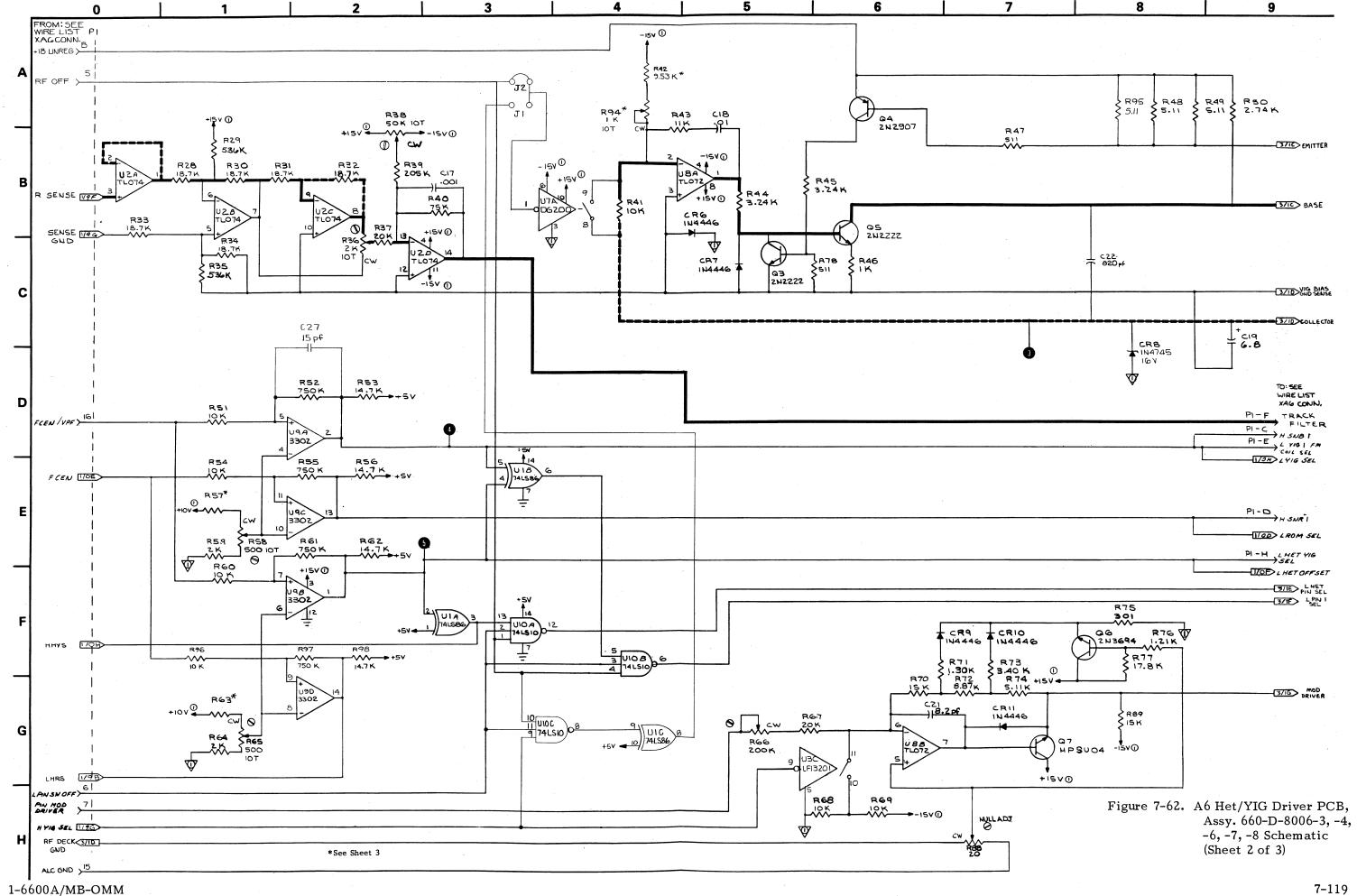


Figure 1. Corrected A6 PCB Parts Locator Diagram

3)

3)



Changed: 15 May 83

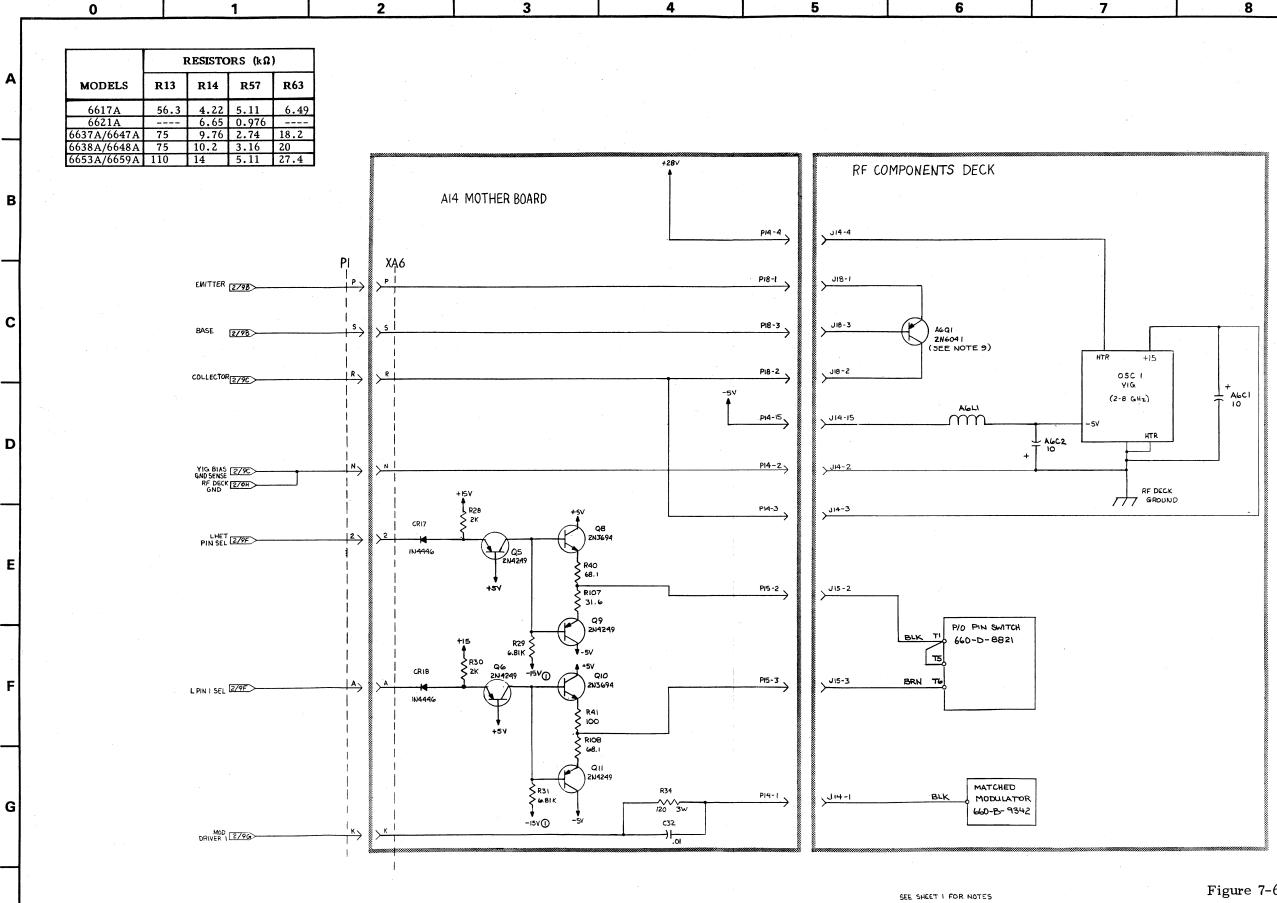
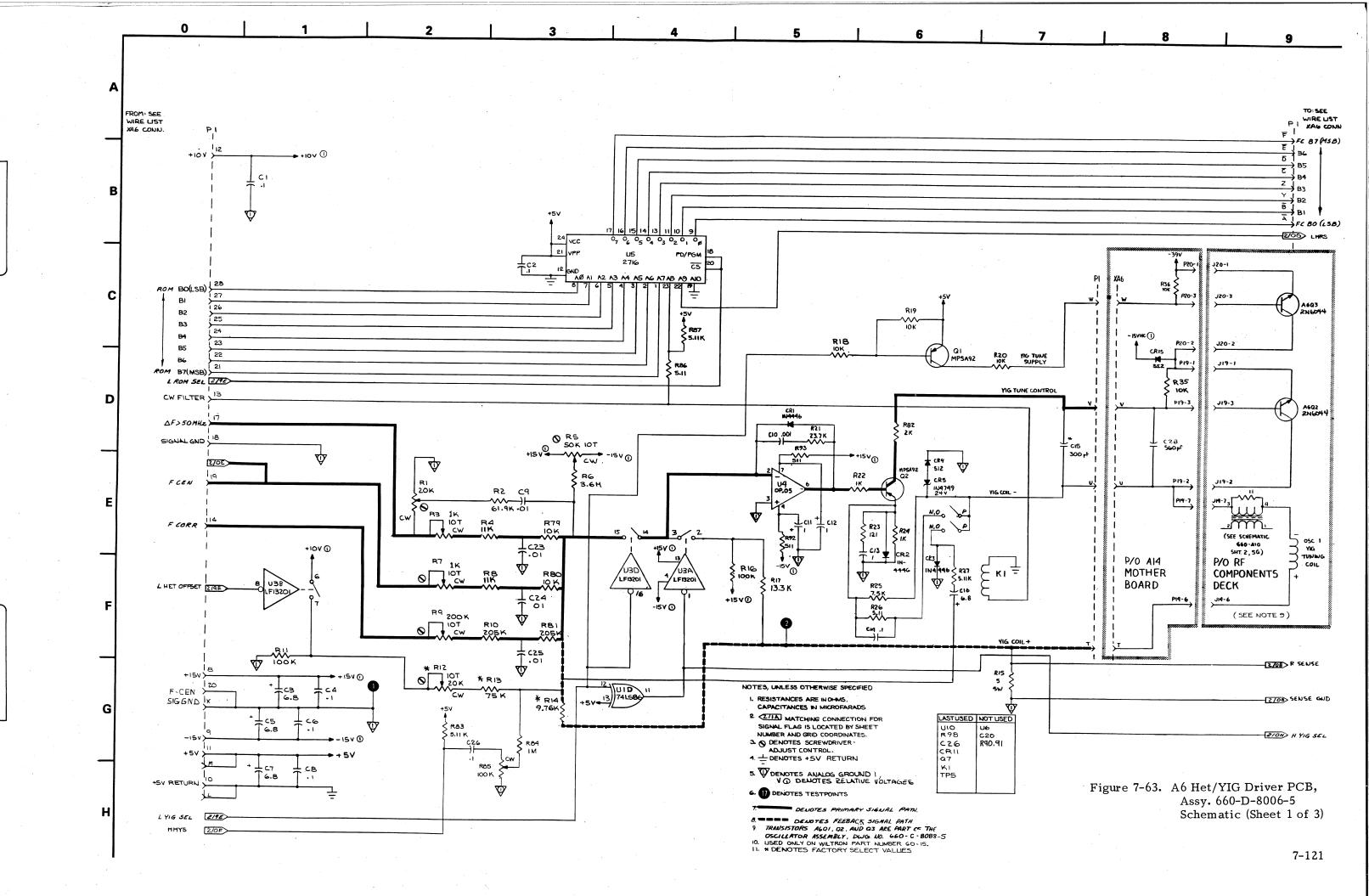
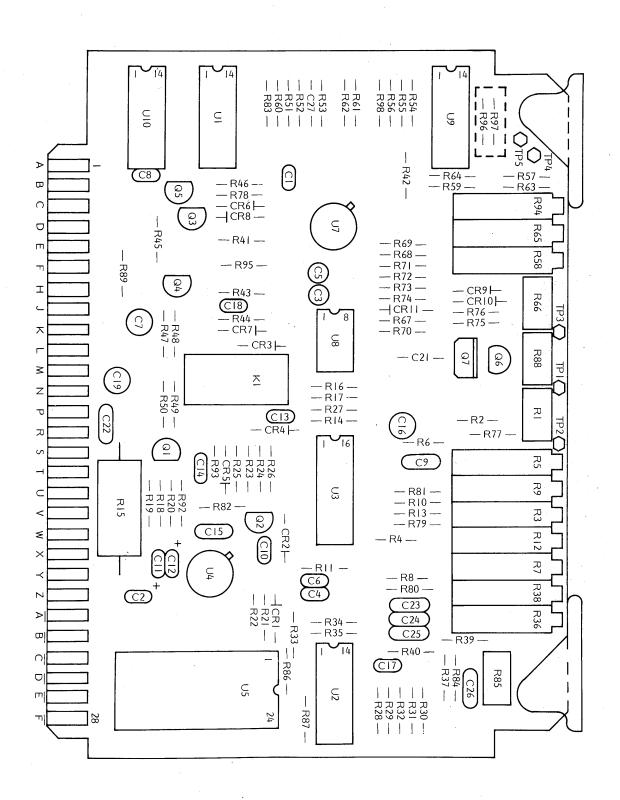
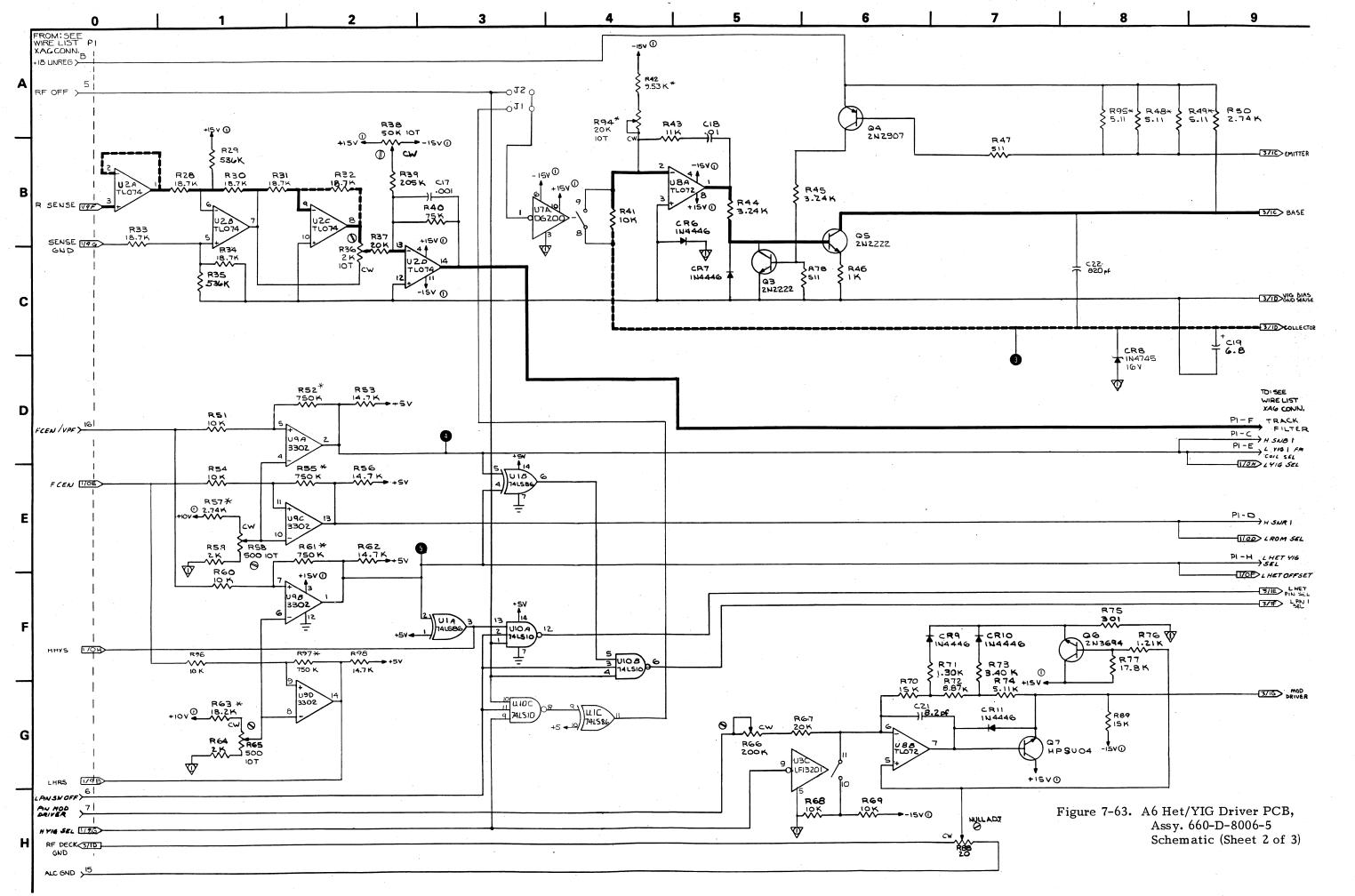


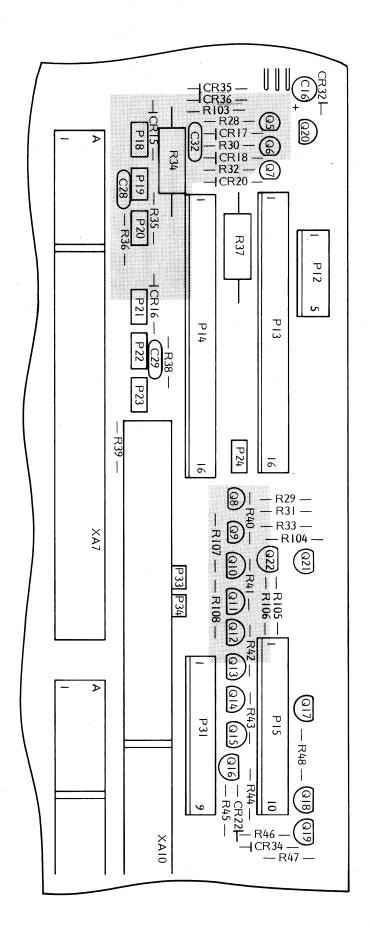
Figure 7-62. A6 Het/YIG Driver PCB, Assy. 660-D-8006-3, -4, -6, -7, -8 Schematic (Sheet 3 of 3)

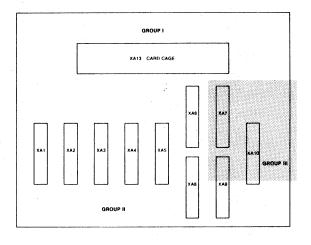
7-120









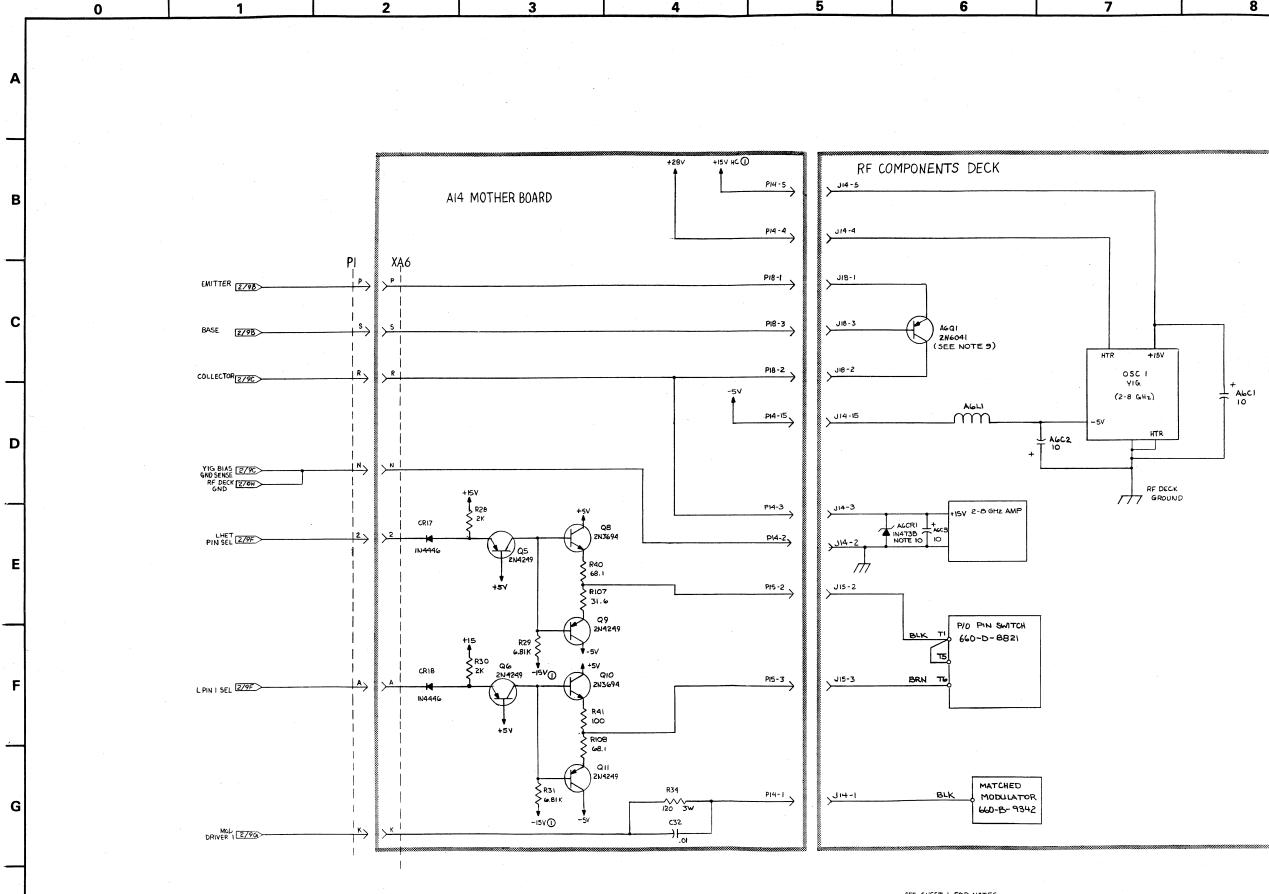


Osc 1 YIG, PIN Driver, and PIN/Modulator Parts Locator Diagram

ER

AS NSE

CTOR



SEE SHEET I FOR NOTES

Figure 7-63. A6 Het/YIG Driver PCB, Assy. 660-D-8006-5 Schematic (Sheet 3 of 3)

Н

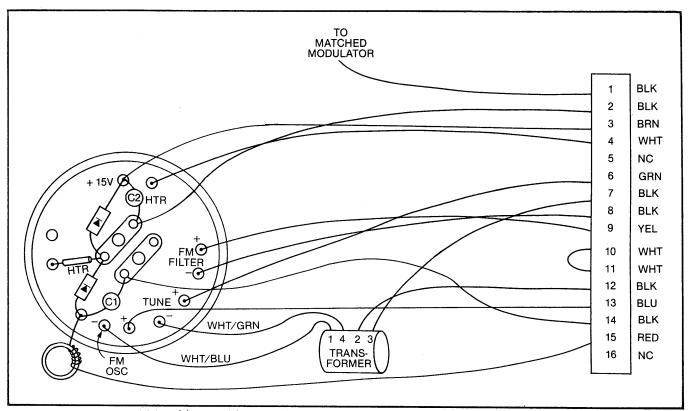


Figure 7-112. 6617A/6637A/6638A/6647A/6648A/6653A/6659A A6 Oscillator Wiring Diagram (Changed March 15, 1983)

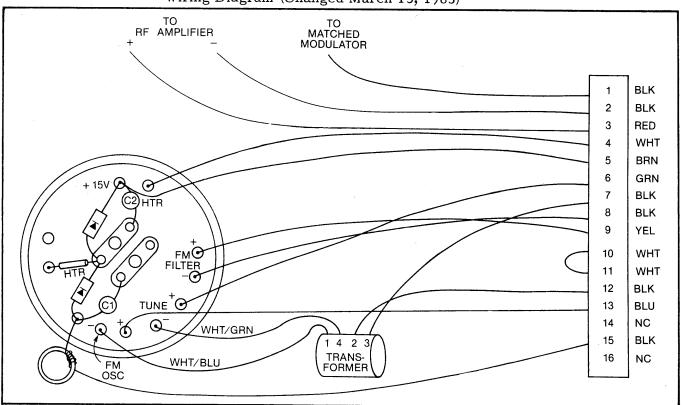


Figure 7-112A. 6617A-40/6621A-40/6637A-40/6647A-40 A6 Oscillator Wiring Diagram

### CHANGE #15

MODELS AFFECTED: All

BASIC FRAME SN: 313001 & up

# 1. Page 6-19, Table 6-3, "RESISTORS" Grouping

Change to read:

"REF DES.	DESCRIPTION	WILTRON PART NO.
R17	MF, $1/4$ W, $1\%$ , $261 \text{ k}\Omega$	110-261k-1
R18	MF, $1/4W$ , 1%, 261 k $\Omega$	110-261k-1
R24	MF, $1/4W$ , 1%, 261 k $\Omega$	110-261k-1
R25	MF, $1/4W$ , 1%, 261 k $\Omega$	110-261k-1
R31	MF, $1/4W$ , 1%, 261 k $\Omega$	110-261k-1
R32	MF, $1/4W$ , $1\%$ , $261 \text{ k}\Omega$	110-261k-1
R58	MF, $1/4W$ , $1\%$ , $30.1 \text{ k}\Omega$	110-30.1k-1
R60	MF, $1/4W$ , $1\%$ , $2.49 k\Omega$	110-2.49k-1"

### 2. Page 7-74, Figure 7-38, Sheet 2

- a. At coordinates 6A, change the values of R17 and R18 to "261 K."
- b. At coordinates 6B, change the values of R24 and R25 to "261 K."
- c. At coordinates 6D, change the values of R31 and R32 to "261 K."

### 3. Page 7-75, Figure 7-38, Sheet 3

At coordinates 6E, change the values of R58 to "30.1 K" and R60 to "2.49 K."

PCO 2721 2/83

### CHANGE #16

MODELS AFFECTED: All

BASIC FRAME SN: 311001 & up

## 1. Page 6-48, Table 6-22, "MISCELLANEOUS" Grouping

Add:

REF DES.	DESCRIPTION	WILTRON PART NO.
	Power Down Circuit PCB	660-A-13642

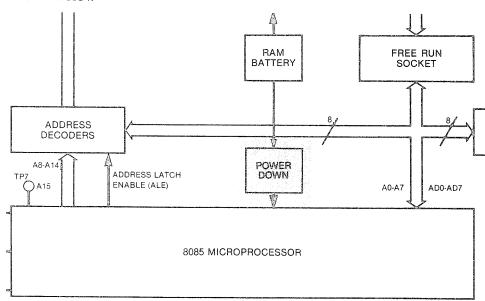
## 2. Page 7-18, paragraph 7-6.1c

Add the following paragraph to the end of the RAM circuit description:

 $\frac{\text{"When }}{\text{RESIN}}$  the ac power is turned off, the Power Down Circuit resets the microprocessor via the  $\frac{\text{"ESIN }}{\text{NESIN}}$  input, to prevent possible RAM memory loss."

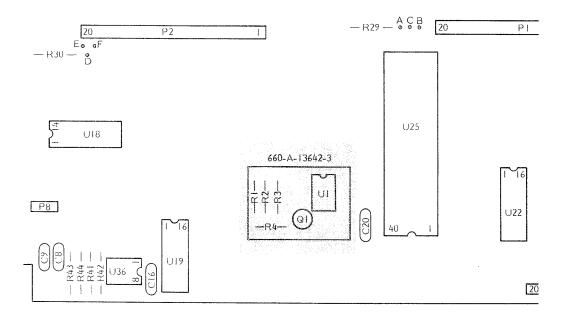
### 3. Page 7-19, Figure 7-11

Change as shown below



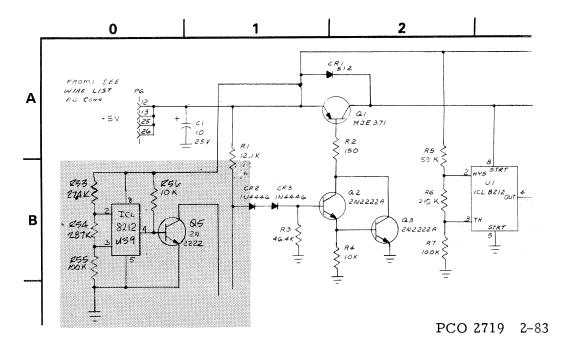
## 4. Page 7-21, Figure 7-14

Change as shown below.



### 5. Page 7-22, Figure 7-15

Add the Power Down circuit (660-A-13642 PCB) as shown below.



CHANGE #17

MODELS AFFECTED: 6609A BASIC FRAME SN: 303004 & up

## 1. Page 6-37, Table 6-15

- a. Under "CAPACITORS," change the value of C5 to .0047  $\mu F$  and the part number to 230-36.
- b. Under "RESISTORS," change the value of R18 to 2 k $\Omega$  and the part number to 110-2k-1.

### 2. Page 7-130 (Changed 1 Feb 83), Figure 7-67

a. At coordinates 4B, change the value of C5 to .0047  $\mu F$  and the value of R18 to 2 k  $\Omega$  .

TCO G930 3-83

# TABLE OF CONTENTS

Section			Page
I	GEN	ERAL INFORMATION	
	1-1	Scope of the Manual	1-1
	1-2	Introduction	1-1
	1-3	Description	1-1
	1-4	Identification Number	1-1
	1-5	Options	1-1
	1-6	Specifications	1-2
	1-7	Characteristics	1-2
п	INST	ALLATION	
	2-1	Introduction	2-1
	2-2	Initial Inspection	2-1
	2-3	Preparation for Use	2-1
	2-4	GPIB Setup and Interconnection	2-2
		2-4.1 Interface Connector	2-2
		2-4.2 Cable Length Restrictions	2-2
		2-4.3 GPIB Interconnection	
			2-3
			2-3
		2-4.5 Data Delimiting (CR-CR/LF Switch)	2-3
		2-4.6 Option 3 (GPIB) Installation	2-4
		2-5 Preparation for Storage and/or Shipment	2-4
		2-5.1 Preparation for Storage	2-5
		2-5.2 Preparation for Shipment	2-5
ш	OPE	RATION	
	3–1	Introduction	3-1
	3-2	Front Panel Controls	3-1
		3-2.1 DATA ENTRY Pushbuttons	3-1
		3-2.2 FREQUENCY RANGE Pushbuttons	3-6
		3-2.3 TRIGGER Pushbuttons	3-8
		3-2.4 MARKERS Pushbuttons	3-9
		3-2.5 LEVELING Controls	3-10
		3-2.6 RF OUTPUT Controls, Indicators, and Connector	3-10
		3-2.7 POWER, SELF TEST, and RESET Controls	3-10
		3-2.8 BUS ADRS/RETURN TO LOCAL Control	2-11
		and GPIB Indicators	3-11
			2-11

Section				Page
(III)	3–3	Rear Pa	anel Controls and Connectors	3-13
	3-4	Self-Te	st Features	3-13
	3-5	Operati 3-5.1 3-5.2	Operational Checkout Procedures	3-21 3-21
		3-5.3	Pushbuttons and Phase-Lock Operation	3-22 3-24
		3-5.4	Operational Checkout Procedure, External Leveling Function (6642A)	3-24
	3-6	Descrin	otion of the IEEE-488 (IEC-625) Interface Bus	3-29
		3-6.1	Data Bus Description	3-29
		3-6.2	Management Bus Description	3-30
		3-6.3	Data Byte Transfer Control (Handshake)	3-30
			Bus Description	3-30
	3-7	GPIB O	peration (Option 3)	3-31
		3-7.1	GPIB Commands: Front Panel Controls	3-32
		3-7.2	GPIB Commands: Step Sweep	3-36
		3-7.3	GPIB Commands, Group Execute Trigger Modes	3-37
		3-7.4	GPIB Commands: Service Request Modes	3-38
		3-7.5	GPIB Commands: Output	3-41
		3-7.6	GPIB Commands: Miscellaneous	3-42
		3-7.7	Bus Messages	3-45
		3-7.8 3-7.9	Program Errors	3-48
		3-7.10	Reset Programming and Default ConditionsQuick Reference Data	3-50
		3-7.11	Index of Sweep Generator GPIB Command Codes	3-51 3-51
IV	PER	FORMAN	NCE VERIFICATION	
	4-1	Introdu	ction	4-1
	4-2	Recomm	mended Test Equipment	4-1
	4-3	Frequer	ncy Accuracy Tests	4-1
	4-4	Sweep 7	Time Test	4-5
	4-5	Output	Power Tests	4-6
	4-6	Residua	al AM Test	4-8
	4-7	Residua	al FM Test	4-10
	4-8	Externa	al FM and Phase-Lock Test	4-11
	4-9		put Signal Tests, All Models Except 6642A, 6653A,	4-12

Section			Page
(IV)	4-10	RF Output Signal Tests, Model 6642A	4-15
	4-11	RF Output Signal Tests, Models 6653A and 6659A	4-18
v	CAL	BRATION AND ADJUSTMENTS	
	5-1	Introduction	5-1
	5-2	Recommended Test Equipment	. 5-1
	5-3	Adjustments Following PCB or Component Repair or Replacement	5-1
	5-4	Power Supply Adjustments	5-1
	5-5	A2 Ramp Generator Adjustments	5-5
	5-6	A5 Frequency Instruction Adjustments	5-9
	5-7	A3 Marker Generator Adjustments	5-12
	5-8	A6-A9 YIG (Het/YIG) Driver PCB Adjustments	5-17 5-17 5-21
	5-9	Frequency Calibration	5-23
	5-10	2-8 GHz Band (Osc 1) Tracking Filter Adjustments (Models 6617A, 6647A, 6648A, and 6659A)	5-31
	5-11	Sweep Rate Compensation Adjustment	5-34
	5-12	ALC Loop Calibration	5-34 5-34
		5-12.2 ALC Loop Adjustments (Model 6642A, 26.5-40 GHz Band)	5-34 5-41
VI	PAR	TS LISTS	
	6-1	Introduction	6-1
	6-2	Parts-Ordering Information	6-1
	6-3	Abbreviations	6-1
	6-4	Organization of Parts Listings	6-1
VII	SERV	/ICE	
	7-1	Introduction	7-1

<u>Section</u>			Page
(VII)	7–2	General Information	7-1 7-1 7-1
	7-3	6600A Series Programmable Sweep Generator, Removal and Reinstallation Instructions	7-1
		7-3.1 Front Panel Assembly, Removal and Reinstallation Instructions	7-1
		<ul> <li>7-3.2 Front Panel, Disassembly and Reassembly Instructions</li> <li>7-3.3 INCREASE/DECREASE Lever, Switch-Assembly</li> </ul>	7–3
		Replacement	7-6
		Instructions	7-6
		and Reinstallation	7–7
	7-4	6600A Series Programmable Sweep Generator, Overall Circuit Description	7-8
	7-5	6600A Series Programmable Sweep Generator, Overall	
	1 3	Troubleshooting	7-17
	7-6	A12 Microprocessor PCB	7-17
		7-6.1 Al2 Microprocessor PCB, Circuit Description	7-17
		Data	7-27
	7-7	All Front Panel PCB	7-35
		7-7.1 All Front Panel PCB, Circuit Description	7-35 7-35
	7-8	A1 GPIB Interface PCB	7-41
		7-8.1 A1 GPIB Interface PCB, Circuit Description	7-41
		and Data	7-49
	7-9	A2 Ramp Generator PCB	7-55
		<ul> <li>7-9.1 A2 Ramp Generator PCB, Circuit Description</li></ul>	7-55
		and Data	7-64
	7-10	A3 Marker Generator PCB	7-67
		7-10.1 A3 Marker Generator PCB, Circuit Description	7-67
		and Data	7-77
	7-11	A4 Automatic Level Control (ALC) PCB	7-83
		Description	7–83
		Loop, Troubleshooting Information and Data	7-89

Section				Page
(VII)	7-12	A5 Freq	quency Instruction and A6-A9 YIG Driver PCBs	7-10
		7-12.1	A5 Frequency Instruction PCB, Circuit Description	7-10
		7-12.2	A6-A9 YIG Driver PCBs, Overall Description	7-11
		7-12.3	Assy 660-D-8007-3, -5, -7, and -99 -91; -12868-3 and	1 - 1 1.
			-99-91 Het/YIG Driver PCBs, Circuit Description	7-11
		7-12.4	Assy 660-D-8007-4 Het/YIG Driver PCB, Circuit	• • •
			Description	7-128
		7-12.5	Assy 660-D-8007-6 Het/YIG Driver PCB, Circuit	
		- 10 (	Description	7-134
		7-12.6	Assy 660-D-8190 and 8191 YIG Driver PCB, Circuit	
	100	- 10 -	Description	7-140
		7-12.7	Assy 660-D-8008 and -8009 YIG Driver PCBs	
		7 13 0	(All Dash Numbers), Circuit Description	7-148
		7-12.8	A5 Frequency Instruction and A6-A9 YIG Driver PCBs.	Sept. Cit
			Troubleshooting Information and Data	7-17
	7_13	A 10 TONA	/Attornator DCD	
	1-13	7-13.1	/Attenuator PCB	7-175
		7-13.2	A10 FM/Attenuator PCB, Circuit Description	7-175
		. 15.2	A10 FM/Attenuator PCB, Troubleshooting Information	
			and Data	7-180
	7-14	RF Decl	k, Circuit Description	7 100
				7-183
	7-15	A13/A14	4 Switching Power Supply and A14 Motherboard PCBs	7 100
		7-15.1	A13/A14 Switching Power Supply, Circuit Description	7-190 7-190
		7-15.2	A4 Motherboard PCB, Wire Lists and Service Data	7-190
		7-15.3	A13/A14 Switching Power Supply, Troubleshooting	1-177
			Information and Data	7-230
				. 250
	7-16	A18 GPI	B Connector PCB, Circuit Description	7-230
* **				
APPEND	IX			enguista (1876) Anguista (1886)
1	QUIC	K REFEI	RENCE DATA	۸ 1 1
				A1-1
2	STEP	SWEEP S	STEP-TO-FREQUENCY CONVERSION FORMULA	A2-1
•				1 X W - I
3	JO 4µ	JTPUT P	ORTS (µP-TO-ANALOG INTERFACE)	۸ 2_1

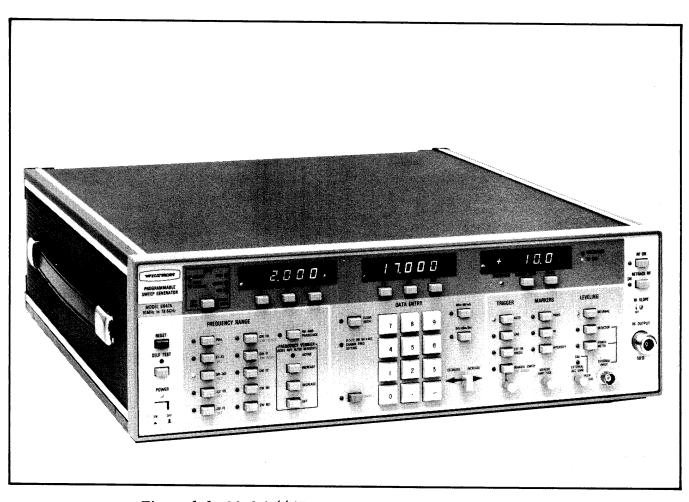


Figure 1-1. Model 6647A Programmable Sweep Generator

### SECTION I

## **GENERAL INFORMATION**

# 1-1 SCOPE OF THE MANUAL.

This manual is the operation and maintenance (O&M) manual for the multiband models (paragraph 1-3) of the 6600A Series Programmable Sweep Generator. The manual provides general information, installation, operation, performance verification, calibration, replaceable parts, and maintenance/service information and instructions. Refer to the Table of Contents for the manual organization.

### 1-2 INTRODUCTION

Section I provides a description, specifications, characteristics, and option information.

### 1-3 DESCRIPTION

The 6600A Series (Figure 1-1) is a family of microprocessor-based, pushbutton-controlled, GPIB-capable, broadband signal sources that generate swept and CW frequencies from 10 MHz to 40 GHz. This ever-expanding family of sweepers presently consists of 29 models. These 29 models are divided into single-band and multiband sweep generators, depending upon the number of internal bands used for frequency-range coverage. Singleband models use one YIG oscillator to span their range, whereas multiband models use two or more YIGs, or a combination consisting of a YIG (or YIGs) and a frequency down-converter.

# 1-4 IDENTIFICATION NUMBER

All WILTRON instruments are assigned a unique six-digit ID number, such as "205001." The first digit of this ID (2 in the example) represents the instrument's year-of-manufacture; the next two (05), its manufac-

turing "run;" and the last three (001), its serial number. Each 6600A Series sweep generator has two ID numbers assigned, one for the basic frame and one for the RF deck. The ID number for the RF deck, which provides primary identification, is affixed to the outside of the rear panel. The basic frame ID number appears on the inside of the rear panel. Please use the primary (outside) serial number when ordering parts or when corresponding with Customer Service.

### 1-5 OPTIONS

The following options are available for the 6600A Series sweep generators:

- Option 1, Rack Mount. Sweep generator comes equipped with mounting ears and chassis track slides that have a 90° tilt capability.
- Option 2, 10 dB Step Attenuator. Sweep generator comes supplied with a front panel or GPIB-programmable 10 dB step attenuator. Step attenuator has a 70 dB range.
- Option 3, GPIB Interface. Sweep generator is equipped to operate on the IEEE-488 (IEC-625) Interface Bus. With Option 3 installed, all front panel pushbuttons except POWER are bus-programmable. Option 3 may be installed in the field.
- Option 9, Main RF Connector on Rear Panel. Sweep generator comes supplied with an SMA female connector installed on the rear panel rather than on the front panel.
- Option 10, Auxiliary RF Output Connector (Rear Panel). Sweep generator comes equipped with a second RF connector (SMA female) installed on the rear panel.

Its output power level is approximately 25 dB below the main connector power level, and its Maximum Leveled Power specification is derated by 1.5 dB.

- Option 12, RF Output Interface, Sweep Generator to Model 661 Tracking Sweeper Controller. Sweep generator comes supplied with a rear panel SMA connector for supplying a 10 dB attenuated RF sample to the Model 661 Tracking Sweeper Controller.
- Option 13, Hardware Interface to HP 5342 or HP 5343A Microwave Counter. Sweep generator comes supplied with a rear panel BNC connector that allows the HP counter to be used to count the marker frequency(ies).

• Option 14, Data I/O Rear Panel Connector. Sweep generator comes supplied with a 37-pin Data I/O connector for interfacing the Model 661 Tracking Sweeper Controller with the IEEE-488 Interface Bus. Sweep generator must also have Option 3.

### 1-6 SPECIFICATIONS

Guaranteed performance specifications for the multiband models of the 6600A Series Programmable Sweep Generator are provided in Figure 1-2.

### 1-7 CHARACTERISTICS

Operational characteristics, along with brief descriptions of input and output connectors for the 6600A Series sweep generator (all models), are given in Tables 1-1 and 1-2.

Table 1-1. "RESET" Output Power Level (Power Level Indicated on LEVEL Display when RESET is Pressed)

	POWER LEVEL (dBm)									
MODEL	Standard Model	With Opt. 2	With Opt. 10	With Opt. 2 & 10						
6609A	13.0	12.5	11.5	11.0						
6617A	10.0	9.0	8.5	7.5						
6621A	10.0	8.7	8.5	7.2						
6621A-40	16.0	14.7	14.5	13.2						
6629A	10.0	8.2	6.7							
6629A-40	16.0	14.2	14.5	12.7						
6637A	10.0	8.2	8.5	6.7						
6637A-40	16.0	14.2	14.5	12.7						
6638A	7.0	5.2	5.5	3.7						
6642A	0.0	N/A	N/A	N/A						
6647A	6647A 10.0		8.5	6.7						
6648A	7.0	5.2	3.5	3.7						
6653A	6.0	2.0	3.5	0.5						
6659A	6.0	2.0	4.5	0.5						

## UNIVERSAL SPECIFICATIONS, ALL MODELS

**EXTERNAL AM INPUT:** Rear panel BNC connector. 10k ohm impedance.

Sensitivity: 1 dB/V

Frequency Response (typical): DC-50 kHz

Input Impedance: 10 k $\Omega$ 

Amplitude Control Range: > 13 dB

Maximum Input: 20V

EXTERNAL FM AND PHASE LOCK INPUT: Rear panel BNC

connector. 10k ohm impedance.

Sensitivity: -6 MHz/V

Maximum Deviation for Modulation Frequency of:

DC-100 kHz: ± 25 MHz 100-250 kHz: ± 5 MHz **EXTERNAL SQUARE WAVE INPUT:** Externally applied TTL-compatible square wave modulates output at dc to 50 kHz rate. Will accommodate ±6V square wave. On/Off ratio, typically 40 dB. Maximum input, ±20 volts. Rear panel BNC connector. Not available on 6642A

**POWER VARIATION WITH TEMPERATURE:**  $\pm 0.5$  dB/°C. Not applicable to 6642A.

**RESIDUAL AM** (50 kHz Bandwidth): >50 dBc. Not applicable to 6642A

**OUTPUT CONNECTOR:** Type N Female, all models except: **Model 6653A and 6659A:** Ruggedized WSMA Female. **Model 6642A:** WSMA Female (18–26.5 GHz); UG-599/U (26.5–40 GHz).

# SOURCE SWR SPECIFICATIONS INDIVIDUAL MODELS

MODEL	SOURCE SWR (50Ω)	SOURCE SWR WITH OPTIONS 2 AND 9				
6609A	1.3	1.5				
6617A	1.4 (≤2 GHz) 1.2 (>2 GHz)	1.5				
6621A, 6621A-40	1.3 (≤8 GHz) 1.5 (>8 GHz)	2.0				
6629A, 6629A-40	1.5	2.0				
6637A, 6637A-40, 6638A	1.2 (≤8 GHz) 1.4 (>8 GHz)	2.0				
6642A	2.0 (18–26.5 GHz) N/A (26.5–40 GHz)	N/A				
6647A, 6648A	1.4 (<2 GHz) 1.2 (2-8 GHz) 1.4 (>8 GHz)	2.0				
6653A, 6659A	1.5 (≤ 18 GHz) 1.7 (> 18 GHz)	2.0				

# FREQUENCY, POWER, AND PURITY SPECIFICATIONS, INDIVIDUAL MODELS

		OUTPUT POWER (25°C ±5°)		POWER LEVEL ACCURACY		LEVELED POWER VARIATION		SIGNAL PURITY			FREQUENCY ACCURACY (25°C)		FREQUENCY STABILITY						
MODEL	FREQUENCY RANGE (GHz)	INTERNALLY LEVELED MAXIMUM (dBm)	WITH OPT. 2, 70 dB ATTENUATOR (dBm)	LEVELED (dB)	WITH OPT. 2, 70 dB ATTENUATOR, ADD: (dB)	ATTENUATOR ACCURACY PER STEP (dB)	WITH FREQUENCY (dB)	WITH FREQUENCY OPT. 2, 70 db Attenuator (db)	HARMONICS (dBc)	NON- Harmonics (dBc)	RESIDUAL FM 3 (kHz pk)	CW MODE (MHz)	SWEEP MODE ≤50 MHz (MHz)	WITH TEMPERATURE (MHz/°C)	WITH 10% LINE VOLTAGE CHANGE (kHz)	WITH 10 dB POWER LEVEL CHANGE (kHz)	WITH 3:1 LOAD SWR (kHz)	WITH TIME, 10 MINUTES Typical <sup>4</sup> (kHz)	MODEL
6609A	.01-2	> 13	> 12.5	± 0.6	±0.8	±0.3	±0.3	±0.8	> 30	> 40	< 7	±5	±10	±1	± 100	± 100	± 10	± 200	6609A
6617A	.01-8	> 10	> 9	±0.9	±1	±0.4	±0.5	±1	> 30 (< 2 GHz) > 40 (> 2 GHz)	> 40 (< 2 GHz) > 60 (> 2 GHz)	< 7	±5	±10	±1 (<2 GHz) ±0.5 (>2 GHz)	± 100	± 100	± 100	± 200	6617A
6621A	2-12.4	> 10	> 8.7	±1	±1.5	±0.4	±0.5	±1.4	> 40	>60	< 10	± 10	±15	±0.5	± 100	±500	±300	± 200	6621A
6621A-40	2-12.4	> 16	> 14.7	±1	±1.5	±0.4	±0.5	±1.4	> 25	> 60	< 10	± 10	± 15	±0.5	± 100	±500	±300	± 200	6621A-40
6629A	8-18.6	> 10	> 8.2	±1	±1.5	±0.4	±0.5	±1.5	> 40	>60	< 10	± 10	±15	±0.5	±100	±500	± 300	± 200	
6629A-40	8-18.6	> 16	> 14.2	±1	±1.5	±0.4	±0.5	±1.5	> 40	>60	< 10	± 10	±15	±0.5	± 100	±500	± 300	± 200	6629A-40
6637A	2-18.6	> 10	> 8.2	±1	±1.5	±0.4	±0.5	±1.5	> 40	>60	<7 (<8 GHz) <10 (>8 GHz)	± 10	±15	±0.5	± 100	±500	± 300	± 200	6637A
6637A-40	2-18.6	> 16	> 14.2	·±1	±1.5	± 0.4	±0.5	±1.5	> 25	>60	<7 (<8 GHz) <10 (>8 GHz)	±10	± 15	±0.5	± 100	± 500	±300	± 200	6637A-40
6638A	2-20	> 10 (≤ 18 GHz) > 7 (> 18 GHz)	>8.2 (≤ 18 GHz) >5.2 (> 18 GHz)	±1	± 1.5	±0.7	±0.5	±1.5	> 40	> 60	<7 (<8 GHz) <10 (>8 GHz)	± 10	±15	±0.5	±100	±500	± 300	± 200	6638A
6642A	18-40	>5 (18-26.5 GHz) >0 (26.5-40 GHz) 1	N/A	±2 (< 26.5 GHz) N/A (> 26.5 GHz)	N/A	N/A	±1 (<26.5 GHz) N/A (>26.5 GHz)	N/A	> 30 (< 26.5 GHz) > 20 (> 26.5 GHz)	> 60	< 30 (< 26.5 GHz) < 40 (> 26.5 GHz)	± 15 ( < 26.5 GHz) ± 20 ( > 26.5 GHz)	±25 (<26.5 GHz) ±30 (>26.5 GHz)	±2	±200	±500	± 300	± 400	6642A
6647A	.01-18.6	> 10	>8.2	±1	± 1.5	±0.4	±0.6	±1.5	> 30 (< 2 GHz) > 40 (> 2 GHz)	> 40 (< 2 GHz) > 60 (> 2 GHz)	<7 (<8 GHz) <10 (>8 GHz)	± 10	±15	±1 (<2 GHz) ±0.5 (>2 GHz)	± 100	± 500	± 300	± 200	6647A
6648A	.01-20	> 10 (≤ 18 GHz) > 7 (> 18 GHz)	> 8.2 (≤ 18 GHz) > 5.2 (> 18 GHz)	±1	± 1.5	±0.7	±0.6	±1.5	> 30 (< 2 GHz) > 40 (> 2 GHz)	> 40 (< 2 GHz) > 60 (> 2 GHz)	<7 (<8 GHz) <10 (>8 GHz)	± 10	±15	±1 (<2 GHz) ±0.5 (>2 GHz)	± 100	±500	±300	± 200	6648A
6653A	2-26.5	> 10 (≤ 18 GHz) > 6 (> 18 GHz)	>7 (≤18 GHz) >2 (>18 GHz)	±1	±2	±0.7	±1.0	±1.5	. >40	>60	<7 (<8 GHz) <10 (8 to 18 GHz) <15 (>18 GHz)	±20	±30	±1	± 100	± 500	±300	± 200	6653A
6659A	.01-26.5	> 10 (≤ 18 GHz) > 6 (> 18 GHz)	>5 (≤ 18 GHz) >1.6 (> 18 GHz)	±1	±2	±0.7	±1.0	±1.5	> 30 ( < 2 GHz) > 40 ( > 2 GHz)	> 40 (< 2 GHz) > 60 (> 2 GHz)	<7 (<8 GHz) <10 (8 to 18 GHz) <15 (>18 GHz)	± 20	±30	±1 (<2 GHz) ±0.5 (>2 GHz)	± 100	±500	±300	± 200	6659A

<sup>&</sup>lt;sup>1</sup> External leveling only.

Figure 1-2. Specifications

<sup>&</sup>lt;sup>2</sup> Excluding 5% band edges where specification is > 20 dBc.

<sup>&</sup>lt;sup>3</sup> Measured in 30 Hz-15 kHz bandwidth.

<sup>&</sup>lt;sup>4</sup> After 30 minutes warmup at selected CW frequency.

**SWEEP TIME:** Continuously adjustable from .01 to 99 seconds, displayed on front panel LED readout.

### **SWEEP MODES:**

Full Sweep: Sweeps full band in one continuous frequency sweep. The highand low-end frequency points are displayed on the front panel.

F1 to F2 Sweep: Sweeps between user-selected frequencies (F1 and F2), which are displayed on the front panel.

M1 to M2 Sweep: Sweeps between userselected frequencies (M1 and M2), which are displayed on the front panel.

ΔF F0 Sweep: Sweeps symmetrically about a center frequency (F0) that is user-selected. F0 frequency and sweep-width frequency range are simultaneously displayed on the front panel.

ΔF F1 Sweep: Sweeps symmetrically about a center frequency (F1) that is user-selected. F1 frequency and sweep-width frequency range are simultaneously displayed on the front panel.

### **CONTINUOUS WAVE (CW) MODES:**

CW FO \	Fixed frequency CW output
CW F1	at the respective F0, F1, F2, M1, or M2 frequency
CW F2	point. The frequency of
CW M1	the CW signal is displayed on a front-panel LED
CW M2 /	readout.

### FINE-FREQUENCY CONTROL:

Frequency Vernier controls are available and may be used with a microwave counter to finely adjust (1) the output frequency in any CW mode or (2) the center frequency in either  $\Delta F$  sweep mode. Without changing the frequency appearing on the applicable numeric

display, these pushbuttons will change the output frequency by up to  $\pm 10~\mathrm{MHz}$  for all models except the 6642A, 6653A, and 6659A. For these three models, the output frequency can be changed by up to  $\pm 25~\mathrm{MHz}$ .

#### TRIGGER MODES:

Automatic: Sweep recurs automatically.

Line: Sweep recurs in sync with the line frequency or in sync with multiples of the line frequency.

External or Single: Sweep recurs when triggered. Triggering can be accomplished either from the front panel or by applying an external pulse to the rear panel.

Manual: Frequency may be swept manually between upper and lower frequency limits, using the front-panel MANUAL SWEEP control.

### MARKERS:

Video: Positive video pulse(s). Markers appear at frequencies M1, M2, and F0, depending upon sweep mode. In the FULL, F1-F2, and  $\Delta F$  F1 modes, three markers are available. In the  $\Delta F$  F0 mode, two markers (M1 and M2) are available. And, in the M1-M2 mode, one marker (F0) is available. The frequency and amplitude of the marker(s) may be controlled from the front panel.

RF: Negative RF pip(s). Markers appear at frequencies M1, M2, and F0, as described for Video above. The frequency and amplitude of the marker(s) may be controlled from the front panel.

Intensity: Intensity dot(s) are created when the sweep is made to dwell momentarily at the marker frequency(ies). No connection between the sweep generator and the CRT Z-axis is

required. Markers appear at frequencies M1, M2, and F0, as described for "Video" above. The frequency of the marker(s) may be selected from the front panel.

#### **LEVELING MODES:**

**Internal:** The output power is sampled internally and used to provide leveled RF power at the RF OUTPUT connector.

**Detector:** The output power may be sampled externally using a coupler and detector, and used to provide leveled RF power at the device under test.

Power Meter: The output power may be sampled externally using a coupler and a power meter, and used to provide leveled RF power at the device under test.

### SHIFTED FUNCTIONS:

Alternating Sweep: Sweep generator alternates between any two of the five frequency-sweep ranges: Full, F1-F2, M1-M2,  $\Delta F$  F0,  $\Delta F$  F1. When used with a compatible network analyzer, such as the WILTRON 560A, this function allows two sweeps to be input into the same channel through a single RF detector or SWR Autotester.

CW Filter, Enable-Disable: Provides for switching the CW filter out of the YIG oscillator tuning circuit. This filter is automatically inserted for CW and narrow (≤50 MHz) sweep modes.

CW Ramp, On-Off: Provides a 0-10V horizontal sweep ramp during CW modes. When the sweep generator is used with the WILTRON Model 560 or 560A Scalar Network Analyzer, this sweep ramp causes the network analyzer to display a trace (rather than

a dot) when the sweep generator outputs a CW frequency.

External Sweep: Provides for sweeping the output frequency using an externally supplied sweep ramp, which is input via the rear panel EXT SWEEP connector.

SELF TEST: Diagnostic self-test routines are accomplished each time the unit is turned on and when the front-panel SELF TEST pushbutton is pressed. In the event of a self-test failure, an error code is displayed on front-panel LED readouts. If the unit passes, the word PASS is indicated on an LED readout.

### **EXTERNAL LEVELING CONTROL (ALC):**

The gain of the external leveling input (detector or power meter) may be calibrated from the front panel for all models except 6642A; the use of an external indicating device such as an oscilloscope is not necessary.

**RESET:** Sweep generator operation in either the local (front panel) or remote (GPIB) operational mode can be reset to a predetermined state by pressing the front panel RESET pushbutton.

GPIB OPERATION: All front-panel pushbuttons except POWER can be programmed over the IEEE-488 Interface Bus (GPIB). Front-panel indicators light when:

- 1. the sweeper is under GPIB (remote) control.
- 2. Local Lockout is programmed.
- 3. a Service Request (SRQ) is initiated.
- 4. the sweeper is addressed to either Talk or Listen.

A chart showing GPIB subset capability is given in Figure 3-30.

### **INPUT/OUTPUT CONNECTORS:**

Horizontal Output: 0 to 10 volts during all sweep and CW modes (if CW RAMP is activated).  $<100\Omega$  impedance.

**Seq Sync Output:** Positive TTL-level pulse during sweep retrace.

Retrace Blanking (+) Output: +5 volt, TTL-compatible pulse during retrace blanking.

Retrace Blanking (-) Output: -5 volt pulse during retrace blanking.

Marker Output: 0 to +5 volt pulse when video marker is selected. Pulse amplitude depends upon front panel MARK-ERS AMPLITUDE control.  $1~k\Omega$  impedance.

Bandswitch Blanking Output:  $\pm 5$  volts, depending upon BANDSWITCH BLANK-ING switch, during oscillator bandswitching. <100 $\Omega$  impedance. Not used in Single-Band models.

1V/GHz Output: 1 volt per GHz of output frequency (.5V/GHz for 6636A and 6640A). <100 $\Omega$  impedance.

Penlift Output: Normally-open relay contacts for lifting recorder pen during retrace. Internal jumper available for normally-closed contacts.

Sweep Trigger Input: When TRIGGER-EXT OR SINGLE pushbutton is engaged, an externally applied clock pulse with the below-listed characteristics triggers a sweep upon closure-to-ground.

Amplitude: 4 to 25 Vpk Pulse Width: >1  $\mu$ s Fall Time: <5  $\mu$ s Polarity: Low true

Sweep Dwell Input: +5V (maximum) TTL pulse causes frequency sweep to

dwell. Provides interface for HP 8410 Network Analyzer.

External AM Input: Provides for amplitude modulation of the output signal.  $10 \text{ k}\Omega$  input impedance and 1V/dB input sensitivity.

External FM and Phase Lock Input: Provides for frequency modulation of the output signal.  $10 \text{ k}\Omega$  input impedance and -6 MHz/V input sensitivity.

External Square Wave Input: TTL-compatible input that allows a ±10 volt (maximum) square wave to modulate the RF output signal. Input square wave frequency from dc to 50 kHz.

External Sweep Input: Allows a 0 to 10 volt external sweep ramp to sweep the output frequency. 10 k $\Omega$  input impedance.

NONVOLATILE STORAGE: Front-panel control settings are retained in an internal memory (storage) when the ac power is turned off. When the ac power is turned on again, the previously-stored control settings are returned. The internal memory is powered by a rechargeable battery. Battery charge will last approximately 20 days when the sweeper is turned off and will be automatically recharged when the sweeper is turned on again.

**INPUT POWER:** 100, 115-120 Vac (+5%, -10%) at 2.0A rms or 220, 230-240 Vac (+5%, -10%) at 1.0A rms, 44-68 Hertz.

**OPERATING TEMPERATURE RANGE:** 0 to 50 degrees centigrade.

## PHYSICAL:

Height: 13.34 cm (5.25 inches)
Width: 43.18 cm (17 inches)
Depth: 47.6 cm (18.75 inches)
Weight: 15.08 kg (33.5 pounds)

### **SECTION II**

### INSTALLATION

### 2-1 INTRODUCTION

This section provides information on initial inspection, preparation for use, and General Purpose Interface Bus (GPIB) interconnections. Also included is information concerning reshipment and storage of the sweep generator.

### 2-2 INITIAL INSPECTION

Inspect the shipping container for damage. If the container or cushioning material is damaged, retain until the contents of the shipment have been checked against the packing list and the instrument has been checked for mechanical and electrical operation.

If the sweep generator is damaged mechanically, notify your local sales representative or WILTRON Customer Service. If either the shipping container is damaged or the cushioning material shows signs of stress, notify the carrier as well as WILTRON. Keep the shipping materials for carrier's inspection.

### 2-3 PREPARATION FOR USE

Preparation for use consists of checking that the sweep generator is set for the correct line voltage. The line-voltage module on rear panel enables the sweep generator to be used with any of four international line voltages: 100, 115/120, 220, or 230/240. Before leaving the factory, each sweep generator is preset and tagged for the line voltage present in the customer's area. If the actual line voltage is different from that stated on the

tag, the following procedure gives instructions for changing the line-voltage selector card.

- a. Refer to Figure 2-1. Disconnect the power cord from the voltage selector module 1 and slide cover 2 down to gain access to the fuse compartment.
- b. To select a different line voltage:
  - 1. Pull on FUSE PULL 3 and remove line fuse 4 and PC board 5.

### NOTE

The PC board is tightly secured within the module housing. It may be necessary to use needle-nose pliers or a similar tool as a pry.

- 2. Using the example for 115/120 Vac operation (Figure 2-1) as a guide, reinstall the PC board. For the correct installation of this board, the desired line-voltage callout should be located:
  - a. adjacent to the input receptacle and
  - b. facing toward the BNC connector-bank.
- 3. Push the FUSE PULL back to its normal position and insert a fuse of the proper value (as indicated on the right side of the module) into the fuse holder.

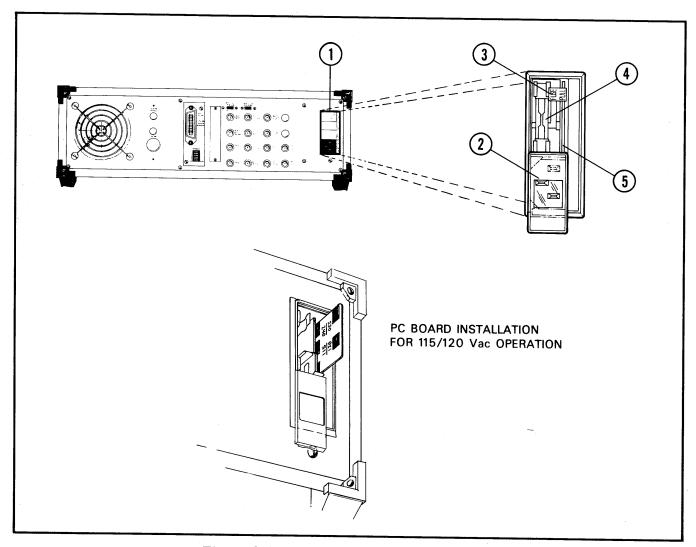


Figure 2-1. Line Voltage Selector Module

### 2-4 GPIB SETUP AND INTERCONNECTION

With Option 3 installed, the sweep generator is capable of providing automated microwave measurements via the GPIB. Specific GPIB information — including interface connections, cable requirements, and addressing instructions—is contained in the following paragraphs.

#### 2-4.1 Interface Connector

Interface between the sweep generator and other devices on the GPIB is via a 24-wire interface cable. The interface cable is specifically constructed with each end con-

taining a connector shell with two connector faces. These double-faced connectors allow for parallel connection of two or more cables to a single device. Figure 2-2 shows the pin assignments for the Type 57 GPIB connector, installed on the rear panel.

### 2-4.2 Cable Length Restrictions

The GPIB system can accommodate up to fifteen instruments at any one time. To achieve design performance on the bus, the proper timing and voltage level relationships must be maintained. If either the cable length between separate instruments or the accumulated cable length between all instruments is too long, the data and control lines

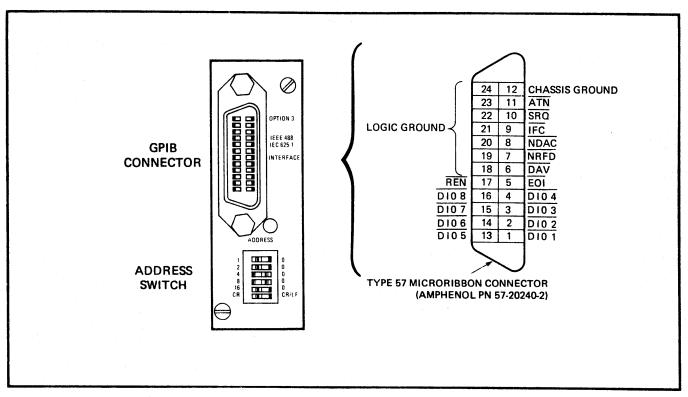


Figure 2-2. Option 3 Panel (ADDRESS Switch and GPIB Connector)

cannot be driven properly and the system may fail to perform. Cable length restrictions are as follows:

- No more than 15 instruments may be installed on the bus.
- Total accumulative cable length in meters may not exceed 2 times the number of bus instruments, or 20 meters – whichever is less.

### 2-4.3 GPIB Interconnection

The only interconnection required for GPIB operation is between the sweep generator and the controller. To accomplish this interconnection, a special cable is required. This cable — WILTRON Part No. 2000-1, -2, or -4 (1, 2, or 4 meters in length) — is available from the factory.

### 2-4.4 GPIB Address

The sweep generator is shipped from the factory preset to address 5. If a different

address is desired, the ADDRESS switches on the Option 3 panel (Figure 2-2) provide for the selection of any address number between 0 and 30. Figure 2-3 provides a tabulation of the available address numbers, and Figure 2-4 provides an example of how an address number is selected.

### 2-4.5 Data Delimiting (CR-CR/LF Switch)

On the GPIB, data delimiting is accomplished using either the carriage return (CR) or both the carriage return and the line feed (CR/LF) ASCII characters, depending upon the requirements of the instrument used as system controller. For example, the PET 2001 requires CR. The HP 9825A requires CR/LF, while the WILTRON 85 and the Tektronix 4051 can use either CR or CR/LF.

To provide ease in selecting the proper datadelimiting character for the controller in use, a switch is provided on the rear Option 3 panel. To use this switch, simply press the rocker arm to the position of the required delimiting character (Figure 2-4).

···		(MSB	i) 		(	LSB)			(MSB	)		(	LSB
Decimal Address	ASCII Character	16	8	4	2	1	Decimal Address	ASCII Character	16	8	4	2	1
0	Space	0	0	0	0	0	16	0	1	0	0	0	0
1	!	0	0	0	0	1	17	1	1	0	0	0	1
2	"	0	0	0	i	0	18	2	1	0	0	1	0
3	#	0	0	0	1	1	19	3	1	ó	0	1	1
4	\$	0	0	1	0	0	20	4	1	0	1	0	0
5	%	0	0	1	0	1	21	5	1	0	1	0	1
6	& .	0	0	1	1	0	22	6	1	0	1	1	0
7	1	0	0	1	1	1	23	7	1	0	1	1	1
8	(	0	1	0	0	0	24	8	1	1	0	0	0
9	)	0	1	0	0	1	25	9	1	1	0	0	1
10	*	0	1	0	1	0	26	;	1	1	0	1	0
11	+	0	1	0	1	1	27	;	1	1	0	1	1
12	,	0	1	1	0	0	28	<	1	1	1	0	0
13	-	0	1	1	0	1	29	=	1	1	1	0	1
14		0	1	1	1	0	30	>	1	1	1	1	0
15	/.	0	1	1	1	1							

Switch OFF = 0

Figure 2-3. Available Address Codes and Corresponding ADDRESS Switch Positions

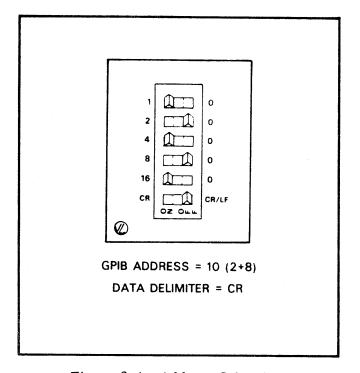


Figure 2-4. Address Selection

#### 2-4.6 Option 3 (GPIB) Installation

Option 3, which consists of the A1 PCB and the A18 GPIB Connector Assembly, may be installed in the field, as follows:

- a. Remove the rear panel cover plate and install the A18 Connector Assembly. See Figure 3-20, index number 3, for location.
- b. Connect the A18P1 connector to A14P4, on the motherboard. See Figure 7-125 for location.
- c. Install the A1 PCB into its marked slot in the 660-D-8000 Mainframe Assembly. See Figure 6-1, index number 1, for location.

#### 2-5 PREPARATION FOR STORAGE AND/OR SHIPMENT

Instructions for preparing the sweep generator for storage, shipment, or both are provided in paragraphs 2-5.1 and 2-5.2.

### 2-5.1 Preparation for Storage

Preparation for storage involves cleaning the unit, packing the inside of the unit with moisture-absorbing dessicant crystals, and storing the unit in a temperature environment between -40 and +70 degrees centigrade.

### 2-5.2 Preparation for Shipment

To provide maximum protection against damage in transit, the sweep generator should be repackaged in the original shipping container. If this container is no longer available and the sweep generator is being returned to WILTRON for repair, contact WILTRON Customer Service and a new shipping container will be sent to you free of charge. In the event neither of these two options is possible, the following paragraphs provide instructions for packaging and shipment.

a. Use a Suitable Container. Obtain a corrugated cardboard carton with a 275-pound test strength and inside dimensions of no less than six inches more than the instrument dimensions; this allows for cushioning.

- b. Protect the Instrument. Surround the instrument with polyethylene sheeting to protect the finish.
- c. Cushion the Instrument. Cushion the instrument on all sides by tightly packing dunnage or urethane foam between the carton and the instrument; allow a minimum of three inches of dunnage on all sides.
- d. Seal the Container. Seal the carton by using either shipping tape or an industrial stapler.
- e. Address the Container. If the instrument is being returned to WILTRON for service, mark the WILTRON address and your return address on the carton in one or more prominent locations. The WILTRON address is:

WILTRON Company ATTN: Customer Service 825 E. Middlefield Road Mountain View, CA 94043

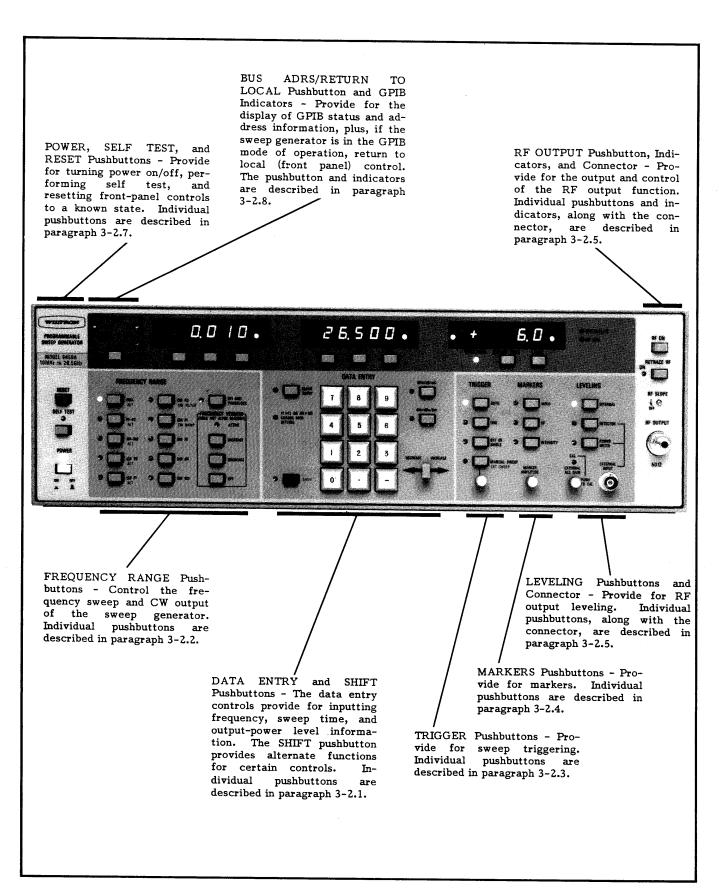


Figure 3-1. Sweep Generator Front Panel Controls

# SECTION III OPERATION

### 3-1 INTRODUCTION

This section contains information on the front and rear panel controls and connectors, plus a description of the sweep generator self-test feature. Also included are operational checkout procedures and a description of the Option 3 GPIB command codes.

### 3-2 FRONT PANEL CONTROLS

The front panel controls are grouped by function, as shown in Figure 3-1. Detailed descriptions of individual controls within each group are given in paragraphs 3-2.1 thru 3-2.8.

#### 3-2.1 DATA ENTRY Pushbuttons

There are five discrete frequency parameters (F0, F1, F2, M1, and M2) and one sweep width parameter ( $\Delta F$ ) – plus the sweep time and RF-output power level parameters – used to control the operation of the sweep generator. The DATA ENTRY pushbuttons (Figure 3-2) provide for entering new values for these parameters.

To provide an overview, several examples of how these pushbuttons are used to accomplish data entry are given in Figure 3-3. Individual DATA ENTRY pushbuttons are described in subparagraphs a. through f.

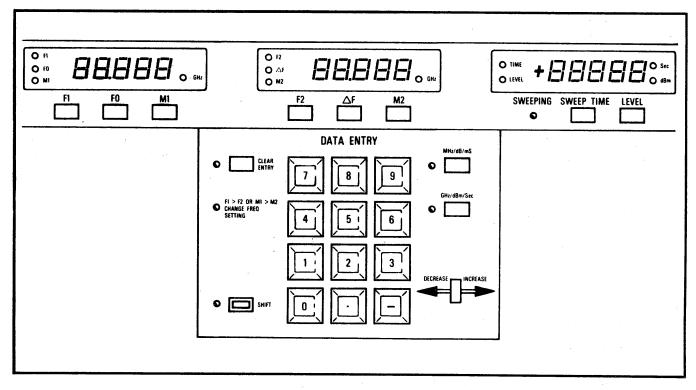


Figure 3-2. DATA ENTRY Pushbuttons

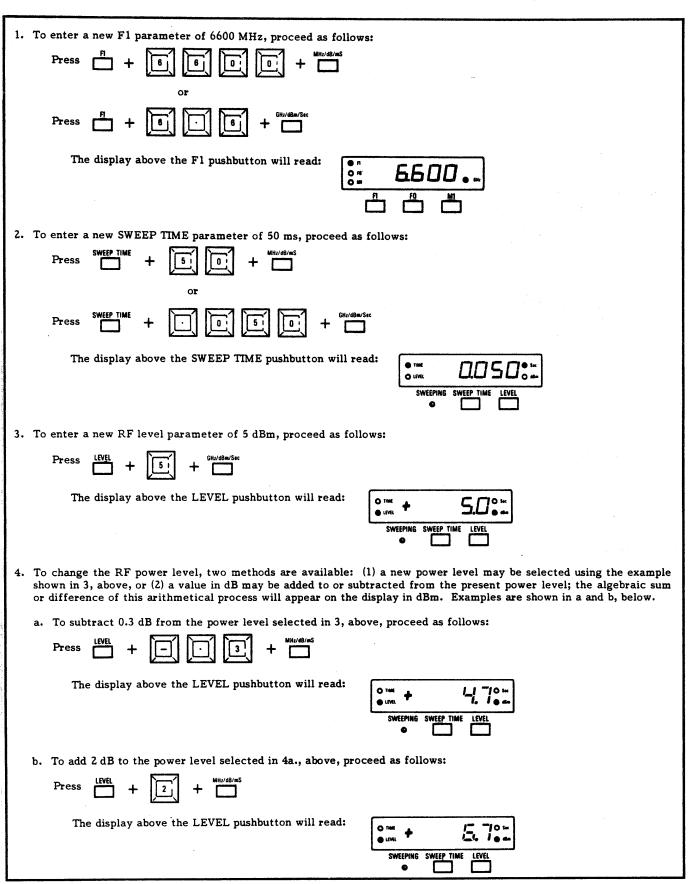


Figure 3-3. How to Enter Parameter Data (Examples)

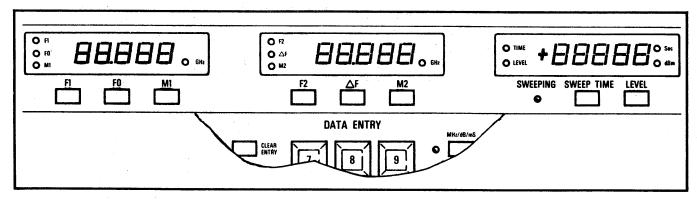


Figure 3-4. F1, F0, M1, F2,  $\Delta$ F, M2, SWEEP TIME and LEVEL Pushbuttons and SWEEPING Indicator

- a. F1, F0, M1, F2, ΔF, M2, SWEEP TIME, and LEVEL Pushbuttons and SWEEPING Indicator (Figure 3-4).
  - 1. The pushbuttons enable the selected parameter's value to be changed via the DATA ENTRY keypad or the INCREASE/DECREASE lever or to be monitored via the appropriate LED readout. The parameter that is selected for either changing or monitoring is hereafter known as the selected parameter.
  - 2. The SWEEPING Indicator lights during the forward portion of the frequency sweep. The indicator is out during retrace.
- b. DATA ENTRY Keypad (Figure 3-5). The DATA ENTRY keypad is used to change

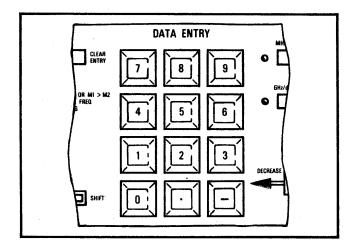


Figure 3-5. DATA ENTRY Keypad

- the value of the selected frequency, sweep time, or level parameter. When the selected parameter is frequency (F1, F0, M1, F2,  $\Delta$ F, or M2), the new value may be entered in either MHz or GHz. When the selected parameter is sweep time, the new value may be entered in either seconds or milliseconds. And, when the selected parameter is power level, the new value may be entered in either dB or dBm.
- c. INCREASE/DECREASE Lever (Figure 3-6). When enabled by a parameter pushbutton (F1, SWEEP TIME, LEVEL, etc.), this lever may be used to increase or decrease the parameter's value. The length of lever travel, either right or left, determines the rate at which the parameter's value increases or decreases. To increase or decrease the parameter's value in one-increment steps, "tap" the switch in the direction of desired change. When the lever is "tapped," a frequency parameter will change in 1 MHz increments. An RF level parameter will

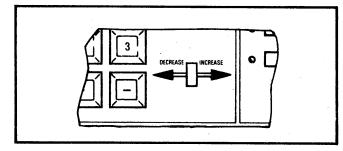


Figure 3-6. INCREASE/DECREASE Lever

change in 0.1 dB increments. And, a sweep time parameter will change in 1 ms increments between .01 and 1.0 seconds, 0.1-second increments between 1 and 10 seconds, and 1-second increments between 10 and 99 seconds.

### NOTE

For SWEEP TIME, move the lever toward DECREASE to increase time, and toward INCREASE to decrease time.

- d. MHz/dB/mS and GHz/dBm/Sec Pushbuttons (Figure 3-7). These two pushbuttons are data string terminators. That is, they mark the end of a parameter-input entry, and they assign the appropriate units (GHz, dBm, mS, etc.) to the entry. However, whereas
  - a frequency parameter may be ended in either MHz or GHz, the value is always displayed in GHz.
  - a sweep time parameter may be ended in either seconds (Sec) or milliseconds (mS), the value is always displayed in seconds.
  - a power level parameter may be ended in either dB or dBm, the value is always displayed in dBm. The dB terminator pushbutton allows the displayed power level parameter to be either added to or subtracted from in dB's. When the dB terminator is used, the sweep generator performs the calculations that convert the out-

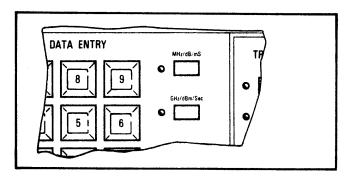


Figure 3-7. MHz/dB/mS and GHz/dBm/Sec (Terminator) Pushbuttons

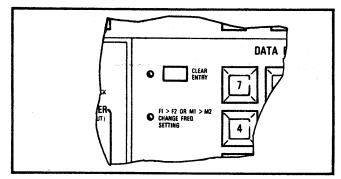


Figure 3-8. CLEAR ENTRY Pushbutton and F1>F2 OR M1>M2 Indicator

put power to a value in dBm. Example 4 in Figure 3-3 shows the use of the dB terminator pushbutton.

- e. CLEAR ENTRY Pushbutton and Indicator and F1>F2 OR M1>M2 CHANGE FREQUENCY SETTING Indicator (Figure 3-8).
  - The CLEAR ENTRY pushbutton clears the keypad of an illegal or incomplete data entry (described below), and allows a new value to be entered.
  - 2. The CLEAR ENTRY indicator flashes when an illegal or incomplete data entry has been attempted. (In addition, an illegal entry causes the LED readout displaying the illegal entry to flash; an incomplete entry causes both data terminator pushbutton indicators (Figure 3-7) to flash.)
  - 3. The F1>F2 OR M1>M2 CHANGE FREQ SETTING indicator, along with the two LED readouts displaying frequency, flashes when a "backward" sweep is attempted. A backward sweep is when the respective value of F2 or M2 is less than that of F1 or M1. To clear a backward sweep, either re-enter the frequency values so that F1 or M1 is less than F2 or M2 or select a different frequency range.

An illegal entry is one in which a frequency, sweep time, or output-power level value beyond the range of the sweep generator is entered via the keypad. When this occurs, the CLEAR ENTRY pushbutton must be used to clear the keypad before the error can be corrected.

An incomplete entry is one in which a parameter value is entered on the keypad and the entry is not terminated with a terminator pushbutton (Figure 3-7). When this occurs, the error can be corrected by pressing the appropriate terminator pushbutton or by pressing the CLEAR ENTRY pushbutton and re-entering the data.

f. SHIFT Pushbutton (Figure 3-9). Provides additional functions, designated by blue lettering, for the pushbuttons described below. When SHIFT is pressed, the numeric displays and LED indicators will go out, except for the currently active SHIFT functions. Pressing SHIFT again returns the displays and indicators to their unshifted (normal) indications — no parameters are changed.

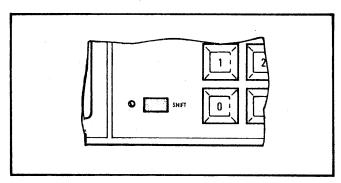


Figure 3-9. SHIFT Pushbutton

1. ALT Pushbuttons (Figure 3-10). Cause the RF output to alternate between any two of the five available sweep ranges (FULL, F1-F2, M1-M2, ∆F F0,  $\Delta F$  F1). The two sweeps (A and B) are selected, and their start/stop parameters set, in the normal manner (paragraph 3-2.2a). The A (primary) sweep is chosen first, the SHIFT pushbutton is pressed, then the B (alternating) sweep is chosen. After the B sweep is chosen, the numeric displays and LED indicators will return unshifted state; the LED indicators associated with the A and B sweep ranges will alternately flash on and off.

When using the alternating sweeps, the following apply:

- (a) Frequency markers (VIDEO, RF, and INT) are available and can be set or changed while an alternating sweep is in progress. Marker frequencies can be set on either network analyzer trace. A marker frequency that is changed on one trace will dynamically move to the correct frequency point on the other trace.
- (b) When the INCREASE/DE-CREASE lever is used, it temporarily halts sweep alternations and leaves the A sweep displayed on the network analyzer or oscilloscope. When the lever is released, sweep alternations resume.
- (c) If the A or B (or both) sweep is to be a CW frequency, select a  $\Delta F$  mode and set the  $\Delta F$  frequency for 0 MHz.
- (d) Neither an external nor a manual sweep can be used with an ALT sweep mode. If EXT SWEEP or MANUAL SWEEP has been selected, the microprocessor will ignore any attempt to select an ALT sweep. Conversely, if an ALT sweep has been selected, the microprocessor will ignore attemps to select EXT SWEEP or MANUAL SWEEP.

To exit the alternating sweep mode, press any frequency range pushbutton (including CW).

2. CW FILTER Pushbutton (Figure 3-11).

Provides enable/disable, conditionalin/unconditional-out control over the
CW filter located in the YIG oscillator
tuning circuit. When enabled (LED
on), this pushbutton causes the CW
filter to be switched-in for CW and
narrow (≤50 MHz) sweep modes, and

not inserted otherwise. Conversely, when CW FILTER is disabled (LED off), it causes the CW filter to be unconditionally switched-out of the YIG tuning circuit. CW FILTER is selected by first pressing SHIFT, then this pushbutton. Approximately 1 second after pressing CW FILTER, the front panel will automatically return to its unshifted (normal) state. RESET (default) state: Enabled (On).

### NOTE

The CW FILTER pushbutton becomes disabled (LED off) when an alternating (ALT) sweep mode is selected. When the ALT mode is exited, the CW FILTER pushbutton resumes its previously selected state.

- 3. CW RAMP Pushbutton (Figure 3-11). Provides a 0-10V HORIZ OUTPUT sweep ramp for all CW modes (CW F0, CW F1, CW F2, etc.). This pushbutton should be activated (LED on) when the sweep generator is used with a Model 560 or 560A Scalar Network Analyzer; otherwise, the pushbutton should be off. CW RAMP is selected by first pressing SHIFT, then this pushbutton. Approximately 1 second after pressing CW RAMP, the front panel will automatically return to its unshifted (nor-RESET (default) state: mal) state. Off.
- 4. EXT SWEEP Pushbutton (Figure 3-14). Provides for sweeping the output frequency using an external sweep ramp, which is supplied via the rear panel EXT SWEEP connector. SWEEP is selected by first pressing pushbutton. this then Approximately 1 second after pressing EXT SWEEP, the front panel will automatically return to its unshifted Pressing any other (normal) state. TRIGGER pushbutton will deactivate EXT SWEEP. RESET (default) state: Off.

### 3-2.2 FREQUENCY RANGE Pushbuttons

The FREQUENCY RANGE pushbuttons are used to

- select the sweep generator's operational mode – either sweep or CW;
- apply fine-frequency vernier corrections to output frequency in the selected CW mode or to center frequency in the selected ΔF sweep mode;
- apply frequency modulation to or phaselock control over output frequency in the selected CW output mode.

Individual FREQUENCY RANGE pushbuttons are described below.

a. FULL, F1-F2, M1-M2, ΔF F0, and ΔF F1

Pushbuttons (Figure 3-10). These pushbuttons select the sweep mode as follows:

FULL: Selects a mode in which the frequency sweep is from the sweep generator's lower to its upper frequency limit. When FULL is engaged, its indicator lights, the lower frequency limit appears on the F1-F0-M1 LED readout, and the upper frequency limit appears on the F2- $\Delta$ F-M2 LED readout. RESET (default) state: On.

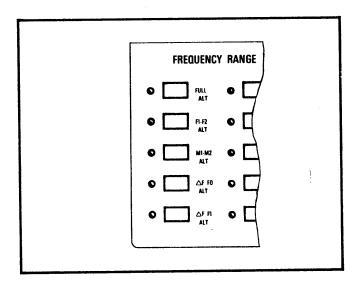


Figure 3-10. FULL, F1-F2, M1-M2, ΔF F0, ΔF F1 Pushbuttons

F1-F2: Selects a mode in which the frequency sweep is from F1 to F2. When F1-F2 is engaged, its indicator lights, the F1 frequency appears on the F1-F0-M1 LED readout, and the F2 frequency appears on the F2- $\Delta$ F-M2 LED readout.

M1-M2: Selects a mode in which the frequency sweep is from M1 to M2. When M1-M2 is engaged, its indicator lights, the M1 frequency appears on the F1-F0-M1 LED readout, and the M2 frequency appears on the F2- $\Delta$ F-M2 LED readout.

 $\Delta F$  F0: Selects a mode in which the frequency sweep is symmetrical about the F0 frequency. The width of this sweep, though usually narrow-band, can go from 0 to 100% of the full frequency range. When  $\Delta F$  F0 is engaged, its indicator lights, the F0 frequency appears on the F1-F0-M1 LED readout, and the  $\Delta F$  Frequency appears on the F2- $\Delta F$ -M2 LED readout.

### NOTE

The  $\Delta F$  F0 and  $\Delta F$  F1 sweeps can be asymmetrical. Asymmetry will occur when one-half the width of the  $\Delta F$  sweep will cause the band-edge at either end of the frequency band to be exceeded. The sweep generator cannot sweep beyond its band-edges. (It will sweep only to the band-edge on one side of F0 (or F1) and up to one-half the  $\Delta F$  sweep on the other side.)

 $\Delta F$  F1: Selects a mode in which the frequency sweep is symmetrical about the F1 frequency. The width of this sweep and the frequency readouts are as described for  $\Delta F$  F0, above.

The FULL, F1-F2, M1-M2, etc. controls are interlocked with the CW control group (subparagraph b, below) so that only one control can be engaged at any one time.

### b. CW F0, CW F1, CW F2, CW M1, and CW M2 Pushbuttons (Figure 3-11).

These pushbuttons select a CW frequency mode, as follows:

CW F0: Selects a mode in which the CW frequency is at F0. When CW F0 is engaged, its indicator lights, and the F0 frequency appears on the F1-F0-M1 LED readout. The LED readout above  $F2-\Delta F-M2$  is blanked out.

CW F1: Selects a mode in which the CW frequency is at F1. When CW F1 is engaged, its indicator lights, and the F1 frequency appears on the F1-F0-M1 LED readout. The LED readout above F2- $\Delta$ F-M2 is blanked out.

CW F2: Selects a mode in which the CW frequency is at F2. When CW F2 is engaged, its indicator lights, and the F2 frequency appears on the  $F2-\Delta F-M2$  LED readout. The LED readout above F1-F0-M1 is blanked out.

CW M1: Selects a mode in which the CW frequency is at M1. When CW M1 is engaged, its indicator lights, and the M1 frequency appears on the F1-F0-M1 LED readout. The LED readout above F2- $\Delta$ F-M2 is blanked out.

CW M2: Selects a mode in which the CW frequency is at M2. When CW M2 is engaged, its indicator lights and the M2 frequency appears on the  $F2-\Delta F-M2$  LED readout. The LED readout above F1-F0-M1 is blanked out.

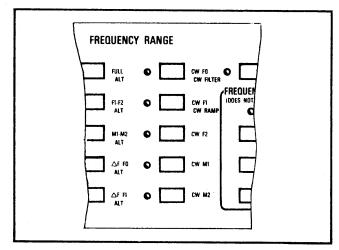


Figure 3-11. CW F0, CW F1, CW F2, CW M1/ and CW M2 Pushbuttons

c. FREQUENCY VERNIER Pushbuttons (Figure 3-12). These pushbuttons may be used to make fine adjustments to (1) output frequency in the selected CW mode or (2) center frequency in the selected  $\Delta F$ mode. The resolution frequency achievable using these pushbuttons is ±100 kHz for all models except the 6642A, 6653A, and 6659A. For these three models, resolution is ±200 kHz. Individual pushbuttons are described below.

**INCREASE:** Increases by a maximum of 12.7 MHz (25 MHz for Models 6642A, 6653A and 6659A) the value of selected CW output or  $\Delta F$  center frequency. The LED readout value of the selected CW or  $\Delta F$  frequency is not affected by this control.

**DECREASE:** Decreases by a maximum of 12.7 MHz (25 MHz for Models 6642A, 6653A and 6659A) the value of the selected CW output or  $\Delta F$  center frequency. The LED readout value of the selected CW or  $\Delta F$  frequency is not affected by this control.

**OFF:** Cancels the vernier correction being applied to the selected CW output or  $\Delta F$  center frequency and turns the ACTIVE indicator OFF in that mode.

### NOTE

A different vernier correction value can be entered for each of the five frequency parameters (F0, F1, F2, M1, M2). Once made, the vernier correction is stored in memory with the parameter and remains in effect even when the sweep generator has been turned off. Pressing the OFF pushbutton or changing the frequency value of a parameter cancels the vernier correction.

d. FM AND PHASELOCK Pushbutton (Figure 3-13). This pushbutton allows the sweep generator output frequency to be either frequency-modulated or phase-locked to an external frequency standard. The external FM or phase-lock signal is input via

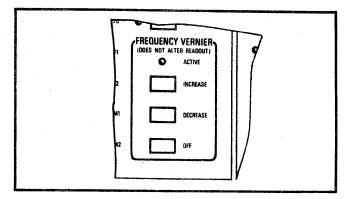


Figure 3-12. FREQUENCY VERNIER Controls

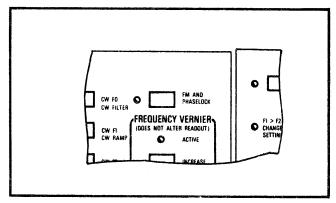


Figure 3-13. FM AND PHASELOCK Pushbutton

the rear panel EXT FM  $\emptyset$  LOCK INPUT connector.

### 3-2.3 TRIGGER Pushbuttons

The TRIGGER pushbuttons (Figure 3-14) select a trigger mode for the frequency sweep. These pushbuttons are interlocked so that only one may be selected at a time. A description of each pushbutton follows:

AUTO: Selects a mode in which the sweep recurs periodically with a minimum delay (hold-off) time between sweeps. RESET (default) state: On.

LINE: Selects a mode in which the sweep recurs at a multiple or submultiple of the line frequency.

EXT OR SINGLE: Selects a mode in which the sweep recurs only when internally or externally triggered. External

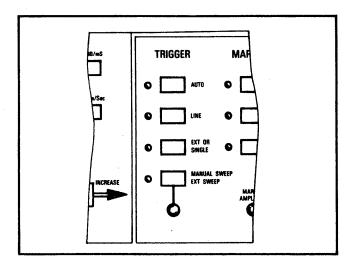


Figure 3-14. TRIGGER Pushbuttons

triggering is via the rear panel EXT TRIGGER INPUT connector; internal triggering is via this pushbutton. When the pushbutton is first pressed, the mode is selected. When the pushbutton is next pressed, the sweep is triggered. And, if the pushbutton is pressed again while the sweep is in progress, the sweep is aborted and reset.

MANUAL SWEEP: Selects a mode in which the frequency band is manually tuned. Manual tuning is provided by the associated control.

#### 3-2.4 MARKERS Pushbuttons

There are three markers (M1, M2, F0) available with the sweep generator. Marker frequency is selected using the DATA ENTRY keypad (paragraph 3-2.1) or the RESET pushbutton (paragraph 3-2.7) — the keypad provides user selection, and the pushbutton provides preset selection. Marker type is selected using the MARKERS pushbuttons (Figure 3-15). The number of markers (1, 2, or 3) that occur when pressing a MARKERS pushbutton depends on which sweep mode has been selected: for FULL, F1-F2, and  $\Delta F$  F1, all three markers occur; for  $\Delta F$  F0, markers M1 and M2 occur; and for M1-M2, marker F0 occurs.

To determine which marker frequency (M1, M2, or F0) is being observed on a CRT display, press the M1, M2, and F0 pushbuttons

while observing the display. The marker will disappear from the display when the corresponding pushbutton is pressed.

The MARKERS pushbuttons are described below. These pushbuttons are interlocked in such a way that all three may be off, but only one may be on at a time.

VIDEO: Causes a positive-video pulse to occur at the marker frequency(ies). The amplitude of this pulse can be adjusted from 0 to +5 volts using the MARKER AMPLITUDE control. RESET (default) state: On.

RF: Causes a negative RF pip to occur at the marker frequency(ies). The amplitude of this pip can be adjusted between 0 and approximately 10 dB using the MARKER AMPLITUDE control.

INTENSITY: Causes an intensity dot to occur at the marker frequency(ies). The intensity marker is created by causing the sweep to dwell at the marker frequency(ies). No connection is required between the sweep generator and a CRT Z-axis input. The intensity of this marker is not affected by the MARKER AMPLITUDE control.

#### NOTE

For the intensity marker to be used with the Model 560/560A Scalar Network Analyzer, the network analyzer must be in the REAL TIME display mode.

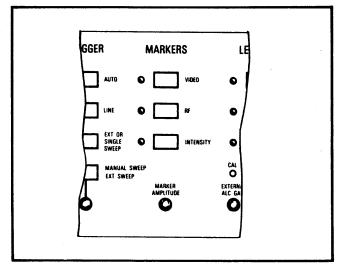


Figure 3-15. MARKERS Pushbuttons

### 3-2.5 LEVELING Controls

The LEVELING controls (Figure 3-16) select the type of leveling to be employed. These controls are interlocked so that all three pushbuttons may be off, but only one pushbutton may be on at a time. A description of each pushbutton follows.

INTERNAL: Selects an internally mounted directional detector for use in leveling the output power. When this pushbutton is engaged, the output power is sampled at the front-panel connector and fed back for leveling control. Internal leveling is not available for the 26.5-40 GHz band on the 6642A. RESET (default) state: On.

**DETECTOR:** Allows an external directional coupler and either a positive or a negative detector to be used in leveling the output power. When this pushbutton is engaged, the output power may be sampled at the end of the transmission line and fed back for leveling control.

**POWER METER:** Allows an external power meter, with either a positive or a negative recorder output voltage, to be used in leveling the output power. When this pushbutton is engaged, the output power may be sampled at the end of the transmission line and fed back for leveling control.

The sweep generator is compatible with power meters having a ±1V FS analog output, such as the HP 431/432, HP 435/436, and PM 1009/1010 models.

EXTERNAL ALC GAIN: Adjusts the gain of the signal applied to the EXTERNAL INPUT connector. The control's calibrate function automatically indicates when the gain is adjusted correctly for optimum ALC operation. To use this function, push in and turn the control until the CAL indicator comes on and stays on continuously. The indicator goes out when the control is released to its normal position.

#### NOTE

The PUSH TO CAL function is not operative for the 26.5-40 GHz band on the 6642A.

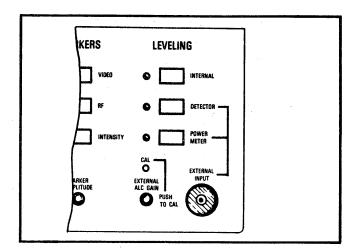


Figure 3-16. LEVELING Controls

### 3-2.6 RF OUTPUT Controls, Indicators, and Connector

The RF OUTPUT controls, indicators, and connector (Figure 3-17) are described below.

RF ON (Pushbutton): Turns the RF output on and off. RESET (default) state: On.

RETRACE RF (Pushbutton): Turns the RF output on and off during sweep retrace. This control is interlocked with the RF ON control so that it cannot be turned on unless the RF ON control is on, but it can be turned off independently of the RF ON control.

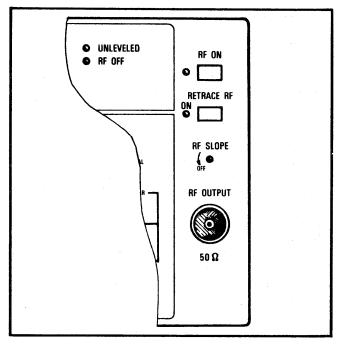


Figure 3-17. RF OUTPUT Controls

RF SLOPE (Control): Clockwise rotation adjusts the slope of the detected, leveled RF output signal. The control is used to compensate for the linear-with-frequency attenuation characteristics of RF transmission lines, when such lines are used with swept-frequency measurements. The OFF position provides optimum flatness at the RF OUT-PUT connector.

**UNLEVELED** (Indicator): Lights when the RF output is unleveled.

RF OFF (Indicator): Flashes when the RF output is off.

RF OUTPUT (Connector): Provides RF output from  $50\Omega$  source. To prevent RF losses due to impedance mismatch, the mating connector and cable should have a  $50\Omega$  impedance rating.

### 3-2.7 POWER, SELF TEST, and RESET Controls

These controls (Figure 3-18) are described below.

**POWER:** Turns ac power on and off. When power is turned on, the A12 Microprocessor PCB software-version number (e.g. 1.7) appears on the F1-F0-M1 LED and a self test is initiated.

**SELF TEST:** Initiates self testing of sweep-generator circuits. Paragraph 3-4 describes the self-test feature.

**RESET:** Presets the front panel controls as shown below and numeric parameters as shown in Table 3-1.

#### Front Panel Controls

FREQUENCY RANGE: FULL (upper and lower frequency limits are displayed).

TRIGGER: AUTO MARKERS: Off

LEVELING: INTERNAL

RF ON: On

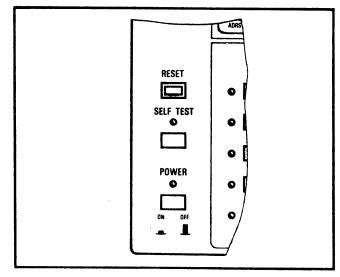


Figure 3-18. POWER, SELF TEST, and RESET Controls

### 3-2.8 BUS ADRS/RETURN TO LOCAL Control and GPIB Indicators

The BUS ADRS/RETURN TO LOCAL pushbutton and the REMOTE, LOCAL LOCKOUT, TALK, LISTEN, and SRQ GPIB indicators (Figure 3-19) are described below.

BUS ADRS/RETURN TO LOCAL (Pushbutton): In the local (front panel) mode, the pushbutton causes the bus address to be displayed on the SWEEP TIME-LEVEL LED readout. In the remote (GPIB) mode, provided that a local lockout bus message is not programmed, the pushbutton causes the sweep generator to return to the local mode.

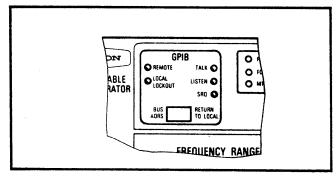


Figure 3-19. BUS ADRS/RETURN TO LOCAL Control and GPIB Indicators

Table 3-1. Reset (Default) Setting for Numeric Parameters

 $\begin{array}{c} \underline{\text{All Models:}}\\ \text{SWEEP TIME: 50 ms}\\ \text{LEVEL: Maximum Leveled Power (Table 1-1)}\\ \Delta F\text{: }1000\text{ Hz} \end{array}$ 

Model: 6609A	Model: 6629A-40	Model: 6647A
F1: 10 MHz	F1: 8000 MHz	F1: 10 MHz
F2: 2000 MHz	F2: 18000 MHz	F2: 18000 MH:
F0: 1000 MHz	F0: 13000 MHz	F0: 10000 MH:
M1: 500 MHz	M1: 9000 MHz	M1: 1000 MHz
M2: 1500 MHz	M2: 17000 MHz	M2: 17000 MH
Model: 6617A	Model: 6637A	Model: 6648A
F1: 10 MHz	F1: 2000 MHz	F1: 10 MHz
F2: 8000 MHz	F2: 18000 MHz	F2: 20000 MH:
F0: 4000 MHz	F0: 10000 MHz	
M1: 3000 MHz	M1: 3000 MHz	F0: 10000 MH2
M2: 7000 MHz	M1: 3000 MH2 M2: 17000 MHz	M1: 3000 MHz M2: 19000 MH
		W. 2. 17000 MH
Model: 6621A	Model: 6637A-40	Model: 6653A
F1: 2000 MHz	F1: 2000 MHz	F1: 2000 MHz
F2: 12000 MHz	F2: 18000 MHz	F2: 26000 MH2
F0: 9000 MHz	F0: 10000 MHz	F0: 14000 MH <sub>2</sub>
M1: 3000 MHz	M1: 3000 MHz	M1: 3000 MHz
M2: 11000 MHz	M2: 17000 MHz	M2: 25000 MH2
Model: 6621A-40	Model: 6638A	Model: 6659A
F1: 2000 MHz	F1: 2000 MHz	E1. 10 Mary
F2: 12000 MHz	F2: 20000 MHz	F1: 10 MHz
F0: 9000 MHz	F0: 11000 MHz	F2: 26000 MHz
M1: 3000 MHz	M1: 3000 MHz	F0: 14000 MHz
M2: 11000 MHz	M1: 3000 MH2 M2: 19000 MHz	M1: 3000 MHz M2: 25000 MH:
Model: 6629A	Model: 6642A	
F1: 8000 MHz	E1. 19000 Mart	
F2: 18000 MHz	F1: 18000 MHz	
F0: 13000 MHz	F2: 40000 MHz	
	F0: 25000 MHz M1: 19000 MHz	
M1: 9000 MHz	141. 10000 × 4**	

**REMOTE** (Indicator): Lights when sweep generator goes under GPIB control. Remains lit until sweep generator is returned to local control.

LOCAL LOCKOUT (Indicator): Lights when sweep generator receives a local lockout message; remains lit until local lockout message is rescinded. When LOCAL LOCKOUT indicator is lit, sweep generator cannot be returned to local control via the front panel.

TALK (Indicator): Lights when sweep generator is addressed to talk; remains lit until unaddressed.

LISTEN (Indicator): Lights when sweep generator is addressed to listen; remains lit until unaddressed.

SRQ (Indicator): Lights when sweep generator sends a Service Request; remains lit until

a serial poll is received or the SRQ function is reset (paragraph 3-7.4).

### 3-3 REAR PANEL CONTROLS AND CONNECTORS

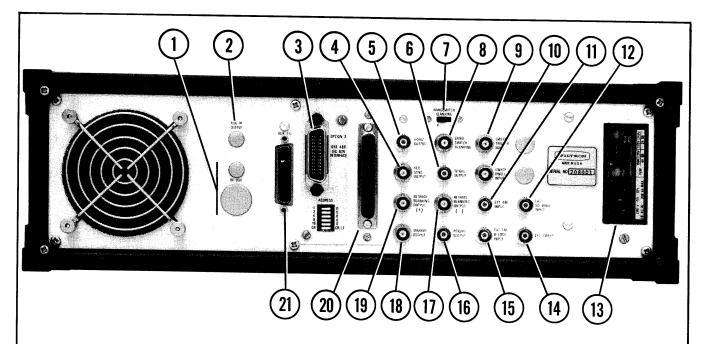
The rear panel controls and connectors are described in Figure 3-20.

#### 3-4 SELF-TEST FEATURES

The sweep generator is equipped with a selftest feature that uses an internal microprocessor to test (1) selected circuits on each of the printed circuit boards and (2) all of the indicators and LED displays on the front panel. There are three ways in which a selftest is initiated. And, if an error is detected, there are up to 25 error codes that may be displayed on the front panel. The three ways in which a self test is initiated are described in Table 3-2; the error codes are described in Table 3-3.

Table 3-2. Three Ways in Which Self-Test is Initiated

#### **How Self Test** Indication If Indication If Is Initiated Self Test Passes Self Test Fails 1. Pressing POWER pushbutton An error code number between to ON. 00 and 24 is displayed above the $F2-\Delta F-M2$ group of pushbuttons (Table 3-3). 2. Pressing SELF TEST. a. All front panel indicators and LED Same as above. displays are tested. (Indicators and displays light and remain lit 5 seconds.) and 3. Sending sweep generator a. Numeric LED readouts are blanked. a. Numeric LED readouts are TST command over the bus blanked. b. The ASCII character "P" is sent (Option 3). b. The ASCII character "F" is over the bus to the controller. sent over the bus to the controller.



- Main RF OUTPUT Connector (Option 9): Provides 50-ohm RF output. (Not available on 6642A above 26.5 GHz.)
- Auxiliary RF OUTPUT Connector (Option 10): Provides 50-ohm RF output. Output power is attenuated by  $\approx\!\!25~\mathrm{dB}$  from the power available at the main RF OUTPUT connector.
- 3 IEEE-488 Interface Bus Connector (Option 3): Provides input output connections to General Purpose Interface Bus (GPIB).
- SEQ SYNC OUTPUT: Provides a positive pulse during sweep retrace, and when the RF plug-in switches between different YIG oscillators (bandswitches). Signal is used to supply retrace information to the WILTRON Model 560/560A and HP Model 8410 Network Analyzers. Connects to FROM SEQ SYNC WILTRON connector on Model 560 or to Z-AXIS SELECT on Model 560A.
- HORIZ OUTPUT: Provides 0 to 10 volts during all sweep modes, and during all CW modes when CW RAMP is activated. Connects to HORIZ INPUT (HORIZONTAL INPUT on 560A) connector on Model 560 Scalar Network Analyzer.
- 6 1V/GHz OUTPUT: Provides voltage signal equal to 1V per GHz for all models except the 6642A, 6653A, and 6659A. For these three models, the signal is 0.5V per GHz. Signal may be used as an approximate frequency reference and also for tuning the HP 8410B Network Analyzer.
- (7) BANDSWITCH BLANKING (+, -): Switches BANDSWITCH BLANKING signal either plus or minus.
- 8 BANDSWITCH BLANKING: Provides + or -5V pulse, depending on BAND-SWITCH BLANKING switch, during RF oscillator bandswitching. ±5V pulse may be used to blank sweep generator bandswitch points on oscilloscope display.

**SWEEP TRIGGER INPUT:** Provides for external sweep triggering when TRIGGER-EXT OR SINGLE pushbutton is engaged. Trigger occurs on closure-to-ground. To provide for proper triggering, the input pulse should be a clock pulse with the following characteristics:

Amplitude: 4 to 25 Vpk Pulse Width: >1µs

Fall Time: <5µs
Polarity: Low true

- SWEEP DWELL INPUT: Allows a pulse from the HP 8410 Network Analyzer to cause the sweep generator sweep to dwell during 8410 sweep retrace.
- EXT AM INPUT: Provides for applying amplitude modulation to the RF output signal. The frequency of the modulating signal can go from dc to 50 kHz. Input impedance is 10 kilohms.
- EXT SQ WAVE INPUT: Provides for applying square-wave modulation to the RF output signal. The input square wave can have a frequency of up to 50 kHz and an amplitude of ±10 volts. Input impedance is TTL compatible. (Not available on 6642A.)
- Voltage Selector Module: Allows 100, 115-120, 220, or 230-240 Vac line voltage values to be used with sweep generator. Refer to paragraph 2-3 for setup instructions.
- **EXT SWEEP:** Allows an external 0 to 10 volt ramp to be used to sweep the output frequency. To use this input, the EXT SWEEP pushbutton must be activated.
- EXT FM Ø LOCK INPUT: Provides for applying frequency modulation and phase-lock control (paragraph 3-2.2d) to the RF output signal.
- PENLIFT OUTPUT: Provides isolated, normally-open relay contacts for lifting recorder pen during sweep retrace. Can be modified internally for normally-closed relay contact operation.
- RETRACE BLANKING OUTPUT (-): Provides -5V pulse during sweep retrace.
- MARKER OUTPUT: Provides video marker output when MARKERS-VIDEO pushbutton is engaged. Connects to MARKER INPUT connector on Model 560/560A Scalar Network Analyzer.
- RETRACE BLANKING OUTPUT (+): Provides +5V pulse during sweep retrace. Connects to FROM BLANKING (+) WILTRON connector on WILTRON Model 560/560A Scalar Network Analyzer.
- DATA I/O (Option 14): 37-pin connector providing interface between the Model 661 Tracking Sweeper Controller and the GPIB. Connects with DATA I/O port on 661. See Figure 3-21 for a pinout diagram.
- AUX I/O: 25-pin connector providing interface between the sweep generator and the Model 661 Tracking Sweeper Controller or Model 560A Scalar Network Analyzer. See Figure 3-22 for a pinout diagram.

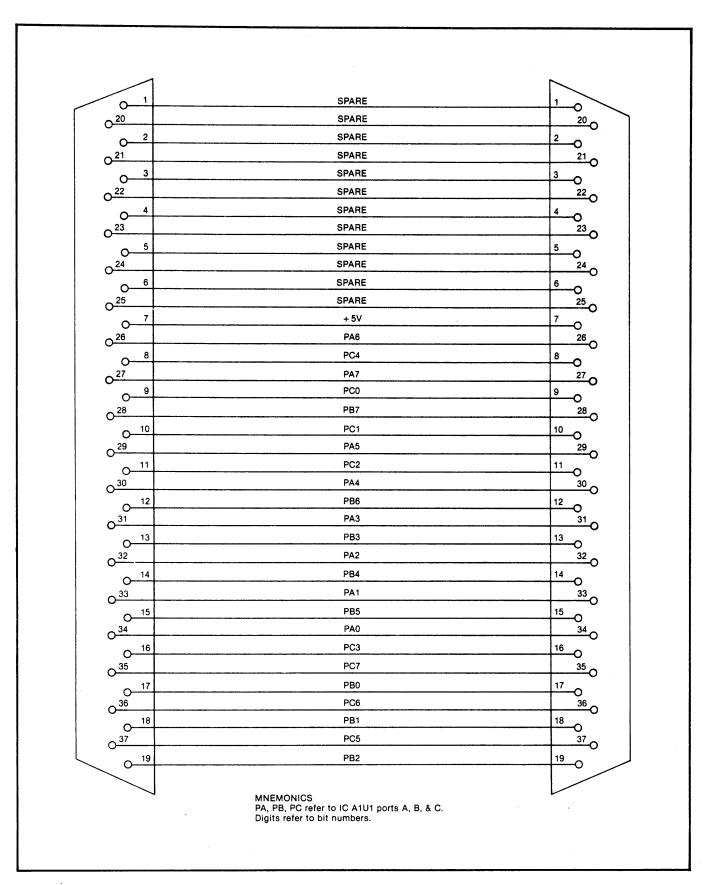


Figure 3-21. Pinout Diagram, DATA I/O Interconnect Cable

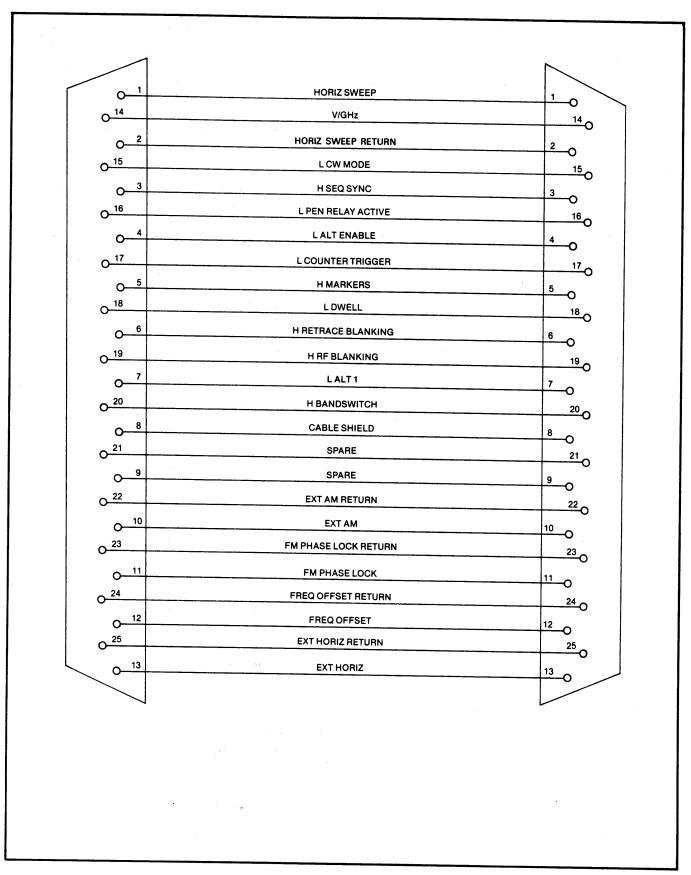


Figure 3-22. Pinout Diagram, AUX I/O Interconnect Cable

### Table 3-3. Self-Test Error Codes

GENERAL: The microprocessor's self-test routines reside in software modules; each module is assigned an error-code number. When a self-test is initiated, these software modules are called up in sequential order, beginning with number 00 and ending with number 24. If an error is detected, the error-code number is displayed and the self-test continues. If multiple errors are detected, each error-code number is displayed. To abort self-test once it has begun, press the RESET pushbutton.

SWEEP GENERATOR ERROR DISPLAY	MEANING OF ERROR CODE	RECOMMENDED ACTION
	A voltage supply other than the 5V supply is out of tolerance. If the 5V supply is faulty, the sweep generator will not operate.	See Figure 7-127 for troubleshooting flow-chart.
Error Ci	Line voltage too low.	See Figure 7-128 for troubleshooting flow-chart.
Error   C OC	Line voltage too high.	See Figure 7-129 for troubleshooting flow-chart.
	ROM U5 fails bit parity check.	Replace A12 U5.
	ROM U6 fails bit parity check.	Replace A12 U6.
: Error :	ROM U7 fails bit parity check.	Replace A12 U7.
	ROM U8 fails bit parity check.	Replace A12 U8.
Error	ROM U9 fails bit parity check.	Replace A12 U9.
: Error : UB	One or more RAMs, U11, U12, U37, U38, fail write verification test.	Replace RAMs.

SWEEP GENER.		MEANING OF	RECOMMENDED	
ERROR DISPI		The association of error codes, PCBs, and frequency bands is shown below:  Error PCB Code (Band) 09 A6 (Het.) 10 A6 (Osc. 1) 11 A7 (Osc. 2) 12 A8 (Osc. 3) 13 A9 (Osc. 4)	Troubleshooting flowcharts are given below:    Error Code	
Erroro  Erroro		The association of error codes and frequency bands is shown below:  Error Code 15	See Figure 7-46 for troubleshooting flow-charts.	
Error.	<i>2</i>	Analog circuit error, detected during Ramp Generator (A2) PCB test.	See Figure 7-35 for troubleshooting flow-chart.	
Error or or	 	Analog circuit error, detected during Marker (A3) PCB test.	See Figure 7-40 for troubleshooting flow-chart.	
Error o a	23 °-	Analog circuit error, detected during FM Attenuator (A10) PCB test.	See Figure 7-92 for troubleshooting flow-chart.	

SWEEP GENERATOR	MEANING OF	RECOMMENDED
ERROR DISPLAY	ERROR CODE	ACTION
	Only appears if Option 3 installed. Indicates error detected during GPIB Interface (A1) PCB test.	See Figure 7-28 for troubleshooting flow-chart.

Table 3-4. Recommended Test Equipment for Operational Checkout

EQUIPMENT	REQUIRED CHARACTERISTICS	RECOMMENDED MANUFACTURER	PURPOSE
Scalar Network Analyzer	Ability to display frequency response of sweep generator.	WILTRON Model 560 Scalar Network Analyzer, with 7N50 Detector or 7S50, Option 2 Detector (6642A)	Display sweep generator output during operational checkout.
Microwave Frequency Counter	.01 to 26.5 GHz frequency response with source locking capability.	EIP Model 578	Used with Table 3-6 to check the operation of the FREQUENCY VERNIER controls and phaselocking capability for all models except 6642A.
Microwave Frequency Counter	26.5 to 40 GHz frequency response with source-locking capability.	EIP Model 578/06 with 590 frequency extension kit and Option 91 Remote Sensor	Used with Table 3-6 to check the operation of the 6642A FRE-QUENCY VERNIER controls and phase-locking capability.
Directional Coupler	Ability to couple signals within a por- tion of the 10 MHz to 18 GHz frequency range.	NARDA Model 3202B-10	
RF Detector	Ability to detect signals within the 10 MHz to 18 GHz frequency range.	WILTRON Model 75N50	Used with Table 3-7 to check the operation of external leveling feature.
Power Meter	Ability to provide output signal that is (1) proportional to the measured power and (2) 1 volt for full-scale deflection.	Hewlett-Packard Model 435A with 8481 Power Sensor	
Crystal Detector	2/ 5	HP R422A	
Power Meter	26.5 to 40 GHz frequen- cy range	HP 432A, with R486A Thermis- tor Mount	Used with Table 3-8 to check the operation of the 6642A external leveling feature.
Adapter Cable for 560	Adapt 560 input to waveguide detector.	WILTRON 560-10BX-1	
Connector Adapters (2)	Adapt between SMA- female and BNC-male connectors.	Pomona Elect. 4290	

### 3-5 OPERATIONAL CHECKOUT PROCEDURES

The operational checkout procedures for the sweep generator are given in paragraphs 3-5.1, 3-5.2, 3-5.3 and 3-5.4. These procedures are organized by function, so that only those functions being used need to be checked.

Table 3-4 (facing page) gives the recommended test equipment for the four operational checkout procedures (Tables 3-5, 3-6, 3-7, 3-8.)

Notice that the test equipment differs for each checkout procedure. Tf the recommended equipment test is not available. equipment with equivalent characteristics may be substituted.

### 3-5.1 Operational Checkout, Sweep Generator Confidence Test

This paragraph provides the confidence test procedure for the sweep generator. Figure 3-23 shows the test setup and Table 3-5 gives the test procedure.

Table 3-5. Sweep Generator Confidence Test (All models except 6642A)

- 1. Connect the equipment as shown in Figure 3-23.
- 2. Turn on the sweep generator and press RESET. If no error code appears on the appropriate LED readouts (Table 3-3), the sweep generator should be functioning normally.

### NOTE

The digits on the LED displays will be random for the first 1/2-second after turn-on.

- 3. Observe the 560 CRT. A leveled trace should be located near center screen.
- 4. Press LEVELING INTERNAL. The 560 trace should go unleveled.
- 5. Press INTERNAL again. A leveled trace returns to the 560 CRT.
- 6. Press LEVEL and set for 0 dBm (+3 dBm, 6609A; -5 dBm, 6642A). Verify that the 560 trace "jumps" 2 divisions (10 dB), and that the trace remains level.

END OF CONFIDENCE TEST

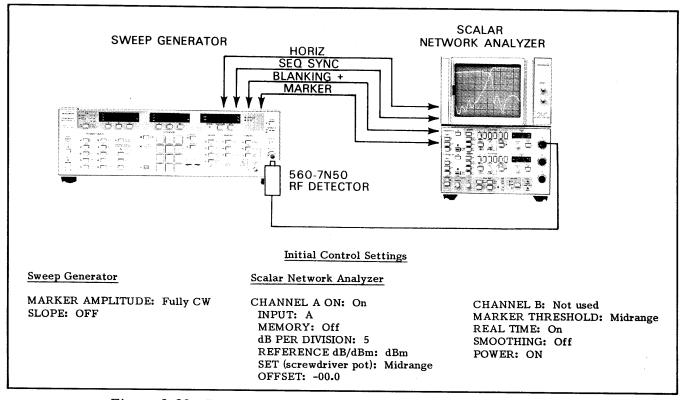


Figure 3-23. Equipment Setup for Confidence Test (except 6642A)

### 3-5.2 Operational Checkout Procedure, FREQUENCY VERNIER Pushbuttons and Phase-Lock Operation

The FREQUENCY VERNIER pushbuttons provide for making small changes to the output frequency in the CW F0 thru CW M2,  $\Delta$ F F0, and  $\Delta$ F F1 operational modes. These frequency changes do not affect the readout that appears on the respective frequency's front panel LED display.

The phase-lock operation automatically "locks" the sweep generator's output frequen-

cy to the crystal-controlled time-base of the frequency counter. When the EIP 578 Source Locking Counter is used, the phase-lock function allows the sweep generator's frequency to be accurately resolved to 100 kHz for all models except the 6642A, 6653A and 6659A. For these 3 models, resolution is ±200 kHz.

The test setup for operationally checking the FREQUENCY VERNIER controls and phase-lock operation for all models except 6642A is shown in Figure 3-24; the test setup for the 6642A is shown in Figure 3-25; the checkout procedure is given in Table 3-6.

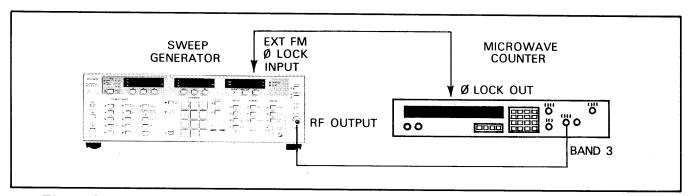


Figure 3-24. Test Setup for Operational Checkout of FREQUENCY VERNIER Controls (All models except 6642A)

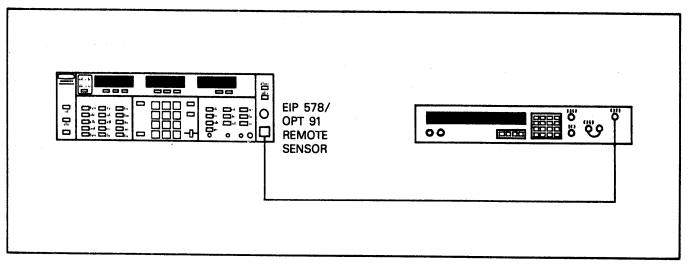


Figure 3-25. Test Equipment Setup for Operational Checkout of FREQUENCY VERNIER Controls on Model 6642A, 26.5-40 GHz Band

Table 3-6. Operational Checkout Procedure, FREQUENCY VERNIER Controls and Phase-Lock Operation (all models)

- 1. Connect test equipment as shown in Figure 3-24 or 3-25.
- 2. Turn on power to sweep generator (sweeper) and frequency counter (counter).
- 3. On sweeper, press LEVEL and set for 0 dBm.
- 4. Connect  $50\Omega$  cable between RF OUTPUT on sweeper and the appropriate BAND input on counter.

### Frequency Vernier Controls Operation

- 5. On sweeper, press CW F0 and set for low-end frequency +50 MHz.
- 6. Observe counter:
  - a. If frequency is below the sweeper-output frequency, press & hold FREQUENCY VERNIER INCREASE until counter frequency equals sweeper frequency.
  - b. If frequency is above the sweeper-output frequency, press & hold FREQUENCY VERNIER DECREASE until counter frequency equals sweeper frequency.
- 7. On sweeper, press CW F2 and set for midband frequency.
- 8. Repeat step 6 above.
- 9. On sweeper, press CW M2 and set for high-end frequency -50 MHz.
- 10. Repeat step 6 above.

### Table 3-6. Operational Checkout Procedure, FREQUENCY VERNIER Controls and Phase-Lock Operation (all models) (Continued)

- 11. Verify that the FREQUENCY VERNIER ACTIVE indicator is lit for each of the parameters receiving a frequency correction, as follows:
  - a. Press CW F0 and verify that ACTIVE indicator is lit.
  - b. Press CW F1 and verify that ACTIVE indicator is not lit.
  - c. Press CW F2 and verify that ACTIVE indicator is lit.
  - d. Press CW M1 and verify that ACTIVE indicator is not lit.
  - e. Press CW M2 and verify that ACTIVE indicator is lit.
  - f. Press  $\Delta F$  F0 and verify that ACTIVE indicator is lit.
  - g. Press ΔF F1 and verify that ACTIVE indicator is not lit.
- 12. Verify that frequency-vernier correction is canceled when the parameter to which a vernier correction was applied is changed, as follows:
  - a. Press CW F0 and set for midband frequency.
  - b. Verify that the FREQUENCY VERNIER ACTIVE indicator went out.

### Phase-Lock Operation

- 13. Connect a BNC-to-BNC test cable between Ø LOCK OUT on counter and EXT FM Ø LOCK INPUT on sweeper.
- 14. On counter, enter a lock frequency within the sweeper's range (use keypad and enter this frequency on the auxiliary (small) display).
- 15. On sweeper,
  - a. Press CW F1 and set for the "lock" frequency.
  - b. Press FM AND PHASELOCK.
- 16. On counter, press LOCK.
- 17. Observe counter; it should indicate the lock frequency ±1 count.

### 3-5.3 Operational Checkout Procedure, External Leveling Function (All Models Except 6642A)

External leveling of the RF source is pro-

vided by the front panel EXTERNAL INPUT connector and the LEVELING-DETECTOR or -POWER METER pushbutton. A test setup for external leveling is shown in Figure 3-26; the operational checkout procedure is given in Table 3-7.

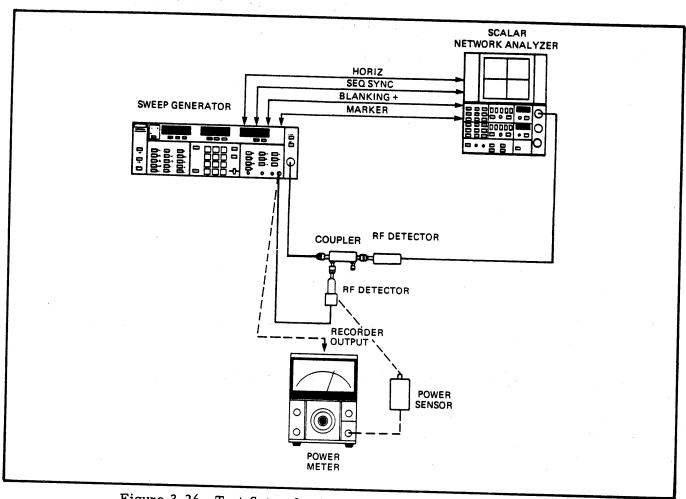


Figure 3-26. Test Setup for External Leveling (except 6642A)

Table 3-7. Operational Checkout Procedure, LEVELING-DETECTOR and -POWER METER Controls (except 6642A)

- 1. Connect test equipment for detector leveling, as shown by the solid lines in Figure 3-26.
- 2. Turn on power on sweep generator (sweeper) and scalar network analyzer (network analyzer).
- 3. On sweeper,
  - a. Press FREQUENCY RANGE F1-F2.
  - b. Set F1 and F2 parameters for a sweep range compatible with the directional coupler being used. For example:
    - Push F1 and set for 1 GHz.
    - Push F2 and set for 12.4 GHz.

The above two settings are compatible with the NARDA 3202B-10.

c. Press LEVEL and set for 0 dBm.

### Table 3-7. Operational Checkout Procedure, LEVELING-DETECTOR and -POWER METER Controls (Continued)

- d. Press SWEEP TIME and set for 50 ms.
- e. Press TRIGGER AUTO.
- f. Press LEVELING INTERNAL.
- 4. On network analyzer,
  - a. Position front panel controls as follows:

CHANNEL A ON: On
INPUT: A
MEMORY: Off
REFERENCE dB/dBm: dBm
OFFSET: 00.0
dB PER DIVISION: 1

- b. Press Channel A REF POS LOCATE and adjust SET control to position trace on center graticule line.
- c. Release REF POS LOCATE and observe that a leveled trace slightly below the 0 dBm reference line appears on the CRT.
- 5. On sweeper,
  - a. Press LEVELING DETECTOR.
  - b. Push in on EXTERNAL ALC GAIN control and turn until CAL indicator comes on and stays on.
  - c. Release EXTERNAL ALC GAIN.
- 6. Observe that a leveled trace is present on CRT.
- 7. Observe that the UNLEVELED indicator on the sweeper is not lit.
- 8. On sweeper, press LEVELING DETECTOR to off. Observe that the CRT trace becomes unleveled and the sweeper UNLEVELED indicator lights.
- 9. Disconnect the RF detector from between the sweeper and the directional coupler; in its place, connect the power meter as shown by the dashed lines in Figure 3-24.
- 10. On sweeper,
  - a. Press CW F1.
  - b. Press LEVELING POWER METER.
  - c. Push in on EXTERNAL ALC GAIN control and turn until CAL indicator comes on and stays on.

### d. Release EXTERNAL ALC GAIN.

### NOTE

The response to a changing power level is slow using a power meter; consequently, external leveling should be accomplished using either CW or a slow (99 s) sweep speed.

### 3-5.4 Operational Checkout Procedure, External Leveling Function (6642A)

External leveling of the RF source is provided by the front panel EXTERNAL INPUT connector and the LEVELING-DETECTOR or -POWER METER pushbutton. In this model, which uses two RF output connectors, external leveling (1) must be used

with the 26.5-40 GHz band — which does not contain an internal leveling capability — and (2) can only be used with one band at a time. That is, both the 18-26.5 and 26.5-40 GHz bands cannot be externally leveled at the same time. A test equipment setup for externally leveling the 26.5-40 GHz band is shown in Figure 3-27; the procedure for leveling the 26.5-40 GHz band is given in Table 3-8.

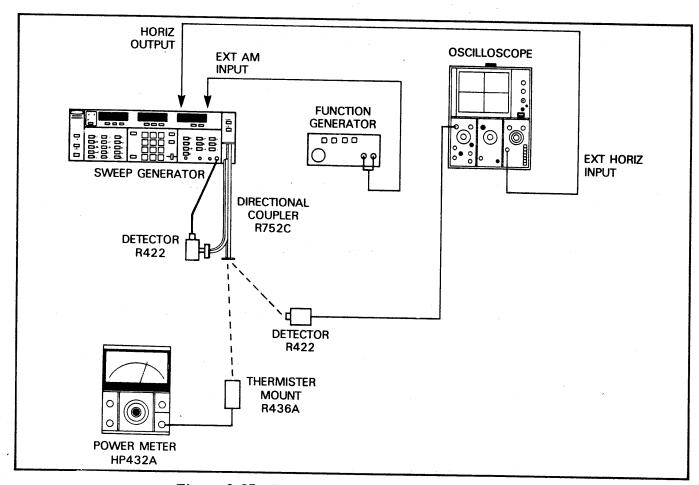


Figure 3-27. External Leveling Test Setup (6642A)

## Table 3-8. Operational Checkout Procedure, LEVELING-DETECTOR and -POWER METER Controls (6642A)

- 1. Connect test equipment for detector leveling, as shown in Figure 3-27. Turn the equipment on.
- 2. Adjust function generator for a 10 kHz, 0-300 mV square-wave output.
- 3. On sweeper,
  - a. Adjust RF SLOPE fully counterclockwise to OFF.
  - b. Press RESET.
  - c. Press CW F1.
  - d. Press LEVELING DETECTOR.
- 4. On oscilloscope, adjust vertical and horizontal controls to obtain a square wave.
- 5. On sweeper, adjust EXTERNAL ALC GAIN for best square-wave response.
- 6. Remove the oscilloscope from the directional coupler, and connect the power meter's thermistor mount in its place.
- 7. On sweeper,
  - a. Adjust EXTERNAL ALC GAIN for a 0 dBm reading on power meter.
  - b. Press CW F2.
  - c. Readjust EXTERNAL ALC GAIN (if necessary) for 0 dBm power meter reading.
  - d. Press CW F1.
  - e. Repeat steps a. thru d. as necessary to obtain 0 dBm at both 27 and 40 GHz.
  - f. Press LEVEL and set for -10 dBm.
- 9. Observe that power meter indicates -10 dBm. If not, refer to paragraph 5-11.2 for adjustment instructions.
- 10. Disconnect the power meter, and connect the waveguide to the device-under-test.
- 11. The sweeper is now ready for making 0 to -10 dBm leveled power measurements.

### 3-6 DESCRIPTION OF THE IEEE-488 (IEC-625) INTERFACE BUS

The IEEE-488 bus (General Purpose Interface Bus - GPIB) is an instrumentation interface for integrating instruments, calculators, and computers into systems. The bus uses 16 signal lines to effect transfer of data and commands to as many as 15 instruments. The instruments on the bus are connected in par-

allel, as shown in Figure 3-28. Eight of the signal lines (DIO 1 thru DIO 8) are used for the transfer of data and other messages in a byte-serial, bit-parallel form. The remaining eight lines are used for communications timing (handshake), control, and status information. Data is transmitted on the eight GPIB data lines as a series of eight-bit characters, referred to as bytes. Normally, a seven-bit ASCII (American Standard Code for

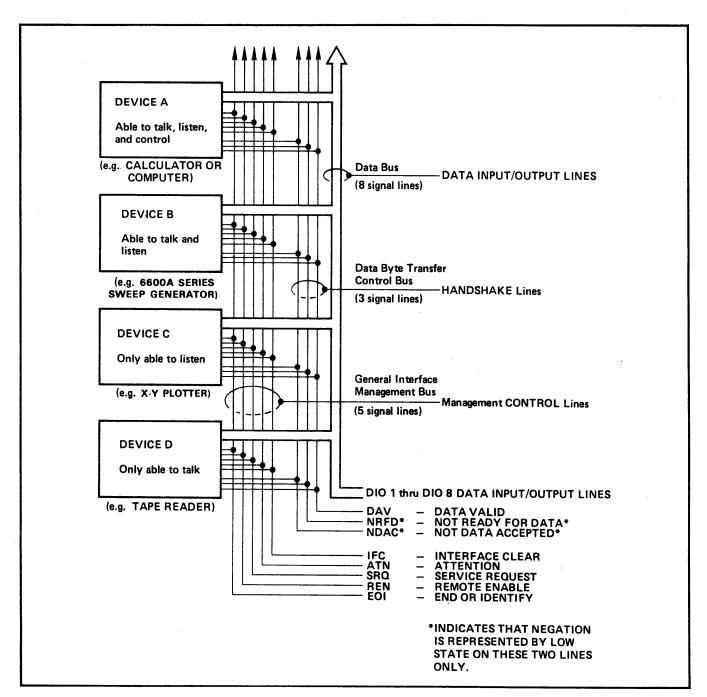


Figure 3-28. Interface Connections and Bus Structure

Information Interchange) code is used. The eighth (parity) bit is not used. Data is transferred by means of an interlocked handshake technique. This technique permits asynchronous communications over a wide range of data rates. The following paragraphs provide an overview of the data, management, and handshake buses, and describe how these buses interface with the sweep generator.

### 3-6.1 Data Bus Description

The data bus contains eight bi-directional, active-low signal lines — DIO 1 thru DIO 8. One byte of information (eight bits) is transferred over the bus at a time. DIO 1 represents the least-significant bit (LSB) in the byte; DIO 8 represents the most-significant bit (MSB) in the byte. Each byte represents a peripheral address (either primary or secondary), a control word, or a data byte. Data bytes are usually formatted in ASCII code, without parity. The data bus provides the conduit for transmitting control information and data between the controller and the instrument (sweep generator).

### 3-6.2 Management Bus Description

The management bus is a group of five signal lines that are used to control the operation of the bus system. Functional information regarding the individual management-bus control lines is provided below.

- a. ATN (attention). When this line is TRUE, the sweep generator will respond to appropriate interface messages (e.g. device clear and serial poll) and to its own listen/talk address.
- b. EOI (end or identify). This line is set TRUE during the last byte of a multi-byte message. This line is also used in conjunction with ATN to indicate a parallel-poll.
- c. IFC (interface clear). When this line is TRUE, the sweep generator interface functions are placed in a known state, i.e., unaddressed to talk, unaddressed to listen, and service request idle.

- d. REN (remote enable). When this line is TRUE, the sweep generator is enabled for entrance into the remote state (i.e., certain front panel functions disabled) upon receipt of its listen address. The remote state is exited when either (1) the REN line is FALSE (high), (2) the go-to-local (GTL) message is received, or (3) the sweep generator programming command RL (return to local) is received.
- e. <u>SRQ</u> (service request). This line is pulled LOW (true) by the sweep generator to indicate that certain conditions (paragraph 3-7.4) exist.

### 3-6.3 Data Byte Transfer Control (Hand-shake) Bus Description

Information is transferred on the data lines under control of a technique called the three-wire handshake. The three handshake bus signal lines are described below; Figure 3-29 shows a typical interlocking handshake operation.

- a. DAV (data valid). This line is set TRUE (arrow 1) when the talker has (1) sensed that NRFD is FALSE, (2) placed a byte of data on the bus, and (3) waited an appropriate length of time for the data to settle.
- b. NRFD (not ready for data). This line is set TRUE (arrow 2) by a listener to indicate that valid data has not yet been accepted. The time between the events shown by arrows 1 and 2 is variable, and depends upon the speed with which a listener can accept the information.
- c. NDAC (not data accepted). This line is set FALSE by a listener when the listener has accepted the current data byte for internal processing. When the data byte has been accepted, the listener releases its hold on NDAC and allows the line to go FALSE. However, because the GPIB is constructed in a wired-OR configuration, this line will not go FALSE until all listeners participating in the interchange have also released the line. As shown by the arrow labeled 3, when the NDAC line

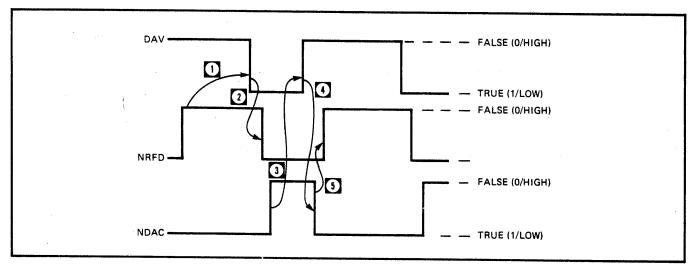


Figure 3-29. Typical Handshake Operation

goes FALSE the DAV line follows suit a short time later. The FALSE state of the DAV line indicates to the bus that valid data has been removed; consequently, with valid data no longer on the line, the NDAC line is pulled LOW again in preparation for the next data interchange. This action is shown by the arrow labeled 4.

The next action that occurs is shown by arrow 5. This arrow shows NRFD going FALSE after NDAC returns to its TRUE state. The FALSE state of NRFD indiciates to the bus that all listeners are ready for the next information interchange. The time period between these last two events (NDAC going TRUE and NRFD going FALSE) is variable and is dependent upon the length of time that it takes a listener to process the data byte. Therefore, the result of the wired-OR construction of the handshake bus is that a talker is forced to wait for the slowest instrument to accept the current data before it can place a new byte of information on the bus.

### 3-7 GPIB OPERATION (Option 3)

The sweep generator, when equipped with Option 3, has the capability for complete front-panel-control operation over the GPIB. When used on the GPIB, the sweep generator functions as both a listener and a talker;

Figure 3-30 provides a listing showing the GPIB subset functions and gives the sweep generator's capability for each function.

To provide bus control, a system of device-dependent commands (hereafter known as bus commands) and IEEE-488 Bus Messages (hereafter known as bus messages) is used. The bus commands (approximately 100 in number) are divided into the following six classes:

- 1. Front Panel Control Related Commands.
- 2. Digital Sweep Commands.
- 3. Group Execute Trigger Mode Commands.
- 4. Service Request Mode Commands.
- 5. Output Commands.
- 6. Miscellaneous Commands.

These six classes of commands are described in paragraphs 3-7.1 thru 3-7.6, respectively. The bus messages recognized by the sweep generator are discussed in paragraph 3-7.7. In addition to bus commands and bus messages, the two types of errors that can occur with bus programming are discussed in paragraph 3-7.8. The sweep generator's default-from-reset-or-turn-on states are described in paragraph 3-7.9. A description of information supplied to provide quick reference data for GPIB programmers is given in paragraph 3-7.10. And an alphabetical index to bus command mnemonics is provided in paragraph 3-7.11.

GPIB SUBSET	FUNCTION	DESCRIPTION
AH1	Acceptor Handshake	Complete Capability
SH1	Source Handshake	Complete Capability
Т6	Talker	<ol> <li>Basic Talker</li> <li>Serial Poll</li> <li>Unaddressed if MLA</li> <li>No Talk Only (TON)</li> </ol>
TEØ	Talker With Address Extension	No Capability
L4	Listener	<ol> <li>Basic Listener</li> <li>Unaddressed if MTA</li> <li>No Listen Only (LON)</li> </ol>
LEØ	Listener With Address Extension	No Capability
SR1	Service Request	Complete Capability
RL1	Remote/Local	Complete Capability
PP1	Parallel Poll	Complete Capability
DC1	Device Clear	Complete Capability
DT1	Device Trigger	Complete Capability
CØ	Controller	No Capability

Figure 3-30. 6600A Series Sweep Generator IEEE-488
Interface Bus Subset Capability

# 3-7.1 GPIB Commands: Front Panel Controls

The GPIB commands used to activate front-

panel-control functions are listed in Table 3-9. Programming examples that demonstrate the use of these commands are shown in Figure 3-31.

Table 3-9. 6600A Series Sweep Generator Front-Panel-Control-Related Commands

FRONT PANEL CONTROL	BUS COMMAND	NOTES
A. DATA ENTRY		
1. Parameter Entry Controls	·	Select the sweep generator parameter and enter the parameter's value. The decimal digits (Xs) in these commands are the
F0 F1 F2 M1 M2 ΔF SWEEP TIME RF LEVEL	FØXXXXGH (or MH) F1XXXXGH (or MH) F2XXXXGH (or MH) M1XXXXGH (or MH) M2XXXXGH (or MH) DLFXXXXGH (or MH) SWTXXSEC (or MS) LVLXXDM (or DB)	parameter's value in either GHz or MHz, seconds or milliseconds, dBm or dB (see below). This value is written in the same manner that it is entered from the keyboard, i.e., either an integer or decimal number (e.g. 2 or 2.21) followed by a suitable terminator (paragraph 3-2.1). The number is not limited to two or four digits; it can be any number of digits, so long as it does not exceed the limits of the instrument.
2. <u>Data</u> <u>Terminators</u>	·	Select parameter terminator (paragraph 3-2.1).
GHz MHz Seconds Milliseconds dB dBm	GH MH SEC MS DB DM	
3. SHIFT	SH	Enables shifted functions (paragraph 3-2.1f) to be selected using their unshifted command codes. Example: To select an F1-F2/M1-M2 alternating sweep, program "SH FF MM".
4. CLEAR ENTRY	CLR	Clears invalid (or illegal) parameter entries (paragraph 3-2.1e).
B. FREQUENCY RANGE		
1. Sweep Range Controls		Select sweep range (paragraph 3-2.2a).
FULL F1-F2 M1-M2 ΔF F0 ΔF F1	FUL FF MM DFØ DF1	

Table 3-9. 6600A Series Sweep Generator Front-Panel-Control-Related Commands (Continued)

	Control-Related Commands (Continued)					
FRONT PANEL CONTROL	BUS COMMAND	NOTES				
2. CW Frequency Select Controls		Select sweep range (paragraph 3-2.2b).				
CW F0 CW F1 CW F2 CW M1 CW M2	CFØ CF1 CF2 CM1 CM2					
3. Frequency Vernier Controls		Provide a vernier correction for the selected frequency parameter. Correction is specified in hundreds of kilohertz (paragraph 3-2.2c).				
INCREASE DECREASE	FVSXXXE FVS-XXXE					
OFF	FVØ	Cancels the vernier correction (paragraph 3-2.2c).				
C. TRIGGER Controls		Select trigger mode (paragraph 3-2.3).				
AUTO LINE EXT OR SINGLE	AUT LIN EXT TRS	Selects AUTO sweep. Selects LINE sweep. Selects external sweep. Triggers single sweep.				
MANUAL SWEEP	MAN	Selects manual frequency tuning.				
		NOTE  When MAN command is used, sweep tuning is accomplished using front panel controls.				
D. MARKERS Controls  VIDEO RF	VM1 RM1	Turn on the selected marker (paragraph 3-2.4).				
INTENSITY All Markers Off	IM1 MKØ	Turns all markers off.				

Table 3-9. 6600A Series Sweep Generator Front-Panel-Control-Related Commands (Continued)

FRONT PANEL CONTROL	BUS COMMAND	NOTES		
E. LEVELING Controls		Select the leveling source (paragraph 3-2.5).		
INTERNAL DETECTOR POWER METER No Leveling	IL1 DL1 PL1 LVØ	Turns leveling off.		
F. RF Output Controls		Tanno to torning off.		
RF OFF RF ON RETRACE	RFØ RF1 RTØ	Turns RF off. Turns RF on. Turns RF off during retrace.		
RF Off RETRACE RF On	RT1	Turns RF on during retrace (paragraph 3-2.6).		
G. POWER	None	AC power cannot be turned off and on over the interface bus.		
H. SELF TEST	TST	Initiates a self-test (paragraph 3-4).		
I. RESET	RST	Resets all parameters and controls to a predetermined (initialized) state (paragraph 3-2.7).		
		NOTE		
		The RST command causes the sweep generator's GPIB interface to become unaddressed. Therefore, RST should be used alone.		
J. FM OR PHASELOCK		Allows external frequency modulation or phase-lock control to be applied to the sweep generator (paragraph 3-2.2d).		
Off On	FMØ FM1			

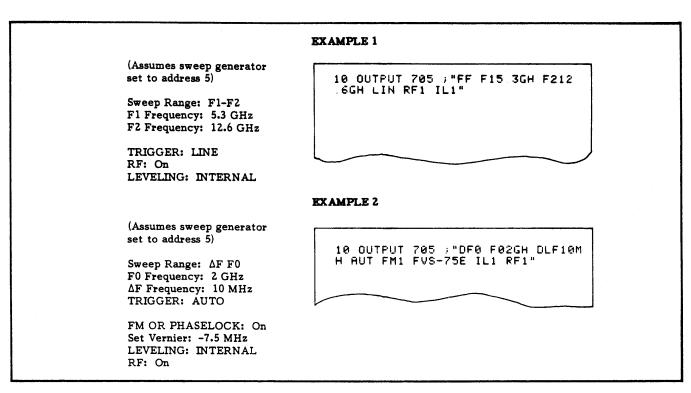


Figure 3-31. GPIB Front Panel Programming Examples

#### 3-7.2 GPIB Commands: Step Sweep

To provide a high-resolution sweep over a narrow band of frequencies, the sweep generator is equipped with a digitally stepped sweep (step sweep). This sweep, which contains 4096 discrete points, can be incrementally stepped so that any number (or all) of the discrete points can be used. The width of the step sweep and the frequency start and stop points (or center frequency for a  $\Delta F$ sweep) are selected using front-panel-control command statements. (Example: F1XXXXGH F2XXXXGH, DFØ FØXXXXGH, DLFXXXXMH, MM M1XXXXMH

M2XXXXMH.) Because the step sweep is a frequency sweep, the following apply:

- a. The front panel LED displays remain unchanged as the sweep progresses from start to stop.
- b. The frequencies corresponding to the step sweep's intermediate steps must be calculated. The formula for calculating step sweep frequencies is given in Appendix 2.

The step sweep commands are given in Table 3-10.

Table 3-10. 6600A Series	s Sweep Generator	. Digital Sweeb	Commands
--------------------------	-------------------	-----------------	----------

NAME	COMMAND	FUNCTION		
Step Sweep	STP	Selects the Step Sweep mode of operation.		
Step Select	STSXXXXE	Selects the increment point at which the Step Sweep starts. This sweep start can be any point from 0 to 4095. Zero is the usual starting point, in which case STSØE (or STSE) is the command to use.		

Table 3-10. 6600A Series Sweep Generator Digital Sweep Commands (Continued)

NAME	COMMAND	FUNCTION	
Increment Size	SIZXXXXE	Selects the number of steps by which the Step Sweep is to be incremented when an "N" command (see below) is received. Also, selects the number of steps in which a "UP" or "DN" command (Table 3-14) will increment the selected parameter (paragraph 3-2.1a).  The Xs in this command represent digits. A maximum of 4 and a minimum of 0 digits may be used. The number that is formed by the digits must be an integer of a fractional number is used, any digits that appear the right of the decimal point are ignored. (Example SIZ146E and SIZ146.5E are equivalent commands.)	
Go to Next Step	N	Increments the Step Sweep by the number of steps programmed with the Increment Size Command.	
		The following is an example of the syntax required to implement a step sweep that starts at 0 volts, has an increment size of 819 steps, and takes data at 5 discrete frequency points:	
		10 OUTPUT 705;* "STP STSE SIZ819E" 20 FOR I = 0 TO 4 30 • 40 • Input Statements, etc. 50 • 60 OUTPUT 705; "N" 70 NEXT I	
		*Assumes sweep generator address is 5.	

# 3-7.3 GPIB Commands: Group Execute Trigger Modes

To speed up bus operations, the Group Execute Trigger (GET) bus message can be used to increment or decrement frequency,

sweep time, or output-power level. The GET bus message can also be used to increment or decrement the step sweep. The bus commands that configure the sweep generator for this increase/decrease response to a GET bus message are listed in Table 3-11.

Table 3-11. 6600A Series Sweep Generator Group
Execute Trigger (GET) Mode Commands

NAME	COMMAND	FUNCTION
Trigger Single Sweep	GTS	Configures the sweep generator to execute a single sweep each time a GET bus message is received. This is the default mode, i.e., the mode assumed when no GET Mode command is programmed.
Increment- Selected Parameter	GTU	Configures the sweep generator to execute an "UP" command (Table 3-14) each time a GET bus message is received.
Decrement- Selected Parameter	GTD	Configures the sweep generator to execute a "DN" command (Table 3-14) each time a GET bus message is received.
Go to Next Step	GTN	Configures the sweep generator to execute an "N" command (Table 3-10) each time a GET bus message is received.

# 3-7.4 GPIB Commands: Service Request Modes

To notify the controller that certain conditions exist (such as end-of-sweep, marker encountered, unleveled, and error entry), the

sweep generator uses the GPIB Service Request function. To use this function, the sweep generator employs a system of Service Request mode commands; these commands are described in Table 3-12.

Table 3-12. 6600A Series Sweep Generator Service Request (SRQ) Commands

NAME	COMMAND	FUNCTION		
Enable SRQ Capability	SQ1	Enables the following SRQ mode commands to request service from the controller.		
Disable SRQ Capability	SQØ	Disables the SRQ function. This is the default mode, i.e., the mode assumed when neither SQ1 nor SQØ is programmed.		
<u>Dwell-at-Marker</u> <u>Mode</u> : On	DW1	Activates the dwell-at-marker mode. In this mode, when an intensity marker is encountered, the frequency sweep will dwell at the marker until a Continue Sweep (CNT) command is received. When DW1 and SQ1 are		

Table 3-12. 6600A Series Sweep Generator Service Request (SRQ) Commands (Continued)

NAME	COMMAND	FUNCTION			
Dwell-at-Marker  Mode (continued):		both programmed, the SRQ line is pulled LOW (true), and Status Byte (Figure 3-32) bits 0 and 6 are set HIGH (decimal 65). When DW1 and SQØ are both programmed, only the Status Byte is generated; the SRQ line is not activated.			
Off	DWØ	Deactivates the dwell-at-marker mode. This is the default mode, i.e., the mode assumed when neither DW nor DWØ is programmed.			
End-of-Sweep <u>Mode</u> :					
On	ES1	Activates the end-of-sweep mode. When ES1 and SQ1 are both programmed, the ending of the frequency sweep causes the SRQ line to be pulled LOW (true) and Status Byte bits 1 and 6 to be set HIGH (decimal 66). When ES1 and SQØ are both programmed, only the Status Byte is generated; the SRQ line is not activated.			
Off	ESØ	Deactivates end-of-sweep mode. This is the default mode, i.e., the mode assumed when neither ES1 nor ESØ is programmed.			
Unleveled Condition Mode:					
On	UL1	Activates the unleveled-condition mode. When UL1 and SQ1 are both programmed, an unleveled output-power condition causes the SRQ line to be pulled LOW (true) and Status Byte bits 2 and 6 to be set HIGH (decimal 68). When UL1 and SQØ are both programmed, only the Status Byte is generated; the SRQ line is not activated.			
Off	ULØ	Deactivates the unleveled condition mode. This is the default mode; i.e., the mode assumed when neither ULØ nor UL1 is programmed.			
Parameter-Entry Error Mode:					
On	PE1	Activates the parameter-entry error mode. When PE1 and SQ1 are both programmed, a parameter-entry error (paragraph 3-7.8) causes the SRQ line to be pulled LOW (true) and Status Byte bits 4 and 6 to be set HIGH (decimal 80). When PE1 and SQØ are both programmed, only the Status Byte is generated; the SRQ line is not activated.			

Table 3-12. 6600A Series Sweep Generator Service Request (SRQ) Commands (Continued)

NAME	COMMAND	FUNCTION
Parameter-Entry Error Mode (continued): Off	PEØ	Deactivates the parameter-entry error mode. This is the default mode; i.e., the mode assumed when neither
		PEØ nor PE1 is programmed.
Syntax Error Mode:		
On	SE1	Activates the syntax error mode. When SE1 and SQ1 are both programmed, a syntax error (paragraph 3-7.8) causes the SRQ line to be pulled LOW (true) and Status Byte bits 5 and 6 to be set HIGH (decimal 96). When SE1 and SQØ are both programmed, only the Status Byte is generated; the SRQ line is not activated.
Off	SEØ	Deactivates the syntax error mode. This is the default mode, i.e., the mode assumed when neither SEØ nor SE1 is programmed.

	STATUS BYTE BITS							
7	6	5	4	3	2	1	0	

Bits 3 and 7 are not used by the sweep generator.

Bit 6 is the request service bit. This bit is set HIGH when certain conditions, as shown below, exist.

Bits 0, 1, 2, 4, and 5 are combined with the service request bit to provide a code number that tells the controller which condition exists. The condition codes are given below.

Bit 6 & Ø set HIGH: An intensity marker was encountered.

Bit 6 & 1 set HIGH: The frequency sweep has ended.

Bit 6 & 2 set HIGH: An unleveled RF output condition has been detected.

Bit 6 & 4 set HIGH: An invalid parameter was entered.

Bit 6 & 5 set HIGH: A syntax error has been detected.

### NOTE

The Status Byte is explained under "Serial Poll Operation" in Table 3-15.

Figure 3-32. Sweep Generator Status-Byte Coding

### 3-7.5 GPIB Commands: Output

To provide equipment identification and parameter information upon request, the sweep generator is equipped with output

commands. The use of these commands causes the sweep generator to output the requested information when next addressed to talk. These output commands are given in Table 3-13.

Table 3-13. 6600A Series Sweep Generator Output Commands

NAME	COMMAND	FUNCTION						
Output Identify	OI	Causes the sweep generator to identify itself by sending certain parameter information over the bus. This parameter information consists of model number, lowend frequency, high-end frequency, minimum output-power level, maximum output-power level, and software revision number. This command can be used to send parameter information to the controller automatically, thus relieving the operator from having to input the information manually. The format in which the OI data is returned is shown below.  Number of Bytes 4 5 5 6 4 4  Data 6636A 18.00 26.50 -005.0 05.0 01.7						
		Software revision no.  Maximum RF output power, in dBm  Minimum RF output power, in dBm  High-end frequency, in GHz  Low-end frequency, in GHz  Model Number						
Output ΔF	ODF	Returns the value of the $\Delta F$ frequency parameter to the						
Parameter Output FØ Parameter	OFØ	Returns the value of the FØ frequency parameter to the controller. Value is given in MHz.						
Output F1 Parameter	OF1	Returns the F1 frequency value, as described above.						
Output F2 Parameter	OF2	Returns the F2 frequency value, as described above.						

Table 3-13. 6600A Series Sweep Generator Output Commands (Continued)

NAME	COMMAND	FUNCTION						
Output F <sub>low</sub>	OFL	Returns the low-end frequency value, as described above.						
Output F <sub>high</sub>	OFH	Returns the high-end frequency value, as described above.						
Output M1 Parameter	OM1	Returns the M1 frequency value, as described above.						
Output M2 Parameter	ОМ2	Returns the M2 frequency value, as described above.						
Output Power Level	OLV	Returns the output-power level value to the controller. Value is given in ±0.1 dB increments.						
Output Status Byte	OSB	Returns the Status Byte (Figure 3-32) to the controller.						
Output Sweep Time	OST	Returns the sweep time value to the controller. Value is given in milliseconds.						

# 3-7.6 GPIB Commands: Miscellaneous

There are 9 GPIB commands unrelated to either front-panel, digital-sweep, GET-mode,

SRQ-mode or output operation. These miscellaneous commands are described in Table 3-14.

Table 3-14. 6600A Series Sweep Generator Miscellaneous Commands

NAME	COMMAND	FUNCTION
Continue Sweep	CNT	Causes the sweep to continue after having dwelled at an intensity marker. CNT is used in conjunction with the SRQ Dwell-at-Marker Mode.
Front Panel Displays:		
Off	DSØ	Turns off the front panel numeric displays so that unauthorized personnel cannot read the frequency range currently in use.
On	DS1	Turns the front panel numeric displays on. This is the default, or unprogrammed, condition (paragraph 3-7.9).

Table 3-14. 6600A Series Sweep Generator Miscellaneous Commands (Continued)

NAME	COMMAND	FUNCTION							
Decrement the Selected Parameter	DN	Decrements the selected frequency, sweep time, or RF level parameter by the number of steps programmed with the Increment Size command (SIZ). For DN to be effective, the selected parameter must still be active. That is, the selected parameter's command statement (F1XXXXGH, SWTXXMS, LVLXXDM, etc.) must be the last command to appear before DN is commanded. A non-parameter command, such as AUT, IL1, or VM1, cannot be sandwiched between the parameter mnemonic and the DN command. If necessary, ensure that the selected parameter is still active by prefacing DN (or a string of DNs) with the selected parameter's mnemonic. For example, send F1 DN (or DN DN DN etc.).							
Increment the Selected Parameter	UP	Increments the selected frequency, sweep time, or RF level parameter by the number of steps programmed with the Increment Size command (SIZ). As described for the DN command, above, the selected parameter must still be active for UP to be effective.							
CW Filter:									
Out	FLØ	Causes the CW filter to be out of the RF output signal line.							
In	FL1	Inserts a CW filter in the RF output signal line. This command overrides the CW filter control inherent in front-panel programming (i.e., CW filter inserted for sweep widths 50 MHz and below and not inserted for sweep widths above 50 MHz).							
Return to Local	RL	Causes the sweep generator to return to local (front panel) control, provided that a local lockout message (Table 3-15) is not in effect.							
Recall the Front Panel Control Settings	RCL	Causes the sweep generator to be reconfigured with the front-panel-control settings that were previously saved using the SAV command (below). Figure 3-33 provides a programming example.							
Horizontal Output During CW	,								
OFF ON	CS0 CS1	Operation is the same as that described for the CW RAMP function in paragraph 3-2.1f.3.							

Table 3-14. 6600A Series Sweep Generator Miscellaneous Commands (Continued)

NAME	COMMAND	FUNCTION					
Reset Sweep	RSS	Resets the frequency sweep to the sweep-start frequency, as programmed by a Parameter Entry command (e.g. FFF1XXXXGH). RSS can be used to abort the sweep currently in progress prior to sending a trigger command.					
Save the Front Panel Control Settings	SAV	Causes the sweep generator to return an ASCII encoded representation of the entire instrument setup. This instrument setup information is contained in a data string approximately 310 bytes long. The SAV command can be used to store the front-panel-control settings for a measurement test setup. This test setup information can be stored on a program tape for future use. Figure 3-33 provides a programming example.					

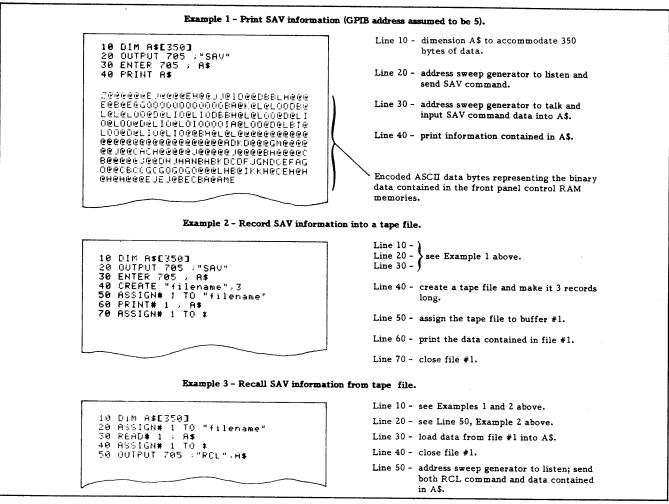


Figure 3-33. Programming Examples Using SAV and RCL Commands

#### 3-7.7 Bus Messages

The 6600 Series Sweep Generators recognize most of the IEEE-488 bus messages. A listing of the recognized bus messages, including specific information describing how the

messages are used, is given in Table 3-15. Sample program statements showing how the WILTRON 85/HP9845A, HP 9825A, and Tektronix 4051/4052 bus controllers implement the recognized bus messages are shown in Table 3-16.

Table 3-15. Bus Messages Recognized by the 6600A Series Sweep Generators

BUS MESSAGE	HOW MESSAGE IS USED BY SWEEP GENERATOR
Device Clear	1. Aborts all current sweep generator GPIB activities.
	2. Resets the STS, SIZ, SQ1, DW1, UL1, ES1, EF, and EI commands to their default condition (paragraph 3-7.9).
Go to Local	Returns the sweep generator to local control.
Group Execute Trigger	1. Triggers a new sweep if the EXT (Table 3-9) and the GTS (Table 3-11) commands are both programmed.
	2. Increments the selected parameter (paragraph 3-2.1a) by the number of steps programmed using the SIZ command (Table 3-10) if the GTU command (Table 3-11) is programmed.
	3. Decrements the selected parameter by the number of steps programmed using the SIZ command if the GTD command (Table 3-11) is programmed.
	4. Increments the digital sweep by the number of steps programmed using the SIZ command if the GTN command (Table 3-11) is programmed.
Interface Clear	Stops the sweep generator GPIB interface from listening or talking. The front panel controls <u>are not</u> cleared.
Local Lockout	Prevents the RETURN TO LOCAL pushbutton or the RL command (Table 3-14) from returning the sweep generator to local control.
Remote Enable	Places the sweep generator under remote control if the REM line is TRUE and the sweep generator is addressed to listen. If placed in remote and not supplied with program data, sweep generator operation is determined by the position in which the front panel controls were set immediately prior to going remote.
Service Request (SRQ) Messages:	The sweep generator is equipped with SRQ capability. It will respond to both serial- and parallel-poll messages. Serial- and parallel-poll operations are described below.

Table 3-15. Bus Messages Recognized by the 6600A Series Sweep Generators (Continued)

BUS MESSAGE	HOW MESSAGE IS USED BY SWEEP GENERATOR
Serial-Poll Enable (SPE) Serial-Poll Disable (SPD)	Serial Poll Operation  The SPE message causes the sweep generator to respond with a decimally-coded status byte (Figure 3-32). This status byte is coded to give the controller two pieces of information:
	1. Whether it was the device requesting service.
	2. If it was the service-requesting device, the type of service that it needs.
	The SPD message, which is sent by the controller in response to receiving a status byte, terminates serial-poll operation.
Parallel-Poll Configure (PPC)	Parallel-Poll Operation
Parallel-Poll Enable (PPE)  Parallel-Poll Unconfigure (PPU)  Parallel-Poll	When queried by a parallel-poll message command (PPOLL or pol; see Table 3-16), the sweep generator (if configured for parallel-poll operation; see below) responds by setting its assigned data bus line to the logical state (1, 0) that indicates its correct SRQ status.  To configure a bus device that is (1) built for parallel-poll operation and (2) designed to be remotely configured on the bus,
Disable (PPD)	the controller sends a two-byte parallel-poll configure and enable (PPC and PPE) message.
	The PPC byte configures the device to respond to a parallel-poll message such as PPOLL or pol. The PPE byte assigns the logical sense (1, 0) that the parallel-poll response will take.
	When the sweep generator receives the PPC/PPE message, it configures itself to properly respond to the parallel-poll message.
	The PPU (or PPD) message is sent by the controller when a parallel-poll response is no longer desired. This message causes the sweep generator to become unconfigured for parallel-poll response.

Table 3-16. Sample Bus Message Statements

BUS MESSAGE	SAMPLE STATEMENT SHOWING HOW MESSAGE IS IMPLEMENTED					
	MODELS 85/9845A	HP 9825	TEKTRONIX 4051			
Go to Local (GTL)	LOCAL 7	1cl 7	WBYTE Ω 95,			
	LOCAL 705 <sup>2</sup>	1cl 705 <sup>2</sup>	63, 37, 4:			
Group Execute Trigger (GET)	TRIGGER 7	trg 7	WBYTE Ω 95,			
	TRIGGER 705	trg 705	63, 37, 8:			
Interface Clear (IFC)	ABORTIO 7	cli 7				
	ABORTIO 705	cli 705				
Local Lockout (LLO)	LOCAL LOCKOUT 7	110 7	WBYTE Ω 17: <sup>1</sup>			
Remote Enable	REMOTE 7 rem 7		PRINT $\Omega$ 5 <sup>2</sup>			
	REMOTE 705	rem 705				
Serial Poll (Query Message)	SPOLL (7)	rds (7)—A: if	POLL A, B; 5			
,	SPOLL (705)	bit (7, A); gto (Line No.)				
Parallel Poll (Query Message)	PPOLL (7)	pol(7)-A: if bit (0, A) = 1; gsb "Serv 0": if bit (1, A) = 1; gsb "Serv 1"				
Parallel Poll Configure (PPC)  (The statements assign the sweep generator data line DIO5 for parallelpoll response with Sense (S) = 0.)	MODEL 85 ONLY:  SEND 7; LISTEN 5 CMD 3 SCG 5 UNL  HP 9845 ONLY:  PPOLL CONFIGURE 705; 5	polc 705, 5 <sup>2</sup>				

Sends message to all bus instruments.
 Sends message to instrument at address 5 (sweep generator).

Table 3-16. Sample Bus Message Statements (Continued)

BUS MESSAGE	SAMPLE STATEMENT SHOWING HOW MESSAGE IS IMPLEMENTED						
	MODELS 85/9845A	HP 9825	TEKTRONIX 4051				
Parallel Poll Unconfigure (PPU)	MODEL 85 ONLY:  SEND 7; LISTEN 5 CMD 21  HP 9845 ONLY:  PPOLL UNCONFIGURE 705	polu 7 polu 705					
Device Clear (DC and SDC)	MODEL 85 ONLY:  CLEAR 7 CLEAR 705  HP 9845 ONLY:  RESET 7 RESET 705	clr 7 clr 705	INIT <sup>1</sup> WBYTE Ω 95, 63, 37, 4: <sup>2</sup>				

<sup>1</sup> Sends message to all bus instruments.

#### 3-7.8 Program Errors

There are two types of errors that occur in bus programming: invalid-parameter errors and syntax errors. These two error types are described below.

- a. Invalid-Parameter Error. Invalid-parameter errors are those that will cause either the front panel CLEAR ENTRY, F1>F2 OR M1>M2 CHANGE FREQ SETTING, or GHz/dBm/Sec and MHz/dB/mS indicators to flash. These errors include:
  - Programming a frequency sweep where F1 is greater than F2 or M1 is greater than M2 (backward sweep, paragraph 3-2.1e).

- 2. Attempting to enter a frequency, sweep-time, or RF level parameter that exceeds the limits of the sweep generator.
- 3. Failing to properly end a parameter entry with a suitable terminator, such as MH, DB, MS, etc.

Invalid-parameter errors cause the front-panel indicators to flash.

b. Syntax Errors. Syntax errors are errors that occur in the formulation of a program statement, such as writing "EXTTFS" instead of "EXTTRS". To prevent misinterpretation of command statements, the sweep generator ignores

<sup>&</sup>lt;sup>2</sup> Sends message to instrument at address 5 (sweep generator).

all portions of the command statement following the syntax error. All commands are ignored until the sweep generator receives the Unlisten command (ASCII?)

over the bus or until the sweep generator is addressed to talk. An example showing how the sweep generator evaluates a syntax error is given in Figure 3-34.

Correctly-written program statement commanding external sweep, trigger sweep, and RF marker (sweep generator assumed to be set to address 5):

10 OUTPUT 705; "EXTTRSRM1"

Same program statement with syntax error.

10 OUTPUT 705; "EXTTFSRM1"

#### Program Format, HP 9825A and Model 85

lst Data Transaction	n 2nd Data Transaction
U L D A T A N I	U L D A T A N I

This portion of the program statement, plus all future statements, is ignored until sweep generator receives the Unlisten (UNL) command (ASCII?). The Unlisten Command is normally sent over the bus either (1) immediately prior to the next time the sweep generator is addressed (HP 9825 or Model 85, see below) or (2) immediately after the last data byte of the current data transaction has been received (TEK 4051 and PET 2001).

# Program Format, TEK 4051 & PET 2001

lst Data Transaction  L D A T A U L D A T A U I S S S S S S S S S S S S S S S S S S													
I	lst	Da	ıta	Tra	nsa	ction	2n	d D	ata	Tra	ınsa	ctio	n
	I S T A D	P	A	T }	A	N L I S T E	I S T A D	D	A	T ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	A	N L I S T E	

Figure 3-34. Program Statement with Syntax Error (Example)

# 3-7.9 Reset Programming and Default Conditions

Reset programming provides the means for quickly returning the sweep generator to its default (preprogrammed) operational state. In the manual (local) mode, the default state can be entered into only by pressing the RESET pushbutton. In the GPIB (remote) mode, however, there are several ways in which to enter the default state. These

reset-programming methods, along with related data, are given in Table 3-17. The default settings for the numeric frequency, sweep time, and output power level parameters are the same as those given for the RESET pushbutton (Table 3-1). A recommended command sequence for reset programming is given in Figure 3-35. The use of this recommended command sequence assures that all parameters and commands assume their preprogrammed state <u>each</u> time reset is desired.

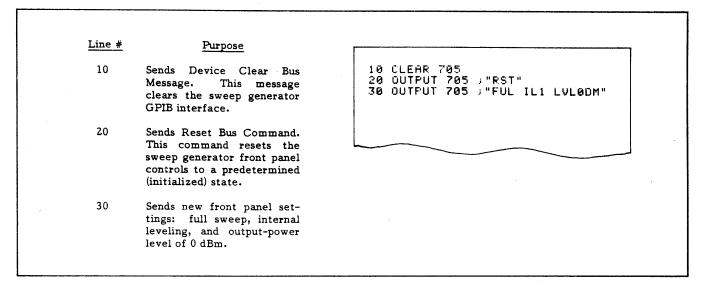


Figure 3-35. Reset Programming Statements

Table 3-17. Resetting the Sweep Generator GPIB Interface Circuits

	METHODS OF RESETTING GPIB INTERFACE CIRCUITS	FUNCTIONS AFFECTED	DEFAULT CONDITION	
1.	Pressing RETURN TO LOCAL pushbutton.	Digital Sweep	STS = Ø SIZ = Ø	
		Service Request Modes	SQØ DWØ ULØ ESØ	
	• •	Group Execute Trigger Mode	GTS	
		Bus Messages	Local	

Table 3-17. Resetting the Sweep Generator GPIB Interface Circuits (Continued)

	METHODS OF RESETTING GPIB INTERFACE CIRCUITS	FUNCTIONS AFFECTED	DEFAULT CONDITION
2.	Pressing RESET pushbutton.	Same as above.	Same as above, plus local and local lockout messages are also reset.
3.	Sending RST command over the bus.	Same as above.	Same as 2, above.
4.	Executing the interface message Device Clear.	Same as above.	Same as 1, above, except local bus message is not reset.
5.	Turning the POWER switch on and off.	Same as above	Same as 2, above.

# 3-7.10 Quick Reference Data

An alphabetical index of sweep generator GPIB command codes, along with a tabulation of default data, is provided in Appendix 1. This appendix may be copied and used as a handy source for the quick reference of certain GPIB programming data.

# 3-7.11 Index of Sweep Generator GPIB Command Codes

An alphabetical index of the sweep generator GPIB command codes is given in Table 3-18. This table lists the command mnemonic, the name of the command, and the table number where the command is described.

Table 3-18. Index of Sweep Generator GPIB Command Mnemonics

MNE- MONIC	NAME	TABLE NO.
AUT	Auto Trigger	3-9
CFØ	CW Select FØ	3-9
CF1	CW Select F1	3-9
CF2	CW Select F2	3-9
CLR	Clear Keypad	3-9
CM1	CW Select M1	3-9
CM2	CW Select M2	3-9
CNT	Continue Sweep	3-14
CS0	Horizontal Output Off During CW Operation	3-14
CS1	Horizontal Output On	
	During CW Operation	3-14
DB	dB Data Terminator	3-9

MNE- MONIC	NAME	TABLE NO.
DFØ	Sweep Range ∆F F0	3-9
DF1	Sweep Range $\Delta F$ F1	3-9
DL1	Detector Leveling	3-9
DLF	Enter $\Delta F$ Frequency	3-9
DM	dBm Data Terminator	3-9
DN	Decrement Selected	
	Parameter	3-14
DSØ	Front Panel Displays Off	3-14
DS1	Front Panel Displays On	3-14
DWØ	Dwell at Marker Mode Off	3-12
DW1	Dwell at Marker Mode On	3-12
ESØ	End of Sweep Mode Off	3-12

Table 3-18. Index of Sweep Generator GPIB Command Mnemonics (Continued)

MNE- MONIC	NAME	TABLE NO.		MNE- MONIC	NAME	TABLE NO.
ES1	End of Sweep Mode On	3-12		OFH	Output High-End	3-13
EXT	External Trigger	3-9			Frequency	3 13
FØ	Enter Parameter FØ	3-9		OLV	Output RF Level	3-13
F1	Enter Parameter F1	3-9		ОМ1	Output M1 Frequency	3-13
F2	Enter Parameter F2	3-9		OM2	Output M2 Frequency	3-13
FF	Sweep Range F1-F2	3-9		OSB	Output Status Byte	3-13
FLØ	CW Filter Off	3-14		OST	Output Sweep Time	3-13
FL1	CW Filter On	3-14	,			
FMØ	Frequency Modulation Off	3-9		PEØ	Parameter Entry Error Mode Off	3-12
FM1	Frequency Modulation On	3-9		PE1	Parameter Entry Error	3-12
FUL	Sweep Range Full	3-9			Mode On	
FVØ	Frequency Vernier Off	3-9		PL1	Power Meter Leveling	3-9
FVS	Set Frequency Vernier	3-9				
				RCL	Recall Front Panel Setup	3-14
GH	GHz Data Terminator	3-9		RFØ	RF Off	3-9
GTD	GET* Mode Execute			RF1	RF On	3-9
	"DN" Command	3-11		RL	Return to Local	3-14
GTN	GET Mode Execute	3-11		RM1	RF Marker On	3-9
C.T.C	"N" Command			RSS	Reset Sweep	3-14
GTS	GET Mode Trigger Sweep	3-11		RST	Reset Front Panel	3-9
GTU	GET Mode Execute	3-11		RTØ	RF During Retrace Off	3-9
-	"UP" Command			RT1	RF During Retrace On	3-9
IL1	Internal Leveling	3-9		SAV	Save Front Panel Setup	3-14
IM1	Intensity Marker	3-9		SEØ	Syntax Error Mode Off	3-12
				SE1	Syntax Error Mode On	3-12
LIN	Line Trigger	3-9		SEC	Seconds Data Terminator	3-9
LVØ	Leveling Off	3-9		SH	Shift	3-9
LVL	Enter Level Parameter	3-9		SIZ	Increment Size	3-10
1,41	T . M1 D .			SQØ	SRQ Mode Off	3-12
M1	Enter M1 Parameter	3-9		SQ1	SRQ Mode On	3-12
M2	Enter M2 Parameter	3-9		STP	Step Sweep	3-10
MAN	Manual Sweep	3-9		STS	Step Select	3-10
MH MKØ	MHz Data Terminator Markers Off	3-9		SWT	Enter Sweep Time	3-9
MM		3-9			Parameter	
MS	Sweep Range M1-M2 Millisecond Data	3-9				
MIS	Terminator	3-9		TRS	Trigger Sweep	3-9
				TST	Self-Test	3-9
N	Go to Next Increment (Digital Sweep)	3-10		ULØ	Unleveled Condition	3-12
				UL1	Mode Off Unleveled Condition	3-12
ODF	Output $\Delta F$ Frequency	3-13			Mode On	
OI	Identify Instrument	3-13		UP	Increment Selected	3-14
OFØ	Output FØ Frequency	3-13		-	Parameter	
OF1	Output F1 Frequency	3-13				
OF2	Output F2 Frequency	3-13		VM1	Video Marker On	3-9
OFL	Output Low-End	3-13				·
L	Frequency				/	

<sup>\*</sup>Group Execute Trigger

# **SECTION IV**

# PERFORMANCE VERIFICATION

#### 4-1 INTRODUCTION

This section contains the performance verification procedures, which are organized as follows:

Para.	Test
4-3	FREQUENCY ACCURACY
4-4	SWEEP TIME
4-5	OUTPUT POWER
4-6	RESIDUAL AM
4-7	RESIDUAL FM
4-8	EXTERNAL FM AND
	PHASE LOCK
4-9 thru 4-11	RF OUTPUT SIGNAL

### 4-2 RECOMMENDED TEST EQUIPMENT

A listing of the test equipment required for performance verification and for calibration (Section V) is given in Table 4-1.

#### 4-3 FREQUENCY ACCURACY TESTS

To verify the sweep generator's frequency accuracy, perform the steps in subparagraphs a. thru c. below. If any of the frequencies are found to be out of tolerance, perform the A5 Frequency Instruction adjustments in paragraph 5-6 and the applicable Frequency Calibration adjustments in paragraph 5-9.

# a. CW Frequency Accuracy

- 1. Connect the test equipment as shown in Figure 4-1, and turn the equipment on.
- 2. Press RESET on the sweep generator (sweeper).
- 3. Press CW F1.

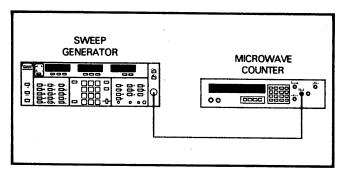


Figure 4-1. Test Equipment Setup for Frequency Accuracy Tests

- 4. For all models except the 6642A: Verify that F1 is accurate to within ±10 MHz (±20 MHz for the 6653A and 6659A) at the following frequencies:
  - (a) Low end of the frequency range.
  - (b) High end of the frequency range.
  - (c) Each applicable bandswitch point ±50 MHz (that is, 1.950 & 2.050 GHz, 7.950 & 8.050 GHz, 12.350 & 12.450 GHz, and 17.950 & 18.050 GHz).
  - (d) Each 1 GHz of tuning.
- 5. For the 6642A: Verify that F1 displays the following accuracies:
  - (a) ±15 MHz for the low end of the frequency range and each 1 GHz of tuning up to 26.000 GHz.
  - (b)  $\pm 20$  MHz at 26.550 GHz and each 1 GHz of tuning up to 40 GHz.
- 6. Press RESET.
- 7. Sequentially press CW F0, CW F2, CW M1, and CW M2; verify that each CW parameter indicates its RESET frequency (Table 4-2).

Table 4-1. Recommended Test Equipment for Performance Verification and Calibration

INSTRUMENT	REQUIRED CHARACTERISTICS	RECOMMENDED MANUFACTURER
Digital Multimeter	DC Volts: .05% to 30V, .002% to 10V. 5-1/2 digit resolution.	Keithley Model 191
Oscilloscope	60 MHz bandwidth. 1 mV sensitivity.	Tektronix 5440/5A481/5B42
Function Generator	300 mV to 10V output. 10 kHz square wave. 10 kHz sine wave.	HP 3311A
Microwave Counter	10 MHz to 26.5 GHz range. 0.25 MHz accuracy.	EIP Model 548
RF Power Meter	10 MHz to 26.5 GHz freq. range. +13 dBm measurement capability.	HP 435A, with .01- 18 GHz 8481A Power Sensor
Spectrum Analyzer, with External Mixer	60 dB power range. 10 MHz to 40 GHz freq. range. IF output. 50 dB signal-to-noise ratio, .01 to 2 GHz.	HP 8565A, HP 11517A Mixer, HP 11519A Adapter (18-26.5 GHz), HP 11520A Adapter (26.5-40 GHz)
Modulation Meter	15 kHz bandwidth. 1 kHz sensitivity.	Marconi TF2304
True RMS Voltmeter	-60 dB sensitivity. 10 kHz bandwidth.	Fluke 8921A
Adjustable AC Line Transformer (Variac)	100/120V line voltage.  220/240V line voltage.	General Radio W5MTB, General Radio
	, in the second	W10HM73
Line Voltage Monitor	120V line voltage.	RCA 120B
	240V line voltage.	RCA WV 503A
Scalar Network Analyzer	Frequency range: .01 to 26.5 GHz.	WILTRON Model 560 or 560A w/560-7S50 Opt. 2 Detector
RF Detector	Frequency range: .01 to 34 GHz.	WILTRON Model 70S50B

Table 4-1. Recommended Test Equipment for Performance Verification and Calibration (Continued)

		,
INSTRUMENT	REQUIRED CHARACTERISTICS	RECOMMENDED MANUFACTURER
Microwave Counter	18.0 to 40 GHz range. 0.25 MHz accuracy.	EIP Model 578, with 590 Frequen- cy Extension Kit and Option 91 Remote Sensor
RF Power Meter	18.0 to 40 GHz range. +5 dBm measurement capability.	HP 432A, with K482A and R486A Thermistor Mounts
Waveguide Attenuator	18.0 to 40 GHz range. 20 dB attenuation.	HP R382A and K382A
Directional Coupler	18.0 to 40 GHz range.	HP R752C
RF Detector	26.5 to 40 GHz range.	HP R422A
Network Analyzer Cable	Connect BNC female detector output to 560A Scalar Network Analyzer.	560A-10BX
Power Supply	0-5 Vdc.	HP 6821

Table 4-2. Reset (Default) Settings for Numeric Parameters

All Models:  SWEEP TIME: 50 ms  LEVEL: Maximum Leveled Power (Table 1-1)  ΔF: 1000 MHz				
Model: 6609A	Model: 6621A	Model: 6629A	Model: 6637A	
F1: 10 MHz	F1: 2000 MHz	F1: 8000 MHz	F1: 2000 MHz	
F2: 2000 MHz	F2: 12000 MHz	F2: 18000 MHz	F2: 18000 MHz	
F0: 1000 MHz		F0: 13000 MHz	F0: 10000 MHz	
M1: 500 MHz	M1: 3000 MHz	M1: 9000 MHz		
M2: 1500 MHz	M2: 11000 MHz	M2: 17000 MHz	M2: 17000 MHz	
Model: 6617A	Model: 6621A-40	Model: 6629A-40	Model: 6637A-40	
F1: 10 MHz	F1: 2000 MHz	F1: 8000 MHz	F1: 2000 MHz	
F2: 8000 MHz	F2: 12000 MHz		F2: 20000 MHz	
F0: 4000 MHz	F0: 9000 MHz	F0: 13000 MHz		
M1: 3000 MHz	M1: 3000 MHz	M1: 9000 MHz	M1: 3000 MHz	
M2: 7000 MHz	M2: 11000 MHz	M2: 17000 MHz	M2: 19000 MHz	
(continued)				

Table 4-2. Reset (Default) Settings for Numeric Parameters (continued)

#### All Models:

# SWEEP TIME: 50 ms

LEVEL: Maximum Leveled Power (Table 1-1)

 $\Delta$ F: 1000 MHz

Model 6638A	Model: 6647A	Model: 6653A	Model: 6659A
F1: 2000 MHz F2: 18000 MHz F0: 10000 MHz M1: 3000 MHz M2: 17000 MHz	F1: 10 MHz F2: 18000 MHz F0: 10000 MHz M1: 1000 MHz M2: 17000 MHz	F1: 2000 MHz F2: 26000 MHz F0: 14000 MHz M1: 3000 MHz M2: 25000 MHz	F1: 10 MHz F2: 26000 MHz F0: 13000 MHz M1: 3000 MHz M2: 25000 MHz
Model: 6642A	Model: 6648A		
F1: 18000 MHz F2: 40000 MHz F0: 25000 MHz M1: 19000 MHz M2: 39000 MHz	F1: 10 MHz F2: 20000 MHz F0: 10000 MHz M1: 3000 MHz M2: 19000 MHz		

# b. Sweep Frequency Accuracy Tests

- 1. Press FREQUENCY RANGE ΔF F0.
- 2 Press  $\Delta F$  and set for 0.050 GHz.
- 3. Press F0.
- 4. For all models other than the 6609A: In turn set F0 to the midfrequency of each applicable YIG band (5, 10, 15, and 22 GHz; or for the 6642A, 22 and 33 GHz) and verify swept-frequency accuracy, as follows:
  - (a) Press MANUAL SWEEP.
  - (b) Rotate the MANUAL SWEEP control fully counterclockwise.

- (c) Verify that the counter reads 25 MHz below the F0 frequency, with an accuracy as specified in Table 4-3.
- (d) Rotate the MANUAL SWEEP control fully clockwise.
- (e) Verify that the counter reads 25 MHz above the F0 frequency, with the accuracy specified in Table 4-3.
- 5. For the 6609A only:
  - (a) Set  $\Delta F$  F0 to 1 GHz.
  - (b) Using steps 4a thru 4e above, verify the swept-frequency accuracy.

Table 4-3. Swept-Frequency Accuracy Specifications

FREQUENCY (MHz)	MODEL	
±15	All models except 6642A, 6653A, and 6659A	
±30	6653A and 6659A	
± 25	6642A, frequencies 26.5 GHz and below	
±30	6642A, frequencies above 26.5 GHz	

### c. Frequency Vernier Accuracy Tests

- 1. Press RESET.
- 2. Press CW F0.
- Record the counter's frequency readout.
- 4. Press FREQUENCY VERNIER IN-CREASE and hold depressed until the frequency stops increasing.
- 5. Verify that the counter's frequency readout increased by ≥12 MHz (≥25 MHz for the 6642A, 6653A and 6659A) from the frequency recorded in step 3.
- 6. Press FREQUENCY VERNIER OFF.
- 7. Press FREQUENCY VERNIER DE-CREASE and hold depressed until the frequency stops decreasing.
- 8. Verify that the counter's frequency readout decreased by ≥12 MHz (≥25 MHz for the 6642A, 6653A, and 6659A) from the frequency recorded in step 3.

#### 4-4 SWEEP TIME TEST

To verify the sweep generator's sweep time, perform the steps below. If the sweep time is found to be out of tolerance, perform the A2 Ramp Generator Adjustments in paragraph 5-5.

a. Connect the test equipment as shown in Figure 4-2, and turn the equipment on.

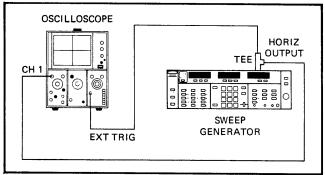


Figure 4-2. Test Equipment Setup for Sweep
Time Test

- b. Press RESET on the sweep generator.
- c. Press FREQUENCY RANGE  $\Delta F$  F0.
- d. Press SWEEP TIME and set for 10 ms.
- e. Verify that the oscilloscope displays a 10 ms ±2.0 ms ramp, as shown in Figure 4-3.

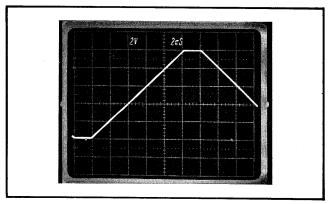


Figure 4-3. A2 Sweep Ramp, 10 ms Sweep

- f. Press SWEEP TIME and set for 1 second.
- g. Verify that the oscilloscope displays a 1 ±0.2 second ramp, as shown in Figure 4-4.

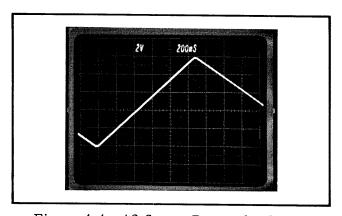


Figure 4-4. A2 Sweep Ramp, 1 s Sweep

- h. Press SWEEP TIME and set for 10 seconds.
- i. Verify that the oscilloscope displays a 10 ±2 second ramp.

#### 4-5 OUTPUT POWER TESTS

For all models except the 26.5 to 40 GHz band of the 6642A, verify the output power level as described below. If the output power level is found to be out of tolerance, perform the ALC Calibration adjustments in paragraph 5-14.

#### NOTE

The 26.5 to 40 GHz band of the 6642A is not internally leveled.

- a. Connect the test equipment as shown in Figure 4-5, and turn the equipment on.
- b. Press RESET on the sweep generator (sweeper).
- c. Verify that the RF SLOPE control is OFF.
- d. Press LEVELING DETECTOR.
- e. On the network analyzer, adjust CHAN-NEL A OFFSET control to position the trace's minimum power point on the center graticule line; see Figure 4-6.

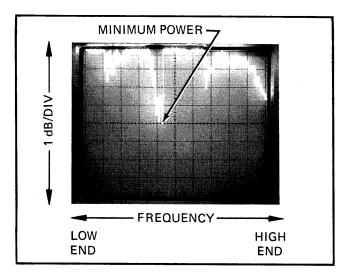


Figure 4-6. Unleveled Power

- f. Verify that the OFFSET dB display reads at least 0.2 dBm greater than the sweeper's output level, as indicated on the LEVEL LED display.
- g. On the sweeper, press LEVELING IN-TERNAL.
- h. On the network analyzer, press CHAN-NEL A .5 dB PER DIVISION.

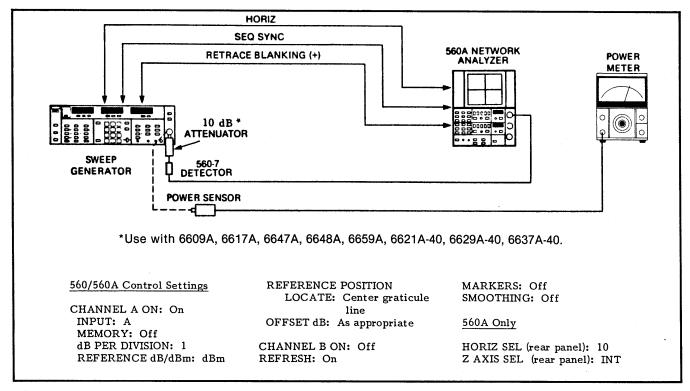


Figure 4-5. Test Equipment Setup for Output Power Tests

i. Verify that the peak-to-peak ripple (Figure 4-7) on the network analyzer trace is as shown in Table 4-4.

Table 4-4. Power Accuracy, Peak-to-Peak Ripple

MODEL	PK-PK ACCURACY (dB)	OPT. 2 PK-PK ACCURACY (dB)
6609A	1.2	1.9
6617A	1.4	2.2
6621A	1.4	3.0
6621A-40	1.4	3.0
6629A	1.4	3.2
6629A-40	1.4	3.2
6637A	1.4	3.2
6637A-40	1.4	3.2
6638A	1.4	3.2
6642A	2.2	
66 <b>4</b> 7A	1.6	3.2
6648A	1.6	3.2
6653A	2.2	3.2
6659A	2.2	3.2

j. Disconnect the detector from the sweeper, and connect the power sensor in its place.

#### NOTE

The unleveled output power of the 6621A-40, 6629A-40, 6637A-40, and .01-2 GHz heterodyne band on applicable models may exceed +23 dBm at some frequencies. Be advised that the maximum input power level of the HP 465 Power Meter is 300 mW (+23 dBm).

k. Press MANUAL SWEEP.

- On the sweeper, press CW F0 and set F0 for the midrange frequency. Example: 1 GHz (6609A), 10 GHz (6637A), 22 GHz (6642A) etc.
- m. Verify that the power meter reads the power level indicated on the sweeper's LEVEL LED display, ±0.2 dB.
- n. For the 6653A and 6659A only:
  - 1. Set F0 for 23 GHz.
  - 2. Verify that the power meter reads the power level indicated on the sweeper's LEVEL LED display, ±0.2 dBm.
  - 3. Return F0 to the midrange frequency.
- o. Press LEVEL and set the output power level first to 5 dB, then to 10 dB below the RESET power level, as indicated on the LEVEL LED display. At each setting, verify that the power meter reads the LEVEL display value, ±0.2 dB.
- p. For the 6653A and 6659A only:
  - 1. Set F0 for 23 GHz.
  - 2. Repeat step o. above.
  - 3. Return F0 to midrange frequency.
- q. For all models except the 6642A, press F0 and set for the high-end frequency.

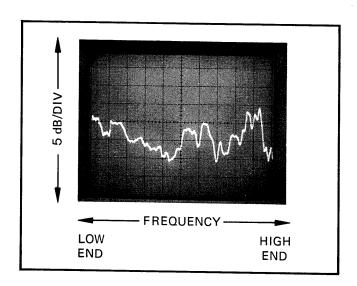


Figure 4-7. Leveled Power

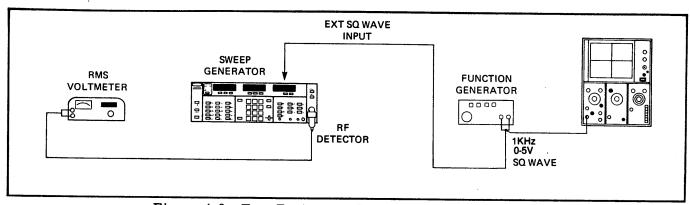


Figure 4-8. Test Equipment Setup for Residual AM Test

- r. Record power meter reading.
- s. Rotate RF SLOPE fully clockwise.
- t. Verify that the power meter reading increases by  $\approx 3~\mathrm{dB}$ .
- u. Return RF SLOPE to OFF.

#### 4-6 RESIDUAL AM TEST

To verify that the residual amplitude modulation signals in the sweep generator are tolerable, perform the steps below. If the residual AM is found to be out of tolerance, contact WILTRON Customer Service.

- a. Connect the test equipment as shown in Figure 4-8, and turn the equipment on.
- b. Press RESET on the sweep generator (sweeper).
- c. Press CW F1 and set to the midrange frequency.
- d. Record the RMS voltmeter reading.
- e. Turn the function generator off.
- f. Record the second RMS voltmeter reading.

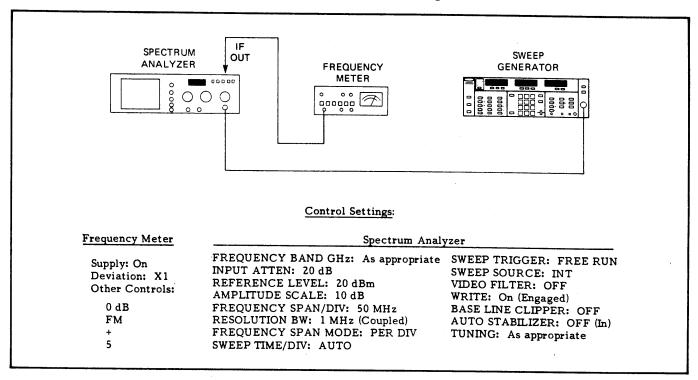


Figure 4-9. Test Equipment Setup for Residual FM Test, .01 to 20 GHz

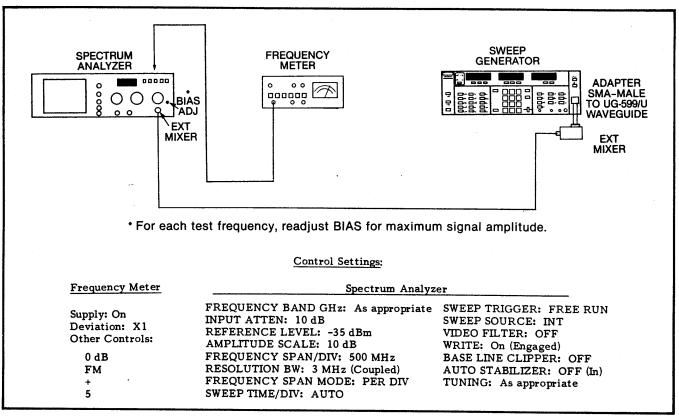


Figure 4-10. Test Equipment Setup for Residual FM Test, 18 to 26.5 GHz

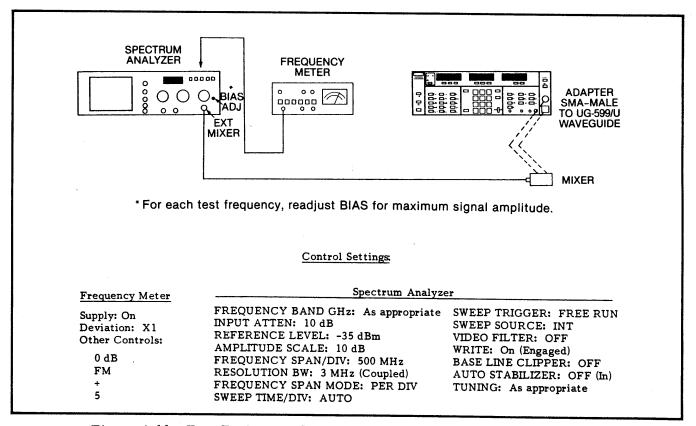


Figure 4-11. Test Equipment Setup for Residual FM Test, 18 to 40 GHz

g. Calculate the sweeper's residual AM per the following formula: Residual AM (-dBc)\* =

Residual AM 
$$(-dBc)* =$$

$$- \left[ \begin{vmatrix} \text{step d} \\ \text{reading} \end{vmatrix} + \begin{vmatrix} \text{step f} \\ \text{reading} \end{vmatrix} + 9 \text{ dB} \right].$$

- \* dB below the carrier.
- h. Residual AM should be less than -50 dBc.
- Turn the function generator back on.
- j. Repeat steps c. thru h. for the midfrequency in each applicable frequency band (1 GHz (Het. Band); 5 GHz (YIG 1 Band); 10 GHz (YIG 2 Band); 15 GHz (YIG 3 Band); 22.25 GHz (YIG 4 Band); or for 6642A, 22.25 GHz (YIG 1 Band) and 33.25 GHz (YIG 2 Band)).

#### 4-7 RESIDUAL FM TEST

To verify that the residual frequency modulation signals in the sweep generator are tolerable, perform the steps below. If the residual FM is found to be out of tolerance, contact WILTRON Customer Service.

- a. Connect the test equipment as shown in Figure 4-9, 4-10, or 4-11 as applicable.
- b. Using the following procedure, check residual FM at each applicable frequency in Table 4-5.
  - On the sweep generator (sweeper), press CW F0 and set for the desired frequency.
  - On the spectrum analyzer:
    - Adjust TUNING to center the sweeper's output frequency on the CENTER FREQUENCY graticule line.
    - (b) Adjust REFERENCE LEVEL to place the top of the waveform on the REFERENCE LEVEL graticule line.
    - (c) Observe the display; it should resemble Figure 4-12.
    - (d) Press ZERO SPAN and readjust TUNING to place the trace on the REFERENCE LEVEL graticule line (Figure 4-13).

Table 4-5. Residual FM Test Frequencies

FREQUENCY (GHz)	MODEL
.05	6609A, 6617A, 6647A, 6648A, 6659A
1.8	Same as above.
7.8	6617A, 6621A, 6621A-40, 6637A, 6637A-40, 6638A, 6647A, 6648A, 6653A, 6659A
12.2	6621A, 6621A-40, 6629A, 6629A-40, 6637A, 6637A-40, 6638A, 6647A, 6648A, 6653A, 6659A
17.8	6653A, 6659A
18.6	6629A, 6629A-40, 6637A, 6637A-40, 6638A, 6642A, 6647A, 6648A
20	6638A, 6648A
26.5	6642A, 6653A, 6659A
40	6642A

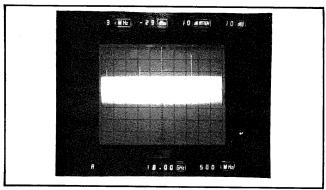


Figure 4-12. Sweeper's Frequency At 500 MHz/Division FREQUENCY SPAN

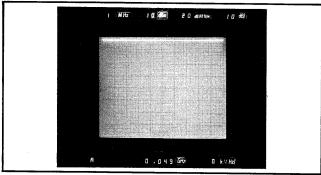


Figure 4-13. Spectrum Analyzer ZERO SPAN Display

(e) Position AUTO STABILIZER to ON; if necessary, readjust the TUNING control to place the

trace on the REFERENCE LEVEL graticule line.

3. On the modulation meter, after ensuring the HIGH and LOW indicators are not lit, read the frequency deviation meter. The meter should indicate as shown in Table 4-6.

#### NOTE

Increase REFERENCE LEV-EL setting as necessary to ensure that LOW LEVEL indicator goes out.

# 4-8 EXTERNAL FM AND PHASE-LOCK TEST

To verify that the sweep generator provides the correct -6 MHz/V frequency deviation for an input FM or phase-lock signal, perform the steps below. If the FM Sensitivity specification is found to be out of tolerance, contact WILTRON Customer Service.

- a. Set up the test equipment as shown in Figure 4-14 and turn the equipment on.
- b. Adjust the power supply for a DVM reading of -4V ±0.04 volts.

Table 4-6. Residual FM Specifications

MODEL	SPECIFICATION (kHz) (30 Hz to 15 kHz BW)
6609A, 6617A	7
6621A, 6621A-40, 6629A, 6629A-40	10
6637A, 6637A-40, 6638A, 6647A, 6648A	7, below 8 GHz 10, below 8 GHz
6653A, 6659A	7, below 8 GHz 10, 8 to 18 GHz 15, above 18 GHz
6642A	30, below 26.5 GHz 40, above 26.5 GHz

- c. On the sweep generator:
  - 1. Press RESET.
  - 2. Press CW F0.
  - 3. Press and hold the appropriate FRE-QUENCY VERNIER pushbutton until the counter reads the F0 frequency ±100 kHz (±200 kHz for the 6642A, 6653A, or 6659A).
  - 4. Press FM AND PHASELOCK.
- d. Verify that the counter's frequency readout increased by 24 ± 2.4 MHz.
- e. Readjust the power supply for a DVM reading of  $+4 \pm 0.04$  volts.
- f. Verify that the counter's frequency readout decreased by 24 ± 2.4 MHz.

# 4-9 RF OUTPUT SIGNAL TESTS, ALL MODELS EXCEPT 6642A, 6653A, AND 6659A

To verify that the sweep generator's RF output signal meets the harmonic, spurious, purity, and frequency-pulling specifications,

perform the steps in subparagraphs a. thru d. below. If any of the output-signal tests are found to be out of tolerance, contact WILTRON Customer Service.

# a. 2nd Harmonic Attenuation Tests

- Connect the test equipment as shown in Figure 4-15 and turn the equipment on.
- 2. On the sweep generator (sweeper):
  - (a) Press SHIFT then CW RAMP to off (rear panel HORIZ OUTPUT DURING CW switch to OFF for 6600 models).
  - (b) Press RESET.
  - (c) Press CW F1.
- 3. On the spectrum analyzer, adjust TUNING to position the sweeper's fundamental frequency near the CENTER FREQUENCY graticule line.
- 4. While observing the spectrum analyzer's display,

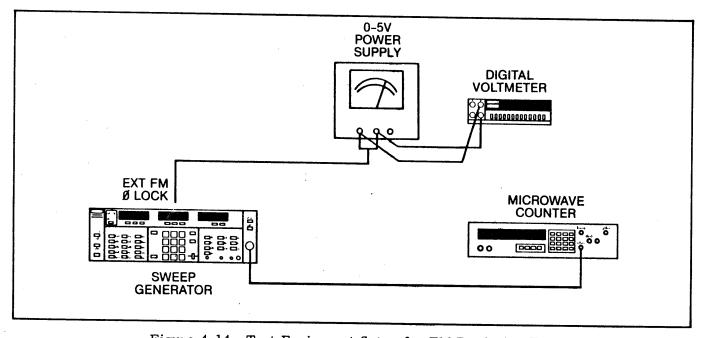
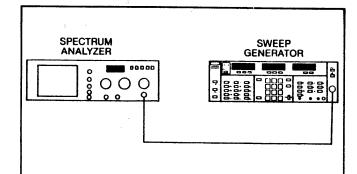


Figure 4-14. Test Equipment Setup for FM Deviation Test



#### Spectrum Analyzer Control Settings

FREQUENCY BAND: As appropriate
RESOLUTION BW: 1 MHz
REF LEVEL: 10 dBm
INPUT ATTN: As appropriate
FREQUENCY SCAN/DIV: As appropriate
FREQ SPAN MODE: PER DIV
LOG SCALE: 10 dB
SWEEP SOURCE: INT
SWEEP TRIGGER: FREE RUN
SWEEP TIME/DIV: AUTO

Figure 4-15. Test Equipment Setup for RF Output Signal Tests

- (a) move the sweeper's IN-CREASE/DECREASE lever toward INCREASE, so that the displayed signals move slowly upward in frequency, and
- (b) at the same time, adjust the spectrum analyzer's TUNING control clockwise to keep the 2nd harmonic on screen.

#### NOTE

Change the spectrum analyzer's FREQUENCY RANGE setting as necessary in order to observe the sweep generator's entire frequency range.

5. Verify that the applicable 2nd harmonic is attenuated as shown below, except for the 6621A40, 6629A-40, and 6637A-40. For these models, the 2nd harmonic is attenuated to -25 dBc..

FREQUENCY	ATTENUATION
.01 - 2 GHz	-30 dBc
2 - 20 GHz	-40 dBc

# b. Spurious Signal Test

- 1. On the sweeper, move the IN-CREASE/DECREASE lever to maximum DECREASE, and return F1 to the low-end frequency.
- 2. On the spectrum analyzer:
  - (a) Press FREQUENCY BAND as appropriate to display low-end frequency.
  - (b) Adjust TUNING for the sweeper's low-end frequency.
- 3. While observing the spectrum analyzer for non-harmonically-related (spurious) signals, move the sweeper's INCREASE/DECREASE lever toward INCREASE.
- 4. Verify that spurious signals, if present, are <-40 dBc for the .01-2 GHz band and <-60 dBc for the remaining 2 to 18.6 (or 20) GHz frequency range.

#### NOTE

Spurious signals may be generally characterized as follows: They will (1) be weak in power, (2) "pop up" abruptly and track oppositely to the fundamental and harmonic signals, and (3) disappear abruptly. An example of a spurious response at 984 MHz is shown in Figure 4-16.

### c. Signal Purity Test

1. On the sweeper, press CW F1 and set

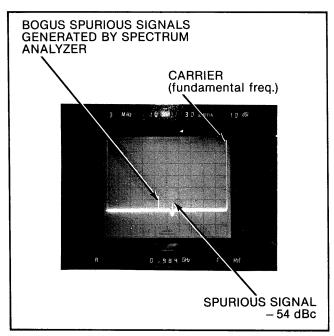


Figure 4-16. Example of a Spurious Signal

for 0.050 GHz (6609A); 8.050 GHz (6629A/6629A-40); or 2.050 GHz (all other models).

#### 2. On the spectrum analyzer:

- (a) Press FREQUENCY BAND as appropriate to display the step 1. frequency.
- (b) Adjust FREQUENCY SPAN/DIV for 100 kHz (coupled).
- (c) Adjust TUNING to center the sweeper's fundamental frequency on the CENTER FREQUENCY graticule line, as shown in Figure 4-17.
- (d) Set VIDEO FILTER to .03.
- Verify that the noise sidebands located 100 kHz away from the sweeper's fundamental frequency are <-60 dBc.
- 4. Repeat the Signal Purity Test for the following frequencies, as applicable:
  - (a) 8.05 GHz
  - (b) 12.35 GHz

- (c) 12.45 GHz
- (d) 18.6 GHz
- (e) 20.0 GHz

# d. Frequency Pulling Test

#### 1. On the sweeper:

- (a) Press CW F0 and set for 0.050 GHz (6609A), 8.050 GHz (6629A/6629A-40), or 2.050 GHz (all other models).
- (b) Press LEVEL and set as shown below:

$\underline{Model}$	Power Level (dBm)
6609A	+13
6621A-40, 6629A-40, 6637A-40	+16
All Others	+10

## 2. On the spectrum analyzer,

- (a) press FREQUENCY BAND as appropriate to display the step 1(a) frequency;
- (b) adjust FREQUENCY SPAN/DIV to 100 kHz (coupled);
- (c) adjust TUNING to center the sweeper's fundamental frequency on the CENTER FREQUENCY graticule line.

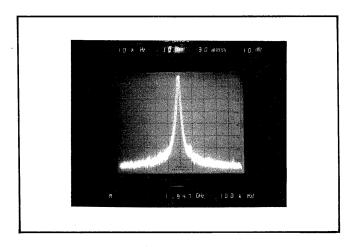


Figure 4-17. Noise Sidebands

3. On the sweeper, press LEVEL and set as shown below:

Model	Power Level (dBm)
6609A	+3
6621A-40, 6629A-40, 6637A-40	+6
All Others	0

4. On the spectrum analyzer, verify that the displayed signal moved less than  $\pm 500~\mathrm{kHz}$ .

### NOTE

The waveform photograph in Figure 4-18 shows a representative frequency shift. The photograph is a double exposure: the first exposure is the signal at 10 dBm and the second is the same signal at 0 dBm.

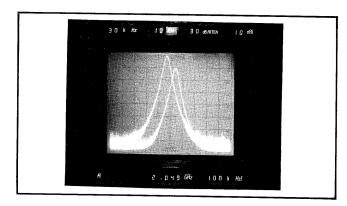


Figure 4-18. Example of Frequency Pulling

- 5. Repeat the Frequency Pulling test for the following frequencies, as applicable:
  - (a) 8.05 GHz
  - (b) 12.35 GHz
  - (c) 12.45 GHz
  - (d) 18.6 GHz
  - (e) 20.0 GHz

# 4-10 RF OUTPUT SIGNAL TESTS, MODEL 6642A

To test the sweep generator's RF output for (1) spurious signals, (2) signal purity 100 kHz above and below the carrier frequency, and (3) frequency pulling with a 10 dB power level change, perform the steps in subparagraphs a. thru c. below. If these tests indicate that the output signal is not within either the -60 dBc spurious or signal purity specification or the ±500 kHz frequency pulling specification, contact WILTRON Customer Service.

## a. Spurious Signal Test

- 1. Connect the test equipment and position the controls as shown in Figure 4-19; turn the equipment on.
- 2. On the sweep generator (sweeper):
  - (a) Press SHIFT then CW RAMP (set rear panel HORIZ ON DURING CW to OFF for 6600 models).
  - (b) Press RESET.
  - (c) Press CW F1.
- 3. On the spectrum analyzer:
  - (a) Adjust TUNING to position the sweeper's frequency on the CENTER FREQUENCY graticule line.
  - (b) Adjust EXT MIXER BIAS for maximum signal amplitude.
  - (c) Adjust REFERENCE LEVEL to place the top of the waveform on the REFERENCE LEVEL graticule line.
  - (d) The display should resemble Figure 4-20.
- 4. On the sweeper, press F1.
- 5. While observing the analyzer and operating the TUNING control to keep the sweeper's frequency on screen, operate the sweeper's IN-

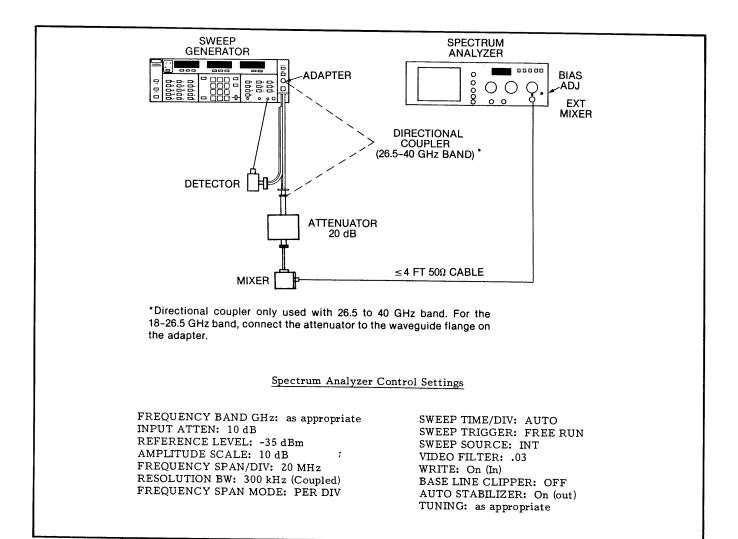


Figure 4-19. Test Equipment Setup for RF Output Tests

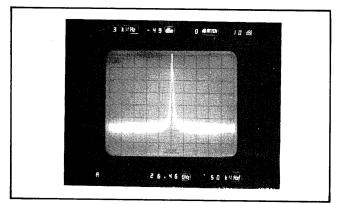


Figure 4-20. Analyzer Display, with 30 dB Signal-to-Noise Ratio

CREASE/DECREASE lever to slowly increase frequency to 26.5 GHz.

NOTE

Readjust EXT MIXER BIAS

for peak signal amplitude each 500 MHz.

- 6. Ensure that no bonified spurious signals (that is, signals that pass the analyzer's SIG IDENT test) are present.
- 7. Remove the attenuator/mixer combination from the 18-26.5 GHz connector, and connect it to the directional coupler as shown in Figure 4-19.
- 8. On the sweeper, press LEVELING-DETECTOR and adjust EXT ALC GAIN to midrange.

9. Repeat steps 5 and 6 above for the 26.5 to 40 GHz band.

# b. Signal Purity Test

- 1. Remove the attenuator/mixer combination from the directional coupler, and return it to the 18-26.5 GHz connector.
- 2. On the sweeper, operate the IN-CREASE/DECREASE lever to place the F1 frequency at 18 GHz.
- 3. On the spectrum analyzer:
  - (a) Adjust FREQUENCY SPAN for 5 MHz per division.
  - (b) Adjust TUNING to center the sweeper's frequency on the CEN-TER FREQUENCY graticule line.
  - (c) Readjust FREQUENCY SPAN for 50 kHz per division. Move the control in incremental steps, and readjust TUNING control as necessary to keep the signal centered on the display.
  - (d) Rapidly (so as to capture the signal while it is still in the center of the screen), perform the following steps:
    - rotate PERSIST fully clockwise;
    - (2) press SWEEP TRIGGER-SINGLE;
    - (3) press ERASE;
    - (4) press SWEEP TRIGGER-START/RESTART;
    - (5) press STORE.
- 4. A trace similar to the one shown in Figure 4-21 should be obtained. Ensure that no sidebands are present 100 kHz (2 divisions) on either side of the carrier frequency.

- 5. On the spectrum analyzer,
  - (a) press WRITE;
  - (b) rotate PERSIST fully counterclockwise;
  - (c) press FREE RUN.
- 6. On the sweeper, set F1 for 26 GHz and repeat step 2.
- 7. Remove the attenuator/mixer combination from the 18-26.5 GHz connector, and reconnect it to the directional coupler.
- 8. Repeat steps 3 thru 5 at 26.5 and 40 GHz.

#### c. Frequency Pulling Test

- 1. Remove the attenuator/mixer combination from the directional coupler, and return it to the 18-26.5 GHz connector.
- 2. On the sweeper, press CW F1 and set for 18 GHz.
- 3. On the spectrum analyzer:
  - (a) Rotate VIDEO FILTER to OFF.
  - (b) Adjust FREQUENCY SPAN TO 100 kHz.

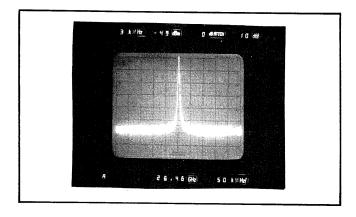


Figure 4-21. Noise Sidebands (6642A)

- (c) Adjust TUNING to center the sweeper's frequency on the display.
- 4. On the sweeper, press LEVEL and set for -5 dBm.
- 5. Ensure that the sweeper's frequency did not shift more than ±500 kHz.
- 6. Remove the attenuator/mixer combination from the 18-26.5 GHz connector, and reconnect it to the directional coupler.
- 7. On the sweeper, press CW F1 and set for 27 GHz.
- 8. On the analyzer, readjust TUNING to center the sweeper's frequency on the display.
- 9. On the sweeper, press LEVEL and set for -10 dBm.

#### NOTE

For the 26.5 to 40 GHz band the LEVEL LED readout does not indicate actual power unless the power level has been calibrated using a power meter. However, a reduction of 10 dB from the power level indicated on the LEVEL readout will result in an approximate 10 dB reduction in power, which can be verified on the spectrum analyzer.

10. Ensure that the sweeper's frequency did not shift more than ±500 kHz.

# 4-11 RF OUTPUT SIGNAL TESTS, MODELS 6653A AND 6659A

To verify that the sweep generator's RF output signal meets the harmonic, spurious, purity, and frequency-pulling specifications, perform the steps in subparagraphs a. thru d. below. If any of the output-signal tests are found to be out of tolerance, contact WILTRON Customer Service.

## a. 2nd Harmonic Attenuation Tests

- 1. Connect test equipment as shown in Figure 4-22 and turn the equipment on.
- 2. On the sweep generator (sweeper):
  - (a) Press SHIFT then CW RAMP to off (set rear panel HORIZ OUT-PUT DURING CW to OFF for 6600 models).
  - (b) Press RESET.
  - (c) Press CW F1.
- 3. On the spectrum analyzer, adjust TUNING to position the sweeper's fundamental frequency near the CENTER FREQUENCY graticule line.
- 4. While observing the spectrum analyzer's display,
  - (a) move the sweeper's IN-CREASE/DECREASE lever toward INCREASE, so that the displayed signals move slowly upward in frequency, and
  - (b) at the same time, adjust the spectrum analyzer's TUNING control clockwise to keep the 2nd harmonic on screen.

#### NOTE

Change the spectrum analyzer's FREQUENCY RANGE setting as necessary in order to observe the sweep generator's entire frequency range.

- 5. Stop frequency tuning at 20 GHz (6653A/6659A).
- 6. Verify that the applicable 2nd harmonic is attenuated as shown below.

FREQUENCY	ATTENUATION
.01 - 2 GHz	-30 dBc
2 - 26.5 GHz	-40 dBc

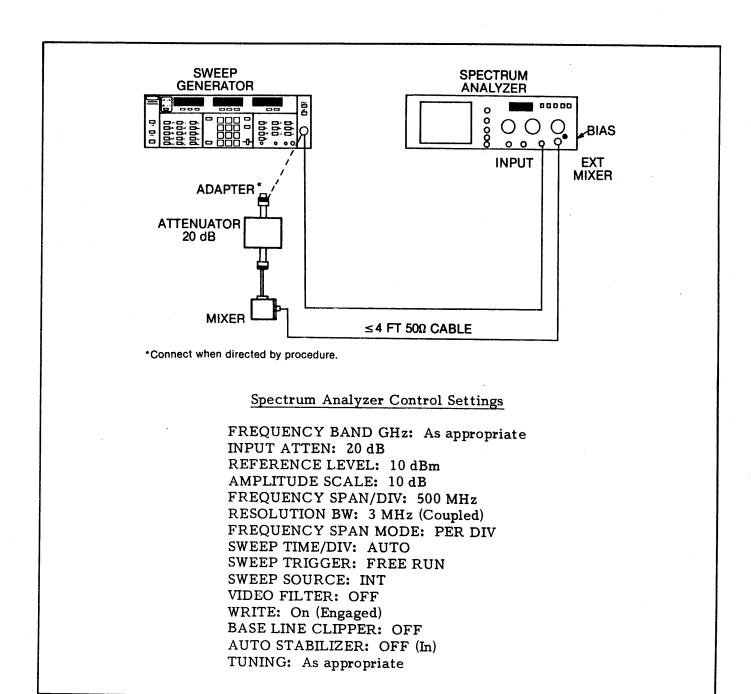


Figure 4-22. Test Equipment Setup for RF Output Tests, Models 6653A and 6659A

## b. Spurious Signal Test

- 1. On the sweeper, move the IN-CREASE/DECREASE lever to maximum DECREASE, and return F1 to the low-end frequency.
- 2. On the spectrum analyzer:

- (a) Press FREQUENCY BAND .01-1.8 GHz (or 1.7-4.1 GHz).
- (b) Adjust TUNING for sweeper's low-end frequency.
- 3. While observing the spectrum analyzer for non-harmonically-related (spurious) signals, move the

sweeper's INCREASE/DECREASE lever toward INCREASE.

4. Verify that spurious signals, if present, are <-40 dBc for the .01-2 GHz band, and <-60 dBc for the remaining 2 to 18.0 GHz frequency range.

#### NOTE

Spurious signals may be generally characterized as follows: they will (1) be weak in power, (2) "pop up" abruptly and track oppositely to the fundamental and harmonic signals, and (3) disappear abruptly. An example of a spurious response at 984 MHz is shown in Figure 4-23.

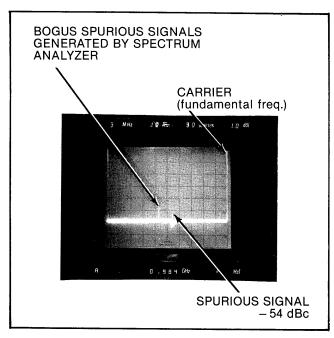


Figure 4-23. Example of a Spurious Signal

- 5. Remove the cable from the RF OUT-PUT connector, and connect the attenuator/mixer combination in its place.
- 6. On the spectrum analyzer:
  - (a) Adjust TUNING to position the sweeper's frequency on the CENTER FREQUENCY graticule line.

- (b) Adjust EXT MIXER BIAS for maximum signal amplitude.
- (c) Adjust REFERENCE LEVEL to place the top of the waveform on the REFERENCE LEVEL graticule line.
- (d) The display should resemble Figure 4-24.

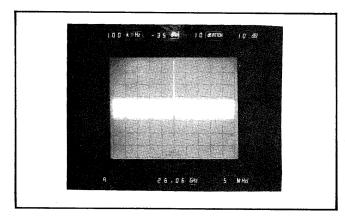


Figure 4-24. Analyzer Display, With 30 dB Signal-To-Noise Ratio

- 7. On the sweeper, press F1.
- 8. While observing the analyzer and operating the TUNING control to keep the sweeper's frequency on the screen, operate the sweeper's INCREASE/DECREASE lever to slowly increase the frequency to 26.5 GHz.

## NOTE

Readjust EXT MIXER BIAS for peak signal amplitude each 500 MHz.

9. Ensure no bonified spurious signals (that is, signals that pass the analyzer's SIG IDENT test) are present.

#### c. Signal Purity Test

1. Remove the attenuator/mixer combi-

nation from the RF OUTPUT connector, and replace it with the test cable.

- 2. On the sweeper, press CW F1 and set for 2.050 GHz.
- 3. On the spectrum analyzer:
  - (a) Press FREQUENCY BAND 1.7-4.1 GHz.
  - (b) Adjust FREQUENCY SPAN/DIV for 100 kHz.
  - (c) Adjust RESOLUTION BW for 10 kHz.
  - (d) Adjust TUNING to center the sweeper's fundamental frequency on the CENTER FREQUENCY graticule line, as shown in Figure 4-25.

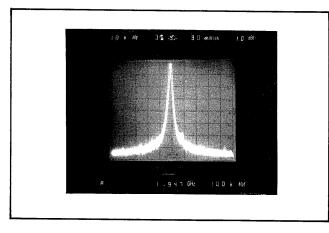


Figure 4-25. Noise Sidebands (≤18 GHz)

- (e) Adjust VIDEO FILTER to .03.
- 4. Verify that the noise sidebands located 100 kHz away from the sweeper's fundamental frequency are <-60 dBc.
- 5. Repeat the Signal Purity Test for the following frequencies:

- (a) 8.05 GHz
- (b) 12.35 GHz
- (c) 12.45 GHz
- (d) 18.0 GHz
- 6. Remove the test cable from the RF OUTPUT connector, and replace it with the attenuator/mixer combination.
- 7. On the sweeper, operate the IN-CREASE/DECREASE lever to place the F1 frequency at 26.0 GHz.
- 8. On the spectrum analyzer:
  - (a) Adjust FREQUENCY SPAN for 5 MHz.
  - (b) Adjust TUNING to center the sweeper's frequency on the CENTER FREQUENCY graticule line.
  - (c) Readjust FREQUENCY SPAN for 50 kHz. Move the control in incremental steps, and readjust TUNING as necessary to keep the signal centered on the display.
  - (d) Rapidly (so as to capture the signal while it is still in the center of the screen), perform the following steps:
    - (1) rotate PERSIST fully clock-wise;
    - (2) press SWEEP TRIGGER-SINGLE.
    - (3) press ERASE;
    - (4) press SWEEP TRIGGER-START/RESTART;
    - (5) press STORE.

9. A trace similar to the one shown in Figure 4-26 should be obtained. Ensure that no sidebands are present 100 kHz (2 division) on either side of the carrier frequency.

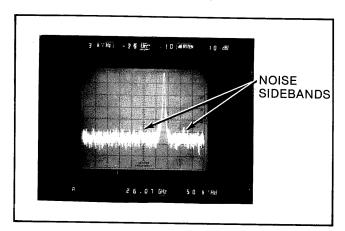


Figure 4-26. Noise Sidebands (>18.0 GHz)

- 10. On the analyzer:
  - (a) Press WRITE.
  - (b) Rotate PERSIST fully counterclockwise.
  - (c) Press FREE RUN.
- 11. On the sweeper, press CW F2 and repeat step 8.

#### d. Frequency Pulling Test

- 1. Remove the attenuator/mixer combination from the RF OUTPUT connector, and replace it with the test cable.
- 2. On the sweeper:
  - (a) Press CW F0 and set for 2.050 GHz.
  - (b) Press LEVEL and set for +10 dBm.
- On the spectrum analyzer:
  - (a) Press FREQUENCY BAND 1.7-4.1 GHz.
  - (b) Adjust FREQUENCY SPAN/DIV to 100 kHz.
  - (c) Adjust RESOLUTION BW for 30 kHz.

- (d) Adjust TUNING to center the sweeper's fundamental frequency on the CENTER FREQUENCY graticule line.
- 4. On the sweeper, press LEVEL and set for 0 dBm.
- 5. On the spectrum analyzer, verify that the displayed signal moves less than ±500 kHz.

#### NOTE

The waveform photograph in Figure 4-27 shows a representative frequency shift. The photograph is a double exposure: the first exposure is the signal at 100 dBm and the second is the same signal at 0 dBm.

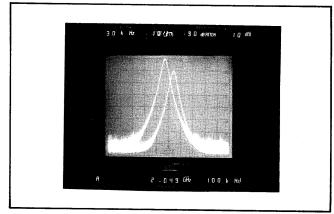


Figure 4-27. Example of Frequency Pulling

- 6. Repeat the Frequency Pulling test for the following frequencies:
  - (a) 8.05 GHz
  - (b) 12.35 GHz
  - (c) 12.45 GHz
  - (d) 18.0 GHz
- 7. Remove the test cable from the RF OUTPUT connector, and replace it with the attenuator/mixer combination.

- 8. On the spectrum analyzer:
  - (a) Rotate VIDEO FILTER to OFF.
  - (b) Adjust FREQUENCY SPAN TO 100 kHz.
  - (c) Adjust TUNING to center the

- sweeper's frequency on the display.
- 9. On the sweeper, press LEVEL and set for -6 dBm.
- 10. Ensure that the sweeper's frequency did not shift more than ±500 kHz.

# **SECTION V**

# **CALIBRATION AND ADJUSTMENTS**

#### 5-1 INTRODUCTION

This section contains adjustment and calibration instructions, and is organized as follows:

Para.	Adjustment or Calibration
5-4	Power Supply
5-5	A2 Ramp Generator
5-6	A5 Frequency Instruction
5-7	A3 Marker Generator
5-8	A6-A9 YIG Driver
5-9	Frequency Calibration
5-10	Tracking Filter
5-11	Sweep Rate Compensation
5-12	ALC Loop Calibration

#### 5-2 RECOMMENDED TEST EQUIPMENT

The test equipment recommended for calibration of the sweep generator is listed in Table 4-1.

#### 5-3 ADJUSTMENTS FOLLOWING PCB OR COMPONENT REPAIR OR REPLACEMENT

Table 5-1 lists the adjustments that should be performed following the repair or replacement of PCBs and components.

#### 5-4 POWER SUPPLY ADJUSTMENTS

This paragraph provides instructions for adjusting the +5V and -38V supplies and the OUT OF REG, HIGH LINE, and LOW LINE motherboard LEDs. These adjustments should be performed when (1) power supply troubles are suspected and (2) after maintenance on any of the A13/A14 power supply circuits has been performed. The test equipment setup for the adjustments in subparagraphs d. and e. is shown in Figure 5-1.

#### a. +5 Volt Adjustment

1. Remove the top, bottom, and right-side covers. Refer to paragraph 7-3.1 for instructions, if necessary.



If maintenance has been performed on the A13/A14 power supply, perform steps 2 thru 8; otherwise, proceed to step 9.

2. Remove the A1 (Option 3) and A2 thru A10 PCBs (Figure 5-2).

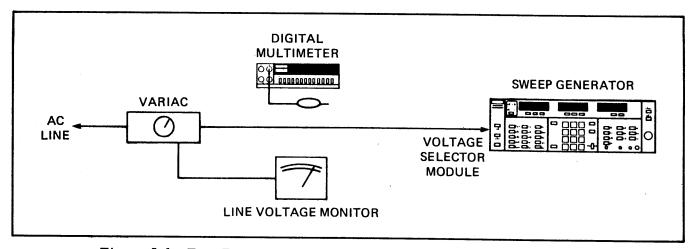


Figure 5-1. Test Equipment Setup for Low- and High-Line Adjustments

Table 5-1. Recommended Adjustments Following Repair Actions

IF A REPAIR OR REPLACEMENT ACTION WAS MADE TO:	PERFORM THE FOLLOWING ADJUSTMENTS IN PARAGRAPH(S):
A1 PCB	None
A2 PCB	5-5 thru 5-12
A3 PCB	5–7
A4 PCB	5–12
A5 PCB	5–6 & 5–9 thru 5–12
A6 PCB	5-6 thru 5-12
After performing mainte-	
After performing maintenance on the A6-A9 PCBs or installing a replacement YIG, check the bias before applying power to the YIG. Refer to paragraph 5-8.2.	
A7 PCB	5-6 thru 5-12
A8 PCB	5-6 thru 5-12
A10 PCB	5-6 & 5-9 thru 5-12
A11 PCB	None
A12 PCB	None
A13/A14 PCBs	5-4 thru 5-12
Osc 1 YIG	Same as for the A6 PCB.
Osc 2 YIG	Same as for the A7 PCB.
Osc 3 YIG	Same as for the A8 PCB.
PIN Switch, Coupler, or Down Converter	A4 Log Amplifier. (This adjustment requires specialized test equipment, available only at the factory.)

- As applicable, disconnect the following A14 connectors (Figure 5-2): P5, P6, P7, P12, P13, P14, P16, P17, P20, P23, P27, and P30.
- 4. Clip a 1/2W fixed resistor, 50 to  $100\Omega$ , between the +5V and GND test points (Figure 5-3).
- 5. Attach the digital multimeter (DMM) test leads to the resistor installed in

step 4 above.

- 6. Press POWER to ON, and adjust A13R6 (Figure 5-4) for approximately 5 volts.
- 7. Press POWER to OFF, and disconnect the resistor from P3.
- 8. Reconnect the PCBs and connectors disconnected in steps 2 and 3.

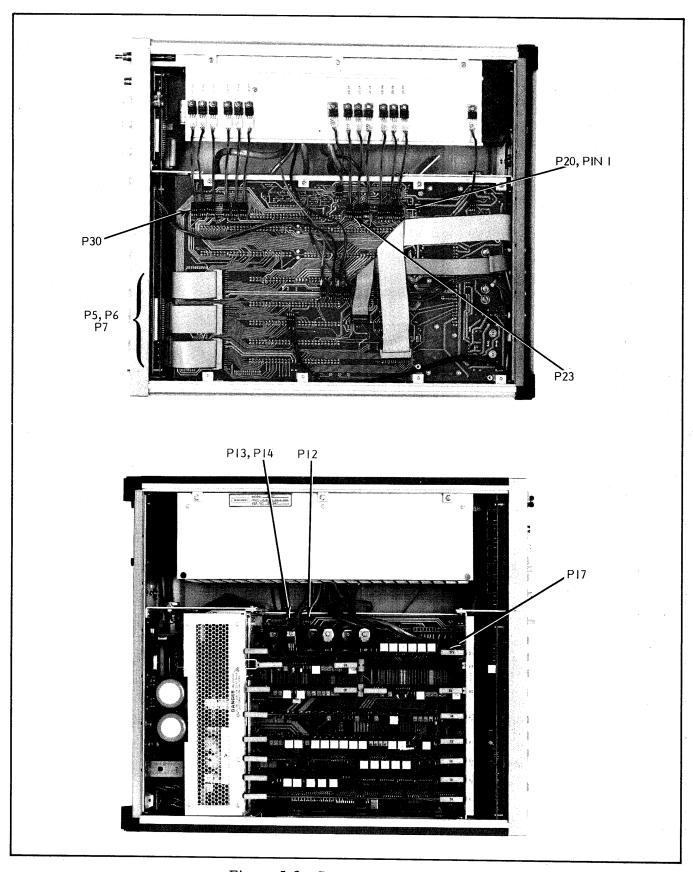


Figure 5-2. Connector Locations

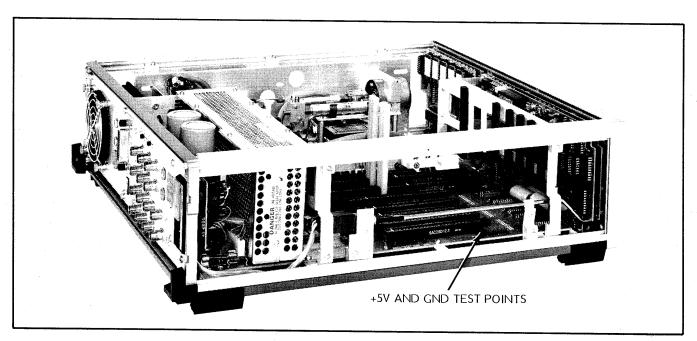


Figure 5-3. Connector P3, Pins 13 and 26

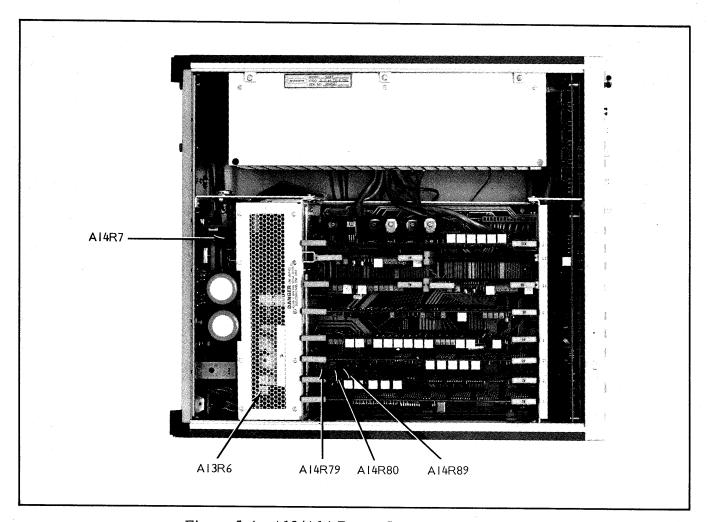


Figure 5-4. A13/A14 Power Supply Adjustments

- 9. Connect the DMM test leads between the +5V and GND test points.
- 10. Press POWER to ON and adjust A13R6 (Figure 5-4) for +5V ± 1.0 mV.

#### b. -38 Volt Adjustment

- 1. Disconnect the DMM from P3 and connect it between A14P20, pin 1 (Figure 5-2), and chassis ground.
- 2. Adjust A14R7 (Figure 5-4) for -38V ±100 mV.
- 3. Remove the DMM from P20.

#### c. Out-of-Regulation Adjustment

- 1. Adjust A14R89 clockwise to its limit.
- 2. While observing the A14 OUT OF REG indicator, readjust A14R89 counterclockwise until the indicator goes out. Stop.
- 3. While counting the number of potentiometer turns, continue to adjust A14R89 counterclockwise until the indicator lights. Stop.
- 4. Readjust A14R89 clockwise halfway between the indicator's on and off states.

# d. Low Line Voltage Adjustment

- 1. Press POWER to OFF.
- 2. Connect test equipment as shown in Figure 5-1.
- 3. Adjust the variac for 100 Vac (12% below the nominal line voltage), as observed on the line voltage monitor.
- 4. Press Power to ON.
- Adjust A14R79 (LOW) to its clockwise limit; then readjust counterclockwise until the A14 LOW LINE indicator lights.
- 6. Readjust the variac for 115 Vac (nominal line voltage), and ensure the LOW LINE indicator is not lit.

# e. <u>High Line Voltage Adjustment</u>

- 1. Adjust the variac for 130 Vac (12% above the nominal line voltage).
- Adjust A14R80 (HIGH) to its clockwise limit; then readjust counterclockwise until the HIGH LINE indicator lights.
- 3. Readjust the variac for 115 Vac (nominal line voltage), and ensure the HIGH LINE indicator is not lit.

# f. Voltage Regulation and Ripple Checks

The A13/A14 power supplies are well regulated and filtered. Also, the low- and high-line monitoring circuits are adjusted to flag their respective error codes well in advance of specified limits. Consequently, the power supply regulation and filtering (ripple) need not be checked on a periodic schedule. However, in the event that regulation or filtering problems are suspected, the specifications in Table 5-2 are provided.

# 5-5 A2 RAMP GENERATOR ADJUSTMENTS

This paragraph provides instructions for adjusting the voltage and time of the A2 sweep ramp. These adjustments should be checked and, if necessary, adjusted following maintenance on the A2 PCB, and when any of the frequency specifications are found to be out of tolerance.

#### a. Reference Supply Verification

- 1. Connect test equipment as shown in Figure 5-5, and turn the equipment on.
- 2. Remove the top cover from the sweep generator (sweeper). Refer to paragraph 7-3.1 for instructions, if necessary.
- 3. With the digital multimeter (DMM) referenced to A2TP5 (Figure 5-6), monitor A2U18
  - (a) pin 1 and verify the reference voltage is +12 ±1.0 volts;

Table 5-2. Power Supply Regulation and Ripple Specifications

VOLTAGE SUPPLY	MONITOR POINT	REF. POINT	REGULATION TOLERANCE	RIPPLE TOLERANCE (pk-pk)
+5V	A14TP3	A14TP4	±3 mV	±50 mV
+15V LC	XA6-8	Chassis	±300 mV	±10 mV
-15V LC	XA6-9	Chassis	±300 mV	±10 mV
+15V HC	XA10-24	Chassis	±300 mV	±10 mV
-15V HC	XA10-23	Chassis	±300 mV	±10 mV
+24V	A14P12-2	Chassis	±300 mV	±10 mV
-38V	A14P20-1	Chassis	±300 mV	± 10 mV

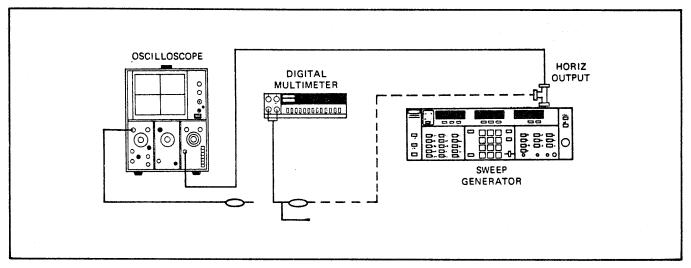


Figure 5-5. Test Equipment Setup for A2 Ramp Generator Adjustments

(b) pin 7 and verify the reference voltage is  $-12 \pm 1.0$  volts.

#### b. Ramp Voltage Adjustment

- 1. Press RESET on sweeper.
- 2. On the oscilloscope, set the horizontal time base for External, and adjust its Vernier control so that the trace extends the full width of the screen (10 divisions).
- 3. On the sweeper, press SWEEP TIME

and set for 99 seconds.

- 4. Connect the DMM common lead to A2TP5; connect the "hot" lead to A2TP6.
- 5. While the ramp is sweeping in the forward direction, adjust A2R31 for +10V ± 1 mV.
- 6. Move the DMM hot lead to A2TP7
- 7. After the ramp has swept thru its first 10 seconds (1 division), adjust A2R39 for 0V ± 1 mV.

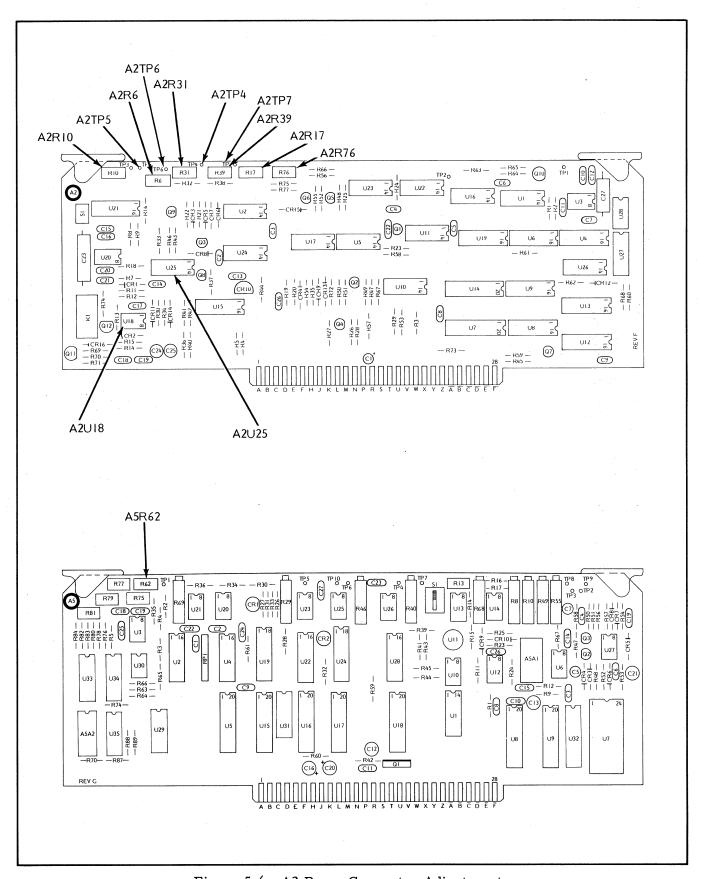


Figure 5-6. A2 Ramp Generator Adjustments

- 8. Disconnect the DMM leads from the A2 PCB, and move them to the rear panel HORIZ OUTPUT connector (hot lead to the center conductor, and common lead to the shield).
- 9. Ground the center conductor on the rear panel EXT SWEEP connector.
- 10. Press SHIFT and EXTERNAL SWEEP (place the A2 PCB INT-EXT switch in EXT, for sweepers without the SHIFT functions).
- 11. Adjust A5R62 (Figure 5-6) for 0V ±1 mV.
- 12. Return the sweeper to AUTO sweep (INT-EXT switch back to INT) and remove the ground from the EXT SWEEP connector.

#### NOTE

The adjustment of A5R62 affects marker calibration. Check marker frequencies (paragraph 5-7) following the adjustment of A5R62.

#### c. Ramp-Voltage Clamping Adjustment

- 1. Disconnect the DMM leads from the HORIZ OUTPUT connector, and connect the test lead to A2TP4 and the common lead to A2TP5.
- 2. On the sweeper,
  - (a) press SWEEP TIME and set for 50 ms;
  - (b) press EXT OR SINGLE twice (trigger a single sweep);
  - (c) adjust A2R76 for +10V ±1 mV. (Allow 15-30 seconds for the voltage to settle, before taking a voltage reading.)
- 3. Disconnect the DMM leads from A2TP4 and A2TP5.

#### d. Sweep Time Adjustment

1. Connect the oscilloscope as follows:

- (a) probe to A2TP4,
- (b) ground to A2TP5.
- 2. Set the oscilloscope controls as follows:
  - (a) vertical to 2V per division,
  - (b) horizontal to 200 ms per division.
- 3. On the sweeper,
  - (a) press  $\Delta F F0$ ;
  - (b) press SWEEP TIME and set for 0.999 seconds;
  - (c) adjust A2R10 for a forward sweep duration (Figure 5-7) of  $1.0 \pm 0.1$  seconds.

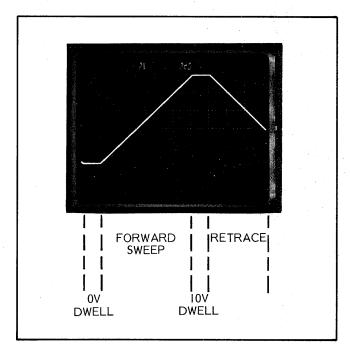


Figure 5-7. A2 Sweep Ramp

- 4. Set the oscilloscope horizontal for 2 ms per division.
- 5. On the sweeper,
  - (a) set SWEEP TIME for 10 ms;
  - (b) adjust A2R6 for a forward sweep duration of 10 ± 1 ms.
- 6. Set the oscilloscope horizontal control for 200 ms per division.

- 7. On the sweeper,
  - (a) set SWEEP TIME for 1 second;
  - (b) adjust A2R17 for a forward sweep duration of 1.0 ±0.1 second.
- 8. With the oscilloscope, verify retrace and dwell times at 10 ms and 1 second. Retrace and dwell time specifications are shown in Table 5-3. If the retrace time is out of tolerance, check that +15V is present at A2R8 (Figure 7-33, Sheet 2). If +15V is present, troubleshoot A2U21D and associated resistors. If the dwell time is out of tolerance, troubleshoot the dwell timing circuit (paragraph 7-9.1b).

Table 5-3. Retrace and Dwell Time Specifications

SWEEP TIME	RETRACE TIME	DWELL TIME
10 ms to 0.999 s	10 ± 1 ms	5 ± 0.2 ms
1 s to 99 s	1 ± 0.1 s	5 ± 0.2 ms*

<sup>\*</sup>At zero-volt dwell, dwell time is proportional to sweep time.

# 5-6 A5 FREQUENCY INSTRUCTION ADJUSTMENTS

This paragraph provides instructions for adjusting the A5 sweep width ( $\Delta F$ ) ramp, the A5 F Center DAC voltages, and the A6-A9 bandswitch reference voltages. These adjustments should be checked and, if necessary, adjusted following maintenance on any of the A5-A9 PCBs or when any of the frequency specifications are found to be out of tolerance.

# a. Bandswitch Reference Voltage Adjustment

- 1. Set up the test equipment as shown in Figure 5-8 and turn the equipment on.
- 2. Remove the top cover from the sweep generator (sweeper). Refer to

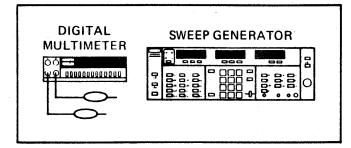


Figure 5-8. Setup for A5 Frequency Instruction Adjustments

paragraph 7-3.1 for instructions, if necessary.

- 3. Connect the common lead on the digital multimeter (DMM) to A5TP3 (Figure 5-9) and the test lead to A5TP9.
- 4. Adjust A5R55 for  $+10V \pm 1.0$  mV.
- 5. Move the DMM test lead to A5TP8 and adjust A5R49 for  $-10 \pm 1.0$  mV.
- b. Sweep Width ( $\Delta F$ ) Signal Path Adjustments
  - 1. Press RESET.
  - 2. Press SHIFT, then EXT SWEEP.
  - 3. Remove the DMM leads from A5TP8 and A5TP3. Connect a BNC-to-clip-lead jumper between the rear panel EXT SWEEP connector and A5TP9 and A5TP3 (center conductor to A5TP9).
  - 4. Connect the DMM test lead to A5TP5 and the common lead to A5TP10. Note the voltage level at A5TP5.
  - 5. Disconnect the BNC connector from EXT SWEEP; note the voltage value at A5TP5.
  - 6. Alternately connect and disconnect the BNC connector at the EXT SWEEP connector, and adjust A5R29 for equal TP5 voltages, ±1.0 mV. Record this voltage value.

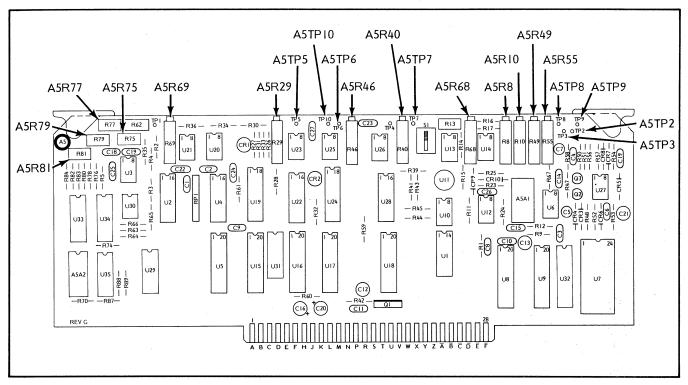


Figure 5-9. A5 Frequency Instruction Adjustments

- 7. Press MANUAL SWEEP, and rotate its associated control fully clockwise.
- 8. Adjust A5R69 for the voltage value recorded in step 6 above.
- 9. Rotate the MANUAL SWEEP control fully counterclockwise, and verify that the voltage at A5TP5 is the same as that recorded in step 10 above, ±25.0 mV.
- 10. Rotate the MANUAL SWEEP control to midrange (0 volts at A5TP5).
- 11. Press  $\Delta F$  F0.
- 12. Press  $\Delta F$  and set for 0 MHz.
- 13. Move the DMM test lead to A5TP6.
- 14. Adjust A5R46 for  $0V \pm 1.0$  mV.
- 15. Move the DMM test lead to A5TP7.
- 16. Adjust A5R40 for  $0V \pm 1.0$  mV.
- c. F Center Adjustments

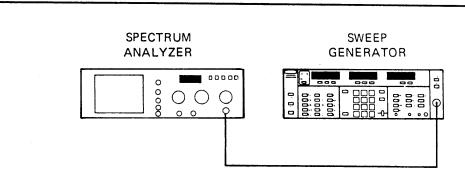
- 1. Press TRIGGER AUTO.
- 2. Press CW F1 and verify it is set for the low-end frequency.
- 3. Move the DMM test lead to A5TP2 and the common lead to A5TP3.
- 4. Adjust A5R10 for the applicable voltage shown below, ±1 mV:

Model	Voltage	(mVdc)
6609A	5	0.0
6617A	1	2.5
6621A, 6621A-40	1,61	2.9
6629A, 6629A-40	4,30	1.0
6637A, 6637A-40	1,07	5.2
6638A	1,00	0.0
6642A	4,50	0.0
6647A		5.4
6648A		5.0
6653A	75	4.7
6659A		3.8

- 5. Press CW F2 and set for the high-end frequency.
- 6. Adjust A5R8 for  $10V \pm 0.1 \text{ mV}$ .

- 7. Using CW F1 and CW F2, repeat (if necessary) the low- and high-end frequency adjustments until the voltages specified above are achieved.
- d. Frequency-Band Overlap Adjustments (Not for 6609A or 6642A)
  - 1. Connect equipment as shown in Figure 5-10, and turn the equipment on.
  - 2. Het Band Overlap Adjustment (Models 6617A, 6647A, 6648A, and 6659A)
    - (a) On the sweeper,
      - (1) press RESET;
      - (2) press  $\Delta F F0$ ;
      - (3) press  $\Delta F$  and set for 250 MHz;
      - (4) press F0 and set for 2 GHz;
      - (5) press SWEEP TIME and set for 20 seconds.
    - (b) On the spectrum analyzer,
      - press FREQUENCY RANGE GHz as appropriate to display the F0 frequency;
      - (2) adjust TUNING for the frequency that was set in step

- 2 (a)(4) above;
- (3) position INPUT ATTEN so that the top of the sweptfrequency display is visible (Figure 5-11);
- (4) adjust INTENSITY and PER-SIST so that the overlap width shows up as an intensification of the swept display (Figure 5-11).
- (c) On the sweeper, adjust A5R81 for a frequency overlap of 5 MHz.
- 3. Osc 1 Overlap Adjustment (Models 6621A, 6621A-40, 6637A, 6637A-40, 6638A, 6647A, 6648A, 6653A, and 6659A)
  - (a) For 6647A, 6648A, and 6659A: press F0 and set for 8 GHz.
  - (b) For all other models: perform step 2(a), (1) thru (4), but set F0 for 8 GHz.
  - (c) Perform step 2(b), (1) thru (4).
  - (d) On sweeper, adjust A5R79 for a frequency overlap of 5 MHz.



# Spectrum Analyzer Control Settings

FREQUENCY BAND GHz: See procedure INPUT ATTEN: See procedure REFERENCE LEVEL: -20 dBm AMPLITUDE SCALE: 10 dB FREQUENCY SPAN/DIV: 5 MHz RESOLUTION BW: 100 kHz (Coupled) FREQUENCY SPAN MODE: PER DIV

SWEEP TIME/DIV: AUTO
SWEEP TRIGGER: FREE RUN
SWEEP SOURCE: INT
VIDEO FILTER: Off
WRITE: On (In)
BASE LINE CLIPPER: OFF
AUTO STABILIZER: On (out)
TUNING: See procedure

Figure 5-10. Test Equipment Setup For Frequency-Band Overlap Test

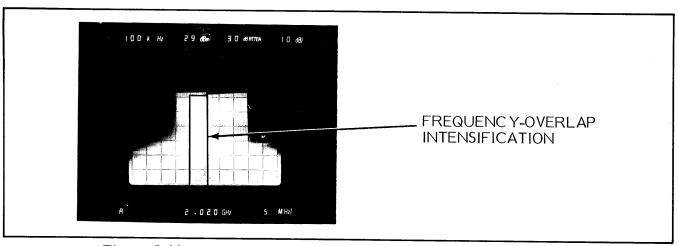


Figure 5-11. Swept-Frequency Display, Showing Frequency Overlap

- 4. Osc 2 Overlap Adjustment (Models 6629A, 6629A-40, 6637A, 6637A-40, 6638A, 6647A, 6648A, 6653A, and 6659A)
  - (a) For 6629A and 6629A-40: perform steps 2(a), (1) thru (4), but set F0 for 12.4 GHz.
  - (b) For all other models: press F0 and set for 12.4 GHz.
  - (c) Perform steps 2(b), (1) thru (4).
  - (d) On the sweeper, adjust A5R77 for a frequency overlap of 5 MHz.
- 5. Osc 3 Overlap Adjustment (Models 6653A and 6659A)
  - (a) Press F0 and set for 18 GHz.
  - (b) Perform steps 2(b), (1) thru (4).
  - (c) On the sweeper, adjust A5R75 for a frequency overlap of 5 MHz.

## e. V/GHz Adjustment

- 1. Press F1 and set for the high-end frequency.
- 2. Connect the DMM leads to the rear panel 1V/GHz connector.
- 3. Adjust A5R68 for a voltage value equal to 1V per GHz, ±2.0 mV, of F1 frequency (0.5V/GHz for the 6642A, 6653A, and 6659A). Example: If the

high-end frequency is 2 GHz (6609A), adjust A5R68 for 2.0 volts, ±2.0 mV. If the high-end voltage is 18.6 GHz (6647A), adjust A5R68 for 18.6 volts, ±2.0 mV. And if the high-end frequency is 26.5 GHz (6653A), adjust A5R68 for 13.25 volts, ±2.0 mV.

- 4. Press F1 and set for the low-end frequency.
- 5. Verify that the DMM reads a voltage value equal to 1V/GHz, ±25.0 mV, of F1 frequency.

# 5-7 A3 MARKER GENERATOR ADJUSTMENTS

This paragraph provides instructions for adjusting both the F0, M1, and M2 marker frequencies and the MODIFY SIGNAL output voltage from the front panel INCREASE/DE-CREASE lever. These adjustments should be checked and, if necessary, adjusted following maintenance on the A3 PCB.

Two methods for adjusting the marker frequencies are provided: (1) using the Model 560 or 560A Scalar Network Analyzer and (2) using an oscilloscope. The method using the 560 or 560A (subparagraph c) is preferred. If a 560 or 560A is not available, an alternate procedure using an oscilloscope is described in subparagraph b.

The reference voltage check in subparagraph a. below should be performed <u>before</u> adjusting the marker frequencies.

# a. A3 Reference Voltage Check

- 1. Remove the top cover from the sweep generator (sweeper). Refer to paragraph 7-3.1 for instructions.
- 2. Press POWER to ON.
- 3. Press RESET.
- 4. With a digital multimeter (DMM) referenced to A3TP1 (Figure 5-13),
  - (a) monitor A3U3 pin 1 (R33 lead nearest top edge of PCB); verify voltage is -10 ± 0.25V.
  - (b) monitor A3U3 pin 7 (middle terminal on R13); verify the voltage is -10 ± 0.25V.
- 5. If either voltage is out of tolerance, troubleshoot A3U3 and its associated components before continuing with this procedure.

# b. Marker Frequency Calibration Using an Oscilloscope

1. Set up the test equipment as shown in Figure 5-12, and turn the equipment on.

- 2. Connect the DMM "hot" lead to the center conductor of the rear panel HORIZ OUTPUT connector; connect the common lead to the shield.
- 3. Ground the center conductor on the rear panel EXT SWEEP connector.
- 4. Press SHIFT and EXT SWEEP (place the A2 PCB INT/EXT switch in EXT, for sweepers without the SHIFT functions).
- 5. Adjust A5R62 (Figure 5-12) for  $0V \pm 1$  mV.
- 6. Return the sweeper to AUTO sweep (INT/EXT switch back to INT) and remove the ground from the EXT SWEEP connector.
- 7. Disconnect the DMM from the HORIZ OUTPUT connector.
- 8. On the sweeper,
  - (a) press MARKERS VIDEO;
  - (b) rotate MARKER AMPLITUDE fully clockwise;
  - (c) press F0 and set for the high-end frequency;

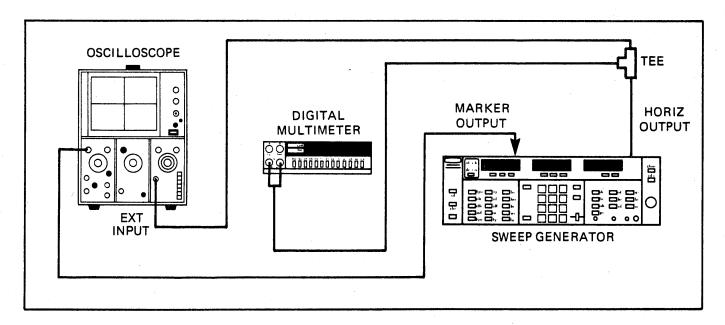


Figure 5-12. Test Equipment Setup for A3 Marker Generator Adjustments

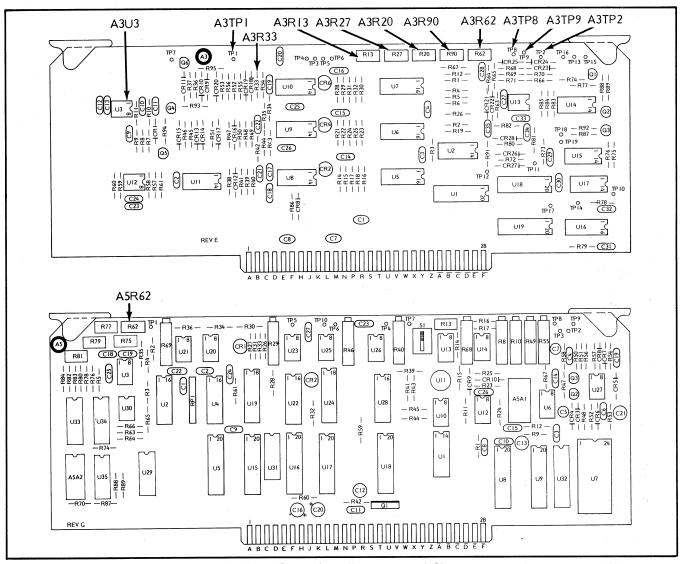


Figure 5-13. A3 Marker Generator Adjustments

- (d) adjust A3R13 (Figure 5-13) until the F0 marker is just visible on the right edge of the oscilloscope display, as shown in Figure 5-14;
- (e) set F0 for 10 GHz;
- (f) press M1 and set for the highend frequency;
- (g) using A3R20, repeat step (d) above for the M1 marker;
- (h) set M1 for 12 GHz;
- (i) press M2 and set for high-end frequency;
- (j) using A3R27, repeat step (d) above for the M2 marker.

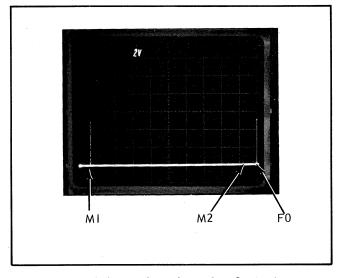
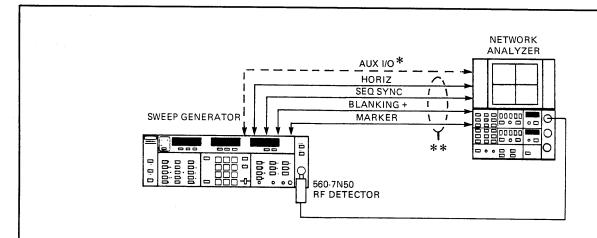


Figure 5-14. F0, M1, and M2 Markers

- c. Marker Frequency Calibration Using the Model 560 or 560A Scalar Network Analyzer
  - 1. Set up the test equipment as shown in Figure 5-15, and turn the equipment on.
  - 2. On the sweeper,
    - (a) press RESET;
    - (b) press SHIFT, then CW RAMP;
    - (c) press MARKERS VIDEO;
    - (d) rotate MARKERS AMPLITUDE fully clockwise.
  - 3. On the network analyzer,
    - (a) adjust Channel A OFFSET to position the trace in the center of

the display;

- (b) adjust MARKERS THRESHOLD, if necessary, to obtain markers.
- 4. On the sweeper,
  - (a) press F0 and set for high-end frequency;
  - (b) adjust A3R13 (Figure 5-13) until the F0 marker is just visible on the right edge of the 560 display, as shown in Figure 5-16.
  - (c) set F0 for 10 GHz;
  - (d) press M1 and set for high-end frequency;
  - (e) using A3R20, repeat step (b) above for the M1 marker;



# Initial Control Settings

#### Sweep Generator

MARKER AMPLITUDE: Fully CW HORIZ OUTPUT DURING CW (rear panel): ON SLOPE: OFF

\*Used with 560A. Also set: HORIZONTAL SELECT: 10V Z-AXIS SEL: EXT

\*\*560 only.

#### Scalar Network Analyzer

CHANNEL A ON: On
INPUT: A
MEMORY: Off
dB PER DIVISION: 5
REFERENCE dB/dBm: dBm
SET (screwdriver pot): Midrange
OFFSET: +10
CHANNEL B: Not used
MARKER THRESHOLD: Midrange
REAL TIME: On
SMOOTHING: Off

POWER: On

Figure 5-15. Test Setup for Marker Frequency Adjustment, Using the Model 560 or 560A Scalar Network Analyzer

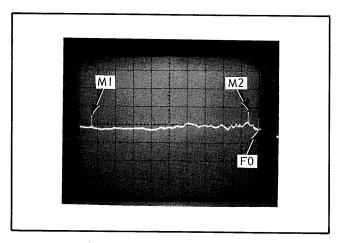


Figure 5-16. Model 6637A Markers, as shown on 560 Display

- (f) set M1 for 12 GHz;
- (g) press M2 and set for high-end frequency;

(h) using A3R27, repeat step (b) above for the M2 marker.

# d. $\frac{INCREASE/DECREASE\ Lever\ Voltage}{Adjustment}$

- 1. Connect the common lead on the DMM to A3TP2, and the test lead to A3TP8.
- 2. Move the INCREASE/DECREASE lever to full INCREASE; release the lever and allow it to spring back to the center. Note the voltage value.
- 3. Move the INCREASE/DECREASE lever to full DECREASE; release the lever and allow it to spring back to the center. Note the voltage value.
- 4. Repeat steps 2 and 3, and adjust A12R46 (Figure 5-17) until the noted

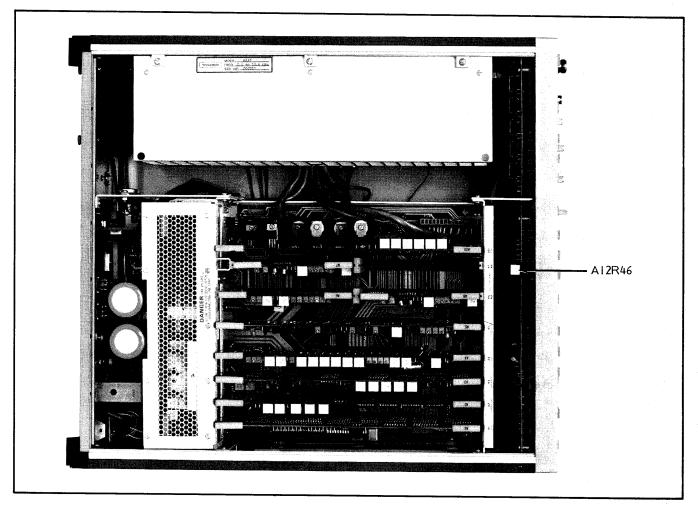


Figure 5-17. A12R46 Adjustment Location

voltages are equal,  $\pm 200 \text{ mV}$ . Voltage value should be between 0 and  $\pm 0.5 \text{V}$ .

- 5. Transfer the DMM test lead to A3TP9.
- 6. Move the INCREASE/DECREASE lever to its full INCREASE position, and adjust A3R62 (Figure 5-13) for +4.8V ± 20 mV.
- Move the INCREASE/DECREASE lever to its full DECREASE position, and adjust A3R90 for +4.8V ±20 mV.

# 5-8 A6-A9 YIG (HET/YIG) DRIVER PCB ADJUSTMENTS

Procedures for adjusting the A6-A9 YIG (Het/YIG) Driver PCBs are provided in paragraphs 5-8.1 and 5-8.2. Depending upon model, the 6600A Series sweep generators have from 1 to 4 YIG Driver PCBs installed. There are two field-level adjustments on each YIG Driver PCB: YIG bias and oscillator-bandswitching voltage. The bandswitching-voltage adjustments, plus adjustment on the A5 PCB that must be performed at the highest bandswitch point for each model, are described in paragraph The YIG bias adjustments are de-5-8.1. scribed in paragraph 5-8.2.

## 5-8.1 A6-A9 Oscillator-Bandswitching Voltage Adjustments

This paragraph provides instructions for ad-

justing the A6-A9 PCB oscillator-bandswitching voltages. These adjustments should be performed following maintenance on the A6-A9 PCBs. A guide directing which steps need to be performed for which model numbers is provided in Table 5-4.

Table 5-4. Model Number Guide to
A6-A9 PCB BandswitchingVoltage Adjustments in Paragraph
5-8.1

MODEL	PERFORM SUBPARAGRAPH(S)
6609A	
6617A	a., b., c., g.
6621A & 6621A-40	a., b., d., g.
6629A & 6629A-40	a., b., e., g.
6637A & 6637A-40	a., b., d., e., g.
6638A	a., b., d., e., g.
6642A	a., b., d., g.
6647A	a., b., c., d., e., g.
6648A	a., b., c., d., e., g.
6653A	a., b., d., e., f., g.
6659A	a., b., c., d., e., f., g.

a. Set up the test equipment as shown in Figure 5-18, and turn the equipment on.

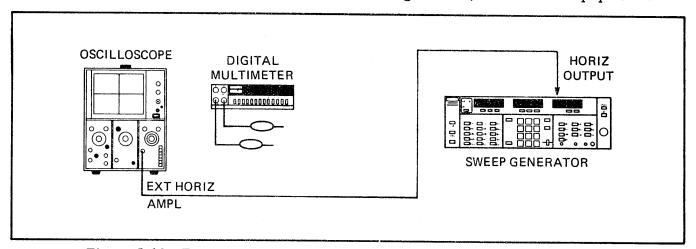


Figure 5-18. Test Equipment Setup for the A6-A9 YIG Driver Adjustments

- b. Remove the top cover from the sweep generator (sweeper). Refer to paragraph 7-3.1 for instructions, if necessary.
- c. A6 PCB, 2 GHz Bandswitching-Voltage Adjustment.
  - Press RESET on sweeper.
  - 2. Press CW F1 and set for 2 GHz.
  - 3. Connect the DMM test lead to A6TP5; connect the common lead to A6TP1 (Figure 5-19).
  - 4. Adjust A6R65 clockwise until the DMM reads  $\approx 0V$  (TTL low).
  - Readjust A6R65 counterclockwise until the DMM reads ≈+5V (TTL high).
  - 6. For the 6617A, rotate the 8 GHz bandswitching adjustment (R58) fully clockwise.
- d. A6 PCB 8 GHz (or 26.5 GHz for Model 6642A) Bandswitching-Voltage Adjustment
  - 1. Press CW F1 and set for 8 (or 26.5) GHz.
  - 2. Move the DMM test lead to A6TP4.
  - 3. Adjust A6R58 clockwise until the DMM reads  $\approx$ 0V (TTL low).
  - 4. Readjust A6R58 counterclockwise until the DMM reads  $\approx +5V$  (TTL high).
  - 5. For the 6621A, 6621A-40, and 6642A, rotate the A7 PCB bandswitching adjustment (A7R68) fully clockwise.
- e. A7 PCB Bandswitching-Voltage Adjustment
  - 1. Press CW F1 and set for 12.4 GHz.
  - 2. Connect the DMM test lead to A7TP4

- (Figure 5-20); connect the common lead to A7TP1.
- 3. Adjust A7R68 counterclockwise until the DMM reads ≈ 0V (TTL low).
- Readjust A6R58 counterclockwise until the DMM reads ≈+5V (TTL high).
- For the 6629A, 6629A-40, 6637A, 6637A-40, 6638A, 6647A, and 6648A, rotate the <u>A8 PCB</u> bandswitching adjustment (A8R68) fully clockwise.
- f. A8 PCB Bandswitching-Voltage Adjustment (6653A/6659A)
  - 1. Press CW F1 and set for 18 GHz.
  - 2. Connect the DMM test lead to A8TP4 (Figure 5-20); connect the common lead to A8TP1.
  - 3. Adjust A8R68 counterclockwise until the DMM reads ≈0V (TTL low).
  - 4. Readjust A8R68 clockwise until the DMM reads ≈+5V (TTL high).
- g. A5 Volts-Per-Frequency Adjustment
  - 1. Press FREQUENCY RANGE ΔF F0.
  - 2. Press F0 and set for the frequency shown below:

Model	Frequency (GHz)
6617A	2.000
6621A & 6621A-4	000.8 0.
6642A	26.500
6653A & 6659A	18.000
All Others	12.400

- 3. Adjust the oscilloscope vertical controls to obtain a horizontal trace, as shown in Figure 5-21.
- 4. Adjust A5R13 on the Frequency Instruction PCB to center the bandswitch intensity-dot on the oscilloscope display (Figure 5-21).

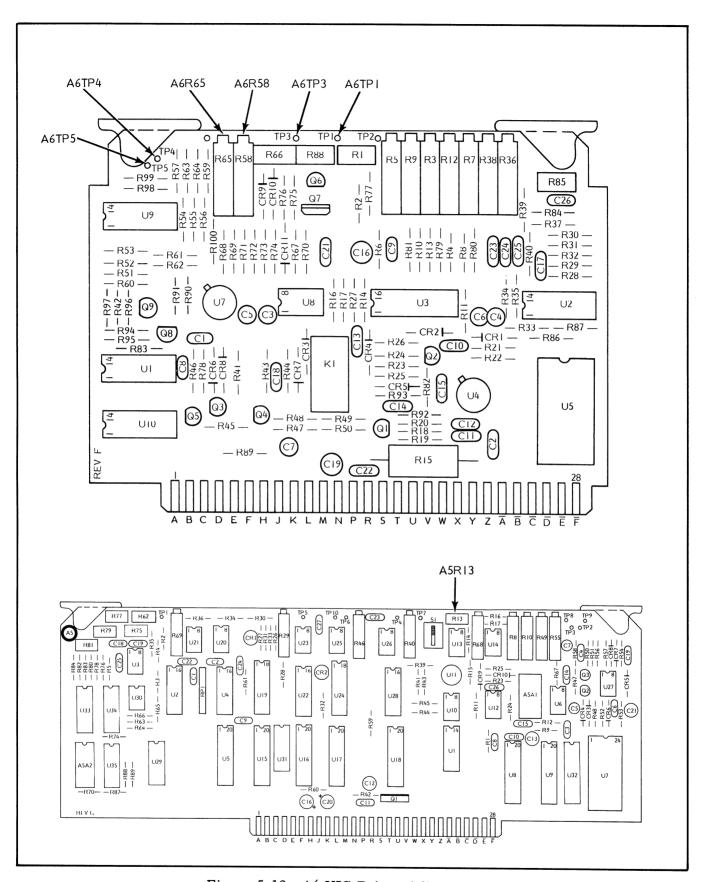


Figure 5-19. A6 YIG Driver Adjustments

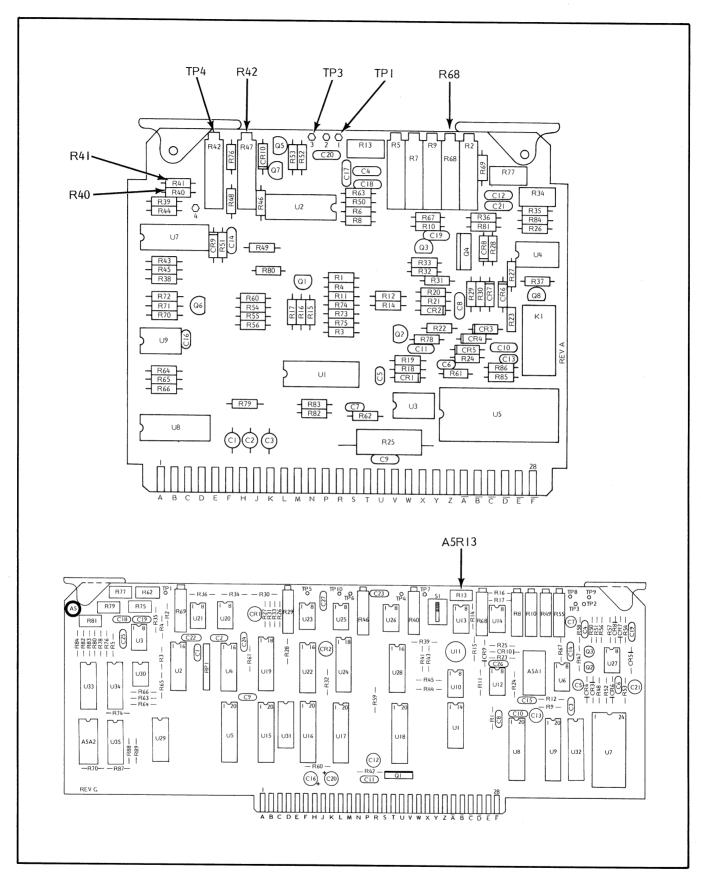


Figure 5-20. A7-A9 YIG Driver Adjustments

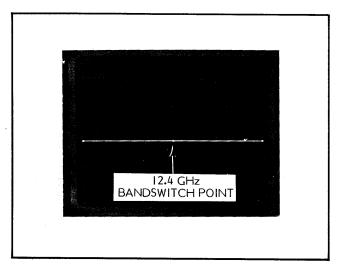


Figure 5-21. Bandswitch Dwell Signal

## 5-8.2 YIG Bias Check

This paragraph provides instructions for checking YIG oscillator bias voltage(s). YIGoscillator bias is a factory adjustment that is not normally required except when a YIG oscillator has been replaced or maintenance has been performed in the A6-A9 PCB bias circuit. When a YIG oscillator is replaced, however, no bias adjustment is required by the user because WILTRON supplies a fully calibrated replacement YIG and YIG driver PCB. (The YIG driver PCB must be replaced with the YIG oscillator, because of the uniquely programmed linearizer ROM.) After maintenance in the bias circuit or during troubleshooting, check and adjust YIG bias as follows:

# CAUTION

When a replacement YIG has been installed or maintenance has been performed in the A6-A9 PCB YIG bias circuitry, check that the RF Deckmounted bias-output transistor Q3 is not short-circuited BEFORE APPLYING POWER TO THE YIG.

- a. Set up the equipment as shown in Figure 5-22, and turn the equipment on.
- b. Remove the top cover from the sweep

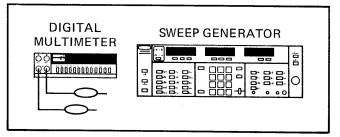


Figure 5-22. Test Equipment Setup for A8 YIG Driver Bias Adjustments

generator; refer to paragraph 7-3.1, if necessary.

#### c. A6 PCB YIG Bias Check

- 1. For all models except 6629A, 6629A-40 and 6642A:
  - (a) Connect the digital multimeter (DMM) test lead to A6TP3 (Figure 5-19); connect the common lead to A6TP1.
  - (b) Verify that the DMM reads -5 ±0.2 Vdc.
- 2. For the 6629A, 6629A-40, and 6642A: Perform the steps in subparagraph d. below.

# d. A7-A9 PCB YIG Bias Check and Adjustment

- 1. Look in the upper-left quadrant of the applicable A7-A9 PCB and determine whether resistors R40 and R41 are installed (Figure 5-20).
  - (a) If the resistors are installed, the YIG uses a sweeping-bias voltage. Proceed to step 2.
  - (b) If the resistors are not installed, the YIG uses a fixed-bias voltage. Proceed to step 3.

## 2. <u>Sweeping-Bias Voltage Check and</u> Adjustment Procedure

(a) Remove the cover from the RF Deck Assembly, and read the bias voltage stamped on the applicable YIG oscillator. Typically, the bias-voltage annotation

- will read as follows: "BIAS -12.0V -9.0V." The first value is the low-end voltage; the second value is the high-end voltage. These are nominal voltage values.
- (b) Connect the digital multimeter (DMM) test lead to TP3 (Figure 5-20); connect the common lead to TP1.
- (c) Press RESET.
- (d) Press FREQUENCY RANGE F1-F2.
- (e) Press F1 and set for the applicable YIG's low-end voltage (Table 5-5).
- (f) Press F2 and set for the applicable YIG's high-end voltage.
- (g) Press MANUAL SWEEP and rotate its associated control fully counterclockwise.
- (h) If maintenance has been per-

- formed on the bias circuit and the voltage is being adjusted, refer to step (1); otherwise, refer to step (2).
- (1) Adjust R47 for the low-end bias voltage stamped on the YIG.
- (2) Check that the bias voltage is approximately equal to the bias voltage value stamped on the YIG.
- (i) Rotate the MANUAL SWEEP control fully clockwise.
- (j) If maintenance has been performed on the bias circuit and the voltage is being adjusted, refer to step (1); otherwise, refer to step (2).
  - (1) Adjust R42 for the high-end bias voltage stamped on the YIG.
  - (2) Check that the bias voltage is approximately equal to the bias-voltage value stamped on the YIG.

Table 5-5. Oscillator Frequencies

OSCILLATOR		FREQUEN	ICY (GHz)
BAND	MODEL(S)	LOW END	HIGH END
1	6617A, 6621A, 6621A-40, 6637A, 6637A-40, 6638A, 6647A, 6653A, 6659A	2.000	8.000
1	6642A	18.000	26.500
2	6621A, 6621A-40, 6629A, 6629A-40, 6637A, 6637A-40, 6638A, 6647A, 6648A, 6653A, 6659A	8.000	12.400
2	66 <b>4</b> 2A	26.500	40.000
3	6629A, 6629A-40, 6637A 6637A-40, 6638A, 6647A 6648A	12.400	18.600
3	6653A, 6659A	12.400	18.000
4	6653A, 6659A	18.000	26.500

age is approximately equal to the bias-voltage value stamped on the YIG.

# 3. Fixed-Bias Voltage Check and Adjustment Procedure

- (a) Press POWER to OFF.
- (b) Remove the A7 PCB and note whether its assembly number is 660-D-8008 or -8009 (-8190 or -8191 respectively for the 6642A). This information will be used in steps (f) and (g).
- (c) Reinstall the PCB, and press POWER to ON.
- (d) Connect the test lead of the digital multimeter (DMM) to TP3; connect the common lead to TP1.
- (e) Press RESET.
- (f) PCB assembly 660-D-8008 (8190): If maintenance has been performed in the bias circuit and the voltage is being adjusted, refer to step (1); otherwise, refer to step (2).
  - (1) Adjust R47 for -5 Vdc.
  - (2) Check that the bias voltage is approximately -5 Vdc.
- (g) PCB Assembly 660-D-8009 (-8191): If maintenance has been performed in the bias circuit and the voltage is being adjusted, refer to step (1); otherwise, refer to step (2).
  - (1) Adjust R47 for +15 Vdc.
  - (2) Check that the bias voltage is approximately +15 Vdc.

### 5-9 FREQUENCY CALIBRATION

This paragraph provides instructions for calibrating the sweep generator's frequency. Frequency calibration procedures are provided for each Osc 1 thru Osc 4 YIG-tuned oscillator, and for the Het Band for Models 6617A, 6647A, 6648A, and 6659A. For the

6609A, the Osc 1 procedure provides calibration instructions for its Het Band. A guide directing which procedures apply to which models is provided in Table 5-6. The sweep generator output frequency should be calibrated following maintenance on the A2, A5, and A6-A9 PCBs, and when any of the YIG oscillators are replaced.

Table 5-6. Model Number Guide to Frequency Calibration Adjustments in Paragraph 5-9

MODEL	PERFORM SUBPARAGRAPH(S)
6609A	a. thru d.
6617A	a. thru e.
6621A & 6621A-40	a. thru d., f.
6629A & 6629A-40	a. thru c., f., g.
6637A & 6637A-40	a. thru d., f., g.
6638A	a. thru d., f., g.
6642A	a. thru d., f.
66 <b>4</b> 7 A	a. thru g.
66 <b>4</b> 8A	a. thru g.
6653A	a. thru d., f. thru h.
6659A	a. thru h.

- a. Set up test equipment as shown in Figure 5-23, and turn the equipment on.
- b. Remove the top cover from the sweep generator (sweeper). Refer to paragraph 7-3.1 for instructions, if necessary.
- c. Press RESET on sweeper.
- d. Osc 1 Frequency Calibration



To prevent misalignment due to being on the wrong side of the YIG oscillator's hysteresis curve, steps 1 thru 7 should be followed exactly as written.

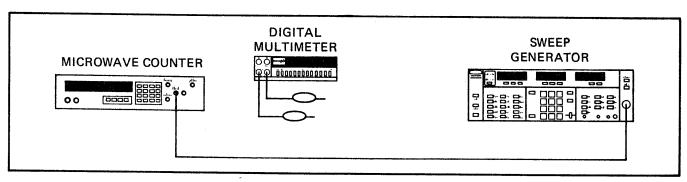


Figure 5-23. Test Equipment Setup for Frequency Calibration

1. Press CW F1 and set for the frequency shown below.

Model	Frequency (GHz)
6609A	0.050
6642A	18.050
All Others	2.050

2. Press CW F2 and set for the frequency shown below.

Model	Frequency (GHz)
6609A	1.950
66 <b>4</b> 2A	26.450
All Others	7.950

- 3. Press CW F1; wait ≈10 s for the frequency to settle.
- 4. Using care to prevent the frequency from going below that shown in column 2 below, adjust A6R5 (A6R12 for 6609A) (Figure 5-24) for the frequency shown in column 3 below.

	Low-End	Adjustment
	Frequency	Frequency
<u>Model</u>	$\underline{(GHz)}$	(GHz)
6609A	0.010	$0.050 \pm 1 \text{ MHz}$
66 <b>4</b> 2A	18.000	$18.050 \pm 1 \text{ MHz}$
All Others	2.000	$2.050 \pm 1 \text{ MHz}$

- 5. Press CW F2; wait  $\approx 10$  s for the frequency to settle.
- 6. Using care to prevent the frequency from going above the frequency shown in column 2 below, adjust A6R7 for the frequency shown in column 3 below.

Model	High-End Frequency (GHz)	Adjustment Frequency (GHz)
6609A 6642A All Others	2.000 26.500 8.000	1.950 ±1 MHz 26.450 ±1 MHz 7.950 ±1 MHz
	NOTE	

In steps 4 and 6, if the frequency goes below the low-end frequency or above the highend frequency, the adjustments are invalid. If this happens, repeat steps 1 thru 6.

- 7. Repeat steps 3 thru 6, as necessary, until the two frequencies are within tolerance.
- 8. Press FREQUENCY RANGE F1-F2.
- 9. Press MANUAL SWEEP and set the associated control fully counter-clockwise.
- 10. Adjust A6R3 for a counter reading, as indicated below:

<u>Model</u>	Frequency (GHz)
6609A	$0.050 \pm 1 \text{ MHz}$
66 <b>4</b> 2A	$18.050 \pm 1 \text{ MHz}$
All Others	$2.050 \pm 1 \text{ MHz}$

11. Press CW F0 and set for the frequency shown below:

Model	Frequency (GHz)
6609A	1.000
6642A	22.250
All Others	5.000

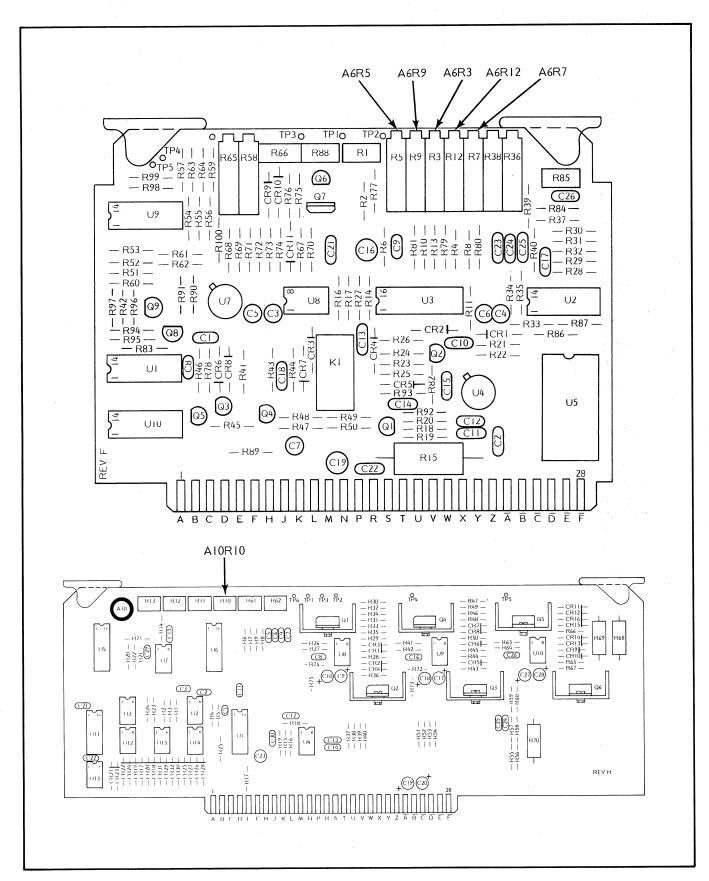


Figure 5-24. Osc 1 Frequency Adjustments

- 12. After the frequency has settled, observe and record the counter reading.
- 13. Press FREQUENCY VERNIER IN-CREASE and hold depressed until the frequency stops increasing.
- 14. Adjust A6R9 until the counter reads 12.7 ±0.1 MHz (25 ±0.1 MHz for 6642A, 6653A, and 6659A) above the frequency recorded in step 12.
- 15. Press FREQUENCY VERNIER OFF, and note that the counter reads the frequency recorded in step 12.
- 16. Press FREQUENCY VERNIER DE-CREASE and hold depressed until the frequency stops decreasing.
- 17. Verify that the counter reading decreased by 12.7 ±0.1 MHz (25 ±0.1 MHz for 6642A, 6653A, and 6659A) from the value recorded in step 12.
- 18. Press FREQUENCY VERNIER OFF.
- 19. Press FREQUENCY RANGE ΔF F0.
- 20. Press  $\Delta F$  and set for 0 MHz.
- 21. Using the FREQUENCY VERNIER pushbuttons, set the F0 frequency for the counter reading shown below:

Frequency (GHz)
1.000
18.050
5.000

- 22. Press  $\Delta F$  and set for 50 MHz.
- 23. Rotate the MANUAL SWEEP control between its clockwise and counter-clockwise ends and note the frequency at each end.
- 24. Adjust A10R10 on the FM/Attenuator PCB so that the frequency excursions from the step 24 frequency are equal, ±0.5 MHz, at each end of the MANUAL SWEEP control range.

- e. <u>.01-2 GHz Band (Heterodyne) Frequency</u> Calibration (Models 6617A, 6647A, 6648A, and 6659A)
  - 1. Press CW F1 and set for 1 GHz.
  - 2. Adjust A6R12 (Figure 5-24) for a counter reading of 1.000 GHz ±1 MHz.
  - 3. Press F1 and sequentially set the frequency for 0.010 GHz, then 2.000 GHz.
  - 4. Verify that the counter reads 0.010 and 1.950 GHz ±10 MHz, respectively, at each end of the band. If not, readjust A6R12 as necessary to achieve this frequency tolerance.
- f. Osc 2 Frequency Calibration



To prevent misalignment due to being on the wrong side of the YIG oscillator's hysteresis curve, steps 1 thru 7 should be followed exactly as written.

- 1. Press RESET.
- 2. Press FREQUENCY RANGE F1-F2.
- 3. Press F1 and set for the frequency shown below.

Model	Frequency (GHz)	
6642A	26.550	
All Others	8,050	

4. Press F2 and set for the frequency shown below.

Model	Frequency (GHz)
6642A	39.950
All Others	12.350

- Press CW F1; wait ≈10 s for the frequency to settle.
- 6. Using care to prevent the frequency from going below that shown in col-

umn 2 below, adjust A7R2 (Figure 5-25) for the frequency shown in column 3 below.

A.C.	Low-End	Adjustment
	Frequency	Frequency
Model	(GHz)	(GHz)
6642A	26.500	$26.550 \pm 1 \text{ MHz}$
All Others	8.000	$8.950 \pm 1  MHz$

- 7. Press CW F2; wait  $\approx 10$  s for the frequency to settle.
- 8. Using care to prevent the frequency from going above that shown in column 2 below, adjust A7R7 for the frequency shown in column 3 below.

	High-End	Adjustment
	Frequency	Frequency
$\underline{Model}$	(GHz)	(GHz)
66 <b>4</b> 2A	40.000	$39.950 \pm 1  MHz$
All Others	12.400	$12.350 \pm 1  MHz$

#### NOTE

In steps 6 and 8, if the frequency goes below the low-end frequency or above the highend frequency, the adjustments are invalid. If this happens, repeat steps 2 thru 8.

- 9. Repeat steps 5 thru 8, as necessary, until the two frequencies are within tolerance.
- 10. Press FREQUENCY RANGE F1-F2.
- 11. Press MANUAL SWEEP and set the associated control fully counter-clockwise.
- 12. Adjust A7R5 for a counter reading as indicated below:

Model	Frequency (GHz)
6642A	$26.050 \pm 1 \text{ MHz}$
All Others	$8.050 \pm 1 \mathrm{MHz}$

13. Press CW F0, and set for the frequency shown below:

<u>Model</u>	Frequency (GHz)
6642A	22.250
All Others	10.000

- 14. After the frequency has settled, observe and record the counter reading.
- 15. Press FREQUENCY VERNIER IN-CREASE and hold depressed until the frequency stops increasing.
- 16. Adjust A7R9 until the counter reads 12.7 ±0.1 MHz (25 ±0.1 MHz for 6642A, 6653A, 6659A) above the frequency recorded in step 14.
- 17. Press FREQUENCY VERNIER OFF, and note that the counter reads the frequency recorded in step 14.
- 18. Press FREQUENCY VERNIER DE-CREASE and hold depressed until the frequency stops decreasing.
- 19. Verify that the counter reading decreased by 12.7 ±0.1 MHz (25 ±0.1 MHz for 6642A, 6653A, 6659A) from the value recorded in step 14.
- 20. Press FREQUENCY VERNIER OFF.
- 21. Press FREQUENCY RANGE ΔF F0.
- 22. Press  $\Delta F$  and set for 0 MHz.
- 23. Using the FREQUENCY VERNIER pushbuttons, set the F0 frequency for the counter reading shown below:

Model	Frequency (GHz)
66 <b>4</b> 2A	22.250
All Others	10.000

- 24. Press  $\Delta F$  and set for 50 MHz.
- 25. Rotate the MANUAL SWEEP control between its clockwise and counter-clockwise ends and note the frequency at each end.
- 26. Adjust A10R11 on the FM/Attenuator PCB so that the frequency excursions from the step 23 frequency are equal, ±0.5 MHz, at each end of the MAN-UAL SWEEP control range.

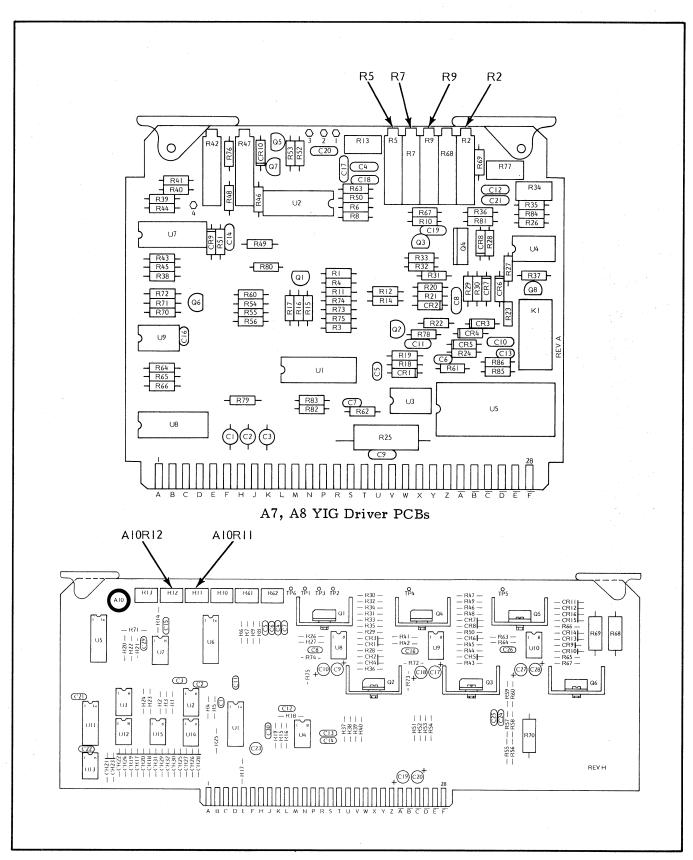


Figure 5-25. 8-12.4 and 12.4-18.6 (or 20) GHz Band (Osc 2 and 3) Frequency Adjustments

#### g. Osc 3 Frequency Calibration

# CAUTION

To prevent misalignment due to being on the wrong side of the YIG oscillator's hysteresis curve, steps 1 thru 7 should be followed exactly as written.

- 1. Press RESET.
- 2. Press FREQUENCY RANGE F1-F2.
- 3. Press F1 and set for 12.450 GHz.
- 4. Press F2 and set for the frequency shown below.

Model	Frequency (GHz)
6638A/6648A	19.950
6653A/6659A	17.950
6637A/6647A	18.550

- Press CW F1; wait ≈10 s for the frequency to settle.
- 6. Using care to prevent the frequency from going below 12.400 GHz, adjust A8R2 (Figure 5-25) for 12.450 GHz ±1 MHz, as indicated on the counter.
- 7. Press CW F2; wait ≈10 s for the frequency to settle.
- 8. Using care to prevent the frequency from going above that shown in column 2 below, adjust A8R7 for the frequency shown in column 3 below:

	High-End	Adjustment
	Frequency	Frequency
Model	(GHz)	(GHz)
6638A/6648A	20.000	$19.950 \pm 1  \text{MHz}$
6653A/6659A	18.000	$17.950 \pm 1  MHz$
6637A/6647A	18.600	$18.550 \pm 1  MHz$

#### NOTE

In steps 6 and 8, if the frequency goes below the low-end frequency or above the highend frequency, the adjustments are invalid. If this happens,

#### repeat steps 5 thru 8.

- 9. Repeat steps 5 thru 8, as necessary, until the two frequencies are within tolerance.
- 10. Press FREQUENCY RANGE F1-F2.
- 11. Press MANUAL SWEEP and set the associated control fully counter-clockwise.
- 12. Adjust A8R5 for a reading of 12.450 GHz ±1 MHz, as indicated on the counter.
- 13. Press CW F0, and set for 15 GHz.
- 14. After the frequency has settled, observe and record the counter reading.
- 15. Press FREQUENCY VERNIER IN-CREASE and hold depressed until the frequency stops increasing.
- 16. Adjust A8R9 until the counter reads 12.7 ±0.1 MHz (25 ±0.1 MHz for 6653A and 6659A) above the frequency recorded in step 14.
- 17. Press FREQUENCY VERNIER OFF, and note that the counter reads the frequency recorded in step 14.
- 18. Press FREQUENCY VERNIER DE-CREASE and hold depressed until the frequency stops decreasing.
- 19. Verify that the counter reading decreased by 12.7 ±0.1 MHz (25 ±0.1 MHz for 6653A and 6659A) below the value recorded in step 14.
- 20. Press FREQUENCY VERNIER OFF.
- 21. Press FREQUENCY RANGE ΔF F0.
- 22. Press  $\Delta F$  and set for 0 MHz.
- 23. Using the FREQUENCY VERNIER pushbuttons, set the F0 frequency for a counter reading of 15.000 GHz.
- 24. Press  $\Delta F$  and set for 50 MHz.

- 25. Rotate the MANUAL SWEEP control between its clockwise and counter-clockwise ends and note the frequency at each end.
- 26. Adjust A10R12 on the FM/Attenuator PCB so that the frequency excursions from 15 GHz are equal, ± 0.5 MHz, at each end of the MANUAL SWEEP control.

#### h. Osc 4 Frequency Calibration



To prevent misalignment due to being on the wrong side of the YIG oscillator's hysteresis curve, steps 1 thru 8 should be followed exactly as written.

- 1. Press RESET.
- 2. Press FREQUENCY RANGE F1-F2.
- 3. Press F1 and set for 18.050 GHz.
- 4. Press F2 and set for 26.450 GHz.
- 5. Press CW F1; wait  $\approx 10$  s for the frequency to settle.
- 6. Using care to prevent the frequency from going below 18.000 GHz, adjust A8R2 (Figure 5-25) for 18.050 GHz ±1 MHz, as indicated on the counter.
- 7. Press CW F2; wait  $\approx 10$  s for the frequency to settle.
- 8. Using care to prevent the frequency from going above 26.500 GHz, adjust A8R7 for 26.450 GHz ±1 MHz, as indicated on the counter.

#### NOTE

In steps 6 and 8, if the frequency goes below 18.000 or above 26.500 GHz, the adjustments are invalid. If this happens, repeat steps 5 thru 8.

9. Repeat steps 5 thru 8, as necessary,

- until the two frequencies are within tolerance.
- 10. Press FREQUENCY RANGE F1-F2.
- 11. Press MANUAL SWEEP and set the associated control fully counter-clockwise.
- 12. Adjust A8R5 for a reading of 18.050 GHz ±1 MHz, as indicated on the counter.
- 13. Press CW F0, and set for 22.250 GHz.
- 14. After the frequency has settled, observe and record the counter reading.
- 15. Press FREQUENCY VERNIER IN-CREASE and hold depressed until the frequency stops increasing.
- 16. Adjust A8R9 until the counter reads 25.0 ±0.1 MHz above the frequency recorded in step 14.
- 17. Press FREQUENCY VERNIER OFF, and note that the counter reads the frequency recorded in step 14.
- 18. Press FREQUENCY VERNIER DE-CREASE and hold depressed until the frequency stops decreasing.
- 19. Verify that the counter reading decreased by 25.0 ±0.1 MHz below the value recorded in step 14.
- 20. Press FREQUENCY VERNIER OFF.
- 21. Press FREQUENCY RANGE  $\Delta F$  F0.
- 22. Press  $\Delta F$  and set for 0 MHz.
- 23. Using the FREQUENCY VERNIER pushbuttons, set the F0 frequency for a counter reading of 15.000 GHz.
- 24. Press  $\Delta F$  and set for 50 MHz.
- 25. Rotate the MANUAL SWEEP control between its clockwise and counter-clockwise ends and note the frequency at each end.

PCB so that the frequency excursions from 22.250 GHz are equal, ± 0.5 MHz, at each end of the MANUAL SWEEP control range.

#### 5-10 2-8 GHz BAND (OSC 1) TRACKING FILTER ADJUSTMENTS (Models 6617A, 6647A, 6648A, and 6659A)

This paragraph provides instructions for adjusting the 2-8 GHz band (Osc 1) tracking filter. These adjustments should be performed following maintenance on the A6 PCB or when the power output of the sweep generator is below its specified tolerance in the 2-8 GHz band.

- a. Connect test equipment as shown in Figure 5-26, and turn the equipment on.
- b. Remove the top cover from the sweep generator (sweeper). Refer to paragraph 7-3.1 for instructions, if necessary.
- c. Press RESET on sweeper.

- d. Press FREQUENCY RANGE F1-F2.
- e. Press F1 and set for 2 GHz.
- f. Press F2 and set for 8 GHz.
- g. Press INTERNAL leveling to the off position (indicator not lit).
- h. On the network analyzer,
  - 1. press Channel A REF POS LOCATE and adjust the associated SET potentiometer so that the reference line is positioned on the display's center graticule line;
  - 2. release REF POS LOCATE;
  - 3. a trace similar to that shown in Figure 5-27 should be observed.
- i. On the sweeper,
  - 1. alternately adjust A6R36 and A6R38 (Figure 5-31) to obtain maximum out-

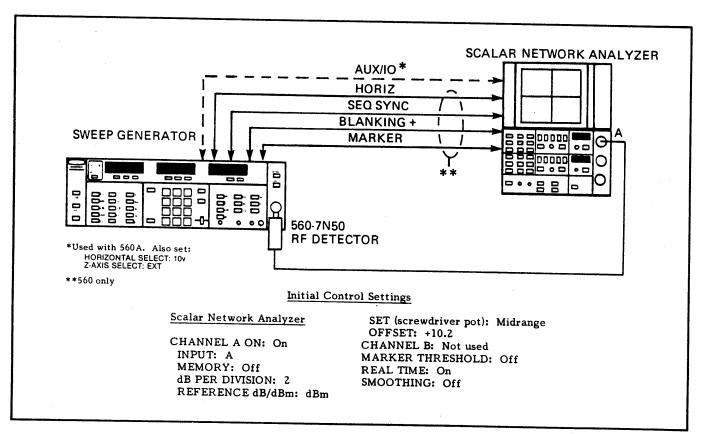


Figure 5-26. Test Equipment Setup for Tracking Filter Adjustments

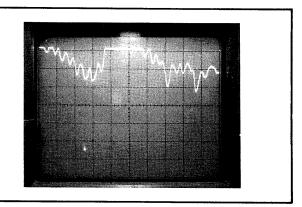


Figure 5-27. F1-F2 Sweep, Unleveled Power put power across the frequency band. A6R36 will adjust power at the low and A6R38 at the high end of the frequency band;

- 2. press INTERNAL leveling;
- 3. press FULL.
- j. On the network analyzer, press Channel A.2 dB PER DIVISION.
- k. On the sweeper,
  - 1. press LEVEL;
  - 2. operate the INCREASE/DECREASE lever to place the minimum-power point of the displayed trace (Figure 5-28) on the center graticule line.

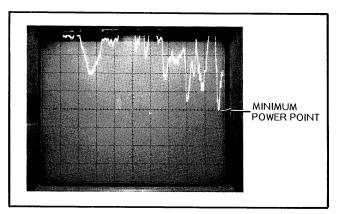


Figure 5-28. Minimum Power Point on Leveled Output Power Signal

- 3. press  $\Delta F$  F0;
- 4. press  $\Delta F$  and set for 50 MHz;
- 5. press F0 and set for 2.000 GHz.

1. On network analyzer, press Channel A .5 dB PER DIVISION. The trace should appear on the top half of the display (Figure 5-29).

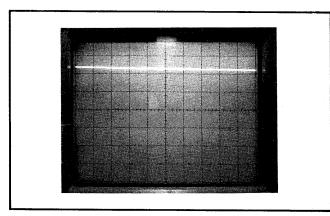


Figure 5-29. Narrow-Band Sweep, Leveled Power

- m. On sweeper, move the INCREASE/DE-CREASE lever toward INCREASE so that the F0 frequency slowly advances, as indicated on the LED numeric display.
- n. Observe the network analyzer display and ensure that the trace does not go unleveled (Figure 5-30) at any frequency between 2 and 8 GHz.

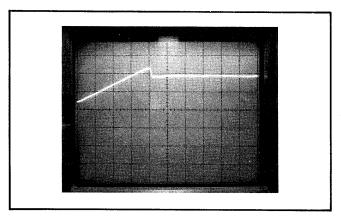


Figure 5-30. Narrow-Band Sweep, Unleveled Power

- o. If the trace goes unleveled, adjust A10R62 until it becomes leveled (Figure 5-29).
- p. Using the INCREASE/DECREASE lever, recheck the  $\Delta F$  F0 narrow-band sweep and ensure that it has leveled power at all frequencies between 2 and 8 GHz.

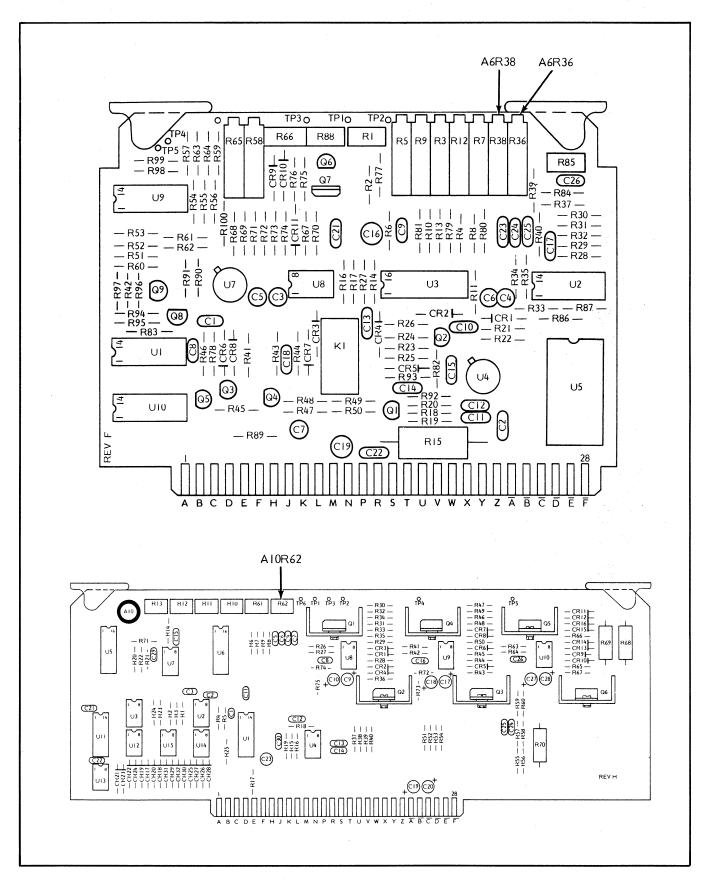


Figure 5-31. Tracking Filter Adjustments

### 5-11 SWEEP RATE COMPENSATION ADJUSTMENT

This paragraph provides instructions for adjusting the sweep generator so that the frequency shift is minimum when the sweep rate is varied. This adjustment should be performed following maintenance on any of the A6-A9 PCBs, or when a frequency shift is detected while increasing or decreasing sweep speed.

- a. Connect the test equipment as shown in Figure 5-33, and turn the equipment on.
- b. Remove the top cover from the sweep generator (sweeper). Refer to paragraph 7-3.1 for instructions, if necessary.
- c. Press RESET.
- d. Press INTERNAL leveling to off (indicator not lit).
- e. Press SWEEP TIME and set for 10 ms.
- f. Adjust oscilloscope vertical control to obtain a waveform similar to that shown in Figure 5-32.

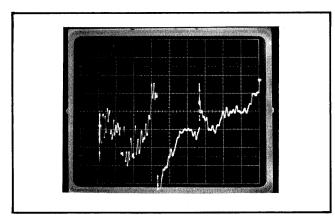


Figure 5-32. Model 6647A Unleveled Full-Band Sweep

- g. While monitoring the oscilloscope,
  - 1. select a perturbation to observe in the Osc 1 (2-8 GHz) band (Figure 5-34),
  - 2. alternately change the SWEEP TIME between 10 and 30 ms, and

- 3. adjust A6R1 (Figure 5-35) for a minimum frequency shift, as indicated by the selected perturbation.
- h. Repeat step g. for the applicable Osc 2, Osc 3, and Osc 4 YIG bands. Adjust A7R13 for Osc 2, A8R13 for Osc 3, and A9R13 for Osc 4.

#### 5-12 ALC LOOP CALIBRATION

This paragraph provides instructions for calibrating the sweep generator's ALC (automatic level control) loop. The procedure in paragraph 5-12.1 covers all models except the 26.5 to 40 GHz band of the 6642A. This band is covered in paragraph 5-12.2. The ALC loop calibration procedures should be performed following the repair or replacement of any of the ALC loop components.

### 5-12.1 ALC Loop Adjustments (All Models Except 6642A, 26.5 to 40 GHz Band)

This paragraph describes the ALC loop adjustments, which are divided into four groups: ALC Bandwidth, RF Slope, Power Level, and Coupler/Het detector Tracking for Models 6617A, 6647A, 6648A, and 6659A.

#### a. ALC Loop Bandwidth Adjustments

- 1. Set up the test equipment as shown in Figure 5-36, and turn the equipment on.
- 2. Remove the top cover from the sweep generator (sweeper). Refer to paragraph 7-3.1 for instructions, if necessary.
- 3. Adjust the function generator to supply the sweeper with a 10 kHz, 0-10V square wave.
- 4. Press RESET on sweeper.
- 5. Het Band (A4/A6 PCBs) Loop Adjustment (Models 6609A, 6617A, 6647A, 6648A, and 6659A)
  - (a) Press CW F1 and set for 1.000 GHz.

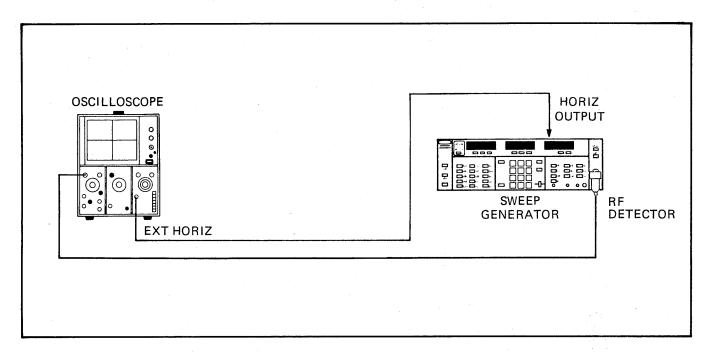


Figure 5-33. Test Equipment Setup for Sweep Rate Compensation Adjustments

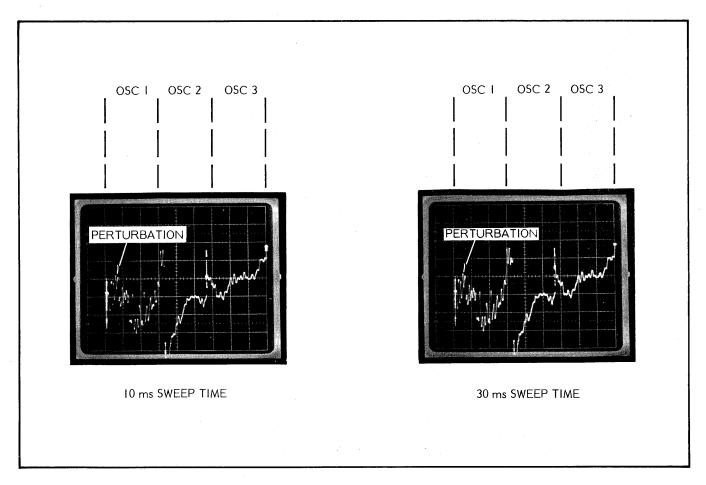


Figure 5-34. Waveforms Showing Frequency Shift with Sweep Time Change

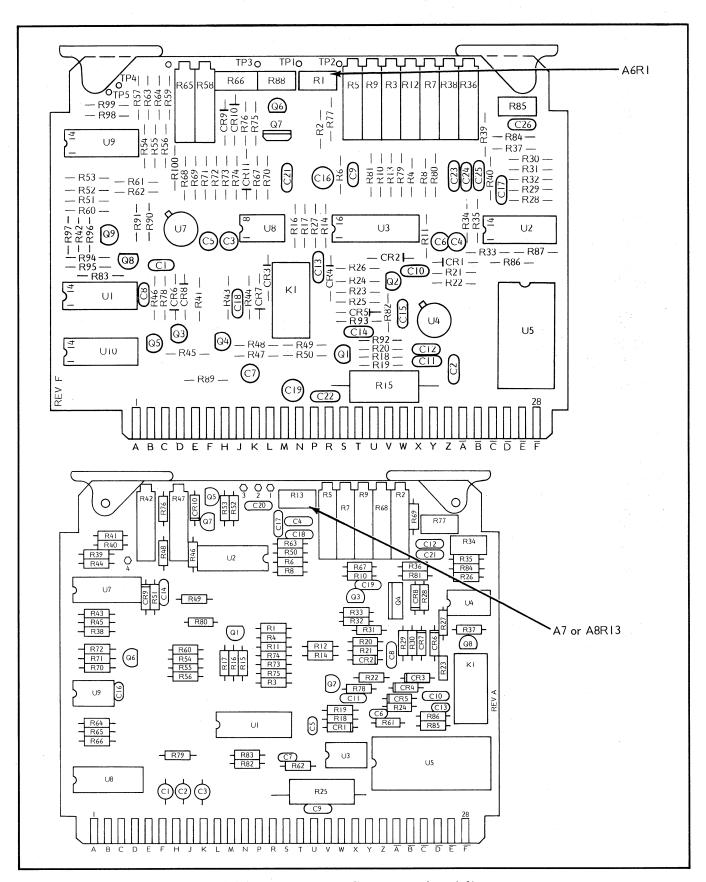


Figure 5-35. Sweep Rate Compensation Adjustments

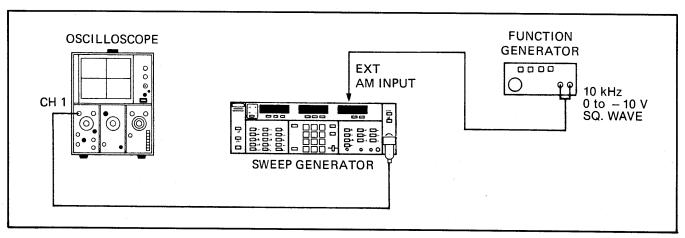


Figure 5-36. Test Equipment Setup for Making ALC Loop Bandwidth Adjustments

(b) Adjust the oscilloscope vertical and horizontal controls to display a square wave similar to that shown in Figure 5-37.

#### NOTE

Ensure that the UNLEVELED indicator is not lit, which may happen if the square wave is riding a dc offset.

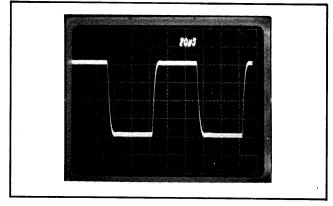


Figure 5-37. ALC Loop Square Wave

- (c) Adjust A4R124 and A6R66 (Figure 5-38) for a square wave with no overshoot and a rise time of less than 20 μs.
- (d) For 6609A, go to step 11; for all other models, go to step 6.
- 6. Osc 1 (A4/A6 PCBs) Loop Adjustment
  (All models except 6609A, 6629A and
  6629A-40)\*

(a) Press CW F1 and set as shown below:

 Model
 Frequency (GHz)

 6642A
 22.250

 All Others
 5.000

(b) Adjust the oscilloscope vertical and horizontal controls to display a square wave similar to that shown in Figure 5-37.

#### NOTE

Ensure that the UNLEVELED indicator is not lit, which may happen if the square wave is riding a dc offset.

- (c) Adjust A4R123 and A6R66 (Figure 5-36) for a square wave with no overshoot and a rise time of less than 20  $\mu$ s.
- (d) For 6617A, go to step 11; for 6642A go to paragraph 5-12.2; and for all other models, go to step 8.
- 7. Osc 2 (A4/A7 PCBs) Loop Adjustment (Models 6629A and 6629A-40)
  - (a) Press CW F1 and set for 10 GHz.

#### NOTE

Ensure that the UNLEVELED indicator is not lit, which may happen if the square wave is riding a dc offset.

(b) Adjust the oscilloscope vertical and horizontal controls to dis-

<sup>\*</sup>For 6629A and 6629A-40, go to step 7.

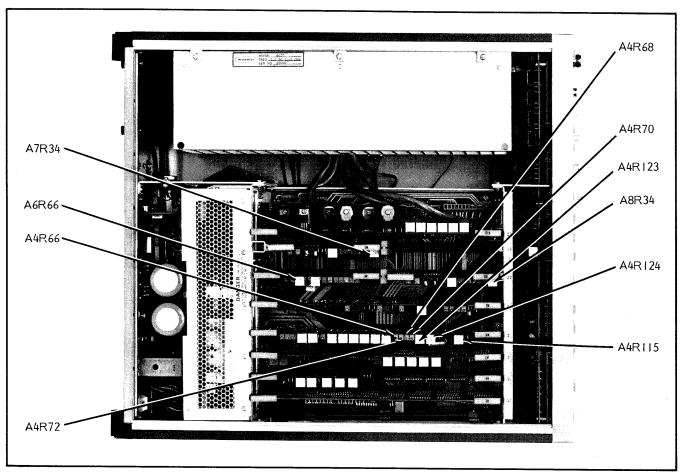


Figure 5-38. ALC Loop Adjustments

- play a square wave similar to that shown in Figure 5-37.
- (c) Adjust A4R123 and A7R34 (Figure 5-38) for a square wave with no overshoot and a rise time of less than 20 μs.
- 8. Osc 2 (A7 PCB) Loop Adjustment (All models except 6609A, 6617A, 6629A, and 6629A-40)
  - (a) Press F1 and set for 10.000 GHz.
  - (b) Adjust A7R34 for the best square-wave response.
  - (c) For 6621A and 6621A-40, go to step 11; for all other models, go to step 9.
- 9. Osc 3 (A8 PCB) Loop Adjustment (Models 6629A, 6629A-40, 6637A, 6637A-40, 6638A, 6647A, 6648A, 6653A, and 6659A

- (a) Press F1 and set for 15 GHz.
- (b) Adjust A8R34 for a square wave with no overshoot and a rise time of less than 20 μs.
- (c) For all models except 6653A and 6659A, go to step 11; for these two models, go to step 10.
- 10. Osc 4 (A9 PCB) Loop Adjustment (Models 6653A and 6659A)
  - (a) Press F1 and set for 22.25 GHz.
  - (b) Press LEVEL and set for -1 dBm.
  - (c) Adjust A9R34 for a square wave with no overshoot and a rise time of less than 20 μs.
  - (d) Go to step 11.
- 11. Press POWER to OFF, and disconnect the test equipment.

## b. RF SLOPE Adjustment (All models except 6642A)\*

1. Set up the test equipment as shown in Figure 5-39, and turn the equipment on.

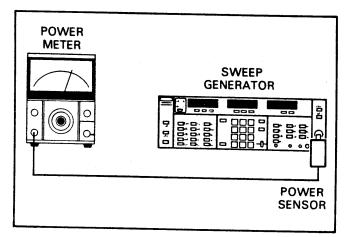


Figure 5-39. Test Equipment Setup for RF SLOPE and Power Level Adjustments

#### NOTE

Ensure that the RF SLOPE control is OFF.

- 2. Press RESET.
- 3. Press LEVEL and set for 5 dB below the power level indicated on the LEVEL LED display.
- 4. Press CW F1 and set as shown below:

Model	Frequency (GHz)
6609A	0.050
6629A and 6629A-40	8.050
All Others	2.050

5. Record the power meter reading.

#### NOTE

Ensure that the CAL FACTOR control on the power is set correctly for the frequency to be measured.

6. Press CW F2 and set as shown below:

Model	Frequency (GHz)
6609A	1.950
6617A	7.950
6621A and 6621A-40	12.350
6629A, 6629A-40, 6637A, 6637A-40, and 6647A	18.550
6638A and 6648A	19.950
6653A and 6659A	26.450

- 7. Record the power meter reading.
- 8. Alternately press CW F1 and CW F2, and adjust A4R115 (Figure 5-38) for equal power at each CW frequency.

# c. Power Level Adjustments (All models except 6642A)\*\*

- 1. Press RESET.
- 2. Press F1 and set as shown below:

Frequency (GHz)
0.050
8.050
2.050

- 3. As indicated on the power meter, adjust A4R66 (Figure 5-38) for the power level indicated on the LEVEL LED display.
- 4. Press LEVEL and set for 9.9 dB below the power level indicated on the LEVEL LED display.
- 5. Adjust A4R72 for the power level indicated on the LEVEL LED display.
- 6. Repeat steps 2 thru 5 as necessary until the steps 2 and 4 power levels are ±0.1 dB.
- 7. Press POWER to OFF, and disconnect the test equipment.

<sup>\*</sup>The RF slope adjustment for the 6642A is described in paragraph 5-12.2.

<sup>\*\*</sup>The power level adjustments for the 6642A are described in paragraph 5-12.1

- d. Coupler and Het Detector Tracking Adjustment (Models 6617A, 6647A, 6648A and 6659A)
  - 1. Set up the test equipment as shown in Figure 5-40, and turn the equipment on.
  - 2. On the sweeper,
    - (a) press FREQUENCY RANGE  $\Delta F$  F0;
    - (b) press F0 and set for 1 GHz;
    - (c) press  $\Delta F$  and set for 1 GHz.
  - 3. On the network analyzer, press REF POS LOCATE, and adjust the SET screwdriver potentiometer to position the reference line to center-screen.
  - 4. On the sweeper,
    - (a) press LEVEL and set for 10 dBm;
    - (b) Adjust A4R142 for a level trace on the network analyzer;
    - (c) press F0 and set for 2 GHz.
    - (d) adjust A4R68 until the power levels on both sides of the 2 GHz center frequency are approxi-

- mately equal, as observed on the network analyzer.
- 5. On the network analyzer, readjust the OFFSET control for a 0 dBm reading on the OFFSET dB display.
- 6. On the sweeper,
  - (a) press LEVEL and set for 0 dBm.
  - (b) adjust A4R70 until the power levels on both sides of the 2 GHz center frequency are approximately equal, as observed on the network analyzer.

#### NOTE

If unable to obtain equal traces with A4R70 (above), adjust the A4U4 offset potentiometer (Figure 5-41); then readjust A4R70 as described above.

7. While observing the network analyzer display and using the 560 OFFSET control to keep the trace on the screen, use the INCREASE/DE-CREASE lever on the sweeper to vary the power level back and forth between 0 and 10 dBm.

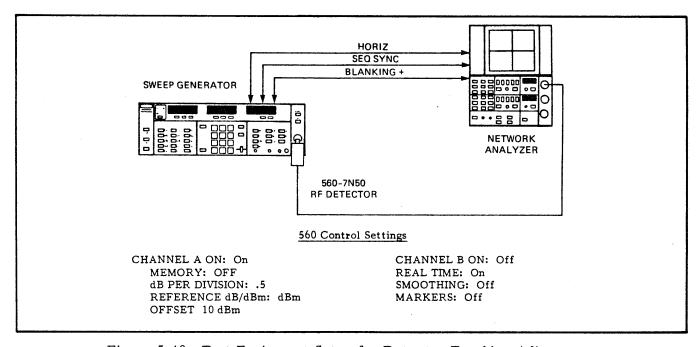


Figure 5-40. Test Equipment Setup for Detector Tracking Adjustment

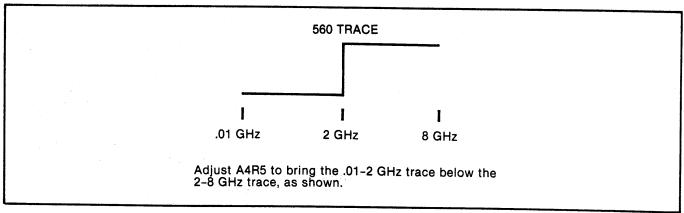


Figure 5-41. Potentiometer A4R5 Adjustments

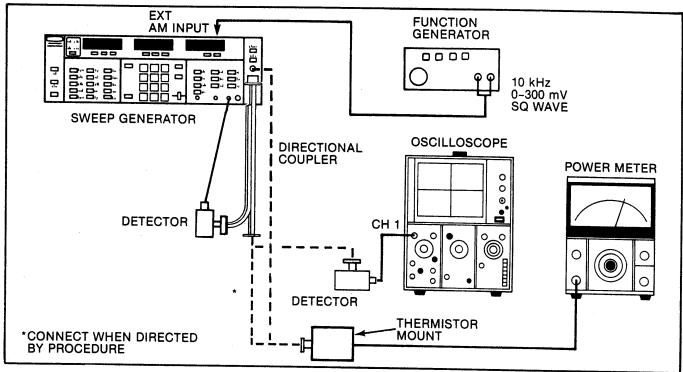


Figure 5-42. Model 6642A, Test Equipment Setup for Making ALC Loop Calibration Adjustments

8. Verify that the power levels on both sides of the 2 GHz center frequency are equal, ±0.5 dB. If they are unequal between 0 and 5 dBm, readjust A4R68. Conversely, if they are unequal between 5 and 10 dBm, readjust A4R70.

# 5-12.2 ALC Loop Adjustments (Model 6642A, 26.5 to 40 GHz Band)

The ALC loop adjustments for the 6642A are divided into three groups: ALC Bandwidth, RF Slope, and Power Level.

## a. ALC Loop Bandwidth Adjustments (26.5-40 GHz Band)

- 1. Set up the test equipment as shown in Figure 5-42 (oscilloscope connected to the directional coupler); turn the equipment on.
- 2. Remove the top cover from the sweep generator (sweeper). Refer to paragraph 7-3.1 for instructions, if necessary.
- 3. Adjust the function generator to

supply the sweeper with a 10 kHz, 0-300 mV square wave.

- 4. Press RESET on sweeper.
- 5. Press CW F1 and set for 30 GHz.
- 6. Press LEVEL and set for -5 dBm.
- 7. Place EXT ALC GAIN control to midrange.
- 8. Adjust the oscilloscope vertical and horizontal controls to display a square wave similar to that shown in Figure 5-43.
- 9. Alternately adjust A4R124 and A7R34 (Figure 5-38) for the best square-wave response. The square wave should resemble Figure 5-43.

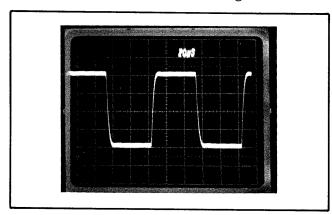


Figure 5-43. ALC Loop Square Wave

- 10. With the oscilloscope, verify the following signal parameters at 0 and -10 dBm power-level settings.
  - Overshoot: <20%
  - Rise Time: <7μs.
- 11. Verify the square-wave response at the upper and lower limits of the 10 dBm leveled-power range; see Table 5-7.

#### b. RF SLOPE Adjustment

1. Disconnect oscilloscope from the directional coupler and connect the power meter's R486A Thermistor Mount in its place.

- 2. Press LEVEL and set for -5 dBm.
- 3. Press F1 and set for 40.000 GHz.
- 4. Record the power meter reading.
- 5. Disconnect the R486A Thermistor Mount from the power meter, and connect a K482A Thermistor Mount between the power meter and the 18-26.5 GHz RF OUTPUT connector on the sweeper.
- 6. Press F1 and set for 18.000 GHz.
- 7. Record the power meter reading.
- 8. Adjust A4R115 (Figure 5-38) for equal power at 18 and 26.5 GHz.

#### c. Power Level Adjustments

- 1. Press LEVEL and set for +3 dBm.
- 2. Adjust A4R66 for a power meter reading of +3.0 dBm.
- 3. Set LEVEL for -7.0 dBm.
- 4. Adjust A4R72 for a power meter reading of -7.0 dBm.
- 5. Repeat steps 2 thru 5 as necessary until the power levels are +3.0 dBm and -7.0 dBm respectively, ±0.1 dB.
- 6. Disconnect the K482A Thermistor Mount from the power meter, and reconnect the R482A Thermistor Mount.
- 7. Press LEVEL and set for +1 dBm.
- 8. Press F1 and set for 26.500 GHz.
- 9. Verify that the power meter reads  $+1.0 \text{ dBm} \pm 0.1 \text{ dB}$ .
- 10. Press LEVEL and set for -9.0 dBm.
- 11. Verify that the power meter reads  $-9.0 \text{ dBm} \pm 0.1 \text{ dB}$ .

### **SECTION VI**

### PARTS LISTS

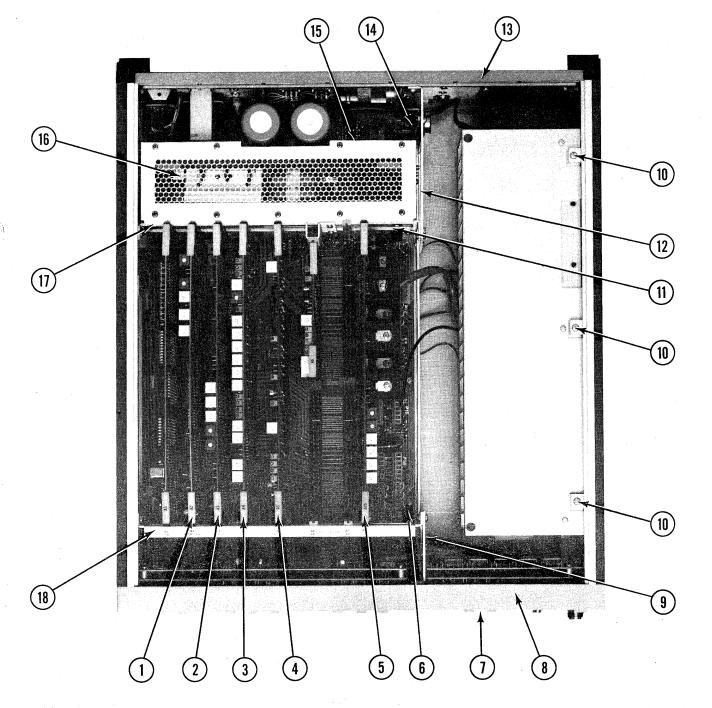
6-1 INTRODUCTION		Illustrated Major Assembly Parts Lists	
	Fig.	Major Assembly	Page
This section provides parts lists for the mul-	6-1	A0 Basic Frame Assy.	6-2
tiband models of the WILTRON 6600A Pro-	6-2	Top Assy.	6-4
grammable Sweep Generators. The parts	6-3	A15 Front Panel Assy.	6-6
	6-4	Al6 Rear Panel Assy.	6-8
lists are divided into three groups: major	6-5	RF Deck Assy 6609A/6617A	6-10
assembly parts, printed circuit board (PCB)	6-6	RF Deck Assy	
parts, and options/accessories. Major		6621A/6621A-40/6629A/	
assembly parts are illustrated in Figures 6-1		6629A-40/6637A/6637A-40/	
thru 6-9. PCB parts, including optional		6638A/6647A/6648A	6-11
1 / 0 1	6-7	RF Deck Assy. – 6642A	6-12
PCB's, are tabulated in Tables 6-1 thru 6-25.	6–8	RF Deck Assy. –	/ 12
Options and accessories are listed in Table 6-	6-9	6653A/6659A	6-13 6-14
26.	0 /	Oscillator Assy.	0-14
6-2 PARTS-ORDERING INFORMATION		PCB Assembly Parts Lists	
	Table	PCB/PCB Assembly No.	Page
Replaceable parts may be ordered either			
from the local WILTRON representative or	6-1	Al GPIB Interface,	
directly from the factory.	6-2	Option 3 (660-D-8001)	6-16
	0-2	A2 Ramp Generator (660-D-8002)	/ 1/
WII TOON Commons	6-3	A3 Marker Generator	6-16
WILTRON Company	0 3	(660-D-8003)	6-18
825 East Middlefield Road	6-4	A4 ALC (660-D-8004)	6-20
Mountain View, California 94043	6-5	A5 Frequency Instruction	0 20
		(660-D-8005)	6-22
Telephone: (415) 969-6500	6-6	A6 HET/YIG Driver,	
TWX: 910-379-6578		.01-2 GHz, 6609A	
IWA: 710-317-0316		(660-D-8007-4)	6-23
	6-7	A6 HET/YIG Driver,	
When ordering, give complete information in-		2-8 GHz, 6617A	
cluding the model and serial number of the	6-8	(660-D-8007-6)	6-25
instrument, the full part description, the	0-8	A6 HET/YIG Driver, 2-8 GHz, 6621A/	
WILTRON part number, and the quantity re-		6637A/6638A/6647A/	
•		6648A (660-D-8007-3, -5, -99-91)	6-26
quired.	6-9	A6 YIG Driver, 2-8 GHz	
		6621A-40/6637A-40	
6-3 ABBREVIATIONS		(660-D-12868-3, -99-91)	6-28
	6-10	A6 YIG Driver, 18-26.5 GHz,	
The following abbreviations appear in the	/ 11	6642A (660-D-8190-99-96)	6-29
"DESCRIPTION" column of the WILTRON	6-11	A6 HET/YIG Driver, 2-8 GHz,	
	6-12	6653A/6659A (660-D-8007-7) A6/A7/A8 YIG Driver,	6-31
parts lists:	0-12	8-12.4 GHz, 6621A/6629A/	
		6637A/6638A/6647A/6648A	
CC - Carbon Composition		(660-D-8009-4, -6, -7, -8,	
MF - Metal Film		-99-90, -99-92)	6-32
WW - Wire-Wound	6-13	A6/A7 YIG Driver, 8-12.4 GHz,	
WW WIIC Would		6621A-40/6629A-40/6637A-40	
		(660-D-8009-14, -17, -99-91,	
6-4 ORGANIZATION OF PARTS LISTINGS	/ • •	-99-93)	6-34
	6-14	A6/A7/A8 YIG Driver,	
The replaceable-parts lists are arranged		12.4-18.6 GHz, 6629A-40/	
under the following three categories:		6637A-40 (660-D-8009-15, -16, -99-94)	6 25
miles the removement the conteguites.		(000 D 0007-13, -10, -99-94)	6-35
1-6600A/MB-OMM			<u> </u>
I COCCITATION CIVILIA			6-1

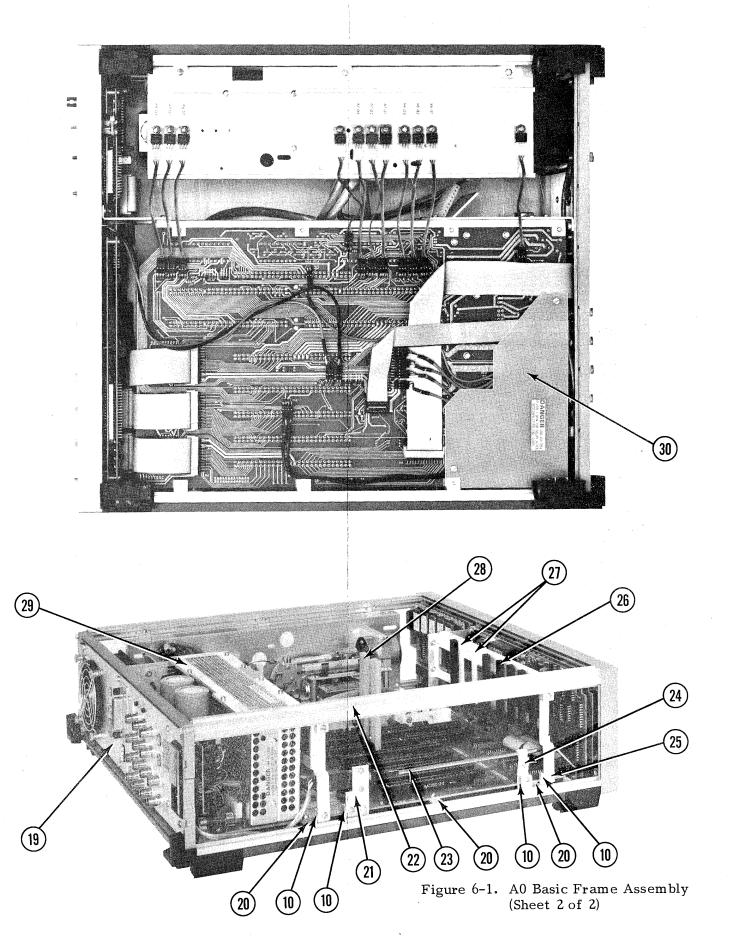
<u>Table</u>	PCB/PCB Assembly No.	Page	Table	PCB/PCB Assembly No.	Page
6-15	A7/A8 YIG Driver,			(660-D-8012)	6-47
	12.4-18.6 (20) GHz		6-23	A13 Switching Power Supply	
	6629A/6637A/6638A/6647A/		_	(660-D-8013)	6-48
	6648A (660-D-8008-4, -7,		6-24	A14 Motherboard	
	<del>-</del> 99-90)	6-37		(660-D-8014)	6-50
6-16	A7 YIG Driver 26.5-40 GHz,		6-25	A18 GPIB Connector	
	6642A (660-D-8191-99-93)	6-38		(660-B-8018)	6-52
6-17	A7 YIG Driver, 8-12.4 GHz,				
	6653A/6659A (660-D-8009-9, -12)	6-39		Options and Accessories Parts List	
6-18	A8 YIG Driver, 12.4-18.6 GHz,			Options and Accessories Parts List	
	6653A/6659A		T-1-1-	Nama	Dago
	(660-D-8009-10, -13)	6-41	<u>Table</u>	Name	Page
6-19	A9 YIG Driver, 18-26.5 GHz,		6-26	Option 1, Rack Mount	6-53
	6653A/6659A		6-26	Option 2, Step Attenuator	6-53
	(660-D-8009-11)	6-42	6-26	Option 3, GPIB Interface	6-53
6-20	A10 FM/Attenuator		6-26	Option 11, External Square-	
	(660-D-8010)	6-43		Wave Input, Standard	
6-21	All Front Panel			(except 6642A)	6-53
	(660-D-8011)	6-45	6-26	Option 13, Counted Markers	
6-22	A12 Microprocessor		6-26	Accessories	6-53

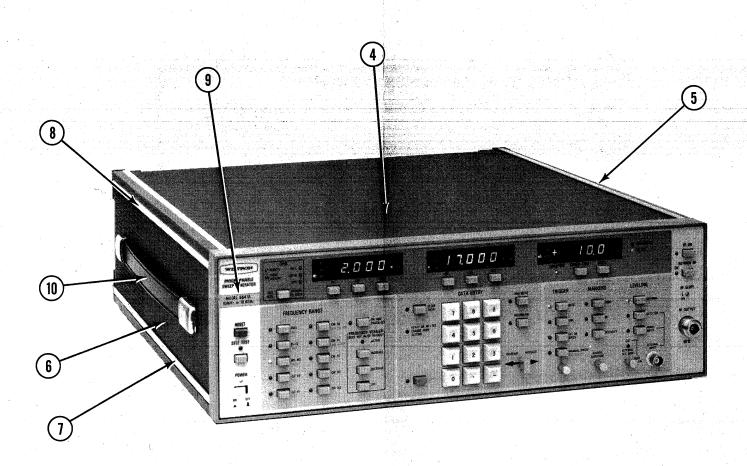
NO.	NAME	PART NO.
1	A2 Ramp Generator PCB (Table 6-2)	660-D-8002
2	A3 Marker Generator PCB (Table 6-3)	660-D-8003
3	A4 Automatic Level Control (ALC) PCB (Table 6-4)	660-D-8004
4	A5 Frequency Instruction PCB (Table 6-5)	660-D-8005
5	A10 FM/Attenuator PCB (Table 6-20)	660-D-8010
6	A14 Motherboard PCB (Table 6-24)	660-D-8014
7	A15 Front Panel Assembly (Figure 6-3)	660-D-8015
8	Casting, Finished Front	660-D-8084
9	Bracket, Support, Front	660-B-8030
10	Clip, Mounting (heat sink & bracket for PCB and POWER switch support)	660-B-8031
11	Card Cage, Front	660-D-8069
12	Bracket, Support, Rear	660-B-8034
13	Casting, Finished Rear	660-D-8083
14	Cable Assembly (Regulator to Motherboard)	660-A-8033
15	Card Cage, Rear	660-D-8070
16	A13 Switching Power Supply PCB (Table 6-23)	660-D-8013
17	Bracket, PCB, Rear	660-B-8028
18	Bracket, PCB, Front	660-B-8027
19	A16 Rear Panel Assembly (Figure 6-4)	660-D-8016
20	Clip, Mounting (PCB)	660-B-8032
21	Plate, POWER Switch Mounting	560-A-7053
22	Extrusion, Corner Frame	660-B-8082
23	POWER Switch Extender Assembly	660-D-8025
24	Clip, Mounting, POWER Switch	560-B-7044
25	Plate, POWER Switch Support	660-A-8099
26	Guide, PCB	553-97
27	Guide, PCB	553-41
	Heat Sink	553-65
28	Guide, PCB	660-A-8035
29	Card Cage, Top	660-B-8068

Figure 6-1. A0 Basic Frame Assembly (Sheet 1 of 2)

	INDEX NO.	NAME	PART NO.
-	30	Shield, Voltage Protection	660-B-8072
		Angle Support, PCB	660-B-8029
	-	Regulator, +15V, 7815	54-MC7815CP
	<u>.</u>	Regulator, -15V, 7915	54-MC7915CP
	<del></del>	Regulator, -15V, μΑ79HGKC	54-145
	_ `	Insulator, Mica	790-70
	_	Clamp, Cable	720-3/16
	_	Washer, Shoulder	790-52







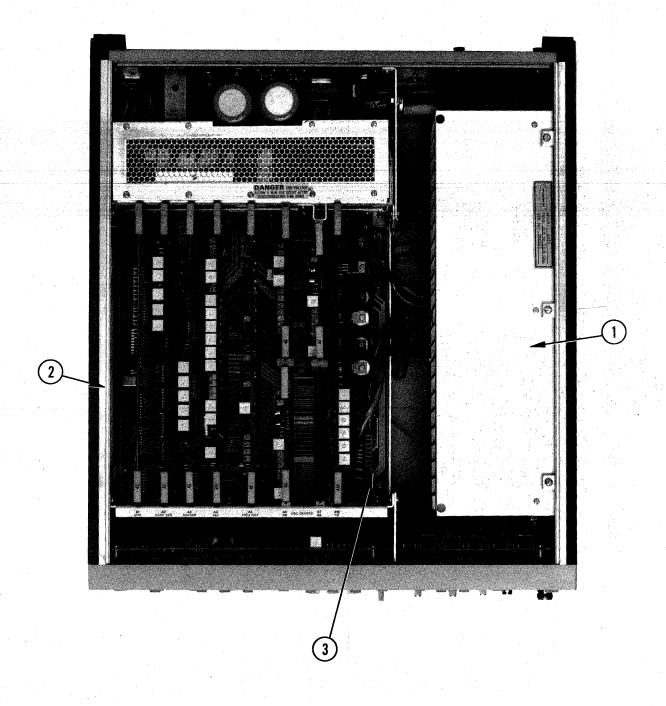


Figure 6-2. Top Assembly (Sheet 1 of 2)

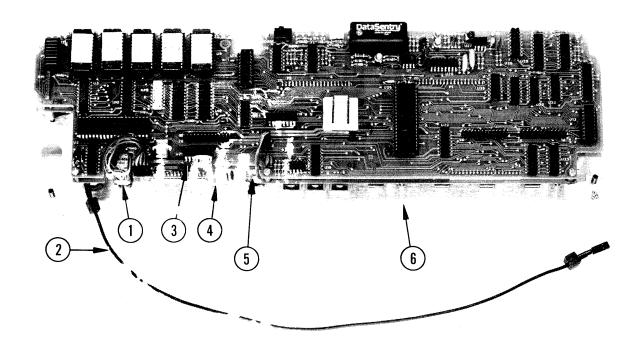
Reference Photo

INDEX	NO. NAME	PART NO.
1	RF Deck Assembly (Figure 6-5 thru 6-8)	
•	a. 6609A	660-D-8050
	b. 6617A	660-D-805 <b>7-</b> 1
	c. 6621A	SPCL-D-11550
	d. 6621A-40	SPCL-D-13065
	e. 6629A	SPCL-D-11585
	f. 6629A-40	SPCL-D-13079
	g. 6637A	660-D-8053-1
	h. 6637A-40	660-D-12871-1
	i. 6638A	660-D-8058-1
	j. 6642A	SPCL-D-11620
	k. 6647A	660-D-8054-1
	1. 6648A	660-D-8055-1
	m. 6653A	660-D-12608-1
	n. 6659A	660-D-12609-1
2	Basic Frame Assembly (Figure 6-1)	660-D-8000
3	Connector Jumper Assembly	660-A-8144
4	Covers, Top and Bottom	660-D-8044
5	Cover, Right Side	660-D-8045
6	Cover, Left Side	660-D-8046
7	Trim Strip, Bottom	560-B-7036
8	Trim Strip, Top	560-B-7037
9	Model Number Nameplate	
	a. 6609A	660-B-8093-3
	b. 6617A	660-B-8093-7
	c. 6621A	SPCL-A-11554
	d. 6621A-40	SPCL-A-13076
	e. 6629A	SPCL-A-11589
	f. 6629A-40	SPCL-A-13083
	g. 6637A	660-B-8093-2
	h. 6637A-40	660-B-8093-11
	i. 6638A	660-B-8093-8
	j. 6642A	SPCL-A-11625
	k. 6647A	660-B-8093-1
	1. 6648A	660-B-8093-9
	m. 6653A	660-B-8093-12
	n. 6659A	660-B-8093-10
10	Handle Assembly	<b>-</b> 00 100
	Strap	783-100
	Cap	783-11
	Bracket	783-12
_	Coupler Assembly (No RF OUTPUT Options)	(/0 = 0125 1
	a. 6609A	660-B-8125-1
	b. 6638A/6648A	660-B-8125-4
	c. All others	660-B-8125-2
_	Tilt Bail	2000-61F
	Foot, Bottom	2000-61G
_	Foot, Rear	2000-61H
_	Fuse, Line (2A SB, 3AG)	631-16
_	Cord, Line	800-119
_	Rubber Pad	2000-61K

Figure 6-2. Top Assembly (Sheet 2 of 2)

INDEX NO.	NAME	PART NO.
1	Potentiometer Assembly,	660-A-8024
	EXTERNAL ALC GAIN	
2	Cable Assembly (EXTERNAL INPUT	660-A-8023
2	to A14P37)	//0 = 0012
3	A12 Microprocessor PCB (Table 6-22)	660-D-8012
4	All Front Panel PCB	660-D-8011
	(Table 6-21)	
5	Switch Assembly, INCREASE/	660-B-8017
	DECREASE	
6	Subpanel	660-D-8042
7	Button, RESET	SPEC-C-8187-3
8	Button, Grey (40 ea.)	SPEC-C-8187-1
9	Button, SHIFT	SPEC-C-8187-4
10	Buttons, Keypad	
	a. "1"	660-A-8073-1
	b. "2"	660-A-8073-2
	c. "3"	660-A-8073-3
	d. "4"	660-A-8073-4
	e. "5"	660-A-8073-5
	f. "6"	660-A-8073-6
	g. "7"	660-A-8073-7
	h. "8"	660-A-8073-8
	i. "9"	660-A-8073-9
	j. "0"	660-A-8073-10
	k. "."	660-A-8073-11
	1. "-"	660-A-8073-12
	Knob (MANUAL SWEEP and MARKER	61084-A-5452
	AMPLITUDE)	
<del></del>	Insert	A710-56
	Knob, Push to Check (EXTERNAL ALC GAIN)	660-A-8064
	Insert	710-56
_	Front Panel (Plastic)	660-D-8043
_	Connector, BNC, Insulated	510-31
	(EXTERNAL INPUT)	310 31
_	Connector Housing, 2-pin	551-230
	Female Pins	551-154
	Connector, Insulated Displacement	551-233
	for RG 174	
_	Knob Retainer	710-56
<del></del>	Cable, Coax	800-5

Figure 6-3. A15 Front Panel Assembly (Sheet 1 of 2)



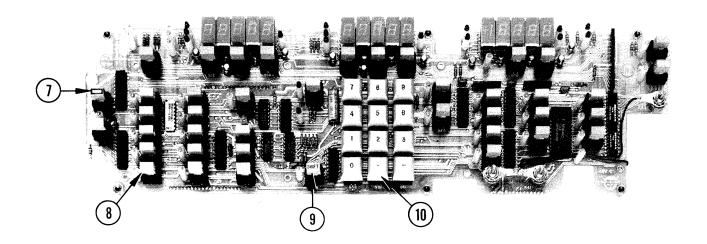


Figure 6-3. A15 Front Panel Assembly (Sheet 2 of 2)

INDEX NO.	NAME	PART NO.
1	Shield, Fan	660-B-8142
2	Fan	650-4
3	Plug, Button, 5/8	790-42
4	Plug, Button, 1/4	790-146
5	Cover, GPIB (In place of cover, A18 GPIB Connector PCB (Table 6-25) is shown installed.)	560-A-7041
6	(Not shown) 25-pin Connector Housing #553-294; Receptacle, #553-89	660-A-12700
7	Switch, DPDT	430-49
8	Connector, BNC	510-5
9	Connector, BNC, Insulated	510-31
10	Plug, Button, 3/8	790-41
11	Transformer	320-58
12	Voltage Selector Module	551-142
	Female Pins, 14 ea.	551-155
13	Panel	660-D-8026
14	Connector Housing, 10-Pin	551-199
	Female Pins (Pins 1 & 3-10)	551–35
	Female Pin (Pin 2)	551-200
15	Switch, POWER	430-139
_	Connector Housing, 4-Pin	551-229
_	Connector Housing, 2-Pin	551-230
	Female Pins, 6 ea.	551-154
	Connector Insulation (Displacement for RG 174)	551-233
_	Filter, Air	783-116
	Finger Guard	790-142
_	Thumb Nut	790-143
_	Cable, Shielded Pair	800-28
_	Cable, Coax, RG174	800-5
_	Cable Assembly, Flat (between A14X16 and BNC connectors)	802-16A-23.4
· <del>-</del>	Connector Housing, 3-Pin	551-202
	Receptacle	551-250
_	Capacitor, .0047 μF, 3 kV	250-97

Figure 6-4. A16 Rear Panel Assembly (Sheet 1 of 2)

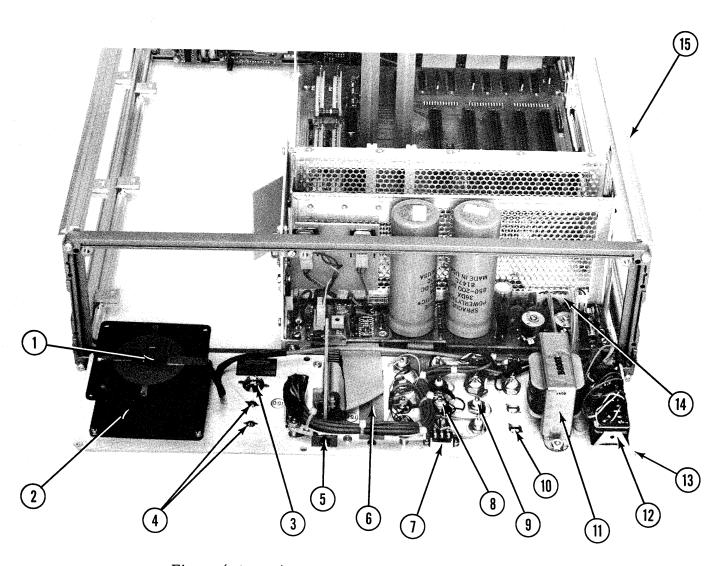


Figure 6-4. Al6 Rear Panel Assembly (Sheet 2 of 2)

		Timer no.
1	YIG Oscillator Assembly (Figure 6-9)	
	a. 4.6-6.6 GHz (6609A)	660-C-8192
	b. 2-8 GHz (6617A)	660-C-8087-2
2 .	Matched Modulator Assembly	660-B-9342
3	Filter	Figure 6-9
4	Cable Clip	721-17
5	Down Converter Assembly (6617A)	MEF-D-9157
6	DPDT Switch	660-B-8149
7	Transformer Assembly	355 2 511,
	a. 6609A	320-65
	b. 6617A	320-66

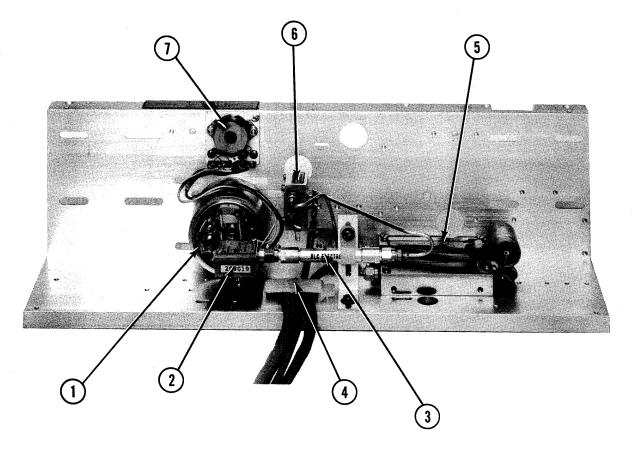


Figure 6-5. RF Deck Assembly - 6609A/6617A

660-C-12873-1

660-C-12873-4

660-C-12873-3 660-A-8102-6

Figure 6-9

54-184

1010-28

660-D-8821

(2) Avantek Osc. & Litton Amp.

(3) WJ Osc. & Amplica Amp.

(4) WJ Osc. & Litton Amp.

Cable Assembly, Isolator to Filter

PIN Switch Assembly

Voltage Regulator, -5V

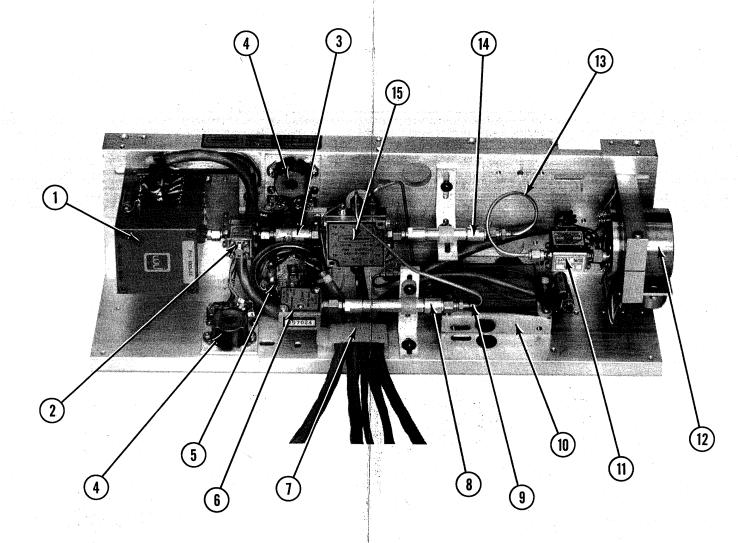


Figure 6-6. RF Deck Assembly - 6621A/6621A-40/6629A/6629A-40/6637A/6637A-40/6638A/6647A/6648A

13

14

15

Filter

10 dB Pad

INDEX NO.	NAME	PART NO.
1	Oscillator Assembly, 18-26.5 GHz (Figure 6-9)	660-C-8175-2
2	Isolator	Figure 6-9
3	Down Converter Assembly (6659A)	MEF-D-9157
4	Cable Assembly, Down Converter to PIN Switch J1	CABL-A-9202-24
5	10 dB Pad	1010-28
6	PIN Switch Assembly	660-D-11745-2
7	Cable Assembly, 10 dB Pad to PIN Switch J6	CABL-A-9202-23
8	Oscillator Assembly, 12.4-18 GHz (Figure 6-9)	//o C 9095 2
	a. Avantek Oscillator	660-C-8085-2 660-C-8085-3
	b. WJ Oscillator	Figure 6-9
9	Filter	CABL-A-9203-6
10	Cable Assembly, Filter to PIN Switch J2	CABL-A-7203 0
11	Cable Assembly	CABL-A-9201-22
	a. Avantek Oscillator to Filter	CABL-A-9204-5
	b. WJ Oscillator to Isolator	721-17
12	Cable Clip	660-B-9342
13	Matched Modulator Assembly	660-C-8087-4
14	Oscillator Assembly, 2-8 GHz (Figure 6-9)	000 0 000. 1
15	Transformer, Compensation	320-66
	a. YIG Oscillator 1005-46 or -47	320-65
	b. YIG Oscillator 1005-53 or -54	320-64
	c. YIG Oscillator 1005-55, -59, or -61	
16	Oscillator Assembly, 8-12.4 GHz (Figure 6-9)	660-C-8086-6
	a. Avantek Oscillator	660-C-8086-7
	b. WJ Oscillator	CABL-A-9202-22
17	Cable Assembly, Filter to PIN Switch J3	20-5
	Transistor, PNP, TIP 117	54-184
_	Voltage Regulator, -5V	

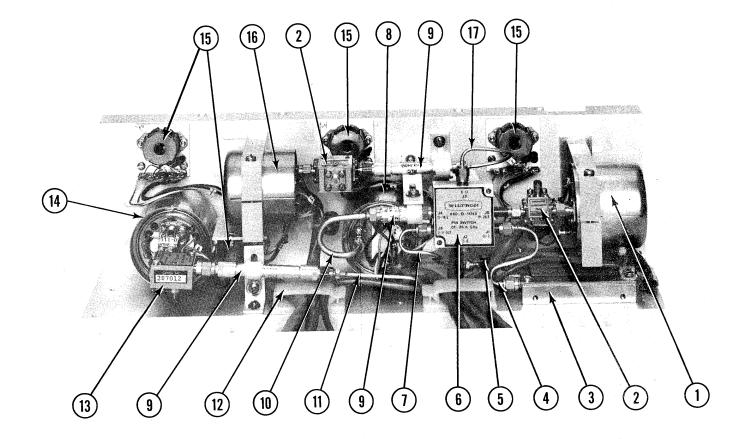
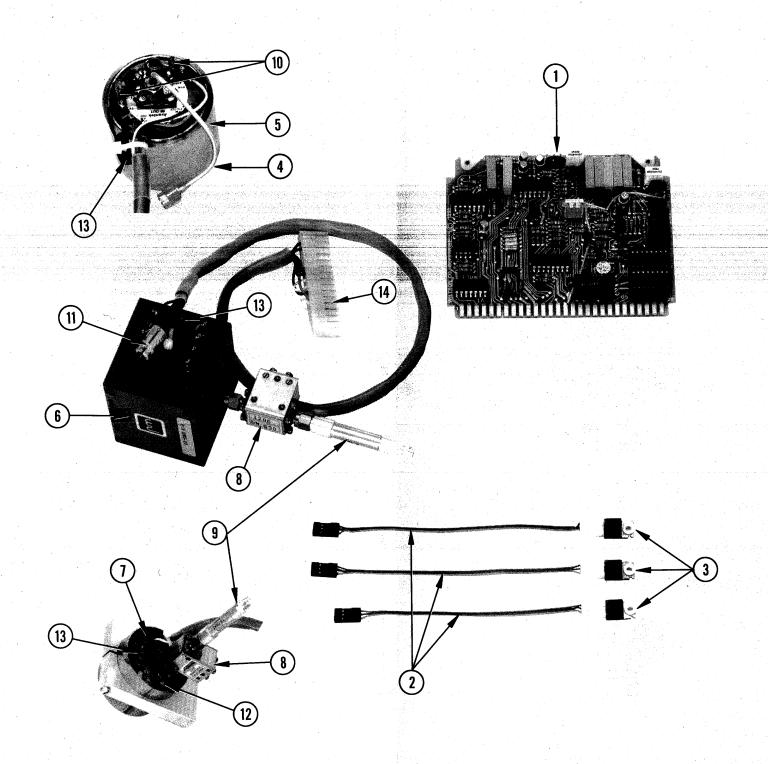


Figure 6-8. RF Deck Assembly - 6653A/6659A



INDEX NO.	NAME	PART NO.
1	PCB Assembly, YIG Driver	//o D 0007 4
	a. 2-8 GHz (6609A, Table 6-6)	660-D-8007-4
	b. 2-8 GHz (6617A, Table 6-7)	660-D-8007-6
	c. 2-8 GHz (6621A, Table 6-8)	660-D-8007-99-91
	d. 2-8 GHz (6637A/6647A, Table 6-8)	660-D-8007-3
	e. 2-8 GHz (6621A-40, Table 6-9)	660-D-12868-99-91
	f. 2-8 GHz (6637A-40, Table 6-9)	660-D-12868-3
	g. 2-8 GHz (6638A/6648A, Table 6-8)	660-D-8007-5
	h. 2-8 GHz (6653A/6659A Table 6-11)	660-D-8007-7
	i. 8-12.4 GHz	
	(1) Avantek (6621A, Table 6-12)	660-D-8009-99-90
	(2) Avantek (6621A-40, Table 6-13)	660-D-8009-99-91
	(3) Avantek (6629A, Table 6-12)	660-D-8009-99-92
Annual Company of the	(4) Avantek (6629A-40, Table 6-13)	660-D-8009-99-93
	(5) Avantek (6637A/6647A, Table 6-12)	660-D-8009-4
	(6) Avantek (6637A-40, Table 6-13)	660-D-8009-14
	(7) Avantek (6638A/6648A, Table 6-12)	660-D-8009-6
	(8) Avantek (6653A/6659A, Table 6-17)	660-D-8009-9
	(9) WJ (6637A/6647A, Table 6-12)	660-D-8009-7
	(10) WJ (6637A-40, Table 6-13)	660-D-8009-17
	(11) WJ (6638A/6648A, Table 6-12)	660-D-8009-8
	(12) WJ (6653A/6659A, Table 6-17)	660-D-8009-12
	j. 12.4-18.6 GHz	
	(1) Avantek (6629A-40, Table 6-14)	660-D-8009-99-94
	(2) Avantek (6637A-40, Table 6-14)	660-D-8009-16
	(3) Avantek (6653A/6659A, Table 6-18)	660-D-8009-10
	(4) WJ (6629A, Table 6-15)	660-D-8008-99-90
	(5) WJ (6637A/6647A, Table 6-15)	660-D-8008-4
	(6) WJ (6637A-40, Table 6-14)	660-D-8009-15
	(7) WJ (6653A/6659A, Table 6-18)	660-D-8009-13
	k. 12.4-20 GHz (6638A/6648A, Table 6-15)	660-D-8008-7
	1. 18.6-26.5 GHz (6653A/6659A, Table 6-19)	660-D-8009-11
	m. 18.6-26.5 GHz (6642A, Table 6-10)	660-D-8190-99-98
	n. 26.5-40 GHz (6642A, Table 6-16)	660-D-8191-99-93
2	Cable, Transistor (3 ea)	660-A-8100
3	Transistors Q1, Q2, Q3;	20-2N6044
<b>3</b> .	Q1 on 6609A/6617A; .01-18 GHz band	20-2N6041
	of 6637A/6637A-40/6647A/6653A and 6659A; and	
	8-12.4 GHz band of 6637 A/6637 A-40/6638 A/6647 A/6648 A	
4 , ,	Cable, SMA Male-Male, RG085	660-A-8101-5

Figure 6-9. Oscillator Assembly (Sheet 1 of 2)

Figure 6-9. Oscillator Assembly (Sheet 2 of 2)

Connector Housing, 16-pin

Cover (for Item 6 oscillator)

Resistor (R1) MF, 1/4W, 1%,  $11\Omega$ 

Female Pin

14

551-247

551-35

110-11-1

660-B-8160

Table 6-1. A1 GPIB Interface, Option 3 (660-D-8001)

				the state of the s	······
	CAPACITORS		U6	74LS155, Dual 1-of-4 Decoder	54-101
			<b>U</b> 7	74LS138, 1-of-8 Decoder	54-74LS138
REF.		WILTRON	U8	74LS373, Octal Latch	54-103
DES.	DESCRIPTION	PART NO.	U9	Not Used	
			U10	74LS04, Hex Inverter	54-74LS04
C1	Tantalum, 2.2 µF, 20V	250-40A	U11	74LS01, Quad Open Collector	54-74LS01
C2	Tantalum, 2.2 µF, 20V	250-40A	""	NAND	31 111101
C3	Tantalum, 10 µF, 25V	250-42 250-42	U12	8085A, CPU	54-93
C4	Monolithic, .1 µF, 50V	230-37	U13	74LS123 one shot	54-116
C5	Monolithic, .1 µF, 50V	230-37	U14	7474, Dual D Flip-Flop	54-7474
C6	Monolithic, .1 µF, 50V	230-37	U15		
C7	Monolithic, .1 μF, 50V	230-37	013	74LS244, Non-inverting Octal	54-143
C8	Monolithic, 1 µF, 50V	230-37	771/	Tri-State Driver	F4 142
C9	Monolithic, .1 µF, 50V	230-37	U16	74LS244, Non-inverting Octal	54-143
0,	Μοποπτιπε, .1 με, 50 γ	230-37		Tri-State Driver	
	DECICTODO		U17	8291 GPIB Listener/Talker	54-124
	RESISTORS		U18	MC3447 Motorola GPIB	54-142
REF.				Transreceiver, ceramic pkg.,	
DES.	DESCRIPTION	WILTRON	*****	Cs. 623	54 142
DES.	DESCRIPTION	PART NO.	U19	MC3447 Motorola GPIB	54-142
R1	NET 1/47 10/ 5 11)	110 # 11. 4		Transreceiver, ceramic pkg.,	
R2	MF, 1/4W, 1%, 5.11k	110-5.11k-1		Cs. 623	
	MF, 1/4W, 1%, 10k	110-10k-1	U20	74LS74, Dual D Flip-Flop	54-44
R3	MF, 1/4W, 1%, 10k	110-10k-1	U21	74LS74, Dual D Flip-Flop	54-44
R4	MF, 1/4W, 1%, 10k	110-10k-1	U22	74LS374, Octal Latch	54-41
R5	MF, 1/4W, 1%, 10k	110-10k-1	U23	74LS112, Dual J-K Flip-Flop	54-74LS112
R6	MF, 1/4W, 1%, 40.2k	110-40.2k-1	U24	74LS374, Octal Latch	54-41
R7	MF, $1/4W$ , $1\%$ , $487\Omega$	110-487-1	U25	74LS00, Quad NAND	54-74LS00
R8	MF, 1/4W, 1%, 40.2k	110-40.2k-1		Socket, Dip, 18-Pin; U9	551-148
R9	MF, 1/4W, 1%, 10k	110-10k-1		Socket, Dip, 40-Pin; U1, 12, 17	553-66
RP1	Resistor Network, 10k, 8-Pin,			Socket, Dip, 24-Pin; U4, 5	553-67
	7-Resistor	123-6		Plug, Dip, 18-Pin; U9	551-236
RP2	Resistor Network, 10k, 8-Pin,				
	7-Resistor	123-6			
				MISCELLANEOUS	
INTE	EGRATED CIRCUITS, SOCKETS, AN	ID PLUGS			
nee			REF.		WILTRON
REF.	D.E.G.D.EDETON	WILTRON	DES.	DESCRIPTION	PART NO.
DES.	DESCRIPTION	PART NO.	1		
			Q1	Transistor, 2N4249, PNP	20-2N4249
U1	8255A, Programmable Interface	54-155	S1	Switch, Slide, SPDT	420-14
U2	PD211ALC-4 256 x 4 Static RAM	54-11	TP1		
U3	PD211ALC-4 256 x 4 Static RAM	54-11	thru		
U5	2716 2k x 8 EPROM	Contact	TP22	Test Point Pins	706-44
		WILTRON	Y1	Crystal, 6.000 MHz	630-17
	Cust	omer Service		Ejector, P.C. Board	553-96

Table 6-2. A2 Ramp Generator (660-D-8002)

	CAPACITORS		C12	Monolithic, 50V, .01 μF	250-77
	CALACITORS		C13	Monolithic, 50V, .01 µF	230-37
REF.		WILTRON	C14	Monolithic, 50V, .1 μF	230-37
DES.	DESCRIPTION	PART NO.	C15	Monolithic, 50V, .1 µF	230-37
	22014 11011	11201	C16	Monolithic, 50V, .1 µF	230-37
C1	Tantalum, 6V, 68 µF	250-58	C17	Monolithic, 50V, .1 µF	230-37
C2	Monolithic, 50V, .1 µF	230-37	C18	Monolithic, 50V, .1 µF	230-37
C3	Monolithic, 50V, .1 µF	230-37	C19	Monolithic, 50V, .1 µF	230-37
C4	Monolithic, 50V, .1 µF	230-37	C20	Monolithic, 50V, .1 µF	230-37
C5	Monolithic, 50V, .1 µF	230-37	C21	Monolithic, 50V, .1 µF	230-37
C6	Monolithic, 50V, .1 µF	230-37	C22	Monolithic, 50V, .1 µF	230-37
C7	Monolithic, 50V, .1 µF	230-37	C 23	Mylar, 250V, 1 µF	210-36
C8	Monolithic, 50V, .1 µF	230-37	C24	Tantalum, 25V, 10 µF	250-42
C9	Monolithic, 50V, .1 µF	230-37	C25	Tantalum, 25V, 10 µF	250-42
C10	Mica, 250V, 270 pF	223-270	C26	Monolithic, 50V, .1 µF	230-37
C11	Monolithic, 50V, .01 μF	250-77	C27	Mylar, 250V, .47 μF	210-28

	DIODES		R26	MF, 1/4W, 1%, 20 kΩ	110-20k-1
REF.		WILTRON	R27 R28	MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $10 k\Omega$	110-511-1
DES.	DESCRIPTION	PART NO.	R29	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1 110-10k-1
			R30	MF, $1/4$ W, $1\%$ , $1.1 \text{ k}\Omega$	110 10k-1 110-1.1k-1
CR1	Silicon, 1N4446	10-1N4446	R31	Variable, $1/2W$ , $10\%$ , $2 k\Omega$	156-2k
CR2	Reference, 1N823, 6.2V, 0.4W	10-1N823	R32	MF, $1/4W$ , $1\%$ , $9.53 \text{ k}\Omega$	110-9.53k-1
CR3	Silicon, 1N4446	10-1N4446	R33	MF, $1/4$ W, $1\%$ , $20 \text{ k}\Omega$	110-20k-1
CR4 CR5	Zener, 1N751A, 5.1V, 0.4W	10-1N751A	R34	MF, $1/4W$ , $1\%$ , $49.9 \text{ k}\Omega$	110-49.9k-1
CR6	Silicon, 1N4446 Silicon, 1N4446	10-1N4446	R35 R36	MF, 1/4W, 1%, 100Ω	110-100-1
CR7	Silicon, 1N4446	10-1N4446 10-1N4446	R37	MF, $1/4$ W, $1\%$ , $14.7 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-14.7k-1 110-10k-1
CR8	Silicon, 1N4446	10-1N4446	R38	MF, $1/4W$ , $1\%$ , $14.7 \text{ k}\Omega$	110-10k-1 110-14.7k-1
CR9	Zener, 1N751A, 5.1V, 0.4W	10-1N751A	R39	Variable, $1/2W$ , $10\%$ , $1 k\Omega$	156-1k
CR10	Hot-carrier, MBD-501	10-4	R40	MF, $1/4W$ , $1\%$ , $14.7 \text{ k}\Omega$	110-14.7k-1
CR11	Zener, 1N758A, 10V, 0.4W	10-1N758A	R41	CC, $1/4W$ , 5%, 2.2 M $\Omega$	101-2.2M-5
CR12	Silicon, 1N4446	10-1N4446	R42	MF, $1/4W$ , $1\%$ , $49.9 \text{ k}\Omega$	110-49.9k-1
CR13 CR14	Zener, 1N751A, 5.1V, 0.4W	10-1N751A	R43	MF, $1/4$ W, $1\%$ , $14.7 \text{ k}\Omega$	110-14.7k-1
CR14	Zener, 1N746A, 3.3V, 0.4W Zener, 1N751A, 5.1V, 0.4W	10-1N746A	R44	MF, 1/4W, 1%, 20 kΩ	110-20k-1
CR16	Silicon, 1N4446	10-1N751A 10-1N4446	R45 R46	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ	110-10k-1
		10 1111110	R47	MF, $1/4W$ , $1\%$ , $10 \text{ K}$ MF, $1/4W$ , $1\%$ , $1.21 \text{ k}$ $\Omega$	110-10k-1 110-1.21k-1
	TRANSISTORS		R48	MF, $1/4$ W, $1\%$ , 20 k $\Omega$	110-1.21k-1 110-20k-1
D. E. E.			R49	MF, $1/4W$ , 1%, 20 k $\Omega$	110-20k-1
REF. DES.	DESCRIPTION	WILTRON	R50	MF, $1/4W$ , $1\%$ , $140 \text{ k}\Omega$	110-140k-1
DES.	DESCRIPTION	PART NO.	R51	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
Q1	2N3694, PNP, 0.2W	20-2N3694	R52	MF, 1/4W, 1%, 511Ω	110-511-1
Q2	2N4249, NPN, 0.4W	20-2N4249	R53 R54	MF, 1/4W, 1%, 10 kΩ	110-10k-1
Q3	2N3694, PNP, 0.2W	20-2N3694	R55	MF, $1/4W$ , $1\%$ , $10 k\Omega$ MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
Q4	2N3694, PNP, 0.2W	20-2N3694	R56	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1 110-10k-1
Q5	2N3694, PNP, 0.2W	20-2N3694	R57	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
Q6	2N4249, NPN, 0.4W	20-2N4249	R58	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
Q7 Q8	2N3694, PNP, 0.2W J112, JFET	20-2N3694	R59	MF, $1/4W$ , $1\%$ , $34 k\Omega$	110-34k-1
Q9	J112, JFET	20-17 20-17	R60	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
Q10	2N3694, PNP, 0.2W	20-2N3694	R61	MF, $1/4$ W, $1\%$ , $3.48 \text{ k}\Omega$	110-3.48k-1
Q11	2N4249, NPN, 0.4W	20-2N4249	R62 R63	MF, 1/4W, 1%, 10 kΩ	110-10k-1
Q12	2N3694, PNP, 0.2W	20-2N3694	R64	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 20 kΩ	110-10k-1
Q13	2N4249, NPN, 0.4W	20-2N4249	R65	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-20k-1 110-10k-1
			R66	MF, $1/4W$ , 1%, $140 \text{ k}\Omega$	110-140k-1
	RESISTORS		R67	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
REF.		WII TOON	R68	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
DES.	DESCRIPTION	WILTRON PART NO.	R69	MF, 1/4W, 1%, 1 kΩ	110-1k-1
		TAKT NO.	R70 R71	MF, 1/4W, 1%, 10 kΩ	110-10k-1
R1	MF, $1/4W$ , $1\%$ , $1.15 \text{ k}\Omega$	110-1.15k-1	R72	MF, $1/4$ W, $1\%$ , $3.48$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$	110-3.48k-1
R2	MF, $1/4W$ , $1\%$ , $17.4 \text{ k}\Omega$	110-17.4k-1	R73	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1 110-10k-1
R3	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1	R74	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
R4	MF, 1/4W, 1%, 9.76 kΩ	110-9.76k-1	R75	CC, $1/4W$ , 5%, 1.2 M $\Omega$	101-1.2M-5
R5 R6	MF, $1/4$ W, $1\%$ , $56.2\Omega$ Variable, $1/2$ W, $10\%$ , $200 k\Omega$	110-56.2-1	R76	Variable, 1/2W, 10%, 1 M $\Omega$	156-1M
R7	MF, $1/4$ W, $1\%$ , $1 M \Omega$	156-200k 110-1M-1A	R77	MF, $1/4$ W, $1\%$ , $1$ M $\Omega$	110-1M-1A
R8	MF, 1/4W, 1%, 4.99 kΩ	110-1M-1A 110-4.99k-1	R78 R79	MF, 1/4W, 1%, 10 kΩ	110-10k-1
R9	MF, $1/4W$ , 1%, 2.74 k $\Omega$	110-2.74k-1	R19	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
R10	Variable, $1/2W$ , $10\%$ , $10 \text{ k}\Omega$	156-10k			
R11	MF, $1/4W$ , $1\%$ , $10.2 \text{ k}\Omega$	110-10.2k-1		INTEGRATED CIRCUITS	
R12	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1			
R13	MF, 1/4W, 1%, 1.07 kΩ	110-1.07k-1	REF.		WILTRON
R14 R15	MF, 1/4W, 1%, 19.6 kΩ MF, 1/4W, 1%, 10 kΩ	110-19.6k-1	DES.	DESCRIPTION	PART NO.
R16	MF, $1/4W$ , $1\%$ , $10 \text{ K}$ ? MF, $1/4W$ , $1\%$ , $392 \text{ k}$ ?	110-10k-1 110-392k-1	Ul	Dual D Flim Flor 741 674	54.44
R17	Variable, $1/2W$ , $10\%$ , $500 \text{ k}\Omega$	156-500k	U2	Dual D Flip-Flop, 74LS74 Quad AND, 74LS08	54-44 54-741 500
R18	MF, 1/4W, 1%, 3.48 kΩ	110-3.48k-1	U3	Timer, NE-555	54-74LS08 54-555
R19	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1	U4	Counter, 74LS161	54-60
R20	MF, $1/4$ W, $1\%$ , $100\Omega$	110-100-1	<b>U</b> 5	Hex Inverter, 74LS04	54-74LS04
R21	MF, 1/4W, 1%, 2.43 kΩ	110-2.43k-1	U6	Decoder, 74LS138	54-74LS138
R22	MF, 1/4W, 1%, 10 kΩ	110-10k-1	U7	Octal Latch, 74LS374	54-41
R23 R24	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ	110-10k-1	U8	2-1 Multiplexer, 74LS157	54-59
R25	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1 110-10k-1	U9 U10	4-Bit Counter, 74LS191	54-120
		10K I	010	Quad Inverter, 74LS05	54-105

U11	Dual D Flip-Flop, 74LS74	54-44	U26	Quad NAND, 74LS01	54-74LS01
U12	2-1 Multiplexer, 74LS157	5 <del>4-</del> 59	U27	Quad NOR, 74LS02	54-57
U13	4-Bit Counter, 74LS191	54-120	U28	Dual Switch, DG200	50-DG200BA
U14	Octal Latch, 74LS374	54-41		,	30 Babobii
U15	8-Bit Latch/DAC, AD7524	54-129		MISCELLANEOUS	
U16	Dual D Flip-Flop, 74LS74	54-44		MISCEPHINEOUS	
U17	Quad NAND Gate, 74LS00	54-74LS00	REF.		WILTRON
U18	Dual Op-Amp, TL072	54-53	DES.	DESCRIPTION	PART NO.
U19	Data Selector, 74LS151	54-119		DECORE HON	FARI NO.
U20	Dual Op-Amp, TL072	54-53	К1	Relay	690-28
U21	Quad Switch, DG201	54-24	S1	Slide Switch	420-14
U22	Dual D Flip-Flop, 74LS74	54-44	TP1	blide Switch	420-14
U 23	4-Input NAND, 74LS20	54-74LS20	thru		
U24	Dual D Flip-Flop, 74LS74	54-44	TP7	Test Points	706-44
U25	QUAD Comparator, LM339	54-45		Ejector, P.C. Board	553-96
	,,		1	Djector, 1.c. Doard	333-90

Table 6-3. A3 Marker Generator (660-D-8003)

			7		<del></del>
	CADACTEORS				
	CAPACITORS		CR3	Not Used	
REF.		WITH ITTO ON	CR4	Shottky, MBD-501	10-4
DES.	DESCRIPTION	WILTRON	CR5	Not Used	
DES.	DESCRIPTION	PART NO.	CR6	Shottky, MBD-501	10-4
C1	Tantalum, 68 µF, 6V	250 50	CR7	Not Used	
C2	Monolithic, .1 μF, 50V	250-58	CR8	Zener, 30V, 5%, 1W	10-1N4751A
C3	Monolithic, .1 μF, 50V	230-37	CR9	Silicon, 1N4446	10-1N4446
C4	Monolithic, .1 µF, 50V	230-37	CR10	Silicon, 1N4446	10-1N4446
C5	Not Used	230-37	CR11	Silicon, 1N4446	10-1N4446
C6	Not Used		CR12	Silicon, 1N4446	10-1N4446
C7		250 12	CR13	Silicon, 1N4446	10 <b>-</b> 1N <b>444</b> 6
C8	Tantalum, 10 μF, 25V	250-42	CR14	Silicon, 1N4446	10-1N4446
C9	Tantalum, 10 µF, 25V	250-42	CR15	Silicon, 1N4446	10-1N4446
C10	Monolithic, .1 µF, 50V	230-37	CR16	Silicon, 1N4446	10-1N4446
C10	Monolithic, .1 µF, 50V	230-37	CR17	Zener, 30V, 5%, 1W	10-1N4751A
	Tantalum, 10 µF, 25V	250-42	CR18	Silicon, 1N4446	10-1N4446
C12	Monolithic, .1 μF, 50V	230-37	CR19	Silicon, 1N4446	10-1N4446
C13	Monolithic, .1 μF, 50V	230-37	CR20	Silicon, 1N4446	10-1N4446
C14	Mica, 20 pF	220-20	CR21	Silicon, 1N4446	10-1N4446
C15	Mica, 20 pF	220-20	CR22	Silicon, 1N4446	10-1N4446
C16	Mica, 20 pF	220-20	CR23	Zener, 3.3V, 5%, .4W	10-1N746A
C17	Monolithic, .1 μF, 50V	230-37	CR24	Silicon, 1N4446	10-1N4446
C18	Monolithic, .1 μF, 50V	230-37	CR25	Silicon, 1N4446	10-1N4446
C19	Monolithic, .1 μF, 50V	230-37	CR26	Silicon, 1N4446	10-1N4446
C 20	Monolithic, .1 μF, 50V	230-37	CR27	Zener, 4.7V, 5%, .4W	10-11
C21	Mica, 3 pF	223-3	CR28	Silicon, 1N4446	10-1N4446
C 22	Mica, 3 pF	223-3			
C 23	Monolithic, .1 μF, 50V	230-37			
C 24	Monolithic, .1 μF, 50V	230-37		TRANSISTORS	
C 25	Monolithic, .1 μF, 50V	230-37			
C26	Monolithic, .1 μF, 50V	230-37	REF.		WILTRON
C 27	Monolithic, .01 μF, 100V	250-77	DES.	DESCRIPTION	PART NO.
C 28	Monolithic, .01 μF, 100V	250-77			1111111101
C29	Mica, 150 pF	220-150	Q1	FET, J112	20-17
C30	Tantalum, 10 μF, 25V	250-42	Q2	FET, J112	20-17
C31	Monolithic, .1 µF, 50V	230-37	Q3	FET, J112	20-17
C32	Tantalum, 10 µF, 25V	250-42	Q4	NPN, 2N3694	20-2N3694
C33	Monolithic, .01 µF, 100V	250-77	Q5	NPN, 2N3694	20-2N3694
C34	Monolithic, .1 µF, 50V	230-37	Q6	NPN, 2N3694	20-2N3694
C35	Monolithic, .1 µF, 50V	230-37		11111, 21130/1	20-2N307 <del>4</del>
				RESISTORS	
	DIODES				
ממום			REF.		WILTRON
REF.	DECOR TOWNS	WILTRON	DES.	DESCRIPTION	PART NO.
DES.	DESCRIPTION	PART NO.	l		
CD 1	D-f 12022 (XI 0 1777	10 111020	R1	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
CR1	Reference, 1N823, 6V, 0.4W	10-1N823	R2	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
CR2	Shottky, MBD-501	10-4	R3	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1

R4	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1	R68	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1
R5	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1	R69	MF, $1/4W$ , 1%, 20 k $\Omega$	110-20k-1
R6	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1	R70	MF, 1/4W, 1%, 301 kΩ	110-301k
R7	MF, $1/4W$ , 1%, 1 k $\Omega$	110-10k-1 110-1k-1	R71		
R8				MF, 1/4W, 1%, 10 kΩ	110-10k-1
	MF, 1/4W, 1%, 10 kΩ	110-10k-1	R72	MF, $1/4$ W, $1\%$ , $100$ kΩ	110-100k-1
R9	MF, $1/4W$ , $1\%$ , $16.2 \text{ k}\Omega$	110-16.2k-1	R73	MF, 1/4W, 1%, 10 kΩ	110-10k-1
R10	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1	R74	MF, 1/4W, 1%, 100 kΩ	110-100k-1
R11	MF, $1/4W$ , $1\%$ , $16.2 k\Omega$	110-16.2k-1	R75	MF, $1/4W$ , $1\%$ , $1 M \Omega$	110-1M-1A
R12	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1	R76	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
R13	Variable, $1/2W$ , $10\%$ , $2 k\Omega$	156-2k	R77	MF, $1/4$ W, $1\%$ , 20 kΩ	110-20k-1
R14	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1	R78	MF, $1/4W$ , 1%, $100 \text{ k}\Omega$	110-100k-1
R15	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1	R79	MF, 1/4W, 1%, 30.1 kΩ	110-30.1k-1
R16	MF, 1/4W, 1%, 1 kΩ	110-1k-1	R80	MF, $1/4W$ , $1\%$ , $30.1 \text{ kg}$	
R17	MF, 1/4W, 1%, 1 M Ω		R81	MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ	110-10k-1
R18	MF, $1/4W$ , $1\%$ , $1 M\Omega$	110-1M-1A	R82		110-100k-1
R19		110-1M-1A		MF, 1/4W, 1%, 100 kΩ	110-100k-1
	MF, 1/4W, 1%, 10 kΩ	110-10k-1	R83	MF, $1/4$ W, 1%, 100 kΩ	110-100k-1
R20	Variable, 1/2W, 10%, 2 kΩ	156-2k	R84	MF, $1/4W$ , $1\%$ , $178 k\Omega$	110-178k-1
R21	MF, $1/4$ W, $1\%$ , $1 k\Omega$	110-1k-1	R85	MF, $1/4W$ , $1\%$ , $27.4 k\Omega$	110-27.4k-1
R22	MF, $1/4$ W, $1\%$ , $1 k\Omega$	110-1k-1	R86	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1
R23	MF, $1/4$ W, $1\%$ , $1 k\Omega$	110-1k-1	R87	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
R24	MF, 1/4W, 1%, 1 M Ω	110-1M-1A	R88	MF, $1/4W$ , $1\%$ , $20 k\Omega$	110-20k-1
R25	MF, $1/4$ W, $1\%$ , $1$ M $\Omega$	110-1M-1A	R89	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
R26	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1	R90	Variable, 1/2W, 10%, 200 kΩ	156-200k
R27	Variable, $1/2W$ , $10\%$ , $2 k\Omega$	156-2k	R91	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
R28	MF, $1/4$ W, $1\%$ , $1 \text{ k}\Omega$	110-1k-1	R92	MF, $1/4$ W, $1\%$ , 20 k $\Omega$	110-20k-1
R29	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1	R93	MF, $1/4W$ , $1\%$ , $1 k\Omega$	
R30	MF, $1/4W$ , $1\%$ , $1 k\Omega$		R94		110-1k-1
R31	MF, $1/4W$ , $1\%$ , $1 M\Omega$	110-1k-1	R95	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1
		110-1M-1A	1,75	MF, $1/4$ W, $1\%$ , $1$ k $\Omega$	110-1k-1
R32	MF, $1/4$ W, $1\%$ , $1$ M $\Omega$	110-1M-1A			
R33	MF, 1/4W, 1%, 17.8 kΩ	110-17.8k-1		INTEGRATED CIRCUITS	
R34	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1	<b>!</b>		
R35	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1	REF.		WILTRON
	NATE 1/4387 107 101-0				
R36	MF, 1/4W, 1%, 10 kΩ	110-10k-1		DESCRIPTION	
R36 R37	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $24.9 \text{ k}\Omega$	110-10k-1 110-24.9k-1	DES.	DESCRIPTION	PART NO.
			DES.		PART NO.
R37	MF, $1/4W$ , $1\%$ , $24.9 k\Omega$	110-24.9k-1 110-100k-1	DES. U1	Octal Latch, 74LS374	<b>PART NO.</b> 54-41
R37 R38	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ	110-24.9k-1 110-100k-1 110-100k-1	<b>DES.</b> U1 U2	Octal Latch, 74LS374 Quad NAND Gate, 74LS01	PART NO.  54-41 54-74LS01
R37 R38 R39 R40	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 133 kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1	DES. U1 U2 U3	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP	<b>PART NO.</b> 54-41
R37 R38 R39 R40 R41	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1	DES. U1 U2 U3 U4	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used	PART NO.  54-41  54-74LS01
R37 R38 R39 R40 R41 R42	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $17.8$ kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1	DES. U1 U2 U3	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP	PART NO.  54-41  54-74LS01
R37 R38 R39 R40 R41 R42 R43	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $17.8$ kΩ MF, $1/4$ W, $1\%$ , $17.8$ kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1	DES. U1 U2 U3 U4	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used	54-41 54-74LS01 54-53 54-129
R37 R38 R39 R40 R41 R42 R43 R44	MF, $1/4$ W, $1\%$ , $24.9$ k $\Omega$ MF, $1/4$ W, $1\%$ , $100$ k $\Omega$ MF, $1/4$ W, $1\%$ , $100$ k $\Omega$ MF, $1/4$ W, $1\%$ , $133$ k $\Omega$ MF, $1/4$ W, $1\%$ , $100$ k $\Omega$ MF, $1/4$ W, $1\%$ , $17.8$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1	DES. U1 U2 U3 U4 U5	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524	54-41 54-74LS01 54-53 54-129 54-129
R37 R38 R39 R40 R41 R42 R43 R44 R45	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $17.8$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1	DES.  U1  U2  U3  U4  U5  U6  U7	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524	54-41 54-74LS01 54-53 54-129 54-129 54-129
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $17.8$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-RC4136
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-100k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-RC4136 54-RC4136
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1	DES.  U1  U2  U3  U4  U5  U6  U7  U8  U9  U10	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R49	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-100k-1	DES.  U1  U2  U3  U4  U5  U6  U7  U8  U9  U10  U11	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-PC4136
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $17.8$ kΩ MF, $1/4$ W, $1\%$ , $10$ 0 kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-24.9k-1 110-100k-1 110-100k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-P6 54-30
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R49	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $17.8$ kΩ MF, $1/4$ W, $1\%$ , $10$ 0 kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ	110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53
R37 R38 R39 R40 R41 R42 R43 R44 R45 R45 R46 R47 R48 R49 R50	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $17.8$ kΩ MF, $1/4$ W, $1\%$ , $10$ 0 kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-133k-1 110-100k-1 110-10k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53 54-45
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R49 R50 R51	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 133 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 100 kΩ	110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-133k-1 110-100k-1 110-18-1 110-17.8k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-R54136 54-R54136 54-R54136 54-R54136 54-R554136
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R49 R50 R51 R52 R53	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ	110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-133k-1 110-100k-1 110-18-1 110-17.8k-1 110-10k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53 54-45
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R49 R50 R51 R52 R53 R54	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 133 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 17.8 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 100 kΩ	110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-13-18k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-R54136 54-R54136 54-R54136 54-R54136 54-R554136
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 133 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 100 kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-133k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10 8 Bit ADC, ADC0804LCN	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-P6 54-30 54-53 54-45 54-44 54-96L02
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55 R56	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 133 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 18 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 24.9 kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-24.9k-1 110-100k-1 110-100k-1 110-100k-1 110-11-18k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10 8 Bit ADC, ADC0804LCN	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-P6 54-30 54-53 54-45 54-44 54-96L02 54-42
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R49 R50 R51 R52 R53 R55 R55 R56 R57	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 133 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 4.99 kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-18-1 110-17.8k-1 110-10k-1 110-24.9k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17 U18	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53 54-45 54-45 54-45 54-42 54-161
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55 R57 R56	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 133 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 200 kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-18-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-24.9k-1 110-200k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17 U18	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10 8 Bit ADC, ADC0804LCN Octal Latch, 74LS374	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53 54-45 54-45 54-45 54-42 54-161
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55 R56 R57 R58 R59	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 200 kΩ MF, 1/4W, 1%, 200 kΩ MF, 1/4W, 1%, 12.4 kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-18-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-24.9k-1 110-200k-1 110-24.9k-1 110-200k-1 110-24.8k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17 U18	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10 8 Bit ADC, ADC0804LCN	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53 54-45 54-45 54-45 54-42 54-161
R37 R38 R39 R40 R41 R42 R43 R44 R45 R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55 R55 R57 R56 R57 R58 R59 R60	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 200 kΩ MF, 1/4W, 1%, 200 kΩ MF, 1/4W, 1%, 200 kΩ MF, 1/4W, 1%, 12.4 kΩ MF, 1/4W, 1%, 1887Ω	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-18k-1 110-10k-1 110-124.9k-1 110-10k-1 110-24.9k-1 110-24.9k-1 110-200k-1 110-24.9k-1 110-200k-1 110-12.4k-1 110-887-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17 U18	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10 8 Bit ADC, ADC0804LCN Octal Latch, 74LS374	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53 54-45 54-45 54-45 54-42 54-161
R37 R38 R39 R40 R41 R42 R43 R44 R45 R45 R46 R50 R51 R52 R53 R54 R55 R55 R56 R57 R58 R59 R60 R61	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 200 kΩ MF, 1/4W, 1%, 200 kΩ MF, 1/4W, 1%, 12.4 kΩ MF, 1/4W, 1%, 887Ω MF, 1/4W, 1%, 887Ω MF, 1/4W, 1%, 887Ω MF, 1/4W, 1%, 200 kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-18-1 110-10k-1 110-124.9k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-24.9k-1 110-24.9k-1 110-200k-1 110-12.4k-1 110-887-1 110-20k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17 U18	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10 8 Bit ADC, ADC0804LCN Octal Latch, 74LS374	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53 54-45 54-45 54-45 54-42 54-161
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R49 R50 R51 R52 R53 R55 R57 R55 R57 R56 R57 R59 R60 R61 R62	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 200 kΩ MF, 1/4W, 1%, 200 kΩ MF, 1/4W, 1%, 887Ω MF, 1/4W, 1%, 887Ω MF, 1/4W, 1%, 20 kΩ Variable, 1/2W, 10%, 200 kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-18k-1 110-10k-1 110-124.9k-1 110-10k-1 110-24.9k-1 110-24.9k-1 110-200k-1 110-24.9k-1 110-200k-1 110-12.4k-1 110-887-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17 U18 U19	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10 8 Bit ADC, ADC0804LCN Octal Latch, 74LS374	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53 54-45 54-45 54-41 54-96L02 54-42 54-161 54-41
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55 R57 R56 R57 R58 R60 R61 R62 R63	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 200 kΩ MF, 1/4W, 1%, 200 kΩ MF, 1/4W, 1%, 887Ω MF, 1/4W, 1%, 887Ω MF, 1/4W, 1%, 887Ω MF, 1/4W, 1%, 20 kΩ Variable, 1/2W, 10%, 200 kΩ MF, 1/4W, 1%, 19.6 kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-18-1 110-10k-1 110-124.9k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-24.9k-1 110-24.9k-1 110-200k-1 110-12.4k-1 110-887-1 110-20k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17 U18 U19	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10 8 Bit ADC, ADC0804LCN Octal Latch, 74LS374	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-P6 54-96 54-96 54-91 54-53 54-45 54-44 54-96L02 54-42 54-161 54-41
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R50 R51 R52 R53 R54 R55 R56 R57 R58 R60 R61 R62 R63 R64	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 133 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 200 kΩ MF, 1/4W, 1%, 887Ω MF, 1/4W, 1%, 887Ω MF, 1/4W, 1%, 20 kΩ Variable, 1/2W, 10%, 200 kΩ MF, 1/4W, 1%, 19.6 kΩ MF, 1/4W, 1%, 19.6 kΩ MF, 1/4W, 1%, 49.9 kΩ	110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-18-1 110-10k-1 110-124.9k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-24.9k-1 110-24.9k-1 110-200k-1 110-12.4k-1 110-887-1 110-20k-1 156-200k	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17 U18 U19	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10 8 Bit ADC, ADC0804LCN Octal Latch, 74LS374	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-P6 54-96 54-96 54-91 54-53 54-45 54-44 54-96L02 54-42 54-161 54-41
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R50 R51 R55 R56 R57 R58 R59 R60 R61 R62 R63 R64 R65	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 200 kΩ MF, 1/4W, 1%, 200 kΩ MF, 1/4W, 1%, 887Ω MF, 1/4W, 1%, 887Ω MF, 1/4W, 1%, 887Ω MF, 1/4W, 1%, 20 kΩ Variable, 1/2W, 10%, 200 kΩ MF, 1/4W, 1%, 19.6 kΩ	110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-18k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-24.9k-1 110-24.9k-1 110-20k-1 110-887-1 110-20k-1 156-200k 110-19.6k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17 U18 U19  REF. DES.	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10 8 Bit ADC, ADC0804LCN Octal Latch, 74LS374	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-96 54-96 54-96 54-91 54-15 54-41 54-96L02 54-42 54-161 54-41
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R50 R51 R52 R53 R54 R55 R56 R57 R58 R60 R61 R62 R63 R64	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 133 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 200 kΩ MF, 1/4W, 1%, 887Ω MF, 1/4W, 1%, 887Ω MF, 1/4W, 1%, 20 kΩ Variable, 1/2W, 10%, 200 kΩ MF, 1/4W, 1%, 19.6 kΩ MF, 1/4W, 1%, 19.6 kΩ MF, 1/4W, 1%, 49.9 kΩ	110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-18k-1 110-10k-1 110-12k-1 110-12k-1 110-12k-1 110-24.9k-1 110-20k-1 110-20k-1 110-20k-1 110-12.4k-1 110-20k-1 110-12.4k-1 110-20k-1 110-12.4k-1 110-20k-1 110-12.4k-1 110-20k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17 U18 U19  REF. DES.	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10 8 Bit ADC, ADC0804LCN Octal Latch, 74LS374  MISCELLANEOUS  DESCRIPTION	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53 54-45 54-44 54-96L02 54-42 54-161 54-41
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R50 R51 R55 R56 R57 R58 R59 R60 R61 R62 R63 R64 R65	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 133 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 200 kΩ MF, 1/4W, 1%, 200 kΩ MF, 1/4W, 1%, 887Ω MF, 1/4W, 1%, 20 kΩ Variable, 1/2W, 10%, 200 kΩ MF, 1/4W, 1%, 19.6 kΩ	110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-24.9k-1 110-24.9k-1 110-20k-1 110-887-1 110-20k-1 156-200k 110-19.6k-1 110-49.9k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17 U18 U19  REF. DES.	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10 8 Bit ADC, ADC0804LCN Octal Latch, 74LS374	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-P6 54-96 54-96 54-91 54-53 54-45 54-44 54-96L02 54-42 54-161 54-41

1-6600A/MB-OMM 6-19

REF.   DESCRIPTION   PART NO.   DES.   DESCRIPTION   DESCRIP		CAPACITORS			RESISTORS	
C2 Ceramic Disc, .1 µF 230-37 R2 MF, 1/4W, 15%, 8.25 kg 110-8,28k-1 C3 Tantalum, 25V, 10 µF 250-42 R4 MF, 1/4W, 15%, 8.25 kg 110-8,28k-1 C4 Tantalum, 25V, 10 µF 250-42 R4 MF, 1/4W, 15%, 8.05 kg 110-3,01k-1 E50-10K C4 Tantalum, 25V, 10 µF 250-58 R5 Variable, Multi-tum, 20 kg 110-3,01k-1 E50-10K C6 Ceramic Disc, .1 µF 230-37 R6 MF, 1/4W, 15%, 3.01 kg 110-3,01k-1 C6 Ceramic Disc, .1 µF 230-37 R7 MF, 1/4W, 15%, 3.03 kg 110-3,01k-1 C6 Ceramic Disc, .1 µF 230-37 R8 MF, 1/4W, 15%, 5.49 kg 110-549k-1 C10 Ceramic Disc, .1 µF 230-37 R1 MF, 1/4W, 15%, 5.49 kg 110-549k-1 C12 Ceramic Disc, .1 µF 230-37 R1 MF, 1/4W, 15%, 5.49 kg 110-549k-1 C12 Ceramic Disc, .1 µF 230-37 R1 MF, 1/4W, 15%, 5.49 kg 110-549k-1 C12 Ceramic Disc, .1 µF 230-37 R1 MF, 1/4W, 15%, 5.49 kg 110-549k-1 C12 Ceramic Disc, .1 µF 230-37 R13 MF, 1/4W, 15%, 64.9 kg 110-340k-1 C12 Ceramic Disc, .1 µF 230-37 R13 MF, 1/4W, 15%, 64.9 kg 110-649k-1 C14 Ceramic Disc, .1 µF 230-37 R13 MF, 1/4W, 15%, 64.9 kg 110-649k-1 C14 Ceramic Disc, .1 µF 230-37 R14 MF, 1/4W, 15%, 64.9 kg 110-649k-1 C14 Ceramic Disc, .0 µF 230-37 R15 MF, 1/4W, 15%, 64.9 kg 110-649k-1 C14 Ceramic Disc, .0 µF 230-37 R17 MF, 1/4W, 15%, 64.9 kg 110-649k-1 C16 Polycarbonate, 0.0047 µF 230-37 R17 MF, 1/4W, 15%, 54.9 kg 110-649k-1 C16 Polycarbonate, 0.0047 µF 230-37 R17 MF, 1/4W, 15%, 54.9 kg 110-649k-1 C16 Ceramic Disc, .0 µF 230-31 R15 MF, 1/4W, 15%, 54.9 kg 110-649k-1 C19 Ceramic Disc, .0 µF 230-31 R15 MF, 1/4W, 15%, 54.9 kg 110-649k-1 C19 Ceramic Disc, .0 µF 230-31 R15 MF, 1/4W, 15%, 54.9 kg 110-649k-1 C19 Ceramic Disc, .0 µF 230-37 R17 MF, 1/4W, 15%, 54.9 kg 110-649k-1 C19 C20 Ceramic Disc, .0 µF 230-31 R18 MF, 1/4W, 15%, 54.9 kg 110-649k-1 C19 C20 Ceramic Disc, .0 µF 230-31 R18 MF, 1/4W, 15%, 54.9 kg 110-649k-1 C19 C20 Ceramic Disc, .0 µF 230-31 R18 MF, 1/4W, 15%, 10 kg 110-649k-1 C19 C20 Ceramic Disc, .0 µF 230-37 R17 MF, 1/4W, 15%, 10 kg 110-649k-1 C19 C20 Ceramic Disc, .0 µF 230-31 R18 MF, 1/4W, 15%, 10 kg 110-649k-1 C19 C20		DESCRIPTION			DESCRIPTION	
C3 Tantalum, 25V, 10 μF 250-42 R3 Variable, Single-Turn. 10 κ1 155-10 κ.  C4 Tantalum, 6V, 68 μF 250-58 R5 Variable, Single-Turn. 10 κ1 150-3.0 lk. 10-3.0 lk. 10-3.		, ,	230-37		MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
C4 Tantalum, 25V, 10 μF 250-42 R4 MF, 14-W, 155, 3-01 kP 110-3-01k-1 C5 Tantalum, 67 (80 μΓ 250-58 R5 MF, 14-W, 155, 3-01 kP 110-3-01k-1 C6 Ceramic Disc, 1 μF 230-37 R6 MF, 14-W, 155, 3-01 kP 110-3-01k-1 C6 Ceramic Disc, 1 μF 230-37 R8 MF, 14-W, 155, 3-01 kP 110-3-01k-1 C6 Ceramic Disc, 1 μF 230-37 R8 MF, 14-W, 155, 155, 40 L1 10-3-01k-1 C6 Ceramic Disc, 1 μF 230-37 R9 MF, 14-W, 155, 54-9 kP 110-5-5-9 kP 110-5-01k-1 μF 230-37 R1 MF, 14-W, 155, 54-9 kP 110-5-5-9 kP 110-5-01k-1 μF 230-37 R11 MF, 14-W, 155, 54-9 kP 110-5-49k-1 C12 Ceramic Disc, 1 μF 230-37 R11 MF, 14-W, 155, 54-9 kP 110-6-4-9 kP 11						110-8.25k-1
C5		, , ,		i .		
Ceamic Disc. 1 μF   230-37   R6   MF, 1/4W, 13%, 3.0 kΩ   110-3.01k-1						
C7   Ceramic Disc, 1 μF   230-37   R7   MF, 1/4W, 1%, 13.3 kΩ   110-13.3 kΩ   110-1				9	· · · · · · · · · · · · · · · · · · ·	
Ceamic Disc., 1 μF   230-37   R8   MF, 1/4W, 1%, 54.9 kΩ   110-50.9k.				1		
C9	C8					
Cit   Ceramic Disc., 1   F   230-37   R10   MF, 1/4W, 1/85, 5.49 kΩ   110-5.49k-1   Cit   Ceramic Disc., 1   F   230-37   R12   Writhen, 20 kΩ   110-64.9k-1   Cit   Ceramic Disc., 1   F   230-37   R13   MF, 1/4W, 1/85, 64.9 kΩ   110-64.9k-1   Cit   Ceramic Disc., 0.047   F   230-37   R13   MF, 1/4W, 1/85, 64.9 kΩ   110-64.9k-1   Cit   Ceramic Disc., 0.047   F   230-37   R14   MF, 1/4W, 1/85, 64.9 kΩ   110-20k-1   Cit   Ceramic Disc., 0.047   F   210-50   R15   MF, 1/4W, 1/85, 64.9 kΩ   110-20k-1   Cit   Ceramic Disc., 0.047   F   230-37   R17   MF, 1/4W, 1/85, 64.9 kΩ   110-549k-1   Cit   Ceramic Disc., 0.01   F   230-37   R17   MF, 1/4W, 1/85, 5.49 kΩ   110-5.49k-1   Cit   Ceramic Disc., 0.01   F   230-37   R18   MF, 1/4W, 1/85, 5.49 kΩ   110-5.49k-1   Cit   Ceramic Disc., 0.02   F   230-27   R20   MF, 1/4W, 1/85, 5.49 kΩ   110-5.49k-1   Cit   Ceramic Disc., 0.02   F   230-27   R20   MF, 1/4W, 1/85, 64.9 kΩ   110-64.9k-1   Cit   Ceramic Disc., 1   F   230-37   R21   MF, 1/4W, 1/85, 64.9 kΩ   110-64.9k-1   Cit   Ceramic Disc., 1   F   230-37   R21   MF, 1/4W, 1/85, 10.8 Ω   110-10k-1   Cit   Ceramic Disc., 0.02   F   230-27   R20   MF, 1/4W, 1/85, 10.8 Ω   110-10k-1   Cit   Ceramic Disc., 0.04   F   230-37   R22   MF, 1/4W, 1/85, 10.8 Ω   110-10k-1   Cit   Ceramic Disc., 0.04   F   230-37   R22   MF, 1/4W, 1/85, 10.8 Ω   110-10k-1   Cit   Ceramic Disc., 0.04   F   230-37   R22   MF, 1/4W, 1/85, 10.8 Ω   110-10k-1   Cit   Ceramic Disc., 0.04   F   230-37   R22   MF, 1/4W, 1/85, 10.8 Ω   110-10k-1   Cit   Ceramic Disc., 0.04   F   230-37   R22   MF, 1/4W, 1/85, 10.8 Ω   110-10k-1   Cit   Ceramic Disc., 0.04   F   230-37   R22   MF, 1/4W, 1/85, 10.8 Ω   110-10k-1   Cit   Ceramic Disc., 0.04   F   230-37   R22   MF, 1/4W, 1/85, 10.8 Ω   110-10k-1   Cit   Ceramic Disc., 0.04   F   230-37   R22   MF, 1/4W, 1/85, 10.8 Ω   110-10k-1   Cit   Ceramic Disc., 0.04   F   230-37   R22   MF, 1/4W, 1/85, 10.8 Ω   110-10k-1   Cit   Ceramic Disc., 0.04   F   230-37   R22   MF, 1/4W, 1/85, 10.8 Ω   110-10k-1   Cit   Ceramic Dis		Ceramic Disc, .1 µF	230-37			·
C12 Ceramic Disc, 1 µF 230-37 R12 MF, 1/4W, 195, 6.25 k0 110-64,9k-1 C13 Ceramic Disc, 1 µF 230-37 R13 MF, 1/4W, 195, 64,9 k0 110-64,9k-1 C14 Ceramic Disc, 1 µF 230-37 R14 MF, 1/4W, 195, 64,9 k0 110-316k-1 C15 Polycarbonate, 0.004 µF 210-50 R15 MF, 1/4W, 195, 20 k0 110-20k-1 C16 Polycarbonate, 0.004 µF 210-50 R16 MF, 1/4W, 195, 20 k0 110-20k-1 C17 Ceramic Disc, 1 µF 230-37 R17 MF, 1/4W, 195, 54,9 k0 110-54(9k-1) C18 Ceramic Disc, 0.01 µF 230-11 R18 MF, 1/4W, 195, 54,9 k0 110-54(9k-1) C19 Ceramic Disc, 0.01 µF 230-11 R18 MF, 1/4W, 195, 54,9 k0 110-54(9k-1) C19 Ceramic Disc, 0.02 µF 230-36 R19 Variable, Multi-turn, 20 k0 110-54(9k-1) C20 C20 Ceramic Disc, 0.02 µF 230-37 R21 MF, 1/4W, 195, 54,9 k0 110-54(9k-1) C22 Ceramic Disc, 1 µF 230-37 R21 MF, 1/4W, 195, 10 k0 110-10k-1 C22 Ceramic Disc, 1 µF 230-37 R22 MF, 1/4W, 195, 10 k0 110-10k-1 C22 Ceramic Disc, 1 µF 230-37 R22 MF, 1/4W, 195, 10 k0 110-10k-1 C24 Not Used C25 Ceramic Disc, 0.01 µF 230-11 R25 MF, 1/4W, 195, 10 k0 110-10k-1 R25 MF, 1/4W, 195, 10 k0 R1 R25		•		R10		
C13 Ceramic Disc., 1 µF						157-20k
C14   Ceramic Disc., 1 μF   230-37   R14   MF, 1/4W, 17%, 316 kg   110-3166-1		- · · · · · · · · · · · · · · · · · · ·				
C15		· · · · · · · · · · · · · · · · · · ·				
C16		, ,				
C17 Ceramic Disc, 1 μF 230-37 R17 MF, 1/4w, 1%, 5.49 kΩ 110-5.49k-1 C18 Ceramic Disc, .0047 μF 230-31 R18 MF, 1/4w, 1%, 5.49 kΩ 110-5.49k-1 C19 Ceramic Disc, .0047 μF 230-36 R19 Variable, Multi-tum, 20 kΩ 157-20k C20 Ceramic Disc, .02 μF 230-37 R20 MF, 1/4w, 1%, 10 kΩ 110-64.9k-1 C22 Ceramic Disc, .1 μF 230-37 R21 MF, 1/4w, 1%, 10 kΩ 110-10k-1 C23 Aluminum, 63V, 47 μF 250-51 R23 MF, 1/4w, 1%, 10 kΩ 110-10k-1 C24 Not Used Disc, .0 μF 230-11 R25 MF, 1/4w, 1%, 10 kΩ 110-10k-1 C25 Ceramic Disc, .0 μF 230-11 R25 MF, 1/4w, 1%, 10 kΩ 110-10k-1 R26 MF, 1/4w, 1%, 10 kΩ 110-10k-1 R26 MF, 1/4w, 1%, 10 kΩ 110-10k-1 R26 MF, 1/4w, 1%, 10 kΩ 110-10c-1 R26 MF, 1/4w, 1/4w						
C18   Ceramic Disc., .01 μF   230-11   R18   MF, 1/44W, 196, .549 kΩ   110-5, 49k-1   120-5,						
C19   Ceramic Disc., .004 μF   Z30-36   R19   Variable, Multi-turn, 20 kΩ   157-20k   C20   Ceramic Disc., .02 μF   Z30-37   R21   MF, 1/4W, 195, 10 kΩ   110-10k-1   C22   Ceramic Disc., .1 μF   Z30-37   R21   MF, 1/4W, 195, 10 kΩ   110-10k-1   C22   Aluminum, 63V, 47 μF   Z50-51   R23   MF, 1/4W, 195, 10 kΩ   110-10k-1   C24   Not Used   R24   MF, 1/4W, 195, 10 kΩ   110-10k-1   R24   MF, 1/4W, 195, 10 kΩ   110-10k-1   R24   MF, 1/4W, 195, 10 kΩ   110-10k-1   R25   MF, 1/4W, 195, 10 kΩ   110-10k-1   R26   MF, 1/4W, 195, 11 kΩ   R26   MF, 1/4W, 195, 10 kΩ   R26   MF,	C18	Ceramic Disc, .01 μF		1		
C21   Ceramic Disc, 1 μF   230-37   R21   MF, 1/4W, 1%, 10 kΩ   110-10k-1		Ceramic Disc, .0047 µF	230-36	R19		
C22   Ceramic Disc, .1 μF   230-37   R22   MF, 1/4W, 1%, 20 kΩ   110-20k-1				1		110-64.9k-1
C23   Aluminum, 63V, 47 μF   C250-51   R23   MF, 1/4W, 1%, 10 kΩ   110-10k-1						
C24						
DIODES			250-51			
DIODES   R.26   MF, 1/4W, 1%, 19.6 kΩ   110-19.6k-1			230-11	1		
DIODES   R27   MF, 1/4W, 1%, 12.1 kΩ   110-12.k-1			200 11			
REF.   DESCRIPTION   PART NO.   R29   MF, 1/4W, 1%, 10.2 kΩ   110-10.2k-1		DIODES				
Description   Part No.   R31   MF, 1/4W, 1%, 51.1Ω   110-51.1-1		<u>DIODES</u>		R28		
DES.   DESCRIPTION   PART NO.   R31   MF, 1/4W, 1%, 51.1Ω   110-51.1-1	REF.		WILTRON			110-16.5k-1
CR1 Silicon, 1N4446 CR2 Silicon, 1N4446 CR3 Silicon, 1N4446 CR3 Silicon, 1N4446 CR3 Silicon, 1N4446 CR4 Silicon, 1N4446 CR5 Silicon, 1N4446 CR6 Silicon, 1N4446 CR6 Silicon, 1N4446 CR7 Silicon, 1N4446 CR7 Silicon, 1N4446 CR7 Reference, 6.2V, 1N823 CR7 Reference, 6.2V, 1N823 CR8 Zener, 5.1V, 0.4W, 1N751A CR9 Silicon, 1N4446 CR10 Silicon, 1N4446 CR10 Silicon, 1N4446 CR11 Silicon, 1N4446 CR12 Silicon, 1N4446 CR13 Silicon, 1N4446 CR14 Silicon, 1N4446 CR15 Silicon, 1N4446 CR16 Silicon, 1N4446 CR17 Silicon, 1N4446 CR18 Silicon, 1N4446 CR19 Silicon, 1N4446 CR19 Silicon, 1N4446 CR10 Silicon, 1N4446 CR10 Silicon, 1N4446 CR10 Silicon, 1N4446 CR11 Silicon, 1N4446 CR11 Silicon, 1N4446 CR12 Silicon, 1N4446 CR13 Silicon, 1N4446 CR14 Silicon, 1N4446 CR16 Silicon, 1N4446 CR17 Silicon, 1N4446 CR18 Silicon, 1N4446 CR19 Silicon, 1N4446 CR19 Silicon, 1N4446 CR10 Silicon,	DES.	DESCRIPTION		·	The state of the s	
CR2 Silicon, 1N4446 10-1N4446 R36 MF, 1/4W, 1%, 100 kΩ 110-100k-1 CR3 Silicon, 1N4446 10-1N4446 R36 MF, 1/4W, 1%, 110 kΩ 110-100k-1 CR4 Silicon, 1N4446 10-1N4446 R37 MF, 1/4W, 1%, 511Ω 110-100k-1 CR5 Silicon, 1N4446 10-1N4446 R38 MF, 1/4W, 1%, 511Ω 110-100k-1 CR6 Silicon, 1N4446 10-1N4446 R39 MF, 1/4W, 1%, 100 kΩ 110-100k-1 CR6 Silicon, 1N4446 10-1N4446 R39 MF, 1/4W, 1%, 100 kΩ 110-100k-1 CR7 Reference, 6.2V, 1N823 10-1N823 R40 MF, 1/4W, 1%, 100 kΩ 110-100k-1 CR8 Zener, 5.1V, 0.4W, 1N751A 10-1N751A R41 MF, 1/4W, 1%, 10, 1%, 900Ω 113-900-0.1 CR9 Silicon, 1N4446 10-1N4446 R42 MF, 1/4W, 1%, 12.4 kΩ 110-12.4k-1 CR10 Silicon, 1N4446 10-1N4446 R43 MF, 1/4W, 1%, 261Ω 110-261-1 CR11 Silicon, 1N4446 10-1N4446 R44 MF, 1/4W, 1%, 261Ω 110-261-1 CR12 Silicon, 1N4446 10-1N4446 R45 MF, 1/4W, 1%, 561Ω 110-261-1 CR13 Silicon, 1N4446 10-1N4446 R45 MF, 1/4W, 1%, 561Ω 110-604-1 CR14 Silicon, 1N4446 10-1N4446 R45 MF, 1/4W, 1%, 560Ω 110-576-1 CR16 Silicon, 1N4446 10-1N4446 R47 MF, 1/4W, 1%, 576Ω 110-28k-1 CR16 Silicon, 1N4446 10-1N4446 R47 MF, 1/4W, 1%, 576Ω 110-12.4k-1 CR16 Silicon, 1N4446 10-1N4446 R49 MF, 1/4W, 1%, 18.2 kΩ 110-12.4k-1 CR16 Silicon, 1N4446 10-1N4446 R49 MF, 1/4W, 1%, 18.2 kΩ 110-12.4k-1 CR16 Silicon, 1N4446 10-1N4446 R52 MF, 1/4W, 1%, 580Ω 110-576-1 CR17 Silicon, 1N4446 10-1N4446 R52 MF, 1/4W, 1%, 580Ω 110-58k-1 CR18 MBD-501 10-4 R48 MF, 1/4W, 1%, 580Ω 110-18k-1 CR19 Silicon, 1N4446 10-1N4446 R52 MF, 1/4W, 1%, 580Ω 110-18k-1 CR19 Silicon, 1N4446 10-1N4446 R52 MF, 1/4W, 1%, 580Ω 110-12.4k-1 CR19 Silicon, 1N4446 10-1N4446 R52 MF, 1/4W, 1%, 580Ω 110-248-1 CR19 Silicon, 1N4446 10-1N4446 R52 MF, 1/4W, 1%, 580Ω 110-248-1 CR19 Silicon, 1N4446 10-1N4446 R52 MF, 1/4W, 1%, 580Ω 110-248-1 CR19 Silicon, 1N4446 10-1N4446 R52 MF, 1/4W, 1%, 580Ω 110-248-1 CR19 Silicon, 1N4446 10-1N4446 R52 MF, 1/4W, 1%, 580Ω 110-248-1 CR19 Silicon, 1N4446 10-1N4446 R52 MF, 1/4W, 1%, 580Ω 110-248-1 CR19 Silicon, 1N4446 10-1N4446 R52 MF, 1/4W, 1%, 580Ω 110-248-1 CR19 Silicon, 1N4446 10-1N4446 R52 MF, 1/4W, 1%, 180Ω R50Ω 110-248-1 R55 MF, 1/4W, 1%				1		
CR3 Silicon, 1N4446 CR3 Silicon, 1N4446 CR4 Silicon, 1N4446 CR5 Silicon, 1N4446 CR6 Silicon, 1N4446 CR6 Silicon, 1N4446 CR7 Reference, 6.2V, 1N823 CR8 Zener, 5.1V, 0.4W, 1N751A CR9 Silicon, 1N4446 CR9 Silicon, 1N4446 CR9 Silicon, 1N4446 CR9 Silicon, 1N4446 CR9 Reference, 6.2V, 1N823 CR8 Zener, 5.1V, 0.4W, 1N751A CR9 Silicon, 1N4446 CR10 Silicon, 1N4446 CR11 Silicon, 1N4446 CR11 Silicon, 1N4446 CR12 Silicon, 1N4446 CR12 Silicon, 1N4446 CR13 Silicon, 1N4446 CR14 Silicon, 1N4446 CR15 Silicon, 1N4446 CR16 Silicon, 1N4446 CR17 Silicon, 1N4446 CR18 Silicon, 1N4446 CR19 Silicon, 1N4446 CR10 Silicon, 1N44		•				
CR4 Silicon, 1N4446 CR5 Silicon, 1N4446 CR6 Silicon, 1N4446 CR7 Reference, 6.2V, 1N823 CR7 Reference, 6.2V, 1N823 CR8 Zener, 5.1V, 0.4W, 1N751A CR9 Silicon, 1N4446 CR7 Reference, 6.2V, 1N823 CR8 Zener, 5.1V, 0.4W, 1N751A CR9 Silicon, 1N4446 CR10 Silicon, 1N4446 CR11 Silicon, 1N4446 CR11 Silicon, 1N4446 CR12 Silicon, 1N4446 CR13 Silicon, 1N4446 CR13 Silicon, 1N4446 CR14 Silicon, 1N4446 CR15 Silicon, 1N4446 CR17 Silicon, 1N4446 CR17 Silicon, 1N4446 CR18 Silicon, 1N4446 CR19 Silicon, 1N4446 CR19 Silicon, 1N4446 CR10 Silicon, 1N446 CR10		· · · · · · · · · · · · · · · · · · ·		1		
CR5   Silicon, 1N4446   10-1N4446   R39   MF, 1/4W, 1%, 100 kΩ   110-10k-1				1		
CR6 Silicon, 1N4446 10-1N4446 R41 MF, 1/4W, 1%, 10 kΩ 110-10k-1 CR7 Reference, 6.2V, 1N823 10-1N823 R40 MF, 1/4W, 0.1%, 900Ω 113-900-0.1 CR8 Zener, 5.1V, 0.4W, 1N751A 10-1N751A R41 MF, 1/4W, 0.1%, 900Ω 113-900-0.1 CR9 Silicon, 1N4446 10-1N4446 R42 MF, 1/4W, 1%, 12.4 kΩ 110-12.4k-1 Silicon, 1N4446 10-1N4446 R44 MF, 1/4W, 1%, 261Ω 110-261-1 CR12 Silicon, 1N4446 10-1N4446 R44 MF, 1/4W, 1%, 261Ω 110-261-1 CR12 Silicon, 1N4446 10-1N4446 R45 MF, 1/4W, 1%, 12.4 kΩ 110-12.4k-1 CR13 Silicon, 1N4446 10-1N4446 R46 MF, 1/4W, 1%, 604Ω 110-604-1 CR14 Silicon, 1N4446 10-1N4446 R47 MF, 1/4W, 1%, 576Ω 110-576-1 CR15 MBD-501 10-4 R48 MF, 1/4W, 1%, 12.4 kΩ 110-12.4k-1 CR16 Silicon, 1N4446 10-1N4446 R49 MF, 1/4W, 1%, 18.2 kΩ 110-12.4k-1 CR16 Silicon, 1N4446 10-1N4446 R49 MF, 1/4W, 1%, 18.2 kΩ 110-182k-1 CR17 Silicon, 1N4446 10-1N4446 R50 MF, 1/4W, 1%, 953Ω 110-953-1 CR18 MBD-501 10-4 R51 MF, 1/4W, 1%, 4.99 kΩ 110-499k-1 CR19 Silicon, 1N4446 10-1N4446 R50 MF, 1/4W, 1%, 4.99 kΩ 110-499k-1 CR20 Silicon, 1N4446 10-1N4446 R52 MF, 1/4W, 1%, 54.9 kΩ 110-15k-1 R50 MF, 1/4W, 1%, 18.2 kΩ 110-15k-1 R50 MF, 1/4W, 1%, 18.4 kΩ 110-15k-1 R51 MF, 1/4W, 1%, 18.4 kΩ 110-12.4k-1 R52 MF, 1/4W, 1%, 18.4 kΩ 110-12.4k-1 R51 MF, 1/4W, 1%, 12.4 kΩ 110-12.4k-1 R51 MF, 1/4				R38	The state of the s	
CR7		,		R39	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
CR9   Silicon, 1N4446   10-1N4446   R43   MF, 1/4W, 1%, 12.4 kΩ   110-12.4k-1	CR7					113-900-0.1
CR10 Silicon, 1N4446 CR11 Silicon, 1N4446 CR12 Silicon, 1N4446 CR12 Silicon, 1N4446 CR13 Silicon, 1N4446 CR13 Silicon, 1N4446 CR14 Silicon, 1N4446 CR15 Silicon, 1N4446 CR16 Silicon, 1N4446 CR17 Silicon, 1N4446 CR18 Silicon, 1N4446 CR18 Silicon, 1N4446 CR19 Silicon, 1N4446 CR19 Silicon, 1N4446 CR10 Silicon, 1N4446 CR10 Silicon, 1N4446 CR10 Silicon, 1N4446 CR11 Silicon, 1N4446 CR12 Silicon, 1N4446 CR13 Silicon, 1N4446 CR16 Silicon, 1N4446 CR17 Silicon, 1N4446 CR17 Silicon, 1N4446 CR18 MBD-501 CR19 Silicon, 1N4446 CR19 Silicon, 1N4446 CR19 Silicon, 1N4446 CR19 Silicon, 1N4446 CR20 Silicon, 1N	CR8	Zener, 5.1V, 0.4W, 1N751A	10-1N751A			
CR11 Silicon, 1N4446 CR12 Silicon, 1N4446 CR13 Silicon, 1N4446 CR13 Silicon, 1N4446 CR14 Silicon, 1N4446 CR15 MBD-501 CR17 Silicon, 1N4446 CR17 Silicon, 1N4446 CR18 MBD-501 CR18 MBD-501 CR18 MBD-501 CR19 Silicon, 1N4446 CR20 MF, 1/4W, 1%, 12.4 kΩ CR20 Silicon, 1N4446 CR20 Silicon, 1N4446 CR20 Silicon, 1N4446 CR20 Silicon, 1N4446 CR20 MF, 1/4W, 1%, 12.4 kΩ CR20 Silicon, 1N4446 CR20 Silicon, 1N4446 CR20 Silicon, 1N4446 CR20 MF, 1/4W, 1%, 12.4 kΩ CR20 Silicon, 1N4446 CR20 MF, 1/4W, 1%, 12.4 kΩ CR20 Silicon, 1N4446 CR20 MF, 1/4W, 1%, 12.4 kΩ CR20 Silicon, 1N4446 CR20 MF, 1/4W, 1%, 12.4 kΩ CR20 Silicon, 1N4446 CR20 MF, 1/4W, 1%, 12.4 kΩ CR20 Silicon, 1N4446 CR20 MF, 1/4W, 1%, 12.4 kΩ CR20 Silicon, 1N4446 CR20 MF, 1/4W		,	10-1N4446			
CR12 Silicon, 1N4446 CR13 Silicon, 1N4446 CR13 Silicon, 1N4446 CR14 Silicon, 1N4446 CR15 MBD-501 CR16 Silicon, 1N4446 CR17 Silicon, 1N4446 CR17 Silicon, 1N4446 CR18 MBD-501 CR18 MBD-501 CR18 MBD-501 CR19 Silicon, 1N4446 CR10 Silicon, 1N4446 CR10 Silicon, 1N4446 CR11 Silicon, 1N4446 CR11 Silicon, 1N4446 CR12 Silicon, 1N4446 CR13 Silicon, 1N4446 CR14 Silicon, 1N4446 CR15 MBD-501 CR18 MBD-501 CR18 MBD-501 CR18 MBD-501 CR19 Silicon, 1N4446 CR20 Silicon, 1N4446 CR30 MF, 1/4W, 1%, 44, 9 kΩ CR20 Silicon, 1N4446 CR20 Silicon, 1N4446 CR30 MF, 1/4W, 1%, 12.4 kΩ CR20 Silicon, 1N4446 CR30 MF, 1/4W, 1%, 12.4 kΩ CR20 Silicon, 1N4446 CR30 MF, 1/4W, 1%, 12.4 kΩ CR20 Silicon, 1N4446 CR30 MF, 1/4W, 1%, 12.4 kΩ CR20 CR30 CR30 MF, 1/4W, 1%, 12.4 kΩ CR20 CR30 CR30 CR30 CR30 CR30 CR30 CR30 CR3						
CR13   Silicon, 1N4446   10-1N4446   R46   MF, 1/4W, 1%, 604Ω   110-604-1				I	The state of the s	
CR14 Silicon, $1N4446$ 10- $1N4446$ R47 MF, $1/4W$ , $1\%$ , $576Ω$ 110- $576-1$ CR15 MBD-501 10-4 R48 MF, $1/4W$ , $1\%$ , $1.24$ kΩ 110- $12.4k-1$ CR16 Silicon, $1N4446$ 10- $1N4446$ R49 MF, $1/4W$ , $1\%$ , $1.82$ kΩ 110- $1.82k-1$ CR17 Silicon, $1N4446$ 10- $1N4446$ R50 MF, $1/4W$ , $1\%$ , $953Ω$ 110- $953-1$ CR18 MBD-501 10-4 R51 MF, $1/4W$ , $1\%$ , $4.99$ kΩ 110- $4.99k-1$ CR19 Silicon, $1N4446$ 10- $1N4446$ R52 MF, $1/4W$ , $1\%$ , $54.9$ kΩ 110- $54.9k-1$ CR20 Silicon, $1N4446$ 10- $1N4446$ R53 MF, $1/4W$ , $1\%$ , $15.4Ω$ 110- $15k-1$ R54 MF, $1/4W$ , $1\%$ , $12.4$ kΩ 110- $12.4k-1$ R55 MF, $1/4W$ , $1\%$ , $487Ω$ 110- $487-1$ R56 MF, $1/4W$ , $1\%$ , $464Ω$ 110- $487-1$ R57 MF, $1/4W$ , $1\%$ , $400Ω$ 110- $400$ R51 MF, $1/4W$ , $1\%$ , $100$ R58 MF, $1/4W$ , $1\%$ , $100$ R64-1 R57 MF, $1/4W$ , $1\%$ , $100$ R58 MF, $1/4W$ , $1\%$ , $100$ R59 MF, $1/4W$ , $1\%$ , $100$ R60 MF, $1/4W$		·				
CR15 MBD-501 $10-4$ R48 MF, $1/4$ W, $1\%$ , $12.4$ kΩ $110-12.4$ k-1 CR16 Silicon, $1N4446$ $10-1N4446$ R49 MF, $1/4$ W, $1\%$ , $1.82$ kΩ $110-12.4$ k-1 CR17 Silicon, $1N4446$ $10-1N4446$ R50 MF, $1/4$ W, $1\%$ , $1.82$ kΩ $110-1.82$ k-1 CR18 MBD-501 $10-4$ R51 MF, $1/4$ W, $1\%$ , $9.9$ kΩ $110-9.53-1$ CR19 Silicon, $1N4446$ $10-1N4446$ R52 MF, $1/4$ W, $1\%$ , $4.9$ kΩ $110-54.9$ k-1 CR20 Silicon, $1N4446$ R52 MF, $1/4$ W, $1\%$ , $1.5$ kΩ $110-15$ k-1 R54 MF, $1/4$ W, $1\%$ , $1.2$ k kΩ $110-15$ k-1 R54 MF, $1/4$ W, $1\%$ , $1.2$ k kΩ $110-12.4$ k-1 R55 MF, $1/4$ W, $1\%$ , $1.2$ k kΩ $110-12.4$ k-1 R55 MF, $1/4$ W, $1\%$ , $1.2$ k kΩ $110-12.4$ k-1 R55 MF, $1/4$ W, $1\%$ , $1.2$ k kΩ $110-12.4$ k-1 R57 MF, $1/4$ W, $1\%$ , $1.2$ k kΩ $110-12.4$ k-1 R58 MF, $1/4$ W, $1\%$ , $1.2$ k kΩ $110-12.4$ k-1 R59 MF, $1/4$ W, $1\%$ , $1.2$ k kΩ $110-12.4$ k-1 R59 MF, $1/4$ W, $1\%$ , $1.2$ k kΩ $110-12.4$ k-1 R60 MF, $1$				R47	MF, $1/4W$ , 1%, $576\Omega$	
CR16 Silicon, 1N4446		•		1		110-12.4k-1
CR18 MBD-501 $10-4$ R51 MF, $1/4$ W, $1\%$ , $4.99$ kΩ $110-4.99$ k-1 CR19 Silicon, $1N4446$ $10-1N4446$ R52 MF, $1/4$ W, $1\%$ , $54.9$ kΩ $110-54.9$ k-1 CR20 Silicon, $1N4446$ $10-1N4446$ R53 MF, $1/4$ W, $1\%$ , $15$ kΩ $110-15$ k-1 R54 MF, $1/4$ W, $1\%$ , $15$ kΩ $110-12.4$ k-1 R55 MF, $1/4$ W, $1\%$ , $487$ Ω $110-487-1$ R56 MF, $1/4$ W, $1\%$ , $464$ Ω $110-464-1$ R57 MF, $1/4$ W, $1\%$ , $12.4$ kΩ $110-2.4$ 8k-1 R58 MF, $1/4$ W, $1\%$ , $12.4$ kΩ $110-2.4$ 8k-1 R58 MF, $1/4$ W, $1\%$ , $10$ 0 R59 MF, $1/4$ W, $1\%$ , $10$ 0 R60 MF, $1/4$ W, $1\%$ , $10$ 0 R60 MF, $1/4$ W, $1\%$ , $10$ 0 R60 MF, $1/4$ W, $10$ 0 R60 MF, $1/4$	CR16	Silicon, 1N4446		1		
CR19 Silicon, 1N4446 10-1N4446 R52 MF, 1/4W, 1%, 54.9 kΩ 110-54.9k-1 CR20 Silicon, 1N4446 10-1N4446 R53 MF, 1/4W, 1%, 15 kΩ 110-15k-1 R54 MF, 1/4W, 1%, 12.4 kΩ 110-12.4k-1 R55 MF, 1/4W, 1%, 487Ω 110-487-1 R56 MF, 1/4W, 1%, 464Ω 110-464-1 R57 MF, 1/4W, 1%, 12.4 kΩ 110-12.4k-1 R58 MF, 1/4W, 1%, 12.4 kΩ 110-12.4k-1 R58 MF, 1/4W, 1%, 2.43 kΩ 110-2.43k-1 R58 MF, 1/4W, 1%, 2.43 kΩ 110-2.43k-1 R59 MF, 1/4W, 1%, 2.05 kΩ 110-2.05k-1 R60 MF, 1/4W, 1%, 2.05 kΩ 110-12.4k-1 R60 MF, 1/4W, 1%, 12.4 kΩ 110-12.4k-1 R60 MF, 1/4W, 1%, 1%, 12.4 kΩ 110-12.4k-1 R60 MF,		* .	10-1N4446			
CR20 Silicon, 1N4446 10-IN4446 R53 MF, 1/4W, 1%, 15 kΩ 110-15k-1 R54 MF, 1/4W, 1%, 12.4 kΩ 110-12.4k-1 R55 MF, 1/4W, 1%, 487Ω 110-487-1 R56 MF, 1/4W, 1%, 464Ω 110-464-1 R57 MF, 1/4W, 1%, 12.4 kΩ 110-12.4k-1 R58 MF, 1/4W, 1%, 2.43 kΩ 110-2.43k-1 R58 MF, 1/4W, 1%, 2.43 kΩ 110-2.43k-1 R59 MF, 1/4W, 1%, 2.05 kΩ 110-2.43k-1 R60 MF, 1/4W, 1%, 2.05 kΩ 110-2.05k-1 R60 MF, 1/4W, 1%, 12.4 kΩ 110-12.4k-1 R60 MF, 1/4W,						
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$						
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	CRZU	Silicon, 1N4446	10-1N4446			
REF.         WILTRON         R57         MF, $1/4W$ , $1\%$ , $12.4 k\Omega$ $110-12.4k-1$ DES.         DESCRIPTION         PART NO.         R58         MF, $1/4W$ , $1\%$ , $2.43 k\Omega$ $110-22.43k-1$ Q1         NPN, .5W, 2N2222A         20-2N2222A         R60         MF, $1/4W$ , $1\%$ , $12.4 k\Omega$ $110-12.4k-1$ Q2         PNP, .4W, 2N4249         20-2N2222A         R61         MF, $1/4W$ , $1\%$ , $12.4 k\Omega$ $110-12.4k-1$ Q3         PNP, .4W, 2N4249         20-2N4249         R62         MF, $1/4W$ , $0.1\%$ , $20 k\Omega$ $113-20k-0.1$ Q4         NPN, .4W, 2N3694         20-2N3694         R64         MF, $1/4W$ , $0.1\%$ , $20 k\Omega$ $113-20k-0.1$ Q5         NPN, .4W, 2N3694         20-2N3694         R64         MF, $1/4W$ , $0.1\%$ , $20 k\Omega$ $113-20k-0.1$		•		R55		
REF. DESCRIPTION         WILTRON PART NO.         R58 MF, $1/4W$ , $1\%$ , $2.43 k\Omega$ $110-2.43k-1$ Q1 NPN, .5W, 2N2222A         20-2N2222A         R60 MF, $1/4W$ , $1\%$ , $12.4 k\Omega$ $110-12.4k-1$ Q2 PNP, .4W, 2N4249         20-2N2222A         R61 MF, $1/4W$ , $1\%$ , $12.4 k\Omega$ $110-12.4k-1$ Q3 PNP, .4W, 2N4249         20-2N4249         R62 MF, $1/4W$ , $0.1\%$ , $20 k\Omega$ $113-20k-0.1$ Q4 NPN, .4W, 2N3694         20-2N3694         R64 MF, $1/4W$ , $0.1\%$ , $20 k\Omega$ $113-20k-0.1$ Q5 NPN, .4W, 2N3694         20-2N3694         R64 MF, $1/4W$ , $0.1\%$ , $20 k\Omega$ $113-20k-0.1$		TRANSISTORS				
DES.         DESCRIPTION         PART NO.         R59         MF, $1/4$ W, $1\%$ , $2.05$ kΩ $110-2.05$ k- $1$ Q1         NPN, .5W, 2N2222A         20-2N2222A         R61         MF, $1/4$ W, $1\%$ , $12.4$ kΩ $110-12.4$ k- $1$ Q2         PNP, .4W, 2N4249         20-2N4249         R62         MF, $1/4$ W, $0.1\%$ , $20$ kΩ $113-20$ k- $0.1$ Q3         PNP, .4W, 2N4249         20-2N4249         R63         MF, $1/4$ W, $0.1\%$ , $20$ kΩ $113-20$ k- $0.1$ Q4         NPN, .4W, 2N3694         20-2N3694         R64         MF, $1/4$ W, $0.1\%$ , $20$ kΩ $113-20$ k- $0.1$	per		WII TOO		· · · · · · · · · · · · · · · · · · ·	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		DESCRIPTION		ı		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2,200	DESCRIPTION	IAKI NO.	1		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Q1	NPN, .5W, 2N2222A	20-2N2222A		· · · · · · · · · · · · · · · · · · ·	
Q3 PNP, .4W, 2N4249 20-2N4249 R63 MF, 1/4W, 0.1%, 20 kΩ 113-20k-0.1 Q4 NPN, .4W, 2N3694 20-2N3694 R64 MF, 1/4W, 0.1%, 20 kΩ 113-20k-0.1 NPN .4W 2N3694 20-2N3694 R64 MF, 1/4W, 0.1%, 20 kΩ 113-20k-0.1						
Q4 NPN, .4W, 2N3694 20-2N3694 R64 MF, 1/4W, 0.1%, 20 kΩ 113-20k-0.1	Q3					
Q5 NPN, .4W, 2N3694 20-2N3694 R65 MF, 1/4W, 0.1%, 20 kΩ 113-20k-0.1	-	·		1		
	Q5	NPN, .4W, 2N3694	20-2N3694	R65	MF, $1/4W$ , $0.1\%$ , $20 \text{ k}\Omega$	113-20k-0.1

R66	Variable, Multi-turn, 2 k $\Omega$	157-2k	R129	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
R67	MF, $1/4W$ , $1\%$ , $2.37 k\Omega$	110-2.37k-1	R130	MF, $1/4W$ , 1%, 4.02 k $\Omega$	110-4.02k-1
R68	Variable, Multi-turn, $2 k\Omega$	157-2k	R131	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1
R69	MF, $1/4W$ , 1%, 1.47 k $\Omega$	110-1.47k-1	R132	MF, $1/4W$ , 1%, 4.02 k $\Omega$	110-4.02k-1
R70	Variable, Multi-turn, $2 k\Omega$	157-2k	R133	MF, $1/4W$ , $1\%$ , 4.02 k $\Omega$	110-4.02k-1
R71	MF, $1/4$ W, $1\%$ , $6.19$ k $\Omega$	110-6.19k-1	R134	MF, $1/4W$ , $1\%$ , $20 \text{ k}\Omega$	110-20k-1
R72	•		R135	MF, $1/4W$ , $1\%$ , $4.02 \text{ k}\Omega$	
R73	Variable, Multi-turn, 2 kΩ	157-2k	R136		110-4.02k-1
R74	MF, 1/4W, 1%, 7.87 kΩ	110-7.87k-1		MF, 1/4W, 1%, 1 kΩ	110-1k-1
	MF, 1/4W, 1%, 10 kΩ	110-10k-1	R137	MF, 1/4W, 1%, 1 kΩ	110-1k-1
R75	MF, 1/4W, 1%, 10 kΩ	110-10k-1	R138	MF, 1/4W, 1%, 4.99 kΩ	110-4.99k-1
R76	CC, 1/4W, 5%, 10 MΩ	101-10M-5	R139	MF, 1/4W, 1%, 649Ω	110-649-1
R77	MF, $1/4W$ , $1\%$ , $133 \text{ k}\Omega$	110-133k-1	R140	MF, $1/4$ W, $1\%$ , $4.99 \text{ k}\Omega$	110-4.99k-1
R78	MF, $1/4W$ , $1\%$ , $2.49 \text{ k}\Omega$	110-2.49k-1	R141	MF, 1/4W, 1%, 887Ω	110-887-1
R79	MF, $1/4W$ , $1\%$ , $8.66 \text{ k}\Omega$	110-8.66k-1	R142	Variable, Single-Turn, 20 kΩ	156-20k
R80	Variable, Single-Turn, $2 k\Omega$	156-2k	R143	MF, $1/4W$ , $1\%$ , $4.99 \text{ k}\Omega$	110-4.99k-1
R81	MF, $1/4W$ , $1\%$ , $6.49 \text{ k}\Omega$	110-6.49k-1	R144	MF, $1/4W$ , $1\%$ , $15 k\Omega$	110-15k-1
R82	Variable, Single-Turn, 2 kΩ	156-2k	R145	MF, $1/4$ W, $1\%$ , $1 k\Omega$	110-1k-1
R83	MF, $1/4W$ , $1\%$ , $11.3 \text{ k}\Omega$	110-11.3k-1	R146	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R84	Variable, Single-Turn, 2 kΩ	156-2k	R147	MF, $1/4W$ , $1\%$ , $3.01 \text{ k}\Omega$	110-3.01k-1
R85	MF, $1/4W$ , $1\%$ , $8.25 \text{ k}\Omega$	110-8.25k-1	R148	MF, $1/4$ W, $1\%$ , $10$ k $\Omega$	110-10k-1
R86	Variable, Single-Turn, 2 kΩ	156-2k	RP1	Package, 1 kΩ	123-1
R87	MF, $1/4W$ , $1\%$ , $8.66 k\Omega$	110-8.66k-1			
R88	Variable, Single-Turn, 2 kΩ	156-2k		INTEGRATED CIRCUITS	
R89	MF, $1/4$ W, $1\%$ , $11$ k $Ω$	110-11k-1			
R90	Variable, Single-Turn, 5 kΩ	156-5k	REF.		WILTRON
R91	MF, $1/4W$ , $1\%$ , $1 M\Omega$	110-1M-1A	DES.	DESCRIPTION	PART NO.
R92	MF, $1/4W$ , $1\%$ , $1 M\Omega$	110-1M-1A	:		
R93	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1	U1	Quad NAND, 74LS00	54-74LS00
R94	MF, $1/4W$ , $1\%$ , $1 M\Omega$	110-1M-1A	U2	Hex Inverter, 74LS04	54-74LS04
R95	MF, $1/4W$ , $1\%$ , $1 M\Omega$	110-1M-1A	U3	Triple NAND, 74LS10	54-42
R96	MF, $1/4W$ , 1%, 1 M $\Omega$	110-1M-1A	U4	Op Amp, LF356N	50-9
R97	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1	U5	Switch, DG201	54-24
R98	MF, $1/4W$ , $1\%$ , $1 M \Omega$	110-1M-1A	<b>U</b> 6	Op Amp, LF356N	50-9
R99	MF, $1/4W$ , $1\%$ , $26.7 k\Omega$	110-26.7k-1	U7	Op Amp, LF356N	50-9
R100	MF, $1/4W$ , $1\%$ , $42.2 \text{ k}\Omega$	110-42.2k-1	U8	Op Amp, TL072	54-53
R101	MF, $1/4W$ , 1%, 30.1 k $\Omega$	110-30.1k-1	บ9	Op Amp, TL072	54-53
R102	MF, $1/4W$ , $1\%$ , $30.1 k\Omega$	110-30.1k-1	U10	Op Amp, TL072	54-53
R103	Variable, Multi-turn, $5 k\Omega$	157-5k	U11	Quad Comparator, MC3302P	54-MC3302P
R104	MF, $1/4W$ , 1%, 301 k $\Omega$	110-301k-1	U12	Transistor Array, CA3054	54-6
R105	MF, $1/4$ W, 1%, 10 kΩ	110-10k-1	U13	Transistor Array, CA3054	54-6
R106	MF, $1/4$ W, $1\%$ , $9.76$ kΩ	110-9.76k-1	U14	Op Amp, LF356N	50-9
R107	MF, $1/4W$ , 1%, $10 \text{ k}\Omega$	110-10k-1	U15	Transistor Array, CA3054	54-6
R108	MF, 1/4W, 1%, 511 kΩ	110-511k-1	U16	Op Amp, TL072	
R109	MF, $1/4W$ , $1\%$ , $10 k\Omega$		U17		54-53
R110	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1	U18	Switch, DG201	54-24
R111	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1	U19	Op Amp, TL074	54-132
R112		110-10k-1	U20	Op Amp, TL074	54-132
R112	MF, 1/4W, 1%, 10 kΩ	110-10k-1		Switch, DG201	54-24
R113	MF, 1/4W, 1%, 20 kΩ	110-20k-1	U21	Op Amp, LF356N	50-9
	MF, $1/4$ W, $1\%$ , $20 \text{ k}\Omega$	110-20k-1	U22	8 Bit DAC, AD 7524	54-129
R115	Variable, Single-Turn, 20 kΩ	156-20k	U23	Quad Schmitt NAND, 74LS132	54-74LS132
R116	MF, $1/4W$ , $1\%$ , $16.5 \text{ k}\Omega$	110-16.5k-1	U24	Octal Latch, 74LS374	54-41
R117	MF, $1/4$ W, $1\%$ , $7.5$ k $\Omega$	110-7.5k-1	U25	Quad Transparent Latch,	54-74LS75
R118	MF, $1/4$ W, $1\%$ , $5.11$ kΩ	110-5.11k-1		74LS75	
R119	MF, $1/4$ W, $1\%$ , $2 k\Omega$	110-2k-1			
R120	MF, $1/4$ W, $1\%$ , $15 \text{ k}\Omega$	110-15k-1		MISCELLANEOUS	
R121	MF, $1/4W$ , $1\%$ , $2 k\Omega$	110-2k-1			
R122	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1	REF.		WILTRON
R123	Variable, Single-Turn, $2 k\Omega$	156-2k	DES.	DESCRIPTION	PART NO.
R124	Variable, Single-Turn, 2 k $\Omega$	156-2k			
R125	MF, $1/4$ W, $1\%$ , $1$ k $\Omega$	110-1k-1	TP1		
R126	MF, $1/4$ W, $1\%$ , $1$ k $\Omega$	110-1k-1	thru		
R127	MF, 1/4W, 1%, 100 kΩ	110-100k-1	TP7	Pin, Test Point	706-44
R128	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1		Ejector, PC Board	553-96

1-6600A/MB-OMM 6-21

	CAPACITORS			d. 6621A-40	CDCI + 1207 (
	222220410			e. 6629A	SPCL-A-13074 SPCL-A-11587
REF		WILTRON		f. 6629A-40	SPCL-A-13081
DES.	DESCRIPTION	PART NO.		g. 6637A	660-A-8145-3
C1				h. 6637A-40	660-A-8145-3
C1	Mica, 100 pF	220-100		i. 6638A	660-A-8145-4
C2 C3	Mica, 100 pF	220-100		j. 6642A	SPCL-A-11623
C3 C4	Disc Ceramic, 0.001 μF Monolithic, 0.1 μF	230-30		k. 6647A	660-A-8145-3
C5	Tant alum, 4.7 $\mu$ F, 35V	230-37	İ	1. 6648A	660-A-8145-4
C6	Monolithic, 0.1 µF	250-39 230-37		m. 6653A	660-A-8145-5
C7	Tant alum, 4.7 µF, 35V	250-37	1	n. 6659A	660-A-8145-5
C8	Monolithic, 0.1 µF	230-37	A2	Resistor Pack	
C9	Monolithic, 0.1 µF	230-37	Į.	a. 6609A	660-A-12632-1
C10	Monolithic, 0.1 µF	230-37		b. 6617A c. 6621A	660-A-12732-2
C11	Monolithic, 0.1 µF	230-37	1	d. 6621A-40	SPCL-B-13091-5
C12	Tantalum, 4.7 μF, 35V	250-39		e. 6629A	SPCL-B-13091-5
C13	Tantalum, 4.7 μF, 35V	250-39	<b>]</b>	f. 6629A-40	SPCL-B-13091-9 SPCL-B-13091-9
C14	Monolithic, 0.1 μF	230-37	1	g. 6637A	660-A-12632-3
C15	Monolithic, 0.1 µF	230-37	1	h. 6637A-40	660-A-12632-3
C16	Tantalum, 4.7 μF, 35V	250-39		i. 6638A	660-A-12632-5
C17	Tantalum, 4.7 µF, 35V	250-39		j. 6642A	SPCL-B-13091-13
C18 C19	Monolithic, 0.1 µF	230-37		k. 6647A	660-A-12632-4
C20	Monolithic, 0.1 μF Tantalum, 4.7 μF, 35V	230-37		I. 6648A	660-A-12632-6
C21	Tantalum, 4.7 μF, 35V Tantalum, 4.7 μF, 35V	250-39	1	m. 6653A	660-A-12632-9
C22	Monolithic, 0.1 μF	250-39 230-37		n. 6659A	660-A-12632-10
C 23	Monolithic, 0.1 µF	230-37	RP1	Resistor Pack, 10 kΩ	123-6
C24	Monolithic, 0.1 μF	230-37	R1 R2	MF, 1/4W, 1%, 10 kΩ	110-10k-1
C25	Disc Ceramic, 0.001 µF	230-30	R3	MF, 1/4W, 1%, 2.37 kΩ	110-2.37k-1
C26	Mica, 100 pF	220-100	R4	MF, $1/4$ W, $1\%$ , $2.37 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $3.92 \text{ k}\Omega$	110-2.37k-1
C27	Disc Ceramic, 0.001 µF	230-30	R5	MF, $1/4W$ , $1\%$ , $3.92 \text{ kW}$ MF, $1/4W$ , $1\%$ , $392\Omega$	110-3.92k-1
			R6	Part of A2	110-392-1
	DIODES		R7	Part of A2	
			R8	Variable, Multi-turn, 50 k $\Omega$	157-50k
REF		WILTRON	R9	MF, $1/4W$ , 1%, 348 k $\Omega$	110-348k-1
DES.	DESCRIPTION	PART NO.	R10	Variable, Multi-turn, 20 kΩ	157-20k
			R11	MF, $1/4W$ , $0.1\%$ , $30 k\Omega$	113-30k-0.1
CR1	Schottky, MBD-501	10-4	R12	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
CR2	Schottky, MBD-501	10-4	R13	Variable, Single-Turn, 500Ω	156-500
CR3 CR4	Silicon, 1N4446	10-1N4446	R14	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
CR5	Silicon, 1N4446	10-1N4446	R15	MF, 1/4W, 0.1%, 30 kΩ	113-30k-0.1
CR6	Zener, 12V, 0.4W, 1N759A Reference, 6.2V, 1N823	10-1N759A	R16 R17	MF, 1/4W, 1%, 10 kΩ	110-10k-1
CR7	Silicon, 1N4446	10-1N823	R18	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$ Part of A2	110-10k-1
CR8	Silicon, 1N4446	10-1N4446 10-1N4446	R19	Part of A2	
CR9	Zener, 11V, 1N962B	10-1N962B	R20	Part of A2	
CR10	Zener, 11V, 1N962B	10-1N962B	R21	Part of A2	
	, ,,	10 111,000	R22	Part of A2	
	TRANSISTORS		R23	MF, $1/4W$ , $0.1\%$ , $30 \text{ k}\Omega$	113-30k-0.1
			R24	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
REF		WILTRON	R25	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1
DES.	DESCRIPTION	PART NO.	R26	MF, $1/4W$ , $0.1\%$ , $10 \text{ k}\Omega$	113-10k-0.1
			R27	MF, $1/4W$ , $0.1\%$ , $10 \text{ k}\Omega$	113-10k-0.1
Q1	PNP, 2N6041	20-2N6041	R28	MF, $1/4W$ , $0.1\%$ , $10 \text{ k}\Omega$	113-10k-0.1
Q2	PNP, 2N2907A	20-2N2907A	R29	Variable, Multi-turn, 500Ω	157-500
Q3	NPN, 2N2222A	20-2N2222A	R30	MF, 1/4W, 0.1%, 30 kΩ	113-30k-0.1
			R31	MF, 1/4W, 0.1%, 10 kΩ	113-10k-0.1
	RE <b>S</b> ISTORS		R32 R33	MF, $1/4W$ , $0.1\%$ , $10 \text{ k}\Omega$	113-10k-0.1
			R34	MF, $1/4$ W, $0.1\%$ , $10 \text{ k}\Omega$ MF, $1/4$ W, $0.1\%$ , $10 \text{ k}\Omega$	113-10k-0.1
REF.		WILTRON	R34	MF, $1/4$ W, $0.1\%$ , $10 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $27.4 \text{ k}\Omega$	113-10k-0.1
DES.	DESCRIPTION	PART NO.	R36	MF, $1/4W$ , $1/90$ , $27.4 \text{ k}\Omega$ MF, $1/4W$ , $0.1\%$ , $10 \text{ k}\Omega$	110-27.4k-1 113-10k-0.1
			R37	Part of A2	113 10K-0.1
A1	Resistor Pack		R38	Part of A2	
	a. 6609A	660-A-8145-1	R39	MF, $1/4$ W, 1%, $511\Omega$	110-511-1
	b. 6617A	660-A-8145-2	R40	Variable, Multi-turn, 20k	157-20k
	c. 6621A	SPCL-A-11552	R41	MF, $1/4W$ , $0.1\%$ , $10 \text{ k}\Omega$	113-10k-0.1

R42	MF, $1/4$ W, 1%, $10 \text{ k}\Omega$	110-10k-1	U2	8 Bit Multiplying DAC,	
R43	MF, $1/4W$ , $0.1\%$ , $10 k\Omega$	113-10k-0.1		MC1408L8	54-148
R44	MF, $1/4W$ , $0.1\%$ , $10 k\Omega$	113-10k-0.1	U3	Op Amp, 356	50-9
R45	MF, $1/4W$ , $0.1\%$ , $10 \text{ k}\Omega$	113-10k-0.1	<b>U4</b>	8 Bit Multiplying DAC,	
R46	Variable, Multi-turn, 20k	157-20k		MC1408L8	54-148
R47	MF, $1/4W$ , $1\%$ , $10\Omega$	110-10-1	U5	Octal Latch, 74LS374	54-41
R48	MF, $1/4W$ , 1%, 1 k $\Omega$	110-1k-1	U6	Op Amp, OP05	50-87
R49	Variable, Single-Turn, 1 kΩ	157-1k	U7	16 Bit DAC	54-150
R50	MF, $1/4W$ , $1\%$ , $6.49 \text{ k}\Omega$	110-6.49k-1	U8	Octal Latch, 74LS374	5 <del>4-4</del> 1
R51	MF, $1/4W$ , $1\%$ , $4.32 \text{ k}\Omega$	110-4.32k-1	U9	Octal Latch, 74LS374	54-41
R52	MF, $1/4W$ , $1\%$ , $422\Omega$	110-422-1	U10	Dual FET-Input Op Amp, TL072	54-53
R53	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1	U11	Dual Analog Switch, DG200BA	50-DG200BA
R54	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1	U12	Op Amp, 301A	50-8
R55	Variable, Single-Turn, $1 \text{ k}\Omega$	157-1k	U13	Op Amp, 356	50-9
R56	MF, $1/4W$ , $1\%$ , 3.83 k $\Omega$	110-3.83k-1	U14	Op Amp, 356	50-9
R57	MF, $1/4W$ , $1\%$ , $1.87 k\Omega$	110-1.87k-1	U15	Octal Latch, 74LS374	54-41
R58	MF, $1/4W$ , $1\%$ , $10\Omega$	110-10-1	U16	Octal Latch, 74LS374	54-41
R59	MF, $1/4W$ , $0.1\%$ , $10 \text{ k}\Omega$	113-10k-0.1	U17	Octal Latch, 74LS374	54-41
R60	MF, $1/4W$ , $1\%$ , $3.92 \text{ k}\Omega$	110-3.92k-1	U18	Octal Latch, 74LS374	54-41
R61	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1	U19	12 Bit Multiplying DAC	54-149
R62	Variable, Single-Turn, 5k	156-5k	U20	Op Amp, 356	50-9
R63	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1	U21	Dual FET-Input Op Amp, TL072	54-53
R64	MF, $1/4W$ , $1\%$ $10 k\Omega$	110-10k-1	U22	Quad Analog Switch, LF13201N	54-20
R65	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1	U 23	Op Amp, 356	50-9
R66	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1	U24	12 Bit Multiplying DAC	54-149
R67	MF, $1/4W$ , 1%, 100 k $\Omega$	110-100k-1	U25	Op Amp, 356	50-9
R68	Variable, Multi-turn, $2 k\Omega$	157-2k	U26	Op Amp, OP05	50-87
R69	Variable, Multi-turn, $2 k\Omega$	157-2k	U27	Dual FET-Input Op Amp, TL072	54-53
R70	MF, $1/4W$ , $1\%$ , $49.9 \text{ k}\Omega$	110-49.9k-1	U28	Quad Analog Switch, LF13201N	54-20
R71	Part of A2		U29	Triple NAND, 74LS10	54-42
R72	Part of A2		U30	Op AMp, 356	50-9
R73	Part of A2		U31	Quad D Flip-Flop, 74LS175	54-74LS175
R74	MF, $1/4W$ , $1\%$ , $49.9 k\Omega$	110-49.9k-1	U32	Octal Latch, 74LS374	54-41
R75	Variable, Single-Turn, 5 k $\Omega$	156-5k	U33	Quad Analog-Switch, LF13201N	54-20
R76	MF, $1/4W$ , $1\%$ , $3.16 \text{ k}\Omega$	110-3.16k-1	U34	Quad Analog-Switch, LF13201N	54-20
R77	Variable, Single-Turn, 5 k $\Omega$	156-5k	U35	Dual FET-Input Op Amp, TL074	54-132
R78	MF, $1/4W$ , $1\%$ , $2.49 k\Omega$	110-2.49k-1			
R79	Variable, Single-Turn, 5 k $\Omega$	156-5k			
R80	MF, $1/4W$ , $1\%$ , $6.81 \text{ k}\Omega$	110-6.81k-1			
R81	Variable, Single-Turn, 5 k $\Omega$	156-5k			
R82	MF, $1/4W$ , $1\%$ , $3.01 \text{ k}\Omega$	110-3.01k-1		MISCELLANEOUS	
R83	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1			
R84	MF, 1/4W, 1%, 10 kΩ	110-10k-1			
R85	Part of A2		REF.		WILTRON
R86	Part of A2		DES.	DESCRIPTION	PART NO.
R87	MF, 1/4W, 1%, 49.9 kΩ	110-49.9k-1			
R88	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1			
R89	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1	P2	Connector, 3-Pin	551-238
			S1	Switch, DPDT	420-14
	INTEGRATED CIRCUITS		TP1		
			thru		
REF.		WILTRON	TP10	Pin, Test Point	706-44
DES.	DESCRIPTION	PART NO.		Socket, I.C., 14-Pin	553-63
				Socket, I.C. 24-Pin	553-67
U1	Hex Inverter, 74LS00	54-74LS00		Ejector, P.C. Board	553-96

Table 6-6. A6 HET/YIG Driver, .01 - 2 GHz, 6609A (660-D-8007-4)

	CAPACITORS		С6	Monolithic, .1 μF	230-37
			C7	Tantalum, 35V, 6.8 μF	250-41
REF.		WILTRON	C8	Monolithic, .1 μF	230-37
DES.	DESCRIPTION	PART NO.	C9	Ceramic, .01 μF	230-11
			C10	Ceramic, .001 μF	230-30
C1	Monolithic, .1 μF	230-37	C11	Tantalum, 1 μF, 35V	250-19
C2	Monolithic, .1 μF	230-37	C12	Tantalum, 1 µF, 35V	250-19
C3	Tantalum, 35V, 6.8 μF	250-41	C13	Monolithic, 1 μF	230-41
C4	Monolithic, .1 μF	230-37	C14	Monolithic, .1 µF	230-37
C5	Tantalum, 35V, 6.8 μF	250-41	C15	Mica, 300 pF	220-300

C16 Tantalum, 35V, 6.8				
	μF 250-41	R17	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$	110 5 111 1
C18 Ceramic, .01 µF	,	3		110-5.11k-1
, ,	230-11	R18	MF, $1/4W$ , $1\%$ , $5.11 k\Omega$	110-5.11k-1
C19 Tantalum, 35V, 6.8	βµF 250-41	R19	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1
C21 Mica, 8.2 pF	221-8.2	R20	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
C22 Mica, 820 pF	220-820	R21	MF, $1/4W$ , $1\%$ , $23.7 k\Omega$	110-23.7k-1
C23 Ceramic, .01 µF	230-11	R22	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1
C24 Ceramic, .01 µF	230-11	R23	MF, $1/4W$ , $1\%$ , $121\Omega$	110-121-1
C25 Ceramic, .01 µF	230-11	R24		
0 20 Octumic, 101 pi	250-11		MF, 1/4W, 1%, 1 kΩ	110-1k-1
D10D70		R25	MF, $1/4W$ , $1\%$ , $7.5 k\Omega$	110-7.5k-1
DIODES		R26	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1
		R27	MF, $1/4W$ , $1\%$ , $5.11 k\Omega$	110-5.11k-1
REF.	WILTRON	R41	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
DES. DESCRIPT	ION PART NO.	R42	MF, $1/4$ W, $1\%$ , $15$ kΩ	110-15k-1
		R43	MF, $1/4W$ , $1\%$ , $11 k\Omega$	110-11k-1
CR1 Silicon, 1N4446	10-1N4446	R44	MF, $1/4W$ , $1\%$ , $3.24 \text{ k}\Omega$	
CR2 Silicon, 1N4446				110-3.24k-1
	10-1N4446	R45	MF, $1/4W$ , $1\%$ , $3.24 \text{ k}\Omega$	110-3.24k-1
	10-1N4446	R46	MF, $1/4$ W, $1\%$ , $1$ k $\Omega$	110-1k-1
CR4 Silicon, SI2	10-SI2	R47	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
CR5 Zener, 24V, 1W, 11	N4749A 10-1N4749A	R48	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1
CR6 Silicon, 1N4446	10-1N4446	R49	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1
CR7 Silicon, 1N4446	10-1N4446	R50	MF, $1/4W$ , $1\%$ , $2.74 \text{ k}\Omega$	110-2.74k-1
CR8 Zener, 6.8V, 1W, 1		R51	MF, $1/4W$ , $1\%$ , $15 k\Omega$	
CR9 Silicon, 1N4446	10-1N4446			110-15k-1
,		R66	Variable, 1-Turn, 500 kΩ	156-500k
CR10 Silicon, 1N4446	10-1N4446	R67	MF, $1/4$ W, $1\%$ , $20$ kΩ	110-20k-1
CR11 Silicon, 1N4446	10-1N4446	R70	MF, $1/4$ W, $1\%$ , $15$ kΩ	110-15k-1
		R71	MF, $1/4W$ , $1\%$ , $1.30 \text{ k}\Omega$	110-1.30k-1
TRANSISTO	RS	R72	MF, $1/4W$ , $1\%$ , $8.87 \text{ k}\Omega$	110-8.87k-1
		R73	MF, $1/4W$ , $1\%$ , $3.40 \text{ k}\Omega$	110-3.40k-1
REF.	WILTRON	R74	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$	110-5.11k-1
DES. DESCRIPT		I.		
DESCRIPT	ION FART NO.	R75	MF, $1/4W$ , $1\%$ , $301\Omega$	110-301-1
01 DVD 1/D0103	20.1474.00	R76	MF, $1/4W$ , $1\%$ , $1.21 \text{ k}\Omega$	110-1.21k-1
Q1 PNP, MPSA92	20-MPSA92	R77	MF, $1/4W$ , $1\%$ , $17.8 \text{ k}\Omega$	110-17.8k-1
Q2 PNP, MPSA92	20-MPSA92	R78	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
Q3 NPN, 2N2222A	20-2N2222A	R79	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
			MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1 110-10k-1
Q4 PNP, 2N2907A	20-2N2907A	R80	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
Q4 PNP, 2N2907A Q5 NPN, 2N2222A	20-2N2907A 20- <b>2</b> N2222A	R80 R81	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ	110-10k-1 110-23.7k-1
Q4 PNP, 2N2907A Q5 NPN, 2N2222A Q6 NPN, 2N3694	20-2N2907 A 20-2N2222 A 20-2N3694	R80 R81 R82	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $23.7 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $2 \text{ k}\Omega$	110-10k-1 110-23.7k-1 110-2k-1
Q4 PNP, 2N2907A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04	20-2N2907 A 20-2N2222A 20-2N3694 20-MPSU04	R80 R81 R82 R88	MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $23.7$ k $\Omega$ MF, $1/4$ W, $1\%$ , $2$ k $\Omega$ Variable, $1$ -Turn, $20$ $\Omega$	110-10k-1 110-23.7k-1 110-2k-1 156-20
Q4 PNP, 2N2907 A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04 Q8 PNP, 2N2907 A	20-2N2907 A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907 A	R80 R81 R82	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $23.7 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $2 \text{ k}\Omega$	110-10k-1 110-23.7k-1 110-2k-1
Q4 PNP, 2N2907A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04	20-2N2907 A 20-2N2222A 20-2N3694 20-MPSU04	R80 R81 R82 R88	MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $23.7$ k $\Omega$ MF, $1/4$ W, $1\%$ , $2$ k $\Omega$ Variable, $1$ -Turn, $20$ $\Omega$	110-10k-1 110-23.7k-1 110-2k-1 156-20
Q4 PNP, 2N2907 A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04 Q8 PNP, 2N2907 A	20-2N2907 A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907 A	R80 R81 R82 R88	MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $23.7$ k $\Omega$ MF, $1/4$ W, $1\%$ , $2$ k $\Omega$ Variable, $1$ -Turn, $20$ $\Omega$	110-10k-1 110-23.7k-1 110-2k-1 156-20
Q4 PNP, 2N2907 A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04 Q8 PNP, 2N2907 A	20-2N2907 A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907 A 20-2N2222A	R80 R81 R82 R88	MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $23.7$ k $\Omega$ MF, $1/4$ W, $1\%$ , $2$ k $\Omega$ Variable, $1$ -Turn, $20\Omega$ MF, $1/4$ W, $1\%$ , $15$ k $\Omega$	110-10k-1 110-23.7k-1 110-2k-1 156-20
Q4 PNP, 2N2907 A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04 Q8 PNP, 2N2907 A Q9 NPN, 2N2222A	20-2N2907 A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907 A 20-2N2222A	R80 R81 R82 R88 R89	MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $23.7$ k $\Omega$ MF, $1/4$ W, $1\%$ , $2$ k $\Omega$ Variable, $1$ -Turn, $20\Omega$ MF, $1/4$ W, $1\%$ , $15$ k $\Omega$	110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1
Q4 PNP, 2N2907 A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04 Q8 PNP, 2N2907 A Q9 NPN, 2N2222A  RESISTOR	20-2N2907 A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907 A 20-2N2222A	R80 R81 R82 R88 R89	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS	110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1
Q4 PNP, 2N2907 A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04 Q8 PNP, 2N2907 A Q9 NPN, 2N2222A  RESISTOR	20-2N2907 A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907 A 20-2N2222A	R80 R81 R82 R88 R89	MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $23.7$ k $\Omega$ MF, $1/4$ W, $1\%$ , $2$ k $\Omega$ Variable, $1$ -Turn, $20\Omega$ MF, $1/4$ W, $1\%$ , $15$ k $\Omega$	110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1
Q4 PNP, 2N2907 A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04 Q8 PNP, 2N2907 A Q9 NPN, 2N2222A  RESISTOR	20-2N2907 A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907 A 20-2N2222A	R80 R81 R82 R88 R89	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION	110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO.
Q4 PNP, 2N2907 A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04 Q8 PNP, 2N2907 A Q9 NPN, 2N2222A  RESISTOR  REF. DES. DESCRIPT	20-2N2907 A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907 A 20-2N2222A  S WILTRON PART NO.	R80 R81 R82 R88 R89 REF. DES.	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05	110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO.
Q4 PNP, 2N2907 A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04 Q8 PNP, 2N2907 A Q9 NPN, 2N2222A  RESISTOR  REF. DES. DESCRIPT R1 Variable, 1-Turn, 7	20-2N2907 A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907 A 20-2N2222A  S WILTRON PART NO. 20 kΩ 156-20K	R80 R81 R82 R88 R89	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION	110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO.
Q4 PNP, 2N2907 A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04 Q8 PNP, 2N2907 A Q9 NPN, 2N2222A  RESISTOR  REF. DES. DESCRIPT	20-2N2907 A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907 A 20-2N2222A  S WILTRON PART NO. 20 kΩ 156-20K	R80 R81 R82 R88 R89 REF. DES.	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05	110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO.
Q4 PNP, 2N2907 A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04 Q8 PNP, 2N2907 A Q9 NPN, 2N2222A  RESISTOR  REF. DES. DESCRIPT R1 Variable, 1-Turn, 7	20-2N2907 A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907 A 20-2N2222A  S  WILTRON PART NO. 20 kΩ 156-20K 110-61.9k-1	R80 R81 R82 R88 R89 REF. DES.	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05	110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable
Q4 PNP, 2N2907 A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04 Q8 PNP, 2N2907 A Q9 NPN, 2N2222A  RESISTOR  REF. DES. DESCRIPT  R1 Variable, 1-Turn, 7 R2 MF, 1/4W, 1%, 61 R3 Variable, 10-Turn	20-2N2907 A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907 A 20-2N2222A  S  WILTRON PART NO.  20 kΩ 156-20K 9 kΩ 110-61.9k-1 1 kΩ 157-1k	R80 R81 R82 R88 R89 REF. DES. U4 U5	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072	110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53
Q4 PNP, 2N2907 A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04 Q8 PNP, 2N2907 A Q9 NPN, 2N2222A  RESISTOR  REF. DES. DESCRIPT  R1 Variable, 1-Turn, 7 R2 MF, 1/4W, 1%, 61. R3 Variable, 10-Turn R4 MF, 1/4W, 1%, 11	20-2N2907 A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907 A 20-2N2222A  S  WILTRON PART NO.  20 kΩ 156-20K 9 kΩ 110-61.9k-1 1 kΩ 157-1k kΩ 110-11k-1	R80 R81 R82 R88 R89 REF. DES.	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716	110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable
Q4 PNP, 2N2907 A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04 Q8 PNP, 2N2907 A Q9 NPN, 2N2222A  RESISTOR  REF. DES. DESCRIPT  R1 Variable, 1-Turn, 7 R2 MF, 1/4W, 1%, 61. R3 Variable, 10-Turn R4 MF, 1/4W, 1%, 11 R5 MF, 1/4W, 1%, 5.1	20-2N2907 A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907 A 20-2N2222A  S  WILTRON PART NO.  20 kΩ 156-20K 9 kΩ 110-61.9k-1 1 kΩ 157-1k kΩ 110-11k-1 1 kΩ 110-5.11k-1	R80 R81 R82 R88 R89 REF. DES. U4 U5	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072 Input NAND Gate, 74LS10	110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53
Q4 PNP, 2N2907 A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04 Q8 PNP, 2N2907 A Q9 NPN, 2N2222A  RESISTOR  REF. DES. DESCRIPT  R1 Variable, 1-Turn, 2 R2 MF, 1/4W, 1%, 61. R3 Variable, 10-Turn R4 MF, 1/4W, 1%, 11 R5 MF, 1/4W, 1%, 5.1 R6 MF, 1/4W, 1%, 5.1	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	R80 R81 R82 R88 R89 REF. DES. U4 U5	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072	110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53
Q4 PNP, 2N2907 A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04 Q8 PNP, 2N2907 A Q9 NPN, 2N2222A  RESISTOR  REF. DES. DESCRIPT  R1 Variable, 1-Turn, 7 R2 MF, 1/4W, 1%, 61. R3 Variable, 10-Turn R4 MF, 1/4W, 1%, 11 R5 MF, 1/4W, 1%, 5.1 R6 MF, 1/4W, 1%, 5.1 R7 Variable, 10-Turn,	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	R80 R81 R82 R88 R89 REF. DES. U4 U5	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072 Input NAND Gate, 74LS10	110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53 54-42
Q4 PNP, 2N2907 A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04 Q8 PNP, 2N2907 A Q9 NPN, 2N2222A  RESISTOR  REF. DES. DESCRIPT  R1 Variable, 1-Turn, 7 R2 MF, 1/4W, 1%, 61. R3 Variable, 10-Turn R4 MF, 1/4W, 1%, 11 R5 MF, 1/4W, 1%, 5.1 R6 MF, 1/4W, 1%, 5.1 R7 Variable, 10-Turn, 88 MF, 1/4W, 1%, 11	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	R80 R81 R82 R88 R89 REF. DES. U4 U5 U8 U10	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072 Input NAND Gate, 74LS10  MISCELLANEOUS	110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53
Q4 PNP, 2N2907 A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04 Q8 PNP, 2N2907 A Q9 NPN, 2N2222A  RESISTOR  REF. DES. DESCRIPT  R1 Variable, 1-Turn, 7 R2 MF, 1/4W, 1%, 61. R3 Variable, 10-Turn R4 MF, 1/4W, 1%, 5.1 R6 MF, 1/4W, 1%, 5.1 R7 Variable, 10-Turn, 18 R7 Variable, 10-Turn, 19 R8 MF, 1/4W, 1%, 11 R9 Variable, 10-Turn, 19	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	R80 R81 R82 R88 R89 REF. DES. U4 U5	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072 Input NAND Gate, 74LS10	110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53 54-42
Q4 PNP, 2N2907 A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04 Q8 PNP, 2N2907 A Q9 NPN, 2N2222A  RESISTOR  REF. DES. DESCRIPT  R1 Variable, 1-Turn, 7 R2 MF, 1/4W, 1%, 61. R3 Variable, 10-Turn R4 MF, 1/4W, 1%, 5.1 R6 MF, 1/4W, 1%, 5.1 R7 Variable, 10-Turn, 7 R8 MF, 1/4W, 1%, 11 R9 Variable, 10-Turn, 7 R10 MF, 1/4W, 1%, 11	$\begin{array}{c} 20-2N2907A\\ 20-2N2222A\\ 20-2N3694\\ 20-MPSU04\\ 20-2N2907A\\ 20-2N2222A\\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	R80 R81 R82 R88 R89 REF. DES. U4 U5 U8 U10	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072 Input NAND Gate, 74LS10  MISCELLANEOUS	110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53 54-42 WILTRON
Q4 PNP, 2N2907 A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04 Q8 PNP, 2N2907 A Q9 NPN, 2N2222A  RESISTOR  REF. DES. DESCRIPT  R1 Variable, 1-Turn, 7 R2 MF, 1/4W, 1%, 61. R3 Variable, 10-Turn R4 MF, 1/4W, 1%, 5.1 R6 MF, 1/4W, 1%, 5.1 R7 Variable, 10-Turn, 18 R7 Variable, 10-Turn, 19 R8 MF, 1/4W, 1%, 11 R9 Variable, 10-Turn, 19	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	R80 R81 R82 R88 R89 REF. DES. U4 U5 U8 U10	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072 Input NAND Gate, 74LS10  MISCELLANEOUS  DESCRIPTION	110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53 54-42 WILTRON PART NO.
Q4 PNP, 2N2907 A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04 Q8 PNP, 2N2907 A Q9 NPN, 2N2222A  RESISTOR  REF. DES. DESCRIPT  R1 Variable, 1-Turn, 7 R2 MF, 1/4W, 1%, 61. R3 Variable, 10-Turn R4 MF, 1/4W, 1%, 5.1 R6 MF, 1/4W, 1%, 5.1 R7 Variable, 10-Turn, 18 R8 MF, 1/4W, 1%, 11 R9 Variable, 10-Turn, 18 R9 WF, 1/4W, 1%, 11 R9 Variable, 10-Turn, 19 R10 MF, 1/4W, 1%, 23 R11 MF, 1/4W, 1%, 51	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	R80 R81 R82 R88 R89 REF. DES. U4 U5 U8 U10	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072 Input NAND Gate, 74LS10  MISCELLANEOUS	110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53 54-42 WILTRON
Q4 PNP, 2N2907 A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04 Q8 PNP, 2N2907 A Q9 NPN, 2N2222A  RESISTOR  REF. DES. DESCRIPT  R1 Variable, 1-Turn, 7 R2 MF, 1/4W, 1%, 61. R3 Variable, 10-Turn R4 MF, 1/4W, 1%, 5.1 R6 MF, 1/4W, 1%, 5.1 R7 Variable, 10-Turn, 8 R6 MF, 1/4W, 1%, 11 R9 Variable, 10-Turn, 11 R9 Variable, 10-Tu	$\begin{array}{c} 20-2N2907A\\ 20-2N2222A\\ 20-2N3694\\ 20-MPSU04\\ 20-2N2907A\\ 20-2N2222A\\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	R80 R81 R82 R88 R89 REF. DES. U4 U5 U8 U10	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072 Input NAND Gate, 74LS10  MISCELLANEOUS  DESCRIPTION	110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53 54-42 WILTRON PART NO.
Q4 PNP, 2N2907A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04 Q8 PNP, 2N2907A Q9 NPN, 2N2222A  RESISTOR  REF. DES. DESCRIPT  R1 Variable, 1-Turn, 7 R2 MF, 1/4W, 1%, 61. R3 Variable, 10-Turn R4 MF, 1/4W, 1%, 5.1 R6 MF, 1/4W, 1%, 5.1 R7 Variable, 10-Turn, 8 R6 MF, 1/4W, 1%, 11 R9 Variable, 10-Turn, 11 R9 Variable, 10-Turn	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	R80 R81 R82 R88 R89  REF. DES.  U4 U5  U8 U10  REF. DES.  —— TP1 thru	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072 Input NAND Gate, 74LS10  MISCELLANEOUS  DESCRIPTION  Ejector, P.C. Board	110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53 54-42 WILTRON PART NO. 553-96
Q4 PNP, 2N2907A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04 Q8 PNP, 2N2907A Q9 NPN, 2N2222A  RESISTOR  REF. DES. DESCRIPT  R1 Variable, 1-Turn, 7 R2 MF, 1/4W, 1%, 61. R3 Variable, 10-Turn R4 MF, 1/4W, 1%, 5.1 R6 MF, 1/4W, 1%, 5.1 R7 Variable, 10-Turn, 8 MF, 1/4W, 1%, 11 R9 Variable, 10-Turn, 11 R9 Wariable, 10-Turn, 12 R10 MF, 1/4W, 1%, 11 R9 Variable, 10-Turn, 14 R10 MF, 1/4W, 1%, 15 R11 MF, 1/4W, 1%, 15 R12 MF, 1/4W, 1%, 51 R13 MF, 1/4W, 1%, 1.1 R13 MF, 1/4W, 1%, 9.0 R14 MF, 1/4W, 1%, 1.1	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	R80 R81 R82 R88 R89  REF. DES.  U4 U5  U8 U10  REF. DES.  ———————————————————————————————————	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072 Input NAND Gate, 74LS10  MISCELLANEOUS  DESCRIPTION  Ejector, P.C. Board  Pin, Test Point	110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53 54-42 WILTRON PART NO. 553-96
Q4 PNP, 2N2907A Q5 NPN, 2N2222A Q6 NPN, 2N3694 Q7 NPN, MPSU04 Q8 PNP, 2N2907A Q9 NPN, 2N2222A  RESISTOR  REF. DES. DESCRIPT  R1 Variable, 1-Turn, 7 R2 MF, 1/4W, 1%, 61. R3 Variable, 10-Turn R4 MF, 1/4W, 1%, 5.1 R6 MF, 1/4W, 1%, 5.1 R7 Variable, 10-Turn, 8 R6 MF, 1/4W, 1%, 11 R9 Variable, 10-Turn, 11 R9 Variable, 10-Turn	$\begin{array}{c} 20-2N2907A\\ 20-2N2222A\\ 20-2N3694\\ 20-MPSU04\\ 20-2N2907A\\ 20-2N2222A\\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	R80 R81 R82 R88 R89  REF. DES.  U4 U5  U8 U10  REF. DES.  —— TP1 thru	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072 Input NAND Gate, 74LS10  MISCELLANEOUS  DESCRIPTION  Ejector, P.C. Board	110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53 54-42 WILTRON PART NO. 553-96

	CAPACITORS			RESISTORS	
REF. DES.	DESCRIPTION	WILTRON PART NO.	REF. DES.	DESCRIPTION	WILTRON PART NO.
C1	Monolithic, .1 μF	230-37	R1	Variable, 1-Turn, 20 k $\Omega$	156-20K
C2	Monolithic, .1 μF	230-37	R2	MF, $1/4W$ , $1\%$ , $61.9 \text{ k}\Omega$	110-61.9k-1
C3	Tantalum, 35V, 6.8 μF	250-41A	R3	Variable, 10-Turn 1 k $\Omega$	157-1k
C4	Monolithic, .1 μF	230-37	R4 R5	MF, $1/4$ W, $1\%$ , $11$ k $\Omega$ Variable, $10$ -Turn, $50$ k $\Omega$	110-11k-1 157-50k
C5	Tantalum, 35V, 6.8 μF	250-41A	R6	$CC, 1/4W, 5\%, 3.6 M\Omega$	101-3.6M-5
C6	Monolithic, .1 μF	230-37	R7	Variable, 10-Turn, 1 k $\Omega$	157-1k
C7	Tantalum, 35V, 6.8 μF	250-41A	R8	MF, $1/4W$ , 1%, 11 k $\Omega$	110-11k-1
C8	Monolithic, .1 μF	230-37 230-11	R9	Variable, 10-Turn, 20 kΩ	157-20k
C9 C10	Ceramic, .01 μF Ceramic, .001 μF	230-30	R10	MF, $1/4$ W, $1\%$ , $100$ kΩ	110-100k-1
C10	Tantalum, 1 µF, 35V	250-19	R11	MF, $1/4$ W, $1\%$ , $100$ kΩ	110-100k-1
C12	Tantalum, 1 µF, 35V	250-19	R12	Variable, 10-Turn, 5 k $\Omega$	157-5k
C13	Monolithic, 1 µF	230-41	R13	MF, $1/4W$ , 1%, 56.3 k $\Omega$	110-56.3k-1
C14	Monolithic, .1 μF	230-37	R14	MF, $1/4W$ , $1\%$ , $4.22 \text{ k}\Omega$	110-4.22k-1
C15	Mica, 300 pF	220-300	R15	WW, 5W, 5Ω	131-3
C16	Tantalum, 35V, 6.8 μF	250-41A	R16 R17	MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 3.24 kΩ	110-100k-1 110-3.24k-1
C17	Ceramic, .001 µF	230-30	R18	MF, $1/4W$ , $1\%$ , $3.24 \text{ K}$ MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-3.24k-1 110-10k-1
C18	Ceramic, .01 μF	230-11	R19	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
C19	Tantalum, 35V, 4.7 μF	250-39	R20	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
C21	Mica, 8.2 pF	221-8.2	R21	MF, $1/4W$ , 1%, 23.7 k $\Omega$	110-23.7k-1
C22 C23	Ceramic, .01 µF	230-11 230-11	R22	MF, 1/4W, 1%, 1 kΩ	110-1k-1
C 23	Ceramic, .01 μF Ceramic, .01 μF	230-11	R23	MF, $1/4W$ , $1\%$ , $121\Omega$	110-121-1
C25	Ceramic, .01 µF	230-11	R24	MF, $1/4$ W, $1\%$ , $1$ k $\Omega$	110-1k-1
C26	Monolithic, .1 μF	230-37	R25	MF, $1/4W$ , $1\%$ , $7.5 k\Omega$	110-7.5k-1
020	, [-1		R26	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1
			R27	MF, 1/4W, 1%, 5.11 kΩ	110-5.11k-1
			R28 R29	MF, $1/4$ W, $1\%$ , $18.7$ k $\Omega$ MF, $1/4$ W, $1\%$ , $562$ k $\Omega$	110-18.7k-1 110-562k-1
	DIODES		R29	MF, $1/4$ W, $1\%$ , $562$ kM MF, $1/4$ W, $1\%$ , $18.7$ k $\Omega$	110-362k-1 110-18.7k-1
			R31	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1
REF.		WILTRON	R32	MF, $1/4$ W, $1\%$ , $18.7$ kΩ	110-18.7k-1
DES.	DESCRIPTION	PART NO.	R33	MF, $1/4$ W, $1\%$ , $18.7$ kΩ	110-18.7k-1
			R34	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1
CR1	Silicon, 1N4446	10-1N4446	R35	MF, $1/4W$ , $1\%$ , $562 k\Omega$	110-562k-1
CR2	Silicon, 1N4446	10-1N4446	R36	Variable, 10-Turn, 2 kΩ	157-2k
CR3 CR4	Silicon, 1N4446	10-1N4446 10-SI2	R37	MF, 1/4W, 1%, 20 kΩ	110-20k-1
CR4 CR5	Silicon, SI2 Zener, 24V, 1W, 1N4749A	10-312 10-1N4749A	R38	Variable, 10-Turn, 50 k $\Omega$	157-50k
CR6	Silicon, 1N4446	10-1N4446	R39 R40	MF, $1/4$ W, $1\%$ , $205 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $75 \text{ k}\Omega$	110-205k-1 110-75k-1
CR7	Silicon, 1N4446	10-1N4446	R40	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ	110-10k-1
CR8	Zener, 6.8V, 1W, 1N4736A	10-1N4736A	R42	MF, 1/4W, 1%, 15 kΩ MF, 1/4W, 1%, 15 kΩ	110-15k-1
CR9	Silicon, 1N4446	10-1N4446	R43	MF, $1/4W$ , $1\%$ , $11 k\Omega$	110-11k-1
CR10	Silicon, 1N4446	10-1N4446	R44	MF, $1/4W$ , $1\%$ , $3.24 \text{ k}\Omega$	110-3.24k-1
CR11	Silicon, 1N4446	10-1N4446	R45	MF, $1/4W$ , $1\%$ , $3.24 \text{ k}\Omega$	110-3.24k-1
			R46	MF, $1/4$ W, $1\%$ , $1$ k $\Omega$	110-1k-1
			R47	MF, $1/4$ W, $1\%$ , $511\Omega$	110-511-1
	TRANSISTORS		R48	MF, 1/4W, 1%, 5.11Ω	110-5.11-1
	IKANSISTORS		R49	MF, 1/4W, 1%, 5.11Ω	110-5.11-1
DEE		WILTRON	R50 R51	MF, $1/4$ W, $1\%$ , $2.74$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$	110-2.74k-1 110-10k-1
REF.	DESCRIPTION	PART NO.	R51	MF, $1/4$ W, $1/6$ , $10$ KΩ MF, $1/4$ W, $1\%$ , $750$ kΩ	110-750k-1
DES.	DESCRIPTION	1.111.110.	R53	MF, $1/4W$ , $1\%$ , $130 \text{ K}$	110-14.7k-1
Q1	PNP, MPSA92	20-MPSA92	R54	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
Q2	PNP, MPSA92	20-MPSA92	R55	MF, 1/4W, 1%, 750 kΩ	110-750k-1
Q3	PNP, 2N2907A	20-2N2907A	R56	MF, $1/4W$ , 1%, 14.7 k $\Omega$	110-14.7k-1
Q4	NPN, 2N2222A	20-2N2222A	R57	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1
Q5	PNP, 2N2907A	20-2N2907A	R58	Variable, 10-Turn, $500\Omega$	157-500
Q6	NPN, 2N3694	20-2N3694	R59	MF, $1/4W$ , $1\%$ , $2 k\Omega$	110-2k-1
Q7	NPN, MPSU04	20-MPSU04	R60	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
Q8	PNP, 2N2907A	20-2N2907A	R61	MF, 1/4W, 1%, 750 kΩ	110-750k-1
Q9	NPN, 2N2222A	20-2N2222A	R62	MF, $1/4W$ , $1\%$ , $14.7 \text{ k}\Omega$	110-14.7k-1

R63	MF, $1/4W$ , 1%, 6.49 k $\Omega$	110-6.49k-1	R97	MF, $1/4$ W, $1\%$ , $15$ k $Ω$	110-15k-1
R64	MF, $1/4W$ , $1\%$ , $2 k\Omega$	110-2k-1	R98	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
R65	Variable, 10-Turn, $500\Omega$	157-500	R99	MF, $1/4W$ , $1\%$ , $750 \text{ k}\Omega$	110-750k-1
R66	Variable, 1-Turn, 500 kΩ	156-500k	R100	MF, $1/4W$ , 1%, 14.7 k $\Omega$	110-14.7k-1
R67	MF, $1/4W$ , 1%, 20 k $\Omega$	110-20k-1	21200	1111 , 1, 111 , 170 , 110 , 110	110 11.11 1
R68	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1			
R69	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1		INTEGRATED CIRCUITS	
R70	MF, $1/4W$ , $1\%$ , $15 k\Omega$	110-15k-1			
R71	MF, 1/4W, 1%, 1.30 kΩ	110-13R-1 110-1.30k-1	REF.		WILTRON
R72	MF, $1/4W$ , $1\%$ , $8.87 \text{ k}\Omega$	110-1.30k-1 110-8.87k-1	DES.	DESCRIPTION	PART NO.
R73	MF, $1/4W$ , $1\%$ , $3.40 \text{ k}\Omega$				
R74	MF, $1/4W$ , $1\%$ , $5.40 \text{ K}$ ? MF, $1/4W$ , $1\%$ , $5.11 \text{ k}$ ?	110-3.40k-1 110-5.11k-1	U1	Quad EX-OR Gate, 74LS86	54-125
R75	MF, $1/4W$ , $1/8$ , $3.11 \text{ K}$ MF, $1/4W$ , $1\%$ , $301\Omega$		U2	Quad Op Amp, TL074	54-132
R76		110-301-1	U3	Quad Analog Switch, LF13201	54-20
R77	MF, 1/4W, 1%, 1.21 kΩ	110-1.21k-1	U4	Op-Amp, OP05	54-87
	MF, 1/4W, 1%, 17.8 kΩ	110-17.8k-1	U5	2k x 8 EPROM	Not Field-
R78	MF, 1/4W, 1%, 511Ω	110-511-1			Replaceable
R79	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1	U7	Dual Analog Switch, DG200	50-DG200BA
R80	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1	U8	Dual Op-Amp, TL072	54-53
R81	MF, $1/4$ W, $1\%$ , $110$ kΩ	110 <b>-</b> 110k-1	U9	Quad Volt Comparator, MC3302P	54-53 54-MC3302P
R82	MF, $1/4W$ , $1\%$ , $2 k\Omega$	110-2k-1	U10	Input NAND Gate, 74LS10	54-MC3302P 54-42
R83	MF, $1/4$ W, $1\%$ , $5.11$ kΩ	110-5.11k-1	010	mput NAND Gate, 74L510	54-42
R84	MF, $1/4W$ , $1\%$ , $1 M\Omega$	110-1M-1			
R85	MF, $1/4$ W, $1\%$ , $100$ kΩ	110-100k-1		MISCELLANEOUS	
R86	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1			
R87	MF, $1/4W$ , $1\%$ , $5.11 k\Omega$	110-5.11k-1	REF.		WILTRON
R88	Variable, 1-Turn, 20Ω	156-20	DES.	DESCRIPTION	PART NO.
R89	MF, $1/4W$ , 1%, 14.7 k $\Omega$	110-14.7k-1	225	22501111 11011	11111111101
R91	MF, $1/4$ W, $1\%$ , 20 kΩ	110-20k-1		Ejector, P.C. Board	553-96
R92	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1	TP1	Ljector, 1.e. Doard	333 /0
R93	MF, $1/4W$ , 1%, $511\Omega$	110-511-1	thru		
R94	MF, 1/4W, 1%, 5.11 kΩ	110-5.11k-1	TP5	Pin, Test Point	706-44
R95	MF, $1/4$ W, 1%, $5.11 \text{ k}\Omega$	110-5.11k-1	K1	Relay, 2 Form C	690-28
R96	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-3.11k-1 110-1k-1	<u></u>		•
20,0	1121 , 1/ 111 , 1/0, 1 K36	110-1K-1		Socket, I.C., 24-Pin	553-67

Table 6-8. A6 HET/YIG Driver, 2-8 GHz, 6621A/6637A/6638A/6647A/6648A (660-D-8007-3, -5, -99-91)

	CAPACITORS			DIODES	
REF. DES.	DESCRIPTION	WILTRON PART NO.	REF. DES.	DESCRIPTION	WILTRON PART NO.
C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13	Monolithic, .1 µF Monolithic, .1 µF Tantalum, 35V, 6.8 µF Monolithic, .1 µF Tantalum, 35V, 6.8 µF Monolithic, .1 µF Tantalum, 35V, 6.8 µF Monolithic, .1 µF Ceramic, .01 µF Ceramic, .001 µF Tantalum, 1 µF, 35V Tantalum, 1 µF, 35V Monolithic, 1 µF	230-37 230-37 250-41 230-37 250-41 230-37 250-41 230-37 230-11 230-30 250-19 250-19	CR1 CR2 CR3 CR4 CR5 CR6 CR7 CR8 CR9 CR10	Silicon, 1N4446 Silicon, 1N4446 Silicon, 1N4446 Silicon, SI2 Zener, 24V, 1W, 1N4749A Silicon, 1N4446 Silicon, 1N4446 Zener, 6.8V, 1W, 1N4736A Silicon, 1N4446 Silicon, 1N4446 Silicon, 1N4446	10-1N4446 10-1N4446 10-SIZ 10-1N4749A 10-1N4446 10-1N4446 10-1N4736A 10-1N4446 10-1N4446 10-1N4446
C14 C15 C16	Monolithic, .1 μF Mica, 300 pF Tantalum, 35V, 6.8 μF	230-37 220-300 250-41	REF. DES.	TRANSISTORS  DESCRIPTION	WILTRON PART NO.
C18 C19 C21 C22 C23 C24 C25	Ceramic, .01 µF Tantalum, 35V, 6.8 µF Mica, 8.2 pF Mica, 820 pF Ceramic, .01 µF Ceramic, .01 µF Ceramic, .01 µF	230-11 250-41 221-8.2 220-820 230-11 230-11	Q1 Q2 Q3 Q4 Q5 Q6	PNP, MPSA92 PNP, MPSA92 PNP, 2N2907A NPN, 2N2222A PNP, 2N2907A NPN, 2N3694	20-MPSA92 20-MPSA92 20-2N2907 A 20-2N2222A 20-2N2907 A 20-2N3694

Q7	NPN, MPSU04	20-MPSU04 <b>[</b>	R52	MF, 1/4W, 1%, 750 kΩ	110-750k-1
Q8	PNP, 2N2907A	20-2N2907A	R53	MF, $1/4W$ , $1\%$ , $14.7 \text{ k}\Omega$	110-14.7k-1
Q9	NPN, 2N2222A	20-2N2222A	R54	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
			R55	MF, $1/4W$ , $1\%$ , $750 \text{ k}\Omega$	110-750k-1
	RESISTORS		R56	MF, $1/4$ W, $1\%$ , $14.7 \text{ k}\Omega$	110-14.7k-1
	RESISTORS		R57 <sup>1</sup> R57 <sup>2</sup>	MF, $1/4$ W, $1\%$ , $2.74$ k $\Omega$	110-2.74k-1
REF.		WILTRON	R57 <sup>3</sup>	MF, 1/4W, 1%, 3.16k	110-3.16k-1 110-2.74k-1
DES.	DESCRIPTION	PART NO.	R58	MF, $1/4$ W, $1\%$ , $2.74$ k Variable, $10$ -Turn, $500\Omega$	157-500
			R59	MF, $1/4$ W, $1\%$ , $2 k\Omega$	110-2k-1
R1	Variable, 1-Turn, 20 k $\Omega$	156-20k	R60	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
R2	MF, 1/4W, 1%, 61.9 kΩ	110-61.9k-1	R61	MF, $1/4$ W, $1\%$ , $750 \text{ k}\Omega$	110-750k-1
R3	Variable, 10-Turn 1 k $\Omega$	157-1k	R62	MF, $1/4$ W, $1\%$ , $14.7$ kΩ	110-14.7k-1
R4	MF, $1/4$ W, $1\%$ , $11$ k $\Omega$	110-11k-1	R63 <sup>1</sup>	MF, $1/4W$ , 1%, 18.2 k $\Omega$	110-18.2k-1
R5	MF, $1/4$ W, $1\%$ , $5.11$ kΩ	110-5.11k-1	R63 <sup>2</sup>	MF, 1/4W, 1%, 20k	110-20k-1
R6	CC, $1/4$ W, 5%, $3.6$ M $\Omega$	101-3.6M-5	R64	MF, $1/4W$ , $1\%$ , $2 k\Omega$	110-2k-1
R7	Variable, 10-Turn, 1 kΩ	157-1k	R65	Variable, 10-Turn, 500 $\Omega$	157-500
R8 R9	MF, 1/4W, 1%, 11 kΩ	110-11k-1	R66	Variable, 1-Turn, 500 k $\Omega$	156-500k
R10	Variable, 10-Turn, 200 k $\Omega$ MF, 1/4W, 1%, 205 k $\Omega$	157-200k 110-205k-1	R67	MF, $1/4W$ , $1\%$ , $20 \text{ k}\Omega$	110-20k-1
R11	MF, $1/4W$ , $1\%$ , $100 \text{ k}\Omega$	110-203k-1 110-100k-1	R68	MF, 1/4W, 1%, 10 kΩ	110-10k-1
R12	Variable, 10-Turn, 20 k $\Omega$	157-20k	R69	MF, 1/4W, 1%, 10 kΩ	110-10k-1
R13	MF, $1/4$ W, $1\%$ , $75 k\Omega$	110-75k-1	R70 R71	MF, $1/4$ W, $1\%$ , $15$ k $\Omega$	110-15k-1 110-1.30k-1
R14 <sup>1</sup>	MF, $1/4$ W, $1\%$ , $9.76$ kΩ	110-9.76k-1	R72	MF, 1/4W, 1%, 1.30 kΩ MF, 1/4W, 1%, 8.87 kΩ	110-1.30k-1 110-8.87k-1
R14 <sup>2</sup>	MF, 1/4W, 1%, 10.2k	110-10.2k-1	R73	MF, $1/4W$ , $1\%$ , $3.40 \text{ k}\Omega$	110-3.40k-1
R14 <sup>3</sup>	MF, 1/4W, 1%, 6.65k	110-6.65k-1	R74	MF, $1/4W$ , $1\%$ , $5.40 \text{ km}$	110-5.11k-1
R15	ww, 5w, 5Ω	131-3	R75	MF, $1/4W$ , $1\%$ , $301\Omega$	110-301-1
R16	MF, $1/4$ W, $1\%$ , $100$ k $Ω$	110-100k-1	R76	MF, $1/4W$ , 1%, 1.21 k $\Omega$	110-1.21k-1
R171	MF, $1/4$ W, $1\%$ , $3.24$ k $\Omega$	110-3.24k-1	R77	MF, $1/4W$ , $1\%$ , $17.8 \text{ k}\Omega$	110-17.8k-1
R17 <sup>2</sup>	MF, 1/4W, 1%, 3.16k	110-3.16k-1	R78	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
R17 <sup>3</sup>	MF, 1/4W, 1%, 3.24k	110-3.24k-1	R79	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R18 R19	MF, 1/4W, 1%, 10 kΩ	110-10k-1	R80	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R19 R20	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ	110-10k-1	R81	MF, $1/4W$ , $1\%$ , $205 k\Omega$	110-205k-1
R21	MF, $1/4W$ , $1\%$ , $10 \text{ K}$ MF, $1/4W$ , $1\%$ , $23.7 \text{ k}$ $\Omega$	110-10k-1 110-23.7k-1	R82	MF, $1/4$ W, $1\%$ , $2 k\Omega$	110-2k-1
R22	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-23.7k-1 110-1k-1	R83	MF, 1/4W, 1%, 5.11 kΩ	110-5.11k-1
R23	MF, $1/4W$ , $1\%$ , $121\Omega$	110-121-1	R84	MF, 1/4W, 1%, 1 MΩ	110-1M-1
R24	MF, $1/4$ W, $1\%$ , $1 k\Omega$	110-1k-1	R85 R86	Variable, 1-Turn, 100k MF, 1/4W, 1%, 5.11Ω	156-100k 110-5.11-1
R25	MF, $1/4W$ , $1\%$ , $7.5 k\Omega$	110-7.5k-1	R87	MF, $1/4W$ , $1\%$ , $5.11M$ MF, $1/4W$ , $1\%$ , $5.11 k\Omega$	110-5.11k-1
R26	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1	R88	Variable, 1-Turn, $20\Omega$	156-20
R27	MF, $1/4W$ , $1\%$ , $5.11 k\Omega$	110-5.11k-1	R89	MF, $1/4W$ , $1\%$ , $15 k\Omega$	110-15k-1
R28,	MF, $1/4W$ , $1\%$ , $18.7 k\Omega$	110-18.7k-1	R90	MF, $1/4W$ , 1%, 33.2 k $\Omega$	110-33.2k-1
R291	MF, $1/4$ W, $1\%$ , $536$ k $\Omega$	110-536k-1	R90 <sup>3</sup>	MF, 1/4W, 1%, 31.6k	110-31.6k-1
R29 <sup>2</sup>	MF, $1/4W$ , $1\%$ , $526\Omega$	110-526-1	R91	MF, $1/4W$ , $1\%$ , $33.2 k\Omega$	110-33.2k-1
R30	MF, 1/4W, 1%, 18.7 kΩ	110-18.7k-1	R91 <sup>3</sup>	MF, 1/4W, 1%, 20k	110-20k-1
R31	MF, 1/4W, 1%, 18.7 kΩ	110-18.7k-1	R92	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
R32 R33	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ	110-18.7k-1 110-18.7k-1	R93	MF, $1/4$ W, $1\%$ , $511\Omega$	110-511-1
R34	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1 110-18.7k-1	R94	MF, 1/4W, 1%, 5.11 kΩ	110-5.11k-1
R35 <sup>1</sup>	MF, 1/4W, 1%, 536 kΩ MF, 1/4W, 1%, 536 kΩ	110-18.7k-1 110-536k-1	R95	MF, 1/4W, 1%, 5.11 kΩ	110-5.11k-1
R35 <sup>2</sup>	MF, $1/4W$ , $1\%$ , $526\Omega$	110-526-1	R96 R97	MF, $1/4$ W, $1\%$ , $1 k\Omega$ MF, $1/4$ W, $1\%$ , $15 k\Omega$	110-1k-1 110-15k-1
R36	Variable, 10-Turn, 2 kΩ	157-2k	R98	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-13k-1 110-10k-1
R37	MF, $1/4\dot{W}$ , $1\%$ , $20$ kΩ	110-20k-1	R99	MF, $1/4W$ , $1\%$ , $750 \text{ k}\Omega$	110-750k-1
R38	Variable, 10-Turn, 50 k $\Omega$	157-50k	R100	MF, $1/4W$ , 1%, 14.7 k $\Omega$	110-14.7k-1
R39	MF, $1/4W$ , $1\%$ , $205 k\Omega$	110-205k-1		, , , , , , , , , , , , , , , , , , , ,	
R40	MF, $1/4$ W, $1\%$ , $75$ k $\Omega$	110-75k-1			
R41	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1		INTEGRATED CIRCUITS	
R42	MF, $1/4$ W, $1\%$ , $15 \text{ k}\Omega$	110-15k-1			
R43	MF, 1/4W, 1%, 11 kΩ	110-11k-1	REF.		WILTRON
R44	MF, 1/4W, 1%, 3.24 kΩ	110-3.24k-1	DES.	DESCRIPTION	PART NO.
R45 R46	MF, $1/4$ W, $1\%$ , $3.24$ k $\Omega$ MF, $1/4$ W, $1\%$ , $1$ k $\Omega$	110-3.24k-1 110-1k-1	TT 1	Ound EV. OD C-4- 741 004	E4 125
R40 R47	MF, $1/4W$ , $1\%$ , $1RR$ MF, $1/4W$ , $1\%$ , $511\Omega$	110-12-1	U1 U2	Quad EX-OR Gate, 74LS86	54-125 54-132
R48	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1	U3	Quad Op Amp, TL074 Quad Analog Switch, LF13201	54-132 54-20
R49	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1	U4	Op-Amp, OP05	54-87
R50	MF, $1/4W$ , 1%, 2.74 k $\Omega$	110-2.74k-1	U5	2k x 8 EPROM, 2716	Not Field-
R51	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1		,	Replaceable
			U7	Dual Analog Switch, DG200	50-DG200BA
1 Used	on 660-D-8007-3 assembly.		U8	Dual Op-Amp, TL072	54-53
<sup>2</sup> Used (	on 660-D-8007-5 assembly.		U9	Quad Volt Comparator, MC3302P	54-MC3302P
3 Used	on 660-D-8007-99-91 assembly.		U10	Input NAND Gate, 74LS10	54-42

MISCELLANEOUS			TP1		
REF.		WILTRON	thru		
DES.	DESCRIPTION	PART NO.	TP5	Pin, Test Point	706-44
220.	DESCRIPTION	PART NO.	K1	Relay, 2 Form C	690-28
	Ejector, P.C. Board	553-96	i	Socket, I.C., 24-Pin	553-67

Table 6-9. A6 YIG Driver, 2-8 GHz, 6621A-40/6637A-40 (660-D-12868-3, -99-91)

	CAPACITORS		Q8	PNP, 2N2907A	20-2N2907A
REF.		WILTRON	Q9	NPN, 2N2222A	20-2N2222A
DES.	DESCRIPTION	PART NO.		RESISTORS	
C1	Monolithic, .1 μF	230-37	DEE		
C2	Monolithic, .1 µF	230-37	REF. DES.	DESCRIPTION	WILTRON
C3 C4	Tantalum, 35V, 6.8 μF	250-41	DEG.	DESCRIPTION	PART NO.
C5	Monolithic, .1 μF Tantalum, 35V, 6.8 μF	230-37 250-41	R1	Variable, 1-Turn, 20 kΩ	156-20k
C6	Monolithic, .1 μF	230-37	R2	MF, $1/4W$ , 1%, 61.9 k $\Omega$	110-61.9k-1
C7	Tantalum, 35V, 6.8 µF	250-41	R3	Variable, 10-Turn, 1 kΩ	157-1k
C8	Monolithic, .1 µF	230-37	R4	MF, $1/4W$ , $1\%$ , $11 k\Omega$	110-11k-1
C9	Ceramic, .01 µF	230-11	R5.	MF, $1/4W$ , $1\%$ , $50 k\Omega$	110-50k-1
C10	Ceramic, .001 µF	230-30	R6	CC, $1/4$ W, 5%, 3.6 M $\Omega$	101-3.6M-5
C11	Tantalum, 1 µF, 35V	250-19	R7	Variable, 10-Turn, 1 k $\Omega$	157-1k
C12	Tantalum, 1 µF, 35V	250-19	R8	MF, 1/4W, 1%, 11 kΩ	110-11k-1
C13	Monolithic, 1 μF	230-41	R9	Variable, 10-Turn, 200 k $\Omega$	157-200k
C14	Monolithic, .1 μF	230-37	R10	MF, $1/4$ W, $1\%$ , $205$ kΩ	110-205k-1
C15	Mica, 300 pF	220-300	R11	MF, $1/4$ W, $1\%$ , $100$ kΩ	110-100k-1
C16	Tantalum, 35V, 6.8 μF	250-41	R12	Variable, 10-Turn, 20 kΩ	157-20k
C17	Ceramic, .001 μF	230-30	R13	MF, $1/4$ W, $1\%$ , $75$ kΩ	110-75k-1
C18	Ceramic, .01 µF	230-11	R14	MF, 1/4W, 1%, 9.76 kΩ	110-9.76k-1
C19	Tantalum, 35V, 6.8 $\mu$ F	250-41	R14 <sup>1</sup>	MF, 1/4W, 1%, 6.65k	110-6.65k-1
C21	Mica, 8.2 pF	221-8.2	R15	WW, 5W, 5Ω	131-3
C22	Mica, 820 pF	220-820	R16 R17	MF, $1/4W$ , $1\%$ , $100 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $3.24 \text{ k}\Omega$	110-100k-1
C 23	Ceramic, .01 µF	230-11	R18	MF, $1/4$ W, $1\%$ , $3.24$ kW MF, $1/4$ W, $1\%$ , $10$ k $\Omega$	110-3.24k-1
C24	Ceramic, .01 µF	230-11	R19	MF, $1/4W$ , $1\%$ , $10 \text{ K}\Omega$	110-10k-1
C 25	Ceramic, .01 µF	230-11	R20	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1 110-10k-1
C26	Monolithic, .1 μF	230-37	R21	MF, $1/4W$ , $1\%$ , $10 \text{ K}$ MF, $1/4W$ , $1\%$ , $23.7 \text{ k}\Omega$	110-10k-1 110-23.7k-1
	DIODEC		R22	MF, $1/4W$ , $1\%$ , $23.7$ K% MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-23.7k=1 110-1k-1
	DIODES		R23	MF, $1/4W$ , $1\%$ , $121\Omega$	110-121-1
REF.		WILTRON	R24	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1
DES.	DESCRIPTION	PART NO.	R25	MF, $1/4$ W, $1\%$ , $7.5$ k $\Omega$	110-7.5k-1
			R26	MF, $1/4W$ , 1%, $5.11\Omega$	110-5.11-1
CR1	Silicon, 1N4446	10-1N4446	R27	MF, $1/4W$ , $1\%$ , $5.11 k\Omega$	110-5.11k-1
CR2	Silicon, 1N4446	10-1N4446	R28	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1
CR3	Silicon, 1N4446	10-1N4446	R29	MF, $1/4W$ , $1\%$ , $536 k\Omega$	110-536k-1
CR4 CR5	Silicon, SI2	10-SI2	R30	MF, $1/4$ W, $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1
	Zener, 24V, 1W, 1N4749A	10-1N4749A	R31	MF, $1/4$ W, $1\%$ , $18.7$ k $Ω$	110-18.7k-1
CR6 CR7	Silicon, 1N4446 Silicon, 1N4446	10-1N4446	R32	MF, $1/4W$ , $1\%$ , $18.7 k\Omega$	110-18.7k-1
CR8	Zener, 6.8V, 1W, 1N4736A	10-1N4446 10-1N4736A	R33	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1
CR9	Silicon, 1N4446	10-1N4446	R34	MF, $1/4W$ , 1%, $18.7 \text{ k}\Omega$	110-18.7k-1
CR10	Silicon, 1N4446	10-1N4446 10-1N4446	R35	MF, $1/4$ W, $1\%$ , $536$ k $\Omega$	110-536k-1
CR11	Silicon, 1N4446	10-1N4446	R36	Variable, 10-Turn, 2 k $\Omega$	110-2k-1
01111	J. 1111110	10 1111110	R37	MF, 1/4W, 1%, 20 kΩ	110-20k-1
	TRANSISTORS		R38	Variable, 10-Turn, 50 k $\Omega$	110-50k-1
			R39 R40	MF, 1/4W, 1%, 205 kΩ MF, 1/4W, 1%, 75 kΩ	110-205k-1
REF.		WILTRON	R40	MF, $1/4$ W, $1\%$ , $75$ KM MF, $1/4$ W, $1\%$ , $10$ k $\Omega$	110-75k-1
DES.	DESCRIPTION	PART NO.	R42	MF, $1/4W$ , $1\%$ , $10 \text{ K}$ MF, $1/4W$ , $1\%$ , $9.53 \text{ k}$ $\Omega$	110-10k-1 110-9.53k-1
Q1	PNP, MPSA92	20-MPSA92	R43	MF, $1/4W$ , $1\%$ , $7.33$ k% MF, $1/4W$ , $1\%$ , $11$ k $\Omega$	110-9.53k-1 110-11k-1
Q2	PNP, MPSA92	20-MPSA92 20-MPSA92	R44	MF, $1/4W$ , $1\%$ , $3.24 \text{ k}\Omega$	110-11k-1 110-3.24k-1
Q3	PNP, 2N2907A	20-MP3A92 20-2N2907 A	R45	MF, $1/4W$ , $1\%$ , $3.24 \text{ k}\Omega$	110-3.24k-1
Q4	NPN, 2N2222A	20-2N2222A	R46	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1
Q5	PNP, 2N2907A	20-2N2907A	R47	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
Q6	NPN, 2N3694	20-2N3694	R48	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1
Q7	NPN, MPSU04	20-MPSU04	R49	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1
			R50	MF, $1/4W$ , $1\%$ , $2.74 \text{ k}\Omega$	110-2.74k-1
<sup>†</sup> Used c	on 660-D-12868-99-91		R51	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1

R52	MF, $1/4$ W, $1\%$ , $750$ kΩ	110-750k-1	R88	Variable, 1-Turn $20\Omega$	156-20
R53	MF, $1/4W$ , 1%, 14.7 k $\Omega$	110-14.7k-1	R89	MF, 1/4W, 1%, 15k	110-15k-1
R54	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1	R90	MF, $1/4W$ , $1\%$ , $33.2 \text{ k}\Omega$	110-33.2k-1
R55	MF, $1/4$ W, $1\%$ , $750$ kΩ	110-750k-1	$R90^{1}$	MF, $1/4W$ , $1\%$ , $31.6 \text{ k}\Omega$	110-31.6k-1
R56	MF, $1/4W$ , $1\%$ , $14.7 \text{ k}\Omega$	110-14.7k-1	R91	MF, $1/4$ W, $1\%$ , $33.2$ kΩ	110-33.2k-1
R57	MF, $1/4$ W, $1\%$ , $2.74$ kΩ	110-2.74k-1	R91 <sup>1</sup>	MF, 1/4W, 1%, 31.6 kΩ	110-31.6k-1
R58	Variable, 10-Turn, 500Ω	157-500	R92	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
R59	MF, $1/4$ W, $1\%$ , $2$ k $\Omega$	110-2k-1	R93	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
R60	MF, 1/4W, 1%, 10 kΩ	110-10k-1	R94	Variable, 10-Turn, 20 k $\Omega$	157-20k
R61	MF, $1/4$ W, $1\%$ , $750$ kΩ	110-750k-1	R95	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1
R62	MF, $1/4$ W, $1\%$ , $14.7 \text{ k}\Omega$	110-14.7k-1	R96	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
R63	MF, $1/4W$ , $1\%$ , $18.2 \text{ k}\Omega$	110-18.2k-1	R97	MF, $1/4W$ , $1\%$ , $750 \text{ k}\Omega$	110-750k-1
R64	MF, $1/4W$ , $1\%$ , $2 k\Omega$	110-2k-1	R98	MF, $1/4W$ , $1\%$ , $14.7 k\Omega$	110-14.7k-1
R65	Variable, 10-Turn, $500\Omega$	157-500		, , , ,	
R66	Variable, 1-Turn, $500 \text{ k}\Omega$	156-500k		INTEGRATED CIRCUITS	
R67	MF, $1/4W$ , $1\%$ , $20 k\Omega$	110-20k-1			
R68	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1	REF.		WILTRON
R69	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1	DES.	DESCRIPTION	PART NO.
R70	MF, $1/4W$ , $1\%$ , $15 k\Omega$	110-15k-1			
R71	MF, $1/4W$ , $1\%$ , $1.30 \text{ k}\Omega$	110-1.30k-1	<b>U4</b>	Op-Amp, OP05	54~87
R72	MF, $1/4W$ , $1\%$ , $8.87 \text{ k}\Omega$	110-8.87k-1	บ5	2k x 8 EPROM	Not Field-
R73	MF, $1/4W$ , $1\%$ , $3.40 \text{ k}\Omega$	110-3.40k-1			Replaceable
R74	MF, $1/4W$ , $1\%$ , $5.11 k\Omega$	110-5.11k-1	U8	Dual Op-Amp, TL072	•
R75					74-71
1(1)	MF, $1/4W$ , $1\%$ , $301\Omega$	110-301-1	U10		54-53 54-42
R76	MF, $1/4$ W, $1\%$ , $301\Omega$ MF, $1/4$ W, $1\%$ , $1.21 k\Omega$	110-301-1 110-1.21k-1	U10	Input NAND Gate, 74LS10	54-53 54-42
	MF, $1/4W$ , $1\%$ , $1.21 \text{ k}\Omega$	110-1.21k-1	U10	Input NAND Gate, 74LS10	
R76	MF, $1/4W$ , $1\%$ , $1.21 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $17.8 \text{ k}\Omega$	110-1.21k-1 110-17.8k-1	U10		
R76 R77	MF, 1/4W, 1%, 1.21 kΩ MF, 1/4W, 1%, 17.8 kΩ MF, 1/4W, 1%, 511Ω	110-1.21k-1 110-17.8k-1 110-511-1		Input NAND Gate, 74LS10	54-42
R76 R77 R78	MF, 1/4W, 1%, 1.21 kΩ MF, 1/4W, 1%, 17.8 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ	110-1.21k-1 110-17.8k-1 110-511-1 110-10k-1	REF.	Input NAND Gate, 74LS10  MISCELLANEOUS	54-42 WILTRON
R76 R77 R78 R79	MF, 1/4W, 1%, 1.21 kΩ MF, 1/4W, 1%, 17.8 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ	110-1.21k-1 110-17.8k-1 110-511-1 110-10k-1 110-10k-1		Input NAND Gate, 74LS10	54-42
R76 R77 R78 R79 R80 R81	MF, 1/4W, 1%, 1.21 kΩ MF, 1/4W, 1%, 17.8 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 205 kΩ	110-1.21k-1 110-17.8k-1 110-511-1 110-10k-1 110-10k-1 110-205k-1	REF. DES.	Input NAND Gate, 74LS10  MISCELLANEOUS  DESCRIPTION	54-42 WILTRON PART NO.
R76 R77 R78 R79 R80 R81 R82	MF, 1/4W, 1%, 1.21 kΩ MF, 1/4W, 1%, 17.8 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 205 kΩ MF, 1/4W, 1%, 2 kΩ	110-1.21k-1 110-17.8k-1 110-511-1 110-10k-1 110-10k-1 110-205k-1 110-2k-1	REF. DES.	Input NAND Gate, 74LS10  MISCELLANEOUS	54-42 WILTRON
R76 R77 R78 R79 R80 R81	MF, 1/4W, 1%, 1.21 kΩ MF, 1/4W, 1%, 17.8 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 205 kΩ MF, 1/4W, 1%, 2 kΩ MF, 1/4W, 1%, 5.11 kΩ	110-1.21k-1 110-17.8k-1 110-511-1 110-10k-1 110-10k-1 110-205k-1 110-2k-1 110-5.11k-1	REF. DES.  TP1	Input NAND Gate, 74LS10  MISCELLANEOUS  DESCRIPTION	54-42 WILTRON PART NO.
R76 R77 R78 R79 R80 R81 R82 R83	MF, 1/4W, 1%, 1.21 kΩ MF, 1/4W, 1%, 17.8 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 205 kΩ MF, 1/4W, 1%, 2 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5,11 kΩ	110-1.21k-1 110-17.8k-1 110-511-1 110-10k-1 110-10k-1 110-205k-1 110-2k-1 110-5.11k-1 110-1M-1	REF. DES.  TP1 thru	Input NAND Gate, 74LS10  MISCELLANEOUS  DESCRIPTION  Ejector, P.C. Board	54-42 WILTRON PART NO. 553-96
R76 R77 R78 R79 R80 R81 R82 R83 R84 R85	MF, $1/4$ W, $1\%$ , $1.21$ kΩ MF, $1/4$ W, $1\%$ , $17.8$ kΩ MF, $1/4$ W, $1\%$ , $511$ Ω MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $205$ kΩ MF, $1/4$ W, $1\%$ , $2$ kΩ MF, $1/4$ W, $1\%$ , $5.11$ kΩ MF, $1/4$ W, $1\%$ , $5.11$ kΩ Variable, $1$ -Turn, $100$ kΩ	110-1.21k-1 110-17.8k-1 110-511-1 110-10k-1 110-10k-1 110-205k-1 110-2k-1 110-5.11k-1 110-1M-1 156-100k	REF. DES.  TP1 thru TP5	Input NAND Gate, 74LS10  MISCELLANEOUS  DESCRIPTION  Ejector, P.C. Board  Pin, Test Point	54-42  WILTRON PART NO.  553-96  706-44
R76 R77 R78 R79 R80 R81 R82 R83 R84	MF, 1/4W, 1%, 1.21 kΩ MF, 1/4W, 1%, 17.8 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 205 kΩ MF, 1/4W, 1%, 2 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5,11 kΩ	110-1.21k-1 110-17.8k-1 110-511-1 110-10k-1 110-10k-1 110-205k-1 110-2k-1 110-5.11k-1 110-1M-1	REF. DES.  TP1 thru	Input NAND Gate, 74LS10  MISCELLANEOUS  DESCRIPTION  Ejector, P.C. Board	54-42 WILTRON PART NO. 553-96

Table 6-10. A6 YIG Driver, 18-26.5 GHz, 6642 A (660-D-8190-99-98)

	CAPACITORS			DIODES	
REF. DES.	DESCRIPTION	WILTRON PART NO.	REF. DES.	DESCRIPTION	WILTRON PART NO.
C1 C2 C3 C4 C5 C6	Tantalum, 4.7 μF Tantalum, 4.7 μF Tantalum, 4.7 μF Disc Ceramic, .01 μF Disc Ceramic, .001 μF Tantalum, 1 μF	250-39 250-39 250-39 230-11 230-30	CR1 CR2 CR3 CR4 CR5	Silicon, 1N4446 Silicon, 1N4446 Silicon, SI2 Zener, 24V, 1W, 1N4749A Silicon, SI2	10-1N4446 10-1N4446 10-SI2 10-1N4749A 10-SI2
C7 C8 C9 C10	Tantalum, 1 µF Tantalum, 1 µF Monolithic, 1.0 µF Mica, 300 pF Monolithic, .1 µF Tantalum, 6.8 µF	250-19 250-19 230-41 220-300 230-37 250-41	CR6 CR7 CR8 CR9 CR10	Silicon, 1N4446 Silicon, 1N4446 Silicon, 1N4446 Zener, 10V, 0.4W, 1N758A Silicon, 1N4446	10-1N4446 10-1N4446 10-1N4446 10-1N758A 10-1N4446
C12 C13 C14 C16	Mica, 5 pF Monolithic, .1 μF Disc Ceramic, .01 μF	220-5 230-37 230-11		TRANSISTORS	
C17 C18 C19	Monolithic, .1 μF Disc Ceramic, .01 μF Disc Ceramic, .01 μF Disc Ceramic, .01 μF	230-37 230-11 230-11 230-11	REF. DES.	DESCRIPTION	WILTRON PART NO.
C 20 C 21 Used o	Mica, 820 pF Mica, 39 pF on 660-D-12868-99-91	220-820 220-39	Q1 Q2 Q3 Q4	PNP, MPSA92 PNP, MPSA92 NPN, 2N4249 NPN, MPSU55	20-MPSA92 20-MPSA92 20-2N4249 20-30

Q5	NPN, 2N2222A	20-2N2222A	R53	MF, $1/8W$ , $1\%$ , $1 k\Omega$	110-1k-1
Q6	PNP, 2N2907A	20-2N2907A	R54	MF, $1/8W$ , $1\%$ , $511\Omega$	110-511-1
Q7	NPN, 2N2222A	20-2N2222A	R55	CC, $1/2W$ , $5\%$ , $.5\Omega$	1025-5
Q8	NPN, 2N2222A	20-2N2222A	R56	CC, 1/2W, 5%, .5Ω	1025-5
	,		R57	MF, $1/8W$ , $1\%$ , $5.11\Omega$	110-5.11-1
	DECICTODO		R58	MF, 1/8W, 1%, 5.11Ω	110-5.11-1
	RESISTORS		R60	MF, $1/8W$ , $1\%$ , $2.15 \text{ k}\Omega$	110-2.15k-1
REF.		WILTRON	R61	MF, $1/8W$ , $1\%$ , $511\Omega$	110-511-1
DES.	DESCRIPTION	PART NO.	R62	MF, $1/8W$ , $1\%$ , $511\Omega$	110-511-1
	Discital from	1711(110)	R63	MF, $1/8W$ , $1\%$ , $10 k\Omega$	110-10k-1
R1	CC, $1/4$ W, 5%, $3.3$ M $\Omega$	101-3.3M-5	R64	MF, $1/8W$ , $1\%$ , $10 k\Omega$	110-10k-1
R2			R65	MF, $1/8W$ , $1\%$ , $750 k\Omega$	110-750k-1
R3	Variable, 10-Turn, 50 kΩ	157-50k	R66	MF, $1/8W$ , $1\%$ , $14.7 k\Omega$	110-14.7k-1
	CC, 1/4W, 5%, 3.6 MΩ	101-3.6M-5	R67	MF, $1/8W$ , $1\%$ , $5.11\Omega$	110-5.11-1
R4	MF, $1/8$ W, $1\%$ , $61.9$ k $\Omega$	110-61.9k-1	R68	Variable, 10-Turn, 500Ω	157-500
R5	Variable, 10-Turn, 1 kΩ	157-1k	R69	MF, $1/8W$ , $1\%$ , $2 k\Omega$	110-2k-1
R6	MF, $1/8W$ , $1\%$ , $10 k\Omega$	110-10k-1	R70	MF, $1/8W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R7	Variable, 10-Turn, 1 k $\Omega$	157-1k	R71	MF, $1/8W$ , $1\%$ , $750 \text{ k}\Omega$	110-750k-1
R8	MF, 1/8W, 1%, 10 kΩ	110-10k-1	R72		
R9	Variable, 10-Turn, 200 k $\Omega$	157-200k		MF, 1/8W, 1%, 14.7 kΩ	110-14.7k-1
R10	MF, $1/8W$ , $1\%$ , $301 k\Omega$	110-301k-1	R73	MF, 1/8W, 1%, 10 kΩ	110-10k-1
R11	MF, $1/8W$ , $1\%$ , $6.19 k\Omega$	110-6.19k-1	R74	MF, 1/8W, 1%, 10 kΩ	110-10k-1
R12	MF, $1/8W$ , $1\%$ , $20 k\Omega$	110-20k-1	R75	MF, $1/8$ W, $1\%$ , $205$ k $\Omega$	110-205k-1
R13	Variable, 1-Turn, 20 kΩ	156-20k	R76	MF, $1/8W$ , $1\%$ , $511\Omega$	110-511-1
R14	MF, $1/8W$ , $1\%$ , 2.61 k $\Omega$	110-2.61k-1	R77	Variable, 1-Turn, $20\Omega$	156-20
R15	MF, $1/8$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1	R78	MF, $1/8W$ , $1\%$ , $2 k\Omega$	110-2k-1
R16	MF, $1/8$ W, $1\%$ , $10$ kΩ	110-10k-1	R79	MF, $1/8W$ , $1\%$ , $14.7 k\Omega$	110-14.7k-1
R17	MF, $1/8$ W, $1\%$ , $10$ kΩ	110-10k-1 110-10k-1	R80	MF, $1/8W$ , $1\%$ , $23.7 k\Omega$	110-23.7k-1
R18	MF, $1/8$ W, $1\%$ , $23.7$ kΩ	110-10k-1 110-23.7k-1	R81	MF, $1/8W$ , $1\%$ , $23.7 k\Omega$	110-23.7k-1
R19	MF, 1/8W, 1%, 23.7 k% MF, 1/8W, 1%, 1 k $\Omega$		R82	MF, $1/8W$ , $1\%$ , $20 k\Omega$	110-20k-1
		110-1k-1	R83	MF, $1/8W$ , $1\%$ , $20 k\Omega$	110-20k-1
R20	MF, 1/8W, 1%, 121Ω	110-121-1	R84	MF, $1/8W$ , $1\%$ , 5.11 k $\Omega$	110-5.11k-1
R21	MF, 1/8W, 1%, 1 kΩ	110-1k-1	R85	MF, $1/8W$ , $1\%$ , $5.11 \text{ k}\Omega$	110-5.11k-1
R22	MF, $1/8$ W, $1\%$ , $7.5$ kΩ	110-7.5k-1	R86	MF, $1/8W$ , $1\%$ , $511\Omega$	110-511-1
R23	MF, $1/8$ W, $1\%$ , $511\Omega$	110-511-1			
R24	MF, $1/8W$ , $1\%$ , $5.11 k\Omega$	110-5.11k-1			
R25	$WW, 5W, 5\Omega$	131-3		MITECD ATED CIDCIITE	
R26	MF, $1/8W$ , $1\%$ , $15.4 \text{ k}\Omega$	110-15.4k-1		INTEGRATED CIRCUITS	
R27	MF, $1/8W$ , $1\%$ , $649\Omega$	110-649-1	ששת		WIII TOOM
R28	MF, $1/8W$ , $1\%$ , $6.19 \text{ k}\Omega$	110-6.19k-1	REF.	DECORPOR	WILTRON
R29	MF, $1/8$ W, $1\%$ , $1.37$ kΩ	110-1.37k-1	DES.	DESCRIPTION	PART NO.
R30	MF, $1/8W$ , $1\%$ , $3.83 \text{ k}\Omega$	110-3.83k-1			
R31	MF, 1/8W, 1%, 1 kΩ	110-1k-1	U1	Quad Analog Switch, LF13201	54-20
R32	MF, $1/8W$ , $1\%$ , $1.21 k\Omega$	110-1.21k-1	U2	NAND Gate, 74LS10	54-42
R33	MF, $1/8W$ , $1\%$ , $17.8 k\Omega$	110-17.8k-1	U3	Op Amp, OP05	54-87
R34	Variable, 1-Turn, 500 k $\Omega$	156-500k	U4	Dual Op Amp, TL072	54-53
R35	MF, $1/8W$ , $1\%$ , $49.9 k\Omega$	110-49.9k-1	U5	256 x 4 PROM,	Not Field-
R36	MF, $1/8W$ , $1\%$ , $5.11 k\Omega$	110-5.11k-1			Replaceable
R37	MF, $1/8W$ , $1\%$ , $5.11 k\Omega$	110-5.11k-1	U7	Quad Op Amp, TL074	54-132
R38	MF, $1/8W$ , $1\%$ , $18.7 k\Omega$	110-18.7k-1	U8	Quad Ex. OR Gate 74LS86	54-125
R39	MF, $1/8W$ , $1\%$ , $18.7 k\Omega$	110-18.7k-1	U9	Dual Volt. Comp., LM393	54-158
R40	MF, $1/8W$ , $1\%$ , $10 k\Omega$	110-10k-1			
R41	MF, $1/8$ W, $1\%$ , $133$ k $\Omega$	110-133k-1			
R42	Variable, 10-Turn, 50 k $\Omega$	157-50k		MISCELLANEOUS	
R43	MF, $1/8W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1		MISOLULINICOU	
R44	MF, 1/8W, 1%, 18.7 k $\Omega$	110-18.7k-1	REF.		WILTRON
R45	MF, 1/8W, 1%, 10.7 kΩ MF, 1/8W, 1%, 10 kΩ	110-10.7k-1 110-10k-1	DES.	DESCRIPTION	
R46			DES.	DESCRIPTION	PART NO.
R47	MF, 1/8W, 1%, 14.7 kΩ	110-14.7k-1	l _	Finaton D.C. Parad	552.04
	Variable, 10-Turn, 1 k $\Omega$	157-1k	 TD1	Ejector, P.C. Board	553-96
R48	MF, 1/8W, 1%, 11 kΩ	110-11k-1	TP1		
R49	MF, 1/8W, 1%, 10 kΩ	110-10k-1	thru	Di	70/ 44
R50	MF, $1/8$ W, $1\%$ , $511\Omega$	110-511-1	TP4	Pin, Test Point	706-44
R51	MF, 1/8W, 1%, 4.99 kΩ	110-4.99k-1	K1	Relay, 2 Form C	690-28
R52	MF, $1/8W$ , $1\%$ , $3.83 \text{ k}\Omega$	110-3.83k-1	l	Socket, I.C., 24-Pin	553-67

	CAPACITORS			RESISTORS	
REF. DES.	DESCRIPTION	WILTRON PART NO.	REF. DES.	DESCRIPTION	WILTRON PART NO.
C1	Monolithic, .1 μF	230-37	R1 R2	Variable, 1-Turn, 20 k $\Omega$ MF, 1/4W, 1%, 61.9 k $\Omega$	156-20K 110-61.9k-1
C2	Monolithic, .1 μF	230-37	R3	Variable, 10-Turn, 1 kΩ	157-1k
C3 C4	Tantalum, 35V, 6.8 μF Monolithic, .1 μF	250-41 230-37	R4	MF, $1/4$ W, $1\%$ , $11$ k $\Omega$	110-11k-1
C5	Tantalum, 35V, 6.8 μF	250-41	R5	Variable, 10-Turn, 50 kΩ	157-50k
C6	Monolithic, .1 μF	230-37	R6 R7	CC, $1/4W$ , $5\%$ , $3.6 M\Omega$ Variable, $10$ -Turn, $1 k\Omega$	101-3.6M-5 157-1k
C7	Tantalum, 35V, 6.8 μF	250-41	R8	MF, $1/4W$ , 1%, 11 k $\Omega$	110-11k-1
C8	Monolithic, .1 μF	230-37	R9	Variable, 10-Turn, 200 kΩ	157-200k
C9 C10	Ceramic, .01 μF Ceramic, .001 μF	230-11 230-30	R10	MF, $1/4W$ , $1\%$ , $205 \text{ k}\Omega$	110-205k-1
C11	Tantalum, 1 µF, 35V	250-19	R11	MF, 1/4W, 1%, 100 kΩ	110-100k-1
C12	Tantalum, 1 µF, 35V	250-19	R12 R13	Variable, 10-Turn, 20 k $\Omega$ MF, 1/4W, 1%, 110 k $\Omega$	157-20k 110-110k-1
C13	Monolithic, 1 μF	230-41	R14	MF, $1/4W$ , $1\%$ , $110 \text{ k}\Omega$	110-110k-1 110-14.0k-1
C14	Monolithic, .1 μF	230-37	R15	ww, 5w, 5Ω	131-3
C15 C16	Mica, 300 pF Tantalum, 35V, 6.8 μF	220-300 250-41	R16	MF, $1/4$ W, $1\%$ , $100$ kΩ	110-100k-1
C17	Ceramic, .001 µF	230-30	R17	MF, $1/4$ W, $1\%$ , $3.16 \text{ k}\Omega$	110-3.16k-1 110-10k-1
C18	Ceramic, .01 μF	230-11	R18 R19	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ	110-10k-1 110-10k-1
C19	Tantalum, 35V, 6.8 μF	250-41	R20	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
C21 C22	Mica, 8.2 pF Mica, 820 pF	221-8.2 220-820	R21	MF, $1/4W$ , 1%, 23.7 k $\Omega$	110-23.7k-1
C23	Ceramic, .01 μF	230-11	R22	MF, $1/4$ W, $1\%$ , $1 k\Omega$	110-1k-1
C24	Ceramic, .01 µF	230-11	R23 R24	MF, $1/4$ W, $1\%$ , $121\Omega$ MF, $1/4$ W, $1\%$ , $1 k\Omega$	110-121-1 110-1k-1
C25	Ceramic, .01 µF	230-11	R25	MF, $1/4W$ , $1\%$ , $7.5 k\Omega$	110-7.5k-1
C26	Monolithic, .1µF	230-37	R26	MF, $1/4W$ , 1%, $5.11\Omega$	110-5.11-1
			R27	MF, $1/4W$ , $1\%$ , $5.11 k\Omega$	110-5.11k-1
			R28 R29	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 536 kΩ	110-18.7k-1 110-536k-1
	DIODES		R30	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-336k-1 110-18.7k-1
			R31	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1
REF.		WILTRON	R32	MF, 1/4W, 1%, 18.7 kΩ	110-18.7k-1
DES.	DESCRIPTION	PART NO.	R33 R34	MF, $1/4$ W, $1\%$ , $18.7 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1 110-18.7k-1
CR1	Silicon, 1N4446	10-1N4446	R35	MF, $1/4W$ , 1%, 536 k $\Omega$	110-536k-1
CR2	Silicon, 1N4446	10-1N4446	R36	Variable, 10-Turn, 2 k $\Omega$	157-2k
CR3	Silicon, 1N4446	10-1N4446	R37	MF, $1/4W$ , $1\%$ , $20 \text{ k}\Omega$	110-20k-1
CR4 CR5	Silicon, SI2	10-SI2	R38 R39	Variable, 10-Turn, 50 k $\Omega$ MF, 1/4W, 1%, 205 k $\Omega$	157-50k 110-205k-1
CR6	Zener, 24V, 1W, 1N4749A Silicon, 1N4446	10-1N4749A 10-1N4446	R40	MF, $1/4W$ , $1\%$ , $75 k\Omega$	110-205R-1 110-75k-1
CR7	Silicon, 1N4446	10-1N4446	R41	MF, $1/4$ W, $1\%$ , $10$ k $Ω$	110-10k-1
CR8	Zener, 6.8V, 1W, 1N4736A	10-1N4736A	R42	MF, $1/4W$ , $1\%$ , $15 k\Omega$	110-15k-1
CR9	Silicon, 1N4446	10-1N4446	R43 R44	MF, $1/4$ W, $1\%$ , $11 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $3.24 \text{ k}\Omega$	110-11k-1
CR10 CR11	Silicon, 1N4446 Silicon, 1N4446	10-1N4446 10-1N4446	R45	MF, $1/4W$ , $1\%$ , $3.24 \text{ k}\Omega$	110-3.24k-1 110-3.24k-1
Oitti	billeon, IIIII	10 1141110	R46	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1
			R47	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
	TRANSISTORS		R48 R49	MF, 1/4W, 1%, 5.11Ω	110-5.11-1
			R50	MF, $1/4W$ , $1\%$ , $5.11\Omega$ MF, $1/4W$ , $1\%$ , $2.74 k\Omega$	110-5.11-1 110-2.74k-1
REF.		WILTRON	R51	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
DES.	DESCRIPTION	PART NO.	R52	MF, $1/4W$ , $1\%$ , $750 \text{ k}\Omega$	110-750k-1
01	DND MDCA02	20 MDC 402	R53	MF, 1/4W, 1%, 14.7 kΩ	110-14.7k-1
Q1 Q2	PNP, MPSA92 PNP, MPSA92	20-MPSA92 20-MPSA92	R54 R55	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $750 \text{ k}\Omega$	110-10k-1 110-750k-1
Q3	PNP, 2N2907A	20-2N2907A	R56	MF, $1/4W$ , $1\%$ , $750 \text{ k}\%$ MF, $1/4W$ , $1\%$ , $14.7 \text{ k}\%$	110-750k-1 110-14.7k-1
Q4	NPN, 2N2222A	20-2N2222A	R57	MF, $1/4W$ , 1%, 5.11 k $\Omega$	110-5.11k-1
Q5	PNP, 2N2907A	20-2N2907A	R58	Variable, 10-Turn, 500Ω	157-500
Q6 Q7	NPN, 2N3694 NPN, MPSU04	20-2N3694 20-MPSU04	R59 R60	MF, $1/4W$ , $1\%$ , $2 k\Omega$ MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-2k-1
Q8	PNP, 2N2907A	20-MP3004 20-2N2907A	R61	MF, $1/4$ W, $1\%$ , $10$ K $\Omega$ MF, $1/4$ W, $1\%$ , $750$ k $\Omega$	110-10k-1 110-750k-1
Q9	NPN, 2N2222A	20-2N2222A	R62	MF, $1/4W$ , $1\%$ , $14.7 \text{ k}\Omega$	110-14.7k-1

R63 R64 R65 R66 R67 R68	MF, $1/4$ W, $1\%$ , $27.4 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $2 \text{ k}\Omega$ Variable, $10\text{-Turn}$ , $500\Omega$ Variable, $1\text{-Turn}$ , $500 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $20 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-27.4k-1 110-2k-1 157-500 156-500k 110-20k-1 110-10k-1	R96 R97 R98 R99 R100	MF, $1/4$ W, $1\%$ , $1 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $15 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $750 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $14.7 \text{ k}\Omega$	110-1k-1 110-15k-1 110-10k-1 110-750k-1 110-14.7k-1
R69 R70 R71	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 15 kΩ MF, 1/4W, 1%, 1.30 kΩ	110-10k-1 110-15k-1 110-1.30k-1	REF.	INTEGRATED CIRCUITS	WILTRON
R72 R73 R74	MF, 1/4W, 1%, 8.87 kΩ MF, 1/4W, 1%, 3.40 kΩ MF, 1/4W, 1%, 5.11 kΩ	110-8.87k-1 110-3.40k-1 110-5.11k-1	DES.	DESCRIPTION  Quad EX-OR Gate, 74LS86	PART NO. 54-125
R75 R76 R77	MF, $1/4W$ , 1%, $301\Omega$ MF, $1/4W$ , 1%, $1.21 k\Omega$	110-301-1 110-1.21k-1	U2 U3	Quad Op Amp, TL074 Quad Analog Switch, LF13201	54-132 54-20
R78 R79	MF, $1/4$ W, $1\%$ , $17.8 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-17.8k-1 110-511-1 110-10k-1	U4 U5	Op-Amp, OP05 2k x 8 EPROM	54-87 Not Field- Replaceable
R80 R81 R82	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 205 kΩ MF, 1/4W, 1%, 2 kΩ	110-10k-1 110-205k-1 110-2k-1	U7 U8 U9	Dual Analog Switch, DG200 Dual Op-Amp, TL072 Quad Volt Comparator, MC3302P	50-DG200BA 54-53 54-MC3302P
R83 R84 R85	MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 1M MF, 1/4W, 1%, 100 kΩ	110-5.11k-1 110-1M-1 110-100k-1	บ10	Input NAND Gate, 74LS10	54-42
R86 R87	MF, $1/4W$ , $1\%$ , $5.11\Omega$ MF, $1/4W$ , $1\%$ , $5.11 k\Omega$	110-100k-1 110-5.11-1 110-5.11k-1	REF.	MISCELLANEOUS	WILTRON
R88 R89 R90	Variable, 1-Turn, $20\Omega$ MF, $1/4$ W, $1\%$ , $15 k\Omega$ MF, $1/4$ W, $1\%$ , $31.6 k\Omega$	156-20 110-15k-1 110-31.6k-1	DES.	DESCRIPTION	PART NO.
R91 R92	MF, 1/4W, 1%, 20 kΩ MF, 1/4W, 1%, 511Ω	110-20k-1 110-511-1	TP1 thru	Ejector, P.C. Board	553-96
R93 R94 R95	MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $5.11$ k $\Omega$ MF, $1/4$ W, $1\%$ , $5.11$ k $\Omega$	110-511-1 110-5.11k-1 110-5.11k-1	TP5 K1 	Pin, Test Point Relay, 2 Form C Socket, I.C., 24-Pin	706-44 690-28 553-67

Table 6-12. A6/A7/A8 YIG Driver, 8-12.4 GHz, 6621A/6629A/6637A/6638A/6647A/6648A (660-D-8009-4, -6, -7, -8, -99-90, -99-92)

<u> </u>	CAPACITORS		CR2 CR3	Silicon, 1N4446 Silicon, SI2	10-1N4446 10-SI2
REF.		WILTRON	CR3	Zener, 24V, 1W, 1N4749A	10-512 10-1N4749A
DES.	DESCRIPTION	PART NO.	CR5	Silicon, SI2	10-SI2
			CR6	Silicon, 1N4446	10-1N4446
C1	Tantalum, 4.7 μF	250-39	CR7	Silicon, 1N4446	10-1N4446
C2	Tantalum, 4.7 μF	250-39	CR8	Silicon, 1N4446	10-1N4446
C3	Tantalum, 4.7 μF	250-39	CR9	Zener, 10V, 0.4W, 1N758A	10-1N758A
C4	Disc Ceramic, .01 μF	230-11	CR10	Silicon, 1N4446	10-1N4446
C5	Disc Ceramic, .001 µF	230-30	CR11	Silicon, 1N4446	10-1N4446
C6	Tantalum, 1 µF, 35V	250-19		,	
C7	Tantalum, 1 µF, 35V	250-19		TRANSISTORS	
C8	Monolithic, 1.0 μF	230-41			
C9	Mica, 300 pF	220-300	REF.		WILTRON
C10	Monolithic, .1 μF	230-37	DES.	DESCRIPTION	PART NO.
C11	Tantalum, 6.8 μF	250-41A			
C12	Mica, 5 pF	220-5	Q1	PNP, MPSA92	20-MPSA92
C13	Monolithic, .1 μF	230-37	Q2	PNP, MPSA92	20-MPSA92
C14	Disc Ceramic, .01 μF	230-11	Q3	NPN, 2N3694	20-2N3694
C16	Monolithic, .1 μF	230-37	Q4	NPN, 2N2222A	20-2N2222A
C17	Disc Ceramic, .01 µF	230-11	Q5	NPN, 2N2222A	20-2N2222A
C18	Disc Ceramic, .01 μF	230-11	Q6	PNP, 2N2907A	20-2N2907A
C19	Disc Ceramic, .01 μF	230-11	Q7	NPN, 2N2222A	20-2N2222A
C20	Mica, 820 pF	220-820			
				RESISTORS	
	DIODES				
			REF.		WILTRON
REF.		WILTRON	DES.	DESCRIPTION	PART NO.
DES.	DESCRIPTION	PART NO.			
			R1	CC, $1/4W$ , 5%, $3.3 M\Omega$	101-3.3M-5
CR1	Silicon, 1N4446	10-1N4446	R2	Variable, 15-Turn, 50 k $\Omega$	157-50k

R3	CC 1/4397 F07 2 / 340	101 2 /1/ 5	1		
	CC, 1/4W, 5%, 3.6 MΩ	101-3.6M-5	R59_	MF, $1/4W$ , $1\%$ , $6.19\Omega$	110-6.19-1
R4	MF, $1/4W$ , 1%, 61.9 kΩ	110-61.9k-1	R59 <sup>5</sup>	MF, $1/4W$ , $1\%$ , $6.49\Omega$	110-6.49-1
R5	Variable, 15-Turn, 1 k $\Omega$	157-1k	R596	MF, $1/4W$ , $1\%$ , $6.49\Omega$	110-6.49-1
R7	Variable, 15-Turn, 1 k $\Omega$	157-1k	R60	MF, $1/4W$ , $1\%$ , $2.15 k\Omega$	110-2.15k-1
R9	Variable, 15-Turn, 200 kΩ	157-200k	R61 <sup>1</sup>	MF, $1/4W$ , $1\%$ , $33.2 k\Omega$	110-33.2k-1
R10_	MF, $1/4$ W, $1\%$ , $205$ kΩ	110-205k-1	R61 <sup>2</sup>	MF, $1/4W$ , $1\%$ , $33.2 k\Omega$	110-33.2k-1
R10 <sup>5</sup>	MF, $1/4$ W, $1\%$ , $6.65$ kΩ	110-6.65k-1	R61 <sup>3</sup>	MF, $1/4W$ , $1\%$ , $38.3 \text{ k}\Omega$	110-38.3k-1
R106	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1	R614	MF, $1/4W$ , 1%, 38.3 k $\Omega$	110-38.3k-1
R11 <sup>1</sup>	MF, $1/4W$ , $1\%$ , $10.5 k\Omega$	110-10.5k-1	R621	MF, $1/4W$ , 1%, 33.2 k $\Omega$	110-33.2k-1
R112	MF, $1/4W$ , $1\%$ , $11 k\Omega$	110-11k-1	R62 2	MF, $1/4W$ , $1\%$ , $33.2 k\Omega$	
R113	MF, $1/4W$ , 1%, 10 k $\Omega$	110-11k-1	R62 3		110-33.2k-1
R114	MF, $1/4$ W, $1\%$ , $11$ kΩ		R02	MF, 1/4W, 1%, 38.3 kΩ	110-38.3k-1
R12		110-11k-1	R624	MF, $1/4W$ , $1\%$ , $38.3 \text{ k}\Omega$	110-38.3k-1
	MF, $1/4$ W, $1\%$ , $20 \text{ k}\Omega$	110-20k-1	R62 5	MF, $1/4$ W, $1\%$ , $10.7$ kΩ	110-10.7k-1
R13	Variable, 1-Turn, 20 k $\Omega$	156-20k	R626	MF, $1/4$ W, $1\%$ , $10.7$ kΩ	110-10.7k-1
R14_	MF, $1/4W$ , $1\%$ , $2.74 k\Omega$	110-2.74k-1	R63	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R14 <sup>5</sup>	MF, $1/4W$ , $1\%$ , $2.67 k\Omega$	110-2.67k-1	R64	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
R146	MF, $1/4W$ , $1\%$ , $4.22 \text{ k}\Omega$	110-4.22k-1	R65	MF, $1/4W$ , $1\%$ , $750 \text{ k}\Omega$	110-750k-1
R15	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1	R66	MF, $1/4W$ , $1\%$ , $14.7 k\Omega$	110-14.7k-1
R16	MF, $1/4W$ , $1\%$ , $4.99 \text{ k}\Omega$	110-4.99k-1	R67	MF, $1/4$ W, $1\%$ , $866\Omega$	110-866-1
R17	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1	R67 <sup>2</sup>	MF, $1/4$ W, $1\%$ , $1.15$ kΩ	110-1.15k-1
R18	MF, $1/4W$ , $1\%$ , 23.7 k $\Omega$	110-23.7k-1	R67 3		
R19	MF, $1/4W$ , $1\%$ , $23.1 \text{ km}$	110-25.7k-1 110-1k-1	R67 4	MF, 1/4W, 1%, 866Ω	110-866-1
R20	MF, $1/4W$ , $1\%$ , $121\Omega$			MF, 1/4W, 1%, 1.15 kΩ	110-1.15k-1
R21		110-121-1	R67 5	MF, $1/4$ W, $1\%$ , $5.11\Omega$	110-5.11-1
	MF, $1/4$ W, $1\%$ , $1 \text{ k}\Omega$	110-1k-1	R67 6	MF, $1/4$ W, $1\%$ , $866$ Ω	110-866-1
R22	MF, $1/4$ W, $1\%$ , $7.5 \text{ k}\Omega$	110-7.5k-1	R68	Variable, 15-Turn, $500\Omega$	157-500
R23	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1	R69	MF, $1/4W$ , $1\%$ , $2 k\Omega$	110-2k-1
R24	MF, $1/4$ W, $1\%$ , $5.11$ kΩ	110-5.11k-1	R70	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R25	WW, 5W, $5\Omega$	131-3	R71	MF, $1/4$ W, $1\%$ , $750$ kΩ	110-750k-1
R26	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1	R72	MF, $1/4W$ , $1\%$ , $14.7 \text{ k}\Omega$	110-14.7k-1
R27	MF, $1/4W$ , $1\%$ , $750\Omega$	110-750-1	R73	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
R28	MF, $1/4W$ , 1%, 5.49 k $\Omega$	110-5.49k-1	R74		
R29	MF, $1/4W$ , $1\%$ , $1.78 \text{ k}\Omega$		•	MF, 1/4W, 1%, 10 kΩ	110-10k-1
R30		110-1.78k-1	R75	MF, $1/4$ W, $1\%$ , $205 k\Omega$	110-205k-1
	MF, $1/4W$ , $1\%$ , $2.15 \text{ k}\Omega$	110-2.15k-1	R76	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
R31	MF, $1/4$ W, $1\%$ , $1 k\Omega$	110-1k-1	R77	Variable, 1-Turn, $20\Omega$	156-20
R32	MF, $1/4W$ , $1\%$ , $1.21 k\Omega$	110-1.21k-1	R78	MF, $1/4W$ , $1\%$ , $2 k\Omega$	110-2k-1
R33	MF, $1/4$ W, $1\%$ , $17.8$ kΩ	110-17.8k-1	R79	MF, $1/4W$ , 1%, 15 k $\Omega$	110-15k-1
R34	Variable, 1-Turn, 200 k $\Omega$	156-200k	R80	MF, $1/4W$ , 1%, $511\Omega$	110-511-1
R35	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1	R81	MF, $1/4W$ , $1\%$ , $511\Omega$	
R38	MF, $1/4W$ , $1\%$ , $18.7 k\Omega$	110-18.7k-1	R82		110-511-1
R39	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1	1	MF, 1/4W, 1%, 100 kΩ	110-100k-1
R42	Variable, 15-Turn, 50 k $\Omega$		R83	MF, 1/4W, 1%, 100 kΩ	110-100k-1
R43		157-50k	R84	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$	110-5.11k-1
	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1	R85	MF, $1/4W$ , $1\%$ , $5.11 k\Omega$	110-5.11k-1
R44	MF, $1/4$ W, $1\%$ , $18.7$ kΩ	110-18.7k-1	R86	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1
R45	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1			
R46	MF, $1/4W$ , $1\%$ , $9.53 \text{ k}\Omega$	110-9.53k-1			
R47	Variable, 15-Turn, 1 kΩ	157-1k	I	INTEGRATED CIRCUITS	
R48	MF, $1/4W$ , $1\%$ , $11 k\Omega$			HVIDGICITIES OFFICOLIS	
		110-11k-1		MATERIAL CINCOLLE	
R49		110-11k-1 110-10k-1	REF.	IVIDAMINAD ORGOTTS	WILTRON
	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1	REF. DES.		WILTRON PART NO.
R50	MF, $1/4W$ , $1\%$ , $10 k\Omega$ MF, $1/4W$ , $1\%$ , $511\Omega$	110-10k-1 110-511-1	1	DESCRIPTION	WILTRON PART NO.
R50 R51	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ	110-10k-1 110-511-1 110-4.99k-1	DES.	DESCRIPTION	PART NO.
R50 R51 R52	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ	110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1	DES.	DESCRIPTION  Quad Analog Switch, LF13201	<b>PART NO.</b> 54-20
R50 R51 R52 R53	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 1 kΩ	110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1	DES. U1 U2	DESCRIPTION  Quad Analog Switch, LF13201  NAND Gate, 74LS10	PART NO.  54-20 54-42
R50 R51 R52 R53 R54	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 511Ω	110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1	DES. U1 U2 U3	DESCRIPTION  Quad Analog Switch, LF13201  NAND Gate, 74LS10  Op Amp, OP05	PART NO.  54-20 54-42 54-87
R50 R51 R52 R53 R54 R55	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19Ω	110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-6.19-1	DES. U1 U2 U3 U4	DESCRIPTION  Quad Analog Switch, LF13201  NAND Gate, 74LS10  Op Amp, OP05  Quad Op Amp, TL072	<b>PART NO.</b> 54-20 54-42 54-87 54-53
R50 R51 R52 R53 R54 R55 R55 5	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω	110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-6.19-1 110-6.49-1	DES. U1 U2 U3	DESCRIPTION  Quad Analog Switch, LF13201  NAND Gate, 74LS10  Op Amp, OP05	PART NO.  54-20 54-42 54-87 54-53 Not Field-
R50 R51 R52 R53 R54 R55 R55 5	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω MF, 1/4W, 1%, 6.49Ω	110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-6.19-1	U1 U2 U3 U4 U5	DESCRIPTION  Quad Analog Switch, LF13201  NAND Gate, 74LS10  Op Amp, OP05  Quad Op Amp, TL072	<b>PART NO.</b> 54-20 54-42 54-87 54-53
R50 R51 R52 R53 R54 R55 R55 5 R55 6	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω	110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-6.19-1 110-6.49-1 110-6.19-1	U1 U2 U3 U4 U5	DESCRIPTION  Quad Analog Switch, LF13201  NAND Gate, 74LS10  Op Amp, OP05  Quad Op Amp, TL072	PART NO.  54-20 54-42 54-87 54-53 Not Field-
R50 R51 R52 R53 R54 R55 R555 R556 R566	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω MF, 1/4W, 1%, 6.49Ω	110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-6.19-1 110-6.49-1 110-6.19-1	U1 U2 U3 U4 U5	DESCRIPTION  Quad Analog Switch, LF13201  NAND Gate, 74LS10  Op Amp, OP05  Quad Op Amp, TL072  2k x 8 EPROM	54-20 54-42 54-87 54-53 Not Field- Replaceable
R50 R51 R52 R53 R54 R55 5 R556 R556 R566 S	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω MF, 1/4W, 1%, 6.49Ω MF, 1/4W, 1%, 6.49Ω MF, 1/4W, 1%, 6.49Ω	110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1	U1 U2 U3 U4 U5	DESCRIPTION  Quad Analog Switch, LF13201  NAND Gate, 74LS10  Op Amp, OP05  Quad Op Amp, TL072  2k x 8 EPROM  Quad Op Amp, TL074  Quad Ex. OR Gate, 74LS86	54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125
R50 R51 R52 R53 R54 R55 5 R556 R556 R566 S	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω	110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.19-1	U1 U2 U3 U4 U5 U7 U8	DESCRIPTION  Quad Analog Switch, LF13201  NAND Gate, 74LS10  Op Amp, OP05  Quad Op Amp, TL072  2k x 8 EPROM  Quad Op Amp, TL074	54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132
R50 R51 R52 R53 R54 R55 5 R556 R556 5 R566 5 R57 7	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω	110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.19-1 110-6.49-1	U1 U2 U3 U4 U5 U7 U8	DESCRIPTION  Quad Analog Switch, LF13201  NAND Gate, 74LS10  Op Amp, OP05  Quad Op Amp, TL072  2k x 8 EPROM  Quad Op Amp, TL074  Quad Ex. OR Gate, 74LS86  Dual Volt. Comp., LM393	54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125
R50 R51 R52 R53 R54 R55 5 R556 R566 5 R566 5 R57 7 R576	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω	110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1	U1 U2 U3 U4 U5 U7 U8	DESCRIPTION  Quad Analog Switch, LF13201  NAND Gate, 74LS10  Op Amp, OP05  Quad Op Amp, TL072  2k x 8 EPROM  Quad Op Amp, TL074  Quad Ex. OR Gate, 74LS86	54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125
R50 R51 R52 R53 R54 R55 5 R55 6 R56 5 R57 7 R57 6 R57 8	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω	110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.19-1	U1 U2 U3 U4 U5 U7 U8 U9	DESCRIPTION  Quad Analog Switch, LF13201  NAND Gate, 74LS10  Op Amp, OP05  Quad Op Amp, TL072  2k x 8 EPROM  Quad Op Amp, TL074  Quad Ex. OR Gate, 74LS86  Dual Volt. Comp., LM393	PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158
R50 R51 R52 R53 R54 R55 5 R556 R556 5 R577 R577 R577 R578 R58 5	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω	110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1	U1 U2 U3 U4 U5 U7 U8 U9	DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS	PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158
R50 R51 R52 R53 R54 R55 5 R55 6 R56 5 R57 7 R57 6 R57 8	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω	110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.19-1	U1 U2 U3 U4 U5 U7 U8 U9	DESCRIPTION  Quad Analog Switch, LF13201  NAND Gate, 74LS10  Op Amp, OP05  Quad Op Amp, TL072  2k x 8 EPROM  Quad Op Amp, TL074  Quad Ex. OR Gate, 74LS86  Dual Volt. Comp., LM393	PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158
R50 R51 R52 R53 R54 R555 5 R556 6 R566 5 R57 7 R57 R57 R57 R57 R58 8	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω	110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1	U1 U2 U3 U4 U5 U7 U8 U9	DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION	PART NO.  54-20 54-42 54-87 54-53 Not Field-Replaceable 54-132 54-125 54-158  WILTRON PART NO.
R50 R51 R52 R53 R54 R55 R555 R556 R566 R57 R576 R576 R576 R	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω	110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1	U1 U2 U3 U4 U5 U7 U8 U9	DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS	PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158
R50 R51 R52 R53 R54 R55 R555 R556 R566 S57 R576 R577 R576 R585 R586 TUsed of	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω	110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1	U1 U2 U3 U4 U5 U7 U8 U9  REF. DES.	DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION	PART NO.  54-20 54-42 54-87 54-53 Not Field-Replaceable 54-132 54-125 54-158  WILTRON PART NO.
R50 R51 R52 R53 R54 R55 R555 R556 R566 R567 R577 R576 R588 R5886 R586 S1Useed on 3Useed on	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω	110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1	U1 U2 U3 U4 U5  U7 U8 U9  REF. DES.  TP1 thru	DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION	PART NO.  54-20 54-42 54-87 54-53 Not Field-Replaceable 54-132 54-125 54-158  WILTRON PART NO.
R50 R51 R52 R53 R54 R55 R55 5 R55 6 R56 5 R57 R57 7 R57 6 R58 8 R58 6 Used on 3 Used on 3 Used on	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω MF,	110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1	U1 U2 U3 U4 U5 U7 U8 U9  REF. DES.	DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION	PART NO.  54-20 54-42 54-87 54-53 Not Field-Replaceable 54-132 54-125 54-158  WILTRON PART NO.
R50 R51 R52 R53 R54 R55 R555 R556 R56 5 R56 5 R57 7 R57 6 R58 R58 6 R58 6 Used on 3 Used on 4 Used on 5 Used on	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω MF,	110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1	U1 U2 U3 U4 U5  U7 U8 U9  REF. DES.  TP1 thru	DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION  Ejector, PC Board	PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158  WILTRON PART NO.  553-96
R50 R51 R52 R53 R54 R55 R555 R556 R56 5 R56 5 R57 7 R57 6 R58 R58 6 R58 6 Used on 3 Used on 4 Used on 5 Used on	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω MF,	110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1	U1 U2 U3 U4 U5  U7 U8 U9  REF. DES.  TP1 thru TP4	DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 Zk x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION  Ejector, PC Board  Pin, Test Point	PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158  WILTRON PART NO.  553-96

1-6600A/MB-OMM 6-33

Table 6-13. A6/A7 YIG Driver, 8-12.4 GHz, 6621A-40/6629A-40/6637A-40 (660-D-8009-14, -17, -99-91, -99-93)

	CAPACITORS		R3	CC, 1/4W, 5%, 3.6 MΩ	101-3.6M-5
REF.		WILTRON	R4	MF, $1/4W$ , $1\%$ , $61.9 k\Omega$	110-61.9k-1
DES.	DESCRIPTION	PART NO.	R5 R6	Variable, 15-Turn, 1 kΩ	157-1k
C1	Tantalum, 4.7 µF	250-39A	R7	MF, $1/4$ W, $1\%$ , $11$ k $\Omega$ Variable, $15$ -Turn, $1$ k $\Omega$	110-11k-1 157-1k
C2	Tantalum, 4.7 μF	250-39A 250-39A	R8	MF, $1/4$ W, $1\%$ , $11 \text{ k}\Omega$	110-11k-1
C3	Tantalum, 4.7 µF	250-39A	R9	Variable, 15-Turn, 200 kΩ	157-200k
C4	Disc Ceramic, .01 μF	230-11	R10	MF, $1/4W$ , $1\%$ , $205 k\Omega$	110-205k-1
C5	Disc Ceramic, .001 μF	230-30	R111	MF, $1/4W$ , $1\%$ , $10.5 \text{ k}\Omega$	110-10.5k-1
C6 C7	Monolithic, .1 µF	230-37	R11 <sup>2</sup> R11 <sup>3</sup>	MF, 1/4W, 1%, 10 kΩ	110-10k-1
C8	Monolithic, .1 μF Monolithic, 1.0 μF	230-37	R114	MF, $1/4$ W, $1\%$ , $6.65$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$	110-6.65k-1 110-10k-1
C9	Not Used	230-41	R12	MF, $1/4W$ , $1\%$ , $20 \text{ k}\Omega$	110-10k-1 110-20k-1
C10	Monolithic, .1 µF	230-37	R13	Variable, 1-Turn, 20 k $\Omega$	156-20k
C11	Tantalum, 6.8 μF	250-41	R14	MF, $1/4W$ , $1\%$ , $2.74 \text{ k}\Omega$	110-2.74k-1
C12	Mica, 5 pF	220-5	R143	MF, $1/4W$ , $1\%$ , $2.67 k\Omega$	110-2.67k-1
C13	Monolithic, .1 µF	230-37	R144	MF, $1/4$ W, $1\%$ , $4.22 \text{ k}\Omega$	110-4.22k-1
C14	Disc Ceramic, .01 µF	230-11	R15 R16	MF, 1/4W, 1%, 10 kΩ	110-10k-1
C15 C16	Not Used Monolithic, .1 µF	230-37	R17	MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 10 kΩ	110-4.99k-1 110-10k-1
C17	Disc Ceramic, .01 µF	230-11	R18	MF, $1/4$ W, $1\%$ , 23.7 k $\Omega$	110-10k-1 110-23.7k-1
C18	Disc Ceramic, .01 µF	230-11	R19	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1
C19	Disc Ceramic, .01 μF	230-11	R20	MF, $1/4$ W, $1\%$ , $121\Omega$	110-121-1
C 20	Mica, 300 pF	220-300	R21	MF, $1/4$ W, $1\%$ , $1 k\Omega$	110-1k-1
	DIODES		R22 R23	MF, $1/4$ W, $1\%$ , $7.5 \text{ k}\Omega$	110-7.5k-1
	DIODES		R24	MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $5.11 k\Omega$	110-511-1
REF.		WILTRON	R25	WW, 5W, $5\Omega$	110-5.11k-1 131-3
DES.	DESCRIPTION	PART NO.	R26	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
CR1	Silicon, 1N4446	10-1N4446	R27	MF, $1/4W$ , $1\%$ , $750\Omega$	110-750-1
CR2	Not Used	10-114440	R28	MF, $1/4W$ , $1\%$ , $5.49 k\Omega$	110-5.49k-1
CR3	Silicon, SI2	10-SI2	R29	MF, $1/4W$ , $1\%$ , $1.78 \text{ k}\Omega$	110-1.78k-1
CR4	Zener, 24V, 1W, 1N4749A	10-1N4749A	R30 R31	MF, $1/4$ W, $1\%$ , $2.15$ k $\Omega$ MF, $1/4$ W, $1\%$ , $1$ k	110-2.15k-1
CR5	Silicon, SI2	10-SI2	R32	MF, $1/4W$ , $1\%$ , $1R$ MF, $1/4W$ , $1\%$ , $1.21 \text{ k}\Omega$	110-1k-1 110-1.21k-1
CR6	Silicon, 1N4446	10-1N4446	R33	MF, $1/4W$ , $1\%$ , $17.8 \text{ k}\Omega$	110-17.8k-1
CR7 CR8	Silicon, 1N4446 Silicon, 1N4446	10-1N4446	R34	Variable, 1-Turn, 200 kΩ	156-200k
CR9	Zener, 10V, 0.4W, 1N758A	10-1N4446 10-1N758A	R35	MF, $1/4$ W, $1\%$ , $1 k\Omega$	110-1k-1
CR10	Silicon, 1N4446	10-1N4446	R36	MF, 1/4W, 1%, 10 kΩ	110-10k-1
CR11	Silicon, 1N4446	10-1N4446	R37 R38	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 18.7 kΩ	110-10k-1
	TTD A MISTORION O		R39	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1 110-18.7k-1
	TRANSISTORS		R42	Variable, 15-Turn, 50 k $\Omega$	157~50k
REF.		WILTRON	R43	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1
DES.	DESCRIPTION	PART NO.	R44	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1
Q1	PNP, MPSA92	20-MPSA92	R45 R46	MF, 1/4W, 1%, 10 kΩ	110-10k-1
Q2	PNP, MPSA92	20-MPSA92	R47	MF, $1/4$ W, $1\%$ , 9.53 k $\Omega$ Variable, 15-Turn, 20 k $\Omega$	110-9.53k-1 157-20k
Q3	NPN, 2N3694	20-2N3694	R48	MF, $1/4W$ , 1%, 11 k $\Omega$	110-11k-1
Q4	NPN, 2N2222A	20-2N2222A	R49	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
Q5	NPN, 2N2222A	20-2N2222A	R50	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
Q6 Q7	PNP, 2N2907A NPN, 2N2222A	20-2N2907A	R51	MF, 1/4W, 1%, 4.99 kΩ	110-4.99k-1
Q8	NPN, 2N2222A	20-2N2222A 20-2N2222A	R52 R53	MF, $1/4W$ , $1\%$ , $3.83 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $1 \text{ k}\Omega$	110-3.83k-1
~-	,	EO ENEBEEN	R54	MF, $1/4W$ , $1\%$ , $511\Omega$	110-1k-1 110-511-1
	RESISTORS		R55	MF, $1/4$ W, $1\%$ , $8.66\Omega$	110-8.66-1
REF.		WILTRON	R56	MF, $1/4W$ , 1%, $8.66\Omega$	110-8.66-1
DES.	DESCRIPTION	PART NO.	R57	MF, 1/4W, 1%, 8.66Ω	110-8.66-1
R1	CC, 1/4W, 5%, 3.3 MΩ		R58 R59	MF, 1/4W, 1%, 8.66Ω	110-8.66-1
R2	Variable, 15-Turn, 50 k $\Omega$	101-3.3M-5 157-50k	R60	MF, $1/4$ W, $1\%$ , $8.66\Omega$ MF, $1/4$ W, $1\%$ , $2.15 k\Omega$	110-8.66-1
		IJI-JUK	R61 <sup>1</sup>	MF, $1/4W$ , $1\%$ , $2.15 \text{ k}\%$ MF, $1/4W$ , $1\%$ , $33.2 \text{ k}\%$	110-2.15k-1 110-33.2k-1
1 Used	on 660-D-8009-14 assembly.		R61 <sup>2</sup>	MF, $1/4W$ , $1\%$ , $38.3 \text{ k}\Omega$	110-33.2k-1 110-38.3k-1
<sup>2</sup> Used	on 660-D-8009-17 assembly.		R61 <sup>3</sup>	MF, $1/4W$ , 1%, 33.2 k $\Omega$	110-33.2k-1
Used	on 660-D-8009-99-91 assembly.		R61 <sup>4</sup>	MF, $1/4W$ , 1%, 33.2 k $\Omega$	110-33.2k-1
Used	on 660-D-8009-99-93 assembly.		R62 <sup>1</sup>	MF, $1/4W$ , $1\%$ , 33.2 kΩ	110-33.2k-1

R62 <sup>2</sup>	MF, $1/4W$ , $1\%$ , $38.3 \text{ k}\Omega$	110-38.3k-1		INTEGRATED CIRCUITS	
R62 <sup>3</sup> R62 <sup>1</sup> R63	MF, 1/4W, 1%, 33.2 kΩ MF, 1/4W, 1%, 33.2 kΩ MF, 1/4W, 1%, 10 kΩ	110-33.2k-1 110-33.2k-1 110-10k-1	REF. DES.	DESCRIPTION	WILTRON PART NO.
R64 R66 R67 R67 <sup>2</sup> R68 R69	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 14.7 kΩ MF, 1/4W, 1%, 866Ω MF, 1/4W, 1%, 5.11Ω Variable, 15-Turn, 500Ω MF, 1/4W, 1%, 2 kΩ	110-10k-1 110-14.7k-1 110-866-1 110-5.11-1 157-500 110-2k-1	U1 U2 U3 U4 U5	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM	54-20 54-42 54-87 54-53 Not Field-
R70 R72 R73 R74 R75 R76	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 14.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 205 kΩ MF, 1/4W, 1%, 511Ω	110-10k-1 110-14.7k-1 110-10k-1 110-10k-1 110-205k-1 110-511-1	U7 U8 U9	Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393 MISCELLANEOUS	Replaceable 54-132 54-125 54-158
R77 R78 R79 R80	Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 2 kΩ MF, 1/4W, 1%, 15 kΩ MF, 1/4W, 1%, 511Ω	156-20 110-2k-1 110-15k-1 110-511-1	REF. DES.	DESCRIPTION	WILTRON PART NO.
R81 R82 R83	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ	110-511-1 110-511-1 110-100k-1 110-100k-1 110-5.11k-1	TP1 thru TP4	Ejector, PC Board Pin, Test Point	553-96 706-44
R84 R85 R86	MF, 1/4W, 1%, 5.11 k $\Omega$ MF, 1/4W, 1%, 5.11 k $\Omega$ MF, 1/4W, 1%, 5.11 $\Omega$	110-5.11k-1 110-5.11k-1 110-5.11-1	K1	Relay, 2 Form C Socket, I.C., 24-Pin	690-28 553-67

Table 6-14. A6/A7/A8 YIG Driver, 12.4-18.6 GHz, 6629A-40/6637A-40 (660-D-8009-15, -16, -99-94)

REF. DES.	<u>CAPACITORS</u> DESCRIPTION	WILTRON PART NO.	CR5 CR6 CR7 CR8	Silicon, SI2 Silicon, 1N4446 Silicon, 1N4446 Silicon, 1N4446	10-SI2 10-1N4446 10-1N4446 10-1N4446
C1	Tantalum, 4.7 μF	250-39A	CR9 CR10	Zener, 10V, 0.4W, 1N758A Silicon, 1N4446	10-1N758A 10-1N4446
C2	Tantalum, 4.7 μF	250-39A	CR10	Silicon, 1N4446	10-1N4446
C3	Tantalum, 4.7 μF	250-39A	CKII	bilicon, intito	10 1144110
C4	Disc Ceramic, .01 μF	230-11		TRANSISTORS	
C5	Disc Ceramic, .001 μF	230-30		IKANSBIOKS	
C6	Monolithic, .1 μF	230-37	REF.		WILTRON
C7	Monolithic, .1 μF	230-37	DES.	DESCRIPTION	PART NO.
C8	Monolithic, 1.0 μF	230-41	220.		11111111101
C9	Not Used	230-37			
C10	Monolithic, .1 μF	250-41	Q1	PNP, MPSA92	20-MPSA92
C11	Tantalum, 6.8 μF	220-5	Q2	PNP, MPSA92	20-MPSA92
C12	Mica, 5 pF	230-37	Q3	NPN, 2N3694	20-2N3694
C13	Monolithic, .1 μF	230-37	Q4	NPN, 2N2222A	20-2N2222A
C14	Disc Ceramic, .01 μF	230-11	Q5	NPN, 2N2222A	20-2N2222A
C15	Not Used	230-37	Q6	PNP, 2N2907A	20-2N2907A
C16	Monolithic, .1 μF	230-37	Q7	NPN, 2N2222A	20-2N2222A
C17	Disc Ceramic, .01 µF	230-11	Q8	NPN, 2N2222A	20-2N2222A
C18 C19	Disc Ceramic, .01 μF Disc Ceramic, .01 μF	230-11		D ECICEOD C	
C20	, ,	220-300		RESISTORS	
C 20	Mica, 300 pF	220-300			
	DIODES		REF.		WILTRON
REF.		WILTRON	DES.	DESCRIPTION	PART NO.
DES.	DESCRIPTION	PART NO.	R1	CC, 1/4W, 5%, 3.3 MΩ	101-3.3M-5
CR1	Silicon, 1N4446	10-1N4446	R2	Variable, 15-Turn, 50 k $\Omega$	157-50k
CR2	Not Used		R3	$CC, 1/4W, 5\%, 3.6 M\Omega$	101-3.6M-5
CR3	Silicon, SI2	10-SI2	R4	MF, $1/4W$ , 1%, 61.9 k $\Omega$	110-61.9k-1
CR4	Zener, 24V, 1W, 1N4749A	10-1N4749A	R5	Variable, 15-Turn, 1 k $\Omega$	157-1k
			R6	MF, $1/4$ W, $1\%$ , $11 \text{ k}\Omega$	110-11k-1
lused.	on 660-D-8009-14 assembly.		R7	Variable, 15-Turn, 1 k $\Omega$	157-1k
211sed	on 660-D-8009-17 assembly.		R8	MF, $1/4W$ , $1\%$ , $11 k\Omega$	110-11k-1

R9	Variable, 15-Turn, 200 kΩ	157-200k	R59	MF, $1/4W$ , $1\%$ , $8.66\Omega$	110-8.66-1
R10	MF, $1/4$ W, $1\%$ , $205$ kΩ	110-205k-1	R60	MF, $1/4W$ , $1\%$ , $2.15 k\Omega$	110-2.15k-1
R11 <sup>1</sup>	MF, $1/4W$ , $1\%$ , $4.64 k\Omega$	110-4.64k-1	R61 <sup>1</sup>	MF, $1/4$ W, $1\%$ , $100$ kΩ	110-100k-1
R11 <sup>2</sup>	MF, $1/4W$ , $1\%$ , $4.22 k\Omega$	110-4.22k-1	R61 <sup>2</sup>	MF, $1/4W$ , 1%, 100 kΩ	
R11 <sup>3</sup>	MF, $1/4W$ , $1\%$ , $7.68 \text{ k}\Omega$	110-7.68k-1	R61 3		110-100k-1
R12	MF, $1/4W$ , 1%, 20 k $\Omega$		R01	MF, 1/4W, 1%, 33.2 kΩ	110-33.2k-1
R13		110-20k-1	R62 <sup>3</sup>	MF, $1/4W$ , $1\%$ , $33.2 k\Omega$	110-33.2k-1
R14 <sup>1</sup>	Variable, 1-Turn, 20 kΩ	156-20k	R63	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
	MF, $1/4W$ , 1%, 1.91 k $\Omega$	110-1.91k-1	R64	MF, 1/4W, 1%, 10 kΩ	110-10k-1
$R14^{\frac{2}{3}}$	MF, $1/4W$ , $1\%$ , $2.74 k\Omega$	110-2.74k-1	R65	MF, $1/4$ W, $1\%$ , $750$ kΩ	110-750k-1
R14 <sup>3</sup>	MF,1 /4W, 1%, 3.16 kΩ	110-3.16k-1	R66	MF, $1/4W$ , $1\%$ , $14.7 k\Omega$	110-14.7k-1
R15	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1	R67 <sup>1</sup>	MF, $1/4W$ , $1\%$ , $866\Omega$	110-866-1
R16	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1	R67 <sup>2</sup>	MF, $1/4W$ , 1%, $866\Omega$	110-866-1
R17	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1	R67 <sup>3</sup>	MF, $1/4W$ , $1\%$ , $5.11\Omega$	
R18	MF, $1/4$ W, $1\%$ , 23.7 kΩ	110-10K-1 110-23.7k-1	R68		110-5.11-1
R19	MF, 1/4W, 1%, 1 kΩ			Variable, 15-Turn, 500Ω	157-500
R 20		110-1k-1	R69	MF, $1/4W$ , $1\%$ , $2 k\Omega$	110-2k-1
	MF, 1/4W, 1%, 121Ω	110-121-1	R70	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R21	MF, 1/4W, 1%, 1 kΩ	110-1k-1	R71	MF, 1/4W, 1%, 750 kΩ	110-750k-1
R22	MF, $1/4$ W, $1\%$ , $7.5$ kΩ	110-7.5k-1	R72	MF, $1/4W$ , $1\%$ , $14.7 k\Omega$	110-14.7k-1
R23	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1	R73	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
R24	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$	110-5.11k-1	R74	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
R25	WW, 5W, 2Ω	131-1	R75	MF, $1/4W$ , 1%, 205 k $\Omega$	110-205k-1
R26	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1	R76	MF, $1/4W$ , 1%, $511\Omega$	110-511-1
R27	MF, $1/4W$ , $1\%$ , $750\Omega$	110-750-1	R77	· · · · · · · · · · · · · · · · · · ·	and the second s
R28	MF, $1/4W$ , $1\%$ , $5.49 \text{ k}\Omega$		•	Variable, 1-Turn, 20Ω	156-20
R29	MF, $1/4W$ , $1\%$ , $1.78 \text{ k}\Omega$	110-5.49k-1	R78	MF, 1/4W, 1%, 2 kΩ	110-2k-1
R30		110-1.78k-1	R79	MF, $1/4$ W, $1\%$ , $15$ k $\Omega$	110-15k-1
	MF, $1/4W$ , $1\%$ , $2.15 \text{ k}\Omega$	110-2.15k-1	R80	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
R31	MF, 1/4W, 1%, 1 kΩ	110-1k-1	R81	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
R32	MF, $1/4$ W, $1\%$ , $1.21$ kΩ	110-1.21k-1	R82	MF, $1/4$ W, $1\%$ , $100$ kΩ	110-100k-1
R33	MF, $1/4$ W, $1\%$ , $17.8$ kΩ	110-17.8k-1	R83	MF, $1/4W$ , 1%, 100 k $\Omega$	110-100k-1
R34	Variable, 1-Turn, 200 kΩ	156-200k	R84	MF, $1/4W$ , 1%, 5.11 k $\Omega$	110-5.11k-1
R35	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1	R85	MF, $1/4W$ , 1%, 5.11 k $\Omega$	110-5.11k-1
R36	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1	R86	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1
R37	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1	1.00	1111 4 1/ 1114 1/04 3:1136	110-5.11-1
R38	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1			
R39	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$			INTEGRATED CIRCUITS	
R40 <sup>3</sup>	MF, $1/4W$ , $1\%$ , $61.9 \text{ k}\Omega$	110-18.7k-1			
R41 <sup>3</sup>		110-61.9k-1	REF.		WILTRON
	MF, 1/4W, 1%, 61.9 kΩ	110-61.9k-1	DES.	DESCRIPTION	PART NO.
R42	Variable, 15-Turn, 50 kΩ	157-50k	DEG.	DESCRIPTION	FART NO.
R43	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1	77.1	O	54.30
R44	MF, $1/4$ W, $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1	U1	Quad Analog Switch, LF13201	54-20
R45	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1	U2	NAND Gate, 74LS10	54-42
R46 <sup>1</sup>	MF, $1/4W$ , $1\%$ , $9.53 k\Omega$	110-9.53k-1	U3	Op Amp, OP05	5 <del>4</del> -87
R46 <sup>2</sup>	MF, $1/4W$ , $1\%$ , $9.53 \text{ k}\Omega$	110-9.53k-1	U4	Quad Op Amp, TL072	54-53
R46 <sup>3</sup>	MF, $1/4W$ , $1\%$ , $8.45 k\Omega$	110-8.45k-1	U5	2k x 8 EPROM	Not Field-
R47	Variable, 15-Turn, 20 kΩ	157-20k			Replaceable
R48	MF, $1/4$ W, $1\%$ , $11 \text{ k}\Omega$	110-11k-1	<b>U7</b>	Quad Op Amp, TL074	54-132
R49	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$		U8	Quad Ex. OR Gate, 74LS86	54-125
		110-10k-1	U9	Dual Volt. Comp., LM393	54-158
R50	MF, 1/4W, 1%, 511Ω	110-511-1	- /	Duai voiti Compi, Zino,	31 130
R51	MF, $1/4W$ , $1\%$ , $4.99 \text{ k}\Omega$	110 <b>-4.</b> 99k-1			
R52	MF, $1/4$ W, $1\%$ , $3.83 \text{ k}\Omega$	110-3.83k-1		MISCELLANEOUS	
R53	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1			
R54	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1	REF.		WILTRON
R55	MF, $1/4W$ , $1\%$ , $8.66\Omega$	110-8.66-1	DES.	DESCRIPTION	
R56	MF, $1/4W$ , 1%, $8.66\Omega$	110-8.66-1		DESCRIPTION	PART NO.
R57	MF, $1/4W$ , 1%, $8.66\Omega$	110-8.66-1		Einstein DC D	
R58	MF, $1/4W$ , $1\%$ , $8.66\Omega$			Ejector, PC Board	553-96
*****	1721 9 1/211 9 1/0, 0,0006	110-8.66-1	TP1		
1 11004	n 660-D-8009-15 assembly.		thru		
2 TI a = 1	1 000-D-8009-15 assembly.		TP4	Pin, Test Point	706-44
3 rr. 1	n 660-D-8009-16 assembly		K1	Relay, 2 Form C	690-28
Used or	n 660-D-8009-99-94 assembly.			Socket, I.C., 24-Pin	553-67

Table 6-15. A7/A8 YIG Driver, 12.4-18.6 (20) GHz, 6629A/6637A/6638A/6647A/6648A (660-D-8008-4, -7, -99-90)

REF.  DESCRIPTION  WILTRON  PART NO.  R4  MF, 1/4W, 1%, 61, 91, 92  110-61, 91-11  Tantahun, 47 UF  Tantahun, 19 UF  Tantahun, 47 UF  Tantahun, 47 UF  Tantahun, 47 UF  Tantahun, 19 UF  Tantahun, 47 UF  Tantahun, 19 UF  Tantahun			and the second of the second o		THE RESERVE OF THE CONTRACTOR OF THE PROPERTY	
REF. DESCRIPTION PART NO. R5		CAP <b>ACITOR</b> S		R2	Variable, 15-Turn, 50 k $\Omega$	157-50k
DESCRIPTION   PART NO.   R5		<del></del>				
Tantalum, 4.7 μF   250-39   R7   Variable, 15-Tum, 1 kΩ   110-11k-1   157-1k   15	REF.		WILTRON	R4	MF, $1/4W$ , 1%, 61.9 k $\Omega$	110-61.9k-1
Tantalum, 4.7 μF   250-39   R7   Variable, 15-Turn, 1kΩ   157-1k   157-1	DES.	DESCRIPTION	PART NO.	R5	Variable, 15-Turn, $1 k\Omega$	157-1k
C2				R6	MF, $1/4W$ , $1\%$ , $11 k\Omega$	110-11k-1
C3         Tantalum, 4.7 μF         250-39         R9         Variable, 15-Turn, 200 kΩ         157-200k           C4         Disc Ceramic, .001 μF         230-310         R10²         MF, 1/4w, 1%, 205 kΩ         110-210k-1           C5         Disc Ceramic, .001 μF         230-30         R10²         MF, 1/4w, 1%, 205 kΩ         110-20k-1           C6         Tantalum, 1 μF, 35V         230-19         R11²         MF, 1/4w, 1%, 5.11 kΩ         110-5.11k-1           C7         Tantalum, 1 μF, 35V         230-41         R12         MF, 1/4w, 1%, 7.66 kΩ         110-5.11k-1           C9         Mica, 300 μF         220-300         R13         Variable, 1-Turn, 20 kΩ         156-20k           C11         Tontilitie, 1 μF         220-30         R14         MF, 1/4w, 1%, 1.87 kΩ         110-1.67k-1           C12         Tontilitie, 1 μF         220-3         R14         MF, 1/4w, 1%, 3.10 kΩ         110-1.68k-1           C13         Monolithic, 1 μF         230-37         R16         MF, 1/4w, 1%, 3.20 kΩ         110-1.0k-1           C16         Mica, 80 pF         220-820         R18         MF, 1/4w, 1%, 120         110-23-R-1           C16         Mica, 80 pF         220-820         R18         MF, 1/4w, 1%, 120         110-23-R-1		Tantalum, 4.7 μF	250-39	R7	Variable, 15-Turn, 1 k $\Omega$	157-1k
C4 Disc Ceramic, 01 μF			250-39	R8	MF, $1/4$ W, $1\%$ , $11$ k $\Omega$	110-11k-1
C5   Disc Ceramic, 001 μF   230-30   R10	C3	Tantalum, 4.7 μF	250-39			157-200k
C6   Tantalum, 1 μF, 35V   250-19   R11			230-11			110-210k-1
Tantalum, 1 μF, 35V   250-19   R11		Disc Ceramic, .001 μF	230-30			110-205k-1
C8				R11 1		
C9						
C10				1		
C11		, <u>.</u>				
C12				R14 1		
C14   Disc Ceramic, 01 μF   230-31   R16   MF, 1/4W, 196, 10 kΩ   110-10k-1						
C15		•				
C16						
C16						
C18		· -		l		
C18						
Diodes		, , ,				
DIODES						
DIODES   R24   MF, 1/4W, 1%, 5.11 kΩ   110-5.11k-1	C19	Disc Ceramic, .UI µF	230-11			
REF.   DESCRIPTION   PART NO.   R25   WW, 5W, 3Ω   131-2				4		
REF.   DESCRIPTION   PART NO.   R26   MF.   1/4W, 1%, 10 kΩ   110-10k-1		DIODES				
Description   Part No.   R28   MF, 1/4W, 1%, 750Ω   110-750-1						
CR1   Silicon, 1N4446   10-1N4446   R29   MF, 1/4W, 1%, 5.49 kΩ   110-5.49k-1	REF.					
CR1   Silicon, 1N4446   10-1N4446   R29   MF, 1/4W, 1%, 1.78 kΩ   110-1.78k-1   CR2   Silicon, IN4446   10-1N4446   R30   MF, 1/4W, 1%, 1.5 kΩ   110-2.15k-1   CR3   Silicon, SI2   10-SI2   R31   MF, 1/4W, 1%, 1.5 kΩ   110-1.21k-1   CR5   Silicon, SI2   10-SI2   R33   MF, 1/4W, 1%, 178 kΩ   110-1.21k-1   CR5   Silicon, SI2   10-SI2   R33   MF, 1/4W, 1%, 17.8 kΩ   110-1.78k-1   CR6   Silicon, IN4446   10-1N4446   R35   MF, 1/4W, 1%, 17.8 kΩ   110-1.78k-1   CR7   Silicon, IN4446   10-1N4446   R35   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   CR9   Silicon, IN4446   10-1N4446   R38   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   CR1   Silicon, IN4446   10-1N4446   R38   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   CR1   Silicon, IN4446   10-1N4446   R41   MF, 1/4W, 1%, 18.7 kΩ   110-10k-1   CR11   Silicon, IN4446   10-1N4446   R41   MF, 1/4W, 1%, 18.7 kΩ   110-10k-1   R41   MF, 1/4W, 1%, 18.8 k3 kΩ   110-10k-1   R41   MF, 1	DES.	DESCRIPTION	PART NO.			
CR2   Silicon, 1N4446   10-1N4446   R30   MF, 1/4W, 1%, 1k   110-1k-1   110-1k-1   CR3   Silicon, SIZ   10-SIZ   R31   MF, 1/4W, 1%, 1k   110-1k-1   CR5   Silicon, SIZ   10-SIZ   R32   MF, 1/4W, 1%, 1k   110-1k-1   CR5   Silicon, SIZ   10-SIZ   R33   MF, 1/4W, 1%, 1.21 kΩ   110-1.21k-1   CR5   Silicon, IN4446   10-1N4446   R33   MF, 1/4W, 1%, 1 kΩ   110-1k-1   CR6   Silicon, IN4446   10-1N4446   R35   MF, 1/4W, 1%, 1 kΩ   110-1k-1   CR8   Silicon, IN4446   10-1N4446   R38   MF, 1/4W, 1%, 1 kΩ   110-1k-1   CR9   Zener, 10V, 0.4W, 1N758   10-1N758   R39   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   CR10   Silicon, IN4446   10-1N4446   R40   MF, 1/4W, 1%, 10 kΩ   110-10k-1   CR11   Silicon, IN4446   10-1N4446   R41   MF, 1/4W, 1%, 10 kΩ   110-10k-1   R41   MF, 1/4W, 1%, 18.7 kΩ   110-10k-1   R42   Wariable, 15-Turn, 50 kΩ   157-50k   R43   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   REF.   WILTRON   R45   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   REF.   DESCRIPTION   PART NO.   R46   MF, 1/4W, 1%, 10 kΩ   110-10k-1   R44   MF, 1/4W, 1%, 10 kΩ   110-10k-1   R42   MF, 1/4W, 1%, 10 kΩ   110-10k-1   R44   MF, 1/4W, 1%, 10 kΩ   1						
CR3   Silicon, SIV   10-SIV		•	and the second s			
CR3   Silicon, SiZ   CR4   Zener, 24V, 1W, 1N4749A   10-1N4749A   10-1N4749A   CR5   Silicon, SIZ   10-SIZ   R33   MF, 1/4W, 1%, 1.21 kΩ   110-1.21k-1   CR6   Silicon, IN4446   10-1N4446   R34   Variable, 1-Turn, 200 kΩ   156-200k   CR7   Silicon, 1N4446   10-1N4446   R35   MF, 1/4W, 1%, 1 kΩ   110-18.7k-1   CR8   Silicon, 1N4446   10-1N4446   R35   MF, 1/4W, 1%, 1 kΩ   110-18.7k-1   CR9   Zener, 10V, 0.4W, 1N758A   10-1N758A   R38   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   CR10   Silicon, 1N4446   10-1N4446   R40   MF, 1/4W, 1%, 10 kΩ   110-10k-1   CR11   Silicon, 1N4446   10-1N4446   R41   MF, 1/4W, 1%, 10 kΩ   110-10k-1   R41   MF, 1/4W, 1%, 10 kΩ   110-10k-1   R41   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   CR10   Silicon, 1N4446   R41   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   CR10   Silicon, 1N4446   R41   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   CR10   Silicon, 1N4446   R41   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   CR10   Silicon, 1N4446   R41   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   CR10   Silicon, 1N4446   R41   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   CR10   Silicon, 1N4446   R41   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   CR10   Silicon, 1N4446   R41   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   CR10   Silicon, 1N4446   R41   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   CR10   Silicon, 1N4446   R41   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   CR10   Silicon, 1N4446   R41   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   CR10   Silicon, 1N4446   R41   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   CR10   Silicon, 1N4446   R41   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   CR10   Silicon, 1N4446   R41   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   CR10   Silicon, 1N4446   R41   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   CR10   Silicon, 1N4446   R41   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   CR10   Silicon, 1N4446   R41   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   CR10   Silicon, 1N4446   R41   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   R41   MF, 1/4W, 1%, 18.7				4		
CR5   Silicon, SiZ   10-5iZ   R33   MF, 1/4W, 1%, 17.8 kΩ   110-17.8k-1						
CR6   Silicon, 1N4446   10-1N4446   R35   MF, 1/4W, 1%, 1 kΩ   110-1k-1		· · · ·		8		
CR7   Silicon, IN4446   10-1N4446   R35   MF, 1/4W, 1%, 1 kΩ   110-1k-1				9		
CR8 Silicon, IN4446 CR9 Zener, 10V, 0.4W, 1N758A CR10 Silicon, 1N4446 CR11 MF, 1/4W, 1%, 110 kΩ  110-110k-1 CR12 CVariable, 15-Turn, 10 kΩ CR12 CVariable, 15-Turn, 10 kΩ CR14 MF, 1/4W, 1%, 18, 18, 18Ω CR15 CVariable, 15-Turn, 10 kΩ CR16 MF, 1/4W, 1%, 110 kΩ CR17 CVAriable, 15-Turn, 10 kΩ CR18 CVAriable, 15-Turn, 10 kΩ CR19 CVAriable, 15-Turn, 10 kΩ CR10 CVAriable, 15-Turn, 10 kΩ CVAriable, 15-Tu						
CR9   Zener, 10V, 0.4W, 1N758A   10-1N758A   R39   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   CR10   Silicon, 1N4446   10-1N4446   R411   MF, 1/4W, 1%, 10 kΩ   110-10k-1   CR11   Silicon, 1N4446   10-1N4446   R411   MF, 1/4W, 1%, 10 kΩ   110-10k-1   R412   MF, 1/4W, 1%, 10 kΩ   110-10k-1   R412   MF, 1/4W, 1%, 10 kΩ   110-61.9k-1   R42   Variable, 15-Turn, 50 kΩ   157-50k   R43   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   REF.   WILTRON   R45   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   REF.   DESCRIPTION   PART NO.   R46   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   R44   MF, 1/4W, 1%, 10 kΩ   110-10k-1   R45k-1   R47   Variable, 15-Turn, 10 kΩ   157-10k   R48   MF, 1/4W, 1%, 10 kΩ   110-10k-1   R48   MF, 1/4W, 1%, 18 kΩ   110-383k-1   R48   MF, 1/4W, 1%, 18 kΩ   110-383k-1   R48   MF, 1/4W, 1%, 18 kΩ   110-383k-1   R48   MF, 1/4W, 1%, 18 kΩ   110-3866-1   R48   MF, 1/4W, 1%, 18 kΩ   110-8.66-1   R48   MF, 1/4W, 1%, 10 kΩ   110-8.66-1   R48   MF, 1/4W, 1%, 10 kΩ   110-8.66-1   R48   MF, 1/4W, 1%, 10 kΩ   110-33.2k-1   R48   MF, 1/4W, 1%, 33.2 kΩ   110-33.2k-1   R48   MF, 1/4W, 1%, 10 kΩ   110-10k-1   R41   MF, 1/4W, 1%, 33.2 kΩ   110-33.2k-1   R48   MF, 1/4W, 1%, 10 kΩ   110-10k-1   R41   MF, 1/4W, 1%, 10 kΩ   110-33.2k-1   R41   MF, 1/4W, 1%, 10 kΩ   110-33.2k-1   R41   MF, 1/4W, 1%, 10 kΩ   110-33.2						
CR10   Silicon, 1N4446   10-1N4446   R41   MF, 1/4W, 1%, 10 kΩ   110-10k-1					The state of the s	
CR10   Silicon, 1N4446   10-1N4446   R41   MF, 1/4W, 1%, 110 kΩ   110-110k-1 R41   R41   MF, 1/4W, 1%, 61.9 kΩ   110-61.9k-1 R42   Variable, 15-Turn, 50 kΩ   157-50k R43   MF, 1/4W, 1%, 18.7 kΩ   110-118.7k-1 R44   MF, 1/4W, 1%, 18.7 kΩ   110-118.7k-1 R45   MF, 1/4W, 1%, 18.7 kΩ   110-118.7k-1 R45   MF, 1/4W, 1%, 10 kΩ   110-10k-1 R46   MF, 1/4W, 1%, 10 kΩ   110-10k-1 R46   MF, 1/4W, 1%, 10 kΩ   110-10k-1 R46   MF, 1/4W, 1%, 11 kΩ   110-11k-1 R47   R45   MF, 1/4W, 1%, 11 kΩ   110-11k-1 R47   R45   MF, 1/4W, 1%, 11 kΩ   110-11k-1 R47   R46   MF, 1/4W, 1%, 11 kΩ   110-10k-1 R46   MF, 1/4W, 1%, 11 kΩ   110-10k-1 R48   MF, 1/4W, 1%, 11 kΩ   110-10k-1 R48   MF, 1/4W, 1%, 11 kΩ   110-10k-1 R48   MF, 1/4W, 1%, 18, 11 kΩ   110-11k-1 R49   MF, 1/4W, 1%, 18, 11 kΩ   110-511-1 R49   MF, 1/4W, 1%, 18, 11 kΩ   110-511-1 R49   MF, 1/4W, 1%, 18, 11 kΩ   110-11k-1 R49   MF, 1/4W, 1%, 18, 10 kΩ   110-8.66-1 R56   MF, 1/4W, 1%, 8.06 kΩ   110-8.66-1 R57   MF, 1/4W, 1%, 8.06 kΩ   110-8.66-1 R57   MF, 1/4W, 1%, 8.06 kΩ   110-8.66-1 R57   MF, 1/4W, 1%, 8.06 kΩ   110-8.66-1 R56   MF, 1/4W, 1%, 8.06 kΩ   110-8.66-1 R61   MF, 1/4W, 1%, 8			and the second s			
R41   R41   R42   MF, 1/4W, 1%, 61.9 kΩ   110-61.9k-1   R42   Variable, 15-Turn, 50 kΩ   157-50k   R43   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   R44   MF, 1/4W, 1%, 18.4 kΩ   110-18.7k-1   R45   MF, 1/4W, 1%, 10 kΩ   110-10k-1   R46   MF, 1/4W, 1%, 10 kΩ   110-10k-1   R46   MF, 1/4W, 1%, 10 kΩ   110-10k-1   R47   Variable, 15-Turn, 10 kΩ   157-10k   R47   Variable, 15-Turn, 10 kΩ   157-10k   R47   Variable, 15-Turn, 10 kΩ   110-11k-1   R49   MF, 1/4W, 1%, 11 kΩ   110-11k-1   R50   MF, 1/4W, 1%, 10 kΩ   110-10k-1   R46   MF, 1/4W, 1%, 10 kΩ   110-10k-1   R50   MF, 1/4W, 1%, 10 kΩ   110-10k-1   R50   MF, 1/4W, 1%, 1%, 18 kΩ   110-3.83k-1   R50   MF, 1/4W, 1%, 1%, 18 kΩ   110-3.83k-1   R50   MF, 1/4W, 1%, 18 kΩ   110-18.66-1   R55   MF, 1/4W, 1%, 18 kΩ   110-18-10-11-1   R55   MF, 1/4W, 1%, 8.06Ω   110-8.66-1   R57   MF, 1/4W, 1%, 8.06Ω   110-8.66-1   R58   MF, 1/4W, 1%, 8.06Ω   110-8.66-1   R59   CC, 1/2W, 5Ω   10-2.55-5   R60   MF, 1/4W, 1%, 33.2 kΩ   110-33.2k-1   10-33.2k-1   10-33.2k-1   10-33.2k-1   10-33.2k-1   10-33.2k-1   10-33.2k				R41 <sup>1</sup>		
TRANSISTORS   R42   Variable, 15-Turn, 50 kΩ   157-50k   R43   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   REF.   DESCRIPTION   PART NO.   R45   MF, 1/4W, 1%, 18.7 kΩ   110-18.7k-1   R46   MF, 1/4W, 1%, 10 kΩ   110-10k-1   R45k-1   R47   Variable, 15-Turn, 10 kΩ   110-8.45k-1   R47   Variable, 15-Turn, 10 kΩ   157-10k   R46   MF, 1/4W, 1%, 18.45 kΩ   110-8.45k-1   R47   Variable, 15-Turn, 10 kΩ   157-10k   R46   MF, 1/4W, 1%, 1%, 11 kΩ   110-11k-1   R46k-1   R47   Variable, 15-Turn, 10 kΩ   110-10k-1   R46k-1   R47   Variable, 15-Turn, 10 kΩ   110-11k-1   R46k-1   R47   Variable, 15-Turn, 10 kΩ   110-11k-1   R46k-1   R4	CRII	Sincon, IN4440	10-114440	R41 <sup>2</sup>		
REF. WILTRON PART NO. R45 MF, 1/4W, 1%, 18.7 kΩ 110-18.7k-1 PART NO. R45 MF, 1/4W, 1%, 10 kΩ 110-10k-1 PART NO. R46 MF, 1/4W, 1%, 8.45 kΩ 110-8.45k-1 R47 Variable, 15-Turn, 10 kΩ 157-10k R47 Variable, 15-Turn, 10 kΩ 110-11k-1 Q2 PNP, MPSA92 20-MPSA92 R48 MF, 1/4W, 1%, 10 kΩ 110-11k-1 Q3 NPN, 2N3694 20-2N3694 R50 MF, 1/4W, 1%, 10 kΩ 110-10k-1 Q4 NPN, 2N2222A 20-2N2222A R51 MF, 1/4W, 1%, 4.99 kΩ 110-4.9k-1 Q5 PNP, 2N2907A 20-2N2222A R51 MF, 1/4W, 1%, 3.83 kΩ 110-3.83k-1 Q6 NPN, 2N2222A 20-2N2222A R52 MF, 1/4W, 1%, 3.83 kΩ 110-3.83k-1 Q7 PNP, 2N2907A 20-2N2222A R53 MF, 1/4W, 1%, 511Ω 110-1k-1 R55 MF, 1/4W, 1%, 8.06Ω 110-8.66-1 R56 MF, 1/4W, 1%, 8.06Ω 110-8.66-1 R57 MF, 1/4W, 1%, 8.06Ω 110-8.66-1 R56 MF, 1/4W, 1%, 8.06Ω 110-8.66-1 R56 MF, 1/4W, 1%, 8.06Ω 110-8.66-1 R57 MF, 1/4W, 1%, 8.06Ω 110-8.66-1 R56 MF, 1/4W, 1%, 8.06Ω 110-8.66-1 R57 MF, 1/4W					Variable, 15-Turn, 50 k $\Omega$	157-50k
REF. DES.         DESCRIPTION         WILTRON PART NO.         R45 MF, 1/4W, 1%, 10 kΩ         110-10k-1           Q1 PNP, MPSA92         20-MPSA92         R46 MF, 1/4W, 1%, 8.45 kΩ         110-8.45k-1           Q2 PNP, MPSA92         20-MPSA92         R48 MF, 1/4W, 1%, 11 kΩ         110-11k-1           Q3 NPN, 2N3694         20-2N3694         R50 MF, 1/4W, 1%, 10 kΩ         110-10k-1           Q4 NPN, 2N2222A         20-2N2222A         R51 MF, 1/4W, 1%, 4.99 kΩ         110-4.99k-1           Q5 PNP, 2N2907A         20-2N2222A         R52 MF, 1/4W, 1%, 3.83 kΩ         110-18-1           Q6 NPN, 2N222A         20-2N2222A         R53 MF, 1/4W, 1%, 10 kΩ         110-18-1           Q7 PNP, 2N2907A         20-2N2907A         R52 MF, 1/4W, 1%, 151 kΩ         110-18-1           Q7 PNP, 2N2907A         20-2N2907A         R54 MF, 1/4W, 1%, 8.06Ω         110-8.66-1           REF.         R55 MF, 1/4W, 1%, 8.06Ω         110-8.66-1           R65 MF, 1/4W, 1%, 8.06Ω         110-8.66-1           R57 MF, 1/4W, 1%, 8.06Ω         110-8.66-1           R61 MF, 1/4W, 1%, 20, 2.15 kΩ         110-2.15k-1           R1 CC, 1/4W, 5%, 3.3 MΩ         101-3.3M-5         R61 MF, 1/4W, 1%, 33.2 kΩ         110-2.15k-1           R61 MF, 1/4W, 1%, 33.2 kΩ         110-33.2k-1         100-33.2k-1 <t< td=""><td></td><td>TRANSISTORS</td><td></td><td>R43</td><td>MF, <math>1/4W</math>, 1%, 18.7 k<math>\Omega</math></td><td>110-18.7k-1</td></t<>		TRANSISTORS		R43	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1
DES.         DESCRIPTION         PART NO.         R46         MF, 1/4W, 1%, 8.45 kΩ         110-8.45k-1           Q1         PNP, MPSA92         20-MPSA92         R48         MF, 1/4W, 1%, 11 kΩ         110-11k-1           Q2         PNP, MPSA92         20-MPSA92         R48         MF, 1/4W, 1%, 10 kΩ         110-10k-1           Q3         NPN, 2N3694         20-2N3694         R50         MF, 1/4W, 1%, 511Ω         110-511-1           Q4         NPN, 2N2222A         20-2N2222A         R51         MF, 1/4W, 1%, 54.99 kΩ         110-4.99k-1           Q5         PNP, 2N2907A         20-2N2222A         R51         MF, 1/4W, 1%, 3.83 kΩ         110-3.83k-1           Q6         NPN, 2N2222A         20-2N2222A         R53         MF, 1/4W, 1%, 3.83 kΩ         110-18-1           Q7         PNP, 2N2907A         20-2N2907A         R54         MF, 1/4W, 1%, 511Ω         110-1k-1           Q7         PNP, 2N2907A         20-2N2907A         R54         MF, 1/4W, 1%, 8.06Ω         110-8.66-1           REF.         WILTRON         R56         MF, 1/4W, 1%, 8.06Ω         110-8.66-1           REF.         WILTRON         R58         MF, 1/4W, 1%, 8.06Ω         110-8.66-1           REF.         WILTRON         R59         CC, 1/2				R44	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$				1		110-10k-1
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	DES.	DESCRIPTION	PART NO.		MF, $1/4W$ , $1\%$ , $8.45 k\Omega$	110-8.45k-1
Q2         PNP, MPSA92         20-MPSA92         R49         MF, $1/4$ W, $1\%$ , $10 kΩ$ $110-10k-1$ Q3         NPN, 2N3694         20-2N3694         R50         MF, $1/4$ W, $1\%$ , $511Ω$ $110-511-1$ Q4         NPN, 2N2222A $20-2N2222A$ R51         MF, $1/4$ W, $1\%$ , $4.99 kΩ$ $110-4.99k-1$ Q5         PNP, 2N2907A $20-2N2907A$ R52         MF, $1/4$ W, $1\%$ , $3.83 kΩ$ $110-10k-1$ Q7         PNP, 2N2907A $20-2N2222A$ R53         MF, $1/4$ W, $1\%$ , $10 kΩ$ $110-1k-1$ Q7         PNP, 2N2907A $20-2N2907A$ R54         MF, $1/4$ W, $1\%$ , $10 kΩ$ $110-1k-1$ R55         MF, $1/4$ W, $1\%$ , $1\%$ , $8.06Ω$ $110-8.66-1$ R56         MF, $1/4$ W, $1\%$ , $8.06Ω$ $110-8.66-1$ R57         MF, $1/4$ W, $1\%$ , $8.06Ω$ $110-8.66-1$ R58         MF, $1/4$ W, $1\%$ , $8.06Ω$ $110-8.66-1$ R59         CC, $1/2$ W, $5Ω$ $102-5.5-5$ R60         MF, $1/4$ W, $1\%$ , $33.2 kΩ$ $110-2.15k-1$ R1         CC, $1/4$ W, $5\%$ , $3.3$ MΩ $101-3.3$ M-5         R61 MF, $1/4$ W, $1\%$ , $10 kΩ$ $110-33.2k-1$ 10used	٥.	DVD ACCCCC	20 1/20 100		· · · · · · · · · · · · · · · · · · ·	
Q3 NPN, 2N3694 20-2N3694 R50 MF, $1/4$ W, $1\%$ , $511$ Ω 110-511-1 Q4 NPN, 2N2222A 20-2N2222A R51 MF, $1/4$ W, $1\%$ , $4.99$ kΩ 110-4.99k-1 Q5 PNP, 2N2907A 20-2N2907A R52 MF, $1/4$ W, $1\%$ , $3.83$ kΩ 110-3.83k-1 Q6 NPN, 2N2222A 20-2N2222A R53 MF, $1/4$ W, $1\%$ , $1$ kΩ 110-1k-1 Q7 PNP, 2N2907A 20-2N2907A R54 MF, $1/4$ W, $1\%$ , $1\%$ , $511$ Ω 110-1k-1 R55 MF, $1/4$ W, $1\%$ , $8.06$ Ω 110-8.66-1 R57 MF, $1/4$ W, $1\%$ , $8.06$ Ω 110-8.66-1 R57 MF, $1/4$ W, $1\%$ , $8.06$ Ω 110-8.66-1 R57 MF, $1/4$ W, $1\%$ , $8.06$ Ω 110-8.66-1 R57 MF, $1/4$ W, $1\%$ , $8.06$ Ω 110-8.66-1 R59 CC, $1/2$ W, $1\%$ , $1/2$ W, $1\%$ , $1/2$ PART NO. R59 CC, $1/2$ W, $1/2$ PART NO. R59 CC, $1/2$ W, $1/2$ PART NO. R60 MF, $1/4$ W, $1/2$ PART NO. R61 MF, $1/4$ W, $1/2$ PART NO. R62 MF, $1/4$ PART NO. R63 MF, $1/4$ PART NO. R64 MF, $1/4$ PART NO. R65 MF, $1/4$ PART		•				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		· - · · · · · · · · · · · · · · · · · ·		1	the state of the s	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$						
Q6       NPN, 2N2222A       20-2N2222A       R53       MF, $1/4$ W, $1\%$ , $1 kΩ$ $110-1k-1$ Q7       PNP, 2N2907A       20-2N2907A       R54       MF, $1/4$ W, $1\%$ , $511Ω$ $110-511-1$ RESISTORS       RESISTORS       R56       MF, $1/4$ W, $1\%$ , $8.06Ω$ $110-8.66-1$ REF.       WILTRON       R58       MF, $1/4$ W, $1\%$ , $8.06Ω$ $110-8.66-1$ DES.       DESCRIPTION       PART NO.       R58       MF, $1/4$ W, $1\%$ , $8.06Ω$ $110-8.66-1$ R1       CC, $1/4$ W, $5\%$ , $3.3$ MΩ $101-3.3$ M-5       R60       MF, $1/4$ W, $1\%$ , $2.15$ kΩ $110-2.15k-1$ R61       MF, $1/4$ W, $1\%$ , $10$ kΩ $110-10k-1$ $1$ Used on $660-D-8008-4$ and $-7$ assemblies.       R63       MF, $1/4$ W, $1\%$ , $10$ kΩ $110-33.2k-1$						
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		•		8		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		· · · · · · · · · · · · · · · · · · ·		l l		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Ųί	FNF, 6N69U(A	60-6N6901A			
REF.       WILTRON       R58       MF, $1/4$ W, $1\%$ , $8.06\Omega$ $110-8.66-1$ DES.       DESCRIPTION       PART NO.       R58       MF, $1/4$ W, $1\%$ , $8.06\Omega$ $110-8.66-1$ R1       CC, $1/4$ W, $5\%$ , $3.3$ M $\Omega$ $101-3.3$ M-5       R60       MF, $1/4$ W, $1\%$ , $2.15$ k $\Omega$ $110-2.15$ k-1         R61       MF, $1/4$ W, $1\%$ , $110$ k $\Omega$ $110-110$ k-1         R61       MF, $1/4$ W, $1\%$ , $33.2$ k $\Omega$ $110-33.2$ k-1         R62       MF, $1/4$ W, $1\%$ , $1\%$ , $33.2$ k $\Omega$ $110-33.2$ k-1         R63       MF, $1/4$ W, $1\%$ , $1\%$ , $10$ k $\Omega$ $110-10$ k-1						
REF.         WILTRON         R58         MF, $1/4$ W, $1\%$ , $8.06\Omega$ $110-8.66-1$ DES.         DESCRIPTION         PART NO.         R59         CC, $1/2$ W, $.5\Omega$ $1025-5$ R1         CC, $1/4$ W, $5\%$ , $3.3$ M $\Omega$ $101-3.3$ M-5         R61 $^1$ MF, $1/4$ W, $1\%$ , $110$ k $\Omega$ $110-10$ k-1           R61 $^2$ MF, $1/4$ W, $1\%$ , $33.2$ k $\Omega$ $110-33.2$ k-1           R62 $^2$ MF, $1/4$ W, $1\%$ , $33.2$ k $\Omega$ $110-33.2$ k-1           R63 MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ $110-10$ k-1		RESISTORS		8		
DES.         DESCRIPTION         PART NO.         R59         CC, 1/2W, .5Ω         1025-5           R1         CC, 1/4W, 5%, 3.3 MΩ         101-3.3M-5         R61 $^{1}$ MF, 1/4W, 1%, 110 kΩ         110-2.15k-1           R61 $^{2}$ MF, 1/4W, 1%, 130 kΩ         110-33.2k-1           R62 $^{2}$ MF, 1/4W, 1%, 33.2 kΩ         110-33.2k-1           R63 MF, 1/4W, 1%, 10 kΩ         110-10k-1           R63 MF, 1/4W, 1%, 10 kΩ         110-10k-1				8		
$ \begin{array}{c} R60 & MF, 1/4W, 1\%, 2.15 \ k\Omega \\ R1 & CC, 1/4W, 5\%, 3.3 \ M\Omega \\ \hline \\ R1 & CC, 1/4W, 5\%, 3.3 \ M\Omega \\ \hline \\ 101-3.3M-5 \\ \hline \\ R61 & MF, 1/4W, 1\%, 110 \ k\Omega \\ \hline \\ R61 & MF, 1/4W, 1\%, 33.2 \ k\Omega \\ \hline \\ R62 & MF, 1/4W, 1\%, 33.2 \ k\Omega \\ \hline \\ R62 & MF, 1/4W, 1\%, 33.2 \ k\Omega \\ \hline \\ R63 & MF, 1/4W, 1\%, 10 \ k\Omega \\ \hline \\ R63 & MF, 1/4W, 1\%, 10 \ k\Omega \\ \hline \end{array} $		nnaar		8		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	DES.	DESCRIPTION	PART NO.			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		00 1/477 70 000	101 0 0			
R62 MF, 1/4W, 1%, 33.2 kΩ 110-33.2k-1 R63 MF, 1/4W, 1%, 10 kΩ 110-10k-1	R1	CC, $1/4$ W, $5\%$ , $3.3$ M $\Omega$	101-3.3M <b>-</b> 5	R01 2		
Used on 660-D-8008-4 and -7 assemblies. R63 MF, 1/4W, 1%, 10 kΩ 110-10k-1				D 62 2		
	. د ـ ـ ت ا	660-D-0000 4 7				
Used on 000-D-0000-77-70 assembly.   R04 MF, 1/4W, 1%, 10 KM 110-10K-1			5.			
	o seu (	on coo-b-cooc-77-70 assembly.		1 104	1VII. 9 1/ T VV 9 1/0, 1U KM	110-10K-1

R65 R66 R67	MF, $1/4$ W, $1\%$ , $750 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $14.7 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $5.11\Omega$	110-750k-1 110-14.7k-1 110-5.11-1	REF. DES.	DESCRIPTION	WILTRON PART NO.
R68 R69 R70 R71 R72 R73 R74	Variable, 15-Turn, 500Ω MF, 1/4W, 1%, 2 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 750 kΩ MF, 1/4W, 1%, 14.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ	157-500 110-2k-1 110-10k-1 110-750k-1 110-14.7k-1 110-10k-1 110-10k-1	U1 U2 U3 U4 U5	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM Quad Op Amp, TL074	54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132
R75 R76 R77 R78 R79 R80	MF, 1/4W, 1%, 205 kΩ MF, 1/4W, 1%, 511Ω Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 2 kΩ MF, 1/4W, 1%, 15 kΩ MF, 1/4W, 1%, 511Ω	110-205k-1 110-511-1 156-20 110-2k-1 110-15k-1 110-511-1	U8 U9	Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS	54-125 54-158
R81 R82 R83	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ	110-511-1 110-100k-1 110-100k-1	REF. DES.	DESCRIPTION	WILTRON PART NO.
R84 R85 R86	MF, $1/4$ W, $1\%$ , $5.11 k\Omega$ MF, $1/4$ W, $1\%$ , $5.11 k\Omega$ MF, $1/4$ W, $1\%$ , $5.11\Omega$	110-5.11k-1 110-5.11k-1 110-5.11-1	TP1 thru	Ejector, PC Board	553-96
	INTEGRATED CIRCUITS		TP4 K1 	Pin, Test Point Relay, 2 Form C Socket, I.C., 24-Pin	706-44 690-28 553-67

Table 6-16. A7 YIG Driver, 26.5-40 GHz, 6642A (660-D-8191-99-93)

-			even a succession of the succession of		
D.E.E.	CAPACITORS		CR9 CR10	Zener, 10V, 0.4W, 1N758A Silicon, 1N4446	10-1N758A 10-1N4446
REF. DES.	DESCRIPTION	WILTRON PART NO.		TRANSISTORS	
		TART NO.		TRANSISTORS	
C1	Tantalum, 4.7 μF	250-39	REF.		WILTRON
C2	Tantalum, 4.7 μF	250-39	DES.	DESCRIPTION	PART NO.
C3	Tantalum, 4.7 μF	250-39			
C4	Disc Ceramic, .01 μF	230-11	Q1	PNP, MPSA92	20-MPSA92
C5	Disc Ceramic, .001 μF	230-30	Q2	PNP, MPSA92	20-MPSA92
C6	Tantalum, 1 μF, 35V	250-19	Q3	PNP, 2N4249	20-2N4249
C7	Tantalum, 1 $\mu$ F, 35V	250-19	Q4	PNP, MPSU55	20-30
C8	Monolithic, 1.0 μF	230-41	Q5	PNP, 2N2907A	20-2N2907A
C9	Mica, 300 pF	220-300	Q6	NPN, 2N2222A	20-2N2222A
C10	Monolithic, .1 μF	230-37	Q7	PNP, 2N2907A	20-2N2907A
C11	Tantalum, 6.8 μF	250-41	Q8	PNP, 2N2907A	20-2N2907A
C12	Mica, 5 pF	220-5			
C13	Monolithic, .1 μF	230-37		RESISTORS	
C14	Disc Ceramic, .01 μF	230-11			
C15	Mica, 820 pF	220-820	REF.		WILTRON
C16	Monolithic, .1 μF	230-37	DES.	DESCRIPTION	PART NO.
C17	Disc Ceramic, .01 μF	230-11			
C18	Disc Ceramic, .01 μF	230-11	R1	CC, $1/4W$ , 5%, $3.3 M\Omega$	101-3.3M-5
C19	Disc Ceramic, .01 μF	230-11	R2	Variable, 15-Turn, 50 k $\Omega$	157-50k
C20	Mica, 39 pF	220-39	R3	CC, $1/4W$ , 5%, $3.6 M\Omega$	101-3.6M-5
			R4	MF, $1/4$ W, $1\%$ , $61.9$ k $Ω$	110-61.9k-1
	DIODES		R5	Variable, 15-Turn, 1 kΩ	157-1k
			R6	MF, 1/4W, 1%, 10 kΩ	110-10k-1
REF.		WILTRON	R7	Variable, 1-Turn, 1 k $\Omega$	157-1k
DES.	DESCRIPTION	PART NO.	R8	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
			R9	Variable, 1-Turn, 200 k $\Omega$	157-200k
CR1	Silicon, 1N4446	10-1N4446	R10	MF, $1/4W$ , $1\%$ , $162 k\Omega$	110-162k-1
CR2	Silicon, 1N4446	10-1N4446	R11	MF, $1/4$ W, $1\%$ , $3.16$ kΩ	110 <b>-</b> 3.16k-1
CR3	Silicon, SI2	10-SI2	R12	MF, $1/4$ W, $1\%$ , $20 \text{ k}\Omega$	110-20k-1
CR4	Zener, 24V, 1W, 1N4749A	10-1N4749A	R13	Variable, 1-Turn, 20 k $\Omega$	156-20k
CR5	Silicon, SI2	10-SI2	R14	MF, $1/4$ W, $1\%$ , $2.05$ kΩ	110-2.05k-1
CR6	Silicon, 1N4446	10-1N4446	R15	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
CR7	Silicon, 1N4446	10-1N4446	R16	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
CR8	Silicon, 1N4446	10-1N4446	R17	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1

D 10					
R18	MF, $1/4W$ , $1\%$ , $23.7 k\Omega$	110-23.7k-1	R66	MF, $1/4W$ , $1\%$ , $14.7 \text{ k}\Omega$	110-14.7k-1
R19	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1	R67	MF, $1/4W$ , 1%, 5.11 $\Omega$	110-5.11-1
R20	MF, $1/4W$ , $1\%$ , $121\Omega$	110-121-1	R68	Variable, 1-Turn, 500Ω	157-500
R21	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1	R69	MF, $1/4W$ , $1\%$ , $2 k\Omega$	110-2k-1
R22	MF, $1/4W$ , $1\%$ , $7.5 k\Omega$	110-7.5k-1	R70	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R23	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1	R71	MF, $1/4W$ , $1\%$ , $750 \text{ k}\Omega$	110-750k-1
R24	MF, $1/4W$ , $1\%$ , $5.11 k\Omega$	110-5.11k-1	R72	MF, $1/4$ W, $1\%$ , $14.7$ kΩ	110-14.7k-1
R25	$WW, 5W, 5\Omega$	131-3	R73	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
R26	MF, $1/4W$ , 1%, 15.4 k $\Omega$	110-15k-1	R74	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
R27	MF, $1/4W$ , $1\%$ , $649\Omega$	110-649-1	R75	MF, $1/4W$ , $1\%$ , $750 \text{ k}\Omega$	110-750k-1
R28	MF, $1/4$ W, $1\%$ , $6.19$ kΩ	110-6.19k-1	R76	MF, $1/4W$ , $1\%$ , $5311\Omega$	110-730k-1
R29	MF, $1/4W$ , $1\%$ , $1.37 \text{ k}\Omega$	110-1.37k-1	R77	Variable, 1-Turn, $20\Omega$	
R30	MF, $1/4W$ , $1\%$ , $3.83 \text{ k}\Omega$	110-1.57k-1 110-3.83k-1	R78	, ,	156-20
R31	MF, $1/4W$ , $1\%$ , $3.83$ kW MF, $1/4W$ , $1\%$ , $1$ k $\Omega$	110-3:83R-1 110-1k-1		MF, 1/4W, 1%, 2 kΩ	110-2k-1
R32	MF, $1/4W$ , $1\%$ , $1 \times M$ MF, $1/4W$ , $1\%$ , $1.21 \times M$		R79	MF, 1/4W, 1%, 14.7 kΩ	110-14.7k-1
R32		110-1.21k-1	R80	MF, $1/4$ W, $1\%$ , $23.7 \text{ k}\Omega$	110-23.7k-1
	MF, 1/4W, 1%, 17.8 kΩ	110-17.8k-1	R81	MF, 1/4W, 1%, 23.7 kΩ	110-23.7k-1
R34	Variable, 1-Turn, 500 kΩ	156-500k	R82	MF, $1/4W$ , $1\%$ , $20 \text{ k}\Omega$	110-20k-1
R35	MF, $1/4W$ , $1\%$ , $49.9 \text{ k}\Omega$	110-49.9k-1	R83	MF, $1/4$ W, $1\%$ , $20 \text{ k}\Omega$	110-20k-1
R36	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$	110-5.11k-1	R84	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$	110-5.11k-1
R37	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$	110-5.11k-1	R85	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$	110-5.11k-1
R38	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1	R86	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1
R39	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1			
R40	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1		INTEGRATED CIRCUITS	
R41	MF, $1/4$ W, $1\%$ , $100 \text{ k}\Omega$	110-100k-1			
R42	Variable, 1-Turn, 50 k $\Omega$	157-50k	REF.		WILTRON
R43	MF, $1/4W$ , $1\%$ , $18.7 k\Omega$	110-18.7k-1	DES.	DESCRIPTION	PART NO.
		110 10	DEG.	DEDORM HOW	FART NO.
R44	MF, $1/4W$ , 1%, 18.7 kΩ	110-18.7k-1	DES.	Discitle How	FART NO.
R45		5	U1	Quad Analog Switch, LF13201	54-20
	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1			
R45	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ	110-18.7k-1 110-10k-1	U1	Quad Analog Switch, LF13201 NAND Gate, 74LS10	54-20
R45 R46	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ MF, 1/4W, 1%, 11 kΩ	110-18.7k-1 110-10k-1 110-8.45k-1	U 1 U 2	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05	54-20 54-42 54-87
R45 R46 R47	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ MF, 1/4W, 1%, 11 kΩ	110-18.7k-1 110-10k-1 110-8.45k-1 157-10k	U1 U2 U3 U4	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072	54-20 54-42 54-87 54-53
R45 R46 R47 R48	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ	110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1	U 1 U 2 U 3	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05	54-20 54-42 54-87 54-53 Not Field-
R45 R46 R47 R48 R49	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ	110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-10k-1 110-511-1	U1 U2 U3 U4 U5	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM	54-20 54-42 54-87 54-53 Not Field- Replaceable
R45 R46 R47 R48 R49 R50	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ	110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-10k-1 110-511-1 110-4.99k-1	U1 U2 U3 U4 U5	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM Quad Op Amp, TL074	54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132
R45 R46 R47 R48 R49 R50 R51	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ	110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1	U1 U2 U3 U4 U5 U7 U8	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86	54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125
R45 R46 R47 R48 R49 R50 R51 R52	MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $8.45$ kΩ Variable, $1$ -Turn, $10$ kΩ MF, $1/4$ W, $1\%$ , $11$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $511$ Ω MF, $1/4$ W, $1\%$ , $4.99$ kΩ MF, $1/4$ W, $1\%$ , $4.99$ kΩ MF, $1/4$ W, $1\%$ , $4.91$ kΩ	110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1	U1 U2 U3 U4 U5	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM Quad Op Amp, TL074	54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132
R45 R46 R47 R48 R49 R50 R51 R52 R53	MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $8.45$ kΩ Variable, $1$ -Turn, $10$ kΩ MF, $1/4$ W, $1\%$ , $11$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $511$ Ω MF, $1/4$ W, $1\%$ , $4.99$ kΩ MF, $1/4$ W, $1\%$ , $4.99$ kΩ MF, $1/4$ W, $1\%$ , $4.91$ kΩ MF, $1/4$ W, $1\%$ , $4.91$ kΩ MF, $1/4$ W, $1\%$ , $4.91$ kΩ	110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1	U1 U2 U3 U4 U5 U7 U8	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393	54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125
R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55	MF, $1/4$ W, $1\%$ , $18.7 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $8.45 \text{ k}\Omega$ Variable, $1\text{-Turn}$ , $10 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $11 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $4.99 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $3.83 \text{ k}\Omega$	110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-5.11-1	U1 U2 U3 U4 U5 U7 U8	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86	54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125
R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55	MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $8.45$ kΩ Variable, $1$ -Turn, $10$ kΩ MF, $1/4$ W, $1\%$ , $11$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $511$ Ω MF, $1/4$ W, $1\%$ , $4.99$ kΩ MF, $1/4$ W, $1\%$ , $3.83$ kΩ MF, $1/4$ W, $1\%$ , $3.83$ kΩ MF, $1/4$ W, $1\%$ , $3.83$ kΩ MF, $1/4$ W, $1\%$ , $5.11$ Ω MF, $1/4$ W, $1\%$ , $5.11$ Ω MF, $1/4$ W, $1\%$ , $5.11$ Ω	110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-5.11-1	U1 U2 U3 U4 U5 U7 U8 U9	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393	54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158
R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55 R56 R57	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 5.11Ω MF, 1/4W, 1%, 5.11Ω MF, 1/4W, 1%, 5.11Ω	110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-5.11-1 110-5.11-1	U1 U2 U3 U4 U5 U7 U8 U9	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS	54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158
R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55 R56 R57	MF, $1/4$ W, $1\%$ , $18.7 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $8.45 \text{ k}\Omega$ Variable, $1\text{-Turn}$ , $10 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $11 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $4.99 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $3.83 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $5.11\Omega$	110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-10k-1 110-511-1 110-3.83k-1 110-1k-1 110-511-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1	U1 U2 U3 U4 U5 U7 U8 U9	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393	54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158
R45 R46 R47 R48 R49 R50 R51 R52 R53 R55 R55 R55 R56 R57	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 5.11Ω CC, 1/2W, 5%, .5Ω	110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-511-1 110-511-1 110-3.83k-1 110-1k-1 110-511-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1	U1 U2 U3 U4 U5 U7 U8 U9	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION	54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158 WILTRON PART NO.
R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55 R56 R57 R58 R59 R60	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 5.11Ω CC, 1/2W, 5%, .5Ω MF, 1/4W, 1%, 2.15 kΩ	110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1	U1 U2 U3 U4 U5 U7 U8 U9	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS	54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158
R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55 R56 R57 R58 R59 R60 R61	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 5.11Ω	110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1	U1 U2 U3 U4 U5 U7 U8 U9	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION	54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158 WILTRON PART NO.
R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55 R56 R57 R58 R59 R60 R61 R62	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 5.11Ω	110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-12.15k-1 110-12.1k-1	U1 U2 U3 U4 U5  U7 U8 U9  REF. DES.  TP1 thru	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION  Ejector, PC Board	54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158 WILTRON PART NO. 553-96
R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55 R56 R57 R58 R59 R60 R61 R62 R63	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 5.11Ω	110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-10-10k-1	U1 U2 U3 U4 U5  U7 U8 U9  REF. DES.  TP1 thru TP4	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION  Ejector, PC Board  Pin, Test Point	54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158 WILTRON PART NO. 553-96
R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55 R56 R57 R58 R60 R61 R62 R63 R64	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 53.83 kΩ MF, 1/4W, 1%, 5.11Ω	110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-10k-1 110-511-1 110-3.83k-1 110-1k-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-10k-1 110-10k-1 110-10k-1	U1 U2 U3 U4 U5  U7 U8 U9  REF. DES.  TP1 thru TP4 K1	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION  Ejector, PC Board  Pin, Test Point Relay, 2 Form C	54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158 WILTRON PART NO. 553-96
R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55 R56 R57 R58 R59 R60 R61 R62 R63	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 5.11Ω	110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-10-10k-1	U1 U2 U3 U4 U5  U7 U8 U9  REF. DES.  TP1 thru TP4	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION  Ejector, PC Board  Pin, Test Point	54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158 WILTRON PART NO. 553-96

Table 6-17. A7 YIG Driver, 8-12.4 GHz, 6653A/6659A (660-D-8009-9, -12)

	CAPACITORS		C13 C14	Monolithic, .1 μF Disc Ceramic, .01 μF	230-37
REF. DES.	DESCRIPTION	WILTRON PART NO.	C14 C16 C17 C18	Monolithic, .1 µF Disc Ceramic, .01 µF Disc Ceramic, .01 µF	230-11 230-37 230-11 230-11
C1 C2 C3 C4 C5	Tantalum, 4.7 µF Tantalum, 4.7 µF Tantalum, 4.7 µF Disc Ceramic, .01 µF Disc Ceramic, .001 µF	250-39 250-39 250-39 230-11 230-30	C19 C20	Disc Ceramic, .01 µF Disc Ceramic, .01 µF Mica, 820 pF  DIODES	230-11 230-11 220-820
C6 C7 C8 C9 C10	Tantalum, 1 μF, 35V Tantalum, 1 μF, 35V Monolithic, 1.0 μF Mica, 300 pF Monolithic, .1 μF	250-19 250-19 230-41 220-300 230-37	REF. DES. CR1 CR2	DESCRIPTION  Silicon, 1N4446  Silicon, 1N4446	WILTRON PART NO. 10-1N4446 10-1N4446
C11 C12	Tantalum, 6.8 μF Mica, 5 pF	250-41 220-5	CR3 CR4	Silicon, SI2 Zener, 24V, 1W, 1N4749A	10-SI2 10-1N4749A

CR5	Silicon, SI2	10-SI2	R47	Variable, 15-Turn, 1 k $\Omega$	157-1k
CR6	Silicon, 1N4446	10-1N4446	R48	MF, 1/4W, 1%, 11 kΩ	
CR7	Silicon, 1N4446	10-1N4446	R49	MF, $1/4W$ , $1\%$ , $11 \text{ K}\Omega$ MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-11k-1
CR8	Silicon, 1N4446	10-1N4446	R50	MF, $1/4W$ , $1\%$ , $10 \text{ K}$ MF, $1/4W$ , $1\%$ , $511\Omega$	110-10k-1
CR9	Zener, 10V, 0.4W, 1N758A	10-1N758A	R51		110-511-1
CR10	Silicon, 1N4446	10-1N4446	i e	MF, 1/4W, 1%, 4.99 kΩ	110-4.99k-1
CR11	Silicon, 1N4446		R52	MF, 1/4W, 1%, 3.83 kΩ	110-3.83k-1
OICII	billeon, 1144440	10-1N4446	R53	MF, $1/4$ W, $1\%$ , $1 \text{ k}\Omega$	110-1k-1
			R54	MF, $1/4$ W, $1\%$ , $511\Omega$	110-511-1
	TRANSISTORS		R55	MF, $1/4$ W, $1\%$ , $6.19\Omega$	110-6.19-1
			R56	MF, $1/4W$ , $1\%$ , $6.19\Omega$	110-6.19-1
REF.		WILTRON	R57	MF, $1/4W$ , $1\%$ , $6.19\Omega$	110-6.19-1
DES.	DESCRIPTION	PART NO.	R58	MF, $1/4W$ , $1\%$ , $6.19\Omega$	110-6.19-1
			R59	MF, $1/4W$ , $1\%$ , $6.19\Omega$	110-6.19-1
Q1	PNP, MPSA92	20-MPSA92	R60	MF, $1/4W$ , $1\%$ , $2.15 k\Omega$	110-2.15k-1
Q2	PNP, MPSA92	20-MPSA92	R61 1	MF, $1/4W$ , $1\%$ , $33.2 k\Omega$	110-33.2k-1
Q3	PNP, 2N3694	20-2N3694	R61 <sup>2</sup>	MF, $1/4W$ , $1\%$ , $38.3 k\Omega$	110-38.3k-1
Q4	NPN, 2N2222A	20-2N2222A	R62 1	MF, $1/4W$ , $1\%$ , $33.2 k\Omega$	110-33.2k-1
Q5	NPN, 2N2222A	20-2N2222A	R62 2	MF, $1/4W$ , $1\%$ , $38.3 k\Omega$	110-38.3k-1
Q6	PNP, 2N2907A	20-2N2907A	R63	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
Q7	NPN, 2N2222A	20-2N2222A	R64	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
	•		R65	MF, $1/4W$ , $1\%$ , $750 k\Omega$	110-750k-1
	<b>RESISTORS</b>		R66	MF, $1/4W$ , 1%, 14.7 k $\Omega$	110-14.7k-1
			R67	MF, $1/4W$ , 1%, 2.26 k $\Omega$	110-2.26k-1
REF.		WILTRON	R68	Variable, 15-Turn, 500Ω	157-500
DES.	DESCRIPTION	PART NO.	R69	MF, $1/4W$ , $1\%$ , $2 k\Omega$	110-2k-1
			R70	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R1	CC, $1/4W$ , 5%, 3.3 M $\Omega$	101-3.3M-5	R71	MF, $1/4$ W, $1\%$ , $750$ kΩ	110-750k-1
R2	Variable, 15-Turn, 50 kΩ	157-50k	R72	MF, $1/4W$ , $1\%$ , $14.7 \text{ k}\Omega$	110-14.7k-1
R3	CC, $1/4W$ , 5%, 3.6 M $\Omega$	101-3.6M-5	R73	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
R4	MF, $1/4W$ , $1\%$ , $61.9 \text{ k}\Omega$	110-61.9k-1	R74	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R5	Variable, 15-Turn, 1 kΩ	157-1k	R75	MF, $1/4W$ , $1\%$ , $205 k\Omega$	110-10k-1 110-205k-1
R7	Variable, 15-Turn, 1 kΩ	157-1k	R76	MF, $1/4W$ , $1\%$ , $511\Omega$	110-2058-1
R9	Variable, 15-Turn, 200 k $\Omega$	157-200k	R77	Variable, 1-Turn, $20\Omega$	
R10	MF, $1/4W$ , 1%, 205 k $\Omega$	110-205k-1	R78		156-20
R11 <sup>1</sup>	MF, $1/4W$ , $1\%$ , $14.7 \text{ k}\Omega$	110-203k-1 110-14.7k-1	R79	MF, 1/4W, 1%, 2 kΩ	110-2k-1
R11 <sup>2</sup>	MF, $1/4W$ , $1\%$ , $14.7 \text{ K}$ MF, $1/4W$ , $1\%$ , $14 \text{ k}\Omega$			MF, 1/4W, 1%, 15 kΩ	110-15k-1
R12	MF, $1/4W$ , $1\%$ , $14K$ % MF, $1/4W$ , $1\%$ , $20 k\Omega$	110-14k-1	R80	MF, $1/4$ W, $1\%$ , $511\Omega$	110-511-1
R13	Variable, 1-Turn, 20 k $\Omega$	110-20k-1	R81	MF, $1/4$ W, $1\%$ , $511\Omega$	110-511-1
R13		156-20k	R82	MF, $1/4W$ , 1%, 100 k $\Omega$	110-100k-1
	MF, 1/4W, 1%, 2.61 kΩ	110-2.61k-1	R83	MF, $1/4$ W, $1\%$ , $100$ kΩ	110-100k-1
R15	MF, 1/4W, 1%, 10 kΩ	110-10k-1	R84	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$	110-5.11k-1
R16	MF, $1/4W$ , $1\%$ , 4.99 k $\Omega$	110-4.99k-1	R85	MF, $1/4W$ , $1\%$ , $5.11 k\Omega$	110-5.11k-1
R17	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1	R86	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1
R18	MF, $1/4W$ , $1\%$ , $23.7 k\Omega$	110-23.7k-1			
R19	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1		THE PART AND ATT ATTEMA	
R20	MF, $1/4W$ , $1\%$ , $121\Omega$	110-121-1		INTEGRATED CIRCUITS	
R21	MF, 1/4W, 1%, 1 kΩ	110-1k-1			
R22	MF, $1/4W$ , $1\%$ , $7.5 k\Omega$	110-7.5k-1	REF.		WILTRON
R23	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1	DES.	DESCRIPTION	PART NO.
R24	MF, 1/4W, 1%, 5.11 kΩ	110-5.11k-1			
R25	WW, 5W, 5Ω	131-3	U1	Quad Analog Switch, LF13201	54-20
R26	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1	U2	NAND Gate, 74LS10	54-42
R27	MF, $1/4W$ , $1\%$ , $750\Omega$	110-750-1	U3	Op Amp, OP05	54-87
R28	MF, $1/4W$ , $1\%$ , $5.49 k\Omega$	110-5.49k-1	U4	Quad Op Amp, TL072	54-53
R29	MF, $1/4W$ , $1\%$ , $1.78 \text{ k}\Omega$	110-1.78k-1	U5	2k x 8 EPROM	Not Field-
R30	MF, $1/4W$ , $1\%$ , $2.15 k\Omega$	110-2.15k-1			Replaceable
R31	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1	U7	Quad Op Amp, TL074	54-132
R32	MF, $1/4W$ , $1\%$ , $1.21 \text{ k}\Omega$	110-1.21k-1	U8	Quad Ex. OR Gate, 74LS86	54-125
R33	MF, $1/4W$ , 1%, 17.8 k $\Omega$	110-17.8k-1	U9	Dual Volt. Comp., LM393	54-158
R34	Variable, 1-Turn, 200 k $\Omega$	156-200k		- ·	
R35	MF, $1/4$ W, $1\%$ , $1 k\Omega$	110-1k-1			
R38	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18-1 110-18.7k-1		MISCELLANEOUS	
R39	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1			
R42	Variable, 15-Turn, 50 k $\Omega$	157-50k	REF.		WILTRON
R43	MF, $1/4W$ , 1%, 18.7 k $\Omega$		DES.	DESCRIPTION	PART NO.
R44	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1			
R45	MF, $1/4W$ , $1\%$ , $18.7 \text{ K}$ MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-18.7k-1		Ejector, PC Board	553-96
R46		110-10k-1	TP1		333 /0
17.40	MF, $1/4W$ , $1\%$ , $9.53 \text{ k}\Omega$	110-9.53k-1	thru		
				Din Tot Daint	70/ 44
			1 1 2 4		
<sup>1</sup> Used (	on 660-D-8009-9 assembly		TP4	Pin, Test Point	706-44 690-28
<sup>1</sup> Used o	on 660-D-8009-9 assembly.		K1 	Relay, 2 Form C Socket, I.C., 24-Pin	690-28 553-67

	CAPACITORS		R5 R7	Variable, 15-Turn, 1 kΩ Variable, 15-Turn, 1 kΩ	157-1k 157-1k
REF.		WILTRON	R9	Variable, 15-Turn, 1 k $\Omega$ Variable, 15-Turn, 200 k $\Omega$	157-1k 157-200k
DES.	DESCRIPTION	PART NO.	R10	MF, $1/4W$ , $1\%$ , $205 k\Omega$	110-205k-1
C1	Tantalum, 4.7 μF	250-39	R11 <sup>1</sup> R11 <sup>2</sup>	MF, $1/4$ W, $1\%$ , $6.19$ k $\Omega$ MF, $1/4$ W, $1\%$ , $6.81$ k $\Omega$	110-6.19k-1 110-6.81k-1
C2	Tantalum, 4.7 μF	250-39	R12	MF, $1/4W$ , $1\%$ , $0.81 \text{ K}$	110-20k-1
C3	Tantalum, 4.7 μF	250-39	R13	Variable, 1-Turn, 20 k $\Omega$	156-20k
C4	Disc Ceramic, .01 µF	230-11	R14 1	MF, $1/4W$ , $1\%$ , $1.78 \text{ k}\Omega$	110-1.78k-1
C5 C6	Disc Ceramic, .001 μF Tantalum, 1 μF, 35V	230-30 250-19	R14 <sup>2</sup> R15	MF, $1/4$ W, $1\%$ , $1.87$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ	110-1.87k-1 110-10k-1
C7	Tantalum, 1 µF, 35V	250-19	R16	MF, $1/4W$ , $1\%$ , $4.99 \text{ k}\Omega$	110-10k-1 110-4.99k-1
C8	Monolithic, 1.0 μF	230-41	R17	MF, 1/4W, 1%, 10 kΩ	. 110-10k-1
C9 C10	Mica, 300 pF	220-300	R18	MF, $1/4W$ , $1\%$ , $23.7 k\Omega$	110-23.7k-1
C10	Monolithic, .1 μF Tantalum, 6.8 μF	230-37 250-41 A	R19 R20	MF, 1/4W, 1%, 1 kΩ	110-1k-1
C12	Mica, 5 pF	220-5	R21	MF, $1/4$ W, $1\%$ , $121\Omega$ MF, $1/4$ W, $1\%$ , $1 k\Omega$	110-121-1 110-1k-1
C13	Monolithic, .1 μF	230-37	R22	MF, $1/4W$ , $1\%$ , $7.5 k\Omega$	110-7.5k-1
C14	Disc Ceramic, .01 μF	230-11	R23	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
C16 C17	Monolithic, .1 μF Disc Ceramic, .01 μF	230-37 230-11	R24 R25	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$	110-5.11k-1
C18	Disc Ceramic, .01 µF	230-11	R26	WW, 5W, 2Ω MF, $1/4$ W, $1\%$ , $10$ kΩ	131-1 110-10k-1
C19	Disc Ceramic, .01 µF	230-11	R27	MF, $1/4W$ , $1\%$ , $750\Omega$	110-750-1
C 20	Mica, 820 pF	220-820	R28	MF, $1/4W$ , $1\%$ , $5.49 \text{ k}\Omega$	110-5.49k-1
	DIODES		R29 R30	MF, 1/4W, 1%, 1.78 kΩ	110-1.78k-1
	<u> </u>		R31	MF, $1/4W$ , $1\%$ , $2.15 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $1 \text{ k}\Omega$	110-2.15k-1 110-1k-1
REF.		WILTRON	R32	MF, $1/4W$ , $1\%$ , $1.21 \text{ k}\Omega$	110-1.21k-1
DES.	DESCRIPTION	PART NO.	R33	MF, $1/4W$ , $1\%$ , $17.8 \text{ k}\Omega$	110-17.8k-1
CR1	Silicon, 1N4446	10-1N4446	R34 R35	Variable, 1-Turn, 200 kΩ	156-200k
CR2	Silicon, 1N4446	10-1N4446	R38	MF, $1/4$ W, $1\%$ , $1 k\Omega$ MF, $1/4$ W, $1\%$ , $18.7 k\Omega$	110-1k-1 110-18.7k-1
CR3	Silicon, SI2	10-SI2	R39	MF, $1/4W$ , 1%, $18.7 \text{ k}\Omega$	110-18.7k-1
CR4	Zener, 24V, 1W, 1N4749A	10-1N4749A	R42	Variable, 15-Turn, 50 k $\Omega$	157-50k
CR5 CR6	Silicon, SI2 Silicon, 1N4446	10-SI2 10-1N4446	R43 R44	MF, 1/4W, 1%, 18.7 kΩ	110-18.7k-1
CR7	Silicon, 1N4446	10-1N4446	R44 R45	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-18.7k-1 110-10k-1
CR8	Silicon, 1N4446	10-1N4446	R46	MF, $1/4W$ , 1%, 9.53 k $\Omega$	110-9.53k-1
CR9	Zener, 10V, 0.4W, 1N758A	10-1N758A	R47	Variable, 15-Turn, 1 k $\Omega$	157-1k
CR10 CR11	Silicon, 1N4446 Silicon, 1N4446	10-1N4446 10-1N4446	R48 R49	MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ	110-11k-1 110-10k-1
Once	<b>5.11.11.11</b>	10 1111110	R50	MF, $1/4W$ , $1\%$ , $10 \text{ K}$ MF, $1/4W$ , $1\%$ , $511\Omega$	110-108-1
	<u>TRANSISTORS</u>		R51	MF, $1/4W$ , $1\%$ , 4.99 k $\Omega$	110-4.99k-1
DEE		WIII TOON	R52	MF, $1/4W$ , $1\%$ , $3.83 \text{ k}\Omega$	110-3.83k-1
REF. DES.	DESCRIPTION	WILTRON PART NO.	R53 R54	MF, $1/4$ W, $1\%$ , $1 k\Omega$ MF, $1/4$ W, $1\%$ , $511\Omega$	110-1k-1 110-511-1
2 201		11111111111	R55	MF, $1/4W$ , $1\%$ , $511\%$ MF, $1/4W$ , $1\%$ , $6.19\Omega$	110-6.19-1
Q1	PNP, MPSA92	20-MPSA92	R56	MF, $1/4W$ , $1\%$ , $6.19\Omega$	110-6.19-1
Q2	PNP, MPSA92	20-MPSA92	R57	MF, $1/4$ W, $1\%$ , $6.19\Omega$	110-6.19-1
Q3 Q4	PNP, 2N3694 NPN, 2N2222A	20-2N3694 20-2N2222A	R58 R59	MF, $1/4W$ , $1\%$ , $6.19\Omega$ MF, $1/4W$ , $1\%$ , $6.19\Omega$	110-6.19-1 110-6.19-1
Q5	NPN, 2N2222A	20-2N2222A	R60	MF, $1/4W$ , $1\%$ , $2.15 \text{ k}\Omega$	110-2.15k-1
Q6	PNP, 2N2907A	20-2N2907A	R61	MF, $1/4$ W, $1\%$ , $100$ kΩ	110-100k-1
Q7	NPN, 2N2222A	20-2N2222A	R63	MF, 1/4W, 1%, 10 kΩ	110-10k-1
	<b>RESISTORS</b>		R64 R65	MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $750$ kΩ	110-10k-1 110-750k-1
			R66	MF, $1/4W$ , $1\%$ , $14.7 \text{ k}\Omega$	110-14.7k-1
REF.	D.T.G.D.TD.TTO.Y	WILTRON	R67	MF, $1/4W$ , $1\%$ , $825\Omega$	110-825-1
DES.	DESCRIPTION	PART NO.	R68 R69	Variable, 15-Turn, $500\Omega$ MF, 1/4W, 1%, $2 k\Omega$	157-500 110-2k-1
R1	CC, $1/4W$ , 5%, $3.3 M\Omega$	101-3.3M-5	R70	MF, $1/4W$ , $1\%$ , $2 \text{ K}$ MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-2k-1 110-10k-1
R2	Variable, 15-Turn, 50 k $\Omega$	157-50k	R71	MF, $1/4$ W, $1\%$ , $750$ k $\Omega$	110-750k-1
R3 R4	CC, $1/4W$ , 5%, 3.6 M $\Omega$	101-3.6M-5	R72	MF, 1/4W, 1%, 14.7 kΩ	110-14.7k-1
L.4	MF, $1/4$ W, $1\%$ , $61.9 \text{ k}\Omega$	110-61.9k-1	R73 R74	MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1 110-10k-1
			R75	MF, $1/4W$ , $1\%$ , $10 \text{ k}$ MF, $1/4W$ , $1\%$ , $205 \text{ k}$ $\Omega$	110-10k-1 110-205k-1
	on 660-D-8009-10 assembly.		R76	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
⁴Used	on 660-D-8009-13 assembly.		R77	Variable, 1-Turn, $20\Omega$	156-20

R78 R79 R80 R81 R82 R83 R84 R85 R86	MF, $1/4$ W, $1\%$ , $2 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $15 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $100 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $100 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $5.11 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $5.11 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $5.11\Omega$	110-2k-1 110-15k-1 110-511-1 110-511-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1	U3 U4 U5 U7 U8 U9	Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS	54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158
	INTEGRATED CIRCUITS		REF. DES.	DESCRIPTION	WILTRON PART NO.
REF. DES.	DESCRIPTION	WILTRON PART NO.	 TP1 thru	Ejector, PC Board	553-96
U1 U2	Quad Analog Switch, LF13201 NAND Gate, 74LS10	54-20 54-42	TP4 K1	Pin, Test Point Relay, 2 Form C Socket, I.C., 24-Pin	706-44 690-28 553-67

Table 6-19. A9 YIG Driver, 18-26.5 GHz, 6653A/6659A (660-D-8009-11)

	CAPACITORS			TRANSISTORS	
REF. DES.	DESCRIPTION	WILTRON PART NO.	REF. DES.	DESCRIPTION	WILTRON PART NO.
C1	Tantalum, 4.7 µF	250-39	Q1	PNP, MPSA92	20-MPSA92
C2	Tantalum, 4.7 µF	250-39	Q2	PNP, MPSA92	20-MPSA92
C3	Tantalum, 4.7 µF	250-39	Q3	PNP, 2N3694	20-2N3694
C4	Disc Ceramic, .01 µF	230-11	Q4	NPN, 2N2222A	20-2N2222A
C5	Disc Ceramic, .001 µF	230-30	Q5	NPN, 2N2222A	20-2N2222A
C6	Tantalum, 1 µF, 35V	250-19	06	PNP, 2N2907A	20-2N2907A
C <b>7</b>	Tantalum, 1 µF, 35V	250-19	07	NPN, 2N2222A	20-2N2222A
C8	Monolithic, 1.0 µF	230-41		,	20 211002211
C9	Mica, 300 pF	220-300			
C10	Monolithic, .1 µF	230-37		RESISTORS	
C11	Tantalum, 6.8 µF	250-41A			
C12	Mica, 5 pF	220-5	REF.		WILTRON
C13	Monolithic, .1 μF	230-37	DES.	DESCRIPTION	PART NO.
C14	Disc Ceramic, .01 µF	230-11	٦,	GG 1/477 FM 2.224	
C16	Monolithic, .1 µF	230-37	R1	CC, $1/4$ W, 5%, 3.3 M $\Omega$	101-3.3M-5
C17	Disc Ceramic, .01 µF	230-11	R2 R3	Variable, 15-Turn, 50 kΩ	157-50k
C18	Disc Ceramic, .01 µF	230-11		CC, 1/4W, 5%, 3.6 MΩ	101-3.6M-5
C19	Disc Ceramic, .01 µF	230-11	R4	MF, $1/4W$ , $1\%$ , $61.9 \text{ k}\Omega$	110-61.9k-1
C20	Mica, 820 pF	220-820	R5	Variable, 15-Turn, 1 kΩ	157-1k
	•		R7	Variable, 15-Turn, 1 kΩ	157-1k
			R9 R10	Variable, 15-Turn, 200 kΩ	157-200k
	DIODES		R10	MF, 1/4W, 1%, 205 kΩ	110-205k-1
	DIODES			MF, $1/4W$ , $1\%$ , $4.02 \text{ k}\Omega$	110-4.02k-1
REF.		WILTRON	R12 R13	MF, $1/4$ W, $1\%$ , $20 \text{ k}\Omega$	110-20k-1
DES.	DESCRIPTION	PART NO.	R13	Variable, 1-Turn, 20 kΩ	156-20k
DLO.	DESCRI HON	FARI NO.	R15	MF, $1/4$ W, $1\%$ , $1.54$ k $\Omega$	110-1.54k-1
CR1	Silicon, 1N4446	10-1N4446	R16	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 4.99 kΩ	110-10k-1
CR2	Silicon, 1N4446	10-1N4446	R17	MF, $1/4W$ , $1\%$ , 4.99 KM MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-4.99k-1
CR3	Silicon, SI2	10-512	R18		110-10k-1
CR4	Zener, 24V, 1W, 1N4749A	10-312 10-1N4749A	R19	MF, $1/4$ W, $1\%$ , $23.7 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $1 \text{ k}\Omega$	110-23.7k-1
CR5	Silicon, SI2	10-SI2	R20	MF, $1/4W$ , $1\%$ , $1 \text{ KM}$ MF, $1/4W$ , $1\%$ , $121\Omega$	110-1k-1
CR6	Silicon, 1N4446	10-312 10-1N4446	R21	MF, $1/4W$ , $1\%$ , $121\%$ MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-121-1
CR7	Silicon, 1N4446	10-1N4446	R22	MF, $1/4$ W, $1\%$ , $1$ kW MF, $1/4$ W, $1\%$ , $7.5$ k $\Omega$	110-1k-1 110-7.5k-1
CR8	Silicon, 1N4446	10-1N4446	R23	MF, $1/4W$ , $1\%$ , $7.5 \text{ K}$	110-7.5k-1 110-511-1
CR9	Zener, 10V, 0.4W, 1N758A	10-1N758A	R24	MF, $1/4W$ , $1\%$ , $511M$ MF, $1/4W$ , $1\%$ , $5.11 k\Omega$	
CR10	Silicon, 1N4446	10-1N4446	R25	$WW, 5W, 2\Omega$	110-5.11k-1 131-1
CR11	Silicon, 1N4446	10-1N4446	R26	WW, 5W, $2M$ MF, $1/4$ W, $1\%$ , $10$ kΩ	131-1 110-10k-1
01111		10 1141110	1 1000	1V11 , 1/TW , 1/0, 10 K36	110-10K-1

R27	MF, $1/4W$ , $1\%$ , $750\Omega$	110-750-1	R73	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
R28	MF, $1/4W$ , $1\%$ , $5.49 \text{ k}\Omega$	110-5.49k-1	R74	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
R29	MF, $1/4W$ , $1\%$ , $1.78 \text{ k}\Omega$	110-1.78k-1	R75	MF, $1/4W$ , 1%, 205 k $\Omega$	110-205k-1
R30	MF, $1/4W$ , $1\%$ , $2.15 k\Omega$	110-2.15k-1	R76	MF, $1/4W$ , 1%, $511\Omega$	110-511-1
R31	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1	R77	Variable, 1-Turn, 20Ω	156-20
R32	MF, $1/4W$ , 1%, 1.21 k $\Omega$	110-1.21k-1	R78	MF, $1/4W$ , $1\%$ , $2 k\Omega$	110-2k-1
R33	MF, $1/4W$ , $1\%$ , $17.8 \text{ k}\Omega$	110-17.8k-1	R79	MF, $1/4W$ , 1%, 15 k $\Omega$	110-15k-1
R34	Variable, 1-Turn, 200 kΩ	156-200k	R80	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
R35	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1	R81	MF, $1/4W$ , 1%, $511\Omega$	110-511-1
R38	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1	R82	MF, $1/4W$ , 1%, 100 k $\Omega$	110-100k-1
R39	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1	R83	MF, $1/4$ W, $1\%$ , $100$ kΩ	110-100k-1
R42	Variable, 15-Turn, 50 kΩ	157-50k	R84	MF, $1/4W$ , $1\%$ , $5.11 k\Omega$	110-5.11k-1
R43	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1	R85	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$	110-5.11k-1
R44	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1	R86	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1
R45	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1		, , , ,	
R46	MF, $1/4W$ , $1\%$ , 9.53 k $\Omega$	110-9.53k-1		INTEGRATED CIRCUITS	
R47	Variable, 15-Turn, 1 kΩ	157-1k			
R48	MF, $1/4W$ , $1\%$ , $11 k\Omega$	110-11k-1	REF.		WILTRON
R49	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1	DES.	DESCRIPTION	PART NO.
R50	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1			
R51	MF, $1/4W$ , $1\%$ , $4.99 \text{ k}\Omega$	110-4.99k-1	Ul	Quad Analog Switch, LF13201	54-20
R52	MF, $1/4W$ , $1\%$ , $3.83 \text{ k}\Omega$	110-3.83k-1	U2	NAND Gate, 74LS10	54-42
R53	MF, 1/4W, 1%, 1 kΩ	110-1k-1	U3	Op Amp, OP05	54-87
R54	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1	U4	Quad Op Amp, TL072	54-53
R55	MF, $1/4W$ , 1%, $6.19\Omega$	110-6.19-1	U5	2k x 8 EPROM	Not Field-
R56	MF, $1/4W$ , $1\%$ , $6.19\Omega$	110-6.19-1			Replaceable
R57	MF, $1/4W$ , 1%, 6.19 $\Omega$	110-6.19-1	U7	Quad Op Amp, TL074	54-132
R58	MF, $1/4W$ , $1\%$ , $6.19\Omega$	110-6.19-1	U8	Quad Ex. OR Gate, 74LS86	54-125
R59	MF, $1/4W$ , $1\%$ , $6.19\Omega$	110-6.19-1	U9	Dual Volt. Comp., LM393	54-158
R60	MF, $1/4W$ , $1\%$ , $2.15 k\Omega$	110-2.15k-1		- '	
R61	MF, $1/4W$ , 1%, 12.1 k $\Omega$	110-12.1k-1		MISCELLANEOUS	
R63	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1			
R64	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1	REF.		WILTRON
R65	MF, $1/4W$ , $1\%$ , $750 \text{ k}\Omega$	110-750k-1	DES.	DESCRIPTION	PART NO.
R66	MF, $1/4W$ , $1\%$ , $14.7 \text{ k}\Omega$	110-14.7k-1			
R67	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1		Ejector, PC Board	553-96
R68	Variable, 15-Turn, 500Ω	157-500	TP1	•	
R69	MF, $1/4W$ , 1%, 2 k $\Omega$	110-2k-1	thru		
R70	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1	TP4	Pin, Test Point	706-44
R71	MF, $1/4W$ , $1\%$ , $750 \text{ k}\Omega$	110-750k-1	K1	Relay, 2 Form C	690-28
R72	MF, $1/4$ W, $1\%$ , $14.7$ kΩ	110-14.7k-1		Socket, I.C., 24-Pin	553-67

Table 6-20. A10 FM/Attenuator (660-D-8010)

	CAPACITORS		C18 C19	Tantalum, 25V, 10 μF Tantalum, 25V, 10 μF	250-42 250-42
REF.		WILTRON	C20	Tantalum, 25V, 10 μF Tantalum, 25V, 10 μF	250-42
DES.	DESCRIPTION	PART NO.	C21	Monolithic, .1 µF	230-37
DES.	DESCRICTION	raki no.	C22	Monolithic, .1 µF	230-37
C1	Mica, 130 pF	220-130	C23	Tantalum, 6V, 68 μF	250-58
C2	Monolithic, .1 μF	230-37	C24	Ceramic Disc .01 µF	230-11
C3	Monolithic, .1 μF	230-37	C25	Ceramic Disc .01 µF	230-11
C4	Monolithic, .1 µF	230-37	C26	Mica, 8 pF	220-8
C5	Monolithic, .1 μF	230-37	C27	Tantalum, 25V, 10 μF	250-42
C6	Monolithic, .1 μF	230-37	C28	Tantalum, 25V, 10 µF	250-42
C7 <sup>1</sup>	Monolithic, .1 μF	230-37	C29	Ceramic, .0047 µF	230-36
C8	Mica, 8 pF	220-8	C30	Mica, 8 pF	220-8
C9	Tantalum, 25V, 10 μF	250-42			
C10	Tantalum, 25V, 10 μF	250-42			
C11	Ceramic Disc, .001 μF	230-30		DIODES	
C12	Mica, 8 pF	220-8			
C13	Monolithic, .1 μF	230-37	REF.		WILTRON
C14	Monolithic, .1 μF	230-37	DES.	DESCRIPTION	PART NO.
C15	Mica, 8 pF	220-8			
C16	Mica, 8 pF	220-8	CR1	Silicon, 1N4446	10-1N4446
C17	Tantalum, 25V, 10 μF	250-42	CR2	Silicon, 1N4446	10-1N4446
			CR3	Zener, 3.3V, 0.4W, 1N746A	10-1N746A
1.01 ul	F, 230-11, 6637A-40 only.		CR4	Zener, 3.3V, 0.4W, 1N746A	10-1N746A

CR5 CR6 CR7	Silicon, 1N4446 Silicon, 1N4446 Zener, 3.3V, 0.4W, 1N746A	10-1N4446 10-1N4446 10-1N746A	R19 R20 R21	MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 16.5 kΩ Not Used	110-4.99k-1 110-16.5k-1
CR8	Zener, 3.3V, 0.4W, 1N746A	10-1N746A	R22	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
CR9	Silicon, 1N4446	10-1N4446	R23	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
CR10 CR11	Silicon, 1N4446	10-1N4446	R24	MF, $1/4$ W, $1\%$ , $100$ kΩ	110-100k-1
CR12	Silicon, 1N4446 Silicon, 1N4446	10-1N4446	R25 R26	MF, 1/4W, 1%, 10 kΩ	110-10k-1
CR13	Silicon, 1N4446	10-1N4446 10-1N4446	R27	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $8.87 \text{ k}\Omega$	110-10k-1 110-8.87k-1
CR14	Zener, 4.7V, 0.4W, 1N750A	10-11	R28	MF, $1/4W$ , $1\%$ , $49.9 \text{ k}\Omega$	110-49.9-1
CR15	Zener, 4.7V, 0.4W, 1N750A	10-11	R29	MF, $1/4W$ , $1\%$ , $2.8 \text{ k}\Omega$	110-2.8k-1
CR16	Silicon, 1N4446	10-1N4446	R30	MF, $1/4W$ , $1\%$ , $14.7\Omega$	110-14.7-1
CR17	Silicon, 1N4446	10-1N4446	R31	MF, $1/4W$ , $1\%$ , $14.7\Omega$	110-14.7-1
CR18	Silicon, 1N4446	10-1N4446	R32	MF, $1/4$ W, $1\%$ , $14.7$ Ω	110-14.7-1
CR19 CR20	Silicon, 1N4446 Silicon, 1N4446	10-1N4446	R33	MF, 1/4W, 1%, 14.7Ω	110-14.7-1
CR21	Silicon, 1N4446	10-1N4446 10-1N4446	R34 R35	MF, $1/4$ W, $1\%$ , $14.7$ $\Omega$ MF, $1/4$ W, $1\%$ , $14.7$ $\Omega$	110-14.7-1 110-14.7-1
CR22	Silicon, 1N4446	10-1N4446 10-1N4446	R36	MF, $1/4W$ , $1\%$ , $2.8 \text{ k}\Omega$	110-14.7-1 110-2.8k-1
CR23	Silicon, 1N4446	10-1N4446	R37	MF, $1/4W$ , $1\%$ , $42.2\Omega$	110-42.2-1
CR24	Silicon, 1N4446	10-1N4446	R38	MF, $1/4W$ , $1\%$ , $42.2\Omega$	110-42.2-1
CR25	Silicon, 1N4446	10-1N4446	R39	MF, $1/4$ W, $1\%$ , $42.2$ Ω	110-42.2-1
CR26	Silicon, 1N4446	10-1N4446	R40	MF, $1/4$ W, $1\%$ , $42.2\Omega$	110-42.2-1
CR27 CR28	Silicon, 1N4446	10-1N4446	R41	MF, 1/4W, 1%, 10 kΩ	110-10k-1
CR26	Silicon, 1N4446 Silicon, 1N4446	10-1N4446 10-1N4446	R42 R43	MF, $1/4$ W, $1\%$ , $9.76$ k $\Omega$	110-9.76k-1
CR30	Silicon, 1N4446	10-1N4446 10-1N4446	R43	MF, $1/4W$ , $1\%$ , $3.65 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $80.6\Omega$	110-3.65k-1 110-80.6-1
CR31	Silicon, 1N4446	10-1N4446	R45	MF, $1/4W$ , $1\%$ , $80.6\Omega$	110-80.6-1
CR32	Silicon, 1N4446	10-1N4446	R46	MF, $1/4W$ , $1\%$ , $34.8\Omega$	110-34.8-1
			R47	MF, $1/4W$ , $1\%$ , $34.8\Omega$	110-34.8-1
			R48	MF, $1/4W$ , $1\%$ , $34.8\Omega$	110-34.8-1
			R49	MF, $1/4W$ , $1\%$ , $34.8\Omega$	110-34.8-1
	<u>TRANSISTORS</u>		R50	MF, $1/4$ W, $1\%$ , $3.65 \text{ k}\Omega$	110-3.65k-1
			R51 R52	MF, 1/4W, 1%, 121Ω	110-121-1
DEE		THE ME ON	R52	MF, $1/4$ W, $1\%$ , $121\Omega$ MF, $1/4$ W, $1\%$ , $121\Omega$	110-121-1 110-121-1
REF. DES.	DESCRIPTION	WILTRON DART NO	R54	MF, $1/4W$ , $1\%$ , $121\Omega$	110-121-1
DEG.	DESCRIPTION	PART NO.	R55	MF, $1/4W$ , 1%, $10 \text{ k}\Omega$	110-10k-1
Q1	PNP, 10W, 2N6552	20-3	R56	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
Q2	NPN, 10W, 2N6555	20-4	R57	MF, 1/4W, 1%, 10 kΩ	110-10k-1
Q3	PNP, 10W, 2N6552	20-3	R58	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
Q4	NPN, 10W, 2N6555	20-4	R59	MF, 1/4W, 1%, 10 kΩ	110-10k-1
Q5	NPN, 50W, TIP110	20-22	R60 R61	MF, 1/4W, 1%, 10 kΩ Variable, 10k, 1-Turn	110-10k-1 156-10k
Q6	PNP, 50W, TIP115	20-23	R62	Variable, 10k, 1-Turn	156-10k
			R63	MF, $1/4W$ , $1\%$ , $46.4 \text{ k}\Omega$	110-46.4k-1
			R64	MF, $1/4W$ , $1\%$ , $8.25 \text{ k}\Omega$	110-8.25k-1
	DECICTORS		R65	MF, $1/4W$ , $1\%$ , $100\Omega$	110-100-1
	RESISTORS		R66	MF, $1/4W$ , $1\%$ , $3.65 \text{ k}\Omega$	110-3.65k-1
			R67 R68	MF, $1/4$ W, $1\%$ , $3.65$ k $\Omega$	110-3.65k-1
REF.		WILTRON	R69	WW, 3W, 5Ω WW, 3W, 5Ω	130-5-3 130-5-3
DES.	DESCRIPTION	PART NO.	R70	WW, 3W, 5Ω	130-5-3
			R71	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
R1	MF, $1/4W$ , $1\%$ , $14.3 \text{ k}\Omega$	110-14.3k-1	R72	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
R2	MF, 1/4W, 1%, 14.3 kΩ	110-14.3k-1	R73	MF, $1/4W$ , $1\%$ , $9.76 \text{ k}\Omega$	110-9.76k-1
R3 R4	MF, $1/4W$ , $1\%$ , $100 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-100k-1 110-10k-1	R74	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R5	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1 110-10k-1	R75	MF, $1/4W$ , $1\%$ , $8.82 \text{ k}\Omega$	110-8.82k-1
R6	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1			
R7	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1			
R8	MF, $1/4$ W, $1\%$ , $1$ k $\Omega$	110-1k-1		INTEGRATED CIRCUITS	
R9	MF, $1/4$ W, $1\%$ , $1 \text{ k}\Omega$	110-1k-1			
R10	Variable, 5k, 1-Turn	156-5k	D DE		WW 601
R11 R12	Variable, 5k, 1-Turn Variable, 5k, 1-Turn	156-5k 156-5k	REF. DES.	DESCRIPTION	WILTRON
R13	Variable, 5k, 1-Turn Variable, 5k, 1-Turn	156-5k	DES.	DESCRIPTION	PART NO.
R14	MF, $1/4$ W, $1\%$ , $7.32$ k $\Omega$	110-7.32k-1	U1	Quad Exclusive OR 74LS86	54-125
R15	MF, 1/4W, 1%, 4.99 kΩ	110-4.99k-1	U2	Comparator, LM311H	54-30
R16	MF, $1/4$ W, $1\%$ , $4.99$ kΩ	110-4.99k-1	U3	Comparator, LM311H	54-30
R17	MF, 1/4W, 1%, 100Ω	110-100-1	U4	Op Amp, LF357	50-7
R18	MF, $1/4W$ , $1\%$ , $4.99 \text{ k}\Omega$	110-4.99k-1	U5	Quad Switch DG201CJ	54-24

U6	Quad Switch DG201CJ	54-24	1	MISCELLANEOUS	
U7	Op Amp, LF357	50-7			
U8	Op Amp, LF357	50-7	REF.		WILTRON
U9	Op Amp, LF357	50-7	DES.	DESCRIPTION	PART NO.
U10	Op Amp, LF357	50-7			
U11	Hex Inverter, 74LS04	54-74LS04	TP1		
U12	Dual AND Driver, 75451	54-144	thru		
U13	Dual AND Driver, 75451	54-144	TP6	Pin, Test Point	706 <del>-44</del>
U14	Dual AND Driver, 75451	54-144		Heatsink, Transistor #6030	553-53
U15	Dual AND Driver, 75451	54-144		Ejector, P.C. Board	553-96

Table 6-21. All Front Panel (660-D-8011)

	CAPACITORS		DS37	Light Emitting, Yellow	15-7
			DS38	Light Emitting, Yellow	15-7
REF.		WILTRON	DS39	Light Emitting, Yellow	15-7
DES.	DESCRIPTION	PART NO.	DS40	Light Emitting, Yellow	15-7
			DS41	Light Emitting, Yellow	15-7
C1	Electrolytic, 250 μF, 25V	250-53	DS42	Light Emitting, Yellow	15-7
C2	Monolithic, 0.1 μF, 50V	230-37	DS43	Light Emitting, Yellow	15-7
C3	Monolithic, 0.1 μF, 50V	230-37	DS44	Light Emitting, Yellow	15-7
C4	Monolithic, 0.1 μF, 50V	230-37	DS45	Light Emitting, Yellow	15-7
C5	Monolithic, 0.1 µF, 50V	230-37	DS46	Light Emitting, Yellow	15-7
C6	Monolithic, 0.1 µF, 50V	230-37	DS47	Light Emitting, Yellow	15-7
C7	Monolithic, 0.1 µF, 50V	230-37	DS48	Display, 7-Segment, LED	15-15
C8	Monolithic, 0.1 µF, 50V	230-37	DS49	Display, 7-Segment, LED	15-15
			DS50	Display, 7-Segment, LED	15-15
	DIODES		DS51	Display, 7-Segment, LED	15-15
			DS52	Display, 7-Segment, LED	15-15
REF.		WILTRON	DS53	Display, 7-Segment, LED	15-15
DES.	DESCRIPTION	PART NO.	DS54	Display, 7-Segment, LED	15-15
			DS55	Display, 7-Segment, LED	15-15
DS1	Light Emitting, Red	15-5	DS56	Display, 7-Segment, LED	15-15
DS2	Light Emitting, Red	15-5	DS57	Display, 7-Segment, LED	15-15
DS3	Light Emitting, Red	15-5	DS58	Display, +/- 1, LED	15-14
DS4	Light Emitting, Red	15-5	DS59	Display, 7-Segment, LED	15-15
DS5	Light Emitting, Red	15-5	DS60	Display, 7-Segment, LED	15-15
DS6	Light Emitting, Red	15-5	DS61	Display, 7-Segment, LED	15-15
DS7	Light Emitting, Red	15-5	DS62	Display, 7-Segment, LED	15-15
DS8	Light Emitting, Red	15-5	DS63	Light Emitting, Red	15-5
DS9	Not Used	15-5	DS64	Light Emitting, Red	15-5
DS10	Light Emitting, Red	15-5	DS65	Light Emitting, Red Light Emitting, Yellow	15-7
DS10	Light Emitting, Red	15-5	DS66	Light Emitting, Tenow Light Emitting, Yellow	15-7
DS12	Not Used	15-5	DS67		15-7
DS12	Light Emitting, Red	15-5	DS68	Light Emitting, Yellow	
DS13	Not Used	15-5	DS69	Light Emitting, Yellow Light Emitting, Yellow	15-7
DS14 DS15	Not Used		B .	Light Emitting, Fellow Light Emitting, Yellow	15-7
DS15	Light Emitting, Yellow	15-7	DS70		15-7
DS10	Not Used	15-7	DS71 DS72	Light Emitting, Yellow	15-7
DS17	Light Emitting, Red	15-5		Light Emitting, Yellow	15-7
DS18	Light Emitting, Red Light Emitting, Yellow		DS73	Light Emitting, Red	15-5
	Light Emitting, Tellow Light Emitting, Yellow	15-7 15-7		COMMECTORS	
DS20			ł	CONNECTORS	
DS21 DS22	Light Emitting, Yellow	15-7 15-7	DEE		WII TOOM
	Light Emitting, Yellow	15-7 15-7	REF.	DECEDITION	WILTRON
DS23	Light Emitting, Yellow	15-7	DES.	DESCRIPTION	PART NO.
DS24	Light Emitting, Yellow	15-7	1 .,	30 D: CID E 1	551 182
DS25	Light Emitting, Yellow	15-7	J1	20 Pin, SIP, Female	551-173
DS26	Light Emitting, Yellow	15-7	J2	20 Pin, SIP, Female	551-173
DS27	Light Emitting, Yellow	15-7	J3	20 Pin, SIP, Female	551-173
DS28	Light Emitting, Yellow	15-7	J4	20 Pin, SIP, Female	551-173
DS29	Light Emitting, Yellow	15-7	1		
DS30	Light Emitting, Yellow	15-7	1	TRANSISTORS	
DS31	Light Emitting, Yellow	15-7			
DS32	Light Emitting, Yellow	15-7	REF.		WILTRON
DS33	Light Emitting, Yellow	15-7	DES.	DESCRIPTION	PART NO.
DS34	Not Used		1		
DS35	Light Emitting, Red	15-5	Q1	PNP, 2N2907	20-2N2907
DS36	Light Emitting, Yellow	15-7	Q2	PNP, 2N2907	20-2N2907

1-6600A/MB-OMM

Q3 Q4	PNP, 2N2907 PNP, 2N2907	20-2N2907 20-2N2907		SWITCHES	
Q5 Q6	PNP, 2N2907 PNP, 2N2907	20-2N2907 20-2N2907	REF. DES.	DESCRIPTION	WILTRON PART NO.
Q <b>7</b> Q8	PNP, 2N2907 PNP, 2N2907	20-2N2907	S1	SPST, Momentary	430-130
Q9	PNP, 2N2907 PNP, 2N2907	20-2N2907	S2	SPST, Momentary	430-130
Q10	PNP, 2N2907	20-2N2907	S3	SPST, Momentary	430-130
Q10 Q11	PNP, 2N2907	20-2N2907	S4	SPST, Momentary	430-130
Q12	PNP, 2N2907	20-2N2907	S5	SPST, Momentary	430-130
Q13	PNP, 2N2907	20-2N2907	S6	SPST, Momentary	430-130
Q14	PNP, 2N2907	20-2N2907	S7	SPST, Momentary	430-130
Q15	PNP, 2N2907	20-2N2907 20-2N2907	S8	SPST, Momentary	430-130
213	1111, 2112,01	20-2112901	S9	SPST, Momentary	430-130
			S10	SPST, Momentary	430-130
	RESISTORS	]	S11	SPST, Momentary	430-130
		1	S12	SPST, Momentary	430-130
REF.		WILTRON	S13	DPST, Momentary	430-131
DES.	DESCRIPTION	PART NO.	S14	DPST, Momentary	430-131
		ļ	S15	SPST, Momentary	430-130
R1	MF, 1/4W, 1%, 215Ω	110-215-1	S16	SPST, Momentary	430-130
R2	MF, 1/4W, 1%, 215Ω	110-215-1	S17	DPST, Momentary	430-131
R3	MF, 1/4W, 1%, 215Ω	110-215-1	S18	SPST, Momentary	430-130
R4	Not Used		S19	SPST, Momentary	430-130
R5	MF, 1/4W, 1%, 215Ω	110-215-1	S20	Not Used	
R6	MF, 1/4W, 1%, 215Ω	110-215-1	S21	Not Used	
R7	MF, 1/4W, 1%, 215Ω	110-215-1	S22	SPST, Momentary	430-130
R8	Not Used	110 215 1	S23	SPST, Momentary	430-130
R9	MF, 1/4W, 1%, 215Ω	110-215-1	S24	SPST, Momentary	430-130
R10 R11	MF, $1/4W$ , $1\%$ , $215\Omega$ MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S25	SPST, Momentary	430-130
R12	MF, $1/4$ W, $1\%$ , $215\%$ MF, $1/4$ W, $1\%$ , $215\%$	110-215-1	S26	Not Used	
R13	MF, $1/4$ W, $1\%$ , $215\%$ MF, $1/4$ W, $1\%$ , $215\%$	110-215-1	S27	SPST, Momentary	430-130
R14	MF, $1/4W$ , $1/6$ , $215\%$ MF, $1/4W$ , $1\%$ , $215\%$	110-215-1 110-215-1	S28	SPST, Momentary	430-130
R15	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S29 S30	SPST, Momentary SPST, Momentary	430-130
R16	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S31	SPST, Momentary	430-130
R17	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S31	SPST, Momentary	430-130
R18	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S32	SPST, Momentary	430-130 430-130
R19	Not Used	110 015 1	S34	SPST, Momentary	430-130
R20	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S35	SPST, Momentary	430-130
R21	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S36	SPST, Momentary	430-130
R22	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S37	DPST, Momentary	430-131
R23	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S38	DPST, Momentary	430-131
R24	MF, $1/4W$ , $1\%$ , $147\Omega$	110-147-1	S39	SPST, Momentary	430-130
R25	MF, $1/4W$ , $1\%$ , $147\Omega$	110-147-1	S40	Not Used	
R26	MF, $1/4W$ , $1\%$ , $147\Omega$	110-147-1	S41	Not Used	
R27	MF, $1/4W$ , $1\%$ , $147\Omega$	110-147-1	S42	SPST, Momentary	430-130
R28	MF, $1/4$ W, $1\%$ , $147\Omega$	110-147-1	S43	SPST, Momentary	430-130
R29	MF, $1/4W$ , $1\%$ , $147\Omega$	110-147-1	S44	SPST, Momentary	430-130
R30	MF, $1/4$ W, $1\%$ , $147\Omega$	110-147-1	S45	SPST, Momentary	430-130
R31	MF, $1/4W$ , $1\%$ , $147\Omega$	110-147-1	S46	SPST, Momentary	430-130
R32	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S47	SPST, Momentary	430-130
R33	MF, 1/4W, 1%, 4.64k	110-4.64k-1	S48	SPST, Momentary	430-130
R34	MF, 1/4W, 1%, 215Ω	110-215-1	S49	SPST, Momentary	430-130
R35	MF, 1/4W, 1%, 215Ω	110-215-1	S50	SPST, Momentary	430-130
R36	MF, 1/4W, 1%, 215Ω	110-215-1	S51	SPST, Momentary	430-130
R37	MF, 1/4W, 1%, 215Ω	110-215-1	S52	SPST, Momentary	430-130
R38	MF, 1/4W, 1%, 10k	110-10k-1	S53	SPST, Momentary	430-130
R39	Not Used	146.2	S54	DPST, Momentary	430-131
R40	Variable, 20k	146-3	S55	SPST, Momentary	430-130
R41	Variable, 20k	146-3	S56	SPST, Momentary	430-130
R42 R43	Not Used Variable, 20k	146-5	S57	SPST, Momentary	430-130
RP1	variable, $20k$ DIP, $56\Omega$	123-11	S58	SPST, Momentary	430-130
RP2	DIP, $30\%$ DIP, $220\%$	123-11		MITTERN ATTER CITY CITY	
RP3	DIP, $220\Omega$	123-12		INTEGRATED CIRCUITS	
RP4	DIP, $220\Omega$	123-12	REF.		WIII TOOM
RP5	SIP, $220\Omega$	123-13	DES.	DESCRIPTION	WILTRON
RP6	SIP, $220\Omega$	123-14	DES.	DESCRIPTION	PART NO.
RP7	SIP, 4.7k	123-14	U1	74LS374, Octal Latch	54-41
RP8	SIP, 4.7k	123-15	U2	74LS374, Octal Latch	54-41 54-41
=	•	·= ==	~ <b>~</b>	, Cotta Daton	~ · · ·

U3	74LS374, Octal Latch	54-41		MISCELLANEOUS	
U4	74LS374, Octal Latch	5 <del>4-4</del> 1	1		
U5	74LS374, Octal Latch	5 <b>4-4</b> 1	REF.		WILTRON
U6	74LS374, Octal Latch	5 <b>4-4</b> 1	DES.	DESCRIPTION	PART NO.
U7	74LS138, 3 to 8 Decoder	54-74LS138	1		
U8	7406, HEX Inverter	54-104		Socket, DIP, 14 Pin	551-143
U9	7406, HEX Inverter	5 <b>4</b> -10 <b>4</b>		Standoff, Nylon (Long LED)	790-129
U10	7406, HEX Inverter	54-104	<b> </b>	Standoff, Nylon (Short LED)	790-130
U11	74154, 4 to 16 Decoder	54-147		Standoff, Nylon (Display LED)	790-131

Table 6-22. Al2 Microprocessor (660-D-8012)

	CAPACITORS			TRANSISTORS	
REF. DES.	DESCRIPTION	WILTRON PART NO.	REF. DES.	DESCRIPTION	WILTRON PART NO.
C1 C2	Tantalum, 10 µF, 25V	250-42	Q1 Q2	PNP, MJE371 NPN, 2N2222A	20-24 20-2N2222A
C3	Tantalum, 10 μF, 25V Mylar, 0.047 μF, 250V	250-42 210-28	Q3	NPN, 2N2222A	20-2N2222A
C4	Tantalum, 1 $\mu$ F, 35V	250-19	Q4	NPN, 2N2222A	20-2N2222A
C5	Disc Ceramic, 0.01 µF, 100V	230-11		•	
C6	Mylar, 0.1 µF, 250V	210-30			
C7	Disc Ceramic, 0.01 µF, 100V	230-11		RESISTORS	
C8	Disc Ceramic, 0.01 µF, 100V	230-11	DEE		
C9	Disc Ceramic, 0.01 µF, 100V	230-11	REF. DES.	DESCRIPTION	WILTRON
C10	Monolithic, 0.1 µF, 50V	230-37	DES.	DESCRIPTION	PART NO.
C11 C12	Monolithic, 0.1 µF, 50V	230-37	R1	MF, 1/4W, 1%, 12.1k	110-12.1k-1
C12	Monolithic, 0.1 μF, 50V Monolithic, 0.1 μF, 50V	230-37 230-37	R2	MF, $1/4W$ , 1%, $150\Omega$	110-150-1
C14	Monolithic, 0.1 µF, 50V	230-37	R3	MF, 1/4W, 1%, 46.4k	110-46.4k-1
C15	Monolithic, 0.1 µF, 50V	230-37	R4	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
C16	Monolithic, 0.1 µF, 50V	230-37	R5	MF, 1/4W, 1%, 68.1k	110-68.1k-1
C17	Monolithic, 0.1 μF, 50V	230-37	R6	MF, 1/4W, 1%, 237k	110-237k-1
C18	Monolithic, 0.1 µF, 50V	230-37	R7	MF, 1/4W, 1%, 100k	110-100k-1
C19	Monolithic, 0.1 µF, 50V	230-37	R8 R9	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 100k	110-10k-1
C20	Monolithic, 0.1 μF, 50V	230-37	R10	MF, 1/4W, 1%, 100K MF, 1/4W, 1%, 1M	110-100k-1 110-1M-1A
C22	Monolithic, 0.1 μF, 50V	230–37	R11	CC, $1/2W$ , $5\%$ , $430\Omega$	102-430-5
			R12	MF, $1/4W$ , 1%, $10 \text{ k}\Omega$	110-10k-1
			R13	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
	DIODES		R14	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
REF.		WILTRON	R15	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
DES.	DESCRIPTION	PART NO.	R16	MF, 1/4W, 1%, 100k	110-100k-1
220.	DEBOIGE TION	imer no.	R17	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
CR1	Silicon Rectifier, SI2	10-SI2	R18 R19	MF, 1/4W, 1%, 10 kΩ	110-10k-1
CR2	1N4446	10-1N4446	R20	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ	110-10k-1 110-10k-1
CR3	1N4446	10-1N4446	R21	MF, 1/4W, 1%, 100k	110-10k-1 110-100k-1
CR4	1N4446	10-1N4446	R22	MF, 1/4W, 1%, 100k	110-100k-1
CR5 CR6	1N4446 1N4446	10-1N4446	R23	MF, 1/4W, 1%, 100k	110-100k-1
CRO	11/4440	10-1N4446	R24	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
			R25	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
	~~		R26	MF, 1/4W, 1%, 10 kΩ	110-10k-1
	CONNECTORS		R27 R28	MF, 1/4W, 1%, 100k	110-100k-1
REF.		WILTRON	R29	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $215\Omega$	110-10k-1 110-215-1
DES.	DESCRIPTION	PART NO.	R30	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1
			R31	MF, $1/4W$ , 1%, $10 \text{ k}\Omega$	110-10k-1
P1	20 Pin, Male	551-215	R32	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
P2	20 Pin, Male	551-215	R33	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
P3	20 Pin, Male	551-215	R34	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
P4	20 Pin, Male	551-215	R35	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
P5	26 Pin, Male	551-102	R36	MF, 1/4W, 1%, 82.5k	110-82.5k-1
P6 P7	26 Pin, Male 26 Pin, Male	551-102 551-102	R37	MF, 1/4W, 1%, 31.6k	110-31.6k-1
P8	3 Pin, Male	551-102 551-207	R38 R39	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
P9	Plug, DIP, 18 Pin	551-236	R40	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ	110-10k-1 110-10k-1
-,				1112 9 1/ 217 9 1/09 10 Rub	110-10K-1

R41	MF, 1/4W, 1%, 20k	110-20k-1	U17	Not Used	
R42	MF, 1/4W, 1%, 20k	110-20k-1	U18	74LS138, Decoder	54-74LS138
R43	MF, 1/4W, 1%, 31.6k	110-31.6k-1	U19	74LS138, Decoder	54-74LS138
R44	MF, 1/4W, 1%, 100k	110-100k-1	U20	74LS138, Decoder	54-74LS138
R45	MF, 1/4W, 1%, 20k	110-20k-1	U21	74LS138, Decoder	54-74LS138
R46	Variable, Single-Turn, 10k	156-10k	U22	74LS138, Decoder	54-74LS138
R47	MF, 1/4W, 1%, 20k	110-20k-1	U23	74LS138, Decoder	54-74LS138
R48	MF, $1/4W$ , 1%, $100\Omega$	110-100-1	U24	74LS30, 8-input NAND	54-58
R49	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1	U25	8279-5, Keyboard/Display	31 30
R50	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1		Interface	54-97
R51	MF, 1/4W, 1%, 1k	110-1k-1	U26	96L02, Dual Monostable	54-96L02
R52	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1	U27	555, Timer	54-555
RP1	SIP, 10k	123-6	U28	74LS161, 4-Bit Binary Counter	54-60
RP2	DIP, 100k	123-10	U29	74LS374, Octal Latch	54-41
			U30	74LS374, Octal Latch	54-41
	INTEGRATED CIRCUITS		U31	74LS374, Octal Latch	54-41
			U32	74LS04, HEX Inverter	54-74LS04
REF.		WILTRON	U33	74LS04, HEX Inverter	54-74LS04
DES.	DESCRIPTION	PART NO.	U34	74LS02, Quad 2-Input NOR	54-57
			U35	74LS02, Quad 2-Input NOR	54-57
U1	Micropower Comparator	54-151	U36	TL072, Dual Op Amp	54-53
U2	8085A, Microprocessor	54-93	U37	5101L-1, 256 x 4 CMOS RAM	54-146
U3	74LS373, Octal Latch	54-103	U38	5101L-1, 256 x 4 CMOS RAM	54-146
U4	74LS138, Decoder	54-74LS138		•	
U5	2716, 2k x 8 EPROM )	Contact		MISCELLANEOUS	
U6	2716, 2k x 8 EPROM (	WILTRON			
U7	2716, 2k x 8 EPROM	Customer	REF.		WILTRON
U8	2716, 2k x 8 EPROM 🕽	Service	DES.	DESCRIPTION	PART NO.
U9	Not Used				
<b>U</b> 10	74LS244, Octal Tri-state Driver	54-143	B1	Battery, 2.4V	633-8
U11	5101L-1, 256x4 CMOS RAM	54-146	S1	Switch, Slide, SPDT	420-14
U12	5101L-1, 256x4 CMOS RAM	54-146	Y1	Crystal, 6.000 MHz	630-17
U13	DP8304B, Bidirectional Bus			Socket, 20 Pin DIP	553-98
	Driver	54-128		Socket, 24 Pin DIP	553-67
U14	DP8304B, Bidirectional Bus			Socket, 40 Pin DIP	553-66
	Driver	54-128	TP1	•	
U15	74LS04, HEX Inverter	54-74LS04	thru		
U16	74LS01, Quad NAND Gate	54-74LS01	TP27	Pin, Test Point	706-44

Table 6-23. Al3 Switching Power Supply (660-D-8013)

	CAPACITORS		C23 C24	Tantalum, 6.8 μF, 35V Disc., .0027 μF, 100V	250-41A 230-34
REF.		WILTRON	C25	Disc., .0027 µF, 100V	230-34
DES.	DESCRIPTION	PART NO.	C26	Tantalum, 6.8 µF, 35V	250-41A
225.			C27	Electrolytic, 150 µF, 25V	250-52
C1	Monolithic, .1 µF, 50V	230-37	C28	Electrolytic, 150 µF, 25V	250-52
C2	Tantalum, 1 µF, 35V	250-19	C29	Tantalum, 6.8 µF, 35V	250-41A
C3	Tantalum, 10 µF, 25V	250-42	C30	Tantalum, 6.8 µF, 35V	250-41A
C4	Monolithic, .1 µF, 50V	230-37	C31	Tantalum, 6.8 µF, 35V	250-41A
C5	Mylar, 1000 pF, 500V, 5%	227-13	C32	Tantalum, 6.8 µF, 35V	250-41A
C6	Tantalum, 10 µF, 25V	250-42	C33	Electrolytic, 47 µF, 63V	250-51
C7	Tantalum, 2.2 µF, 20V	250-40	C34	Disc., .0027 μF, 100V	230-34
C8	Tantalum, 4.7 µF, 35V	250-39	C35	Tantalum, 6.8 µF, 35V	250-41A
C9	Mylar, $.01 \mu F$ , $200 V$	210-20	C36	Disc., .002 μF, 500V	230-33
C10	Monolithic, .1 µF, 50V	230-37	C37	Disc., .002 µF, 500V	230-33
C11	Mylar, 1000 pF, 500V, 5%	227-13	C38	Tantalum, 6.8 µF, 35V	250-41A
C12	Monolithic, .1 µF, 50V	230-37	C39	Mylar, .1 μF, 250V	210-30
C13	Tantalum, 10 µF, 25V	250-42	C40	Electrolytic, 47 µF, 63V	250-51
C14	Tantalum, 12 µF, 350V	250-85	C41	Tantalum, 6.8 µF, 35V	250-41A
C15	Tantalum, 12 µF, 350V	250-85	C42	Disc., .002 μF, 500V	230-33
C16	Mica, 470 pF	220-470	C43	Disc., .002 $\mu$ F, 500V	230-33
C17	Disc., .0027 μF, 100V	230-34	C44	Tantalum, 6.8 µF, 35V	250-41A
C18	Disc., .0027 µF, 100V	230-34	C45	Mylar, $.1 \mu F$ , $250V$	210-30
C19	Tantalum, 6.8 μF, 35V	250-41A	C46	Electrolytic, 47 μF, 63V	250-51
C20	Electrolytic, 150 μF, 25V	250-52	C47	Tantalum, 6.8 µF, 35V	250-41A
C21	Electrolytic, 150 μF, 25V	250-52	C48	Monolithic, .1 µF, 50V	230-37
C22	Tantalum, 6.8 μF, 35V	250-41A	C49	Mica, 15 pF	220-15

6-48

C50 C51	Disc, Ceramic, .01 μF, 1kV Disc, Ceramic, .01 μF, 1kV	230-40 230-40		TRANSISTORS	
C52 C53	Tantalum, .0047 μF, 3kV Tantalum, .0047 μF, 3kV	250–97 250–97	REF. DES.	DESCRIPTION	WILTRON PART NO.
	DIODES		Q1 Q2	PNP, 2N2907 NPN, 2N2222A	20-2N2907 20-2N2222A
REF. DES.	DESCRIPTION	WILTRON PART NO.	Q3 Q4 Q5	PNP, MPSA92 PNP, MPSA92 HEXFET, $1\Omega$ , 350V, 3.5A,	20-MPSA92 20-MPSA92
CR1 CR2 CR3 CR4 CR5	Silicon, 1N4446 Silicon, 1N4446 Silicon, 1N4446 Silicon, 1N4446 Silicon, 1N4446	10-1N4446 10-1N4446 10-1N4446 10-1N4446 10-1N4446	Q6	1RF730 HEXFET, 1Ω, 350V, 3.5A, 1RF730	20-39 20-39
CR6 CR7 CR8	Silicon, 1N4446 Silicon, 1N4446 Silicon, 1N4446	10-1N4446 10-1N4446 10-1N4446	<u>resistors</u>		
CR9 CR10 CR11	Zener, 15V, 1W, 5%, 1N4744A Silicon, 1N4446 Fast Recovery, 400V, 1A,	10-1N4744A 10-1N4446	REF. DES.	DESCRIPTION	WILTRON PART NO.
CR12 CR13	1N4936 Fast Recovery, 400V, 1A, 1N4936 Schottky, 40V, 5A, 1N5825	10-23 10-23 10-22	R1 R2	MF, 1/4W, 1%, 147Ω MF, 1/4W, 1%, 3.16k	110-147-1 110-3.16k-1
CR14 CR15 CR16	Schottky, 40V, 5A, 1N5825 Schottky, 40V, 5A, 1N5825 Zener, 25V, 5W, 5%, 1N5360A Fast Recovery, 100V, 3A,	10-22 10-22 10-24	R3 R4 R5 R6	MF, 1/4W, 1%, 22.1k MF, 1/4W, 1%, 2.26k MF, 1/4W, 1%, 22.1k Trimmer, 1k	110-22.1k-1 110-2.26k-1 110-22.1k-1 156-1k
CR17	MR851 Fast Recovery, 100V, 3A, MR851	10-27 10-27	R7 R8 R9	MF, 1/4W, 1%, 6.49k CC, 1/4W, 5%, 22M MF, 1/4W, 1%, 42.2k	110-6.49k-1 101-22M-5 110-42.2k-1
CR18	Fast Recovery, 100V, 3A, MR851	10-27	R10 R11	MF, 1/4W, 1%, 4.53k MF, 1/4W, 1%, 147Ω	110-4.53k-1 110-147-1
CR19 CR20	Fast Recovery, 100V, 3A, MR851 Fast Recovery, 200V, 3A,	10-27	R12 R13 R14	MF, 1/4W, 1%, 750k MF, 1/4W, 1%, 10k MF, 1/4W, 1%, 10k	110-750k-1 110-10k-1 110-10k-1
CR21	MR852 Fast Recovery, 200V, 3A,	10-26	R15 R16	MF, 1/4W, 1%, 3.32k MF, 1/4W, 1%, 3.32k	110-3.32k-1 110-3.32k-1
CR22	MR852 Fast Recovery, 200V, 3A, MR852	10-26 10-26	R17 R18 R19	MF, 1/4W, 1%, 499Ω MF, 1/4W, 1%, 499Ω MF, 1/4W, 1%, 24.9k	110-499-1 110-499-1
CR23	Fast Recovery, 200V, 3A, MR852	10-26	R20 R21	MF, 1/4W, 1%, 24.9k MF, 1/4W, 1%, 1.47k MF, 1/4W, 1%, 10k	110-24.9k-1 110-1.47k-1 110-10k-1
CR24 CR25	Fast Recovery, 200V, 3A, MR852 Fast Recovery, 200V, 3A,	10-26	R22 R23	MF, 1/4W, 1%, 100k MF, 1/4W, 1%, 14.7k	110-100k-1 110-14.7k-1
CR26	MR852 Fast Recovery, 400V, 2A,	10-26	R24 R25 R26	MF, 1/4W, 1%, 13.3k MF, 1/4W, 1%, 6.81k MF, 1/4W, 1%, 8.45k	110-13.3k-1 110-6.81k-1 110-8.45k-1
CR27	MR854 Fast Recovery, 400V, 2A, MR854	10-25 10-25	R27 R28	Trimmer, 5k MF, 1/4W, 1%, 1k	156-5k 110-1k-1
CR28	Fast Recovery, 100V, 1A, 1N4934	10-23	R29 R30 R31	MF, 1/4W, 1%, 1k MF, 1/4W, 1%, 1k MF, 1/4W, 1%, 1k	110-1k-1 110-1k-1 110-1k-1
CR29	Fast Recover, 100V, 1A, 1N4934	10-31	R32 R33 R34	CC, 1/2W, 5%, 100k CC, 1/2W, 5%, 100k CC, 1/2W, 5%, 100k	102-100k-5 102-100k-5 102-100k-5
	INDUCTOR ASSEMBLIES		R35 R36 R37	CC, 2W, 5%, 750Ω MF, 1/4W, 1%, 10Ω MF, 1/4W, 1%, 10Ω MF, 1/4W, 1%, 2010	104-750-5 110-10-1 110-10-1
REF. DES.	DESCRIPTION	WILTRON PART NO.	R38 R39 R40 R41	MF, 1/4W, 1%, 30.1Ω MF, 1/4W, 1%, 30.1Ω CC, 1/2W, 5%, 51Ω MF, 1/4W, 1%, 100Ω	110-30.1-1 110-30.1-1 102-51-5 110-100-1
L1 L2 L3 L4	SPEC-A-8076 SPEC-A-8077 SPEC-A-8074 SPEC-A-8075	310-66 310-67 310-64 310-65	R42 R43 R44 R45	MF, 1/4W, 1%, 100Ω CC, 1/2W, 5%, 150Ω CC, 1/2W, 5%, 150Ω MF, 1/4W, 1%, 100Ω	110-100-1 102-150-5 102-150-5 110-100-1
L5 L6	SPEC-A-8076 SPEC-A-8074	310-66 310-64	R46 R47	MF, $1/4$ W, $1\%$ , $1$ k CC, $2$ W, $5\%$ , $750$ Ω	110-1k-1 104-750-5

	TRANSFORMERS		U2	Op Amp, LF356H	50-2
REF. DES.	DESCRIPTION	WILTRON PART NO.	U3	Timer, 555NE	54-555
DES.	DESCRIPTION	PART NO.	U4	Pulse Width Modulator, MC3420P	54-140
T1	Driver Transformer Assy			,	
	SPEC-A-8078	320-56			
T2 ·	Driver Transformer Assy				
	SPEC-A-8078	320-56		MISCELLANEOUS	
T3	Output Transformer Assy				
	SPEC-A-8079	320-57	REF.		WILTRON
T4	Common-Mode-Isolation	320-70	DES.	DESCRIPTION	PART NO.
	INTEGRATED CIRCUITS		TP1		
REF.		WILTRON	thru	<b>.</b>	_
DES.	DESCRIPTION	PART NO.	TP10	Pins, Test Point	706-44
				Ejector, P.C. Board	553-96
U1	Voltage Regulator, 12V, UA7812	54-LM340T-12		Insulator for Q5 and Q6	790-67

Table 6-24. A14 Motherboard (660-D-8014)

				·	
	CAPACITORS			DIODES AND BRIDGE REC	CTIFIER
REF. DES.	DESCRIPTION	WILTRON PART NO.	REF. DES.	DESCRIPTION	WILTRON PART NO.
C1	Disc Ceramic, 500V, 0.001µF	230-3			
C2	Disc Ceramic, 500V, 0.001µF	230-3	CR1	Zener, 18V, 0.4W	10-1N967B
C3	Disc Ceramic, 500V, 0.001µF	230-3	CR2	Zener, 5.6V, 0.4W	10-1N752A
C4	Electrolytic, 35V, 470µF	250-87	CR3	Silicon, 1N4446	10-1N4446
C5	Disc Ceramic, 1kV, 0.01µF	230-40	CR4	Silicon, 1N4446	10-1N4446
C6	Disc Ceramic, 1kV, 0.01µF	230-40	CR5	Silicon Rectifier, SI2	10SI2
C7	Disc Ceramic, 1kV, 0.01µF	230-40	CR6	Silicon Rectifier, SI2	10-SI2
C8	Disc Ceramic, 1kV, 0.01µF	230-40	CR7	Silicon Rectifier, SI2	10-SI2
C9	Disc Ceramic, 1kV, 0.01µF	230-40	CR8	Silicon Rectifier, SI2	10-SI2
C10	Disc Ceramic, 1kV, 0.01µF	230-40	CR9	Silicon Rectifier, SI2	10-SI2
C11	Disc Ceramic, 1kV, 0.01µF	230-40	CR10	Silicon Rectifier, SI2	10-SI2
C12	Electrolytic, 200V, 850µF	250-86	CR11	Silicon Rectifier, SI2	10-SI2
C13	Electrolytic, 200V, 850µF	250-86	CR12	Bridge Rectifier	60-13
C14	Disc Ceramic, .01µF	230-11	CR13	Silicon, 1N4446	10-1N4446
C15	Tantalum, 35V, 6.8µF	250-41A	CR14	Zener, 4.7V, 0.4W	10-11
C16	Tantalum, 35V, 6.8µF	250-41A	CR15	Silicon Rectifier, SI2	10-SI2
C17	Tantalum, 35V, 6.8µF	250-41A	CR16	Silicon Rectifier, SI2	10-SI2
C18	Electrolytic, 63V, 10µF	250-34	CR17	Silicon, 1N4446	10-1N4446
C19	Tantalum, 35V, 6.8µF	250-41A	CR18	Silicon, 1N4446	10-1N4446
C 20	Tantalum, 35V, 6.8µF	250-41A	CR19	Silicon, 1N4446	10-1N4446
C21	Electrolytic, 63V, 47µF	250-51	CR20	Silicon, 1N4446	10-1N <b>444</b> 6
C22	Electrolytic, 25V, 100µF	250-50	CR21	Silicon Rectifier, SI2	10-SI2
C 23	Tantalum, 25V, 10µF	250-42	CR 22	Silicon, 1N4446	10-1N4446
C 24	Tantalum, 25V, 10μF	250-42	CR 23	Silicon Rectifier, SI2	10-SI2
C 25	Tantalum, 25V, 10µF	250-42	CR24	Silicon Rectifier, SI2	10-SI2
C26	Tantalum, 35V, 1µF	250-19	CR25	Silicon Rectifier, SI2	10-SI2
C 27	Mylar, 250V, 0.1µF	210-30	CR26	Silicon Rectifier, SI2	10-SI2
C 28	Mica, 560pF	223-560	CR27	Silicon Rectifier, SI2	10-SI2
C 29	Mica, 560pF	223-560	CR28	Silicon Rectifier, SI2	10-SI2
C30	Mica, 560pF	223-560	CR 29	Silicon Rectifier, SI2	10-SI2
C31	Mica, 560pF	223-560	CR30	Silicon Rectifier, SI2	10-SI2
C32	Disc Ceramic, .01µF	230-11	CR31	Silicon Rectifier, SI2	10-SI2
Ç33	Monolithic, 100V, 0.1µF	230-37	CR32	Silicon Rectifier, SI2	10-SI2
C34	Tantalum, 35V, 6.8µF	250-41A	CR33	Silicon Rectifier, SI2	10-SI2
C35	Monolithic, 100V, .1µF	230-37	CR34	Silicon, 1N4446	10-1N4446
C36	Electrolytic, 63V, 10µF	250-34	CR35	Silicon, 1N4446	10-1N4446
C37	Tantalum, 1µF, 35V	250-19	CR36	Silicon, 1N4446	10-1N4446

Table 6-26. Options and Accessories Parts List

#### Option 1, Rack Mount

# NAME PART NO. Left Side Assembly 660-D-8111 Right Side Assembly 660-D-8112

#### Option 2, Step Attenuator

Step Attenuator	1010-27
Cable Assembly, Coupler to Step Attenuator	660-A-8121-1
Cable Assembly, Attenuator to Rear Panel	660-A-8143-1
Connector Housing, 9-pin	551-200

#### Option 3, GPIB Interface

A1 GPIB Interface PCB 660-D-8001-3 (see Table 6-1)

A18 GPIB Connector PCB 660-B-8018 (see Table 6-25; attached to rear panel)

#### Option 11, External Square-Wave Input, Standard (except 6642A)

PIN Switch Modulator 1020-17

#### Option 13, Counted Markers

BNC Connector, Rear-Panel 510-42

#### Accessories

PCB Extender Board 660-D-8062-3

Table 7-1. Service Section Organization

TITLE OF INFORMATION	PAGE	PARAGRAPH
Removal and Installation Procedures	7-1	7-3
Overall Circuit Description	7-8	7-4
Overall Troubleshooting, Description Overall Troubleshooting Flowchart	7-17 7-16	7-5
A12 Microprocessor PCB, Description  A12 PCB Schematic  A12 PCB Troubleshooting Flowchart	7-17 7-22 7-28	7-6
All Front Panel PCB, Description All PCB Schematic	7-35 7-39	7-7
Al GPIB Interface PCB, Description Al PCB Schematic Al PCB Troubleshooting Flowchart	7-41 7-45 7-48	7-8
A2 Ramp Generator PCB, Description A2 PCB Schematic A2 PCB Troubleshooting Flowchart	7-55 7-60 7-65	7-9
A3 Marker Generator PCB, Description A3 PCB Schematic A3 Troubleshooting Flowchart	7-67 7-73 7-79	7-10
A4 Automatic Level Control PCB, Description A4 PCB Schematic A4 PCB Troubleshooting Flowchart	7-83 7-86 7-93	7-11
A5 Frequency Instruction and A6-A9 YIG Driver PCBs, Description A5 PCB Schematic A6 PCB Description, Assy. 660-D-8007-3, -5, -7, & -99-91 A6 PCB Description, Assy. 660-D-8007-4 A6 PCB Description, Assy. 660-D-8007-6 A6 PCBs Description, Assy. 660-D-8190 and -8191 A7-A9 PCBs Description, Assy. 660-D-8008 and -8009, All Dash Numbers A5-A9 PCB Troubleshooting Flowcharts	7-106 7-106 7-115 7-128 7-134 7-140 7-148	7-12
A10 FM/Attenuator PCB, Description A10 PCB Schematic A10 PCB Troubleshooting Flowchart	7-175 7-178 7-181	7-13
RF Deck, Description Model 6609A RF Deck Block Diagram Model 6617A RF Deck Block Diagram Model 6621A/6621A-40 RF Deck Block Diagram Model 6629A/6629A-40 RF Deck Block Diagram Model 6627A/6637A-40/6638A RF Deck Block Diagram Model 6642A RF Deck Block Diagram Model 6647A/6648A RF Deck Block Diagram Model 6653A RF Deck Block Diagram Model 6659A RF Deck Block Diagram Model 6659A RF Deck Block Diagram	7-183 7-184 7-184 7-185 7-185 7-185 7-187 7-186 7-188 7-189	7-14
A13/A14 PCBs Switching Power Supply, Description A13/A14 PCB Schematic A14 Motherboard PCB Wire Lists A13/A14 PCBs Troubleshooting Flowcharts A13 PCB Low-Voltage Troubleshooting Procedure	7-190 7-195 7-202 7-229 7-233	7-15
A18 GPIB Connector PCB, Description A18 PCB Schematic	7-230 7-237	7-16

#### **SECTION VII**

#### **SERVICE**

#### 7-1 INTRODUCTION

This section contains general information, disassembly/reassembly instructions, and service information — circuit descriptions, schematics, parts locator diagrams, and troubleshooting data — for the overall sweep generator and individual printed circuit boards (PCBs). This service information is organized as shown in Table 7-1 (facing page).

#### 7-2 GENERAL INFORMATION

#### 7-2.1 Printed Circuit Board (PCB) Exchange Program

WILTRON has an exchange program that includes most of the 6600A Series PCBs. Upon request, WILTRON will immediately ship a replacement for any sweep generator PCB covered by this program. The customer has 30 days in which to return the defective PCB. Contact Customer Service at 415-969-6500 to make arrangements for an exchange.

# 7-2.2 Recommended Test Equipment for Troubleshooting

A list of the recommended test equipment for troubleshooting the sweep generator is provided in Table 7-2.

#### 7-3 6600A SERIES PROGRAMMABLE SWEEP GENERATOR, REMOVAL AND REINSTALLATION INSTRUCTIONS

Instructions for the removal and reinstallation or the disassembly and reassembly of certain 6600A Series Sweep Generator components and subassemblies are provided in paragraphs 7-3.1 thru 7-3.5.

## 7-3.1 Front Panel Assembly, Removal and Reinstallation Instructions

#### a. Removal.

- 1. Turn off ac power.
- Remove the top, bottom, and side covers of the basic frame as follows:
  - (a) Remove the four corner brackets from the rear panel (Figure 7-1).
  - (b) Slide the covers to the rear and remove.
- 3. Stand the sweep generator on its side, with the RF Deck up.
- 4. Disconnect the cable connector from A14P37 (Figure 7-2).
- 5. Using a 3/32-inch hex wrench, remove the four corner and two midpanel screws securing the front panel assembly to the basic frame (Figure 7-3).
- 6. Reposition the sweep generator topside up (sitting on its feet); gently push the front panel assembly away from the front of the basic-frame assembly.
- 7. Disconnect the ribbon connectors from P5, P6, and P7 on the A12 Microprocessor PCB. Use care to avoid bending the connector pins.
- b. Reinstallation. The reinstallation procedure for the front panel assembly is a reversal of the removal procedure.

# CAUTION

To prevent chafing, insure that the 3-wire harness going

Table 7-2. Recommended Test Equipment for Troubleshooting

INSTRUMENT	REQUIRED CHARACTERISITCS	RECOMMENDED MANUFACTURER
Digital Multimeter	al Multimeter Dc Voltage: .05% to 30V .002% to 10V.	
Oscilloscope	60 MHz bandwidth, 1mV vertical sensitivity, and variable external horizontal input capability.	Tektronix Models 5440/ 5A18/5B10
Scalar Network Analyzer	Ability to display frequency response of sweep generator.	WILTRON Model 560A
RF Detector	Ability to detect signals within the 10 MHz to 26.5 GHz frequency range.	WILTRON Model 7S50, Option 2
Signature Analyzer	Ability to make signature analysis of microprocessor circuitry.	Hewlett-Packard Model 5004A
Directional Coupler	Directional Coupler  Ability to couple signals within a portion of the 10 MHz to 18 GHz frequency range.	
DC Power Supply	DC Power Supply 3 volts @ 3 amps	
Dual DC Power Supply	1 supply = 0 to 7V 1 supply = +15V Common ground OK.	
DC Power Supply	30V - Isolated from ground and other voltage supplies.	нр 6216

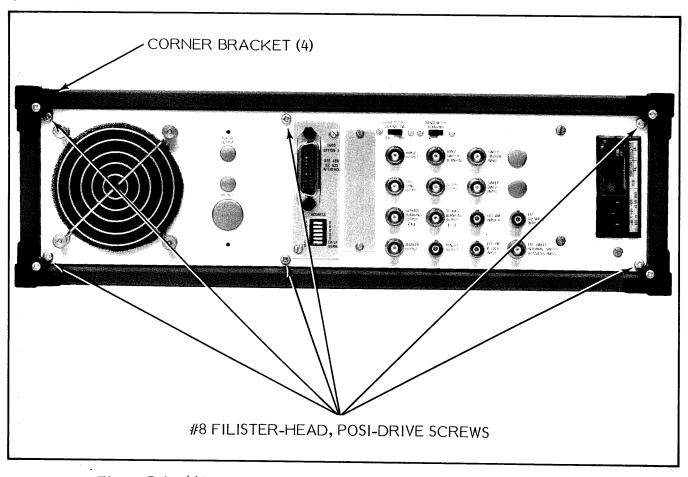


Figure 7-1. 6600A Series Programmable Sweep Generator, Rear Panel

to A12P8 is well clear of the bottom mid-panel screw that secures the front panel assembly to the basic frame.

# 7-3.2 Front Panel, Disassembly and Reassembly Instructions

#### a. Disassembly.

1. Remove the front panel assembly from the basic frame; refer to paragraph 7-3.1.

# CAUTION

The INCREASE/DECREASE lever extends out approximately 1/4 inch beyond the surfaces of the front panel pushbuttons. Use care to prevent bending the lever shaft.

- 2. Disconnect the 5-wire connector from A12P4.
- 3. Disconnect the 3-wire connector from A12P8.

# CAUTION

The A12 and A11 PCBs are interconnected using 4 inline-pin connectors (Figure 7-4). When separating the two PCBs, use care to avoid bending connector pins.

- 4. Remove the six 1/2-inch 4-40 screws, flatwashers, and lockwashers from the A12 PCB; separate the A12 PCB from the A11 PCB.
- 5. Remove the knobs from the MANUAL SWEEP, MARKER AMPLITUDE, and EXTERNAL ALC GAIN

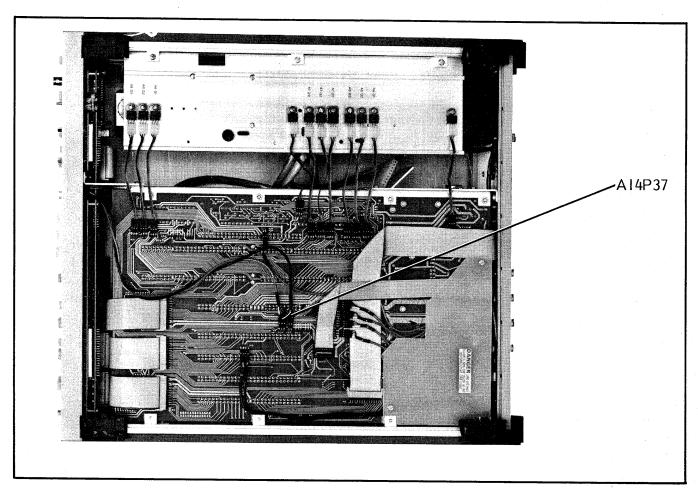


Figure 7-2. 6600A Series Programmable Sweep Generator, Bottom View

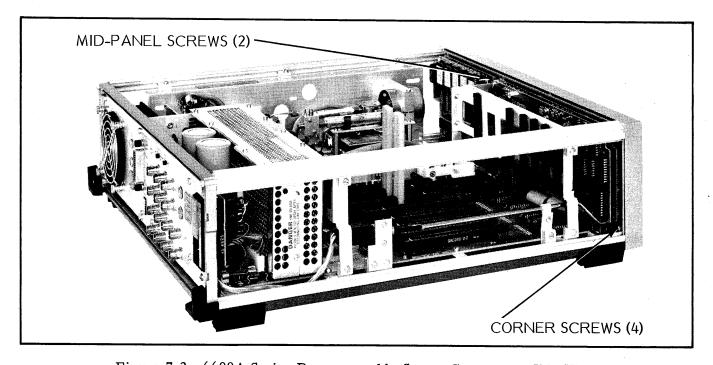


Figure 7-3. 6600A Series Programmable Sweep Generator, Side View

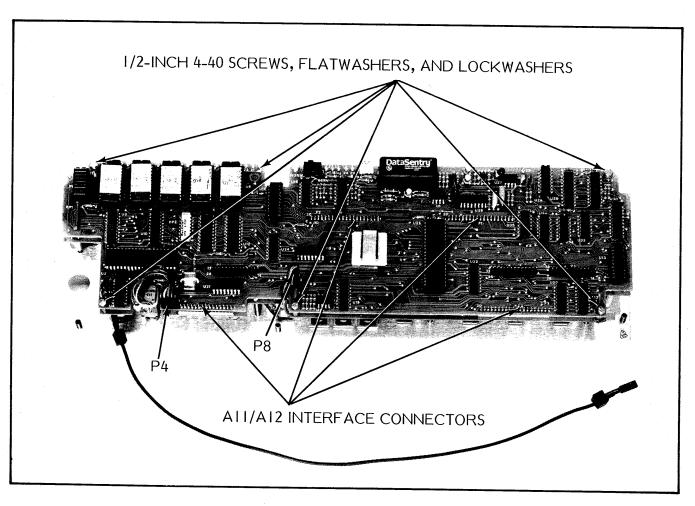


Figure 7-4. 6600A Series Programmable Sweep Generator, Front Panel Assembly

controls. To remove, pull knobs straight off.

- 6. Remove the eight 7/8-inch 4-40 screws, flatwashers, and lockwashers from the A11 PCB.
- 7. Separate the A11 PCB from the front panel.

#### b. Reassembly.

- 1. Mount the A11 PCB onto the front panel. Use care to insure that the LEDs and pushbuttons are properly aligned with their respective cutouts on the front panel.
- 2. Reinstall the eight 7/8-inch 4-40 screws, flatwashers, and lockwashers

- so that they are snug, but not tight, to the PCB.
- 3. Check each pushbutton, especially those on the keypad, and insure that none is binding. Reposition the A11 PCB slightly, if required, to prevent pushbutton binding.
- 4. Tighten the eight All retaining screws.
- 5. Reinstall the knobs on the MANUAL SWEEP, MARKER AMPLITUDE, and EXTERNAL ALC GAIN controls.

#### NOTE

The knob with the "shoulder" goes on the EXTERNAL ALC GAIN potentiometer.

- 6. Rejoin the All and All PCBs, as follows:
  - (a) Position the A12 PCB so that the male pins on P3 and P4 mate with their respective female pins on A11J3 and A11J4. Insure that the pins of A12P1 and A12P2 are aligned with their mating pins on A11J1 and A11J2.
  - (b) While observing the four connectors, gently press the two PCBs together until the connectors are properly seated.
  - (c) Reinstall the six 1/2-inch 4-40 screws, flatwashers, and lockwashers.
- 7. Reconnect the 5-wire connector to A12P4 (green wire to pin 20); see Figure 7-4.
- 8. Reconnect the 3-wire connector to A12P8 (brown wire to pin 1); see Figure 7-4.
- 9. Reinstall the front panel assembly into the basic frame; refer to paragraph 7-3.1.

#### 7-3.3 INCREASE/DECREASE Lever, Switch-Assembly Replacement

The INCREASE/DECREASE lever switch-assembly is not repairable in the field. In the event of an electrical or mechanical failure, the entire switch-assembly must be replaced. To replace this assembly, proceed as follows:

#### NOTE

The knob on the INCREASE/DECREASE lever is secured to the lever shaft with an epoxy compound. The removal of this knob may cause its destruction. Consequently, when ordering replacement TN-CREASE/DECREASE lever switch-assembly, a placement knob (WILTRON part number 430-106) should be ordered also.

- a. Remove the front panel assembly from the basic frame; refer to paragraph 7-3.1.
- b. Disassemble the front panel assembly; refer to paragraph 7-3.2.
- c. Remove the knob from the INCREASE/DECREASE lever (see NOTE above).
- d. Remove the two 1/4-inch 4-40 screws, flatwashers, and lockwashers, and remove the assembly from the front panel.
- e. Install the new assembly and secure using the 4-40 hardware.
- f. Install new knob on lever shaft, and secure it in place using a quick-drying cement (such as a 3-minute epoxy compound).
- g. Reassemble the front panel assembly; refer to paragraph 7-3.2.
- h. Reinstall the front panel assembly into basic frame; refer to paragraph 7-3.1.

### 7-3.4 Rear Panel Assembly, Removal and Reinstallation Instructions

#### a. Removal.

- 1. Turn off ac power and disconnect the input line voltage.
- 2. Remove the top and side covers from the sweep generator as follows:
  - (a) Remove the 4 corner-brackets from the rear panel of the sweep generator, Figure 7-1.
  - (b) Slide the top and side covers to the rear and remove.

#### WARNING

There are dangerous charged-capacitor voltages present on P1 pins 3 thru 10 when power is removed. Discharge these pins to chassis ground before performing maintenance.

- 3. Disconnect the Molex connector from A14P1 (Figure 7-5).
- 4. Remove the six #8 fillister-head, posi-drive screws from the rear panel (Figure 7-1).
- 5. Gently push the rear panel out from the basic frame and lay it back on the work surface. It is not necessary to remove the rear panel assembly completely; all rear panel components are accessible with the panel in this position.
- b. Reinstallation. The reinstallation procedure for the rear panel assembly is a reversal of the removal procedure.

#### 7-3.5 A13 Switching Power Supply PCB, Removal and Reinstallation

WARNING

Voltages hazardous to life are present through the A13/A14 Switching Power Supply, even when power is turned off and the ac line cord is removed. Before performing maintenance on this power supply, observe the following precautions:

After ac power is turned off and the line cord is removed,

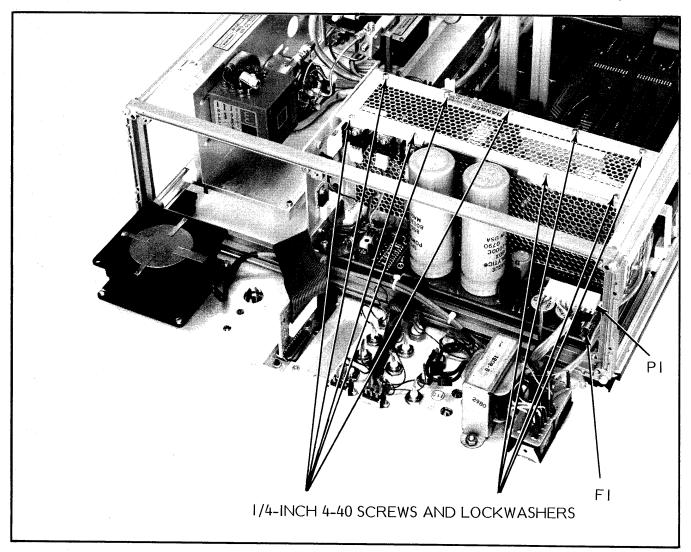


Figure 7-5. 6600A Series Programmable Sweep Generator, Rear Quarter Panels and Assemblies

allow 5 minutes for the capacitor voltages to decay.

Avoid touching the terminals on the 5A FB fuse, A14F1, (Figure 7-5) when power is turned on. +165 Vdc is present on these terminals.

# a. Removal.

- 1. Turn off the ac power and disconnect the ac line cord from the Voltage Selector Module.
- 2. Remove the top cover from the sweep generator, as follows:
  - (a) Remove the two top, corner brackets from the rear panel of the sweep generator (Figure 7-1).
  - (b) Slide the cover to the rear and remove.
- 3. Remove the ten 1/4-inch 4-40 screws and lockwashers from the top cover of the A13 card-cage assembly, and remove the cover.
- 4. Using the ejectors on the ends of the PCB, eject the PCB from the XA13 socket.
- b. Reinstallation. The reinstallation instructions are a reversal of the removal instructions.

## NOTE

The A13 PCB power supply switching-frequency is in the RF spectrum (50 kHz). To prevent this RF energy from being radiated, insure that the card-cage cover is securely seated and fastened with all ten screws before the ac power is reapplied.

# 7-4 6600A SERIES PROGRAMMABLE SWEEP GENERATOR, OVERALL CIRCUIT DESCRIPTION

The 6600A Series Programmable Sweep Generator is a microprocessor-controlled, broad-

band sweeper that uses drop-in (rather than plug-in) radio- and microwave-frequency components. Like most other sweepers, the 6600A is organized into "mainframe" circuits that are universal for all models and frequency components that are model-dependent. For descriptive purposes, the model-dependent circuits are subdivided into five classes: Models 6609A/6617A, Models 6621A/ 6621A-40/ 6629A/ 6629A-40, Models 6637A/ 6637A-40/ 6638A/ 6647A/ 6648A, Models 6653A/6659A, and Model 6642A. Overall diagrams for the 6609A/6617A. 6637A/6637A-40/6638A/6647A/6648A, 6653A/6659A are provided in Figures 7-7 thru 7-9 respectively.

versal Circuits. The 6600A series universal circuits consist of the following printed circuit boards (PCBs): A12 Microprocessor, A11 Front Panel, A1 GPIB Interface (Option 3), A2 Ramp Generator, A3 Marker Generator, A4 Automatic Level Control (ALC), A5 Frequency Instruction, and A10 FM/Attenuator.

The A12 Microprocessor PCB provides overall control for RF signal generation. As shown in Figure 7-7, the A12 PCB interfaces with the Analog Circuits via the  $\mu$ P Bus, and with the front panel controls via the A11 PCB. The A12 PCB is described in paragraph 7-6.1.

The A11 Front Panel PCB provides an interface for all of the front panel push-buttons except RESET and SELF TEST. These two pushbuttons are connected directly to the A12, where their activation causes microprocessor interrupt routines to be generated. The A11 PCB is described in paragraph 7-7.1.

The A1 GPIB Interface PCB is only installed for sweep generators containing Option 3. This PCB provides interface between the IEEE-488 Interface Bus (General Purpose Interface Bus-GPIB) and the sweep generator. The A1 PCB is described in paragraph 7-8.1.

The A2 Ramp Generator PCB is the sweep-generation source when either the

TRIGGER-AUTO, -LINE, or -EXT OR SINGLE pushbutton is used to select the triggering mode. These three pushbuttons control the A2 sweep ramp via the  $\mu P$ BUS. Triggering for the A2 sweep ramp is accomplished via the µP Bus for the single sweep mode, via the EXT TRIGGER IN line for the external sweep mode, or via the AC LINE VOLTAGE input for the line trigger mode. The remaining two input lines, INTENSITY MARKER and EOB, cause the A2 sweep ramp to dwell momentarily. The INTENSITY MARKER line causes the ramp to dwell when an intensity marker is commanded. And the EOB line causes the ramp to dwell during an oscillator bandswitch (see NOTE). The A2 PCB output lines include the RAMP OUT signal that goes to the A5 PCB and the five signals that go to the rear panel BANDSWITCH BLANKING connectors: (+), (-); RETRACE BLANKING (+), (-); and SEQ SYNC. The A2 PCB is described in paragraph 7-9.1.

### NOTE

As shown in Figure 7-8, three YIG oscillators are used to generate a full-band sweep with the Models 6637A/38A/47A/48A. The frequency at which the sweep (or CW tuning) goes from a lower- to a higher-frequency oscillator (or from the heterodyne band to the first oscillator band) is known as the bandswitch point.

The A3 Marker Generator PCB generates the F0, M1, and M2 markers. The marker frequency and mode (VIDEO, RF, INTENSITY) data enters A3 via the µP BUS. The frequency data is converted to an analog voltage, compared with the RAMP, 0-10V, signal, and used to generate the frequency marker. The mode data selects the type of marker to be displayed: either intensity, RF, or video. The RAMP, 0-10V, signal is also buffered on A3 and supplied to the rear panel HORIZ OUTPUT con-

nector. The A3 PCB, in addition to generating markers, also contains the logic circuitry associated with the front panel INCREASE/DECREASE lever. The MODIFY SIGNAL line provides the input to this logic circuitry. The frequency data generated by this logic circuitry is in the form of an 8-bit digital word. This word is sent to the microprocessor via the µP Bus. The A3 PCB is described in paragraph 7-10.1.

The A4 Automatic Level Control PCB is the control arm for the RF-output-signal leveling loop. The input arm for the leveling loop is either the built-in Coupler/Detector that is used for internal leveling, or it is the external coupler and detector (or power meter) that is required for external leveling. The output arm of the leveling loop is the PIN switch attenuator current-driver circuit (not shown) located on the A6-A9 YIG Driver PCBs. These current-driver circuits operate the MOD DRIVER 1, 2, 3, and 4 lines used to control Mod and PIN switch attenuation. The A4 also performs the following functions:

- 1. It sets the magnitude of the RF output power, which the user selects using the front panel LEVEL pushbutton.
- 2. It creates a "dip" in output power at the RF marker frequency.
- 3. It provides the RF SLOPE correction to the output power signal.

The A4 PCB, in addition to controlling the leveling loop, provides a latch for the ATTN 1 through ATTN 4 control bits. These control bits come from the microprocessor and go to the A10 PCB. The A4 PCB is described in paragraph 7-11.1.

The A5 Frequency Instruction PCB generates tuning and bandswitch-control voltages for the A6-A9 YIG Driver PCBs. The bandswitch-control voltage is the FCEN/VPF signal, and the tuning voltages are the F CEN, ΔF>50 MHz, and F CORR signals. There are three sweep-voltage-producing sources in the sweep generator: The A2 PCB, the front panel MANUAL SWEEP potentiometer, and the Step Fre-

quency DAC (digital-to-analog converter, paragraph 3-7.2), located on A5. One of these sources, as determined by the microprocessor, is selected on A5 and used to generate the  $\Delta F > 50$  MHz signal. The center frequency, which the user selects using the front panel FREQUENCY RANGE controls, provides the F CEN signal. And a correction voltage, which is the sum of the FREQUENCY VERNIER signal from the front panel and the Linearizing ROM signal (see NOTE) from the applicable A6-A9 YIG Driver PCB, provides the F CORR signal. The FRE-QUENCY VERNIER signal enters A5 via the µP Bus, and the linearizing ROM signal enters via the FC (frequency correction) Bus. The A5 PCB also supplies a tuning signal, ∆F≤50 MHz, for the FM coil in the YIG oscillator; this signal goes to the A10 PCB. The ∆F≤50 MHz signal sweeps the YIG oscillator via the FM coil when the sweep width is ≤50 MHz. The A5 PCB is described in paragraph 7-12.1.

#### NOTE

Many YIG oscillators, though inherently linear, often have linearity errors due to magnetic saturation effects. To correct for linearity errors, digital data providing up to ±64 MHz of frequency correction may be stored in read-only memory (ROM). If required by the installed YIG oscillator, a Linearizing ROM is mounted on the applicable A6, A7, A8, or A9 YIG Driver PCB.

The A10 FM/Attenuator PCB provides a tuning current for the YIG Osc 1-4 FM (frequency modulation) coils and the Osc 1 YIG tracking filter. The tracking filter tuning current is derived from the TRACK FILTER 1 voltage generated on the A6 PCB. The FM coil tuning current may be derived from either of two sources: an external FM signal from the rear panel via the EXT FM ØLOCK INPUT connector or a sweep width voltage from the A5 PCB via the  $\Delta F \leq 50$  MHz signal

line. In addition to the FM and tracking filter currents, the A10 generates an end-of-band pulse (EOB) whenever a band-switch occurs. The HET YIG SEL and YIG 1, 2, 3 and 4 SEL lines from the A6-A8 PCBs provide the input for the EOB circuit. The A10 PCB is described in paragraph 7-13.1.

The A14 Motherboard PCB provides an interconnecting plane for the A1 through A10 PCBs. It also provides interconnection via connectors between the A1-A10 PCBs and the A12 PCB, the rear panel connectors, and the RF Deck components. The A14 PCB also contains diagnostic (self-test) and PIN Switch port drive and attenuator circuitry; it also contains part of the switching power supply circuitry. The A14 PCB is described in paragraph 7-15.2.

The A13 Switching Power Supply PCB, in conjunction with the power supply circuits on the A14 PCB, provides power supply voltages for the sweep generator circuits. The A13/A14 Switching Power Supply is described in paragraph 7-15.1.

The A18 GPIB Interface Connector PCB provides a connecting plane for the Option 3 rear panel GPIB connector and address switches. This PCB is installed only on sweep generators containing Option 3. The A18 PCB is described in paragraph 7-16.

b. Models 6609A/6617A. The model-dependent circuits and components for the 6609A and 6617A consist of the A6 Het/YIG Driver PCB and the components shown on the RF Deck.

The A6 Het/YIG Driver PCB provides tuning and bias currents for the YIG tuning coil. The tuning current is derived from the three tuning voltages (**F CEN**,  $\Delta$ **F>50 MHz**, **F CORR**) supplied by the A5 PCB. The oscillator bias current is generated on the A6 PCB. In addition to tuning and bias currents, the A6 PCB also generates a tracking filter voltage, which is supplied to the A10 PCB. This voltage indirectly provides tuning for the YIG tracking filter that is built into the 6617A

7-10 1-6600A/MB-OMM

YIG module. The other A6 output is the HET YIG SEL line that is supplied to the A10 PCB (6617A). The A6 PCB is described in paragraph 7-12.3.

The RF Deck is a subassembly; it contains all of the sweep generator RF components. This subassembly is described in paragraph 7-14.

- c. Models 6621A/6621A-40/6629A/6629A-40. The model-dependent circuits and components for these four models are as follows (Figure 7-8):
  - 1. The 6621A and 6621A-40 consist of the A6 Het/YIG Driver PCB, A7 YIG Driver PCB, YIG OSC 1, YIG OSC 2, PIN Switch, and Coupler/Detector.
  - The 6629A and 6629A-40 consist of the A7 and A8 YIG Driver PCBs, YIG OSC 2, YIG OSC 3, PIN Switch, and Coupler Detector.

The circuit description for the model-dependent circuits is the same as that for the 6637A/6638A/6647A/6648A circuits in subparagraph d. below.

d. Models 6637A/6637A-40/6638A/6647A/6648A. The model-dependent circuits and components for these five models consist of the A6, A7, and A8 YIG Driver PCBs, and the components shown on the RF Deck (Figure 7-8).

The A6 Het/YIG Driver and the A7 and A8 YIG Driver PCBs provide tuning and bias currents for the Osc 1, 2, and 3 YIG tuning coils. The tuning currents are derived from the three tuning voltages (F CEN, ΔF >50 MHz, F CORR) supplied by the A5 PCB. The oscillator bias currents are generated individually on each A6-A8 PCB. In addition to tuning and bias currents, the A6 PCB also generates a tracking filter voltage, which is supplied to the A10 PCB. This voltage indirectly provides tuning for the YIG tracking filter that is built into the Osc 1 YIG module. With the exception of the MOD DRIVER signals previously described, the other A6-A8 outputs are control lines. The SNB and SNR lines are select-next-band and select-next-ROM lines, respectively.

When the presently selected oscillator band has reached its upper-most frequency, the SNB line selects the next oscillator band and the SNR line enables this next oscillator band's linearizing ROM. The HET YIG SEL and YIG 1, 2, and 3 SEL lines are supplied to the A10 PCB. A detailed overall description of the A6-A8 PCBs is given in paragraph 7-12.2. The A6 PCB is described in paragraph 7-12.3, and the A7 and A8 PCBs are described in paragraph 7-12.4.

The RF Deck is a subassembly; it contains all of the sweep generator RF components. This subassembly is described in paragraph 7-14.

e. Models 6653A/6659A. The model-dependent circuits and components for the 6653A and 6659A consist of the A6-A9 YIG Driver PCBs and the components shown on the RF Deck (Figure 7-9).

The A6 Het-YIG Driver and A7, A8, and A9 YIG Driver PCBs provide tuning and bias currents for the Osc 1, 2, 3 and 4 YIG tuning coils. The tuning currents are derived from the three tuning voltages (F CEN,  $\Delta F > 50$  MHz, F CORR) supplied by the A5 PCB. The oscillator bias currents are generated individually on the A6-A9 In addition to tuning and bias PCBs. currents, the A6 PCB also generates a tracking filter voltage, which is supplied to the A10 PCB. This voltage indirectly provides tuning for the YIG tracking filter that is built into the Osc 1 YIG module. With the exception of the Mod Driver signals previously described, the other A6-A9 outputs are control lines. The SNB and SNR lines are select-next-band and select-next-ROM lines, respectively. When the presently-selected oscillator has reached its upper-most frequency, the SNB line selects the next oscillator band and the SNR line enables this next oscillator band's linearizing ROM. The HET YIG SEL and YIG 1, 2, 3, and 4 FM COIL SEL lines are supplied to the A10 PCB. An overall description of the A6-A9 PCBs is given in paragraph 7-12.2. The A6 PCB is described in paragraph 7-12.3 and the A7-A9 PCBs are described in paragraph 7-12.4.

The RF Deck is a subassembly; it contains all of the sweep generator RF components. This subassembly is described in paragraph 7-14.

f. Model 6642A. The model-dependent circuits and components for the 6642A consist of the A6 and A7 PCBs and the RF Deck components, as shown in Figure 7-6.

The A6 and A7 YIG Driver PCBs provide tuning and bias currents for the Osc 1 and 2 YIG tuning coils. The tuning currents are derived from the three tuning voltages (F CEN, AF>50 MHz, F CORR) supplied by the A5 PCB. The oscillator bias currents are generated individually on the A6 and A7 PCBs. With the exception of the MOD DRIVER signals previously de-

scribed, the other A6 and A7 outputs are control lines. The SNB and SNR lines are select-next-band and select-next-ROM lines, respectively. When the presently-selected oscillator band has reached its upper-most frequency, the SNB line selects the next oscillator band and the SNR line enables this next oscillator band's linearizing ROM. The YIG 1, 2, 3, and 4 SEL lines are supplied to the A10 PCB. An overall description of the A6/A7 PCBs is given in paragraph 7-12.2. The A6 PCB is described in paragraph 7-12.3 and the A7 PCB is described in paragraph 7-12.4.

The RF Deck is a subassembly; it contains all of the sweep generator RF components. This subassembly is described in paragraph 7-14.

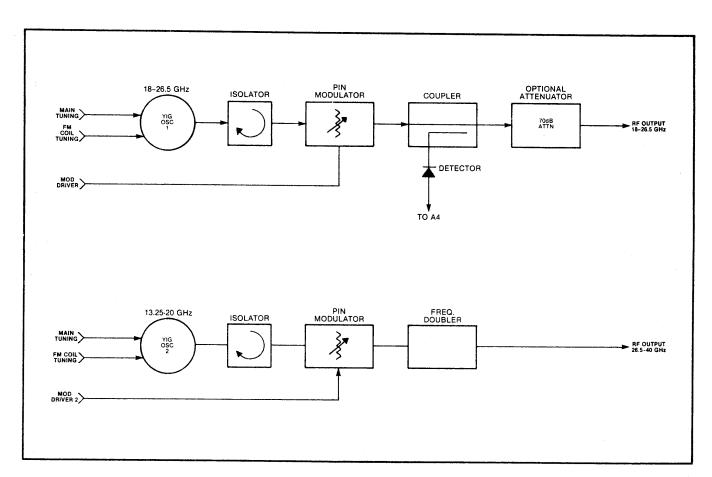
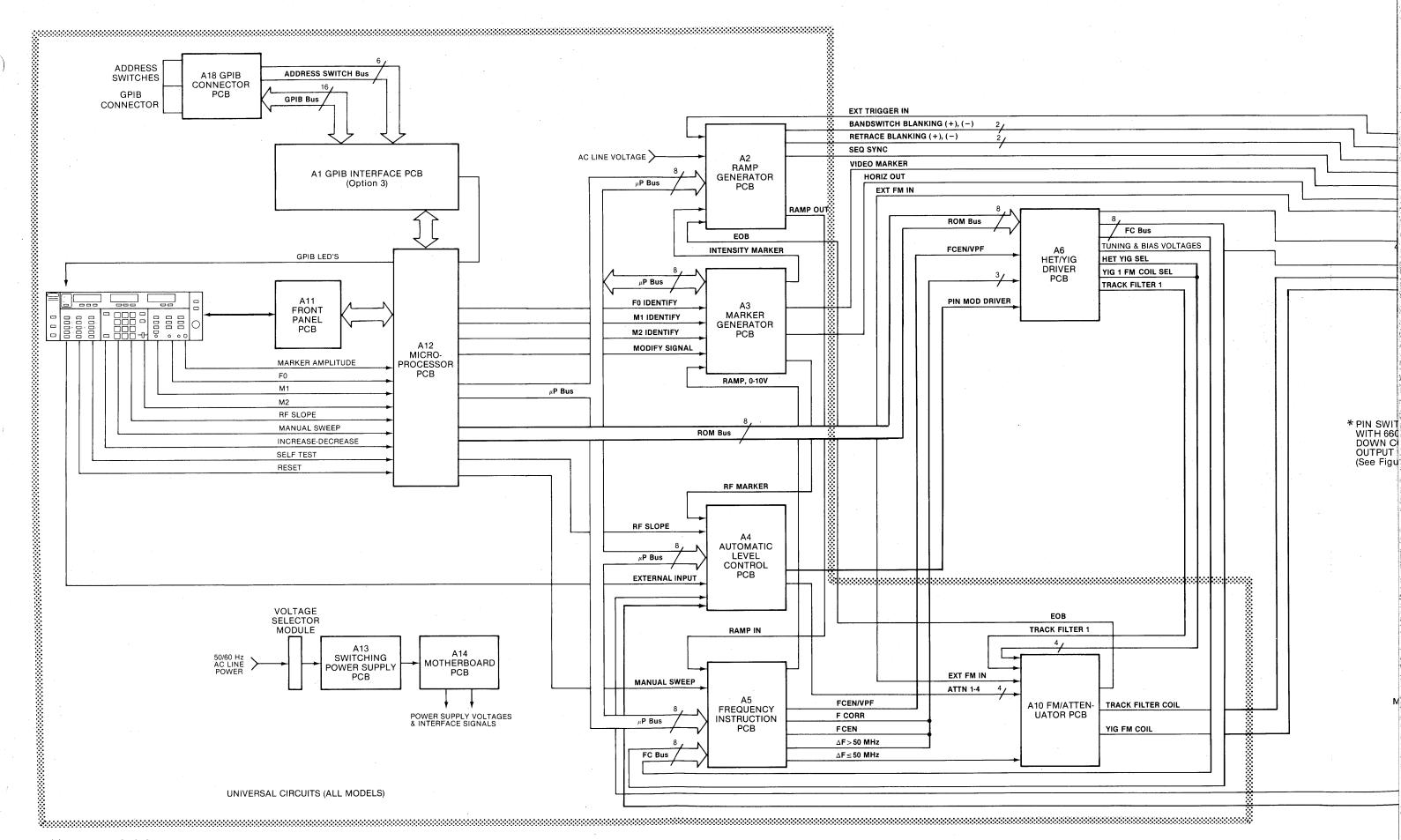
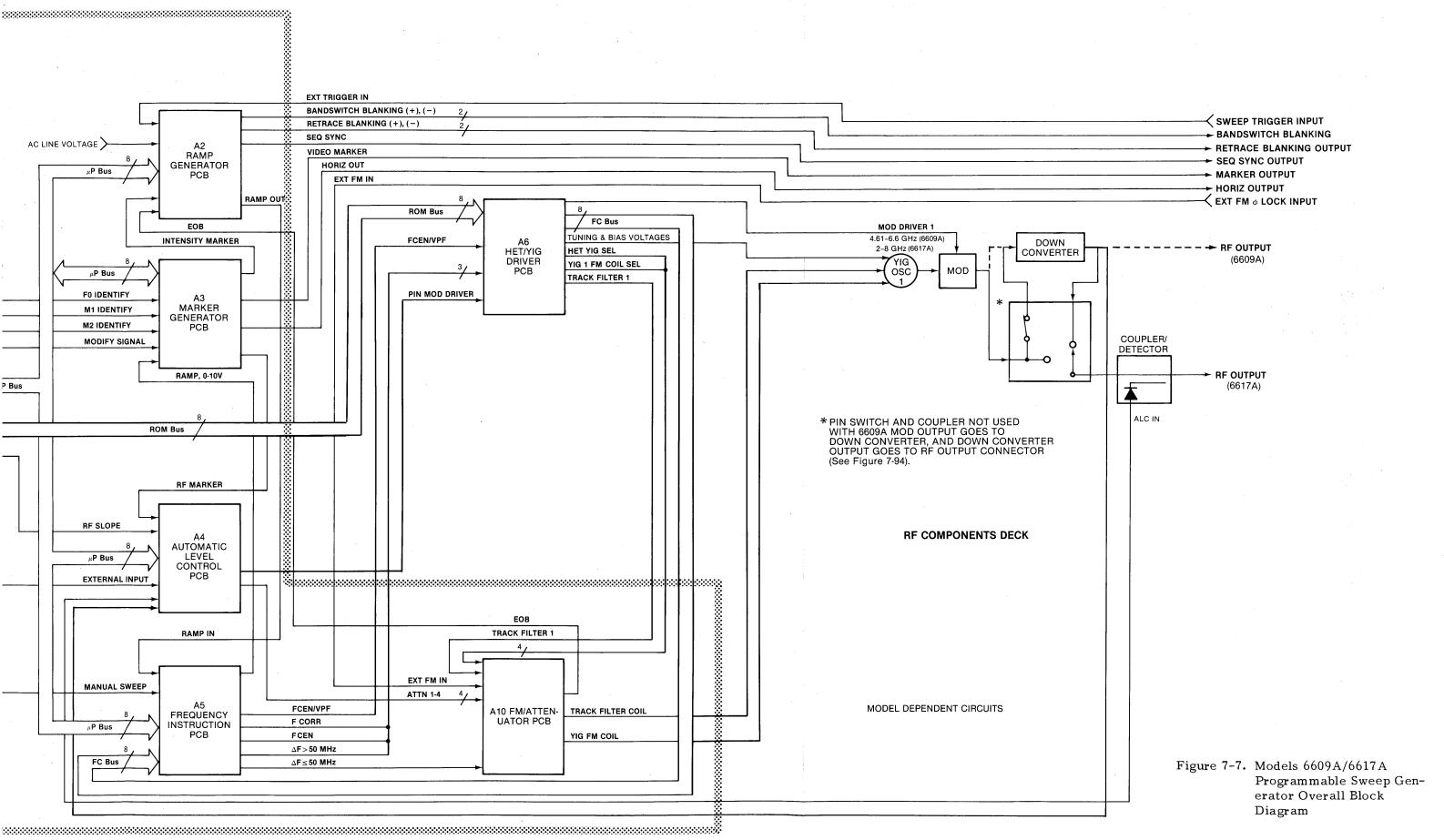
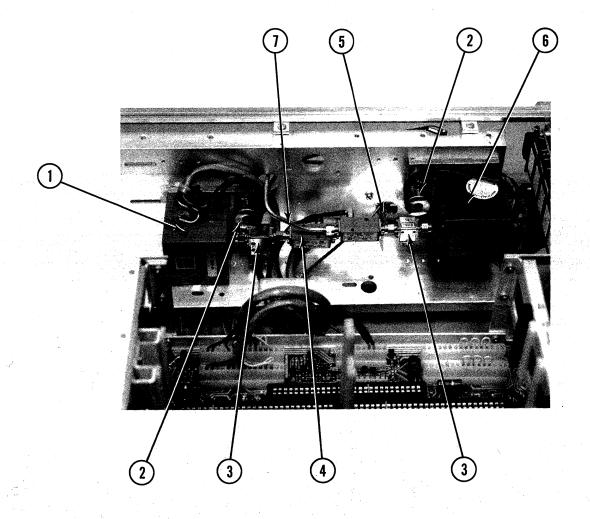


Figure 7-6. Model 6642A RF Components Deck







INDEX NO.	NAME	PART NO.
1	YIG Oscillator Assembly, 13.25-20 GHz (Figure 6-9)	SPCL-C-11622
2	Compensation Transformer	320-64
3	Isolator	Figure 6-9
4	PIN Modulator	1020-17
5	Cable Assembly, PIN Mod. to Doubler	660-A-8103-3
6	YIG Oscillator Assembly, 18-26.5 GHz (Figure 6-9)	SPCL-C-11621
7	Cable Assembly, PIN Mod. to Coupler	660-A-8103-5
	Housing, 10-pin	551-199
<u> </u>	PIN Modulator Cable Assembly	SPEC-S-6494
	Cable Clip	721-17
andrija Gravija, <del>m</del> aja sa	Waveguide Assembly	660-A-8166
	Frequency Doubler	1040-13
<u> </u>	WSMA Output Assembly	660-D-9371
	Detector, Model 70	70-A-7453
. Na h <del>a</del> n ing	Thermistor	35-4
iki k <del>a</del> pita	Feed-Thru	702-2
	Coupler, 18-26.5 GHz	1091-21
y <u></u> , 1 - 4	Coupler Cable Assembly	660-A-9378
	(VR1) IC, -5V Regulator, μA7905	54-185
	Nylon Clamp, 1/2"	720-1/2
_	RF Deck Extrusion	660-D-8115
	Standoff, 4-40 x 1.75"	785-420
_	Base Plate	790-163
_	Washer	790-164
	Clamp	790-165
in	(T1) Compensation Transformer	320-64

Figure 6-7. RF Deck Assembly - 6642A

INDEX NO.	NAME	PART NO.
1	Oscillator Assembly, 18-26.5 GHz (Figure 6-9)	660-C-8175-2
2	Isolator	Figure 6-9
3	Down Converter Assembly (6659A)	MEF-D-9157
4	Cable Assembly, Down Converter to PIN Switch J1	CABL-A-9202-24
5	10 dB Pad	1010-28
-6	PIN Switch Assembly	660-D-11745-2
7	Cable Assembly, 10 dB Pad to PIN Switch J6	CABL-A-9202-23
8	Oscillator Assembly, 12.4-18 GHz (Figure 6-9)	
	a. Avantek Oscillator	660-C-8085-2
	b. WJ Oscillator	660-C-8085-3
9	Filter	Figure 6-9
10	Cable Assembly, Filter to PIN Switch J2	CABL-A-9203-6
11	Cable Assembly	
	a. Avantek Oscillator to Filter	CABL-A-9201-22
	b. WJ Oscillator to Isolator	CABL-A-9204-5
12	Cable Clip	721–17
13	Matched Modulator Assembly	660-B-9342
14	Oscillator Assembly, 2-8 GHz (Figure 6-9)	660-C-8087-4
15	Transformer, Compensation	220 (/
	a. YIG Oscillator 1005-46 or -47	320-66
•	b. YIG Oscillator 1005-53 or -54	320-65
- 4	c. YIG Oscillator 1005-55, -59, or -61	320-64
16	Oscillator Assembly, 8-12.4 GHz (Figure 6-9)	//0 0 000/ /
	a. Avantek Oscillator	660-C-8086-6
	b. WJ Oscillator	660-C-8086-7
17	Cable Assembly, Filter to PIN Switch J3	CABL-A-9202-22
_	Transistor, PNP, TIP 117	20-5
_ ·	Voltage Regulator, -5V	54-184

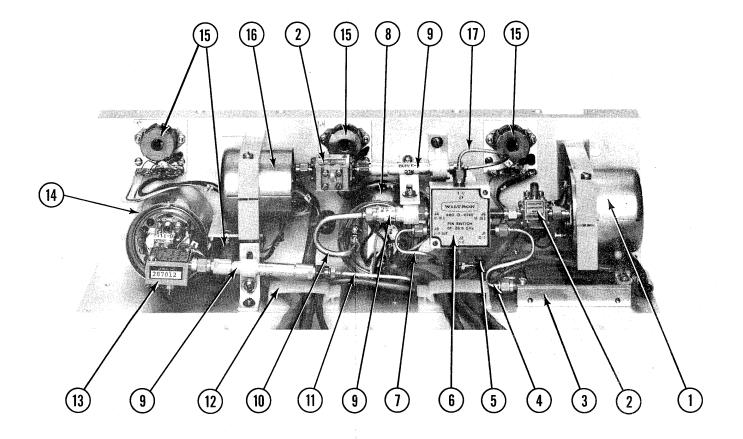
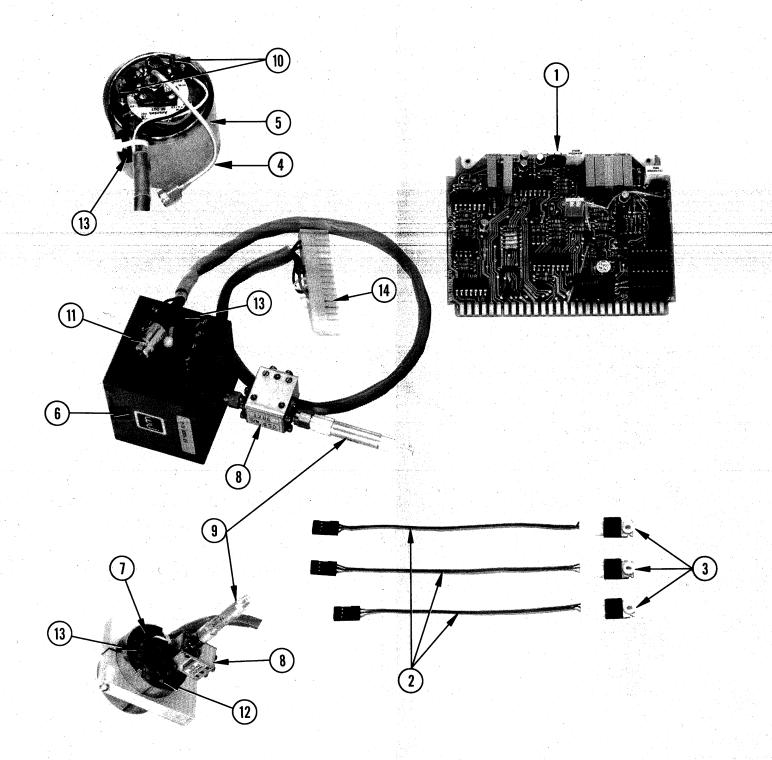


Figure 6-8. RF Deck Assembly - 6653A/6659A



INDEX NO.	NAME	PART NO.
1	PCB Assembly, YIG Driver	//o == 000 <b>=</b> 4
	a. 2-8 GHz (6609A, Table 6-6)	660-D-8007-4
	b. 2-8 GHz (6617A, Table 6-7)	660-D-8007-6
	c. 2-8 GHz (6621A, Table 6-8)	660-D-8007-99-91
	d. 2-8 GHz (6637A/6647A, Table 6-8)	660-D-8007-3
	e. 2-8 GHz (6621A-40, Table 6-9)	660-D-12868-99-91
	f. 2-8 GHz (6637A-40, Table 6-9)	660-D-12868-3
	g. 2-8 GHz (6638A/6648A, Table 6-8)	660-D-8007-5
	h. 2-8 GHz (6653A/6659A Table 6-11)	660-D-8007 <b>-</b> 7
	i. 8-12.4 GHz	
Bara Albahasa I	(1) Avantek (6621A, Table 6-12)	660-D-8009-99-90
	(2) Avantek (6621A-40, Table 6-13)	660-D-8009-99-91
	(3) Avantek (6629A, Table 6-12)	660-D-8009-99 <b>-</b> 92
atana ya ta sakanikatan may sakata pambo sak	(4) Avantek (6629A-40, Table 6-13)	660-D-8009-99-93
Talan da Principal br>Referencia da Principal d	(5) Avantek (6637A/6647A, Table 6-12)	660-D-8009-4
	(6) Avantek (6637A-40, Table 6-13)	660-D-8009-14
	(7) Avantek (6638A/6648A, Table 6-12)	660-D-8009-6
	(8) Avantek (6653A/6659A, Table 6-17)	660-D-8009-9
	(9) WJ (6637A/6647A, Table 6-12)	660-D-8009-7
	(10) WJ (6637A-40, Table 6-13)	660-D-8009-17
	(11) WJ (6638A/6648A, Table 6-12)	660-D-8009-8
	(12) WJ (6653A/6659A, Table 6-17)	660-D-8009-12
	j. 12.4-18.6 GHz	
	(1) Avantek (6629A-40, Table 6-14)	660-D-8009-99-94
	(2) Avantek (6637A-40, Table 6-14)	660-D-8009-16
	(3) Avantek (6653A/6659A, Table 6-18)	660-D-8009-10
	(4) WJ (6629A, Table 6-15)	660-D-8008-99-90
	(5) WJ (6637A/6647A, Table 6-15)	660-D-8008-4
	(6) WJ (6637A-40, Table 6-14)	660-D-8009-15
	(7) WJ (6653A/6659A, Table 6-18)	660-D-8009-13
	k. 12.4-20 GHz (6638A/6648A, Table 6-15)	660-D-8008-7
	1. 18.6-26.5 GHz (6653A/6659A, Table 6-19)	660-D-8009-11
	m. 18.6-26.5 GHz (6642A, Table 6-10)	660-D-8190-99-98
	n. 26.5-40 GHz (6642A, Table 6-16)	660-D-8191-99-93
2	Cable, Transistor (3 ea)	660-A-8100
3	Transistors Q1, Q2, Q3;	20-2N6044
-	Q1 on 6609A/6617A; .01-18 GHz band	20-2N6041
	of 6637A/6637A-40/6647A/6653A and 6659A; and	
	8-12.4 GHz band of 6637A/6637A-40/6638A/6647A/6648A	
4	Cable, SMA Male-Male, RG085	660-A-8101-5

Figure 6-9. Oscillator Assembly (Sheet 1 of 2)

Figure 6-9. Oscillator Assembly (Sheet 2 of 2)

Resistor (R1) MF, 1/4W, 1%,  $11\Omega$ 

Cover (for Item 6 oscillator)

110-11-1

660-B-8160

Table 6-1. A1 GPIB Interface, Option 3 (660-D-8001)

					<del></del>
	<u>CAPACITORS</u>		U6	74LS155, Dual 1-of-4 Decoder	54-101
	<u> </u>		U7	74LS138, 1-of-8 Decoder	54-74LS138
REF.		WILTRON	U8	74LS138, 1-01-8 Decoder 74LS373, Octal Latch	54-14LS136 54-103
DES.	DESCRIPTION	PART NO.	U9	Not Used	5 <del>4</del> -103
	DESCRIPTION	FART NU.	U10	74LS04, Hex Inverter	54-74LS04
C1	Tantalum, 2.2 µF, 20V	250-40A	U11		54-74LS04 54-74LS01
C2	Tantalum, 2.2 $\mu$ F, 20V	250-40A 250-40A	011	74LS01, Quad Open Collector	24-14F201
C3	Tantalum, 10 μF, 25V			NAND	<b>7.1.00</b>
C4	Monolithic, .1 µF, 50V	250-42	U12	8085A, CPU	54-93
C5	Monolithic, .1 µF, 50V	230-37	U13	74LS123 one shot	54-116
C6	Monolithic, .1 μF, 50V Monolithic, .1 μF, 50V	230-37	U14	7474, Dual D Flip-Flop	54-7474
C7	Monolithic, .1 μF, 50V Monolithic, .1 μF, 50V	230-37	U15	74LS244, Non-inverting Octal	54-143
C8		230-37		Tri-State Driver	
C8	Monolithic, 1 µF, 50V	230-37	U16	74LS244, Non-inverting Octal	54-143
Cy	Monolithic, .1 μF, 50V	230-37		Tri-State Driver	
	D Doromon a		U17	8291 GPIB Listener/Talker	54-124
	RESISTORS		U18	MC3447 Motorola GPIB	54-142
				Transreceiver, ceramic pkg.,	
REF.		WILTRON	l	Cs. 623	
DES.	DESCRIPTION	PART NO.	U19	MC3447 Motorola GPIB	54-142
			1	Transreceiver, ceramic pkg.,	
R1	MF, 1/4W, 1%, 5.11k	110-5.11k-1		Cs. 623	
R2	MF, 1/4W, 1%, 10k	110-10k-1	U20	74LS74, Dual D Flip-Flop	54-44
R3	MF, 1/4W, 1%, 10k	110-10k-1	U21	74LS74, Dual D Flip-Flop	54-44
R4	MF, 1/4W, 1%, 10k	110-10k-1	U22	74LS374, Octal Latch	54-41
R5	MF, 1/4W, 1%, 10k	110-10k-1	U23	74LS112, Dual J-K Flip-Flop	54-74LS112
R6	MF, 1/4W, 1%, 40.2k	110-40.2k-1	U24	74LS374, Octal Latch	54-41
R7	MF, $1/4W$ , $1\%$ , $487\Omega$	110-487-1	U25	74LS00, Quad NAND	54-74LS00
R8	MF, 1/4W, 1%, 40.2k	110-40.2k-1		Socket, Dip, 18-Pin; U9	551-148
R9	MF, 1/4W, 1%, 10k	110-10k-1		Socket, Dip, 40-Pin; U1, 12, 17	553-66
RP1	Resistor Network, 10k, 8-Pin,			Socket, Dip, 24-Pin; U4, 5	553-67
	7-Resistor	123-6		Plug, Dip, 18-Pin; U9	551-236
RP2	Resistor Network, 10k, 8-Pin,		i		
	7-Resistor	123-6			
				MISCELLANEOUS	
INTI	EGRATED CIRCUITS, SOCKETS, AN	ID PLUGS			
			REF.		WILTRON
REF.		WILTRON	DES.	DESCRIPTION	PART NO.
DES.	DESCRIPTION	PART NO.			
			Q1	Transistor, 2N4249, PNP	20-2N4249
U1	8255A, Programmable Interface	54-155	S1	Switch, Slide, SPDT	420-14
U2	PD211ALC-4 256 x 4 Static RAM	54-11	TP1	• •	
U3	PD211ALC-4 256 x 4 Static RAM	54-11	thru		
U5	2716 2k x 8 EPROM	Contact	TP22	Test Point Pins	706-44
		WILTRON	Y1	Crystal, 6.000 MHz	630-17
	Cust	omer Service		Ejector, P.C. Board	553-96
			•	_,	555 / 5

Table 6-2. A2 Ramp Generator (660-D-8002)

	CAPACITORS		C12 C13	Monolithic, 50V, .01 μF Monolithic, 50V, .1 μF	250-77 230-37
REF.		WILTRON	C14	Monolithic, 50V, .1 μF	230-37
DES.	DESCRIPTION	PART NO.	C15	Monolithic, 50V, .1 μF	230-37
			C16	Monolithic, 50V, .1 µF	230-37
C1	Tantalum, 6V, 68 μF	250-58	C17	Monolithic, 50V, .1 μF	230-37
C2	Monolithic, 50V, .1 μF	230-37	C18	Monolithic, 50V, .1 μF	230-37
C3	Monolithic, 50V, .1 μF	230-37	C19	Monolithic, 50V, .1 µF	230-37
C4	Monolithic, 50V, .1 μF	230-37	C20	Monolithic, 50V, .1 µF	230-37
C5	Monolithic, 50V, .1 µF	230-37	C21	Monolithic, 50V, .1 µF	230-37
C6	Monolithic, 50V, .1 μF	230-37	C22	Monolithic, 50V, .1 µF	230-37
C7	Monolithic, 50V, .1 μF	230-37	C 23	Mylar, 250V, 1 μF	210-36
C8	Monolithic, 50V, .1 μF	230-37	C24	Tantalum, 25V, 10 µF	250-42
C9	Monolithic, 50V, .1 μF	230-37	C25	Tantalum, 25V, 10 µF	250-42
C10	Mica, 250V, 270 pF	223-270	C26	Monolithic, 50V, .1 μF	230-37
C11	Monolithic, 50V, .01 μF	250-77	C27	Mylar, 250V, .47 μF	210-28

	DIODES		R26	MF, 1/4W, 1%, 20 kΩ	110-20k-1
			R27	MF, $1/4W$ , $1\%$ , $511\Omega$	110-208-1
REF.		WILTRON	R28	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
DES.	DESCRIPTION	PART NO.	R29	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
			R30	MF, $1/4W$ , $1\%$ , $1.1 k\Omega$	110-1.1k-1
CR1	Silicon, 1N4446	10-1N4446	R31	Variable, $1/2W$ , $10\%$ , $2 k\Omega$	156-2k
CR2	Reference, 1N823, 6.2V, 0.4W	10-1N823	R32	MF, $1/4W$ , $1\%$ , $9.53 \text{ k}\Omega$	110-9.53k-1
CR3 CR4	Silicon, 1N4446	10-1N4446	R33	MF, 1/4W, 1%, 20 kΩ	110-20k-1
CR5	Zener, 1N751A, 5.1V, 0.4W Silicon, 1N4446	10-1N751A	R34	MF, 1/4W, 1%, 49.9 kΩ	110-49.9k-1
CR6	Silicon, 1N4446	10-1N4446 10-1N4446	R35 R36	MF, 1/4W, 1%, 100Ω	110-100-1
CR7	Silicon, 1N4446	10-1N4446	R37	MF, 1/4W, 1%, 14.7 kΩ MF $^{1}$ /4W, 1%, 10 kΩ	110-14.7k-1
CR8	Silicon, 1N4446	10-1N4446	R38	MF, $1/4W$ , 1%, 14.7 k $\Omega$	110-10k-1
CR9	Zener, 1N751A, 5.1V, 0.4W	10-1N751A	R39	Variable, $1/2W$ , $10\%$ , $14.7$ k $\Omega$	110-14.7k-1
CR10	Hot-carrier, MBD-501	10-4	R40	MF, $1/4W$ , $1\%$ , $14.7 \text{ k}\Omega$	156-1k 110-14.7k-1
CR11	Zener, 1N758A, 10V, 0.4W	10-1N758A	R41	CC, $1/4W$ , 5%, 2.2 M $\Omega$	101-2.2M-5
CR12	Silicon, 1N4446	10-1N4446	R42	MF, $1/4$ W, $1\%$ , 49.9 kΩ	110-49.9k-1
CR13	Zener, 1N751A, 5.1V, 0.4W	10-1N751A	R43	MF, $1/4W$ , 1%, 14.7 k $\Omega$	110-14.7k-1
CR14	Zener, 1N746A, 3.3V, 0.4W	10-1N746A	R44	MF, $1/4W$ , $1\%$ , $20 k\Omega$	110-20k-1
CR15	Zener, 1N751A, 5.1V, 0.4W	10-1N751A	R45	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
CR16	Silicon, 1N4446	10-1N4446	R46	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
	TD ANCICTORS		R47	MF, $1/4W$ , $1\%$ , $1.21 k\Omega$	110-1.21k-1
	TRANSISTORS		R48	MF, $1/4$ W, $1\%$ , $20$ kΩ	110-20k-1
REF.		WILTRON	R49	MF, $1/4$ W, $1\%$ , $20 \text{ k}\Omega$	110-20k-1
DES.	DESCRIPTION	PART NO.	R50	MF, 1/4W, 1%, 140 kΩ	110-140k-1
		111111 1101	R51	MF, 1/4W, 1%, 10 kΩ	110-10k-1
Q1	2N3694, PNP, 0.2W	20-2N3694	R52 R53	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
Q2	2N4249, NPN, 0.4W	20-2N4249	R54	MF, $1/4W$ , $1\%$ , $10 k\Omega$ MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
Q3	2N3694, PNP, 0.2W	20-2N3694	R55	MF, $1/4W$ , $1\%$ , $10 \text{ k}\%$ MF, $1/4W$ , $1\%$ , $10 \text{ k}\%$	110-10k-1
Q4	2N3694, PNP, 0.2W	20-2N3694	R56	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
Q5	2N3694, PNP, 0.2W	20-2N3694	R57	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1 110-10k-1
Q6	2N4249, NPN, 0.4W	20-2N4249	R58	MF, 1/4W, 1%, 10 kΩ	110-10k-1
Q7	2N3694, PNP, 0.2W	20-2N3694	R59	MF, $1/4W$ , $1\%$ , $34 k\Omega$	110-10k-1 110-34k-1
Q8	J112, JFET	20-17	R60	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
Q9 Q10	J112, JFET	20-17	R61	MF, $1/4W$ , $1\%$ , $3.48 \text{ k}\Omega$	110-3.48k-1
Q10 Q11	2N3694, PNP, 0.2W 2N4249, NPN, 0.4W	20-2N3694	R62	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
Q12	2N3694, PNP, 0.2W	20-2N4249	R63	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
Q13	2N4249, NPN, 0.4W	20-2N3694 20-2N4249	R64	MF, $1/4W$ , 1%, 20 k $\Omega$	110-20k-1
2.0	211217, 11111, 0.411	20-2114247	R65	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
	<b>RESISTORS</b>		R66	MF, 1/4W, 1%, 140 kΩ	110-140k-1
			R67 R68	MF, 1/4W, 1%, 10 kΩ	110-10k-1
REF.		WILTRON	R69	MF, 1/4W, 1%, 10 kΩ	110-10k-1
DES.	DESCRIPTION	PART NO.	R70	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 10 kΩ	110-1k-1
			R71	MF, $1/4W$ , $1\%$ , $3.48 \text{ k}\Omega$	110-10k-1
R1	MF, $1/4W$ , $1\%$ , $1.15 k\Omega$	110-1.15k-1	R72	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-3.48k-1 110-10k-1
R2	MF, $1/4$ W, $1\%$ , $17.4$ k $\Omega$	110-17.4k-1	R73	MF, 1/4W, 1%, 10 kΩ	110-10k-1
R3	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1	R74	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
R4	MF, 1/4W, 1%, 9.76 kΩ	110-9.76k-1	R75	CC, 1/4W, 5%, 1.2 MΩ	101-1.2M-5
R5	MF, 1/4W, 1%, 56.2Ω	110-56.2-1	R76	Variable, 1/2W, 10%, 1 M Ω	156-1M
R6 R7	Variable, $1/2W$ , $10\%$ , $200 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $1 \text{ M}\Omega$	156-200k	R77	MF, $1/4$ W, $1\%$ , $1$ M $\Omega$	110-1M-1A
R8	MF, $1/4W$ , $1\%$ , $1 \text{ M} \Omega$ MF, $1/4W$ , $1\%$ , $4.99 \text{ k}\Omega$	110-1M-1A	R78	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R9	MF, $1/4W$ , $1\%$ , $4.99$ KM MF, $1/4W$ , $1\%$ , $2.74$ k $\Omega$	110-4.99k-1 110-2.74k-1	R79	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R10	Variable, $1/2W$ , $10\%$ , $10 \text{ k}\Omega$	156-10k			
R11	MF, $1/4W$ , 1%, $10.2 \text{ k}\Omega$	110-10.2k-1		TAITECD ATTEN CITY CITY	
R12	MF, 1/4W, 1%, 10 kΩ	110-10k-1		INTEGRATED CIRCUITS	
R13	MF, $1/4W$ , 1%, 1.07 k $\Omega$	110-1.07k-1	REF.		WII TOON
R14	MF, $1/4W$ , $1\%$ , $19.6 k\Omega$	110-19.6k-1	DES.	DESCRIPTION	WILTRON
R15	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1	1	DEBORE TION	PART NO.
R16	MF, $1/4W$ , 1%, 392 k $\Omega$	110-392k-1	Ul	Dual D Flip-Flop, 74LS74	54-44
R17	Variable, 1/2W, 10%, 500 k $\Omega$	156-500k	U2	Quad AND, 74LS08	54-74LS08
R18	MF, $1/4W$ , 1%, $3.48 \text{ k}\Omega$	110-3.48k-1	U3	Timer, NE-555	54-555
R19	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1	U4	Counter, 74LS161	5 <del>4</del> -60
R20	MF, 1/4W, 1%, 100Ω	110-100-1	U5	Hex Inverter, 74LS04	54-74LS04
R21	MF, 1/4W, 1%, 2.43 kΩ	110-2.43k-1	U6	Decoder, 74LS138	54-74LS138
R22	MF, 1/4W, 1%, 10 kΩ	110-10k-1	U7	Octal Latch, 74LS374	54-41
R23 R24	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ	110-10k-1	U8	2-1 Multiplexer, 74LS157	54-59
R25	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ	110-10k-1	U9	4-Bit Counter, 74LS191	54-120
ICLU	1711 , 1/ T 17 , 1/0, 10 KM	110-10k-1	U10	Quad Inverter, 74LS05	54-105

U11	Dual D Flip-Flop, 74LS74	54-44	U26	Quad NAND, 74LS01	54-74LS01
U12	2-1 Multiplexer, 74LS157	5 <del>4-</del> 59	U27	Quad NOR, 74LS02	54-57
U13	4-Bit Counter, 74LS191	54-120	U28	Dual Switch, DG200	50-DG200BA
U14	Octal Latch, 74LS374	54-41	ł	, =	***********
U15	8-Bit Latch/DAC, AD7524	54-129		MISCELLANEOUS	
U16	Dual D Flip-Flop, 74LS74	54-44		MISOEDERIVEOUS	
U17	Quad NAND Gate, 74LS00	54-74LS00	REF.		WILTRON
U18	Dual Op-Amp, TL072	54-53	DES.	DESCRIPTION	PART NO.
U19	Data Selector, 74LS151	54-119	] 220.	DESCRIPTION	PARI NO.
U20	Dual Op-Amp, TL072	54-53	K1	Relay	690-28
U21	Quad Switch, DG201	54-24	S1	Slide Switch	-,
U22	Dual D Flip-Flop, 74LS74	54-44	TP1	Silde Switch	420-14
U23	4-Input NAND, 74LS20	54-74LS20	thru		
U24	Dual D Flip-Flop, 74LS74	54-44	TP7	Test Points	706-44
U25	QUAD Comparator, LM339	54-45	111	Ejector, P.C. Board	
	.c	31 43		Ejector, P.C. Board	553-96

Table 6-3. A3 Marker Generator (660-D-8003)

					<del></del>
	CADACTTORS		<b>ans</b>		
	CAPACITORS		CR3	Not Used	
REF.			CR4	Shottky, MBD-501	10-4
	P.D.C.P.PPTC11	WILTRON	CR5	Not Used	
DES.	DESCRIPTION	PART NO.	CR6	Shottky, MBD-501	10-4
C1	Tont alum 48 NE 4W	350 50	CR7	Not Used	
C2	Tantalum, 68 µF, 6V	250-58	CR8	Zener, 30V, 5%, 1W	10-1N4751A
C3	Monolithic, .1 µF, 50V	230-37	CR9	Silicon, 1N4446	10-1N4446
	Monolithic, .1 µF, 50V	230-37	CR10	Silicon, 1N4446	10-1N4446
C4	Monolithic, .1 μF, 50V	230-37	CR11	Silicon, 1N4446	10-1N4446
C5	Not Used		CR12	Silicon, 1N4446	10-1N4446
C6	Not Used		CR13	Silicon, 1N4446	10-1N4446
C7	Tantalum, 10 μF, 25V	250-42	CR14	Silicon, 1N4446	10-1N4446
C8	Tantalum, 10 µF, 25V	250-42	CR15	Silicon, 1N4446	10-1N4446
C9	Monolithic, .1 μF, 50V	230-37	CR16	Silicon, 1N4446	10-1N4446
C10	Monolithic, .1 μF, 50V	230-37	CR17	Zener, 30V, 5%, 1W	10-1N4751A
C11	Tantalum, 10 μF, 25V	250-42	CR18	Silicon, 1N4446	10-1N4446
C12	Monolithic, .1 μF, 50V	230-37	CR19	Silicon, 1N4446	10-1N4446
C13	Monolithic, .1 μF, 50V	230-37	CR20	Silicon, 1N4446	10-1N4446
C14	Mica, 20 pF	220-20	CR21	Silicon, 1N4446	10-1N4446
C15	Mica, 20 pF	220-20	CR22	Silicon, 1N4446	10-1N4446
C16	Mica, 20 pF	220-20	CR23	Zener, 3.3V, 5%, .4W	10-1N746A
C17	Monolithic, .1 µF, 50V	230-37	CR24	Silicon, 1N4446	
C18	Monolithic, .1 µF, 50V	230-37	CR25	Silicon, 1N4446	10-1N4446
C19	Monolithic, .1 µF, 50V	230-37	CR26	Silicon, 1N4446	10-1N4446
C20	Monolithic, .1 µF, 50V	230-37	CR27		10-1N4446
C21	Mica, 3 pF	223-3	CR28	Zener, 4.7V, 5%, .4W	10-11
C22	Mica, 3 pF	223-3	CR20	Silicon, 1N4446	10-1N4446
C23	Monolithic, .1 µF, 50V	230-37			
C24	Monolithic, .1 µF, 50V			MD 434GTGTGTGTG	
C25	Monolithic, .1 µF, 50V	230-37		TRANSISTORS	
C26	, , ,	230-37			
	Monolithic, .1 µF, 50V	230-37	REF.		WILTRON
C27	Monolithic, .01 μF, 100V	250-77	DES.	DESCRIPTION	PART NO.
C28	Monolithic, .01 μF, 100V	250-77			
C29	Mica, 150 pF	220-150	Q1	FET, J112	20-17
C30	Tantalum, 10 µF, 25V	250-42	Q2	FET, J112	20-17
C31	Monolithic, .1 μF, 50V	230-37	Q3	FET, J112	20-17
C32	Tantalum, 10 μF, 25V	250-42	Q4	NPN, 2N3694	20-2N3694
C33	Monolithic, .01 μF, 100V	250-77	Q5	NPN, 2N3694	20-2N3694
C34	Monolithic, .1 μF, 50V	230-37	Q6	NPN, 2N3694	20-2N3694
C35	Monolithic, .1 μF, 50V	230-37		•	
				D DOTOMOD A	
	DIODES			RESISTORS	
REF.		WILTRON	REF.	DECORPOR	WILTRON
DES.	DESCRIPTION	PART NO.	DES.	DESCRIPTION	PART NO.
			R1	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
CR1	Reference, 1N823, 6V, 0.4W	10-1N823	R2	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
CR2	Shottky, MBD-501	10-4	R3	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1 110-10k-1
	<del>-</del> •		•	, -, , 0, 200	110 10R-1

R4	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1	R68	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1
R5	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1	R69	MF, $1/4$ W, $1\%$ , $20 \text{ k}\Omega$	110-20k-1
R6	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1	R70	MF, $1/4$ W, $1\%$ , $301$ kΩ	
R7	MF, $1/4W$ , $1\%$ , $1 k\Omega$				110-301k
R8		110-1k-1	R71	MF, 1/4W, 1%, 10 kΩ	110-10k-1
	MF, 1/4W, 1%, 10 kΩ	110-10k-1	R72	MF, $1/4W$ , $1\%$ , $100 \text{ k}\Omega$	110-100k-1
R9	MF, $1/4$ W, $1\%$ , $16.2 \text{ k}\Omega$	110-16.2k-1	R73	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
R10	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110 <b>-</b> 10k-1	R74	MF, $1/4$ W, $1\%$ , $100$ kΩ	110-100k-1
R11	MF, $1/4W$ , $1\%$ , $16.2 \text{ k}\Omega$	110-16.2k-1	R75	MF, $1/4W$ , $1\%$ , $1 M\Omega$	110-1M-1A
R12	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1	R76	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
R13	Variable, $1/2W$ , $10\%$ , $2 k\Omega$	156-2k	R77	MF, $1/4W$ , $1\%$ , $20 k\Omega$	110-20k-1
R14	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1	R78	MF, $1/4$ W, 1%, 100 kΩ	110-100k-1
R15	MF, $1/4W$ , 1%, 1 k $\Omega$	110-1k-1	R79	MF, $1/4W$ , 1%, 30.1 k $\Omega$	
R16	MF, $1/4$ W, 1%, 1 k $\Omega$	110-1k-1	R80	MF, $1/4W$ , 1%, $10 \text{ k}\Omega$	110-30.1k-1
R17	MF, 1/4W, 1%, 1 M Ω	110-1M-1A	R81		110-10k-1
R18	MF, $1/4W$ , $1\%$ , $1 M \Omega$		t .	MF, 1/4W, 1%, 100 kΩ	110-100k-1
R19		110-1M-1A	R82	MF, $1/4W$ , $1\%$ , $100 \text{ k}\Omega$	110-100k-1
R20	MF, 1/4W, 1%, 10 kΩ	110-10k-1	R83	MF, $1/4$ W, $1\%$ , $100 \text{ k}\Omega$	110-100k-1
	Variable, $1/2W$ , $10\%$ , $2 k\Omega$	156-2k	R84	MF, $1/4$ W, $1\%$ , $178 k\Omega$	110-178k-1
R21	MF, $1/4$ W, $1\%$ , $1 k\Omega$	110-1k-1	R85	MF, $1/4W$ , $1\%$ , $27.4 k\Omega$	110-27.4k-1
R22	MF, $1/4$ W, $1\%$ , $1 k\Omega$	110-1k-1	R86	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1
R23	MF, $1/4$ W, $1\%$ , $1$ k $\Omega$	110-1k-1	R87	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
R24	MF, $1/4$ W, $1\%$ , $1$ M $\Omega$	110-1M-1A	R88	MF, $1/4W$ , $1\%$ , $20 k\Omega$	110-20k-1
R25	MF, $1/4W$ , $1\%$ , $1 M \Omega$	110-1M-1A	R89	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
R26	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1	R90	Variable, 1/2W, 10%, 200 kΩ	156-200k
R27	Variable, $1/2W$ , $10\%$ , $2 k\Omega$	156-2k	R91	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
R28	MF, $1/4W$ , 1%, 1 k $\Omega$	110-1k-1	R92	MF, $1/4$ W, $1\%$ , $20 \text{ k}\Omega$	110-20k-1
R29	MF, $1/4$ W, $1\%$ , $1 k\Omega$	110-1k-1	R93	MF, $1/4W$ , 1%, 1 k $\Omega$	
R30	MF, $1/4$ W, $1\%$ , $1 k\Omega$		R94	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1
R31	MF, $1/4W$ , $1\%$ , $1 M\Omega$	110-1k-1	R95		110-1k-1
R32		110-1M-1A	1,75	MF, 1/4W, 1%, 1 kΩ	110-1k-1
	MF, 1/4W, 1%, 1 MΩ	110-1M-1A			
R33	MF, $1/4$ W, $1\%$ , $17.8 \text{ k}\Omega$	110-17.8k-1		INTEGRATED CIRCUITS	
R34	MF, 1/4W, 1%, 10 kΩ	110-10k-1			
R35	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1	REF.		WILTRON
	MF 1/4W/ 10% 10 I-O	110 101 1			
R36	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1	l .	DESCRIPTION	
R37	MF, $1/4W$ , $1\%$ , $24.9 \text{ k}\Omega$	110-10k-1 110-24.9k-1	DES.	DESCRIPTION	PART NO.
			DES.		PART NO.
R37	MF, $1/4W$ , $1\%$ , $24.9 \text{ k}\Omega$	110-24.9k-1	DES. U1	Octal Latch, 74LS374	<b>PART NO.</b> 54-41
R37 R38	MF, $1/4$ W, $1\%$ , $24.9 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $100 \text{ k}\Omega$	110-24.9k-1 110-100k-1 110-100k-1	DES. U1 U2	Octal Latch, 74LS374 Quad NAND Gate, 74LS01	PART NO. 54-41 54-74LS01
R37 R38 R39	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1	DES. U1 U2 U3	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP	<b>PART NO.</b> 54-41
R37 R38 R39 R40	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1	DES. U1 U2 U3 U4	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used	PART NO. 54-41 54-74LS01
R37 R38 R39 R40 R41 R42	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $17.8$ kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1	DES. U1 U2 U3 U4 U5	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP	PART NO. 54-41 54-74LS01
R37 R38 R39 R40 R41 R42 R43	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $17.8$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1	DES. U1 U2 U3 U4	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used	<b>PART NO.</b> 54-41 54-74LS01 54-53 54-129
R37 R38 R39 R40 R41 R42 R43 R44	MF, $1/4$ W, $1\%$ , $24.9$ k $\Omega$ MF, $1/4$ W, $1\%$ , $100$ k $\Omega$ MF, $1/4$ W, $1\%$ , $100$ k $\Omega$ MF, $1/4$ W, $1\%$ , $133$ k $\Omega$ MF, $1/4$ W, $1\%$ , $100$ k $\Omega$ MF, $1/4$ W, $1\%$ , $17.8$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1	DES. U1 U2 U3 U4 U5	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524	<b>PART NO.</b> 54-41 54-74LS01 54-53 54-129 54-129
R37 R38 R39 R40 R41 R42 R43 R44 R45	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $17.8$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1	DES.  U1  U2  U3  U4  U5  U6	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524	54-41 54-74LS01 54-53 54-129 54-129 54-129
R37 R38 R39 R40 R41 R42 R43 R44 R45	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $17.8$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-RC4136
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $17.8$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-100k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-RC4136 54-RC4136
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $17.8$ kΩ MF, $1/4$ W, $1\%$ , $10$ 0 kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1	DES.  U1  U2  U3  U4  U5  U6  U7  U8  U9  U10	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R46 R47	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $10$ 0 kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ	110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-100k-1 110-100k-1 110-100k-1 110-133k-1	DES.  U1  U2  U3  U4  U5  U6  U7  U8  U9  U10  U11	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-P6
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R49 R50	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $10$ 0 kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ	110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-100k-1 110-133k-1 110-100k-1	DES.  U1  U2  U3  U4  U5  U6  U7  U8  U9  U10  U11  U12	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-RC4136
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R47 R48 R49 R50 R51	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $10$ 0 kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ	110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-100k-1 110-133k-1 110-100k-1	DES.  U1  U2  U3  U4  U5  U6  U7  U8  U9  U10  U11  U12  U13	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R49 R50	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $10$ 0 kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ	110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-100k-1 110-100k-1 110-100k-1 110-133k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-RC4136
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R47 R48 R49 R50 R51	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $10$ 0 kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ	110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-133k-1 110-100k-1 110-18-1 110-17.8k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53 54-45 54-44
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R49 R50 R51 R52	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $17.8$ kΩ MF, $1/4$ W, $1\%$ , $10$ 0 kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ	110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-133k-1 110-100k-1 110-18-1 110-17.8k-1 110-10k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-RC4136
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R50 R51 R52 R53	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $133$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $10$ 0 kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ	110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-133k-1 110-100k-1 110-18-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1	DES.  U1  U2  U3  U4  U5  U6  U7  U8  U9  U10  U11  U12  U13  U14  U15  U16  U17	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53 54-45 54-44
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R50 R51 R52 R53 R54 R55	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ	110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-133k-1 110-133k-1 110-100k-1 110-18-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17 U18	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10 8 Bit ADC, ADC0804LCN	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53 54-45 54-44 54-96L02
R37 R38 R39 R40 R41 R42 R43 R44 R45 R46 R47 R50 R51 R51 R55 R55 R55	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 133 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10  kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-18-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1	DES.  U1  U2  U3  U4  U5  U6  U7  U8  U9  U10  U11  U12  U13  U14  U15  U16  U17	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53 54-45 54-44 54-96L02 54-42
R37 R38 R39 R40 R41 R42 R43 R44 R45 R45 R46 R47 R50 R51 R52 R53 R55 R55 R55 R55 R55 R55 R55 R55 R57	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 133 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 100 kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-18-1 110-18-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-24.9k-1 110-24.9k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17 U18	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10 8 Bit ADC, ADC0804LCN	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53 54-45 54-44 54-96L02 54-42 54-161
R37 R38 R39 R40 R41 R42 R443 R445 R446 R47 R48 R50 R51 R52 R53 R556 R57 R58	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 133 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10  kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 200 kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-18-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-24.9k-1 110-200k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17 U18	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10 8 Bit ADC, ADC0804LCN Octal Latch, 74LS374	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53 54-45 54-44 54-96L02 54-42 54-161
R37 R38 R39 R40 R41 R42 R443 R445 R446 R47 R48 R50 R51 R52 R53 R556 R57 R58 R59	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 133 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10  kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 200 kΩ MF, 1/4W, 1%, 200 kΩ MF, 1/4W, 1%, 12.4 kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-100k-1 110-100k-1 110-133k-1 110-10k-1 110-18-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-24.9k-1 110-200k-1 110-24k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17 U18	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10 8 Bit ADC, ADC0804LCN	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53 54-45 54-44 54-96L02 54-42 54-161
R37 R38 R39 R40 R41 R42 R44 R45 R47 R48 R50 R51 R52 R554 R556 R57 R59 R60	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 133 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10  kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 200 kΩ MF, 1/4W, 1%, 200 kΩ MF, 1/4W, 1%, 12.4 kΩ MF, 1/4W, 1%, 18, 887Ω	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-18-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-24.9k-1 110-200k-1 110-24.9k-1 110-200k-1 110-12.4k-1 110-887-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17 U18 U19	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10 8 Bit ADC, ADC0804LCN Octal Latch, 74LS374	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53 54-45 54-44 54-96L02 54-42 54-161
R37 R38 R39 R40 R41 R42 R44 R45 R45 R50 R51 R55 R55 R55 R55 R55 R55 R60 R61	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 133 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10  kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 200 kΩ MF, 1/4W, 1%, 4887Ω MF, 1/4W, 1%, 887Ω MF, 1/4W, 1%, 887Ω MF, 1/4W, 1%, 887Ω MF, 1/4W, 1%, 200 kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-18k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-24.9k-1 110-200k-1 110-887-1 110-20k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17 U18 U19	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10 8 Bit ADC, ADC0804LCN Octal Latch, 74LS374	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53 54-45 54-44 54-96L02 54-42 54-161
R37 R38 R39 R40 R41 R42 R44 R44 R45 R50 R51 R55 R55 R55 R55 R55 R61 R62	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ WF, $1/4$ W, $1\%$ , $100$ kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-18-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-24.9k-1 110-24.9k-1 110-20k-1 110-12.4k-1 110-887-1 110-20k-1 156-200k	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17 U18 U19	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10 8 Bit ADC, ADC0804LCN Octal Latch, 74LS374	54-41 54-74LS01 54-53 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53 54-45 54-44 54-96L02 54-42 54-161 54-41
R37 R38 R39 R40 R41 R42 R44 R44 R45 R45 R51 R55 R55 R55 R55 R55 R61 R62 R63	MF, $1/4$ W, $1\%$ , $24.9$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $100$ kΩ MF, $1/4$ W, $1\%$ , $10$ 0 kΩ Variable, $1/2$ W, $10\%$ , $200$ kΩ MF, $1/4$ W, $1\%$ , $10.6$ kΩ	110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-18-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-24.9k-1 110-24.9k-1 110-200k-1 110-887-1 110-20k-1 156-200k 110-19.6k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17 U18 U19	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10 8 Bit ADC, ADC0804LCN Octal Latch, 74LS374	54-41 54-74LS01 54-53  54-129 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53 54-45 54-44 54-96L02 54-42 54-161 54-41
R37 R38 R39 R41 R42 R44 R445 R445 R450 R51 R53 R55 R55 R55 R55 R61 R62 R63 R64	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 133 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 183 kΩ MF, 1/4W, 1%, 18 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 200 kΩ MF, 1/4W, 1%, 887Ω MF, 1/4W, 1%, 887Ω MF, 1/4W, 1%, 887Ω MF, 1/4W, 1%, 20 kΩ Variable, 1/2W, 10%, 200 kΩ MF, 1/4W, 1%, 19.6 kΩ MF, 1/4W, 1%, 19.6 kΩ MF, 1/4W, 1%, 49.9 kΩ	110-24.9k-1 110-100k-1 110-100k-1 110-133k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-18-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-24.9k-1 110-24.9k-1 110-20k-1 110-12.4k-1 110-887-1 110-20k-1 156-200k	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17 U18 U19	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10 8 Bit ADC, ADC0804LCN Octal Latch, 74LS374	54-41 54-74LS01 54-53  54-129 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53 54-45 54-44 54-96L02 54-42 54-161 54-41
R37 R38 R39 R41 R42 R442 R445 R45 R450 R51 R553 R556 R557 R560 R661 R663 R664 R65	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 133 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10  kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 200 kΩ Variable, 1/2W, 10%, 200 kΩ MF, 1/4W, 1%, 19.6 kΩ MF, 1/4W, 1%, 19.6 kΩ MF, 1/4W, 1%, 19.6 kΩ MF, 1/4W, 1%, 49.9 kΩ MF, 1/4W, 1%, 19.9 kΩ MF, 1/4W, 1%, 19.9 kΩ MF, 1/4W, 1%, 100 kΩ	110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-18-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-24.9k-1 110-24.9k-1 110-24.9k-1 110-200k-1 110-887-1 110-20k-1 156-200k 110-19.6k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17 U18 U19  REF. DES.	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10 8 Bit ADC, ADC0804LCN Octal Latch, 74LS374	54-41 54-74LS01 54-53  54-129 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53 54-45 54-44 54-96L02 54-42 54-161 54-41
R37 R38 R40 R41 R42 R445 R45 R46 R47 R49 R51 R553 R556 R557 R560 R662 R665 R665 R666	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 200 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 19.6 kΩ MF, 1/4W, 1%, 19.6 kΩ MF, 1/4W, 1%, 19.6 kΩ MF, 1/4W, 1%, 19.9 kΩ MF, 1/4W, 1%, 10 kΩ	110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-100k-1 110-100k-1 110-100k-1 110-10k-1 110-24.9k-1 110-24.9k-1 110-24.9k-1 110-200k-1 110-887-1 110-20k-1 156-200k 110-19.6k-1 110-49.9k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17 U18 U19  REF. DES.	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10 8 Bit ADC, ADC0804LCN Octal Latch, 74LS374  MISCELLANEOUS  DESCRIPTION	PART NO.  54-41 54-74LS01 54-53  54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53 54-45 54-44 54-96L02 54-42 54-161 54-41  WILTRON PART NO.
R37 R38 R39 R41 R42 R442 R445 R45 R450 R51 R553 R556 R557 R560 R661 R663 R664 R65	MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 133 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 10  kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 24.9 kΩ MF, 1/4W, 1%, 200 kΩ Variable, 1/2W, 10%, 200 kΩ MF, 1/4W, 1%, 19.6 kΩ MF, 1/4W, 1%, 19.6 kΩ MF, 1/4W, 1%, 19.6 kΩ MF, 1/4W, 1%, 49.9 kΩ MF, 1/4W, 1%, 19.9 kΩ MF, 1/4W, 1%, 19.9 kΩ MF, 1/4W, 1%, 100 kΩ	110-24.9k-1 110-100k-1 110-133k-1 110-100k-1 110-17.8k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-100k-1 110-100k-1 110-100k-1 110-133k-1 110-100k-1 110-18-1 110-10k-1 110-10k-1 110-12.4k-1 110-24.9k-1 110-20k-1	DES.  U1 U2 U3 U4 U5 U6 U7 U8 U9 U10 U11 U12 U13 U14 U15 U16 U17 U18 U19  REF. DES.	Octal Latch, 74LS374 Quad NAND Gate, 74LS01 Op Amp, TL072CP Not Used 8 Bit DAC, AD7524 8 Bit DAC, AD7524 8 Bit DAC, AD7524 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad Op Amp, RC4136 Quad AND Gate, 74LS09 Voltage Comparator, LM311 Op Amp, TL072CP Op Amp, LM339 Dual Flip-Flop, 74LS74 Dual One-Shot, 96L02 2-input NAND, 74LS10 8 Bit ADC, ADC0804LCN Octal Latch, 74LS374	54-41 54-74LS01 54-53  54-129 54-129 54-129 54-129 54-RC4136 54-RC4136 54-RC4136 54-96 54-30 54-53 54-45 54-44 54-96L02 54-42 54-161 54-41

	CAPACITORS			RESISTORS	
REF. DES.	DESCRIPTION	WILTRON PART NO.	REF. DES.	DESCRIPTION	WILTRON PART NO.
C1	Ceramic Disc, .1 μF	230-37	R1	MF, 1/4W, 1%, 10 kΩ	110-10k-1
C2	Ceramic Disc, .1 µF	230-37	R2	MF, $1/4W$ , $1\%$ , $8.25 k\Omega$	110-8.25k-1
C3 C4	Tantalum, 25V, 10 $\mu$ F Tantalum, 25V, 10 $\mu$ F	250-42 250-42	R3	Variable, Single-Turn, 10 kΩ	156-10k
C5	Tantalum, 6V, 68 µF	250-58	R4 R5	MF, $1/4$ W, $1\%$ , $3.01$ k $\Omega$ Variable, Multi-turn, $20$ k $\Omega$	110-3.01k-1 157-20k
C6	Ceramic Disc, .1 µF	230-37	R6	MF, $1/4W$ , 1%, 3.01 k $\Omega$	110-3.01k-1
C7	Ceramic Disc, .1 µF	230-37	R7	MF, $1/4W$ , 1%, 13.3 k $\Omega$	110-13.3k-1
C8	Ceramic Disc, .1 µF	230-37	R8	MF, $1/4W$ , 1%, 54.9 k $\Omega$	110-54.9k-1
C9 C10	Ceramic Disc, .1 μF	230-37	R9	Variable, Single-Turn, 20 kΩ	156-20k
C10	Mica, 27 pF Ceramic Disc, .1 μF	220-27 230-37	R10 R11	MF, 1/4W, 1%, 5.49 kΩ	110-5.49k-1
C12	Ceramic Disc, .1 µF	230-37	R12	Variable, Multi-turn, 20 k $\Omega$ MF, 1/4W, 1%, 8.25 k $\Omega$	157-20k 110-8.25k-1
C13	Ceramic Disc, .1 μF	230-37	R13	MF, $1/4W$ , $1\%$ , $64.9 \text{ k}\Omega$	110-64.9k-1
C14	Ceramic Disc, .1 µF	230-37	R14	MF, $1/4W$ , 1%, 316 k $\Omega$	110-316k-1
C15	Polycarbonate, .0047 μF	210-50	R15	MF, $1/4W$ , $1\%$ , $20 k\Omega$	110-20k-1
C16 C17	Polycarbonate, .0047 µF Ceramic Disc1 µF	210-50	R16 R17	MF, 1/4W, 1%, 64.9 kΩ	110-64.9k-1
C18	Ceramic Disc, .1 µF Ceramic Disc, .01 µF	230-37 230-11	R18	MF, $1/4$ W, $1\%$ , $5.49$ k $\Omega$ MF, $1/4$ W, $1\%$ , $5.49$ k $\Omega$	110-5.49k-1 110-5.49k-1
C19	Ceramic Disc, .0047 µF	230-36	R19	Variable, Multi-turn, 20 k $\Omega$	157-20k
C20	Ceramic Disc, .02 μF	230-27	R20	MF, $1/4W$ , 1%, $64.9 \text{ k}\Omega$	110-64.9k-1
C21	Ceramic Disc, .1 µF	230-37	R21	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
C22 C23	Ceramic Disc, .1 µF	230-37	R22	MF, 1/4W, 1%, 20 kΩ	110-20k-1
C 24	Aluminum, 63V, 47 μF Not Used	250-51	R23 R24	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
C25	Ceramic Disc, .01 µF	230-11	R25	MF, $1/4W$ , $1\%$ , $1.07 \text{ k}\Omega$	110-10k-1 110-1.07k-1
	, ,		R26	MF, $1/4W$ , 1%, 19.6 k $\Omega$	110-19.6k-1
	DIODES		R27	MF, $1/4W$ , $1\%$ , $12.1 k\Omega$	110-12.1k-1
			R28	MF, $1/4$ W, $1\%$ , $10.2 \text{ k}\Omega$	110-10.2k-1
REF.		WILTRON	R29 R31	MF, $1/4$ W, $1\%$ , $16.5 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $51.1\Omega$	110-16.5k-1
DES.	DESCRIPTION	PART NO.	R32	MF, $1/4W$ , $1\%$ , $51.1\%$	110-51.1-1 110-51.1-1
CR1	Silicon, 1N4446	10-1N4446	R34	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
CR2	Silicon, 1N4446	10-1N4446	R35	MF, $1/4W$ , $1\%$ , $100 \text{ k}\Omega$	110-100k-1
CR3	Silicon, 1N4446	10-1N4446	R36	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
CR4	Silicon, 1N4446	10-1N4446	R37 R38	MF, $1/4W$ , $1\%$ , $511\Omega$ MF, $1/4W$ , $1\%$ , $100 k\Omega$	110-511-1
CR5	Silicon, 1N4446	10-1N4446	R39	MF, $1/4W$ , $1\%$ , $100 \text{ k}\%$ MF, $1/4W$ , $1\%$ , $10 \text{ k}\%$	110-100k-1 110-10k-1
CR6 CR7	Silicon, 1N4446 Reference, 6.2V, 1N823	10-1N4446 10-1N823	R40	MF, $1/4$ W, $0.1\%$ , $900\Omega$	113-900-0.1
CR8	Zener, 5.1V, 0.4W, 1N751A	10-1N623 10-1N751A	R41	MF, $1/4W$ , $0.1\%$ , $900\Omega$	113-900-0.1
CR9	Silicon, 1N4446	10-1N4446	R42	MF, $1/4W$ , $1\%$ , $12.4 k\Omega$	110-12.4k-1
CR10	Silicon, 1N4446	10-1N4446	R43 R44	MF, 1/4W, 1%, 261Ω MF, 1/4W, 1%, 261Ω	110-261-1
CR11	Silicon, 1N4446	10-1N4446	R45	MF, 1/4W, 1%, 201 $\Omega$ MF, 1/4W, 1%, 12.4 k $\Omega$	110-261-1 110-12.4k-1
CR12 CR13	Silicon, 1N4446 Silicon, 1N4446	10-1N4446 10-1N4446	R46	MF, $1/4W$ , 1%, $604\Omega$	110-604-1
CR14	Silicon, 1N4446	10-1N4446 10-1N4446	R47	MF, $1/4W$ , 1%, $576\Omega$	110-576-1
CR15	MBD-501	10-4	R48	MF, $1/4$ W, $1\%$ , $12.4 \text{ k}\Omega$	110-12.4k-1
CR16	Silicon, 1N4446	10-1N4446	R49	MF, 1/4W, 1%, 1.82 kΩ	110-1.82k-1
CR17	Silicon, 1N4446	10-1N4446	R50 R51	MF, $1/4W$ , $1\%$ , $953\Omega$ MF, $1/4W$ , $1\%$ , $4.99 k\Omega$	110-953-1 110-4.99k-1
CR18 CR19	MBD-501 Silicon, 1N4446	10-4 10-1N4446	R52	MF, $1/4$ W, $1\%$ , $54.9$ k $\Omega$	110-54.9k-1
CR20	Silicon, 1N4446	10-1N4446	R53	MF, $1/4W$ , $1\%$ , $15 k\Omega$	110-15k-1
			R54	MF, $1/4W$ , $1\%$ , $12.4 k\Omega$	110-12.4k-1
	TRANSISTORS		R55	MF, 1/4W, 1%, 487Ω	110-487-1
	IKANSISTORS		R56 R57	MF, 1/4W, 1%, 464Ω MF, 1/4W, 1%, 12.4 kΩ	110-464-1 110-12 4k-1
REF.		WILTRON	R58	MF, 1/4W, 1%, 12.4 k $\Omega$	110-12.4k-1 110-2.43k-1
DES.	DESCRIPTION	PART NO.	R59	MF, $1/4W$ , $1\%$ , $2.05 k\Omega$	110-2.05k-1
01	NIDNI EW ONICCO	20 21/2222	R60	MF, $1/4W$ , $1\%$ , $12.4 k\Omega$	110-12.4k-1
Q1 Q2	NPN, .5W, 2N2222A PNP, .4W, 2N4249	20-2N2222A 20-2N4249	R61	MF, 1/4W, 1%, 12.4 kΩ	110-12.4k-1
Q2 Q3	PNP, .4W, 2N4249	20-2N4249 20-2N4249	R62 R63	MF, $1/4$ W, $0.1\%$ , $20 \text{ k}\Omega$ MF, $1/4$ W, $0.1\%$ , $20 \text{ k}\Omega$	113-20k-0.1
$\overline{Q}_{4}$	NPN, .4W, 2N3694	20-2N3694	R64	MF, $1/4W$ , $0.1\%$ , $20 \text{ k}\Omega$	113-20k-0.1 113-20k-0.1
Q5	NPN, .4W, 2N3694	20-2N3694	R65	MF, $1/4W$ , $0.1\%$ , $20 \text{ k}\Omega$	113-20k-0.1

Reform   March   Ma						
R66	R66	Variable, Multi-turn, $2 k\Omega$	157-2k	R129	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R68	R67	•				
Reform   MF, 1/4W, 1%, 1.47 kΩ   110-1.47k-1   R132   MF, 1/4W, 1%, 4.02 kΩ   110-4.02k-1   R70   Variable, Multi-turn, 2 kΩ   157-2k   R133   MF, 1/4W, 1%, 20 kΩ   110-4.02k-1   R72   Variable, Multi-turn, 2 kΩ   110-6.19k-1   R134   MF, 1/4W, 1%, 20 kΩ   110-4.02k-1   R73   MF, 1/4W, 1%, 619 kΩ   110-10k-1   R137   MF, 1/4W, 1%, 1 kΩ   110-10k-1   R138   MF, 1/4W, 1%, 1 kΩ   110-10k-1   R137   MF, 1/4W, 1%, 1 kΩ   110-10k-1   R138   MF, 1/4W, 1%, 1 kΩ   110-4.02k-1   R137   MF, 1/4W, 1%, 1 kΩ   110-4.02k-1   R138   MF, 1/4W, 1%, 1 kΩ   110-4.02k-1   R138   MF, 1/4W, 1%, 4.99 kΩ   110-4.02k-1   R138   MF, 1/4W, 1%,						
R70						
R71						
R73						
R74			l l			
R75						
R76			110-7.87k-1			110-1k-1
R76   CC, 1/4W, 5%, 10 MΩ   101-10M-5   R139   MF, 1/4W, 1%, 649Ω   110-649-1   R778   MF, 1/4W, 19%, 2.49 kΩ   110-2.49k-1   R78   MF, 1/4W, 19%, 2.49 kΩ   110-2.49k-1   R141   MF, 1/4W, 19%, 649Ω   110-887-1   R179   MF, 1/4W, 19%, 6.69 kΩ   110-2.49k-1   R141   MF, 1/4W, 19%, 6.49 kΩ   110-6.49k-1   R142   Variable, Single-Turn, 2 kΩ   156-2k   R143   MF, 1/4W, 19%, 6.49 kΩ   110-16k-1   R152   Variable, Single-Turn, 2 kΩ   156-2k   R144   MF, 1/4W, 19%, 1 kΩ   110-16k-1   R154   Variable, Single-Turn, 2 kΩ   156-2k   R145   MF, 1/4W, 19%, 1 kΩ   110-10k-1   R164   Variable, Single-Turn, 2 kΩ   156-2k   R165   MF, 1/4W, 19%, 1 kΩ   110-10k-1   R166   Variable, Single-Turn, 2 kΩ   156-2k   R167   MF, 1/4W, 19%, 1 kΩ   110-10k-1   R168   Variable, Single-Turn, 2 kΩ   156-2k   R169   WF, 1/4W, 19%, 1 kΩ   110-10k-1   R170   WILTRON   R171		MF, 1/4W, 1%, 10 kΩ	110-10k-1	R137	MF, 1/4W, 1%, 1 kΩ	110-1k-1
R77		MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1	R138	MF, $1/4$ W, $1\%$ , $4.99$ kΩ	110-4.99k-1
R776   MF, 1/4W, 15%, 133 kΩ   110-133k-1   R140   MF, 1/4W, 15%, 687   110-4,99k-1   R147   MF, 1/4W, 15%, 687   110-5,249k-1   R141   MF, 1/4W, 15%, 687   110-4,99k-1   R141   MF, 1/4W, 15%, 687   110-15k-1   R142   MF, 1/4W, 15%, 687   110-15k-1   R142   MF, 1/4W, 15%, 687   R141   MF, 1/4W, 15%, 687   R141   MF, 1/4W, 15%, 687   R141   MF, 1/4W, 15%, 687   R142   MF, 1/4W, 15%, 687   R141   MF, 1/4W, 15%, 687   R142   MF, 1/4W, 15%, 687   R141   MF, 1/4W, 15%, 687	R76	CC, $1/4W$ , 5%, 10 M $\Omega$	101-10M-5	R139	MF, $1/4W$ , $1\%$ , $649\Omega$	110-649-1
R78   MF, 1/4W, 19%, 2-49 kΩ   110-2-49k-1   R141   MF, 1/4W, 19%, 687Ω   110-8-60ch   R80   Variable, Single-Turn, 2 kΩ   156-2k   R143   MF, 1/4W, 19%, 649 kΩ   110-16k-1   R82   Variable, Single-Turn, 2 kΩ   156-2k   R143   MF, 1/4W, 19%, 649 kΩ   110-16k-1   R82   Variable, Single-Turn, 2 kΩ   156-2k   R144   MF, 1/4W, 19%, 15kΩ   110-15k-1   R84   MF, 1/4W, 19%, 15kΩ   110-16k-1   R84   Variable, Single-Turn, 2 kΩ   156-2k   R145   MF, 1/4W, 19%, 10kΩ   110-10k-1   R84   Variable, Single-Turn, 2 kΩ   156-2k   R147   MF, 1/4W, 19%, 10kΩ   110-10k-1   R85   MF, 1/4W, 19%, 10kΩ   110-10k-1   R86   Variable, Single-Turn, 2 kΩ   156-2k   R147   MF, 1/4W, 19%, 10kΩ   110-10k-1   R86   Variable, Single-Turn, 2 kΩ   156-2k   R147   MF, 1/4W, 19%, 10kΩ   110-10k-1   R88   MF, 1/4W, 19%, 10kΩ   R88   Variable, Single-Turn, 2 kΩ   156-2k   REF.   DESCRIPTION   PART NO.   PART	R77	MF, $1/4W$ , $1\%$ , $133 k\Omega$		R140		
R79	R78					
R80						
R81						
R82						
R84						
R84			l l			
R86						
R86			156-2k		MF, $1/4W$ , $1\%$ , $3.01 \text{ k}\Omega$	110-3.01k-1
R87		MF, $1/4$ W, $1\%$ , $8.25$ kΩ	110-8.25k-1	R148	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
R88	R86	Variable, Single-Turn, 2 k $\Omega$	156-2k	RP1	Package, 1 kΩ	123-1
R88	R87	MF, $1/4W$ , $1\%$ , $8.66 k\Omega$	110-8.66k-1			
R89	R88	Variable, Single-Turn, 2 kΩ			INTEGRATED CIRCUITS	
R90	R89	MF. $1/4W$ . $1\%$ . $11 k\Omega$				
R91				REF.		WIT TRON
R92         MF, $1/4W$ , $1\%$ , $10 kΩ$ $110-1M-1A$ U1         Quad NAND, 74LS00 $54-74LS00$ R93         MF, $1/4W$ , $1\%$ , $10 kΩ$ $110-1M-1A$ U2         Hex Inverter, 74LS04 $54-74LS04$ R94         MF, $1/4W$ , $1\%$ , $1 MΩ$ $110-1M-1A$ U2         Hex Inverter, 74LS04 $54-74LS00$ R95         MF, $1/4W$ , $1\%$ , $1 MΩ$ $110-1M-1A$ U3         Triple NAND, 74LS10 $54-42$ R96         MF, $1/4W$ , $1\%$ , $10 RΩ$ $110-10L-1A$ U4         Op Amp, LF356N $50-9$ R97         MF, $1/4W$ , $1\%$ , $10 RΩ$ $110-10L-1A$ U6         Op Amp, LF356N $50-9$ R98         MF, $1/4W$ , $1\%$ , $2.6.7 kΩ$ $110-2.6.7k-1$ U7         Op Amp, LF356N $50-9$ R99         MF, $1/4W$ , $1\%$ , $40.2.2 kΩ$ $110-20.1k-1$ U8         Op Amp, LF356N $50-9$ R100         MF, $1/4W$ , $1\%$ , $30.1 kΩ$ $110-30.1k-1$ U8         Op Amp, TL072 $54-53$ R101         MF, $1/4W$ , $1\%$ , $30.1 kΩ$ $110-30.1k-1$ U10         Op Amp, TL072 $54-53$ R102         MF, $1/4W$ , $1\%$ , $30.1 kΩ$ $110-30.1k-1$ </td <td></td> <td></td> <td></td> <td></td> <td>DESCRIPTION</td> <td></td>					DESCRIPTION	
R93         MF, $1/4W$ , $1\%$ , $10 kΩ$ 110-10k-1         U1         Quad NAND, 74LS00         54-74LS00           R94         MF, $1/4W$ , $1\%$ , $1 MΩ$ 110-1M-1A         U2         Hex Inverter, 74LS04         54-74LS00           R95         MF, $1/4W$ , $1\%$ , $1 MΩ$ 110-1M-1A         U3         Triple NAND, 74LS10         54-42           R96         MF, $1/4W$ , $1\%$ , $1 MΩ$ 110-1M-1A         U4         Op Amp, LF356N         50-9           R97         MF, $1/4W$ , $1\%$ , $10 kΩ$ 110-1M-1A         U6         Op Amp, LF356N         50-9           R98         MF, $1/4W$ , $1\%$ , $10 kΩ$ 110-26.7k-1         U7         Op Amp, LF356N         50-9           R100         MF, $1/4W$ , $1\%$ , $26.7 kΩ$ 110-26.7k-1         U7         Op Amp, LF356N         50-9           R100         MF, $1/4W$ , $1\%$ , $26.7 kΩ$ 110-26.7k-1         U7         Op Amp, LF356N         50-9           R100         MF, $1/4W$ , $1\%$ , $30.1 kΩ$ 110-30.1k-1         U10         Op Amp, TL072         54-53           R101         MF, $1/4W$ , $1\%$ , $30.1 kΩ$ 110-30.1k-1         U10         Op Amp, TL072         54-53           R102         MF, $1/4W$ , $1\%$ , $30.1 kΩ$ 110-30.1k-1         U10         Op Amp, TL072				DES.	DESCRIPTION	PART NO.
R94         MF, $1/4W$ , 1%, 1 MΩ         110-1M-1A         U2         Hex Inverter, 74IS04         54-74IS04           R95         MF, $1/4W$ , 1%, 1 MΩ         110-1M-1A         U3         Triple NAND, 74LS10         54-42           R96         MF, $1/4W$ , 1%, 1 MΩ         110-1M-1A         U4         Op Amp, LF356N         50-9           R97         MF, $1/4W$ , 1%, 10 kΩ         110-1M-1A         U6         Op Amp, LF356N         50-9           R98         MF, $1/4W$ , 1%, 26.7 kΩ         110-26.7k-1         U7         Op Amp, LF356N         50-9           R99         MF, $1/4W$ , 1%, 26.7 kΩ         110-26.7k-1         U7         Op Amp, LF356N         50-9           R100         MF, $1/4W$ , 1%, 30.1 kΩ         110-30.1k-1         U9         Op Amp, TL072         54-53           R101         MF, $1/4W$ , 1%, 30.1 kΩ         110-30.1k-1         U9         Op Amp, TL072         54-53           R103         Variable, Multi-turn, 5 kΩ         157-5k         U11         Quad Comparator, MC3302P         54-MC3302P           R104         MF, $1/4W$ , 1%, 30.1 kΩ         110-301k-1         U12         Transistor Array, CA3054         54-6           R105         MF, $1/4W$ , 1%, 9.76 kΩ         110-10k-1         U13         Transistor Array, CA3054         5				711	O 1 N A ND 741 COO	54 547 500
R95         MF, 1/4W, 1%, 1 MΩ $110-1M-1A$ U3         Triple NAND, 74LS10 $54-42$ R96         MF, 1/4W, 1%, 1 MΩ $110-1M-1A$ U4         Op Amp, LF356N         50-9           R97         MF, 1/4W, 1%, 10 kΩ $110-10k-1$ U5         Switch, DG201 $54-24$ R98         MF, 1/4W, 1%, 1%, 1 MΩ $110-10k-1$ U6         Op Amp, LF356N $50-9$ R100         MF, 1/4W, 1%, 26.7 kΩ $110-26.7k-1$ U7         Op Amp, LF356N $50-9$ R100         MF, 1/4W, 1%, 30.1 kΩ $110-30.1k-1$ U9         Op Amp, LT072 $54-53$ R101         MF, 1/4W, 1%, 30.1 kΩ $110-30.1k-1$ U9         Op Amp, TL072 $54-53$ R102         MF, 1/4W, 1%, 30.1 kΩ $110-30.1k-1$ U10         Op Amp, TL072 $54-53$ R102         MF, 1/4W, 1%, 30.1 kΩ $110-30.1k-1$ U1         U10         Op Amp, TL072 $54-53$ R102         MF, 1/4W, 1%, 30.1 kΩ $110-30.1k-1$ U1         U1         Op Amp, TL072 $54-53$ R102         MF, 1/4W, 1%, 10.0 kΩ $110-10k-1$ U1         Tarnsistor Ara		the state of the s			•	
R96         MF, 1/4W, 1%, 1 M Ω         110-1M-1A         U4         Op Amp, LF356N         50-9           R97         MF, 1/4W, 1%, 10 kΩ         110-1M-1A         U5         Switch, DG201         54-24           R98         MF, 1/4W, 1%, 10 kΩ         110-1M-1A         U6         Op Amp, LF356N         50-9           R99         MF, 1/4W, 1%, 26.2 kΩ         110-26.7k-1         U7         Op Amp, LF356N         50-9           R100         MF, 1/4W, 1%, 42.2 kΩ         110-30.1k-1         U7         Op Amp, LF356N         50-9           R101         MF, 1/4W, 1%, 30.1 kΩ         110-30.1k-1         U9         Op Amp, TL072         54-53           R101         MF, 1/4W, 1%, 30.1 kΩ         110-30.1k-1         U10         Op Amp, TL072         54-53           R103         Variable, Multi-turn, 5 kΩ         1157-5k         U11         Quad Comparator, MC3302P         54-MC3302P           R104         MF, 1/4W, 1%, 30.1 kΩ         110-30.1k-1         U12         Transistor Array, CA3054         54-6           R105         MF, 1/4W, 1%, 10 kΩ         110-10k-1         U13         Transistor Array, CA3054         54-6           R106         MF, 1/4W, 1%, 10 kΩ         110-10k-1         U15         Transistor Array, CA3054         54-6		the state of the s				
R97         MF, 1/4W, 1%, 10 kΩ $110-10k-1$ U5         Switch, DG201 $54-24$ R98         MF, 1/4W, 1%, 1 MΩ $110-10k-1$ U6         Op Amp, LF356N $50-9$ R99         MF, 1/4W, 1%, 26, 26 $R$ Ω $110-26-7k-1$ U7         Op Amp, LF356N $50-9$ R100         MF, 1/4W, 1%, 26, 26 $R$ Ω $110-42.2k-1$ U8         Op Amp, TL072 $54-53$ R101         MF, 1/4W, 1%, 30.1 kΩ $110-30.1k-1$ U10         Op Amp, TL072 $54-53$ R102         MF, 1/4W, 1%, 30.1 kΩ $110-30.1k-1$ U10         Op Amp, TL072 $54-53$ R103         Variable, Multi-turn, 5 kΩ $157-5k$ U11         Quad Comparator, MC3302P $54-65$ R104         MF, 1/4W, 1%, 30.1 kΩ $110-301k-1$ U12         Transistor Array, CA3054 $54-6$ R105         MF, 1/4W, 1%, 10 kΩ $110-10k-1$ U13         Transistor Array, CA3054 $54-6$ R106         MF, 1/4W, 1%, 10 kΩ $110-10k-1$ U13         Transistor Array, CA3054 $54-6$ R107         MF, 1/4W, 1%, 10 kΩ $110-10k-1$ U13         Transist						
R98						50-9
R99         MF, 1/4W, 1%, 26.7 kΩ         110-26.7k-1         U7         Op Amp, LF356N         50-9           R100         MF, 1/4W, 1%, 22.2 kΩ         110-42.2k-1         U8         Op Amp, TL072         54-53           R101         MF, 1/4W, 1%, 30.1 kΩ         110-30.1k-1         U9         Op Amp, TL072         54-53           R102         MF, 1/4W, 1%, 30.1 kΩ         110-30.1k-1         U10         Op Amp, TL072         54-53           R103         Variable, Multi-turn, 5 kΩ         157-5k         U11         Quad Comparator, MC3302P         54-53           R104         MF, 1/4W, 1%, 30.1 kΩ         110-301k-1         U12         Transistor Array, CA3054         54-6           R105         MF, 1/4W, 1%, 30 kΩ         110-10k-1         U13         Transistor Array, CA3054         54-6           R106         MF, 1/4W, 1%, 10 kΩ         110-10k-1         U15         Transistor Array, CA3054         54-6           R107         MF, 1/4W, 1%, 10 kΩ         110-10k-1         U15         Transistor Array, CA3054         54-6           R108         MF, 1/4W, 1%, 10 kΩ         110-10k-1         U15         Transistor Array, CA3054         54-6           R107         MF, 1/4W, 1%, 10 kΩ         110-10k-1         U15         Transistor Array, CA3054	R97	MF, 1/4W, 1%, 10 kΩ	110-10k-1	U5	Switch, DG201	54-24
R100 MF, 1/4W, 1%, 42.2 kΩ 110-42.2k-1 U8 Op Amp, TL072 54-53 R101 MF, 1/4W, 1%, 30.1 kΩ 110-30.1k-1 U9 Op Amp, TL072 54-53 R102 MF, 1/4W, 1%, 30.1 kΩ 110-30.1k-1 U10 Op Amp, TL072 54-53 R103 Variable, Multi-turn, 5 kΩ 157-5k U11 Quad Comparator, MC3302P 54-MC3302P R104 MF, 1/4W, 1%, 301 kΩ 110-301k-1 U12 Transistor Array, CA3054 54-6 R105 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U13 Transistor Array, CA3054 54-6 R106 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U14 Op Amp, LF356N 50-9 R107 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U15 Transistor Array, CA3054 54-6 R106 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U15 Transistor Array, CA3054 54-6 R106 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U17 Switch, DG201 54-24 R110 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U17 Switch, DG201 54-24 R111 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U18 Op Amp, TL072 54-53 R112 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U18 Op Amp, TL074 54-132 R112 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U20 Switch, DG201 54-24 R113 MF, 1/4W, 1%, 20 kΩ 110-20k-1 U20 Switch, DG201 54-24 R113 MF, 1/4W, 1%, 20 kΩ 110-20k-1 U21 Op Amp, LF356N 50-9 R114 MF, 1/4W, 1%, 20 kΩ 110-20k-1 U21 Op Amp, LF356N 50-9 R114 MF, 1/4W, 1%, 20 kΩ 110-20k-1 U21 Op Amp, LF356N 50-9 R114 MF, 1/4W, 1%, 20 kΩ 110-20k-1 U22 Op Amp, LF356N 50-9 R116 MF, 1/4W, 1%, 10 kΩ 110-16k-1 U20 Switch, DG201 54-24 R113 MF, 1/4W, 1%, 20 kΩ 110-20k-1 U21 Op Amp, LF356N 50-9 R116 MF, 1/4W, 1%, 20 kΩ 110-20k-1 U22 Op Amp, LF356N 50-9 R116 MF, 1/4W, 1%, 20 kΩ 110-20k-1 U22 Op Amp, LF356N 50-9 R116 MF, 1/4W, 1%, 20 kΩ 110-2k-1 R117 MF, 1/4W, 1%, 20 kΩ 110-2k-1 R119 MF, 1/4W, 1%, 20 kΩ 110-2k-1 R120 MF, 1/4W, 1%, 51 kΩ 110-511k-1 R19 MF, 1/4W, 1%, 51 kΩ 110-51k-1 REF. DES. DESCRIPTION PART NO. R123 Variable, Single-Turn, 2 kΩ 156-2k DES. DESCRIPTION PART NO. R123 Variable, Single-Turn, 2 kΩ 156-2k DES. DESCRIPTION PART NO. R123 Variable, Single-Turn, 2 kΩ 156-2k DES. DESCRIPTION PART NO. R123 Variable, Single-Turn, 2 kΩ 156-2k DES. DESCRIPTION PART NO. R123 Variable, Single-Turn, 2 kΩ 156-2k DES. DESCRIPTION PART NO. R123 Variable, Single-Turn, 2 kΩ 156-2k DES. DESCRIPTION PART NO.	R98	MF, $1/4W$ , $1\%$ , $1 M\Omega$	110-1M-1A	U6	Op Amp, LF356N	50-9
R101 MF, 1/4W, 1%, 30.1 k $\Omega$ 110-30.1k-1 U9 Op Amp, TL072 54-53 R102 MF, 1/4W, 1%, 30.1 k $\Omega$ 110-30.1k-1 U10 Op Amp, TL072 54-53 PATS A S4-53 PATS A S4-54 PATS	R99	MF, $1/4W$ , 1%, 26.7 k $\Omega$	110-26.7k-1	U7	Op Amp, LF356N	50-9
R101 MF, 1/4W, 1%, 30.1 kΩ 110-30.1k-1 U10 Op Amp, TL072 54-53   R102 MF, 1/4W, 1%, 30.1 kΩ 110-30.1k-1 U10 Op Amp, TL072 54-53   R103 Variable, Multi-turn, $5 k\Omega$ 110-30.1k-1 U10 Op Amp, TL072 54-MC3302P   R104 MF, 1/4W, 1%, 301 kΩ 110-301k-1 U12 Transistor Array, CA3054 54-6   R105 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U13 Transistor Array, CA3054 54-6   R106 MF, 1/4W, 1%, 9.76 kΩ 110-9.76k-1 U14 Op Amp, LF356N 50-9   R107 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U15 Transistor Array, CA3054 54-6   R108 MF, 1/4W, 1%, 511 kΩ 110-511k-1 U16 Op Amp, TL072 54-53   R109 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U17 Switch, DG201 54-24   R110 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U18 Op Amp, TL072 54-132   R111 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U19 Op Amp, TL074 54-132   R112 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U19 Op Amp, TL074 54-132   R112 MF, 1/4W, 1%, 20 kΩ 110-20k-1 U21 Op Amp, LF356N 50-9   R114 MF, 1/4W, 1%, 20 kΩ 110-20k-1 U21 Op Amp, LF356N 50-9   R114 MF, 1/4W, 1%, 20 kΩ 110-20k-1 U22 8 Bit DAC, AD 7524 54-129   R115 Variable, Single-Turn, 20 kΩ 156-20k U23 Quad Schmitt NAND, 74LS132 54-74LS132   R119 MF, 1/4W, 1%, 511 kΩ 110-51k-1 U25 Quad Transparent Latch, 54-74LS75   R118 MF, 1/4W, 1%, 51 kΩ 110-15k-1 U25 Quad Transparent Latch, 54-74LS75   R119 MF, 1/4W, 1%, 51 kΩ 110-15k-1 U25 Quad Transparent Latch, 54-74LS75   R122 MF, 1/4W, 1%, 51 kΩ 110-18k-1 U25 DES. DESCRIPTION PART NO.   R123 Variable, Single-Turn, 2 kΩ 156-2k DES. DESCRIPTION PART NO.   R124 Variable, Single-Turn, 2 kΩ 156-2k DES. DESCRIPTION PART NO.   R125 MF, 1/4W, 1%, 1 kΩ 110-1k-1 thru   R126 MF, 1/4W, 1%, 1 kΩ 110-1k-1 thru   R127 MF, 1/4W, 1%, 10 kΩ 110-1k-1 thru   R128 MF, 1/4W, 1%, 10 kΩ 110-1k-1 thru   R129 MF, 1/4W, 1%, 10 kΩ 110-1k-1 thru   R121 MF, 1/4W, 1%, 10 kΩ 110-1k-1 thru   R122 MF, 1/4W, 1%, 10 kΩ 110-1k-1 thru   R123 MF, 1/4W, 1%, 10 kΩ 110-1k-1 thru   R126 MF, 1/4W, 1%, 10 kΩ 110-1k-1 thru   R127 MF, 1/4W, 1%, 10 kΩ 110-1k-1 thru   R128 MF, 1/4W, 1%, 10 kΩ 110-1k-1 thru   R129 MF, 1/4W, 1%, 10 kΩ 110-1k-1 thru   R120 MF, 1/4W, 1%, 10 kΩ 110-1k-1 thru   R121 MF, 1/4	R100	MF, $1/4W$ , $1\%$ , $42.2 \text{ k}\Omega$	110-42.2k-1	U8	Op Amp, TL072	54-53
R102 MF, 1/4W, 1%, 30.1 kΩ 110-30.1k-1 U10 Op Amp, TL072 54-53 R103 Variable, Multi-turn, 5 kΩ 157-5k U11 Quad Comparator, MC3302P 54-MC3302P R104 MF, 1/4W, 1%, 301 kΩ 110-301k-1 U12 Transistor Array, CA3054 54-6 R105 MF, 1/4W, 1%, 301 kΩ 110-10k-1 U13 Transistor Array, CA3054 54-6 R106 MF, 1/4W, 1%, 301 kΩ 110-10k-1 U13 Transistor Array, CA3054 54-6 Op Amp, LF356N 50-9 R107 MF, 1/4W, 1%, 101 kΩ 110-10k-1 U15 Transistor Array, CA3054 54-6 R108 MF, 1/4W, 1%, 101 kΩ 110-10k-1 U16 Op Amp, LF356N 50-9 R107 MF, 1/4W, 1%, 101 kΩ 110-10k-1 U17 Switch, DG201 54-24 R110 MF, 1/4W, 1%, 101 kΩ 110-10k-1 U18 Op Amp, TL072 54-53 R109 MF, 1/4W, 1%, 101 kΩ 110-10k-1 U18 Op Amp, TL074 54-132 R111 MF, 1/4W, 1%, 101 kΩ 110-10k-1 U19 Op Amp, TL074 54-132 R112 MF, 1/4W, 1%, 101 kΩ 110-10k-1 U19 Op Amp, TL074 54-132 R112 MF, 1/4W, 1%, 201 kΩ 110-20k-1 U20 Switch, DG201 54-24 R113 MF, 1/4W, 1%, 201 kΩ 110-20k-1 U21 Op Amp, LF356N 50-9 R114 MF, 1/4W, 1%, 201 kΩ 110-20k-1 U22 Sit DAC, AD 7524 54-129 R115 Variable, Single-Turn, 201 kΩ 156-20k U23 Quad Schmitt NAND, 74LS132 54-74LS132 R116 MF, 1/4W, 1%, 16.5 kΩ 110-7.5k-1 U24 Octal Latch, 74LS374 54-41 R117 MF, 1/4W, 1%, 511 kΩ 110-5k-1 R25 Quad Transparent Latch, 74LS75 R118 MF, 1/4W, 1%, 511 kΩ 110-5k-1 R25 Quad Transparent Latch, 74LS75 R118 MF, 1/4W, 1%, 511 kΩ 110-5k-1 R25 Quad Transparent Latch, 74LS75 R118 MF, 1/4W, 1%, 511 kΩ 110-5k-1 R25 Quad Transparent Latch, 74LS75 R118 MF, 1/4W, 1%, 511 kΩ 110-5k-1 R25 Quad Transparent Latch, 74LS75 R118 MF, 1/4W, 1%, 511 kΩ 110-5k-1 R25 Quad Transparent Latch, 74LS75 PART NO. R124 Variable, Single-Turn, 2 kΩ 156-2k DES. DESCRIPTION PART NO. R124 Variable, Single-Turn, 2 kΩ 156-2k DES. DESCRIPTION PART NO. R124 Variable, Single-Turn, 2 kΩ 156-2k R125 MF, 1/4W, 1%, 1 kΩ 110-1k-1 Thu	R101			U9		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	R102				·	
R104 MF, 1/4W, 1%, 301 kΩ 110-301k-1 R105 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U13 Transistor Array, CA3054 54-6 R105 MF, 1/4W, 1%, 9.76 kΩ 110-10k-1 U14 Op Amp, LF356N 50-9 R107 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U15 Transistor Array, CA3054 54-6 R108 MF, 1/4W, 1%, 511 kΩ 110-10k-1 U15 Transistor Array, CA3054 54-6 R108 MF, 1/4W, 1%, 511 kΩ 110-10k-1 U16 Op Amp, TL072 54-53 R109 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U17 Switch, DG201 54-24 R111 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U18 Op Amp, TL074 54-132 R112 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U19 Op Amp, TL074 54-132 R112 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U20 Switch, DG201 54-24 R113 MF, 1/4W, 1%, 20 kΩ 110-20k-1 U21 Op Amp, LF356N 50-9 R114 MF, 1/4W, 1%, 20 kΩ 110-20k-1 U21 Op Amp, LF356N 50-9 R114 MF, 1/4W, 1%, 20 kΩ 110-20k-1 U22 8 Bit DAC, AD 7524 54-129 R115 Variable, Single-Turn, 20 kΩ 156-20k U23 Quad Schmitt NAND, 74LS132 S4-74LS132 R116 MF, 1/4W, 1%, 511 kΩ 110-7.5k-1 R118 MF, 1/4W, 1%, 511 kΩ 110-7.5k-1 R120 MF, 1/4W, 1%, 511 kΩ 110-2k-1 R120 MF, 1/4W, 1%, 511 kΩ 110-2k-1 R120 MF, 1/4W, 1%, 511 kΩ 110-2k-1 R120 MF, 1/4W, 1%, 511 Ω 110-5k-1 R121 MF, 1/4W, 1%, 511 Ω 110-5k-1 R222 MF, 1/4W, 1%, 511 Ω 110-5k-1 R222 MF, 1/4W, 1%, 511 Ω 110-5k-1 REF. DES. DESCRIPTION PART NO. R123 Variable, Single-Turn, 2 kΩ 156-2k DES. DESCRIPTION PART NO. R124 Variable, Single-Turn, 2 kΩ 110-1k-1 thru R127 MF, 1/4W, 1%, 1 kΩ 110-10k-1 TP7 Pin, Test Point 706-44			1			•
R105 MF, 1/4W, 1%, 10 kΩ 110-10k-1 R106 MF, 1/4W, 1%, 9.76 kΩ 110-9.76k-1 U14 Op Amp, LF356N 50-9 R107 MF, 1/4W, 1%, 511 kΩ 110-10k-1 U15 Transistor Array, CA3054 54-6 Op Amp, TL072 54-53 R109 MF, 1/4W, 1%, 511 kΩ 110-10k-1 U16 Op Amp, TL072 54-53 R109 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U17 Switch, DG201 54-24 R110 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U18 Op Amp, TL074 54-132 R111 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U19 Op Amp, TL074 54-132 R112 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U19 Op Amp, TL074 54-132 R112 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U19 Op Amp, TL074 54-132 R113 MF, 1/4W, 1%, 20 kΩ 110-20k-1 U20 Switch, DG201 54-24 R113 MF, 1/4W, 1%, 20 kΩ 110-20k-1 U20 Switch, DG201 54-24 R113 MF, 1/4W, 1%, 20 kΩ 110-20k-1 U21 Op Amp, LF356N 50-9 R114 MF, 1/4W, 1%, 10.5 kΩ 110-16.5k-1 U22 8 Bit DAC, AD 7524 54-129 R115 Variable, Single-Turn, 20 kΩ 156-20k U23 Quad Schmitt NAND, 74LS132 54-74LS132 R116 MF, 1/4W, 1%, 7.5 kΩ 110-16.5k-1 U24 Octal Latch, 74LS374 54-41 R117 MF, 1/4W, 1%, 5.11 kΩ 110-2k-1 R120 MF, 1/4W, 1%, 511 kΩ 110-511k-1 R25 R122 MF, 1/4W, 1%, 511 kΩ 110-511k-1 R212 MF, 1/4W, 1%, 515 kΩ 110-15k-1 R123 Variable, Single-Turn, 2 kΩ 156-2k R125 MF, 1/4W, 1%, 1 kΩ 110-1k-1 thru R127 MF, 1/4W, 1%, 1 kΩ 110-10k-1 TP7 Pin, Test Point 706-44						
R106 MF, 1/4W, 1%, 9.76 kΩ 110-9.76k-1 R107 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U15 Transistor Array, CA3054 54-6 R108 MF, 1/4W, 1%, 511 kΩ 110-10k-1 U16 Op Amp, TL072 54-53 R109 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U17 Switch, DG201 54-24 R110 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U18 Op Amp, TL074 54-132 R111 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U19 Op Amp, TL074 54-132 R112 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U20 Switch, DG201 54-24 R110 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U20 Switch, DG201 54-24 R113 MF, 1/4W, 1%, 20 kΩ 110-20k-1 U21 Op Amp, TL074 54-132 R114 MF, 1/4W, 1%, 20 kΩ 110-20k-1 U21 Op Amp, LF356N 50-9 R114 MF, 1/4W, 1%, 20 kΩ 110-20k-1 U22 8 Bit DAC, AD 7524 54-129 R115 Variable, Single-Turn, 20 kΩ 156-20k U23 Quad Schmitt NAND, 74LS132 54-74LS132 R116 MF, 1/4W, 1%, 16.5 kΩ 110-15.11k-1 R17 MF, 1/4W, 1%, 5.11 kΩ 110-7.5k-1 U25 Quad Transparent Latch, 54-74LS75 R119 MF, 1/4W, 1%, 5.11 kΩ 110-2k-1 R120 MF, 1/4W, 1%, 5.11 kΩ 110-2k-1 R120 MF, 1/4W, 1%, 5.11 kΩ 110-15k-1 R21 MF, 1/4W, 1%, 15 kΩ 110-15k-1 R21 MF, 1/4W, 1%, 15 kΩ 110-1k-1 T21 R21 MF, 1/4W, 1%, 1 kΩ 110-1k-1 T21 R21 MF, 1/4W, 1%, 1 kΩ 110-1k-1 T21 R21 MF, 1/4W, 1%, 1 kΩ 110-1k-1 T21 MF, 1/4W, 1%, 1 kΩ 110-1b-1 T21 MF, 1/4W, 1%, 100 kΩ 110-1b-1 T21 MF, 1/4W, 1%, 10						
R107 MF, $1/4$ W, $1\%$ , $10$ kΩ $110-10k-1$ R108 MF, $1/4$ W, $1\%$ , $10$ kΩ $110-511k-1$ U16 Op Amp, TL072 54-53 R109 MF, $1/4$ W, $1\%$ , $10$ kΩ $110-10k-1$ U17 Switch, DG201 54-24 R110 MF, $1/4$ W, $1\%$ , $10$ kΩ $110-10k-1$ U18 Op Amp, TL074 54-132 R112 MF, $1/4$ W, $1\%$ , $10$ kΩ $110-10k-1$ U19 Op Amp, TL074 54-132 R112 MF, $1/4$ W, $1\%$ , $10$ kΩ $110-10k-1$ U20 Switch, DG201 54-24 R113 MF, $1/4$ W, $1\%$ , $10$ kΩ $110-10k-1$ U20 Switch, DG201 54-24 R113 MF, $1/4$ W, $1\%$ , $10$ kΩ $110-20k-1$ U20 Switch, DG201 54-24 R113 MF, $1/4$ W, $1\%$ , $20$ kΩ $110-20k-1$ U21 Op Amp, LF356N 50-9 R114 MF, $1/4$ W, $1\%$ , $20$ kΩ $110-20k-1$ U22 8 Bit DAC, AD 7524 54-129 R115 Variable, Single-Turn, $20$ kΩ $156-20k$ U23 Quad Schmitt NAND, 74LS132 54-74LS132 R116 MF, $1/4$ W, $1\%$ , $16.5$ kΩ $110-16.5k-1$ U24 Octal Latch, $74$ LS374 54-41 R17 MF, $1/4$ W, $1\%$ , $1/6$ , $1/6$ kΩ $110-2k-1$ R120 MF, $1/4$ W, $1\%$ , $1/6$ kΩ $110-2k-1$ R120 MF, $1/4$ W, $1\%$ , $1/6$ kΩ $110-2k-1$ R120 MF, $1/4$ W, $1\%$ , $1/6$ kΩ $110-2k-1$ R121 MF, $1/4$ W, $1\%$ , $1/6$ kΩ $110-2k-1$ R122 MF, $1/4$ W, $1\%$ , $1/6$ kΩ $110-2k-1$ R123 Variable, Single-Turn, $2$ kΩ $156-2k$ DES. DESCRIPTION PART NO. R123 Variable, Single-Turn, $2$ kΩ $156-2k$ DES. DESCRIPTION PART NO. R123 Wariable, Single-Turn, $2$ kΩ $156-2k$ TP1 TP1 R126 MF, $1/4$ W, $1\%$ , $1/6$ kΩ $110-1k-1$ TP1 TP1 Pin, Test Point $706-44$						
R108 MF, 1/4W, 1%, 511 kΩ 110-511k-1 U16 Op Amp, TL072 54-53 R109 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U17 Switch, DG201 54-24 U17 Switch, DG201 54-24 U17 Switch, DG201 54-24 U18 Op Amp, TL074 54-132 U19 Op Amp, TL074 S4-132 U19 Op Amp, LF356N S0-9 U10-20k-1 U21 Op Amp, LF356N S0-9 U10-20k-1 U21 Op Amp, LF356N S0-9 U10-20k-1 U22 8 Bit DAC, AD 7524 S4-129 U19 Op Amp, LF356N S0-9 U10-20k-1 U22 8 Bit DAC, AD 7524 S4-129 U19 Op Amp, LF356N S0-9 U10-20k-1 U21 Op Amp, LF356N S0-9 U10-20k-1 U22 U10 Op Amp, LF356N S0-9 U10-20k-1 U22 U10 Op Amp, LF356N S0-9 U10-20k-1 U						
R109 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U17 Switch, DG201 54-24 R110 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U18 Op Amp, TL074 54-132 R111 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U19 Op Amp, TL074 54-132 R112 MF, 1/4W, 1%, 10 kΩ 110-10k-1 U20 Switch, DG201 54-24 U21 Op Amp, LF356N 50-9 R114 MF, 1/4W, 1%, 20 kΩ 110-20k-1 U21 Op Amp, LF356N 50-9 R114 MF, 1/4W, 1%, 20 kΩ 110-20k-1 U22 8 Bit DAC, AD 7524 54-129 U22 8 Bit DAC, AD 7524 54-129 U23 Quad Schmitt NAND, 74LS132 54-74LS132 R116 MF, 1/4W, 1%, 16.5 kΩ 110-16.5k-1 U24 Octal Latch, 74LS374 54-41 U25 Quad Transparent Latch, 54-74LS75 U24 Octal Latch, 74LS374 54-41 U25 Quad Transparent Latch, 54-74LS75 U25 Quad Transparent Latch, 54-74LS75 U25 MF, 1/4W, 1%, 5.11 kΩ 110-51.1k-1 R19 MF, 1/4W, 1%, 2 kΩ 110-2k-1 R122 MF, 1/4W, 1%, 5 thΩ 110-15k-1 R22 MF, 1/4W, 1%, 5 thΩ 110-51.1-1 REF. MISCELLANEOUS U25 MF, 1/4W, 1%, 1 kΩ 110-1k-1 TP1 R126 MF, 1/4W, 1%, 1 kΩ 110-1k-1 TP1 R126 MF, 1/4W, 1%, 1 kΩ 110-1k-1 TP1 R126 MF, 1/4W, 1%, 1 kΩ 110-1k-1 TP1 R127 MF, 1/4W, 1%, 100 kΩ 110-1k-1 TP7 Pin, Test Point 706-44						5 <del>4</del> –6
R110 MF, $1/4W$ , $1\%$ , $10 k\Omega$						54-53
R111 MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$			110-10k-1	U 17	Switch, DG201	54-24
R112 MF, $1/4$ W, $1\%$ , $10 k\Omega$ 110-10k-1 U20 Switch, DG201 54-24 R113 MF, $1/4$ W, $1\%$ , $20 k\Omega$ 110-20k-1 U21 Op Amp, LF356N 50-9 R114 MF, $1/4$ W, $1\%$ , $20 k\Omega$ 110-20k-1 U22 8 Bit DAC, AD 7524 54-129 R115 Variable, Single-Turn, $20 k\Omega$ 156-20k U23 Quad Schmitt NAND, 74LS132 54-74LS132 R116 MF, $1/4$ W, $1\%$ , $16.5 k\Omega$ 110-16.5k-1 U24 Octal Latch, 74LS374 54-41 R117 MF, $1/4$ W, $1\%$ , $7.5 k\Omega$ 110-7.5k-1 U25 Quad Transparent Latch, 54-74LS75 R118 MF, $1/4$ W, $1\%$ , $5.11 k\Omega$ 110-51.1k-1 R120 MF, $1/4$ W, $1\%$ , $1/4$ B		MF, $1/4$ W, $1\%$ , $10$ k $Ω$	110-10k-1	U18	Op Amp, TL074	54-132
R112 MF, 1/4W, 1%, 10 kΩ 110-10k-1 R113 MF, 1/4W, 1%, 20 kΩ 110-20k-1 R114 MF, 1/4W, 1%, 20 kΩ 110-20k-1 R115 Variable, Single-Turn, 20 kΩ 156-20k R116 MF, 1/4W, 1%, 16.5 kΩ 110-16.5k-1 R117 MF, 1/4W, 1%, 7.5 kΩ 110-7.5k-1 R118 MF, 1/4W, 1%, 5.11 kΩ 110-5.11k-1 R119 MF, 1/4W, 1%, 2 kΩ 110-2k-1 R120 MF, 1/4W, 1%, 15 kΩ 110-15k-1 R121 MF, 1/4W, 1%, 5 sinΩ 110-5k-1 R122 MF, 1/4W, 1%, 5 sinΩ 110-5k-1 R123 Variable, Single-Turn, 2 kΩ 156-2k R124 Variable, Single-Turn, 2 kΩ 156-2k R125 MF, 1/4W, 1%, 1 kΩ 110-1k-1 R126 MF, 1/4W, 1%, 1 kΩ 110-1k-1 R127 MF, 1/4W, 1%, 1 kΩ 110-10k-1 R127 MF, 1/4W, 1%, 100 kΩ 110-100k-1 R127 MF, 1/4W, 1%, 100 kΩ 110-100k-1 R128 MF, 1/4W, 1%, 100 kΩ 110-100k-1 R129 MF, 1/4W, 1%, 100 kΩ 110-100k-1 R120 MF, 1/4W, 1%, 100 kΩ 110-100k-1 R121 MF, 1/4W, 1%, 100 kΩ 110-100k-1 R122 MF, 1/4W, 1%, 100 kΩ 110-100k-1 R123 MF, 1/4W, 1%, 100 kΩ 110-100k-1 R124 MF, 1/4W, 1%, 100 kΩ 110-100k-1 R126 MF, 1/4W, 1%, 100 kΩ 110-100k-1 R127 MF, 1/4W, 1%, 100 kΩ 110-100k-1 R128 MF, 1/4W, 1%, 100 kΩ 110-100k-1 R129 MF, 1/4W, 1%, 100 kΩ 110-100k-1 R120 MF, 1/4W, 1%, 100 kΩ 110-100k-1 R121 MF, 1/4W, 1%, 100 kΩ 110-100k-1 R122 MF, 1/4W, 1%, 100 kΩ 110-100k-1 R123 MF, 1/4W, 1%, 100 kΩ 110-100k-1 R126 MF, 1/4W, 1%, 100 kΩ 110-100k-1 R127 MF, 1/4W, 1%, 100 kΩ 110-100k-1 R129 Switch, DG201 Subjection Science Spinal Science Spin	R111	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1	U 19	Op Amp, TL074	54-132
R113 MF, $1/4$ W, $1\%$ , $20 \text{ k}\Omega$	R112	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1	U20	Switch, DG201	
R114 MF, 1/4W, 1%, 20 kΩ 110-20k-1 R115 Variable, Single-Turn, 20 kΩ 156-20k R116 MF, 1/4W, 1%, 16.5 kΩ 110-16.5k-1 R117 MF, 1/4W, 1%, 7.5 kΩ 110-7.5k-1 R118 MF, 1/4W, 1%, 5.11 kΩ 110-2k-1 R119 MF, 1/4W, 1%, 5 kΩ 110-2k-1 R120 MF, 1/4W, 1%, 5 kΩ 110-15k-1 R121 MF, 1/4W, 1%, 5 kΩ 110-2k-1 R122 MF, 1/4W, 1%, 5 hΩ 110-511-1 R123 Variable, Single-Turn, 2 kΩ 156-2k R124 Variable, Single-Turn, 2 kΩ 156-2k R125 MF, 1/4W, 1%, 1 kΩ 110-1k-1 R126 MF, 1/4W, 1%, 1 kΩ 110-1k-1 R127 MF, 1/4W, 1%, 1 kΩ 110-1k-1 R127 MF, 1/4W, 1%, 100 kΩ 110-100k-1 R127 MF, 1/4W, 1%, 100 kΩ 110-100k-1 R128 Part NO. R129 S Bit DAC, AD 7524 54-74LS132 S4-74LS132 R120 Quad Schmitt NAND, 74LS132 54-74LS132 R124 Octal Latch, 74LS374 54-41 R125 Quad Transparent Latch, 74LS75 R14S75 R14S75 R154-74LS75 R156-2k	R113	MF, $1/4W$ , $1\%$ , $20 k\Omega$		U21		
R115 Variable, Single-Turn, $20 \text{ k}\Omega$ 156-20k	R114		110-20k-1			
R116 MF, $1/4$ W, $1\%$ , $16.5 \text{ k}\Omega$ 110-16.5k-1 R117 MF, $1/4$ W, $1\%$ , $7.5 \text{ k}\Omega$ 110-7.5k-1 R118 MF, $1/4$ W, $1\%$ , $5.11 \text{ k}\Omega$ 110-5.11k-1 R120 MF, $1/4$ W, $1\%$ , $2 \text{ k}\Omega$ 110-2k-1 R121 MF, $1/4$ W, $1\%$ , $2 \text{ k}\Omega$ 110-2k-1 R122 MF, $1/4$ W, $1\%$ , $511\Omega$ 110-511-1 R123 Variable, Single-Turn, $2 \text{ k}\Omega$ 156-2k R125 MF, $1/4$ W, $1\%$ , $1 \text{ k}\Omega$ 156-2k R125 MF, $1/4$ W, $1\%$ , $1 \text{ k}\Omega$ 110-1k-1 R126 MF, $1/4$ W, $1\%$ , $1 \text{ k}\Omega$ 110-1k-1 R127 MF, $1/4$ W, $1\%$ , $1 \text{ k}\Omega$ 110-1k-1 R127 MF, $1/4$ W, $1\%$ , $1 \text{ k}\Omega$ 110-1k-1 TP1 R126 MF, $1/4$ W, $1\%$ , $1 \text{ k}\Omega$ 110-10k-1 TP7 Pin, Test Point 706-44					•	
R117 MF, $1/4$ W, $1\%$ , $7.5 k\Omega$						
R118 MF, $1/4$ W, $1\%$ , $5.11$ k $\Omega$						
R119 MF, $1/4$ W, $1\%$ , $2 k\Omega$				023		54-74LS75
R120       MF, $1/4$ W, $1\%$ , $15 \text{ k}\Omega$ $110-15\text{k}-1$ MISCELLANEOUS         R121       MF, $1/4$ W, $1\%$ , $2 \text{ k}\Omega$ $110-2\text{k}-1$ R122         R122       MF, $1/4$ W, $1\%$ , $511\Omega$ $110-511-1$ REF.       WILTRON         R123       Variable, Single-Turn, $2 \text{ k}\Omega$ $156-2\text{k}$ DES.       DESCRIPTION       PART NO.         R124       Variable, Single-Turn, $2 \text{ k}\Omega$ $156-2\text{k}$ TP1       <					74LS75	
R121 MF, $1/4$ W, $1\%$ , $2 k\Omega$						
R122 MF, $1/4$ W, $1\%$ , $511\Omega$ 110-511-1 REF. R123 Variable, Single-Turn, $2 k\Omega$ 156-2k DES. DESCRIPTION PART NO. R124 Variable, Single-Turn, $2 k\Omega$ 156-2k R125 MF, $1/4$ W, $1\%$ , $1 k\Omega$ 110-1k-1 TP1 R126 MF, $1/4$ W, $1\%$ , $1 k\Omega$ 110-1k-1 thru R127 MF, $1/4$ W, $1\%$ , $100 k\Omega$ 110-100k-1 TP7 Pin, Test Point 706-44			110-15k-1		MISCELLANEOUS	
R123 Variable, Single-Turn, $2 \text{ k}\Omega$ 156-2k DES. DESCRIPTION PART NO. R124 Variable, Single-Turn, $2 \text{ k}\Omega$ 156-2k R125 MF, $1/4\text{W}$ , $1\%$ , $1 \text{ k}\Omega$ 110-1k-1 TP1 R126 MF, $1/4\text{W}$ , $1\%$ , $1 \text{ k}\Omega$ 110-1k-1 thru R127 MF, $1/4\text{W}$ , $1\%$ , $100 \text{ k}\Omega$ 110-100k-1 TP7 Pin, Test Point 706-44			110-2k-1			
R123 Variable, Single-Turn, $2 \text{ k}\Omega$ 156-2k DESCRIPTION PART NO. R124 Variable, Single-Turn, $2 \text{ k}\Omega$ 156-2k R125 MF, 1/4W, 1%, $1 \text{ k}\Omega$ 110-1k-1 TP1 R126 MF, 1/4W, 1%, $1 \text{ k}\Omega$ 110-1k-1 thru R127 MF, 1/4W, 1%, $100 \text{ k}\Omega$ 110-100k-1 TP7 Pin, Test Point 706-44		MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1	REF.		WILTRON
R124 Variable, Single-Turn, $2 k\Omega$ 156-2k R125 MF, 1/4W, 1%, $1 k\Omega$ 110-1k-1 TP1 R126 MF, 1/4W, 1%, $1 k\Omega$ 110-1k-1 thru R127 MF, 1/4W, 1%, $100 k\Omega$ 110-100k-1 TP7 Pin, Test Point 706-44	R123	Variable, Single-Turn, $2 k\Omega$		DES.	DESCRIPTION	
R125 MF, $1/4$ W, $1\%$ , $1 k\Omega$ 110-1k-1 TP1 R126 MF, $1/4$ W, $1\%$ , $1 k\Omega$ 110-1k-1 thru R127 MF, $1/4$ W, $1\%$ , $100 k\Omega$ 110-100k-1 TP7 Pin, Test Point 706-44	R124					
R126 MF, $1/4$ W, $1\%$ , $1 k\Omega$ 110-1k-1 thru R127 MF, $1/4$ W, $1\%$ , $100 k\Omega$ 110-100k-1 TP7 Pin, Test Point 706-44				TP1		
R127 MF, $1/4$ W, 1%, $100 \text{ k}\Omega$ 110-100k-1 TP7 Pin, Test Point 706-44						
D120 APP 1// 101 0					Pin Test Point	706-44
Ejector, PC Board 553-96						
	1(150	1711 9 1/ TT 9 1/09 10 K36	110-10K-1		Ejector, PC board	553-90

	CAPACITORS	-		d. 6621A-40	SPCL-A-13074
				e. 6629A	SPCL-A-13074 SPCL-A-11587
REF		WILTRON		f. 6629A-40	SPCL-A-13081
DES.	DESCRIPTION	PART NO.	1	g. 6637A	660-A-8145-3
C1			Ī	h. 6637A-40	660-A-8145-3
C1 C2	Mica, 100 pF Mica, 100 pF	220-100	ı	i. 6638A	660-A-8145-4
C3		220-100		j. 6642A	SPCL-A-11623
C4	Disc Ceramic, 0.001 μF Monolithic, 0.1 μF	230-30		k. 6647A	660-A-8145-3
C5	Tantalum, 4.7 μF, 35V	230-37 250-39	1	1. 6648A	660-A-8145-4
C6	Monolithic, 0.1 µF	230-37		m. 6653A	660-A-8145-5
C7	Tant alum, 4.7 µF, 35V	250-37	A2	n. 6659A	660-A-8145-5
C8	Monolithic, 0.1 µF	230-37	AZ	Resistor Pack	//0
C9	Monolithic, 0.1 µF	230-37		a. 6609A b. 6617A	660-A-12632-1
C10	Monolithic, 0.1 µF	230-37	1	c. 6621A	660-A-12732-2
C11	Monolithic, 0.1 μF	230-37		d. 6621A-40	SPCL-B-13091-5
C12	Tantalum, 4.7 $\mu$ F, 35V	250-39	i	e. 6629A	SPCL-B-13091-5 SPCL-B-13091-9
C13	Tantalum, 4.7 $\mu$ F, 35V	250-39		f. 6629A-40	SPCL-B-13091-9 SPCL-B-13091-9
C14	Monolithic, 0.1 µF	230-37		g. 6637A	660-A-12632-3
C15	Monolithic, 0.1 μF	230-37	l	h. 6637A-40	660-A-12632-3
C16	Tantalum, $4.7 \mu F$ , $35V$	250-39	1	i. 6638A	660-A-12632-5
C17	Tantalum, 4.7 μF, 35V	250-39		j. 6642A	SPCL-B-13091-13
C18 C19	Monolithic, 0.1 µF	230-37		k. 6647A	660-A-12632-4
C20	Monolithic, 0.1 μF Tantalum, 4.7 μF, 35V	230-37		1. 6648A	660-A-12632-6
C21	Tantalum, 4.7 μF, 35V	250-39		m. 6653A	660-A-12632-9
C22	Monolithic, 0.1 μF	250-39 230-37		n. 6659A	660-A-12632-10
C 23	Monolithic, 0.1 µF	230-37	RP1	Resistor Pack, 10 kΩ	123-6
C24	Monolithic, 0.1 µF	230-37	R1 R2	MF, 1/4W, 1%, 10 kΩ	110-10k-1
C25	Disc Ceramic, 0.001 µF	230-30	R3	MF, $1/4$ W, $1\%$ , $2.37 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $2.37 \text{ k}\Omega$	110-2.37k-1
C26	Mica, 100 pF	220-100	R4	MF, $1/4W$ , $1\%$ , 2.37 k $\Omega$ MF, $1/4W$ , $1\%$ , 3.92 k $\Omega$	110-2.37k-1
C27	Disc Ceramic, 0.001 µF	230-30	R5	MF, $1/4W$ , $1\%$ , $3.92 \text{ kW}$ MF, $1/4W$ , $1\%$ , $392 \Omega$	110-3.92k-1
			R6	Part of A2	110-392-1
	DIODES		R7	Part of A2	
	<del></del>	•	R8	Variable, Multi-turn, 50 k $\Omega$	157-50k
REF		WILTRON	R9	MF, $1/4W$ , $1\%$ , $348 \text{ k}\Omega$	110-348k-1
DES.	DESCRIPTION	PART NO.	R10	Variable, Multi-turn, 20 kΩ	157-20k
			R11	MF, $1/4W$ , $0.1\%$ , $30 k\Omega$	113-30k-0.1
CR1	Schottky, MBD-501	10-4	R12	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
CR2	Schottky, MBD-501	10-4	R13	Variable, Single-Turn, $500\Omega$	156-500
CR3	Silicon, 1N4446	10-1N4446	R14	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
CR4 CR5	Silicon, 1N4446	10-1N4446	R15	MF, $1/4$ W, $0.1$ %, $30$ kΩ	113-30k-0.1
CR6	Zener, 12V, 0.4W, 1N759A Reference, 6.2V, 1N823	10-1N759A	R16	MF, 1/4W, 1%, 10 kΩ	110-10k-1
CR7	Silicon, 1N4446	10-1N823	R17 R18	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
CR8	Silicon, 1N4446	10-1N4446	R19	Part of A2 Part of A2	
CR9	Zener, 11V, 1N962B	10-1N4446 10-1N962B	R20	Part of A2	
CR10	Zener, 11V, 1N962B	10-1N962B	R21	Part of A2	
		10-114,020	R22	Part of A2	
	TRANSISTORS		R23	MF, $1/4W$ , $0.1\%$ , $30 \text{ k}\Omega$	113-30k-0.1
	111110101010		R24	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
REF		WILTRON	R25	MF, $1/4$ W, $1\%$ , $1$ k $\Omega$	110-1k-1
DES.	DESCRIPTION	PART NO.	R26	MF, $1/4W$ , $0.1\%$ , $10 \text{ k}\Omega$	113-10k-0.1
			R27	MF, $1/4W$ , $0.1\%$ , $10 k\Omega$	113-10k-0.1
Q1	PNP, 2N6041	20-2N6041	R28	MF, $1/4W$ , $0.1\%$ , $10 \text{ k}\Omega$	113-10k-0.1
Q2	PNP, 2N2907A	20-2N2907A	R29	Variable, Multi-turn, 500Ω	157-500
Q3	NPN, 2N2222A	20-2N2222A	R30	MF, 1/4W, 0.1%, 30 kΩ	113-30k-0.1
			R31	MF, 1/4W, 0.1%, 10 kΩ	113-10k-0.1
	RESISTORS		R32 R33	MF, $1/4$ W, $0.1\%$ , $10 \text{ k}\Omega$	113-10k-0.1
	TEDED TOTAL		R33	MF, 1/4W, 0.1%, 10 kΩ MF, 1/4W, 0.1%, 10 kΩ	113-10k-0.1
REF.		WILTRON	R34 R35	MF, $1/4$ W, $0.1\%$ , $10 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $27.4 \text{ k}\Omega$	113-10k-0.1
DES.	DESCRIPTION	PART NO.	R36	MF, $1/4W$ , $1/90$ , $27.4 \text{ k}\Omega$ MF, $1/4W$ , $0.1\%$ , $10 \text{ k}\Omega$	110-27.4k-1 113-10k-0.1
		<del>-</del> -	R37	Part of A2	113-10K-0.1
A1	Resistor Pack		R38	Part of A2	
	a. 6609A	660-A-8145-1	R39	MF, $1/4W$ , 1%, $511\Omega$	110-511-1
	b. 6617A	660-A-8145-2	R40	Variable, Multi-turn, 20k	157-20k
	c. 6621A	SPCL-A-11552	R41	MF, $1/4W$ , $0.1\%$ , $10 \text{ k}\Omega$	113-10k-0.1
				•	

R42	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1	U2	8 Bit Multiplying DAC,	
R43	MF, $1/4W$ , $0.1\%$ , $10 k\Omega$	113-10k-0.1		MC1408L8	54-148
R44	MF, $1/4W$ , $0.1\%$ , $10 \text{ k}\Omega$	113-10k-0.1	U3	Op Amp, 356	50-9
R45	MF, $1/4W$ , $0.1\%$ , $10 \text{ k}\Omega$	113-10k-0.1	U4	8 Bit Multiplying DAC,	
R46	Variable, Multi-turn, 20k	157-20k		MC1408L8	54-148
R47	MF, $1/4W$ , $1\%$ , $10\Omega$	110-10-1	U5	Octal Latch, 74LS374	54-41
R48	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1	U6	Op Amp, OP05	50-87
R49	Variable, Single-Turn, 1 kΩ	157-1k	U7	16 Bit DAC	54-150
R50	MF, $1/4W$ , $1\%$ , $6.49 \text{ k}\Omega$	110-6.49k-1	U8	Octal Latch, 74LS374	54-41
R51	MF, $1/4W$ , $1\%$ , $4.32 \text{ k}\Omega$	110-4.32k-1	U9	Octal Latch, 74LS374	54-41
R52	MF, $1/4W$ , $1\%$ , $422\Omega$	110-422-1	U10	Dual FET-Input Op Amp, TL072	54-53
R53	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1	U11	Dual Analog Switch, DG200BA	50-DG200BA
R54	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1	U12	Op Amp, 301A	50-8
R55	Variable, Single-Turn, 1 kΩ	157-1k	U13	Op Amp, 356	50-9
R56	MF, $1/4W$ , $1\%$ , $3.83 \text{ k}\Omega$	110-3.83k-1	U14	Op Amp, 356	50-9
R57	MF, $1/4W$ , $1\%$ , $1.87 k\Omega$	110-1.87k-1	U15	Octal Latch, 74LS374	54-41
R58	MF, $1/4W$ , $1\%$ , $10\Omega$	110-10-1	U16	Octal Latch, 74LS374	54-41
R59	MF, $1/4W$ , $0.1\%$ , $10 \text{ k}\Omega$	113-10k-0.1	U17	Octal Latch, 74LS374	54-41
R60	MF, $1/4W$ , $1\%$ , $3.92 \text{ k}\Omega$	110-3.92k-1	U18	Octal Latch, 74LS374	54-41
R61	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1	U19	12 Bit Multiplying DAC	54-149
R62	Variable, Single-Turn, 5k	156-5k	U20	Op Amp, 356	50-9
R63	MF, 1/4W, 1%, 10 kΩ	110-10k-1	U21	Dual FET-Input Op Amp, TL072	54-53
R64	MF, $1/4W$ , $1\%$ 10 k $\Omega$	110-10k-1	U22	Quad Analog Switch, LF13201N	54-20
R65	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1	U 23	Op Amp, 356	50-9
R66	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1	U24	12 Bit Multiplying DAC	54-149
R67	MF, 1/4W, 1%, 100 kΩ	110-100k-1	U25	Op Amp, 356	50-9
R68	Variable, Multi-turn, $2 k\Omega$	157-2k	U26	Op Amp, OP05	50-87
R69	Variable, Multi-turn, $2 k\Omega$	157-2k	U27	Dual FET-Input Op Amp, TL072	54-53
R70	MF, $1/4W$ , $1\%$ , $49.9 \text{ k}\Omega$	110-49.9k-1	U28	Quad Analog Switch, LF13201N	54-20
R71	Part of A2		U29	Triple NAND, 74LS10	54-42
R72	Part of A2		U30	Op AMp, 356	50-9
R73	Part of A2		U31	Quad D Flip-Flop, 74LS175	54-74LS175
R74	MF, 1/4W, 1%, 49.9 kΩ	110-49.9k-1	U32	Octal Latch, 74LS374	54-41
R75	Variable, Single-Turn, $5 k\Omega$	156-5k	U33	Quad Analog-Switch, LF13201N	54-20
R76	MF, $1/4W$ , 1%, $3.16 \text{ k}\Omega$	110-3.16k-1	U34	Quad Analog-Switch, LF13201N	54-20
R77	Variable, Single-Turn, $5 k\Omega$	156-5k	U35	Dual FET-Input Op Amp, TL074	54-132
R78	MF, $1/4W$ , 1%, 2.49 k $\Omega$	110-2.49k-1	000	Budi I BI Imput Op IImp, IBO I	31 13 <b>2</b>
R79	Variable, Single-Turn, 5 k $\Omega$	156-5k			
R80	MF, $1/4W$ , 1%, 6.81 k $\Omega$	110-6.81k-1			
R81	Variable, Single-Turn, $5 \text{ k}\Omega$	156-5k			
R82	MF, $1/4$ W, $1\%$ , $3.01$ kΩ	110-3.01k-1		MISCELLANEOUS	
R83	MF, $1/4W$ , 1%, 10 kΩ	110-10k-1		MIOCEBEANEOGD	
R84	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1			
R85	Part of A2		REF.		WILTRON
R86	Part of A2		DES.	DESCRIPTION	PART NO.
R87	MF, $1/4W$ , $1\%$ , $49.9 \text{ k}\Omega$	110-49.9k-1	DLO.	DESCRIPTION	TAKT NO.
R88	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1			
R89	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1	P2	Connector, 3-Pin	551-238
	, , , ,		S1	Switch, DPDT	420-14
	INTEGRATED CIRCUITS		TP1	5 W. Cell, 21 21	120 11
			thru		
REF.		WILTRON	TP10	Pin, Test Point	706-44
DES.	DESCRIPTION	PART NO.		Socket, I.C., 14-Pin	553-63
				Socket, I.C. 24-Pin	553-67
U1	Hex Inverter, 74LS00	54-74LS00		Ejector, P.C. Board	553-96
	·	•		,	

Table 6-6. A6 HET/YIG Driver, .01 - 2 GHz, 6609A (660-D-8007-4)

	CAPACITORS		C6	Monolithic, .1 μF	230-37
		i	C7	Tantalum, 35V, 6.8 μF	250-41
REF.		WILTRON	C8	Monolithic, .1 μF	230-37
DES.	DESCRIPTION	PART NO.	C9	Ceramic, .01 µF	230-11
			C10	Ceramic, .001 µF	230-30
C1	Monolithic, .1 µF	230-37	C11	Tantalum, 1 µF, 35V	250-19
C2	Monolithic, .1 µF	230-37	C12	Tantalum, 1 µF, 35V	250-19
C3	Tantalum, 35V, 6.8 μF	250-41	C13	Monolithic, 1 µF	230-41
C4	Monolithic, .1 µF	230-37	C14	Monolithic, .1 µF	230-37
C5	Tantalum, 35V, 6.8 μF	250-41	C15	Mica, 300 pF	220-300

01/					
C16	Tantalum, 35V, 6.8 µF	250-41	R17	MF, $1/4W$ , $1\%$ , $5.11 k\Omega$	110 5 111 1
C18	Ceramic, .01 µF				110-5.11k-1
		230-11	R18	MF, $1/4W$ , $1\%$ , $5.11 k\Omega$	110-5.11k-1
C19	Tantalum, 35V, 6.8 μF	250-41	R19	MF, 1/4W, 1%, 1 kΩ	110-1k-1
C21	Mica, 8.2 pF	221-8.2	R20	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
C22	Mica, 820 pF	220-820	R21	MF, $1/4W$ , $1\%$ , $23.7 k\Omega$	110-23.7k-1
C23	Ceramic, .01 µF	230-11	R22	MF, $1/4W$ , 1%, 1 k $\Omega$	110-1k-1
C24	Ceramic, .01 µF	230-11	R23	MF, $1/4$ W, $1\%$ , $121\Omega$	110-121-1
C25	Ceramic, .01 µF	230-11			
023	Octamic, for pr	230-11	R24	MF, $1/4$ W, $1\%$ , $1 \text{ k}\Omega$	110-1k-1
			R25	MF, $1/4W$ , $1\%$ , 7.5 k $\Omega$	110-7.5k-1
	DIODES		R26	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1
			R27	MF, $1/4W$ , $1\%$ , $5.11 k\Omega$	110-5.11k-1
REF.		WILTRON	R41	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
DES.	DESCRIPTION	PART NO.	R42	MF, $1/4$ W, $1\%$ , $15$ kΩ	110-15k-1
			R43	MF, $1/4$ W, $1\%$ , $11 k\Omega$	
CR1	Silicon, 1N4446	10 1814446			110-11k-1
		10-1N4446	R44	MF, $1/4W$ , $1\%$ , $3.24 \text{ k}\Omega$	110-3.24k-1
CR2	Silicon, 1N4446	10-1N4446	R45	MF, $1/4W$ , $1\%$ , $3.24 \text{ k}\Omega$	110-3.24k-1
CR3	Silicon, 1N4446	10-1N4446	R46	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1
CR4	Silicon, SI2	10-SI2	R47	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
CR5	Zener, 24V, 1W, 1N4749A	10-1N4749A	R48	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1
CR6	Silicon, 1N4446	10-1N4446	R49	MF, $1/4$ W, $1\%$ , $5.11\Omega$	110-5.11-1
CR7	Silicon, 1N4446	10-1N4446	R50	MF, $1/4W$ , $1\%$ , $3.11\%$ MF, $1/4W$ , $1\%$ , $2.74 \text{ k}\Omega$	
CR8	•				110-2.74k-1
	Zener, 6.8V, 1W, 1N4736A	10-1N4736A	R51	MF, $1/4W$ , $1\%$ , $15 k\Omega$	110-15k-1
CR9	Silicon, 1N4446	10-1N4446	R66	Variable, 1-Turn, 500 k $\Omega$	156-500k
CR10	Silicon, 1N4446	10-1N4446	R67	MF, $1/4$ W, $1\%$ , $20$ kΩ	110-20k-1
CR11	Silicon, 1N4446	10-1N4446	R70	MF, $1/4W$ , $1\%$ , $15 k\Omega$	110-15k-1
			R71	MF, $1/4W$ , 1%, 1.30 k $\Omega$	110-1.30k-1
	TRANSISTORS		R72	MF, $1/4$ W, $1\%$ , $8.87 \text{ k}\Omega$	
	11111101010110				110-8.87k-1
D.F.F.			R73	MF, $1/4W$ , $1\%$ , $3.40 \text{ k}\Omega$	110-3.40k-1
REF.		WILTRON	R74	MF, $1/4$ W, $1\%$ , $5.11$ kΩ	110-5.11k-1
DES.	DESCRIPTION	PART NO.	R75	MF, $1/4W$ , $1\%$ , $301\Omega$	110-301-1
			R76	MF, $1/4W$ , $1\%$ , $1.21 k\Omega$	110-1.21k-1
~ 1	DND MDCAG2				
Q1	PNP, MPSA92	20-MPSA92	R77	MF, 1/4W, 1%, 17.8 kΩ	110-17.8k-1
	•	20-MPSA92 20-MPSA92	R77 R78	MF, $1/4$ W, $1\%$ , $17.8 \text{ k}\Omega$	110-17.8k-1
Q2	PNP, MPSA92	20-MPSA92	R78	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
Q2 Q3	PNP, MPSA92 NPN, 2N2222A	20-MPSA92 20-2N2222A	R78 R79	MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $10 k\Omega$	110-511-1 110-10k-1
Q2 Q3 Q4	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A	20-MPSA92 20-2N2222A 20-2N2907A	R78 R79 R80	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ	110-511-1 110-10k-1 110-10k-1
Q2 Q3 Q4 Q5	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N2222A	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A	R78 R79 R80 R81	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ	110-511-1 110-10k-1
Q2 Q3 Q4 Q5 Q6	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A	20-MPSA92 20-2N2222A 20-2N2907A	R78 R79 R80	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ	110-511-1 110-10k-1 110-10k-1
Q2 Q3 Q4 Q5	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N2222A NPN, 2N3694 NPN, MPSU04	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A	R78 R79 R80 R81	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1
Q2 Q3 Q4 Q5 Q6 Q7	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N2222A NPN, 2N3694 NPN, MPSU04	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04	R78 R79 R80 R81 R82 R88	MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $23.7$ k $\Omega$ MF, $1/4$ W, $1\%$ , $2$ k $\Omega$ Variable, $1$ -Turn, $20$ $\Omega$	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20
Q2 Q3 Q4 Q5 Q6 Q7 Q8	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N2222A NPN, 2N3694 NPN, MPSU04 PNP, 2N2907A	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907A	R78 R79 R80 R81 R82	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1
Q2 Q3 Q4 Q5 Q6 Q7	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N2222A NPN, 2N3694 NPN, MPSU04	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04	R78 R79 R80 R81 R82 R88	MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $23.7$ k $\Omega$ MF, $1/4$ W, $1\%$ , $2$ k $\Omega$ Variable, $1$ -Turn, $20\Omega$ MF, $1/4$ W, $1\%$ , $15$ k $\Omega$	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20
Q2 Q3 Q4 Q5 Q6 Q7 Q8	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N2222A NPN, 2N3694 NPN, MPSU04 PNP, 2N2907A NPN, 2N2222A	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907A	R78 R79 R80 R81 R82 R88	MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $23.7$ k $\Omega$ MF, $1/4$ W, $1\%$ , $2$ k $\Omega$ Variable, $1$ -Turn, $20$ $\Omega$	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20
Q2 Q3 Q4 Q5 Q6 Q7 Q8	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N2222A NPN, 2N3694 NPN, MPSU04 PNP, 2N2907A	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907A	R78 R79 R80 R81 R82 R88 R89	MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $23.7$ k $\Omega$ MF, $1/4$ W, $1\%$ , $2$ k $\Omega$ Variable, $1$ -Turn, $20\Omega$ MF, $1/4$ W, $1\%$ , $15$ k $\Omega$	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1
Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N2222A NPN, 2N3694 NPN, MPSU04 PNP, 2N2907A NPN, 2N2222A	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907A 20-2N2222A	R78 R79 R80 R81 R82 R88 R89	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1
Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N2222A NPN, 2N3694 NPN, MPSU04 PNP, 2N2907A NPN, 2N2222A RESISTORS	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907A 20-2N2222A	R78 R79 R80 R81 R82 R88 R89	MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $23.7$ k $\Omega$ MF, $1/4$ W, $1\%$ , $2$ k $\Omega$ Variable, $1$ -Turn, $20\Omega$ MF, $1/4$ W, $1\%$ , $15$ k $\Omega$	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1
Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N2222A NPN, 2N3694 NPN, MPSU04 PNP, 2N2907A NPN, 2N2222A	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907A 20-2N2222A	R78 R79 R80 R81 R82 R88 R89	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1
Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N2222A NPN, 2N3694 NPN, MPSU04 PNP, 2N2907A NPN, 2N2222A RESISTORS	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907A 20-2N2222A	R78 R79 R80 R81 R82 R88 R89	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1
Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907 A NPN, 2N2222A NPN, 2N3694 NPN, MPSU04 PNP, 2N2907 A NPN, 2N2222A  RESISTORS  DESCRIPTION	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907A 20-2N2222A	R78 R79 R80 R81 R82 R88 R89	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87
Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N2222A NPN, 2N3694 NPN, MPSU04 PNP, 2N2907A NPN, 2N2222A  RESISTORS  DESCRIPTION Variable, 1-Turn, 20 kΩ	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907A 20-2N2222A WILTRON PART NO.	R78 R79 R80 R81 R82 R88 R89	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field-
Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 REF. DES.	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N2222A NPN, 2N3694 NPN, MPSU04 PNP, 2N2907A NPN, 2N2222A  RESISTORS  DESCRIPTION  Variable, 1-Turn, 20 kΩ MF, 1/4W, 1%, 61.9 kΩ	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907A 20-2N2222A WILTRON PART NO. 156-20K 110-61.9k-1	R78 R79 R80 R81 R82 R88 R89	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable
Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 REF. DES. R1 R2 R3	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N2222A NPN, 2N3694 NPN, MPSU04 PNP, 2N2907A NPN, 2N2222A  RESISTORS  DESCRIPTION  Variable, 1-Turn, 20 kΩ MF, 1/4W, 1%, 61.9 kΩ Variable, 10-Turn 1 kΩ	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907A 20-2N2222A WILTRON PART NO. 156-20K 110-61.9k-1 157-1k	R78 R79 R80 R81 R82 R88 R89 REF. DES. U4 U5	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53
Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 REF. DES. R1 R2 R3 R4	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N2222A NPN, 2N3694 NPN, MPSU04 PNP, 2N2907A NPN, 2N2222A  RESISTORS  DESCRIPTION  Variable, 1-Turn, 20 kΩ MF, 1/4W, 1%, 61.9 kΩ Variable, 10-Turn 1 kΩ MF, 1/4W, 1%, 11 kΩ	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907A 20-2N2222A WILTRON PART NO. 156-20K 110-61.9k-1	R78 R79 R80 R81 R82 R88 R89	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable
Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 REF. DES. R1 R2 R3 R4 R5	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N2222A NPN, 2N3694 NPN, MPSU04 PNP, 2N2907A NPN, 2N2222A  RESISTORS  DESCRIPTION  Variable, 1-Turn, 20 kΩ MF, 1/4W, 1%, 61.9 kΩ Variable, 10-Turn 1 kΩ	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907A 20-2N2222A WILTRON PART NO. 156-20K 110-61.9k-1 157-1k	R78 R79 R80 R81 R82 R88 R89 REF. DES. U4 U5	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53
Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 REF. DES. R1 R2 R3 R4	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N2222A NPN, 2N3694 NPN, MPSU04 PNP, 2N2907A NPN, 2N2222A  RESISTORS  DESCRIPTION  Variable, 1-Turn, 20 kΩ MF, 1/4W, 1%, 61.9 kΩ Variable, 10-Turn 1 kΩ MF, 1/4W, 1%, 11 kΩ	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907A 20-2N2222A WILTRON PART NO. 156-20K 110-61.9k-1 157-1k 110-11k-1	R78 R79 R80 R81 R82 R88 R89 REF. DES. U4 U5	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072 Input NAND Gate, 74LS10	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53
Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 REF. DES. R1 R2 R3 R4 R5 R6	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907 A NPN, 2N2694 NPN, 2N3694 NPN, MPSU04 PNP, 2N2907 A NPN, 2N2222A  RESISTORS  DESCRIPTION  Variable, 1-Turn, 20 kΩ MF, 1/4W, 1%, 61.9 kΩ Variable, 10-Turn 1 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907A 20-2N2222A  WILTRON PART NO.  156-20K 110-61.9k-1 157-1k 110-11k-1 110-5.11k-1 110-5.11-1	R78 R79 R80 R81 R82 R88 R89 REF. DES. U4 U5	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53
Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 REF. DES. R1 R2 R3 R4 R5 R6 R7	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N23694 NPN, MPSU04 PNP, 2N2907A NPN, 2N2222A  RESISTORS   DESCRIPTION  Variable, 1-Turn, 20 kΩ MF, 1/4W, 1%, 61.9 kΩ Variable, 10-Turn 1 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ Variable, 10-Turn, 1 kΩ Variable, 10-Turn, 1 kΩ	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907A 20-2N2222A  WILTRON PART NO.  156-20K 110-61.9k-1 157-1k 110-11k-1 110-5.11k-1 110-5.11k-1 110-5.11k-1	R78 R79 R80 R81 R82 R88 R89 REF. DES. U4 U5	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072 Input NAND Gate, 74LS10	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53 54-42
Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 REF. DES. R1 R2 R3 R4 R5 R6 R7 R8	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N23694 NPN, MPSU04 PNP, 2N2907A NPN, MPSU04 PNP, 2N2222A  RESISTORS   DESCRIPTION  Variable, 1-Turn, 20 kΩ MF, 1/4W, 1%, 61.9 kΩ Variable, 10-Turn 1 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 5.11 kΩ	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907A 20-2N2222A  WILTRON PART NO.  156-20K 110-61.9k-1 157-1k 110-5.11-1 110-5.11-1 157-1k 110-11k-1	R78 R79 R80 R81 R82 R88 R89 REF. DES. U4 U5	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072 Input NAND Gate, 74LS10  MISCELLANEOUS	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53 54-42 WILTRON
Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 REF. DES. R1 R2 R3 R4 R5 R6 R7 R8 R9	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N2222A NPN, 2N3694 NPN, MPSU04 PNP, 2N2907A NPN, 2N2222A  RESISTORS   DESCRIPTION  Variable, 1-Turn, 20 kΩ MF, 1/4W, 1%, 61.9 kΩ Variable, 10-Turn 1 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 Ω  Variable, 10-Turn, 1 kΩ MF, 1/4W, 1%, 5.11 Ω  Variable, 10-Turn, 1 kΩ MF, 1/4W, 1%, 5.11 kΩ Variable, 10-Turn, 1 kΩ MF, 1/4W, 1%, 5.11 kΩ Variable, 10-Turn, 20 kΩ	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907A 20-2N2222A  WILTRON PART NO.  156-20K 110-61.9k-1 157-1k 110-11k-1 110-5.11k-1 110-5.11k-1 110-5.11k-1 157-1k 110-11k-1 157-1k	R78 R79 R80 R81 R82 R88 R89 REF. DES. U4 U5	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072 Input NAND Gate, 74LS10	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53 54-42
Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 REF. DES. R1 R2 R3 R4 R5 R6 R7 R8 R9 R10	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N2222A NPN, 2N3694 NPN, MPSU04 PNP, 2N2907A NPN, 2N2222A  RESISTORS  DESCRIPTION  Variable, 1-Turn, 20 kΩ MF, 1/4W, 1%, 61.9 kΩ Variable, 10-Turn 1 kΩ MF, 1/4W, 1%, 5.11 kΩ Variable, 10-Turn, 1 kΩ MF, 1/4W, 1%, 11 kΩ Variable, 10-Turn, 20 kΩ MF, 1/4W, 1%, 11 kΩ Variable, 10-Turn, 20 kΩ MF, 1/4W, 1%, 23.7 kΩ	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907A 20-2N2222A  WILTRON PART NO.  156-20K 110-61.9k-1 157-1k 110-11k-1 110-5.11k-1 110-5.11k-1 110-5.11k-1 110-5.11k-1 157-1k 110-11k-1 157-1k 110-11k-1	R78 R79 R80 R81 R82 R88 R89 REF. DES. U4 U5	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072 Input NAND Gate, 74LS10  MISCELLANEOUS  DESCRIPTION	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53 54-42 WILTRON PART NO.
Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 REF. DES. R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N2222A NPN, 2N3694 NPN, MPSU04 PNP, 2N2907A NPN, 2N2222A  RESISTORS  DESCRIPTION  Variable, 1-Turn, 20 kΩ MF, 1/4W, 1%, 61.9 kΩ Variable, 10-Turn 1 kΩ MF, 1/4W, 1%, 5.11 kΩ Variable, 10-Turn, 20 kΩ MF, 1/4W, 1%, 13.7 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 511 Ω	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907A 20-2N2222A  WILTRON PART NO.  156-20K 110-61.9k-1 157-1k 110-11k-1 110-5.11r-1 157-1k 110-11k-1 157-20k 110-11k-1 157-20k 110-23.7k-1 110-511-1	R78 R79 R80 R81 R82 R88 R89 REF. DES. U4 U5	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072 Input NAND Gate, 74LS10  MISCELLANEOUS	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53 54-42 WILTRON
Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 REF. DES. R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N2222A NPN, 2N3694 NPN, MPSU04 PNP, 2N2907A NPN, 2N2222A  RESISTORS  DESCRIPTION  Variable, 1-Turn, 20 kΩ MF, 1/4W, 1%, 61.9 kΩ Variable, 10-Turn 1 kΩ MF, 1/4W, 1%, 5.11 kΩ Variable, 10-Turn, 1 kΩ MF, 1/4W, 1%, 11 kΩ Variable, 10-Turn, 20 kΩ MF, 1/4W, 1%, 11 kΩ Variable, 10-Turn, 20 kΩ MF, 1/4W, 1%, 23.7 kΩ	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907A 20-2N2222A  WILTRON PART NO.  156-20K 110-61.9k-1 157-1k 110-11k-1 110-5.11k-1 110-5.11k-1 110-5.11k-1 110-5.11k-1 157-1k 110-11k-1 157-1k 110-11k-1	R78 R79 R80 R81 R82 R88 R89 REF. DES. U4 U5	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072 Input NAND Gate, 74LS10  MISCELLANEOUS  DESCRIPTION	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53 54-42 WILTRON PART NO.
Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 REF. DES. R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N2222A NPN, 2N3694 NPN, MPSU04 PNP, 2N2907A NPN, 2N2222A  RESISTORS  DESCRIPTION  Variable, 1-Turn, 20 kΩ MF, 1/4W, 1%, 61.9 kΩ Variable, 10-Turn 1 kΩ MF, 1/4W, 1%, 5.11 kΩ Variable, 10-Turn, 1 kΩ MF, 1/4W, 1%, 5.11 kΩ Variable, 10-Turn, 20 kΩ MF, 1/4W, 1%, 11 kΩ Variable, 10-Turn, 20 kΩ MF, 1/4W, 1%, 511 kΩ	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907A 20-2N2222A  WILTRON PART NO.  156-20K 110-61.9k-1 157-1k 110-11k-1 110-5.11k-1 110-5.11k-1 110-5.11k-1 110-5.11k-1 110-5.11k-1 110-11k-1 157-20k 110-11k-1 157-20k 110-23.7k-1 110-511-1 110-511-1	R78 R79 R80 R81 R82 R88 R89  REF. DES.  U4 U5  U8 U10  REF. DES.  —— TP1	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072 Input NAND Gate, 74LS10  MISCELLANEOUS  DESCRIPTION	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53 54-42 WILTRON PART NO.
Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 REF. DES. R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12 R13	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N2222A NPN, 2N3694 NPN, MPSU04 PNP, 2N2907A NPN, 2N2222A  RESISTORS  DESCRIPTION  Variable, 1-Turn, 20 kΩ MF, 1/4W, 1%, 61.9 kΩ Variable, 10-Turn 1 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ Variable, 10-Turn, 1 kΩ MF, 1/4W, 1%, 11 kΩ Variable, 10-Turn, 20 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 9.09 kΩ	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907A 20-2N2222A  WILTRON PART NO.  156-20K 110-61.9k-1 157-1k 110-11k-1 110-5.11-1 157-1k 110-11k-1 110-5.11-1 157-1k 110-11k-1 110-5.11-1 157-1k 110-11k-1 110-9.09k-1	R78 R79 R80 R81 R82 R88 R89  REF. DES.  U4 U5  U8 U10  REF. DES.  —— TP1 thru	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072 Input NAND Gate, 74LS10  MISCELLANEOUS  DESCRIPTION  Ejector, P.C. Board	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53 54-42 WILTRON PART NO. 553-96
Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 REF. DES. R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12 R13 R14	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N2222A NPN, 2N3694 NPN, MPSU04 PNP, 2N2907A NPN, 2N2222A  RESISTORS  DESCRIPTION  Variable, 1-Turn, 20 kΩ MF, 1/4W, 1%, 61.9 kΩ Variable, 10-Turn 1 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ Variable, 10-Turn, 1 kΩ MF, 1/4W, 1%, 5.11 kΩ Variable, 10-Turn, 1 kΩ MF, 1/4W, 1%, 11 kΩ Variable, 10-Turn, 20 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 509 kΩ MF, 1/4W, 1%, 9.09 kΩ MF, 1/4W, 1%, 9.09 kΩ MF, 1/4W, 1%, 1.10 kΩ	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907A 20-2N2222A  WILTRON PART NO.  156-20K 110-61.9k-1 157-1k 110-5.11k-1 110-5.11k-1 110-5.11c-1 157-20k 110-11k-1 157-20k 110-23.7k-1 110-511-1 110-11k-1 110-9.09k-1 110-1.10k-1	R78 R79 R80 R81 R82 R88 R89  REF. DES.  U4 U5  U8 U10  REF. DES.  TP1 thru TP5	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072 Input NAND Gate, 74LS10  MISCELLANEOUS  DESCRIPTION  Ejector, P.C. Board  Pin, Test Point	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53 54-42 WILTRON PART NO. 553-96
Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 REF. DES. R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12 R13	PNP, MPSA92 NPN, 2N2222A PNP, 2N2907A NPN, 2N2222A NPN, 2N3694 NPN, MPSU04 PNP, 2N2907A NPN, 2N2222A  RESISTORS  DESCRIPTION  Variable, 1-Turn, 20 kΩ MF, 1/4W, 1%, 61.9 kΩ Variable, 10-Turn 1 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ Variable, 10-Turn, 1 kΩ MF, 1/4W, 1%, 11 kΩ Variable, 10-Turn, 20 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 9.09 kΩ	20-MPSA92 20-2N2222A 20-2N2907A 20-2N2222A 20-2N3694 20-MPSU04 20-2N2907A 20-2N2222A  WILTRON PART NO.  156-20K 110-61.9k-1 157-1k 110-11k-1 110-5.11-1 157-1k 110-11k-1 110-5.11-1 157-1k 110-11k-1 110-5.11-1 157-1k 110-11k-1 110-9.09k-1	R78 R79 R80 R81 R82 R88 R89  REF. DES.  U4 U5  U8 U10  REF. DES.  —— TP1 thru	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 23.7 kΩ MF, 1/4W, 1%, 2 kΩ Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ  INTEGRATED CIRCUITS  DESCRIPTION  Op-Amp, OP05 2k x 8 EPROM, 2716  Dual Op-Amp, TL072 Input NAND Gate, 74LS10  MISCELLANEOUS  DESCRIPTION  Ejector, P.C. Board	110-511-1 110-10k-1 110-10k-1 110-23.7k-1 110-2k-1 156-20 110-15k-1 WILTRON PART NO. 54-87 Not Field- Replaceable 54-53 54-42 WILTRON PART NO. 553-96

	CAPACITORS			RESISTORS	
REF. DES.	DESCRIPTION	WILTRON PART NO.	REF. DES.	DESCRIPTION	WILTRON PART NO.
C1	Monolithic, .1 μF	230-37	R1	Variable, 1-Turn, 20 kΩ	156-20K
C2	Monolithic, .1 μF	230-37	R2	MF, 1/4W, 1%, 61.9 k $\Omega$ Variable, 10-Turn 1 k $\Omega$	110-61.9k-1 157-1k
C3	Tantalum, 35V, 6.8 μF	250-41A	R3 R4	MF, $1/4W$ , 1%, 11 k $\Omega$	110-11k-1
C4	Monolithic, .1 μF	230-37	R5	Variable, 10-Turn, 50 k $\Omega$	157-50k
C5 C6	Tantalum, 35V, 6.8 μF Monolithic, .1 μF	250-41A 230-37	R6	CC, $1/4W$ , 5%, 3.6 M $\Omega$	101-3.6M-5
C7	Tantalum, 35V, 6.8 µF	250-41A	R7	Variable, 10-Turn, 1 k $\Omega$	157-1k
C8	Monolithic, .1 μF	230-37	R8	MF, $1/4W$ , $1\%$ , $11 k\Omega$	110-11k-1
C9	Ceramic, .01 µF	230-11	R9	Variable, 10-Turn, 20 k $\Omega$	157-20k
C10	Ceramic, .001 μF	230-30	R10 R11	MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ	110-100k-1 110-100k-1
C11	Tantalum, 1 μF, 35V	250-19	R12	Variable, 10-Turn, 5 k $\Omega$	157-5k
C12	Tantalum, 1 µF, 35V	250-19	R13	MF, $1/4W$ , 1%, 56.3 k $\Omega$	110-56.3k-1
C13 C14	Monolithic, 1 μF Monolithic, .1 μF	230-41 230-37	R14	MF, $1/4W$ , $1\%$ , 4.22 k $\Omega$	110-4.22k-1
C15	Mica, 300 pF	220-300	R15	$WW, 5W, 5\Omega$	131-3
C16	Tantalum, 35V, 6.8 μF	250-41A	R16	MF, 1/4W, 1%, 100 kΩ	110-100k-1
C17	Ceramic, .001 μF	230-30	R17 R18	MF, $1/4$ W, $1\%$ , $3.24$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$	110-3.24k-1 110-10k-1
C18	Ceramic, .01 μF	230-11	R19	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1 110-10k-1
C19	Tantalum, 35V, 4.7 μF	250-39	R20	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
C21 C22	Mica, 8.2 pF	221-8.2 230-11	R21	MF, $1/4$ W, $1\%$ , $23.7$ kΩ	110-23.7k-1
C23	Ceramic, .01 μF Ceramic, .01 μF	230-11	R22	MF, $1/4$ W, $1\%$ , $1$ k $\Omega$	110-1k-1
C24	Ceramic, .01 µF	230-11	R23	MF, $1/4$ W, $1\%$ , $121\Omega$	110-121-1
C25	Ceramic, .01 μF	230-11	R24	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1
C26	Monolithic, .1 μF	230-37	R25 R26	MF, $1/4$ W, $1\%$ , $7.5$ k $\Omega$ MF, $1/4$ W, $1\%$ , $5.11$ $\Omega$	110-7.5k-1 110-5.11-1
			R27	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$	110-5.11k-1
			R28	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1
	DIODES		R29	MF, $1/4W$ , $1\%$ , $562 \text{ k}\Omega$	110-562k-1
	<u>DIODES</u>		R30	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1
REF.		WILTRON	R31	MF, $1/4$ W, $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1
DES.	DESCRIPTION	PART NO.	R32 R33	MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ	110-18.7k-1 110-18.7k-1
		1 3 2 2 1 1 0 1	R34	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1
CR1	Silicon, 1N4446	10-1N4446	R35	MF, $1/4W$ , $1\%$ , $562 k\Omega$	110-562k-1
CR2	Silicon, 1N4446	10-1N4446	R36	Variable, 10-Turn, 2 kΩ	157-2k
CR3	Silicon, 1N4446	10-1N4446	R37	MF, $1/4$ W, $1\%$ , $20 \text{ k}\Omega$	110-20k-1
CR4 CR5	Silicon, SI2 Zener, 24V, 1W, 1N4749A	10-SI2 10-1N4749A	R38	Variable, 10-Turn, 50 k $\Omega$	157-50k
CR6	Silicon, 1N4446	10-1N4749A 10-1N4446	R39 R40	MF, $1/4$ W, $1\%$ , $205 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $75 \text{ k}\Omega$	110-205k-1 110-75k-1
CR7	Silicon, 1N4446	10-1N4446	R40 R41	MF, $1/4W$ , $1\%$ , $13 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
CR8	Zener, 6.8V, 1W, 1N4736A	10-1N4736A	R42	MF, $1/4$ W, $1\%$ , $15$ kΩ	110-15k-1
CR9	Silicon, 1N4446	10-1N4446	R43	MF, $1/4$ W, $1\%$ , $11$ kΩ	110-11k-1
CR10	Silicon, 1N4446	10-1N4446	R44	MF, $1/4W$ , $1\%$ , $3.24 \text{ k}\Omega$	110-3.24k-1
CR11	Silicon, 1N4446	10-1N4446	R45	MF, 1/4W, 1%, 3.24 kΩ	110-3.24k-1
			R46 R47	MF, $1/4W$ , $1\%$ , $1 k\Omega$ MF, $1/4W$ , $1\%$ , $511\Omega$	110-1k-1 110-511-1
			R48	MF, $1/4W$ , $1\%$ , $5.11\%$ MF, $1/4W$ , $1\%$ , $5.11\%$	110-511-1
	TRANSISTORS		R49	MF, $1/4W$ , 1%, $5.11\Omega$	110-5.11-1
			R50	MF, $1/4W$ , $1\%$ , $2.74 \text{ k}\Omega$	110-2.74k-1
REF.		WILTRON	R51	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
DES.	DESCRIPTION	PART NO.	R52	MF, $1/4W$ , $1\%$ , $750 \text{ k}\Omega$	110-750k-1
01	DND MDS 402	20-MPSA92	R53	MF, 1/4W, 1%, 14.7 kΩ	110-14.7k-1
Q1 Q2	PNP, MPSA92 PNP, MPSA92	20-MPSA92 20-MPSA92	R54 R55	MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $750$ kΩ	110-10k-1 110-750k-1
Q3	PNP, 2N2907A	20-2N2907A	R56	MF, $1/4W$ , $1\%$ , $730 \text{ km}$ MF, $1/4W$ , $1\%$ , $14.7 \text{ k}\Omega$	110-750k-1 110-14.7k-1
Q4	NPN, 2N2222A	20-2N2222A	R57	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1
Q5	PNP, 2N2907A	20-2N2907A	R58	Variable, 10-Turn, $500\Omega$	157-500
Q6	NPN, 2N3694	20-2N3694	R59	MF, $1/4W$ , $1\%$ , $2 k\Omega$	110-2k-1
Q7	NPN, MPSU04	20-MPSU04	R60	MF, 1/4W, 1%, 10 kΩ	110-10k-1
Q8	PNP, 2N2907A	20-2N2907A	R61	MF, 1/4W, 1%, 750 kΩ	110-750k-1
Q9	NPN, 2N2222A	20-2N2222A	R62	MF, $1/4W$ , $1\%$ , $14.7 k\Omega$	110-14.7k-1

R63	MF, 1/4W, 1%, 6.49 kΩ	110-6.49k-1	R97	MF, $1/4W$ , $1\%$ , $15 k\Omega$	110-15k-1
R64	MF, $1/4W$ , $1\%$ , $2 k\Omega$	110-2k-1	R98	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
R65	Variable, 10-Turn, 500Ω	157-500	R99	MF, $1/4$ W, $1\%$ , $750$ kΩ	110-750k-1
R66	Variable, 1-Turn, 500 kΩ	156-500k	R100	MF, $1/4W$ , $1\%$ , $14.7 k\Omega$	110-14.7k-1
R67	MF, $1/4W$ , 1%, 20 k $\Omega$	110-20k-1		, -, -·· , -/·· , - <b>-</b> ·· <b>-</b> ··	110 111111 1
R68	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1			
R69	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1		INTEGRATED CIRCUITS	
R70	MF, $1/4W$ , 1%, 15 k $\Omega$	110-15k-1			
R71	MF, $1/4W$ , 1%, 1.30 k $\Omega$	110-1.30k-1	REF.		WILTRON
R72	MF, $1/4W$ , $1\%$ , $8.87 \text{ k}\Omega$	110-8.87k-1	DES.	DESCRIPTION	PART NO.
R73	MF, $1/4W$ , 1%, 3.40 k $\Omega$	110-3.40k-1			
R74	MF, $1/4W$ , 1%, 5.11 k $\Omega$	110-5.11k-1	U1	Quad EX-OR Gate, 74LS86	54-125
R75	MF, $1/4W$ , $1\%$ , $301\Omega$	110-301-1	U2	Quad Op Amp, TL074	54-132
R76	MF, $1/4W$ , 1%, 1.21 k $\Omega$	110-1.21k-1	U3	Quad Analog Switch, LF13201	54-20
R77	MF, $1/4W$ , 1%, 17.8 k $\Omega$	110-17.8k-1	U4	Op-Amp, OP05	5 <del>4</del> -87
R78	MF, $1/4W$ , 1%, $511\Omega$	110-511-1	U5	2k x 8 EPROM	Not Field-
R79	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1			Replaceable
R80	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1	U7	Dual Analog Switch, DG200	50-DG200BA
R81	MF, $1/4W$ , 1%, 110 k $\Omega$	110-110k-1	U8	Dual Op-Amp, TL072	54-53
R82	MF, $1/4W$ , $1\%$ , $2 k\Omega$	110-2k-1	U9	Quad Volt Comparator, MC3302P	54-MC3302P
R83	MF, $1/4W$ , 1%, 5.11 k $\Omega$	110-5.11k-1	U10	Input NAND Gate, 74LS10	54-42
R84	MF, $1/4W$ , 1%, 1 M $\Omega$	110-1M-1			
R85	MF, $1/4W$ , 1%, $100 \text{ k}\Omega$	110-100k-1		MISCELLANEOUS	
R86	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1		MISCELLINIVEOUS	
R87	MF, $1/4W$ , 1%, 5.11 k $\Omega$	110-5.11k-1	REF.		WILTRON
R88	Variable, 1-Turn, 20Ω	156-20	DES.	DESCRIPTION	PART NO.
R89	MF, $1/4W$ , $1\%$ , $14.7 k\Omega$	110-14.7k-1	<i>D</i> <b>D D</b> .	DEBORM HOW	111111 1101
R91	MF, $1/4W$ , $1\%$ , $20 \text{ k}\Omega$	110-20k-1		Ejector, P.C. Board	553-96
R92	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1	TP1	Djector, 1.c. Dourd	333 70
R93	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1	thru		
R94	MF, $1/4W$ , 1%, 5.11 k $\Omega$	110-5.11k-1	TP5	Pin, Test Point	706-44
R95	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$	110-5.11k-1	K1	Relay, 2 Form C	690-28
R96	MF, $1/4$ W, $1\%$ , $1 \text{ k}\Omega$	110-1k-1		Socket, I.C., 24-Pin	553-67
	, -, -, -, -, -, -, -, -, -, -, -, -	110 IK I		bocker, 1.O., Lan III	333-01

Table 6-8. A6 HET/YIG Driver, 2-8 GHz, 6621A/6637A/6638A/6647A/6648A (660-D-8007-3, -5, -99-91)

REF.	CAPACITORS	WII TOON		DIODES	
DES.	DESCRIPTION	WILTRON PART NO.	REF. DES.	DESCRIPTION	WILTRON PART NO.
C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14	Monolithic, .1 μF Monolithic, .1 μF Tantalum, 35V, 6.8 μF Monolithic, .1 μF Tantalum, 35V, 6.8 μF Monolithic, .1 μF Tantalum, 35V, 6.8 μF Monolithic, .1 μF Ceramic, .01 μF Ceramic, .001 μF Tantalum, 1 μF, 35V Tantalum, 1 μF, 35V Monolithic, 1 μF Monolithic, .1 μF	230-37 230-37 250-41 230-37 250-41 230-37 250-41 230-37 230-11 230-30 250-19 250-19 230-41 230-37	CR1 CR2 CR3 CR4 CR5 CR6 CR7 CR8 CR9 CR10	Silicon, 1N4446 Silicon, 1N4446 Silicon, 1N4446 Silicon, SI2 Zener, 24V, 1W, 1N4749A Silicon, 1N4446 Silicon, 1N4446 Zener, 6.8V, 1W, 1N4736A Silicon, 1N4446 Silicon, 1N4446 Silicon, 1N4446 Silicon, 1N4446	10-1N4446 10-1N4446 10-SI2 10-1N4749A 10-1N4446 10-1N4446 10-1N4736A 10-1N4446 10-1N4446 10-1N4446
C15 C16 C18 C19 C21 C22 C23 C24 C25	Mica, 300 pF Tantalum, 35V, 6.8 µF Ceramic, .01 µF Tantalum, 35V, 6.8 µF Mica, 8.2 pF Mica, 820 pF Ceramic, .01 µF Ceramic, .01 µF	220-300 250-41 230-11 250-41 221-8.2 220-820 230-11 230-11	REF. DES. Q1 Q2 Q3 Q4 Q5 Q6	DESCRIPTION  PNP, MPSA92 PNP, MPSA92 PNP, 2N2907 A NPN, 2N2222A PNP, 2N2907 A NPN, 2N3694	WILTRON PART NO. 20-MPSA92 20-MPSA92 20-2N2907 A 20-2N2222A 20-2N2907 A 20-2N3694

Q7	NPN, MPSU04	20-MPSU04	R52	MF, 1/4W, 1%, 750 kΩ	110-750k-1
Q8 Q9	PNP, 2N2907A NPN, 2N2222A	20-2N2907A 20-2N2222A	R53 R54	MF, $1/4$ W, $1\%$ , $14.7 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-14.7k-1 110-10k-1
Q 7	WI W, BIVEBEEN	BO-ENGEGER	R55	MF, $1/4$ W, $1\%$ , $750$ kΩ	110-750k-1
			R56	MF, $1/4W$ , 1%, 14.7 k $\Omega$	110-14.7k-1
	RESISTORS		R57 1	MF, $1/4$ W, $1\%$ , $2.74$ k $\Omega$	110-2.74k-1
REF.		WITT TTO N	R57 <sup>2</sup>	MF, 1/4W, 1%, 3.16k	110-3.16k-1
DES.	DESCRIPTION	WILTRON PART NO.	R57 <sup>3</sup>	MF, 1/4W, 1%, 2.74k	110-2.74k-1
DEO.	DESCRITION	TAKT NO.	R58 R59	Variable, 10-Turn, $500\Omega$ MF, $1/4$ W, $1\%$ , $2 k\Omega$	157-500 110-2k-1
R1	Variable, 1-Turn, 20 k $\Omega$	156-20k	R60	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-2k-1 110-10k-1
R2	MF, $1/4W$ , $1\%$ , $61.9 k\Omega$	110-61.9k-1	R61	MF, $1/4W$ , 1%, 750 k $\Omega$	110-750k-1
R3	Variable, 10-Turn 1 k $\Omega$	157-1k	R62	MF, $1/4W$ , 1%, 14.7 k $\Omega$	110-14.7k-1
R4	MF, $1/4$ W, $1\%$ , $11 \text{ k}\Omega$	110-11k-1	R63 1	MF, $1/4W$ , $1\%$ , $18.2 \text{ k}\Omega$	110-18.2k-1
R5	MF, 1/4W, 1%, 5.11 kΩ	110-5.11k-1	R63 <sup>2</sup>	MF, 1/4W, 1%, 20k	110-20k-1
R6 R7	CC, $1/4$ W, 5%, 3.6 M $\Omega$ Variable, 10-Turn, 1 k $\Omega$	101-3.6M-5 157-1k	R64	MF, $1/4$ W, $1\%$ , $2 k\Omega$	110-2k-1
R8	MF, $1/4$ W, $1\%$ , $11 \text{ k}\Omega$	110-11k-1	R65	Variable, 10-Turn, 500Ω	157-500
R9	Variable, 10-Turn, 200 k $\Omega$	157-200k	R66 R67	Variable, 1-Turn, 500 k $\Omega$ MF, 1/4W, 1%, 20 k $\Omega$	156-500k 110-20k-1
R10	MF, $1/4W$ , $1\%$ , $205 k\Omega$	110-205k-1	R68	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-20k-1 110-10k-1
R11	MF, 1/4W, 1%, 100 kΩ	110-100k-1	R69	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
R12	Variable, 10-Turn, 20 k $\Omega$	157-20k	R70	MF, $1/4W$ , $1\%$ , $15 k\Omega$	110-15k-1
R13	MF, $1/4$ W, $1\%$ , $75 k\Omega$	110-75k-1	R71	MF, $1/4W$ , $1\%$ , $1.30 \text{ k}\Omega$	110-1.30k-1
R14 <sup>1</sup> R14 <sup>2</sup>	MF, 1/4W, 1%, 9.76 kΩ	110-9.76k-1	R72	MF, $1/4W$ , $1\%$ , $8.87 \text{ k}\Omega$	110-8.87k-1
R143	MF, 1/4W, 1%, 10.2k MF, 1/4W, 1%, 6.65k	110-10.2k-1 110-6.65k-1	R73	MF, 1/4W, 1%, 3.40 kΩ	110-3.40k-1
R15	WW, 5W, 5Ω	131-3	R74 R75	MF, $1/4$ W, $1\%$ , $5.11$ k $\Omega$ MF, $1/4$ W, $1\%$ , $301$ $\Omega$	110-5.11k-1 110-301-1
R16	MF, $1/4$ W, $1\%$ , $100$ kΩ	110-100k-1	R76	MF, $1/4W$ , $1\%$ , $1.21 \text{ k}\Omega$	110-1.21k-1
R171	MF, $1/4W$ , $1\%$ , $3.24 \text{ k}\Omega$	110-3.24k-1	R77	MF, $1/4W$ , $1\%$ , $17.8 \text{ k}\Omega$	110-17.8k-1
R17 <sup>2</sup>	MF, 1/4W, 1%, 3.16k	110-3.16k-1	R78	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
R17 <sup>3</sup>	MF, 1/4W, 1%, 3.24k	110-3.24k-1	R79	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
R18 R19	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ	110-10k-1 110-10k-1	R80	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R20	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1 110-10k-1	R81	MF, 1/4W, 1%, 205 kΩ	110-205k-1
R21	MF, $1/4W$ , $1\%$ , $23.7 \text{ k}\Omega$	110-23.7k-1	R82 R83	MF, $1/4$ W, $1\%$ , $2 k\Omega$ MF, $1/4$ W, $1\%$ , $5.11 k\Omega$	110-2k-1 110-5.11k-1
R22	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1	R84	MF, $1/4W$ , $1/6$ , $3.11$ RM MF, $1/4W$ , $1\%$ , $1$ M $\Omega$	110-1M-1
R23	MF, $1/4W$ , $1\%$ , $121\Omega$	110-121-1	R85	Variable, 1-Turn, 100k	156-100k
R24	MF, $1/4$ W, $1\%$ , $1 \text{ k}\Omega$	110-1k-1	R86	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1
R25	MF, $1/4W$ , $1\%$ , $7.5 k\Omega$	110-7.5k-1	R87	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$	110-5.11k-1
R26 R27	MF, $1/4W$ , $1\%$ , $5.11\Omega$ MF, $1/4W$ , $1\%$ , $5.11 k\Omega$	110-5.11-1 110-5.11k-1	R88	Variable, 1-Turn, 20Ω	156-20
R28	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1	R89 R90	MF, 1/4W, 1%, 15 kΩ	110-15k-1
R291	MF, $1/4W$ , 1%, 536 k $\Omega$	110-536k-1	R90 3	MF, 1/4W, 1%, 33.2 kΩ MF, 1/4W, 1%, 31.6k	110-33.2k-1 110-31.6k-1
R29 <sup>2</sup>	MF, $1/4W$ , $1\%$ , $526\Omega$	110-526-1	R91	MF, $1/4W$ , $1\%$ , $33.2 k\Omega$	110-33.2k-1
R30	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1	R91 <sup>3</sup>	MF, 1/4W, 1%, 20k	110-20k-1
R31	MF, $1/4$ W, $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1	R92	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
R32	MF, 1/4W, 1%, 18.7 kΩ	110-18.7k-1	R93	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
R33 R34	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ	110-18.7k-1 110-18.7k-1	R94	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$	110-5.11k-1
R35 <sup>1</sup>	MF, $1/4W$ , $1\%$ , $536 k\Omega$	110-13.1k-1 110-536k-1	R95 R96	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $1 \text{ k}\Omega$	110-5.11k-1
R35 <sup>2</sup>	MF, $1/4W$ , 1%, $526\Omega$	110-526-1	R97	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 15 kΩ	110-1k-1 110-15k-1
R36	Variable, 10-Turn, 2 k $\Omega$	157-2k	R98	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
R37	MF, $1/4W$ , $1\%$ , $20 k\Omega$	110-20k-1	R99	MF, $1/4W$ , $1\%$ , $750 \text{ k}\Omega$	110-750k-1
R38	Variable, 10-Turn, 50 k $\Omega$	157-50k	R100	MF, $1/4$ W, $1\%$ , $14.7$ k $\Omega$	110-14.7k-1
R39 R40	MF, $1/4$ W, $1\%$ , $205 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $75 \text{ k}\Omega$	110-205k-1 110-75k-1			
R41	MF, $1/4W$ , $1\%$ , $73KM$ MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-73k-1 110-10k-1		INTEGRATED CIRCUITS	
R42	MF, $1/4W$ , 1%, 15 k $\Omega$	110-15k-1		INTEGRATED CIRCUITS	
R43	MF, $1/4W$ , $1\%$ , $11 k\Omega$	110-11k-1	REF.		WILTRON
R44	MF, $1/4W$ , $1\%$ , $3.24 \text{ k}\Omega$	110-3.24k-1	DES.	DESCRIPTION	PART NO.
R45	MF, $1/4$ W, $1\%$ , $3.24 \text{ k}\Omega$	110-3.24k-1			
R46	MF, $1/4$ W, $1\%$ , $1 k\Omega$	110-1k-1 110-511-1	U1	Quad EX-OR Gate, 74LS86	54-125
R47 R48	MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $5.11\Omega$	110-511-1 110-5.11-1	U2	Quad Op Amp, TL074	54-132 54-20
R49	MF, $1/4W$ , $1/6$ , $5.11\%$ MF, $1/4W$ , $1\%$ , $5.11\%$	110-5.11-1	U3 U4	Quad Analog Switch, LF13201 Op-Amp, OP05	54-20 54-87
R50	MF, $1/4W$ , 1%, $2.74 \text{ k}\Omega$	110-2.74k-1	U5	2k x 8 EPROM, 2716	Not Field-
R51	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1	-	,	Replaceable
-			U7	Dual Analog Switch, DG200	50-DG200BA
<sup>1</sup> Used	on 660-D-8007-3 assembly.		U8	Dual Op-Amp, TL072	54-53
Used 6	on 660-D-8007-5 assembly.		U9 U10	Quad Volt Comparator, MC3302P	54-MC3302P
⁻ Used	on 660-D-8007-99-91 assembly.		010	Input NAND Gate, 74LS10	54-42

MISCELLANEOUS			TP1			
REF.		WITH TED ON	thru			
DES.	DESCRIPTION	WILTRON	TP5	Pin, Test Point	706-44	
DEG.	DESCRIPTION	PART NO.	K1	Relay, 2 Form C	690-28	
	Ejector, P.C. Board	553-96		Socket, I.C., 24-Pin	553-67	

Table 6-9. A6 YIG Driver, 2-8 GHz, 6621A-40/6637A-40 (660-D-12868-3, -99-91)

	CAPACITORS		Q8	PNP, 2N2907A	20-2N2907A
REF.		WILTRON	Q9	NPN, 2N2222A	20-2N2222A
DES.	DESCRIPTION	PART NO.		RESISTORS	
C1	Monolithic, .1 μF	230-37	D.E.E.		
C2	Monolithic, .1 μF	230-37	REF. DES.	DESCRIPTION	WILTRON
C3	Tantalum, 35V, 6.8 μF	250-41	DES.	DESCRIPTION	PART NO.
C4 C5	Monolithic, .1 µF	230-37	R1	Variable, 1-Turn, 20 k $\Omega$	156-20k
C6	Tantalum, 35V, 6.8 μF	250-41	R2	MF, $1/4$ W, 1%, 61.9 k $\Omega$	110-61.9k-1
C7	Monolithic, .1 μF Tantalum, 35V, 6.8 μF	230-37	R3	Variable, 10-Turn, 1 k $\Omega$	157-1k
C8	Monolithic, .1 μF	250-41 230-37	R4	MF, $1/4$ W, $1\%$ , $11$ k $\Omega$	110-11k-1
C9	Ceramic, .01 μF	230-37	R5.	MF, $1/4W$ , $1\%$ , $50 k\Omega$	110-50k-1
C10	Ceramic, .001 µF	230-30	R6	CC, $1/4W$ , 5%, 3.6 M $\Omega$	101-3.6M-5
C11	Tantalum, 1 µF, 35V	250-19	R7	Variable, 10-Turn, 1 kΩ	157-1k
C12	Tantalum, 1 µF, 35V	250-19	R8	MF, $1/4$ W, $1\%$ , $11$ kΩ	110-11k-1
C13	Monolithic, 1 µF	230-41	R9	Variable, 10-Turn, 200 k $\Omega$	157-200k
C14	Monolithic, .1 µF	230-37	R10	MF, $1/4W$ , $1\%$ , $205 k\Omega$	110-205k-1
C15	Mica, 300 pF	220-300	R11	MF, $1/4W$ , $1\%$ , $100 k\Omega$	110-100k-1
C16	Tantalum, 35V, 6.8 μF	250-41	R12	Variable, 10-Turn, 20 k $\Omega$	157-20k
C17	Ceramic, .001 µF	230-30	R13	MF, $1/4$ W, $1\%$ , $75$ kΩ	110-75k-1
C18	Ceramic, .01 µF	230-11	R14	MF, $1/4$ W, $1\%$ , $9.76$ kΩ	110-9.76k-1
C19	Tantalum, 35V, 6.8 µF	250-41	R14 <sup>1</sup>	MF, 1/4W, 1%, 6.65k	110-6.65k-1
C21	Mica, 8.2 pF	221-8.2	R15	WW, 5W, 5Ω	131-3
C22	Mica, 820 pF	220-820	R16	MF, $1/4$ W, $1\%$ , $100$ kΩ	110-100k-1
C 23	Ceramic, .01 μF	230-11	R17	MF, $1/4$ W, $1\%$ , $3.24$ kΩ	110-3.24k-1
C24	Ceramic, .01 μF	230-11	R18	MF, 1/4W, 1%, 10 kΩ	110-10k-1
C25	Ceramic, .01 μF	230-11	R19	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
C26	Monolithic, .1 μF	230-37	R20	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
			R21 R22	MF, 1/4W, 1%, 23.7 kΩ	110-23.7k-1
	DIODES		R23	MF, $1/4$ W, $1\%$ , $1 k\Omega$ MF, $1/4$ W, $1\%$ , $121\Omega$	110-1k-1
REF.		WILTRON	R24	MF, $1/4W$ , $1\%$ , $121M$ MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-121-1 110-1k-1
DES.	DESCRIPTION	PART NO.	R25	MF, $1/4W$ , $1\%$ , $7.5 k\Omega$	110-1k-1 110-7.5k-1
		1111111101	R26	MF, $1/4W$ , $1\%$ , $7.5 \text{ KM}$ MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-7.58-1
CR1	Silicon, 1N4446	10-1N4446	R27	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$	110-5.11k-1
CR2	Silicon, 1N4446	10-1N4446	R28	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1
CR3	Silicon, 1N4446	10-1N4446	R29	MF, $1/4W$ , $1\%$ , 536 k $\Omega$	110-536k-1
CR4	Silicon, SI2	10-SI2	R30	MF, $1/4$ W, 1%, 18.7 k $\Omega$	110-18.7k-1
CR5	Zener, 24V, 1W, 1N4749A	10-1N4749A	R31	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1
CR6	Silicon, 1N4446	10-1N4446	R32	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1
CR7	Silicon, 1N4446	10-1N4446	R33	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1
CR8	Zener, 6.8V, 1W, 1N4736A	10-1N4736A	R34	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1
CR9	Silicon, 1N4446	10-1N4446	R35	MF, $1/4W$ , $1\%$ , $536 k\Omega$	110-536k-1
CR10	Silicon, 1N4446	10-1N4446	R36	Variable, 10-Turn, 2 k $\Omega$	110-2k-1
CR11	Silicon, 1N4446	10-1N4446	R37	MF, $1/4W$ , $1\%$ , $20 k\Omega$	110-20k-1
	mp A Maramo p a		R38	Variable, 10-Turn, 50 k $\Omega$	110-50k-1
	TRANSISTORS		R39	MF, $1/4W$ , $1\%$ , $205 k\Omega$	110-205k-1
REF.		WILTRON	R40	MF, $1/4W$ , $1\%$ , $75 k\Omega$	110-75k-1
DES.	DESCRIPTION	PART NO.	R41	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
			R42	MF, $1/4W$ , $1\%$ , $9.53 \text{ k}\Omega$	110-9.53k-1
Q1	PNP, MPSA92	20-MPSA92	R43	MF, $1/4W$ , $1\%$ , $11 k\Omega$	110-11k-1
Q2	PNP, MPSA92	20-MPSA92	R44	MF, $1/4$ W, $1\%$ , $3.24$ kΩ	110-3.24k-1
Q3	PNP, 2N2907A	20-2N2907A	R45	MF, 1/4W, 1%, 3.24 kΩ	110-3.24k-1
Q4	NPN, 2N2222A	20-2N2222A	R46	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1
Q5	PNP, 2N2907A	20-2N2907A	R47	MF, $1/4$ W, $1\%$ , $511\Omega$	110-511-1
Q6	NPN, 2N3694	20-2N3694	R48	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1
Q7	NPN, MPSU04	20-MPSU04	R49	MF, 1/4W, 1%, 5.11Ω	110-5.11-1
l Hood a	on 660-D-12868-99-91		R50 R51	MF, 1/4W, 1%, 2.74 kΩ MF, 1/4W, 1%, 10 kΩ	110-2.74k-1
o sea o	11 000-D-15000-33-31		L LC 2 I	1v11' , 1/ T vv , 1/0, 10 K34	110-10k-1

R57	R52 R53 R54 R55 R56	MF, $1/4$ W, $1\%$ , $750$ k $\Omega$ MF, $1/4$ W, $1\%$ , $14.7$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $750$ k $\Omega$ MF, $1/4$ W, $1\%$ , $750$ k $\Omega$	110-750k-1 110-14.7k-1 110-10k-1 110-750k-1 110-14.7k-1	R88 R89 R90 R90 <sup>1</sup> R91	Variable, 1-Turn 20Ω MF, 1/4W, 1%, 15k MF, 1/4W, 1%, 33.2 kΩ MF, 1/4W, 1%, 31.6 kΩ MF, 1/4W, 1%, 33.2 kΩ	156-20 110-15k-1 110-33.2k-1 110-31.6k-1 110-33.2k-1
R59         MF, 1/4W, 1%, 2 kΩ         110-2k-1         R93         MF, 1/4W, 1%, 1%, 10 kΩ         110-51-1           R60         MF, 1/4W, 1%, 10 kΩ         110-10k-1         R94         Variable, 10-Turn, 20 kΩ         157-20k           R61         MF, 1/4W, 1%, 750 kΩ         110-750k-1         R95         MF, 1/4W, 1%, 511Ω         110-511-1           R62         MF, 1/4W, 1%, 14.7 kΩ         110-14.7k-1         R96         MF, 1/4W, 1%, 10 kΩ         110-10k-1           R63         MF, 1/4W, 1%, 14.7 kΩ         110-18.2k-1         R97         MF, 1/4W, 1%, 10 kΩ         110-10k-1           R64         MF, 1/4W, 1%, 2 kΩ         110-2k-1         R96         MF, 1/4W, 1%, 750 kΩ         110-750k-1           R65         Variable, 10-Turn, 500Ω         157-500         R98         MF, 1/4W, 1%, 14.7 kΩ         110-14.7k-1           R66         Variable, 10-Turn, 500 kΩ         156-500k         INTEGRATED CIRCUITS         WILTRON           R67         MF, 1/4W, 1%, 10 kΩ         110-10k-1         REF.         WILTRON           R68         MF, 1/4W, 1%, 10 kΩ         110-10k-1         REF.         DESCRIPTION         PART NO.           R71         MF, 1/4W, 1%, 13.0 kΩ         110-130k-1         U4         Op-Amp, OP05         54-87           <		, , , ,				
R60         MF, 1/4W, 1%, 10 kΩ         110-10k-1         R94         Variable, 10-Turn, 20 kΩ         157-20k           R61         MF, 1/4W, 1%, 750 kΩ         110-750k-1         R95         MF, 1/4W, 1%, 5, 11Ω         110-5.11-1           R62         MF, 1/4W, 1%, 18.2 kΩ         110-14.7k-1         R96         MF, 1/4W, 1%, 10 kΩ         110-10k-1           R63         MF, 1/4W, 1%, 18.2 kΩ         110-12k-1         R96         MF, 1/4W, 1%, 750 kΩ         110-750k-1           R64         MF, 1/4W, 1%, 2 kΩ         110-2k-1         R98         MF, 1/4W, 1%, 750 kΩ         110-750k-1           R65         Variable, 10-Turn, 500 Ω         157-500         R98         MF, 1/4W, 1%, 14.7 kΩ         110-14.7k-1           R66         Variable, 10-Turn, 500 Ω         157-500         R98         MF, 1/4W, 1%, 14.7 kΩ         110-14.7k-1           R66         Variable, 1-Turn, 500 Ω         157-500         R98         MF, 1/4W, 1%, 14.7 kΩ         110-14.7k-1           R67         MF, 1/4W, 1%, 10 kΩ         110-20k-1         REF.         REF.         WILTRON           R68         MF, 1/4W, 1%, 15 kΩ         110-10k-1         DES.         DESCRIPTION         Not Field-Replaceable           R71         MF, 1/4W, 1%, 15, 11 kΩ         110-30k-1         U8 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td></t<>						
R61         MF, 1/4W, 1%, 750 kΩ $110-750k-1$ R95         MF, 1/4W, 1%, 5.11Ω $110-5.11-1$ R62         MF, 1/4W, 1%, 14.7 kΩ $110-14.7k-1$ R96         MF, 1/4W, 1%, 18.2 kΩ $110-10k-1$ R63         MF, 1/4W, 1%, 18.2 kΩ $110-18.2k-1$ R96         MF, 1/4W, 1%, 750 kΩ $110-10k-1$ R64         MF, 1/4W, 1%, 2 kΩ $110-2k-1$ R98         MF, 1/4W, 1%, 750 kΩ $110-750k-1$ R65         Variable, 1-Turn, 500 kΩ $156-500k$ R98         MF, 1/4W, 1%, 14.7 kΩ $110-14.7k-1$ R66         Variable, 1-Turn, 500 kΩ $156-500k$ INTEGRATED CIRCUITS           R67         MF, 1/4W, 1%, 10 kΩ $110-20k-1$ REF.           R68         MF, 1/4W, 1%, 10 kΩ $110-10k-1$ REF.           R70         MF, 1/4W, 1%, 130 kΩ $110-10k-1$ DES.         DESCRIPTION         PART NO.           R71         MF, 1/4W, 1%, 130 kΩ $110-130k-1$ U4         Op-Amp, OP05         54-87           R72         MF, 1/4W, 1%, 301Ω $110-3.40k-1$ U5 $2k \times 8$ EPROM         Not Field-Replaceable           R74         MF, 1/4W, 1%, 511Ω $110-3.40k-$						
R62         MF, 1/4W, 1%, 14.7 kΩ         110-14.7k-1         R96         MF, 1/4W, 1%, 10 kΩ         110-10k-1           R63         MF, 1/4W, 1%, 18.2 kΩ         110-18.2k-1         R97         MF, 1/4W, 1%, 15 kΩ         110-750k-1           R64         MF, 1/4W, 1%, 2 kΩ         110-2k-1         R98         MF, 1/4W, 1%, 15 kΩ         110-750k-1           R65         Variable, 10-Turn, 500 kΩ         156-500k         R98         MF, 1/4W, 1%, 14.7 kΩ         110-14.7k-1           R66         Variable, 1-Turn, 500 kΩ         156-500k         INTEGRATED CIRCUITS         WILTRON           R68         MF, 1/4W, 1%, 10 kΩ         110-10k-1         REF.         WILTRON           R69         MF, 1/4W, 1%, 15 kΩ         110-10k-1         REF.         WILTRON           R70         MF, 1/4W, 1%, 15 kΩ         110-130k-1         DES.         DESCRIPTION         PART NO.           R71         MF, 1/4W, 1%, 130 kΩ         110-130k-1         U4         Op-Amp, OP05         54-87           R72         MF, 1/4W, 1%, 88 r kΩ         110-8.87k-1         U5         2k x 8 EPROM         Not Field-Replaceable           R73         MF, 1/4W, 1%, 511 kΩ         110-3.40k-1         U8         Dual Op-Amp, TL072         54-53           R75         MF, 1/4W, 1					* *	
R63         MF, 1/4W, 1%, 18.2 kΩ         110-18.2k-1         R97         MF, 1/4W, 1%, 750 kΩ         110-750k-1           R64         MF, 1/4W, 1%, 2 kΩ         110-2k-1         R98         MF, 1/4W, 1%, 750 kΩ         110-750k-1           R65         Variable, 10-Turn, 500 kΩ         157-500         INTEGRATED CIRCUITS           R66         Variable, 1-Turn, 500 kΩ         156-500k         INTEGRATED CIRCUITS           R67         MF, 1/4W, 1%, 10 kΩ         110-10k-1         REF.           R68         MF, 1/4W, 1%, 10 kΩ         110-10k-1         DES.           R70         MF, 1/4W, 1%, 10 kΩ         110-10k-1         DES.           R71         MF, 1/4W, 1%, 1.30 kΩ         110-130k-1         U4         Op-Amp, OP05         54-87           R72         MF, 1/4W, 1%, 1.30 kΩ         110-3.40k-1         U5         2k x 8 EPROM         Not Field-Replaceable           R74         MF, 1/4W, 1%, 3.40 kΩ         110-5.11k-1         U8         Dual Op-Amp, TL072         54-53           R75         MF, 1/4W, 1%, 3.01 kΩ         110-5.11k-1         U10         Input NAND Gate, 74LS10         54-42           R76         MF, 1/4W, 1%, 18 kΩ         110-10k-1         REF.         MISCELLANEOUS           R78         MF, 1/4W, 1%, 10 kΩ         <						
R64         MF, $1/4W$ , $1\%$ , $2 k\Omega$ $110-2k-1$ R98         MF, $1/4W$ , $1\%$ , $14.7 k\Omega$ $110-14.7k-1$ R65         Variable, $10$ -Turn, $500 k\Omega$ $156-500k$ INTEGRATED CIRCUITS           R66         Variable, $1$ -Turn, $500 k\Omega$ $156-500k$ INTEGRATED CIRCUITS           R67         MF, $1/4W$ , $1\%$ , $20 k\Omega$ $110-20k-1$ REF.           R68         MF, $1/4W$ , $1\%$ , $10 k\Omega$ $110-10k-1$ DES.           R70         MF, $1/4W$ , $1\%$ , $1.30 k\Omega$ $110-15k-1$ DES.           R71         MF, $1/4W$ , $1\%$ , $1.30 k\Omega$ $110-15k-1$ U4         Op-Amp, OP05 $54-87$ R72         MF, $1/4W$ , $1\%$ , $5.11 k\Omega$ $110-3.40k-1$ U5 $2k \times 8$ EPROM         Not Field-Replaceable           R73         MF, $1/4W$ , $1\%$ , $5.11 k\Omega$ $110-301-1$ U10         Input NAND Gate, $74LS10$ $54-53$ R75         MF, $1/4W$ , $1\%$ , $5.11 k\Omega$ $110-17.8k-1$ U10         Input NAND Gate, $74LS10$ $54-42$ R76         MF, $1/4W$ , $1\%$ , $5.11 k\Omega$ $110-10k-1$ REF.         MISCELLANEOUS           R78         MF, $1/4W$ , $1\%$ , $5.0 k\Omega$ $110-10k-1$ REF.         DESCRIPTION						
R65         Variable, 10-Turn, 500 Ω         157-500         INTEGRATED CIRCUITS           R66         Variable, 1-Turn, 500 kΩ         156-500k         INTEGRATED CIRCUITS           R67         MF, 1/4W, 1%, 20 kΩ         110-20k-1         REF.           R68         MF, 1/4W, 1%, 10 kΩ         110-10k-1         DES.         DESCRIPTION         PART NO.           R70         MF, 1/4W, 1%, 15 kΩ         110-10k-1         DES.         DESCRIPTION         PART NO.           R71         MF, 1/4W, 1%, 13.0 kΩ         110-130k-1         U4         Op-Amp, OP05         54-87           R72         MF, 1/4W, 1%, 8.87 kΩ         110-8.87k-1         U5         2k x 8 EPROM         Not Field-Replaceable           R73         MF, 1/4W, 1%, 8.87 kΩ         110-3.40k-1         U8         Dual Op-Amp, TL072         54-87           R74         MF, 1/4W, 1%, 301Ω         110-3.01-1         U8         Dual Op-Amp, TL072         54-53           R75         MF, 1/4W, 1%, 10.21 kΩ         110-121k-1         U8         Dual Op-Amp, TL072         54-53           R75         MF, 1/4W, 1%, 10.8 kΩ         110-121k-1         U10         Input NAND Gate, 74LS10         54-42           R75         MF, 1/4W, 1%, 10 kΩ         110-10k-1         DES.         DESCRIPTION<			4			
R66         Variable, 1-Turn, 500 kΩ         156-500k         INTEGRATED CIRCUITS           R67         MF, 1/4W, 1%, 20 kΩ         110-20k-1         REF.         WILTRON           R68         MF, 1/4W, 1%, 10 kΩ         110-10k-1         REF.         DESCRIPTION         PART NO.           R69         MF, 1/4W, 1%, 10 kΩ         110-10k-1         DES.         DESCRIPTION         PART NO.           R70         MF, 1/4W, 1%, 130 kΩ         110-130k-1         U4         Op-Amp, OP05         54-87           R71         MF, 1/4W, 1%, 8.87 kΩ         110-8.87k-1         U5         2k x 8 EPROM         Not Field-Replaceable           R73         MF, 1/4W, 1%, 3.40 kΩ         110-3.40k-1         U8         Dual Op-Amp, TL072         54-53           R74         MF, 1/4W, 1%, 511 kΩ         110-3.40k-1         U10         Input NAND Gate, 74LS10         54-53           R75         MF, 1/4W, 1%, 501 kΩ         110-3.40k-1         U10         Input NAND Gate, 74LS10         54-42           R76         MF, 1/4W, 1%, 17.8 kΩ         110-12.1k-1         U10         Input NAND Gate, 74LS10         54-42           R77         MF, 1/4W, 1%, 511 kΩ         110-10k-1         REF.         MISCELLANEOUS           R80         MF, 1/4W, 1%, 20 kΩ         110-2k-				21,0	1111 9 17 177 9 1709 1 111 1100	110-14.1K-1
R67         MF, $1/4$ W, $1\%$ , $20$ kΩ $110-20k-1$ R68         MF, $1/4$ W, $1\%$ , $10$ kΩ $110-10k-1$ REF.         WILTRON           R69         MF, $1/4$ W, $1\%$ , $10$ kΩ $110-10k-1$ DES.         DESCRIPTION         PART NO.           R70         MF, $1/4$ W, $1\%$ , $1.30$ kΩ $110-1.30k-1$ U4         Op-Amp, OP05 $54-87$ R71         MF, $1/4$ W, $1\%$ , $8.87$ kΩ $110-8.87k-1$ U5 $2k$ x 8 EPROM         Not Field-Replaceable           R73         MF, $1/4$ W, $1\%$ , $3.40$ kΩ $110-3.40k-1$ U8         Dual Op-Amp, TL072 $54-53$ R74         MF, $1/4$ W, $1\%$ , $5.01$ kΩ $110-5.11k-1$ U8         Dual Op-Amp, TL072 $54-53$ R75         MF, $1/4$ W, $1\%$ , $301$ Ω $110-5.11k-1$ U10         Input NAND Gate, $74LS10$ $54-42$ R76         MF, $1/4$ W, $1\%$ , $17.8$ kΩ $110-121k-1$ $110-121k-1$ MISCELLANEOUS $110-1010k-1$	R66				INTEGRATED CIRCUITS	
R69         MF, 1/4W, 1%, 10 kΩ $110-10k-1$ DES.         DESCRIPTION         PART NO.           R70         MF, 1/4W, 1%, 15 kΩ $110-15k-1$ U4         Op-Amp, OP05 $54-87$ R71         MF, 1/4W, 1%, 1.30 kΩ $110-1.30k-1$ U4         Op-Amp, OP05 $54-87$ R72         MF, 1/4W, 1%, 3.40 kΩ $110-8.87k-1$ U5 $2k \times 8$ EPROM         Not Field-Replaceable           R73         MF, 1/4W, 1%, 3.40 kΩ $110-3.40k-1$ U8         Dual Op-Amp, TL072 $54-53$ R75         MF, 1/4W, 1%, 5.11 kΩ $110-5.11k-1$ U10         Input NAND Gate, 74LS10 $54-42$ R76         MF, 1/4W, 1%, 1.21 kΩ $110-1.21k-1$ U10         Input NAND Gate, 74LS10 $54-42$ R77         MF, 1/4W, 1%, 1.21 kΩ $110-1.21k-1$ MISCELLANEOUS $40-42$ R78         MF, 1/4W, 1%, 5.11Ω $110-5.11-1$ REF.         WILTRON           R80         MF, 1/4W, 1%, 5.0 kΩ $110-10k-1$ DES.         DESCRIPTION         PART NO.           R81         MF, 1/4W, 1%, 5.11 kΩ $110-205k-1$ $$ Ejector, P.C. Board $553-96$	R67	MF, $1/4W$ , $1\%$ , $20 k\Omega$	110-20k-1			
R70 MF, 1/4W, 1%, 15 kΩ 110-15k-1 R71 MF, 1/4W, 1%, 1.30 kΩ 110-1.30k-1 U4 Op-Amp, OP05 54-87 R72 MF, 1/4W, 1%, 8.87 kΩ 110-8.87k-1 U5 $2k \times 8$ EPROM Not Field-R73 MF, 1/4W, 1%, 5.11 kΩ 110-3.40k-1 R74 MF, 1/4W, 1%, 5.11 kΩ 110-5.11k-1 U8 Dual Op-Amp, TL072 54-53 R75 MF, 1/4W, 1%, 301Ω 110-301-1 U10 Input NAND Gate, 74LS10 54-42 R77 MF, 1/4W, 1%, 1.21 kΩ 110-12.81k-1 R77 MF, 1/4W, 1%, 17.8 kΩ 110-17.8k-1 R79 MF, 1/4W, 1%, 511Ω 110-511-1 R79 MF, 1/4W, 1%, 10 kΩ 110-10k-1 DES. DESCRIPTION PART NO. R80 MF, 1/4W, 1%, 10 kΩ 110-10k-1 DES. DESCRIPTION PART NO. R81 MF, 1/4W, 1%, 205 kΩ 110-205k-1 R82 MF, 1/4W, 1%, 2 kΩ 110-2k-1 TP1 R84 MF, 1/4W, 1%, 5.11 kΩ 110-1M-1 thru R85 Variable, 1-Turn, 100 kΩ 156-100k TP5 Pin, Test Point 706-44 R86 MF, 1/4W, 1%, 5.11 Ω 110-5.11-1 K1 Relay, 2 Form C 690-28	R68	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1	REF.		WILTRON
R71 MF, $1/4$ W, $1\%$ , $1.30$ kΩ $110-1.30$ k-1 U4 Op-Amp, OP05 54-87 R72 MF, $1/4$ W, $1\%$ , $8.87$ kΩ $110-8.87$ k-1 U5 $2$ k x 8 EPROM Not Field-R73 MF, $1/4$ W, $1\%$ , $3.40$ kΩ $110-3.40$ k-1 Replaceable R74 MF, $1/4$ W, $1\%$ , $5.11$ kΩ $110-5.11$ k-1 U8 Dual Op-Amp, TL072 54-53 R75 MF, $1/4$ W, $1\%$ , $301$ Ω $110-301-1$ U10 Input NAND Gate, 74LS10 54-42 R76 MF, $1/4$ W, $1\%$ , $17.8$ kΩ $110-1.21$ k-1 R77 MF, $1/4$ W, $1\%$ , $17.8$ kΩ $110-17.8$ k-1 R78 MF, $1/4$ W, $1\%$ , $17.8$ kΩ $110-10$ k-1 R80 MF, $1/4$ W, $1\%$ , $10$ kΩ $110-10$ k-1 R80 MF, $1/4$ W, $1\%$ , $10$ kΩ $110-10$ k-1 R81 MF, $1/4$ W, $1\%$ , $10$ kΩ $110-20$ k-1 R82 MF, $1/4$ W, $1\%$ , $2$ kΩ $110-20$ k-1 R84 MF, $1/4$ W, $1\%$ , $5.11$ kΩ $110-5.11$ k-1 TP1 R84 MF, $1/4$ W, $1\%$ , $5.11$ kΩ $110-1$ M-1 thru R85 Variable, $1-T$ urn, $100$ kΩ $156-100$ k TP5 Pin, Test Point $706-44$ R86 MF, $1/4$ W, $1\%$ , $5.11$ Ω $110-5.11-1$ K1 Relay, 2 Form C			110-10k-1	DES.	DESCRIPTION	PART NO.
R72 MF, 1/4W, 1%, 8.87 kΩ 110-8.87k-1		MF, $1/4W$ , $1\%$ , $15 k\Omega$	110-15k-1			
R73 MF, 1/4W, 1%, 3.40 kΩ 110-3.40k-1 Replaceable R74 MF, 1/4W, 1%, 5.11 kΩ 110-5.11k-1 U8 Dual Op-Amp, TL072 54-53 R75 MF, 1/4W, 1%, 301Ω 110-301-1 U10 Input NAND Gate, 74LS10 54-42 R76 MF, 1/4W, 1%, 1.21 kΩ 110-1.21k-1 R77 MF, 1/4W, 1%, 17.8 kΩ 110-17.8k-1 R78 MF, 1/4W, 1%, 511Ω 110-511-1 R79 MF, 1/4W, 1%, 10 kΩ 110-10k-1 R80 MF, 1/4W, 1%, 10 kΩ 110-10k-1 R81 MF, 1/4W, 1%, 205 kΩ 110-205k-1 R82 MF, 1/4W, 1%, 205 kΩ 110-205k-1 R82 MF, 1/4W, 1%, 5.11 kΩ 110-5.11k-1 TP1 R84 MF, 1/4W, 1%, 5.11 kΩ 110-1M-1 thru R85 Variable, 1-Turn, 100 kΩ 156-100k TP5 Pin, Test Point 706-44 R86 MF, 1/4W, 1%, 5.11 Ω 110-5.11-1 K1 Relay, 2 Form C 690-28			110-1.30k-1			
R74 MF, $1/4$ W, $1\%$ , $5.11$ kΩ $110-5.11$ k-1 U8 Dual Op-Amp, TL072 $54-53$ R75 MF, $1/4$ W, $1\%$ , $301$ Ω $110-301-1$ U10 Input NAND Gate, $74$ LS10 $54-42$ R76 MF, $1/4$ W, $1\%$ , $1.21$ kΩ $110-1.21$ k-1 R77 MF, $1/4$ W, $1\%$ , $1.21$ kΩ $110-1.21$ k-1 R78 MF, $1/4$ W, $1\%$ , $511$ Ω $110-511-1$ R79 MF, $1/4$ W, $1\%$ , $10$ kΩ $110-10$ k-1 R80 MF, $1/4$ W, $1\%$ , $10$ kΩ $110-10$ k-1 DES. DESCRIPTION PART NO. R81 MF, $1/4$ W, $1\%$ , $205$ kΩ $110-205$ k-1 R82 MF, $1/4$ W, $1\%$ , $205$ kΩ $110-205$ k-1 R83 MF, $1/4$ W, $1\%$ , $205$ kΩ $110-205$ k-1 TP1 R84 MF, $1/4$ W, $1\%$ , $5.11$ kΩ $110-5.11$ k-1 TP1 R85 Variable, $1-T$ urn, $100$ kΩ $156-100$ k TP5 Pin, Test Point $706-44$ R86 MF, $1/4$ W, $1\%$ , $5.11$ Ω $110-5.11-1$ K1 Relay, $2$ Form C				U5	2k x 8 EPROM	Not Field-
R75 MF, $1/4$ W, $1\%$ , $301Ω$ $110-301-1$ R76 MF, $1/4$ W, $1\%$ , $1.21 kΩ$ $110-1.21k-1$ R77 MF, $1/4$ W, $1\%$ , $1.21 kΩ$ $110-1.21k-1$ R78 MF, $1/4$ W, $1\%$ , $511Ω$ $110-511-1$ R79 MF, $1/4$ W, $1\%$ , $10 kΩ$ $110-10k-1$ REF. MISCELLANEOUS WILTRON PART NO. R81 MF, $1/4$ W, $1\%$ , $205 kΩ$ $110-205k-1$ R82 MF, $1/4$ W, $1\%$ , $205 kΩ$ $110-205k-1$ R83 MF, $1/4$ W, $1\%$ , $205 kΩ$ $110-205k-1$ R84 MF, $1/4$ W, $1\%$ , $5.11 kΩ$ $110-5.11k-1$ TP1 R84 MF, $1/4$ W, $1\%$ , $5.11 kΩ$ $110-10k-1$ thru R85 Variable, $1-T$ urn, $100 kΩ$ $156-100k$ TP5 Pin, Test Point $706-44$ R86 MF, $1/4$ W, $1\%$ , $5.11Ω$ $110-5.11-1$ K1 Relay, $2$ Form C			1			
R76 MF, $1/4$ W, $1\%$ , $1.21$ kΩ $110-1.21$ k-1 R77 MF, $1/4$ W, $1\%$ , $17.8$ kΩ $110-17.8$ k-1 R78 MF, $1/4$ W, $1\%$ , $511$ Ω $110-511-1$ R79 MF, $1/4$ W, $1\%$ , $10$ kΩ $110-10$ k-1 REF. DESCRIPTION PART NO. R80 MF, $1/4$ W, $1\%$ , $20$ kΩ $110-20$ 5k-1 R81 MF, $1/4$ W, $1\%$ , $20$ 5 kΩ $110-20$ 5k-1 R82 MF, $1/4$ W, $1\%$ , $20$ 5 kΩ $110-20$ 5k-1 R83 MF, $1/4$ W, $1\%$ , $20$ 5 kΩ $110-20$ 5k-1 TP1 R84 MF, $1/4$ W, $1\%$ , $5.11$ kΩ $110-1$ M-1 thru R85 Variable, $1-T$ urn, $100$ kΩ $156-100$ k TP5 Pin, Test Point $706-44$ R86 MF, $1/4$ W, $1\%$ , $5.11$ Ω $110-5.11$ -1 K1 Relay, $2$ Form C 690-28			•	-		
R77 MF, $1/4$ W, $1\%$ , $17.8$ kΩ $110-17.8$ K-1 R78 MF, $1/4$ W, $1\%$ , $511Ω$ $110-511-1$ R79 MF, $1/4$ W, $1\%$ , $10$ kΩ $110-10$ k-1 REF. WILTRON R80 MF, $1/4$ W, $1\%$ , $10$ kΩ $110-10$ k-1 DES. DESCRIPTION PART NO. R81 MF, $1/4$ W, $1\%$ , $205$ kΩ $110-205$ k-1 R82 MF, $1/4$ W, $1\%$ , $2$ kΩ $110-2$ k-1 — Ejector, P.C. Board 553-96 R83 MF, $1/4$ W, $1\%$ , $5.11$ kΩ $110-1$ M-1 TP1 R84 MF, $1/4$ W, $1\%$ , $1/4$ M, $1/4$				U10	Input NAND Gate, 74LS10	54-42
R78 MF, $1/4$ W, $1\%$ , $511$ Ω $110-511-1$ R79 MF, $1/4$ W, $1\%$ , $10$ kΩ $110-10$ k-1 REF. WILTRON R80 MF, $1/4$ W, $1\%$ , $10$ kΩ $110-10$ k-1 DES. DESCRIPTION PART NO. R81 MF, $1/4$ W, $1\%$ , $205$ kΩ $110-205$ k-1 R82 MF, $1/4$ W, $1\%$ , $2$ kΩ $110-2$ k-1 Ejector, P.C. Board $553-96$ R83 MF, $1/4$ W, $1\%$ , $5.11$ kΩ $110-5.11$ k-1 TP1 R84 MF, $1/4$ W, $1\%$ , $1$ MΩ $110-1$ M-1 thru R85 Variable, $1-T$ urn, $100$ kΩ $156-100$ k TP5 Pin, Test Point $706-44$ R86 MF, $1/4$ W, $1\%$ , $5.11$ Ω $110-5.11-1$ K1 Relay, $2$ Form C						
R79 MF, $1/4$ W, $1\%$ , $10$ kΩ $110-10$ k-1 R80 MF, $1/4$ W, $1\%$ , $10$ kΩ $110-10$ k-1 DES. DESCRIPTION PART NO. R81 MF, $1/4$ W, $1\%$ , $205$ kΩ $110-205$ k-1 R82 MF, $1/4$ W, $1\%$ , $2$ kΩ $110-2$ k-1 —— Ejector, P.C. Board 553-96 R83 MF, $1/4$ W, $1\%$ , $5.11$ kΩ $110-5.11$ k-1 TP1 R84 MF, $1/4$ W, $1\%$ , $1$ MΩ $110-1$ M-1 thru R85 Variable, $1-T$ urn, $100$ kΩ $156-100$ k TP5 Pin, Test Point 706-44 R86 MF, $1/4$ W, $1\%$ , $5.11$ Ω $110-5.11-1$ K1 Relay, $2$ Form C 690-28					MISCELLANEOUS	
R80 MF, $1/4$ W, $1\%$ , $10$ kΩ $110-10k-1$ DES. DESCRIPTION PART NO. R81 MF, $1/4$ W, $1\%$ , $205$ kΩ $110-205k-1$ R82 MF, $1/4$ W, $1\%$ , $2$ kΩ $110-2k-1$ — Ejector, P.C. Board 553-96 R83 MF, $1/4$ W, $1\%$ , $5.11$ kΩ $110-5.11k-1$ TP1 R84 MF, $1/4$ W, $1\%$ , $1$ MΩ $110-1$ M-1 thru R85 Variable, $1$ -Turn, $100$ kΩ $156-100$ k TP5 Pin, Test Point 706-44 R86 MF, $1/4$ W, $1\%$ , $5.11$ Ω $110-5.11-1$ K1 Relay, $2$ Form C 690-28				DEE		W
R81 MF, $1/4$ W, $1\%$ , $205 k\Omega$					DESCRIPTION	
R82 MF, $1/4$ W, $1\%$ , $2 k\Omega$				DES.	DESCRIPTION	PARI NO.
R83 MF, 1/4W, 1%, 5.11 kΩ 110-5.11k-1 TP1 R84 MF, 1/4W, 1%, 1 MΩ 110-1M-1 thru R85 Variable, 1-Turn, 100 kΩ 156-100k TP5 Pin, Test Point 706-44 R86 MF, 1/4W, 1%, 5.11Ω 110-5.11-1 K1 Relay, 2 Form C 690-28					Fiector P.C. Board	EE2 04
R84 MF, 1/4W, 1%, 1 MΩ 110-1M-1 thru R85 Variable, 1-Turn, 100 kΩ 156-100k TP5 Pin, Test Point 706-44 R86 MF, 1/4W, 1%, 5.11Ω 110-5.11-1 K1 Relay, 2 Form C 690-28					Ljector, 1.C. Doard	553-90
R85 Variable, 1-Turn, 100 kΩ 156-100k TP5 Pin, Test Point 706-44 R86 MF, 1/4W, 1%, 5.11Ω 110-5.11-1 K1 Relay, 2 Form C 690-28						
R86 MF, 1/4W, 1%, 5.11Ω 110-5.11-1 K1 Relay, 2 Form C 690-28	R85				Pin, Test Point	706-44
DOB 100 1100 100 1100 1100 1100 1100 1100	R86				•	
	R87	MF, $1/4W$ , $1\%$ , $5.11 k\Omega$			3 *	•

Table 6-10. A6 YIG Driver, 18-26.5 GHz, 6642A (660-D-8190-99-98)

	CAPACITORS			DIODES	
REF. DES.	DESCRIPTION	WILTRON PART NO.	REF. DES.	DESCRIPTION	WILTRON PART NO.
C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11	Tantalum, 4.7 μF Tantalum, 4.7 μF Tantalum, 4.7 μF Disc Ceramic, .01 μF Disc Ceramic, .001 μF Tantalum, 1 μF Tantalum, 1 μF Monolithic, 1.0 μF Mica, 300 pF Monolithic, .1 μF Tantalum, 6.8 μF Mica, 5 pF	250-39 250-39 250-39 230-11 230-30 250-19 250-19 230-41 220-300 230-37 250-41 220-5	CR1 CR2 CR3 CR4 CR5 CR6 CR7 CR8 CR9	Silicon, 1N4446 Silicon, 1N4446 Silicon, SI2 Zener, 24V, 1W, 1N4749A Silicon, SI2 Silicon, 1N4446 Silicon, 1N4446 Silicon, 1N4446 Zener, 10V, 0.4W, 1N758A Silicon, 1N4446	10-1N4446 10-1N4446 10-SI2 10-1N4749A 10-SI2 10-1N4446 10-1N4446 10-1N4446 10-1N758A 10-1N4446
C13 C14 C16	Monolithic, .1 μF Disc Ceramic, .01 μF Monolithic, .1 μF	230-37 230-11		TRANSISTORS	
C17 C18 C19	Disc Ceramic, .01 µF Disc Ceramic, .01 µF Disc Ceramic, .01 µF	230-37 230-11 230-11 230-11	REF. DES.	DESCRIPTION	WILTRON PART NO.
C20 C21	Mica, 820 pF Mica, 39 pF on 660-D-12868-99-91	220-820 220-39	Q1 Q2 Q3 Q4	PNP, MPSA92 PNP, MPSA92 NPN, 2N4249 NPN, MPSU55	20-MPSA92 20-MPSA92 20-2N4249 20-30

Q5	NPN, 2N2222A	20-2N2222A	R53	MF, $1/8W$ , $1\%$ , $1 k\Omega$	110-1k-1
Q6	PNP, 2N2907A	20-2N2907A	R54	MF, $1/8W$ , $1\%$ , $511\Omega$	110-511-1
Q7	NPN, 2N2222A	20-2N2222A	R55	CC, 1/2W, 5%, .5Ω	1025-5
Q8	NPN, 2N2222A	20-2N2222A	R56	$CC, 1/2W, 5\%, .5\Omega$	1025-5
<i>-</i>		Do DIVERDEN	R57		110-5.11-1
				MF, 1/8W, 1%, 5.11Ω	
	D Detemon a		R58	MF, $1/8$ W, $1\%$ , $5.11$ $\Omega$	110-5.11-1
	RESISTORS		R60	MF, $1/8W$ , $1\%$ , $2.15 k\Omega$	110-2.15k-1
REF.		WILTRON	R61	MF, $1/8W$ , $1\%$ , $511\Omega$	110-511-1
DES.	DESCRIPTION		R62	MF, $1/8W$ , $1\%$ , $511\Omega$	110-511-1
DES.	DESCRIPTION	PART NO.	R63	MF, $1/8W$ , $1\%$ , $10 k\Omega$	110-10k-1
D.1	CC 1/4W FM 22340	101 2 21/ 5	R64	MF, $1/8W$ , $1\%$ , $10 k\Omega$	110-10k-1
R1	CC, $1/4$ W, 5%, 3.3 M $\Omega$	101-3.3M-5	R65	MF, $1/8W$ , $1\%$ , $750 \text{ k}\Omega$	110-750k-1
R2	Variable, 10-Turn, 50 k $\Omega$	157-50k	R66	MF, $1/8W$ , $1\%$ , $14.7 k\Omega$	110-14.7k-1
R3	CC, $1/4W$ , $5\%$ , $3.6 M\Omega$	101-3.6M-5	R67	MF, $1/8W$ , $1\%$ , $5.11\Omega$	110-5.11-1
R4	MF, $1/8$ W, $1\%$ , $61.9$ k $\Omega$	110-61.9k-1	R68	Variable, 10-Turn, $500\Omega$	157-500
R5	Variable, 10-Turn, 1 kΩ	157-1k			
R6	MF, $1/8W$ , $1\%$ , $10 k\Omega$	110-10k-1	R69	MF, 1/8W, 1%, 2 kΩ	110-2k-1
R7	Variable, 10-Turn, 1 kΩ	157-1k	R70	MF, $1/8W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R8	MF, $1/8\dot{W}$ , $1\%$ , $10\dot{k}\Omega$	110-10k-1	R71	MF, $1/8$ W, $1\%$ , $750$ kΩ	110-750k-1
R9	Variable, 10-Turn, 200 k $\Omega$	157-200k	R72	MF, $1/8W$ , $1\%$ , $14.7 k\Omega$	110-14.7k-1
R10	MF, $1/8W$ , $1\%$ , $301 k\Omega$	110-301k-1	R73	MF, 1/8W, 1%, 10 kΩ	110-10k-1
R11	MF, $1/8W$ , $1\%$ , $6.19 \text{ k}\Omega$		R74	MF, $1/8W$ , $1\%$ , $10 k\Omega$	110-10k-1
		110-6.19k-1	R75	MF, $1/8W$ , $1\%$ , $205 k\Omega$	110-205k-1
R12	MF, 1/8W, 1%, 20 kΩ	110-20k-1	R76	MF, $1/8W$ , $1\%$ , $511\Omega$	110-511-1
R13	Variable, 1-Turn, 20 k $\Omega$	156-20k	R77	Variable, 1-Turn, 20Ω	156-20
R14	MF, $1/8W$ , $1\%$ , $2.61 \text{ k}\Omega$	110-2.61k-1	R78	MF, $1/8W$ , $1\%$ , $2 k\Omega$	110-2k-1
R15	MF, 1/8W, 1%, 10 kΩ	110-10k-1	R79		
R16	MF, 1/8W, 1%, 10 kΩ	110-10k-1		MF, 1/8W, 1%, 14.7 kΩ	110-14.7k-1
R17	MF, $1/8W$ , $1\%$ , $10 k\Omega$	110-10k-1	R80	MF, $1/8W$ , $1\%$ , $23.7 k\Omega$	110-23.7k-1
R18	MF, $1/8W$ , $1\%$ , $23.7 k\Omega$	110-23.7k-1	R81	MF, $1/8W$ , $1\%$ , $23.7 k\Omega$	110-23.7k-1
R19	MF, $1/8W$ , $1\%$ , $1 k\Omega$	110-1k-1	R82	MF, $1/8W$ , $1\%$ , $20 k\Omega$	110-20k-1
R20	MF, $1/8W$ , $1\%$ , $121\Omega$	110-121-1	R83	MF, $1/8$ W, $1\%$ , $20$ kΩ	110-20k-1
R21			R84	MF, $1/8W$ , $1\%$ , $5.11 k\Omega$	110-5.11k-1
	MF, 1/8W, 1%, 1 kΩ	110-1k-1	R85	MF, $1/8W$ , $1\%$ , $5.11 k\Omega$	110-5.11k-1
R22	MF, 1/8W, 1%, 7.5 kΩ	110-7.5k-1	R86	MF, $1/8W$ , $1\%$ , $511\Omega$	110-511-1
R23	MF, $1/8W$ , $1\%$ , $511\Omega$	110-511-1		, , , , , , , , , , , , , , , , , , , ,	
R24	MF, $1/8W$ , $1\%$ , $5.11 k\Omega$	110-5.11k-1			
R25	$\mathbf{W}\mathbf{W}$ , $5\mathbf{W}$ , $5\Omega$	131-3		DIMPOR A MITTO CITO CITO	
R26	MF, $1/8W$ , $1\%$ , $15.4 \text{ k}\Omega$	110-15.4k-1		INTEGRATED CIRCUITS	
R27	MF, $1/8W$ , $1\%$ , $649\Omega$	110-649-1			
R28	MF, $1/8W$ , $1\%$ , $6.19 k\Omega$	110-6.19k-1	REF.		WILTRON
R29	MF, $1/8W$ , $1\%$ , $1.37 k\Omega$	110-1.37k-1	DES.	DESCRIPTION	PART NO.
R30	MF, $1/8W$ , $1\%$ , $3.83 \text{ k}\Omega$	110-3.83k-1			
R31	MF, $1/8W$ , $1\%$ , $1 k\Omega$	110-1k-1	U1	Quad Analog Switch, LF13201	5 <b>4</b> -20
R32	MF, $1/8W$ , $1\%$ , $1.21 \text{ k}\Omega$	110-1.21k-1	U2	NAND Gate, 74LS10	54-42
R33	MF, $1/8W$ , $1\%$ , $17.8 \text{ k}\Omega$	110-17.8k-1	U3	Op Amp, OP05	54-87
R34	Variable, 1-Turn, 500 k $\Omega$	156-500k	U4	Dual Op Amp, TL072	54-53
R35			<b>U</b> 5	256 x 4 PROM,	Not Field-
	MF, $1/8$ W, $1\%$ , $49.9$ k $\Omega$	110-49.9k-1			Replaceable
R36	MF, $1/8W$ , $1\%$ , $5.11 k\Omega$	110-5.11k-1	7ט	Quad Op Amp, TL074	54-132
R37	MF, $1/8W$ , $1\%$ , $5.11 k\Omega$	110-5.11k-1	1		
R38	MF, $1/8W$ , $1\%$ , $18.7 k\Omega$	110-18.7k-1	U8	Quad Ex. OR Gate 74LS86	54-125
R39	MF, $1/8$ W, $1\%$ , $18.7$ k $Ω$	110-18.7k-1	U9	Dual Volt. Comp., LM393	54-158
R40	MF, $1/8$ W, $1\%$ , $10$ kΩ	110-10k-1			
R41	MF, $1/8W$ , $1\%$ , $133 k\Omega$	110-133k-1			
R42	Variable, 10-Turn, 50 k $\Omega$	157-50k		MISCELLANEOUS	
R43	MF, $1/8W$ , $1\%$ , $18.7 k\Omega$	110-18.7k-1		Action to the control of the control	
R44	MF, $1/8W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1	REF.		WILTRON
R45	MF, $1/8W$ , $1\%$ , $10.7 \text{ km}$ MF, $1/8W$ , $1\%$ , $10 \text{ k}\Omega$		DES.	DESCRIPTION	PART NO.
R46		110-10k-1	J 25.	DESCRIPTION	TART NO.
	MF, 1/8W, 1%, 14.7 kΩ	110-14.7k-1	1	First DC R : 1	552.0/
R47	Variable, 10-Turn, 1 kΩ	157-1k		Ejector, P.C. Board	553-96
R48	MF, $1/8$ W, $1\%$ , $11 k\Omega$	110-11k-1	TP1		
R49	MF, $1/8$ W, $1\%$ , $10$ kΩ	110-10k-1	thru		
R50	MF, $1/8$ W, $1\%$ , $511\Omega$	110-511-1	TP4	Pin, Test Point	706-44
R51	MF, $1/8W$ , $1\%$ , $4.99 k\Omega$	110-4.99k-1	K1	Relay, 2 Form C	690-28
R52	MF, $1/8W$ , $1\%$ , $3.83 \text{ k}\Omega$	110-3.83k-1		Socket, I.C., 24-Pin	553-67
			•		

	CAPACITORS			RESISTORS	
REF. DES.	DESCRIPTION	WILTRON PART NO.	REF. DES.	DESCRIPTION	WILTRON PART NO.
C1	Monolithic, .1 μF	230-37	R1	Variable, 1-Turn, 20 $k\Omega$	156-20K
C2	Monolithic, .1 μF	230-37	R2	MF, $1/4W$ , $1\%$ , $61.9 \text{ k}\Omega$	110-61.9k-1
C3	Tantalum, 35V, 6.8 μF	250-41	R3	Variable, 10-Turn, 1 kΩ	157-1k
C4	Monolithic, .1 μF	230-37	R4	MF, 1/4W, 1%, 11 kΩ	110-11k-1
C5	Tantalum, 35V, 6.8 μF	250-41	R5 R6	Variable, 10-Turn, 50 k $\Omega$ CC, 1/4W, 5%, 3.6 M $\Omega$	157-50k 101-3.6M-5
C6	Monolithic, .1 μF	230-37	R7	Variable, 10-Turn, 1 k $\Omega$	157-1k
C7	Tantalum, 35V, 6.8 μF	250-41	R8	MF, $1/4$ W, $1\%$ , $11 \text{ k}\Omega$	110-11k-1
C8	Monolithic, .1 μF	230-37	R9	Variable, 10-Turn, 200 k $\Omega$	157-200k
C9	Ceramic, .01 µF	230-11	R10	MF, $1/4W$ , $1\%$ , $205 k\Omega$	110-205k-1
C10	Ceramic, .001 µF	230-30	R11	MF, $1/4$ W, $1\%$ , $100$ kΩ	110-100k-1
C11 C12	Tantalum, 1 μF, 35V Tantalum, 1 μF, 35V	250-19 250-19	R12	Variable, 10-Turn, 20 k $\Omega$	157-20k
C12	Monolithic, 1 µF	230-19	R13	MF, $1/4W$ , $1\%$ , $110 k\Omega$	110-110k-1
C14	Monolithic, .1 μF	230-37	R14	MF, 1/4W, 1%, 14.0 kΩ	110-14.0k-1
C15	Mica, 300 pF	220-300	R15	WW, 5W, 5Ω	131-3
C16	Tantalum, 35V, 6.8 μF	250-41	R16 R17	MF, $1/4$ W, $1\%$ , $100 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $3.16 \text{ k}\Omega$	110-100k-1 110-3.16k-1
C17	Ceramic, .001 µF	230-30	R18	MF, $1/4W$ , $1\%$ , $3.10 \text{ km}$ MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-3.16k-1 110-10k-1
C18	Ceramic, .01 μF	230-11	R19	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
C19	Tantalum, 35V, 6.8 μF	250-41	R20	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
C21	Mica, 8.2 pF	221-8.2	R21	MF, $1/4W$ , $1\%$ , $23.7 k\Omega$	110-23.7k-1
C22 C23	Mica, 820 pF	220-820	R22	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1
C 24	Ceramic, .01 μF Ceramic, .01 μF	230-11 230-11	R23	MF, $1/4W$ , $1\%$ , $121\Omega$	110-121-1
C25	Ceramic, .01 µF	230-11	R24	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1
C26	Monolithic, .1µF	230-37	R25	MF, $1/4$ W, $1\%$ , $7.5$ kΩ	110-7.5k-1
		200 01	R26	MF, 1/4W, 1%, 5.11Ω	110-5.11-1
			R27	MF, 1/4W, 1%, 5.11 kΩ	110-5.11k-1
			R28 R29	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $536 \text{ k}\Omega$	110-18.7k-1 110-536k-1
	DIODES		R30	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-336k 1 110-18.7k-1
			R31	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1
REF.		WILTRON	R32	MF, $1/4W$ , $1\%$ , $18.7 k\Omega$	110-18.7k-1
DES.	DESCRIPTION	PART NO.	R33	MF, $1/4$ W, $1\%$ , $18.7$ kΩ	110-18.7k-1
			R34	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1
CR1	Silicon, 1N4446	10-1N4446	R35	MF, $1/4W$ , 1%, 536 k $\Omega$	110-536k-1
CR2	Silicon, 1N4446	10-1N4446	R36	Variable, 10-Turn, 2 kΩ	157-2k
CR3	Silicon, 1N4446	10-1N4446	R37	MF, 1/4W, 1%, 20 kΩ	110-20k-1
CR4 CR5	Silicon, SI2	10-SI2	R38 R39	Variable, 10-Turn, 50 k $\Omega$ MF, 1/4W, 1%, 205 k $\Omega$	157-50k 110-205k-1
CR6	Zener, 24V, 1W, 1N4749A Silicon, 1N4446	10-1N4749A 10-1N4446	R40	MF, $1/4W$ , $1\%$ , $75 k\Omega$	110-205k-1 110-75k-1
CR7	Silicon, 1N4446	10-1N4446 10-1N4446	R41	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
CR8	Zener, 6.8V, 1W, 1N4736A	10-1N4736A	R42	MF, $1/4W$ , 1%, 15 k $\Omega$	110-15k-1
CR9	Silicon, 1N4446	10-1N4446	R43	MF, $1/4W$ , 1%, 11 k $\Omega$	110-11k-1
CR10	Silicon, 1N4446	10-1N4446	R44	MF, $1/4W$ , $1\%$ , $3.24 k\Omega$	110-3.24k-1
CR11	Silicon, 1N4446	10-1N4446	R45	MF, $1/4W$ , $1\%$ , $3.24 \text{ k}\Omega$	110-3.24k-1
			R46	MF, $1/4$ W, $1\%$ , $1 \text{ k}\Omega$	110-1k-1
			R47	MF, $1/4$ W, $1\%$ , $511\Omega$	110-511-1
	TRANSISTORS		R48	MF, 1/4W, 1%, 5.11Ω	110-5.11-1
			R49 R50	MF, $1/4$ W, $1\%$ , $5.11\Omega$ MF, $1/4$ W, $1\%$ , $2.74$ k $\Omega$	110-5.11-1
REF.		WILTRON	R51	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-2.74k-1 110-10k-1
DES.	DESCRIPTION	PART NO.	R52	MF, $1/4$ W, $1\%$ , $750$ kΩ	110-750k-1
			R53	MF, $1/4W$ , 1%, 14.7 k $\Omega$	110-14.7k-1
Q1	PNP, MPSA92	20-MPSA92	R54	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
Q2	PNP, MPSA92	20-MPSA92	R55	MF, $1/4$ W, $1\%$ , $750$ kΩ	110-750k-1
Q3	PNP, 2N2907A	20-2N2907A	R56	MF, $1/4W$ , $1\%$ , $14.7 \text{ k}\Omega$	110-14.7k-1
Q4	NPN, 2N2222A	20-2N2222A	R57	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$	110-5.11k-1
Q5	PNP, 2N2907A	20-2N2907A	R58	Variable, 10-Turn, 500Ω	157-500
Q6	NPN, 2N3694	20-2N3694	R59	MF, 1/4W, 1%, 2 kΩ	110-2k-1
Q7 08	NPN, MPSU04	20-MPSU04	R60	MF, 1/4W, 1%, 10 kΩ ·	110-10k-1
Q8 Q9	PNP, 2N2907A NPN, 2N2222A	20-2N2907 A 20-2N2222A	R61 R62	MF, 1/4W, 1%, 750 kΩ MF, 1/4W, 1%, 14.7 kΩ	110-750k-1 110-14.7k-1
~/		DO DIVERDEN	100	1111 9 1/ 111 9 1/U9 1401 K36	110-14. (K-1

R63 R64 R65 R66 R67 R68	MF, $1/4$ W, $1\%$ , $27.4 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $2 \text{ k}\Omega$ Variable, $10\text{-Turn}$ , $500\Omega$ Variable, $1\text{-Turn}$ , $500 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $20 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-27.4k-1 110-2k-1 157-500 156-500k 110-20k-1 110-10k-1	R96 R97 R98 R99 R100	MF, $1/4W$ , $1\%$ , $1 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $15 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $750 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $14.7 \text{ k}\Omega$	110-1k-1 110-15k-1 110-10k-1 110-750k-1 110-14.7k-1
R69 R70 R71	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 15 kΩ MF, 1/4W, 1%, 1.30 kΩ	110-10k-1 110-15k-1 110-1.30k-1	REF.	INTEGRATED CIRCUITS	WILTRON
R72 R73 R74	MF, $1/4W$ , $1\%$ , $8.87 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $3.40 \text{ k}\Omega$	110-8.87k-1 110-3.40k-1	DES.	DESCRIPTION	PART NO.
R75 R76	MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 301Ω MF, 1/4W, 1%, 1.21 kΩ	110-5.11k-1 110-301-1 110-1.21k-1	U1 U2 U3	Quad EX-OR Gate, 74LS86 Quad Op Amp, TL074 Quad Analog Switch, LF13201	54-125 54-132 54-20
R77 R78 R79	MF, 1/4W, 1%, 17.8 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 10 kΩ	110-17.8k-1 110-511-1 110-10k-1	U4 U5	Op-Amp, OP05 2k x 8 EPROM	54-87 Not Field-
R80 R81 R82	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 205 kΩ MF, 1/4W, 1%, 2 kΩ	110-10k-1 110-10k-1 110-205k-1 110-2k-1	U7 U8 U9	Dual Analog Switch, DG200 Dual Op-Amp, TL072 Quad Volt Comparator, MC3302P	Replaceable 50-DG200BA 54-53 54-MC3302P
R83 R84 R85	MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 1M MF, 1/4W, 1%, 1M	110-5.11k-1 110-1M-1 110-100k-1	U10	Input NAND Gate, 74LS10	54-42
R86 R87	MF, 1/4W, 1%, 5.11Ω MF, 1/4W, 1%, 5.11 kΩ	110-100k-1 110-5.11-1 110-5.11k-1	REF.	MISCELLANEOUS	WILTRON
R88 R89 R90	Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 15 kΩ MF, 1/4W, 1%, 21.6 kΩ	156-20 110-15k-1	DES.	DESCRIPTION	PART NO.
R91 R92	MF, 1/4W, 1%, 31.6 kΩ MF, 1/4W, 1%, 20 kΩ MF, 1/4W, 1%, 511Ω	110-31.6k-1 110-20k-1 110-511-1	TP1 thru	Ejector, P.C. Board	553-96
R93 R94 R95	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ	110-511-1 110-5.11k-1 110-5.11k-1	TP5 K1 	Pin, Test Point Relay, 2 Form C Socket, I.C., 24-Pin	706-44 690-28 553-67

Table 6-12. A6/A7/A8 YIG Driver, 8-12.4 GHz, 6621A/6629A/6637A/6638A/6647A/6648A (660-D-8009-4, -6, -7, -8, -99-90, -99-92)

		- 110		, , , , ,	
	CAPACITORS		CR2 CR3	Silicon, 1N4446 Silicon, SI2	10-1N4446 10-SI2
REF.		WILTRON	CR4	Zener, 24V, 1W, 1N4749A	10-1N4749A
DES.	DESCRIPTION	PART NO.	CR5	Silicon, SI2	10-SI2
			CR6	Silicon, 1N4446	10-1N4446
C1	Tantalum, 4.7 μF	250–39	CR7	Silicon, 1N4446	10-1N4446
C2	Tantalum, 4.7 μF	250-39	CR8	Silicon, 1N4446	10-1N4446
C3	Tantalum, 4.7 μF	250-39	CR9	Zener, 10V, 0.4W, 1N758A	10-1N758A
C4	Disc Ceramic, .01 μF	230-11	CR10	Silicon, 1N4446	10-1N4446
C5	Disc Ceramic, .001 μF	230-30	CR11	Silicon, 1N4446	10-1N4446
C6	Tantalum, 1 μF, 35V	250-19			
C7	Tantalum, 1 μF, 35V	250-19		TRANSISTORS	
C8	Monolithic, 1.0 μF	230-41			
C9	Mica, 300 pF	220-300	REF.		WILTRON
C10	Monolithic, .1 μF	230-37	DES.	DESCRIPTION	PART NO.
C11	Tantalum, 6.8 μF	250-41A			
C12	Mica, 5 pF	220-5	Q1	PNP, MPSA92	20-MPSA92
C13	Monolithic, .1 μF	230-37	Q2	PNP, MPSA92	20-MPSA92
C14	Disc Ceramic, .01 μF	230-11	Q3	NPN, 2N3694	20-2N3694
C16	Monolithic, .1 μF	230-37	Q4	NPN, 2N2222A	20-2N2222A
C17	Disc Ceramic, .01 μF	230-11	Q5	NPN, 2N2222A	20-2N2222A
C18	Disc Ceramic, .01 μF	230-11	Q6	PNP, 2N2907A	20-2N2907A
C19	Disc Ceramic, .01 µF	230-11	Q7	NPN, 2N2222A	20-2N2222A
C20	Mica, 820 pF	220-820			
				<b>RESISTORS</b>	
	DIODES				
			REF.		WILTRON
REF.		WILTRON	DES.	DESCRIPTION	PART NO.
DES.	DESCRIPTION	PART NO.			
			R1	CC, $1/4W$ , 5%, $3.3 M\Omega$	101-3.3M-5
CR1	Silicon, 1N4446	10-1N4446	R2	Variable, 15-Turn, 50 k $\Omega$	157-50k

R3	CC, $1/4W$ , 5%, 3.6 M $\Omega$	101-3.6M-5	R59	MF, $1/4W$ , $1\%$ , $6.19\Omega$	110-6.19-1
R4	MF, $1/4W$ , 1%, 61.9 k $\Omega$	110-61.9k-1	R595		
		1		MF, $1/4W$ , $1\%$ , $6.49\Omega$	110-6.49-1
R5	Variable, 15-Turn, 1 kΩ	157-1k	R596	MF, $1/4W$ , $1\%$ , $6.49\Omega$	110-6.49-1
R7	Variable, 15-Turn, 1 kΩ	157-1k	R60	MF, $1/4W$ , $1\%$ , $2.15 k\Omega$	110-2.15k-1
R9	Variable, 15-Turn, 200 kΩ	157-200k	R61 <sup>1</sup>		
		· · · · · · · · · · · · · · · · · · ·	R01-	MF, $1/4W$ , $1\%$ , $33.2 \text{ k}\Omega$	110-33.2k-1
R10_	MF, $1/4$ W, $1\%$ , $205$ kΩ	110-205k-1	R61 <sup>2</sup>	MF, $1/4W$ , $1\%$ , $33.2 k\Omega$	110-33.2k-1
R10 <sup>5</sup>	MF, $1/4W$ , $1\%$ , $6.65 k\Omega$	110-6.65k-1	R61 <sup>3</sup>	MF, $1/4W$ , $1\%$ , $38.3 \text{ k}\Omega$	110-38.3k-1
R106	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1	R614	MF, $1/4W$ , $1\%$ , $38.3 \text{ k}\Omega$	110-38.3k-1
R111	MF, $1/4W$ , 1%, $10.5 \text{ k}\Omega$				
		110-10.5k-1	R621	MF, $1/4W$ , $1\%$ , $33.2 \text{ k}\Omega$	110-33.2k-1
R11 <sup>2</sup>	MF, $1/4W$ , $1\%$ , $11 k\Omega$	110-11k-1	R62 <sup>2</sup>	MF, $1/4W$ , $1\%$ , $33.2 k\Omega$	110-33.2k-1
R11 <sup>3</sup>	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1	R62 <sup>3</sup>	MF, $1/4W$ , 1%, 38.3 k $\Omega$	110-38.3k-1
R114	MF, $1/4W$ , $1\%$ , $11 k\Omega$	110-11k-1	7(24		
	· · · · · · · · · · · · · · · · · · ·		R62 4	MF, $1/4W$ , $1\%$ , $38.3 \text{ k}\Omega$	110-38.3k-1
R12	MF, $1/4$ W, $1\%$ , $20$ kΩ	110-20k-1	R62 <sup>5</sup>	MF, $1/4W$ , $1\%$ , $10.7 \text{ k}\Omega$	110-10.7k-1
R13	Variable, 1-Turn, 20 kΩ	156-20k	R626	MF, $1/4W$ , $1\%$ , $10.7 k\Omega$	110-10.7k-1
R14	MF, $1/4W$ , $1\%$ , $2.74 \text{ k}\Omega$	110-2.74k-1	R63		
R14 <sup>5</sup>				MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
	MF, $1/4W$ , $1\%$ , $2.67 \text{ k}\Omega$	110-2.67k-1	R64	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
R146	MF, $1/4W$ , $1\%$ , $4.22 \text{ k}\Omega$	110-4.22k-1	R65	MF, $1/4W$ , $1\%$ , $750 \text{ k}\Omega$	110-750k-1
R15	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1	R66	MF, $1/4W$ , $1\%$ , $14.7 k\Omega$	110-14.7k-1
R16	MF, $1/4$ W, $1\%$ , 4.99 kΩ	1			
		110-4.99k-1	R67	MF, $1/4W$ , $1\%$ , $866\Omega$	110-866-1
R17	MF, 1/4W, 1%, 10 kΩ	110-10k-1	R67 <sup>2</sup>	MF, $1/4W$ , $1\%$ , $1.15 k\Omega$	110-1.15k-1
R18	MF, $1/4W$ , $1\%$ , $23.7 k\Omega$	110-23.7k-1	R67 <sup>3</sup>	MF, $1/4W$ , $1\%$ , $866\Omega$	110-866-1
R19	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1	R67 4	MF, $1/4$ W, $1\%$ , $1.15$ kΩ	
R20			201		110-1.15k-1
	MF, 1/4W, 1%, 121Ω	110-121-1	R67 <sup>5</sup>	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1
R21	MF, $1/4$ W, $1\%$ , $1$ k $\Omega$	110-1k-1	R67 <sup>6</sup>	MF, $1/4W$ , $1\%$ , $866\Omega$	110-866-1
R22	MF, $1/4W$ , $1\%$ , $7.5 k\Omega$	110-7.5k-1	R68	Variable, 15-Turn, $500\Omega$	157-500
R23	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1			
			R69	MF, $1/4$ W, $1\%$ , $2 k\Omega$	110-2k-1
R24	MF, $1/4$ W, $1\%$ , $5.11$ kΩ	110-5.11k-1	R70	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
R25	$WW, 5W, 5\Omega$	131-3	R71	MF, $1/4W$ , $1\%$ , $750 \text{ k}\Omega$	110-750k-1
R26	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1	R72	MF, $1/4W$ , 1%, 14.7 k $\Omega$	
R27	MF, $1/4W$ , $1\%$ , $750\Omega$	1			110-14.7k-1
		110-750-1	R73	MF, 1/4W, 1%, 10 kΩ	110-10k-1
R28	MF, $1/4W$ , $1\%$ , $5.49 \text{ k}\Omega$	110-5.49k-1	R74	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
R29	MF, $1/4W$ , $1\%$ , $1.78 \text{ k}\Omega$	110-1.78k-1	R75	MF, $1/4W$ , $1\%$ , $205 k\Omega$	110-205k-1
R30	MF, $1/4W$ , $1\%$ , $2.15 \text{ k}\Omega$	110-2.15k-1			
		1	R76	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
R31	MF, $1/4$ W, $1\%$ , $1 k\Omega$	110-1k-1	R77	Variable, 1-Turn, 20Ω	156-20
R32	MF, $1/4W$ , $1\%$ , $1.21 k\Omega$	110-1.21k-1	R78	MF, $1/4W$ , $1\%$ , $2 k\Omega$	110-2k-1
R33	MF, $1/4W$ , $1\%$ , $17.8 \text{ k}\Omega$	110-17.8k-1	R79	MF, $1/4W$ , $1\%$ , $15 k\Omega$	110-15k-1
		110 11:01 1	IX ( 7		
D34	Variable 1 Turn 200 l-0	154 2001-			
R34	Variable, 1-Turn, 200 k $\Omega$	156-200k	R80	MF, $1/4W$ , 1%, $511\Omega$	110-511-1
R34 R35	Variable, 1-Turn, 200 k $\Omega$ MF, 1/4W, 1%, 1 k $\Omega$	156-200k 110-1k-1		MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
	MF, $1/4W$ , 1%, 1 k $\Omega$	110-1k-1	R80 R81	MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $511\Omega$	110-511-1 110-511-1
R35 R38	MF, $1/4W$ , $1\%$ , $1 k\Omega$ MF, $1/4W$ , $1\%$ , $18.7 k\Omega$	110-1k-1 110-18.7k-1	R80 R81 R82	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ	110-511-1 110-511-1 110-100k-1
R35 R38 R39	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ	110-1k-1 110-18.7k-1 110-18.7k-1	R80 R81 R82 R83	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ	110-511-1 110-511-1
R35 R38 R39 R42	MF, $1/4W$ , $1\%$ , $1$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ Variable, $15$ -Turn, $50$ k $\Omega$	110-1k-1 110-18.7k-1	R80 R81 R82	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ	110-511-1 110-511-1 110-100k-1
R35 R38 R39	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ	110-1k-1 110-18.7k-1 110-18.7k-1	R80 R81 R82 R83 R84	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ	110-511-1 110-511-1 110-100k-1 110-100k-1 110-5.11k-1
R35 R38 R39 R42 R43	MF, $1/4W$ , $1\%$ , $1$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ Variable, $15$ -Turn, $50$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1	R80 R81 R82 R83 R84 R85	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ	110-511-1 110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1
R35 R38 R39 R42 R43 R44	MF, $1/4W$ , $1\%$ , $1$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ Variable, $15$ -Turn, $50$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1	R80 R81 R82 R83 R84	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ	110-511-1 110-511-1 110-100k-1 110-100k-1 110-5.11k-1
R35 R38 R39 R42 R43 R44 R45	MF, $1/4W$ , $1\%$ , $1$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ Variable, $15$ -Turn, $50$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1	R80 R81 R82 R83 R84 R85	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ	110-511-1 110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1
R35 R38 R39 R42 R43 R44 R45 R46	MF, $1/4W$ , $1\%$ , $1$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ Variable, $15$ -Turn, $50$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $10$ k $\Omega$ MF, $1/4W$ , $1\%$ , $9.53$ k $\Omega$	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1	R80 R81 R82 R83 R84 R85	MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $100 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $100 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $5.11 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $5.11 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $5.11\Omega$	110-511-1 110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1
R35 R38 R39 R42 R43 R44 R45	MF, $1/4W$ , $1\%$ , $1$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ Variable, $15$ -Turn, $50$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1	R80 R81 R82 R83 R84 R85	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ	110-511-1 110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1
R35 R38 R39 R42 R43 R44 R45 R46 R47	MF, $1/4W$ , $1\%$ , $1$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ Variable, $15$ -Turn, $50$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $10$ k $\Omega$ MF, $1/4W$ , $1\%$ , $9.53$ k $\Omega$ Variable, $15$ -Turn, $1$ k $\Omega$	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k	R80 R81 R82 R83 R84 R85	MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $100 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $100 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $5.11 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $5.11 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $5.11\Omega$	110-511-1 110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1
R35 R38 R39 R42 R43 R44 R45 R46 R47	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ Variable, 15-Turn, 50 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 9.53 kΩ Variable, 15-Turn, 1 kΩ MF, 1/4W, 1%, 11 kΩ	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1	R80 R81 R82 R83 R84 R85 R86	MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $100 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $100 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $5.11 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $5.11 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $5.11\Omega$	110-511-1 110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1
R35 R38 R39 R42 R43 R44 R45 R46 R47 R46 R47	MF, $1/4W$ , $1\%$ , $1$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ Variable, $15$ -Turn, $50$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $10$ k $\Omega$ MF, $1/4W$ , $1\%$ , $9.53$ k $\Omega$ Variable, $15$ -Turn, $1$ k $\Omega$ MF, $1/4W$ , $1\%$ , $11$ k $\Omega$ MF, $1/4W$ , $1\%$ , $11$ k $\Omega$ MF, $1/4W$ , $1\%$ , $10$ k $\Omega$	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-10k-1	R80 R81 R82 R83 R84 R85 R86	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω MF, 1/4W, 1%, 5.11Ω	110-511-1 110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1
R35 R38 R39 R42 R43 R44 R45 R46 R46 R47 R48 R49 R50	MF, $1/4W$ , $1\%$ , $1$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ Variable, $15$ -Turn, $50$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $10$ k $\Omega$ MF, $1/4W$ , $1\%$ , $9.53$ k $\Omega$ Variable, $15$ -Turn, $1$ k $\Omega$ MF, $1/4W$ , $1\%$ , $11$ k $\Omega$ MF, $1/4W$ , $1\%$ , $10$ k $\Omega$ MF, $1/4W$ , $1\%$ , $10$ k $\Omega$ MF, $1/4W$ , $1\%$ , $10$ k $\Omega$	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-10k-1 110-10k-1 110-511-1	R80 R81 R82 R83 R84 R85 R86	MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $100 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $100 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $5.11 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $5.11 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $5.11\Omega$	110-511-1 110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1
R35 R38 R39 R42 R43 R44 R45 R46 R47 R48 R49 R50 R51	MF, $1/4W$ , $1\%$ , $1$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ Variable, $15$ -Turn, $50$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $10$ k $\Omega$ MF, $1/4W$ , $1\%$ , $9.53$ k $\Omega$ Variable, $15$ -Turn, $1$ k $\Omega$ MF, $1/4W$ , $1\%$ , $11$ k $\Omega$ MF, $1/4W$ , $1\%$ , $11$ k $\Omega$ MF, $1/4W$ , $1\%$ , $10$ k $\Omega$	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-10k-1	R80 R81 R82 R83 R84 R85 R86	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω MF, 1/4W, 1%, 5.11Ω	110-511-1 110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1
R35 R38 R39 R42 R43 R44 R45 R46 R46 R47 R48 R49 R50	MF, $1/4W$ , $1\%$ , $1$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ Variable, $15$ -Turn, $50$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $18.7$ k $\Omega$ MF, $1/4W$ , $1\%$ , $10$ k $\Omega$ MF, $1/4W$ , $1\%$ , $9.53$ k $\Omega$ Variable, $15$ -Turn, $1$ k $\Omega$ MF, $1/4W$ , $1\%$ , $11$ k $\Omega$ MF, $1/4W$ , $1\%$ , $10$ k $\Omega$ MF, $1/4W$ , $1\%$ , $10$ k $\Omega$ MF, $1/4W$ , $1\%$ , $10$ k $\Omega$	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-10k-1 110-10k-1 110-511-1	R80 R81 R82 R83 R84 R85 R86	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω MF, 1/4W, 1%, 5.11Ω	110-511-1 110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1
R35 R38 R39 R42 R43 R44 R45 R46 R47 R48 R49 R50 R51	MF, $1/4$ W, $1$ %, $1$ kΩ MF, $1/4$ W, $1$ %, $18.7$ kΩ MF, $1/4$ W, $1$ %, $18.7$ kΩ Variable, $15$ -Turn, $50$ kΩ MF, $1/4$ W, $1$ %, $18.7$ kΩ MF, $1/4$ W, $1$ %, $18.7$ kΩ MF, $1/4$ W, $1$ %, $10$ kΩ MF, $1/4$ W, $1$ %, $9.53$ kΩ Variable, $15$ -Turn, $1$ kΩ MF, $1/4$ W, $1$ %, $11$ kΩ MF, $1/4$ W, $1$ %, $11$ kΩ MF, $1/4$ W, $1$ %, $10$ kΩ	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1	R80 R81 R82 R83 R84 R85 R86	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201	110-511-1 110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1 WILTRON PART NO.
R35 R38 R39 R42 R43 R44 R45 R46 R47 R48 R49 R50 R51 R52 R53	MF, $1/4$ W, $1\%$ , $1$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ Variable, $15$ -Turn, $50$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $9.53$ kΩ Variable, $15$ -Turn, $1$ kΩ MF, $1/4$ W, $1\%$ , $11$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1	R80 R81 R82 R83 R84 R85 R86	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10	110-511-1 110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1 WILTRON PART NO. 54-20 54-42
R35 R38 R39 R42 R43 R44 R45 R46 R47 R48 R49 R50 R51 R52 R53 R54	MF, $1/4$ W, $1$ %, $1$ kΩ MF, $1/4$ W, $1$ %, $18.7$ kΩ MF, $1/4$ W, $1$ %, $18.7$ kΩ Variable, $15$ -Turn, $50$ kΩ MF, $1/4$ W, $1$ %, $18.7$ kΩ MF, $1/4$ W, $1$ %, $18.7$ kΩ MF, $1/4$ W, $1$ %, $10$ kΩ MF, $1/4$ W, $1$ %, $9.53$ kΩ Variable, $15$ -Turn, $1$ kΩ MF, $1/4$ W, $1$ %, $11$ kΩ MF, $1/4$ W, $1$ %, $10$ kΩ	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-1k-1 110-511-1	R80 R81 R82 R83 R84 R85 R86	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05	110-511-1 110-511-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1 WILTRON PART NO. 54-20 54-42 54-87
R35 R38 R39 R42 R43 R44 R45 R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55	MF, $1/4$ W, $1\%$ , $1$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ Variable, $15$ -Turn, $50$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $9.53$ kΩ Variable, $15$ -Turn, $1$ kΩ MF, $1/4$ W, $1\%$ , $11$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1	R80 R81 R82 R83 R84 R85 R86 REF. DES. U1 U2 U3 U4	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10	110-511-1 110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1 WILTRON PART NO. 54-20 54-42
R35 R38 R39 R42 R43 R44 R45 R45 R46 R47 R48 R49 R50 R51 R52 R53 R55 R55	MF, $1/4$ W, $1$ %, $1$ kΩ MF, $1/4$ W, $1$ %, $18.7$ kΩ MF, $1/4$ W, $1$ %, $18.7$ kΩ Variable, $15$ -Turn, $50$ kΩ MF, $1/4$ W, $1$ %, $18.7$ kΩ MF, $1/4$ W, $1$ %, $18.7$ kΩ MF, $1/4$ W, $1$ %, $10$ kΩ MF, $1/4$ W, $1$ %, $9.53$ kΩ Variable, $15$ -Turn, $1$ kΩ MF, $1/4$ W, $1$ %, $11$ kΩ MF, $1/4$ W, $1$ %, $10$ kΩ	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-10k-1 110-511-1 110-3.83k-1 110-1k-1 110-1k-1 110-511-1 110-511-1 110-511-1 110-511-1 110-511-1 110-6.19-1	R80 R81 R82 R83 R84 R85 R86	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05	110-511-1 110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1 WILTRON PART NO. 54-20 54-42 54-87 54-53
R35 R38 R39 R42 R43 R44 R45 R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ WF, 1/4W, 1%, 18.7 kΩ Variable, 15-Turn, 50 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 9,53 kΩ Variable, 15-Turn, 1 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-9.53k-1 157-1k 110-11k-1 110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-6.19-1 110-6.49-1	R80 R81 R82 R83 R84 R85 R86 REF. DES. U1 U2 U3 U4	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072	110-511-1 110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1 WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field-
R35 R38 R39 R42 R43 R44 R45 R46 R47 R48 R49 R50 R51 R52 R53 R55 R55 R55 R55	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ WF, 1/4W, 1%, 18.7 kΩ Variable, 15-Turn, 50 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 9,53 kΩ Variable, 15-Turn, 1 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19 Ω MF, 1/4W, 1%, 6.19 Ω MF, 1/4W, 1%, 6.49 Ω MF, 1/4W, 1%, 6.49 Ω MF, 1/4W, 1%, 6.49 Ω	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-6.19-1 110-6.49-1 110-6.49-1	R80 R81 R82 R83 R84 R85 R86 REF. DES. U1 U2 U3 U4 U5	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM	110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1 WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field- Replaceable
R35 R38 R39 R42 R443 R445 R445 R447 R450 R551 R553 R555 R555 R555 R555	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ Variable, 15-Turn, 50 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 9,53 kΩ Variable, 15-Turn, 1 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 6.19 Ω MF, 1/4W, 1%, 6.19 Ω MF, 1/4W, 1%, 6.49 Ω	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-1k-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.19-1	R80 R81 R82 R83 R84 R85 R86 REF. DES. U1 U2 U3 U4 U5	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074	110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1 WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132
R35 R38 R39 R42 R43 R44 R45 R46 R47 R48 R50 R51 R52 R53 R55 R55 R55 R55 R55 R56	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ WF, 1/4W, 1%, 18.7 kΩ Variable, 15-Turn, 50 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 9.53 kΩ Variable, 15-Turn, 1 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 6.19 Ω MF, 1/4W, 1%, 6.49 Ω MF, 1/4W, 1%, 6.49 Ω MF, 1/4W, 1%, 6.49 Ω MF, 1/4W, 1%, 6.19 Ω MF, 1/4W, 1%, 6.19 Ω MF, 1/4W, 1%, 6.49 Ω MF, 1/4W, 1%, 6.49 Ω	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-5:11-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1	R80 R81 R82 R83 R84 R85 R86 REF. DES. U1 U2 U3 U4 U5	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 Zk x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86	110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1 WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field- Replaceable
R35 R38 R39 R42 R43 R44 R45 R46 R47 R49 R50 R51 R52 R55 R55 R55 R55 R55 R55 R55 R55 R55	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ Variable, 15-Turn, 50 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 9,53 kΩ Variable, 15-Turn, 1 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 6.19 Ω MF, 1/4W, 1%, 6.19 Ω MF, 1/4W, 1%, 6.49 Ω	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-1k-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.19-1	R80 R81 R82 R83 R84 R85 R86 REF. DES. U1 U2 U3 U4 U5	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074	110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1 WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132
R35 R38 R39 R42 R43 R44 R45 R46 R47 R49 R50 R51 R52 R55 R55 R55 R55 R55 R55 R55 R55 R55	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ WF, 1/4W, 1%, 18.7 kΩ Variable, 15-Turn, 50 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 9.53 kΩ Variable, 15-Turn, 1 kΩ MF, 1/4W, 1%, 9.53 kΩ Variable, 15-Turn, 1 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-511-1 110-4.99k-1 110-511-1 110-511-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1	R80 R81 R82 R83 R84 R85 R86 REF. DES. U1 U2 U3 U4 U5	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 Zk x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86	110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1 WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125
R35 R38 R39 R42 R43 R44 R45 R445 R46 R47 R49 R51 R553 R555 R555 R555 R556 R57 R57	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ Variable, 15-Turn, 50 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 9.53 kΩ Variable, 15-Turn, 1 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1	R80 R81 R82 R83 R84 R85 R86 REF. DES. U1 U2 U3 U4 U5	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 Zk x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393	110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1 WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125
R35 R38 R39 R42 R443 R445 R445 R445 R447 R448 R551 R553 R554 R555 R556 S776 R577	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ Variable, 15-Turn, 50 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 9.53 kΩ Variable, 15-Turn, 1 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 1511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.499 kΩ MF, 1/4W, 1%, 6.49Ω	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1	R80 R81 R82 R83 R84 R85 R86 REF. DES. U1 U2 U3 U4 U5	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 Zk x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86	110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1 WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125
R35 R38 R39 R42 R443 R445 R445 R450 R511 R553 R55556 S6 F577 R557 R557 R557 R557	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ Variable, 15-Turn, 50 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 9.53 kΩ Variable, 15-Turn, 1 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.49 kΩ	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-6.19-1 110-6.49-1	R80 R81 R82 R83 R84 R85 R86 REF. DES. U1 U2 U3 U4 U5 U7 U8 U9	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 Zk x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393	110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1  WILTRON PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158
R35 R38 R39 R42 R443 R445 R445 R50 R512 R555 F555 F555 R555 R557 R557 R557 R558 R558	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ Variable, 15-Turn, 50 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 9,53 kΩ Variable, 15-Turn, 1 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1	R80 R81 R82 R83 R84 R85 R86 REF. DES. U1 U2 U3 U4 U5 V7 U8 U9	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 Zk x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393	110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1 WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125
R35 R38 R39 R42 R443 R445 R445 R450 R511 R553 R55556 S6 F577 R557 R557 R557 R557	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ Variable, 15-Turn, 50 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 9.53 kΩ Variable, 15-Turn, 1 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.49 kΩ	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-6.19-1 110-6.49-1	R80 R81 R82 R83 R84 R85 R86 REF. DES. U1 U2 U3 U4 U5 U7 U8 U9	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 Zk x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393	110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1  WILTRON PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158
R35 R38 R39 R42 R443 R445 R446 R447 R449 R551 R552 R556 F556 F557 R557 R557 R558 R558 R558	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ Variable, 15-Turn, 50 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 9.53 kΩ Variable, 15-Turn, 1 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 6.19 Ω MF, 1/4W, 1%, 6.49 Ω	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1	R80 R81 R82 R83 R84 R85 R86 REF. DES. U1 U2 U3 U4 U5 U7 U8 U9	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 Zk x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION	110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1  WILTRON PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158  WILTRON PART NO.
R35 R38 R39 R42 R443 R445 R446 R447 R448 R49 R551 R552 R553 R555 R556 S66 R577 R578 R588 R588 R588 R588 R588 R588	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ Variable, 15-Turn, 50 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 9.53 kΩ Variable, 15-Turn, 1 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1	R80 R81 R82 R83 R84 R85 R86 REF. DES. U1 U2 U3 U4 U5 V7 U8 U9	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 Zk x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS	110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1 WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158
R35 R38 R39 R42 R43 R44 R45 R46 R47 R48 R49 R50 R51 R52 R53 R55 R556 S5 R57 R57 R57 R58 R58 R58 R58 R58 R58 R58 R58 R58	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 9.53 kΩ Variable, 15-Turn, 1 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1	R80 R81 R82 R83 R84 R85 R86 REF. DES. U1 U2 U3 U4 U5 U7 U8 U9	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 Zk x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION	110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1  WILTRON PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158  WILTRON PART NO.
R35 R38 R39 R42 R43 R44 R45 R46 R47 R48 R50 R51 R52 R53 R54 F55 R556 F57 R57 R57 R57 R57 R57 R58	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 9.53 kΩ Variable, 15-Turn, 1 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 13 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω MF, 1/4W,	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1	R80 R81 R82 R83 R84 R85 R86 REF. DES. U1 U2 U3 U4 U5 U7 U8 U9	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 Zk x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION	110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1  WILTRON PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158  WILTRON PART NO.
R35 R38 R39 R42 R43 R44 R45 R46 R47 R48 R50 R51 R52 R53 R54 F55 R556 F57 R57 R57 R57 R57 R57 R58	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 9.53 kΩ Variable, 15-Turn, 1 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 13 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω MF, 1/4W,	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1	R80 R81 R82 R83 R84 R85 R86  REF. DES.  U1 U2 U3 U4 U5  U7 U8 U9  REF. DES.	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL072 2k x 8 EPROM  Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION  Ejector, PC Board	110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1  WILTRON PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158  WILTRON PART NO.  553-96
R35 R38 R39 R42 R43 R44 R45 R46 R47 R48 R50 R51 R52 R53 R54 R55 R556 R566 S R57 R57 R57 R58	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 9.53 kΩ Variable, 15-Turn, 1 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω MF, 1/	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1	R80 R81 R82 R83 R84 R85 R86  REF. DES.  U1 U2 U3 U4 U5  U7 U8 U9  REF. DES.  TP1 thru TP4	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION  Ejector, PC Board  Pin, Test Point	110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1  WILTRON PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158  WILTRON PART NO.  553-96
R35 R38 R39 R42 R43 R44 R45 R46 R47 R48 R50 R51 R52 R53 R54 R55 R556 S67 R57 R57 R57 R57 R57 R57 R58	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 9.53 kΩ Variable, 15-Turn, 1 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω MF, 1/4W,	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1	R80 R81 R82 R83 R84 R85 R86  REF. DES.  U1 U2 U3 U4 U5  U7 U8 U9  REF. DES.  —— TP1 thru TP4 K1	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL072 2k x 8 EPROM  Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION  Ejector, PC Board  Pin, Test Point Relay, 2 Form C	110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1  WILTRON PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158  WILTRON PART NO.  553-96
R35 R38 R39 R42 R43 R44 R45 R46 R47 R48 R50 R51 R52 R53 R54 R55 R556 S77 R57 R57 R57 R57 R57 R57 R58	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 9.53 kΩ Variable, 15-Turn, 1 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.19Ω MF, 1/4W, 1%, 6.49Ω MF, 1/	110-1k-1 110-18.7k-1 110-18.7k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 157-1k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-6.19-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1 110-6.49-1	R80 R81 R82 R83 R84 R85 R86  REF. DES.  U1 U2 U3 U4 U5  U7 U8 U9  REF. DES.  TP1 thru TP4	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION  Ejector, PC Board  Pin, Test Point	110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1  WILTRON PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158  WILTRON PART NO.  553-96

Table 6-13. A6/A7 YIG Driver, 8-12.4 GHz, 6621A-40/6629A-40/6637A-40 (660-D-8009-14, -17, -99-91, -99-93)

	CAPACITORS		R3	CC, 1/4W, 5%, 3.6 MΩ	101-3.6M-5
REF. DES.	DESCRIPTION	WILTRON PART NO.	R4 R5	MF, 1/4W, 1%, 61.9 kΩ Variable, 15-Turn, 1 kΩ	110-61.9k-1 157-1k
			R6	MF, $1/4W$ , $1\%$ , $11 k\Omega$	110-11k-1
C1	Tantalum, 4.7 µF	250-39A	R7	Variable, 15-Turn, 1 kΩ	157-1k
C2	Tantalum, 4.7 μF	250-39A	R8 R9	MF, $1/4$ W, $1\%$ , $11 k\Omega$	110-11k-1
C3 C4	Tantalum, 4.7 μF Disc Ceramic, .01 μF	250-39A	R10	Variable, 15-Turn, 200 k $\Omega$ MF, 1/4W, 1%, 205 k $\Omega$	157-200k
C5	Disc Ceramic, .01 µF	230-11 230-30	R11 <sup>1</sup>	MF, $1/4W$ , $1\%$ , $203 \text{ k}\%$ MF, $1/4W$ , $1\%$ , $10.5 \text{ k}\%$	110-205k-1 110-10.5k-1
C6	Monolithic, .1 µF	230-30	R11 <sup>2</sup>	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10:5k-1 110-10k-1
C7	Monolithic, .1 µF	230-37	R11 <sup>3</sup>	MF, $1/4W$ , 1%, 6.65 k $\Omega$	110-6.65k-1
C8	Monolithic, 1.0 µF	230-41	R11 <sup>4</sup>	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
C9	Not Used		R12	MF, $1/4W$ , $1\%$ , $20 k\Omega$	110-20k-1
C10	Monolithic, .1 μF	230-37	R13	Variable, 1-Turn, 20 k $\Omega$	156-20k
C11	Tantalum, 6.8 μF	250-41	R14	MF, $1/4W$ , $1\%$ , $2.74 \text{ k}\Omega$	110-2.74k-1
C12	Mica, 5 pF	220-5	R143	MF, $1/4$ W, $1\%$ , $2.67 \text{ k}\Omega$	110-2.67k-1
C13	Monolithic, .1 μF	230-37	R14 <sup>4</sup>	MF, $1/4$ W, $1\%$ , $4.22 \text{ k}\Omega$	110-4.22k-1
C14 C15	Disc Ceramic, .01 μF	230-11	R15 R16	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 4.99 kΩ	110-10k-1
C16	Not Used Monolithic, .1 μF	230-37	R17	MF, $1/4W$ , $1/6$ , $4.79$ KM MF, $1/4W$ , $1\%$ , $10$ k $\Omega$	110-4.99k-1 110-10k-1
C17	Disc Ceramic, .01 µF	230-37	R18	MF, $1/4$ W, $1\%$ , $23.7 \text{ k}\Omega$	110-10k-1 110-23.7k-1
C18	Disc Ceramic, .01 µF	230-11	R19	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1
C19	Disc Ceramic, .01 µF	230-11	R20	MF, $1/4W$ , $1\%$ , $121\Omega$	110-121-1
C 20	Mica, 300 pF	220-300	R21	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1
			R22	MF, $1/4$ W, $1\%$ , $7.5 \text{ k}\Omega$	110-7.5k-1
	DIODES		R23	MF, $1/4$ W, $1\%$ , $511\Omega$	110-511-1
REF.		WILTRON	R24 R25	MF, 1/4W, 1%, 5.11 kΩ	110-5.11k-1
DES.	DESCRIPTION	PART NO.	R25	WW, 5W, 5Ω	131-3
		THE NO.	R27	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $750\Omega$	110-10k-1 110-750-1
CR1	Silicon, 1N4446	10-1N4446	R28	MF, $1/4$ W, $1\%$ , $5.49$ kΩ	110-7-50-1 110-5.49k-1
CR2	Not Used	10 ==0	R29	MF, $1/4W$ , $1\%$ , $1.78 \text{ k}\Omega$	110-1.78k-1
CR3 CR4	Silicon, SI2 Zener, 24V, 1W, 1N4749A	10-SI2	R30	MF, $1/4W$ , $1\%$ , $2.15 \text{ k}\Omega$	110-2.15k-1
CR4	Silicon, SI2	10-1N4749A 10-SI2	R31	MF, 1/4W, 1%, 1k	110-1k-1
CR6	Silicon, 1N4446	10-312 10-1N4446	R32	MF, $1/4W$ , $1\%$ , $1.21 k\Omega$	110-1.21k-1
CR7	Silicon, 1N4446	10-1N4446	R33	MF, $1/4$ W, $1\%$ , $17.8 \text{ k}\Omega$	110-17.8k-1
CR8	Silicon, 1N4446	10-1N4446	R34	Variable, 1-Turn, 200 kΩ	156-200k
CR9	Zener, 10V, 0.4W, 1N758A	10-1N758A	R35 R36	MF, $1/4$ W, $1$ %, $1$ kΩ MF, $1/4$ W, $1$ %, $10$ kΩ	110-1k-1
CR10	Silicon, 1N4446	10-1N4446	R37	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1 110-10k-1
CR11	Silicon, 1N4446	10-1N4446	R38	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1
	TRANSISTORS		R39	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1
	<u> </u>		R42	Variable, 15-Turn, 50 k $\Omega$	157-50k
REF.		WILTRON	R43	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1
DES.	DESCRIPTION	PART NO.	R44	MF, 1/4W, 1%, 18.7 kΩ	110-18.7k-1
Q1	PNP, MPSA92	20-MPSA92	R45 R46	MF, 1/4W, 1%, 10 kΩ	110-10k-1
Q2	PNP, MPSA92	20-MPSA92	R47	MF, $1/4$ W, $1\%$ , $9.53$ k $\Omega$ Variable, $15$ -Turn, $20$ k $\Omega$	110-9.53k-1 157-20k
Q3	NPN, 2N3694	20-2N3694	R48	MF, $1/4$ W, $1\%$ , $11 k\Omega$	110-11k-1
Q4	NPN, 2N2222A	20-2N2222A	R49	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
Q5	NPN, 2N2222A	20-2N2222A	R50	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
Q6	PNP, 2N2907A	20-2N2907A	R51	MF, $1/4W$ , $1\%$ , $4.99 k\Omega$	110-4.99k-1
Q7 Q8	NPN, 2N2222A	20-2N2222A	R52	MF, $1/4$ W, $1\%$ , $3.83$ kΩ	110-3.83k-1
Qδ	NPN, 2N2222A	20-2N2222A	R53 R54	MF, 1/4W, 1%, 1 kΩ	110-1k-1
	RESISTORS		R55	MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $8.66\Omega$	110-511-1
DEE		WIII TROM	R56	MF, $1/4W$ , $1\%$ , $8.66\Omega$	110-8.66-1 110-8.66-1
REF. DES.	DESCRIPTION	WILTRON PART NO.	R57	MF, $1/4W$ , 1%, $8.66\Omega$	110-8.66-1
		I AKI NO.	R58	MF, $1/4W$ , $1\%$ , $8.66\Omega$	110-8.66-1
R1	CC, $1/4W$ , 5%, 3.3 M $\Omega$	101-3.3M-5	R59	MF, $1/4W$ , $1\%$ , $8.66\Omega$	110-8.66-1
R2	Variable, 15-Turn, 50 k $\Omega$	157-50k	R60	MF, $1/4W$ , $1\%$ , $2.15 \text{ k}\Omega$	110-2.15k-1
1172	on 660-D-8009-14 assembly.		R61 <sup>1</sup>	MF, 1/4W, 1%, 33.2 kΩ	110-33.2k-1
2 Used	on 660-D-8009-14 assembly. on 660-D-8009-17 assembly.		R61 <sup>2</sup> R61 <sup>3</sup>	MF, 1/4W, 1%, 38.3 kΩ	110-38.3k-1
3 Used	on 660-D-8009-99-91 assembly.		R61 4	MF, 1/4W, 1%, 33.2 kΩ MF, 1/4W, 1%, 33.2 kΩ	110-33.2k-1
<sup>4</sup> Used	on 660-D-8009-99-93 assembly.		R621	MF, $1/4W$ , $1\%$ , $33.2 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $33.2 \text{ k}\Omega$	110-33.2k-1
	,, •			y +/ +11 9 1/09 JJ.L R.M	110 <b>-</b> 33.2k-1

R62 <sup>2</sup>	MF, $1/4$ W, $1\%$ , $38.3$ kΩ	110-38.3k-1		INTEGRATED CIRCUITS	
R62 <sup>3</sup> R62 <sup>1</sup> R63	MF, $1/4$ W, $1\%$ , $33.2$ k $\Omega$ MF, $1/4$ W, $1\%$ , $33.2$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$	110-33.2k-1 110-33.2k-1 110-10k-1 110-10k-1	REF. DES.	DESCRIPTION	WILTRON PART NO.
R64 R66 R67 R67 <sup>2</sup> R68 R69 R70 R72 R73	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 14.7 kΩ MF, 1/4W, 1%, 866Ω MF, 1/4W, 1%, 5.11Ω Variable, 15-Turn, 500Ω MF, 1/4W, 1%, 2 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 14.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ	110-10k-1 110-14.7k-1 110-866-1 110-5.11-1 157-500 110-2k-1 110-10k-1 110-10k-1 110-10k-1	U1 U2 U3 U4 U5 U7 U8 U9	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 Zk x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393	54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158
R75 R76 R77 R78 R79	MF, 1/4W, 1%, 205 kΩ MF, 1/4W, 1%, 511Ω Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 2 kΩ MF, 1/4W, 1%, 15 kΩ	110-205k-1 110-205k-1 110-511-1 156-20 110-2k-1 110-15k-1	REF. DES.	MISCELLANEOUS  DESCRIPTION	WILTRON PART NO.
R80 R81 R82 R83 R84 R85 R86	MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11Ω	110-511-1 110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1	TP1 thru TP4 K1	Ejector, PC Board  Pin, Test Point Relay, 2 Form C Socket, I.C., 24-Pin	553-96 706-44 690-28 553-67
ROU	TATT. 9 1/2 AA 9 1/09 2.1170	110 3.11 1		, <del></del> , <del></del>	555 6.

Table 6-14. A6/A7/A8 YIG Driver, 12.4-18.6 GHz, 6629A-40/6637A-40 (660-D-8009-15, -16, -99-94)

REF. DES.	CAPACITORS  DESCRIPTION	WILTRON PART NO.	CR5 CR6 CR7 CR8	Silicon, SI2 Silicon, 1N4446 Silicon, 1N4446 Silicon, 1N4446	10-SI2 10-1N4446 10-1N4446 10-1N4446
C1	Tantalum, 4.7 μF	250-39A	CR9	Zener, 10V, 0.4W, 1N758A	10-1N758A
C2	Tantalum, 4.7 μF	250-39A	CR10	Silicon, 1N4446	10-1N4446
C3	Tantalum, 4.7 μF	250-39A	CR11	Silicon, 1N4446	10-1N4446
C4	Disc Ceramic, .01 μF	230-11		mp A MCCCMOD C	
C5	Disc Ceramic, .001 µF	230-30		TRANSISTORS	
C6	Monolithic, .1 μF	230-37	222		*****
C7	Monolithic, .1 μF	230-37	REF.	D DAGD IDWO.	WILTRON
C8	Monolithic, 1.0 μF	230-41	DES.	DESCRIPTION	PART NO.
C9	Not Used				
C10	Monolithic, .1 μF	230-37	Q1	PNP, MPSA92	20-MPSA92
C11	Tantalum, 6.8 μF	250-41	Q2	PNP, MPSA92	20-MPSA92
C12	Mica, 5 pF	220-5	Q3	NPN, 2N3694	20-2N3694
C13	Monolithic, .1 μF	230-37	Q4	NPN, 2N2222A	20-2N2222A
C14	Disc Ceramic, .01 μF	230-11	Q5	NPN, 2N2222A	20-2N2222A
C15	Not Used		Q6	PNP, 2N2907A	20-2N2907A
C16	Monolithic, .1 μF	230-37	Q7	NPN, 2N2222A	20-2N2222A
C17	Disc Ceramic, .01 μF	230-11	Q8	NPN, 2N2222A	20-2N2222A
C18	Disc Ceramic, .01 μF	230-11			
C19	Disc Ceramic, .01 μF	230-11		RESISTORS	
C20	Mica, 300 pF	220-300			
	DIODES		REF. DES.	DESCRIPTION	WILTRON PART NO.
REF.		WILTRON	520.		1111111101
DES.	DESCRIPTION	PART NO.			
CD 1	C11: 1814444	10 1374444	R1	CC, 1/4W, 5%, 3.3 MΩ	101-3.3M-5
CR1	Silicon, 1N4446	10-1N4446	R2	Variable, 15-Turn, 50 kΩ	157-50k
CR2	Not Used	10-SI2	R3	CC, $1/4W$ , 5%, 3.6 M $\Omega$	101-3.6M-5
CR3	Silicon, SI2		R4	MF, $1/4W$ , $1\%$ , $61.9 \text{ k}\Omega$	110-61.9k-1
CR4	Zener, 24V, 1W, 1N4749A	10-1N4749A	R5	Variable, 15-Turn, 1 kΩ	157-1k
1			R6	MF, $1/4W$ , 1%, 11 k $\Omega$	110-11k-1
Used	on 660-D-8009-14 assembly.		R7	Variable, 15-Turn, 1 kΩ	157-1k
∠Used	on 660-D-8009-17 assembly.		R8	MF, $1/4$ W, $1\%$ , $11$ k $\Omega$	110-11k-1

R9	Variable, 15-Turn, 200 k $\Omega$	157-200k	R59	MF, $1/4W$ , $1\%$ , $8.66\Omega$	110-8.66-1
R10	MF, $1/4W$ , $1\%$ , $205 k\Omega$	110-205k-1	R60	MF, $1/4W$ , 1%, 2.15 k $\Omega$	
R11 <sup>1</sup>	MF, $1/4W$ , $1\%$ , $4.64 \text{ k}\Omega$	110-4.64k-1	R61 l		110-2.15k-1
R11 <sup>2</sup>	MF, $1/4W$ , $1\%$ , 4.22 k $\Omega$		K01-	MF, $1/4W$ , 1%, 100 k $\Omega$	110-100k-1
R113	, , , , ,	110-4.22k-1	R61 <sup>2</sup>	MF, $1/4$ W, $1\%$ , $100$ kΩ	110-100k-1
	MF, $1/4$ W, $1\%$ , $7.68$ kΩ	110-7.68k-1	R61 <sup>3</sup>	MF, $1/4W$ , $1\%$ , $33.2 k\Omega$	110-33.2k-1
R12	MF, $1/4W$ , $1\%$ , $20 k\Omega$	110-20k-1	R62 <sup>3</sup>	MF, $1/4W$ , $1\%$ , $33.2 \text{ k}\Omega$	110-33.2k-1
R13	Variable, 1-Turn, 20 kΩ	156-20k	R63		
R14 <sup>1</sup>	MF, $1/4W$ , $1\%$ , $1.91 \text{ k}\Omega$			MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R14 <sup>2</sup>		110-1.91k-1	R64	MF, 1/4W, 1%, 10 kΩ	110-10k-1
K14-	MF, $1/4W$ , $1\%$ , $2.74 \text{ k}\Omega$	110-2.74k-1	R65	MF, $1/4$ W, $1\%$ , $750$ kΩ	110-750k-1
R14 <sup>3</sup>	MF,1 /4W, 1%, 3.16 k $\Omega$	110-3.16k-1	R66	MF, $1/4W$ , 1%, 14.7 k $\Omega$	110-14.7k-1
R15	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1	R67 <sup>1</sup>		
R16			K01-2	MF, $1/4$ W, $1\%$ , $866\Omega$	110-866-1
	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1	R67 <sup>2</sup>	MF, 1/4W, 1%, 866Ω	110-866-1
R17	MF, 1/4W, 1%, 10 kΩ	110-10k-1	R67 <sup>3</sup>	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1
R18	MF, $1/4W$ , $1\%$ , $23.7 k\Omega$	110-23.7k-1	R68	Variable, 15-Turn, 500Ω	157-500
R19	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1	R69		
R20	MF, 1/4W, 1%, 121Ω			MF, $1/4$ W, $1\%$ , $2 k\Omega$	110-2k-1
		110-121-1	R70	MF, 1/4W, 1%, 10 kΩ	110-10k-1
R21	MF, $1/4$ W, $1\%$ , $1$ k $\Omega$	110-1k-1	R71	MF, $1/4$ W, $1\%$ , $750$ kΩ	110-750k-1
R22	MF, $1/4W$ , $1\%$ , $7.5 k\Omega$	110-7.5k-1	R72	MF, $1/4W$ , 1%, 14.7 k $\Omega$	110-14.7k-1
R23	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1	R73	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	
R24	MF, $1/4W$ , 1%, 5.11 k $\Omega$				110-10k-1
		110-5.11k-1	R74	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R25	WW, 5W, 2Ω	131-1	R75	MF, $1/4W$ , $1\%$ , $205 k\Omega$	110-205k-1
R26	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1	R76	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
R27	MF, $1/4W$ , $1\%$ , $750\Omega$	110-750-1	R77	Variable, 1-Turn, $20\Omega$	156-20
R28	MF, $1/4W$ , $1\%$ , $5.49 k\Omega$				
R29		110-5.49k-1	R78	MF, $1/4W$ , $1\%$ , $2 k\Omega$	110-2k-1
	MF, $1/4W$ , $1\%$ , $1.78 \text{ k}\Omega$	110-1.78k-1	R79	MF, 1/4W, 1%, 15 kΩ	110-15k-1
R30	MF, $1/4W$ , $1\%$ , $2.15 k\Omega$	110-2.15k-1	R80	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
R31	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1	R81	MF, $1/4W$ , 1%, $511\Omega$	110-511-1
R32	MF, $1/4W$ , $1\%$ , $1.21 \text{ k}\Omega$	110-1.21k-1	R82	MF, $1/4$ W, $1\%$ , $100 \text{ k}\Omega$	
R33	MF, $1/4$ W, 1%, 17.8 kΩ	110 17 0 1			110-100k-1
		110-17.8k-1	R83	MF, 1/4W, 1%, 100 kΩ	110-100k-1
R34	Variable, 1-Turn, 200 k $\Omega$	156-200k	R84	MF, $1/4W$ , $1\%$ , $5.11 k\Omega$	110-5.11k-1
R35	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110 11 1			
1(3)	1011 9 1/ 111 9 1/09 1 Kat	11U-1K-1	I R85	MF, $1/4W$ , $1\%$ , $5.11 k\Omega$	110-5 111-1
R36		110-1k-1 110-10k-1	R85	MF, $1/4$ W, $1\%$ , $5.11$ k $\Omega$	110-5.11k-1
R36	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1	R85 R86	MF, $1/4$ W, $1\%$ , $5.11 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $5.11\Omega$	110-5.11k-1 110-5.11-1
R36 R37	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1 110-10k-1			
R36 R37 R38	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-10k-1		MF, 1/4W, 1%, 5.11Ω	
R36 R37 R38 R39	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-10k-1 110-10k-1			
R36 R37 R38 R39 R40 <sup>3</sup>	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1		MF, 1/4W, 1%, 5.11Ω	
R36 R37 R38 R39 R40 <sup>3</sup>	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $61.9 \text{ k}\Omega$	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1		MF, 1/4W, 1%, 5.11Ω	
R36 R37 R38 R39 R40 <sup>3</sup> R41 <sup>3</sup>	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $61.9 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $61.9 \text{ k}\Omega$	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1 110-61.9k-1	R86 <b>REF.</b>	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS	110-5.11-1 <b>WILTRON</b>
R36 R37 R38 R39 R40 <sup>3</sup> R41 <sup>3</sup> R42	MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $61.9$ kΩ MF, $1/4$ W, $1\%$ , $61.9$ kΩ Variable, $15$ -Turn, $50$ kΩ	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1 110-61.9k-1 157-50k	R86	MF, 1/4W, 1%, 5.11Ω	110-5.11-1
R36 R37 R38 R39 R40 <sup>3</sup> R41 <sup>3</sup> R42 R42	MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $61.9$ kΩ MF, $1/4$ W, $1\%$ , $61.9$ kΩ Variable, $15$ -Turn, $50$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1 110-61.9k-1 157-50k 110-18.7k-1	R86 REF. DES.	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION	WILTRON PART NO.
R36 R37 R38 R39 R40 <sup>3</sup> R41 <sup>3</sup> R42 R42 R43	MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $61.9$ kΩ MF, $1/4$ W, $1\%$ , $61.9$ kΩ Variable, $15$ -Turn, $50$ kΩ	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1 110-61.9k-1 157-50k 110-18.7k-1	R86 REF. DES. U1	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201	WILTRON PART NO. 54-20
R36 R37 R38 R39 R40 <sup>3</sup> R41 <sup>3</sup> R42 R43 R44	MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $61.9$ kΩ MF, $1/4$ W, $1\%$ , $61.9$ kΩ Variable, $15$ -Turn, $50$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1 110-61.9k-1 157-50k 110-18.7k-1 110-18.7k-1	R86 REF. DES.	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION	WILTRON PART NO.
R36 R37 R38 R39 R40 <sup>3</sup> R41 <sup>3</sup> R42 R43 R44	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $61.9 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $61.9 \text{ k}\Omega$ Variable, $15$ -Turn, $50 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1 110-61.9k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1	R86 REF. DES. U1	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10	WILTRON PART NO.  54-20 54-42
R36 R37 R38 R39 R40 <sup>3</sup> R41 <sup>3</sup> R42 R43 R44 R45 R46 <sup>1</sup>	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $61.9 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $61.9 \text{ k}\Omega$ Variable, $15$ -Turn, $50 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1 110-61.9k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1	REF. DES. U1 U2 U3	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05	WILTRON PART NO. 54-20 54-42 54-87
R36 R37 R38 R39 R40 <sup>3</sup> R41 <sup>3</sup> R42 R43 R44 R45 R46 <sup>1</sup> R46 <sup>2</sup>	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $61.9 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $61.9 \text{ k}\Omega$ Variable, $15$ -Turn, $50 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $9.53 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $9.53 \text{ k}\Omega$	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1 110-61.9k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 110-9.53k-1	REF. DES. U1 U2 U3 U4	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072	WILTRON PART NO. 54-20 54-42 54-87 54-53
R36 R37 R38 R39 R40 <sup>3</sup> R41 <sup>3</sup> R42 R43 R44 R45 R46 <sup>1</sup> R46 <sup>2</sup> R46 <sup>3</sup>	MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $61.9$ kΩ MF, $1/4$ W, $1\%$ , $61.9$ kΩ Variable, $15$ -Turn, $50$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $19$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $9.53$ kΩ MF, $1/4$ W, $1\%$ , $9.53$ kΩ MF, $1/4$ W, $1\%$ , $9.53$ kΩ	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1 110-61.9k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1	REF. DES. U1 U2 U3	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05	WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field-
R36 R37 R38 R39 R40 <sup>3</sup> R41 <sup>3</sup> R42 R43 R44 R45 R46 <sup>1</sup> R46 <sup>2</sup>	MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $61.9$ kΩ MF, $1/4$ W, $1\%$ , $61.9$ kΩ Variable, $15$ -Turn, $50$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $19$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $9.53$ kΩ MF, $1/4$ W, $1\%$ , $9.53$ kΩ MF, $1/4$ W, $1\%$ , $9.53$ kΩ	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1 110-61.9k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 110-9.53k-1	REF. DES. U1 U2 U3 U4 U5	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM	WILTRON PART NO. 54-20 54-42 54-87 54-53
R36 R37 R38 R39 R40 <sup>3</sup> R41 <sup>3</sup> R42 R43 R44 R45 R46 <sup>1</sup> R46 <sup>2</sup> R46 <sup>3</sup>	MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $61.9$ kΩ MF, $1/4$ W, $1\%$ , $61.9$ kΩ Variable, $15$ -Turn, $50$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $9.53$ kΩ MF, $1/4$ W, $1\%$ , $9.53$ kΩ MF, $1/4$ W, $1\%$ , $9.53$ kΩ Variable, $15$ -Turn, $20$ kΩ	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1 110-61.9k-1 157-50k 110-18.7k-1 110-10k-1 110-9.53k-1 110-9.53k-1 110-8.45k-1 157-20k	REF. DES. U1 U2 U3 U4	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072	WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field-
R36 R37 R38 R39 R40 <sup>3</sup> R41 <sup>3</sup> R42 R43 R44 R45 R46 <sup>2</sup> R46 <sup>3</sup> R46 <sup>3</sup> R47 R48	MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $61.9$ kΩ MF, $1/4$ W, $1\%$ , $61.9$ kΩ Variable, $15$ -Turn, $50$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $9.53$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1 110-61.9k-1 157-50k 110-18.7k-1 110-10k-1 110-9.53k-1 110-9.53k-1 110-8.45k-1 157-20k 110-11k-1	REF. DES. U1 U2 U3 U4 U5	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074	WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132
R36 R37 R38 R40 3 R41 3 R42 R43 R44 R45 R46 1 R46 2 R46 3 R47 R48 R49	MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $61.9$ kΩ MF, $1/4$ W, $1\%$ , $61.9$ kΩ Variable, $15$ -Turn, $50$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $9.53$ kΩ	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1 110-61.9k-1 157-50k 110-18.7k-1 110-10k-1 110-9.53k-1 110-9.53k-1 110-9.53k-1 110-8.45k-1 157-20k 110-11k-1 110-10k-1	REF. DES. U1 U2 U3 U4 U5	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86	WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125
R36 R37 R38 R40 3 R41 3 R42 R43 R44 R45 R46 1 R46 2 R46 3 R47 R48 R49 R50	MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $61.9$ kΩ MF, $1/4$ W, $1\%$ , $61.9$ kΩ Variable, $15$ -Turn, $50$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $9.53$ kΩ	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1 110-61.9k-1 157-50k 110-18.7k-1 110-10k-1 110-9.53k-1 110-9.53k-1 110-9.53k-1 110-8.45k-1 157-20k 110-11k-1 110-10k-1 110-10k-1 110-511-1	REF. DES. U1 U2 U3 U4 U5	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074	WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132
R36 R37 R38 R40 3 R41 3 R42 R43 R44 R45 R46 1 R46 2 R46 3 R47 R48 R49 R50 R51	MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $61.9$ kΩ MF, $1/4$ W, $1\%$ , $61.9$ kΩ Variable, $15$ -Turn, $50$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $9.53$ kΩ	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1 110-61.9k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 110-9.53k-1 110-8.45k-1 157-20k 110-11k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1	REF. DES. U1 U2 U3 U4 U5	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86	WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125
R36 R37 R38 R40 3 R41 3 R42 R43 R44 R45 R46 1 R46 2 R46 3 R47 R48 R49 R50	MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $61.9$ kΩ MF, $1/4$ W, $1\%$ , $61.9$ kΩ Variable, $15$ -Turn, $50$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $9.53$ kΩ	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1 110-61.9k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 110-9.53k-1 110-8.45k-1 157-20k 110-11k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1	REF. DES. U1 U2 U3 U4 U5	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393	WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125
R36 R37 R38 R39 R40 3 R412 R42 R443 R445 R466 1 R466 2 R466 3 R47 R48 R47 R48 R49 R50 R51 R52	MF, $1/4W$ , $1\%$ , $10 kΩ$ MF, $1/4W$ , $1\%$ , $10 kΩ$ MF, $1/4W$ , $1\%$ , $18.7 kΩ$ MF, $1/4W$ , $1\%$ , $18.7 kΩ$ MF, $1/4W$ , $1\%$ , $61.9 kΩ$ MF, $1/4W$ , $1\%$ , $61.9 kΩ$ MF, $1/4W$ , $1\%$ , $61.9 kΩ$ Variable, $15$ -Turn, $50 kΩ$ MF, $1/4W$ , $1\%$ , $18.7 kΩ$ MF, $1/4W$ , $1\%$ , $18.7 kΩ$ MF, $1/4W$ , $1\%$ , $10 kΩ$ MF, $1/4W$ , $1\%$ , $9.53 kΩ$ MF, $1/4W$ , $1\%$ , $10 kΩ$ MF, $1/4W$ , $1\%$ , $11 kΩ$ MF, $1/4W$ , $1\%$ , $10 kΩ$	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1 110-61.9k-1 157-50k 110-18.7k-1 110-18.7k-1 110-10k-1 110-9.53k-1 110-9.53k-1 110-8.45k-1 157-20k 110-11k-1 110-10k-1 110-10k-1 110-10k-1 110-3.83k-1	REF. DES. U1 U2 U3 U4 U5	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86	WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125
R36 R37 R38 R39 R40 3 R41 3 R42 R44 R45 R46 1 R46 2 R46 3 R47 R48 R49 R50 R51 R52 R53	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 61.9 kΩ MF, 1/4W, 1%, 61.9 kΩ Variable, 15-Turn, 50 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 9.53 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 15-Turn, 20 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 1 kΩ	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1 157-50k 110-18.7k-1 110-10k-1 110-9.53k-1 110-9.53k-1 110-8.45k-1 157-20k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-3.83k-1 110-1k-1	REF. DES. U1 U2 U3 U4 U5 U7 U8 U9	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393	WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field – Replaceable 54-132 54-125 54-158
R36 R37 R38 R39 R40 <sup>3</sup> R41 <sup>3</sup> R42 R43 R44 R46 <sup>1</sup> R46 <sup>2</sup> R46 <sup>3</sup> R47 R48 R49 R50 R51 R52 R53 R54	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 61.9 kΩ MF, 1/4W, 1%, 61.9 kΩ MF, 1/4W, 1%, 61.9 kΩ Variable, 15-Turn, 50 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 9.53 kΩ MF, 1/4W, 1%, 1% kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 511Ω	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1 157-50k 110-18.7k-1 110-10k-1 110-9.53k-1 110-9.53k-1 110-8.45k-1 157-20k 110-11k-1 110-511-1 110-3.83k-1 110-3.83k-1 110-1k-1 110-1k-1	REF. DES. U1 U2 U3 U4 U5 U7 U8 U9	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS	WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125
R36 R37 R38 R39 R40 <sup>3</sup> R412 R42 R43 R444 R46 <sup>1</sup> R46 <sup>3</sup> R47 R48 R49 R50 R51 R52 R53 R54 R55	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 61.9 kΩ MF, 1/4W, 1%, 61.9 kΩ Variable, 15-Turn, 50 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 9.53 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 15-Turn, 20 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 31 lΩ MF, 1/4W, 1%, 38.8 kΩ MF, 1/4W, 1%, 38.8 kΩ MF, 1/4W, 1%, 38.8 kΩ MF, 1/4W, 1%, 511Ω	110-10k-1 110-10k-1 110-18.7k-1 110-61.9k-1 110-61.9k-1 157-50k 110-18.7k-1 110-10k-1 110-9.53k-1 110-9.53k-1 110-8.45k-1 157-20k 110-11k-1 110-4.99k-1 110-3.83k-1 110-3.83k-1 110-1k-1 110-1k-1 110-1k-1	REF. DES. U1 U2 U3 U4 U5 U7 U8 U9	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393	WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158
R36 R37 R38 R39 R40 <sup>3</sup> R412 R42 R43 R445 R46 <sup>2</sup> R46 <sup>3</sup> R47 R48 R49 R50 R51 R52 R55 R55 R55 R55	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 61.9 kΩ MF, 1/4W, 1%, 61.9 kΩ MF, 1/4W, 1%, 61.9 kΩ Variable, 15-Turn, 50 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 9.53 kΩ MF, 1/4W, 1%, 1% kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 511Ω	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1 157-50k 110-18.7k-1 110-10k-1 110-9.53k-1 110-9.53k-1 110-8.45k-1 157-20k 110-11k-1 110-511-1 110-3.83k-1 110-3.83k-1 110-1k-1 110-1k-1	REF. DES. U1 U2 U3 U4 U5 U7 U8 U9	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS	WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field – Replaceable 54-132 54-125 54-158
R36 R37 R38 R39 R40 <sup>3</sup> R412 R42 R43 R444 R46 <sup>1</sup> R46 <sup>3</sup> R47 R48 R49 R50 R51 R52 R53 R54 R55	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 61.9 kΩ MF, 1/4W, 1%, 61.9 kΩ Variable, 15-Turn, 50 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 9.53 kΩ MF, 1/4W, 1%, 9.53 kΩ MF, 1/4W, 1%, 9.53 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 15-Turn, 20 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 8.66Ω MF, 1/4W, 1%, 8.66Ω MF, 1/4W, 1%, 8.66Ω	110-10k-1 110-10k-1 110-18.7k-1 110-61.9k-1 110-61.9k-1 157-50k 110-18.7k-1 110-10k-1 110-9.53k-1 110-9.53k-1 110-9.53k-1 110-8.45k-1 157-20k 110-11k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-3.83k-1 110-1k-1 110-3.83k-1 110-1k-1	REF. DES.  U1 U2 U3 U4 U5  U7 U8 U9	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION	WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158 WILTRON PART NO.
R36 R37 R38 R39 R40 <sup>3</sup> R412 R442 R443 R444 R466 <sup>2</sup> R466 <sup>3</sup> R47 R48 R49 R50 R51 R52 R55 R55 R55 R55 R55 R55	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 61.9 kΩ MF, 1/4W, 1%, 61.9 kΩ Variable, 15-Turn, 50 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 9.53 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 15-Turn, 20 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 8.66Ω	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1 110-61.9k-1 157-50k 110-18.7k-1 110-10k-1 110-9.53k-1 110-9.53k-1 110-9.53k-1 110-8.45k-1 157-20k 110-11k-1 110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-1k-1 110-10k-1 110-511-1 110-8.66-1 110-8.66-1	REF. DES. U1 U2 U3 U4 U5 U7 U8 U9 REF. DES	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS	WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158
R36 R37 R38 R39 R40 <sup>3</sup> R412 R42 R43 R445 R46 <sup>2</sup> R46 <sup>3</sup> R47 R48 R49 R50 R51 R52 R55 R55 R55 R55	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 61.9 kΩ MF, 1/4W, 1%, 61.9 kΩ Variable, 15-Turn, 50 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 9.53 kΩ MF, 1/4W, 1%, 9.53 kΩ MF, 1/4W, 1%, 9.53 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 15-Turn, 20 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 8.66Ω MF, 1/4W, 1%, 8.66Ω MF, 1/4W, 1%, 8.66Ω	110-10k-1 110-10k-1 110-18.7k-1 110-61.9k-1 110-61.9k-1 157-50k 110-18.7k-1 110-10k-1 110-9.53k-1 110-9.53k-1 110-9.53k-1 110-8.45k-1 157-20k 110-11k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-10k-1 110-3.83k-1 110-1k-1 110-3.83k-1 110-1k-1	REF. DES.  U1 U2 U3 U4 U5  U7 U8 U9  REF. DES.	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION	WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158 WILTRON PART NO.
R36 R37 R38 R39 R403 R413 R42 R443 R445 R4663 R47 R4663 R47 R48 R49 R50 R51 R52 R53 R54 R55 R55 R55 R55 R55 R55 R55 R55 R55	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 61.9 kΩ MF, 1/4W, 1%, 61.9 kΩ MF, 1/4W, 1%, 61.9 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 9.53 kΩ MF, 1/4W, 1%, 9.53 kΩ MF, 1/4W, 1%, 9.53 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 15-Turn, 20 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 8.66Ω	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1 110-61.9k-1 157-50k 110-18.7k-1 110-10k-1 110-9.53k-1 110-9.53k-1 110-9.53k-1 110-8.45k-1 157-20k 110-11k-1 110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-1k-1 110-10k-1 110-511-1 110-8.66-1 110-8.66-1	REF. DES.  U1 U2 U3 U4 U5  U7 U8 U9  REF. DES.  —— TP1 thru	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION  Ejector, PC Board	WILTRON PART NO. 54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158 WILTRON PART NO.
R36 R37 R38 R39 R40 3 R412 R443 R443 R446 1 R466 2 R466 3 R47 R48 R49 R50 R51 R52 R53 R54 R55 R56 R57 R58	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 61.9 kΩ MF, 1/4W, 1%, 61.9 kΩ MF, 1/4W, 1%, 61.9 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 9.53 kΩ MF, 1/4W, 1%, 9.53 kΩ MF, 1/4W, 1%, 9.53 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 15-Turn, 20 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 8.66Ω	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1 110-61.9k-1 157-50k 110-18.7k-1 110-10k-1 110-9.53k-1 110-9.53k-1 110-9.53k-1 110-8.45k-1 157-20k 110-11k-1 110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-1k-1 110-10k-1 110-511-1 110-8.66-1 110-8.66-1	REF. DES.  U1 U2 U3 U4 U5  U7 U8 U9  REF. DES.	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION	WILTRON PART NO.  54-20 54-42 54-87 54-53 Not Field – Replaceable 54-132 54-132 54-125 54-158  WILTRON PART NO.  553-96
R36 R37 R38 R39 R40 <sup>3</sup> R41 <sup>3</sup> R42 R43 R44 R46 <sup>1</sup> R46 <sup>2</sup> R46 <sup>3</sup> R47 R48 R49 R50 R51 R52 R53 R54 R55 R56 R57 R58	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 61.9 kΩ MF, 1/4W, 1%, 61.9 kΩ MF, 1/4W, 1%, 61.9 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 9.53 kΩ MF, 1/4W, 1%, 9.53 kΩ MF, 1/4W, 1%, 9.53 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 15-Turn, 20 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 8.66Ω	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1 110-61.9k-1 157-50k 110-18.7k-1 110-10k-1 110-9.53k-1 110-9.53k-1 110-9.53k-1 110-8.45k-1 157-20k 110-11k-1 110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-1k-1 110-10k-1 110-511-1 110-8.66-1 110-8.66-1	REF. DES.  U1 U2 U3 U4 U5  U7 U8 U9  REF. DES.  —— TP1 thru TP4	INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION  Ejector, PC Board  Pin, Test Point	WILTRON PART NO.  54-20 54-42 54-87 54-53 Not Field – Replaceable 54-132 54-125 54-158  WILTRON PART NO.  553-96
R36 R37 R38 R39 R40 <sup>3</sup> R41 <sup>3</sup> R42 R43 R44 R46 <sup>1</sup> R46 <sup>2</sup> R46 <sup>3</sup> R47 R48 R49 R50 R51 R52 R53 R54 R55 R56 R57 R58	MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 61.9 kΩ MF, 1/4W, 1%, 61.9 kΩ MF, 1/4W, 1%, 61.9 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 9.53 kΩ MF, 1/4W, 1%, 9.53 kΩ MF, 1/4W, 1%, 9.53 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 15-Turn, 20 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 8.66Ω	110-10k-1 110-10k-1 110-18.7k-1 110-18.7k-1 110-61.9k-1 110-61.9k-1 157-50k 110-18.7k-1 110-10k-1 110-9.53k-1 110-9.53k-1 110-9.53k-1 110-8.45k-1 157-20k 110-11k-1 110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-1k-1 110-10k-1 110-511-1 110-8.66-1 110-8.66-1	REF. DES.  U1 U2 U3 U4 U5  U7 U8 U9  REF. DES.  —— TP1 thru	MF, 1/4W, 1%, 5.11Ω  INTEGRATED CIRCUITS  DESCRIPTION  Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION  Ejector, PC Board	WILTRON PART NO.  54-20 54-42 54-87 54-53 Not Field – Replaceable 54-132 54-132 54-125 54-158  WILTRON PART NO.  553-96

Table 6-15. A7/A8 YIG Driver, 12.4-18.6 (20) GHz, 6629A/6637A/6638A/6647A/6648A (660-D-8008-4, -7, -99-90)

	CAPACITORS		R2	Variable, 15-Turn, 50 kΩ	157-50k
	<u> </u>		R3	CC, $1/4$ W, 5%, 3.6 M $\Omega$	101-3.6M-5
REF.		WILTRON	R4	MF, $1/4W$ , 1%, $61.9 \text{ k}\Omega$	110-61.9k-1
DES.	DESCRIPTION	PART NO.	R5	Variable, 15-Turn, 1 kΩ	157-1k
			R6	MF, $1/4W$ , $1\%$ , $11 k\Omega$	110-11k-1
C1	Tantalum, 4.7 μF	250-39	R7	Variable, 15-Turn, 1 kΩ	157-1k
C2	Tantalum, 4.7 μF	250-39	R8	MF, $1/4$ W, $1\%$ , $11 k\Omega$	110-11k-1
C3	Tantalum, 4.7 μF	250-39	R9	Variable, 15-Turn, 200 kΩ	157-200k
C4	Disc Ceramic, .01 µF	230-11	R10 <sup>1</sup>	MF, 1/4W, 1%, 210 kΩ	110-210k-1
C5 C6	Disc Ceramic, .001 µF	230-30	R10 <sup>2</sup> R11 <sup>1</sup>	MF, 1/4W, 1%, 205 kΩ	110-205k-1
C7	Tantalum, 1 $\mu$ F, 35V Tantalum, 1 $\mu$ F, 35V	250-19 250-19	R11 2	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$ MF, $1/4W$ , $1\%$ , $7.68 \text{ k}\Omega$	110-5.11k-1 110-7.68k-1
C8	Monolithic, 1.0 µF	230-41	R12	MF, $1/4W$ , $1\%$ , $7.08 \text{ k}$ MF, $1/4W$ , $1\%$ , $20 \text{ k}$ $\Omega$	110-7.06K-1 110-20k-1
C9	Mica, 300 pF	220-300	R13	Variable, 1-Turn, 20 k $\Omega$	156-20k-1
C10	Monolithic, .1 μF	230-37	R14 <sup>1</sup>	MF, $1/4W$ , 1%, 1.87 k $\Omega$	110-1.87k-1
C11	Tantalum, 6.8 µF	250-41	R14 <sup>2</sup>	MF, $1/4W$ , $1\%$ , $3.16 k\Omega$	110-3.16k-1
C12	Mica, 5 pF	220-5	R15	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
C13	Monolithic, .1 μF	230-37	R16	MF, $1/4W$ , $1\%$ , $4.99 \text{ k}\Omega$	110-4.99k-1
C14	Disc Ceramic, .01 μF	230-11	R17	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
C15	Mica, 820 pF	220-820	R18	MF, $1/4W$ , $1\%$ , $23.7 \text{ k}\Omega$	110-23.7k-1
C16	Monolithic, .1 μF	230-37	R19	MF, $1/4$ W, $1\%$ , $1 k\Omega$	110-1k-1
C17	Disc Ceramic, .01 μF	230-11	R20	MF, 1/4W, 1%, 121Ω	110-121-1
C18 C19	Disc Ceramic, .01 μF Disc Ceramic, .01 μF	230-11 230-11	R21 R22	MF, $1/4W$ , $1\%$ , $1 k\Omega$ MF, $1/4W$ , $1\%$ , $7.5 k\Omega$	110-1k-1
C19	Disc Ceramic, .01 pr	230-11	R22	MF, $1/4W$ , $1\%$ , $7.5 \text{ K}$ ? MF, $1/4W$ , $1\%$ , $511\Omega$	110-7.5k-1 110-511-1
			R24	MF, $1/4W$ , $1/6$ , $5111$ MF, $1/4W$ , $1\%$ , $5.11 k\Omega$	110-511-1 110-5.11k-1
	DIODES		R25	$WW, 5W, 3\Omega$	131-2
T) 1717		WII TOON	R26	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
REF. DES.	DESCRIPTION	WILTRON PART NO.	R27	MF, $1/4W$ , $1\%$ , $750\Omega$	110-750-1
DES.	DESCRIPTION	PART NO.	R28	MF, $1/4W$ , $1\%$ , $5.49 k\Omega$	110-5.49k-1
CR1	Silicon, 1N4446	10-1N4446	R29	MF, $1/4W$ , $1\%$ , $1.78 \text{ k}\Omega$	110-1.78k-1
CR2	Silicon, 1N4446	10-1N4446	R30	MF, $1/4W$ , $1\%$ , $2.15 k\Omega$	110-2.15k-1
CR3	Silicon, SI2	10-SI2	R31	MF, 1/4W, 1%, 1k	110-1k-1
CR4	Zener, 24V, 1W, 1N4749A	10-1N4749A	R32	MF, 1/4W, 1%, 1.21 kΩ	110-1.21k-1
CR5	Silicon, SI2	10-SI2	R33	MF, 1/4W, 1%, 17.8 kΩ	110-17.8k-1
CR6	Silicon, 1N4446	10-1N4446	R34 R35	Variable, 1-Turn, 200 kΩ	156-200k
CR7	Silicon, 1N4446	10-1N4446	R38	MF, $1/4$ W, $1\%$ , $1$ k $\Omega$ MF, $1/4$ W, $1\%$ , $18.7$ k $\Omega$	110-1k-1 110-18.7k-1
CR8	Silicon, 1N4446	10-1N4446	R39	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1
CR9 CR10	Zener, 10V, 0.4W, 1N758A Silicon, 1N4446	10-1N758A 10-1N4446	R40	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
CR10	Silicon, 1N4446	10-1N4446 10-1N4446	R41 <sup>1</sup>	MF, $1/4$ W, $1\%$ , $110$ kΩ	110-110k-1
CICII	Sificon, 1144440	10 1141110	R41 <sup>2</sup>	MF, $1/4W$ , $1\%$ , $61.9 k\Omega$	110-61.9k-1
			R42	Variable, 15-Turn, 50 k $\Omega$	157-50k
	TRANSISTORS		R43	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1
nee		WIII TOOM	R44	MF, $1/4$ W, $1\%$ , $18.7$ kΩ	110-18.7k-1
REF. DES.	DESCRIPTION	WILTRON PART NO.	R45	MF, 1/4W, 1%, 10 kΩ	110-10k-1
DEG.	DESCRI HOW	TAKT NO.	R46 R47	MF, $1/4$ W, $1\%$ , $8.45$ k $\Omega$ Variable, $15$ -Turn, $10$ k $\Omega$	110-8.45k-1
Q1	PNP, MPSA92	20-MPSA92	R48	MF, $1/4$ W, $1\%$ , $11 \text{ k}\Omega$	157-10k 110-11k-1
Q2	PNP, MPSA92	20-MPSA92	R49	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-11k-1 110-10k-1
Q3	NPN, 2N3694	20-2N3694	R50	MF, $1/4W$ , 1%, $511\Omega$	110-511-1
Q4	NPN, 2N2222A	20-2N2222A	R.51	MF, $1/4W$ , 1%, 4.99 k $\Omega$	110-4.99k-1
Q5	PNP, 2N2907A	20-2N2907A	R52	MF, $1/4W$ , 1%, 3.83 k $\Omega$	110-3.83k-1
Q6	NPN, 2N2222A	20-2N2222A	R53	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1
Q7	PNP, 2N2907A	20-2N2907A	R54	MF, $1/4$ W, $1\%$ , $511\Omega$	110-511-1
			R55	MF, $1/4W$ , $1\%$ , $8.06\Omega$	110-8.66-1
	RESISTORS		R56	MF, 1/4W, 1%, 8.06Ω	110-8.66-1
			R57	MF, 1/4W, 1%, 8.06Ω	110-8.66-1
REF.	DECORPORAL	WILTRON	R58 R59	MF, 1/4W, 1%, 8.06Ω	110-8.66-1
DES.	DESCRIPTION	PART NO.	R59	CC, $1/2W$ , $.5\Omega$ MF, $1/4W$ , $1\%$ , $2.15 k\Omega$	1025-5 110-2.15k-1
R1	CC 1/4W 50% 2 2 M O	101-3.3M-5	R61 <sup>1</sup>	MF, $1/4W$ , $1\%$ , $2.13 \text{ K}$ MF, $1/4W$ , $1\%$ , $110 \text{ k}\Omega$	110-2.13k-1 110-110k-1
K1	CC, $1/4$ W, 5%, 3.3 M $\Omega$	101-3.5M-5	R61 <sup>2</sup>	MF, $1/4W$ , $1\%$ , $110 \text{ km}$ MF, $1/4W$ , $1\%$ , $33.2 \text{ k}\Omega$	110-110k-1 110-33.2k-1
			R62 <sup>2</sup>	MF, $1/4$ W, $1\%$ , $33.2 \text{ k}\Omega$	110-33.2k-1
<sup>1</sup> Used o	on 660-D-8008-4 and -7 assemblies.		R63	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
	on 660-D-8008-99-90 assembly.		R64	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
	•		-	· · · · · · · · · · · · · · · · · · ·	

R65 R66 R67	MF, 1/4W, 1%, 750 kΩ MF, 1/4W, 1%, 14.7 kΩ MF, 1/4W, 1%, 5.11Ω	110-750k-1 110-14.7k-1 110-5.11-1	REF. DES.	DESCRIPTION	WILTRON PART NO.
R68 R69 R70 R71 R72 R73 R74 R75 R76	Variable, 15-Turn, 500Ω MF, 1/4W, 1%, 2 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 750 kΩ MF, 1/4W, 1%, 14.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 205 kΩ MF, 1/4W, 1%, 511Ω	157-500 110-2k-1 110-10k-1 110-750k-1 110-14.7k-1 110-10k-1 110-205k-1 110-511-1	U1 U2 U3 U4 U5 U7 U8 U9	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393	54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158
R77 R78 R79 R80 R81 R82 R83	Variable, 1-Turn, 20Ω MF, 1/4W, 1%, 2 kΩ MF, 1/4W, 1%, 15 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 100 kΩ MF, 1/4W, 1%, 100 kΩ	156-20 110-2k-1 110-15k-1 110-511-1 110-511-1 110-100k-1 110-100k-1	REF. DES.	MISCELLANEOUS  DESCRIPTION	WILTRON PART NO.
R84 R85 R86	MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ MF, 1/4W, 1%, 5.11 kΩ	110-5.11k-1 110-5.11k-1 110-5.11-1	TP1 thru	Ejector, PC Board	553-96
	INTEGRATED CIRCUITS		TP4 K1	Pin, Test Point Relay, 2 Form C Socket, I.C., 24-Pin	706-44 690-28 553-67

Table 6-16. A7 YIG Driver, 26.5-40 GHz, 6642A (660-D-8191-99-93)

			eren periodo a periodo a parte como		
DEE	CAPACITORS	WW EDON	CR9 CR10	Zener, 10V, 0.4W, 1N758A Silicon, 1N4446	10-1N758A 10-1N4446
REF. DES.	DESCRIPTION	WILTRON PART NO.		TRANSISTORS	
C1	Tant alum, 4.7 μF	250-39	REF.		WILTRON
C2	Tantalum, 4.7 μF	250-39	DES.	DESCRIPTION	PART NO.
C3	Tantalum, 4.7 μF	250-39			
C4	Disc Ceramic, .01 μF	230-11	Q1	PNP, MPSA92	20-MPSA92
C5	Disc Ceramic, .001 μF	230-30	Q2	PNP, MPSA92	20-MPSA92
C6	Tantalum, 1 μF, 35V	250-19	Q3	PNP, 2N4249	20-2N4249
C7	Tantalum, 1 µF, 35V	250-19	Q4	PNP, MPSU55	20-30
C8	Monolithic, 1.0 μF	230-41	Q5	PNP, 2N2907A	20-2N2907A
C9	Mica, 300 pF	220-300	Q6	NPN, 2N2222A	20-2N2222A
C10	Monolithic, .1 μF	230-37	Q7	PNP, 2N2907A	20-2N2907A
C11	Tantalum, 6.8 μF	250-41	Q8	PNP, 2N2907A	20-2N2907A
C12	Mica, 5 pF	220-5			
C13	Monolithic, .1 μF	230-37		RESISTORS	
C14	Disc Ceramic, .01 μF	230-11			
C15	Mica, 820 pF	220-820	REF.		WILTRON
C16	Monolithic, .1 µF	230-37	DES.	DESCRIPTION	PART NO.
C17	Disc Ceramic, .01 μF	230-11			
C18	Disc Ceramic, .01 μF	230-11	R1	CC, $1/4W$ , $5\%$ , $3.3 M\Omega$	101-3.3M-5
C19	Disc Ceramic, .01 μF	230-11	R2	Variable, 15-Turn, 50 k $\Omega$	157-50k
C20	Mica, 39 pF	220-39	R3	CC, $1/4W$ , $5\%$ , $3.6 M\Omega$	101-3.6M-5
			R4	MF, $1/4$ W, $1\%$ , $61.9$ k $Ω$	110-61.9k-1
	DIODES		R5	Variable, 15-Turn, 1 kΩ	157-1k
			R6	MF, $1/4$ W, $1\%$ , $10$ k $\Omega$	110-10k-1
REF.		WILTRON	R7	Variable, 1-Turn, 1 k $\Omega$	157-1k
DES.	DESCRIPTION	PART NO.	R8	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
			R9	Variable, 1-Turn, 200 k $\Omega$	157-200k
CR1	Silicon, 1N4446	10-1N4446	R10	MF, $1/4W$ , $1\%$ , $162 k\Omega$	110-162k-1
CR2	Silicon, 1N4446	10-1N4446	R11	MF, $1/4$ W, $1\%$ , $3.16$ kΩ	110-3.16k-1
CR3	Silicon, SI2	10-SI2	R12	MF, $1/4W$ , $1\%$ , $20 k\Omega$	110-20k-1
CR4	Zener, 24V, 1W, 1N4749A	10-1N4749A	R13	Variable, 1-Turn, 20 k $\Omega$	156-20k
CR5	Silicon, SI2	10-SI2	R14	MF, $1/4W$ , $1\%$ , $2.05 \text{ k}\Omega$	110-2.05k-1
CR6	Silicon, 1N4446	10-1N4446	R15	MF, $1/4$ W, $1\%$ , $10$ k $\Omega$	110-10k-1
CR7	Silicon, 1N4446	10-1N4446	R16	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
CR8	Silicon, 1N4446	10-1N4446	R17	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1

R18	MF, $1/4W$ , $1\%$ , $23.7 k\Omega$	110-23.7k-1	R66	MF, $1/4W$ , $1\%$ , $14.7 k\Omega$	110-14.7k-1
R19	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1	R67	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1
R20	MF, $1/4W$ , $1\%$ , $121\Omega$	110-121-1	R68	Variable, 1-Turn, 500Ω	157-500
R21	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1	R69	MF, $1/4W$ , $1\%$ , $2 k\Omega$	110-2k-1
R22	MF, $1/4W$ , $1\%$ , $7.5 k\Omega$	110-7.5k-1	R70	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
R23	MF, $1/4W$ , 1%, $511\Omega$	110-511-1	R71	MF, $1/4$ W, $1\%$ , $750$ kΩ	110-750k-1
R24	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$	110-5.11k-1	R72	MF, $1/4W$ , $1\%$ , $14.7 \text{ k}\Omega$	110-14.7k-1
R25	$WW, 5W, 5\Omega$	131-3	R73	MF, 1/4W, 1%, 10 k $\Omega$	
R26	MF, $1/4$ W, $1\%$ , $15.4$ k $\Omega$	110-15k-1	R74		110-10k-1
R27	MF, $1/4W$ , $1\%$ , $649\Omega$	110-138-1		MF, 1/4W, 1%, 10 kΩ	110-10k-1
R28			R75	MF, 1/4W, 1%, 750 kΩ	110-750k-1
R29	MF, 1/4W, 1%, 6.19 kΩ	110-6.19k-1	R76	MF, $1/4$ W, $1\%$ , $511\Omega$	110-511-1
R30	MF, 1/4W, 1%, 1.37 kΩ	110-1.37k-1	R77	Variable, 1-Turn, 20Ω	156-20
	MF, 1/4W, 1%, 3.83 kΩ	110-3.83k-1	R78	MF, $1/4W$ , $1\%$ , $2 k\Omega$	110-2k-1
R31	MF, $1/4$ W, $1\%$ , $1 k\Omega$	110-1k-1	R79	MF, $1/4W$ , $1\%$ , $14.7 \text{ k}\Omega$	110-14.7k-1
R32	MF, $1/4W$ , $1\%$ , $1.21 \text{ k}\Omega$	110-1.21k-1	R80	MF, $1/4W$ , $1\%$ , $23.7 k\Omega$	110-23.7k-1
R33	MF, $1/4$ W, $1\%$ , $17.8 \text{ k}\Omega$	110-17.8k-1	R81	MF, $1/4W$ , $1\%$ , $23.7 k\Omega$	110-23.7k-1
R34	Variable, 1-Turn, 500 kΩ	156-500k	R82	MF, $1/4$ W, $1\%$ , 20 kΩ	110-20k-1
R35	MF, $1/4W$ , $1\%$ , $49.9 \text{ k}\Omega$	110-49.9k-1	R83	MF, $1/4W$ , $1\%$ , $20 \text{ k}\Omega$	110-20k-1
R36	MF, $1/4$ W, $1\%$ , $5.11$ kΩ	110-5.11k-1	R84	MF, $1/4W$ , $1\%$ , $5.11 k\Omega$	110-5.11k-1
R37	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$	110-5.11k-1	R85	MF, $1/4W$ , $1\%$ , $5.11 k\Omega$	110-5.11k-1
R38	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1	R86	MF, $1/4W$ , 1%, $5.11\Omega$	110-5.11-1
R39	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1			
R40	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1		INTEGRATED CIRCUITS	
R41	MF, $1/4$ W, $1\%$ , $100$ kΩ	110-100k-1			
	TT				
R42	Variable, 1-Turn, 50 kΩ	157-50k	REF.		WILTRON
R42 R43	Variable, 1-Turn, 50 k $\Omega$ MF, 1/4W, 1%, 18.7 k $\Omega$	157-50k 110-18.7k+1	REF. DES.	DESCRIPTION	WILTRON PART NO.
		ž.		DESCRIPTION	WILTRON PART NO.
R43	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1			PART NO.
R43 R44	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ	110-18.7k-1 110-18.7k-1	DES.	Quad Analog Switch, LF13201	<b>PART NO.</b> 54-20
R43 R44 R45	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ	110-18.7k-1 110-18.7k-1 110-10k-1	<b>DES.</b> U1 U2	Quad Analog Switch, LF13201 NAND Gate, 74LS10	<b>PART NO.</b> 54-20 54-42
R43 R44 R45 R46	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ	110-18.7k-1 110-18.7k-1 110-10k-1 110-8.45k-1	DES. U1 U2 U3	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05	PART NO. 54-20 54-42 54-87
R43 R44 R45 R46 R47	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ	110-18.7k-1 110-18.7k-1 110-10k-1 110-8.45k-1 157-10k	DES. U1 U2 U3 U4	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072	PART NO.  54-20 54-42 54-87 54-53
R43 R44 R45 R46 R47 R48	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ	110-18.7k-1 110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-10k-1	DES. U1 U2 U3	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05	PART NO.  54-20 54-42 54-87 54-53 Not Field-
R43 R44 R45 R46 R47 R48 R49	MF, $1/4$ W, $1\%$ , $18.7$ k $\Omega$ MF, $1/4$ W, $1\%$ , $18.7$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $8.45$ k $\Omega$ Variable, $1$ -Turn, $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $11$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $511$ $\Omega$	110-18.7k-1 110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-10k-1 110-511-1	DES. U1 U2 U3 U4 U5	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM	54-20 54-42 54-87 54-53 Not Field- Replaceable
R43 R44 R45 R46 R47 R48 R49 R50	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ	110-18.7k-1 110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-10k-1 110-511-1 110-4.99k-1	DES. U1 U2 U3 U4 U5	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM Quad Op Amp, TL074	PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132
R43 R44 R45 R46 R47 R48 R49 R50 R51	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ	110-18.7k-1 110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-10k-1 110-511-1 110-4.99k-1 110-3.83k-1	DES.  U1 U2 U3 U4 U5  U7 U8	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86	PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125
R43 R44 R45 R46 R47 R48 R49 R50 R51 R52 R53	MF, $1/4$ W, $1\%$ , $18.7$ k $\Omega$ MF, $1/4$ W, $1\%$ , $18.7$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $8.45$ k $\Omega$ Variable, $1$ –Turn, $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $11$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $4.99$ k $\Omega$ MF, $1/4$ W, $1\%$ , $4.91$ k $\Omega$ MF, $1/4$ W, $1\%$ , $1.81$ MF, $1/4$ W, $1.82$ MF, $1/4$ W, $1.83$ MF, $1/4$ W, $1.84$ MF, $1/4$ MF,	110-18.7k-1 110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1	DES. U1 U2 U3 U4 U5	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM Quad Op Amp, TL074	PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132
R43 R44 R45 R46 R47 R48 R49 R50 R51 R52 R53 R54	MF, $1/4$ W, $1\%$ , $18.7$ k $\Omega$ MF, $1/4$ W, $1\%$ , $18.7$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $8.45$ k $\Omega$ Variable, $1$ –Turn, $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $11$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $4.99$ k $\Omega$ MF, $1/4$ W, $1\%$ , $4.99$ k $\Omega$ MF, $1/4$ W, $1\%$ , $3.83$ k $\Omega$	110-18.7k-1 110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1	DES.  U1 U2 U3 U4 U5  U7 U8	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393	PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125
R43 R44 R45 R46 R47 R48 R50 R551 R552 R53 R554 R55	MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $18.7$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $8.45$ kΩ Variable, $1$ -Turn, $10$ kΩ MF, $1/4$ W, $1\%$ , $11$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $511$ Ω MF, $1/4$ W, $1\%$ , $4.99$ kΩ MF, $1/4$ W, $1\%$ , $3.83$ kΩ MF, $1/4$ W, $1\%$ , $3.83$ kΩ MF, $1/4$ W, $1\%$ , $3.81$ kΩ	110-18.7k-1 110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-511-1 110-5.11-1	DES.  U1 U2 U3 U4 U5  U7 U8	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86	PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125
R43 R44 R45 R46 R47 R48 R50 R51 R52 R53 R55 R55	MF, $1/4$ W, $1\%$ , $18.7$ k $\Omega$ MF, $1/4$ W, $1\%$ , $18.7$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $8.45$ k $\Omega$ Variable, $1$ -Turn, $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $11$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $151$ $\Omega$ MF, $1/4$ W, $1\%$ , $511$ $\Omega$ MF, $1/4$ W, $1\%$ , $4.99$ k $\Omega$ MF, $1/4$ W, $1\%$ , $3.83$ k $\Omega$ MF, $1/4$ W, $1\%$ , $3.83$ k $\Omega$ MF, $1/4$ W, $1\%$ , $5.11$ $\Omega$ MF, $1/4$ W, $1\%$ , $5.11$ $\Omega$ MF, $1/4$ W, $1\%$ , $5.11$ $\Omega$	110-18.7k-1 110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-5.11-1 110-5.11-1	DES. U1 U2 U3 U4 U5 U7 U8 U9	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393	PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-132 54-158
R43 R44 R45 R46 R47 R48 R50 R51 R552 R554 R556 R57	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 5.11Ω	110-18.7k-1 110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-511-1 110-511-1 110-3.83k-1 110-1k-1 110-511-1 110-5.11-1 110-5.11-1 110-5.11-1	DES.  U1  U2  U3  U4  U5  U7  U8  U9	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS	PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158
R43 R44 R45 R46 R47 R48 R50 R51 R52 R53 R554 R55 R557 R58	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 5.11Ω	110-18.7k-1 110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-511-1 110-511-1 110-3.83k-1 110-1k-1 110-511-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1	DES. U1 U2 U3 U4 U5 U7 U8 U9	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393	PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-132 54-158
R43 R44 R45 R46 R47 R48 R50 R51 R52 R53 R554 R557 R56 R57 R58	MF, $1/4$ W, $1\%$ , $18.7$ k $\Omega$ MF, $1/4$ W, $1\%$ , $18.7$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $8.45$ k $\Omega$ Variable, $1$ -Turn, $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $11$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$ MF, $1/4$ W, $1\%$ , $4.99$ k $\Omega$ MF, $1/4$ W, $1\%$ , $3.83$ k $\Omega$ MF, $1/4$ W, $1\%$ , $1$ k $\Omega$ MF, $1/4$ W, $1\%$ , $5.11$ $\Omega$	110-18.7k-1 110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1	DES.  U1 U2 U3 U4 U5  U7 U8 U9	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION	PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158  WILTRON PART NO.
R43 R44 R45 R46 R47 R48 R50 R51 R52 R53 R556 R57 R560	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 5.11Ω CC, 1/2W, 5%, .5Ω MF, 1/4W, 1%, 2.15 kΩ	110-18.7k-1 110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1	DES.  U1 U2 U3 U4 U5  U7 U8 U9	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS	PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158
R43 R44 R45 R46 R47 R48 R50 R51 R52 R55 R55 R55 R56 R56 R56 R56 R61	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 5.11Ω	110-18.7k-1 110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-511-1 110-4.99k-1 110-511-1 110-511-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1	DES.  U1 U2 U3 U4 U5  U7 U8 U9  REF. DES.	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION	PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158  WILTRON PART NO.
R43 R44 R45 R46 R47 R48 R50 R51 R52 R55 R55 R55 R56 R56 R61 R62	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 5.11Ω	110-18.7k-1 110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-511-1 110-4.99k-1 110-511-1 110-511-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-12.1k-1	DES.  U1 U2 U3 U4 U5  U7 U8 U9  REF. DES.  TP1 thru	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION  Ejector, PC Board	PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158  WILTRON PART NO.  553-96
R43 R44 R45 R46 R47 R48 R51 R552 R553 R556 R557 R560 R61 R62 R63	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 5.11Ω MF, 1/4W, 1%, 10.10 kΩ MF, 1/4W, 1%, 10.10 kΩ	110-18.7k-1 110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-511-1 110-4.99k-1 110-511-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-10-10k-1	DES.  U1 U2 U3 U4 U5  U7 U8 U9  REF. DES.  TP1 thru TP4	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION  Ejector, PC Board  Pin, Test Point	PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158  WILTRON PART NO.  553-96
R43 R44 R45 R46 R47 R48 R551 R553 R556 R556 R661 R663 R64	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 3.83 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 5.11Ω	110-18.7k-1 110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-511-1 110-4.99k-1 110-3.83k-1 110-1k-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-10-10k-1 110-10k-1	DES.  U1 U2 U3 U4 U5  U7 U8 U9  REF. DES.  TP1 thru TP4 K1	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION  Ejector, PC Board  Pin, Test Point Relay, 2 Form C	PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158  WILTRON PART NO.  553-96
R43 R44 R45 R46 R47 R48 R51 R552 R553 R556 R557 R560 R61 R62 R63	MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 18.7 kΩ MF, 1/4W, 1%, 10 kΩ MF, 1/4W, 1%, 8.45 kΩ Variable, 1-Turn, 10 kΩ MF, 1/4W, 1%, 11 kΩ MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 511Ω MF, 1/4W, 1%, 5.11Ω MF, 1/4W, 1%, 10.10 kΩ MF, 1/4W, 1%, 10.10 kΩ	110-18.7k-1 110-18.7k-1 110-10k-1 110-8.45k-1 157-10k 110-11k-1 110-511-1 110-4.99k-1 110-511-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-5.11-1 110-10-10k-1	DES.  U1 U2 U3 U4 U5  U7 U8 U9  REF. DES.  TP1 thru TP4	Quad Analog Switch, LF13201 NAND Gate, 74LS10 Op Amp, OP05 Quad Op Amp, TL072 256 x 4 PROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS  DESCRIPTION  Ejector, PC Board  Pin, Test Point	PART NO.  54-20 54-42 54-87 54-53 Not Field- Replaceable 54-132 54-132 54-125 54-158  WILTRON PART NO.  553-96

Table 6-17. A7 YIG Driver, 8-12.4 GHz, 6653A/6659A (660-D-8009-9, -12)

	CAPACITORS		C13	Monolithic, .1 μF	230-37
REF. DES.	DESCRIPTION	WILTRON PART NO.	C14 C16 C17 C18	Disc Ceramic, .01 µF Monolithic, .1 µF Disc Ceramic, .01 µF Disc Ceramic, .01 µF	230-11 230-37 230-11 230-11
C1	Tantalum, 4.7 µF	250-39	C19	Disc Ceramic, .01 µF	230-11
C2	Tantalum, 4.7 µF	250-39	C20	Mica, 820 pF	220-820
C3	Tantalum, 4.7 μF	250-39		,, <b>F</b>	220 020
C4	Disc Ceramic, .01 µF	230-11		DIODES	
C5	Disc Ceramic, .001 µF	230-30	1		
C6	Tantalum, 1 µF, 35V	250-19	REF.		WILTRON
C7	Tantalum, 1 µF, 35V	250-19	DES.	DESCRIPTION	PART NO.
C8	Monolithic, 1.0 μF	230-41			
C9	Mica, 300 pF	220-300	CR1	Silicon, 1N4446	10-1N4446
C10	Monolithic, .1 μF	230-37	CR2	Silicon, 1N4446	10-1N4446
C11	Tantalum, 6.8 μF	250-41	CR3	Silicon, SI2	10-SI2
C12	Mica, 5 pF	220-5	CR4	Zener, 24V, 1W, 1N4749A	10-1N4749A

CR5	Silicon, SI2	10-SI2	R47	Variable, 15-Turn, 1 k $\Omega$	157-1k
CR6	Silicon, 1N4446	10-1N4446	R48	MF, $1/4W$ , 1%, 11 k $\Omega$	110-11k-1
CR7	Silicon, 1N4446	10-1N4446	R49	MF, $1/4W$ , $1/6$ , $1/6$ KM MF, $1/4W$ , $1/6$ , $1/6$ KM	
CR8	Silicon, 1N4446	10-1N4446	R50	MF, $1/4W$ , $1\%$ , $10 \text{ KM}$ MF, $1/4W$ , $1\%$ , $511\Omega$	110-10k-1
CR9	Zener, 10V, 0.4W, 1N758A	10-1N758A	R51	MF, 1/4W, 1%, 311 $\frac{1}{2}$ MF, 1/4W, 1%, 4.99 kΩ	110-511-1
CR10	Silicon, 1N4446	10-1N4446	R52		110-4.99k-1
CR11	Silicon, 1N4446	10-1N4446		MF, 1/4W, 1%, 3.83 kΩ	110-3.83k-1
01(11	billeon, 1141110	10-114440	R53	MF, $1/4$ W, $1\%$ , $1 \text{ k}\Omega$	110-1k-1
			R54	MF, $1/4$ W, $1\%$ , $511\Omega$	110-511-1
	TRANSISTORS		R55	MF, $1/4$ W, $1\%$ , $6.19\Omega$	110-6.19-1
			R56	MF, $1/4W$ , $1\%$ , $6.19\Omega$	110-6.19-1
REF.		WILTRON	R57	MF, $1/4W$ , $1\%$ , $6.19\Omega$	110-6.19-1
DES.	DESCRIPTION	PART NO.	R58	MF, $1/4W$ , $1\%$ , $6.19\Omega$	110-6.19-1
			R59	MF, $1/4W$ , $1\%$ , $6.19\Omega$	110-6.19-1
Q1	PNP, MPSA92	20-MPSA92	R60	MF, $1/4W$ , $1\%$ , $2.15 k\Omega$	110-2.15k-1
Q2	PNP, MPSA92	20-MPSA92	R611	MF, $1/4W$ , $1\%$ , $33.2 k\Omega$	110-33.2k-1
Q3	PNP, 2N3694	20-2N3694	R61 <sup>2</sup>	MF, $1/4W$ , $1\%$ , $38.3 \text{ k}\Omega$	110-38.3k-1
Q4	NPN, 2N2222A	20-2N2222A	R62 1	MF, $1/4W$ , 1%, 33.2 k $\Omega$	110-33.2k-1
Q5	NPN, 2N2222A	20-2N2222A	R62 2	MF, $1/4W$ , 1%, 38.3 k $\Omega$	110-38.3k-1
Q6	PNP, 2N2907A	20-2N2907A	R63	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
Q7	NPN, 2N2222A	20-2N2222A	R64	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
	,	20 21122221	R65	MF, $1/4W$ , $1\%$ , $750 \text{ k}\Omega$	110-750k-1
	RESISTORS		R66	MF, $1/4W$ , $1\%$ , $14.7 \text{ k}\Omega$	110-14.7k-1
			R67	MF, $1/4W$ , $1\%$ , 2.26 k $\Omega$	110-2.26k-1
REF.		WILTRON	R68	Variable, 15-Turn, $500\Omega$	157-500
DES.	DESCRIPTION	PART NO.	R69	MF, $1/4W$ , $1\%$ , $2 k\Omega$	110-2k-1
			R70	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-2k-1 110-10k-1
R1	CC, $1/4W$ , 5%, 3.3 M $\Omega$	101-3.3M-5	R71	MF, $1/4W$ , $1\%$ , $750 \text{ k}\Omega$	
R2	Variable, 15-Turn, 50 k $\Omega$	157-50k	R72		110-750k-1
R3	CC, 1/4W, 5%, 3.6 MΩ	101-3.6M-5	R73	MF, 1/4W, 1%, 14.7 kΩ	110-14.7k-1
R4	MF, $1/4W$ , 1%, 61.9 k $\Omega$	110-61.9k-1	R74	MF, 1/4W, 1%, 10 kΩ	110-10k-1
R5	Variable, 15-Turn, $1 \text{ k}\Omega$	·		MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R7	Variable, 15-Turn, 1 k $\Omega$	157-1k	R75	MF, $1/4$ W, $1\%$ , $205 \text{ k}\Omega$	110-205k-1
R9		157-1k	R76	MF, $1/4$ W, $1\%$ , $511\Omega$	110-511-1
R10	Variable, 15-Turn, 200 k $\Omega$	157-200k	R77	Variable, 1-Turn, 20Ω	156-20
R11 <sup>1</sup>	MF, 1/4W, 1%, 205 kΩ	110-205k-1	R78	MF, $1/4$ W, $1\%$ , $2 k\Omega$	110-2k-1
R11 <sup>2</sup>	MF, 1/4W, 1%, 14.7 kΩ	110-14.7k-1	R79	MF, $1/4$ W, $1\%$ , $15 k\Omega$	110-15k-1
	MF, 1/4W, 1%, 14 kΩ	110-14k-1	R80	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
R12	MF, $1/4W$ , $1\%$ , $20 k\Omega$	110-20k-1	R81	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
R13	Variable, 1-Turn, 20 k $\Omega$	156-20k	R82	MF, $1/4W$ , $1\%$ , $100 \text{ k}\Omega$	110-100k-1
R14	MF, $1/4W$ , $1\%$ , $2.61 \text{ k}\Omega$	110-2.61k-1	R83	MF, $1/4W$ , 1%, 100 k $\Omega$	110-100k-1
R15	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1	R84	MF, $1/4W$ , 1%, 5.11 k $\Omega$	110-5.11k-1
R16	MF, 1/4W, 1%, 4.99 kΩ	110-4.99k-1	R85	MF, $1/4W$ , 1%, 5.11 k $\Omega$	110-5.11k-1
R17	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1	R86	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1
R18	MF, $1/4W$ , $1\%$ , $23.7 k\Omega$	110-23.7k-1	I	, , ,	
R19	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1	ļ		
R20	MF, $1/4W$ , 1%, $121\Omega$	110-121-1	:	INTEGRATED CIRCUITS	
R21	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1			
R22	MF, $1/4W$ , $1\%$ , $7.5 k\Omega$	110-7.5k-1	REF.		WILTRON
R23	MF, $1/4W$ , 1%, $511\Omega$	110-511-1	DES.	DESCRIPTION	PART NO.
R24	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$	110-5.11k-1	į		
R25	$WW, 5W, 5\Omega$	131-3	U1	Quad Analog Switch, LF13201	54-20
R26	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1	U2	NAND Gate, 74LS10	54-42
R27	MF, $1/4W$ , $1\%$ , $750\Omega$	110-750-1	<b>U</b> 3	Op Amp, OP05	54-87
R28	MF, $1/4W$ , $1\%$ , $5.49 \text{ k}\Omega$		U4	Quad Op Amp, TL072	54-53
R29	MF, $1/4W$ , $1\%$ , $1.78 \text{ k}\Omega$	110-5.49k-1	<b>U</b> 5	2k x 8 EPROM	Not Field-
R30	MF, $1/4W$ , $1\%$ , $1.16 \text{ k}$ MF, $1/4W$ , $1\%$ , $2.15 \text{ k}$ $\Omega$	110-1.78k-1			Replaceable
R31	MF, $1/4W$ , $1\%$ , $2.13 \text{ K}_{M}$	110-2.15k-1	<b>U</b> 7	Quad Op Amp, TL074	54-132
R32		110-1k-1	U8	Quad Ex. OR Gate, 74LS86	54-125
R32	MF, $1/4$ W, $1\%$ , $1.21 \text{ k}\Omega$	110-1.21k-1	U9	Dual Volt. Comp., LM393	
	MF, $1/4$ W, $1\%$ , $17.8 \text{ k}\Omega$	110-17.8k-1	07	Duar voit. Comp., LW393	54-158
R34	Variable, 1-Turn, 200 kΩ	156-200k			
R35	MF, 1/4W, 1%, 1 kΩ	110-1k-1	1	MICCELLANDONS	
R38	MF, $1/4$ W, $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1	1	MISCELLANEOUS	
R39	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1			
R42	Variable, 15-Turn, 50 kΩ	157-50k	REF.		WILTRON
R43	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1	DES.	DESCRIPTION	PART NO.
R44	MF, $1/4$ W, $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1	1		
R45	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1		Ejector, PC Board	553-96
R46	MF, $1/4W$ , 1%, 9.53 k $\Omega$	110-9.53k-1	TP1		
			thru		
1			TP4	Pin, Test Point	706-44
_^Used o	on 660-D-8009-9 assembly.		K1	Relay, 2 Form C	690-28
<sup>2</sup> Used on 660-D-8009-12 assembly.				Socket, I.C., 24-Pin	553-67

	CAPACITORS		R5	Variable, 15-Turn, 1 kΩ	157-1k
<b>n</b>			R7	Variable, 15-Turn, 1 k $\Omega$	157-1k
REF.	DESCRIPTION.	WILTRON	R9	Variable, 15-Turn, 200 k $\Omega$	157-200k
DES.	DESCRIPTION	PART NO.	R10	MF, $1/4$ W, $1\%$ , $205$ kΩ	110-205k-1
C1	Tantalum, 4.7 µF	250-39	R11 1	MF, $1/4$ W, $1\%$ , $6.19$ k $\Omega$	110-6.19k-1
C2	Tantalum, 4.7 µF	250-39	R11 <sup>2</sup>	MF, 1/4W, 1%, 6.81 kΩ	110-6.81k-1
C3	Tantalum, 4.7 µF	250-39	R12 R13	MF, $1/4$ W, $1\%$ , $20 \text{ k}\Omega$ Variable, 1-Turn, $20 \text{ k}\Omega$	110-20k-1 156-20k
C4	Disc Ceramic, .01 µF	230-11	R14 <sup>1</sup>	MF, $1/4W$ , $1\%$ , $1.78 \text{ k}\Omega$	110-1.78k-1
C5	Disc Ceramic, .001 μF	230-30	R14 <sup>2</sup>	MF, $1/4W$ , 1%, 1.87 k $\Omega$	110-1.87k-1
C6	Tantalum, 1 μF, 35V	250-19	R15	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
C7	Tantalum, 1 μF, 35V	250-19	R16	MF, $1/4W$ , $1\%$ , $4.99 k\Omega$	110-4.99k-1
C8	Monolithic, 1.0 μF	230-41	R17	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
C9	Mica, 300 pF	220-300	R18	MF, $1/4W$ , $1\%$ , $23.7 \text{ k}\Omega$	110-23.7k-1
C10 C11	Monolithic, .1 μF Tantalum, 6.8 μF	230-37 250-41A	R19	MF, $1/4$ W, $1\%$ , $1 k\Omega$	110-1k-1
C12	Mica, 5 pF	220-5	R20	MF, $1/4$ W, $1\%$ , $121\Omega$	110-121-1
C13	Monolithic, .1 µF	230-37	R21 R22	MF, $1/4$ W, $1\%$ , $1$ k $\Omega$ MF, $1/4$ W, $1\%$ , $7.5$ k $\Omega$	110-1k-1
C14	Disc Ceramic, .01 µF	230-11	R23	MF, $1/4W$ , $1\%$ , $7.5 \text{ KM}$ MF, $1/4W$ , $1\%$ , $511\Omega$	110-7.5k-1 110-511-1
C16	Monolithic, .1 µF	230-37	R24	MF, $1/4$ W, $1\%$ , $5.11$ kΩ	110-5.11k-1
C17	Disc Ceramic, .01 μF	230-11	R25	$WW, 5W, 2\Omega$	131-1
C18	Disc Ceramic, .01 μF	230-11	R26	MF, $1/4$ W, 1%, 10 kΩ	110-10k-1
C19	Disc Ceramic, .01 μF	230-11	R27	MF, $1/4W$ , $1\%$ , $750\Omega$	110-750-1
C 20	Mica, 820 pF	220-820	R28	MF, $1/4W$ , $1\%$ , $5.49 \text{ k}\Omega$	110-5.49k-1
	DIODES		R29	MF, $1/4$ W, $1\%$ , $1.78 \text{ k}\Omega$	110-1.78k-1
	<u>DIODE3</u>		R30 R31	MF, $1/4W$ , $1\%$ , $2.15 \text{ k}\Omega$	110-2.15k-1
REF.		WILTRON	R31	MF, $1/4$ W, $1\%$ , $1$ k $\Omega$ MF, $1/4$ W, $1\%$ , $1.21$ k $\Omega$	110-1k-1 110-1.21k-1
DES.	DESCRIPTION	PART NO.	R33	MF, $1/4W$ , $1\%$ , $17.8 \text{ k}\Omega$	110-17.8k-1
			R34	Variable, 1-Turn, 200 k $\Omega$	156-200k
CR1	Silicon, 1N4446	10-1N4446	R35	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1
CR2	Silicon, 1N4446	10-1N4446	R38	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1
CR3	Silicon, SI2	10-SI2	R39	MF, $1/4$ W, $1\%$ , $18.7$ kΩ	110-18.7k-1
CR4 CR5	Zener, 24V, 1W, 1N4749A Silicon, SI2	10-1N4749A 10-SI2	R42	Variable, 15-Turn, 50 k $\Omega$	157-50k
CR6	Silicon, 1N4446	10-512 10-1N4446	R43	MF, 1/4W, 1%, 18.7 kΩ	110-18.7k-1
CR7	Silicon, 1N4446	10-1N4446	R44 R45	MF, $1/4$ W, $1\%$ , $18.7$ k $\Omega$ MF, $1/4$ W, $1\%$ , $10$ k $\Omega$	110-18.7k-1 110-10k-1
CR8	Silicon, 1N4446	10-1N4446	R46	MF, $1/4W$ , $1\%$ , $10 \text{ kM}$ MF, $1/4W$ , $1\%$ , $9.53 \text{ k}\Omega$	110-10k-1 110-9.53k-1
CR9	Zener, 10V, 0.4W, 1N758A	10-1N758A	R47	Variable, 15-Turn, 1 k $\Omega$	157-1k
CR10	Silicon, 1N4446	10-1N4446	R48	MF, $1/4W$ , 1%, 11 k $\Omega$	110-11k-1
CR11	Silicon, 1N4446	10-1N4446	R49	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
	MD ANGTOMOD C		R50	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
	TRANSISTORS		R51	MF, $1/4W$ , $1\%$ , $4.99 k\Omega$	110-4.99k-1
REF.		WILTRON	R52	MF, 1/4W, 1%, 3.83 kΩ	110-3.83k-1
DES.	DESCRIPTION	PART NO.	R53 R54	MF, $1/4$ W, $1\%$ , $1$ k $\Omega$ MF, $1/4$ W, $1\%$ , $511\Omega$	110-1k-1
			R55	MF, $1/4W$ , $1\%$ , $511\%$ MF, $1/4W$ , $1\%$ , $6.19\Omega$	110-511-1 110-6.19-1
Q1	PNP, MPSA92	20-MPSA92	R56	MF, $1/4$ W, $1\%$ , $6.19\Omega$	110-6.19-1
Q2	PNP, MPSA92	20-MPSA92	R57	MF, $1/4W$ , $1\%$ , $6.19\Omega$	110-6.19-1
Q3	PNP, 2N3694	20-2N3694	R58	MF, $1/4W$ , $1\%$ , $6.19\Omega$	110-6.19-1
Q4	NPN, 2N2222A	20-2N2222A	R59	MF, $1/4W$ , $1\%$ , $6.19\Omega$	110-6.19-1
Q5 Q6	NPN, 2N2222A PNP, 2N2907A	20-2N2222A	R60	MF, 1/4W, 1%, 2.15 kΩ	110-2.15k-1
Q7	NPN, 2N2222A	20-2N2907A 20-2N2222A	R61 R63	MF, $1/4$ W, $1\%$ , $100 \text{ k}\Omega$	110-100k-1
~ .	111 11, 51155511	20 211222211	R64	MF, $1/4$ W, $1\%$ , $10$ kΩ MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1 110-10k-1
	RESISTORS		R65	MF, $1/4$ W, 1%, 750 k $\Omega$	110-750k-1
			R66	MF, $1/4W$ , 1%, 14.7 k $\Omega$	110-14.7k-1
REF.		WILTRON	R67	MF, $1/4W$ , $1\%$ , $825\Omega$	110-825-1
DES.	DESCRIPTION	PART NO.	R68	Variable, 15-Turn, $500\Omega$	157-500
ъ1	CC 1/AW 50% 2.2340	101 2 214 5	R69	MF, 1/4W, 1%, 2 kΩ	110-2k-1
R1 R2	CC, $1/4$ W, $5\%$ , $3.3$ M $\Omega$ Variable, $15$ -Turn, $50$ k $\Omega$	101-3.3M-5	R70	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R3	CC, $1/4W$ , 5%, 3.6 M $\Omega$	157-50k 101-3.6M-5	R71 R72	MF, $1/4$ W, $1\%$ , $750 \text{ k}\Omega$	110-750k-1
R4	MF, $1/4W$ , $1\%$ , $61.9 \text{ k}\Omega$	110-61.9k-1	R73	MF, $1/4$ W, $1\%$ , $14.7 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-14.7k-1 110-10k-1
	, . , ,	,**	R74	MF, 1/4W, 1%, 10 k $\Omega$	110-10k-1
			R75	MF, $1/4W$ , 1%, 205 k $\Omega$	110-205k-1
	on 660-D-8009-10 assembly.		R76	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
∠Used	on 660-D-8009-13 assembly.		R77	Variable, 1-Turn, $20\Omega$	156-20

R78 R79 R80 R81 R82 R83 R84 R85	MF, $1/4$ W, $1\%$ , $2 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $15 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $511\Omega$ MF, $1/4$ W, $1\%$ , $100 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $100 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $5.11 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $5.11 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $5.11\Omega$	110-2k-1 110-15k-1 110-511-1 110-511-1 110-100k-1 110-100k-1 110-5.11k-1 110-5.11k-1 110-5.11-1	U3 U4 U5 U7 U8 U9	Op Amp, OP05 Quad Op Amp, TL072 2k x 8 EPROM  Quad Op Amp, TL074 Quad Ex. OR Gate, 74LS86 Dual Volt. Comp., LM393  MISCELLANEOUS	54-87 54-53 Not Field- Replaceable 54-132 54-125 54-158
			REF.		WILTRON
	INTEGRATED CIRCUITS		DES.	DESCRIPTION	PART NO.
REF. DES.	INTEGRATED CIRCUITS  DESCRIPTION	WILTRON PART NO.	DES.  TP1 thru TP4	DESCRIPTION  Ejector, PC Board	<b>PART NO.</b> 553-96

Table 6-19. A9 YIG Driver, 18-26.5 GHz, 6653A/6659A (660-D-8009-11)

	CAP <b>AC</b> ITORS			TRANSTERORS	
222	<u>om norrond</u>			TRANSISTORS	
REF. DES.	DESCRIPTION	WILTRON PART NO.	REF. DES.	DESCRIPTION	WILTRON PART NO.
C1	Tantalum, 4.7 μF	250-39	Q1	PNP, MPSA92	20-MPSA92
C2	Tantalum, 4.7 μF	250-39	Q2	PNP, MPSA92	20-MPSA92
C3	Tantalum, 4.7 μF	250-39	Q3	PNP, 2N3694	20-2N3694
C4	Disc Ceramic, .01 μF	230-11	Q4	NPN, 2N2222A	20-2N2222A
C5	Disc Ceramic, .001 μF	230-30	Q5	NPN, 2N2222A	20-2N2222A
C6	Tantalum, 1 μF, 35V	250-19	Q6	PNP, 2N2907A	20-2N2907A
C7	Tantalum, 1 μF, 35V	250-19	Q7	NPN, 2N2222A	20-2N2222A
C8	Monolithic, 1.0 μF	230-41			
C9	Mica, 300 pF	220-300		RESISTORS	
C10	Monolithic, .1 µF	230-37		KESIS TORS	
C11	Tantalum, 6.8 μF	250-41A	REF.		WILTRON
C12	Mica, 5 pF	220-5	DES.	DESCRIPTION	PART NO.
C13	Monolithic, .1 μF	230-37	220.	Discitle Hon	THET NO.
C14	Disc Ceramic, .01 µF	230-11	R1	CC, $1/4W$ , 5%, 3.3 M $\Omega$	101-3.3M-5
C16	Monolithic, .1 μF	230-37	R2	Variable, 15-Turn, 50 k $\Omega$	157-50k
C17	Disc Ceramic, .01 μF	230-11	R3	CC, $1/4W$ , 5%, 3.6 M $\Omega$	101-3.6M-5
C18	Disc Ceramic, .01 μF	230-11	R4	MF, $1/4W$ , $1\%$ , $61.9 \text{ k}\Omega$	110-61.9k-1
C19 C20	Disc Ceramic, .01 μF	230-11	R5	Variable, 15-Turn, 1 kΩ	157-1k
C 20	Mica, 820 pF	220-820	R7	Variable, 15-Turn, 1 kΩ	157-1k
			R9	Variable, 15-Turn, 200 kΩ	157-200k
			R10	MF, $1/4W$ , $1\%$ , $205 k\Omega$	110-205k-1
	DIODES		R11	MF, $1/4W$ , $1\%$ , $4.02 k\Omega$	110-4.02k-1
			R12	MF, $1/4W$ , $1\%$ , $20 k\Omega$	110-20k-1
REF.		WILTRON	R13	Variable, 1-Turn, 20 k $\Omega$	156-20k
DES.	DESCRIPTION	PART NO.	R14	MF, $1/4$ W, $1\%$ , $1.54$ k $\Omega$	110-1.54k-1
			R15	MF, 1/4W, 1%, 10 kΩ	110-10k-1
CR1	Silicon, 1N4446	10-1N4446	R16	MF, $1/4$ W, $1\%$ , $4.99$ kΩ	110-4.99k-1
CR2	Silicon, 1N4446	10-1N4446	R17	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
CR3	Silicon, SI2	10-SI2	R18	MF, $1/4W$ , $1\%$ , $23.7 \text{ k}\Omega$	110-23.7k-1
CR4	Zener, 24V, 1W, 1N4749A	10-1N4749A	R19	MF, $1/4$ W, $1\%$ , $1$ k $\Omega$	110-1k-1
CR5	Silicon, SI2	10-SI2	R20	MF, $1/4W$ , $1\%$ , $121\Omega$	110-121-1
CR6	Silicon, 1N4446	10-1N4446	R21	MF, $1/4$ W, $1\%$ , $1 k\Omega$	110-1k-1
CR7	Silicon, 1N4446	10-1N4446	R22	MF, $1/4$ W, $1\%$ , $7.5$ kΩ	110-7.5k-1
CR8	Silicon, 1N4446	10-1N4446	R23	MF, $1/4$ W, $1\%$ , $511\Omega$	110-511-1
CR9	Zener, 10V, 0.4W, 1N758A	10-1N758A	R24	MF, $1/4$ W, $1\%$ , $5.11$ kΩ	110-5.11k-1
CR10	Silicon, 1N4446	10-1N4446	R25	WW, 5W, 2Ω	131-1
CR11	Silicon, 1N4446	10-1N4446	R26	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1

R27	MF, $1/4W$ , $1\%$ , $750\Omega$	110-750-1	R73	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
R28	MF, $1/4W$ , $1\%$ , $5.49 \text{ k}\Omega$	110-5.49k-1	R74	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R29	MF, $1/4W$ , $1\%$ , $1.78 \text{ k}\Omega$	110-1.78k-1	R75	MF, $1/4$ W, $1\%$ , $205$ kΩ	110-205k-1
R30	MF, $1/4W$ , 1%, 2.15 k $\Omega$	110-2.15k-1	R76	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
R31	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1	R77	Variable, 1-Turn, $20\Omega$	156-20
R32	MF, $1/4W$ , $1\%$ , $1.21 \text{ k}\Omega$	110-1.21k-1	R78	MF, $1/4$ W, $1\%$ , $2$ k $\Omega$	110-2k-1
R33	MF, $1/4W$ , $1\%$ , $17.8 \text{ k}\Omega$	110-17.8k-1	R79	MF, $1/4$ W, $1\%$ , $15$ k $\Omega$	110-15k-1
R34	Variable, 1-Turn, 200 kΩ	156-200k	R80	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
R35	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1	R81	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1
R38	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1	R82	MF, $1/4W$ , 1%, 100 k $\Omega$	110-100k-1
R39	MF, $1/4W$ , $1\%$ , $18.7 \text{ k}\Omega$	110-18.7k-1	R83	MF, $1/4W$ , $1\%$ , $100 \text{ k}\Omega$	110-100k-1
R42	Variable, 15-Turn, 50 kΩ	157-50k	R84	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$	110-5.11k-1
R43	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1	R85	MF, $1/4W$ , $1\%$ , $5.11 \text{ k}\Omega$	110-5.11k-1
R44	MF, $1/4W$ , 1%, 18.7 k $\Omega$	110-18.7k-1	R86	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1
R45	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1		, -, -,, -	
R46	MF, $1/4W$ , $1\%$ , 9.53 k $\Omega$	110-9.53k-1		INTEGRATED CIRCUITS	
R47	Variable, 15-Turn, $1 k\Omega$	157-1k			
R48	MF, $1/4W$ , $1\%$ , $11 k\Omega$	110-11k-1	REF.		WILTRON
R49	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1	DES.	DESCRIPTION	PART NO.
R50	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1			
R51	MF, $1/4W$ , $1\%$ , $4.99 \text{ k}\Omega$	110-4.99k-1	U1	Quad Analog Switch, LF13201	54-20
R52	MF, $1/4W$ , $1\%$ , $3.83 \text{ k}\Omega$	110-3.83k-1	U2	NAND Gate, 74LS10	54-42
R53	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1	U3	Op Amp, OP05	54-87
R54	MF, $1/4W$ , $1\%$ , $511\Omega$	110-511-1	U4	Quad Op Amp, TL072	54-53
R55	MF, $1/4W$ , $1\%$ , $6.19\Omega$	110-6.19-1	U5	2k x 8 EPROM	Not Field-
R56	MF, $1/4W$ , $1\%$ , $6.19\Omega$	110-6.19-1			Replaceable
R57	MF, $1/4W$ , 1%, $6.19\Omega$	110-6.19-1	U7	Quad Op Amp, TL074	54-132
R58	MF, $1/4W$ , $1\%$ , $6.19\Omega$	110-6.19-1	U8	Quad Ex. OR Gate, 74LS86	54-125
R59	MF, $1/4W$ , $1\%$ , $6.19\Omega$	110-6.19-1	U9	Dual Volt. Comp., LM393	54-158
R60	MF, $1/4W$ , $1\%$ , $2.15 k\Omega$	110-2.15k-1		1 /	
R61	MF, $1/4W$ , $1\%$ , $12.1 \text{ k}\Omega$	110-12.1k-1		MISCELLANEOUS	
R63	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1			
R64	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1	REF.		WILTRON
R65	MF, $1/4W$ , $1\%$ , $750 \text{ k}\Omega$	110-750k-1	DES.	DESCRIPTION	PART NO.
R66	MF, $1/4W$ , 1%, 14.7 k $\Omega$	110-14.7k-1			
R67	MF, $1/4W$ , $1\%$ , $5.11\Omega$	110-5.11-1		Ejector, PC Board	553-96
R68	Variable, 15-Turn, $500\Omega$	157-500	TP1	Djector, 10 Dom u	000 / 0
R69	MF, $1/4W$ , $1\%$ , $2 k\Omega$	110-2k-1	thru		
R70	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-2k-1 110-10k-1	TP4	Pin, Test Point	706-44
R71	MF, $1/4W$ , $1\%$ , $750 \text{ k}\Omega$	110-10k-1 110-750k-1	K1	Relay, 2 Form C	690-28
R72	MF, $1/4W$ , $1\%$ , $750 \text{ k}\%$ MF, $1/4W$ , $1\%$ , $14.7 \text{ k}\%$	110-750k-1 110-14.7k-1		Socket, I.C., 24-Pin	553-67
RIL	1V11. 9 1/4 AA 9 1/0, 14. 1 K97	110-14*(K-1		DOCECCO 1000, DE 1 III	555 0.

Table 6-20. A10 FM/Attenuator (660-D-8010)

	CAPACITORS		C18 C19	Tantalum, 25V, 10 µF Tantalum, 25V, 10 µF	250-42 250-42
REF.	Dr.Cop.man.	WILTRON	C20	Tantalum, 25V, 10 μF	250-42 230-37
DES.	DESCRIPTION	PART NO.	C21 C22	Monolithic, .1 μF Monolithic, .1 μF	230-37
C1	Mica, 130 pF	220-130	C23	Tantalum, 6V, 68 μF	250-58
C2	Monolithic, .1 µF	230-37	C23	Ceramic Disc .01 µF	230-38
C3	Monolithic, .1 µF	230-37	C25	Ceramic Disc .01 µF	230-11
C4	Monolithic, .1 µF	230-37	C26	Mica, 8 pF	220-8
C5	Monolithic, .1 µF	230-37	C27	Tantalum, 25V, 10 µF	250-42
C6	Monolithic, .1 µF	230-37	C28	Tantalum, 25V, 10 µF	250-42
$C7^{1}$	Monolithic, .1 μF	230-37	C29	Ceramic, .0047 µF	230-36
C8	Mica, 8 pF	220-8	C30	Mica, 8 pF	220-8
C9	Tantalum, 25V, 10 μF	250-42			
C10	Tantalum, 25V, 10 μF	250-42			
C11	Ceramic Disc, .001 μF	230-30		DIODES	
C12	Mica, 8 pF	220-8	l		
C13	Monolithic, .1 μF	230-37	REF.		WILTRON
C14	Monolithic, .1 μF	230-37	DES.	DESCRIPTION	PART NO.
C15	Mica, 8 pF	220-8			
C16	Mica, 8 pF	220-8	CR1	Silicon, 1N4446	10-1N4446
C17	Tantalum, 25V, 10 μF	250-42	CR2	Silicon, 1N4446	10-1N4446
· · · · · · · · · · · · · · · · · · ·			CR3	Zener, 3.3V, 0.4W, 1N746A	10-1N746A
1.01 µI	F, 230-11, 6637A-40 only.		CR4	Zener, 3.3V, 0.4W, 1N746A	10-1N746A

CR5 CR6 CR7	Silicon, 1N4446 Silicon, 1N4446 Zener, 3.3V, 0.4W, 1N746A	10-1N4446 10-1N4446 10-1N746A	R19 R20 R21	MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 16.5 kΩ Not Used	110-4.99k-1 110-16.5k-1
CR8	Zener, 3.3V, 0.4W, 1N746A	10-1N746A	R22	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
CR9	Silicon, 1N4446	10-1N4446	R23	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
CR10	Silicon, 1N4446	10-1N4446	R24	MF, $1/4W$ , $1\%$ , $100 \text{ k}\Omega$	110-100k-1
CR11	Silicon, 1N4446	10-1N4446	R25	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
CR12	Silicon, 1N4446	10-1N4446	R26	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
CR13	Silicon, 1N4446	10-1N4446	R27	MF, $1/4W$ , $1\%$ , $8.87 k\Omega$	110-8.87k-1
CR14	Zener, 4.7V, 0.4W, 1N750A	10-11	R28	MF, $1/4W$ , $1\%$ , $49.9 k\Omega$	110-49.9-1
CR15	Zener, 4.7V, 0.4W, 1N750A	10-11	R29	MF, $1/4W$ , $1\%$ , $2.8 \text{ k}\Omega$	110-2.8k-1
CR16	Silicon, 1N4446	10-1N4446	R30	MF, $1/4$ W, $1\%$ , $14.7\Omega$	110-14.7-1
CR17	Silicon, 1N4446	10-1N4446	R31	MF, $1/4$ W, $1\%$ , $14.7$ Ω	110-14.7-1
CR18	Silicon, 1N4446	10-1N4446	R32	MF, 1/4W, 1%, 14.7Ω	110-14.7-1
CR19 CR20	Silicon, 1N4446 Silicon, 1N4446	10-1N4446	R33	MF, 1/4W, 1%, 14.7Ω	110-14.7-1
CR21	Silicon, 1N4446	10-1N4446	R34 R35	MF, 1/4W, 1%, 14.7Ω	110-14.7-1
CR22	Silicon, 1N4446	10-1N4446	R36	MF, $1/4$ W, $1\%$ , $14.7\Omega$ MF, $1/4$ W, $1\%$ , $2.8$ k $\Omega$	110-14.7-1
CR23	Silicon, 1N4446	10-1N4446 10-1N4446	R37	MF, $1/4W$ , $1\%$ , 2.8 KM MF, $1/4W$ , $1\%$ , $42.2\Omega$	110-2.8k-1 110-42.2-1
CR24	Silicon, 1N4446	10-1N4446	R38	MF, $1/4W$ , $1\%$ , $42.2\Omega$	110-42.2-1
CR25	Silicon, 1N4446	10-1N4446	R39	MF, $1/4W$ , $1\%$ , $42.2\Omega$	110-42.2-1
CR26	Silicon, 1N4446	10-1N4446	R40	MF, $1/4W$ , $1\%$ , $42.2\Omega$	110-42.2-1
CR27	Silicon, 1N4446	10-1N4446	R41	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
CR28	Silicon, 1N4446	10-1N4446	R42	MF, $1/4$ W, $1\%$ , $9.76$ k $\Omega$	110-9.76k-1
CR29	Silicon, 1N4446	10-1N4446	R43	MF, $1/4W$ , 1%, 3.65 k $\Omega$	110-3.65k-1
CR30	Silicon, 1N4446	10-1N4446	R44	MF, $1/4W$ , $1\%$ , $80.6\Omega$	110-80.6-1
CR31	Silicon, 1N4446	10-1N4446	R45	MF, $1/4W$ , 1%, $80.6\Omega$	110-80.6-1
CR32	Silicon, 1N4446	10-1N4446	R46	MF, $1/4W$ , 1%, 34.8 $\Omega$	110-34.8-1
			R47	MF, $1/4W$ , 1%, 34.8 $\Omega$	110-34.8-1
			R48	MF, $1/4W$ , $1\%$ , $34.8\Omega$	110-34.8-1
			R49	MF, $1/4W$ , $1\%$ , $34.8\Omega$	110-34.8-1
	TRANSISTORS		R50	MF, $1/4W$ , $1\%$ , $3.65 k\Omega$	110-3.65k-1
			R51	MF, $1/4W$ , $1\%$ , $121\Omega$	110-121-1
			R52	MF, $1/4W$ , $1\%$ , $121\Omega$	110-121-1
REF.		WILTRON	R53	MF, $1/4W$ , $1\%$ , $121\Omega$	110-121-1
DES.	DESCRIPTION	PART NO.	R54	MF, $1/4W$ , $1\%$ , $121\Omega$	110-121-1
			R55	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
Q1	PNP, 10W, 2N6552	20-3	R56	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
Q2	NPN, 10W, 2N6555	20-4	R57	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
Q3	PNP, 10W, 2N6552	20-3	R58	MF, 1/4W, 1%, 10 kΩ	110-10k-1
Q4	NPN, 10W, 2N6555	20-4	R59 R60	MF, 1/4W, 1%, 10 kΩ	110-10k-1
Q5	NPN, 50W, TIP110	20-22	R61	MF, 1/4W, 1%, 10 kΩ Variable, 10k, 1-Turn	110-10k-1 156-10k
Q6	PNP, 50W, TIP115	20-23	R62	Variable, 10k, 1-Turn	156-10k
			R63	MF, $1/4W$ , $1\%$ , $46.4 k\Omega$	110-46.4k-1
			R64	MF, $1/4W$ , $1\%$ , 8.25 k $\Omega$	110-8.25k-1
			R65	MF, $1/4W$ , 1%, $100\Omega$	110-100-1
	RESISTORS		R66	MF, $1/4W$ , $1\%$ , $3.65 k\Omega$	110-3.65k-1
			R67	MF, $1/4W$ , 1%, 3.65 k $\Omega$	110-3.65k-1
D. T. D.			R68	WW, 3W, 5Ω	130-5-3
REF.	DECORDAN	WILTRON	R69	WW, 3W, 5Ω	130-5-3
DES.	DESCRIPTION	PART NO.	R70	WW, 3W, 5Ω	130-5-3
R1	MF, $1/4W$ , $1\%$ , $14.3 \text{ k}\Omega$	110-14 21-1	R71	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R2	MF, $1/4W$ , $1/6$ , $14.3 \text{ k}\Omega$	110-14.3k-1 110-14.3k-1	R72	MF, $1/4$ W, 1%, $10 \text{ k}\Omega$	110-10k-1
R3	MF, $1/4W$ , $1\%$ , $100 \text{ k}\Omega$	110-14.5k-1	R73	MF, $1/4$ W, $1\%$ , $9.76$ k $\Omega$	110-9.76k-1
R4	MF, 1/4W, 1%, 10 kΩ	110-100k-1 110-10k-1	R74	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
R5			R75	MF, $1/4W$ , $1\%$ , $8.82 \text{ k}\Omega$	110-8.82k-1
R6	MF. $1/4W$ . $1\%$ . $10 \text{ k}\Omega$		l .		
	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$ MF, $1/4$ W, $1\%$ , $1 \text{ k}\Omega$	110-10k-1 110-1k-1			
R7	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1			
R7 R8	MF, $1/4W$ , $1\%$ , $1 k\Omega$ MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1 110-1k-1		INTEGRATED CIRCUITS	
	MF, $1/4W$ , $1\%$ , $1 k\Omega$	110-1k-1		INTEGRATED CIRCUITS	
R8	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 1 kΩ	110-1k-1 110-1k-1 110-1k-1		INTEGRATED CIRCUITS	
R8 R9	MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 1 kΩ MF, 1/4W, 1%, 1 kΩ	110-1k-1 110-1k-1 110-1k-1 110-1k-1	REF.	INTEGRATED CIRCUITS	WILTRON
R8 R9 R10 R11 R12	MF, $1/4$ W, $1\%$ , $1$ k $\Omega$ MF, $1/4$ W, $1\%$ , $1$ k $\Omega$ MF, $1/4$ W, $1\%$ , $1$ k $\Omega$ MF, $1/4$ W, $1\%$ , $1$ k $\Omega$ Variable, $5$ k, $1$ -Turn	110-1k-1 110-1k-1 110-1k-1 110-1k-1 156-5k	REF. DES.	INTEGRATED CIRCUITS  DESCRIPTION	WILTRON PART NO.
R8 R9 R10 R11 R12 R13	MF, $1/4W$ , $1\%$ , $1 k\Omega$ MF, $1/4W$ , $1\%$ , $1 k\Omega$ MF, $1/4W$ , $1\%$ , $1 k\Omega$ MF, $1/4W$ , $1\%$ , $1 k\Omega$ Variable, $5k$ , $1$ -Turn Variable, $5k$ , $1$ -Turn Variable, $5k$ , $1$ -Turn Variable, $5k$ , $1$ -Turn	110-1k-1 110-1k-1 110-1k-1 110-1k-1 156-5k 156-5k 156-5k 156-5k	DES.		
R8 R9 R10 R11 R12 R13 R14	MF, 1/4W, 1%, 1 kΩ Variable, 5k, 1-Turn MF, 1/4W, 1%, 7.32 kΩ	110-1k-1 110-1k-1 110-1k-1 110-1k-1 156-5k 156-5k 156-5k 156-5k 110-7.32k-1	DES.	DESCRIPTION  Quad Exclusive OR 74LS86	<b>PART NO.</b> 54-125
R8 R9 R10 R11 R12 R13 R14 R15	MF, 1/4W, 1%, 1 kΩ WF, 1/4W, 1%, 1 kΩ Variable, 5k, 1-Turn Variable, 5k, 1-Turn Variable, 5k, 1-Turn Variable, 5k, 1-Turn MF, 1/4W, 1%, 7.32 kΩ MF, 1/4W, 1%, 4.99 kΩ	110-1k-1 110-1k-1 110-1k-1 110-1k-1 156-5k 156-5k 156-5k 156-5k 110-7.32k-1 110-4.99k-1	<b>DES.</b> U1 U2	DESCRIPTION  Quad Exclusive OR 74LS86  Comparator, LM311H	<b>PART NO.</b> 54-125 54-30
R8 R9 R10 R11 R12 R13 R14 R15 R16	MF, 1/4W, 1%, 1 kΩ Variable, 5k, 1-Turn Variable, 5k, 1-Turn Variable, 5k, 1-Turn MF, 1/4W, 1%, 7.32 kΩ MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 4.99 kΩ	110-1k-1 110-1k-1 110-1k-1 110-1k-1 156-5k 156-5k 156-5k 156-5k 110-7.32k-1 110-4.99k-1 110-4.99k-1	DES. U1 U2 U3	DESCRIPTION  Quad Exclusive OR 74LS86  Comparator, LM311H  Comparator, LM311H	<b>PART NO.</b> 54-125 54-30 54-30
R8 R9 R10 R11 R12 R13 R14 R15 R16 R17	MF, 1/4W, 1%, 1 kΩ Variable, 5k, 1-Turn Variable, 5k, 1-Turn Variable, 5k, 1-Turn Variable, 5k, 1-Turn MF, 1/4W, 1%, 7.32 kΩ MF, 1/4W, 1%, 7.32 kΩ MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 100Ω	110-1k-1 110-1k-1 110-1k-1 110-1k-1 156-5k 156-5k 156-5k 156-5k 110-7.32k-1 110-4.99k-1 110-4.99k-1 110-100-1	DES. U1 U2 U3 U4	DESCRIPTION  Quad Exclusive OR 74LS86  Comparator, LM311H  Comparator, LM311H  Op Amp, LF357	<b>PART NO.</b> 54-125 54-30 54-30 50-7
R8 R9 R10 R11 R12 R13 R14 R15 R16	MF, 1/4W, 1%, 1 kΩ Variable, 5k, 1-Turn Variable, 5k, 1-Turn Variable, 5k, 1-Turn MF, 1/4W, 1%, 7.32 kΩ MF, 1/4W, 1%, 4.99 kΩ MF, 1/4W, 1%, 4.99 kΩ	110-1k-1 110-1k-1 110-1k-1 110-1k-1 156-5k 156-5k 156-5k 156-5k 110-7.32k-1 110-4.99k-1 110-4.99k-1	DES. U1 U2 U3	DESCRIPTION  Quad Exclusive OR 74LS86  Comparator, LM311H  Comparator, LM311H	<b>PART NO.</b> 54-125 54-30 54-30

U6	Quad Switch DG201CJ	54-24	i	MISCELLANEOUS	
U7	Op Amp, LF357	50-7	1 .		
U8	Op Amp, LF357	50-7	REF.		WILTRON
U9	Op Amp, LF357	50-7	DES.	DESCRIPTION	PART NO.
U10	Op Amp, LF357	50-7	ł		
U11	Hex Inverter, 74LS04	54-74LS04	TP1		
U12	Dual AND Driver, 75451	54-144	thru		
U13	Dual AND Driver, 75451	54-144	TP6	Pin, Test Point	706-44
U14	Dual AND Driver, 75451	54-144		Heatsink, Transistor #6030	553-53
U15	Dual AND Driver, 75451	54-144		Ejector, P.C. Board	553-96

Table 6-21. All Front Panel (660-D-8011)

	CAPACITORS		DS37	Light Emitting, Yellow	15-7
			DS38	Light Emitting, Yellow	15-7
REF.		WILTRON	DS39	Light Emitting, Yellow	15-7
DES.	DESCRIPTION	PART NO.	DS40	Light Emitting, Yellow	15-7
			DS41	Light Emitting, Yellow	15-7
C1	Electrolytic, 250 μF, 25V	250-53	DS42	Light Emitting, Yellow	15-7
CZ	Monolithic, 0.1 μF, 50V	230-37	DS43	Light Emitting, Yellow	15-7
C3	Monolithic, 0.1 μF, 50V	230–37	DS44	Light Emitting, Yellow	15-7
C4	Monolithic, 0.1 μF, 50V	230-37	DS45	Light Emitting, Yellow	15-7
C5	Monolithic, 0.1 μF, 50V	230-37	DS46	Light Emitting, Yellow	15-7
C6	Monolithic, 0.1 μF, 50V	230-37	DS47	Light Emitting, Yellow	15-7
C7	Monolithic, 0.1 μF, 50V	230-37	DS48	Display, 7-Segment, LED	15-15
C8	Monolithic, 0.1 μF, 50V	230-37	DS49	Display, 7-Segment, LED	15-15
			DS50	Display, 7-Segment, LED	15-15
	DIODES		DS51	Display, 7-Segment, LED	15-15
	•		DS52	Display, 7-Segment, LED	15-15
REF.		WILTRON	DS53	Display, 7-Segment, LED	15-15
DES.	DESCRIPTION	PART NO.	DS54	Display, 7-Segment, LED	15-15
			DS55	Display, 7-Segment, LED	15-15
DS1	Light Emitting, Red	15-5	DS56	Display, 7-Segment, LED	15-15
DS2	Light Emitting, Red	15-5	DS57	Display, 7-Segment, LED	15-15
DS3	Light Emitting, Red	15-5	DS58	Display, +/- 1, LED	15-14
DS4	Light Emitting, Red	15-5	DS59	Display, 7-Segment, LED	15-15
DS5	Light Emitting, Red	15-5	DS60	Display, 7-Segment, LED	15-15
DS6	Light Emitting, Red	15-5	DS61	Display, 7-Segment, LED	15-15
DS7	Light Emitting, Red	15-5	DS62	Display, 7-Segment, LED	15-15
DS8	Light Emitting, Red	15-5	DS63	Light Emitting, Red	15-15
DS9	Not Used	13 3	DS64	Light Emitting, Red	15-5
DS10	Light Emitting, Red	15-5	DS65	Light Emitting, Red Light Emitting, Yellow	15-7
DS11	Light Emitting, Red	15-5	DS66	Light Emitting, 1 ellow	
DS11	Not Used	15-5	DS67	Light Emitting, Yellow	15-7
DS12	Light Emitting, Red	15-5		Light Emitting, Yellow	15-7
DS14	Not Used	15-5	DS68	Light Emitting, Yellow	15-7
DS14 DS15			DS69	Light Emitting, Yellow	15-7
	Not Used	15.7	DS70	Light Emitting, Yellow	15-7
DS16	Light Emitting, Yellow	15–7	DS71	Light Emitting, Yellow	15-7
DS17	Not Used	15.5	DS72	Light Emitting, Yellow	15-7
DS18	Light Emitting, Red	15-5	DS73	Light Emitting, Red	15-5
DS19	Light Emitting, Yellow	15-7			
DS20	Light Emitting, Yellow	15-7		CONNECTORS	
DS21	Light Emitting, Yellow	15-7			
DS22	Light Emitting, Yellow	15-7	REF.		WILTRON
DS23	Light Emitting, Yellow	15-7	DES.	DESCRIPTION	PART NO.
DS24	Light Emitting, Yellow	15-7			
DS25	Light Emitting, Yellow	15-7	J1	20 Pin, SIP, Female	551-173
DS26	Light Emitting, Yellow	15-7	J2	20 Pin, SIP, Female	551-173
DS27	Light Emitting, Yellow	15-7	J3	20 Pin, SIP, Female	551-173
DS28	Light Emitting, Yellow	15-7	J4	20 Pin, SIP, Female	551-173
DS29	Light Emitting, Yellow	15-7	1		
DS30	Light Emitting, Yellow	15-7	1	TRANSISTORS	
DS31	Light Emitting, Yellow	15-7	1		
DS32	Light Emitting, Yellow	15-7	REF.		WILTRON
DS33	Light Emitting, Yellow	15-7	DES.	DESCRIPTION	PART NO.
DS34	Not Used				· - •
DS35	Light Emitting, Red	15-5	Q1	PNP, 2N2907	20-2N2907
DS36	Light Emitting, Yellow	15-7	Q2	PNP, 2N2907	20-2N2907
	. 3		. ~-	·- , ·- ·	

Q3	PNP, 2N2907	20-2N2907		SWITCHES	
Q4	PNP, 2N2907	20-2N2907	DEE		
Q5	PNP, 2N2907	20-2N2907	REF.	DECORPOR	WILTRON
Q6	PNP, 2N2907	20-2N2907	DES.	DESCRIPTION	PART NO.
Q7	PNP, 2N2907	20-2N2907	C1	CDCT Momentons	420 120
Q8	PNP, 2N2907	20-2N2907	S1	SPST, Momentary	430-130
Q9	PNP, 2N2907	20-2N2907	S2	SPST, Momentary	430-130
Q10	PNP, 2N2907	20-2N2907	S3	SPST, Momentary	430-130
Q11	PNP, 2N2907	20-2N2907	S4 S5	SPST, Momentary	430-130
Q12	PNP, 2N2907	20-2N2907	\$6	SPST, Momentary	430-130
Q13	PNP, 2N2907	20-2N2907	S7	SPST, Momentary SPST, Momentary	430-130
Q14	PNP, 2N2907	20-2N2907	S8	SPST, Momentary	430-130
Q15	PNP, 2N2907	20-2N2907	S9	SPST, Momentary	430-130 430-130
			S10	SPST, Momentary	430-130
	RE <b>S</b> ISTORS		S11	SPST, Momentary	430-130
			S12	SPST, Momentary	430-130
REF.		WILTRON	S13	DPST, Momentary	430-131
DES.	DESCRIPTION	PART NO.	S14	DPST, Momentary	430-131
			S15	SPST, Momentary	430-130
R1	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S16	SPST, Momentary	430-130
R2	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S17	DPST, Momentary	430-131
R3	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S18	SPST, Momentary	430-130
R4	Not Used		S19	SPST, Momentary	430-130
R5	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S20	Not Used	130 130
R6	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S21	Not Used	
R7	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S22	SPST, Momentary	430-130
R8	Not Used	l	S23	SPST, Momentary	430-130
R9	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S24	SPST, Momentary	430-130
R10	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S25	SPST, Momentary	430-130
R11	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S26	Not Used	
R12	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S27	SPST, Momentary	430-130
R13	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S28	SPST, Momentary	430-130
R14	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S29	SPST, Momentary	430-130
R15	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S30	SPST, Momentary	430-130
R16	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S31	SPST, Momentary	430-130
R17	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S32	SPST, Momentary	430-130
R18	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S33	SPST, Momentary	430-130
R19	Not Used		S34	SPST, Momentary	430-130
R20	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S35	SPST, Momentary	430-130
R21	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S36	SPST, Momentary	430-130
R22	MF, $1/4$ W, $1\%$ , $215\Omega$	110-215-1	S3 <b>7</b>	DPST, Momentary	430-131
R23	MF, 1/4W, 1%, 215Ω	110-215-1	S38	DPST, Momentary	430-131
R24	MF, 1/4W, 1%, 147Ω	110-147-1	S39	SPST, Momentary	430-130
R25	MF, 1/4W, 1%, 147Ω	110-147-1	S40	Not Used	
R26	MF, 1/4W, 1%, 147Ω	110-147-1	S41	Not Used	
R27	MF, 1/4W, 1%, 147Ω	110-147-1	S42	SPST, Momentary	430-130
R28	MF, 1/4W, 1%, 147Ω	110-147-1	S43	SPST, Momentary	430-130
R29	MF, 1/4W, 1%, 147Ω	110-147-1	S44	SPST, Momentary	430-130
R30	MF, 1/4W, 1%, 147Ω	110-147-1	S45	SPST, Momentary	430-130
R31	MF, 1/4W, 1%, 147Ω	110-147-1	S46	SPST, Momentary	430-130
R32	MF, 1/4W, 1%, 215Ω	110-215-1	S47	SPST, Momentary	430-130
R33	MF, 1/4W, 1%, 4.64k	110-4.64k-1	S48	SPST, Momentary	430-130
R34	MF, 1/4W, 1%, 215Ω	110-215-1	S49	SPST, Momentary	430-130
R35	MF, 1/4W, 1%, 215Ω	110-215-1	S50	SPST, Momentary	430-130
R36	MF, $1/4W$ , $1\%$ , $215\Omega$ MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1	S51	SPST, Momentary	430-130
R37 R38	MF, 1/4W, 1%, 213% MF, 1/4W, 1%, 10k	110-215-1	S52	SPST, Momentary	430-130
R39	Not Used	110-10k-1	S53	SPST, Momentary	430-130
R40	Variable, 20k	146-3	S54	DPST, Momentary	430-131
R41	Variable, 20k	146-3	S55	SPST, Momentary	430-130
R42	Not Used	140-3	S56	SPST, Momentary	430-130
R42	Variable, 20k	146-5	S57 S58	SPST, Momentary	430-130
RP1	DIP, $56\Omega$	123-11	220	SPST, Momentary	430-130
RP2	DIP, $220\Omega$	123-11		INTECD ATED CIDCUITS	
RP3	DIP, 220Ω	123-12		INTEGRATED CIRCUITS	
RP4	DIP, 220Ω	123-12	REF.		WILTRON
RP5	SIP, $220\Omega$	123-13	DES.	DESCRIPTION	PART NO.
RP6	SIP, $220\Omega$	123-14	2000	DESCRIPTION	
RP7	SIP, 4.7k	123-15	U1	74LS374, Octal Latch	54-41
RP8	SIP, 4.7k	123-15	U2	74LS374, Octal Latch	54-41
	,	•			<del></del>

6-46

U3	74LS374, Octal Latch	54-41	1	MISCELLANEOUS	
U4	74LS374, Octal Latch	5 <del>4-4</del> 1			
U5	74LS374, Octal Latch	54-41	REF.		WILTRON
U6	74LS374, Octal Latch	<b>54-4</b> 1	DES.	DESCRIPTION	PART NO.
U7	74LS138, 3 to 8 Decoder	54-74LS138			
U8	7406, HEX Inverter	54-104		Socket, DIP, 14 Pin	551-143
U9	7406, HEX Inverter	54-104		Standoff, Nylon (Long LED)	790-129
U10	7406, HEX Inverter	5 <del>4</del> -104		Standoff, Nylon (Short LED)	790-130
U11	74154, 4 to 16 Decoder	54-147	<b> </b>	Standoff, Nylon (Display LED)	790-131

Table 6-22. Al2 Microprocessor (660-D-8012)

			parazione de la compositione de		
	CAPACITORS			TRANSISTORS	
REF. DES.	DESCRIPTION	WILTRON PART NO.	REF. DES.	DESCRIPTION	WILTRON PART NO.
C1	Tantalum, 10 μF, 25V	250-42	Q1	PNP, MJE371	20-24
C2	Tantalum, 10 µF, 25V	250-42	Q2	NPN, 2N2222A	20-2N2222A
C3	Mylar, 0.047 µF, 250V	210-28	Q3	NPN, 2N2222A	20-2N2222A
C4	Tantalum, 1 µF, 35V	250-19	Q4	NPN, 2N2222A	20-2N2222A
C5	Disc Ceramic, 0.01 µF, 100V	230-11		•	
C6	Mylar, 0.1 μF, 250V	210-30			
C7	Disc Ceramic, 0.01 µF, 100V	230-11		RESISTORS	
C8	Disc Ceramic, 0.01 µF, 100V	230-11			
C9	Disc Ceramic, 0.01 µF, 100V	230-11	REF.		WILTRON
C10	Monolithic, 0.1 μF, 50V	230-37	DES.	DESCRIPTION	PART NO.
C11	Monolithic, 0.1 µF, 50V	230-37			
C12	Monolithic, 0.1 µF, 50V	230-37	R1	MF, 1/4W, 1%, 12.1k	110-12.1k-1
C13			R2	MF, $1/4W$ , $1\%$ , $150\Omega$	110-150-1
	Monolithic, 0.1 µF, 50V	230-37	R3	MF, 1/4W, 1%, 46.4k	110-46.4k-1
C14	Monolithic, 0.1 μF, 50V	230-37	R4	MF, $1/4W$ , 1%, $10 \text{ k}\Omega$	110-10k-1
C15	Monolithic, 0.1 μF, 50V	230-37	R5	MF, 1/4W, 1%, 68.1k	110-10k-1 110-68.1k-1
C16	Monolithic, 0.1 µF, 50V	230-37	R6	MF, 1/4W, 1%, 237k	110-08.1k-1 110-237k-1
C17	Monolithic, 0.1 μF, 50V	230-37	R7	MF, 1/4W, 1%, 100k	110-237K-1 110-100k-1
C18	Monolithic, 0.1 µF, 50V	230-37	R8	MF, $1/4W$ , $1\%$ , $100K$ MF, $1/4W$ , $1\%$ , $10 k\Omega$	
C19	Monolithic, 0.1 μF, 50V	230-37	R9		110-10k-1
C 20	Monolithic, 0.1 μF, 50V	230-37		MF, 1/4W, 1%, 100k	110-100k-1
C22	Monolithic, 0.1 μF, 50V	230-37	R10	MF, 1/4W, 1%, 1M	110-1M-1A
			R11	CC, 1/2W, 5%, 430Ω	102-430-5
			R12	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
	DIODES		R13	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
			R14	MF, $1/4$ W, 1%, 10 kΩ	110-10k-1
REF.		WILTRON	R15	MF, $1/4$ W, 1%, 10 kΩ	110-10k-1
DES.	DESCRIPTION	PART NO.	R16	MF, 1/4W, 1%, 100k	110-100k-1
			R17	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
CR1	Silicon Rectifier, SI2	10-SI2	R18	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
CR2	1N4446	10-1N4446	R19	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
CR3	1N4446	10-1N4446	R20	MF, $1/4$ W, $1\%$ , $10~k\Omega$	110-10k-1
CR4	1N4446	10-1N4446	R21	MF, 1/4W, 1%, 100k	110-100k-1
CR5	1N4446	10-1N4446	R22	MF, 1/4W, 1%, 100k	110-100k-1
CR6	1N4446	10-1N4446	R23	MF, 1/4W, 1%, 100k	110-100k-1
Oito	1141110	10-114-110	R24	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
			R25	MF, $1/4$ W, $1\%$ , $10 k\Omega$	110-10k-1
			R26	MF, 1/4W, 1%, 10 kΩ	110-10k-1
	CONNECTORS		R27	MF, 1/4W, 1%, 100k	110-100k-1
			R28	MF, $1/4W$ , $1\%$ , $10 k\Omega$	110-10k-1
REF.		WILTRON	R29	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1
DES.	DESCRIPTION	PART NO.	R30	MF, $1/4W$ , $1\%$ , $215\Omega$	110-215-1
			R31	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
P1	20 Pin, Male	551-215	R32	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
P2	20 Pin, Male	551-215	R33	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
P3	20 Pin, Male	551-215	R34	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1
P4	20 Pin, Male	551-215	R35	MF, $1/4W$ , 1%, 10 k $\Omega$	110-10k-1
P5	26 Pin, Male	551-102	R36	MF, 1/4W, 1%, 82.5k	110-82.5k-1
P6	26 Pin, Male	551-102	R37	MF, 1/4W, 1%, 31.6k	110-31.6k-1
P7	26 Pin, Male	551-102	R38	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1
P8	3 Pin, Male	551-207	R39	MF, $1/4W$ , 1%, $10 \text{ k}\Omega$	110-10k-1
P9	Plug, DIP, 18 Pin	551-236	R40	MF, $1/4W$ , $1\%$ , $10 \text{ k}\Omega$	110-10k-1
	G, ,	<del>-</del>		, -, -, -, 0, 10 100	110 IOK 1

R41	MF, 1/4W, 1%, 20k	110-20k-1	U17	Not Used	
R42	MF, 1/4W, 1%, 20k	110-20k-1	U18	74LS138, Decoder	54-74LS138
R43	MF, 1/4W, 1%, 31.6k	110-31.6k-1	U19	74LS138, Decoder	54-74LS138
R44	MF, 1/4W, 1%, 100k	110-100k-1	U20	74LS138, Decoder	54-74LS138
R45	MF, 1/4W, 1%, 20k	110-20k-1	U21	74LS138, Decoder	54-74LS138
R46	Variable, Single-Turn, 10k	156-10k	U22	74LS138, Decoder	54-74LS138
R47	MF, 1/4W, 1%, 20k	110-20k-1	U23	74LS138, Decoder	54-74LS138
R48	MF, $1/4W$ , $1\%$ , $100\Omega$	110-100-1	U24	74LS30, 8-input NAND	54-58
R49	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1	U25	8279-5, Keyboard/Display	
R50	MF, $1/4$ W, $1\%$ , $10$ kΩ	110-10k-1		Interface	54-97
R51	MF, 1/4W, 1%, 1k	110-1k-1	U26	96L02, Dual Monostable	54-96L02
R52	MF, $1/4$ W, $1\%$ , $10 \text{ k}\Omega$	110-10k-1	U27	555, Timer	54-555
RP1	SIP, 10k	123-6	U28	74LS161, 4-Bit Binary Counter	54-60
RP2	DIP, 100k	123-10	U29	74LS374, Octal Latch	54-41
			U30	74LS374, Octal Latch	54-41
	INTEGRATED CIRCUITS		U31	74LS374, Octal Latch	54-41
			U32	74LS04, HEX Inverter	54-74LS04
REF.		WILTRON	U33	74LS04, HEX Inverter	54-74LS04
DES.	DESCRIPTION	PART NO.	U34	74LS02, Quad 2-Input NOR	54-57
			U35	74LS02, Quad 2-Input NOR	54-57
U 1	Micropower Comparator	54-151	U36	TL072, Dual Op Amp	54-53
U2	8085A, Microprocessor	54-93	U37	5101L-1, 256 x 4 CMOS RAM	54-146
U3	74LS373, Octal Latch	54-103	U38	5101L-1, 256 x 4 CMOS RAM	54-146
U4	74LS138, Decoder	54-74LS138			
U5	2716, 2k x 8 EPROM	Contact		MISCELLANEOUS	
U6	2716, 2k x 8 EPROM 【	WILTRON			
U7	2716, 2k x 8 EPROM	Customer	REF.		WILTRON
U8	2716, 2k x 8 EPROM )	Service	DES.	DESCRIPTION	PART NO.
U9	Not Used				
U 10	74LS244, Octal Tri-state Driver	54-143	B1	Battery, 2.4V	633-8
U11	5101L-1, 256x4 CMOS RAM	54-146	S1	Switch, Slide, SPDT	420-14
U12	5101L-1, 256x4 CMOS RAM	54-146	Y1	Crystal, 6.000 MHz	630-17
U13	DP8304B, Bidirectional Bus			Socket, 20 Pin DIP	553-98
	Driver	54-128		Socket, 24 Pin DIP	553-67
U14	DP8304B, Bidirectional Bus			Socket, 40 Pin DIP	553-66
	Driver	54-128	TP1	•	
U15	74LS04, HEX Inverter	54-74LS04	thru		
U16	74LS01, Quad NAND Gate	54-74LS01	TP27	Pin, Test Point	706-44

Table 6-23. Al3 Switching Power Supply (660-D-8013)

			T		
	CAPACITORS		C 23	Tantalum, 6.8 μF, 35V	250-41A
			C 24	Disc., .0027 μF, 100V	230-34
REF.		WILTRON	C 25	Disc., .0027 μF, 100V	230-34
DES.	DESCRIPTION	PART NO.	C26	Tantalum, 6.8 µF, 35V	250-41A
			C27	Electrolytic, 150 μF, 25V	250-52
C1	Monolithic, .1 μF, 50V	230-37	C28	Electrolytic, 150 µF, 25V	250-52
C2	Tantalum, 1 μF, 35V	250-19	C29	Tantalum, 6.8 µF, 35V	250-41A
C3	Tantalum, 10 μF, 25V	250-42	C30	Tantalum, 6.8 µF, 35V	250-41A
C4	Monolithic, .1 μF, 50V	230-37	C31	Tantalum, 6.8 µF, 35V	250-41A
C5	Mylar, 1000 pF, 500V, 5%	227-13	C32	Tantalum, 6.8 µF, 35V	250-41A
C6	Tantalum, 10 μF, 25V	250-42	C33	Electrolytic, 47 µF, 63V	250-51
C7	Tantalum, 2.2 $\mu$ F, 20V	250-40	C34	Disc., .0027 μF, 100V	230-34
C8	Tantalum, 4.7 μF, 35V	250-39	C35	Tantalum, 6.8 µF, 35V	250-41A
C9	Mylar, .01 $\mu$ F, 200V	210-20	C36	Disc., .002 µF, 500V	230-33
C10	Monolithic, .1 µF, 50V	230-37	C37	Disc., .002 µF, 500V	230-33
C11	Mylar, 1000 pF, 500V, 5%	227-13	C38	Tantalum, 6.8 µF, 35V	250-41A
C12	Monolithic, .1 µF, 50V	230-37	C39	Mylar, .1 μF, 250V	210-30
C13	Tantalum, 10 µF, 25V	250-42	C40	Electrolytic, 47 μF, 63V	250-51
C14	Tantalum, 12 µF, 350V	250-85	C41	Tantalum, 6.8 µF, 35V	250-41A
C15	Tantalum, 12 µF, 350V	250-85	C42	Disc., .002 μF, 500V	230-33
C16	Mica, 470 pF	220-470	C43	Disc., .002 μF, 500V	230-33
C17	Disc., .0027 μF, 100V	230-34	C44	Tantalum, 6.8 μF, 35V	250-41A
C18	Disc., .0027 μF, 100V	230-34	C45	Mylar, .1 $\mu$ F, 250V	210-30
C19	Tantalum, $6.8 \mu F$ , $35V$	250-41A	C46	Electrolytic, 47 µF, 63V	250-51
C20	Electrolytic, 150 μF, 25V	250-52	C47	Tantalum, 6.8 µF, 35V	250-41A
C21	Electrolytic, 150 μF, 25V	250-52	C48	Monolithic, .1 μF, 50V	230-37
C22	Tantalum, 6.8 μF, 35V	250-41A	C49	Mica, 15 pF	220-15

C50 C51	Disc, Ceramic, .01 μF, 1kV Disc, Ceramic, .01 μF, 1kV	230-40 230-40	TRANSISTORS			
C52 C53	Tantalum, .0047 μF, 3kV Tantalum, .0047 μF, 3kV	250-97 250-97	REF. DES.	DESCRIPTION	WILTRON PART NO.	
	DIODES		Q1 Q2	PNP, 2N2907 NPN, 2N2222A	20-2N2907 20-2N2222A	
REF. DES.	DESCRIPTION	WILTRON PART NO.	Q3 Q4 Q5	PNP, MPSA92 PNP, MPSA92 HEXFET, $1\Omega$ , 350V, 3.5A,	20-MPSA92 20-MPSA92	
CR1 CR2 CR3 CR4 CR5 CR6	Silicon, 1N4446 Silicon, 1N4446 Silicon, 1N4446 Silicon, 1N4446 Silicon, 1N4446 Silicon, 1N4446	10-1N4446 10-1N4446 10-1N4446 10-1N4446 10-1N4446 10-1N4446	Q6	1RF730 HEXFET, 1Ω, 350V, 3.5A, 1RF730	20-39 20-39	
CR7 CR8 CR9	Silicon, 1N4446 Silicon, 1N4446	10-1N4446 10-1N4446 10-1N4744A		RESISTORS		
CR10 CR11	Zener, 15V, 1W, 5%, 1N4744A Silicon, 1N4446 Fast Recovery, 400V, 1A, 1N4936	10-1N4744A 10-1N4446 10-23	REF. DES.	DESCRIPTION	WILTRON PART NO.	
CR12	Fast Recovery, 400V, 1A, 1N4936	10-23	R1 R2	MF, 1/4W, 1%, 147Ω MF, 1/4W, 1%, 3.16k	110-147-1 110-3.16k-1	
CR13 CR14 CR15	Schottky, 40V, 5A, 1N5825 Schottky, 40V, 5A, 1N5825 Zener, 25V, 5W, 5%, 1N5360A	10-22 10-22 10-24	R3 R4 R5	MF, 1/4W, 1%, 22.1k MF, 1/4W, 1%, 2.26k MF, 1/4W, 1%, 22.1k	110-22.1k-1 110-2.26k-1 110-22.1k-1	
CR16 CR17	Fast Recovery, 100V, 3A, MR851 Fast Recovery, 100V, 3A,	10-27	R6 R <b>7</b> R8	Trimmer, 1k MF, 1/4W, 1%, 6.49k CC, 1/4W, 5%, 22M	156-1k 110-6.49k-1 101-22M-5	
CR18	MR851 Fast Recovery, 100V, 3A, MR851	10-27 10-27	R9 R10 R11	MF, 1/4W, 1%, 42.2k MF, 1/4W, 1%, 4.53k MF, 1/4W, 1%, 147Ω	110-42.2k-1 110-4.53k-1	
CR19	Fast Recovery, 100V, 3A, MR851	10-27	R12 R13	MF, 1/4W, 1%, 147M MF, 1/4W, 1%, 750k MF, 1/4W, 1%, 10k	110-147-1 110-750k-1 110-10k-1	
CR20 CR21	Fast Recovery, 200V, 3A, MR852 Fast Recovery, 200V, 3A,	10-26	R14 R15 R16	MF, 1/4W, 1%, 10k MF, 1/4W, 1%, 3.32k MF, 1/4W, 1%, 3.32k	110-10k-1 110-3.32k-1 110-3.32k-1	
CR22	MR852 Fast Recovery, 200V, 3A,	10-26	R17 R18	MF, 1/4W, 1%, 499Ω MF, 1/4W, 1%, 499Ω	110-499-1 110-499-1	
CR23	MR852 Fast Recovery, 200V, 3A, MR852	10-26 10-26	R19 R20 R21	MF, 1/4W, 1%, 24.9k MF, 1/4W, 1%, 1.47k MF, 1/4W, 1%, 10k	110-24.9k-1 110-1.47k-1 110-10k-1	
CR24 CR25	Fast Recovery, 200V, 3A, MR852	10-26	R22 R23	MF, 1/4W, 1%, 100k MF, 1/4W, 1%, 14.7k	110-100k-1 110-14.7k-1	
CR26	Fast Recovery, 200V, 3A, MR852 Fast Recovery, 400V, 2A,	10-26	R24 R25 R26	MF, 1/4W, 1%, 13.3k MF, 1/4W, 1%, 6.81k MF, 1/4W, 1%, 8.45k	110-13.3k-1 110-6.81k-1 110-8.45k-1	
CR27	MR854 Fast Recovery, 400V, 2A, MR854	10-25 10-25	R27 R28	Trimmer, 5k MF, 1/4W, 1%, 1k	156-5k 110-1k-1	
CR28	Fast Recovery, 100V, 1A, 1N4934	10-31	R29 R30 R31	MF, 1/4W, 1%, 1k MF, 1/4W, 1%, 1k MF, 1/4W, 1%, 1k	110-1k-1 110-1k-1 110-1k-1	
CR29	Fast Recover, 100V, 1A, 1N4934	10-31	R32 R33 R34 R35	CC, 1/2W, 5%, 100k CC, 1/2W, 5%, 100k CC, 1/2W, 5%, 100k CC, 2W, 5%, 750Ω	102-100k-5 102-100k-5 102-100k-5 104-750-5	
	INDUCTOR ASSEMBLIES		R36 R37	MF, $1/4W$ , $1\%$ , $10\Omega$ MF, $1/4W$ , $1\%$ , $10\Omega$	110-10-1 110-10-1	
REF. DES.	DESCRIPTION	WILTRON PART NO.	R38 R39 R40 R41	MF, 1/4W, 1%, 30.1Ω MF, 1/4W, 1%, 30.1Ω CC, 1/2W, 5%, 51Ω MF, 1/4W, 1%, 100Ω	110-30.1-1 110-30.1-1 102-51-5 110-100-1	
L1 L2 L3	SPEC-A-8076 SPEC-A-8077 SPEC-A-8074	310-66 310-67 310-64	R42 R43 R44	MF, 1/4W, 1%, 100Ω CC, 1/2W, 5%, 150Ω	110-100-1 102-150-5	
L3 L4 L5 L6	SPEC-A-8074 SPEC-A-8075 SPEC-A-8076 SPEC-A-8074	310-64 310-65 310-66 310-64	R44 R45 R46 R47	CC, 1/2W, 5%, 150Ω MF, 1/4W, 1%, 100Ω MF, 1/4W, 1%, 1k CC, 2W, 5%, 750Ω	102-150-5 110-100-1 110-1k-1 104-750-5	

1-6600A/MB-OMM

TRANSFORMERS			U2	Op Amp, LF356H	50-2
REF. DES.	DESCRIPTION	WILTRON PART NO.	U3	Timer, 555NE	54-555
DES.	DESCRIPTION	PART NO.	U4	Pulse Width Modulator, MC3420P	54-140
T1	Driver Transformer Assy				31 110
	SPEC-A-8078	320-56			
T2	Driver Transformer Assy				
	SPEC-A-8078	320-56		MISCELLANEOUS	
T3	Output Transformer Assy				
	SPEC-A-8079	320-57	REF.		WILTRON
T4	Common-Mode-Isolation	320-70	DES.	DESCRIPTION	PART NO.
	INTEGRATED CIRCUITS		TP1		
REF.		WILTRON	thru TP10	Pins, Test Point	704 44
DES.	DESCRIPTION	PART NO.		Ejector, P.C. Board	706-44 553-96
U1	Voltage Regulator, 12V, UA7812	54-LM340T-12		Insulator for Q5 and Q6	790-67
			I		

Table 6-24. A14 Motherboard (660-D-8014)

-			To the second second			
CAPACITORS				DIODES AND BRIDGE RECTIFIER		
REF. DES.	DESCRIPTION	WILTRON PART NO.	REF. DES.	DESCRIPTION	WILTRON PART NO.	
C1	Disc Ceramic, 500V, 0.001µF	230-3				
C2	Disc Ceramic, 500V, 0.001µF	230-3	CR1	Zener, 18V, 0.4W	10-1N967B	
C3	Disc Ceramic, 500V, 0.001µF	230-3	CR2	Zener, 5.6V, 0.4W	10-1N752A	
C4	Electrolytic, 35V, 470µF	250-87	CR3	Silicon, 1N4446	10-1N4446	
C5	Disc Ceramic, 1kV, 0.01µF	230-40	CR4	Silicon, 1N4446	10-1N4446	
C6	Disc Ceramic, 1kV, 0.01µF	230-40	CR5	Silicon Rectifier, SI2	10SI2	
C7	Disc Ceramic, 1kV, 0.01µF	230-40	CR6	Silicon Rectifier, SI2	10-SI2	
C8	Disc Ceramic, 1kV, 0.01µF	230-40	CR7	Silicon Rectifier, SI2	10-SI2	
C9	Disc Ceramic, 1kV, 0.01µF	230-40	CR8	Silicon Rectifier, SI2	10-SI2	
C10	Disc Ceramic, 1kV, 0.01µF	230-40	CR9	Silicon Rectifier, SI2	10-SI2	
C11	Disc Ceramic, 1kV, 0.01µF	230-40	CR10	Silicon Rectifier, SI2	10-SI2	
C12	Electrolytic, 200V, 850µF	250-86	CR11	Silicon Rectifier, SI2	10-SI2	
C13	Electrolytic, 200V, 850µF	250-86	CR12	Bridge Rectifier	60-13	
C14	Disc Ceramic, .01µF	230-11	CR13	Silicon, 1N4446	10-1N4446	
C15	Tantalum, 35V, 6.8µF	250-41A	CR14	Zener, 4.7V, 0.4W	10-11	
C16	Tantalum, 35V, 6.8µF	250-41A	CR15	Silicon Rectifier, SI2	10-SI2	
C17	Tantalum, 35V, 6.8µF	250-41A	CR16	Silicon Rectifier, SI2	10-SI2	
C18	Electrolytic, 63V, 10µF	250-34	CR17	Silicon, 1N4446	10-1N4446	
C19	Tantalum, 35V, 6.8µF	250-41A	CR18	Silicon, 1N4446	10-1N4446	
C 20	Tantalum, 35V, 6.8µF	250-41A	CR19	Silicon, 1N4446	10-1N4446	
C21	Electrolytic, 63V, 47µF	250-51	CR20	Silicon, 1N4446	10-1N4446	
C22	Electrolytic, 25V, 100µF	250-50	CR21	Silicon Rectifier, SI2	10-SI2	
C 23	Tantalum, 25V, 10µF	250-42	CR 22	Silicon, 1N4446	10-1N4446	
C24	Tantalum, 25V, 10µF	250-42	CR23	Silicon Rectifier, SI2	10-SI2	
C 25	Tantalum, 25V, 10µF	250-42	CR24	Silicon Rectifier, SI2	10-SI2	
C26	Tantalum, 35V, 1µF	250-19	CR25	Silicon Rectifier, SI2	10-SI2	
C27	Mylar, 250V, 0.1µF	210-30	CR26	Silicon Rectifier, SI2	10-SI2	
C28	Mica, 560pF	223-560	CR27	Silicon Rectifier, SI2	10-SI2	
C 29	Mica, 560pF	223-560	CR28	Silicon Rectifier, SI2	10-SI2	
C30	Mica, 560pF	223-560	CR 29	Silicon Rectifier, SI2	10-SI2	
C31	Mica, 560pF	223-560	CR30	Silicon Rectifier, SI2	10-SI2	
C32	Disc Ceramic, .01µF	230-11	CR31	Silicon Rectifier, SI2	10-SI2	
C33	Monolithic, 100V, 0.1µF	230-37	CR32	Silicon Rectifier, SI2	10-SI2	
C34	Tantalum, 35V, 6.8µF	250-41A	CR33	Silicon Rectifier, SI2	10-SI2	
C35	Monolithic, 100V, .1µF	230-37	CR34	Silicon, 1N4446	10-1N4446	
C36	Electrolytic, 63V, 10µF	250-34	CR35	Silicon, 1N4446	10-1N4446	
C37	Tantalum, 1µF, 35V	250-19	CR36	Silicon, 1N4446	10-1N4446	

Table 6-26. Options and Accessories Parts List

# Option 1, Rack Mount

# NAME PART NO. Left Side Assembly 660-D-8111 Right Side Assembly 660-D-8112

## Option 2, Step Attenuator

Step Attenuator	1010-27
Cable Assembly, Coupler to Step Attenuator	660-A-8121-1
Cable Assembly, Attenuator to Rear Panel	660-A-8143-1
Connector Housing, 9-pin	551-200

# Option 3, GPIB Interface

A1 GPIB Interface PCB 660-D-8001-3 (see Table 6-1)

A18 GPIB Connector PCB 660-B-8018 (see Table 6-25; attached to rear panel)

# Option 11, External Square-Wave Input, Standard (except 6642A)

PIN Switch Modulator

1020-17

## Option 13, Counted Markers

BNC Connector, Rear-Panel

510-42

## Accessories

PCB Extender Board

660-D-8062-3

Table 7-1. Service Section Organization

TITLE OF INFORMATION	PAGE	PARAGRAPH
Removal and Installation Procedures	7-1	7-3
Overall Circuit Description	7-8	7-4
Overall Troubleshooting, Description Overall Troubleshooting Flowchart	7-17 7-16	7-5
A12 Microprocessor PCB, Description  A12 PCB Schematic  A12 PCB Troubleshooting Flowchart	7-17 7-22 7-28	7-6
All Front Panel PCB, Description All PCB Schematic	7-35 7-39	7-7
Al GPIB Interface PCB, Description Al PCB Schematic Al PCB Troubleshooting Flowchart	7-41 7-45 7-48	7-8
A2 Ramp Generator PCB, Description A2 PCB Schematic A2 PCB Troubleshooting Flowchart	7-55 7-60 7-65	7-9
A3 Marker Generator PCB, Description A3 PCB Schematic A3 Troubleshooting Flowchart	7-67 7-73 7-79	7-10
A4 Automatic Level Control PCB, Description A4 PCB Schematic A4 PCB Troubleshooting Flowchart	7-83 7-86 7-93	7-11
A5 Frequency Instruction and A6-A9 YIG Driver PCBs, Description A5 PCB Schematic A6 PCB Description, Assy. 660-D-8007-3, -5, -7, & -99-91 A6 PCB Description, Assy. 660-D-8007-4 A6 PCB Description, Assy. 660-D-8007-6 A6 PCBs Description, Assy. 660-D-8190 and -8191 A7-A9 PCBs Description, Assy. 660-D-8008 and -8009, All Dash Numbers A5-A9 PCB Troubleshooting Flowcharts	7-106 7-106 7-115 7-128 7-134 7-140 7-148	7-12
A10 FM/Attenuator PCB, Description A10 PCB Schematic A10 PCB Troubleshooting Flowchart	7-175 7-178 7-181	7-13
RF Deck, Description  Model 6609A RF Deck Block Diagram  Model 6617A RF Deck Block Diagram  Model 6621A/6621A-40 RF Deck Block Diagram  Model 6629A/6629A-40 RF Deck Block Diagram  Model 6627A/6637A-40/6638A RF Deck Block Diagram  Model 6627A/6637A-40/6638A RF Deck Block Diagram  Model 6642A RF Deck Block Diagram  Model 6647A/6648A RF Deck Block Diagram  Model 6653A RF Deck Block Diagram  Model 6659A RF Deck Block Diagram	7-183 7-184 7-184 7-185 7-185 7-185 7-185 7-186 7-188 7-188	7-14
A13/A14 PCBs Switching Power Supply, Description A13/A14 PCB Schematic A14 Motherboard PCB Wire Lists A13/A14 PCBs Troubleshooting Flowcharts A13 PCB Low-Voltage Troubleshooting Procedure	7-190 7-195 7-202 7-229 7-233	7-15
A18 GPIB Connector PCB, Description A18 PCB Schematic	7-230	7-16