

# **599 J/K MSK CONVERTER**

**OPERATION MANUAL**

**79384 D**

**SERIAL NO. \_\_\_\_\_**

September 1978

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**Tracor Instruments**

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Optional Mixer Circuit For Restricted Frequency Range VLF Receivers

For use with VLF receivers which do not tune above 30 KHz such as the Tracor 599G or H or the Fluke receiver a mixer circuit is added to the 599J/K MSK converter. When the baud rate is 200, the frequency is mixed down by 25 KHz. When the baud rate is 100, the frequency is mixed down by 18.75 KHz. The baud-rate switch on the rear panel of the MSK converter must be in the proper position. Coherent 100 KHz must be connected from receiver to MSK converter.

The VLF receiver is tuned as described in the following examples. (These are illustrative only, and there can be no assurance that the specified baud rates will continue in effect.)

Example 1. - NAA 17.8 KHz 200 Baud

Set baud rate switch at 200

Actual transmitted frequencies are 17.75 and 17.85 KHz.

Doubling gives 35.5 and 35.7 KHz

Mixing down by 25.0 KHz gives 10.5 and 10.7 KHz

Receiver may be tuned to either 10.5 or 10.7

Example 2. - NSS 21.4 KHz 100 Baud

Set baud rate switch at 100

Actual transmitted frequencies are 21.375 and 21.425.

Doubling gives 42.75 and 42.85 KHz

Mixing down by 18.75 gives 24.0 and 24.1 KHz

Receiver may be tuned to either 24.0 or 24.1

Theory of Operation (See Figure MSK Add-1)

The coherent 100 KHz from the VLF receiver is shaped to a square wave by Q1 and frequency divided to 25 KHz at U1 pin 11 and to 6.25 KHz at U1 pin 6. The third harmonic of the 6.25 KHz signal is selected by tuned circuit L1/C1 and Q2 produces a square wave at 18.75 KHz.

U2 is an electronic switch cut on and off at a 25 KHz or 18.75 KHz rate. This produces sidebands 25 KHz or 18.75 KHz below the frequency doubled received signal from Q6 of the doubler card. R61, 62, and 63 and C4 are omitted from the doubler card, being replaced by R6, 7, and 8, and C2 on the optional mixer card.

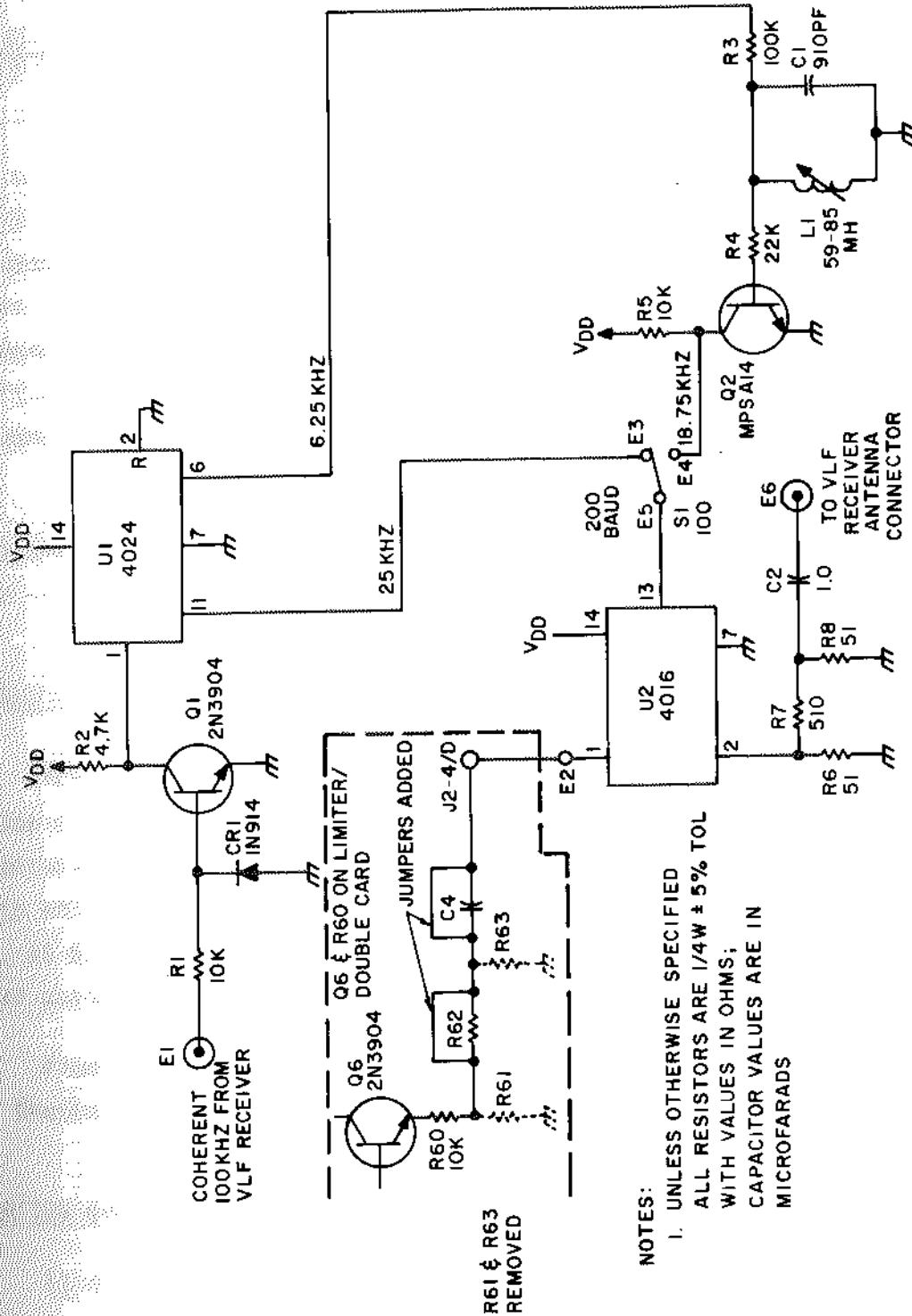


Figure MSKADD-1. Frequency Converter used in 599 J/K with VLF Receivers that do not Tune above 30 kHz. Dwg 79383 A

INTRODUCTION

Some or all of the Navy VLF transmitters may at any time be using a form of code known as MSK (minimum-shift-keying). This is a type of frequency-shift-keying in which the bit frequency is equal to twice the difference frequency. In consequence, if a bit is transmitted at frequency #1, then one bit at frequency #2, and a third bit at frequency #1 again, the phase of frequency #1 during the third bit will differ by 180° from what it was during the first bit. Therefore, there is no coherent "carrier" at either of the two frequencies.

By a process of frequency doubling, those transmissions at zero phase and those at 180° are restored to equal phase at the second harmonic frequency. Phase tracking of the 2nd harmonic with a VLF tracking receiver is then possible.

INSTALLATION

The MSK converter consists of the converter proper and a whip antenna-coupler unit. The output of the converter is connected to the ANTENNA INPUT connector of a Tracor Model 599 J or K VLF tracking receiver using a short length of RG58 cable. The antenna and coupler should be mounted in a clear area, as on a roof top, and connected to the ANTENNA connector of the converter using the 100-foot cable supplied with the converter.

Plug the converter power cord into a source of 105-125 volts, 50-400 Hz. Operation at 220 volts is possible by rewiring the power transformer.

OPERATION WITH STRONG VLF SIGNAL

- 1) Turn on converter rear panel power switch.

- 2) Select the desired VLF transmitter using the FREQUENCY switch on the front panel of the converter.
- 3) Place GAIN switch fully clockwise.
- 4) Place Notch Card switch at OUT.
- 5) Tune VLF receiver. Correct tuning depends upon whether or not the transmitter is using MSK, and if so what bit rate is used. As an example, suppose NSS Annapolis, Maryland, nominally 21.4 KHz is being received. If not sending MSK, it may be received at twice the nominal frequency  $2 \times 21.4 = 42.8$  KHz. If sending MSK at 100 bits per second the two frequencies will be 25 Hz on either side of 21.4; i.e., at 21.425 and 21.375. Reception is then possible at  $2 \times 21.425 = 42.85$  KHz or at  $2 \times 21.375 = 42.75$  KHz. If sending MSK at 200 bits per second the two frequencies are 21.45 and 21.35, which can be received at  $2 \times 21.45 = 42.9$  KHz or  $2 \times 21.35 = 42.7$  KHz.
- 6) Adjust gain of J or K receiver for mid scale amplitude reading on meter.
- 7) Adjust gain of MSK converter. This can be done by setting the voltage at the front panel test point to 0.5 volts peak-to-peak as observed on a cathode ray oscilloscope. Or the gain can be reduced until the 599 J or K meter reading drops (or the audio is heard to diminish). Then the converter gain is increased by one switch position.

#### USE OF NOTCH IN RECEIVING WEAKER SIGNAL WHEN STRONG LOCAL SIGNAL INTERFERS

When the notch option is included, weaker signals can be received.

First tune to the expected interfering signal. Place Notch Card switch at IN. Place Notch switch at OUT. Observe signal at test point using a cathode ray oscilloscope. Set converter gain so signal is not limiting if possible or otherwise set to minimum gain (full CCW).

If the interfering signal is 18.6 KHz or below, place notch switch at LO. If 21.4 KHz or above, place notch switch at HI. Tune the notch filter inductor through the Notch Tune access hole in the front panel using the tuning tool provided to make the interfering signal as small as possible.

Next tune the converter to the desired signal, tune and adjust the 599J or K receiver and set gain of the converter as previously described.

THEORY OF OPERATION (See Schematic

With the notch card IN the signal from the antenna enters the notch card at pins 5 and E. A series tuned circuit at the base of Q1 and a parallel tuned circuit at the collector of Q1 select the desired frequency. Q2 is an amplifier with switchable gain. Emitter followers Q3 and Q4 drive a simple L-C shunt notch used to reject a large interfering signal. Q5 feeds pins 5 and E of the frequency doubler card.

The frequency doubler card is identical to the notch card through Q4, which feeds the front panel monitor point and a limiter circuit composed of CR2, CR3, etc. Successive stages of limiting and amplification permit operation over a range of signal levels. For proper operation the signal must be limited in the circuit of CR6, CR7, etc. Q6 is biased approximately at cut-off so that positive spikes generated by C22 and R59 are passed while negative spikes are rejected. The resultant signal at the emitter of Q6 then contains a large 2nd harmonic content. The signal is attenuated by R60, R61, etc. to a level suitable for introduction into the 599J or K receiver.

ANTENNA COUPLER

Drawing 19358 is a schematic of the antenna coupler. FET Q1 is a high-input impedance low-noise amplifier as required by the high-impedance whip antenna. A surge voltage limiter and two back-to-back zener diodes are included in the input circuitry to protect the other circuit elements from high voltage surges caused by nearby lightning strikes. RC filtering attenuates signals above 100 KHz.

Amplifiers Q2 and Q3 provide additional gain, while emitter follower Q4 provides a low output impedance to drive the cable feeding the converter. DC voltage is supplied via the center conductor of the coaxial cable.

The power supply circuit which produces the regulated 12-volt supply for the various circuits is extremely simple. (See drawing number 19356). AC power is applied to T501. The secondary voltage goes to a bridge rectifier consisting of CR501 through CR504. The ripple is smoothed by C503, producing a DC input to R501 of approximately 32 volts (depending upon the exact line voltage).

The LM309 holds the voltage between pins 2 and 3 at 5 volts. This results in 12 volts to ground at output pin 2.

79384

## LIST OF REPLACEABLE PARTS

DATE 09/18/78

| REFERENCE<br>DESIGNATION | TRACOR<br>STOCK NUMBER | DESCRIPTION              | TYPICAL<br>MFGR      | MANUFACTURER<br>PART NUMBER |
|--------------------------|------------------------|--------------------------|----------------------|-----------------------------|
| *                        | *                      | * ASSEMBLY NO 19348-0001 | PCB ASSY ANT COUPLER | *                           |
| 1                        | 19305                  | PCB ANTENNA COUPLER      | 19397                | 19305                       |
| 9                        | 82                     | INSULATOR TSTR PAD       | 17049                | 88000                       |
| C 1                      | 3321-9102              | CAP FWD CER .1 MFD       | 71590                | UK10-104                    |
| C 2                      | 3321-9102              | CAP FWD CEP .1 MFD       | 71590                | UK10-104                    |
| C 3                      | 8914-0100              | CAP FWD TA 10 MFD        | 01295                | CS13RE106K (MIL-C-26655/2)  |
| C 4                      | 8914-0100              | CAP FWD TA 10 MFD        | 01295                | CS13RE106K (MIL-C-26655/2)  |
| C 5                      | 8914-0470              | CAP FWD TA 47 MFD        | 01295                | CS13RE476K (MIL-C-26655/2)  |
| C 6                      | 21485-9101             | CAP FWD TA 1 MFD         | 05397                | CS13RF105K (MIL-C-26655/2)  |
| C 7                      | 27512-0101             | CAP FWD MICA 100 PFD     | 00853                | CM05F101G03 (MIL-C-5/18)    |
| C 8                      | 27512-0101             | CAP FWD MICA 100 PFD     | 00853                | CM05F101G03 (MIL-C-5/18)    |
| C 9                      | 27512-0102             | CAP FWD MICA 1000 PFD    | 72136                | CM06F102G03 (MIL-C-5/18)    |
| C 10                     | 27512-0102             | CAP FWD MICA 1000 PFD    | 72136                | CM06F102G03 (MIL-C-5/18)    |
| C 11                     | 27512-0100             | CAP FWD MICA 10 PFD      | 00853                | CM05C100K03 (MIL-C-5/18)    |
| C 12                     | 27512-0100             | CAP FWD MICA 10 PFD      | 00853                | CM05C100K03 (MIL-C-5/18)    |
| E 1                      | 610-0093               | TERMINAL,SOLDER          | 71279                | 2027-2                      |
| E 2                      | 610-0093               | TERMINAL,SOLDER          | 71279                | 2027-2                      |
| E 3                      | 610-0093               | TERMINAL,SOLDER          | 71279                | 2027-2                      |
| E 4                      | 610-0093               | TERMINAL,SOLDER          | 71279                | 2027-2                      |
| E 5                      | 610-0093               | TERMINAL,SOLDER          | 71279                | 2027-2                      |
| E 6                      | 18678-0001             | SURGE VOLTAGE PROTEC     | 19397                | 18678-0001                  |
| Q 1                      | 901-4221               | TSTR 2N4221A             | 04713                | 2N4221A                     |
| Q 2                      | 900-2905               | TSTR 2N2905              | 04713                | 2N2905                      |
| Q 3                      | 900-2270               | TSTR 2N2270              | 01295                | 2N2270                      |
| Q 4                      | 900-2270               | TSTR 2N2270              | 01295                | 2N2270                      |
| R 1                      | 201-0101               | RES FWD COMP 100. OHM    | 81349                | RC206F101J (MIL-R-11/3)     |
| R 2                      | 204-0102               | RES FWD COMP 1.00 K      | 81349                | RC076F102J (MIL-R-11/8)     |
| R 3                      | 204-0103               | RES FWD COMP 10.0 K      | 81349                | RC076F103J (MIL-R-11/8)     |
| R 4                      | 204-0395               | RES FWD COMP 3.9 MEG     | 81349                | RC076F395J (MIL-R-11/8)     |
| R 5                      | 204-0151               | RES FWD COMP 150. OHM    | 81349                | RC076F151J (MIL-R-11/8)     |
| R 6                      | 204-0153               | RES FWD COMP 15.0 K      | 81349                | RC076F153J (MIL-R-11/8)     |
| R 7                      | 204-0332               | RES FWD COMP 3.30 K      | 81349                | RC076F332J (MIL-R-11/8)     |
| R 8                      | 204-0152               | RES FWD COMP 1.50 K      | 81349                | RC076F152J (MIL-R-11/8)     |
| R 9                      | 204-0222               | RES FWD COMP 2.20 K      | 81349                | RC076F222J (MIL-R-11/8)     |
| R 10                     | 204-0271               | RES FWD COMP 270. OHM    | 81349                | RC076F271J (MIL-R-11/8)     |
| R 11                     | 204-0271               | RES FWD COMP 270. OHM    | 81349                | RC076F271J (MIL-R-11/8)     |
| R 12                     | 204-0154               | RES FWD COMP 150. K      | 81349                | RC076F154J (MIL-R-11/8)     |
| R 13                     | 204-0275               | RES FWD COMP 2.70 MEG    | 81349                | RC076F275J (MIL-R-11/8)     |
| R 14                     | 204-0471               | RES FWD COMP 470. OHM    | 81349                | RC076F471J (MIL-R-11/8)     |
| R 15                     | 204-0472               | RES FWD COMP 4.70 K      | 81349                | RC076F472J (MIL-R-11/8)     |
| R 16                     | 204-0472               | RES FWD COMP 4.70 K      | 81349                | RC076F472J (MIL-R-11/8)     |
| R 17                     | 204-0472               | RES FWD COMP 4.70 K      | 81349                | RC076F472J (MIL-R-11/8)     |
| R 18                     | 204-0224               | RES FWD COMP 220. K      | 81349                | RC076F224J (MIL-R-11/8)     |
| R 19                     | 204-0332               | RES FWD COMP 3.30 K      | 81349                | RC076F332J (MIL-R-11/8)     |
| R 20                     | 204-0395               | RES FWD COMP 3.9 MEG     | 81349                | RC076F395J (MIL-R-11/8)     |
| CR 1                     | 800-0914               | DIODE IN914              | 01295                | IN914                       |
| CK 2                     | 800-0914               | DIODE IN914              | 01295                | IN914                       |

|     |            |                       |                          |                           |   |   |   |
|-----|------------|-----------------------|--------------------------|---------------------------|---|---|---|
| *   | *          | *                     | * ASSEMBLY NO 19354-0001 | ANTENNA COUPLER ASSY      | * | * | * |
| 2   | 649-0193   | NUT HEX 1/4-20        | 73734                    | 1/4-20 ST STL             |   |   |   |
| 5   | 3624-0014  | LUG SOLDER NO 10      | 83330                    | 1414-10                   |   |   |   |
| 6   | 3624-0021  | LUG SOLDER 1/4        | 73734                    | 1/4X5/8                   |   |   |   |
| 8   | 4189-0030  | WASHER FLAT 1/4       | 88044                    | AM1960C416L               |   |   |   |
| 10  | 4243-0048  | SCR PHD 1/4-20 X 3/4  | 96906                    | MS51957-81                |   |   |   |
| 12  | 4343-0013  | ADHESIVE GEN PURPOSE  | 72653                    | 43-2                      |   |   |   |
| 13  | 4368-0001  | SCR SLFSE 4-40X1/4    | 73734                    | SST CROSS-RECESSFD PAN HD |   |   |   |
| 14  | 4660-0005  | TERMINAL RING NO 10   | 73734                    | 123040                    |   |   |   |
| 15  | 5046-0156  | STANDOFF H 4-40X1 7/8 | 06540                    | 8123-A-0440-1B            |   |   |   |
| 16  | 18196-0001 | BOX MODIFIED          | 19397                    | 18196-0001                |   |   |   |
| 17  | 18197-0002 | COVER, MODIFIED       | 19397                    | 18197-0002                |   |   |   |
| 18  | 19268-0001 | BUSHING ANTENNA       | 19397                    | 19268-0001                |   |   |   |
| 22  | 23454-0004 | INSULATOR THRU-PANEL  | 74970                    | 135-42                    |   |   |   |
| 23  | 23996-0001 | COATING INSUL         | 71984                    | 3140 RTV                  |   |   |   |
| 24  | 23996-0002 | PRIMER                | 71984                    | 1200                      |   |   |   |
| 26  | 3486-0027  | LUG TERMINAL 3/8      | 73734                    | 118100 .030 THK           |   |   |   |
| 27  | 23695-0023 | SCR SET HEX SOC 6-32  | 96906                    | M551021-23                |   |   |   |
| 28  | 6152-0001  | PLATE IDENT           | 19397                    | 6152-0001                 |   |   |   |
| J 1 | 3391-0002  | CONN BNC FEMALE       | 02660                    | UG-1094/U                 |   |   |   |

|   |            |                      |                          |                      |   |   |        |
|---|------------|----------------------|--------------------------|----------------------|---|---|--------|
| * | *          | *                    | * ASSEMBLY NO 79386-0001 | ASSY ACC KIT 599 J/K | * | * | *      |
| 1 | 19354-0001 | ANTENNA COUPLER ASSY | 19397                    | 19354-0001           |   |   |        |
|   | 599168     | ASSY ANTENNA CABLE   | 19397                    | 599168               |   |   |        |
| 2 | 3487-9752  | FUSE 3/4 A 250 VOLT  | 75915                    | F02B 250V 3/4A       |   |   |        |
| 4 | 4274-0001  | ANTENNA WHIP         | 02835                    | ASP-121              |   |   |        |
| 5 | 76293-0002 | TOOL,ADJUSTMENT      | 72653                    | GC-9440              |   |   |        |
|   | 79384      | MANUAL 599 J/K MSK   | 19397                    | 79384                |   |   | TRACOR |

|   |            |                       |                          |                          |   |   |   |
|---|------------|-----------------------|--------------------------|--------------------------|---|---|---|
| * | *          | *                     | * ASSEMBLY NO 79389-0001 | ASSY FRFG SWITCH         | * | * | * |
| C | 27512-0000 | CAP FWD MICA SEL VALS | 00853                    | CM05C----03 (MIL-C-5/18) |   |   |   |

DATE 09/10/78

## LIST OF REPLACEABLE PARTS

| REFERENCE<br>DESIGNATION | TRACOR<br>STOCK NUMBER | DESCRIPTION          | TYPICAL<br>MFGR | MANUFACTURER<br>PART NUMBER |
|--------------------------|------------------------|----------------------|-----------------|-----------------------------|
| C 1                      | 27512-0561             | CAP FWD MICA 560 PFD | 00853           | CM06F561G03 (MIL-C-5/18)    |
| C 2                      | 27512-0511             | CAP FWD MICA 510 PFD | 84171           | CM06F511G03 (MIL-C-5/18)    |
| C 3                      | 27512-0431             | CAP FWD MICA 430 PFD | 84171           | CM06F431G03 (MIL-C-5/18)    |
| C 4                      | 27512-0151             | CAP FWD MICA 150 PFD | 00853           | CM05F151G03 (MIL-C-5/18)    |
| C 5                      | 27512-0750             | CAP FWD MICA 75 PFD  | 00853           | CM05E750G03 (MIL-C-5/18)    |
| C 6                      | 27512-0561             | CAP FWD MICA 560 PFD | 00853           | CMU6F561G03 (MIL-C-5/18)    |
| C 7                      | 27512-0511             | CAP FWD MICA 510 PFD | 84171           | CM06F511G03 (MIL-C-5/18)    |
| C 8                      | 27512-0431             | CAP FWD MICA 430 PFD | 84171           | CM06F431G03 (MIL-C-5/18)    |
| C 9                      | 27512-0151             | CAP FWD MICA 150 PFD | 00853           | CMU5F151G03 (MIL-C-5/18)    |
| C 10                     | 27512-0750             | CAP FWD MICA 75 PFD  | 00853           | CMU5E750G03 (MIL-C-5/18)    |
| C 11                     | 27512-0561             | CAP FWD MICA 560 PFD | 00853           | CM06F561G03 (MIL-C-5/18)    |
| C 12                     | 27512-0511             | CAP FWD MICA 510 PFD | 84171           | CM06F511G03 (MIL-C-5/18)    |
| C 13                     | 27512-0431             | CAP FWD MICA 430 PFD | 84171           | CM06F431G03 (MIL-C-5/18)    |
| C 14                     | 27512-0151             | CAP FWD MICA 150 PFD | 00853           | CM05F151G03 (MIL-C-5/18)    |
| C 15                     | 27512-0750             | CAP FWD MICA 75 PFD  | 00853           | CMU5E750G03 (MIL-C-5/18)    |
| C 16                     | 27512-0561             | CAP FWD MICA 560 PFD | 00853           | CM06F561G03 (MIL-C-5/18)    |
| C 17                     | 27512-0511             | CAP FWD MICA 510 PFD | 84171           | CM06F511G03 (MIL-C-5/18)    |
| C 18                     | 27512-0431             | CAP FWD MICA 430 PFD | 84171           | CM06F431G03 (MIL-C-5/18)    |
| C 19                     | 27512-0151             | CAP FWD MICA 150 PFD | 00853           | CM05F151G03 (MIL-C-5/18)    |
| C 20                     | 27512-0750             | CAP FWD MICA 75 PFD  | 00853           | CMU5E750G03 (MIL-C-5/18)    |
| S 1                      | 3639-2012              | SWITCH ROTARY 4 POLE | 71590           | PA-2012                     |

| *     | *          | *                     | * ASSEMBLY NO | 79390-0001 | ASSY COVER 599 J/K | *                          | * | *      | * | * | TRACOR |
|-------|------------|-----------------------|---------------|------------|--------------------|----------------------------|---|--------|---|---|--------|
| 1     | 19284-0003 | COVER REAR-RCVR       |               | 19397      | 19284-0003         | TFT-200/20 YEL 20 AWG      |   | TRACOR |   |   |        |
| 17    | 3426-0022  | TURING INSULATING     |               | 70331      | 70331              | 1950                       |   |        |   |   |        |
| 22    | 3624-0005  | LUG SOLDER NO 6       |               | 73734      | 73734              | 118100 .030 THK            |   |        |   |   |        |
| 23    | 3486-0027  | LUG TERMINAL 3/8      |               | 73734      | 73734              | DM-103                     |   |        |   |   |        |
| 25    | 3794-0003  | INSULATOR MICA        |               | 08249      | 08249              | 05820                      |   | 122    |   |   |        |
| 33    | 4301-0005  | COMPOUND ST HT TRANS  |               | 73734      | 73734              | 6507-17                    |   |        |   |   |        |
| 34    | 4492-0011  | WSHR SHOULDER NO 6    |               | 86928      | 86928              | 37942                      |   | TH-25  |   |   |        |
| 38    | 23969-0529 | CLIP                  |               | 28520      | 28520              | SR-6W-1                    |   |        |   |   |        |
| 40    | 32115-0061 | CLAMP CARLF           |               | 73734      | 73734              | 123040                     |   |        |   |   |        |
| 42    | 4660-0005  | TERMINAL RING NO 10   |               | 80183      | 80183              | TG-S50                     |   |        |   |   |        |
| C501  | 3403-9503  | CAP FWD CER .05 UF    |               | 71590      | 71590              | UK20-104                   |   |        |   |   |        |
| C502  | 3322-9102  | CAP FWD CER .1 MFD    |               | 56289      | 56289              | 3603926050AC2A             |   |        |   |   |        |
| C503  | 23969-0005 | CAPACITOR 3900 MFD    |               | 75915      | 75915              | F02B 250V 3/4A             |   |        |   |   |        |
| F501  | 3487-9752  | FUSE 3/4 A 250 VOLT   |               | 02660      | 02660              | UG-1094/U                  |   |        |   |   |        |
| J 3   | 3391-0002  | CONN BNC FEMALE       |               | 02660      | 02660              | UG-1094/U                  |   |        |   |   |        |
| J 4   | 3391-0002  | CONN BNC FEMALE       |               | 06486      | 06486              | PW10 7.5 OHM 10 PCT        |   |        |   |   |        |
| R501  | 76456-0006 | RES FWD PWR 7.5 OHM   |               | 06486      | 06486              | PW10 7.5 OHM 10 PCT        |   |        |   |   |        |
| R502  | 76456-0006 | RES FWD PWR 7.5 OHM   |               | 06486      | 06486              | PW10 7.5 OHM 10 PCT        |   |        |   |   |        |
| R503  | 76456-0006 | RES FWD PWR 7.5 OHM   |               | 81349      | 81349              | RN6004640F (MIL-R-10509/1) |   |        |   |   |        |
| R504  | 212-4640   | RES FWD FILM 464, OHM |               | 81349      | 81349              | RN6003320F (MIL-R-10509/1) |   |        |   |   |        |
| R505  | 212-3320   | RES FWD FILM 332 OHM  |               | 19397      | 19397              | 204-0000                   |   |        |   |   |        |
| R506  | 204-0000   | RES SELECTED IN TEST  |               | 09353      | 09353              | 7201                       |   |        |   |   |        |
| S501  | 23969-0881 | SWITCH TOGGLE         |               | 97965      | 97965              | P-6377                     |   |        |   |   |        |
| T501  | 76367-0001 | TRANSFORMER 12/24 V   |               | 12040      | 12040              | LM309K                     |   |        |   |   |        |
| US01  | 24142-0001 | IC LM309K             |               | 70903      | 70903              | 17239                      |   |        |   |   |        |
| W501  | 3467-0028  | CABLE, 3-CONDUCTOR    |               | 04713      | 04713              | IN4002                     |   |        |   |   |        |
| CR501 | 800-4002   | DIODE IN4002          |               | 04713      | 04713              | IN4002                     |   |        |   |   |        |
| CR502 | 800-4002   | DIODE IN4002          |               | 04713      | 04713              | IN4002                     |   |        |   |   |        |
| CR503 | 800-4002   | DIODE IN4002          |               | 04713      | 04713              | IN4002                     |   |        |   |   |        |
| CR504 | 800-4002   | DIODE IN4002          |               | 04713      | 04713              | IN4002                     |   |        |   |   |        |
| CR506 | 800-4002   | DIODE IN4002          |               | 83330      | 83330              | 3005                       |   |        |   |   |        |
| TP501 | 3613-0037  | TERMINAL STRIP 5 PIN  |               | 83330      | 83330              | 3005                       |   |        |   |   |        |
| TP502 | 3613-0037  | TERMINAL STRIP 5 PIN  |               | 83330      | 83330              | 3009                       |   |        |   |   |        |
| TP503 | 3613-0040  | TERMINAL STRIP        |               | 83330      | 83330              | 3009                       |   |        |   |   |        |
| TP504 | 3613-0040  | TERMINAL STRIP        |               | 71400      | 71400              | HKP                        |   |        |   |   |        |
| XF501 | 3488-0001  | FUSEHOLDER 1/4X1 1/4  |               |            |                    |                            |   |        |   |   |        |

| *    | *          | *                     | * ASSEMBLY NO | 79397-0001 | PCR ASSY DOUBLER | *                          | * | * | * | * | TRACOR |
|------|------------|-----------------------|---------------|------------|------------------|----------------------------|---|---|---|---|--------|
| 35   | 79397-0001 | PCR MSK CONV 599 S/J  |               | 19397      | 79397-0001       |                            |   |   |   |   |        |
| C 1  | 3321-9102  | CAP FWD CER .1 MFD    |               | 71590      | 71590            | UK10-104                   |   |   |   |   |        |
| C 2  | 27512-0681 | CAP FWD MICA 680 PFD  |               | 00853      | 00853            | CM06F681G03 (MIL-C-5/18)   |   |   |   |   |        |
| C 3  | 27512-0681 | CAP FWD MICA 680 PFD  |               | 00853      | 00853            | CM06F681G03 (MIL-C-5/18)   |   |   |   |   |        |
| C 4  | 76290-2001 | CAP FWD CER 1.0 MFD   |               | 801P3      | 801P3            | 3C02310508500C5            |   |   |   |   |        |
| C 5  | 3403-9103  | CAP FWD CER .01 UF    |               | 80183      | 80183            | TG-510                     |   |   |   |   |        |
| C 6  | 3403-9103  | CAP FWD CER .01 UF    |               | 80183      | 80183            | TG-510                     |   |   |   |   |        |
| C 8  | 8914-0470  | CAP FWD TA 47 MFD     |               | 01295      | 01295            | CS13RE476K (MIL-C-26655/2) |   |   |   |   |        |
| C 9  | 8914-0470  | CAP FWD TA 47 MFD     |               | 01295      | 01295            | CS13RE476K (MIL-C-26655/2) |   |   |   |   |        |
| C 15 | 3322-9102  | CAP FWD CER .1 MFD    |               | 71590      | 71590            | UK20-104                   |   |   |   |   |        |
| C 16 | 3322-9102  | CAP FWD CER .1 MFD    |               | 71590      | 71590            | UK20-104                   |   |   |   |   |        |
| C 22 | 27512-0221 | CAP FWD MICA 220 PFD  |               | 00853      | 00853            | CM05F221G03 (MIL-C-5/18)   |   |   |   |   |        |
| C 27 | 3322-9102  | CAP FWD CER .1 MFD    |               | 71590      | 71590            | UK20-104                   |   |   |   |   |        |
| C 28 | 3322-9102  | CAP FWD CER .1 MFD    |               | 71590      | 71590            | UK20-104                   |   |   |   |   |        |
| C 29 | 27512-0150 | CAP FWD MICA 15 PFD   |               | 00853      | 00853            | CM05F150G03 (MIL-C-5/18)   |   |   |   |   |        |
| C 30 | 3322-9102  | CAP FWD CER .1 MFD    |               | 71590      | 71590            | UK20-104                   |   |   |   |   |        |
| L 1  | 23975-0001 | INDUCTOR VAR 59-85UHY |               | 53021      | 53021            | NV-243-34370               |   |   |   |   |        |
| L 2  | 23975-0001 | INDUCTOR VAR 59-85UHY |               | 53021      | 53021            | NV-243-34370               |   |   |   |   |        |
| G 1  | 900-3904   | TSTR 2N3904           |               | 04713      | 04713            | 2N3904                     |   |   |   |   |        |
| G 2  | 900-3904   | TSTR 2N3904           |               | 04713      | 04713            | 2N3904                     |   |   |   |   |        |

## LIST OF REPLACEABLE PARTS

| REFERENCE<br>DESIGNATION | T R A C O R<br>STOCK NUMBER | DESCRIPTION           | TYPICAL<br>MFGP | MANUFACTURER<br>PART NUMBER |
|--------------------------|-----------------------------|-----------------------|-----------------|-----------------------------|
| R 4                      | 900-3904                    | TSTR 2N3904           | 04713           | 2N3904                      |
| R 6                      | 900-3904                    | TSTR 2N3904           | 04713           | 2N3904                      |
| R 1                      | 202-0101                    | RES FXD COMP 100 OHM  | 81349           | RC32GF101J (MIL-R-11/6)     |
| R 2                      | 204-0821                    | RES FXD COMP 820. OHM | 81349           | RCU7GF821J (MIL-R-11/8)     |
| R 3                      | 204-0101                    | RES FXD COMP 100. OHM | 81349           | RCU7GF101J (MIL-R-11/8)     |
| R 4                      | 204-0472                    | RES FXD COMP 4.70 K   | 81349           | RCU7GF472J (MIL-R-11/8)     |
| R 5                      | 204-0474                    | RES FXD COMP 470. K   | 81349           | RCU7GF474J (MIL-R-11/8)     |
| R 6                      | 204-0224                    | RES FXD COMP 220. K   | 81349           | RCU7GF224J (MIL-R-11/8)     |
| R 7                      | 204-0473                    | RES FXD COMP 47.0 K   | 81349           | RCU7GF473J (MIL-R-11/8)     |
| R 8                      | 204-0222                    | RES FXD COMP 2.20 K   | 81349           | RCU7GF222J (MIL-R-11/8)     |
| R 9                      | 204-0334                    | RES FXD COMP 330. K   | 81349           | RCU7GF334J (MIL-R-11/8)     |
| R 10                     | 204-0474                    | RES FXD COMP 470. K   | 81349           | RCU7GF474J (MIL-R-11/8)     |
| R 12                     | 204-0332                    | RES FXD COMP 3.30 K   | 81349           | RCU7GF332J (MIL-R-11/8)     |
| R 14                     | 204-0223                    | RES FXD COMP 22.0 K   | 81349           | RCU7GF223J (MIL-R-11/8)     |
| R 15                     | 204-0220                    | RES FXD COMP 2.2 OHM  | 81349           | RCU7GF220J (MIL-R-11/8)     |
| R 16                     | 204-0222                    | RES FXD COMP 2.20 K   | 81349           | RCU7GF222J (MIL-R-11/8)     |
| P 17                     | 204-0222                    | RES FXD COMP 2.20 K   | 81349           | RCU7GF222J (MIL-R-11/8)     |
| H 25                     | 204-0104                    | RES FXD COMP 100. K   | 81349           | RCU7GF104J (MIL-R-11/8)     |
| R 26                     | 204-0104                    | RES FXD COMP 100. K   | 81349           | RCU7GF104J (MIL-R-11/8)     |
| R 27                     | 204-0823                    | RES FXD COMP 82.0 K   | 81349           | RCU7GF823J (MIL-R-11/8)     |
| R 28                     | 204-0472                    | RES FXD COMP 4.70 K   | 81349           | RCU7GF472J (MIL-R-11/8)     |
| R 36                     | 204-0104                    | RES FXD COMP 100. K   | 81349           | RCU7GF104J (MIL-R-11/8)     |
| R 37                     | 204-0104                    | RES FXD COMP 100. K   | 81349           | RCU7GF104J (MIL-R-11/8)     |
| R 38                     | 204-0103                    | RES FXD COMP 10.0 K   | 81349           | RCU7GF103J (MIL-R-11/8)     |
| R 44                     | 204-0105                    | RES FXD COMP 1.00 MEG | 81349           | RCU7GF105J (MIL-P-11/8)     |
| R 45                     | 204-0514                    | RES FXD COMP 510. K   | 81349           | RCU7GF514J (MIL-P-11/8)     |
| R 46                     | 204-0104                    | RES FXD COMP 100. K   | 81349           | RCU7GF104J (MIL-R-11/8)     |
| K 47                     | 204-0104                    | RES FXD COMP 100. K   | 81349           | RCU7GF104J (MIL-R-11/8)     |
| R 48                     | 204-0822                    | RES FXD COMP 8.20 K   | 81349           | RCU7GF822J (MIL-R-11/8)     |
| R 49                     | 204-0104                    | RES FXD COMP 100. K   | 81349           | RCU7GF104J (MIL-R-11/8)     |
| R 50                     | 204-0105                    | RES FXD COMP 1.00 MEG | 81349           | RCU7GF105J (MIL-R-11/8)     |
| R 51                     | 204-0514                    | RES FXD COMP 510. K   | 81349           | RCU7GF514J (MIL-R-11/8)     |
| R 55                     | 204-0102                    | RES FXD COMP 1.00 K   | 81349           | RCU7GF102J (MIL-R-11/8)     |
| R 56                     | 204-0184                    | RES FXD COMP 180. K   | 81349           | RCU7GF184J (MIL-R-11/8)     |
| R 57                     | 204-0473                    | RES FXD COMP 47.0 K   | 81349           | RCU7GF473J (MIL-P-11/8)     |
| R 58                     | 204-0684                    | RES FXD COMP 680 K    | 81349           | RCU7GF684J (MIL-R-11/8)     |
| R 59                     | 204-0333                    | RES FXD COMP 33.0 K   | 81349           | RCU7GF333J (MIL-P-11/8)     |
| R 60                     | 204-0103                    | RES FXD COMP 10.0 K   | 81349           | RCU7GF103J (MIL-P-11/8)     |
| R 61                     | 204-0510                    | RES FXD COMP 51 OHM   | 81349           | RCU7GF510J (MIL-R-11/8)     |
| R 62                     | 204-0511                    | RES FXD COMP 510. OHM | 81349           | RCU7GF511J (MIL-R-11/8)     |
| R 63                     | 204-0510                    | RES FXD COMP 51 OHM   | 81349           | RCU7GF510J (MIL-R-11/8)     |
| U 1                      | 76387-0004                  | IC LM3900N            | 12040           | LM3900N                     |
| CR 2                     | 800-0914                    | DIODE 1N914           | 01295           | 1N914                       |
| CR 3                     | 800-0914                    | DIODE 1N914           | 01295           | 1N914                       |
| CR 4                     | 800-0914                    | DIODE 1N914           | 01295           | 1N914                       |
| CR 5                     | 800-0914                    | DIODE 1N914           | 01295           | 1N914                       |
| CR 6                     | 800-0914                    | DIODE 1N914           | 01295           | 1N914                       |
| CR 7                     | 800-0914                    | DIODE 1N914           | 01295           | 1N914                       |
| CR 8                     | 800-0914                    | DIODE 1N914           | 01295           | 1N914                       |
| CR 9                     | 800-0914                    | DIGIT 1N914           | 01295           | 1N914                       |
| CR 10                    | 800-0914                    | DIODE 1N914           | 01295           | 1N914                       |
| CR 11                    | 800-0914                    | DIODE 1N914           | 01295           | 1N914                       |
| CR 12                    | 800-0914                    | DIODE 1N914           | 01295           | 1N914                       |
| CR 13                    | 800-0914                    | DIODE 1N914           | 01295           | 1N914                       |
| XU 1                     | 76329-0001                  | SOCKET IC 14 PIN      | 00779           | 583527-1                    |

| *    | *          | *                     | * ASSEMBLY NO | 7939R-0002                 | PCB ASSY NOTCH | * | * | * | * | TRACOR |
|------|------------|-----------------------|---------------|----------------------------|----------------|---|---|---|---|--------|
| 23   | 7939T-0001 | PCB MSK CONV 599 S/J  | 19307         | 7939T-0001                 |                |   |   |   |   |        |
| C 1  | 3321-9102  | CAP FXD CER .1 MFD    | 71590         | UK10-104                   |                |   |   |   |   |        |
| C 2  | 27512-0681 | CAP FXD MICA 680 PFD  | 00853         | CMU6F681G03 (MIL-C-5/18)   |                |   |   |   |   |        |
| C 3  | 27512-0681 | CAP FXD MICA 680 PFD  | 00853         | CMU6F681G03 (MIL-C-5/18)   |                |   |   |   |   |        |
| C 5  | 3403-9103  | CAP FXD CER .01 UF    | 80183         | TG-S10                     |                |   |   |   |   |        |
| C 6  | 3403-9103  | CAP FXD CER .01 UF    | 80183         | TG-S10                     |                |   |   |   |   |        |
| C 8  | 8914-0470  | CAP FXD TA 47 MFD     | 01295         | CS13AE476K (MIL-C-26655/2) |                |   |   |   |   |        |
| L 1  | 23975-0001 | INDUCTOR VAR 50-85UHY | 53021         | NV-243-34370               |                |   |   |   |   |        |
| L 2  | 23975-0001 | INDUCTOR VAR 50-85UHY | 53021         | NV-243-34370               |                |   |   |   |   |        |
| L 3  | 23975-0001 | INDUCTOR VAR 50-85UHY | 53021         | NV-243-34370               |                |   |   |   |   |        |
| G 1  | 900-3904   | TSTR 2N3904           | 04713         | 2N3904                     |                |   |   |   |   |        |
| G 2  | 900-3904   | TSTR 2N3904           | 04713         | 2N3904                     |                |   |   |   |   |        |
| G 3  | 900-3904   | TSTR 2N3904           | 04713         | 2N3904                     |                |   |   |   |   |        |
| G 4  | 900-3904   | TSTR 2N3904           | 04713         | 2N3904                     |                |   |   |   |   |        |
| G 5  | 900-4403   | TSTR 2N4403           | 04713         | 2N4403                     |                |   |   |   |   |        |
| R 1  | 202-0101   | RES FXD COMP 100 OHM  | 81349         | RC32GF101J (MIL-R-11/6)    |                |   |   |   |   |        |
| R 2  | 204-0821   | RES FXD COMP 820. OHM | 81349         | RCU7GF821J (MIL-R-11/8)    |                |   |   |   |   |        |
| P 3  | 204-0101   | RES FXD COMP 100. OHM | 81349         | RCU7GF101J (MIL-R-11/8)    |                |   |   |   |   |        |
| R 4  | 204-0472   | RES FXD COMP 4.70 K   | 81349         | RCU7GF472J (MIL-P-11/8)    |                |   |   |   |   |        |
| R 5  | 204-0474   | RES FXD COMP 470. K   | 81349         | RCU7GF474J (MIL-P-11/8)    |                |   |   |   |   |        |
| R 6  | 204-0224   | RES FXD COMP 220. K   | 81349         | RCU7GF224J (MIL-R-11/8)    |                |   |   |   |   |        |
| R 7  | 204-0473   | RES FXD COMP 47.0 K   | 81349         | RCU7GF473J (MIL-R-11/8)    |                |   |   |   |   |        |
| R 8  | 204-0222   | RES FXD COMP 2.20 K   | 81349         | RCU7GF222J (MIL-R-11/8)    |                |   |   |   |   |        |
| R 9  | 204-0334   | RES FXD COMP 330. K   | 81349         | RCU7GF334J (MIL-R-11/8)    |                |   |   |   |   |        |
| R 10 | 204-0474   | RES FXD COMP 470. K   | 81349         | RCU7GF474J (MIL-R-11/8)    |                |   |   |   |   |        |
| R 11 | 204-0101   | RES FXD COMP 100. OHM | 81349         | RCU7GF101J (MIL-R-11/8)    |                |   |   |   |   |        |

DATE 09/18/78

## LIST OF REPLACEABLE PARTS

| REFERENCE<br>DESIGNATION                              | TRACOR<br>STOCK NUMBER | DESCRIPTION           | TYPICAL<br>MFGR | MANUFACTURER<br>PART NUMBER |
|-------------------------------------------------------|------------------------|-----------------------|-----------------|-----------------------------|
| R 13                                                  | 204-0103               | RES FWD COMP 10.0 K   | 81349           | RCU7GF103J (MIL-R-11/8)     |
| R 14                                                  | 204-0223               | RES FWD COMP 22.0 K   | 81349           | RCU7GF223J (MIL-R-11/8)     |
| R 15                                                  | 204-0100               | RES FWD COMP 10.0 OHM | 81349           | RCU7GF100J (MIL-R-11/8)     |
| R 55                                                  | 204-0102               | RES FWD COMP 1.00 K   | 81349           | RCU7GF102J (MIL-R-11/8)     |
| R 56                                                  | 204-0184               | RES FWD COMP 180. K   | 81349           | RCU7GF184J (MIL-R-11/8)     |
| R 57                                                  | 204-0473               | RES FWD COMP 47.0 K   | 81349           | RCU7GF473J (MIL-R-11/8)     |
| R 64                                                  | 204-0102               | RES FWD COMP 1.00 K   | 81349           | RCU7GF102J (MIL-R-11/8)     |
| R 65                                                  | 204-0102               | RES FWD COMP 1.00 K   | 81349           | RCU7GF102J (MIL-R-11/8)     |
| * * ASSEMBLY NO 79400-0001 FINAL ASSY 599 J/K * * * * |                        |                       |                 |                             |
| 1                                                     | 79386-0001             | ASSY ACC KIT 599 J/K  | 19397           | 79386-0001                  |
| 2                                                     | 79389-0001             | ASSY FREQ SWITC       | 19397           | 79390-0001                  |
| 3                                                     | 79390-0001             | ASSY COVER 599 J/K    | 19397           | 79390-0001                  |
| 4                                                     | 79398-0001             | PCR ASSY DOUBLER      | 19397           | 79398-0002                  |
| 5                                                     | 79398-0002             | PCB ASSY NOTCH        | 19397           | AN32AS                      |
| 6                                                     | 3326-0032              | RIVET POP 3/32X.212   | 07707           | RG-1788/U (MIL-C-17/93)     |
| 7                                                     | 3388-0092              | CABLE COAXIAL         | 70903           | 1042                        |
| 8                                                     | 3495-0037              | GROMMET 1/4 ID        | 72653           | 1950                        |
| 9                                                     | 3624-0005              | LUG SOLDER NO 6       | 73734           | 1714A                       |
| 10                                                    | 3803-0875              | PLUG SNAP 7/8 HOLE    | 72653           | 5407                        |
| 11                                                    | 3805-0011              | BOLT SPADE 6-32       | 73734           | RR-67-0-SK-7-M              |
| 12                                                    | 4161-0025              | KNOB PLAIN SKT        | 86747           | 456-07-35-003               |
| 13                                                    | 4353-0013              | KEY POLARIZATION      | 71745           | 8218-SS-0632-7              |
| 14                                                    | 5070-0043              | STANDOFF H 6-32X3/4   | 06540           | 8219-SS-0632-0              |
| 15                                                    | 5070-0056              | STANDOFF H 6-32X7/8   | 06540           | 6152-0001                   |
| 16                                                    | 6152-0001              | PLATE IDENT           | 19397           | SKT-0804                    |
| 17                                                    | 23969-0084             | TEST POINT            | 9A291           | 79003-0001                  |
| 18                                                    | 79003-0001             | PANEL FRONT           | 19397           | 79003-0001                  |
| 19                                                    | 79013-0001             | SHIFLU                | 19397           | 79013-0001                  |
| 20                                                    | 27512-0122             | CAP FWD MICA 1200 PFD | 00853           | CMU6F122G03 (MIL-C-5/18)    |
| 21                                                    | 27512-0751             | CAP FWD MICA 750 PFD  | 84171           | CMU6F751G03 (MIL-C-5/18)    |
| 22                                                    | 3628-001A              | CONNECTOR PCR 18 PIN  | 71785           | 50-18A-20                   |
| 23                                                    | 3628-001B              | CONNECTOR PCR 18 PIN  | 71785           | 50-18A-20                   |
| 24                                                    | 204-0682               | RES FWD COMP 6.80 K   | 81349           | RCU7GF682J (MIL-R-11/8)     |
| 25                                                    | 204-0682               | RES FWD COMP 6.80 K   | 81349           | RCU7GF682J (MIL-R-11/8)     |
| 26                                                    | 3639-2003              | SWITCH ROTARY 2 POLE  | 71590           | PA-2003                     |
| 27                                                    | 24690-7201             | SWITCH, TUGGLE        | 09353           | 7201SY2BE                   |
| 28                                                    | 3639-2003              | SWITCH ROTARY 2 POLE  | 71590           | PA-2003                     |
| * * ASSEMBLY NO 599168- ASSY ANTENNA CABLE * * * *    |                        |                       |                 |                             |
| 1                                                     | 3388-0P2A              | CABLE COAXIAL         | 81349           | RG-5AC/U (NWR-25)           |
| 2                                                     | 4196-0001              | CONN COAX RADIO FREQ  | 81349           | M23329/3-01 (MIL-C-23329/3) |

## MANUAL LISTING OF FEDERAL SUPPLY CODES FOR MANUFACTURERS

| CODE  | MANUFACTURER                                            |                             |
|-------|---------------------------------------------------------|-----------------------------|
| 00779 | AMP INC                                                 | HARRISBURG PA               |
| 00853 | SANGAMO ELECTRIC CO PICKENS DIVISION                    | PICKENS S C                 |
| 01295 | TEXAS INSTRUMENTS INC SEMICONDUCTOR-COMPONENTS DIVISION | DALLAS TEX                  |
| 02660 | AMPHENOL CORP                                           | BROADVIEW ILL               |
| 02833 | ANTENNA SPECIALISTS CO DIV OF ANZAC INDUSTRIES          | CLEVELAND OHIO              |
| 08713 | MOTOROLA SEMICONDUCTOR PRODUCTS INC                     | PHOENIX ARIZ                |
| 05397 | UNION CARBIDE CORP ELECTRONICS DIV                      | CLEVELAND OHIO              |
| 05820 | WAKEFIELD ENGINEERING INC                               | FAIRFIELD MASS              |
| 06486 | IRC DIV OF TRW INC SEMICONDUCTOR PLANT                  | WEST LYNN, MA               |
| 06540 | ATOM ELECTRONIC HARDWARE CO INC                         | NEW ROCHELLE N Y            |
| 07707 | UNITED SHOE MACHINERY CORP FASTENER DIVISION            | SHELTON CONN                |
| 08289 | BLINN DELBERT CO                                        | POMONA CALIF                |
| 09353 | C AND K COMPONENTS INC                                  | NEWTON MASS                 |
| 12640 | NATIONAL SEMICONDUCTOR CORP.                            | DANBURY CONN                |
| 17069 | CIRCUIT STRUCTURES LAB                                  | UPLAND CALIF                |
| 19397 | TRACOR INC                                              | AUSTIN TEX                  |
| 20520 | HEYMAN MFG CO                                           | KENILWORTH N J              |
| 37842 | MALLORY P R AND CO INC                                  | INDIANAPOLIS IND            |
| 53021 | SANGAMO ELECTRIC CO                                     | SPRINGFIELD ILL             |
| 56289 | SPRAGUE ELECTRIC CO                                     | NORTH ADAMS MASS            |
| 70331 | ALPHA WIRE CORP - CANCELED - SEE 92194                  | CHICAGO ILL                 |
| 70903 | LELDEN MFG CO                                           | CAMBRIDGE MASS              |
| 71279 | CAMBRIDGE THERMIONIC CORP                               | ST LOUIS MO                 |
| 71400 | HUSSMAN MFG DIVISION OF MCGRAW-EDISON CO                | MILWAUKEE WIS               |
| 71590 | CENTRALAB DIVISION OF GLORE-UNION INC                   | CHICAGO ILL                 |
| 71785 | CINCH MFG CO AND HOWARD B JONES DIV                     | MIDLAND MICH                |
| 71984 | DOW CORNING CORP                                        | WILLIMANTIC CONN            |
| 72136 | ELECTRO MOTIVE MFG CO                                   | ROCKFORD ILL                |
| 72653 | G C ELECTRONICS MFG CO                                  | CHICAGO ILL                 |
| 73734 | FEDERAL SCREW PRODUCTS CORP                             | WASECA MINN                 |
| 74970 | JOHNSON E F CO                                          | DES PLAINES ILL             |
| 75915 | LITTELFUSE INC                                          | NORTH ADAMS MASS            |
| 80183 | SPRAGUE PRODUCTS CO                                     | STD DIV DIR OF LOG SER DSA  |
| 81349 | MILITARY SPECIFICATIONS                                 | BROOKLYN N Y                |
| 83330 | SMITH HERMAN H INC                                      | GREAT NECK N Y              |
| 84171 | ARCO ELECTRONICS INC                                    | SKOKIE ILL                  |
| 86797 | ROGAN BROS                                              | GLENDALE CALIF              |
| 86928 | SEASTROM MFG CO INC                                     | DEPTS OF NAVY AND AIR FORCE |
| 86044 | AIR FORCE-NAVY AERONAUTICAL STD (ANSI DWGS)             | STD DIV DIR OF LOG SER DSA  |
| 96906 | MILITARY STANDARD (MS) DRAWINGS                         | CHICAGO ILL                 |
| 97985 | STANCOR ELECTRONICS INC                                 | MAMARONECK N Y              |
| 98291 | SEALECTRO CORP                                          |                             |

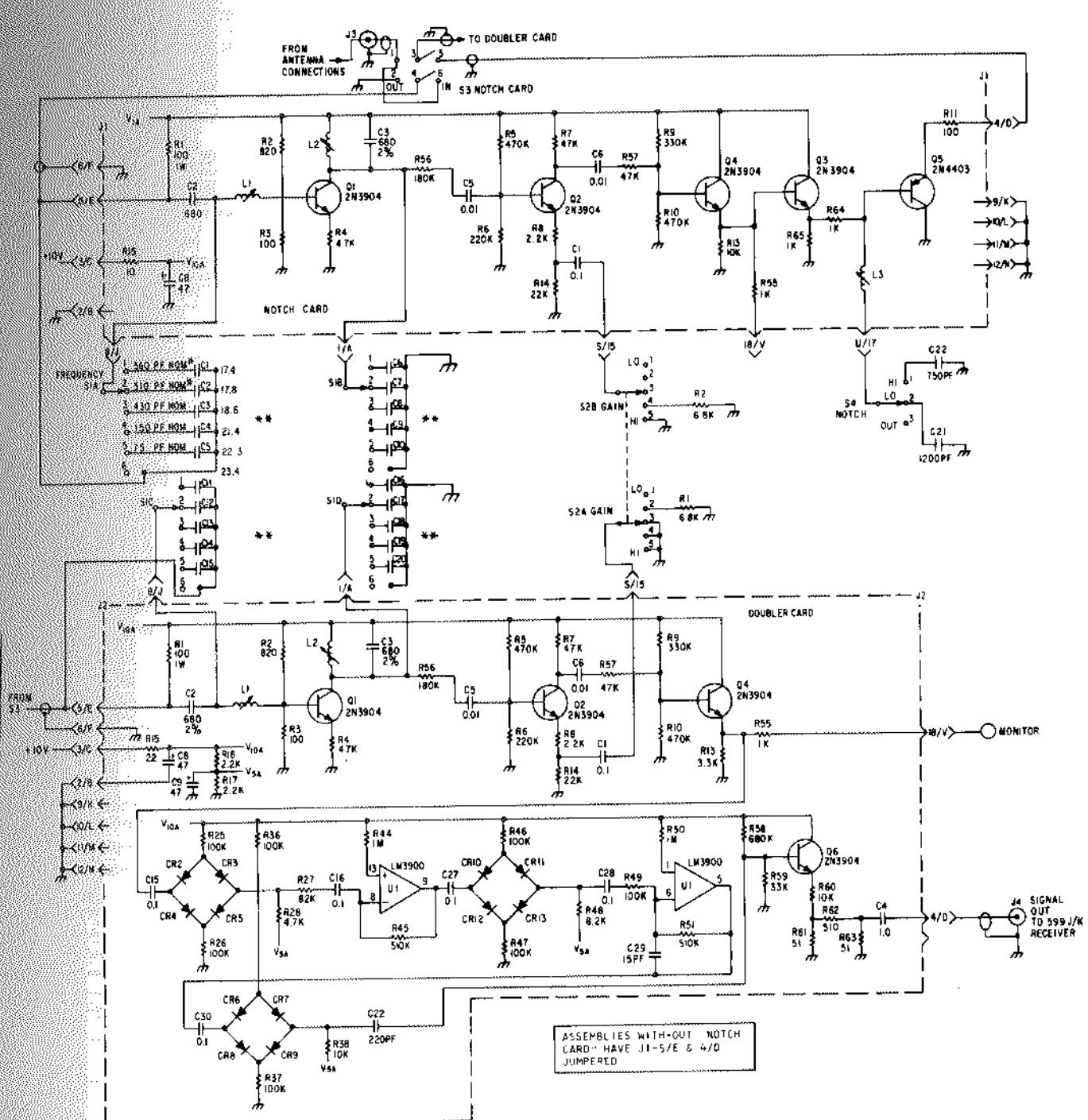
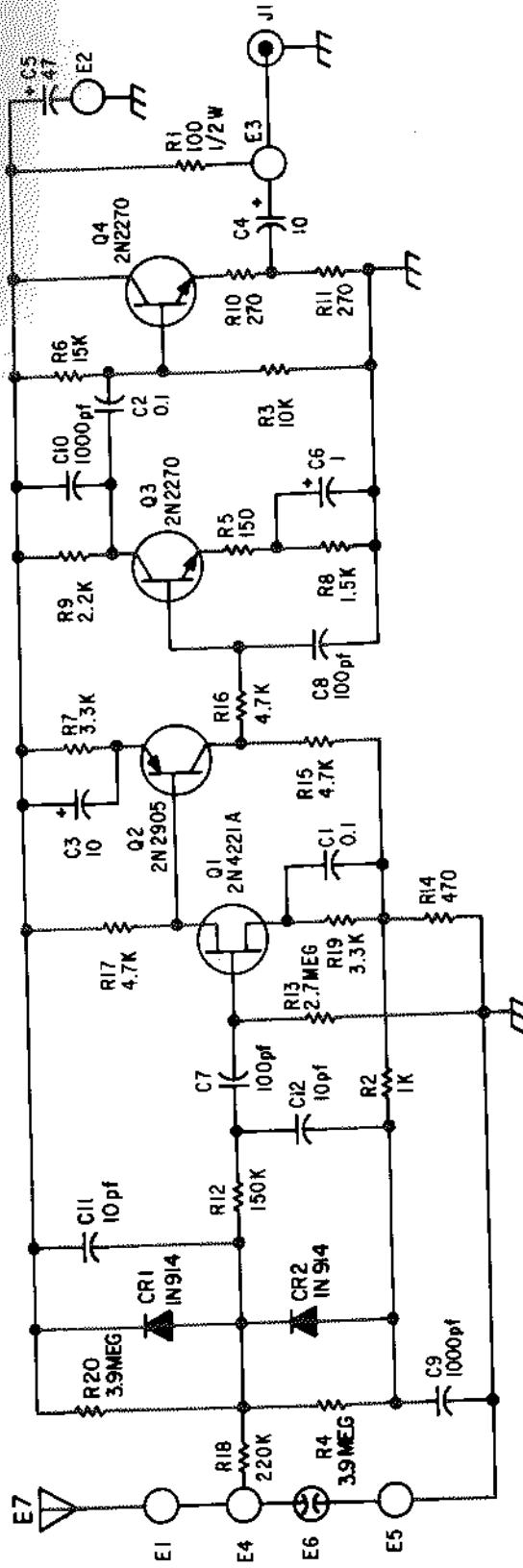
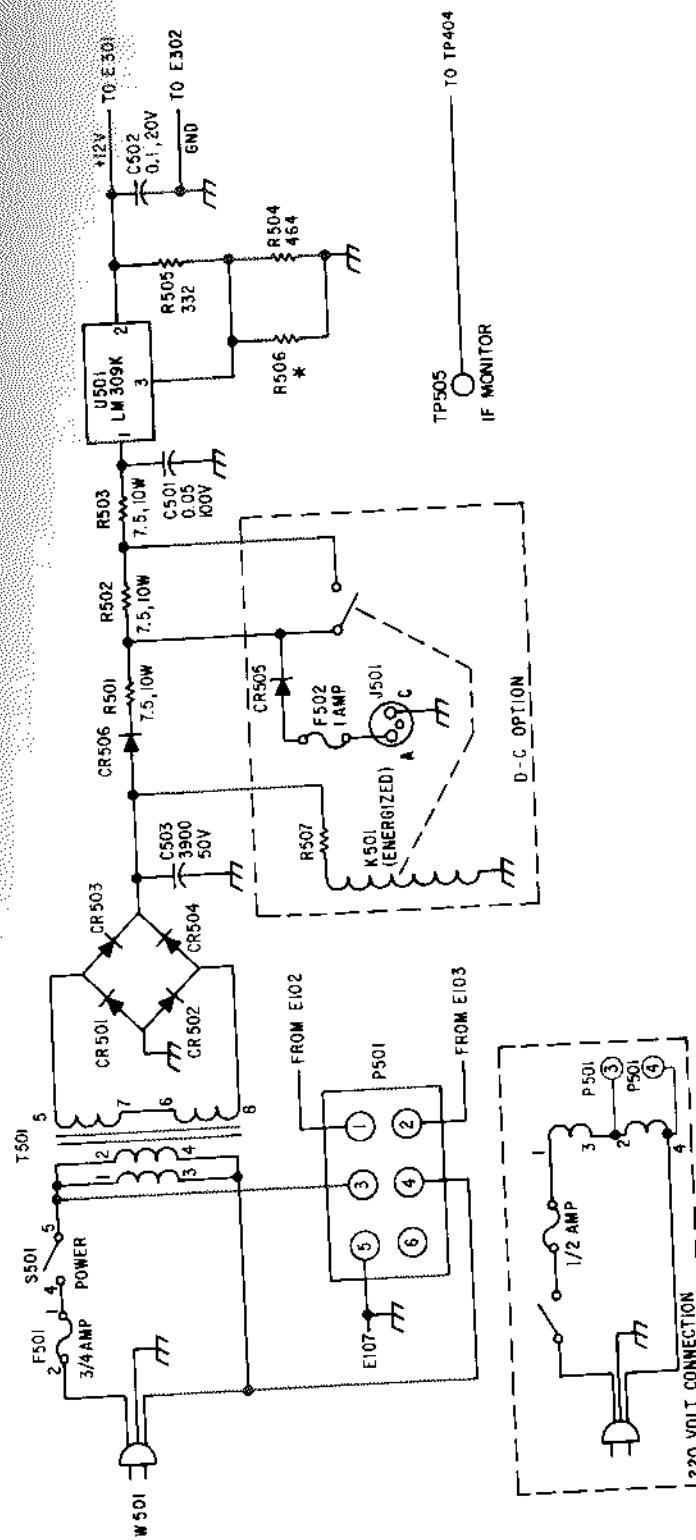


Figure 1. Diagram, Schematic  
MSK CONVERTER 599 J/K, Tracor Drawing No. 79399E



1. ALL RESISTORS ARE  $1/4\text{W} \pm 5\%$  TOL WITH VALUES IN OHMS;  
 CAPACITOR VALUES ARE IN MICROFARADS  
 NOTES: UNLESS OTHERWISE SPECIFIED

Figure 3. Diagram, Schematic Antenna Coupler, Tracor Drawing No. 19358C



\* 3. SELECTED FOR 12V OUT OF U501

2. ALL CR'S ARE IN4002

1. ALL RESISTORS ARE 1/4 W \* 5% TOL WITH VALUES IN OHMS;

CAPACITOR VALUES ARE IN MICROFARADS

NOTES UNLESS OTHERWISE SPECIFIED

Figure 2. Diagram, Schematic Chassis, Tracor Drawing No. 19356 D