# SERVICE MANUAL FOR MODEL YEAR 1989 <br> ELECTRONIC TUNED CASSETTE RADIOS 

## PART NUMBERS

44691064469107<br>44691084469109<br>4469198 (2 SPKR)


huntsville electronics division a Plotai
P.O. Box 240001 - Huntsville, Alabama 35805
© Acustar Inc 1989
 exexcised when troubleshooting the aurion intiegrated circuits As these are DC amplifiers as well as Ac, with essemtialiy rio curremt inimitirng, they may be destroyed by a short circuit to orroiniol as the output of the IC.
B.

TESTING

1. Radio polarity - The positive outputs of the power supply must be commeqted to the radio as shown in Figure 1 -2. The radio wili not operate properiy if connected otherwise.


FIGURE 1-2. RADIO CONNECTION TO TEST SET-UP
2. output mobal - A radio speaker or an s onm resistive load should be commected across the radio speaker Ledas when voltage measurements are beimg made
4. Voltaae Tuned AM Circuits - The capacitances of varactors D1, D2, and D3, in 'the AM tuner module U2, change when the DC voltage applied across them changes and the resonant frequencies of their associated L-C circuits are changed. When a varactor fails, replace the U 2 module.
5. Voltage Tuned FM Circuits - The capacitances of the FM varactors, located in module U4, change when the DC voltage applied across them changes and the resonant frequencies of their associated L-C circuits are changed. When a varactor fails, replace the U4 module.

## E. CLEANING

Because of the inaccessibility of the Tape Mechanism, a combination head and capstan cleaning tape should be used. If the radio is disassembled, the heads, pinch rollers and capstan shafts may be cleaned with isopropyl (rubbing) alcohol.

## III. CIRCUIT DESCRIPTION

A. LOGIC AND CONTROL CIRCUITS

The logic and control functions of the receiver are performed primarily on the Audio/Logic PC Board, by the microprocessor UlOO (see Table 1-3), and the frequency synthesizer U102. The microprocessor accepts commands from the pushbutton switches located on the front of the radio and status signals from the RF board, cassette module and compact disc (CD) player (INFINITY ONLY). It processes the information and generates instructions to the display module and the frequency synthesizer. The display driver controls the vacuum fluorescent display and is located in the VF display module on the control PC board. The frequency synthesizer controls the local oscillator frequency and, thereby, the tuning of the radio. The synthesizer will tune either $200 \mathrm{kHz} / 10 \mathrm{kHz}$ for U.S. use or $100 \mathrm{kHz} / 9 \mathrm{kHz}$ steps for European use. European or U.S. mode selection is accomplished by software. To change the operating mode, press the SET key then the SEL key and press the memory one button three times in succession. For a description of synthesizer pin functions, see Table 1-4.

TABLE 1-3. MICROPROCESSOR (Ul00) PIN DESCRIPTIONS

| PIN NUMBER | DESCRIPTION |
| :---: | :---: |
| 1 | Key Input KO |
| 2 | Key Input Kl |
| 3 | Key Input K2 |
| 4 | Key Input K3 |
| 5 | Radio Test Pin |
| 6 | Frequency Synthesizer Enable - Allows data transfer to the Frequency Synthesizer |
| 7 | Beep Output |
| 8 | Soft mute goes low to turn on 2102 |
| 9 | Reset Input - A high on this pin for 6 usec while the oscillator is running resets the device. |
| 10 | Serial data input and output - Provides serial data to the display driver and frequency synthesizer. |
| 11 | Serial Clock - The serial data clock. |
| 12 | Tape Reel Input - Internally pulled up. |
| 13 | Off/On Key Input |
| 14 | CD "On" Input - Goes low for CD in. |
| 15 | $I^{2} \mathrm{C}$ Data |
| 16 | $\mathrm{I}^{2} \mathrm{C}$ Clock |
| 17 | Power antenna on |
| 18 | N/C |
| 19 | External Oscillator 1.98 MHz fed from the synthesizer |
| 20 | Ground |
| 21 | Used for display blanking |

TABLE 1-3. MICROPROCESSOR (U100) PIN DESCRIPTIONS (Cont.)

| PIN | NUMBER | DESCRIPTION |
| :---: | :---: | :---: |
|  | 22 | Cassette read enable |
|  | 23 | Cassette write enable |
|  | 24 | AM Mono - Goes low for force to mono |
|  | 25 | Station detect - goes low for station |
|  | 26 | Joystick enable |
|  | 27 | Stereo Detect - goes low for stereo |
|  | 28 | Display Driver Enable - Allows data to be transferred to the vacuum fluorescent display driver. |
|  | 29 | N/C |
|  | 30 | W C |
|  | 31 | External access connected to Vcc |
|  | 32 | Goes low for hard mute output to turn on QlOl |
|  | 33 | Power Switch Input - Goes high for ignition on |
|  | 34 | Goes high for FM |
|  | 35 | Goes high for AM |
|  | 36 | Strobe 3 |
|  | 37 | Strobe 2 |
|  | 38 | Strobe 1 |
|  | 39 | Strobe 0 |
|  | 40 | Voltage Supply, Vcc + 5VDC |

TABLE l-4. SYNTHESIZER (U102) PIN DESCRIPTIONS

| PIN NUMBER | DESCRIPTION |
| :---: | :---: |
| 1 | Goes high during the search mode, to desensitize the front end to very weak stations. |
| 2 | Noise Reduction (high $=$ NR on) |
| 3 | Serial data from the microprocessor |
| 4 | Data clock from the microprocessor |
| 5 | Data enable from the microprocessor |
| 6 | Switched supply voltage which is regulated by U103, a 5 volt regulator. |
| 7 | Input from the AM local oscillator |
| 8 | External bypass capacitor for the phase detector |
| 9 | Input from the FM local oscillator |
| 10 | Ground |
| 11 | Unswitched supply voltage (Vcc) for the clock keep alive. Keeps the synthesizer oscillator and dividing chain active when the remaining functions of the synthesizer are powered down. Provides a low power microprocessor clock driver and a time-of-day indication. |
| 12, 13 | Reference oscillator which is controlled for stability by a quartz crystal (X101), capacitors and trimmer capacitor, for accurate setting of the clock. |
| 14 | Reference oscillator frequency divided by two from which the microprocessor derives the instruction time. |
| 15 | Clock signal ( 50 Hz ) used in the program loop timing. |
| 16 | Resistor R124 sets the gain of the phase locked loop. |

TABLE l-4. SYNTHESIZER (U102) PIN DESCRIPTIONS (CONT.)

| PIN NUMBER | DESCRIPTION |
| :---: | :--- |
| 17 | Charge pump output develops tuning <br> voltages and op-amp input. |
| 18 | Operational amplifier output - Supplies <br> the tuning voltage for the RF circuits. |
| 19 | Operational amplifier ground. |
| 20 | Switched supply voltage, 10 volts. |

1. Power-On-Reset - The power-on-reset is controlled by UlOl, see Table l-5. Input pin 2 is always high except when the battery voltage is disconnected. When the ignition voltage is applied, the RC time constant of C116 and R107 causes a pulse to be applied to pins 8 and 9, which causes pin 10 to go to a logic low. Pin 10 is hard wired to pin 1. With a logic high on pin 2 and a logic low on pin 1, the output pin 3 goes high. When pin 3 goes high, the microprocessor resets and pins 8 and 32 of the microprocessor go high. This turns on QlOl and Ql02, which causes the mute pin 11 of the audio output IC'S to go low, therefore, muting the output.

TABLE 1-5. QUAD 2 INPUT NAND SCHMITT-TRIGGER

| INPUT A | INPUT | B | OUTPUT |
| :---: | :---: | :---: | :---: |
| 0 | 0 | 1 |  |
| 0 | 1 | 1 |  |
| 1 | 0 | 1 |  |
| 1 | 1 | 0 |  |

TRUTH TABLE $0=$ Logic Low $1=$ Logic High
2. Analog to Digital Converter - The joystick provides a balance and fader input to A/D converter U202 which places information on the Bus to allow the microcomputer to control U105 for these functions.

1. $\quad \mathrm{RF}$ Stage - The $A M$ signals received by the antenna are coupled through the series choke Ll, which presents a high impedance to FM and shortwave broadcast frequencies, and Cl to AM antenna coil Tl which transformer couples the RF signal to the gate of Ql a J-FET RF amplifier. Transistor Q2 the second RF amplifier has its conduction controlled by the RF amplifier AGC pin 1 of Ul. The RF output of Q 2 is applied to pin 1 of U 2 which contains a varactor diode, fixed capacitor, trimmer capacitor and transformer tuned to resonate at the selected frequency.
2. Local Oscillator - The local oscillator tuning is accomplished through pin 20 of Ul . The local oscillator is controlled by the synthesizer and tuned by the combination of fixed capacitors, trimmer capacitor, transformer and a varactor diode in U2. The output of the oscillator goes directly to the mixer and also the synthesizer.
3. Mixer Staae - The mixer input is tuned by a varactor diode, fixed capacitor, trimmer capacitor and transformer contained in U2. The RF and oscillator are heterodyned in the mixer. The mixer output pin 7 of Ui is tuned to resonate at the IF or difference frequency by FL1 and applied to the IF input pin 9 of Ul through C8.
4. IF Stage - Pin 9 of $U 1$ is the $I F$ input which is amplified internally in Ul, and outputted on pin 10 of Ul. The stage gain of the IF amplifier is controlled by the IF AGC pin 17 of Ul. The IF out is tuned by T2 and coupled by Cl7 to the base of Q3. Transistor Q3 and Q4 are in the cascade configuration with the output being taken off the collector of $Q 4$ and applied to the AM stereo decoder U3.
5. AM Station Detect - When an AM signal is received, the signal meter or station detect output pin 16 of Ul will cause $Q 7$ to conduct which will result in Jl-11 going low. When an AM station is not received, Q7 will be cut off and Jl-11 will go high.
6. Detector and AM Stereo Decoder - The AM stereo decoder chip, U3, contains circuitry to detect and decode AM stereo from stations using the Motorola C-Quam AM stereo system. This system uses a modified form of quadrature modulation which is
compatible with monaural receivers. The phase modulation components of a quadrature signal are extracted and used to phasemodulate the broadcast transmitter. The (L-R) information is contained in this quadrature phase modulation. The (L+R) is transmitted as normal AM. The chip automatically switches to decode stereo when a 25 Hz , 4\% modulated pilot signal is received. Stations transmitting other systems of AM stereo are received in monaural, as are non-stereo stations.

The 450 kHz AM intermediate frequency is applied to pin 3 of u3. The chip contains an envelope detector which detects the (L+R) portion of the signal. A phase locked loop (PLL) detector, utilizing an external resonator controlled oscillator, which operates at eight times the IF frequency, to detect the (L-R) portion of the signal. The frequency of the oscillator is 3600 kHz and is applied to pin 17 with pin 18 being the feedback pin.

The stereo pilot signal is contained in the phase modulated (L-R) portion of the signal. This signal is controlled by an internal AGC and outputted on pin 11. A low pass filter is formed by R19 and C20, from which point the signal goes to pin 13, the input of a 25 Hz bandpass filter. The output of the bandpass filter appears at pin 14, which is also the pilot detector input. The pilot detector has two modes of operation. With a good signal it will switch to stereo after seven consecutive cycles of the 25 Hz pilot. When interference is present the pilot detector requires 37 consecutive cycles of pilot to switch to stereo. Pin 12 of U3 is the interference detector input. If the detected low frequency phase modulated interference exceeds a certain level, the pilot detector will be prevented from switching to stereo. A greater level of interference is required to switch back to monaural if the pilot detector is already in stereo. The most common type of interference that would require the circuitry to switch to monaural mode, would be the reception of more than one station on the selected frequency. Pin 15 goes low to indicate stereo. The decoder can be forced to monaural by holding pin 9 low. When any tuning function is operated, pin 9 is hold low by the microprocessor to switch the decoder to monaural for approximately 1 second.
6. Detector and AM Stereo Decoder (Cont.)

During AM operation, transistors $Q 5$ and $Q 6$ conduct to apply the regulated 10 volts to pin 6 of U3. The AM audio outputs pin 7 (left) and pin 8 (right) are applied to the filter/Amp IC (U7).

## C. FM CIRCUIT

1. FM Front End - The completely integrated FM front end, U4, performs the following functions AGC, RF amp, mixer, oscillator and IF. Increased quality and reliability are achieved by integrating the discrete components. The signal from the antenna is hard wired to pin 13 and the output on pin 6 is the intermediate frequency. Tuning voltage is applied to pin 10 to determine the resonant frequencies of the varactor diodes, capacitor and coil combinations, for the RF, mixer and oscillator stages. Search sensitivity is controlled by pin 4 and the AGC input is applied to pin 3. Pin 1 supplies the IF output to the synthesizer. During FM operation, switched supply voltage will be applied to pin 5 because of the conduction of $Q 9$ and 88 .
2. Audio Detection and Station Detector - The IF output out of the front end is applied to pin 2 of u5. The IF amplifier output has two outputs, one to the level detector for AGC output pin 6 and the other to a buffer amplifier. The buffered IF output on pin 16 is connected to pin 15 by R37. Pins 14 and 15 are the inputs to the peak detector which has two outputs, one for the AF amplifier and the other to the frequency change detector. The detected audio is amplified and outputting on pin 10. Operation of the frequency change detector is determined by R39, C48 and C49. Station detect sensitivity is determined by R36 and C47. The station detect output pin 7 turns on 27 when $a$ station is detected. An internal regulator regulates the Vcc voltage level.
3. Stereo Decoder and Blend - The separation of the left and right audio is accomplished in the FM stereo decoder U6. The multiplexed audio signal goes in on pin 3 and is outputted as left and right audio pins 4 and 6. The frequency of the PLL 19 kHz pilot detector is set at pin 16. The internal Vco frequency can be measured at pin 11 with a sufficiently high impedance counter through a 56K resistor or greater. The IC also contains a stereo
4. Stereo Decoder and Blend (Cont.)
blend and high frequency rolloff circuit controlled by the IF AGC voltage at pins 7 and 5. This feature improves the $S / N$ of a very weak stereo station by gradually reducing the separation and high frequency response. The blend threshold is set by R43.

## D. <br> AUDIO CIRCUIT

1. Filter/Amplifier - The filter/amplifier IC, U7, contains an active high pass-low pass filter which is utilized in the AM mode using input pins 15 and 17. Internal diodes allow the chosen audio to pass but the other mode is blocked by reverse biased diodes. The dual audio amplifier is used for both AM and FM.
2. Dynamic Noise Reduction - The noise reduction is accomplished in U106. The IC contains circuitry which gives up to 10 db of effective noise reduction by varying the audio bandwidth. When there is no program material present, the audio bandwidth is electronically narrowed to cut out the mid and high frequency component of the noise. When music or speech with high frequency material is present, the audio bandwidth is widened so that the audio fidelity is not noticeably affected. The opening of the bandwidth takes only 500 usec. When the bandwidth is open, the noise is masked by the program material. The bandwidth closes back down 60 msec after the high frequency material in the program is removed. The program material is distinguished from the noise by a dynamic level threshold detector. Resistors R132 and R133 set the threshold at which the desired audio is separated from noise. When noise reduction is turned off, pin 2 of $U 102$ pulls pin 9 of U106 to ground, causing a constantly wide audio bandwidth, and no noise reduction. The effect of the noise reduction is greatest on program material containing quiet spots and low modulation.
3. Electronic - Volume, Tone, Balance and Fader - The audio inputs to the Audio Control Circuit, U105, come from three sources. The internal source selector selects the proper source and rejects the others. The input source from the CD player (Infinity only) is applied through Cl63 to pin 8 and through Cl62 to pin 21. The input source from the tape player is applied direct to pin 12 and to pin 17. The input source for the radio is applied
4. Electronic - Volume. Tone, Balance and Fader (Cnt)
through Cl06 to pin 10 and through Cl07 to pin 19. The chosen input source is passed through external capacitors and on pins 13 and 16 to the DNR chip and it comes back in on pins 14 and 15 through C120, C122; and C119, C121. The operation of U105 is software controlled using a two wire $I^{2}$ C Bus connected to pins 1 and 28. Capacitor Cl17 is the Bass control capacitor for the left channel as Cl18 is for the right. Capacitor Cl05 is the treble control capacitor for the left channel as Cl06 is for the right. Capacitors Cl07 and Cl08 are for supply voltage filtering. The internal volume, tone and balance stages are variable depending on the data on the $I^{2} C$ Bus sent by the microprocessor. The U105 has two outputs for the left channel pins 3 and 4 and two outputs for the right channel pins 25 and 26 and the variable fader control in the IC responds to the data from the microprocessor.
5. Power Amplifiers - The audio power amplifiers U107, U108, U109 and Ull0 have their inputs capacitively coupled to pins 2 and 13. Muting is accomplished by the DC voltage level on pin 11. The switched power is applied to pins 6 and 8 for bootstrapping a feedback technique to improve linearity and also pin 10 for $+v p$ (supply voltage). The devices are dual audio integrated Class $B$ hi-fi power amplifiers to be used in the Bridge-Tied-Load (BTL) configuration. Pin 9 is the output feed and pin 5 is the output return.

## E. POWER

There are four power inputs to the radio. The battery line P107 pin 1 maintains the memory and clock functions.

## NOTE

ANY INTERRUPTION OF THE UNSWITCHED POWER WILL CAUSE THE CLOCK TO REVERT BACK TO 12:00 AND THE RADIO TO REVERT TO 530 kHz IN THE U.S. MODE.

The switched voltage is applied to P107 pin 2. Chokes LlOl and L102 provide filtering and isolate power for the left side audio outputs from the right side audio outputs. The switched voltage is necessary to get a clock display and operate the radio. The rheostat dimming line P 107 pin 3 provides a controllable dimming of the incandescent lamps and vacuum fluorescent display by varying the voltage. The side marker input P107 pin 4 is used to lower the brightness of the vacuum fluorescent display.

## F. $\quad$ CLOCK

The clock function is derived from the synthesizer on-chip oscillator which is stabilized by a 3.96 MHz quartz crystal
(X100). Capacitor Cl31 is a fine tuning trimmer for setting the clock accuracy. As an example, if the oscillator frequency was 392 Hz low (196 Hz low at U102 pin 14), this would cause the clock to lose one minute per week. This same degree of error would show up as only 79 Hz low on the AM local oscillator. See Section IV for the oscillator alignment procedure.

## G. MECHANISM CONTROL BOARD

Because of the surface mounted devices/components (SMD), it is recommended that board level maintenance be performed instead of component level.

## H. PREAMPLIFIER

Because of the surface mounted devices/components (SMD), it is recommended that board level maintenance be performed instead of component level.
IV. ALIGNMENT
A. CLOCK REFERENCE FREOUENCY SETTING

1. Standard Method - The reference oscillator can be set without opening the radio by following this method.
a. Turn the radio on and tune to 540 on the display.
b. Connect an accurately calibrated counter to Jl pin 7 (TPl) which is accessible through the top cover, see Fig. 1-4. This should display the AM local oscillator frequency, 990 kHz when the radio is tuned to 540 .
c. Adjust Cl31 to give a local oscillator frequency of exactly $990 \mathrm{kHz} \mathrm{t/} \mathrm{Hz}$. capacitor C131, which is on the audio logic board, can be adjusted with a long tuning tool through a hole in the top cover and RF board, see Fig. l-4.



## VOTES

1 REFERENCE DRAWINGS, ELECTRICAL SCHEMATICS
4393206 RF BOARO ASSY
4234494 AUDIO LOGIC BOARD ASSY
4234484 CONTROL BOARD ASSY
4234507 SHINWA CASSETTE MECHANISM
4234510 ALPINE CASSETTE MECHANISA

FIGURE 2-1. ELECTRONIC TUNED CASSETTE RADIO, BLOCK WIRING DIAGRAM


FIGURE 2-2. ELECTRONIC SCHEMATIC, AUDIO/LOGIC PC BOARD


| PIN | DCV |
| :---: | :---: |
| 1 | 4.95 |
| 2 | 4.95 |
| 3 | 4.95 |
| 4 | 4.95 |
| 5 | 4.9s |
| 6 | 4.95 |
| 7 | 0 |
| 8 | 0 |
| 9 | 0 |
| 10 | 4.30 |
| 11 | 2.50 |
| 12 | 4.95 |
| 13 | 4.9 s |
| 14 | 4.9 s |
| 15 | 3.70 |
| 16 | 3.70 |
| 17 | 0 |
| 18 | 3.90 |
| 19 | 1.80 |
| 20 | 0 |
| 21 | 0 |
| 22 | 0.30 |
| 23 | 0 |
| 24 | 4.9 s |
| 25 | 4.95 |
| 26 | 4.95 |
| 27 | 4.9s |
| 28 | 0 |
| 29 | 4.9s |
| 30 | 1.65 |
| 31 | 4.9 s |
| 32 | 0 |
| 33 | 5.00 |
| 34 | 0 |
| 35 | 3.30 |
| 36 | 0 |
| 37 | 0 |
| 38 | 0.40 |
| 39 | 0 |
| 40 | 4.9s |

YOT

| PIN | $D C V$ |
| :---: | :---: |
| 1 | 4.70 |
| 2 | 5.27 |
| 3 | 0 |
| 4 | 4.70 |
| 5 | 0 |
| 6 | 0 |
| 7 | 0 |
| 8 | 0 |
| 9 | 0 |
| 10 | 4.70 |
| $I I$ | 0 |
| 12 | 4.50 |
| 13 | 4.95 |
| 14 | 4.7 |

U102

| PIN | AM <br> DCV | FM <br> DCV |
| :---: | :---: | :---: |
| 1 | 0 | 0 |
| 2 | 0 | 0 |
| 3 | 1.65 | 1.65 |
| 4 | 1.85 | 1.85 |
| S | 3.85 | 3.85 |
| 6 | $4.9 s$ | 4.95 |
| 7 | 3.80 | 4.90 |
| 8 | 1.40 | 1.40 |
| 9 | $4.3 s$ | 2.85 |
| 10 | 0 | 0 |
| 11 | 4.70 | 4.70 |
| 12 | 0.50 | 0.50 |
| 13 | 0.60 | 0.60 |
| 14 | 1.80 | 1.80 |
| 15 | 3.40 | 3.40 |
| 16 | 2.40 | 3.40 |
| 17 | 0.10 | 2.30 |
| 18 |  | $1.7-7.0$ |
| 19 | 0 | 0 |
| 20 | 10.00 | 10.00 |

U105

| DC V |  |  |  |
| :---: | :---: | :---: | :---: |
| PIN | 1 | 2 | 3 |
| 0103 | 12.7 | 5.0 | 0 |
| U104 | 12.7 | 10.5 | 0 |
| U111 | 12.7 | 5.0 | 0 |

U107, U108, U109, \& U110

| PIN | DCV | ■OV |
| :---: | :---: | :---: |
| 1 | 0.16 | 3.20 |
| 2 | 0.16 | 3.30 |
| 3 | 0 | 0 |
| 4 | 0.16 | 3.20 |
| 5 | 0 | 6.00 |
| 6 | 13.20 | 13.70 |
| 7 | 0 | 0 |
| 8 | 13.20 | 13.70 |
| 9 | 0 | 6.00 |
| 10 | 13.30 | 9.70 |
| 11 | 0 | NC |
| 12 | NC | 1.60 |
| 13 | 0.30 | With |
|  | with | Switche |
|  | Unswitched | and |
|  | Voltage | Unswitched |
|  | Only | Voltage |
|  |  | Applied |
|  |  |  |

U112

| DC V |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| PIN | 1 | 2 | 3 | 4 | 5 |  |
|  | 12.7 | 12.7 | 0 | 0 | 5.0 |  |

U100

| PIN | DCV |
| :---: | :---: |
| 1 | 4.95 |
| 2 | 4.95 |
| 3 | 4.95 |
| 4 | 4.95 |
| 5 | 4.95 |
| 6 | 4.95 |
| 7 | 0 |
| 8 | 0 |
| 9 | 0 |
| 10 | 4.20 |
| 11 | 2.50 |
| 12 | 4.95 |
| 13 | 4.95 |
| 14 | 4.95 |
| 15 | 3.70 |
| 16 | 3.70 |
| 17 | 0 |
| 18 | 2.90 |
| 19 | 1.80 |
| 20 | 0 |
| 21 | 0 |
| 22 | 0.30 |
| 23 | 0 |
| 24 | 4.95 |
| 25 | 4.95 |
| 26 | 4.95 |
| 27 | 4.95 |
| 28 | 0 |
| 29 | 4.95 |
| 30 | 1.65 |
| 31 | 4.95 |
| 32 | 0 |
| 33 | 5.00 |
| 34 | 0 |
| 35 | 3.30 |
| 36 | 0 |
| 37 | 0 |
| 38 | 0.40 |
| 39 | 0 |
| 40 | 4.95 |

U106

| PIN | DCV |
| :---: | :---: |
| 1 | 0.00 |
| 2 | 4.95 |
| 3 | 4.95 |
| 4 | 5.00 |
| 5 | 4.00 |
| 6 | 0.80 |
| 7 | 0 |
| 8 | 5.00 |
| 9 | 0 |
| 10 | 3.50 |
| 11 | 5.00 |
| 12 | 5.00 |
| 13 | 5.00 |
| 14 | 5.00 |

U101

| PIN | DCV |
| :---: | :---: |
| 1 | 4.70 |
| 2 | 5.27 |
| 3 | 0 |
| 4 | 4.70 |
| 5 | 0 |
| 5 | 0 |
| 7 | 0 |
| 8 | 0 |
| 9 | 0 |
| 10 | 4.70 |
| 11 | 0 |
|  | 4.50 |
| 12 | 4.95 |
| 13 | 0 |
| 14 | 4.7 |


|  |
| :--- |
|  |
|  |
|  |
|  |
|  |


U107 U108, U109, \& U110

| PIN | DC V | DC V |
| :---: | :---: | :---: |
| 1 | 0.15 | 2.20 |
| 2 | 0.15 | 2.20 |
| 3 | 0 | 0 |
| 4 | 0.16 | 2.20 |
| 5 | 0 | 6.00 |
| 6 | 13.20 | 12.70 |
| 7 | 0 | 12.70 |
| 8 | 13.20 | 5.00 |
| 9 | 0 | 12.70 |
| 10 | 13.20 | 9.85 |
| 11 | 0 | NC |
| 12 | NC | 1.60 |
| 13 | 0.30 | With |
|  | with | Switched |
|  | Unswitched | and |
|  | Voltage | Unswitched |
|  | Only | Voltage |
|  |  | Applied |
|  |  |  |

U112

| DC V |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| PIN | 1 | 2 | 3 | 4 | 5 |
|  | 12.7 | 12.7 | 0 | 0 | 5.0 |

0100

| PIN | DC V |
| :---: | :---: |
| 1 | 4.95 |
| 2 | 4.95 |
| 3 | 4.95 |
| 4 | 4.95 |
| 5 | 4.95 |
| 6 | 4.95 |
| 7 | 0 |
| 8 | 0 |
| 9 | 0 |
| 10 | 4.20 |
| 11 | 2.50 |
| 12 | 4.95 |
| 13 | 4.95 |
| 14 | 4.95 |
| 15 | 3.70 |
| 16 | 3.70 |
| 17 | 0 |
| 18 | 2.90 |
| 19 | 1.80 |
| 20 | 0 |
| 21 | 0 |
| 22 | 0.30 |
| 23 | 0 |
| 24 | 4.95 |
| 25 | 4.95 |
| 26 | 4.95 |
| 27 | 4.95 |
| 28 | 0 |
| 29 | 4.95 |
| 30 | 1.65 |
| 31 | 4.95 |
| 32 | 0 |
| 33 | 5.00 |
| 34 | 0 |
| 35 | 3.30 |
| 36 | 0 |
| 37 | 0 |
| 38 | 0.40 |
| 39 | 0 |
| 40 | 4.95 |
|  |  |

U106

| PIN | DC V |
| :---: | :---: |
| 1 | 10.00 |
| 2 | 4.95 |
| 3 | 4.95 |
| 4 | 5.00 |
| 5 | 4.00 |
| 6 | 0.80 |
| 7 | 0 |
| 8 | 5.00 |
| 9 | 0 |
| 10 | 3.50 |
| 11 | 5.00 |
| 12 | 5.00 |
| 13 | 5.00 |
| 14 | 5.00 |

U101

| PIN | DC V |
| :---: | :---: |
| 1 | 4.70 |
| 2 | 5.27 |
| 3 | 0 |
| .4 | 4.70 |
| 5 | 0 |
| 6 | 0 |
| 7 | 0 |
| 8 | 0 |
| 9 | 0 |
| 10 | 4.70 |
| 11 | 0 |
| 12 | 4.50 |
|  | 4.95 |
| 13 | 0 |
| 14 | 4.7 |

U102

|  | AM <br> PIN | FM <br> $D C V$ |
| :---: | :---: | :---: |
| 1 | 0 | 0 |
| 2 | 0 | 0 |
| 3 | 1.65 | 1.65 |
| 4 | 1.85 | 1.85 |
| 5 | 3.85 | 3.85 |
| 6 | 4.95 | 4.95 |
| 7 | 2.80 | 4.90 |
| 8 | 1.40 | 1.40 |
| 9 | 4.35 | 2.85 |
| 10 | 0 | 0 |
| 11 | 4.70 | 4.70 |
| 12 | 0.50 | 0.50 |
| 13 | 0.60 | 0.60 |
| 14 | 1.80 | 1.80 |
| 15 | 2.40 | 2.40 |
| 16 | 2.40 | 2.40 |
| 17 | 0.10 | 2.30 |
| 18 | 0 | $1.7-7.0$ |
| 19 | 0 | 0 |
| 20 | 10.00 | 10.00 |

U105

| PIN | DC V |
| :---: | :---: |
| 1 | 1.65 |
| 2 | 0 |
| 3 | 5.00 |
| 4 | 5.00 |
| 5 | 5.00 |
| 6 | 5.00 |
| 7 | 5.00 |
| 8 | 5.00 |
| 9 | 0.05 |
| 10 | 5.00 |
| 11 | 10.00 |
| 12 | 5.00 |
| 13 | 5.00 |
| 14 | 5.00 |
| 15 | 5.00 |
| 16 | 5.00 |
| 17 | 5.00 |
| 18 | 0 |
| 19 | 5.00 |
| 20 | 5.00 |
| 21 | 5.00 |
| 22 | 5.00 |
| 23 | 5.00 |
| 24 | 5.00 |
| 25 | 5.00 |
| 26 | 5.00 |
| 27 | 10.00 |
| 28 | 1.85 |

0100

| PIN | DC V |
| :---: | :---: |
| 1 | 4.95 |
| 2 | 4.95 |
| 3 | 4.95 |
| 4 | 4.95 |
| 5 | 4.95 |
| 6 | 4.95 |
| 7 | 0 |
| 8 | 0 |
| 9 | 0 |
| 10 | 4.20 |
| 11 | 2.50 |
| 12 | 4.95 |
| 13 | 4.95 |
| 14 | 4.95 |
| 15 | 3.70 |
| 16 | 3.70 |
| 17 | 0 |
| 18 | 2.90 |
| 19 | 1.80 |
| 20 | 0 |
| 21 | 0 |
| 22 | 0.30 |
| 23 | 0 |
| 24 | 4.95 |
| 25 | 4.95 |
| 26 | 4.95 |
| 27 | 4.95 |
| 28 | 0 |
| 29 | 4.95 |
| 30 | 1.65 |
| 31 | 4.95 |
| 32 | 0 |
| 33 | 5.00 |
| 34 | 0 |
| 35 | 3.30 |
| 36 | 0 |
| 37 | 0 |
| 38 | 0.40 |
| 39 | 0 |
| 40 | 4.95 |
|  |  |

0106

| PIN | DC $V$ |
| :---: | :---: |
| 1 | 10.00 |
| 2 | 4.95 |
| 3 | 4.95 |
| 4 | 5.00 |
| 5 | 4.00 |
| 6 | 0.80 |
| 7 | 0 |
| 8 | 5.00 |
| 9 | 0 |
| 10 | 3.50 |
| 11 | 5.00 |
| 12 | 5.00 |
| 13 | 5.00 |
| 14 | 5.00 |

U101

| PIN | DC V |
| :---: | :---: |
| 1 | 4.70 |
| 2 | 5.27 |
| 3 | 0 |
| 4 | 4.70 |
| 5 | 0 |
| 6 | 0 |
| 7 | 0 |
| 8 | 0 |
| 9 | 0 |
| 10 | 4.70 |
| 11 | 0 |
| 12 | 4.50 |
| 13 | 4.95 |
| 14 | 4.7 |


| DC V |  |  |  |
| :---: | :---: | :---: | :---: |
| PIN | 1 | 2 | 3 |
| U103 | 12.7 | 5.0 | 0 |
| U104 | 12.7 | 10.5 | 0 |
| U111 | 12.7 | 5.0 | 0 |

U107, U108, U109, \& 0110

| PIN | DC V | DC V |
| :---: | :---: | :---: |
| 1 | 0.16 | 2.20 |
| 2 | 0.16 | 2.20 |
| 3 | 0 | 0 |
| 4 | 0.16 | 2.20 |
| 5 | 0 | 6.00 |
| 6 | 13.20 | 12.70 |
| 7 | 0 | 0 |
| 8 | 13.20 | 12.70 |
| 9 | 0 | 6.00 |
| 10 | 13.20 | 12.70 |
| 11 | 0 | 9.85 |
| 12 | NC | Nc |
| 13 | 0.30 | 1.60 |
|  | With | With |
|  | Unswitched | Switched |
|  | Voltage | and |
|  | Only | Unswitched |
|  |  | Voltage |
|  |  | Applied |

U112

| DC V |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| PIN | 1 | 2 | 3 | 4 | 5 |
|  | 12.7 | 12.7 | 0 | 0 | 5.0 |




FIGURE 2-5. ELECTRICAL SCHEMATIC, AUDIO/LOGIC PC BOARD


FIGURE 2-6. ELECTRICAL SCHEMATIC, RF PC BOARD

U7

| PIN | AM <br> DC V | FM <br> DC $V$ |
| :---: | :---: | :---: |
| 1 | 6.50 | 6.50 |
| 2 | 0 | 0 |
| 3 | 0.15 | 4.66 |
| 4 | 4.91 | 0 |
| 5 | 0.26 | 4.57 |
| 6 | 10.00 | 10.00 |
| 7 |  |  |
| 8 |  |  |
| 9 | 4.61 | 0 |
| 10 | 0 | 0 |
| 11 | 0 | 0 |
| 12 | 0 |  |
| 13 |  |  |
| 14 | 0.76 | 0 |
| 15 | 0.00 | 0 |
| 16 | 0.82 | 0 |
| 17 | 0 | 0 |
| 18 | 0 | 0.50 |
| 19 | 6.50 |  |
| 20 | 9.12 | 0 |


|  | $E$ | $B$ | $C$ |
| :--- | :---: | :---: | :---: |
| Q2 | 4.70 | 5.36 | 8.00 |
| Q3 | 3.57 | 5.84 | 6.48 |
| Q4 | 6.50 | 5.80 | 3.60 | | S |
| :--- |
| Q1 |

U1

| PIN | DV C | 600 kHz e 1, 000 mV Mod. 400 Hz e $30 \%$ |
| :---: | :---: | :---: |
| 1 | 5.36 | 1.75 |
| 2 | 2.03 |  |
| 3 | 0.55 | 0.87 |
| 4 | 0.10 | 0.30 |
| 5 | 0 |  |
| 6 | 2.03 |  |
| 7 | 8.15 |  |
| 8 | 8.17 |  |
| 9 | 0.82 |  |
| 10 | 8.17 |  |
| 11 | 0.68 |  |
| 12 | 0 |  |
| 13 | 2.30 | 3.01 |
| 14 | 8.17 |  |
| 15 | 1.25 |  |
| 16 | 0.04 | 1.47 |
| 17 | 2.27 | 2.98 |
| 18 | 5.71 |  |
| 19 | 5.71 |  |
| 20 | 3.06 |  |

U5

| $P I N$ | DC V |
| :--- | :--- |
| 1 | 3.30 |
| 2 | 3.30 |
| 3 | 3.30 |
| 4 | 0 |
| 5 | 2.3 On Sta. |
|  | $0.0 f$ I Sta. |
| 6 | 1.5 - 6.2 |
| 7 | 7.3 On Sta. |
|  | 0.0 Sta. |
| 8 | 0 |
| 9 | 5.0 |
| 10 | 5.0 |
| 11 | 0 |
| 12 | 8.6 |
| 13 | 4.9 |
| 14 | 2.6 |
| 15 | 2.6 |
| 16 | 2.6 |

U7

| PIN | AM <br> DC $V$ | FM <br> DC |
| :---: | :---: | :---: |
| 1 | 6.50 | 6.50 |
| 2 | 0 | 0 |
| 3 | 0.15 | 4.66 |
| 4 | 4.91 | 0 |
| 5 | 0.26 | 4.57 |
| 6 | 10.00 | 10.00 |
| 7 |  |  |
| 8 |  |  |
| 9 | 4.61 | 0 |
| 10 | 0 | 0 |
| 11 | 0 | 0 |
| 12 |  |  |
| 13 |  |  |
| 14 | 0.76 | 0 |
| 15 | 5.00 | 0 |
| 16 | 0.82 | 0 |
| 17 | 0 | 0 |
| 18 | 0.50 | 6.50 |
| 19 | 9.12 | 0 |
| 20 | 9 |  |


|  | $E$ | $B$ | $C$ |
| :--- | :---: | :---: | :---: |
| Q2 | 4.70 | 5.36 | 8.00 |
| $Q 3$ | 3.57 | 5.84 | 6.48 |
| $Q 4$ | 6.50 | 5.80 | 3.60 |


|  | S | G | $D$ |
| :---: | :---: | :---: | :---: |
| Q1 | 0.41 | 0 | 4.70 |

01

| PIN | DV C | 600 kHz e $1,000 \mathrm{mV}$ Mod. 400 Hz e 30\% |
| :---: | :---: | :---: |
| 1 | 5.36 | 1.75 |
| 2 | 2.03 |  |
| 3 | 0.55 | 0.87 |
| 4 | 0.10 | 0.30 |
| 5 | 0 |  |
| 6 | 2.03 |  |
| 7 | 8.15 |  |
| 8 | 8.17 |  |
| 9 | 0.82 |  |
| 10 | 8.17 |  |
| 11 | 0.68 |  |
| 12 | 0 |  |
| 13 | 2.30 | 3.01 |
| 14 | 8.17 |  |
| 15 | 1.25 |  |
| 16 | 0.04 | 1.47 |
| 17 | 2.27 | 2.98 |
| 18 | 5.71 | . |
| 19 | 5.71 |  |
| 20 | 3.06 |  |

05

| PIN | DC V |
| :--- | :--- |
| 1 | 3.30 |
| 2 | 3.30 |
| 3 | 3.30 |
| 4 | 0 |
| 5 | 2.3 on Sta. |
| 6 | $0.0 f f$ Sta. |
| 7 | 1.5 - 6.2 |
|  | 7.3 On Sta. |
| 8 | 0 off Sta. |
| 9 | 0 |
| 10 | 5.0 |
| 11 | 0 |
| 12 | 8.6 |
| 13 | 4.9 |
| 14 | 2.6 |
| 15 | 2.6 |
| 16 | 2.6 |

U7

| PIN | $\stackrel{A M}{D C^{V}}$ | ${\underset{D C}{ }}_{\text {FM }}^{V}$ |
| :---: | :---: | :---: |
| 1 | 6.50 | 6.50 |
| 2 | 0 | 0 |
| 3 | 0.15 | 4.66 |
| 4 | 4.91 | 0 |
| 5 | 0.26 | 4.57 |
| 6 | 10.00 | 10.00 |
| 7 |  |  |
| 8 |  |  |
| 9 | 4.61 | 0 |
| 10 | 0 | 0 |
| 11 |  |  |
| 12 | 0 | 0 |
| 13 |  |  |
| 14 |  |  |
| 15 | 0.76 | 0 |
| 16 | 5.00 | 0 |
| 17 | 0.82 | 0 |
| 18 | 0 | 0 |
| 19 | 6.50 | 6.50 |
| 20 | 9.12 | 0 |


|  | $E$ | $B$ | $C$ |
| :--- | :---: | :---: | :---: |
| $Q 2$ | 4.70 | 5.36 | 8.00 |
| $Q 3$ | 3.57 | 5.84 | 6.48 |
| $Q 4$ | 6.50 | 5.80 | 3.60 |


|  | $S$ | $G$ | $D$ |
| :---: | :---: | :---: | :---: |
| Q1 | 0.41 | 0 | 4.70 |

01

| PIN | DV C | 600 kHz © $1,000 \mathrm{mV}$ Mod. 400 Hz e $30 \%$ |
| :---: | :---: | :---: |
| 1 | 5.36 | 1.75 |
| 2 | 2.03 |  |
| 3 | 0.55 | 0.87 |
| 4 | 0.10 | 0.30 |
| 5 | 0 |  |
| 6 | 2.03 |  |
| 7 | 8.15 |  |
| 8 | 8.17 |  |
| 9 | 0.82 |  |
| 10 | 8.17 |  |
| 11 | 0.68 |  |
| 12 | 0 |  |
| 13 | 2.30 | 3.01 |
| 14 | 8.17 |  |
| 15 | 1.25 |  |
| 16 | 0.04 | 1.47 |
| 17 | 2.27 | 2.98 |
| 18 | 5.71 |  |
| 19 | 5.71 |  |
| 20 | 3.06 |  |

05

| PIN | DC V |
| :--- | :--- |
| 1 | 3.30 |
| 2 | 3.30 |
| 3 | 3.30 |
| 4 | 0 |
| 5 | 2.3 on Sta. |
| 6 | 0 off Sta. |
| 7 | 1.5 - 6.2 |
|  | 7.3 on Sta. |
| 8 | 0 off Sta. |
| 9 | 0.0 |
| 10 | 5.0 |
| 11 | 0 |
| 12 | 8.6 |
| 13 | 4.9 |
| 14 | 2.6 |
| 15 | 2.6 |
| 16 | 2.6 |

U7

| U6 |  |
| :--- | :--- |
| PIN | DC V |
| 1 | 8.60 |
| 2 | 3.70 |
| 3 | 3.60 |
| 4 | 3.80 |
| 5 | $0 . \overrightarrow{0.30}$ |
| 6 | 3.8 |
| 7 | 0.0 .50 |
| 8 | 0 |
| 9 | 0. Mono |
|  | 5.0 Stereo |
| 10 | 3.40 |
| 11 | 3.50 |
| 12 | 2.20 |
| 13 | 2.00 |
| 14 | 2.20 |
| 15 | 2.05 |
| 16 | 3.20 |

U7

|  | AM |  |
| :---: | :---: | :---: |
| PIN | DC V | FC V |
| 1 | 6.50 | 6.50 |
| 2 | 0 | 0 |
| 3 | 0.15 | 4.66 |
| 4 | 4.91 | 0 |
| 5 | 0.26 | 4.57 |
| 6 | 10.00 | 10.00 |
| 7 |  |  |
| 8 |  |  |
| 9 | 4.61 | 0 |
| 10 | 0 | 0 |
| 11 |  | 0 |
| 12 | 0 | 0 |
| 13 |  |  |
| 14 | 0.76 | 0 |
| 15 | 5.00 | 0 |
| 16 | 0.82 | 0 |
| 17 | 0 | 0 |
| 18 | 6.50 | 6.50 |
| 19 | 9.12 | 0 |
| 20 |  |  |$\quad$|  |
| :--- |


| U2 |  |
| :---: | :---: |
| PIN | DC V |
| 1 | 7.98 |
| 2 | 2.03 |
| 3 | 0 |
| 4 | 2.03 |
| 5 | 8.15 |
| 6 | 2.23 |
| 7 | 5.71 |
| 8 | 5.71 |


| PIN | DC V |  |  |
| :--- | :--- | :--- | :--- |
| 1 | 0 |  |  |
| 3 | $0-6$ |  |  |
| 4 | 0 | on | Sta. |
|  | 0.85 | Search |  |
| 5 | 8.60 |  |  |
| 6 | 3.15 |  |  |
| 7 | 0 |  |  |
| 10 | 1.7 | -7.0 |  |
| 12 | 0 |  |  |
| 13 | 0 |  |  |
| 14 | 0 |  |  |


| PIN | DC V | 600 kHz a $1,000 \mathrm{mV}$ Mod. 400 Hz e 30\% |
| :---: | :---: | :---: |
| 1 | 8.50 | 7.56 |
| 2 | 8.54 | 7.57 |
| 3 | 3.58 |  |
| 4 | 1.66 | 2.41 |
| 5 | 1.50 | 2.22 |
| 6 | 9.14 |  |
| 7 | 0.85 | 1.19 |
| 8 | 0.78 | 1.11 |
| 9 | 0.69 |  |
| 10 | 2.67 | 9.06 |
| 11 | 2.05 |  |
| 12 | 0.57 |  |
| 13 | 0.57 |  |
| 14 | 0.59 |  |
| 15 | 4.81 |  |
| 16 | 0 |  |
| 17 | 2.92 |  |
| 18 | 8.07 |  |
| 19 | 4.82 | 4.00 |
| 20 | 8.50 | 7.24 |


|  | E | B | $C$ |
| :---: | :---: | :---: | :---: |
| $Q 2$ | 4.70 | 5.36 | 8.00 |
| $Q 3$ | 3.57 | 5.84 | 6.48 |
| $Q 4$ | 6.50 | 5.80 | 3.60 |
|  | $S$ | $G$ | $D$ |
| $Q 1$ | 0.41 | 0 | 4.70 |




FIGURE 2-9. ELECTRICAL SCHEMATIC, RF PC BOARD


FIGURE 2-10. ELECTRICAL SCHEMATIC, CONTROL PC BOARD





FIGURE 3-15. ELECTRONIC TUNED CASSETTE RADIO WITH SHINWA, BLOCK WIRING DIAGRAM


NOTES
1 REFERENCE DRAWINGS, ELECTRICAL SCHEMATICS
4393206 RF BOARD ASSY
4234494 AUDIO LOGIC BOARD ASSY
4234484 CONTROL BOARD ASSY 423450 ? SHINWA CASSETTE MECHANISM
4234510 ALPINE CASSETTE MECMANISM



FIGURE 3-16. ELECTRICAL SCHEMATIC, SHINWA CASSETTE CONTROL PC BOARD (DOLBY)


FIGURE 4-26. CASSETTE HOLDER \& BASE PLATE
g. Under cassette-in condition, insert the slider shaft $F$ into the eject arm, and mount it as illustrated by rotating it in direction shown by the arrow (see Figure 4-27).


FIGURE 4-27. EJECT ARM

## Head Base Assembly

| 524 | Head Frame <br> Head Assembly |
| :--- | :--- |
| HD1 |  |
| 472 | SCR F-LOKS |
| 514 | Head Spring |
| 421 | Tape Guide Spring <br> Tape Guide |
| 463 | Shim (option) <br> For head height adjustment |



FIGURE 4-28. HEAD BASE ASSEMBLY

## Pinch Roller Assembly

| 430 | Pinch Roller Assembly <br> Pinch Roller Assembly |
| :--- | :--- |
| 449 | E-Ring |
| 431 | Pinch Roller Spring <br> 457 <br> 422 |
| Pinch Roller Spring <br> Head Base Spring |  |



FIGURE 4-29. PINCH ROLLER ASSEMBLY

## Photo-Transistor Mounting



FIGURE 4-30. REEL PANEL ASSEMBLY (513)

## R/F Frame Mounting

| 487 | R/F Frame |
| :---: | :---: |
| 412 | Washer |
| 489 | Gear, R/F (B) |
| 491 | R/F Gear Assembly |
| 410 | Washer |
| M2 | R/F Motor Assembly |
| 473 | Screw |



FIGURE 4-31. R/F FRAME MOUNTING



FIGURE 4-33. ALPINE CASSETTE MECHANISM


CONTROL BOARD
4234484-I INFINITY \& PREMIUM 4234484-2 SPECIAL PREMIUM

FIGURE 4-34. ELECTRONIC TUNED CASSETTE RADIO, BLOCK WIRING DIAGRAM


## NOTES

I REFERENCE ORAWINGS, ELEGTRICAL SCHEMATICS
4393206 RF BOARD ASSY
4234494 AUDTO LOGIC BOARD ASSY
4234484 CONTROL BOARD ASSY
4234507 SHINWA CASSETTE MECHANISM
4234510 ALPINE CASSETTE MECHANISM



FIGURE 4-35. ELECTRICAL SCHEMATIC WITH AUDIO/CONTROL PC BOARD, ALPINE MECHANISM

