

Midland
70-066 & 70-076
Service
Manual
Low Band

Midland 70-066 & 70-076 Service Manual

Part 1

MIDLAND[®] SYN-TECH[™]

VHF (MID BAND)

SERVICE MANUAL

70-066

70-076



MIDLAND | MR

The Midland Models 70-066A, 70-066B 70-076A and 70-076B are solid state VHF High Band Land Mobile transceivers designed to operate in the 66-80 MHz (70-066A, 70-076A) and 75-88 MHz (70-066B, 70-076B) ranges. Providing up to 80 channel capability and field programmable frequencies and options, these SYNTECH models are designed to provide flexible communications for a variety of applications.

The Service Manual is laid out to facilitate maintenance and service of the units. As necessary, manual supplements will be published and distributed in the following forms:

- | | |
|-------------------------|--|
| Manual Addition (MA) | provides additional information useful in unit alignment and service or upgrade for increased capability. Printed on blue paper. |
| Change Notice (CN) | details circuitry changes made during production by model and serial number. Printed on yellow paper. |
| Manual Correction (MC) | corrects manual errors not related to production changes. Printed on green paper. |
| Technical Bulletin (TB) | provides solutions for field problems and tips for performance improvement. Printed on pink paper. |

Careful use of the manual information will insure properly aligned, installed and maintained units. Comments or suggestions concerning areas of manual improvement are welcome.

TABLE OF CONTENTS

70-066/076

INTRODUCTION	page ii
TABLE OF CONTENTS	page 1
<u>SPECIFICATIONS</u>	
General	page 2
Receiver Performance	page 3
Transmitter Performance & CTCSS	page 4
E/PROM PROGRAMMING	pages 5,6,7
THEORY OF OPERATION	pages 9,10,11,12
BLOCK DIAGRAM	page 13
<u>SUGGESTED TEST INSTRUMENTS</u>	
Test Equipment Set-Up Diagrams	page 15
<u>ALIGNMENT INSTRUCTIONS</u>	
Receiver & PA Board Alignment Diagrams	page 18
Transmitter Alignment Points Diagram	page 19
<u>PC BOARDS</u>	
E/Prom (Top & Btm), 70-066 Display (CX-03) & Control (CX-04)	page 20
70-076 Control Interface (CX-05), Display Driver (CX-06), Display (CX-07), Control Cable Interface (CX-08)	page 21
CONTROL HEAD SCHEMATIC DIAGRAM, 70-076A/B	page 22
CONTROL INTERFACE SCHEMATIC DIAGRAM, 70-076A/B	page 23
CONTROL PANEL SCHEMATIC DIAGRAM, 70-066A/B	page 24
<u>PC BOARD INTER-CONNECT DIAGRAMS</u>	
70-066A/B	page 25
70-076A/B	page 26
<u>RECEIVER PC BOARD DRAWINGS</u>	
70-066/076 (Top & Bottom Views) RX-081	page 27
<u>RECEIVER SCHEMATIC DIAGRAMS</u>	
70-066A/B	page 28
70-076A/B	page 29
<u>TRANSMITTER PC BOARD DRAWINGS</u>	
70-066/076 (Top View) TX-081	page 30
70-066/076 (Bottom View) TX-081	page 31
<u>PA PC BOARD DRAWINGS</u>	
70-066/076 (Top & Bottom Views) PA-081	page 32
TRANSMITTER SCHEMATIC DIAGRAM, 70-066/076	page 33
<u>VOLTAGE CHARTS</u>	
Transistors	page 34
Transistors, F.E.T.'s, Digital IC	page 35
Analog IC & IC901 Pin Out	page 36
<u>REPAIR INFORMATION</u>	
Chip Component Identification, Removal, Replacement	page 37
IC Removal, Replacement	page 38
PC Board Removal	page 39
<u>TROUBLESHOOTING CHARTS</u>	
General	page 40
Receiver	page 41
Transmitter, Modulator	page 42
CPU/PLL	page 43
<u>MOBILE INSTALLATION DIAGRAMS</u>	
70-066	page 44
70-076	page 45
INSTALLATION INSTRUCTIONS	pages 46,47
NOISE SUPPRESSION	pages 48,49
ACCESSORIES	page 50
UNDER DASH DC POWER/ACCESSORY PLUG INSTRUCTIONS	page 51
TRUNK MOUNT DC POWER/ACCESSORY PLUGS INSTRUCTIONS	page 52
MICROPHONE HANG-UP BOX & PARTS LIST	page 53
MICROPHONE SCHEMATIC & PARTS LIST	page 54
<u>EXPLODED MECHANICAL VIEW DRAWINGS</u>	
70-066	page 55
70-076	page 56
PARTS LIST	pages 57,58,59,60,61,62,63,64,65,66,67,68
PARTS ORDERING INFORMATION	page 69

GENERAL SPECIFICATIONS

70-066/076

Nominal operating voltage:	13.6V DC (negative ground) (12.2-16V DC range)
Temperature range:	-30 deg. C to +60 deg. C
Antenna impedance:	50 ohms, unbalanced
Microphone:	Dynamic element, with amplifier
Speaker - internal: (70-066A/066B) external:	8 ohms 3.2 ohms
Frequency control:	Frequency synthesized with EPROM programming
Frequencies of operation:	66-80 MHz (70-066A/076A) 75-88 MHz (70-066B/076B)
Receiver & transmitter performance bandwidth without adjustment:	2.0 MHz Rx/Tx (Standard) 3.0 MHz Rx/8 MHz Tx (Optional)
Frequency tolerance & stability:	+5 PPM Tx and Rx (Standard) +2.5 or 2.0 PPM Tx & Tx (Optional)
Duty cycle:	Intermittent EIA RS 152-C (1 minute Tx, 4 minutes Rx)
High humidity:	95% at 50 C per EIA RS-152-C, sec. 13
Vibration stability:	EIA RS-152-C, sec. 14
Shock stability:	EIA RS-152-C, sec. 15
Channel capability:	Up to 80 channel transmit/receive
Current drain - Standby:	0.35 A DC
Receive:	1.00 A DC
Transmit:	8.00 A DC
Dimensions (HWD):	
Main chassis: (70-066/076)	65 x 185 x 280mm (2.5" x 7.25" x 11")
Control head: (70-076)	50 x 88 x 80mm (2" x 3.5" x 3 3/16")
Speaker: (70-076)	100 x 100 x 77mm (4" x 4" x 3")
Weight:	
Main chassis: (70-066/076)	3.0 kg (6.6 lb.)
Control head: (70-076)	0.8 kg (1.8 lb.)
Speaker: (70-076)	0.71 kg (1.58lb.)

RECEIVER PERFORMANCE SPECIFICATIONS

70-066/076

Refer to EIA RS-204-D and DOC RSS-119 Issue 3 for Method of Measurement and Standard of Performance.

Sensitivity:	12dB SINAD	0.25uV @ 50 ohm
Squelch sensitivity:	Threshold	0.2uV max or 6dB SINAD
	Tight	1.0uV min, 2.0uV max
Squelch blocking:	10dB	
Receiver attack (squelch release) time:	100ms max	
Receiver squelch closing time:	200ms max	
Acceptable RF displacement:	± 3.5 KHz min at 20/25/30 KHz	± 2.25 KHz min at 12.5 KHz
Adjacent channel two signal selectivity and desensitization:	90dB @ ± 30 KHz	
Spurious response attenuation:	90dB	
Intermodulation spurious response attenuation: (measured at useable sensitivity)	80dB	
Audio power output:	1W @ 5% THD @ 8 ohms (Internal)	5W @ 5% THD @ 3.2 ohms (External)
Audio frequency response:	Per EIA and DOC Specifications	
Hum and noise:	Unsquelled 40dB	Squelled 50dB
Conducted spurious RF power:	200uV across 50 ohms (800pW) from DC to 1000MHz	
Intermediate Frequencies:	21.4MHz (1st) and 455KHz (2nd)	

SCAN SPECIFICATIONS

Scan speed:	3-20 channels/second
Channel capacity:	64 (PRI) 64 (SCAN)
Scan detection:	Carrier, tone or vacancy
Scan resume delay:	0.3, 2.5, 5 seconds or infinite

TRANSMITTER PERFORMANCE SPECIFICATIONS

70-066/076

Refer to EIA RS-152-C and DOC RSS-119 Issue 3 for Method of Measurement and Standard of Performance.

Carrier power output:	40W maximum adjustable 20 - 40W 1-10W optional
Modulation system:	PM
Audio frequency response:	Per EIA and DOC RSS-119 Specifications
Audio frequency harmonic distortion:	3% @ 1000Hz for ± 3.0 KHz deviation
System deviation:	\pm KHz, max
Modulation limiting:	Instantaneous peak clipping with low pass audio filter
Hum and noise:	50dB
Occupied bandwidth:	Less than 25uW adjacent channel power, ± 30 KHz (-60dB from carrier power)
Transmitter carrier attack time:	100ms max for 50% rated power
Conducted spurious emissions:	Less than 25uW, 1MHz to 1000MHz
Microphone input level and impedance:	-8dbm ± 3 dB/600 ohms
Output protection:	Shall withstand for 5 minutes all VSWR around Smith Chart of 20:1 without failure or damage.
Output stability:	Shall not exceed spurious emission requirements when operated into a mis-match load with 5:1 VSWR at any point on the Smith Chart.
Code Frequencies:	<u>CTCSS SPECIFICATIONS</u> (Optional, not supplied with unit) All EIA Standard from 67Hz to 241.8Hz
Modulation limits:	500 - 1000Hz
Decode sensitivity:	Less than 6dB SINAD
Receiver response time:	200ms max
Encoder response time:	50ms max
Transmitter tone distortion:	5% max
Transmitter intermodulation distortion:	10%

E/PROM MODULE LOCATION AND REMOVAL

The operating frequencies and optional functions for the Midland 70-066/076 transceivers are programmed in a semiconductor memory E/PROM module. To remove the module for programming, first remove the transceiver top cover, then locate the small printed circuit board near the front of the unit marked "Z-273". The module is mounted on two connectors and can be separated from the main printed circuit board by simply pulling straight up.

PROGRAMMING PREPARATION

NOTE: The 70-066/076 contains the HD44840A27 microcomputer (IC901). The 70-1000 programmer used to program E/PROM modules for the 70-066/076 must be upgraded to the "EO" or later configuration.

The 70-1000 E/PROM Programmer Operator's Manual contains detailed information concerning E/PROM module programming. Be careful to observe the following precautions.

DO NOT APPLY OR REMOVE PROGRAMMED AC POWER WHILE THE E/PROM MODULE IS PLUGGED INTO THE PROGRAMMER.

IT IS NOT NECESSARY OR RECOMMENDED TO PLUG THE E/PROM MODULE INTO THE PROGRAMMER EXCEPT TO PERFORM BLANK CHECK, WRITE, VERIFY OR COPY OPERATIONS.

Apply power to the 70-1000 programmer and confirm the correct display is present.

HEADING INPUT

Input the optional heading data as described in the 70-1000 manual.

BAND SELECTION

A band selection code must be entered to program the frequency range, IF and reference frequencies and local oscillator injection. The standard configuration 70-066/076 will accept only Band 80 which is entered as BAND CODE 2. Band 80 corresponds to a 66-88 MHz frequency range, 21.4 MHz RX IF, 20.48 MHz TX IF, 5 KHz reference frequency and low side local oscillator injection.

The 70-066/076 can be converted to accept bands 8A, 8B, 8C, 8D or 8E as follows:

NOTE: 8D and 8E are only available with the $\phi.\phi$ and later version software.

SCAN PROGRAMMING

Up to 64 channels can be programmed in each of 2 scan groups. Refer to the 70-1000 Operator's Manual for programming details.

FUNCTION CODE PROGRAMMING

Eight transceiver functions are programmable by function code inputs as detailed in the 70-1000 Operator's Manual.

The Busy Channel Lockout Function, if programmed, prevents inadvertent transmission on an occupied frequency and can be programmed to audibly warn the operator that transmission is not occurring. The BCLO function can be jumper selected to operate on carrier or CTCSS tone. The standard radio is configured for carrier BCLO by JP107. If Tone BCLO is desired, remove JP107 and install a jumper in the JP108 position. DO NOT operate the radio with both JP107 and JP108 installed. Time Out Timer programming is selectable from 30 to 210 seconds as detailed in the 70-1000 manual.

Note that for all radios programmed for either noise squelch scan or CTCSS scan, the automatic default condition should be used for function codes 3 and 4 (intervals A and B). These same default conditions should also be used if no scan channels are programmed.

PROGRAMMING THE E/PROM MODULE

Carefully check the programming data entered in the buffer RAM for correctness by repeatedly pressing ENTER or by printing out the buffer RAM contents on the 70-1300A printer.

Prepare the E/PROM module for programming by a thorough erasure in the 70-1100 E/PROM Eraser. Plug the E/PROM module in the programmer adapter, noting the following precaution.

MAKE SURE THE E/PROM MODULE CONNECTORS MATE PROPERLY WITH THE ADAPTER PINS AND ARE NOT OFFSET IN EITHER DIRECTION.

Remove the module at the completion of the Blank Check, Write and Verify operations. Reinstall the E/PROM module in the transceiver, again checking for proper mating of the connectors.

PROM PROGRAMMING

1. Band 8A BAND CODE 1A differs from Band 150 only in using high side receiver local oscillator injection instead of low side. High side injection may be used to reduce or eliminate interference from intermodulation products. Band 15A should be programmed only if the appropriate High Side Injection Kit 70-2171 (70-066B/076B) or 70-2172 (70-066B/076B) has been installed in the transceiver. If this kit has been installed, Band 150 cannot be used.
2. Band 8B; BAND CODE 1B, utilizes a 19.2 MHz TX IF, 12.5 KHz reference frequency and low side local oscillator injection. This band selection allows the programming of "splinter" frequencies. Only those frequencies which are evenly divisible by 12.5 KHz may be programmed in Band 15B. If full-specification receiver performance is required on adjacent 12.5 KHz spaced channels the 12.5 KHz 1st/2nd IF filter Kit 70-2135 should also be added to the transceiver.
3. Band 8C BAND CODE 1C, allows the programming of "splinter" frequencies with high side local oscillator injection instead of low side. To utilize this band, both the 70-2134 12.5 KHz Channel Spacing Kit and the appropriate 70-2173/2174 High Side Injection Kit must be installed in the transceiver. Other band selection codes may not be used after this conversion.
4. Band 8D, band code 1D, utilizes a 20.48 MHz TX IF, 2.5 KHz reference frequency and low side local oscillator injection. This band selection allows the programming of standard 15 KHz spaced channels and 12.5 KHz "splinter" frequencies. To utilize this band the 70-2138 2.5 KHz Channel Spacing Kit must be installed.
5. Band 8E, BAND CODE 1E, allows the programming of standard 15 KHz spaced channels and 12.5 KHz "splinter" frequencies with high side local oscillator injection instead of low side. High side injection may be used to reduce or eliminate interference from intermodulation products. The appropriate high side injection kit with the 70-2138 kit must be used.

CHANNEL PROGRAMMING

When the band selection has been made channel frequencies and auxiliary codes can be entered as outlined in the 70-1000 operators manual.

Note that Auxiliary Code "0" (tone disable) is automatically programmed for each transmit and receive channel if no other code is entered. Auxiliary data may be programmed in E/PROM even if the CTCSS option is not installed in the transceiver.

If the transceiver installation causes all power to be removed from the unit by the ignition switch, it should be noted that the powerup channel will always be the lowest channel number programmed. As long as power is supplied to the radio power/auxiliary connector, the channel in use at

THEORY OF OPERATION

70-066/076

PLL/Synthesizer Function

The frequency synthesizer consists of two phase-locked loops. One loop (Main PLL) is controlled directly by the microcomputer and generates the receive local oscillator frequency. This loop also generates a frequency used in the second loop (Transmit PLL) for transmitter operation.

Reference Oscillator and Main PLL

A stable frequency for the entire radio is generated by a crystal oscillator composed of X101, Q701 and related components. This oscillator operates at 5.12 MHz and stability is maintained by use of a positive crystal heater. This 5.12 MHz signal is divided by 1024 in IC 701 to give the 5KHz reference frequency for the Main PLL loop, consisting of IC 701 phase comparator and programmable divider, Q704-706 loop low pass filter, VCO D702/Q707 and pre-scaler IC 703. The VCO frequency is equal to the channel frequency +21.4 MHz in receive and channel frequency +20.48 MHz in transmit. The VCO frequency is divided by 32/33 by pre-scaler IC 703 and further divided in IC 701, this division ratio being controlled by the output of the EPROM which is latched in the 8 bit shift register IC 902 under control of the microcomputer IC901. Besides being a programmable divider, IC 701 also is a phase comparator which generates an error signal for VCO control if programmable divider output is out of phase with the 5 KHz reference frequency.

Modulator and Transmit PLL

The 5.12 MHz oscillator output is also fed to IC 702 where it is divided by 4 to give 1.28 MHz. This signal goes directly to the transmit phase shift modulator D101/102. Audio from the microphone is shaped and limited by IC 101 (instantaneous deviation control) filtered and buffered and fed to the phase shift modulator. The modulator output becomes the reference frequency for the Transmit PLL loop, consisting of IC 103 phase comparator, D104/Q108 VCO, D108 Mixer and IC 106 fixed divider. The VCO output is at the transmit channel frequency and is mixed at D108 with the ftx +20.48 MHz signal from the Main PLL loop to yield 20.48 MHz. This frequency is divided by 16 at IC 106 to give 1.28 MHz and compared with the 1.28 MHz reference signal from the modulator. Thus the VCO output is forced to track the modulated reference signal, reproducing this modulation at the transmit frequency. IC 102 detects any large difference between the two phase comparator inputs and generates an out-of-lock signal which biases Q111 on and prevents any transmitter signal from reaching the power amplifier stages. Q111 is also biased on during receive by a signal from the microcomputer IC 901.

Transmit Power Amplifier and APC (Automatic Power Controller)

The transmit PLL output is amplified by Q110 and fed to the PA section, where it is amplified to rated output. A sample of the RF output is detected by D504 and coupled to the differential amplifier Q505/Q506. The output of Q505 controls the conduction of Q504 which in turn controls the gain of the pre-driver Q501. Thus any changes in output power are automatically corrected by this control loop. Output power is set at alignment by RV502. Transmitter harmonics are eliminated by output low pass filtering composed of L516-L519 and C531-C535. The PIN diode switch D501 is biased to a low resistance state during transmit and a high impedance condition during receive.

THEORY OF OPERATION

70-066/076

Receiver RF/IF/Detector

The receiver front end consists of filtering by C201-C206 and L201-L203 and RF amplification by Q201. After further filtering the RF signal is mixed at the FET mixer Q202 with the local oscillator signal generated by the Main PLL loop to give the 21.4 MHz IF. The IF signal is filtered by the crystal filter FL 251, amplified by Q251 and fed to the internal mixer of IC 251. The 2nd local oscillator frequency of 20.945 MHz is generated by X251 and the IC251 internal oscillator and injected into the internal mixer, producing the 2nd IF of 455 KHz. The 2nd IF signal is filtered by FL252 and FL253, amplified and limited by the amplifier-limiter stage of IC251, and injected into the quadrature detector circuit consisting of L252 and the internal balanced mixer of IC 251. The output of the balanced mixer is the detected audio signal.

Squelch and Audio Amplifier

The noise signal from the detector is amplified by Q252, detected by D253 and controlled in level by the squelch control RV301. This detected noise signal is coupled to the DC switching amplifier of IC 251. Under conditions of no RF signal, the detected noise signal increases and turns on the DC switching amplifier, which in turn biases off the transceiver audio squelch gate (Q259). The detected audio signal is buffered by Q250 and passed through the squelch gate and volume control RV302 to the audio power amplifier IC252 and then to the speaker.

Microcomputer Channel Data Transfer

At unit power up a pulse is generated by Q405, resetting the microcomputer to an autotest mode. A check is made to insure the EPROM module is installed. If valid data is present at the EPROM, 3 bits of address data corresponding to the selected receive channel frequency are strobed from the microcomputer IC 901 to the latch IC 952. The remaining three address bits are then strobed and latched in IC 952. The EPROM data corresponding to the selected receive channel frequency is then strobed to the 8 bit shift register IC 902 which transfers this data to the programmable divider IC 701 under microcomputer control. IC 701 divides its input signal by the correct ratio to yield the desired local oscillator frequency. IC 701 outputs an out-of-lock signal which mutes the receiver until phase lock is achieved. The microcomputer strobes data corresponding to the selected channel to the latched LED display drivers IC 301 and IC 302 which in turn drive the channel LEDs. Brightness of the LED display is automatically adjusted to ambient light conditions by photosensor CDS 301 and transistors Q301 and Q302.

Manual Channel Selection

Activation of the Up-Down channel selector switch is sensed by the microcomputer, the receive audio is muted and incrementing or decrementing of the channel display is begun. Upon release of the channel selector switch, PROM data corresponding to the new channel is strobed to the programmable divider. If the synthesizer lock signal is not detected after a channel change, receiver and transmitter are inhibited and the channel indicator displays the error code 95. When the PTT is depressed, the microcomputer switches the voltage regulator IC 401 to the transmit condition, outputting 8VDC to the transmitter and disabling the receive 8VDC output. The microcomputer then outputs EPROM address data.

70-2135 12.5 KHz 1st/2nd IF Filter Kit Installation Instructions

70-340/440/066/076

NOTE: The 70-2134 12.5 KHz Channel Spacing Kit must be installed in the transceiver if programming for 12.5KHz channel spacing operation is desired. Refer to the transceiver Service Manual for 70-2134 installation and programming instructions.

1. Remove the 2 screws securing the radio bottom cover and remove the cover.
2. Disconnect J352, J353 and J354. Remove the 5 screws securing the receiver board, slide the board slightly to the rear, then lift up to allow access to the bottom side of the PCB.
3. With a solder removal tool clear the mounting leads of FL252 and FL253. Remove the two filters and install the units provided with the kit.
4. Remove the solder securing the shield located beneath FL251 and remove the shield, noting its orientation. Remove the solder from the two mounting tabs and 4 leads of FL251. Remove FL251 and install the Kit-provided replacement, orienting it so that the lettering faces the front of the radio. Replace the shield in the correct orientation.
5. Re-install the receiver board in the radio, reconnect J352, J353 and J354 and install the unit bottom cover. It is recommended that a label be attached inside the unit cover to indicate kits installed.
6. Coils L208 and L251 should be re-aligned for maximum sensitivity. Refer to the applicable service manual receiver alignment procedure.

70-2135 KIT COMPONENTS

<u>DESCRIPTION</u>	<u>QUANTITY</u>	<u>PART NUMBER</u>
21.4MHz Crystal Filter	1	70-179026
455KHz Ceramic Filter	2	70-179025

THEORY OF OPERATION

70-066/076

to selected transmit channel, which results in the programmable divider IC 701 being reprogrammed for the correct transmit frequency.

Scan Operation

When Scan Operation is activated by selection of either of the front panel pushbuttons, the transmit and receive addresses of the displayed channel are stored in microcomputer memory as the priority channel. The address data corresponding to the first scan channel is then strobed to the latch IC 952, resulting in the generation of the correct local oscillator frequency as described above. The microcomputer then checks for the presence of a high signal level on its Pin 4 input indicating the squelch gate is open (active channel). If this signal is present, scanning stops until the squelch gate stays closed for 5 seconds, at which time address data for the next scan channel is sent to IC 952. If the active channel address is identical to the priority channel address stored in memory, a two-beep signal is generated to alert the operator of the priority channel signal. When a PTT switch closure is sensed by the microcomputer Pin 30, the priority channel transmit address is immediately latched in IC 952 and an audio beep signal is generated. When a second PTT switch closure is sensed by the microcomputer the transmitter is activated.

Busy Channel Lockout and Time Out Timer

The Busy Channel Lockout function can be jumper selected by JP107 to provide lockout on either carrier or CTCSS tone. The busy channel signal, tone or carrier, is input to the microcomputer pin 28 (transmit inhibit). If the Busy Channel Lockout function is programmed in E/PROM transmit is inhibited while the busy channel signal is present. An audio alert signal (if programmed) is generated when the transmitter is keyed to indicate the channel busy condition. The time out timer function is completely internal to the microcomputer. If the continuous transmit time exceeds the time limit programmed in E/PROM, the transmitter is disabled and an audio beep signal is sounded to alert the operator.

Power Supply

The 13.6 VDC input is filtered by L256 and related components and switched by K201 (70-076) or the unit on-off switch (70-066). This filtered 13.6 VDC is supplied directly to the transmit PA driver and final stage and also to pin 2 of IC401, the main voltage regulator. IC401 outputs a constant 8VDC from Pin 1 as well as 8VDC during receive from pin 8 and 8VDC during transmit from pin 6. The receive/transmit switching signal is output from IC901 pin 13 through Q402 and Q403 to IC401 Pin 5. Regulator IC402 (TX board) provides +5VDC for the reference oscillator, synthesizer integrated circuits and the E/PROM module. Regulator IC303 (70-066 control panel and 70-076 control head) supplies +8VDC for microphone bias and LED displays. The microcomputer IC901 is supplied +5VDC from zener diode D402, which is powered by an unswitched 13.6 VDC source. This allows the microcomputer to retain memory of the last selected channel as long as power is connected to the radio. Other microcomputer functions are disabled at unit turn off, since power is removed from pin 19, the standby control pin.

THEORY OF OPERATION

70-066/076

CTCSS Operation

(Optional Accessory)

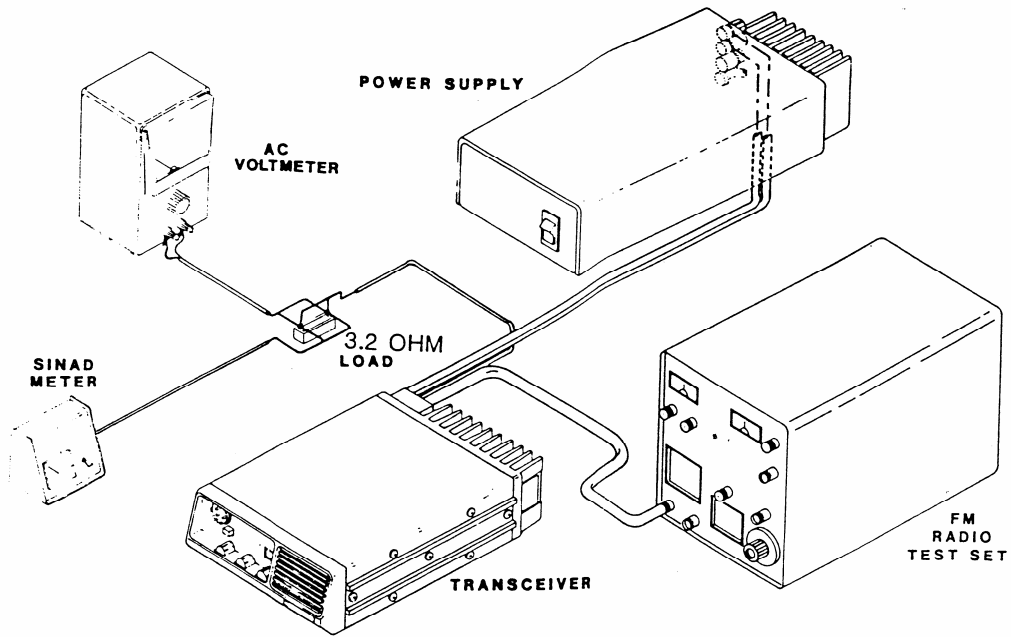
The CTCSS option provides, under microcomputer control, encode and decode of 35 standard EIA CTCSS tones. At each channel change and transmit/receive transition, data corresponding to the selected channel and mode is strobed on lines D0 - D4 and latched in IC1. IC1 outputs this data to IC3 for generation or detection of the correct CTCSS tone. This data is also input to IC2, which outputs a high logic level for encode/decode inhibit if all data lines are low (Aux Code "0"). Encode inhibit is accomplished by holding IC3 pin 17 at a high level through D2. Decode is inhibited by biasing Q1 on through D4. As long as the collector of Q1 is low, the base of Q261 (Receiver board) is also held low. The collector of Q261, which is also connected to the gate of the squelch FET, is then under control of the noise squelch signal from IC251 pin 13. If decode is not inhibited by Code "0" programming, control of the squelch FET is by IC251 pin 13 and Q261. Q261 is controlled by Q260, which is in turn switched by Q2 (CTCSS board). Q2 is normally biased on by IC1 pin 12 but is switched off when the correct tone is detected. The Monitor switch and microphone hangup box both control the status of Q1 and thus allow or inhibit squelch gate control by the CTCSS board in the same manner as Code "0" tone disable programming.

Crystal X1 generates a stable reference frequency for IC 3 tone generation and detection. IC 4 functions as an audio highpass filter to remove CTCSS tones from the speaker audio. Encode tone output is from IC3 pin 16 with tone modulation level adjustable by RV1.

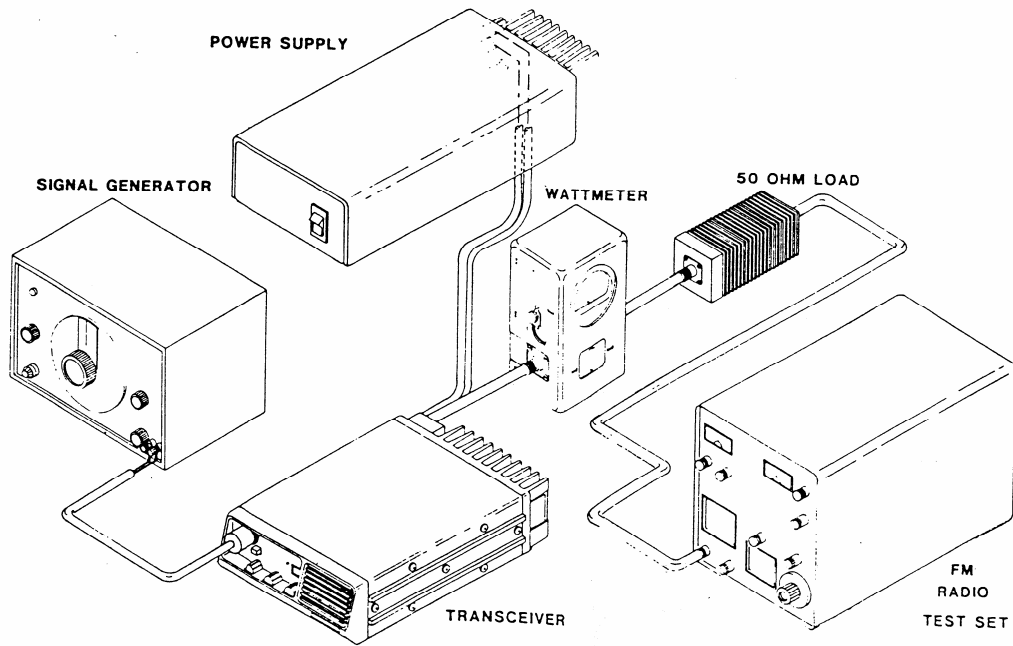
<u>TEST INSTRUMENT</u>	<u>REQUIRED SPECIFICATIONS</u>	<u>INSTRUMENT TYPE</u>
DC Power Supply	13.8 VDC 10 amps	Power/Mate BPA-20F
Att Meter	66-88 MHz	Bird Model 43 with 50B element and 50 watt, 50 ohm load
Digital Multimeter	AC 100 mv - 10v DC 100 mv - 100v	B-K 2810
Voltmeter	10mv - 10v	Heath SM-5238
Speaker Load	3.2 ohm speaker and resistive load (switchable)	Shop Fabricated
RF Signal Generator	66-88 MHz Range. Calibrated output 0.1 to 100 uV. Internal and external modulation capability with internal frequency of 1 KHz at 5 KHz deviation.	Cushman CE-31A
Deviation Meter	0 - 5 KHz Deviation Range ± Deviation Capability	Cushman CE-31A
Frequency Meter	Frequency Range 66-88 MHz Frequency tolerance of ± .00002%	Cushman CE-31A or Heath SM-4120
Signal Generator	0-10 KHz Sine Wave 0-5V	Heath SG-5218
R Test Set	- - - - -	Midland 70-E10
Sinad Meter	- - - - -	Helper Instruments Sinadder

Fold Out →

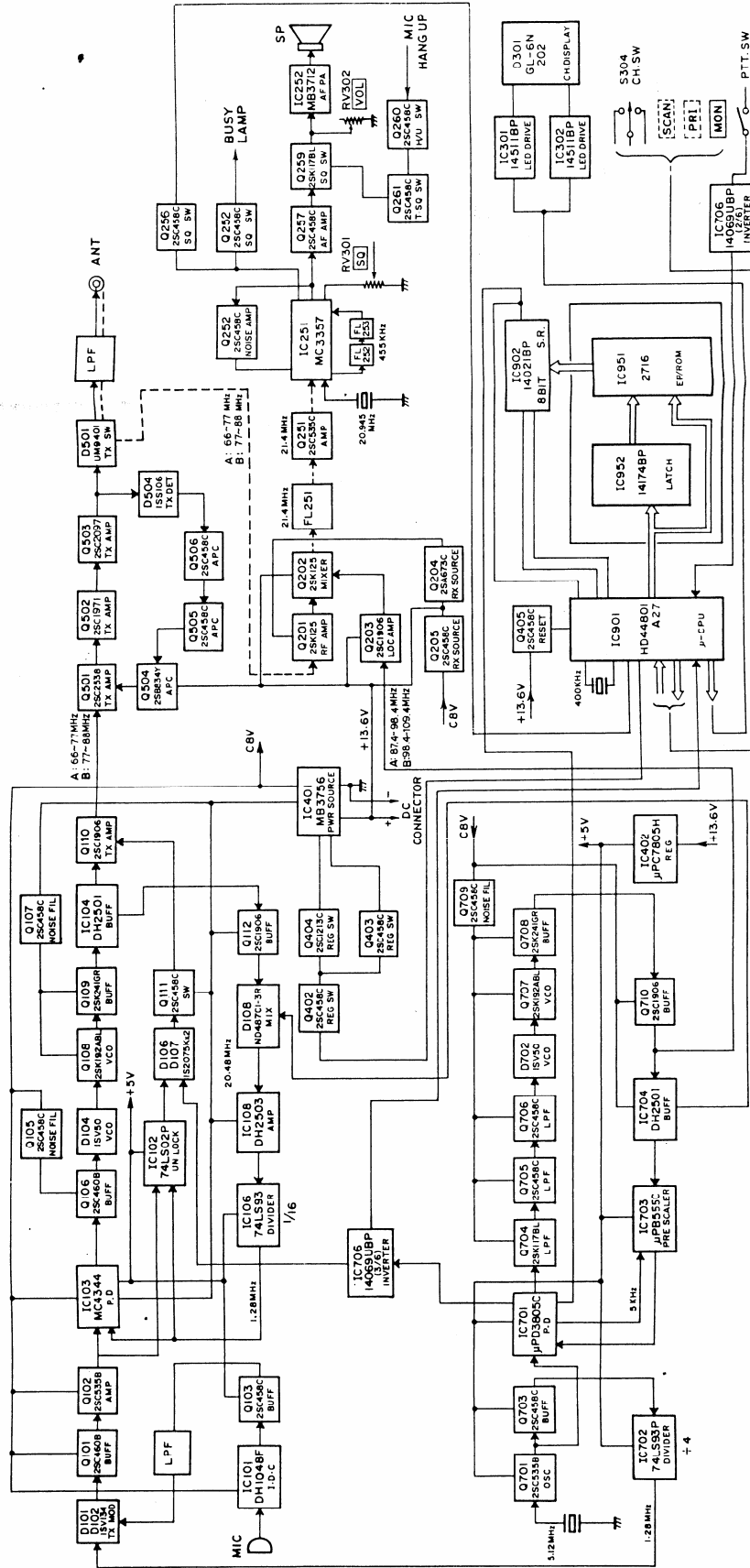
RECEIVER TEST SET-UP



TRANSMITTER TEST SET-UP



BLOCK DIAGRAM



ALIGNMENT INSTRUCTIONS

70-066/076

Remove the 8 screws securing the top and bottom covers. Loosen the 4 screws securing the PA assembly and pivot the top of the PA assembly to the rear. Turn the volume control to a mid position and the squelch control fully counter clockwise. If the 70-E10 test set is used, the red 5 pin test socket should be connected to CM101 for transmitter alignment and the white 5 pin test socket to CM201 for receiver alignment. Both test sockets should be connected with the unused socket position toward the rear of the radio. Refer to the test pins switch position underlined in the steps below. Supply power to the radio and connect a wattmeter and dummy load with a reduced power output for a frequency counter and modulation meter.

IMPORTANT NOTE

A "95" error code display and triple beep can be expected at unit turn on if the channel frequencies programmed in the E/PROM are outside the 2.0 MHz band for which the Main VCO is currently aligned. To eliminate this error indication, adjust L702 (TX board) for approximately 4 volts at TP701. Cycle the unit power off and on. The normal alignment procedures can then be performed.

Error codes "90" and "94" indicate the E/PROM module to be missing, improperly inserted, or incorrectly programmed. Refer to the general troubleshooting chart if these error conditions occur.

VCO AND TRANSMITTER ALIGNMENT

1. Turn RV502 (PA) maximum counter clockwise.

Main VCO Alignment

2. The Main VCO should be adjusted with the radio operating on the channel and in the condition (transmit or receive) corresponding to the highest programmed frequency. If the highest frequency is a transmit frequency, select this channel, key the transmitter and adjust L702 to give 4.0 VDC at TP701. If the highest programmed frequency is a receive frequency, adjust L702 for 4.5 VDC at TP701 while in the receive mode.

Transmit VCO Alignment

3. Monitor TP101 (TX) with a DC voltmeter. Key the transmitter and adjust L107 for 4.5 VDC.

Transmit Driver Alignment

4. Monitor CM 101 pin 2 (position 9) with a selected channel frequency near the center of the programmed frequencies. Adjust CV102 for a dip between two peaks.

ALIGNMENT INSTRUCTIONS

70-066/076

Power Amplifier Alignment

5. Adjust RV502 (PA) maximum clockwise and adjust CV501, CV502 & CV503 for maximum RF output power. Readjust RV502 for 40 watts RF output.

Modulation Adjustment

6. If the CTCSS option is installed, select any channel programmed for CTCSS encode. Key the transmitter and adjust RV1 (marked "MOD" on the CTCSS board) for the desired CTCSS modulation.
7. Input audio modulation of 2500 Hz and adjust RV101 (TX) for 5 KHz deviation. Adjust L101 and L102 for maximum deviation and balance. Vary the modulating signal level to insure deviation does not exceed ± 5 KHz.

Oscillator Frequency Adjustment

8. Monitor the frequency of the transmitted signal and adjust CV701 for the correct frequency.

Note: RV102, L110-L112 and L707-L709 are factory set and should not require field adjustment.

9. Pivot the PA assembly to its original position and tighten the 4 retaining screws.

RECEIVER ALIGNMENT

L. O. Amplifier Alignment

1. Select a channel with a receive frequency near the center of the programmed frequencies. Monitor CM 202 Pin 1 (position 2) and adjust L209 and L210 for a maximum indication.

RF-IF Alignment

2. Connect an on-channel signal generator to the antenna connector. Adjust L201, L202, L204 and L205 for a maximum indication at CM202 Pin 2 (position 3).
3. Adjust L208 and L251 for minimum audio distortion.

Quadrature Coil Alignment

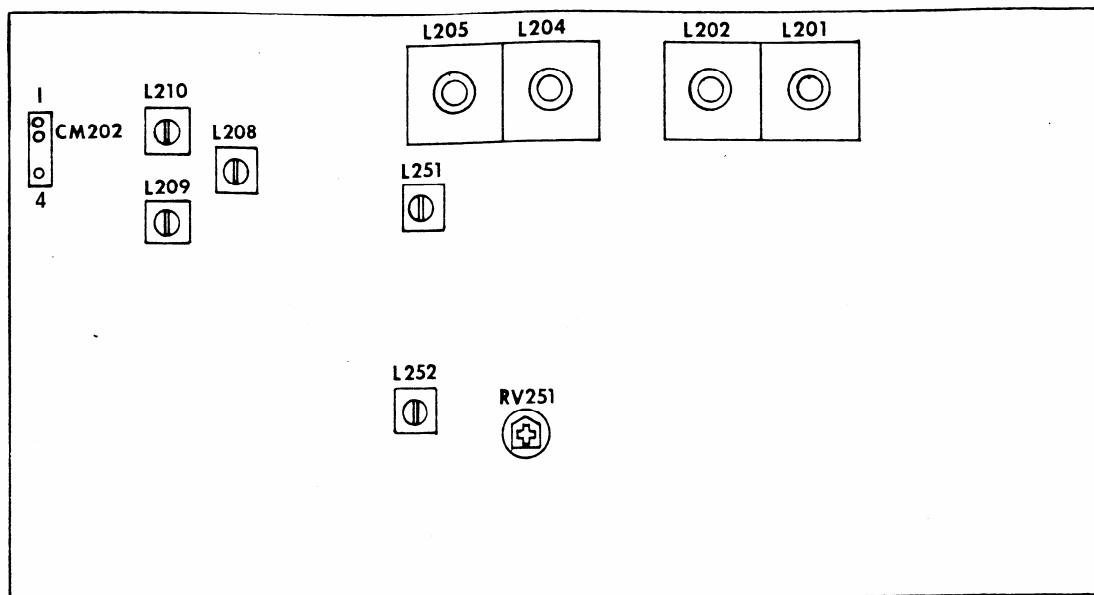
4. Adjust L252 for maximum audio output.

Tight Squelch Adjustment

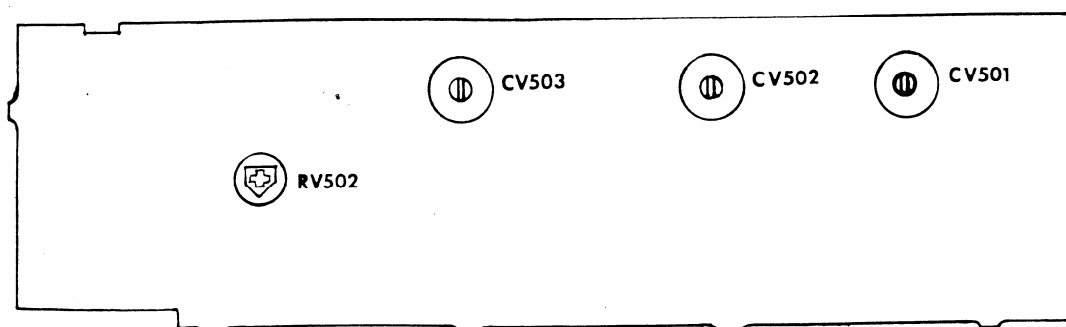
5. Adjust RV251 for the desired tight squelch sensitivity.

RECEIVER ALIGNMENT POINTS

70-066/076

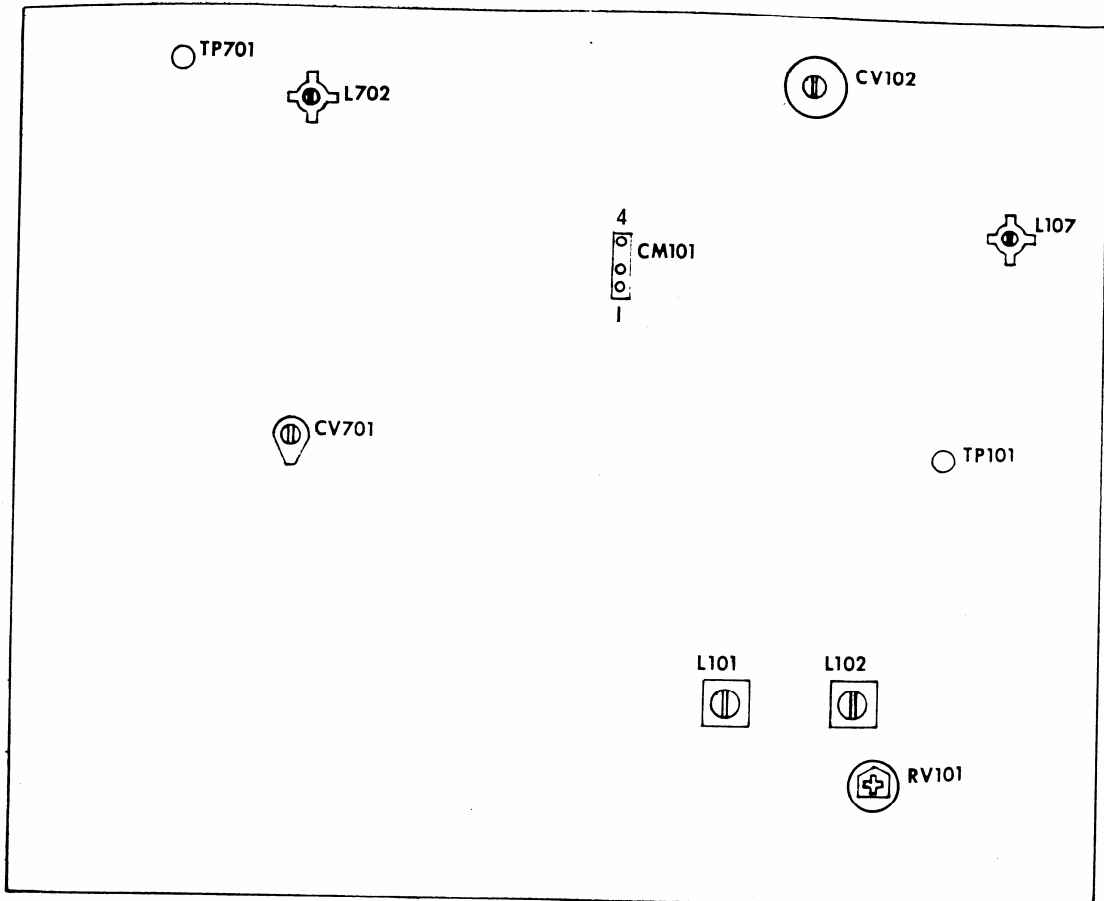


PA BOARD ALIGNMENT POINTS

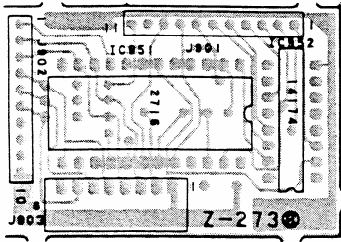


TRANSMITTER ALIGNMENT POINTS

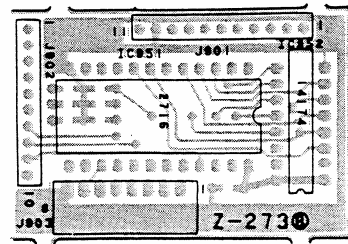
70-066/076



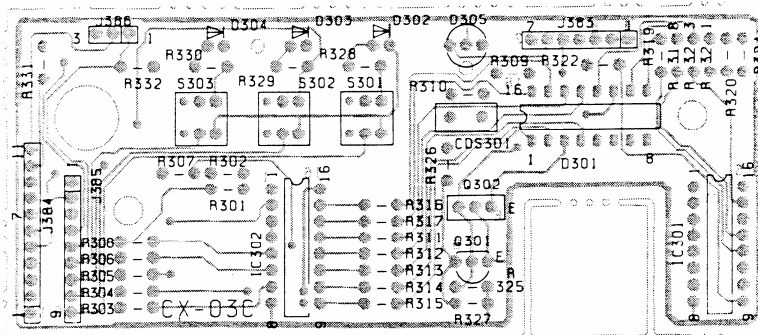
70-066/076
E/PROM MODULE PCB (TOP VIEW) (Z-273)



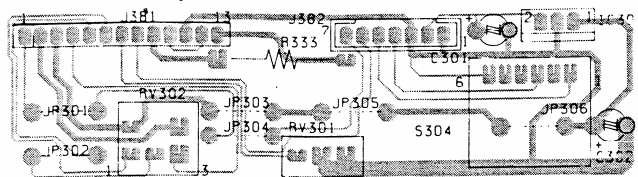
70-066/076
E/PROM MODULE PCB (BOTTOM VIEW) (Z-273)



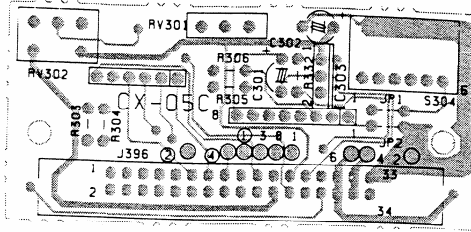
70-066 DISPLAY PCB (CX-03)



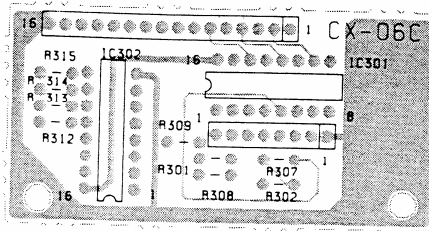
70-066 CONTROL PCB (CX-04)



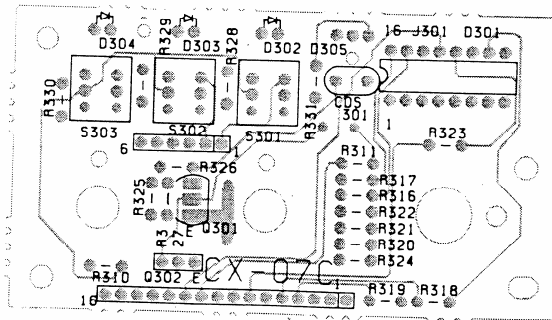
70-076 CONTROL INTERFACE PCB (CX-05)



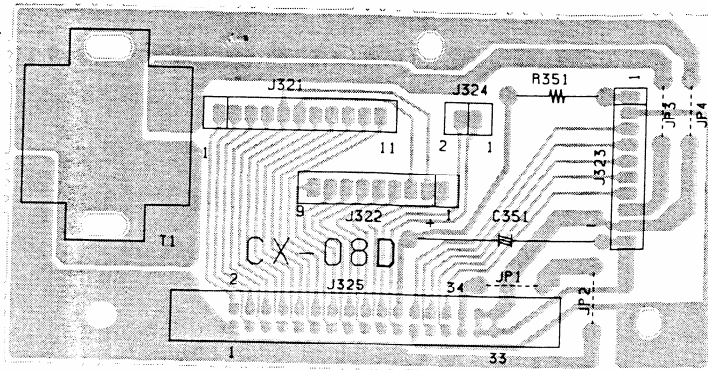
70-076 DISPLAY DRIVER PCB (CX-06)



70-076 DISPLAY PCB (CX-07)



70-076 CONTROL CABLE INTERFACE PCB (CX-08)



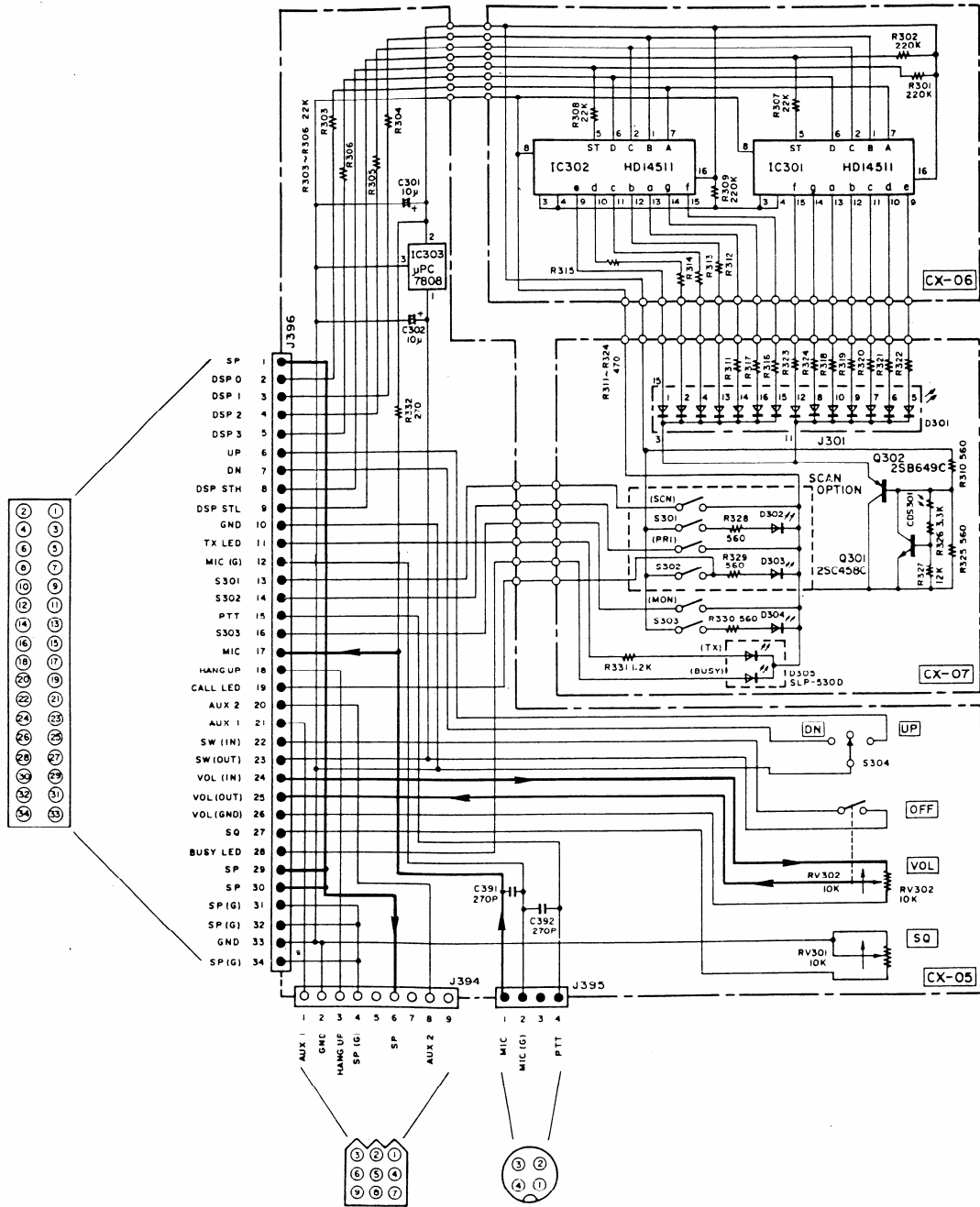
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Part 2

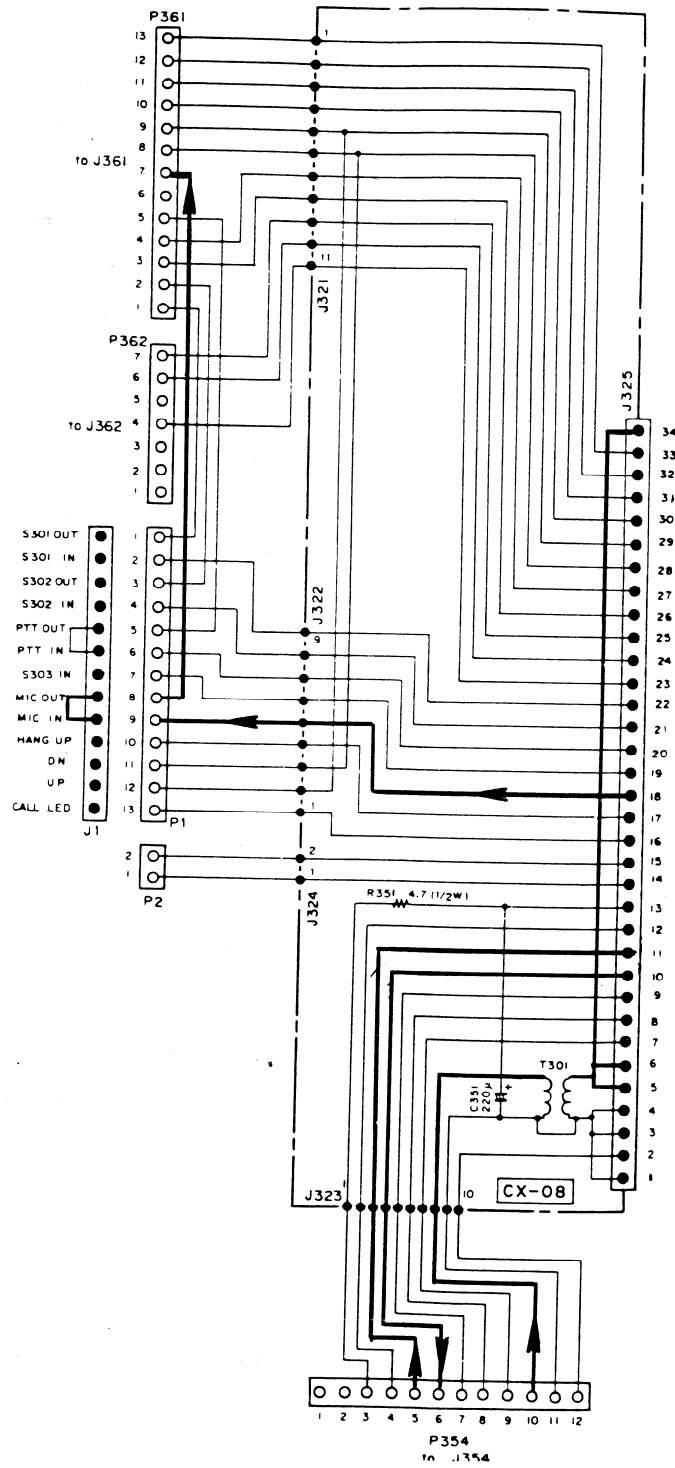
CONTROL HEAD SCHEMATIC DIAGRAM

70-076A/3

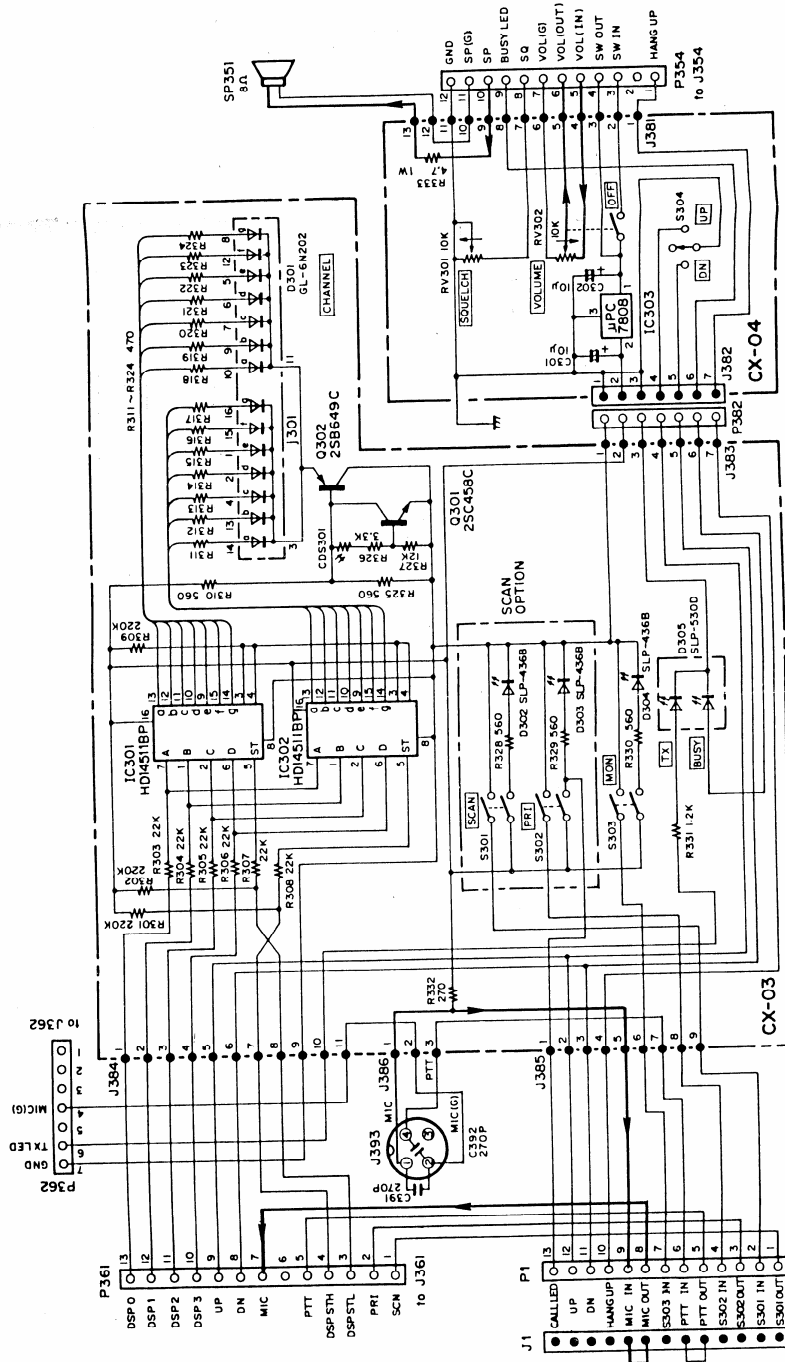


CONTROL INTERFACE SCHEMATIC DIAGRAM

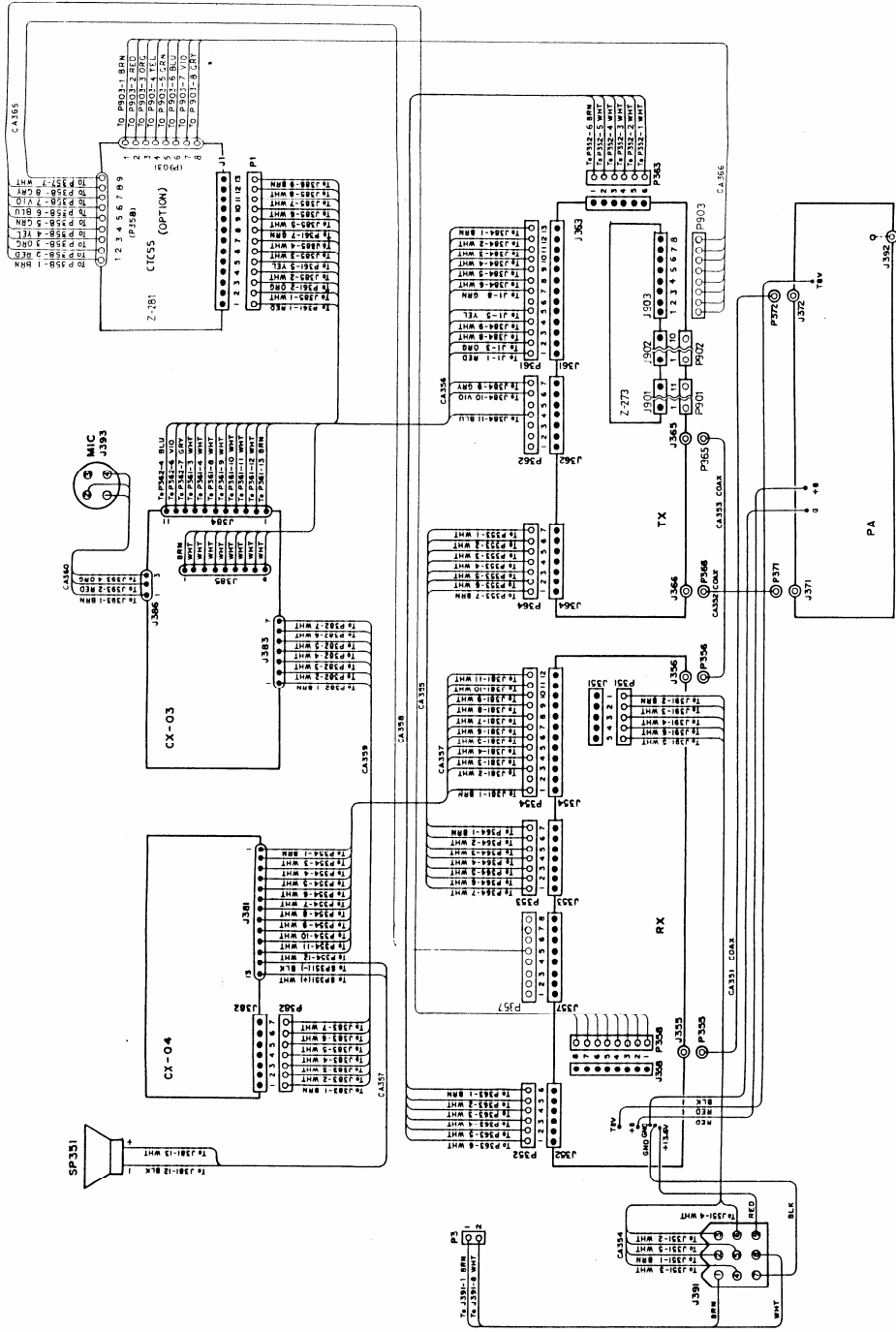
70-076



CONTROL PANEL SCHEMATIC DIAGRAM

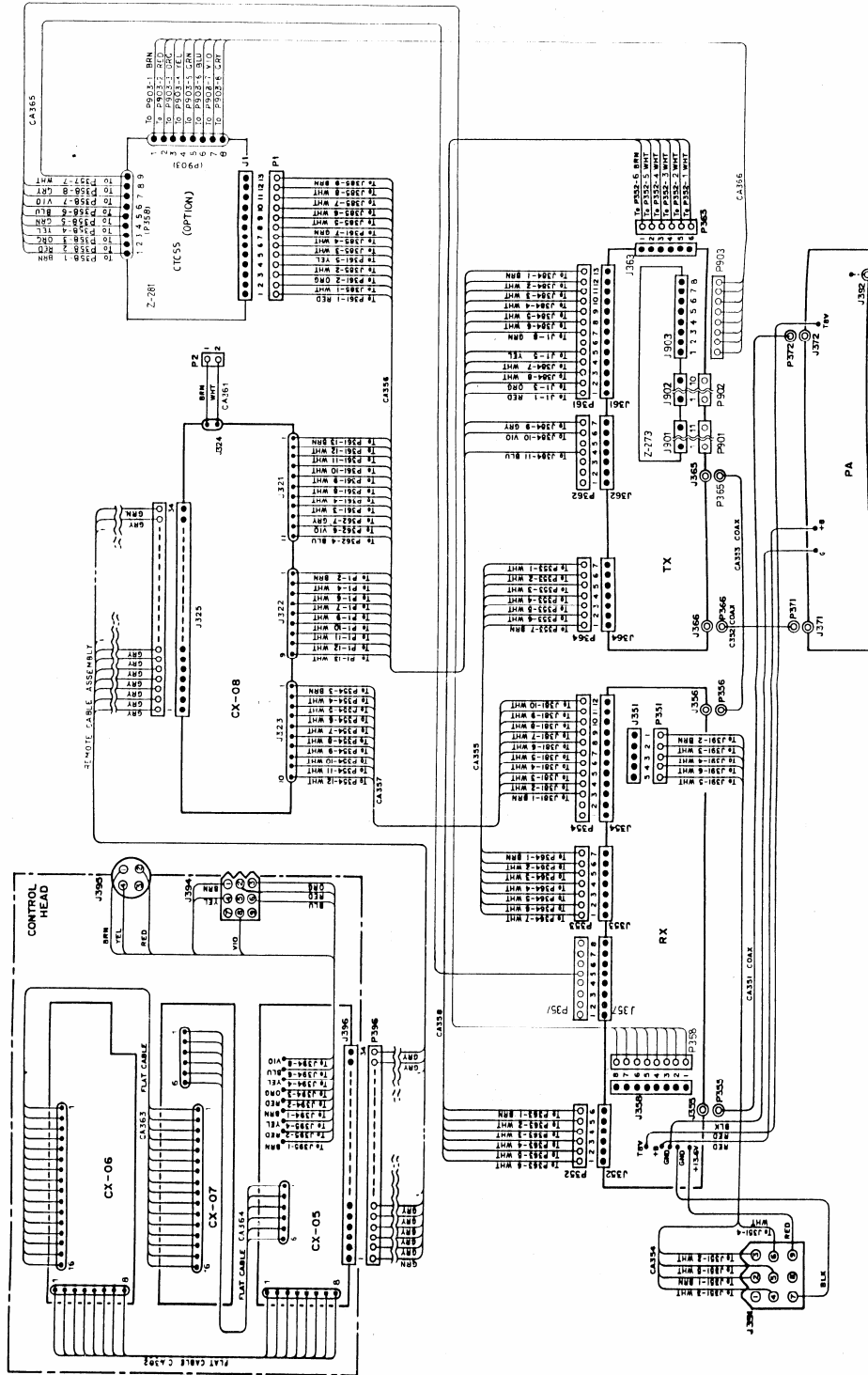


PC BOARD INTER-CONNECT DIAGRAM



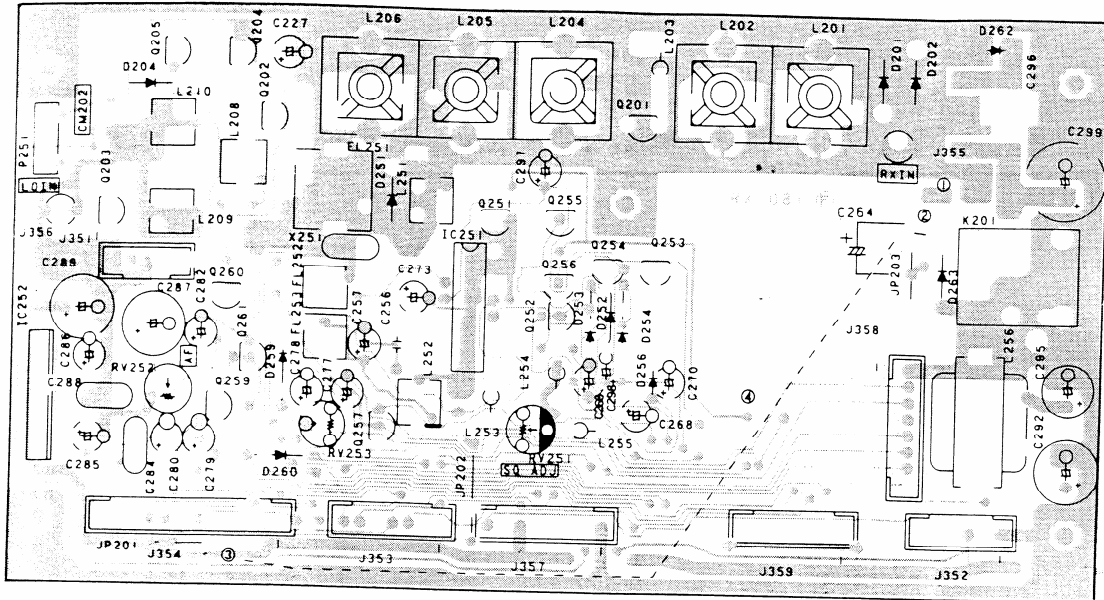
Fold Out

PC BOARD INTER-CONNECT DIAGRAM



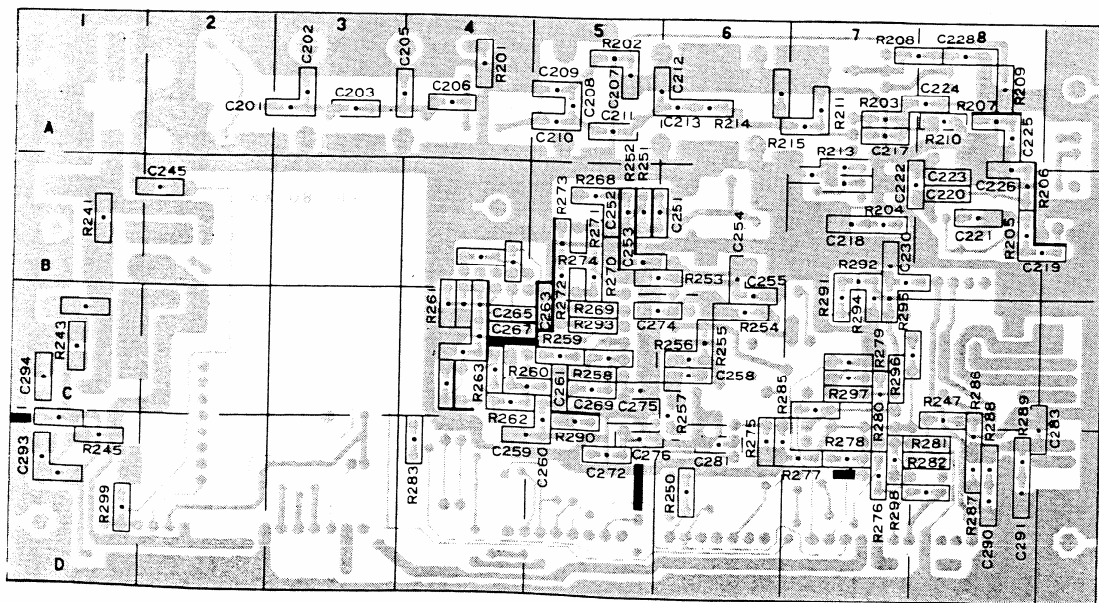
RECEIVER PC BOARD (TOP VIEW)

70-066/076



RECEIVER PC BOARD (BOTTOM VIEW)

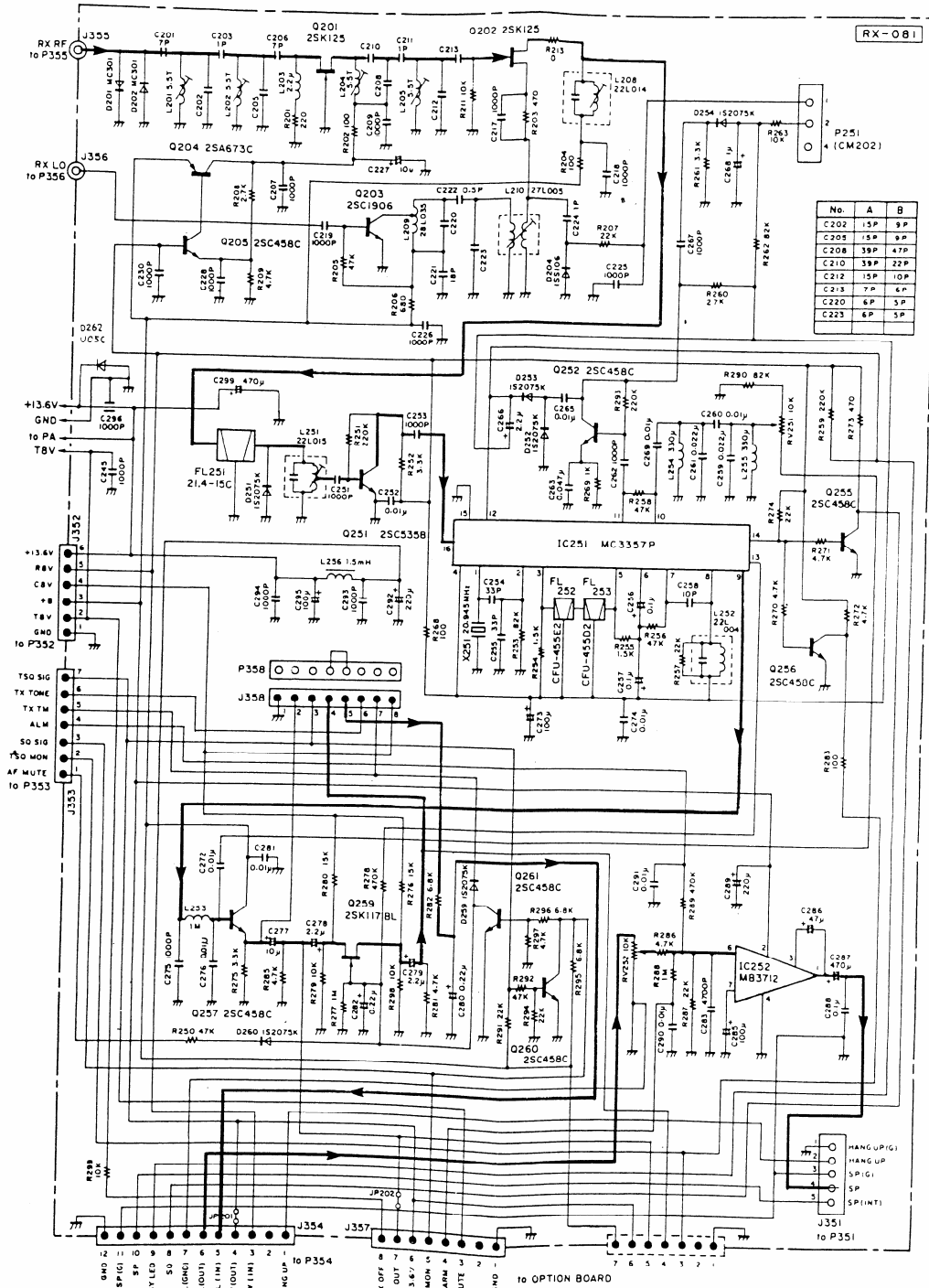
70-066/076



Fold Out →

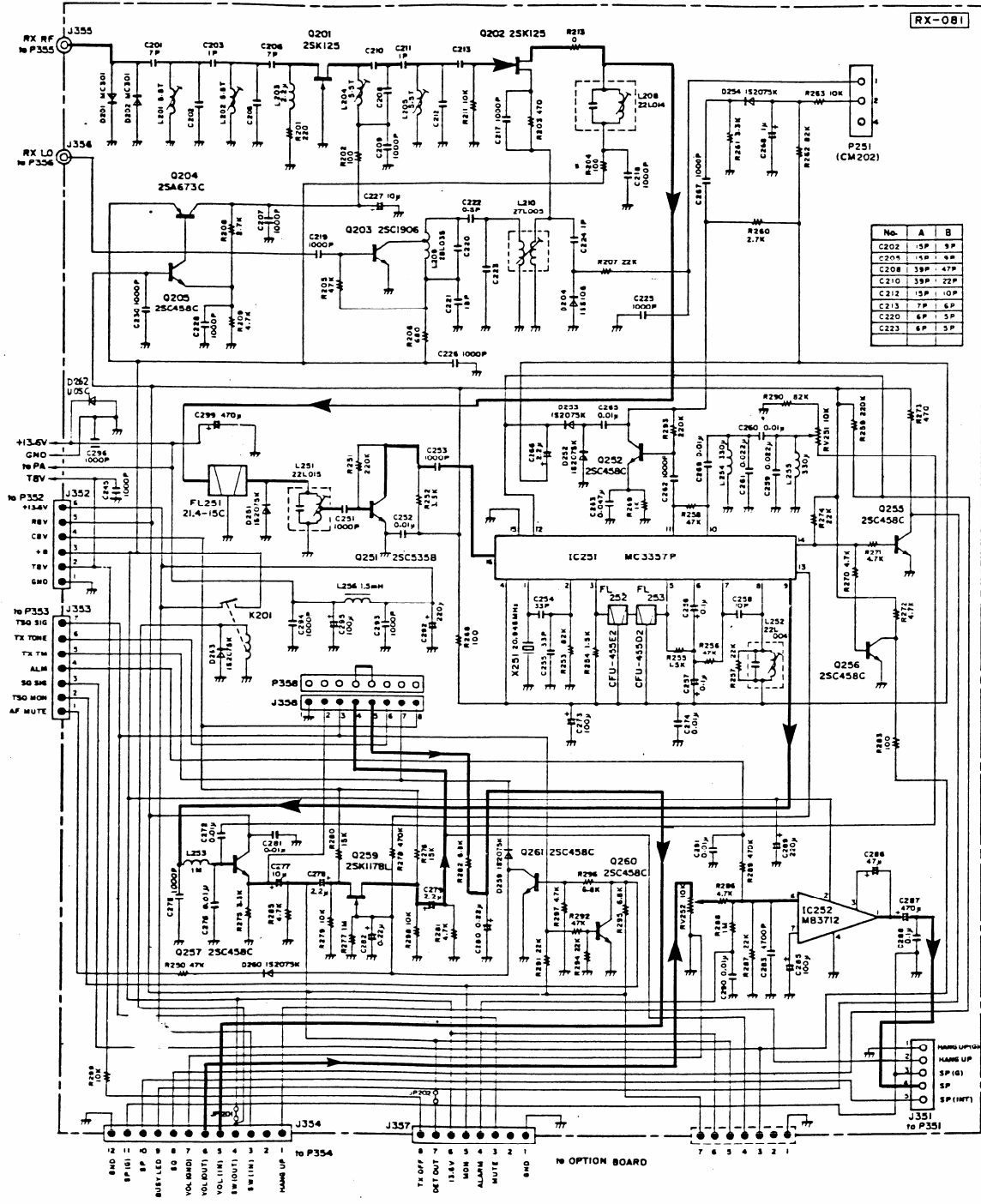
RECEIVER BOARD SCHEMATIC DIAGRAM

70-066A/B



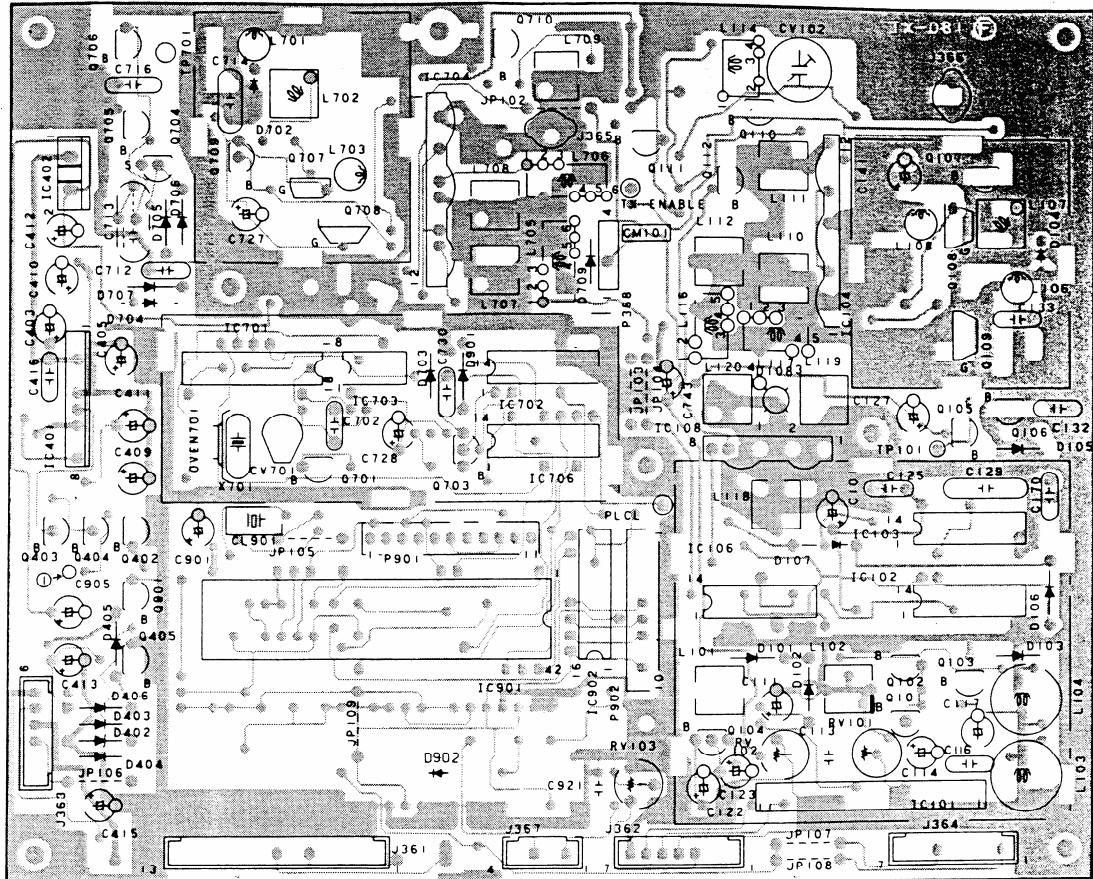
RECEIVER BOARD SCHEMATIC DIAGRAM

70-076A/B



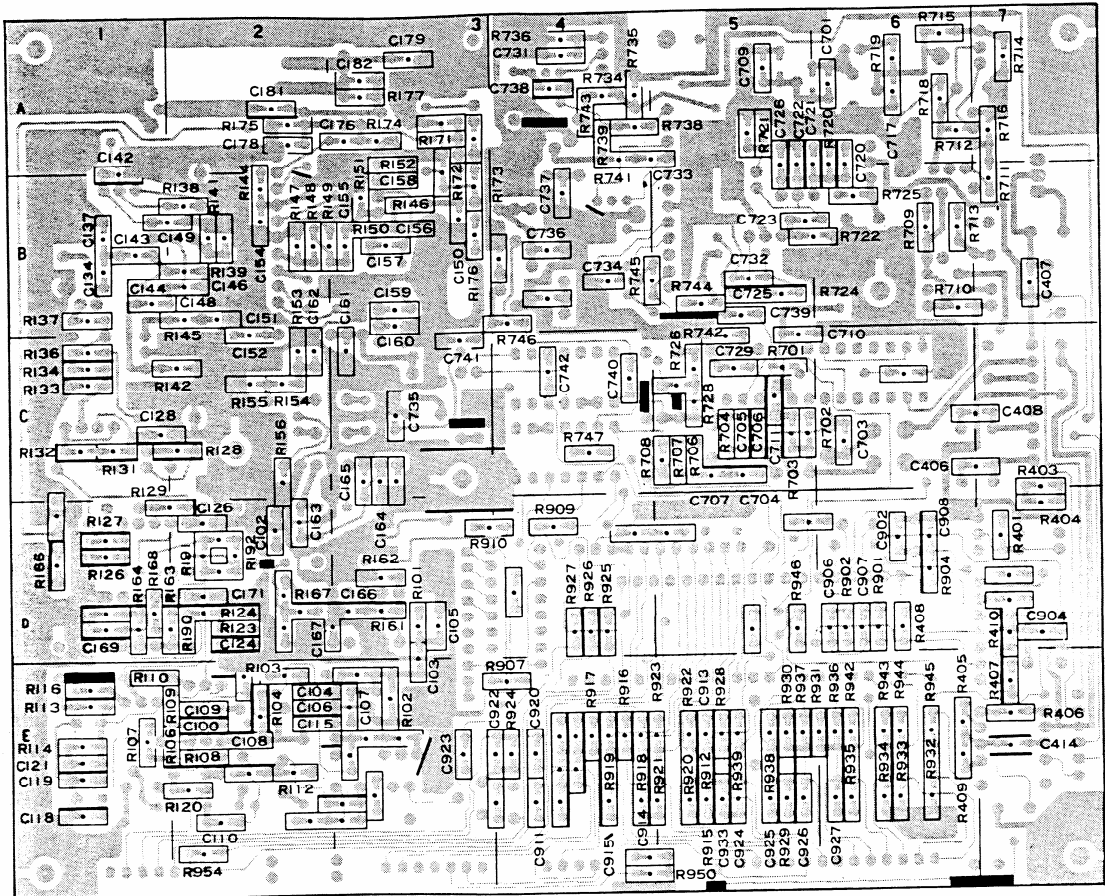
TRANSMITTER PC BOARD (TOP VIEW)

70-066/076



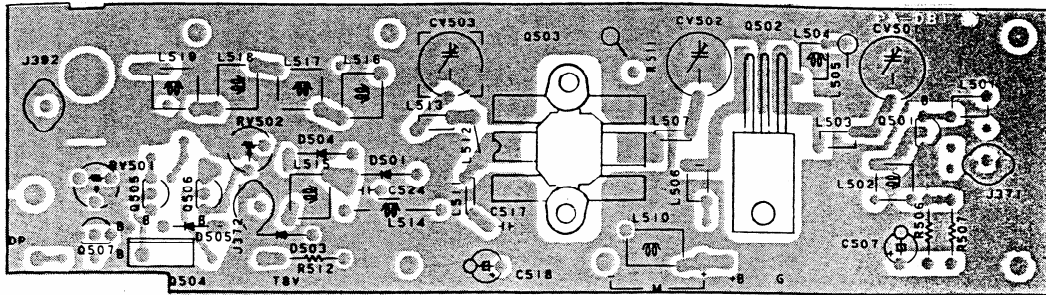
TRANSMITTER PC BOARD (BOTTOM VIEW)

70-066/076



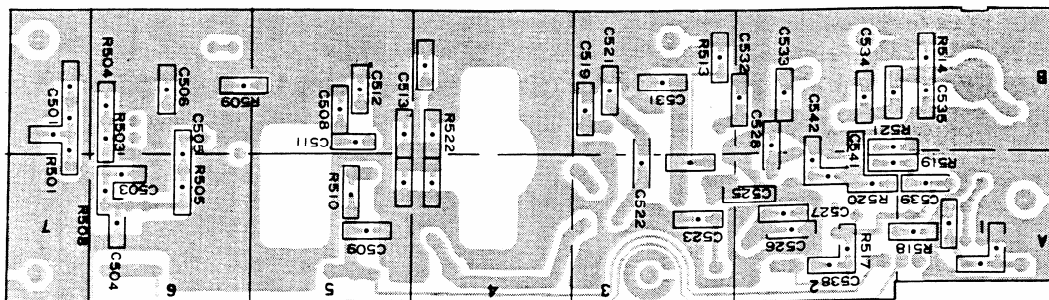
PA PC BOARD (TOP VIEW)

70-066/076



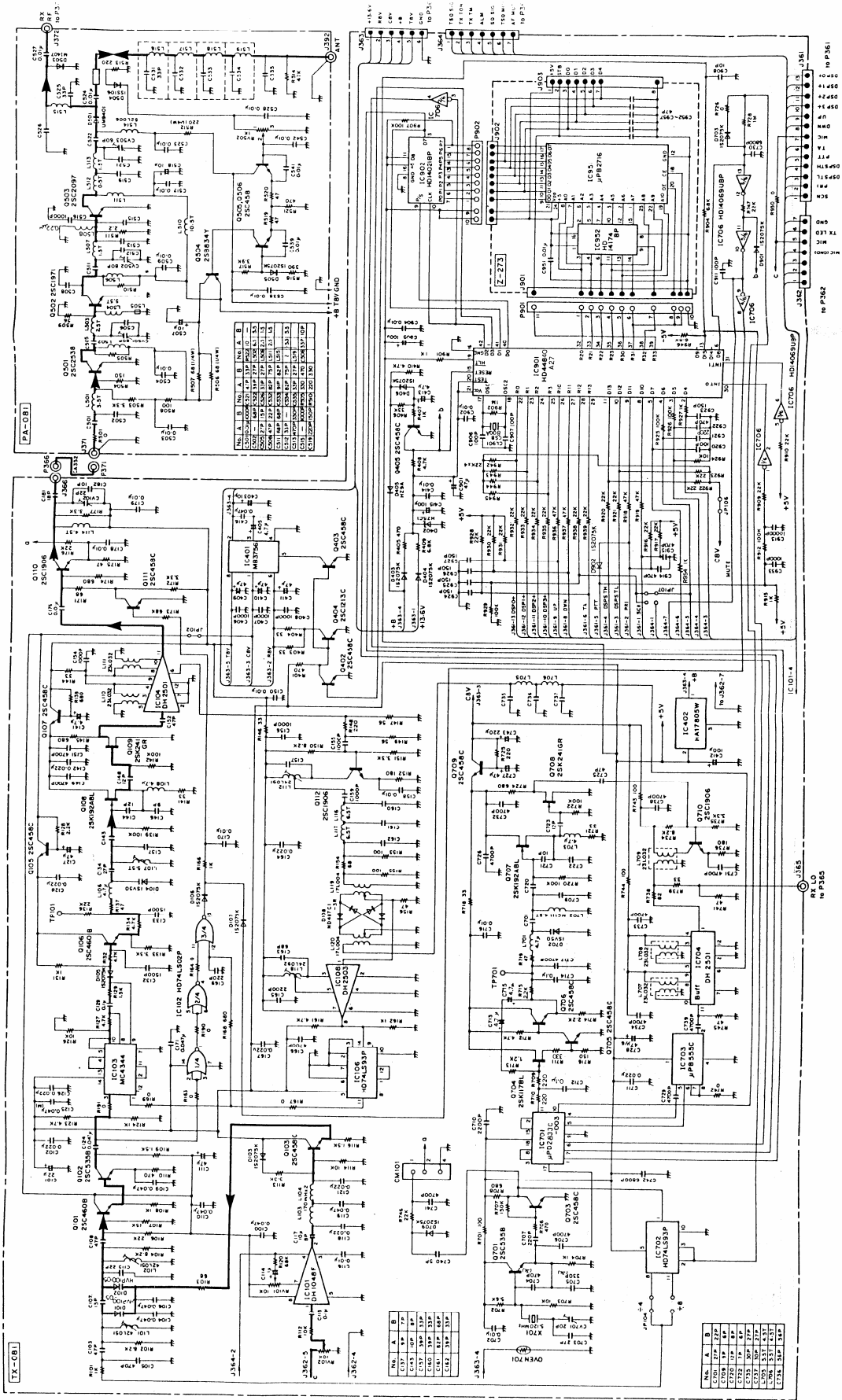
PA PC BOARD (BOTTOM VIEW)

70-066/076



TRANSMITTER SCHEMATIC DIAGRAM

70-066/076



VOLTAGE CHARTS

70-066/076

TRANSISTORS

REF. NO.	DESCRIPTION	MODE	BASE	COLLECTOR	EMITTER	FUNCTION
Q101	2SC460B	TX	3.2	8.0	2.5	Buffer
Q102	2SC535B	TX	2.5	2.97	1.8	Buffer
Q103	2SC458C	TX	3.2	5.0	2.5	AF Buffer
Q105	2SC458C	TX	7.9	8.0	7.3	Power Line Filter
Q106	2SC460B	TX	2.3--7.0	7.3	1.6--0.3	Buffer
Q107	2SC458C	TX	7.9	8.0	7.3	Power Line Filter
Q110	2SC1906	TX	1.2	8.0	0.5	Pre Driver
Q111	2SC458C	TX	.143	1.35	0	Pre Driver Control
Q112	2SC1906	TX	1.9	7.6	1.2	Buffer

Q203	2SC1906	RX	0.6	6.0	0	1st Local Amplifier
Q204	2SA673C	RX	13.0	11.5	13.0	Power Regulator
Q205	2SC458C	RX	8.0	13.0	7.4	Power Control
Q251	2SC535B	RX	0.7	3.8	0	1st IF Amplifier
Q252	2SC458C SQ ON 2SC458C SQ OFF	RX	.9	4.6	1.1	Noise Amplifier
		RX	.9	4.2	1.2	
Q255	2SC458C	RX	0	2.0	0	Sq. Switch
Q256	2SC458C	RX	0	7.4	0	Sq. Switch
Q257	2SC458C	RX	3.9	8.0	3.2	AF Pre Amplifier
Q260	2SC458C	RX	0.6	0.06	0	Sq. Switch
Q261	2SC458C SQ ON 2SC458C SQ OFF	RX	0.02	0	0	Sq. Switch
		RX	0	3.9	0	

Q301	2SC458C 2SC458C	TX	.1	4.0	0	Dimmer Control
		RX	.1	4.0	0	
Q302	2SB649C 2SB649C	TX	4.0	0	4.6	Dimmer Control
		RX	4.0	0	4.6	

REF. NO.	DESCRIPTION	MODE	BASE	COLLECTOR	EMITTER	FUNCTION
Q402	2SC458C	TX	.112	0.7	0	Power Control
		RX	0.7	0	0	
Q403	2SC458C	TX	0.7	0	0	Power Switch
		RX	0	2.0	0	
Q404	2SC1213C	TX	0.7	0	0	Power Control
		RX	0	8	0	
Q405	2SC458C	TX	0.6	0	0	Reset (MCPU)
		RX	0.6	0	0	

Q501	2SC2438	TX	0.1	5--8	0	Pre Driver
Q502	2SC2539	TX	---	13.6	0	Driver
Q503	2SC2630	TX	---	13.6	0	RF Power Amp.
Q504	2SB834Y	TX	12.9	3--8	13.6	APC
Q505	2SC458C	TX	1.6	12.9	1.1	APC Amp.
Q506	2SC458C	TX	1.6--1.9	8.0	1.2	APC Amp.

Fold Out →

VOLTAGE CHARTS

70-066/076

Q701	2SC535B	TX RX	2.9 2.9	4.5 4.5	2.4 2.4	OSC (RX SYN)
Q703	2SC1971	TX RX	0.7 0.7	2.8 2.8	0 0	Buffer
Q705	2SC2097	TX RX	0.6 0.6	2.6 2.6	0 0	Loop Filter (RX Syn.)
Q706	2SC458C	TX RX	2.6 2.6	7.3 7.3	2.0 2.0	Loop Filter (RX Syn.)
Q709	2SC458C	TX RX	8.2 8.2	8.2 8.2	7.4 7.4	Power Line Filter
Q710	2SC1906	TX RX	1.9 1.9	7.3 7.3	1.4 1.4	Buffer

F.E.T'S

REF. NO.	DESCRIPTION	MODE	GATE	DRAIN	SOURCE	FUNCTION
Q108	2SK192A BL	TX	0	7.3	0.3	VCO (TX PLL)
Q109	2SK241GR	TX	0	2.9	0	Buffer

Q201	2SK125	RX	0	10.5	2.5	Front End Amp.
Q202	2SK125	RX	0	12.6	2.5	1st Mixer
Q259	2SK117BL SQ.OPN. 2SK117BL SQ.CLS.	RX RX	3.05 0	3.2 3.2	3.3 3.3	AF Switch

Q704	2SK117BL	TX RX	3.3 3.3	7.3 7.3	3.5 3.5	Loop Filter (RX Syn)
Q707	2SK192ABL	TX RX	0 0	7.4 7.4	0.8 0.8	VCO (RX Syn)
Q708	2SK241GR	TX RX	0 0	1.7 1.7	0.6 0.6	Buffer

DIGITAL IC

REF. NO.	DESCRIPTION	PIN NO.	+ V VOLTAGE	GND PIN NO.	FUNCTION:
IC 102	HD74LS02P	14	5	7	Nor Gates
IC 103	MC4544	14	5	7	Phase Detector
IC 106	HD74LS93P	5	5	10	4 Bit Binary Counter
IC 301	HD14511BP	16	8	8	Led Driver
IC 302	HD14511BP	16	8	8	Led Driver
IC 701	uPD3805C	18	5	9	PLL
IC 702	HD74LS93P	5	5	10	4 Bit Binary Counter
IC 703	uPB555C	1	5	4	Pre Scaler (Rx Syn)
IC 706	HD1406uPB	14	5	7	Buffer
IC 901	HD44840A27	20/21	5	16	CPU
IC 902	HD14021BP	16	5	8	Date Shifter (Rx Syn)
IC 951	uPD2716	24	5	12	Read Only Memory
IC 952	HD14174BP	16	5	8	Data Buffer

VOLTAGE CHARTS

70-066/076

ANALOG IC

REF.NO.	DESCRIPTION	MODE	PIN No.1	PIN No.2	PIN No.3	PIN No.4	PIN No.5	PIN No.6	PIN No.7	PIN No.8	PIN No.9	PIN No.10	PIN No.11	PIN No.12	FUNCTION	
IC 101	DH 1048	TX	--	3.8	4.5	3.8	0	--	4.5	8	--	--	4.5	--	IDC	
IC 104	DH 2501	TX	0	0	0	7.5	7.5	0	0	0	7.5	7.5	0	0	BUFFER	
IC 108	DH 2503	TX	0	0	7.5	0	7.5	0	7.5	1.4	--	--	--	--	BUFFER	
IC 251	MC3357P	SQUELCH													2nd IF AMP	
		CLSD. RX OPEN RX	7.1 7.1	7.1 7.1	7.9 7.9	7.6 7.6	1.0 1.0	1.0 1.0	1.0 1.0	7.7 7.7	4.2 4.2	1.9 1.9	1.9 1.9	1.4 0.2		0 7.0
IC 252	MB 3712	KX	7.0	13.8	13.0	0	--	--	0.6	--	--	--	--	--	AF PWR AMP	
IC 303	uPC7808H	TX	13.8	8.0	0	--	--	--	--	--	--	--	--	--	POWER REGULATOR	
		RX	13.8	8.0	0	--	--	--	--	--	--	--	--	--		
IC 401	MB 3756	TX	8.0	13.6	8.0	0	0	0	0	8	--	--	--	--	POWER REGULATOR	
		RX	8.0	13.6	8.0	0	1.7	0	8	0	0	--	--	--		
IC 402	uPC7805H		13.8	5.0	0										POWER REGULATOR	
IC 704	DH2501	RX	0	0	6.8	6.8	0	0	0	6.8	6.8	0	0	0	BUFFER	

MICROCOMPUTER (IC 901)

PIN OUT DESCRIPTION

PIN NO.	PIN NAME	INPUT OUTPUT	SIGNAL NAME	FUNCTION
1	D3	OUT	DSTB+	Strobe for serial data to synthesizer
2	D4	OUT	TXTM-	Signalling option control (TX: LOW, RX: HIGH)
3	D5	OUT	ALM-	Alert (2KHz Tone)
4	D6	IN	SQSIC+	Squelch Signal (Busy; High)
5	D7	IN	TSQMON-	Tone/Monitor detect (low)
6	D8	OUT	TSQMON-	Scan hold status (NSQ Hold; Low)
		IN	PLCL-	Synthesizer Unlock: LOW (input)
7	D9	OUT	VCOCNT	Audiomute & TX Inhibit: LOW (output)
8	D10	IN	SCN-	VCO Band Switch High Frequency Range: LOW
9	D11	IN	PRI-	Scan Switch (on: LOW)
10	D12	OUT	DSPSTL-	Pri Switch (on: LOW)
11	D13	OUT	DSPSTH-	Display Data Ones Digit Strobe
12	D14	IN	ALBH-	Display Data Tens Digit Strobe
13	D15	OUT	TXDL	Band Select (A: LOW, B: HIGH)
14	NC	-	-	TX/RX Control (Tx: LOW Rx: HIGH)
15	RESET	-	-	No Connection
16	GND	-	-	General Reset (Reset: HIGH)
17	OSC1	-	-	Ground
18	OSC2	-	-	Clock Oscillator (800 KHZ +5%)
19	HLT	-	-	Clock Oscillator (800 KHZ ±5%)
20	TEST	-	-	Standby Mode Control (Standby: LOW)
21	Vcc	-	-	Not Used (HIGH)
22	R00	OUT	DSPO+	Power Supply (+5V±10%)
23	R01	OUT	DSP1+	LED Display Data (HIGH: 6 to 8V, LOW: 0 to 2V)
24	R02	OUT	DSP2+	LED Display Data (HIGH: 6 to 8V, LOW: 0 to 2V)
25	R03	OUT	DSP3+	LED Display Data (HIGH: 6 to 8V, LOW: 0 to 2V)
26	R10	IN	UP-	LED Display Data (HIGH: 6 to 8V, LOW: 0 to 2V)
27	R11	IN	DWN-	Channel Up Switch (ON: LOW)
28	R12	IN	INH+	Channel Down Switch (ON: LOW)
29	R13	IN	TA-	PTT Inhibit (Inhibit: HIGH)
30	INT0	IN	PTT INT+	Wideband/Standard Select (WIDE: LOW)
31	INT1	IN	-	PTT Switch (PTT: HIGH)
32	R20	OUT	RMA0+	Not Used
33	R21	OUT	RMA1+	E/PROM ADDRESS DATA
34	R22	OUT	RMA2+	RMA5+ is also used as the E/PROM ENABLE SIGNAL
35	R23	OUT	RMA3+	" " " " " " " " " "
36	R30	OUT	RMA4+	" " " " " " " " " "
37	R31	OUT	RMA5+	" " " " " " " " " "
38	R32	OUT	ASTB+	" " " " " " " " " "
39	R33	OUT	AUXSTB+	Strobe for E/PROM address data latch
40	D0	OUT	PSST+	Strobe for AUX.DATA (Signalling Option Board)
41	D1	IN	CHDT+	Strobe for E/PROM DATA OUTPUT TO SHIFT REGISTER
42	D2	OUT	DCLK	Serial data from Shift Register
				Clock for CHDT+

HIGH: 3.5 to 5V, LOW: 0 to 1.5V

Measure with high input impedance meter or oscilloscope

Midland
70-066 & 70-076
Service
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Midland 70-066 & 70-076 Service Manual

Part 3

REPAIR INFORMATION

70-066/076

CHIP COMPONENT IDENTIFICATION

Chip components used in Midland SYN-TECH transceivers can be identified as follows:

<u>COLOR</u>	<u>COMPONENT TYPE</u>
Black	Metal Film Resistor
White with value marking	Metal Film Resistor
Light Brown	Ceramic Capacitor
Green	Ceramic Capacitor
White (no marking)	Ceramic Capacitor

Resistor value marking is as follows:

1st two digits - significant digits
3rd digit - number of added zeros

Example: 105 = 10 00000 = 1M Ohm

CHIP COMPONENT REMOVAL/REPLACEMENT

NOTE: Temperature of soldering iron must be maintained at 600-700°F.

COMPONENT REMOVAL

1. Place solder iron tip directly on component in order to melt solder and glue as shown in figure #1 & #2. Remove component with tweezers or long nose pliers.

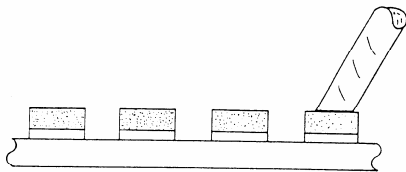


FIG. #1

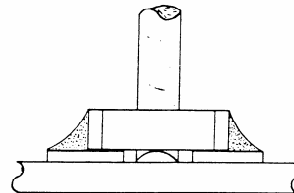
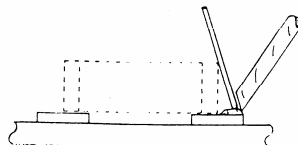


FIG. #2

2. Completely remove old solder from PC board, using a desoldering tool. Application of a small amount of flux will greatly aid in the removal of old solder.

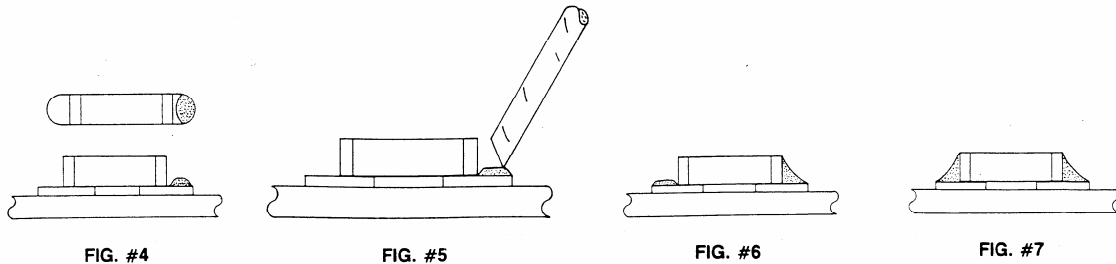
CHIP COMPONENT REPLACEMENT

3. After component has been removed and PC pattern cleaned, apply a small amount of solder on PC pattern and let cool, as shown in figure #3.



CHIP COMPONENT REPLACEMENT (CONTINUED)

4. Insert new component and apply soldering iron tip to PC pattern as shown in figures 4, 5, 6 and 7.



CAUTION: As patterns and components are close to each other, extreme care must be exercised when soldering, as not to damage components or bridge PC pattern paths. High soldering iron temperatures can cause component damage. DO NOT apply the soldering iron tip to a new component during installation.

IC COMPONENT REMOVAL/REPLACEMENTCOMPONENT REMOVAL:

Extreme care must be exercised when removing and replacing defective transistors and IC's. Keep in mind that copper foil is employed on both sides of the printed circuit board. IC's and transistors may be removed from the circuit for testing. If IC's are to be removed from the circuit intact and unharmed, an IC desoldering tip attached to a soldering iron should be used. This tip will melt solder on all pin connections simultaneously and the IC may be pulled from the PC board.

A solder suction tool or braided desoldering wick may be used to remove the solder, freeing one pin at a time. Carefully and thoroughly remove solder from all IC pins until the IC can be removed without resistance. When removing transistors for testing, use needle nose or clamping type seizing pliers that will act as a heatsink on the transistor leads. If a transistor or IC is defective, it may be cut from the leads and removed. The leads may be unsoldered and removed one at a time.

REPLACEMENT:

If it is necessary to bend IC leads, firmly hold and bend the lead with needle nose pliers. Make sure the leads are free from solder and are parallel to the IC body. Remove all solder from the holes in the PC board before attempting replacement. When replacing an IC or transistor on the PC board, make sure the component is properly orientated. Before soldering an IC, verify there is no AC voltage between the solder iron tip and common ground.

PC BOARD REMOVAL

TX/SYNTHESIZER PC BOARD

To remove the TX/Synthesizer PC board, remove the 8 PC board mounting screws. Disconnect the 4 multi pin connectors at J363, J361, J362 and J364, located at the front of the board. Next disconnect the 2 Coaxial connectors at J365 and J366, located at the rear of the board. Slide the PC board to the rear of the radio to clear the front retaining tab, then pull up.

RX PC BOARD

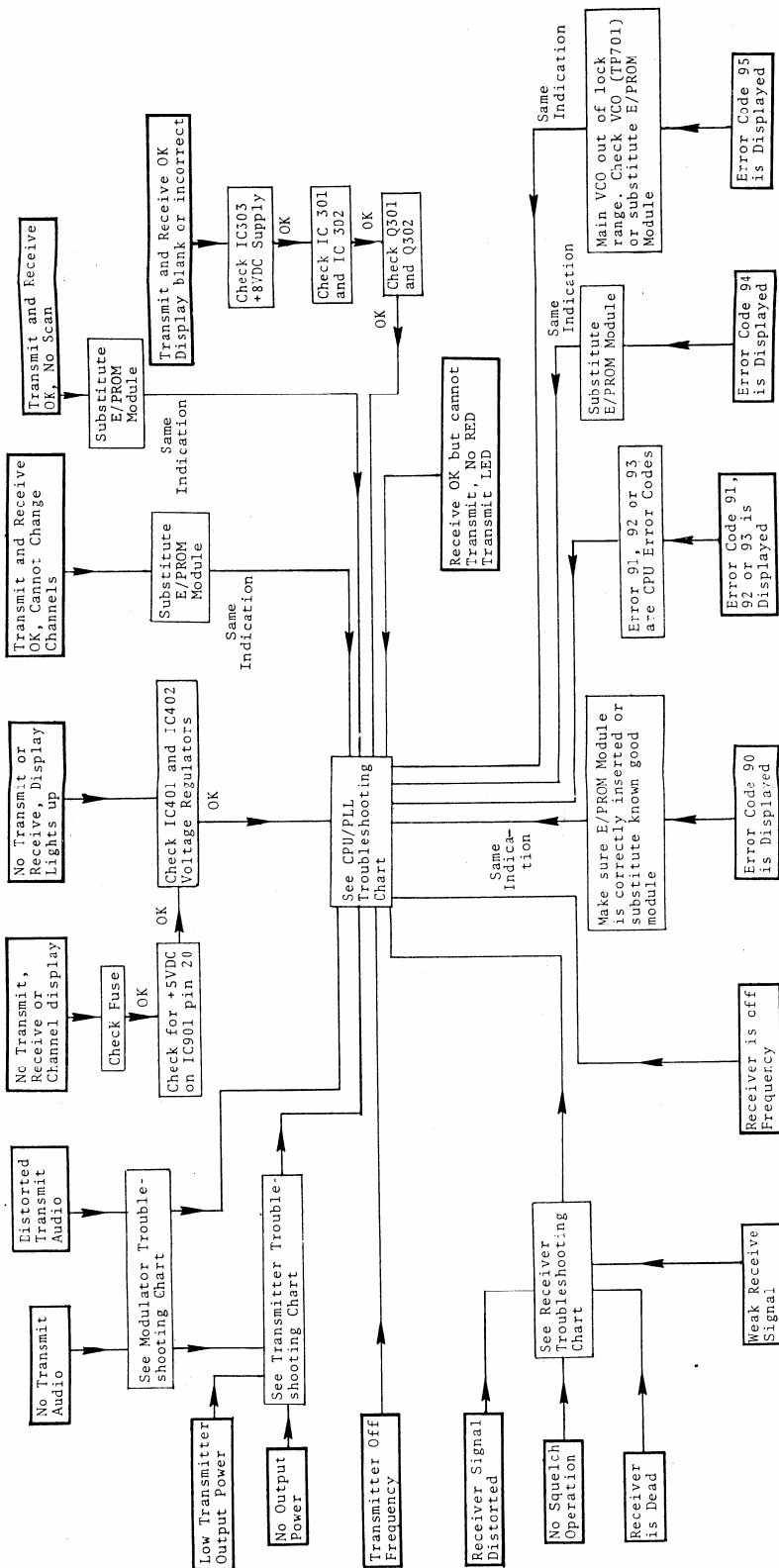
To remove the RX PC board, remove the 5 PC board mounting screws and disconnect the 5 multi pin connectors at J351, J354, J353, J352 and J358 located at the middle and front of the board. Next disconnect the 2 Coaxial connectors at J356 and J355 located near the rear of the board. Slide the PC board to the rear of the radio to clear the front retaining tab and then pull up. The board will still be retained by power wiring but access to the rear of the PCB is possible.

PA PC BOARD

To remove the PA PC board, loosen the 4 screws (2 on each side) located to the outside rear of the unit. Tilt PA/heatsink downwards and remove the 2 PA cover retaining screws and cover. Remove the 10 mounting screws holding the PC board and output transistors. Next unsolder the antenna connector which extends through the PC board on the left hand side. The antenna connector is soldered to the board at 3 connections. All solder must be removed from these connections before attempting to remove the board. Next disconnect the 2 coaxial connectors at J372 and J371 and pull up on the board. The board will still be retained by power wiring but access to the rear of the PCB is possible.

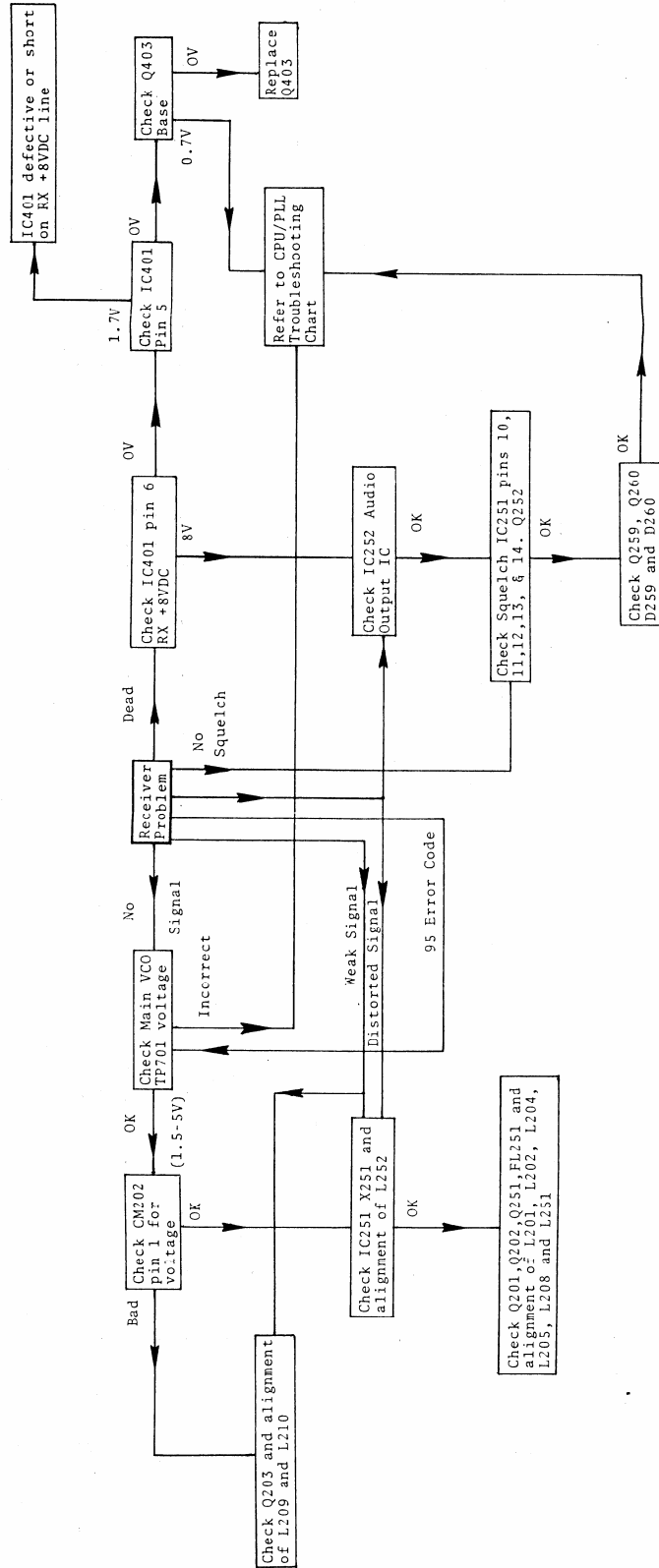
GENERAL TROUBLE SHOOTING CHART

General Troubleshooting Chart



RECEIVER TROUBLESHOOTING CHART

Receiver Troubleshooting Chart

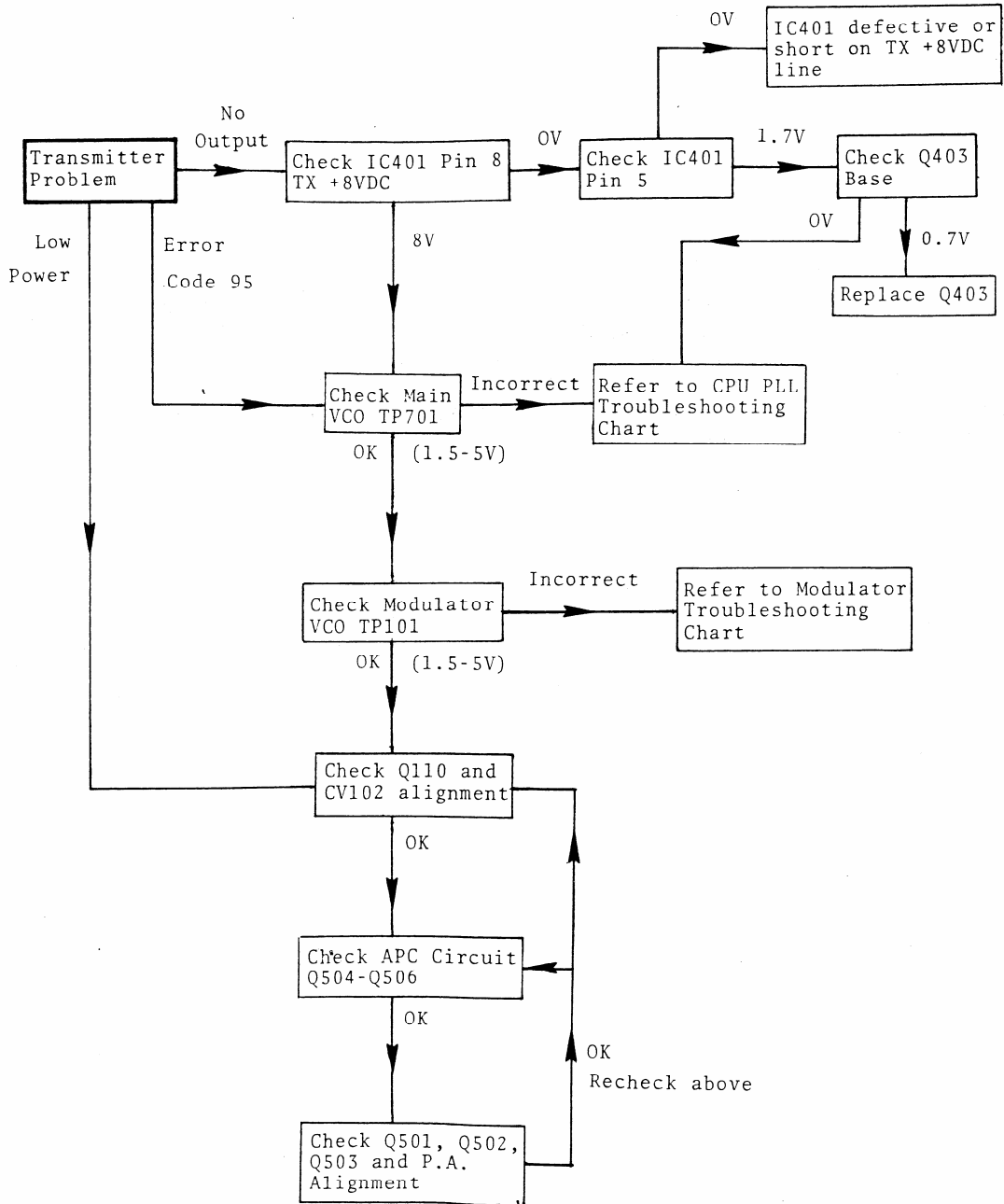


Fold Out →

TRANSMITTER TROUBLESHOOTING CHART

70-066/076

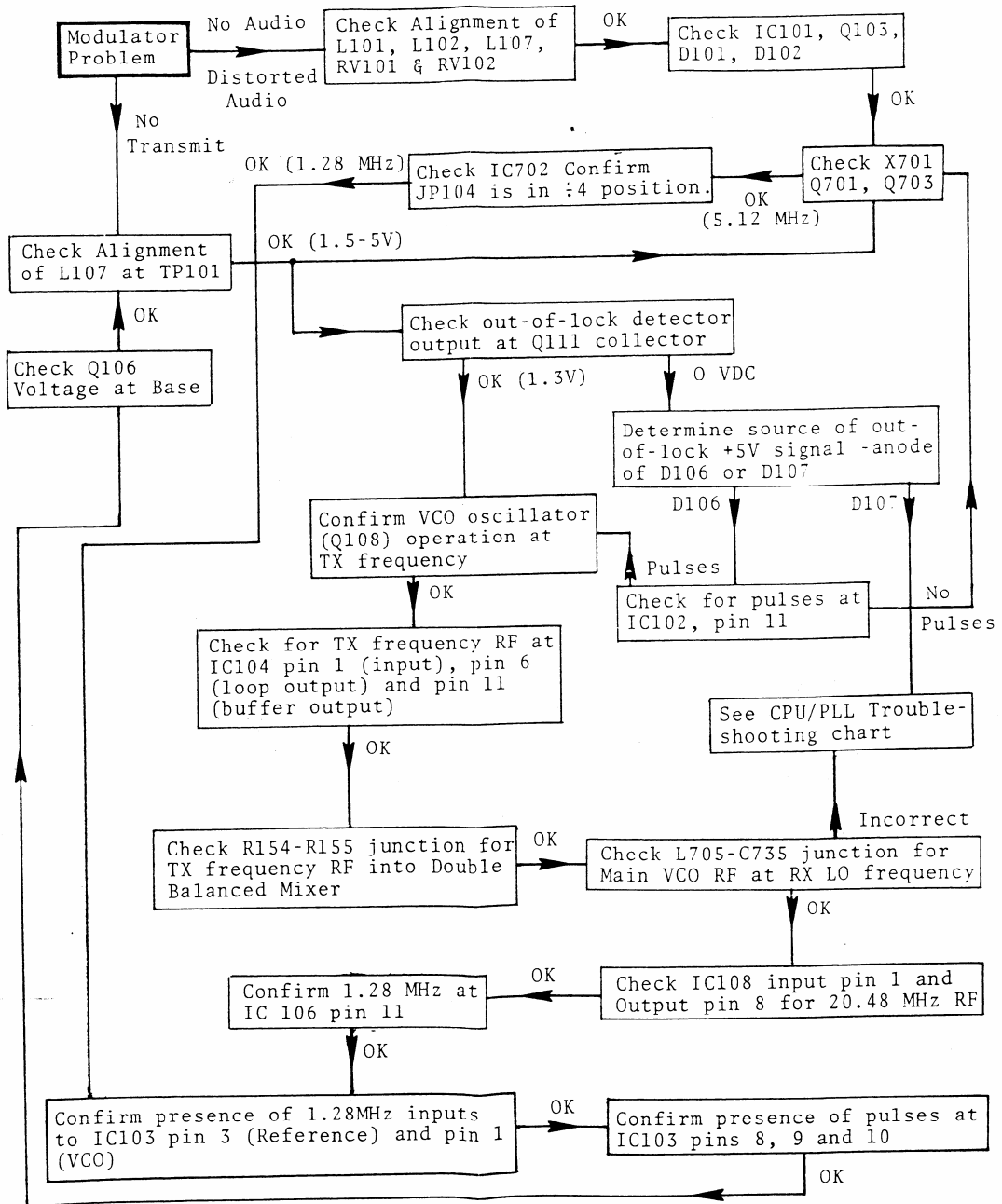
Transmitter Troubleshooting Chart



MODULATOR TROUBLESHOOTING CHART

70-066/076

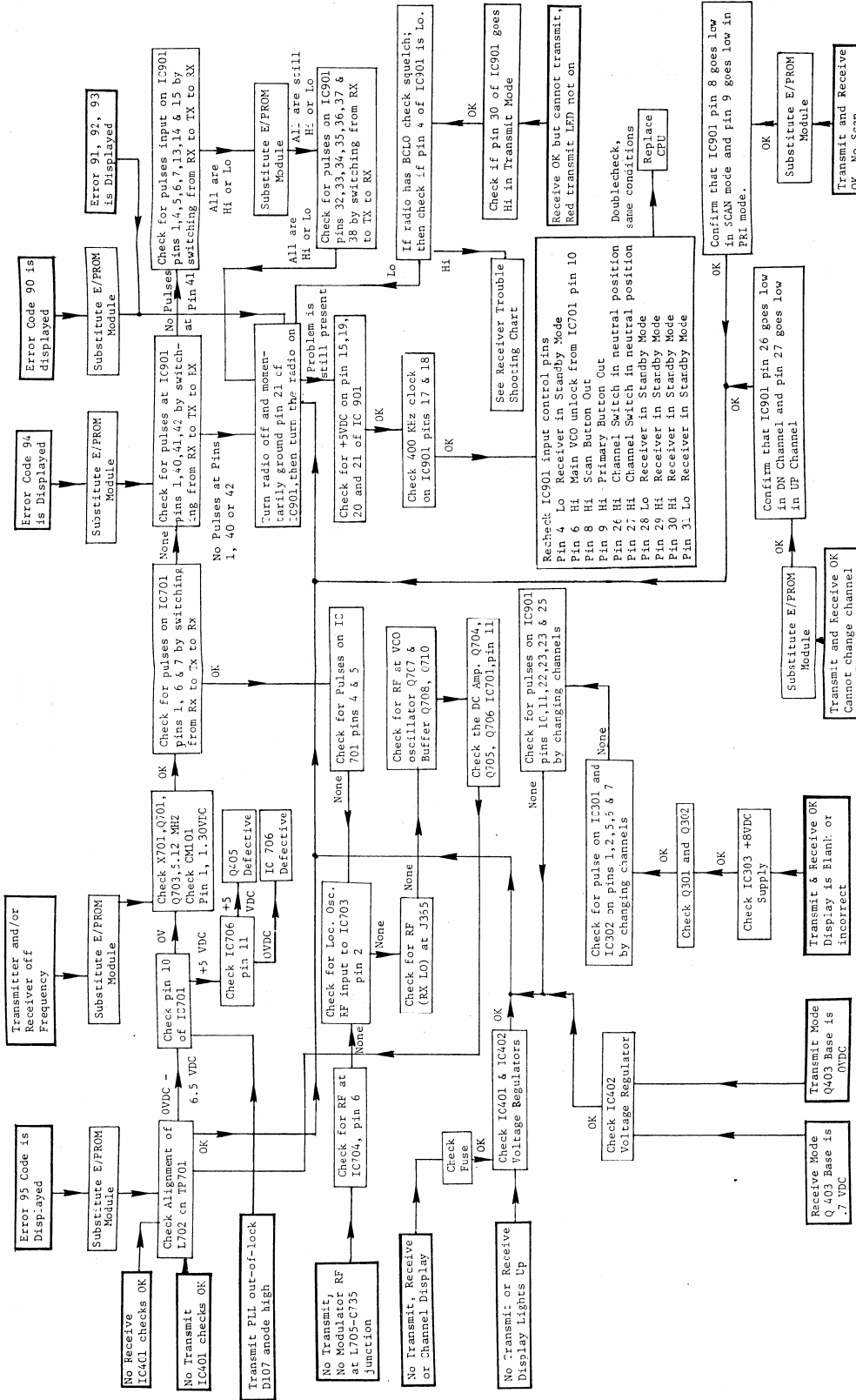
Modulator Troubleshooting Chart



CPU/PLL TROUBLESHOOTING CHART

70-066/076

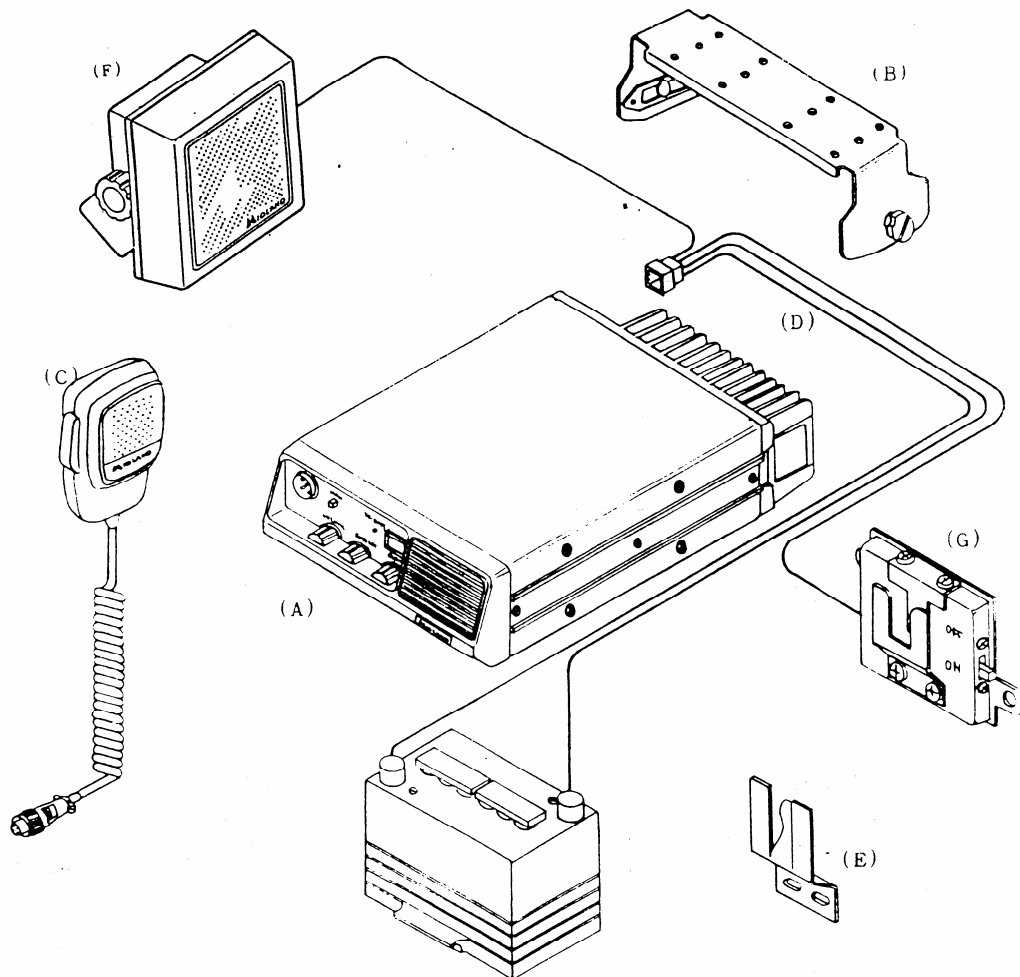
CPU/PLL Troubleshooting Chart



Fold Out

MOBILE INSTALLATION DIAGRAM

70-066



UNIT AND INCLUDED ACCESSORIES:

- (A) Under Dash Type Land Mobile Radio
- (B) Mobile Mounting Bracket
- (C) Dynamic Microphone
- (D) DC Power Cord
- (E) Microphone Clip

MODEL NO.

PART NUMBER

70-2201	70-158066
70-2301	70-038013
70-2211	70-034031
	70-158015

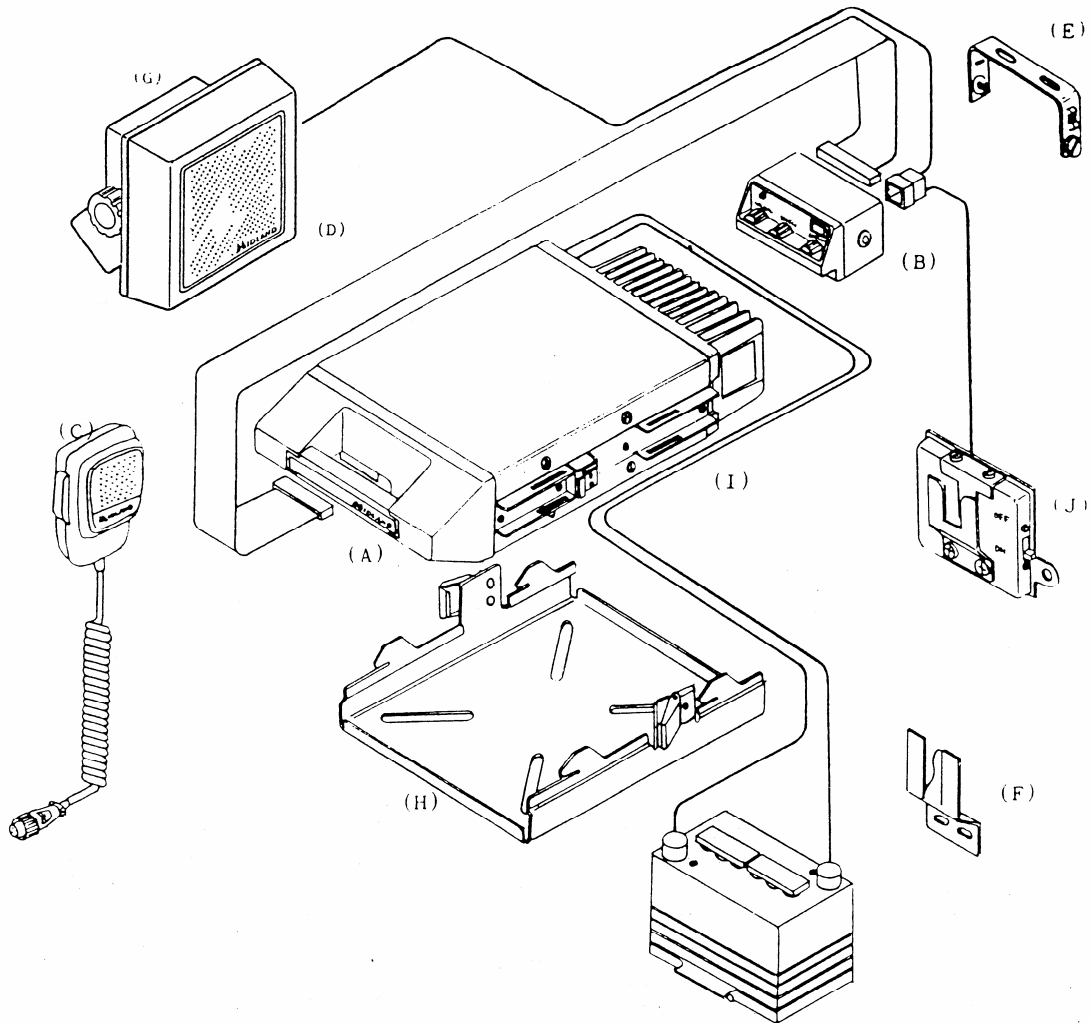
OPTIONAL ACCESSORIES:

- (F) Mobile Trunk Mount External Speaker
- (G) Microphone Hang Up Box

70-2353A
70-2195

MOBILE INSTALLATION DIAGRAM

70-076



UNIT AND INCLUDED ACCESSORIES:

- (A) Trunk Mount Type Remote Unit
- (B) Trunk Mount Type Control Head
- (C) Dynamic Microphone
- (D) Trunk Mount Control Cable
- (E) Bracket, Control Head
- (F) Microphone Clip
- (G) External Speaker
- (H) Mounting Tray, Remote Unit, W/Keys
- (I) DC Power Cord

MODEL NUMBER

PART NUMBER

70-2206	
70-2301	70-038013
70-2222	70-034061
	70-158069
	70-158015
70-2353A	
70-2205	70-158068
70-2212	70-034032

OPTIONAL ACCESSORIES:

- (J) Microphone Hang Up Box

70-2195

INSTALLATION INSTRUCTIONS

70-066/076

LOCATION

UNDER DASH UNIT:

Where you place the transceiver in the vehicle is not critical to its performance; convenience and accessibility are the key factors when installing the transceiver. The mobile mounting bracket will provide you with some guide as to placement. Locations where it can be mounted with metal screws, bolts or pop-rivets generally will work.

REMOTE UNIT:

The remote unit may be mounted up to 4 meters away from the control head utilizing the flat cable assembly supplied with the unit. In larger vehicles, longer control cables available from Midland or assembled in the field may be used. Refer to the accessory list for part numbers of bulk cable, connectors and assembly tooling. The flat cable allows routing under vehicle carpeting if desired. When installing, route the connecting cables away from locations where they will be exposed to exhaust system heat, sharp edges or mechanical damage and where it will be out of the way of the driver and passengers. Wherever possible, existing holes in the trunk wall, door channels and window columns should be utilized. The remote unit may be mounted horizontally, vertically or on it's side. Select a location with sufficient room for the unit to be unlocked and removed from the mounting tray. The mounting tray can be attached using the sheet metal screws and washers provided with the unit.

CONTROL HEAD:

Control head mounting location is not critical to it's performance. Convenience and accessibility are the key factors when installing. Refer to the Mobile Installation Diagram for the control head mount bracket. The mount bracket may be installed with metal screws, bolts or pop rivets.

POWER REQUIREMENTS: (Under dash and trunk mount units):

This transceiver is designed to operate from any 13.8 V DC, 10 amp negative ground source. A standard automotive, 12 volt negative ground system generally is adequate. Inspection of the vehicle's electrical system is recommended prior to installation of the transceiver. A low battery, worn generator/alternator or poor voltage regulator can impair the operation of the transceiver. Noise interference or low voltage output can sometimes be traced to these problems. If an external AC power supply is used with the transceiver, it must be adequately regulated for voltage and current. Low voltage output will produce unsatisfactory results from the transceiver. Receiver sensitivity and transmitter output will be greatly impaired.

CAUTION: EXCESSIVE VOLTAGE OUTPUT ABOVE 16 V CAN CAUSE DAMAGE TO THE TRANSCEIVER. CHECK THE VOLTAGE SOURCE BEFORE CONNECTING THE POWER CABLE.

INSTALLATION INSTRUCTIONS

70-066/067

Included with the transceiver is a DC power cable. The red wire is positive (+) and the black wire is negative (-). If at all possible, make direct connection to the battery terminals to prevent random noise and transient spikes from being fed back into the transceiver and also insure adequate operating voltage. If this type of installation cannot be made, a convenient voltage lead or terminal and chassis ground in the vehicle may be used. This transceiver operates on a negative ground system only, do not attempt to operate in a positive ground vehicle.

ANTENNA:

The most important single factor that can influence the performance of any communications system is the antenna. A good quality antenna of 50 ohms impedance, designed for VHF applications in the 66-88 MHz range is recommended. When adjusting the antenna, whether mobile or fixed, be sure to follow the manufacturers suggested instructions. When adjusting the antenna for VSWR, a high quality SWR meter must be used. The transceiver equipped with an Automatic Protection Circuit (APC) which will disable the transmitter should a high SWR or short circuit in the antenna system occur.

MICROPHONE HANG-UP BOX:

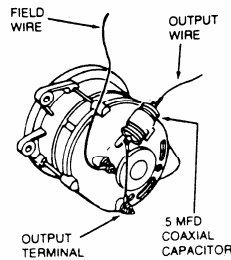
The optional accessory microphone hang-up box (Model 70-2195) is intended to be used in conjunction with the CTCSS option board Model 70-2102A. This unit may be installed in place of the microphone clip or any other location convenient to the operator. The hang-up box may be mounted on a metal or non-metallic surface with the two screws provided. Wiring instructions are shown in the accessory jacks diagrams.

EXTERNAL SPEAKER:

The 70-076 is supplied with an external speaker (Model 70-2353A). The 70-2353A can also be attached to the 70-066 in applications requiring higher audio levels. Consult the installation wiring diagrams for hook up instructions. The external speaker impedance is rated at 3.2 ohms.

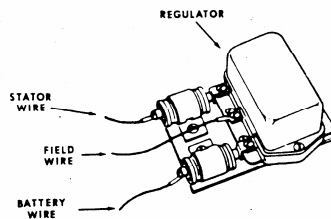
1. ALTERNATOR:

The alternator slip rings should be clean and the brushes should make good contact. A .5uf coaxial capacitor may be installed at the alternator output terminal. Verify that the current rating of the capacitor is sufficient to handle the alternator output current.



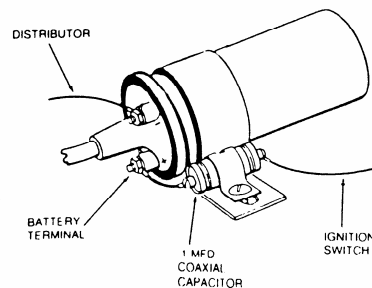
2. Voltage Regulator Interference:

Vibrating breaker contacts in the voltage regulator can cause arcing which results in interference. This interference can be noted as popping in the receiver which will change in frequency as engine speed is varied. To reduce voltage regulator noise, place two .5 uf coaxial capacitors as shown.



3. Ignition Coil Interference:

A .1uf coaxial capacitor placed at the battery side of the ignition coil, will eliminate pulses from the low voltage leads. Refer to diagram.



4. Distributor Interference:

Should sparking in the distributor cause radio interference, replace wire connecting the ignition coil to the distributor cap with a piece of radio ignition wire. Some vehicles are factory equipped with radio ignition wire.

5. Battery Connection:

Connecting the leads of the power cable directly to the vehicle battery will greatly help reduce noise by preventing random noise and transient spikes from being fed back into the transceiver.

ACCESSORIES

70-066/0

ACCESSORIES

USE DESIGNATION:

UD
TM
NO DESIGNATION

PART APPLICATION:

70-066A, 70-066B
70-076A, 70-076B
70-066A, 70-066B, 70-076A, 70-076B

ACCESSORIES INCLUDED WITH UNIT

USE	DESCRIPTION	MODEL NO.	PART NO.
TM	Microphone	70-2301	
	Control Head	70-2206	
	Microphone Clip		70-158015
UD	Mounting Bracket	70-2201	
UD	Nut, Mounting Bracket		70-151354
UD	Plate Side, Mounting Bracket		70-158075
TM	Mounting Bracket, Cont. Head		70-158069
TM	Screw, Mounting Bracket		70-151362
TM	Washer (outside) Mtng. Brkt.		70-151363
TM	Washer (inside) Mtng. Brkt.		70-151364
TM	Clamp, Cable, Mtng. Brkt.		70-158079
TM	Screw, Cable Clamp, Mtng. Brkt.		70-151366
UD	DC Power Cable, 2M	70-2211	70-034031
TM	DC Power Cable, 6M	70-2212	
	Fuse, 10A		70-204001
TM	Remote Cable Assy. 4M	70-2222	
TM	Mounting Tray, W/Keys	70-2205	
TM	Remote Speaker, 5W	70-2353	

OPTIONAL ACCESSORIES

	CTCSS Assembly	70-2102	
	2PPM Frequency Stability Kit	70-2124	
	2.5PPM Frequency Stability Kit	70-2125	
	Low Side Injection Kit	70-2173	
	12.5KHz Channel Spacing Kit	70-2137	
	12.5KHz 1st/2nd IF Filter (Kit	70-2135	
	for 70-2134)	70-2141	
UD	Scan Kit	70-2141	
TM	Scan Kit	70-2142	
UD	Remote Speaker, 5W	70-2353	
TM	Remote Cable Assy. 2M, Flat	70-2223	
	Microphone Hang-Up Box	70-2195	
TM	Remote Cable Assy. 4M, Round	70-2226	
TM	Remote Cable Assy. 2M, Round	70-2227	
TM	Connector, Remote Cable	70-2228	
TM	Cable, 34 Cond. Flat (Bulk)	70-2225	
UD	Tray Mounting W/Lock Kit	70-2256	
UD	Lock, with Keys Kit	70-7080	

OPTIONAL ACCESSORY EQUIPMENT

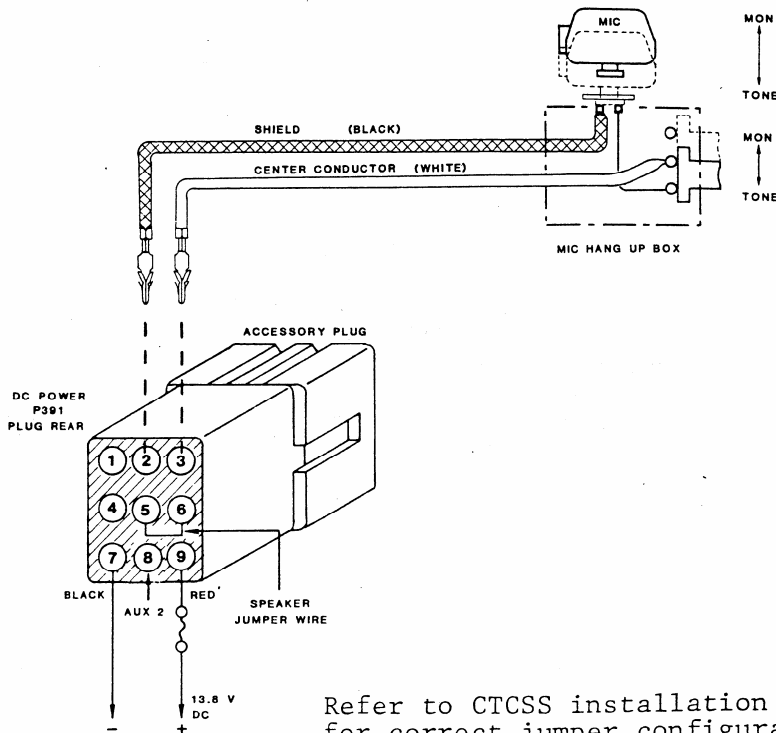
	E/Prom Programmer (110/220V)	70-1000
	E/Prom Eraser (110V)	70-1100
	E/Prom Eraser (220V)	70-1101
	E/Prom Printer (110V)	70-1300D
	E/Prom Printer (220V)	70-1300B
	LMR Test Set	70-E10

ACCESSORY TOOLS:

USE	DESCRIPTION	MODEL NO.	PART NO.
TM	Hand Press	70-2229	
	Tuning Tool, Single Metal Blade		70-156019
	Tuning Tool, Double Metal Blade		70-156020

UNDER DASH DC POWER/ACCESSORY PLUG INSTRUCTIONS 70-066

The accessory jack J391 is designed to accept the 9 pin plug supplied with the unit for DC power. Connections to the plug are shown in the following diagram.



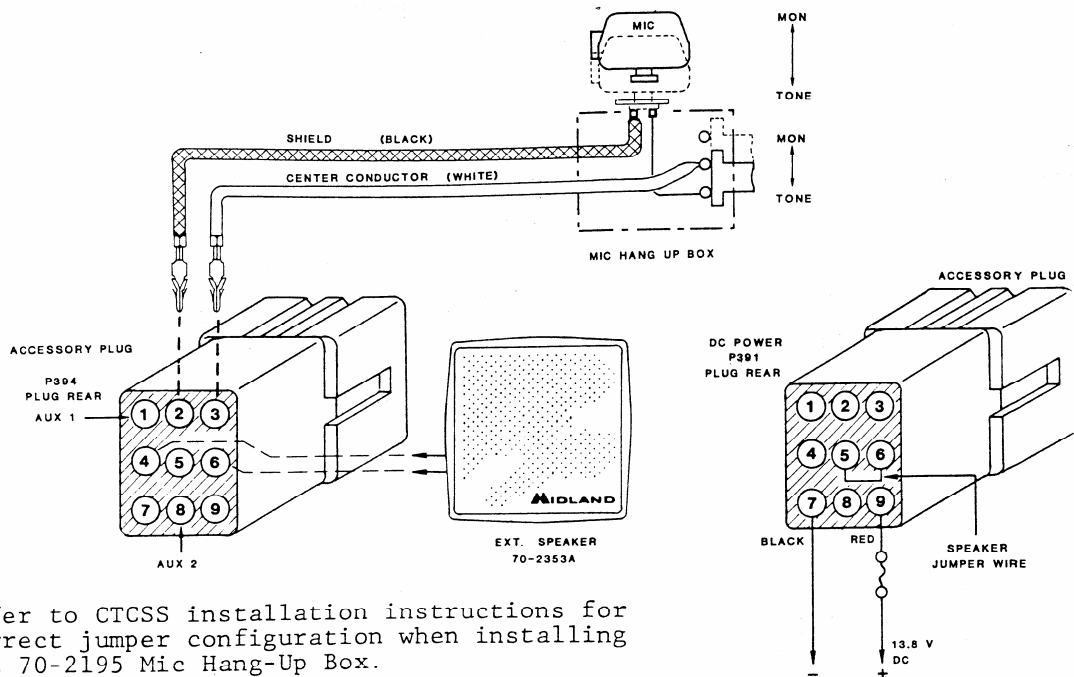
Refer to CTCSS installation instructions for correct jumper configuration when installing the 70-2195 Mic Hang-up Box.

- A. For internal speaker operation, pins #5 and #6 are connected as shown.
- B. For external speaker connections, remove pins #5 and #6 and connecting jumper wire with Molex extractor tool. Speaker wires are equipped with male Molex pins. Insert striped speaker wire in #4 pin position (ground) and insert plain speaker wire to #6 pin position.
- C. For CTCSS operation, connect pins #2 and #3, as shown to mic hang-up box.
- D. Pins #1 and #8 are not connected.

NOTE: Accessory plug P391 utilizes .093" mail pins, Molex #02-0902143. Use Molex crimping tool #HT-1919 and extractor tool #11-03-0006.

TRUNK MOUNT DC POWER/ACCESSORY PLUGS INSTRUCTIONS 70-

The DC power jack 391 is designed to accept the 9 pin plug supplied with the unit for DC power. The control head accepts the 9 pin Accessory plug supplied with the unit for connection of the external speaker and MIC hang up box. Connections to the plugs are shown in the following diagrams.



Refer to CTCSS installation instructions for correct jumper configuration when installing the 70-2195 Mic Hang-Up Box.

- A. The external speaker is normally connected to P394, the Accessory plug as shown above. Insert the male Molex pin connected to the striped wire in pin position #4 (ground), and the other wire in pin position #6. Do not remove the jumper wire between pins 5 and 6 of the DC Power plug P391.
- B. For subaudible tone (CTCSS) operation, the Mic hangup box 70-2195 is connected as shown above to pin positions 2 and 3 of the Accessory plug.
- C. Depending on the installation and the user's preference, the external speaker may be connected directly to the remote unit DC power plug P391 instead of at the control head. If this is desirable, the molex pins and connecting jumper wire between positions 5 and 6 of the DC Power plug P391 should be removed. The external speaker molex pins can then be inserted, the striped wire in pin position 4 and the plain wire in pin position 6. If it becomes desirable to relocate the external speaker and connect it to the control head plug as outlined in (A) above, a jumper connection between pins 5 and 6 of P391 must be made.

NOTE: Plug P391 and P394 utilize .093" male pins, Molex #02-0902143. Use Molex

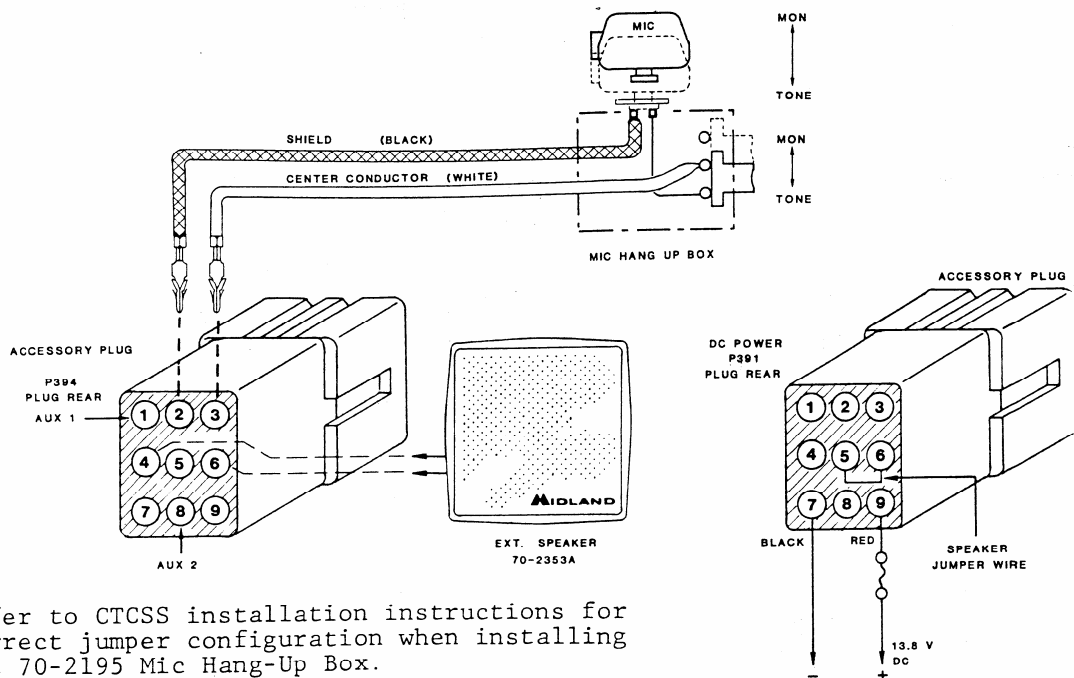
Midland
70-066 & 70-076
Service
Manual
Low Band

Midland 70-066 & 70-076 Service Manual

Part 4

TRUNK MOUNT DC POWER/ACCESSORY PLUGS INSTRUCTIONS 70-

The DC power jack 391 is designed to accept the 9 pin plug supplied with the unit for DC power. The control head accepts the 9 pin Accessory plug supplied with the unit for connection of the external speaker and MIC hang up box. Connections to the plugs are shown in the following diagrams.



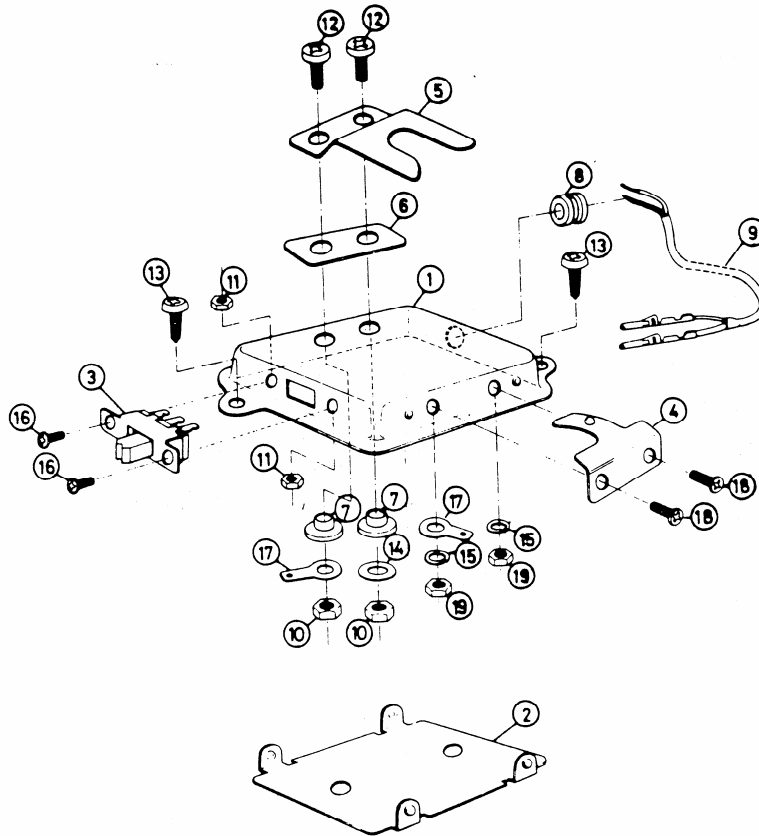
Refer to CTCSS installation instructions for correct jumper configuration when installing the 70-2195 Mic Hang-Up Box.

- The external speaker is normally connected to P394, the Accessory plug as shown above. Insert the male Molex pin connected to the striped wire in pin position #4 (ground), and the other wire in pin position #6. Do not remove the jumper wire between pins 5 and 6 of the DC Power plug P391.
- For subaudible tone (CTCSS) operation, the Mic hangup box 70-2195 is connected as shown above to pin positions 2 and 3 of the Accessory plug.
- Depending on the installation and the user's preference, the external speaker may be connected directly to the remote unit DC power plug P391 instead of at the control head. If this is desirable, the molex pins and connecting jumper wire between positions 5 and 6 of the DC Power plug P391 should be removed. The external speaker molex pins can then be inserted, the striped wire in pin position 4 and the plain wire in pin position 6. If it becomes desirable to relocate the external speaker and connect it to the control head plug as outlined in (A) above, a jumper connection between pins 5 and 6 of P391 must be made.

NOTE: Plug P391 and P394 utilize .093" male pins, Molex #02-0902143. Use Molex

MICROPHONE HANG-UP BOX — EXPLODED VIEW

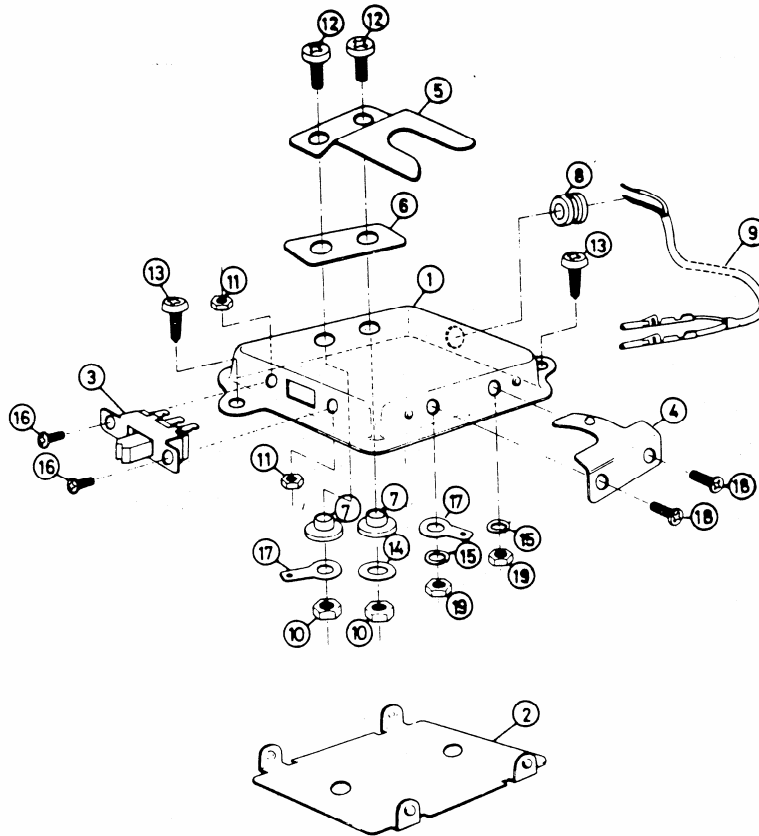
70-066/076



<u>REF. NO.</u>	<u>DESCRIPTION</u>	<u>PART NO.</u>
	<u>MICROPHONE HANG-UP BOX</u>	
1	Cover, Top	70-010068
2	Cover, Bottom	70-010069
3	Switch, Slide	70-183003
4	Hanger, A	70-158022
5	Hanger, B	70-158023
6	Spacer	70-151062
7	Washer, Insulation	70-151063
8	Rubber Bushing, Cord	70-156006
9	Shielded Wire Assembly	70-151064
10	Hex Nut, M3	70-151065
11	Hex Nut, M2	70-151066
12	Bind Head Screw 3 x 8	70-151067
13	Tapping Screw 3 x 8	70-151068
14	Washer 3.2	70-151069
15	Spring Washer 2.6	70-151070
16	Bind Head Screw 2 x 6	70-151071
17	Terminal	70-151072
18	Bind Head Screw 2.6 x 8	70-151073

MICROPHONE HANG-UP BOX — EXPLODED VIEW

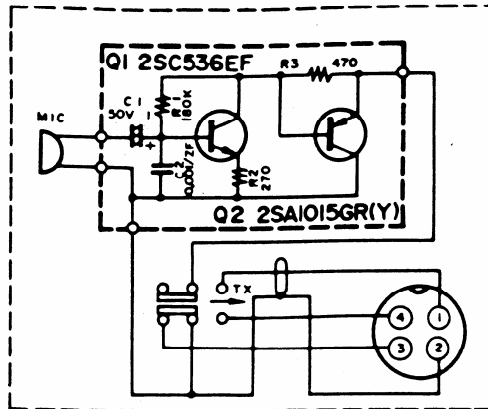
70-066/076



<u>REF. NO.</u>	<u>DESCRIPTION</u>	<u>PART NO.</u>
	<u>MICROPHONE HANG-UP BOX</u>	
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6	Spacer	70-151062
7	Washer, Insulation	70-151063
8	Rubber Bushing, Cord	70-156006
9	Shielded Wire Assembly	70-151064
10	Hex Nut, M3	70-151065
11	Hex Nut, M2	70-151066
12	Bind Head Screw 3 x 8	70-151067
13	Tapping Screw 3 x 8	70-151068
14	Washer 3.2	70-151069
15	Spring Washer 2.6	70-151070
16	Bind Head Screw 2 x 6	70-151071
17	Terminal	70-151072
18	Bind Head Screw 2.6 x 8	70-151073
19	Washer 3.2	70-151074

MICROPHONE

70-066/076



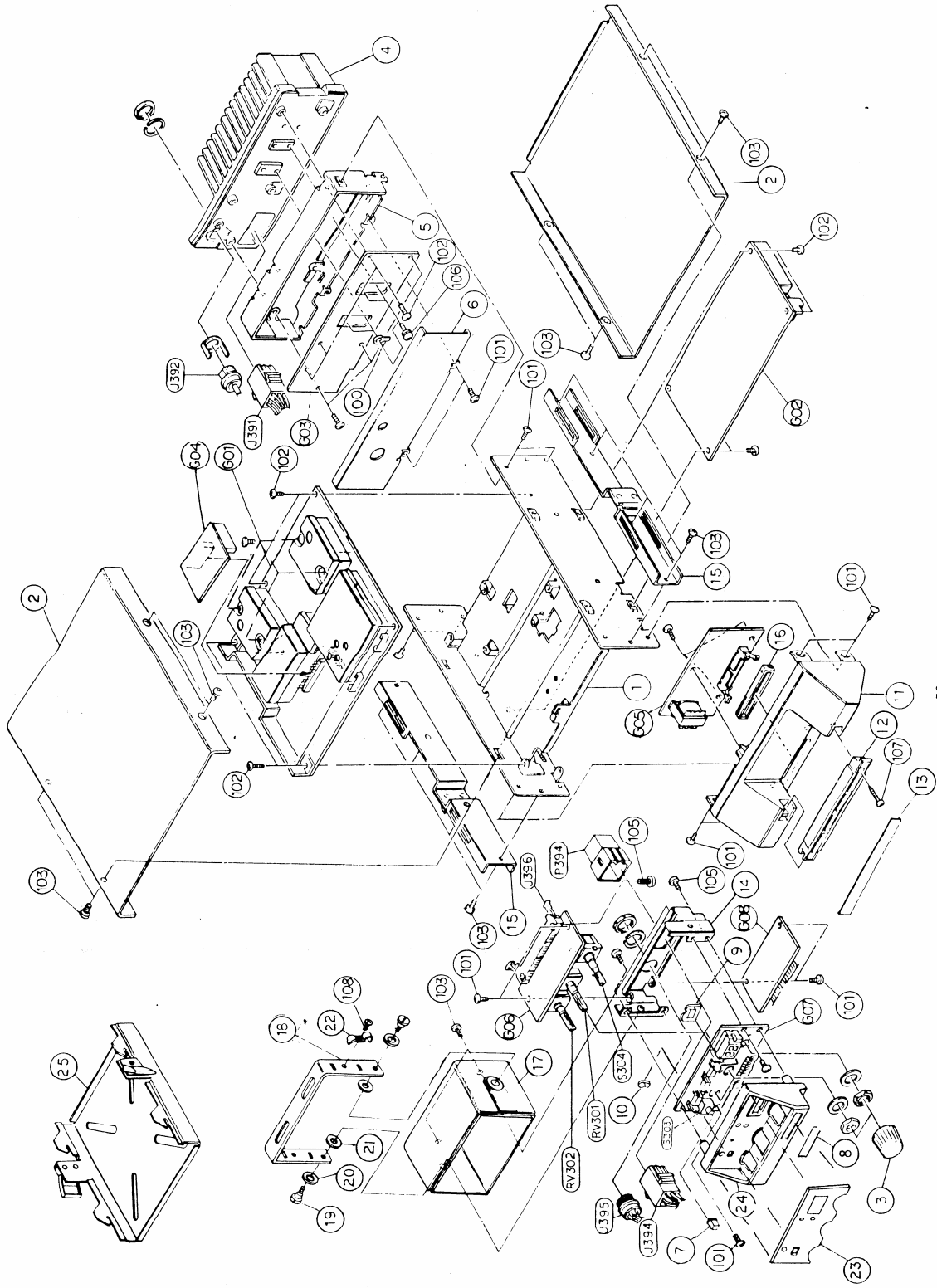
MICROPHONE PARTS LIST

DESCRIPTION:

PART NUMBER:

L.M.R. Dynamic Mic	70-038013
Panel, Case Front Mic	70-010072
Plate, Name Front Panel	70-020022
Case Front	70-010073
Element, Dynamic	70-038004
P/T Switch	70-183004
P/T Knob	70-118007
P.C.B. W/Comp.	70-075014
P.C.B. W/O Comp.	70-070008
2SA 1015	70-080025
2SC536	70-080026
Elect Cap 10F 50 WV	70-135002
Ceramic Cap (102)	70-132005
Cushion, P/T Switch	70-157015
Resistor 270 ohm 1/4 W	70-141010
Resistor 470 ohm 1/4 W	70-141016
Resistor 170K 1/4 W	70-141037
Cord, Mic W/O Cont.	70-034074
Cord, Mic W/Cont.	70-034075
Plug Mic 4 Pin	70-159015
Case Mic Rear	70-013017
Rubber, Mic Case Rear	70-157016
Screw, Case	70-151076
Screw, Mic Button	70-151078
Screw, Front Panel	70-151077
Mic Button	70-118008
Washer Special Mic Button	70-151079
Plate, Case Rear	70-020024
Weight, Ballast	70-151369

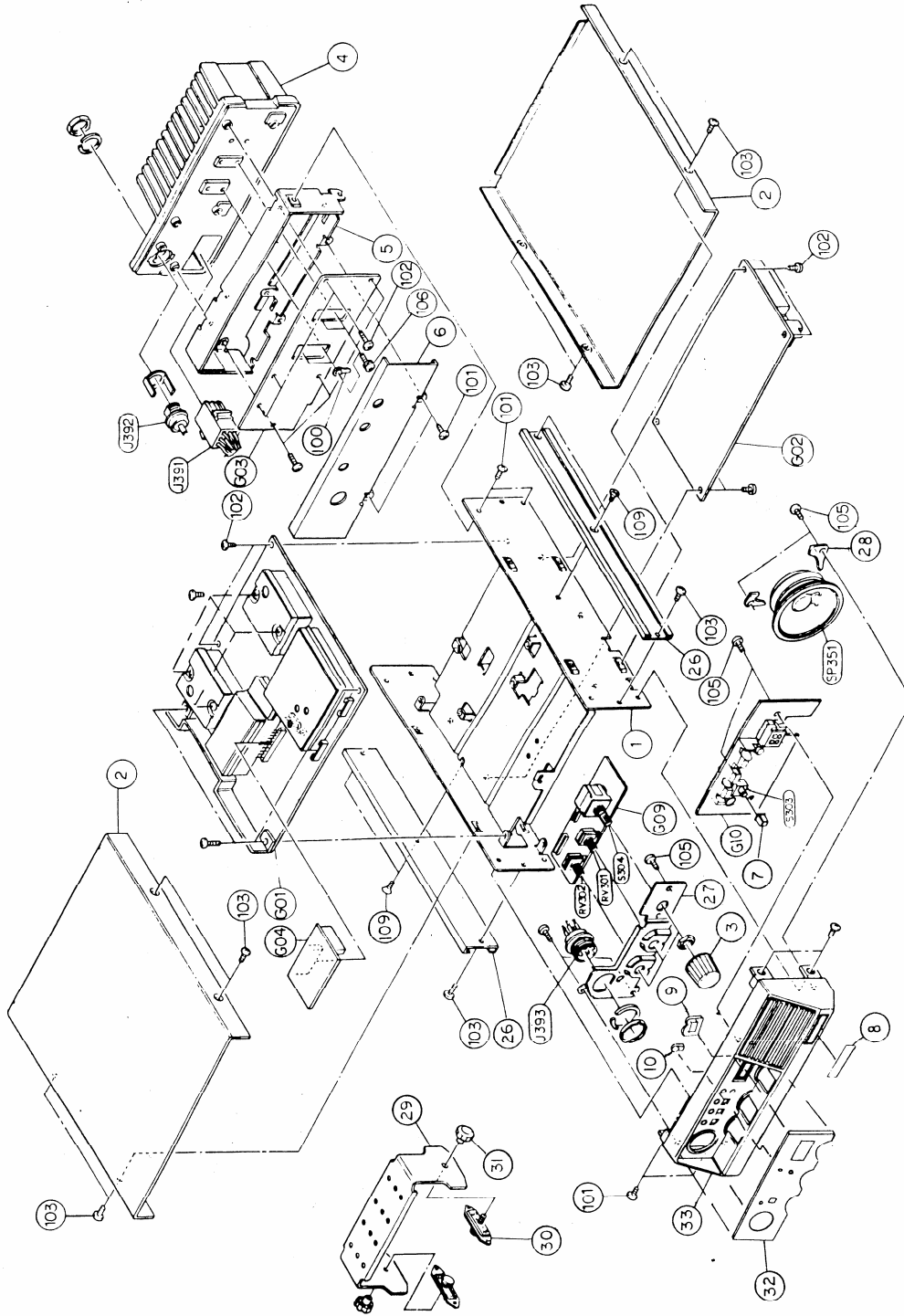
EXPLODED MECHANICAL VIEW



56

Fold Out

EXPLODED MECHANICAL VIEW



PARTS LIST

70-066/076

The following parts list is a composite listing for the 70-066A, 70-066B, 70-076A and 70-076B. For the application of each individual part, refer to the "USE" column as follows:

"USE" DESIGNATION	PART APPLICATION
A	70-066A, 70-076A
B	70-066B, 70-076B
UD	70-066A, 70-066B
TM	70-076A, 70-076B
NO DESIGNATION	70-066A, 70-066B, 70-076A, 70-076B

Refer to the separate exploded mechanical views for mechanical parts unique to trunk-mount or under-dash models. Mechanical parts common to both trunk-mount and under-dash versions are shown with the same reference number on both drawings and in the parts list.

REF.NO.	USE	DESCRIPTION	PART NO.	REF. NO.	USE	DESCRIPTION	PART NO.
CASE MATERIALS EXPLODED MECH. VIEW				30	UD	Plate, Side	70-158075
1		Chassis	70-015021	31	UD	Nut, Mntg. Brkt	70-151354
2		Cover	70-010040	32	UD	Face Plate, Std.	70-020068
3		Knob, Volume	70-110012	33	UD	Panel Front	70-010039
4		Heat Sink	70-089061	100		Grounding Lug	70-151109
5		Case, PA	70-010064	101		Screw Bind Hd.	70-151355
6		Cover, PA	70-010065	102		Screw Bind Hd.	70-151356
7		Button, Switch	70-110013	103		Screw Bind Hd.	70-151357
8		Plate, Brand	70-020070	105		Screw Tap Bnd. Hd.	70-151359
9		Lens, Chnl	70-020071	106		Screw Pan Hd.	70-151361
10		Lens, CDS	70-020072	107	TM	Screw Tap Bnd. Hd.	70-151365
11	TM	Panel, Front	70-010041	108	TM	Screw Bind Hd.	70-151366
12	TM	Grip	70-158077	109	UD	Screw Flat Hd.	70-151360
13	TM	Plate, Grip	70-158078	<u>PCB ASSEMBLIES</u>			
14	TM	Chassis, Control	70-015023	G01		TX-081 PCB Assy.	
15	TM	Side Rail	70-158076	G02		RX-081 PCB Assy.	
16	TM	Rubber Spacer	70-157056	G03		PA-081 PCB Assy.	
17	TM	Cover, Control Hd.	70-010066	G04		Z-273 PCB Assy.	
18	TM	Mtng. Bracket	70-158069	G05	TM	CX-08 PCB Assy.	
19	TM	Screw Mounting	70-151362	G06	TM	CX-05 PCB Assy.	
20	TM	Washer	70-151363	G07	TM	CX-07 PCB Assy.	
21	TM	Washer	70-151364	G08	TM	CX-06 PCB Assy.	
22	TM	Clamp	70-158079	G09	UD	CX-04 PCB Assy.	
23	TM	Face Plate, Std.	70-020069	G10	UD	CX-03 PCB Assy.	
24	TM	Panel, Front	70-010067	<u>JACKS AND CONNECTORS</u>			
25	TM	Mtng. Brkt. Assy.	70-158068	J391		Pwr/Acssy. Conn.	70-159108
26	UD	Rail, Side	70-158067	J392		RF Connector	70-159090
27	UD	Holder, Volume	70-158073	J393	UD	Mic Jack	70-159100
28	UD	Bracket, Spkr.	70-158074	J394	TM	Molex Conn.	70-159108

PARTS LIST

70-066/076

REF. NO.	USE	DESCRIPTION	PART NO.	REF. NO.	USE	DESCRIPTION	PART NO.
<u>JACKS & CONNECTORS CONT.</u>				<u>TRANSMIT/SYNTHESIZER PCB</u>			
J396	TM	Conn. Rem. Cbl.	70-159107	TX - 081			
P394	TM	Conn. Cont. Hd.	70-159112	TOP SIDE COMPONENTS			
<u>CONTROLS</u>				<u>TRANSISTORS</u>			
RV301	TM	Squelch, 10K	70-164030	Q101,106		2SC460B	70-080083
RV302	TM	Vol.W/Sw. 10K	70-164027	Q102,701		2SC535B	70-080095
RV301	UD	Squelch, 10K	70-164031	Q103,105,			
RV302	UD	Vol.W/Sw. 10K	70-164026	107,111,			
<u>SWITCHES</u>				402,403,			
S303		Monitor	70-180012	405,703,			
S304	TM	Chnl. Select	70-180014	705,706,		2SC458C	70-080082
S304	UD	Chnl. Select	70-180013	709,		2SK192ABL	70-080087
<u>SPEAKER</u>				Q108,707		2SK241GR	70-080110
SP351	UD	Speaker	70-060011	Q109,708			
<u>CABLE ASSEMBLIES</u>				Q110,112,			
CA351		J355 to J365	70-034059	710		2SC1906	70-080086
CA352		J366 to J371	70-034059	Q404		2SC1213C	70-080096
CA353		J356 to J365	70-034060	Q704		2SK117BL	70-080088
CA354		J391 to J351	70-034052	<u>INTEGRATED CIRCUITS</u>			
CA355		J353 to J364	70-034055	IC101		DH1048F	70-076141
CA358		J352 to J363	70-034056	IC102		HD74LS02P	70-076099
CA362	TM	CX-05 to CX-06	70-034071	IC103		MC4344	70-076086
CA363	TM	CX-06 to CX-07	70-034072	IC104,704		DH2501	70-076140
CA364	TM	CX-05 to CX-07	70-034073	IC106,702		HD74LS93P	70-076084
	TM	Remote Cbl. Assy.	70-034061	IC108		DH2503	70-076101
<u>MISCELLANEOUS</u>				IC401		MB3756	70-076139
SP352	TM	Remote Speaker	70-060014	IC402		HA17805W	70-076482
C391,392		270pf, 50V	70-131033	IC701		MPD3805C-003	70-076090
F391		Fuse, 10A	70-204026	IC703		MPB555C	70-076135
	UD	066 Pwr.Cord 2M	70-034031	IC706		HD14069UBP	70-076097
	TM	076 Pwr.Cord 6M	70-034032	IC901		HD44840A27	70-076175
		Mic Dynamic	70-038013	IC902		HD14021BP	70-076079
		Mic Hanger	70-158015	<u>COILS</u>			
				L101,102		Trnsfmr 42L051	70-090105
				L103,104		Inductor LPF	70-178047
				L106,108,			
				701,703,		Coil, Choke 4.7uH	70-178054
				L107		Coil, VCO	70-090139
				L110,111,			
				707,708,			
				709		Trnsfmr, Tx	70-090141
				L112		Trnsfmr, Tx	70-090107
				L114		Coil, Choke	70-090129
				L116,117		Coil, LPF	70-090131

PARTS LIST

70-066/076

REF. NO.	USE	DESCRIPTION	PART NO.	REF. NO.	USE	DESCRIPTION	PART NO.
		<u>COILS CONT.</u>				<u>VARIABLE RESISTORS</u>	
L118		Trnsfmr. Tx	70-090108	RV101,102		Trim Pot 10K	70-144045
L119,120		Trnsfmr Dblr mix	70-090114			<u>CRYSTALS</u>	
L705,706	A	Coil, 5.5T	70-090130			Crystal 5.12 MHz	70-128019
L705,706	B	Coil, 4.5T	70-090129	X701		<u>CERAMIC RESONATOR</u>	
		<u>MYLAR CAPACITORS</u>				Ceramic Resonator	70-179020
C116,170, 702,716		.01uf 50V	70-137037	CL901		<u>JACKS, PLUGS & SOCKETS</u>	
C129,714		.1uf 50V	70-137039			13 Pin Jack	70-159098
C132,133		1500pf 50V	70-137035	J361		7 Pin Jack	70-159095
C416		.047uf 50V	70-137034	J362,364		6 Pin Jack	70-159094
C712,730		6800pf 50V	70-137036	J363		Jack, Coax	70-159089
C713		.22uf 50V	70-137040	J365,366		3 Pin Plug	70-159092
		<u>ELECTROLYTIC CAPACITORS</u>		P368,(CML01)		11 Pin Plug	70-159103
C101		22uf 50V	70-135060	P901		10 Pin Plug	70-159104
C111,127, 409,410, 411		47uf 25V	70-135055	P902		Test Point	70-151368
C113		0.1uf 35V	70-138086	TP101,701		<u>MISCELLANEOUS</u>	
C114		1uf 50V	70-135057			Posister	70-086010
C117,921		10uf 50V	70-135059	Oven 701		TX-081 PCB	70-070087
C141,413		4.7uf 50V	70-135058			Htsnk IC401/402	70-089075
C412,415, 905		100uf 10V	70-135053			Shield, Mixer	70-089077
C727,728, 901		47uf, 10V	70-135052			Shield, Mixer Cov.	70-089078
C743		220uf 16V	70-135081			Shield, Synth.	70-089079
		<u>DIODES</u>				Shield, Synth.Cov.	70-089080
D101,102		HVP100.05	70-085271			Shield VCO	70-089081
D103,105, 106,107, 403,404, 406,703, 709,901		1S2075K	70-085001			Cover, VCO Main	70-089082
D104,702		1SV50	70-085044			Cover, VCO TX	70-089087
D108		ND487C1-3R	70-085057				
D402		HZ5C1	70-085058				
D405		HZ9A	70-085076				
		<u>TRIMMER CAPACITORS</u>					
CV102		Trimmer Cap	70-123026				
CV701		Trimmer Cap	70-123023				

PARTS LIST

70-066/076

REF. NO.	USE	DESCRIPTION	PART NO.	REF. NO.	USE	DESCRIPTION	PART NO.
<u>TRANSMIT/SYNTHESIZER PCB</u> TX - 081 BOTTOM SIDE COMPONENTS							
<u>CERAMIC CHIP CAPACITORS</u>							
C100,104, 106,109, 110,119, 124,125, 171		.047uf W5R 50V	70-132034	C157,160, 162	A	39pf CH 50V	70-131194
C102,118, 121,126, 128,142, 164,167, 711		.022uf W5R 50V	70-132033	C157,160, 162	B	33pf CH 50V	70-131192
C103,108, 152,725		47pf CH 50V	70-131196	C161	A	82pf CH 50V	70-132038
C105,704, 907,914, 915,922		470pf SL 50V	70-131204	C161	B	68pf CH 50V	70-131198
C107		15pf CH 50V	70-131185	C163		68pf CH 50V	70-131198
C115		22pf CH 50V	70-131188	C165,710, 906		2200pf W5R 50V	70-131206
C134,703		27pf CH 50V	70-131190	C169,707		220pf CH 50V	70-131199
C137,709	A	9pf CH 50V	70-131181	C181		18pf CH 50V	70-131186
C137	B	7pf CH 50V	70-131179	C182	A	10pf CH 50V	70-131182
C709	B	6pf CH 50V	70-131178	C182	B	NONE	NONE
C143	A	10pf CH 50V	70-131182	C701	A	27pf CH 50V	70-131190
C143,720	B	8pf CH 50V	70-131180	C701	B	22pf CH 50V	70-131188
C144,148, 723		12pf CH 50V	70-131183	C705		330pf SL 50V	70-131203
C720	A	12pf CH 50V	70-131183	C722	A	7pf CH 50V	70-131179
C146		9pf CH 50V	70-131181	C722	B	6pf CH 50V	70-131178
C149,151, 166,706, 717,726, 729,731, 732,733, 734,738, 739,741		4700pf W5R 50V	70-131207	C735,737	A	30pf CH 50V	70-131191
C150,158, 170,176, 178,179, 414,902, 904		.01uf W5R 50V	70-132032	C735,737	B	27pf CH 50V	70-131190
C154,155, 156,159, 406,407, 408,913, 933		1000pf W5R	70-131205	C736		56pf CH 50V	70-131197
				C740		5pf CH 50V	70-131177
				C742		6800pf W5R 50V	70-131208
				C908,911, 920		100pf SL 50V	70-132040
				C923,924, 925,926, 927		150pf SL 50V	70-131201
				<u>METAL CHIP RESISTORS</u>			
				R101,108, 124,131, 162,166, 407,704,715		1K 1/8 W	70-144019
				R102,104, 150,709, 734		8.2K 1/8 W	70-144028
				R103,154, 171		68 ohm 1/8 W	70-144008
				R106,136, 176,746, 747,909, 910,916, 917,920, 921,922, 923,928, 930,931, 932,933,		22K 1/8 W	70-144032

PARTS LIST

70-066/076

REF. NO.	USE	DESCRIPTION	PART NO.	REF. NO.	USE	DESCRIPTION	PART NO.
934,935, 938,939, 942,943, 944,945		22K 1/8 W	70-144032	R409,713, 904,946		6.8K 1/8 W	70-144027
R107		15K 1/8 W	70-144031	R702		5.6K 1/8 W	70-144026
R109,116, 129		1.5K 1/8 W	70-144029	R707		150K 1/8 W	70-144038
R110,401, 405,706, 111		470 ohm 1/8 W	70-144015	R710		1.2K 1/8 W	70-144020
R112,114, 126,703, 924		10K 1/8 W	70-144029	R716		150 ohm 1/8 W	70-144037
R113,133, 151,172, 177,735		3.3K 1/8 W	70-144023	R725,148		220 ohm 1/8 W	70-144013
R120,173		68K 1/8 W	70-144035	R728,902		1M ohm 1/8 W	70-144042
R123,127, 132,134, 161,408, 410,712		4.7K 1/8 W	70-144025	R738		82 ohm 1/8 W	70-144072
R128,714		2.2K 1/8 W	70-144067	R918,919, 936,937		47K 1/8 W	70-144034
R137,156, 175,719, 745,741		47 ohm 1/8 W	70-144006			<u>MISCELLANEOUS</u>	
R138,145, 168,174, 708,711, 724		680 ohm 1/8 W	70-144017			Shield VCO (Tx)	70-089088
R139,142, 720,722, 901,907, 912,925, 926,929		100K 1/8 W	70-144037			Insltr Mylr Flm	70-089091
R141,144, 146,403, 404,718, 721,739		33 ohm 1/8 W	70-144005			Shield Pre Amp	70-089089
R147,149		56 ohm 1/8 W	70-144007			Insltr Pre Amp	70-089090
R152,736		180 ohm 1/8 W	70-144012				
R153,155, 701,743, 744		100 ohm 1/8 W	70-144009				
R163,164, 167,169, 190,191, 726,742, 950		0 ohm	70-144001				
R406		33K 1/8 W	70-144033				

PARTS LIST

70-066/076

REF. NO.	USE	DESCRIPTION	PART NO.	REF. NO.	USE	DESCRIPTION	PART NO.
RECEIVER PCB				C202,205	B	9pf CH 50V	70-131181
RX 081				C203,211, 224		1pf CK 50V	70-131173
BOTTOM SIDE COMPONENTS				C207,209, 217,218, 219,225, 226,228, 230,245, 251,253, 262,267, 275,293, 294		1000pf W5R 50V	70-131205
<u>METAL CHIP RESISTORS</u>				C208,210	A	39pf CH 50V	70-131194
R201		220 ohm 1/8 W	70-144013	C208	B	47pf CH 50V	70-131196
R202,204, 268,283		100 ohm 1/8 W	70-144009	C210	B	22pf CH 50V	70-131188
R203,273		470 ohm 1/8 W	70-144015	C212	A	15pf CH 50V	70-131185
R205,250, 256,258				C212	B	10pf CH 50V	70-131182
292		47K 1/8 W	70-144034	C220,223	A	6pf CH 50V	70-131178
R206		680 ohm 1/8 W	70-144017	C220,223	B	5pf CH 50V	70-131177
R207,257, 274,287, 291,294		22K 1/8 W	70-144032	C221		18pf CH 50V	70-131186
R208,260		2.7K 1/8 W	70-144046	C222		.5pf CK 50V	70-131172
R209,217, 270,271, 272,281, 285,286, 297		4.7K 1/8 W	70-144025	C252,260, 265,269, 272,274, 276,281, 290,291		0.01uf W5R 50V	70-132032
R211,263, 279,298, 299		10K 1/8 W	70-144029	C254,255		33pf CH 50V	70-131192
R213,214, 215		0 ohm	70-144001	C258,250		10pf CH 50V	70-131182
R251,259, 293		220K 1/8 W	70-144039	C259,261		.022uf 50V	70-132033
R252,261, 275		3.3K 1/8 W	70-144023	C263		.047uf 50V	70-132034
R253,262, 290		82K, 1/8 W	70-144036	C283		4700pf W5R 50V	70-131207
R254,255		1.5K 1/8 W	70-144021	<u>MISCELLANEOUS</u>			
R269		1K 1/8 W	70-144019	Shield Rx		70-089085	
R276,280		15K 1/8 W	70-144031	Insulator Rx		70-089086	
R277,288		1M ohm 1/8 W	70-144042				
R278,289		470K 1/8 W	70-144041				
R282,295, 296		6.8K 1/8 W	70-144027				
<u>CERAMIC CHIP CAPACITORS</u>							
C201,206		7pf CH 50V	70-131179				
C213	A	7pf CH 50V	70-131179				
C213	B	6pf CH 50V	70-131178				
C202,205	A	15pf CH 50V	70-131185				

PARTS LIST

70-066/076

REF. NO.	USE	DESCRIPTION	PART NO.	REF. NO.	USE	DESCRIPTION	PART NO.
RECEIVER PCB							
RX 081							
TOPSIDE COMPONENTS							
		<u>COILS & TRANSFORMERS</u>					
L201,202, 204,205		Coil, RX 5.5T	70-090136	D204		1S5106	70-085043
L203		Coil, Rx	70-090121	D251,252, 253,254, 259,260		1S2075K	70-085001
L208		Trnsfmr 21.4 MHz	70-090109	D262		U05C	70-085048
L209		Trnsfmr Loc. Osc.	70-090142	D263	TM	1S2075K	70-085001
L210		Trnsfmr Loc. Osc.	70-090143	<u>ELECTROLYTIC CAPACITORS</u>			
L251		Trnsfmr 21.4 MHz	70-090113	C227,277		10uf, 50V	70-135059
L252		Coil Quad	70-090112	C273,285		100uf, 10V	70-135053
L253		Coil, Choke	70-090125	C287		470uf, 16V	70-135062
L254,255		Coil, Choke	70-090124	C289,292		220uf, 25V	70-135063
L256		Coil, DC Filter	70-090126	C295		100uf, 25V	70-135056
		<u>JACKS, PLUGS & SOCKETS</u>		C299		470uf, 25V	70-135082
P251(CM202)		Plug, 3 Pin	70-159091	<u>TANTALUM CAPACITORS</u>			
P358		Plug, 8 Pin	70-034053	C257		0.1uf, 35V	70-138086
J351		Jack, 5 Pin	70-159093	C268		1uf, 35V	70-138087
J352		Jack, 6 Pin	70-159094	C266,278, 279		2.2uf, 16V	70-138103
J353		Jack, 7 Pin	70-159095	C280,282		.22uf, 35V	70-138102
J354		Jack, 12 Pin	70-159097	C286		47uf, 25V	70-135055
J355,356		Jack, Coax	70-159089	<u>MYLAR CAPACITORS</u>			
J357,358		Jack, 8 Pin	70-159096	C256,288		0.1uf, 50V	70-137039
		<u>INTEGRATED CIRCUITS</u>		<u>RESISTORS</u>			
IC251		MC3357P	70-076138	R293		220K metal, 1/8 W	70-144039
IC252		MC3712	70-076085	<u>MISCELLANEOUS</u>			
		<u>TRANSISTORS</u>		X251		X'tal 20.945 MHz	70-128021
Q201,202		2SK125	70-080089	FL251		Crystal Filter	70-179017
Q203		2SC1906	70-080086	FL252		Fltr. CFU -455E2	70-179019
Q204		2SA673C	70-080079	FL253		Fltr. CFU -455D2	70-179018
Q205,252, 255,256, 257,260, 261		2SC458C	70-080082	RV251,252		Trim Pot, 10K	70-144045
Q251		2SC535B	70-080095	K201	TM	Relay	70-105009
Q259		2SK117BL	70-080088	C296		1000pf, 500V	70-132043
				CL201,202, 204,205, 206		Coil Case, 15F Heatsink IC252 RX PCB RX-081	70-090115 70-089076 70-070086

PARTS LIST

70-066/076

REF. NO.	USE	DESCRIPTION	PART NO.	REF. NO.	USE	DESCRIPTION	PART NO.
TRANSMIT POWER AMPLIFIER							
PA 081							
BOTTOM SIDE COMPONENTS							
<u>METAL CHIP RESISTORS</u>							
R501		0 ohm	70-144001				
R503		3.3K 1/8 W	70-144023				
R504		150 ohm 1/8 W	70-144011				
R505	A	330 ohm 1/8 W	70-144065				
R505	B	470 ohm 1/8 W	70-144015				
R508		100 ohm 1/8 W	70-144009				
R509		56 ohm 1/8 W	70-144007				
R510	A	220 ohm 1/8 W	70-144013				
R510	B	330 ohm 1/8 W	70-144065				
R513		220 ohm 1/8 W	70-144013				
R514		47K 1/8 W	70-144034				
R517		3.9K 1/8 W	70-144024				
R518		390 ohm 1/8 W	70-144066				
R519,520		47 ohm 1/8 W	70-144006				
R521		470 ohm 1/8 W	70-144015				
R522	A	10 ohm 1/8 W	70-144068				
R522	B	NONE	NONE				
<u>CERAMIC CHIP CAPACITORS</u>							
C501	A	.01uf, W5R 50V	70-132032				
C501	B	1000pf, W5R 50V	70-131205				
C502	A	NONE	NONE				
C502	B	68pf, CH 50V	70-131198				
C503,504, 541,542, 509,523, 527,528, 538,539		0.01uf W5R 50V	70-132032				
C505	A	27pf CH 50V	70-131190				
C505	B	15pf CH 50V	70-131185				
C506	A	33pf CH 50V	70-131192				
C506	B	10pf CH 50V	70-131182				
C508	A	47pf CH 50V	70-131196				
C508	B	22pf CH 50V	70-131188				
C511		68pf CH 50V	70-131198				
C512	A	33pf CH 50V	70-131192				
C512	B	NONE	NONE				
C513	A	470pf CH 50V	70-132053				
C513	B	330pf CH 50V	70-132052				
C526	A	33pf CH 50V	70-131192				
C526	B	27pf CH 50V	70-131190				
				<u>MICA CHIP CAPACITORS</u>			
				C519	A	220pf 100V	70-138112
				C519	B	150pf 100V	70-138111
				C521	A	27pf 500V	70-138097
				C521	B	22pf 500V	70-138107
				C522	A	39pf 500V	70-138099
				C522	B	27pf 500V	70-138097
				C525,531		33pf 500V	70-138098
				C532,534	A	82pf 500V	70-138109
				C532,534	B	75pf 500V	70-138108
				C533	A	91pf 500V	70-138110
				C533	B	82pf 500V	70-138109
				C535	A	33pf 500V	70-138098
				C535	B	27pf 500V	70-138097
				<u>TOPSIDE COMPONENTS</u>			
				<u>RESISTORS</u>			
				R506,507		68 ohm 1/4 W	70-145008
				R512		220 ohm 1/4 W	70-145009
				<u>VARIABLE CAPACITORS</u>			
				CV501,502		Var. Cap. 80pf	70-123030
				CV503		Var. Cap. 60pf	70-123031
				<u>VARIABLE RESISTORS</u>			
				RV502		Var. Res. 1K, mtl	70-144044
				<u>TRANSISTORS</u>			
				Q501		2SC2538	70-080108
				Q502		2SC1971	70-080054
				Q503		2SC2097	70-080109
				Q504		2SB834Y	70-080081
				Q505,506		2SC458C	70-080082
				<u>DIODES</u>			
				D501		UM9401	70-085056
				D503		MI407	70-085047
				D504		1SS106	70-085043
				D505		1S2075K	70-085001
				<u>COILS</u>			
				L501		Coil, RF Cplg	70-090099

PARTS LIST

70-066/076

REF. NO.	USE	DESCRIPTION	PART NO.
<u>TOPSIDE COMPONENTS CONT.</u>			
<u>COILS CONT.</u>			
L508		Coil, RF	70-090374
L502	A	Coil, RF Choke	70-090131
L502	B	Coil, RF Choke	70-090130
L503		Coil, RF Cplg.	70-090098
L504		Coil, RF Choke	70-090130
L505		Ferrite Bead	70-090122
L506	A	Coil, RF Choke	70-090099
L506	B	Coil, RF Choke	70-090097
L507		Coil, RF Choke	70-090097
L510		Coil, RF Choke	70-090100
L511	A	Coil, RF Choke	70-090098
L511	B	Coil, RF Choke	70-090097
L512		Coil, T Matching	70-090132
L513		Coil, T Matching	70-090133
L514		Coil, RF Choke	70-090128
L515,516,519 517,518		Coil, RF Cplg.	70-090134
<u>ELECTROLYTIC CAPACITOR</u>			
C507,518		10uf, 50V	70-135059
<u>CERAMIC DISC CAPACITOR</u>			
C517,524		.01uf 50V	70-132041
<u>JACKS</u>			
J371,372		Connector,Jack V	70-159089
J392		Antenna Connect	70-159090

PARTS LIST

70-066/076

REF. NO.	USE	DESCRIPTION	PART NO.	REF. NO.	USE	DESCRIPTION	PART NO.
<u>EPROM PCB</u>				<u>TRANSISTORS</u>			
Z 273				Q301	UD	2SC458C	70-080082
<u>CAPACITORS</u>				Q302	UD	2SB649C	70-080080
C951		0.01 uf 50V	70-132032	<u>DIODES</u>			
C952 - 957		47 pf 50V	70-131200	D301	UD	GL-6N202	70-085051
<u>INTEGRATED CIRCUITS</u>				D302, 303,			
IC 951		uPD 2716D	70-076089	304	UD	SLP436B	70-085052
IC 952		HD 14174BP	70-076081	D305	UD	SLP530D	70-085053
<u>CONNECTORS</u>				CDS301	UD	CDS CELL	70-085054
J901		Jack, 11 Pin	70-159101	<u>PC BOARD</u>			
J902		Jack, 10 Pin	70-159102	CX 03A	UD	PCB	70-070081
J903		Jack, 8 Pin	70-159099	<u>CABLE ASSEMBLY</u>			
<u>PC BOARD</u>				J1	UD	Jack 13 Pin	70-034063
Z273		PCB	70-070070	CA356	UD	Cable J384, J385	70-034058
<u>DISPLAY PCB</u>				CA357	UD	Cable W/J381	70-034057
CX - 03				CA359	UD	Cable W/J383	70-034051
<u>SWITCHES</u>				CA360	UD	Cable W/J386	70-034050
S301	UD	Scan	70-180012	<u>MISCELLANEOUS</u>			
S302	UD	PRI	70-180012	LED Holder			
S303	UD	MON	70-180012	70-159113			
<u>RESISTORS:</u>				<u>CONTROL PCB</u>			
R332	UD	270 ohm 1/8W	70-144047	CX - 04			
R311-324	UD	470 ohm 1/8W	70-145004	<u>SWITCHES</u>			
R310, 325,				S 304	UD	SW, Rotary	70-180013
328-330	UD	560 ohm 1/8W	70-145003	<u>CONTROLS</u>			
R331	UD	1.2K ohm 1/8W	70-145007	RV 301	UD	Squelch	70-164031
R326	UD	3.3K ohm 1/8W	70-145005	RV302	UD	Volume	70-164026
R327	UD	12K ohm 1/8W	70-145006	<u>RESISTORS</u>			
R303-308	UD	22K ohm 1/8W	70-145002	R333	UD	1W 4.7 ohm	70-144043
R301, 302,				<u>CAPACITORS</u>			
309	UD	220K ohm 1/8W	70-145001	C301, 302	UD	10uf 50V	70-135059
<u>INTEGRATED CIRCUITS</u>				<u>CONTROL PCB</u>			
IC301.302UD		HD 14511BP	70-076082	CX - 04			

PARTS LIST

70-066/07

REF. NO.	USE	DESCRIPTION	PART NO.	REF. NO.	USE	DESCRIPTION	PART NO.
<u>CONTROL PCB</u>				<u>DISPLAY DRIVER PCB</u>			
CX - 04 CONTINUED				CX - 06			
<u>INTEGRATED CIRCUITS</u>				<u>RESISTORS</u>			
IC303	UD	uPC 78084	70-076088	R312,313, 314,315	TM	470 ohm 1/8 W	70-145004
<u>CONNECTORS</u>				R307,308	TM	22K ohm 1/8 W	70-145002
J382	UD	Jack, 7 Pin	70-159095	R301,302, 309	TM	220K ohm 1/8 W	70-145001
<u>PCB</u>				<u>INTEGRATED CIRCUITS</u>			
CX - 04A	UD	PCB	70-070082	IC301,302	TM	HD14511BP	70-076082
<u>CONTROL/INTERFACE PCB</u>				<u>PC BOARD</u>			
CX - 05				CX-06A	TM	PCB	70-070085
<u>SWITCHES</u>				<u>DISPLAY PCB</u>			
S304	TM	SW, Rotary	70-180014	CX - 07			
<u>CONTROLS</u>				<u>SWITCHES</u>			
RV 301	TM	Squelch Control	70-164030	S301,302, 303	TM	Scan,Pri,Mon	70-180012
RV 302	TM	Volume Control	70-164027	<u>RESISTORS</u>			
<u>RESISTORS</u>				R311,316- 324	TM	470 ohm 1/8 W	70-145004
R332	TM	270 ohm 1/8 W	70-144047	R310,325, 328-330	TM	560 ohm 1/8 W	70-145003
R303-306	TM	22K ohm 1/8 W	70-145002	R331	TM	1.2K ohm 1/8 W	70-145007
<u>CAPACITORS</u>				R326	TM	3.3K ohm 1/8 W	70-145005
C301,302	TM	10uF 50V	70-135059	R327	TM	12K ohm 1/8 W	70-145006
<u>INTEGRATED CIRCUITS</u>				<u>TRANSISTORS</u>			
IC303	TM	uPC7808H	70-076088	Q301	TM	2SC458C	70-080082
<u>CONNECTORS</u>				Q302	TM	2SB649C	70-080080
J396	TM	Jack 34 Pin	70-159107	<u>DIODES</u>			
<u>PCB</u>				D301	TM	GL-6N202	70-085051
CX -5A	TM	PCB	70-070084	D302,303, 304	TM	SLP436B	70-085052
				D305	TM	SLP530D	70-085053

PARTS LIST

70-066/076

REF. NO.	USE	DESCRIPTION	PART NO.
<u>DISPLAY PCB</u>			
CX - 07 CONTINUED			
		<u>CONNECTORS</u>	
J301	TM	Jack, 16 Pin	70-159105
		<u>PC BOARD</u>	
CX-07A	TM	PCB	70-070086
		<u>MISCELLANEOUS</u>	
		LED Holder	70-159113
<u>CONTROL CABLE INTERFACE PCB</u>			
CX - 08			
		<u>RESISTORS</u>	
R351	TM	4.7 ohm 1/2 W	70-145052
		<u>CAPACITORS</u>	
C351	TM	220uf 25V	70-131224
		<u>TRANSFORMER</u>	
T301	TM	8392159	70-090144
		<u>CONNECTORS</u>	
J325	TM	Jack, 34 Pin	70-159106
		<u>PC BOARD</u>	
CX-08A	TM	PCB	70-070076
		<u>CABLE ASSEMBLY</u>	
CA357	TM	Cable W/J323	70-034069

