MIDLAND SYN-TECH™

UHF

SERVICE MANUAL

70-530

70-630

MIDLAND INTERNATIONAL
1690 North Topping Avenue
Kansas City, Missouri 64120

70-406512
09 - 530630 - SM - 3/83-1M

The Midland Models 70-530A/B/C/D/E and 70-630A/B/C/D/E are solid state UHF Land Mobile transceivers designed to operate in the 406-430 MHz band (70-530A/630A), 430-450 MHz band (70-530E/630E), 450-470 MHz band (70-530B/630B), 470-494 MHz band (70-530C/630C), and 494-512 MHz band (70-530D/630D). Providing up to 36 channel capability and field programmable/eraseable/reprogrammable 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.

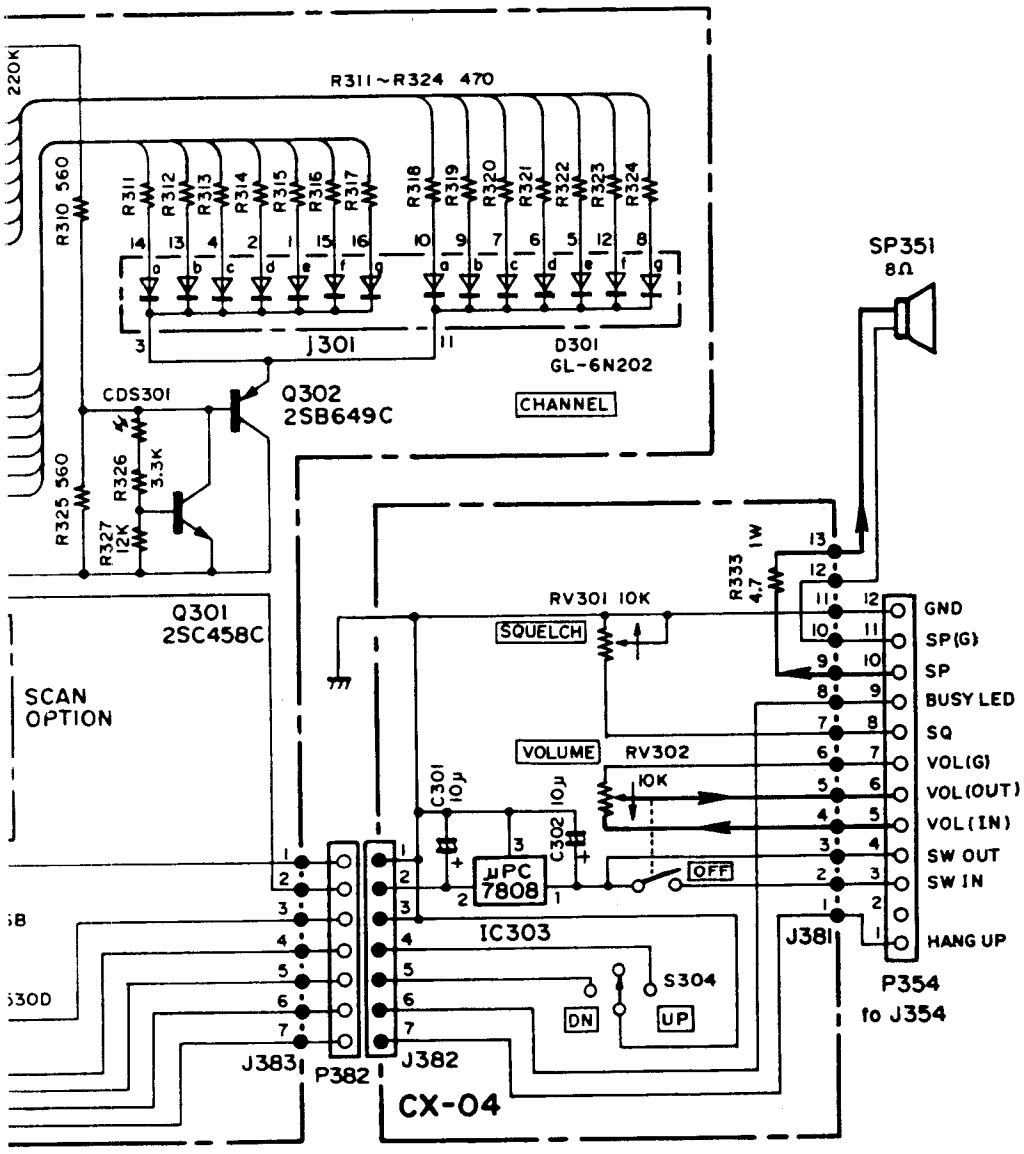
TABLE OF CONTENTS

APPENDIX - OPTION INFORMATION

	MODEL NO.
CTCSS Board	70-2102
Scan Kit	70-2141
Scan Kit	70-2142
20 KHz Channel Spacing Kit	70-2131
2.0 PPM Oscillator Kit	70-2126
2.5 PPM Oscillator Kit	70-2127
Alteration of Scan Speed, Resume Delay & Auto Increment/Decrement	
Conversion to Tone/Carrier Scan Operation	
Conversion to Tone Scan Operation	
Tone Enabled Transmit/Receive	
80 Channel Modification Kit	70-2181
Base Station Mic Kit	70-K33

GENERAL SPECIFICATIONS

Nominal operating voltage:	13.6V DC (negative ground) (12.2-16V DC range)
Temperature range:	-30°C to +60°C
Antenna impedance:	50 ohms, unbalanced
Microphone:	Dynamic element, with amplifier
Speaker - internal: 70-530A,B,C,D,E	8 ohms
external:	4 ohms
Frequency control:	Frequency synthesized with EPROM Programming
Frequencies of operation:	406-430 MHz (70-530A/630A) 430-450 MHz (70-530E/630E) 450-470 MHz (70-530B/630B) 470-494 MHz (70-530C/630C) 494-512 MHz (70-530D/630D)
Receiver performance without adjstmt.:	5 MHz
Transmitter performance without adjstmt:	10 MHz
Maximum transmit-to-receive frequency spearation:	15 MHz
Frequency tolerance and stability:	±5 PPM Tx and Rx (Standard) ±2.5 or 2.0 PPM Tx and Rx (Optional)
Duty cycle:	Intermittent EIA RS 152-B (1 minute Tx, 4 minutes Rx)
High humidity	95% @ 50°C per EIA RS-152-B, sec. 13
Vibration stability:	EIA RS-152-B, sec. 14
Shock stability:	EIA RS-152-B, sec. 15
Channel capability:	Up to 36 channel transmit/receive
Current drain - Standby:	0.35 A DC
Receive:	1.00 A DC
Transmit:	8.50 A DC
Dimensions (HWD):	
Main chassis: (70-530/630)	65 x 185 x 280mm (2½" x 7¼" x 11")
Control head: (70-630)	50 x 88 x 80mm (2" x 3½" x 3 3/16")
Speaker: (70-630)	100 x 100 x 77mm (4" x 4" x 3")
Weight:	
Main chassis: (70-530/630)	3.0 kg (6.6 lb.)
Control Head: (70-630)	0.8 kg (1.8 lb.)
Speaker: (70-630)	0.71 kg (1.58 lb.)


220K
R311~R324 470
R310 560
R311
R312
R313
R314
R315
R316
R317
R318
R319
R320
R321
R322
R323
R324
J301
D301
GL-6N202
CHANNEL
SP351
8Ω
CDS301
Q302
2SB649C
R326
3.3K
R325 560
R327
12K
Q301
2SC458C
SCAN
OPTION
RV301 10K
SQUELCH
R333
4.7 1W
VOLUME
RV302
10K
C301
10μ
C302
10μ
μPC
7808
OFF
IC303
S304
DN
UP
J383
P382
J382
CX-04
J381
P354
to J354
GND
SP(G)
SP
BUSY LED
SQ
VOL(G)
VOL(OUT)
VOL(IN)
SW OUT
SW IN
HANG UP

Refer to EIA RS-204-C and DOC RSS-119 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	
Modulation acceptance bandwidth:	±7.0KHz min @ 20/25/30 KHz ±4.5KHz min @ 12.5 KHz	
Adjacent channel two signal selectivity and desensitization:	90dB @ ±25KHz	
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 @ 4 ohms (External)	
Audio frequency response:	Per EIA and DOC Specifications	
Hum and noise:	Unsquelched 40dB Squelched 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:	3/10 channels/seconds
Channel capacity:	32 (PRI) 32 (SCAN)
Scan detection:	Carrier or tone
Scan resume delay:	2.5/5 seconds

TRANSMITTER SPECIFICATIONS

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

Carrier power output:	30 minimum, adjustable 15-30W
Modulation system:	PM
Audio frequency response:	Per EIA and DOC RSS-119 Specifications
Audio frequency harmonic distortion:	3% @ 1000Hz for ±3.0KHz deviation
System deviation:	±5KHz, max
Modulation limiting:	Instantaneous peak clipping with low pass audio filter
Hum and noise:	50dB
Occupied bandwidth:	Less than 25uW adjacent channel power, ±30KHz (-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 ±3dB/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.

CTCSS SPECIFICATIONS
(Optional, not supplied with unit)

Code Frequencies:	All EIA Standard from 67Hz to 241.8Hz
Modulation limits:	500 - 1000Hz
Decode sensitivity:	Less than 5dB SINAD
Receiver response time:	200ms max
Encoder Response time:	50ms max
Transmitter tone distortion:	5% max
Transmitter intermodulation distortion:	10%

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

E/PROM MODULE LOCATION AND REMOVAL

The operating frequencies and optional functions for the Midland 70-530/630 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

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 PROGRAMMER 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.

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 70-530/630 will accept only Band 400, which is entered as KEY CODE 3. Band 400 corresponds to a 403-520 MHz frequency range, 21.4 MHz RX IF, 19.2 MHz TX IF, 12.5 KHz reference frequency and low side local oscillator injection.

The 70-530/630 can be converted to accept band selection codes 40A, 40B, or 40C as follows:

1. Band 40A, KEY CODE 8 differs from Band 400 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 40A should be programmed only if the appropriate High Side Injection Kit 70-2166/-2170 has been installed in the transceiver. If this kit has been installed, Band 400 cannot be used.

2. Band 40B, KEY CODE B, utilizes a 20.48 MHz TX IF, 10 KHz reference frequency and low side local oscillator injection. This band selection allows the programming of "splinter" frequencies at 10, 20 or 30 KHz channel spacings. The 70-2131 20 KHz Channel Spacing Kit must be added to the transceiver to allow operation on these frequencies. Only those frequencies which are evenly divisible by 10 KHz may be programmed in Band 40B.

3. Band 40C, KEY CODE D, allows the programming of "splinter" frequencies with high side local oscillator injection instead of low side. To utilize this band, both the 70-2131 20 KHz Channel Spacing Kit and the appropriate 70-2166/-2170 High Side Injection Kit must be installed in the transceiver. Other band selection codes may not be used after this conversion.

CHANNEL AND AUXILIARY DATA PROGRAMMING

When the band select key code has been entered, channel and auxiliary data may be programmed as outlined in the 70-1000 Operator's 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 power-up 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 unit turn-off will be displayed at turn-on.

SCAN PROGRAMMING

Up to 32 channels can be programmed in each scan mode, A (PRI) and B (SCAN). This allows scanning of separate or combined groups under control of the user. It is recommended that channels be programmed in both scan groups A and B. If one scan group is left unprogrammed, engaging the corresponding scan pushbutton on the radio may result in a lockup condition preventing manual channel change. Normal operation can be restored by cycling the radio power switch off and on, but elimination of the possibility of this condition is recommended by programming at least one channel in each scan group.

The standard 3 channels/second scan speed and 5 second scan resume delay can be altered by appropriate programming inputs. Refer to the appendix of this manual for details.

Note that the standard radio is configured for carrier scan only. Refer to the appendix for details of conversion to tone or tone/carrier scan operation.

BUSY CHANNEL LOCKOUT AND TIME OUT TIMER PROGRAMMING

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 180 seconds as detailed in the 70-1000 manual.

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. Note that BCLO and TOT functions are not included in the printout and must be checked manually.

Prepare the E/PROM module for the WRITE operation 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.

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 12.8 MHz and stability is maintained by use of a posistor crystal heater. This 12.8 MHz signal is divided by 1024 in IC 701 to give the 12.5KHz 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 -19.2 MHz in transmit. The VCO frequency is divided by 64/65 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 12.5 KHz reference frequency.

Modulator and Transmit PLL

The 12.8 MHz oscillator output is also fed to IC 702 where it is divided by 8 to give 1.6 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 -19.2 MHz signal from the Main PLL loop to yield 19.2 MHz. This frequency is divided by 12 at IC 106 to give 1.6 MHz and compared with the 1.6 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-Q113 and fed to the PA section, where it is amplified to rated output. A sample of the RF output is detected by D503 and coupled to the differential amplifier Q506/Q507. The output of Q506 controls the conduction of Q504 which in turn controls the gain of the pre-driver Q113. 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 L512-514, L519,L520 and C531-C534. The PIN diode switch D501 is biased to a low resistance state during transmit and a high impedance condition during receive.

Receiver RF/IF/Detector

The receiver front end consists of filtering by L201-L202 and RF amplification by Q201 and Q202. After further filtering By L203-L206 the RF signal is mixed at the FET mixer Q203 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.

ManualChannel 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, EPROM 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 8 VDC to the transmitter and disabling the receive 8 VDC output. The microcomputer then outputs EPROM address data corresponding 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 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.

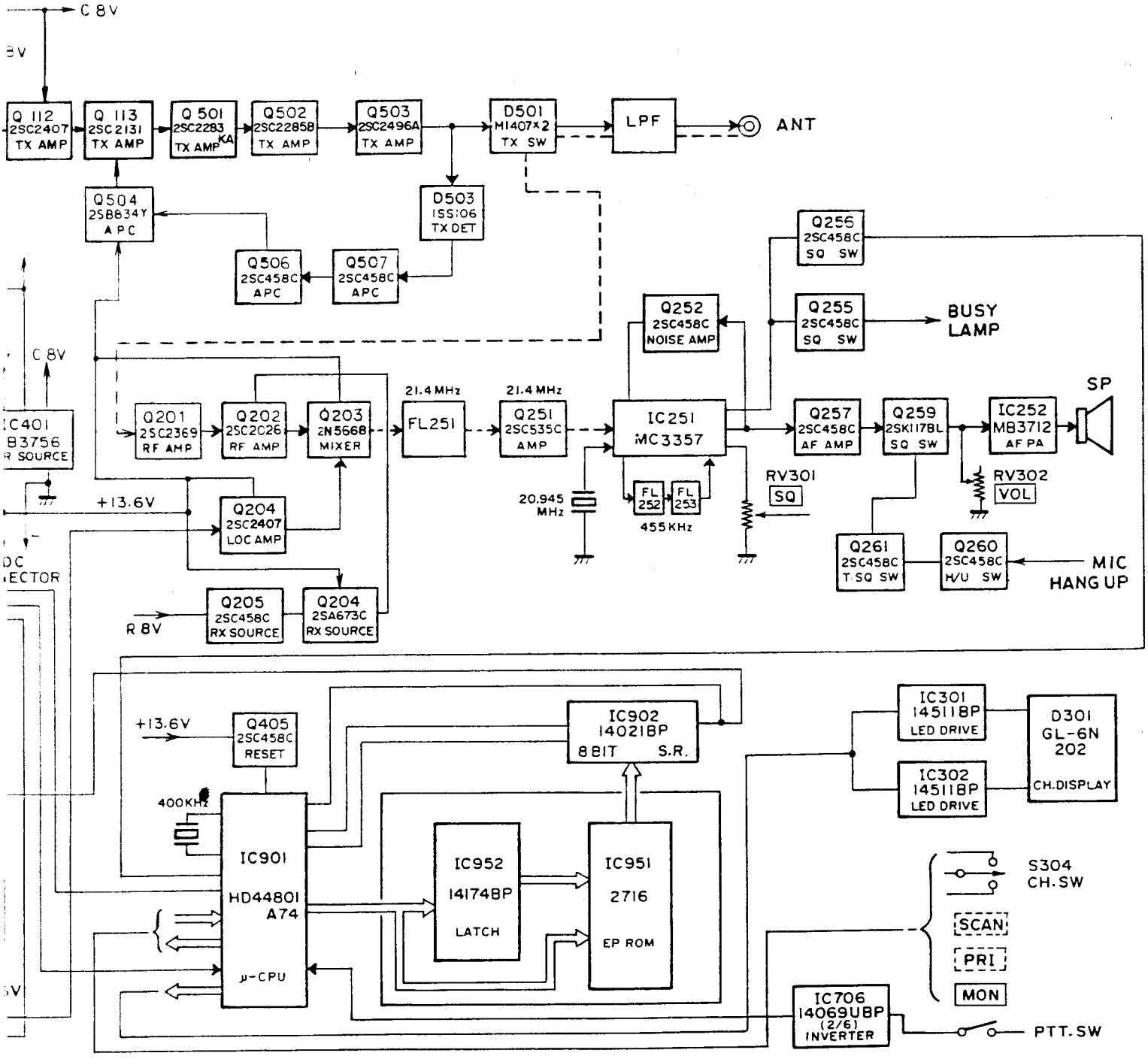
Power Supply

The 13.6 VDC input is filtered by L256 and related components and switched by K201 (70-630) or the unit on-off switch (70-530). This filtered 13.6 VDC is supplied directly to the transmit PA driver and final stages and also to pin 2 of IC 401, the main voltage regulator. IC 401 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 (70-530 control panel and 70-630 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.

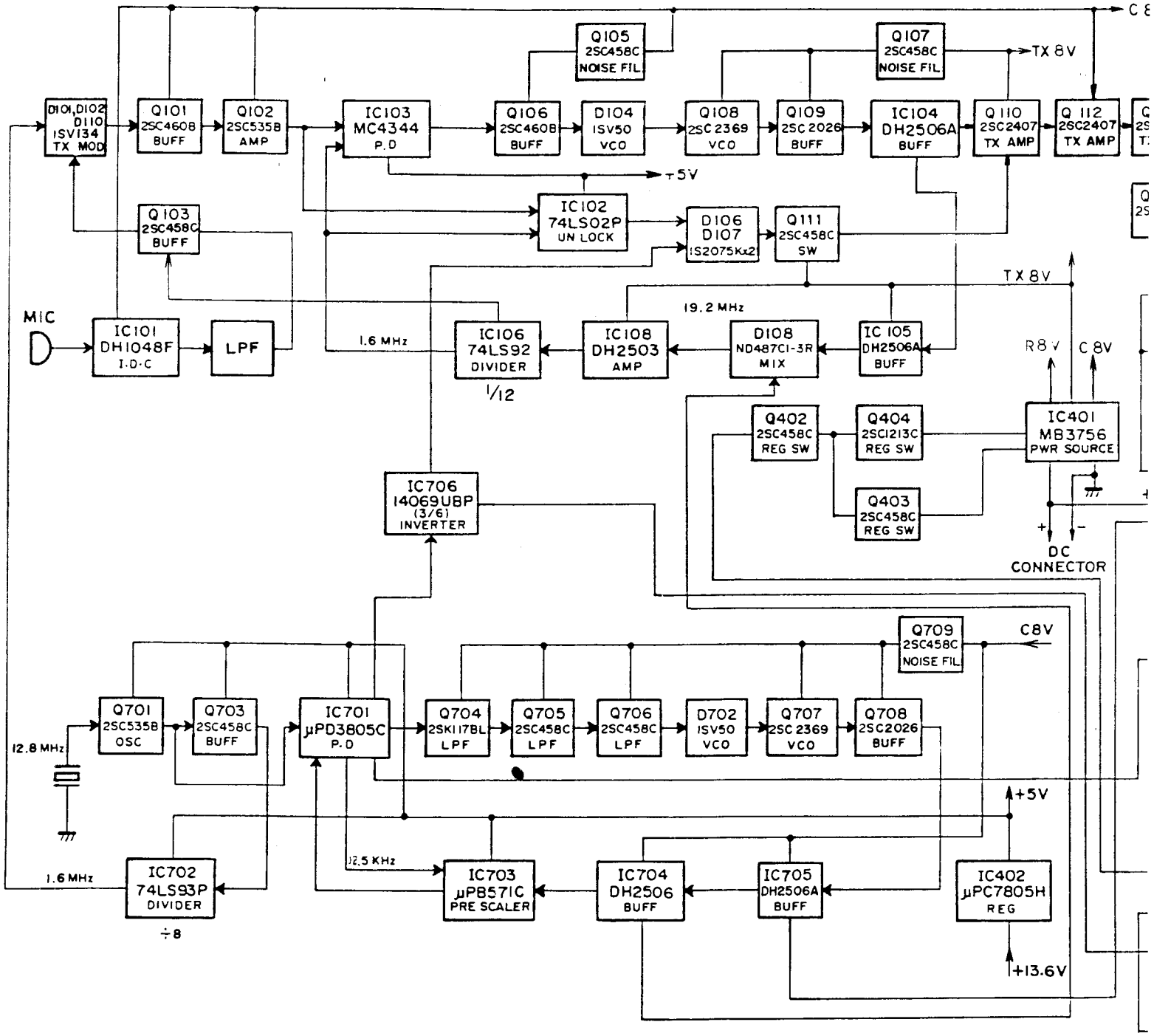
CTCSS Operation (Optional Accessory)

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.


C 8V
Q 112 2SC2407 TX AMP
Q 113 2SC2131 TX AMP
Q 501 2SC2283 TX AMP KA
Q502 2SC2285B TX AMP
Q503 2SC2496A TX AMP
D501 MI1407x2 TX SW
LPF
ANT
Q504 2SB834Y APC
D503 ISS106 TX DET
Q506 2SC458C APC
Q507 2SC458C APC
Q256 2SC458C SQ SW
Q252 2SC458C NOISE AMP
Q255 2SC458C SQ SW
BUSY LAMP
C 8V
Q201 2SC2369 RF AMP
Q202 2SC2026 RF AMP
Q203 2N5668 MIXER
21.4MHz
FL251
21.4MHz
Q251 2SC535C AMP
IC251 MC3357
Q257 2SC458C AF AMP
Q259 2SK117BL SQ SW
IC252 MB3712 AF PA
SP
20.945 MHz
FL 252
FL 253
455KHz
RV301 SQ
RV302 VOL
+13.6V
Q204 2SC2407 LOC AMP
Q261 2SC458C T.SQ SW
Q260 2SC458C H/U SW
MIC HANG UP
R 8V
Q205 2SC458C RX SOURCE
Q204 2SA673C RX SOURCE
+13.6V
Q405 2SC458C RESET
400KHz
IC902 14021BP 8BIT S.R.
IC901 HD44801 A74 μ-CPU
IC952 141748P LATCH
IC951 2716 EP ROM
IC301 145118P LED DRIVE
IC302 145118P LED DRIVE
D301 GL-6N 202 CH.DISPLAY
S304 CH.SW
SCAN
PRI
MON
IC706 14069UBP (2/6) INVERTER
PTT.SW

BLOCK DIAGRAM

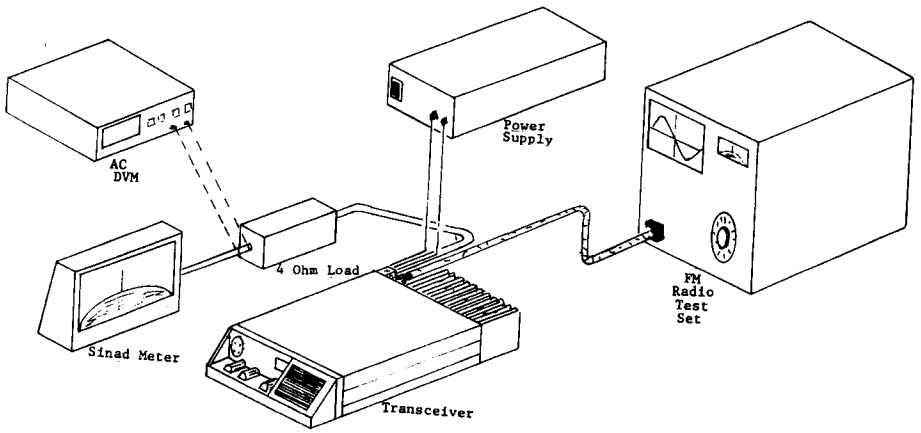


SUGGESTED TEST INSTRUMENTS

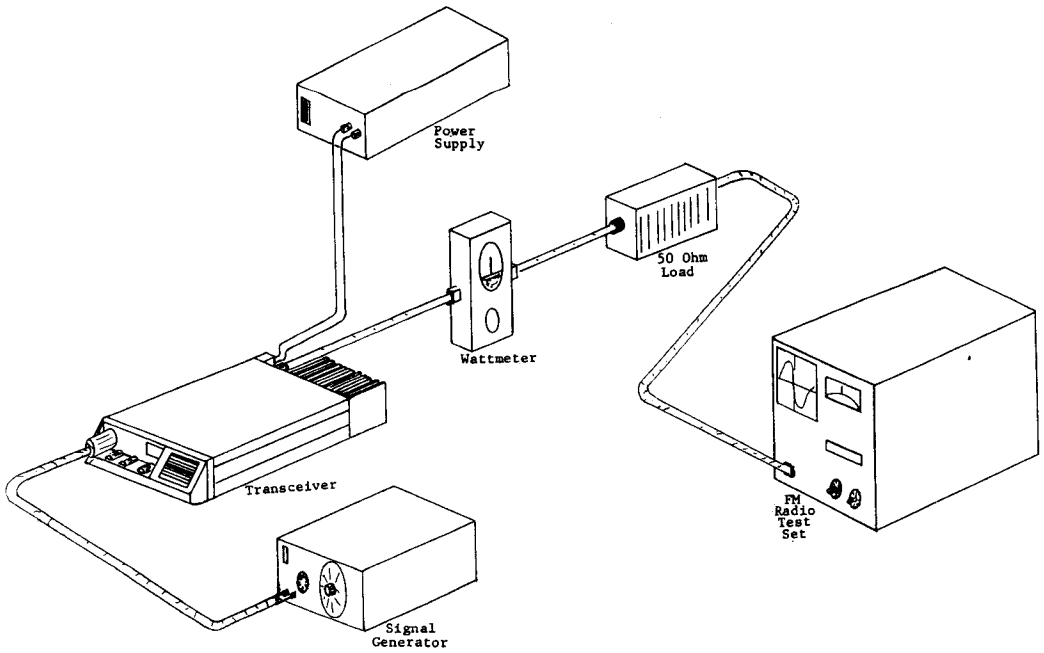
TEST INSTRUMENT	REQUIRED SPECIFICATIONS	INSTRUMENT TYPE
DC Power Supply	13.8 VDC 10 amps	Power/Mate BPA-20F
Watt Meter	406-512 MHz	Bird Model 43 with 50E Element and 100 watt, 50 ohm load
Digital Multimeter	AC 100 mv - 10v DC 100 mv - 100v	B-K 2810
AC Voltmeter	10mv - 10v	Heath SM-5238
Speaker Load	4 ohm speaker and resistive load (switchable)	Shop Fabricated
RF Signal Generator	406-512 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 406-512 MHz Frequency tolerance of +/- .00002%	Cushman CE-31A or Heath SM-4120
Signal Generator	0-10 KHz Sine Wave 0-5V	Heath SG-5218
LMR Test Set	- - - - - - - - - - - - - - - - - -	Midland 70-E10
Sinad Meter	- - - - - - - - - - - - - - - - - -	Helper Instruments Sinadder

Fold Out →

RECEIVER TEST SET-UP



TRANSMITTER TEST SET-UP



Preliminary:

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 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 4.5 VDC at TP701. If the highest programmed frequency is a receive frequency, adjust L702 for 4.0VDC 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 maximum indication.

Power Amplifier Alignment

5. Adjust RV502 (PA) maximum clockwise and adjust CV501, CV502, CV503 and CV 504 for maximum RF output power. NOTE: A non-metallic tipped tuning tool must be used when aligning CV502 and CV503. Readjust RV502 for 30 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, L102 and L105 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 and L118 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 CV202 and CV203 for a maximum indication.

RF-IF Alignment

2. Connect an on-channel signal generator to the antenna connector. Adjust L201 and L202, L204, L205 and L206 for maximum indication at CM202 Pin 2 (position 3).

3. Adjust L208 and L251 for minimum audio distortion.

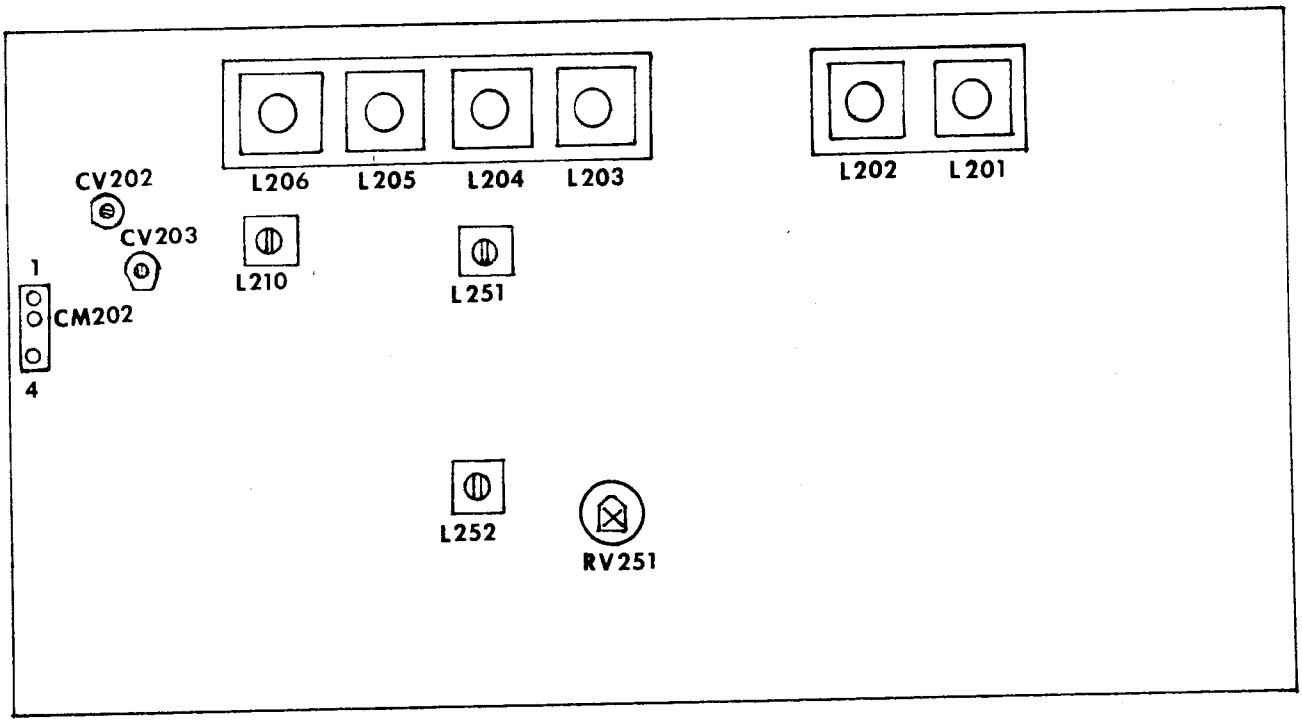
Quadrature Coil Alignment

4. Adjust L252 for maximum audio output.

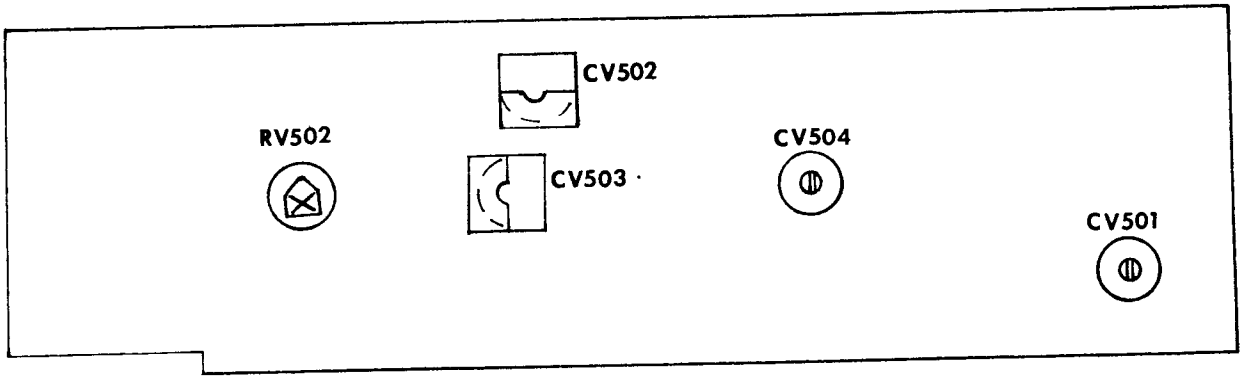
Tight Squelch Adjustment

5. Adjust RV251 for the desired tight squelch sensitivity.

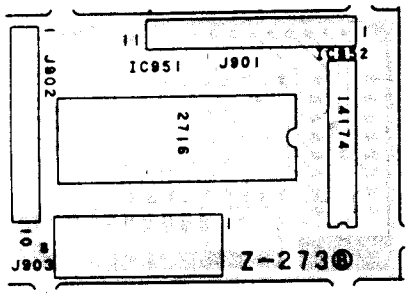
RECEIVER ALIGNMENT POINTS



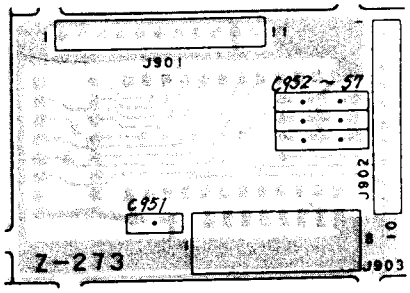
PA BOARD ALIGNMENT POINTS



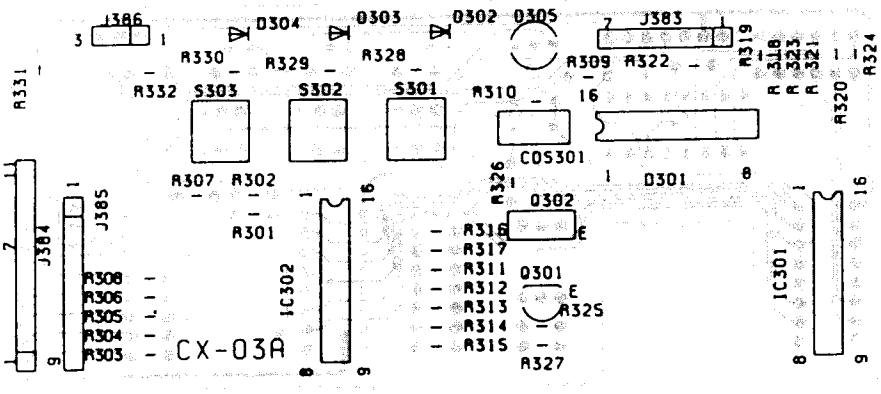
70-530/630
E/PROM MODULE PCB (TOP VIEW) (Z-273)



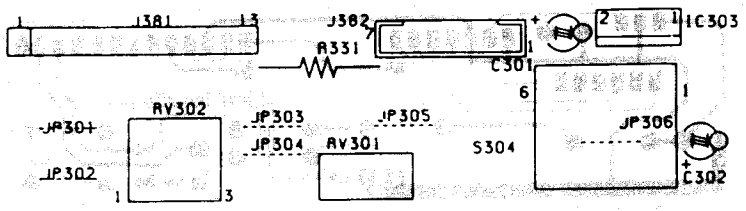
70-530/630
E/PROM MODULE PCB (BOTTOM VIEW) (Z-273)



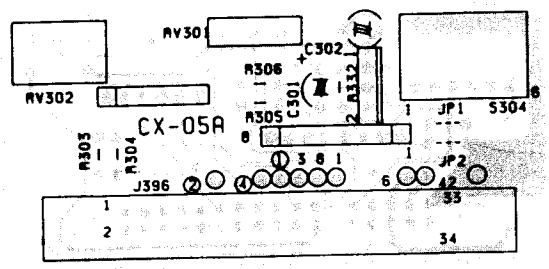
70-530 DISPLAY PCB (CX-03)



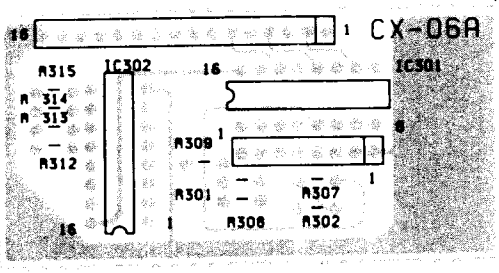
70-530 CONTROL PCB (CX-04)



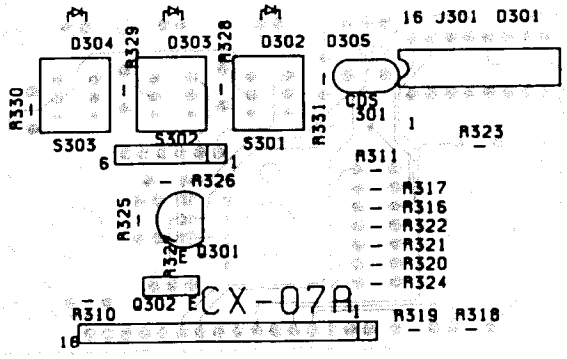
70-630 CONTROL INTERFACE PCB (CX-05)



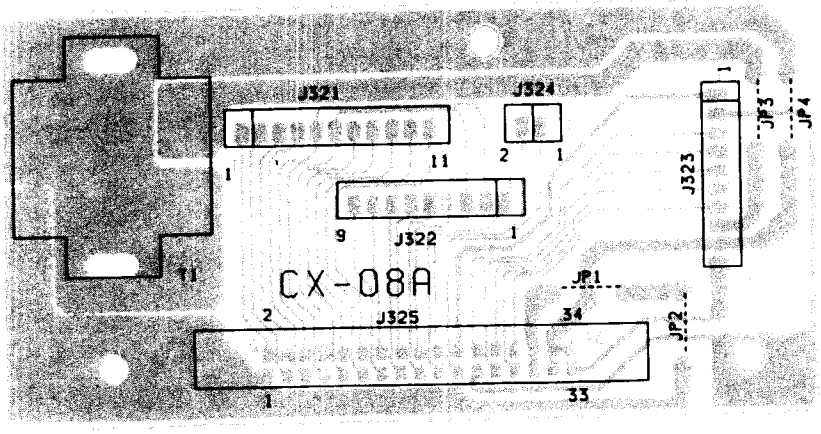
70-630 DISPLAY DRIVER PCB (CX-06)



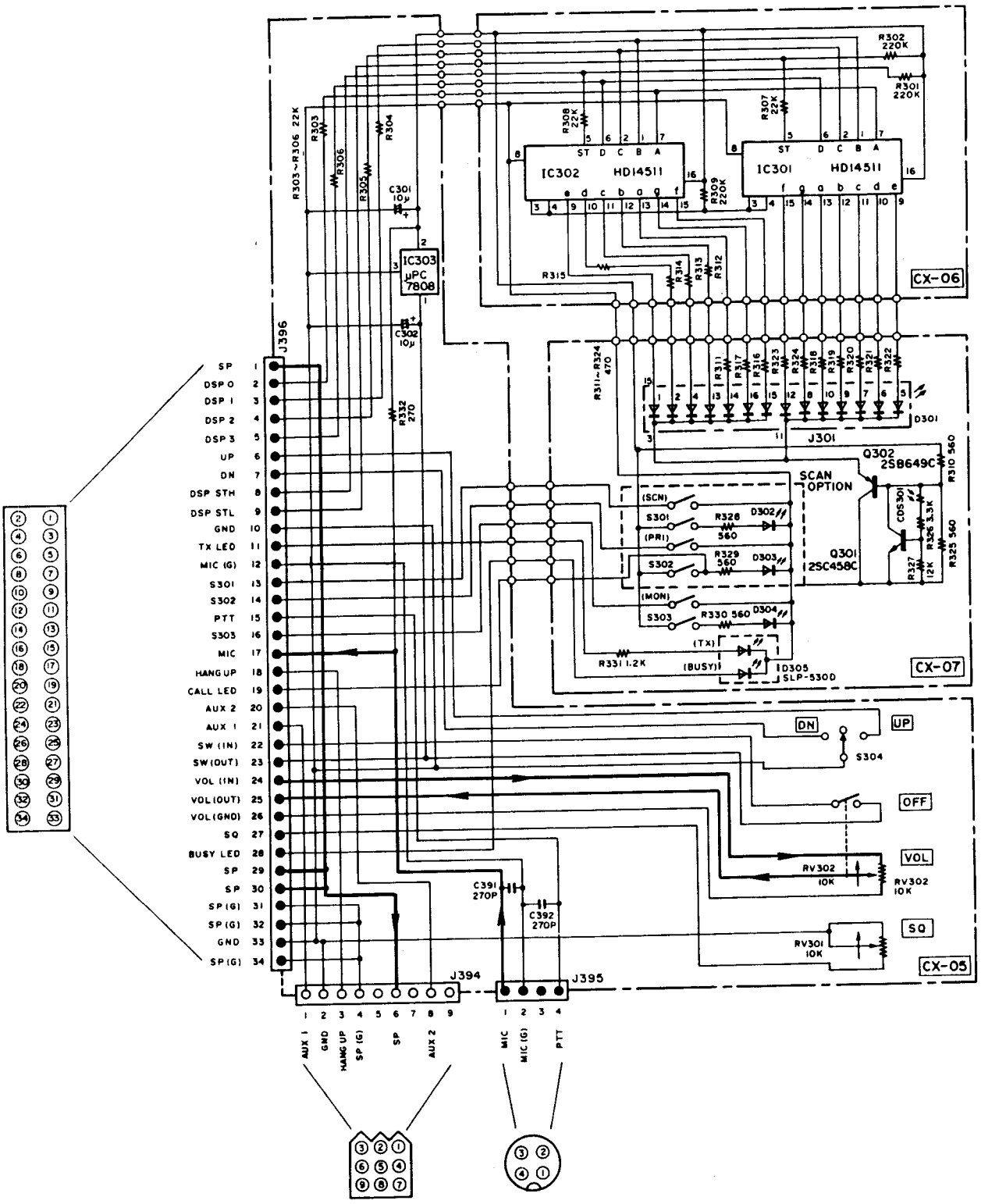
70-630 DISPLAY PCB (CX-07)



70-630 CONTROL CABLE INTERFACE PCB (CX-08)

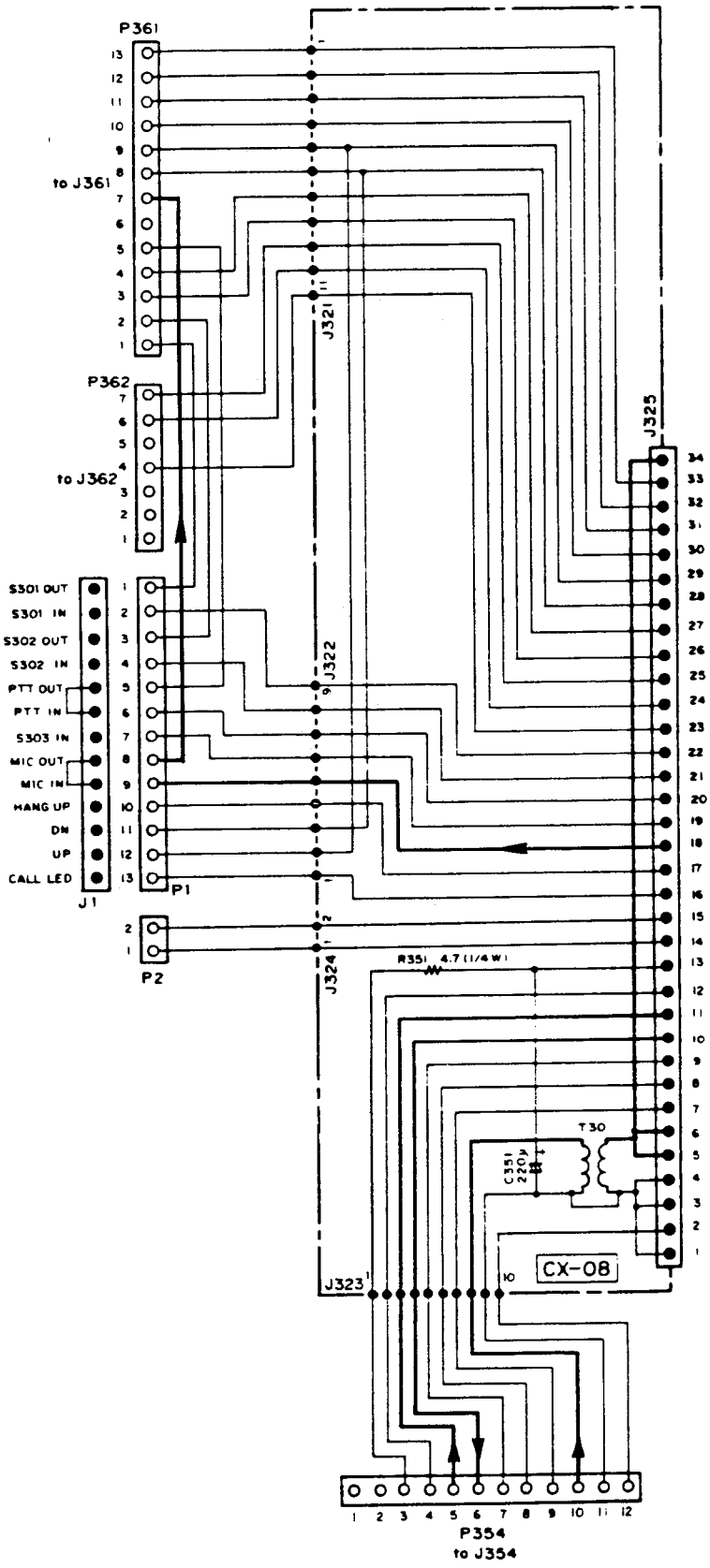


CONTROL HEAD SCHEMATIC DIAGRAM

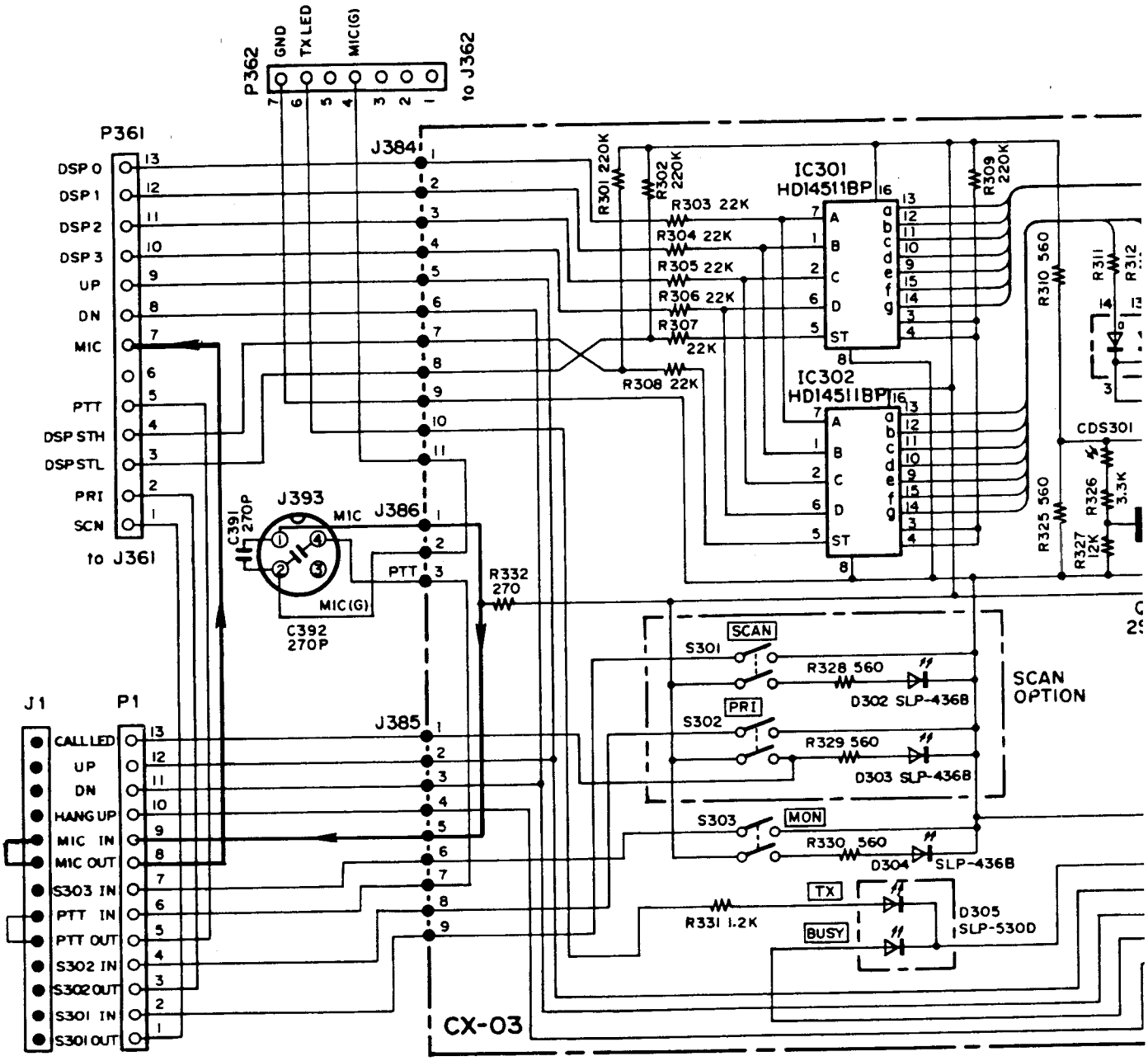


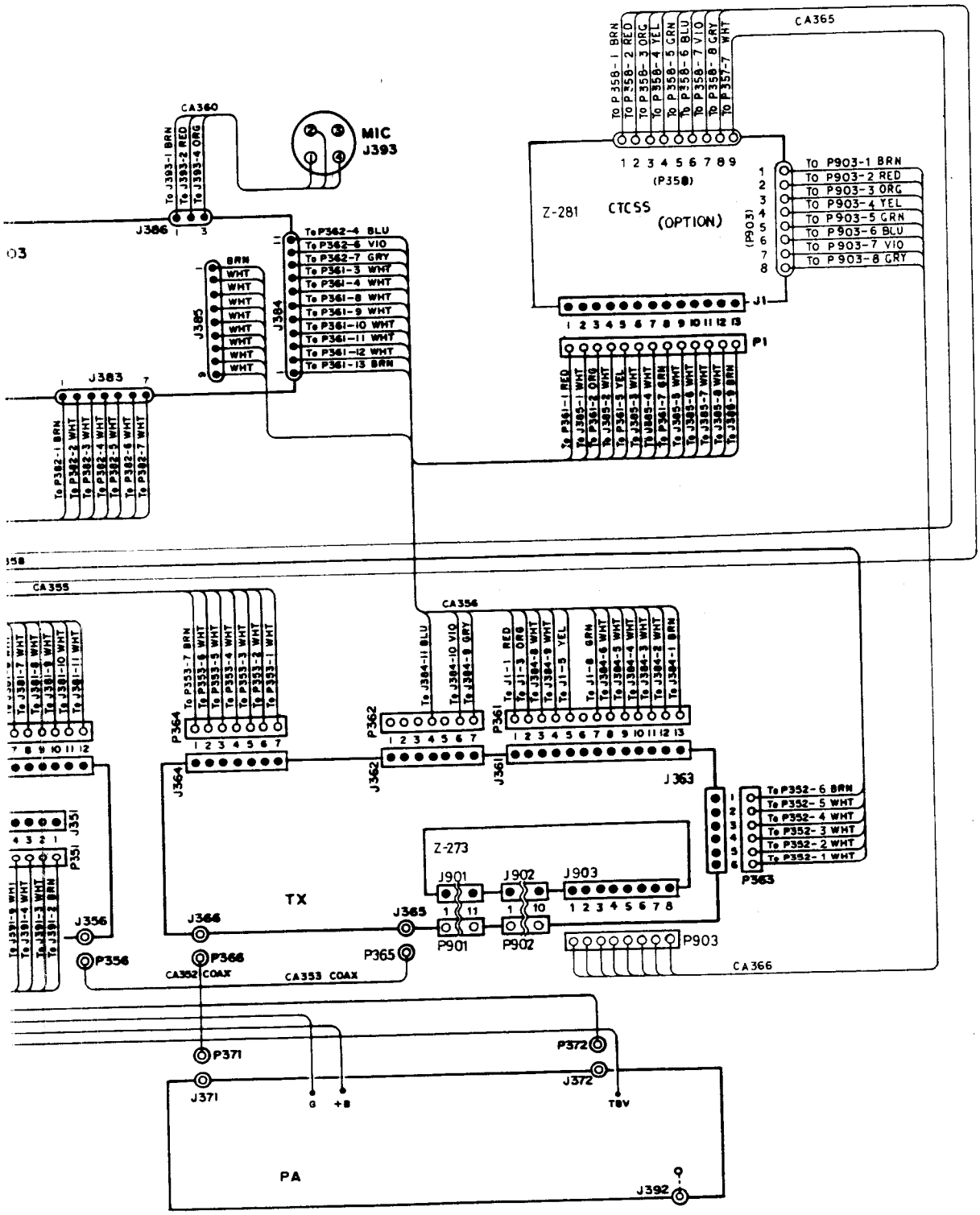
CONTROL INTERFACE SCHEMATIC DIAGRAM

70-630 A,B,C,D,E

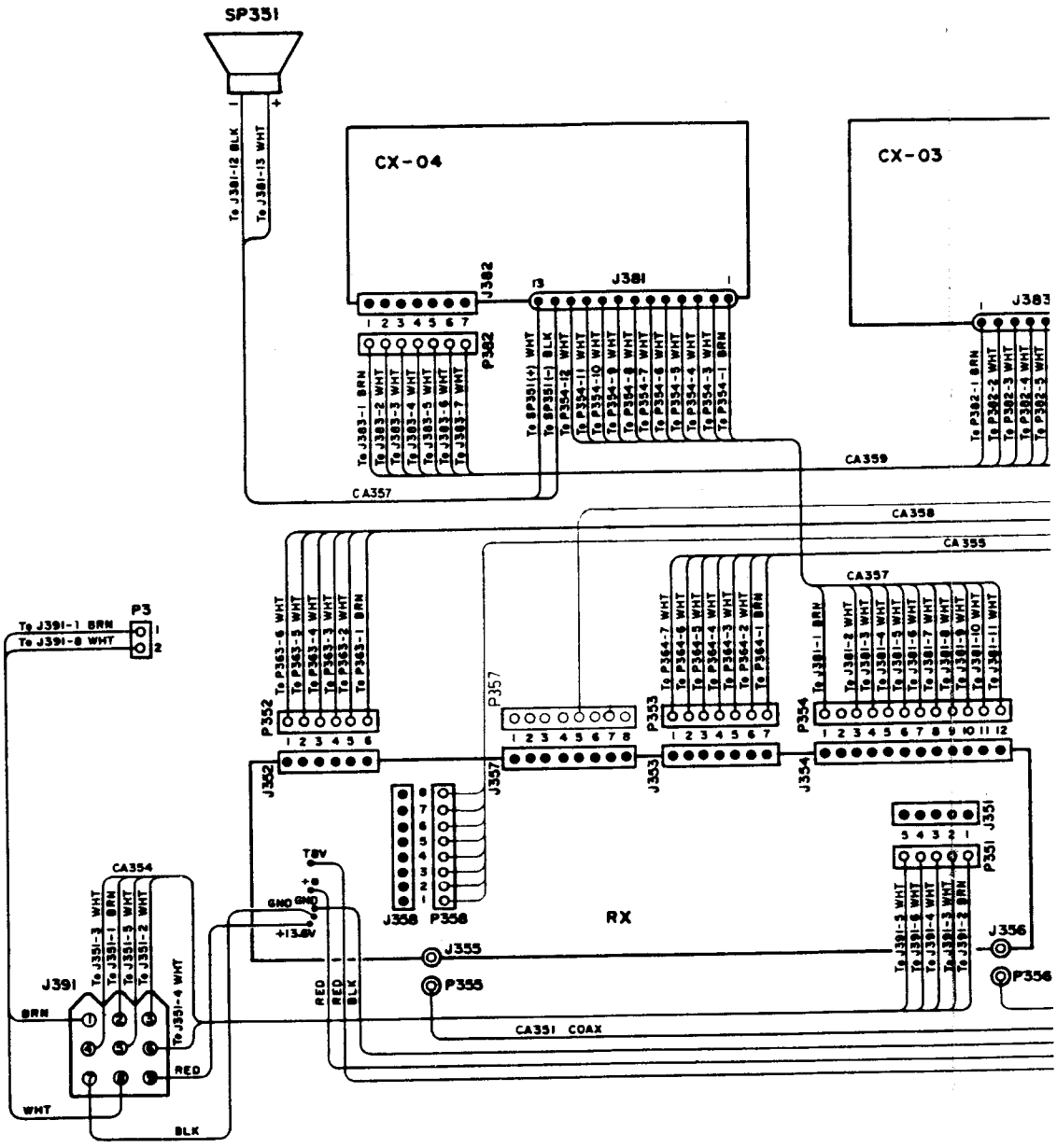


NTROL PANEL SCHEMATIC DIAGRAM

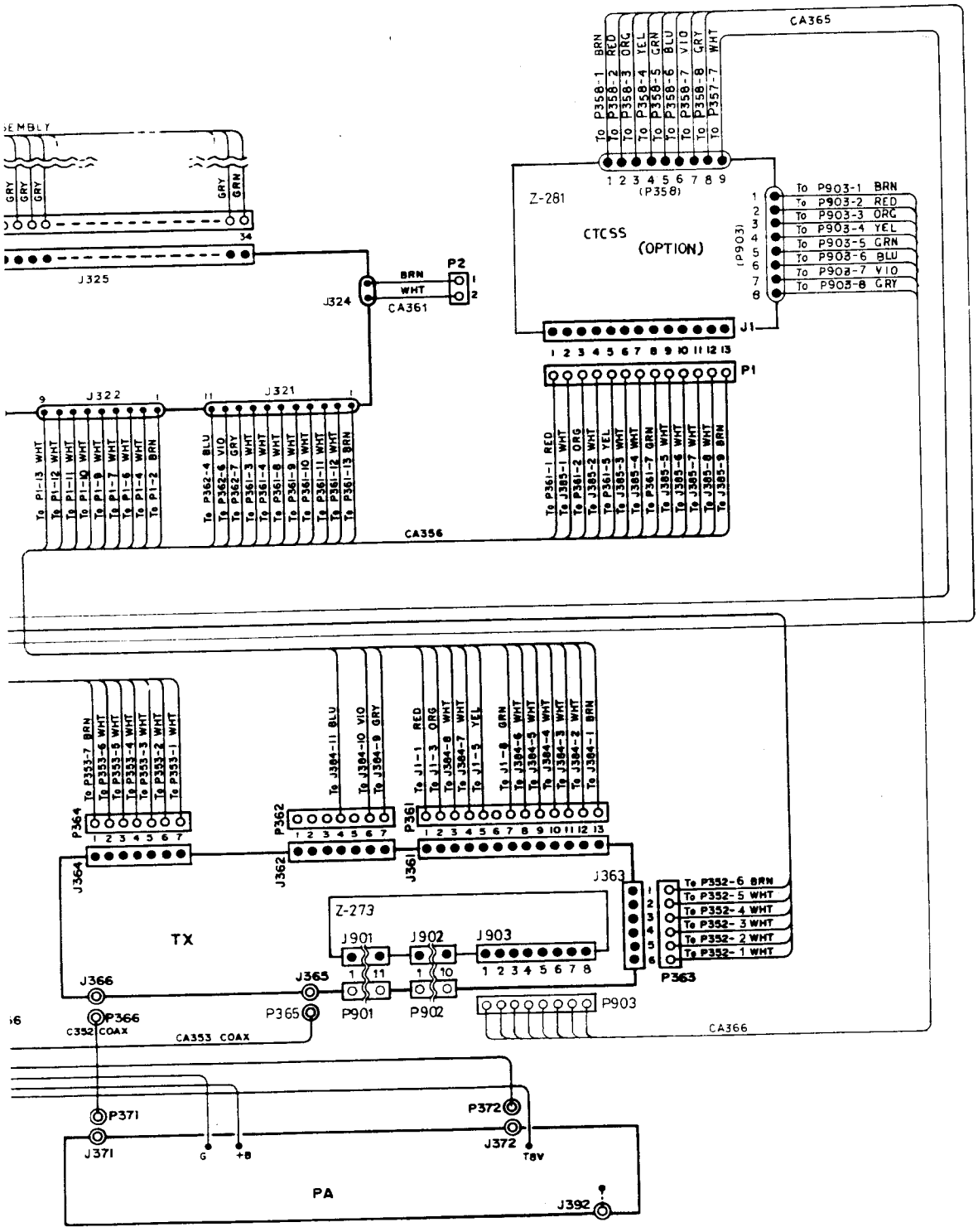



CA360
MIC
J393
J386
CA365
Z-281
CTCSS
(OPTION)
J1
P1
J383
J384
J385
J361
J362
J363
J364
P361
P362
P363
P364
CA355
CA356
Z-273
J901
J902
J903
TX
J365
J366
J356
P356
P365
P366
P901
P902
P903
CA352 COAX
CA353 COAX
CA366
P371
J371
P372
J372
PA
J392

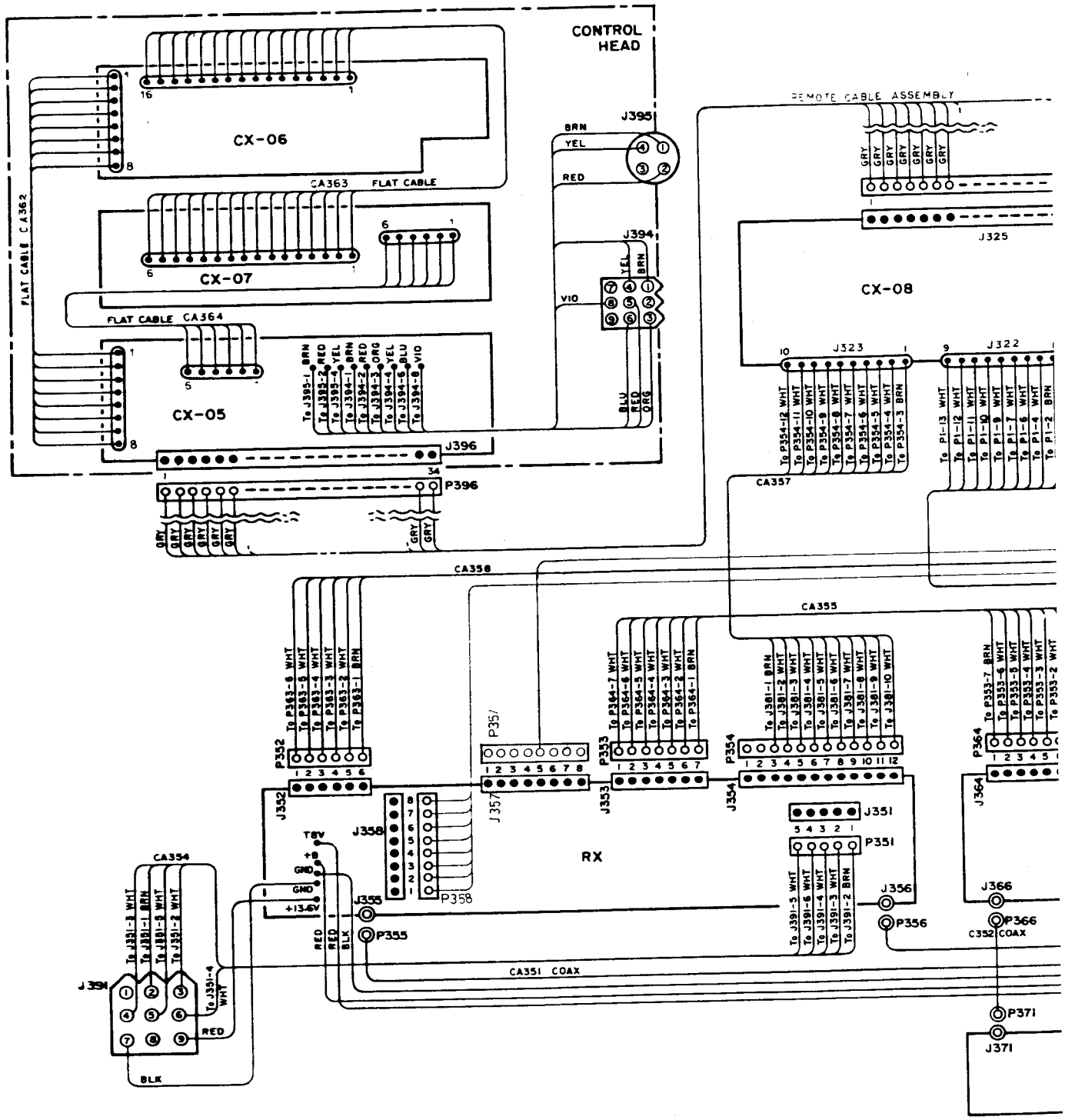
PC BOARD INTER-CONNECT DIAGRAM



Fold Out

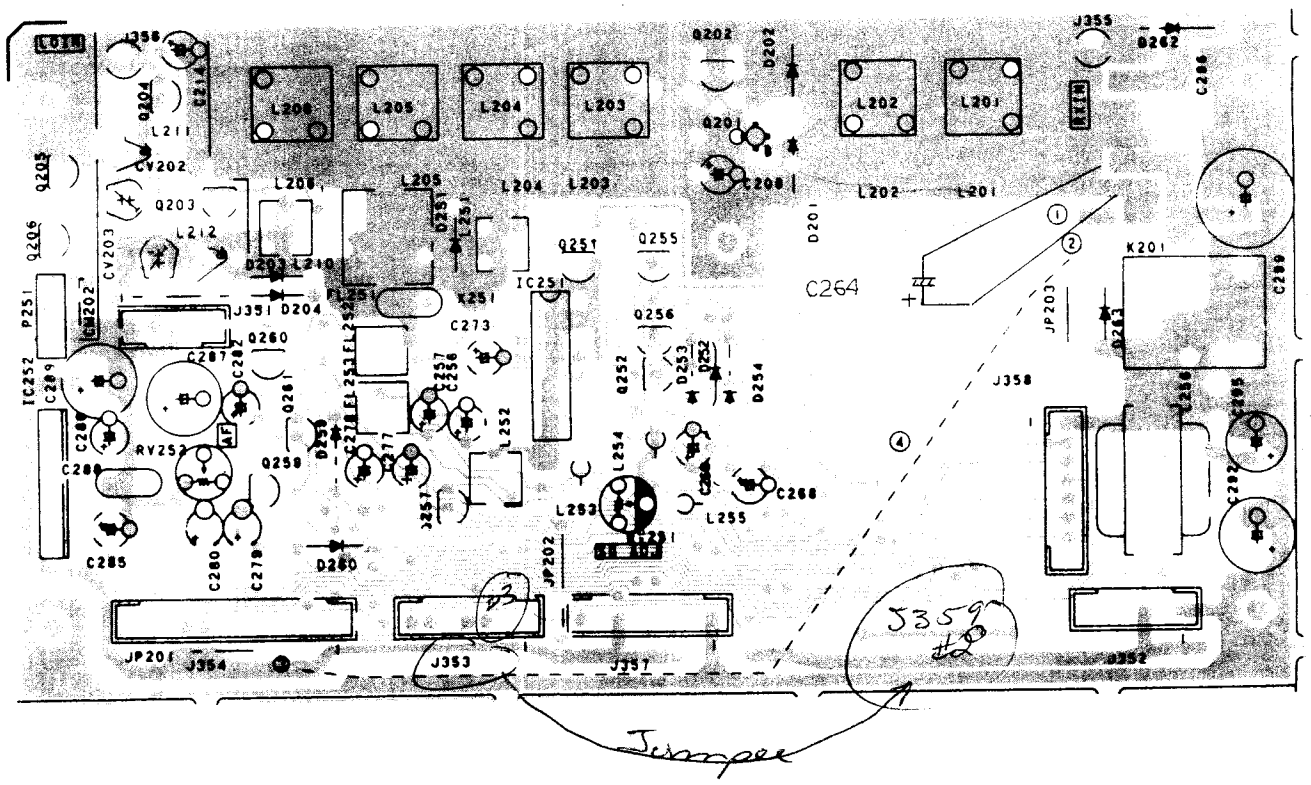

CA365
To P358-1 BRN
To P358-2 RED
To P358-3 ORG
To P358-4 YEL
To P358-5 GRN
To P358-6 BLU
To P358-7 VIO
To P358-8 GRY
To P357-7 WHT
1 2 3 4 5 6 7 8 9
(P358)
Z-281
CTCSS
(OPTION)
(P903)
To P903-1 BRN
To P903-2 RED
To P903-3 ORG
To P903-4 YEL
To P903-5 GRN
To P903-6 BLU
To P903-7 VIO
To P903-8 GRY
J1
1 2 3 4 5 6 7 8 9 10 11 12 13
P1
J325
J324
BRN
WHT
CA361
P2
J322
J321
CA356
To P1-13 WHT
To P1-12 WHT
To P1-11 WHT
To P1-10 WHT
To P1-9 WHT
To P1-7 WHT
To P1-6 WHT
To P1-4 WHT
To P1-2 BRN
To P362-4 BLU
To P362-6 VIO
To P362-7 GRY
To P361-3 WHT
To P361-4 WHT
To P361-8 WHT
To P361-9 WHT
To P361-10 WHT
To P361-11 WHT
To P361-12 WHT
To P361-13 BRN
To P361-1 RED
To J385-1 WHT
To P361-2 ORG
To J385-2 WHT
To P361-5 YEL
To J385-3 WHT
To J385-4 WHT
To P361-7 GRN
To J385-5 WHT
To J385-6 WHT
To J385-7 WHT
To J385-8 WHT
To J385-9 BRN
P364
P362
P361
J364
J362
J361
J363
To P333-7 BRN
To P333-6 WHT
To P333-5 WHT
To P333-4 WHT
To P333-3 WHT
To P333-2 WHT
To P333-1 WHT
To J384-11 BLU
To J384-10 VIO
To J384-9 GRY
To J1-1 RED
To J1-3 ORG
To J384-8 WHT
To J384-7 WHT
To J1-5 YEL
To J1-8 GRN
To J384-6 WHT
To J384-5 WHT
To J384-4 WHT
To J384-3 WHT
To J384-2 WHT
To J384-1 BRN
To P352-6 BRN
To P352-5 WHT
To P352-4 WHT
To P352-3 WHT
To P352-2 WHT
To P352-1 WHT
P363
Z-273
TX
J901
J902
J903
1 2 3 4 5 6 7 8
J366
J365
P365
P901
P902
P903
CA366
P366
C352 COAX
CA353 COAX
P371
J371
G
+8
P372
J372
T8V
PA
J392

PC BOARD INTER-CONNECT DIAGRAM



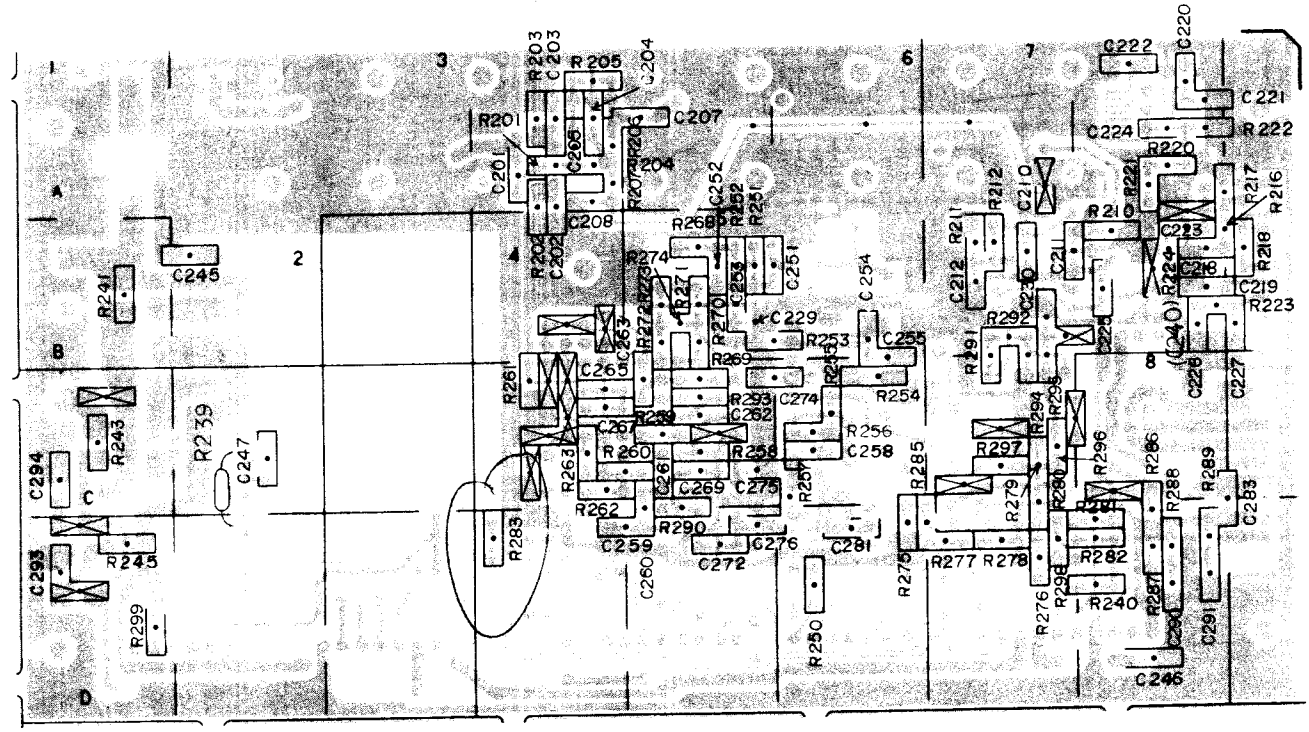
RECEIVER PC BOARD (TOP VIEW)

70-530/630

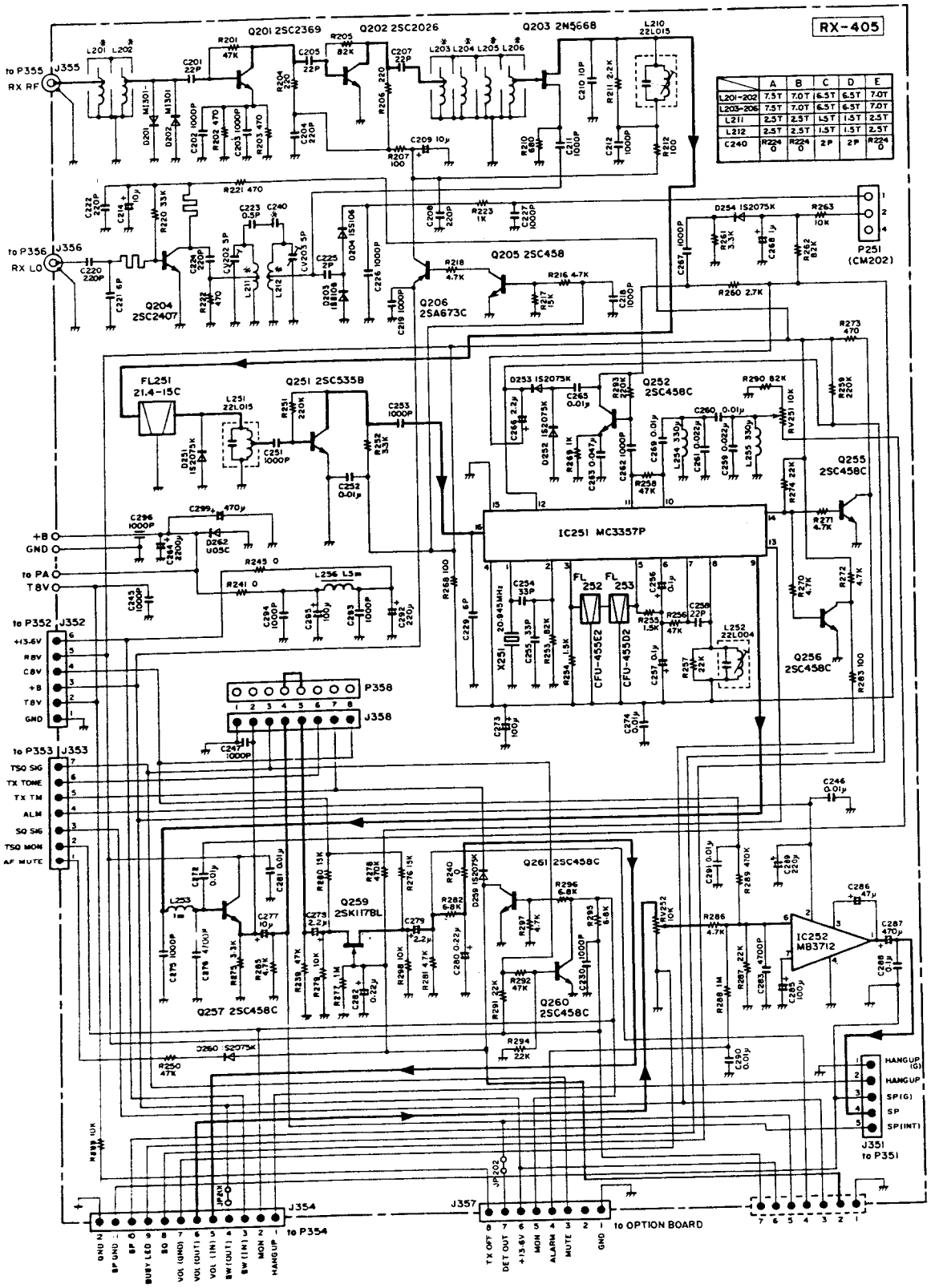


RECEIVER PC BOARD (BOTTOM VIEW)

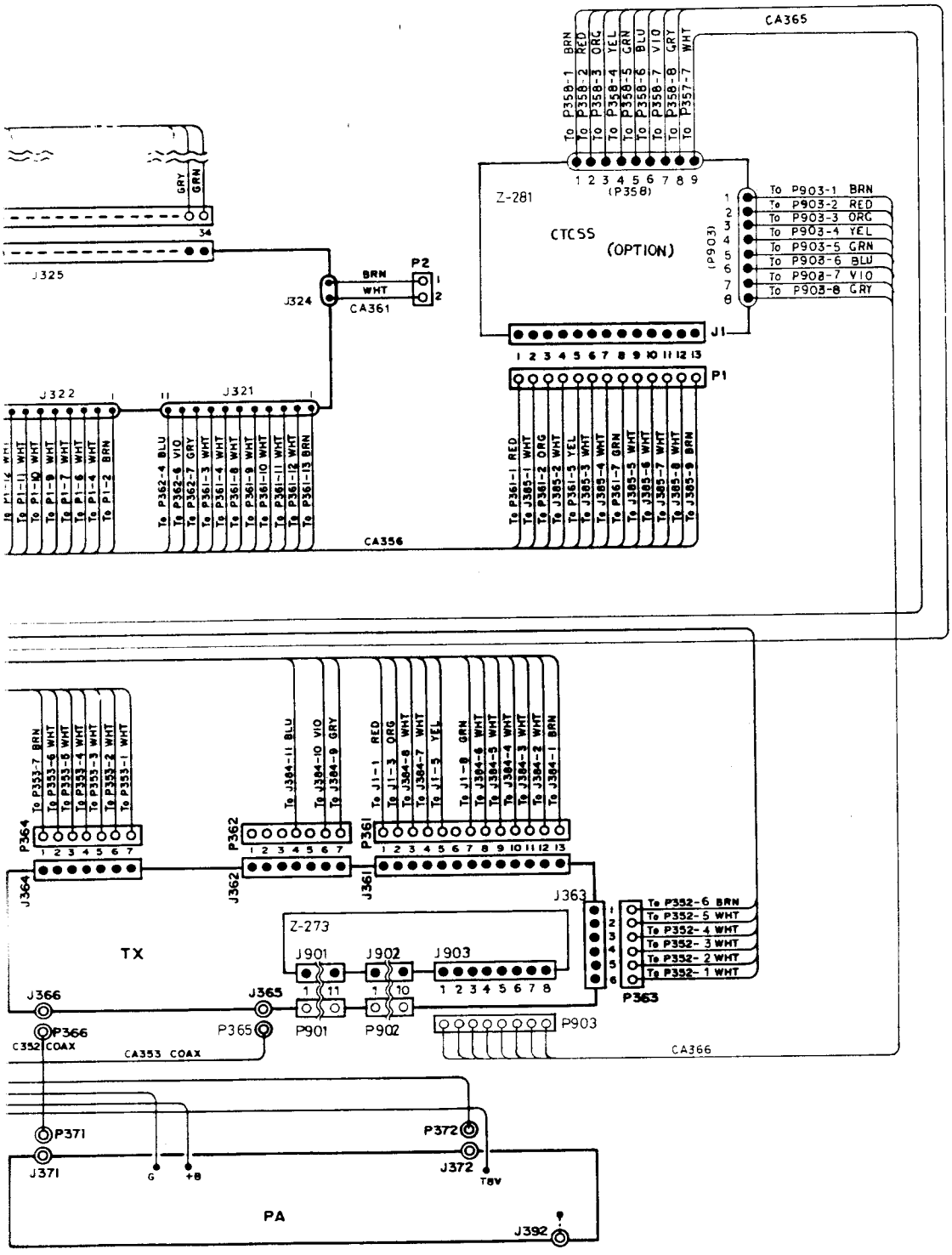
70-530/630



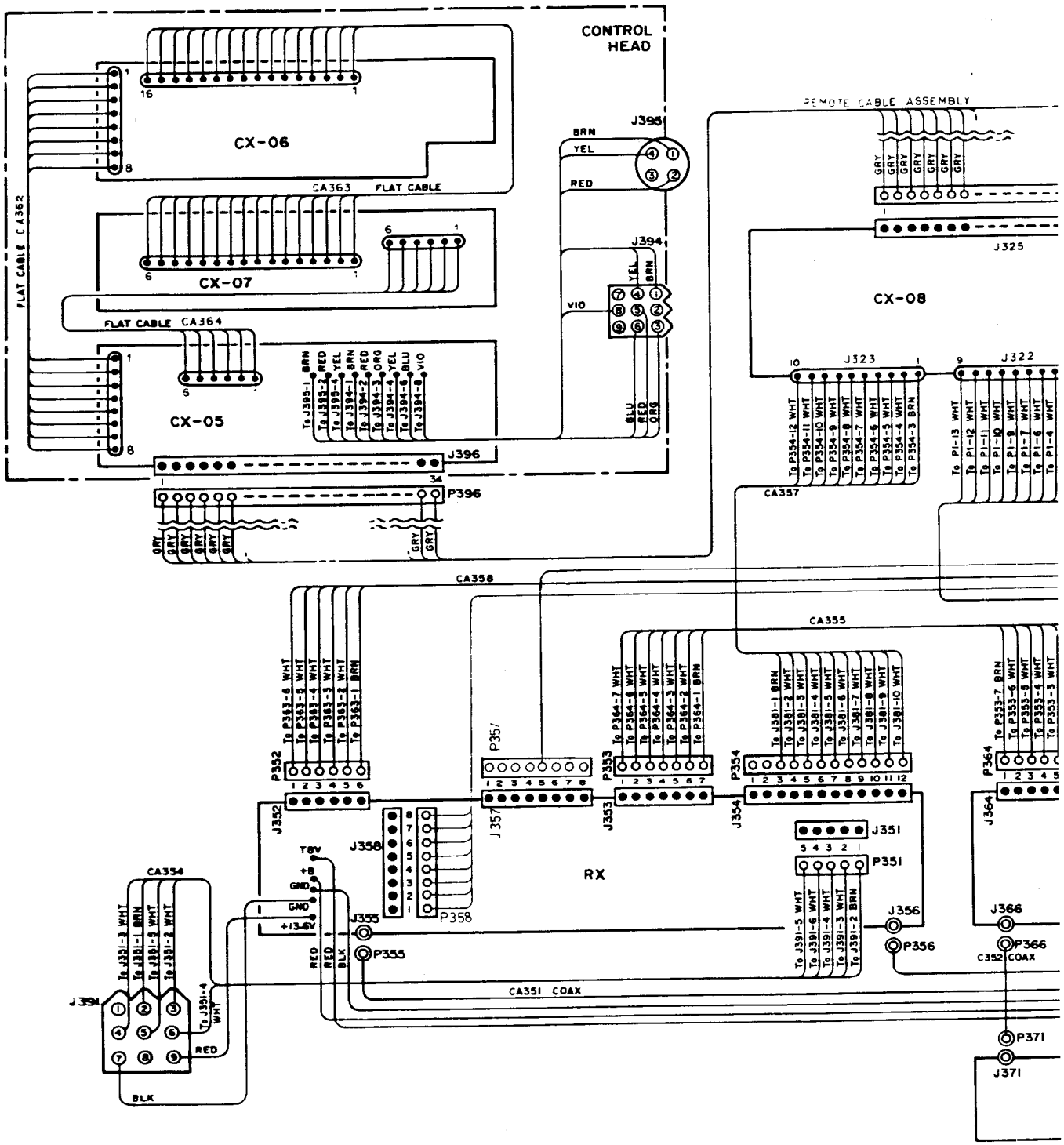
Fold Out

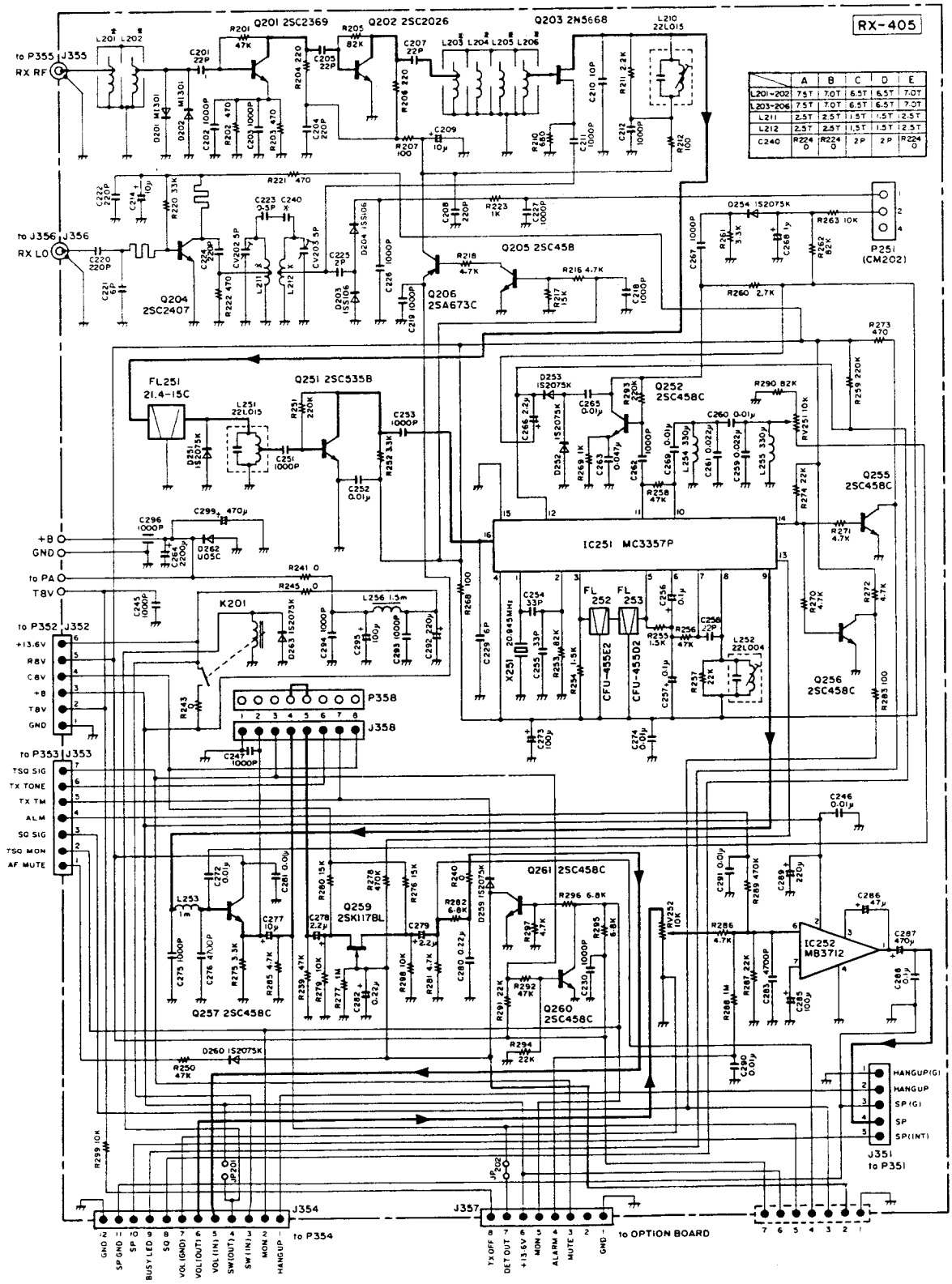


	A	B	C	D	E
L201-202	7.5T	7.0T	6.5T	6.5T	7.0T
L203-206	7.5T	7.0T	6.5T	6.5T	7.0T
L211	2.5T	2.5T	1.5T	1.5T	2.5T
L212	2.5T	2.5T	1.5T	1.5T	2.5T
C240	R224 0	R224 0	2P	2P	R224 0


CA365
To P358-1 BRN
To P358-2 RED
To P358-3 ORG
To P358-4 YEL
To P358-5 GRN
To P358-6 BLU
To P358-7 VIO
To P358-8 GRY
To P357-7 WHT
1 2 3 4 5 6 7 8 9
(P358)
Z-281
CTCSS
(OPTION)
(P903)
To P903-1 BRN
To P903-2 RED
To P903-3 ORG
To P903-4 YEL
To P903-5 GRN
To P903-6 BLU
To P903-7 VIO
To P903-8 GRY
J1
P1
GRY
GRN
34
J325
J324
BRN
WHT
CA361
P2
J322
J321
CA356
To P1-11 WHT
To P1-10 WHT
To P1-9 WHT
To P1-7 WHT
To P1-6 WHT
To P1-4 WHT
To P1-2 BRN
To P362-4 BLU
To P362-6 VIO
To P362-7 GRY
To P361-3 WHT
To P361-4 WHT
To P361-8 WHT
To P361-9 WHT
To P361-10 WHT
To P361-11 WHT
To P361-12 WHT
To P361-13 BRN
To P361-1 RED
To J385-1 WHT
To P361-2 ORG
To J385-2 WHT
To P361-5 YEL
To J385-3 WHT
To J385-4 WHT
To P361-7 GRN
To J385-5 WHT
To J385-6 WHT
To J385-7 WHT
To J385-8 WHT
To J385-9 BRN
P364
P362
P361
J364
J362
J361
To P353-7 BRN
To P353-6 WHT
To P353-5 WHT
To P353-4 WHT
To P353-3 WHT
To P353-2 WHT
To P353-1 WHT
To J384-11 BLU
To J384-10 VIO
To J384-9 GRY
To J1-1 RED
To J1-3 ORG
To J384-8 WHT
To J384-7 WHT
To J1-5 YEL
To J1-8 GRN
To J384-6 WHT
To J384-5 WHT
To J384-4 WHT
To J384-3 WHT
To J384-2 WHT
To J384-1 BRN
J363
To P352-6 BRN
To P352-5 WHT
To P352-4 WHT
To P352-3 WHT
To P352-2 WHT
To P352-1 WHT
P363
Z-273
TX
J901
J902
J903
J366
J365
P366
P365
P901
P902
P903
C352 COAX
CA353 COAX
CA366
P371
P372
J371
J372
G
+8
T8V
PA
J392

PC BOARD INTER-CONNECT DIAGRAM

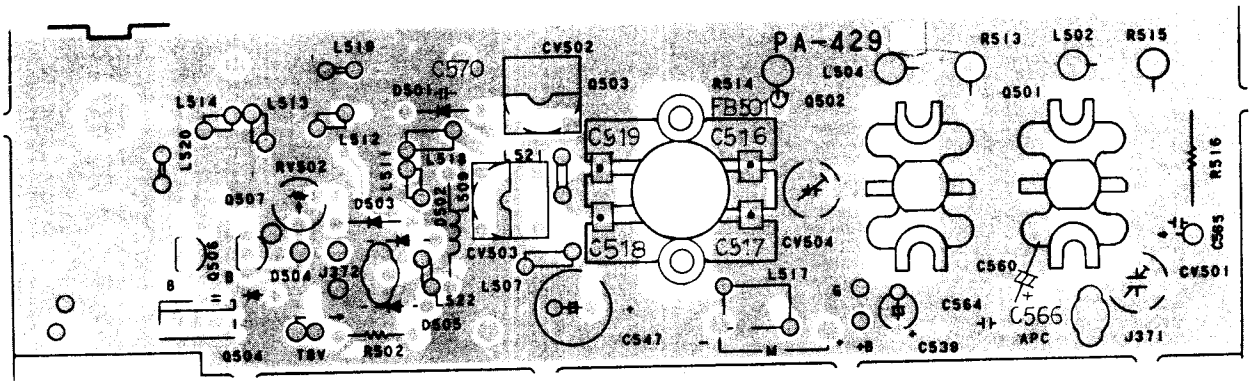




	A	B	C	D	E
L201-202	7.5T	7.0T	6.5T	6.5T	7.0T
L203-206	7.5T	7.0T	6.5T	6.5T	7.0T
L211	2.5T	2.5T	1.5T	1.5T	2.5T
L212	2.5T	2.5T	1.5T	1.5T	2.5T
C240	R224 0	R224 0	2P	2P	R224 0

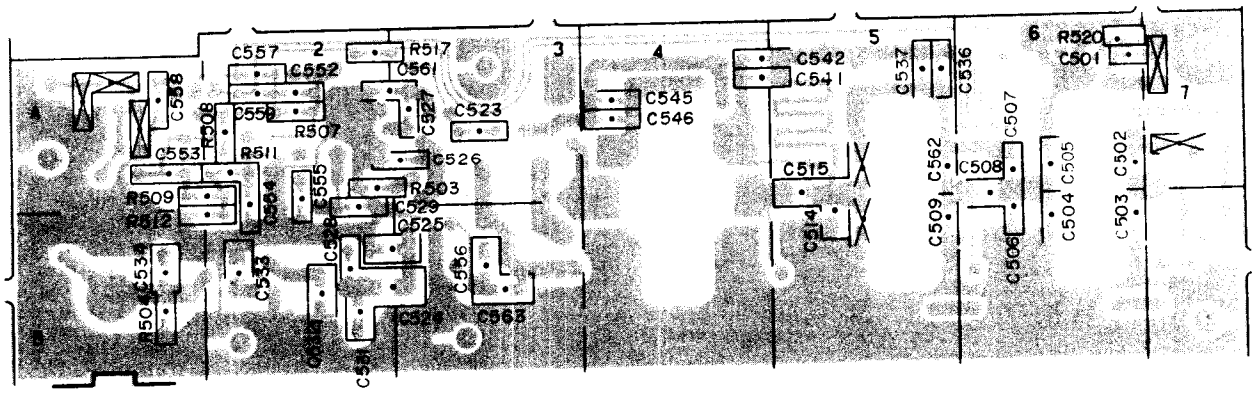
PA PC BOARD (TOP VIEW)

70-530/630

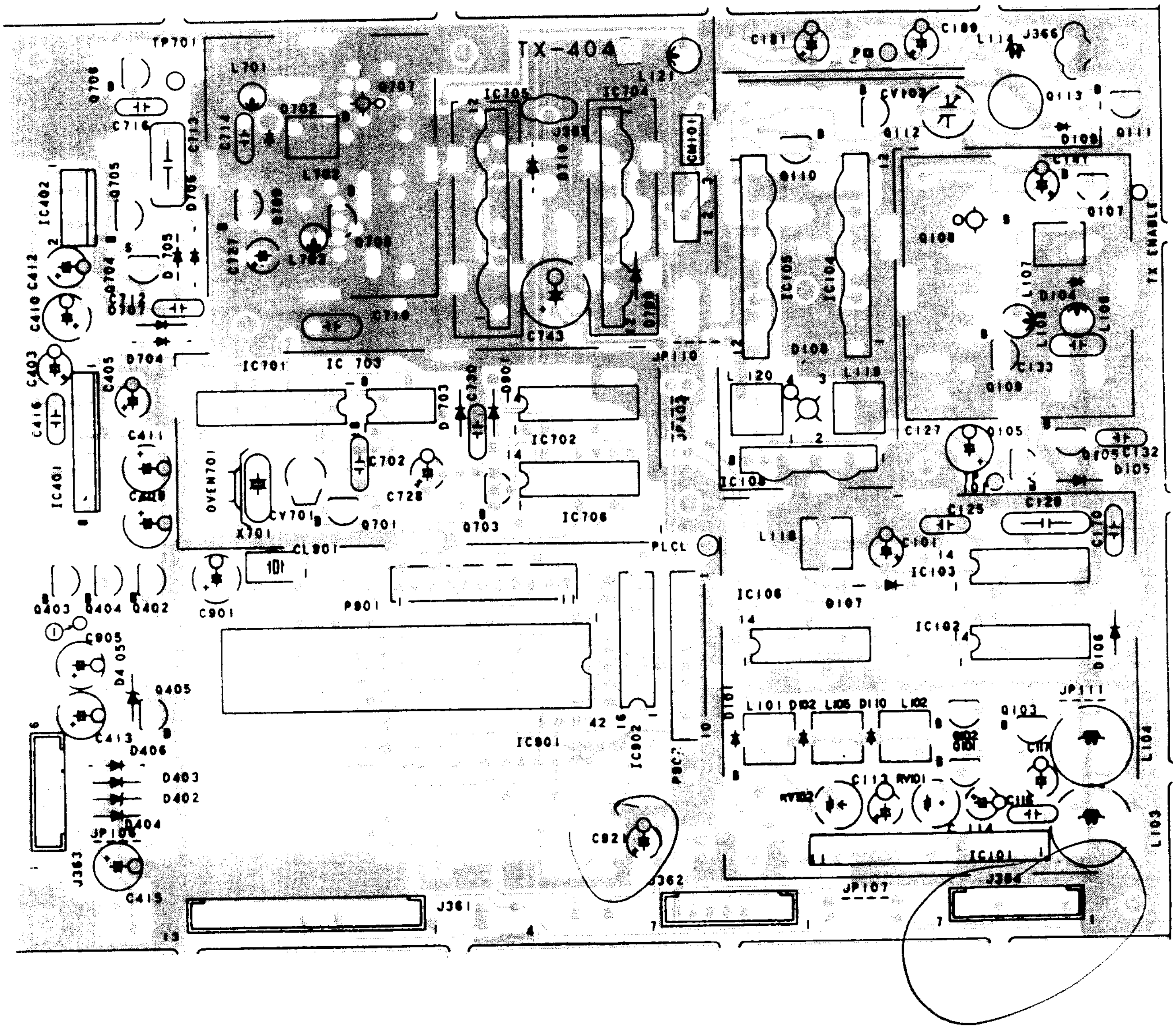


PA PC BOARD (BOTTOM VIEW)

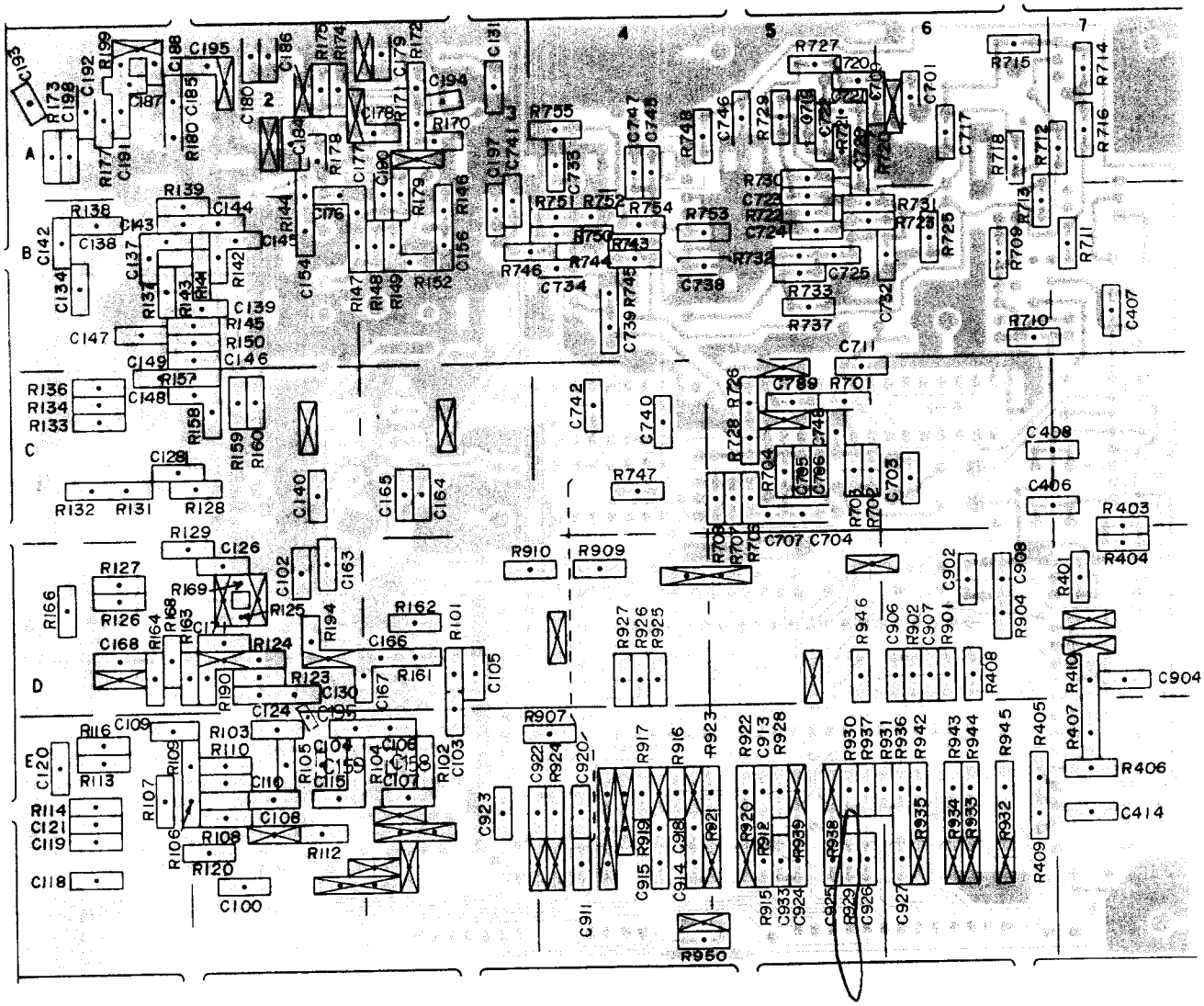
70-530/630

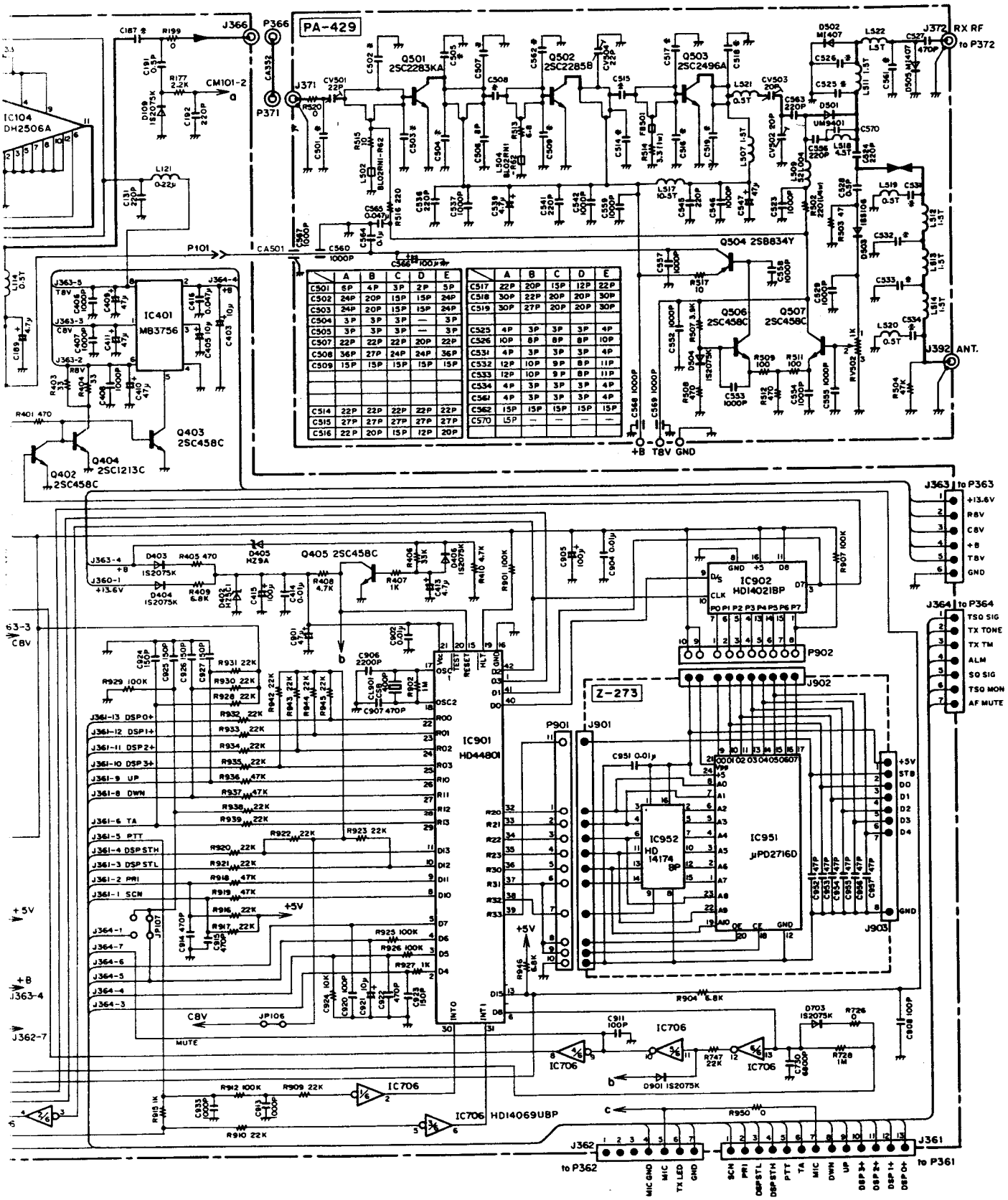


TRANSMITTER PC BOARD (TOP VIEW)

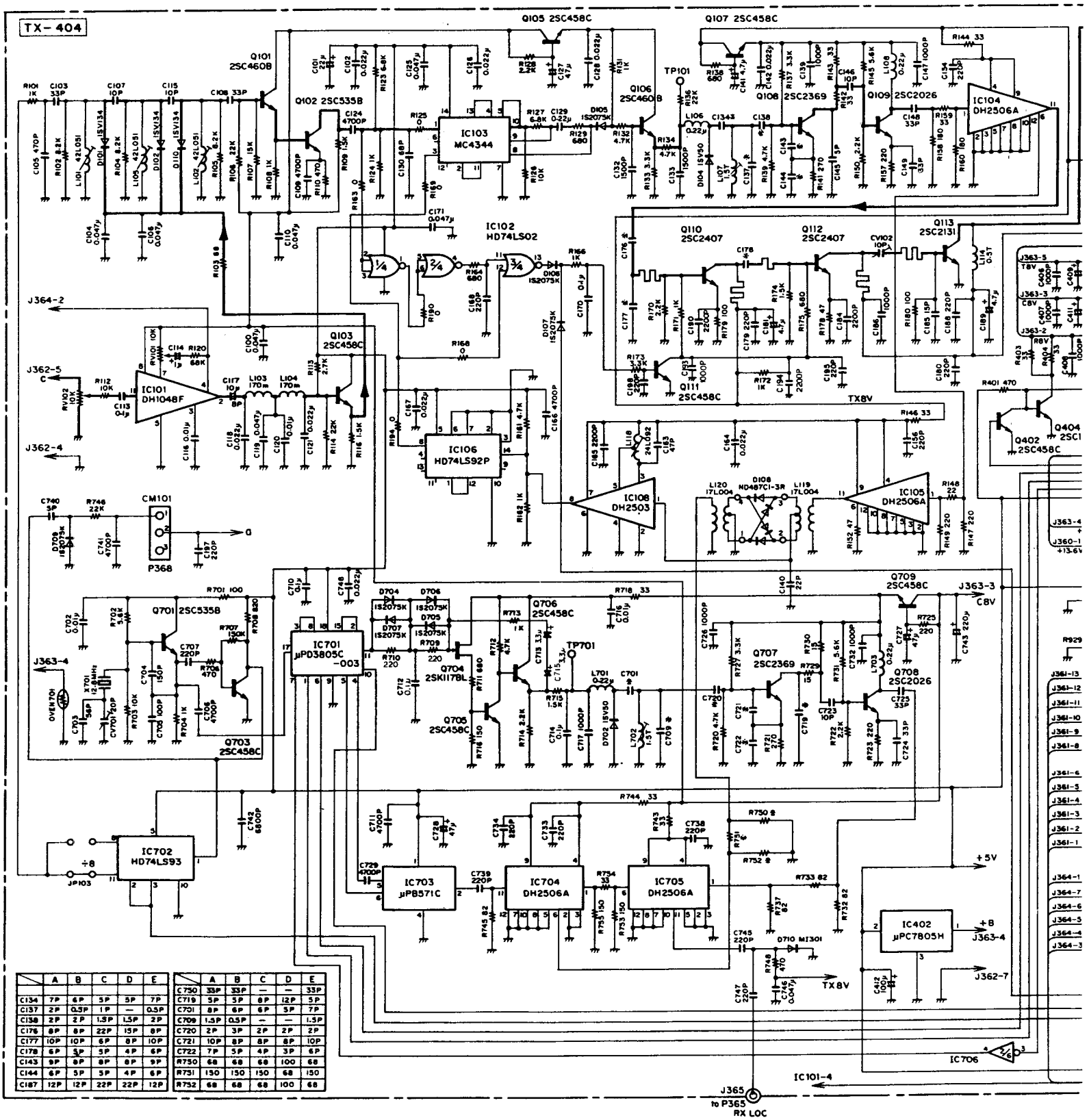


TRANSMITTER PC BOARD (BOTTOM VIEW)




PA-429
J366
P366
J371
P371
CM101-2
IC104
DH2506A
L121
P101
CA501
IC401
M83756
Q403
2SC458C
Q404
2SC1213C
Q402
2SC458C
Q501
2SC2283KA
Q502
2SC2285B
Q503
2SC2496A
Q504 2SB834Y
Q506
2SC458C
Q507
2SC458C
J372 RX RF
to P372
J392 ANT.
+B T8V GND
J363 to P363
+13.6V
R8V
C8V
+B
T8V
GND
J364 to P364
TSO SIG
TX TONE
TX TM
ALM
SQ SIG
TSO MON
AF MUTE
IC902
HD14021BP
P902
J902
Z-273
IC901
HD44801
P901
J901
IC952
HD
14174
BP
IC951
μPD2716D
J903
+5V
STB
D0
D1
D2
D3
D4
GND
IC706
HD14069UBP
MUTE
J362
to P362
J361
to P361
MIC GND
MIC
TX LED
GND
SCN
PRI
DSP STL
DSP STH
PTT
TA
MIC
DWN
UP
DSP 3+
DSP 2+
DSP 1+
DSP 0+

TRANSMITTER SCHEMATIC DIAGRAM



	A	B	C	D	E
C134	7P	6P	5P	5P	7P
C137	2P	0.5P	1P	—	0.5P
C138	2P	2P	1.5P	1.5P	2P
C176	8P	8P	22P	15P	8P
C177	10P	10P	6P	8P	10P
C178	6P	5P	5P	4P	6P
C143	9P	8P	8P	8P	9P
C144	6P	5P	5P	4P	6P
C187	12P	12P	22P	22P	12P

	A	B	C	D	E
C750	33P	33P	—	—	33P
C719	5P	5P	8P	12P	5P
C701	8P	6P	6P	5P	7P
C709	1.5P	0.5P	—	—	1.5P
C720	2P	3P	2P	2P	2P
C721	10P	8P	8P	8P	10P
C722	7P	5P	4P	3P	6P
R750	68	68	68	100	68
R751	150	150	150	68	150
R752	68	68	68	100	68

TRANSISTORS (cont.)

REF. NO.	DESCRIPTION	MODE	BASE	COLLECTOR	EMITTER	FUNCTION
Q701	2SC535B	TX RX	3.0 3.0	4.7 4.7	2.7 2.7	OSC (RX Syn.)
Q703	2SC458C	TX RX	.575 .575	2.6 3.4	0 0	Buffer
Q705	2SC458C	TX RX	0.6 0.6	6.6 5.9	0 0	Loop Filter (RX Syn.)
Q706	2SC458C	TX RX	5.1 2.6	7.3 7.3	6.0 5.3	Loop Filter (RX Syn.)
Q707	2SC2369	TX RX	4.0 4.0	7.0 7.0	3.4 3.4	VCO (RX Syn.)
Q708	2SC2026	TX RX	1.9 1.9	7.4 7.4	1.4 1.4	Buffer
Q709	2SC458C	TX RX	8.2 8.2	8.2 8.2	7.4 7.4	Power Line Filter

F.E.T'S

REF. NO.	DESCRIPTION	MODE	GATE	DRAIN	SOURCE	FUNCTION
Q203	2N5668	RX	0.7	9.3	0	Mixer
Q259	2SK117BL SQ ON 2SK117BL SQ OFF	RX RX	0 3.35	3.2 3.2	3.3 3.3	AF Switch
Q704	2SK117BL	TX RX	2.8 3.0	7.2 7.2	3.1 3.3	Loop Filter (RX Syn.)

DIGITAL IC

REF. NO.	DESCRIPTION	PIN NO.	+ V VOLTAGE	GND. PIN NO.	FUNCTION
IC 102	HD74LS02P	14	5	7	NOR Gates
IC 103	MC4344	14	5	7	Phase Detector
IC 106	HD74LS02P	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	uPB571C	1	5	4	Pre Scaler (RX Syn.)
IC 706	HD14069uBP	14	5	7	Buffer
IC 901	HD14021	20/21	5	16	CPU
IC 902	HD14021BP	16	5	8	Date Shifter (RX Syn.)
IC 951	uPD2716D	24	5	12	Read Only Memory
IC 952	HD14174BP	16	5	8	Data Buffer

TRANSISTORS

REF. NO.	DESCRIPTION	MODE	BASE	COLLECTOR	EMITTER	FUNCTION
Q101	2SC460B	TX	3.2	8.2	2.5	Buffer
Q102	2SC535B	TX	2.5	2.9	1.8	Buffer
Q103	2SC458C	TX	3.9	5.0	3.6	Buffer, AF
Q105	2SC458C	TX	7.9	8.0	7.3	Power Line Filter
Q106	2SC460B	TX	2.3 - 7.0	7.3	1.6 - 6.3	Buffer
Q107	2SC458C	TX	7.9	8.0	7.3	Power Line Filter
Q108	2SC2369	TX	4.1	6.5	3.4	VCO (TX PLL)
Q109	2SC2026	TX	1.9	7.4	1.6	Buffer
Q110	2SC2407	TX	8.2	1.4	2.1	Pre Driver
Q111	2SC458C	TX	0	3.4	0	Pre Driver Control
Q112	2SC2407	TX	0.9	.145	.140	Pre Driver
Q113	2SC2131	TX	0	.145	0	Pre Driver
Q201	2SC2369	RX	3.8	12.0	3.1	RF Amp
Q202	2SC2026	RX	0.7	8.8	0	RF Amp
Q204	2SC2407	RX	3.6	0	0.6	1st Local Amplifier
Q205	2SC458C	RX	0.7	.02	0	B+ Switch
Q206	2SA673C	RX	12.7	13.3	13.4	B+ Switch
Q251	2SC535B	RX	0.7	3.8	0	1st IF Amplifier
Q252	2SC458C SQ ON RX 2SC458C SQ OFF RX		0.7 0.7	4.9 4.6	1.1 1.1	Noise Amplifier
Q255	2SC458C	RX	0	2.0	0	Sq. Switch
Q256	2SC458C	RX	0	7.4	0	Sq. Switch
Q257	2SC458C	RX	4.2	8.0	3.5	AF Pre Amplifier
Q260	2SC458C	RX	0.6	0.06	0	Sq. Switch
Q261	2SC458C SQ ON RX 2SC458C SQ OFF RX		0.02 0	0.1 4.7	0 0	Sq. Switch
Q301	2SC458C 2SC458C	TX RX	0.1 0.1	4.0 4.0	0 0	Dimmer Control
Q302	2SB649C 2SB649C	TX RX	4.0 4.0	0 0	4.6 4.6	Dimmer Control
Q402	2SC458C	TX RX	0 0.7	0.7 0	0 0	Power Control
Q403	2SC458C	TX RX	0.7 0	0 2.7	0 0	Power Switch
Q404	2SC1213C	TX RX	0.7 0	0 8.0	0 0	Power Control
Q405	2SC458C	TX RX	0.6 0.6	0 0	0 0	Reset (MCPU)
Q501	2SC2283KA	TX	0.1	12.8	0	Pre Driver
Q502	2SC2285B	TX	-	13.6	0	Driver
Q503	2SC2496A	TX	-	13.6	0	RF Power Amp.
Q504	2SB834Y	TX	12.9	3 - 10	13.6	APC
Q506	2SC458C	TX	1.6	12.9	1.1	APC Amp.
Q507	2SC458C	TX	1.7 - 1.9	8.0	1.2	APC Amp.

Fold Out →

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	DH1048F	TX	- -	3.8	4.5	3.8	0	- -	4.5	8	- -	- -	4.5	- -					IDC
IC 104	DH2506A	TX	0	0	0	7.5	0	0	0	0	7.5	0	0	0					BUFFER
IC 105	DH2506A	TX	0	0	0	7.5	0	0	0	0	7.5	0	0	0					BUFFER
IC 108	DH2503	TX	0	0	7.5	0	7.5	0	7.5	1.3	- -	- -	- -	- -					BUFFER
IC 251	MC3357P	SQUELCH ON RX	7.1	7.1	7.9	7.7	0.9	0.9	1.0	7.7	4.2	1.9	1.9	0.8	PIN #13 0	PIN #14 1.4	PIN #15 0	PIN #16 2.0	2nd IF AMP
		OFF RX	7.1	7.1	7.9	7.7	0.9	0.9	1.0	7.7	4.2	1.9	1.9	0.2	7.0	0	0	2.0	
IC 252	MB3712	RX	7.0	13.8	13.0	0	-	-	0.6	-	-	-	-	-					AF PWR AMP
IC 303	uPC7808H	TX	13.8	8.1	0	-	-	-	-	-	-	-	-	-					POWER REGULATOR
		RX	13.8	8.1	0	-	-	-	-	-	-	-	-	-					
IC 401	MB3756	TX	8.0	13.6	8.0	0	0	0	0	8.0	-	-	-	-					POWER REGULATOR
		RX	8.0	13.6	8.0	0	2.0	8.0	0	0	-	-	-	-					
IC 402	uPC7805H	TX	13.8	5.0	0	-	-	-	-	-	-	-	-	-					BUFFER
		RX	13.8	5.0	0	-	-	-	-	-	-	-	-	-					
IC 704	DH2506A	TX	0	0	0	7.7	0	0	0	0	7.7	0	0	0					BUFFER
IC 705	DH2506A	TX	0	0	0	7.7	0	0	0	0	7.7	0	0	0					BUFFER

MICROCOMPUTER (IC 901) PIN OUT DESCRIPTION

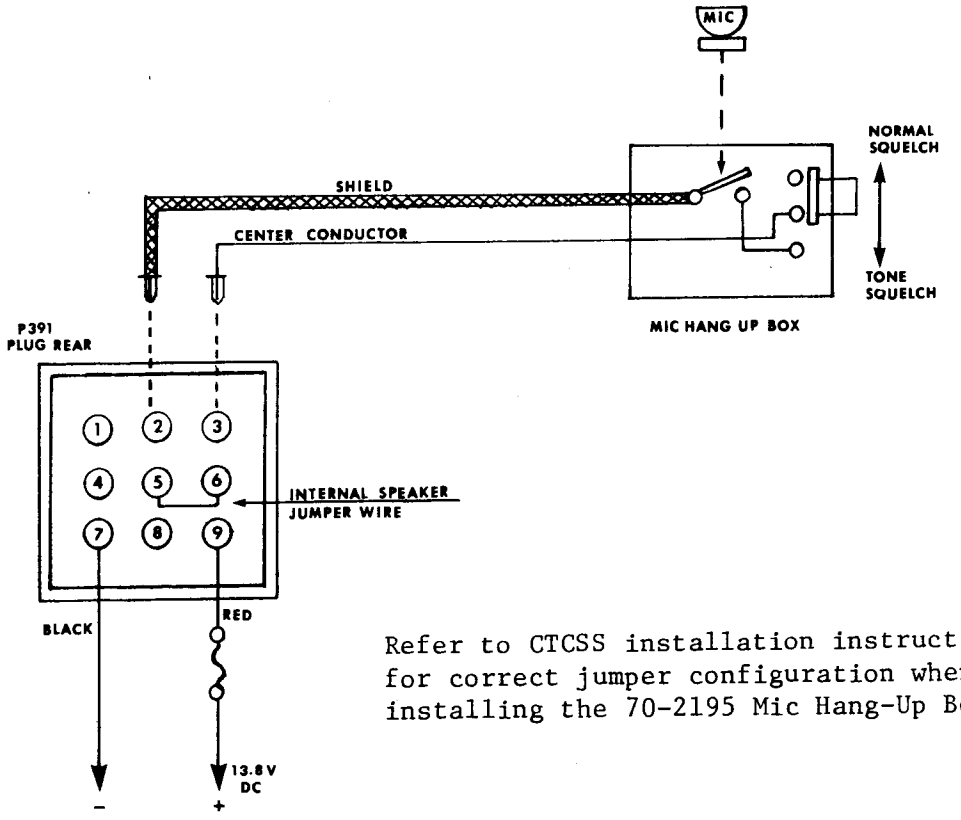
PIN NO.	PIN NAME	INPUT OUTPUT	SIGNAL NAME	FUNCTION
1	D3	OUT	DSTB+	Strobe for serial data to synthesizer
2	D4	OUT	TXTM-	Signalling option control (TX: LOW, RX: HIGH)
3	D5	OUT	ALM-	Alert (2KHz Tone)
4	D6	IN	SQSIG+	Squelch Signal (Busy; High)
5	D7	OUT	TSQMON-	Audio Enable in Scan Mode (Enable: LOW)
6	D8	IN	PLCL-	Synthesizer Unlock: LOW (input)
		OUT	PLCL-	Audiomute & TX Inhibit: LOW (output)
7	D9	OUT	VCOCNT	Not Used
8	D10	IN	SCN-	Scan Switch (on:LOW)
9	D11	IN	PRI-	Pri Switch (on: LOW)
10	D12	OUT	DSPSTL-	Display Data Ones Digit Strobe
11	D13	OUT	DSPSTH-	Display Data Tens Digit Strobe
12	D14	-	---	Not Used
13	D15	OUT	TXDL	TX/RX Control (Tx:LOW Rx: HIGH)
14	NC	-	---	No Connection
15	RESET	-	---	General Reset (Reset: HIGH)
16	GND	-	---	Ground
17	OSC1			Clock Oscillator (400 KHZ ±5%)
18	OSC2			" " " " "
19	HLT	-	---	Standby Mode Control (Standby:LOW)
20	TEST	-	---	Not Used (HIGH)
21	Vcc	-	---	Power Supply (+5V±10%)
22	R00	OUT	DSP0+	LED Display Data (HIGH: 6 to 8V, LOW: 0 to 2V)
23	R01	OUT	DSP1+	" " " " "
24	R02	OUT	DSP2+	" " " " "
25	R03	OUT	DSP3+	" " " " "
26	R10	IN	UP-	Channel Up Switch (ON:LOW)
27	R11	IN	DWN-	Channel Down Switch (ON:LOW)
28	R12	IN	INH+	PTT Inhibit (Inhibit: HIGH)
29	R13	IN	TA-	Not Used (HIGH)
30	INT0	IN	PTTINT+	PTT Switch (PTT: HIGH)
31	INT1	IN	---	Not Used
32	R20	OUT	RMA0+	E/PROM ADDRESS DATA
33	R21	OUT	RMA1+	RMA5+ is also used as the E/PROM ENABLE SIGNAL
34	R22	OUT	RMA2+	" " " " " "
35	R23	OUT	RMA3+	" " " " " "
36	R30	OUT	RMA4+	" " " " " "
37	R31	OUT	RMA5+	" " " " " "
38	R32	OUT	ASTB+	Strobe for E/PROM address data latch
39	R33	OUT	AUXSTB+	Strobe for AUX.DATA (Signalling Option Board)
40	D0	OUT	PSST+	Strobe for E/PROM DATA OUTPUT TO SHIFT REGISTER
41	D1	IN	CHDT+	Serial data from Shift Register
42	D2	OUT	DCLK	Clock for CHDT+

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

Measure with high input impedance meter or oscilloscope

UNDER DASH DC POWER/ACCESSORY PLUG INSTRUCTIONS 70-530

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.

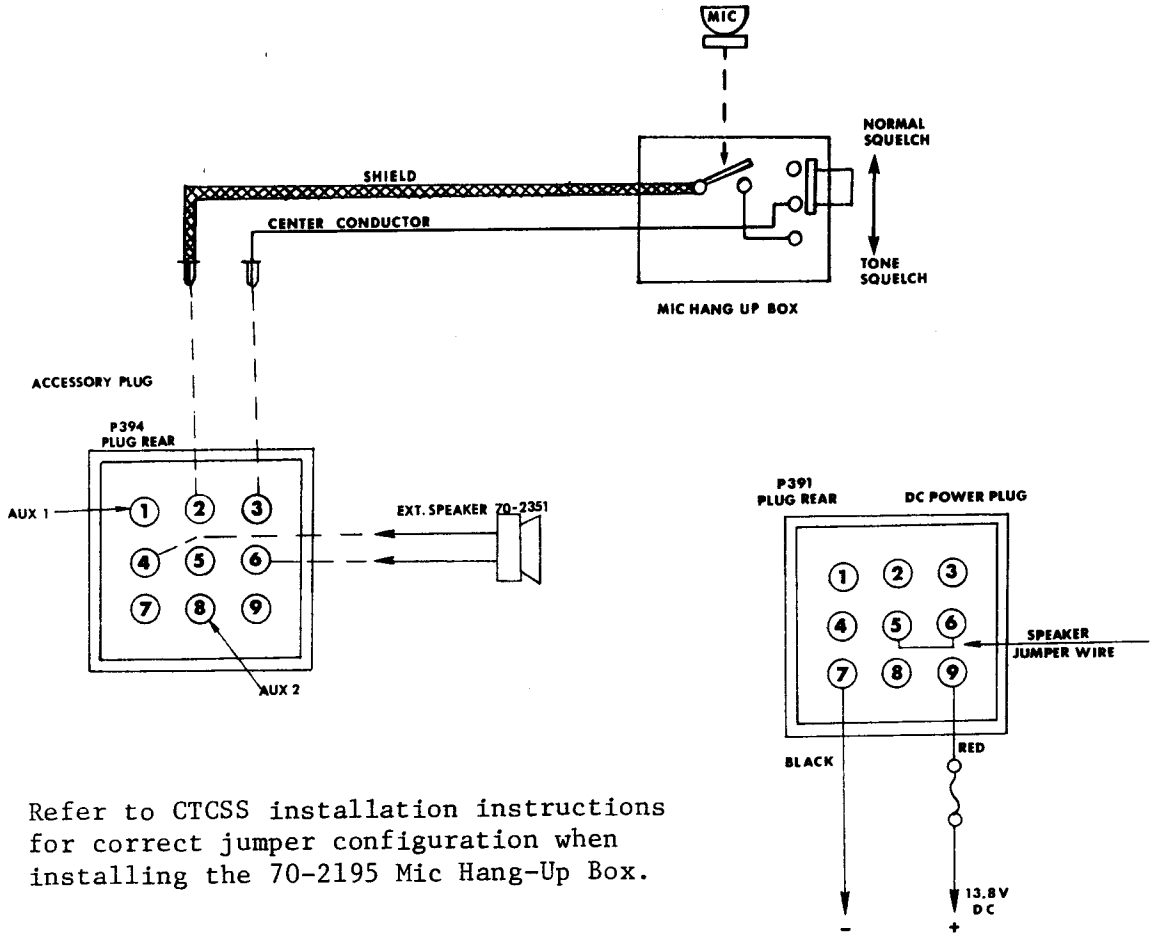
D. Pins #1 and #8 are not connected.

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

TRUNK MOUNT DC POWER/ACCESSORY PLUGS INSTRUCTIONS

70-630

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.



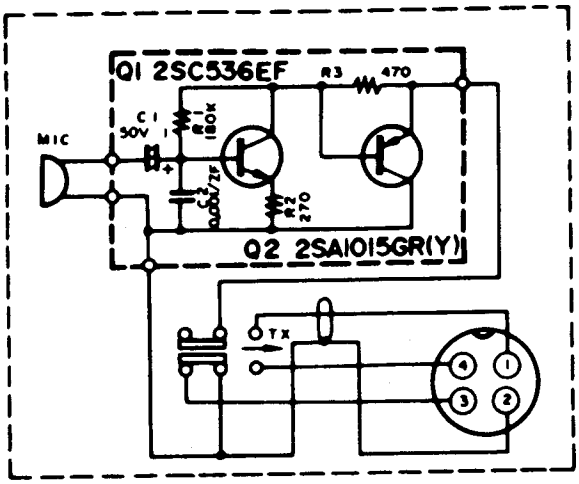
Refer to CTCSS installation instructions for correct jumper configuration when installing the 70-2195 Mic Hang-Up Box.

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 crimping tool #HT-1919 and extractor tool #11-03-0006.



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 ¼W	70-141010
Resistor 470 ohm ¼W	70-141016
Resistor 170K ¼W	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

70-2102 CTCSS KIT INSTALLATION INSTRUCTIONS

UNDER-DASH AND TRUNK-MOUNT MODELS

1. Remove the 4 screws securing the radio top and bottom covers and remove the covers.

2. Turn the radio upside-down on the bench. Screw the threaded standoff supplied with the CTCSS board into the right hand hole located in the option area in front of the receiver board.

3. If the 70-2195 microphone hangup box is not to be installed, a jumper must be installed in the JP2 location on the CTCSS board for proper monitor operation. If the 70-2195 is to be installed, JP2 should not be used.

4. As supplied, the CTCSS board can be programmed to encode and decode on any of the standard EIA Group A and B tones from 71.9 to 241.8 Hz. If Group C tones are desired, remove JP1 from the CTCSS board. In this condition, however, Group A and B tones cannot be selected. Refer to the 70-1000 E/Prom Programmer Operator's Manual for a complete tone selection listing.

5. Remove the jumper plug from J358 (right side of receiver board) and connect the 8 pin connector and cable running from P358 on the CTCSS board.

6. Connect the 8 pin plug with the single wire, P357, to J357 on the receiver board.

7. Remove the clear sleeve and jumper plug from the floating option connector P1. Connect P1 to J1 on the CTCSS Board.

8. Feed the remaining 8 pin connector and cable connected to P903 (CTCSS Board) to the top of the radio through the opening just behind the front panel assembly. Remove the E/Prom module and connect P903 to the J903 jack on the E/Prom module. Reinstall the E/Prom module.

9. Carefully position the CTCSS board over the option area, connector side down and install the 3 screws supplied (left side and center) to secure the board in place.

10. CTCSS modulation adjustment is made by RV1, marked "MOD" on the CTCSS board. Refer to the radio service manual for complete alignment instructions.

70-2102 KIT COMPONENTS

DESCRIPTION	QUANTITY	PART NUMBER
CTCSS PCB Assembly	1	70-075026
Threaded Standoff	1	70-156072
3 x 6 mm Panhead screw	3	70-151355

Fold Out →

CTCSS VOLTAGE CHARTS

TRANSISTORS

REF. NO.	DESCRIPTION		BASE	COLLECTOR	EMITTER	FUNCTION
Q1	2SC458C W/Tone	Mon. ON	0.0	0.0	0.0	Squelch Control
		Mon. OFF	0.0	.050	0.0	
		W/"0" Code	.650	.050	0.0	
	W/O Tone	Mon. ON	0.0	0.0	0.0	
		Mon. OFF	0.0	4.44	0.0	
Q2	2SC458C	Decode	0.0	5.85	0.0	Tone Squelch Switch
		No Decode	.639	0.0	0.0	

INTEGRATED CIRCUITS

REF. NO.	DESCRIPTION	PIN NO.	+ V VOLTAGE	GND. PIN NO.	FUNCTION
IC 1	HD14174BP	16	5V	8	Data Latch
IC 2	HD14078BP	14	5V	7	Encode/Decode Inhibiter
IC 3	MX 325	22	5V	10	Encoder/Decoder
IC 4	HA17902P	4	8V	11	High Pass Filter

IC3 - MX 325 PROGRAM LINE LOGIC

ENCODE/DECODE FREQUENCY (HZ.)	PINS 4	5	6	7	8	9
67.0	1	1	1	1	1	1
71.9	0	1	1	1	1	1
74.4	1	1	1	1	1	0
77.0	0	0	1	1	1	1
79.7	1	1	1	1	0	1
82.5	0	1	1	1	1	0
85.4	1	1	1	1	0	0
88.5	0	0	1	1	1	0
91.5	1	1	1	0	1	1
94.8	0	1	1	1	0	1
100.0	0	0	1	1	0	1
103.5	0	1	1	1	0	0
107.2	0	0	1	1	0	0

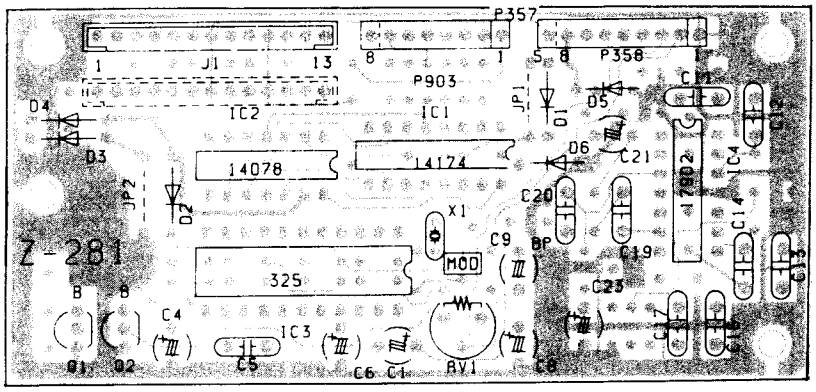
ENCODE/DECODE FREQUENCY (HZ.)	PINS 4	5	6	7	8	9
167.9	0	1	0	1	0	1
173.8	0	0	0	1	0	1
179.9	0	1	0	1	0	0
186.2	0	0	0	1	0	0
192.8	0	1	0	0	1	1
203.5	0	0	0	0	1	1
210.7	0	1	0	0	1	0
218.1	0	0	0	0	0	1
225.7	0	1	0	0	0	1
233.6	0	0	0	0	0	1
241.8	0	1	0	0	0	0
250.3	0	0	0	0	0	0

ENCODE/DECODE FREQUENCY (HZ.)	PINS 4	5	6	7	8	9
110.9	0	1	1	0	1	1
114.8	0	0	1	0	1	1
118.8	0	1	1	0	1	0
123.0	0	0	1	0	1	0
127.3	0	1	1	0	0	1
131.8	0	0	1	0	0	1
136.5	0	1	1	0	0	0
141.3	0	0	1	0	0	0
146.2	0	1	0	1	1	1
151.4	0	0	0	1	1	1
156.7	0	1	0	1	1	0
162.2	0	0	0	1	1	0

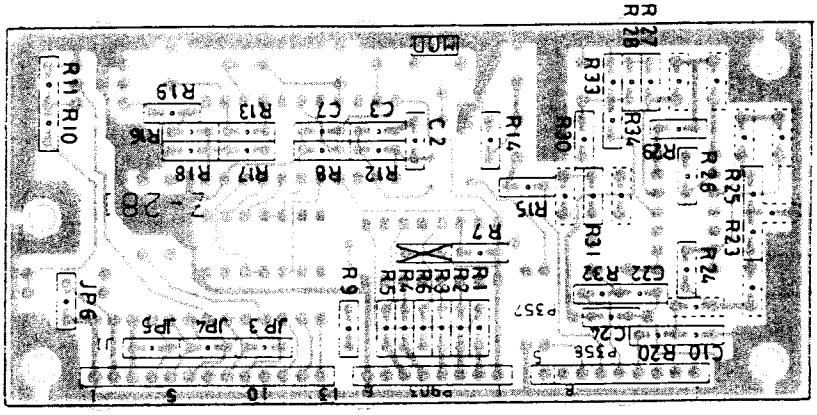
"1" = 5V

"0" = 0V

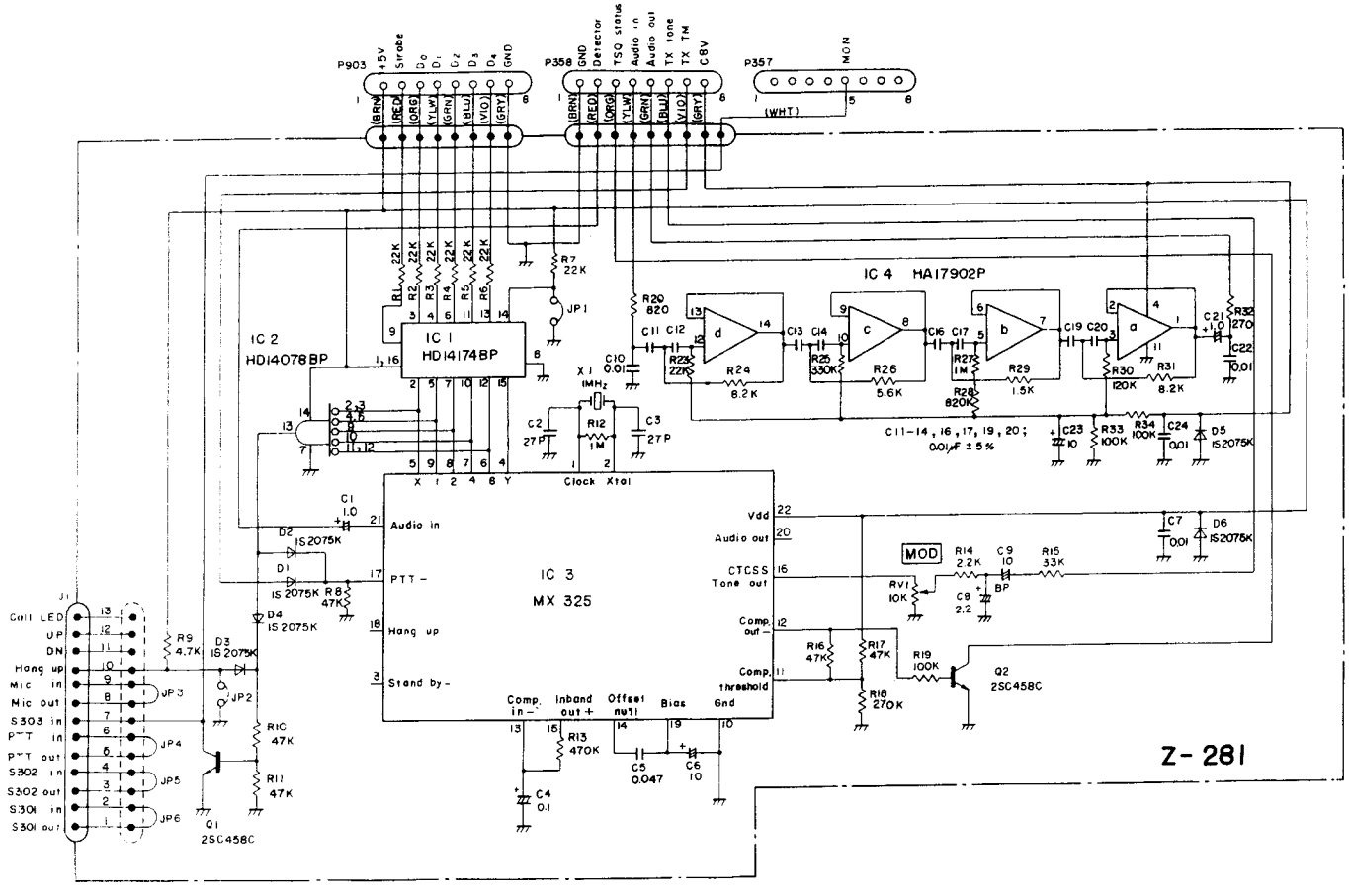
CTCSS PCB (TOP VIEW)



CTCSS PCB (BOTTOM VIEW)



CTCSS SCHEMATIC DIAGRAM



70-2102 PARTS LIST

REF. NO.	DESCRIPTION	PART NO.
	MISCELLANEOUS	
J1	Jack, 13 Pin	70-159098
P357, 358	Cable, Assy. W/Plug	70-034065
P903	Cable, Assy, W/Plug	70-034066
	PC Board	70-075026
X1	Crystal, 1 MHz	70-128024
RV1	Trim Potentiometer	70-144045
	Stud, Mt.	70-156072
	Screw, Mt.	70-151355
	TRANSISTORS	
Q1, 2	2SC458C	70-080082
	INTEGRATED CIRCUITS	
IC1	HD1417BP	70-076081
IC2	HC1407BP	70-076142
IC3	MX325	70-076092
IC4	HA17902P	70-076143
	DIODES	
D1,2,3,4,5,6	IS2075 (K)	70-085001
	TANTALUM CAPACITORS	
C1,21	1uF, 35V	70-138087
C4	.1uf, 35V	70-138086
C8	2.2uf, 35V	70-138103
	ALUMINUM ELECTROLYTIC CAPACITORS	
C6,23	10uf, 50V	70-135059
C9	10uf, 16V	70-135083
	CERAMIC CAPACITORS	
C2,3	27Pf, 50V	70-131190
C7,10,22,24	10,000Pf, 50V	70-132032
	MYLAR CAPACITORS	
C2,3	27Pf, 50V	70-131190
C5	47000 PF, 50V	70-137038
C11,12,13,14,16,17,19, 20	10000Pf, 50V	70-137048
REF. NO.	DESCRIPTION	PART NO.
	METAL FILM CHIP RESISTORS	
JP3,4,5,6	Zero Ohm	70-144001
R1,2,3,4,5,6,7,23	22K, 1/8 W	70-144032
R8,10,11,16,17	47K, 1/8 W	70-144034
R9	4.7K, 1/8 W	70-144025
R12,27	1M, 1/8 W	70-144042
R13	470K, 1/8 W	70-144041
R14	2.2K, 1/8 W	70-144067
R15	33K, 1/8 W	70-144033
R19	100K, 1/8 W	70-144037
R20	820 Ohm, 1/8 W	70-144018
R24,31	8.2K, 1/8 W	70-144028
R25	330K, 1/8 W	70-144040
R26	5.6K, 1/8 W	70-144026
R28	820K, 1/8 W	70-144069
R29	1.2K, 1/8 W	70-144020
R30	120K, 1/8 W	70-144070
R32	270 Ohm, 1/8 W	70-144014
R33,34	100K, 1/8 W	70-144037
R18	270K, 1/8 W	70-144071

70-2102 CTCSS MODIFIED TONE PROGRAMMING

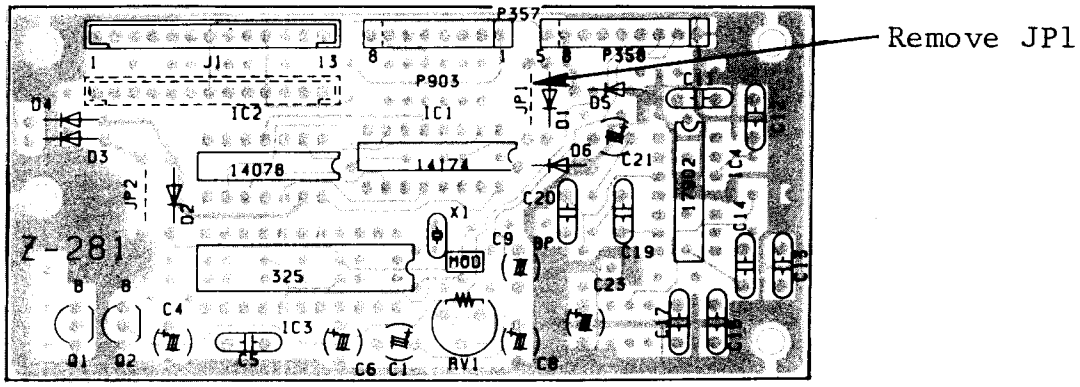
The 70-2102 CTCSS board can be programmed for 31 EIA tones in Group A and B. If JP1 is removed, 5 Group C tones can be programmed, but Group A and B tones are not programmable. To allow simultaneous programming of Groups A and C, Groups B and C or Groups A,B and C tones, follow the instructions given below. If the 97.4 Hz Group C tone is desired, a direct replacement IC 3 is available (P/N 70-076092). Code number 21 should then be used for 97.4 Hz programming.

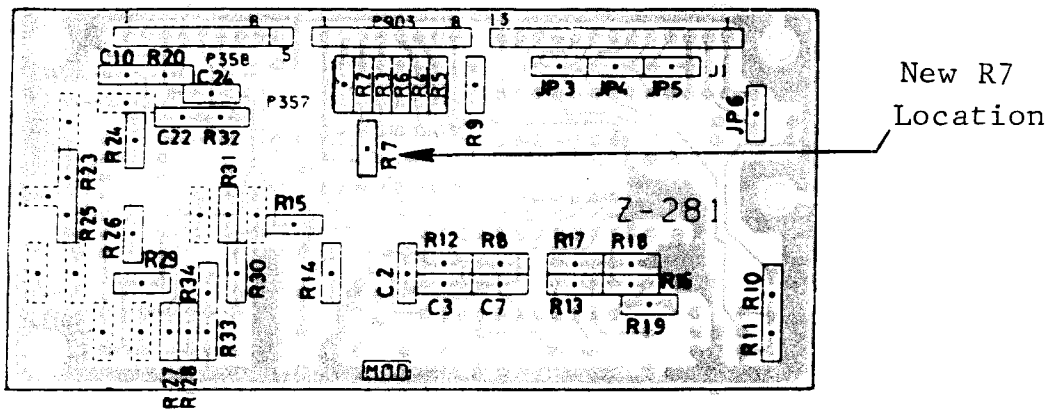
1. Simultaneous Group A and C Programming

Remove JP1 and reposition R7 as shown. Programming should then be as follows:

CODE NUMBER	FREQUENCY	GROUP	CODE NUMBER	FREQUENCY	GROUP
0	Tone Disable		*21	97.4 Hz	C
2	233.6 Hz	A	22	114.8 Hz	A
4	218.1 Hz	A	23	91.5 Hz	C
6	203.5 Hz	A	24	107.2 Hz	A
8	186.2 Hz	A	25	85.4 Hz	C
10	173.8 Hz	A	26	100.0 Hz	A
12	162.6 Hz	A	27	79.7 Hz	C
14	151.4 Hz	A	28	88.5 Hz	A
16	141.3 Hz	A	29	74.4 Hz	C
18	131.8 Hz	A	30	77.0 Hz	A
20	123.0 Hz	A	31	67.0 Hz	C

*With replacement IC 3 only
Codes 1,3,5,....,17, 19 are not used.





70-2102 CTCSS MODIFIED TONE PROGRAMMING

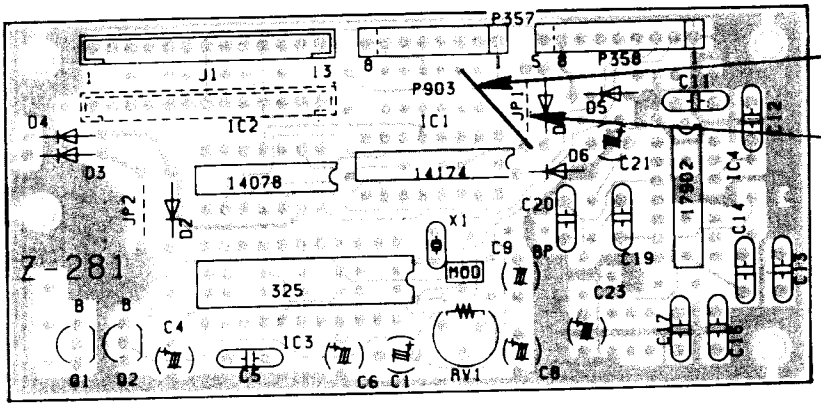
2. Simultaneous Group B and C Programming

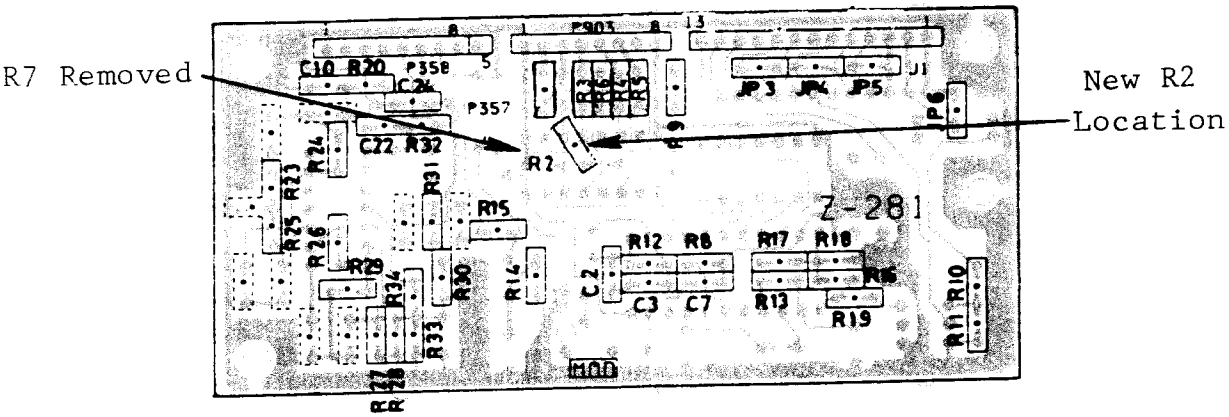
Remove R7 and JP1. Reposition R2 and add the jumper wire as shown. Programming should then be as follows:

CODE NUMBER	FREQUENCY	GROUP	CODE NUMBER	FREQUENCY	GROUP
0	Tone Disable				
2	225.7 Hz	B	*21	97.4 Hz	C
4	210.7 Hz	B	22	110.9 Hz	B
6	192.8 Hz	B	23	91.5 Hz	C
8	179.9 Hz	B	24	103.5 Hz	B
10	167.9 Hz	B	25	85.4 Hz	C
12	156.7 Hz	B	26	94.8 Hz	B
14	146.2 Hz	B	27	79.7 Hz	C
16	136.5 Hz	B	28	82.5 Hz	B
18	127.3 Hz	B	29	74.4 Hz	C
20	118.8 Hz	B	30	71.9 Hz	B
			31	67.0 Hz	C

*With replacement IC 3 only.

Codes 1,3,5,.....17,19 are not used.
The Group B tone 241.8Hz is not programmable.





70-2102 CTCSS MODIFIED TONE PROGRAMMING

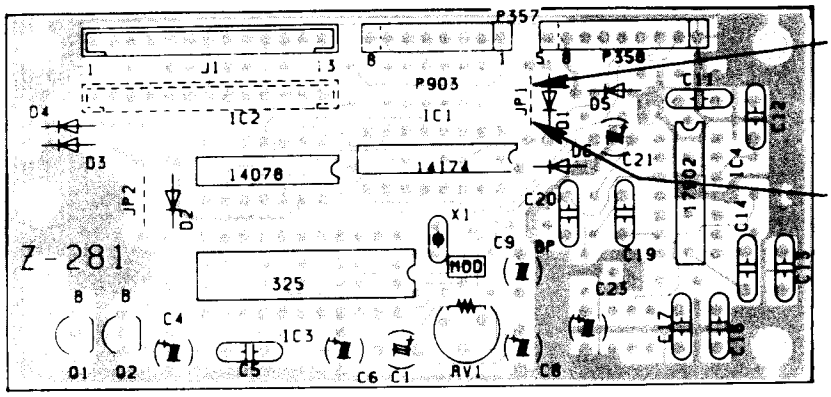
3. Simultaneous Group A, B and C Programming

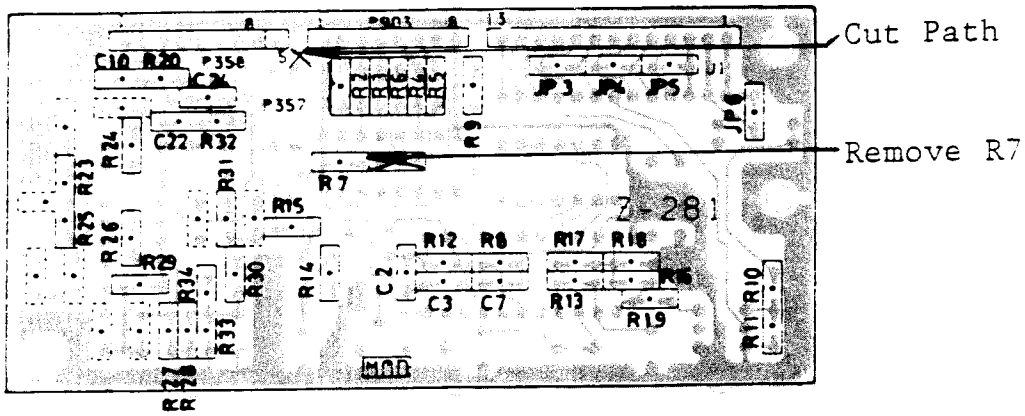
CTCSS tones in Groups A, B and C can be simultaneously programmed on a limited channel number basis by utilizing an appropriate LED channel display segment driver output as a C Group control line. To utilize this input the 70-2102 CTCSS tone board must be modified as follows:

a. Remove JP 1 and replace it with a 100K ohm 1/4 watt resistor. Connect a 6 inch length of wire to the end of the resistor closest to the board edge. If complete connectorization is desirable, a single pin receptacle (P/N 70-159118) can be connected to the resistor in place of the wire by bending the connector end at a right angle, slipping it over the resistor lead and soldering it in place. The mating male pin (P/N 70-034080) can then be connected to the C Group control wire which will be connected as described below.

b. On the bottom of the CTCSS board, cut the ground path connected to the resistor replacing JP-1.

c. Remove chip resistor R7.





(Continued)

70-2102 CTCSS MODIFIED TONE PROGRAMMING

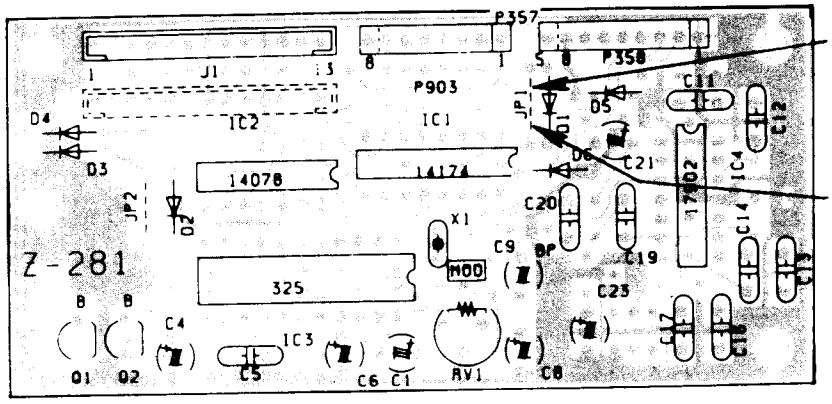
3. Simultaneous Group A, B and C Programming

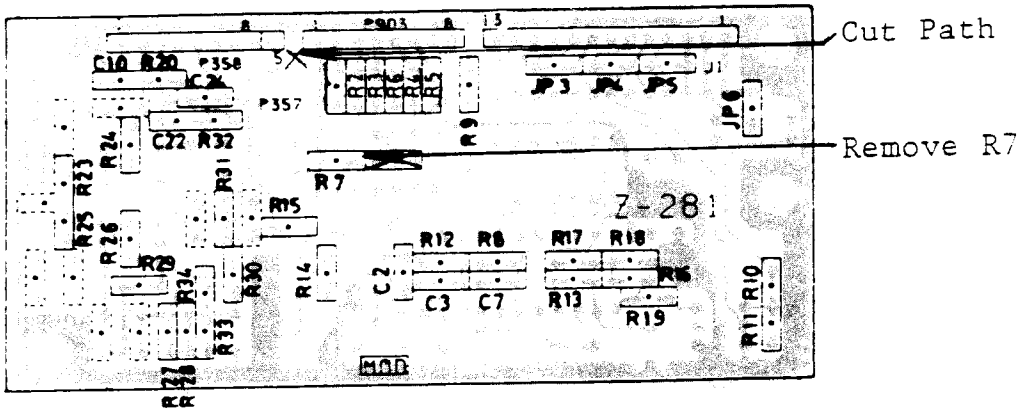
CTCSS tones in Groups A, B and C can be simultaneously programmed on a limited channel number basis by utilizing an appropriate LED channel display segment driver output as a C Group control line. To utilize this input the 70-2102 CTCSS tone board must be modified as follows:

a. Remove JP 1 and replace it with a 100K ohm 1/4 watt resistor. Connect a 6 inch length of wire to the end of the resistor closest to the board edge. If complete connectorization is desirable, a single pin receptacle (P/N 70-159118) can be connected to the resistor in place of the wire by bending the connector end at a right angle, slipping it over the resistor lead and soldering it in place. The mating male pin (P/N 70-034080) can then be connected to the C Group control wire which will be connected as described below.

b. On the bottom of the CTCSS board, cut the ground path connected to the resistor replacing JP-1.

c. Remove chip resistor R7.





(Continued)

70-2102 CTCSS MODIFIED TONE PROGRAMMING

The C Group control wire added in step a, on preceding page, must be connected to the appropriate output of one of the channel display segment drivers IC301 and IC302. On underdash models this connection can be made directly to the IC pin on the back of the CX-03, Display PCB according to the channel number/tone group chart below. On trunk mount models the appropriate IC 301 or IC 302 pin must be connected to either the AUX 1 or AUX 2 on the connector J396 (pin 20 or 21) located on the CX-05 control interface PCB in the control head. The C Group control wire from the CTCSS board can then be terminated in a male pin (P/N 70-034080), which will connect directly with P2, the floating connector carrying AUX 1 and AUX 2.

The C Group control wire should be connected per the following chart. DO NOT attempt to connect to more than one point on IC 301 or IC302.

Connection Point IC302 Pin	C Tone Only Channels	A and/or B Tone Only Channels
Pin 13	00-09,20-39,50-59,70-79	10-19,40-49,60-69
Pin 12	00-49,70-79	50-69
Pin 11	00-19,30-79	20-29
Pin 10	00-09,20-39,50-69	10-19,40-49,70-79
Pin 9	00-09,20-29,60-69	10-19,30-59,70-79
Pin 15	00-09,40-69	10-39,70-79
Pin 14	20-69	00-19,70-79

Connection Point IC301 Pin	C Tone Only All Channels Ending With:	A and/or B Tone Only All Channels Ending With:
Pin 13	0,2,3,5,7,8,9	1,4,6
Pin 12	0,1,2,3,4,7,8,9	5,6
Pin 11	0,1,3,4,5,6,7,8,9	2
Pin 10	0,2,3,5,6,8	1,4,7,9
Pin 9	0,2,6,8	1,3,4,5,7,9
Pin 15	0,4,5,6,8,9	1,2,3,7
Pin 14	2,3,4,5,6,8,9	0,1,7

The Tone programming codes given in the 70-1000 E/PROM Programmer Users Manual are still applicable, but are subject to the IC301/IC302 connection point chosen and the channel number selected. For example if the C Group control wire is connected to IC 302, pin 14, an auxiliary code of 23 will result in a tone frequency of 110.9 Hz (B Group) if programmed on channels 00-19 or 70-79. However, the same code 23 will result in a tone frequency of 91.5 Hz (C Group) if programmed on channels 20-69.

70-2141 SCAN KIT INSTALLATION INSTRUCTIONS

UNDER DASH MODELS ONLY

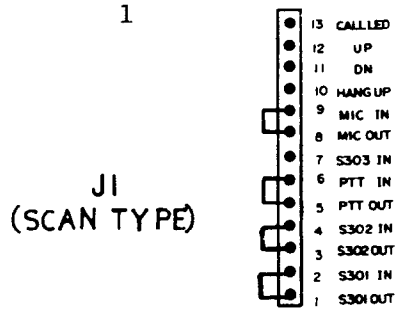
NOTE

When programming the E/PROM for scan operation, it is recommended that channels be programmed in both scan groups (primary and secondary). If one scan group is left unprogrammed, engaging the corresponding scan button on the radio may result in a lockup condition preventing manual channel change. This condition is removed when unit power is cycled off and on, but can be eliminated by programming at least one channel in each group.

1. Remove the 4 screws securing the radio top and bottom covers and remove the covers.
2. Remove the 4 screws securing the front panel assembly to the radio. Carefully slide the front panel assembly forward and away from the radio.
3. Remove the 2 screws securing the display/switch PCB (CX-03) and carefully separate the PCB from the front panel.
4. Note the mounting locations for the switches S301 and S302 and LEDs D302 and D303. Using a solder-sipper or solderwick, carefully remove solder from the switch and diode mounting holes.
5. Install S301 and S302 in the same manner as the monitor switch S303 already installed. Make sure the switches fit completely against the PCB before soldering.
6. Install the yellow LEDs D302 and D303 with the flat side toward the TX/Busy LED (LED's will not seat completely unless oriented correctly).
7. Push the blue switch covers on S301 and S302.
8. Remove the face plate by pushing from the rear of the front panel through the two available holes.
9. Remove the protective backing from the new face plate and carefully press it in place.
10. Carefully re-install the CX-03 PCB in place on the front panel, checking for proper switch operation.
11. Reinstall the front panel assembly on the radio.
12. Remove the clear sleeving and the jumper plug from P1, the floating option connector. Install the jumper plug from the kit (see below) and re-install the sleeving. If the CTCSS option board is installed, this jumper plug is not used.
13. Install an E/PROM module programmed for scan operation and confirm correct operation. Reinstall the unit covers.

70-2141 KIT COMPONENTS

DESCRIPTION	QUANTITY	PART NUMBER
Yellow LED	2	70-085052
Pushbutton Switch	2	70-180012
Switch Cover	2	70-110013
Scan Faceplate	1	70-020066
Jumper Plug	1	70-159109



J1
(SCAN TYPE)

70-2142 SCAN KIT INSTALLATION INSTRUCTIONS

TRUNK MOUNT MODELS ONLY

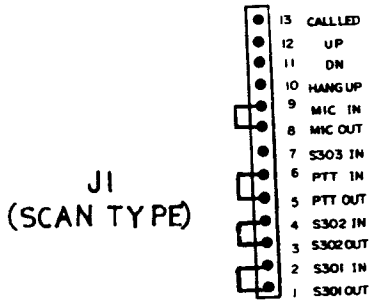
NOTE

When programming the E/PROM for scan operation, it is recommended that channels be programmed in both scan groups (primary and secondary). If one scan group is left unprogrammed, engaging the corresponding scan button on the radio may result in a lockup condition preventing manual channel change. This condition is removed when unit power is cycled off and on, but can be eliminated by programming at least one channel in each group.

1. Remove the 2 thumb screws securing the mounting bracket to the control head. Remove the 2 screws securing the rear cover and remove the cover.
2. Remove the 2 screws securing the front panel assembly. Carefully remove the front panel assembly.
3. Remove the 3 control knobs.
4. Note the mounting locations for the switches S301 and S302 and LEDs D302 and D303. Using a solder-sipper or solderwick, carefully remove solder from the switch and diode mounting holes.
5. Install S301 and S302 in the same manner as the monitor switch S303 already installed. Make sure the switches fit completely against the PCB before soldering.
6. Install the yellow LEDs D302 and D303 with the flat side toward the TX/Busy LED (LEDs will not seat completely unless oriented correctly).
7. Push the blue switch covers on S301 and S302.
8. Remove the face plate by pushing from the rear of the front panel through the two available holes.
9. Remove the protective backing from the new face plate and carefully press it in place.
10. Carefully re-install the control knobs, checking for proper orientation.
11. Reinstall the front panel assembly, rear cover and mounting bracket.
12. Remove the radio bottom cover for access to the option area. Remove the clear sleeving and the jumper plug from P1, the floating option connector. Install the jumper plug from the kit and re-install the sleeving. If the CTCSS option board is installed, this jumper plug is not used.
13. Install an E/Prom module programmed for scan operation and confirm correct operation. Reinstall the unit covers.

70-2142 KIT COMPONENTS

DESCRIPTION	QUANTITY	PART NUMBER
Yellow LED	2	70-085052
Pushbutton Switch	2	70-180012
Switch Cover	2	70-110013
Scan Faceplate	1	70-020067
Jumper plug	1	70-159109



70-2131 20KHz CHANNEL SPACING KIT

The 70-2131 20KHz channel spacing kit is required for transceiver operation on 10, 20 or 30KHz spaced channels. Remove the unit top cover and remove the 8 screws securing the Transmit/Synthesizer board. Disconnect P361-366 and remove the board. Referring to the accompanying diagram for locations, change the top and bottom side components as follows:

1. Top Side Components (Remove oscillators and TX PLL covers)
   Remove IC106 74LS92 IC (TX PLL section).
   Install 74LS93 IC and replace TX PLL cover.

   Remove X701 12.8 MHz crystal and Oven 701.
   Install 5.12 MHz crystal X701, replace Oven 701 and Oscillator cover.

   Remove JP103.
   Install JP104.

2. Bottom Side Components
   Remove C704 150pf chip capacitor
   Install C704 470pf chip capacitor

   Remove C705 100pf chip capacitor
   Install C705 330pf chip capacitor

   Remove R113 2.2K chip resistor
   Install R113 3.3K chip resistor

   Remove R114 18K chip resistor
   Install R114 10k chip resistor
   Remove R194 0 ohm chip resistor
   Install R167 0 ohm chip resistor

   Cut the trace between IC 701 pins 2 and 15.
   Add a jumper wire between IC 701 pins 2 and 16.

3. Reinstall the printed circuit board in the radio.

4. Erase and re-program the E/Prom, using Band 40B (Key Code B) if the radio is of standard configuration (low side receiver injection) and Band 40C (Key Code D) if a High Side Injection Kit (70-2166/-2170) has been installed. It is recommended that a label be attached inside the unit top cover to indicate any kits installed.

5. Follow the standard transmitter and receiver alignment instructions in the unit service manual.

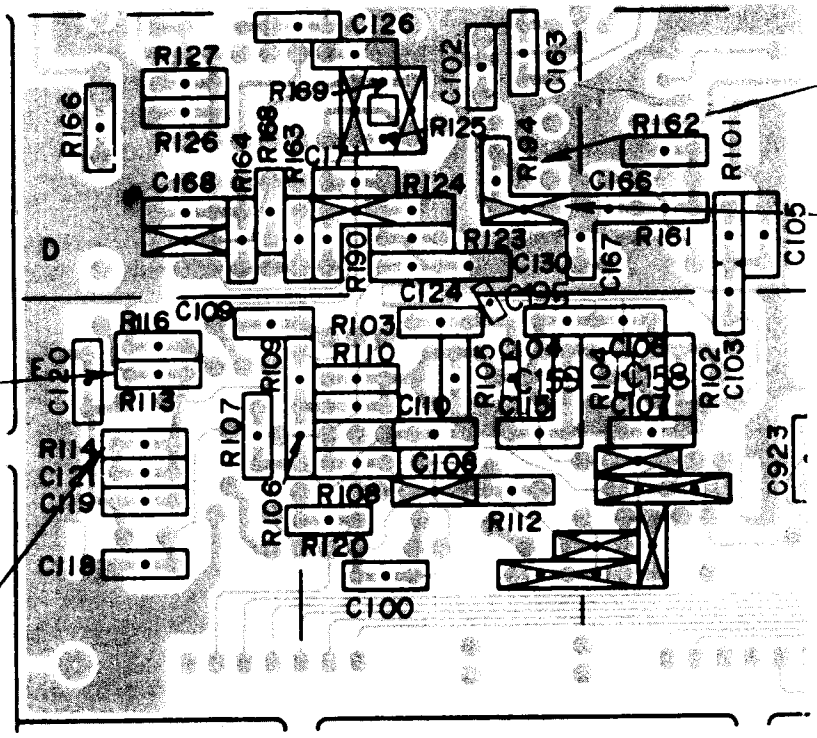
70-2131 KIT COMPONENTS

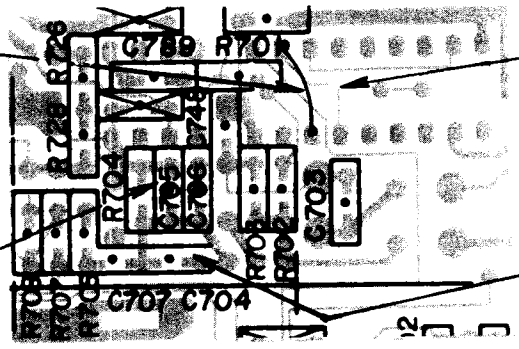
DESCRIPTION	QUANTITY	PART NUMBER
470pf Chip capacitor	1	70-132053
330pf chip capacitor	1	70-132052
3.3K chip resistor	1	70-144023
10K chip resistor	1	70-144029
0 ohm chip resistor	1	70-144001
74LS93 Integrated Circuit	1	70-076084
5.12 MHz crystal	1	70-128019

70-2131 20KHz CHANNEL SPACING KIT

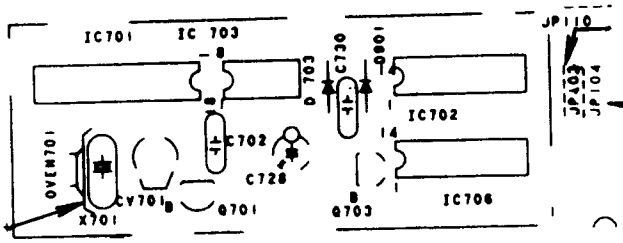
70-2131 20KHz Channel Spacing Kit

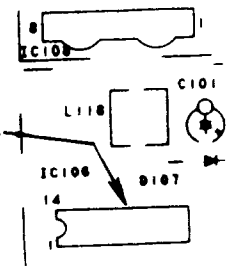
TX-404 Bottom





TX-404 Top





70-2126 2.0 PPM/70-2127 2.5 PPM OSCILLATOR KIT INSTALLATION INSTRUCTIONS

1. Remove the 8 screws securing the Transmit/Synthesizer board (TX153). Disconnect P361-366. Remove the Oscillator Shield cover.

2. Remove the crystal X701 and Oven 701.

3. Install the new X701 and Oven 701.

4. Reinstall the circuit board in the unit.

5. Adjust CV701 for the correct oscillator frequency, following the service manual alignment instructions.

ALTERATION OF SCAN SPEED, RESUME DELAY AND AUTO INCREMENT/DECREMENT

The scan speed, resume delay and automatic channel increment/decrement features of the referenced SYNTECH models can be altered by appropriate changes in E/PROM programming entries. To make the 70-1000 capable of accepting these entries, an internal jumper addition is necessary. This change does not affect any other operational characteristics of the 70-1000. Carefully follow the instructions below:

70-1000 E/PROM PROGRAMMER JUMPER ADDITION

1. Remove the 70-1000 from it's power source, turn it upside down and remove the 2 screws near the rear of the unit which secure the top metal cover. Remove the cover.

2. Locate the "(J188)" board marking on the rear right-hand corner of the main PCB. Add a jumper wire between the 2 terminal pads immediately behind the "(J188)" marking. Replace the cover and retaining screws.

3. Reconnect the 70-1000 to an AC power source and press the power switch. The FREQUENCY readout should briefly display all "8"s, then "PASS0A0" for about 1 second, followed by a "0" in the band readout. If "PASS1A0" is displayed instead, the J188 jumper connection has not been correctly made and should be rechecked. If the display is correct, proceed with the following steps.

PROGRAMMING THE E/PROM

1. Complete the data entry for channel frequencies, auxiliary codes, BCLO, TOT and scan sequence exactly as outlined in the 70-1000 operator's manual. Check all entries for correctness.

2. Before performing the "WRITE" operation, manual mode keyboard entries may be made to alter the standard scan rate of 3 channels/second and 5 seconds resume delay on both the home revert channel and other channels.

Make the following entries, referring to the accompanying chart for the "XX" entries

[RESET]

[MANUAL]

[4][0][4]

[ENTER]

[X][X]

[ENTER]

[RESET]

"XX" ENTRY	SCAN SPEED, CH/SEC	SCAN RESUME DELAY, SECONDS	
		HOME REVERT CHANNEL	OTHER CH.
72	3	5	5
62	3	2.5	5
52	3	5	2.5
42	3	2.5	2.5
32	10	5	5
22	10	2.5	5
12	10	5	2.5
02	10	2.5	2.5

(continued)

ALTERATION OF SCAN SPEED, RESUME DELAY AND AUTO INCREMENT/DECREMENT

IMPORTANT NOTE

If the transceiver has been converted for TONE SCAN operation, the 10 scan channels/second program option should not be used, since reliable tone detection will not occur at this scan rate.

3. Before performing the "WRITE" operation, the automatic channel increment/decrement feature may be disabled so that only 1 channel change per switch activation is possible. This will allow channel changes by counting switch activations without inadvertently engaging the automatic increment/decrement function.

Make the following keyboard entries:

[RESET]

[MANUAL]

[4] [0] [C]

[ENTER]

[4] [6]

[ENTER]

[RESET]

4. Plug the E/PROM into the 70-1000 and perform BLANK CHECK, WRITE and VERIFY operations per the 70-1000 Operator's Manual.

CONVERSION TO TONE/CARRIER SCAN OPERATION

The referenced SYNTECH models can be converted from carrier scan only operation to scan for tone or carrier in the same manner as manual tone/carrier squelch operation. Scan stop and squelch opening occurs on tone coded signals if the channel has been programmed for the correct tone. If tone is not programmed for a channel, scan stop and squelch opening will occur on receipt of carrier. When the monitor switch is engaged, scan stop and squelch opening will occur on carrier for all channels. Refer to the attached drawings for the following changes.

1. Cut or remove the wire connected to P364 pin 6. The pin can be removed from P364 by inserting a resistor lead into the slot at the bottom of the pin 6 position (front of plug). This releases the lock mechanism and allows the wire and pin to be removed.

2. Remove the receiver board from the unit and remove resistor R283, a chip resistor on the bottom of the PCB.

3. Add an insulated jumper wire from the terminal pad connected to J359 pin 2 to the terminal pad at J353 pin 3 (bottom of PCB). Reinstall the receiver board.

4. Remove the transmitter board from the unit. Remove C921, 10uf electrolytic capacitor located on top of the PCB. Remove the 100K ohm chip resistor R929 located on the bottom of the PCB. Reinstall the transmitter board.

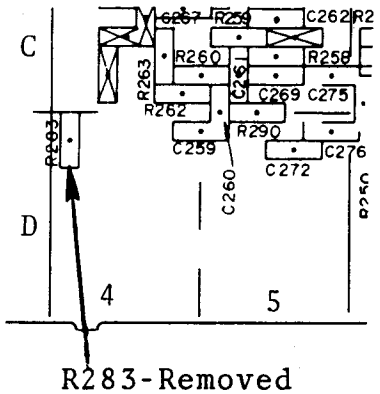
5. Program the desired tone-coded channels and scan channels as detailed in the 70-1000 E/PROM Programmer operator's manual.

NOTE

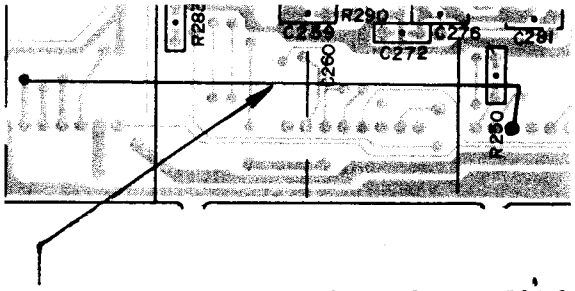
Transceivers configured for tone scan operation should <u>not</u> be programmed for 10 channels/second scan speed, since reliable tone detection will not occur at this scan rate.

(continued)

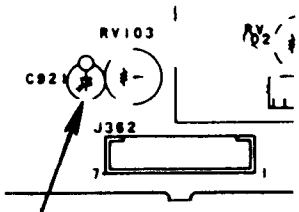
CONVERSION TO TONE/CARRIER SCAN OPERATION



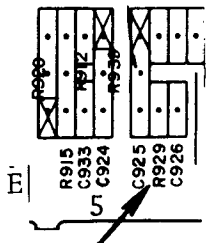
R283-Removed
RX-450 bottom



Add-Jumper J359 Pin 2 pad to J353 Pin 3
RX-405 bottom



C921-Removed
TX-404 top



R929-Removed
TX-404 bottom

CONVERSION TO TONE SCAN OPERATION

The referenced SYNTECH models can be converted from carrier scan operation to tone-only scan operation. (If combined tone/carrier scan operation is desired, refer to the instruction sheets detailing that conversion.)

Carefully follow the instructions given referring to drawing shown below.

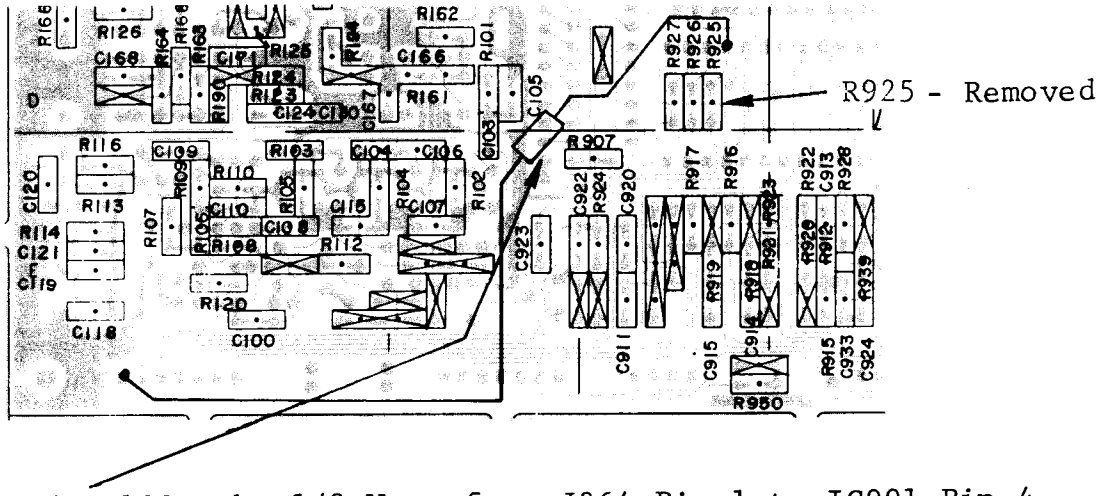
1. Cut or remove the wire connected to P364 pin 6. The wire can be removed from the plug by inserting a resistor lead into the slot below the pin 6 position. (front of plug), to release the socket.

2. Remove the transmit/synthesizer board from the unit. Remove R925, 100K ohm chip resistor located on the bottom of the PCB. Add an insulated-lead 100K ohm 1/8 watt resistor from J364 pin 1 to IC901 pin 4 (bottom of PCB). Reinstall the transmitter/synthesizer PCB.

3. Program the E/PROM for tone frequencies and scan channels as detailed in the 70-1000 E/PROM Programmer Operator's Manual.

NOTE

Transceivers configured for tone scan operation should not be programmed for 10 channels/second scan speed, since reliable tone detection will not occur at this scan rate.



TONE-ENABLED TRANSMIT/RECEIVE

The referenced SYNTECH transceivers can be configured to allow tone-enabled receive and transmit operation. In this mode only correctly coded signals are received and transmitter activation can occur only while the correct tone is being received.

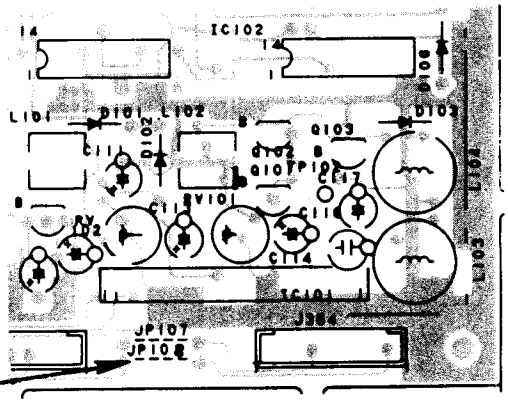
1. Remove the transmit/synthesizer board from the unit. Remove the jumper installed in the JP107 or JP108 position. Both jumper positions must be empty.

2. On the bottom of the transmit/synthesizer board, cut the PC trace at J364 pin 6. Install an insulated jumper wire from J364 pin 6 to the JP107 or JP108 hole closest to J362.

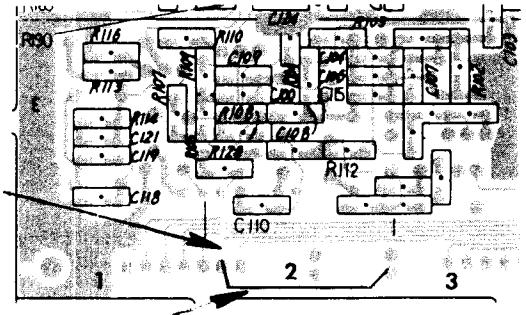
3. Remove the wire (S303, monitor switch) from P1 pin 7.

4. Install JP2 on the CTCSS board.

5. Program the E/PROM for the desired channel and tone frequencies. The BCLO function should be programmed Code 2 to give the user an audible indication that transmit is not occurring.



Remove JP107 or JP108



Cut PC trace at J364 pin 6

ADD - Jumper Wire from J364 Pin 6 to JP107 or JP108 hole.

70-2181 80 CHANNEL MODIFICATION KIT INSTRUCTIONS

The referenced SYN TECH model radios may be modified to allow an increase in channel capacity from 36 to 80 channels. Refer to MA-113A for details of 70-1000 programmer modifications to allow 80 channel programming. The 70-2181 Kit consists of the following:

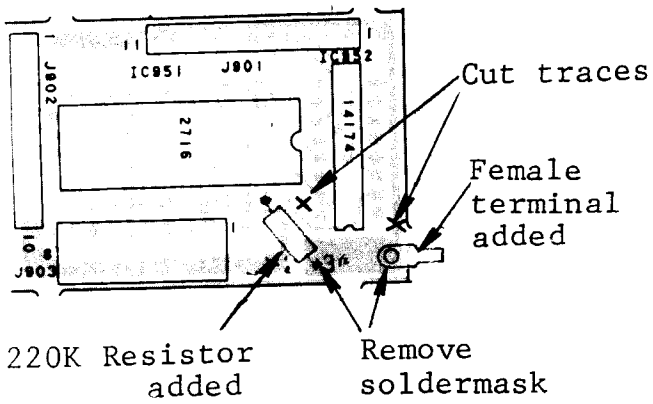
DESCRIPTION	QUANTITY	PART NUMBER
Terminal Assembly	1	70-034080
220K 1/8 W Resistor	1	70-145001
270K 1/8 W Chip Resistor	1	70-144071
Female Terminal	1	70-159118

Kit installation should be done as follows:

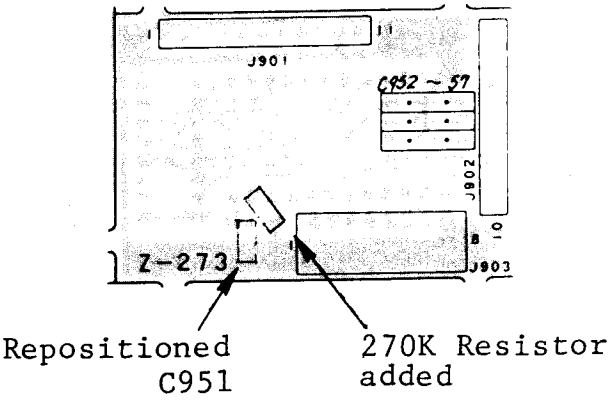
1. Solder the stripped end of the terminal assembly wire in the indicated hole on the synthesizer/transmitter board (see diagram). Board removal may be necessary to clear the hole of solder.
2. Cut the ground trace on the top of the E/PROM module PC board near IC 952 Pin 1. Scrape the soldermask from the isolated pad in the indicated areas. Cut the PC trace that runs between pins 15 and 16 of IC 952.
3. Solder the female terminal on the pad area at the end of the module PC board.
4. Trim the leads of the 220K resistor and solder in place from IC 951 Pin 23 to the isolated pad.
5. Turn the E/PROM module over and locate C951, a brown chip capacitor near the lower left corner of the board. Scrape the soldermask from the ground area located directly below the left end of C951. Carefully remove C951 and reposition it to connect to the ground plane as shown in the diagram. Solder the 270K chip resistor provided with the kit in the position shown.
6. Program the E/PROM as described in Manual Addition MA-113A. After programming, install the E/PROM module in the radio in the normal fashion, then plug the terminal assembly into the female terminal on the E/PROM module. Radio operation is changed only in that 80 channels can now be programmed.

70-2181 80 CHANNEL MODIFICATION KIT INSTRUCTIONS

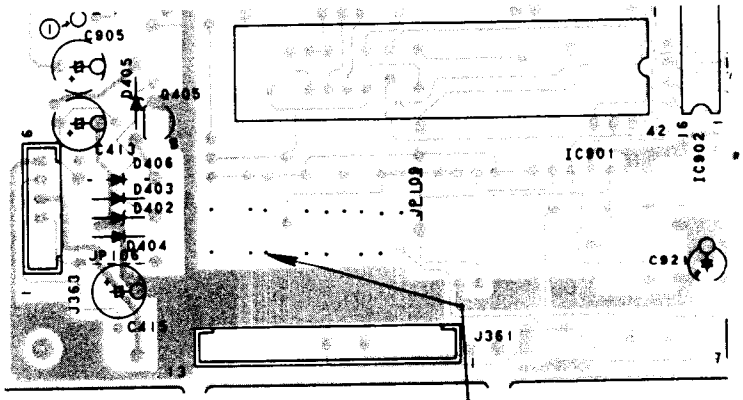
E/PROM MODULE (TOP)



E/PROM MODULE (BOTTOM)



SYNTHESIZER/TRANSMITTER BOARD (TOP)



70-K33 BASE STATION MIC ADAPTOR KIT INSTALL INSTRUCTIONS

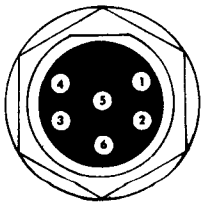
The 70-2305 microphone is a dynamic type with an integral amplifier, automatic sensitivity control circuit and an output converter for driving carbon type transceiver inputs. The push-to-talk switch is a normally-open type that contacts to ground on transmit and the monitor switch is a normally-closed type also contacting to the same ground. Operating power for the electronics is obtained from the transceiver through a connection to a source of filtered +13.8 volts D.C. The 70-2305 pinouts are as follows.

PIN	COLOR	FUNCTION
1	RED (shielded)	Filtered +13.8 VDC
2	SHIELD (SH 2)	Shield for 1 and switch ground
3	BLUE	Monitor switch (NC to ground)
4	WHITE (shielded)	Microphone audio output
5	SHIELD (SH 1)	Microphone audio shield
6	BLACK	Push-to-talk switch (NO)

To allow connection of the 70-2305 to the referenced mobile transceivers, the 4 pin microphone jack on the mobile unit can be replaced by a 6 pin jack. This replacement jack and sufficient wire to complete the modification are contained in kit number 70-K33, available from Midland. Replacement should be made as follows.

1. Remove the transceiver top and bottom covers. Remove the 4 screws securing the front panel to the unit and slide the front panel forward, separating it from the unit. Remove the 2 screws securing the CX-07 Display PCB assembly and separate it from the front panel.
2. Remove the 4 pin microphone jack J393 (the 70-156018 microphone jack removal tool is available for this purpose). Install the replacement jack in the front panel and reconnect the wires and capacitors according to the following chart.

ORIGINAL J393 (4 PIN)	6 PIN REPLACEMENT JACK	
1 (BROWN), C391	4	C391
2 (RED), C391, C392	2 and 5	C391, C392
4 (ORANGE), C392	6	C392
	1	
	3	



REAR VIEW

Pins 1 and 3 of the replacement jack must be connected to the transceiver to supply microphone power and allow control of the sub-audible tone squelch for monitoring. Using the wire supplied in the kit, connect mic jack pin 1 to J381 pin 3 and mic jack pin 3 to J381 pin 1. J381 is located at the rear of the front panel control PCB CX-04. Connections can most easily be made on the bottom of the PCB.

3. Carefully reinstall the CX-03 PCB, positioning C391 and C392 to fit through the hole directly behind the microphone jack. Reinstall the CX-03 retaining screws and reconnect the front panel to the radio.

70-K33 Kit Components

DESCRIPTION	QUANTITY	PART NUMBER
6 pin microphone jack	1	70-159058
24AWG wire, 15"	2	-----