AWA RT-85

CARPHONE

BAND	TYPE No.	FREQUENCY
VHF(LB)	1LM82271	70-85MHz
VHF(HB)	1LM82272	148-174MHz
UHF(LB)	1LM82273	403-420MHz
UHF(MB)	1LM82274	450-475MHz
UHF(HB)	1LM82275	470-500MHz
UHF(SHB)	1LM82276	495-520MHz

Handbook No. 1LH82270

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RT-85 TECHNICAL HANDBOOK

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RT-85 TECHNICAL HANDBOOK

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A.1 - SPECIFICATIONS

GENERAL SPECIFICATIONS

Band	Type Number	Frequency Range (MHz)	No. of Channels	Channel Spacing (KHz)	Maximum Channel Separation (MHz)
VHF(LB)	1LM82271	70-85	1-64	30*	3.0
VHF(HB)	1LM82272	148-174	1-64	30*	5.0
UHF(LB)	1LM82273	403-420	1-64	25	Tx 9.5 Rx 3.0
UHF(MB)	1LM82274	450-475	1-64	25	Tx 9.5 Rx 3.0
UHF(HB)	1LM82275	470-500	1-64	25	Tx 9.5 Rx 3.0
UHF(SHB)	1LM82276	495-520	1-64	25	Tx 9.5 Rx 3.0

* 12.5KHz channel spacing available to order with channel frequencies any multiple of 6.25KHz.

Frequency Stability

+-0.0005% over -10°C to +60°C range (+25°C reference).

Voltage

13.8 V DC Negative Ground.

Primary Power Current (Approx)

Standby with Rx muted and display blanked:		350mA max.
Standby with display active:		450mA approx.
Receiving (3W AF output):		800mA max.
Transmitting	VHF:	6.0A max.
	UHF (1.2MHz separation):	7.5A max.
	UHF (9.5MHz separation):	7.8A max.

Operating Temperature

-10°C to +60°C.

Dimensions

	Transceiver	Control Unit
Height:	60mm	70mm
Width:	185mm	124mm
Depth:	250mm	45mm
Weight:	4.0Kg (including cradle)	0.45Kg

TRANSMITTER SPECIFICATIONS

Type

Phase-locked loop synthesized exciter with Voltage Controlled Oscillator (VCO) at final output frequency, driving power amplifier with regulated power output.

RF Output

25W +-10%.

Power

12.4-16.0 V DC over normal switching bandwidth.

Power Adjustment Ranges

12-25W or 0.5-12W (range selectable from control unit).

Output Impedance

50 ohms unbalanced.

Modulation

Phase/frequency modulation.

Deviation

Does not exceed +-5KHz (+-2.5KHz for 12.5KHz channeling).

Noise Level

Less than 50dB below full deviation (EIA).

Spurious Radiation

Less than 2.5uW.

Microphone Input

Audio response from 300Hz to 2500Hz:
Within +1dB and -3dB of a 6dB/octave characteristic (with 1KHz as the 0dB reference).

Audio response at 3000Hz:
Within +1dB and -4.5dB using above reference.

Audio distortion:
Less than 3% at 1KHz with +-3KHz deviation (EIA).

Auxiliary Audio Input

Audio response from 300Hz to 2500Hz:
Within +1dB and -1dB of a flat response (with 1KHz modulating frequency and +-1KHz deviation as 0dB reference).

Audio response from 2500Hz to 3000Hz:
Within +1dB and -3dB using above reference.

Audio distortion:
Less than 3% at 1KHz with +-3KHz deviation (EIA).

RECEIVER SPECIFICATIONS

Type

Double conversion superheterodyne. Synthesizer derived local oscillator.

Input Impedance

50 ohms.

Intermediate Frequencies

21.4MHz (first IF), 455KHz (second IF).

Sensitivity

Less than 0.35uV pd for 12dB SINAD.
Less than 0.5uV pd for 20dB quieting.

Intermodulation Response

VHF: -80dB below 12dB SINAD sensitivity (EIA method)
UHF: -72dB below SINAD sensitivity (EIA method).

Spurious Responses

Better than 85dB.

Signal-to-Noise Ratio

Better than 50dB unsquelched.
Better than 60dB squelched (EIA).

Squelch Threshold Sensitivity

Better than 0.2uV.

Modulation Acceptance Bandwidth

+-7.5KHz.

Audio Output

More than 3W.

Audio Distortion

Less than 5% at full output.

Audio Response (Loudspeaker Circuit)

Between 300Hz and 3000Hz:
Within +2dB and -8dB of a 6dB/octave de-emphasis characteristic (with 1KHz as the 0dB reference point).

Pre-Squelch Audio Output

Frequency response between 50Hz and 3000Hz:

Within +1dB and -1dB of a flat response (with 1KHz modulating frequency and +-3KHz deviation as 0dB reference).

Level:
Nominal 340mV into 10K ohm impedance at +-3KHz deviation.

Distortion:
Less than 5% at 1KHz modulating frequency and +-3KHz deviation.

Post Squelch Audio Output

310mV rms into 10K ohms.

Squelch Output Control Signal

With load impedance 10K ohms:
Squelch OFF: Greater than 4.5V dc.
Squelch ON: Less than 0.5V dc.

* The performance figures stated herein are typical of those obtained in practice, but are subject to normal production and servicing tolerances.

The manufacturer reserves the right to alter the equipment in line with future technical developments.

A.2 - FEATURES & OPTIONS

STANDARD FEATURES

64 Channel Capacity

Channels numbered 1 to 63 plus "0" can be programmed to any frequency within the specified switching bandwidth for the unit. Any channel can be left unprogrammed, and for any channel, the transmitter and receiver may have different frequencies. The same frequency can also be used on any number of channels.

Synthesized TX and RX Frequencies

VHF - Any frequency multiple of 5KHz.
(Optional - multiples of 6.25KHz)
UHF - Any frequency multiple of 12.5KHz.

Receiver Channel Scanning

If scanning is activated by operation of the SCAN button, the receiver will step across a programmed sequence of channels at a rate of 0.2 or 0.4 sec./channel (programmable), and will stop on a channel if a carrier signal (or carrier plus CTCSS if programmed) is detected. The receiver will then monitor that channel until the received signal stops, after which scanning will resume with a hold time of 1.3 to 7.5 sec. (programmable).

Transmitter Power Adjustment & Switching

The output power of the transceiver may be set to one of two settings (selected from the rear of the control unit):

High - 12 to 25 watts
Low - 0.5 to 12 watts.

Transmitter Time-out Timer

This programmable feature allows a limited transmission period (30, 60, 90, 120, 150, 180 or 210 secs.) when the microphone PTT button is held on. After this period, the TX switches off, and an audible "beep" is sounded. If the PTT button is released, the operator is able to commence another transmission period.
Alternatively, the unit may be programmed so that the TX will not time out, making continual transmission possible.

Channel Busy Indicator

If the receiver noise squelch is opened, either by adjustment of the SQUELCH control or from a received carrier, the yellow BUSY LED on the control unit will light.

Transmit/SELCALL "CALL" Indicator

The CALL LED will light if the transmitter is activated. It will flash if a code is received by the Selective Calling Decoder, if fitted (see HARDWARE OPTIONS below).

Reversed Battery Polarity Protection

Inherent non-destructive protection prevents damage to the unit if the battery supply is reversed. However, to protect the vehicle wiring in the event of a wiring short or a battery reversal, fuses are fitted in the leads between the transceiver and the battery.

Auxiliary Connector

A 20-way flat cable connector on the transceiver allows attachment of external accessories (e.g. a printer).
Access is provided to: the switched supply, ground, RX pre- and post-squelch, squelch outputs, squelch control signal output, loudspeaker mute input, auxiliary TX audio input and PTT.
In addition, 9 pins are left uncommitted, for special user applications.

Carrier Release Time

For special applications, the unit can be programmed so that the TX carrier will hold on for 0-350msec. after release of the microphone PTT button.

Pre-terminated Installation Cables

A battery lead fitted with fuses and transceiver connector is supplied with each unit, requiring only attachment to the battery.
The aerial is supplied with connected coaxial cable and BNC plug, ready for attachment when the cable is cut to length.

Busy Transmit Inhibit

If programmed, this feature prevents transmission whenever the BUSY LED is on.

Control Unit Interchangability

The RT-85 will accept two types of control unit, viz:

the 1-4C82009 RT-80 control unit, which provides limited facilities (10 channels only, no scanning, no status)

or

the 1LC82259 RT-85 control unit, which provides all facilities of the RT-85 system.

HARDWARE OPTIONS

1. CTCSS "Quietline" Encoder ST-100A (Single Tone)

Any CTCSS frequency (67Hz to 200Hz) may be set so that all transmissions have the sub-audible tone generated simultaneously with voice transmission. This is used to open the loudspeaker in special base consoles or to provide access to talk-through base stations and repeaters.

2. CTCSS "Quietline" Encoder/Decoder Z-281 (Programmable)

This CTCSS encoder modulates all transmitted audio signals with the required CTCSS tone, while the decoder allows all received signals to be muted until the required CTCSS tone is present on the incoming signal.
This option allows specific CTCSS encode and decode frequencies (determined when programming) to be independently selected for each RF channel. A different tone frequency may be programmed for TX and RX, and any frequency from EIA groups A or B may be selected. In addition, the unit may be programmed so that CTCSS is inhibited for specific channels. A high pass filter is included in this module to remove the CTCSS tone in the loudspeaker.

* Note: Either Option 1 or Option 2 listed above may be fitted.

3. SELCALL Encoder/Decoder ZX-06A

This plug-in unit allows the receiver to remain muted until a specific 5 tone code is received. At this time, the receiver unmutes (i.e. reverts to noise squelch only), an audible "beep" is sounded from the loudspeaker, and the CALL LED flashes. In addition, the 5 tone code is automatically retransmitted as a "handshake" back to the caller. If the SEND button is depressed, a 5 tone code is sent to open the loudspeaker at a specific base control point.

4. SELCALL Encoder/Decoder with Status/Car-to-Car Calling Facility ZX-06C

This option comprises the ZX-06A Selcall Encoder/Decoder plus the 1LK82267 Selcall Status/Car-to-Car Calling Kit.

In addition to the features of Option 3 above, this option allows either:

a status number 0 to 9 (as displayed on the control unit) to be transmitted on automatic transpond when a call is received or when the SEND button is depressed. A decoder at the base station is required to display this status number.

or

a car number (as displayed on the control unit) to be transmitted when the SEND button is depressed. This allows one car from a group of ten to call another car in the group.

* Note: Either Option 3 or Option 4 listed above may be fitted (in addition to either Option 1 or Option 2).

PROGRAMMING FEATURES RELATED TO OPTIONS 2, 3 and 4

A. SILENT Button and OPEN L.E.D.

If the loudspeaker is muted because Option 2, 3 or 4 is fitted, operation of the SILENT button on the control unit switches the OPEN LED on, and the receiver reverts to noise squelch only.
For special privacy applications, the SILENT button can be rendered inoperative (by programming) so that the operator is unable to open the muting on the receiver.

B. BUSY LED Delay

This option allows a transceiver with CTCSS decoding to function so that the operator does not have to open the receiver muting before transmitting. The option is implemented so that the BUSY LED remains on for approximately 5 seconds after a carrier has been received. If Busy Transmit Inhibit (see STANDARD FEATURES above) is set, transmission will only be possible if the channel has been clear for at least 5 seconds.

C. TX SILENT Inhibit

If "listen before sending" type operation is required, this option is implemented (during programming), so that the operator must open the receiver mute and switch the OPEN LED on before transmission is possible.

EXTERNALLY CONNECTED OPTIONS

1. HS-81 Handset

The standard hand microphone is removed when this option is fitted. The operator may choose to listen through the loudspeaker or through the handset earpiece. The handset also contains a microphone and PTT switch.

2. Extension Cable Kit 1LK82149 / 2LK82149 (Heavy Duty)

For boot mounted installations, this kit provides cables to extend the control unit and battery connections by 4 metres.

3. "Transcript 85" Printer

If special computing equipment is installed at the base station, messages may be directed through the RT-85 unit to the Transcript 85, where they will be printed on metallised paper.
In addition, up to 10,000 status codes may be sent back to the base station from the printer.

4. Security Lock

This lock may be fitted to the mounting cradle to prevent unauthorised removal of the RT-85 transceiver from its cradle.

A.4 - OPERATING INSTRUCTIONS

STANDARD EQUIPMENT - NO OPTIONS FITTED

Each RT-85 Carphone is pre-programmed to suit the specific operational requirements of the user's radio system. These programmable 'software' options are permanently stored within the equipment to provide the operator with the functions and facilities previously determined. However, if necessary, the RT-85 Carphone can be re-programmed at any future time to suit subsequent changes to operational needs.

The following instructions refer to the standard RT-85 Carphone with none of the available options fitted. All operator controls referred to are located on the Control Unit.

POWER ON/OFF

To switch on the equipment, rotate the OFF/SQ control clockwise (downwards direction).

CHANNEL SELECTION

To select the desired channel, momentarily depress the UP or DOWN buttons to singularly advance or retard the previously displayed channel. The channel number is displayed with a 2-digit LED readout STATUS/CHANNEL.

If the RT-85 has been programmed for single channel only, operation of the UP and DOWN buttons for channel change is inhibited. When more than 10 channels have been programmed, depressing either the UP or DOWN buttons for more than one second will cause the stepping of channels to occur at a rate of 10 at a time.

* The STATUS/CHANNEL display will automatically switch off after 20 seconds. This feature prevents visual discomfort to the vehicle operator at night, and also preserves battery current. However, the previously selected operating channel is immediately displayed again by momentarily depressing the UP or DOWN buttons, or operating the microphone PRESS-TO-TALK button to initiate a transmission from the mobile unit.

RECEIVING

1. To hear incoming messages on the selected channel, adjust the VOLUME control for the desired listening level.

2. To silence unwanted noise in the absence of signals, start with the OFF/SQ control at its lowest setting (as near as possible to fully anti-clockwise i.e. upwards direction without turning off power) then, during an interval in which no signals are being received, gradually rotate the control clockwise (downwards) until received noise is silenced.

* In areas of very weak or fluctuating signals, it may be necessary to temporarily return the OFF/SQ control to its lowest setting in order to improve the intelligibility of the incoming signal.

Unless the CTCSS (Quietline) Encoder/Decoder and/or Selcall options are fitted, the SILENT button and OPEN LED indicator have no significance, and their operation is inhibited.

The BUSY LED is illuminated whenever a signal is being received on the channel, or when the OFF/SQ control is set to its lowest point (receiver noise audible).

TRANSMITTING

1. If the set has been pre-programmed so that transmission is inhibited when the BUSY LED is illuminated, transmission will not be possible if the channel is occupied or if SQUELCH is open, in which case a short audio beep will be heard.

2. Wait for a short interval after the BUSY LED is extinguished, and then press the button on the side of the microphone and speak into the microphone at normal conversational level, from a distance of approximately 10 cm. While this PRESS-TO-TALK (PTT) button is operated, the CALL LED is illuminated. (A pulse tone of short duration will be heard in the loudspeaker if the transmitter is not being activated when the PTT button is operated).

3. Release the PTT button immediately after finished speaking, otherwise the reply message will not be heard.

4. It is normal for any continuous transmission to be automatically limited to a preset period of between 0-210 seconds (usually 60 seconds) to curtail lengthy transmissions on the operating channels.

   At the expiration of this preset time period, the operator will hear a tone signal to indicate that his transmitter has automatically switched off. The PTT button must then be released and re-operated before transmission can be continued.

5. When the exchange of messages has been completed, return the microphone to its holder.

EQUIPMENT FITTED with ADDITIONAL PROGRAMMABLE OPTIONS and HARDWARE OPTIONS

CHANNEL SCANNING (RECEIVE)

Pre-determined frequency channels are automatically scanned sequentially in the order decided at time of programming of your equipment.

The operating channel selected manually prior to engaging the SCAN button becomes the 'priority' or 'home-reverting' channel.

When an incoming signal is detected, the automatic scanning action stops until that channel is clear. Scanning will resume after a pre-determined delay (normally 5 seconds) after the channel clears. Alternatively, scanning can be resumed from a busy channel by depressing the UP button once, which causes the next channel to be selected.

The SCAN LED indicator will glow when scanning is operating and the CHANNEL display will indicate the frequency channels being scanned.

A two-beep tone alarm will be heard when a signal is detected on the 'priority' or 'home' channel to indicate that particular channel has been activated.

SCANNING OPERATION (TRANSMIT MODE)

If the microphone PTT button is operated during the scanning mode, this will cause the scanning functions to stop, a single-beep tone alarm will be heard from the loudspeaker, and the 'priority' or 'home' channel will be immediately displayed. Transmission on this channel will not occur however, until the microphone PTT button is released and then re-activated. Scanning action will not be resumed until the SCAN button is again operated manually.

OPERATING with CTCSS 'Quietline' ENCODER ST-100A

This option allows a sub-audible preset tone to be injected automatically into all transmissions made from the vehicle. No special operator action is required, and the system is operated as for the standard configuration.

OPERATING with CTCSS 'Quietline' ENCODER/DECODER Z-281

With this option installed, a vehicle operator can choose to listen only to those messages specifically intended for his network. This is done by depressing the SILENT button to its on position, i.e. when the channel OPEN LED indicator is not lit. In this position, all signals present on the channel, other than those containing the correct Quietline tone, are silenced. However, it is normally arranged for transmissions from the mobile also to be inhibited when operating in SILENT mode.

When transmission is required the equipment can be operated as for the standard system by again depressing the SILENT button. This action will also illuminate the OPEN LED indicator and all messages on the channel will then be heard.

OPERATING WITH STANDARD Selcall DECODER/ENCODER ZX-06A

Receiving Calls

By virtue of this option, the vehicle operator can choose to listen only to those messages specifically directed to him (SILENT mode), or he can listen to all messages on the channel (OPEN channel). In either case, an alert that the base operator is directing a specific call to his vehicle is given by means of a 2-second burst of audio beep tone from the loudspeaker, accompanied by continuous flashing of the red CALL indicator. Should the vehicle operator fail to respond to the call, every succeeding attempt by the base operator to contact the vehicle will produce the audio beep alert tone. (The CALL indicator will continue to flash throughout this period).

Transmitting a Vehicle Address Code

When fitted, this facility enables the vehicle operator to transmit his vehicle address code to the base station by momentarily depressing the SEND button. However, this transmission can only occur when the BUSY indicator is not alight (i.e. the channel is clear), and the SILENT button is in the OPEN channel position.

OPERATING WITH Selcall DECODER/ENCODER ZX-06C INCLUDING CAR-TO-CAR CALLING FACILITY

Receiving Calls

Operation is the same as described above under "OPERATING WITH STANDARD Selcall DECODER/ENCODER ZX-06A".

Calling a Selected Mobile (or Base Station)

Momentarily depress the SEND button. This will cause the 2-digit STATUS/CHANNEL readout to display only the left-hand digit, which can be altered to suit the number required corresponding to the vehicle (or base station) to be called. The displayed number is altered by depressing the UP and DOWN buttons until the required number is displayed. Then, again depress the SEND button to transmit the selected address code.

Note, however, transmission can only occur when the BUSY indicator is not alight (i.e. the channel is clear), and the SILENT button is in the OPEN channel position.

OPERATING WITH Selcall DECODER/ENCODER ZX-06C INCLUDING STATUS CALLING FACILITY

Receiving Calls

Operation is the same as described above under "OPERATING WITH STANDARD Selcall DECODER/ENCODER ZX-06A".

Transmitting a Status Code to the Base Station

Momentarily depress the SEND/STATUS button. This will cause the 2-digit STATUS/CHANNEL readout to display only the left-hand digit, which can be altered to suit the number required corresponding to the status code to be transmitted simultaneously with the vehicle's identification address code. The displayed number is altered by depressing the UP and DOWN buttons until the required number is displayed.

The selected status code may then be manually transmitted by the vehicle operator by again depressing the SEND/STATUS button. Alternatively, the selected status code will be automatically transmitted on the next occasion this vehicle is selectively called, or interrogated by the base operator.

It is normal operating procedure to have allocated one code number, usually '0', to represent a 'no status' condition. This number should then be the last code to be entered if a 'no status' condition is to be reported when the vehicle is next 'polled' by the base operator.

Note also that manual transmission of a status condition can only occur when the BUSY indicator is not alight (i.e. the channel is clear), and the SILENT button is in the OPEN channel position.

OPERATING WITH TELEPHONE HANDSET HS-81

This option makes no operative difference to the equipment, except that the loudspeaker can be switched on or off by means of a switch on the handset mounting cradle. At all times received audio can be heard via the handset earpiece.

A.5 - THEORY of OPERATION

The following description refers to Fig. A-1 (page A.5 - 3).

SYNTHESIZER

Both the transmitter and receiver operating frequencies are controlled from a master oscillator by a dual Phase Locked Loop (PLL) synthesizer.

The main PLL is set to frequency by programmable dividers directed from the central microprocessor. The microprocessor first sets the receive frequency, and then when the PTT button is operated, it sets the transmit frequency.

For reception, the main PLL generates the first mixer injection frequency directly, while for transmission, the main PLL injects the required frequency into a mixer inside the transmitter PLL.

Two reference frequencies, separately divided from the master oscillator are fed into the Phase Detector (PD) in each PLL. The output of each PD is filtered and used to control the output frequency of separate Voltage Controlled Oscillators (VCOs).

In the main PLL, the VCO output, divided in the Prescaler (PRESCA) and Programmable Divider (PROG DIV), is compared with the reference frequency in the PD, thus establishing the main PLL frequency.

In the TX PLL, the VCO output is mixed with the main PLL output, divided and compared with the TX reference frequency in the TX PD to establish the TX output frequency.

TRANSMITTER

Transmitter modulation is achieved by processing the transmitter reference frequency through a Phase Modulator (MOD). Microphone audio signals are amplified, differentiated, clipped and integrated in the Instantaneous Deviation Control (IDC) circuits before being fed to the Phase Modulator.

The TX VCO output is amplified and fed into the 3-stage Power Amplifier (PA AMP). It is then fed to the antenna terminal via a PIN diode antenna switch (ANT SW), to switch TX and RX, followed by a Low Pass Filter (LPF), to eliminate harmonics.

The PA AMP output is detected and fed back into an automatic power control circuit to stabilise the TX output over a wide battery voltage range.

RECEIVER

The RT-85 contains a double conversion superheterodyne receiver with 21.4MHz first IF and 455KHz second IF.

Signals received from the antenna are fed from the ANT SW into an RF amplifier, with front-end selectivity achieved using critically coupled bandpass filters. Signals are converted to 21.4MHz in the first mixer, using the synthesizer output as the local oscillator.

A narrow band crystal filter provides selectivity prior to amplification and mixing to 455KHz, where ceramic resonators provide the final selectivity filtering. A quadrature detector produces audio output which is gated by the noise squelch circuitry before being amplified up to the level required to drive the loudspeaker.

MICROCOMPUTER and EPROM

A 4-bit single chip CMOS microcomputer is used to control the frequency synthesizer and logic functions of the unit. The channeling and programming information for the individual unit is stored in an ultra-violet Erasable Programmable Read Only Memory (EPROM), which is programmed in a separate device prior to being plugged into the RT-85.

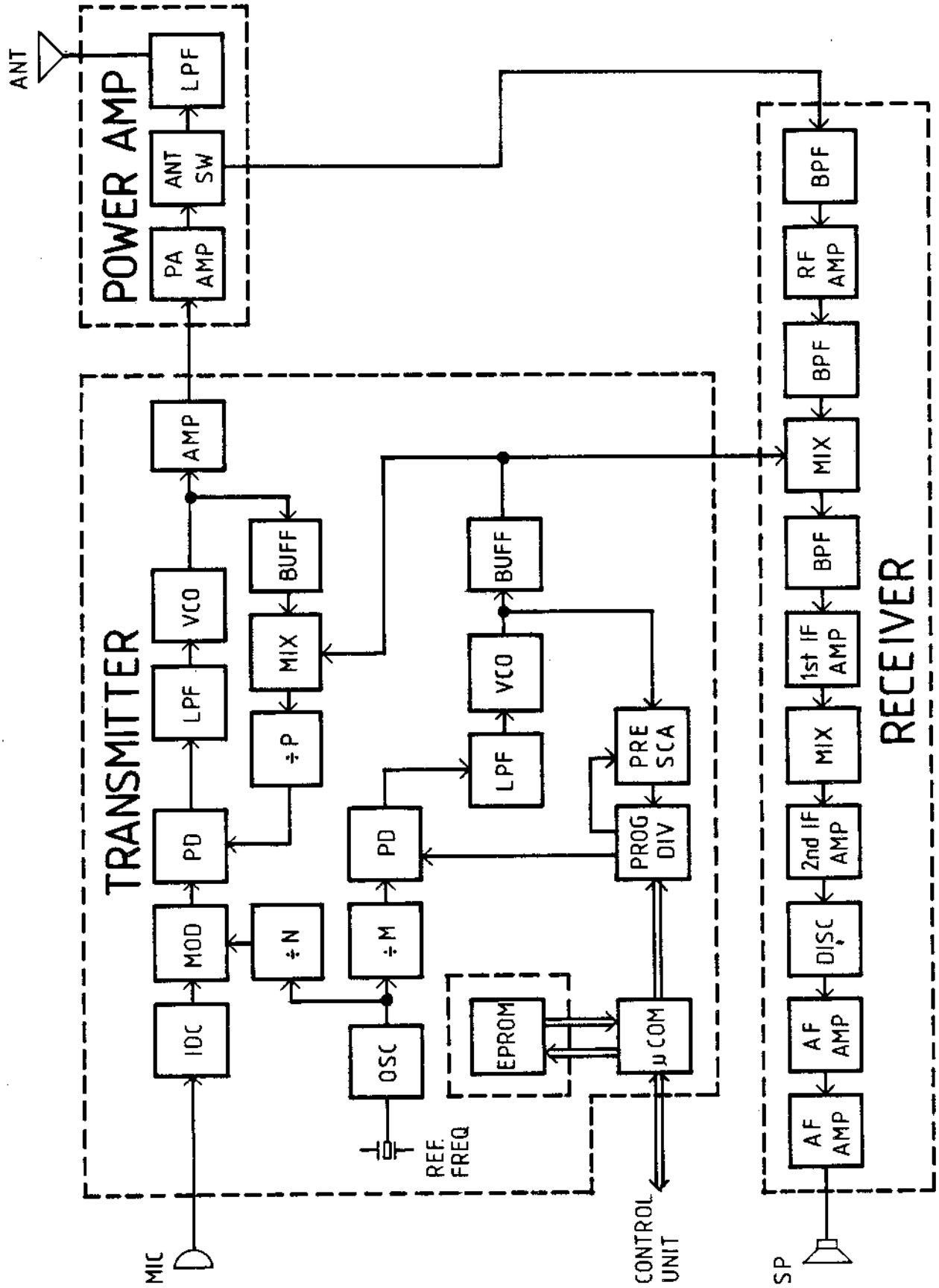
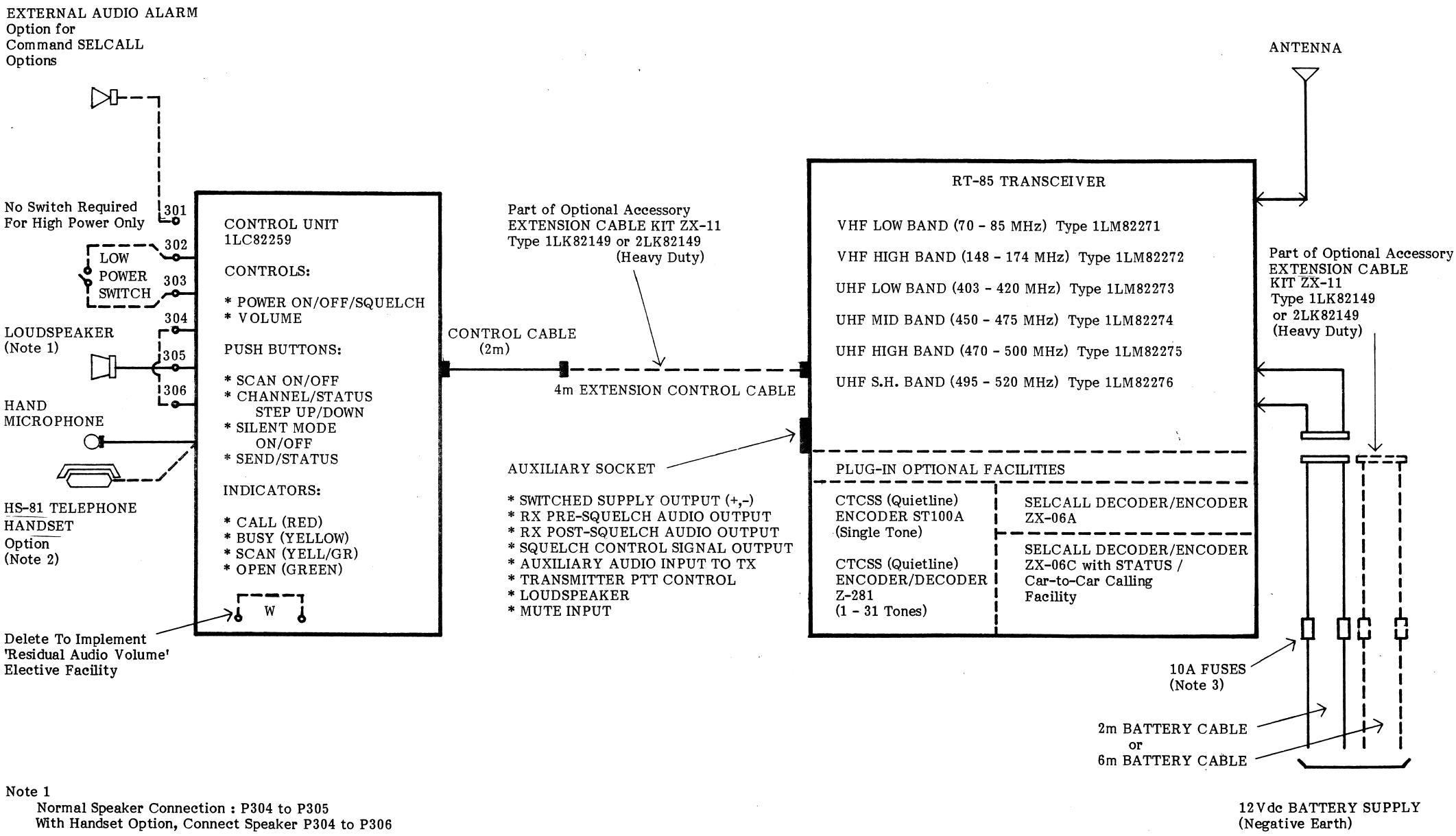


Fig. A-1 RT-85 Transceiver Block Diagram



Note 1
Normal Speaker Connection : P304 to P305
With Handset Option, Connect Speaker P304 to P306

Note 2
For Handset Option Refer to Handbook 82150-4-16

Note 3
Fuses Must be Included in Battery Cable as
There are NO Fuses in Transceiver

RT-85 SYSTEM CONFIGURATION

B.1 - TRANSMITTER ASSEMBLY

IDENTIFICATION

Band	Frequency	PCB No.	Circuit Drawing
VHF(LB)	70-85MHz	TX-081	82271-1-02
VHF(HB)	148-174MHz	TX-153	82272-1-02
UHF(LB)	403-420MHz	TX-404(A)	82273-1-02
UHF(MB)	450-475MHz	TX-404(B)	82273-1-02
UHF(HB)	470-500MHz	TX-404(C)	82273-1-02
UHF(SHB)	495-520MHz	TX-404(D)	82273-1-02

GENERAL DESCRIPTION

The transmitter assembly is a printed circuit board which mounts on the upper side of the diecast RT-85 transceiver frame. It contains the:

- Central microprocessor;
- Master frequency oscillator;
- Main frequency synthesizer;
- IDC transmitter audio circuits;
- Phase modulator;
- Transmitter phase locked loop;
- Exciter output amplifier; and
- DC power regulators.

In addition, the programming EPROM module plugs onto the transmitter assembly.

CIRCUIT DESCRIPTION

CENTRAL MICROPROCESSOR

IC901 acts as the central processor and controller for the RT-85. It is a 4-bit CMOS mask programmed microcomputer, packaged in a single 42 pin chip containing 2048 bytes of ROM and 140x4 bits of RAM. The microcomputer is run by a 400KHz ceramic resonator clock on pins 17 & 18.

The current consumption is low: 17mA being drawn during normal operation. When the transceiver is switched off from the control unit, only 1.2mA is required to retain the microprocessor memory. Thus the unit will "remember" the last used channel, even when switched off.

D402 regulates the dc supply for IC901 and is powered through D403 only when the control unit is on, otherwise the hold-on current is supplied through D404.

When the unit is switched on, after approximately 100ms, Q405 pulls pin 15 of IC901 low, resetting the microprocessor. In the power down mode, pin 15 of IC901 is held high by R408.

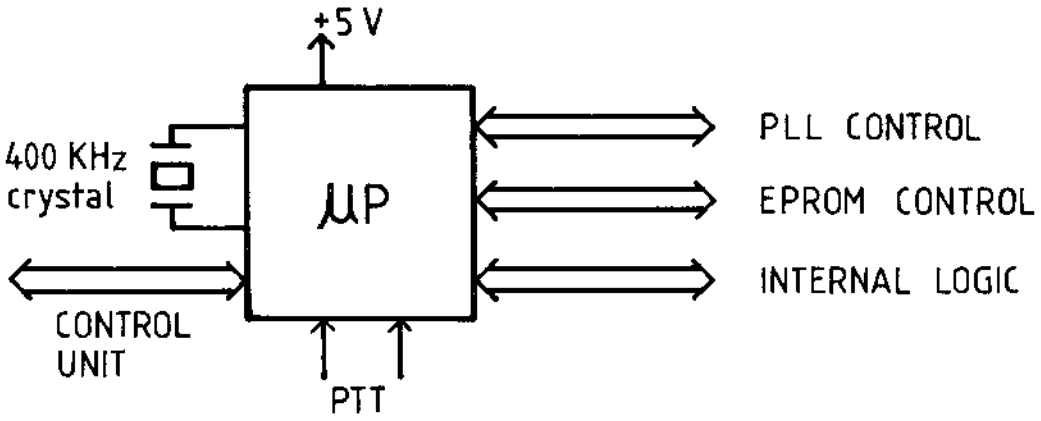


Fig. B-1 Central Microprocessor Controls

Control Unit

When reset, the microprocessor checks the control unit lines DSP0, DSP1, DSP2 & DSP3, and if any of these are low, it assumes that an RT-80 type control unit is fitted. In this situation, DSP0/3 become inputs for channel selection, and $\overline{\text{DSPSTBH}}$ & $\overline{\text{DSPSTBL}}$ become inputs for $\overline{\text{SEND}}$ & $\overline{\text{SILENT}}$.

If any of DSP0/3 are high, they become outputs for commanding the RT-85 control unit switches and displays, and $\overline{\text{DSPSTBH}}$ and $\overline{\text{DSPSTBL}}$ become display strobe outputs.

The microprocessor controls the display and switch functions of the control unit by multiplexing on DSP0/3, $\overline{\text{DSPSTBH}}$, $\overline{\text{DSPSTBL}}$ & $\overline{\text{SWRTN}}$, and remembers all the settings last entered.

Internal Logic

The microprocessor carries out conditional logic tests on a number of signals:

Microprocessor Inputs:

Pin	Signal	Function
5	TSQ/MON	Indicates whether CTCSS or Selcall decoding has occurred.
4	SQ SIGNAL	Indicates operation of noise squelch.
6		Indicates main PLL out of lock.

Microprocessor Outputs:

Pin	Signal	Function
28	$\overline{\text{BUSY}}$	Switches BUSY LED.
29	STATUS STROBE	Pulses status number into Selcall/Status option.
9	$\overline{\text{SILENT}}$	Switches Selcall decoder to silent mode.
8	$\overline{\text{SEND CNT}}$	Causes Selcall encoder to send code (Status version only).
3	AUDIO OUT	"Beep" tones sent to speaker amplifier.
2	TX TM	Switches CTCSS encoder on during transmission.
12	DEPOW	Switches TX PA to low power setting.
13		Switches transmitter on.
39	AUX STB	Strobe for AUX data (CTCSS).
5		Audio enable (low).
6		Audio mute & TX inhibit (low).

PTT Inputs:

Note that these interrupt inputs override all other commands.

Pin	Signal	Function
30	$\overline{\text{PTT}}$	PTT input from control unit.
31	$\overline{\text{ADRS TX}}$	PTT input from Selcall or auxiliary connector.

EPROM and PLL Control

This major function of the microprocessor ensures that the correct frequency is generated by the frequency synthesizer and that the unit shuts down during abnormal operation.

MASTER FREQUENCY OSCILLATOR

Q701 and X701 form a high-stability crystal oscillator running at 5.12MHz (VHF) or 12.8MHz (UHF) and is designed to maintain frequency within 5 ppm from -10°C to +60°C. Both transmit and receive frequencies are maintained by this oscillator.

The channel incremental frequency (5KHz for VHF and 12.5KHz for UHF) is derived in IC701 by dividing by 1024 after amplification in Q703.

The transmit reference is achieved by dividing the oscillator output in IC702:

VHF	(divide by 4)	1.28MHz
UHF	(divide by 8)	1.6MHz.

MAIN FREQUENCY SYNTHESIZER

The following description refers to Fig. B-2 (page B.1 - 5) and the circuit diagrams following this section.

The frequency synthesizer comprises an EPROM IC951, shift register IC902, programmable divider/phase detector IC701, prescaler IC703 and voltage controlled oscillator Q707.

EPROM and Shift Register

When a new channel is selected, or the unit switches to transmit or receive, the synthesizer reads information from the EPROM and sets the appropriate frequency in the main PLL.

Firstly, IC901 sends 6 bits of data from pins 32/37 into IC952 where they are latched to IC951 pins 1/6 by a clock pulse into IC952 pin 9. Another 5 bits of data from IC901 pins 32/36 appear on IC951 pins 7, 8, 19, 22 & 23. The full 11 bit address A0/A10 is latched into IC951 when it is enabled by a pulse from IC901 pin 37.

The 8 bit memory at this address (up to 2048 different addresses are possible) appears at inputs P0/P7 of IC902, and is latched into pin 9 of this shift register by a positive pulse from IC901 pin 40. The 8 bits are then sent serially out of IC902 pin 3 to IC701 in response to negative clock pulses generated by IC901 pin 42, each clock pulse pushing another bit into IC701.

The above process occurs 3 times for each new frequency, sending 24 bits of data into IC701.

Programmable Dividers, Prescaler and Phase Detector

The serial data out of IC902 is clocked into a 17 bit shift register inside IC701, with the first 7 bits of the 24 data bits being discarded. On receipt of a positive pulse from IC902 pin 41 into IC701 pin 1, the contents of the shift register are transferred into a 17 bit latch inside IC701.

The 17 bits output from this latch are used to program two counters: 7 bits program the "divide by a" counter (where "a" can be set between 1 and 128), while the remaining 10 bits program the "divide by n" counter (where "n" can be set between 1 and 1024).

Both counters count pulses from the output of a two-modulus prescaler IC703, which divides its input frequency by 63 (32 for VHF(LB)) when IC703 pin 6 is high, or alternatively by 64 (33 for VHF(LB)) when IC703 pin 6 is low.

After "a" pulses out of the prescaler, the "divide by a" counter output switches high, which changes the prescaler from dividing by 64 (33) to dividing by 63 (32). Meanwhile, the "divide by n" counter has been counting, and after "n" pulses, both counters are reset to zero, IC703 pin 6 switches low, a negative pulse is output to the phase detector, and the cycle starts again.

The phase detector compares the repetition rate of its input pulses against a reference frequency, which is the master oscillator frequency divided by 1024. IC701 pin 11 produces a dc signal at a level dependent on the difference between the reference frequency and the output pulse frequency of the "divide by n" counter. If the phase detector is out of lock, IC701 pin 10 switches low to alert the microprocessor.

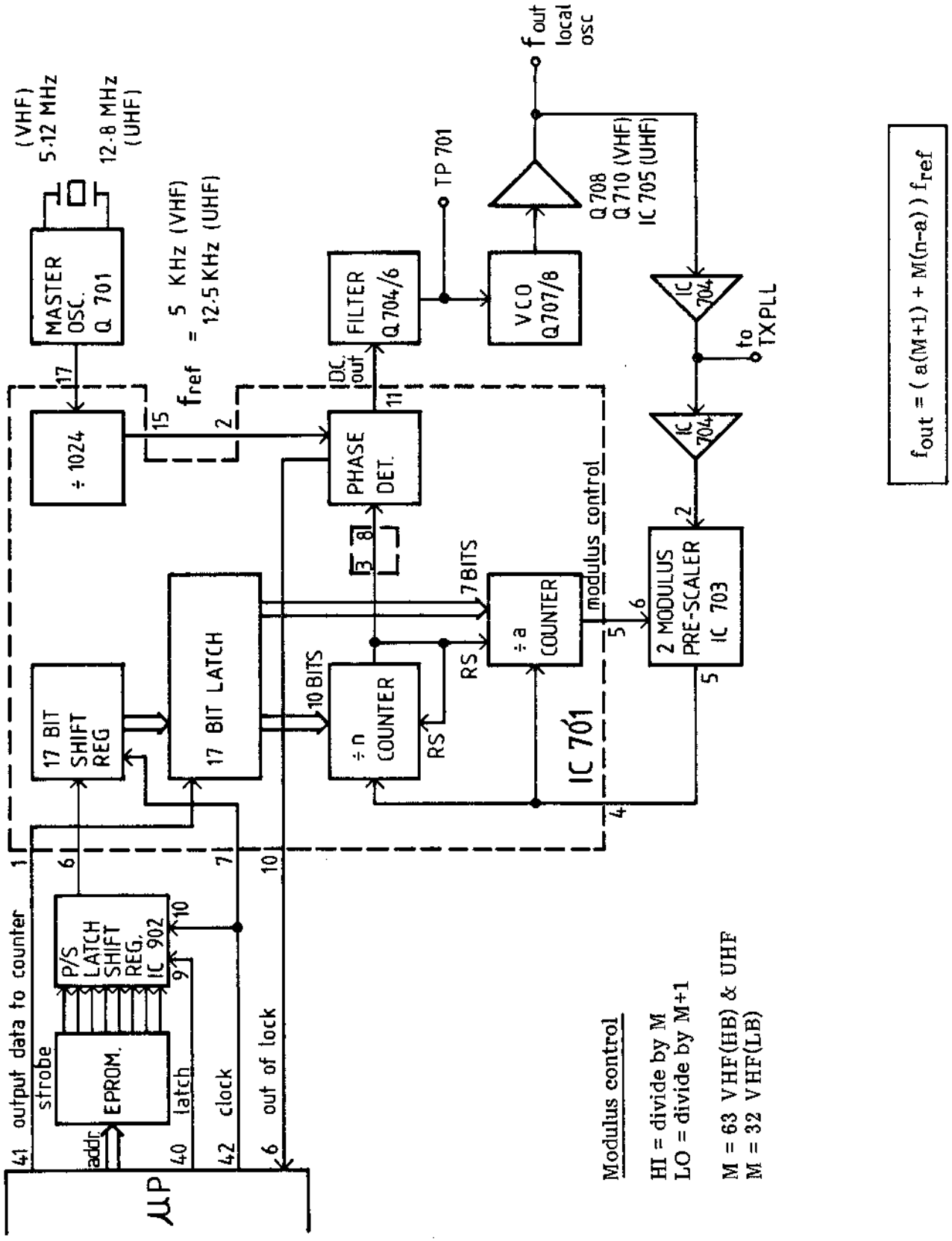


Fig. B-2 Main Frequency Synthesizer

Voltage Controlled Oscillator and Buffers

The phase detector output IC701 pin 11, is amplified in Q704, Q705 & Q706 and then used to bias a varicap diode D702. The capacitance of this diode determines the oscillating frequency of a Colpitts oscillator Q707. The output of this oscillator is the local oscillator frequency of the receiver, and is amplified and buffered in Q709 and IC705 (Q710 for VHF), before being fed to the receiver mixer via J365.

During transmission, this output is again buffered in IC704 and fed to the TX PLL. In addition, IC704 provides an output back to the prescaler IC703 to complete the main PLL.

TRANSMITTER AUDIO CIRCUIT and PHASE MODULATOR

The IDC amplifier IC701 amplifies the microphone signal with 6dB/octave pre-emphasis (C112, R112). This signal is peak clipped to limit deviation, -6dB/octave de-emphasis is applied and frequencies above 3KHz are removed in a low pass filter L103, L104. RV101 sets limiting deviation, while RV102 sets microphone gain.

The auxiliary input level is set by RV103 and this signal is amplified in Q104, with no pre-emphasis being applied. Q103 buffers the audio signal before it is fed to the phase modulator. Two (three for UHF) coupled inductors L101, L102 (L105 for UHF) are tuned by varactor diodes D101, D102 (D110 UHF) to phase modulate the output of IC702. This signal is then buffered and amplified in Q101 and Q102.

TRANSMITTER PHASE LOCKED LOOP

The following description refers to Fig. B-3 (page B.1 - 7) and the circuit diagrams following this section

D108 is a double balanced mixer which converts the exciter output frequency down to the TX IF frequency of 20.48MHz (VHF) or 19.2MHz (UHF). During transmission, the main synthesizer generates the required frequency for this conversion.

IC106 is a fixed divider (by 16 for VHF, by 12 for UHF) and its output frequency is the same as the phase modulator output frequency (1.28MHz (VHF), 1,6MHz (UHF)). IC103 is a phase detector which compares the phase differece between its two inputs and produces a dc output at TP101 proportional to this difference. This dc signal controls the VCO Q108 with varicap D104 setting the actual exciter output frequency. This is buffered in Q109 and IC104, before being amplified by Q112 (VHF) or IC105 (UHF) to a level suitable for injection into the double balanced mixer.

EXCITER OUTPUT and OUT OF LOCK PROTECTION

The output of IC104 is amplified in Q110 (VHF) or Q110, Q112 & Q113 (UHF) to the required exciter output power level: i.e. 20-40mW (VHF) or 0.4-1.2W (UHF).

When the TX PLL is in lock, IC102 pin 13 is low, but if the TX PLL is out of lock, pin 13 has positive pulses which switch on Q111, removing base bias from Q110 and thus inhibiting transmitter output. Q111 can also be switched on through D107 by a high signal out of IC706 pin 8, indicating that the main PLL is out of lock.

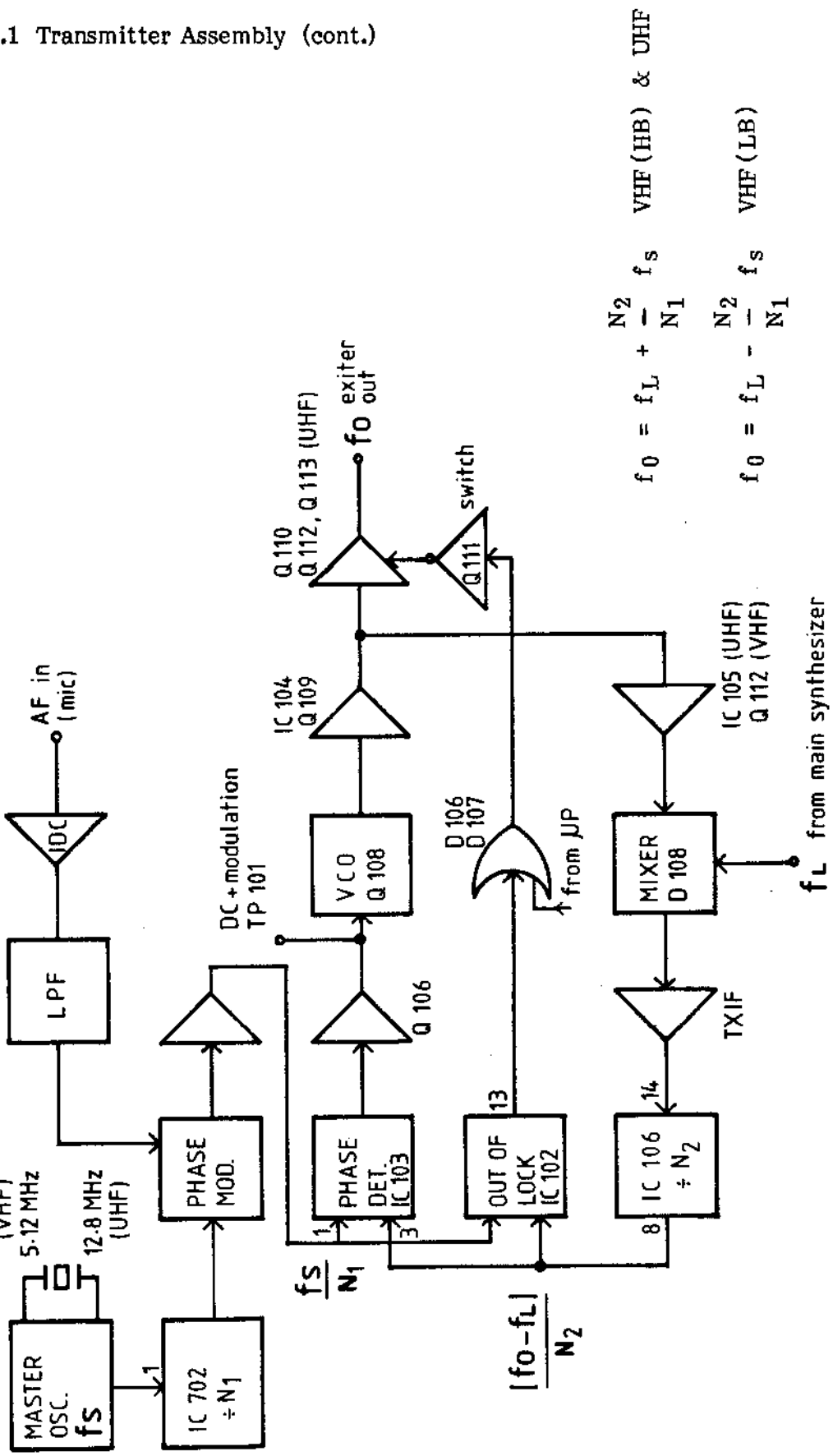


Fig. B-3 Transmit Phase Locked Loop

DC POWER REGULATORS

The transmitter assembly contains the following dc regulators:

5 V for the microcomputer: D402;

main 5 V supply: IC402 (three terminal regulator); and

8 V supplies: IC401.

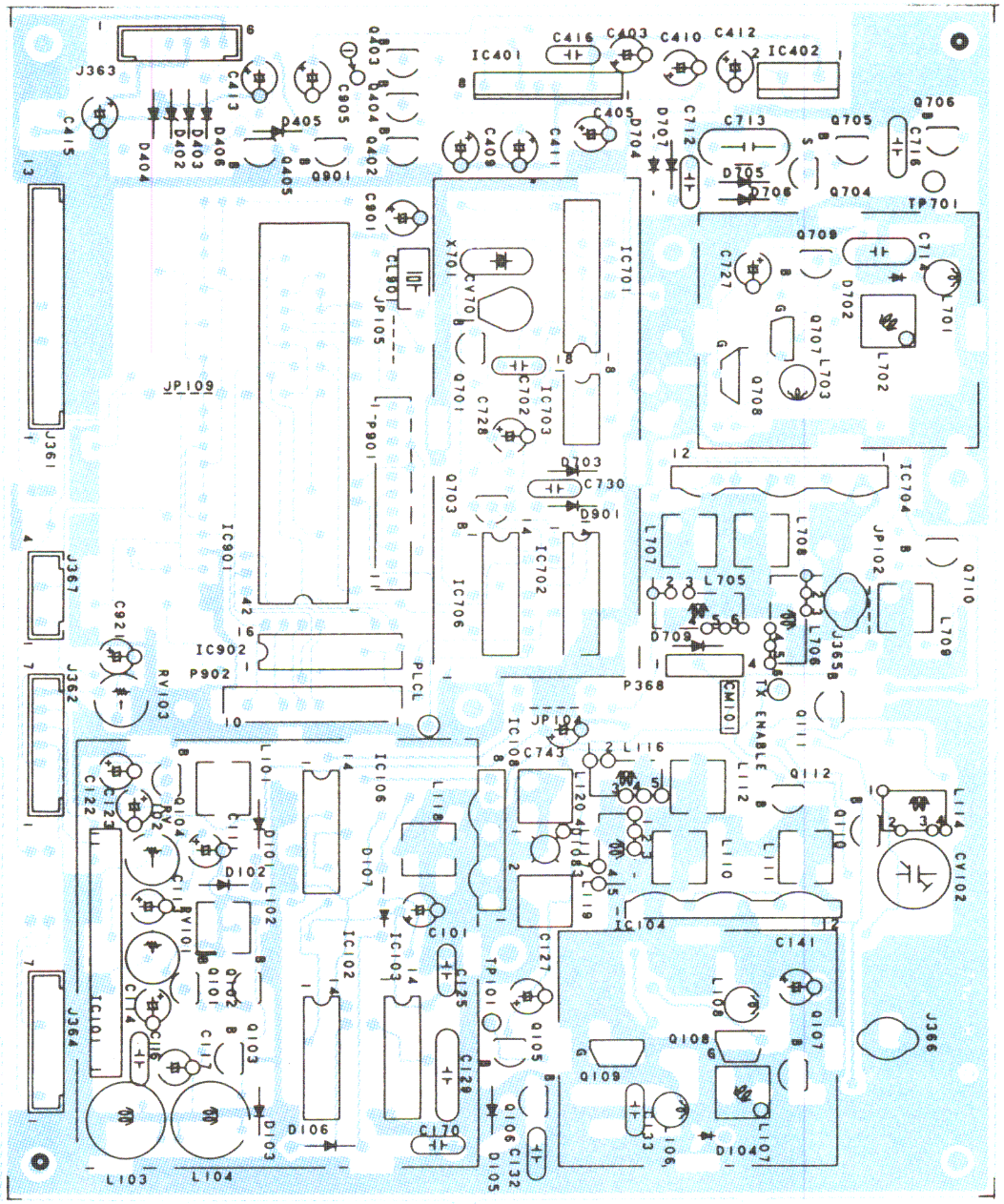
IC401 has three outputs:

C8 V common 8 V which is on whenever the +B supply is on;

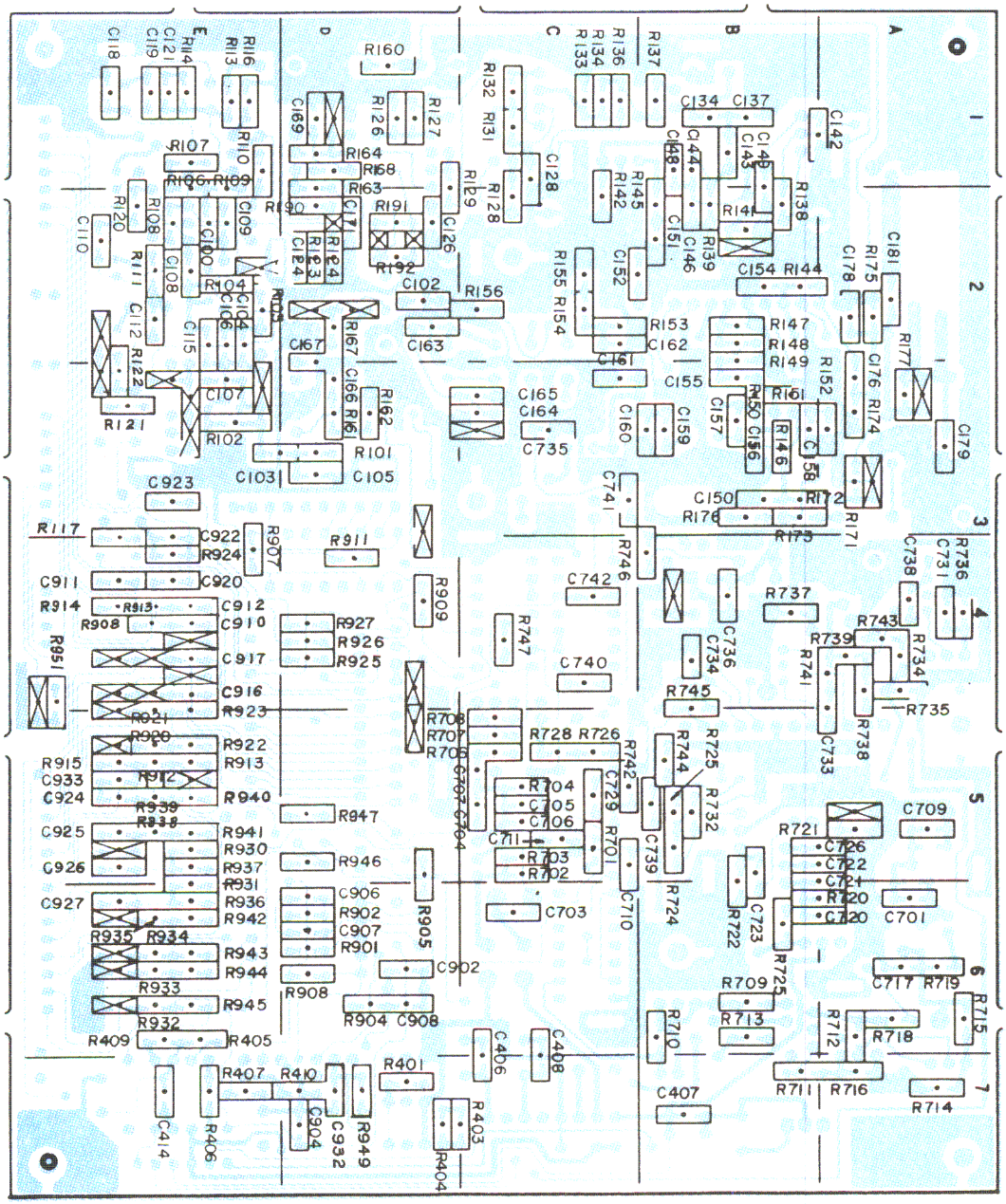
R8 V on during receive periods; and

T8 V on when the unit is transmitting.

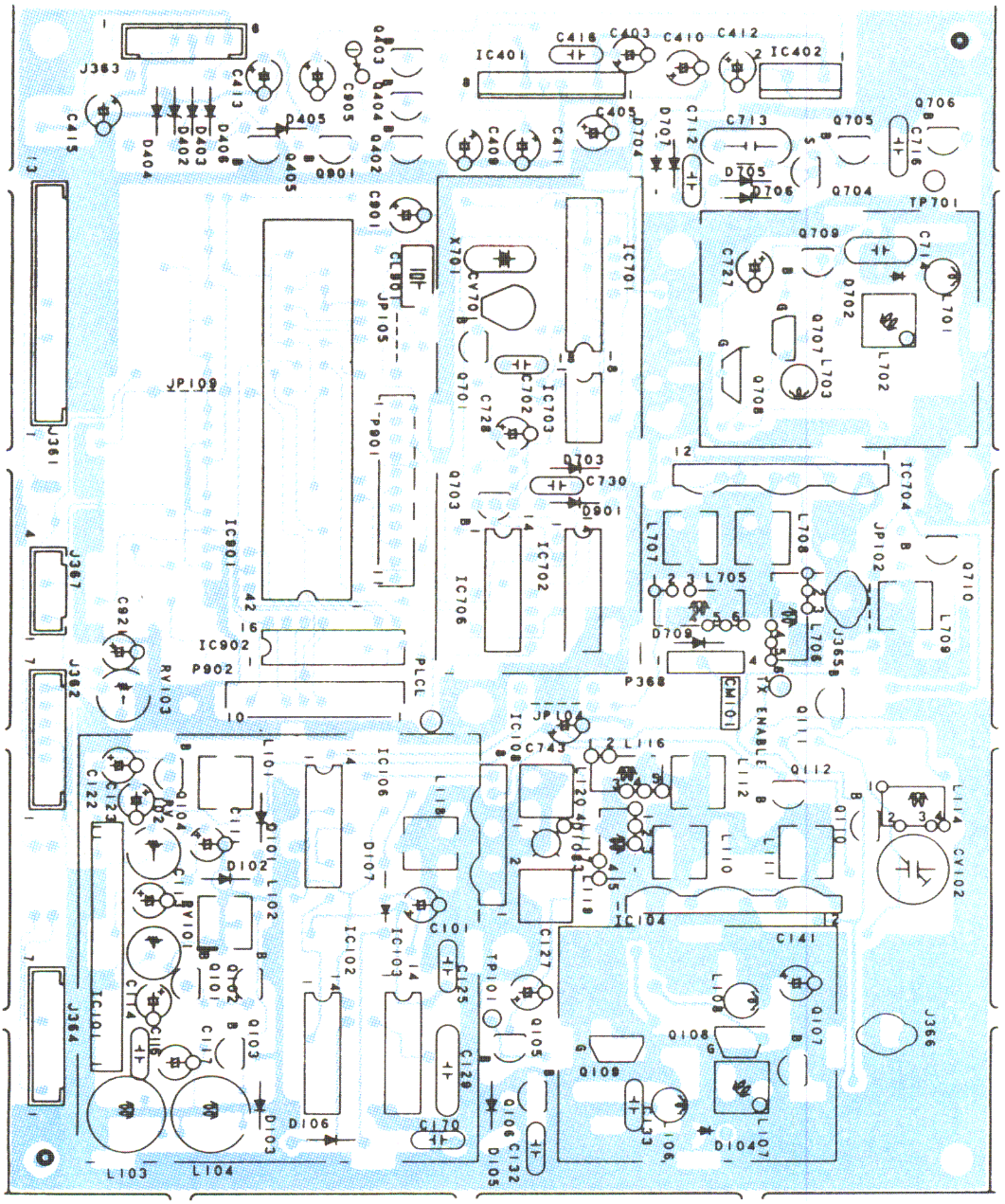
IC901 pin 13 switches low for transmission, switching Q402 off and causing Q403 and Q404 to conduct, changing IC401 from receive to transmit. Q404 clamps R8 V off, ensuring a fast switchover to transmit.



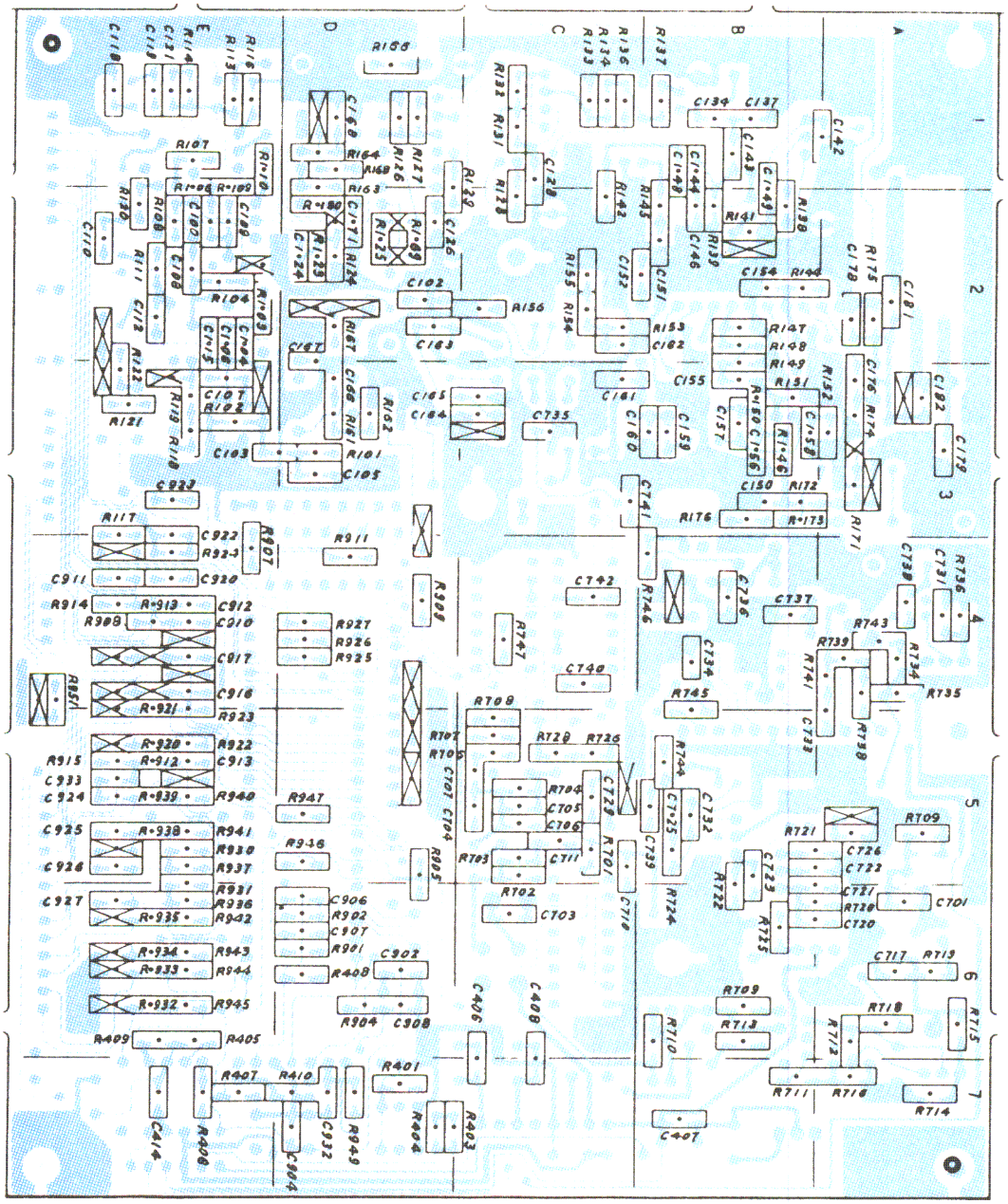
TX-081 TOP SIDE



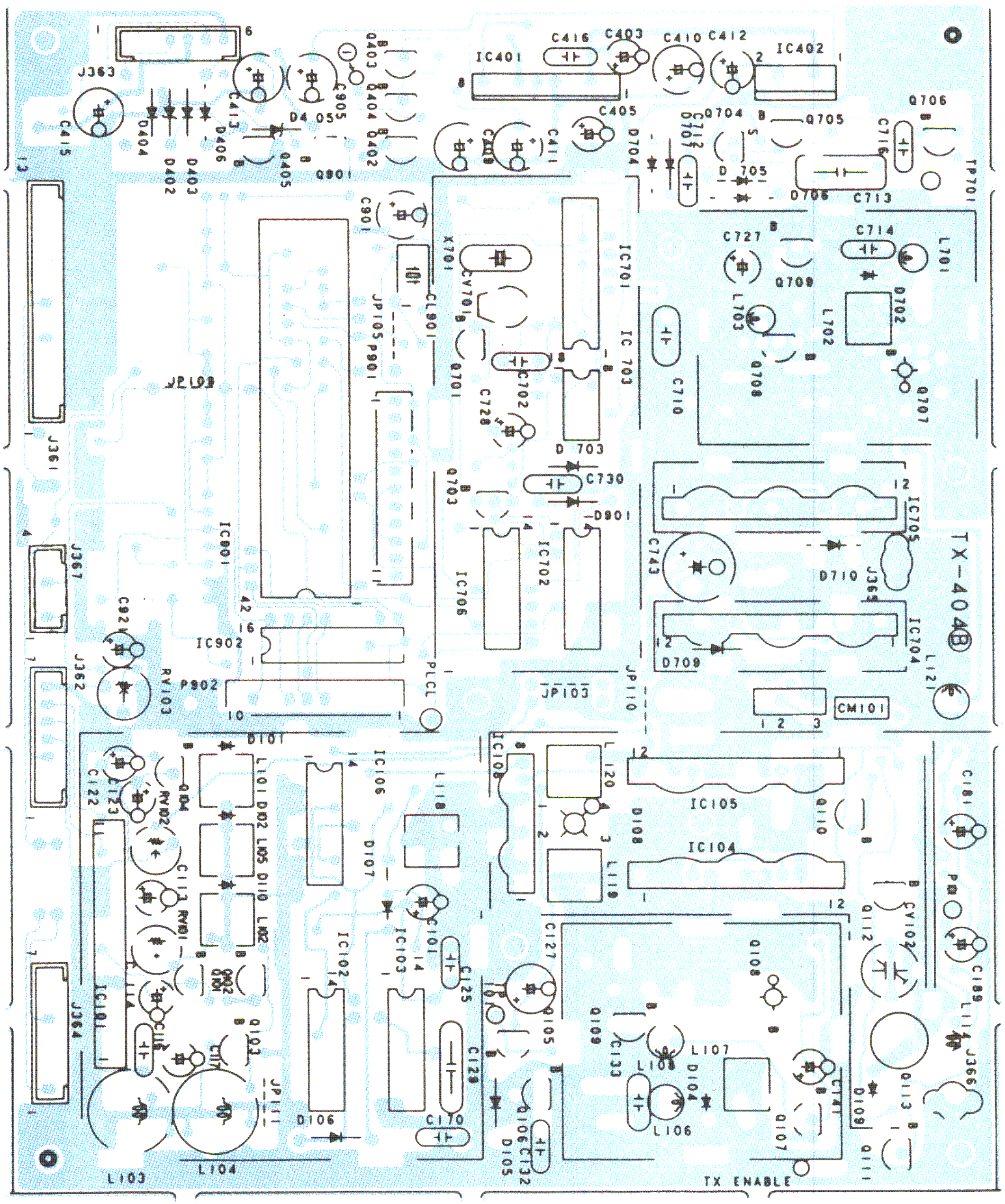
TX-081 BOTTOM SIDE



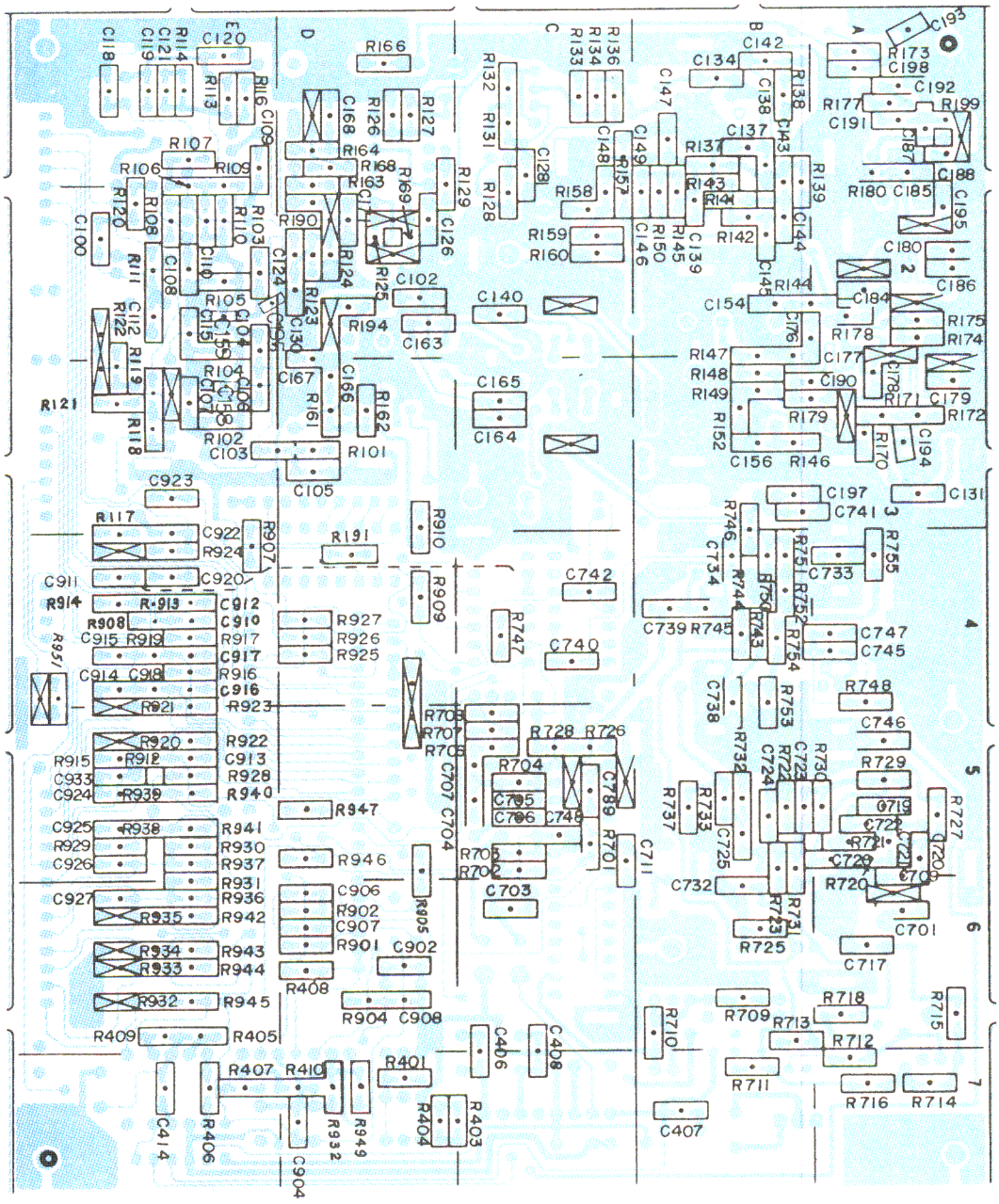
TX-153 TOP SIDE



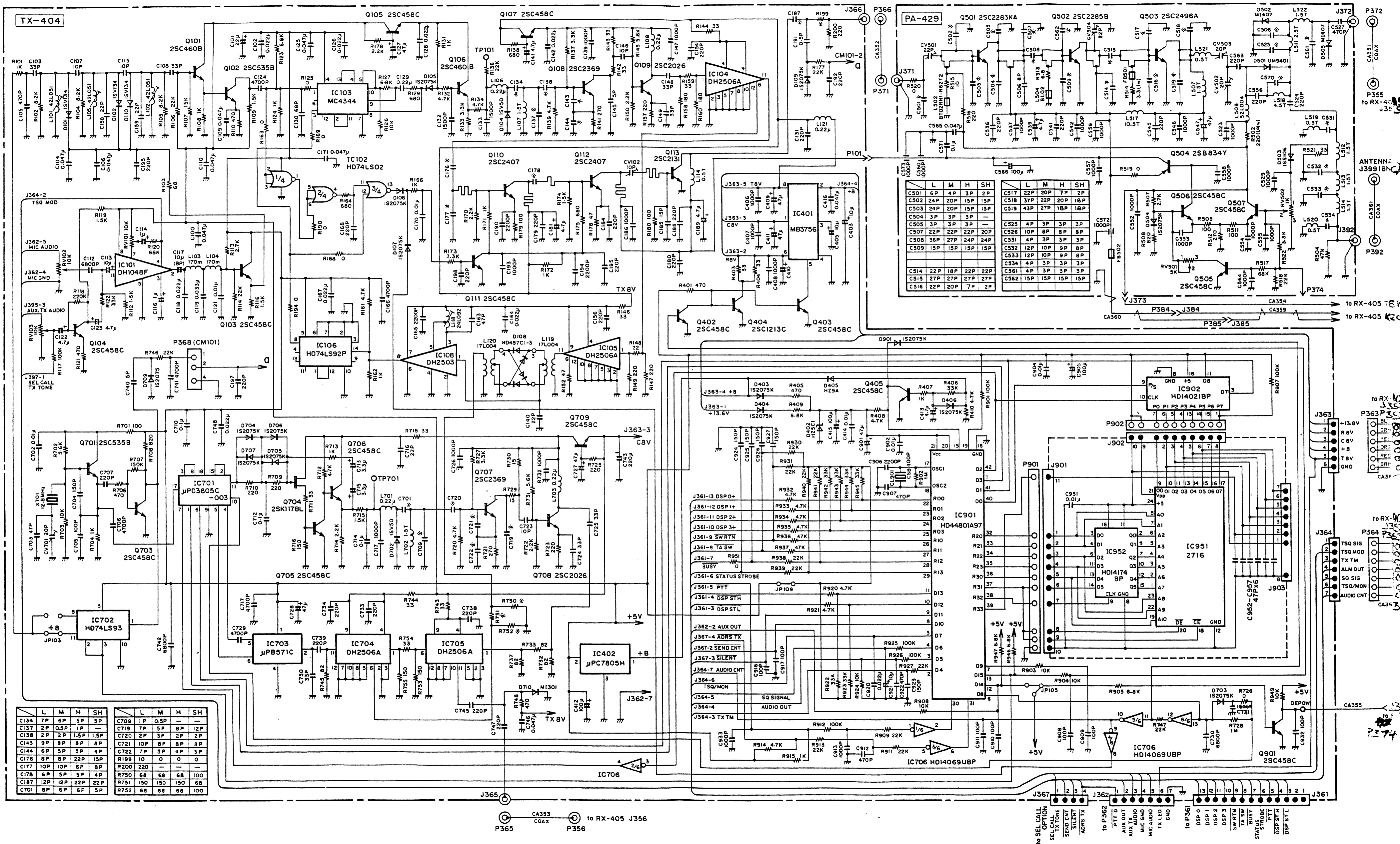
TX-153 BOTTOM SIDE



TX-404 TOP SIDE

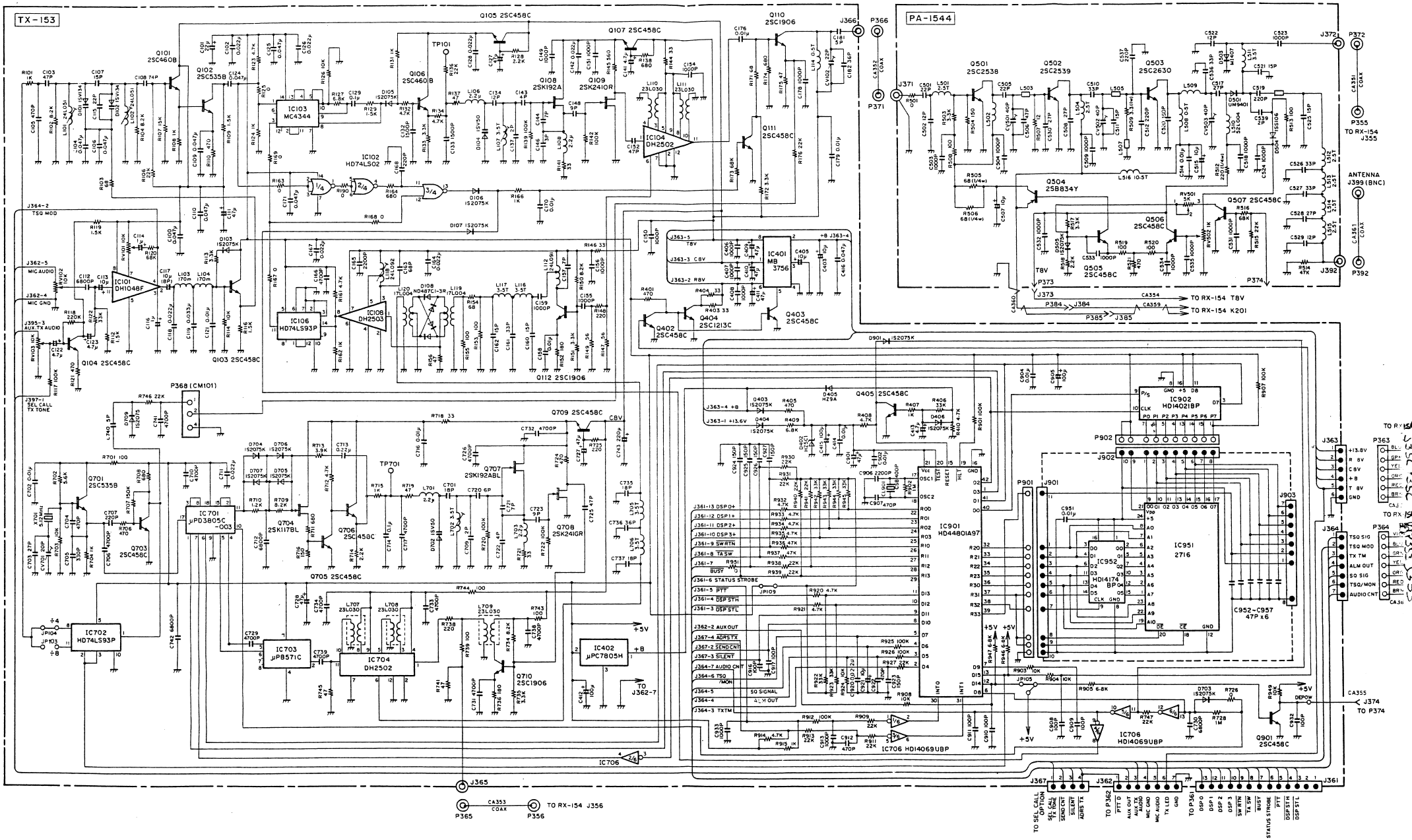


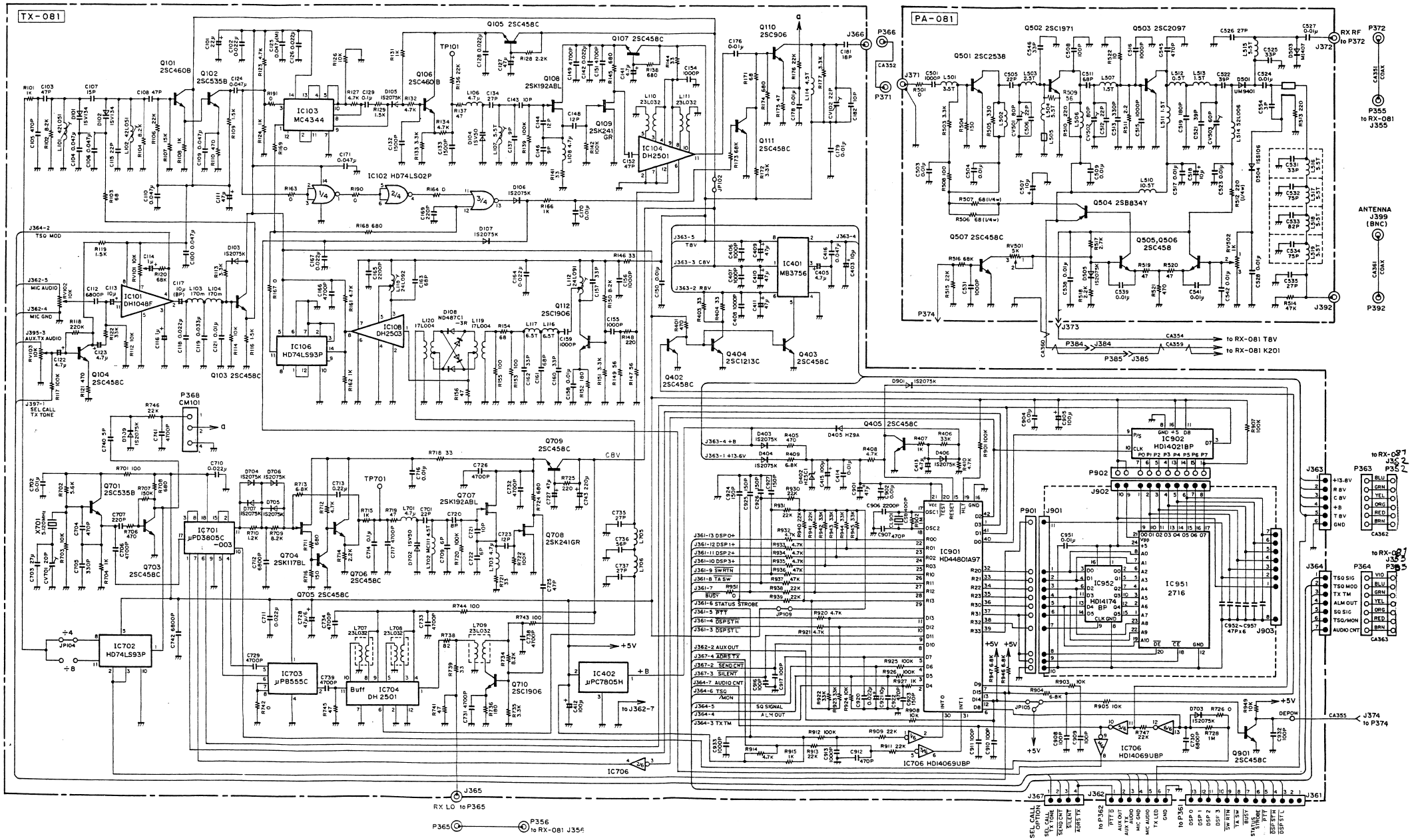
TX-404 BOTTOM SIDE



TRANSMITTER RT-85 UHF 1LM82273, 1LM82274, 1LM82275 & 1LM82276

AWA Drawing 82273-1-02





TRANSMITTER RT-85 VHF (LB) 1LM82271

AWA Drawing 82271-1-02

B.2 - RECEIVER ASSEMBLY

IDENTIFICATION

Band	Frequency	PCB No.	Circuit Drawing
VHF(LB)	70-85MHz	RX-081	82271-1-01
VHF(HB)	148-174MHz	RX-154	82272-1-01
UHF(LB)	403-420MHz	RX-404(A)	82273-1-01
UHF(MB)	450-475MHz	RX-404(B)	82273-1-01
UHF(HB)	470-500MHz	RX-404(C)	82273-1-01
UHF(SHB)	495-520MHz	RX-404(D)	82273-1-01

GENERAL DESCRIPTION

The receiver assembly is a printed circuit board which mounts on the lower side of the diecast RT-85 transceiver frame. It contains the:

- RF amplifier and front end filters;
- Local oscillator amplifier and filter;
- First mixer and 21.4MHz IF;
- Integrated second oscillator, mixer, 455KHz IF and discriminator;
- Noise amplifier and squelch amplifiers;
- Audio gate and switches;
- Speaker amplifier; and
- DC input relay.

CIRCUIT DESCRIPTION

FRONT END, MIXER and FIRST IF

Front end selectivity is achieved by the use of bandpass filters L201, L202, L204, L205 & L206 (also L203 for UHF).

D201 and D202 clip high amplitude input signals before they reach the RF amplifier Q201 (and Q202 for UHF). The local oscillator signal from the main frequency synthesizer is fed into the source of Q202 (VHF), Q203 (UHF) after filtering and amplification by Q203 (VHF), Q204 (UHF).

FL251 is a monolithic crystal bandpass filter which filters the 21.4MHz IF signal prior to amplification in Q251.

SECOND IF and DISCRIMINATOR

IC251 forms the second mixer , crystal oscillator at 20.945MHz and 455KHz IF amplifier. FL252 and FL253 are 455KHz ceramic filters, and L252 tunes the quadrature detector which has its output at IC251 pin 13.

NOISE SQUELCH and AUDIO GATE

L254 and L255 form a band pass filter at approximately 60KHz, and discriminator noise of this frequency is amplified in IC251 (pin 10 in, pin 11 out) and Q252.

With no carrier, IF noise is rectified in D252 and D253 to increase voltage on IC251 pin 12. Depending on the setting of the squelch control, this voltage switches the output of the inverting amplifier IC251 (pin 12 in, pin 13 out) low, which shuts the audio gate Q259 off.

In the presence of carrier, the noise out of Q252 drops switching IC251 pin 13 high. Audio gate Q259 switches high under this condition if either TSQ/MON is low or TSQ SIG J358 pin 3 is high. In addition, IC251 pin 14 will switch low causing the SQ signal (J359 pin 3) to switch high.

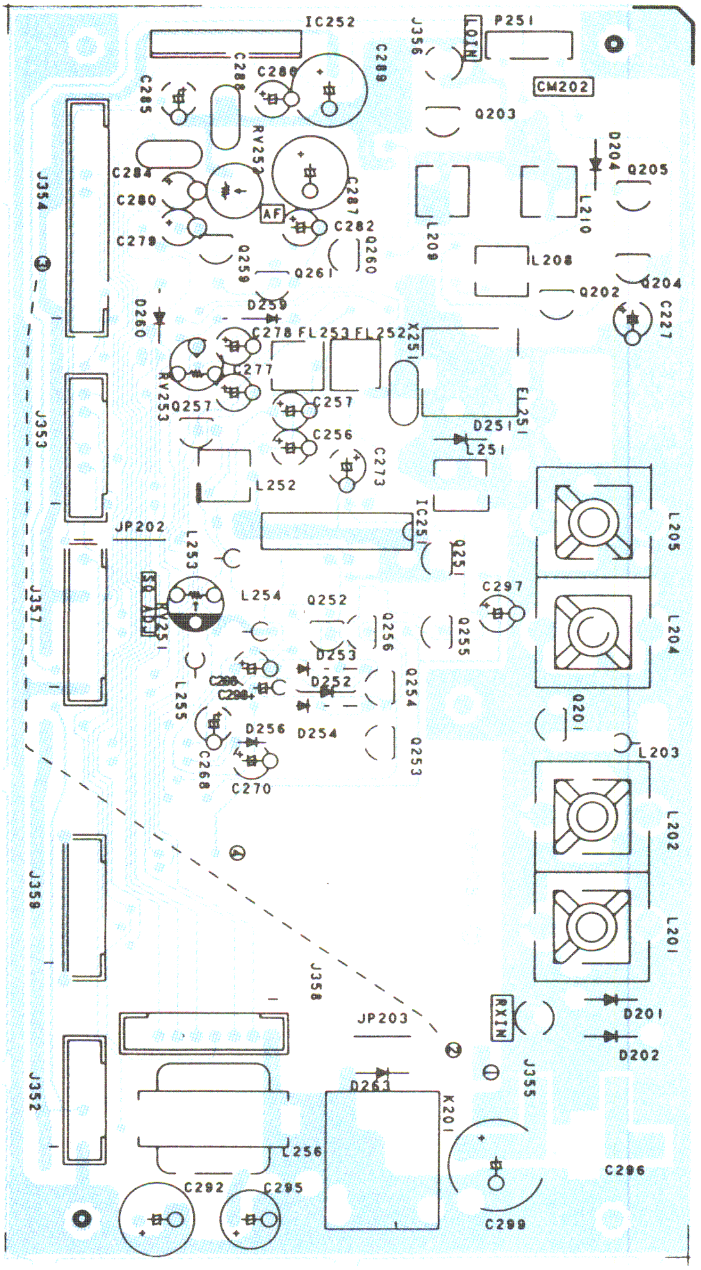
Noise out of Q252 is also rectified by D256, and if there is a sudden large increase in noise (e.g. carrier switched off), then C271 causes Q253 and in turn Q254 to pulse on quickly, discharging C266. This greatly reduces the noise tail heard in the speaker when the carrier is switched off. However, for weak and fading signals, Q253 does not turn on, so the full length noise tail as determined by C266 will be heard.

SPEAKER AMPLIFIER

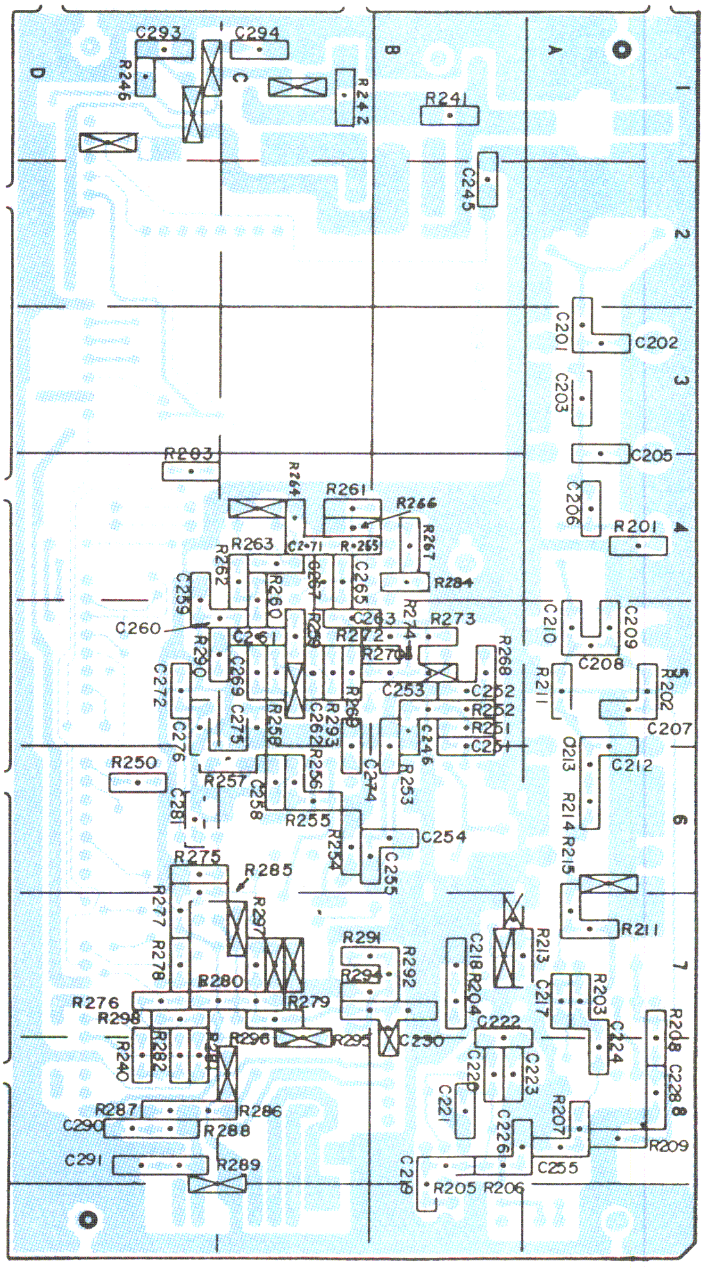
IC252 is an audio power amplifier capable of delivering 3 watts into a 4 ohm load. The signal out of the audio gate Q259 is directed through the volume control and then into IC252. ALARM OUT (J353 pin 4) and BEEP (J357 pin 4) allow injection of tones from the microprocessor and the Selcall decoder into the loudspeaker.

DC INPUT RELAY

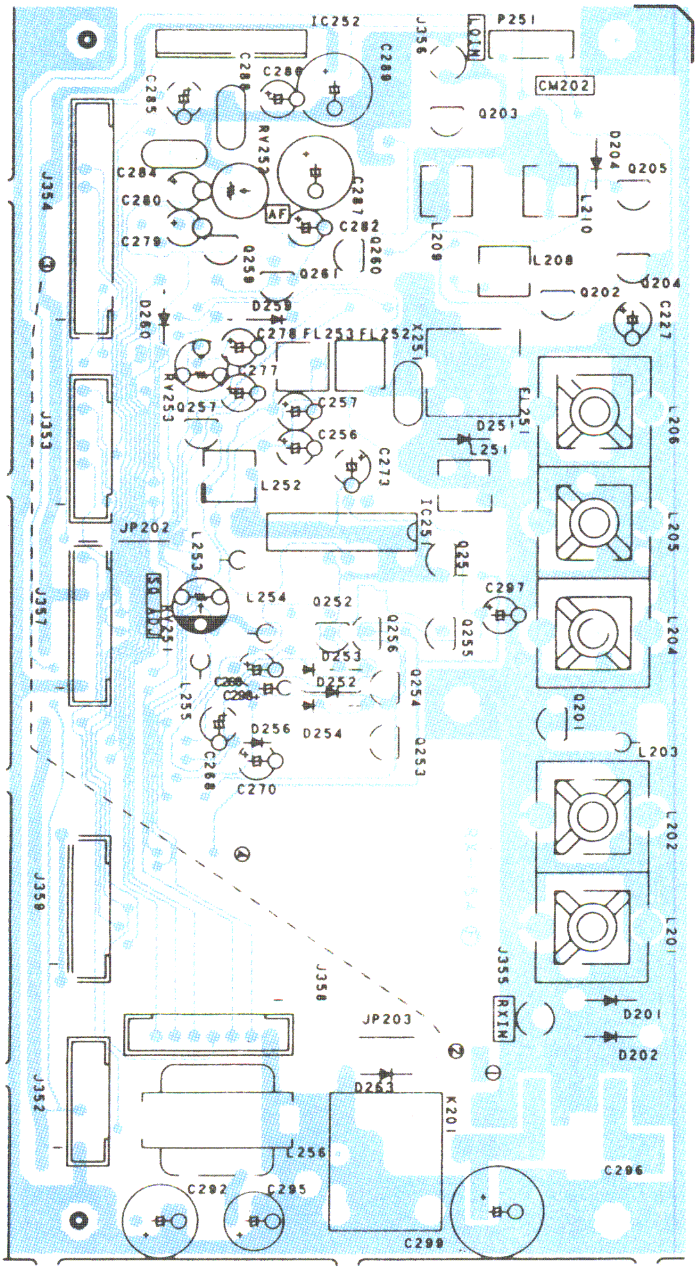
K201 is a relay which is energised whenever the POWER (L) rail is switched from the control unit. The relay contact supplies dc to both transmitter and receiver. L256 with C292 and C293 form a low pass filter which reduces battery noise entering the transceiver.



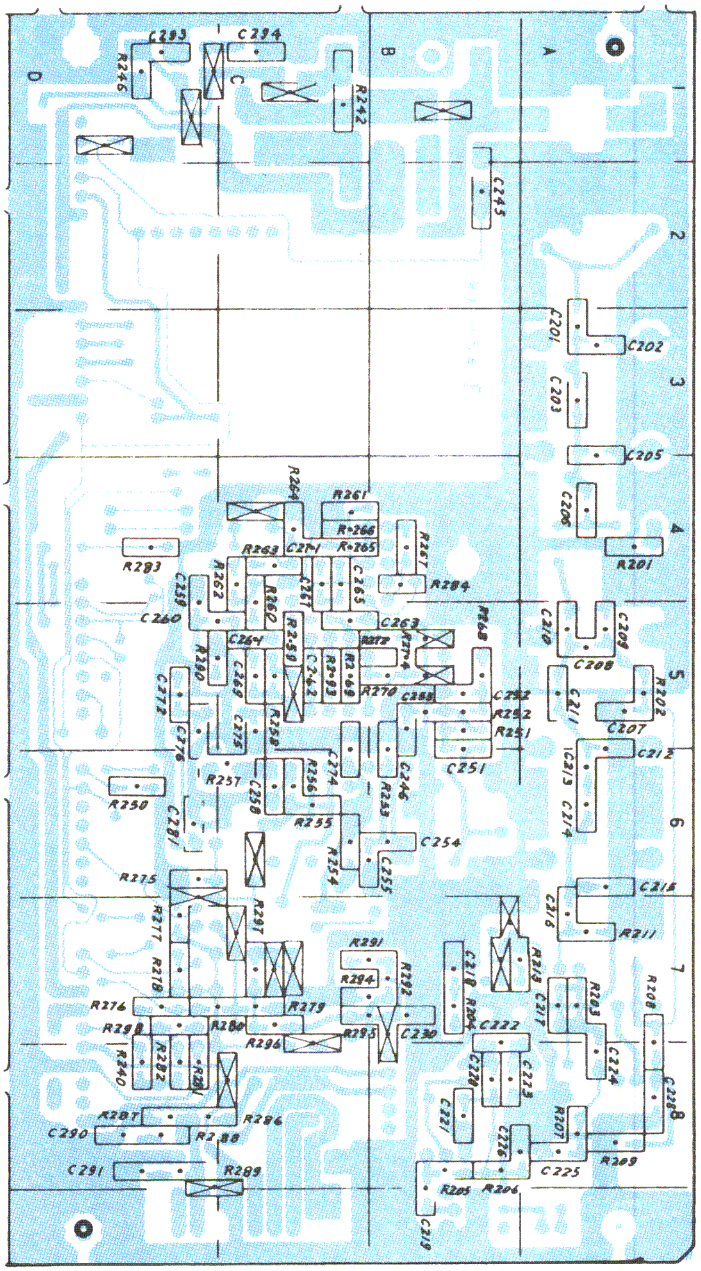
RX-081 TOP SIDE



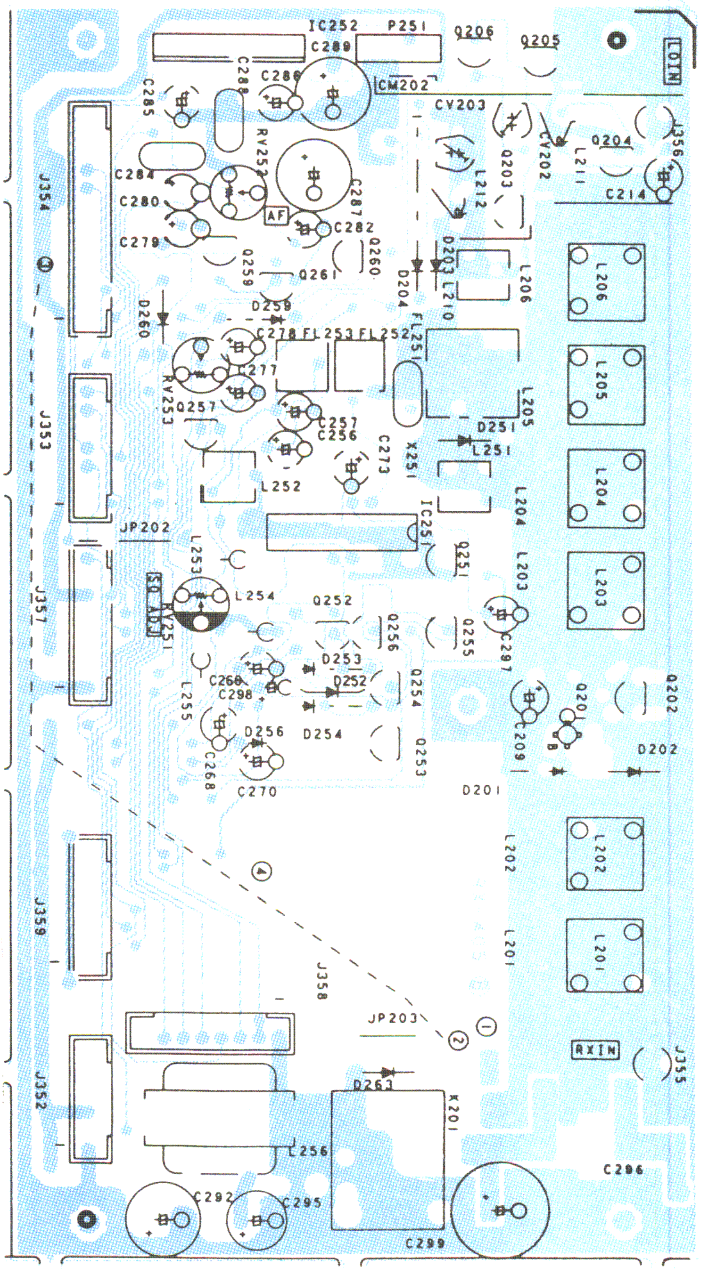
RX-081 BOTTOM SIDE



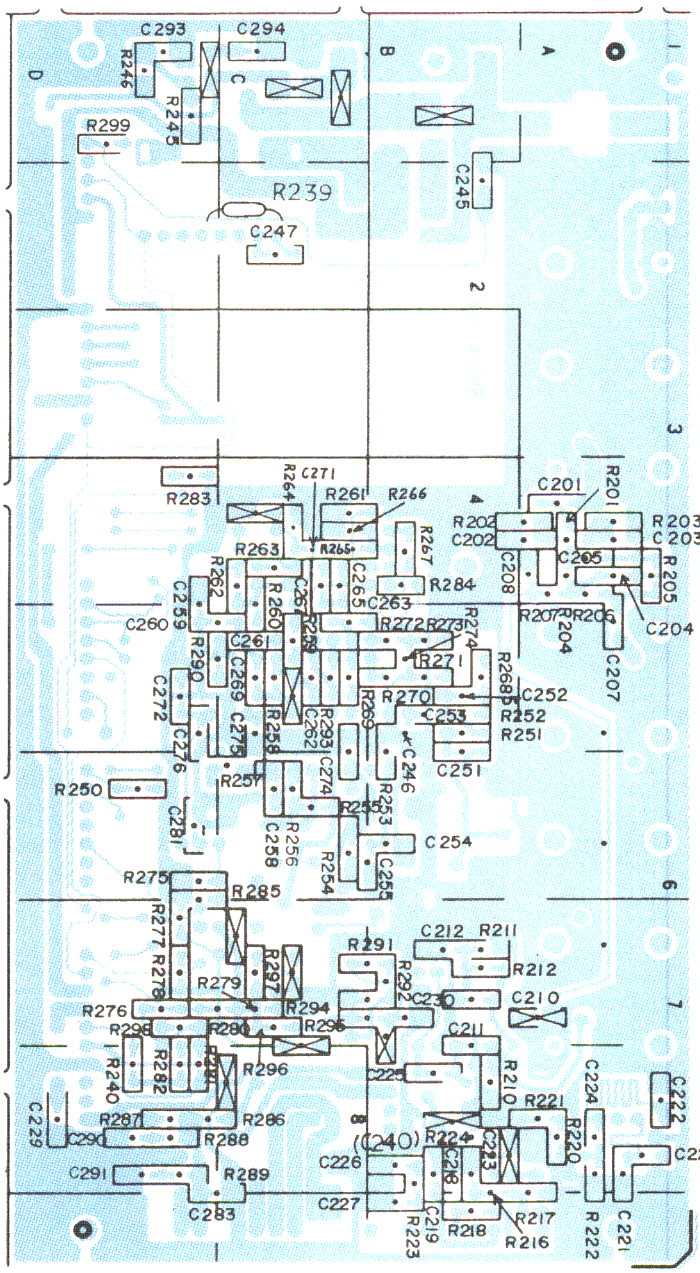
RX-154 TOP SIDE



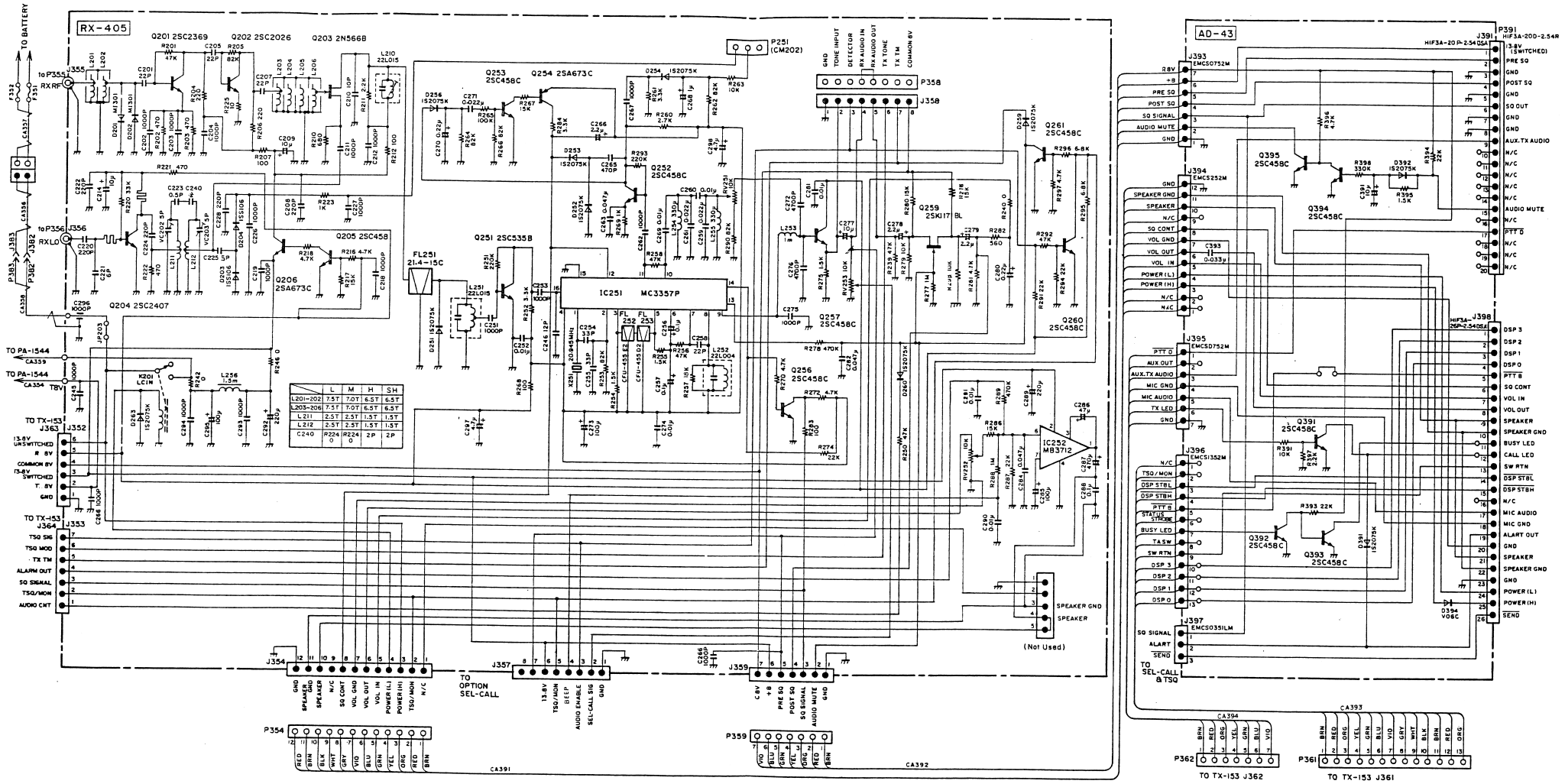
RX-154 BOTTOM SIDE



RX-404 TOP SIDE

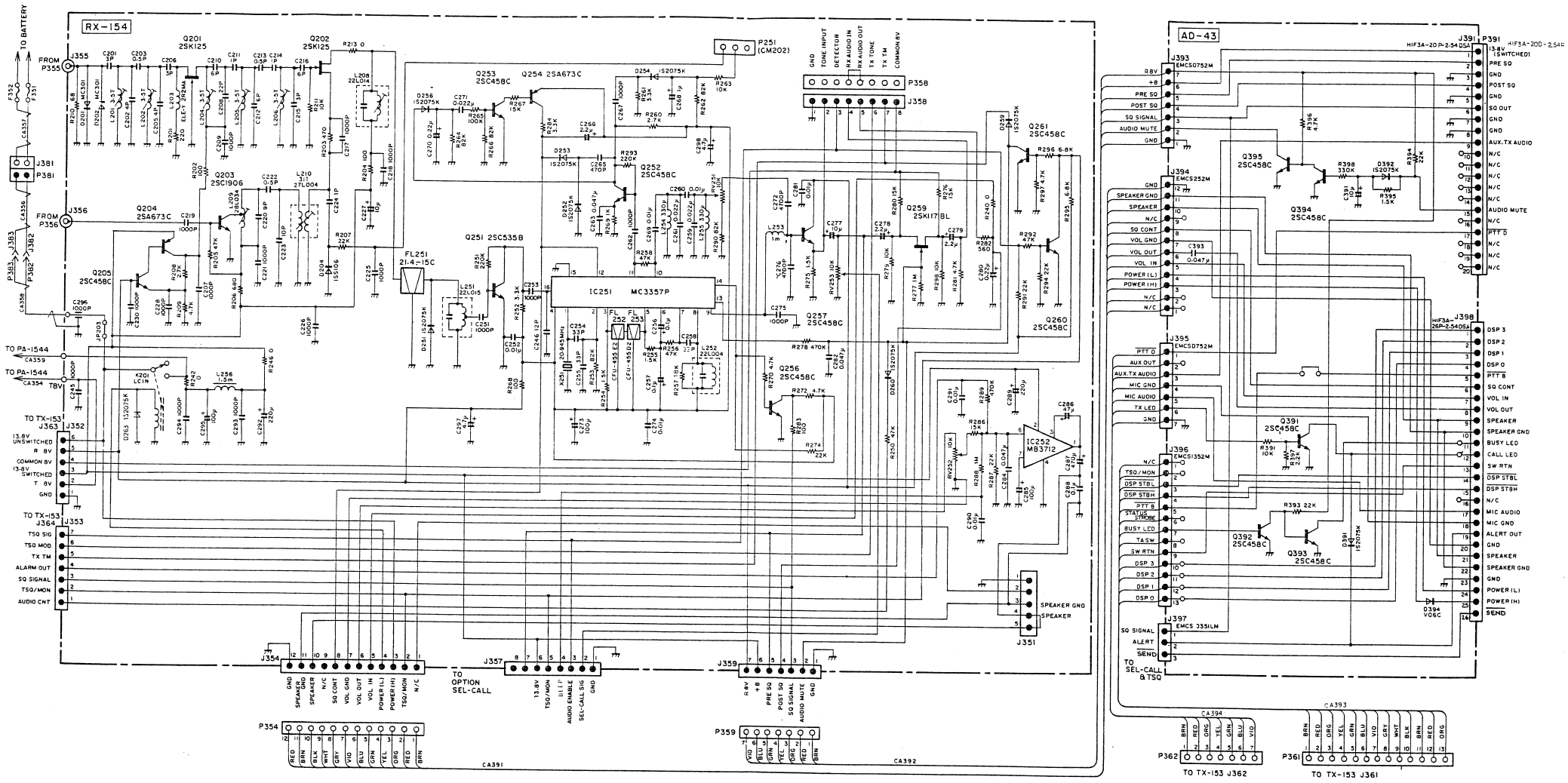


RX-404 BOTTOM SIDE



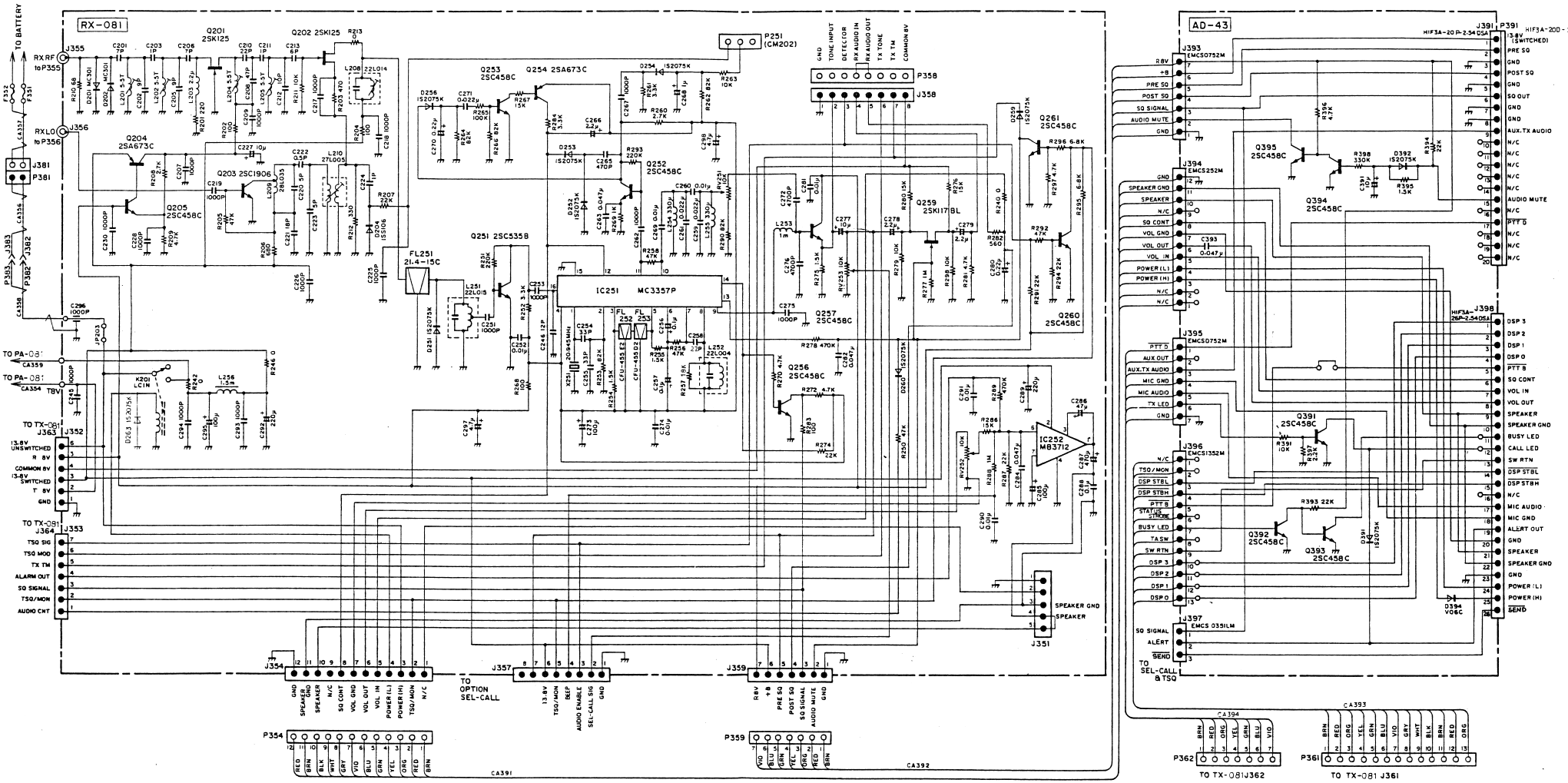
RECEIVER RT-85 UHF 1LM82273, 1LM82274, 1LM82275 & 1LM82276

AWA Drawing 82273-1-01



RECEIVER RT-85 VHF (HB) 1LM82272

AWA Drawing 82272-1-01



RECEIVER RT-85 VHF (LB) 1LM82271

AWA Drawing 82271-1-01

B.3 - POWER AMPLIFIER ASSEMBLY

IDENTIFICATION

Band	Frequency	PCB No.	Circuit Drawing
VHF(LB)	70-85MHz	PA-081	82271-1-02
VHF(HB)	148-174MHz	PA-1544	82272-1-02
UHF(LB)	403-420MHz	PA-429(A)	82273-1-02
UHF(MB)	450-475MHz	PA-429(B)	82273-1-02
UHF(HB)	470-500MHz	PA-429(C)	82273-1-02
UHF(SHB)	495-520MHz	PA-429(D)	82273-1-02

GENERAL DESCRIPTION

The power amplifier is a printed circuit board which mounts within a compartment on the top side of the diecast transceiver frame. Power transistors bolt to the frame, which is shaped to provide maximum efficiency as a heat sink.

The power amplifier contains a:

- three stage power amplifier;
- solid state TX/RX changeover switch;
- PA power detector and regulator; and
- antenna low pass filter.

CIRCUIT DESCRIPTION

The circuit diagram of the Power Amplifier assembly is on the Transmitter Assembly circuit diagram (see Section B.1).

POWER AMPLIFIER CIRCUIT

Q501, Q502 and Q503 make up a three stage amplifier with sufficient gain to provide the specified output power with the minimum dc input voltage. The amplifier gain can be cut by reducing the dc voltage on the collector of Q501. The exciter output is used to drive this amplifier.

TX/RX ANTENNA SWITCH

When the unit is receiving, signals from the antenna pass through C519 and L511 to the receiver. D501 and D503 are not in conduction, and thus do not load the receiver signal.

When transmitting, dc from the T8 V supply passes through R512, L510, D501, L511 & D503, causing the two diodes to conduct. The transmitter power passes through D501 to the antenna, while rf voltage to the receiver is clamped by D503.

PA POWER DETECTOR and REGULATOR

The rf voltage out of the transmitter is coupled to D504 via C539 and an inductive pick-up loop. The rectified dc into the base of Q506 is compared with the reference voltage at the base of Q505, and as these two transistors form a differential amplifier, Q505 collector current amplified in Q504 adjusts the voltage at the collector of Q501. Thus the rf output power will adjust to maintain a constant voltage at the base of Q506.

RV502 allows the output power to be preset between 12 and 25 watts. The reference at the base of Q505 can have two settings:

Normal: voltage divided from TV8 by R517, D505 & R518; or

Depower: Q507 conducts and RV501 sets new reference for an output power of 1 to 12 watts.

ANTENNA LOW PASS FILTER

L512/L515 form a low pass filter which supresses harmonics of the transmitter output frequency.

B.4 - ADAPTOR ASSEMBLY

The adaptor printed circuit board is identified by No. AD-43.

The circuit diagram of the Adaptor Assembly is on the Receiver Assembly circuit diagram (see Section B.2).

The adaptor board is mounted across the rear of the transceiver. It provides interconnection between the transmitter, receiver, CTCSS, Selcall, control unit and the auxiliary connector.

AUDIO MUTE

Under normal conditions, Q394 conducts due to base current through R394, R395 & R398, and Q355 is cut off.

If J391 pin 15 is grounded, C391 is immediately discharged through D392, Q394 switches off, and Q395 conducts, switching off the receive audio. When J391 pin 15 switches high, the audio signal is held off for approximately 150ms due to the time constant C391, R395 and R394.

LED DRIVERS

Q391 and Q393 sink current to switch on the control unit CALL and BUSY LEDs. The CALL LED can also be switched on from the Selcall unit via D391.

B.5 - CONTROL UNIT

The RT-85 control unit is identified by No. 1LC82259. The description below refers to circuit diagram 82259-1-01, which follows this section.

The control unit is housed in a moulded polycarbonate case with integrally moulded buttons forming the front face. A red acrylic lens covers the display window and supports the other LED indicators. Two edge mounted rotary knobs provide volume and squelch control.

Inside the box are two parallel mounted printed circuit boards on which are all the electronic components. Connection to the transceiver is made through a 26-way flat cable. Terminals at the rear of the case allow connection to the loudspeaker, handset and depower switch.

PCB CX-09

This circuit board provides interfacing between the flat cable to the transceiver, external connections P303/P313 and the volume and squelch controls.

IC301 amplifies the low level microphone signal to a high level suitable for transmission through the flat cable to the TX exciter.

IC302 is a 5 V regulator powering the switch and display circuitry.

PCB CX-10

The second PCB mounts the the six switches SW301/SW305, the channel display (IC316), the BUSY, CALL, SCAN, & OPEN LEDs and the associated decode/driver circuits.

Switch Multiplexing

IC313 is a BCD-to-decimal decoder which allows only one of its outputs to switch high at any time depending on the BCD code applied to its inputs A, B, C & D.

The central microprocessor sets up continually changing BCD codes, and IC313 sends momentary high pulses to one side of each switch in turn. If any switch is closed, its pulse will be transferred through D316 and inverter IC313 to the SWITCH RTN conductor back to the microprocessor, thus registering a switch closure.

In addition, two outputs from IC313 set two latches in IC314, which in turn drive the SCAN and OPEN LEDs, thus controlling these LEDs from the microprocessor. Another output from IC313 (pin 4) is a common reset for the two LED latches.

DSP3	DSP2	DSP1	DSP0	Display Number	Switch/Latch
0	0	0	0	0	CHANNEL UP
0	0	0	1	1	CHANNEL DOWN
0	0	1	0	2	SILENT
0	0	1	1	3	
0	1	0	0	4	STATUS/SEND
0	1	0	1	5	
0	1	1	0	6	Depower
0	1	1	1	7	
1	0	0	0	8	SCAN
1	0	0	1	9	
1	0	1	0	Blank	SCAN LED on
1	0	1	1	Blank	
1	1	0	0	Blank	OPEN LED on
1	1	0	1	Blank	
1	1	1	0	Blank	LEDs off
1	1	1	1	Blank	

DSP3	DSP2	DSP1	DSP0	Inputs
A	C	B	D	IC313
D	C	B	A	IC311 & IC312

Display Multiplexing

To set a particular display number, the microprocessor sets the appropriate BCD code on lines DSP0/DSP3, and then sends a negative pulse on the appropriate strobe line $\overline{\text{DSP STBL}}$ or $\overline{\text{DSP STBH}}$. To blank the display, a binary number above 9 is sent from the microprocessor.

Fig. B-4 (page B.5 - 3) shows the interconnection of the control unit display and switches.

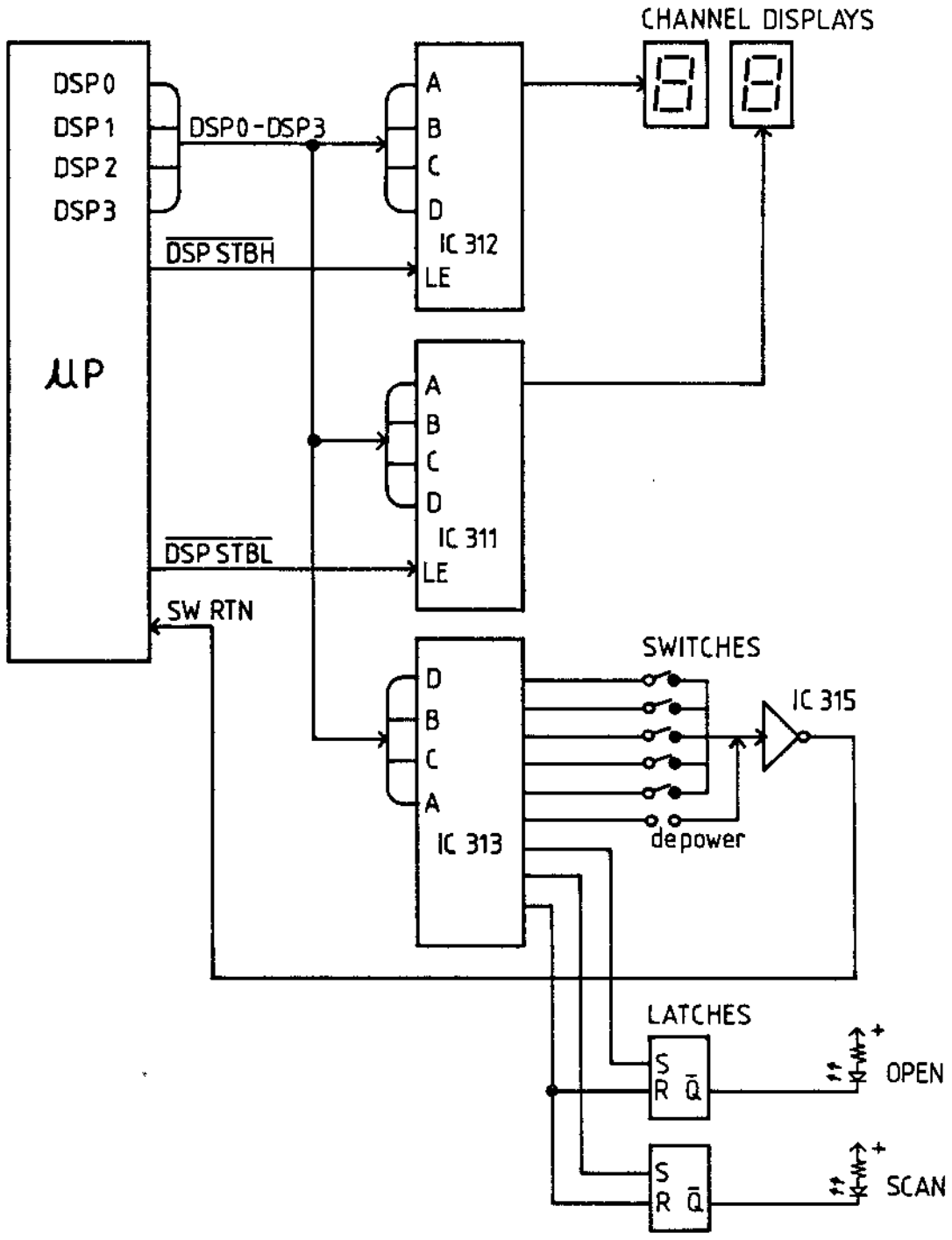
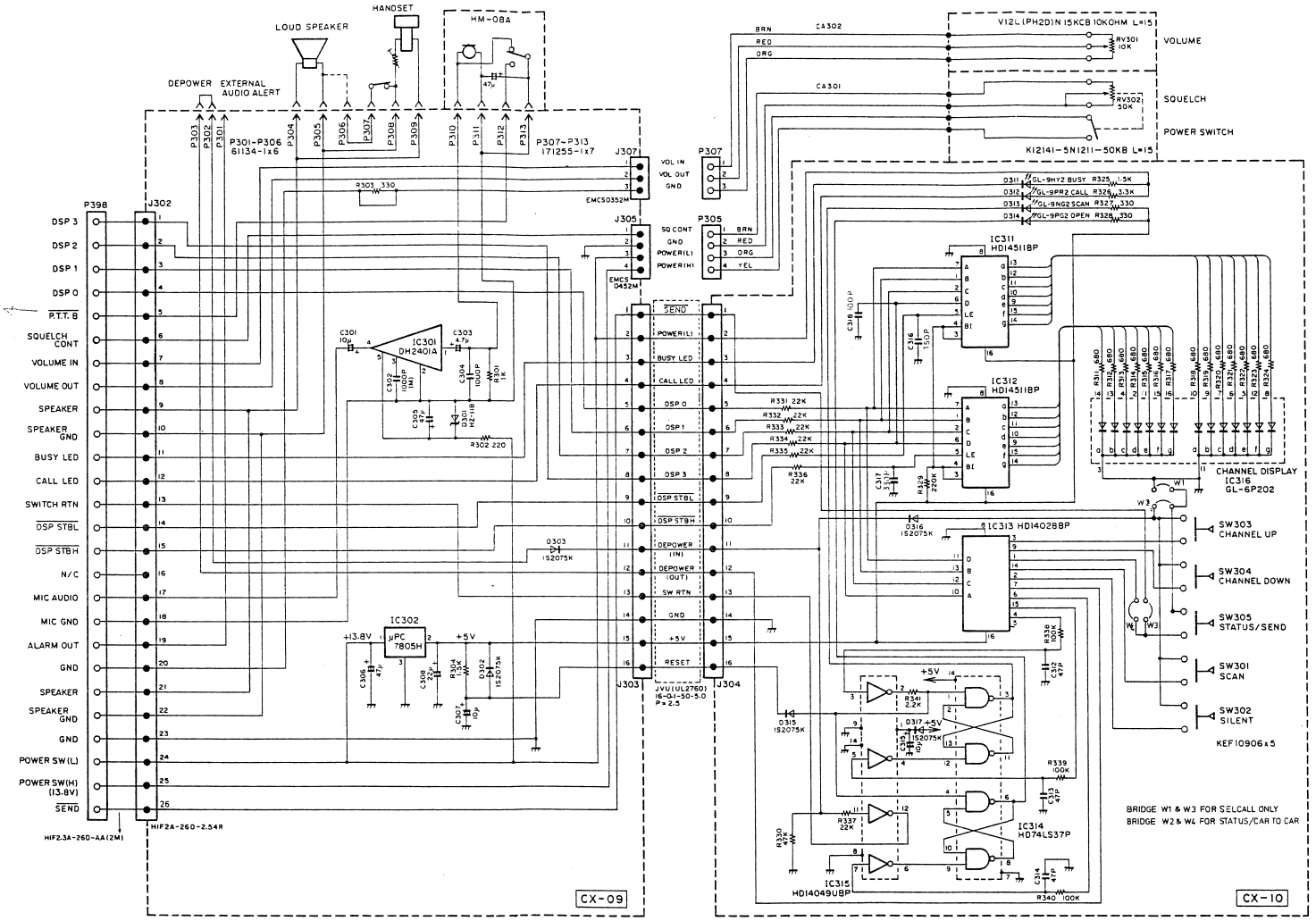


Fig. B-4 Control Unit Display/Switch Interconnection



RT-85 MOBILE CONTROL UNIT 1LC82259

AWA Drawing 82259-1-01

B.6 - CTCSS ENCODER ST-100A

This optional facility is a plug-in module which contains a single-frequency oscillator operating over the range 67Hz to 203Hz.

The circuit diagram is shown on page B.6 - 2.

Fig. B-5 below shows the interconnection between the ST-100A unit and the Receiver PCB.

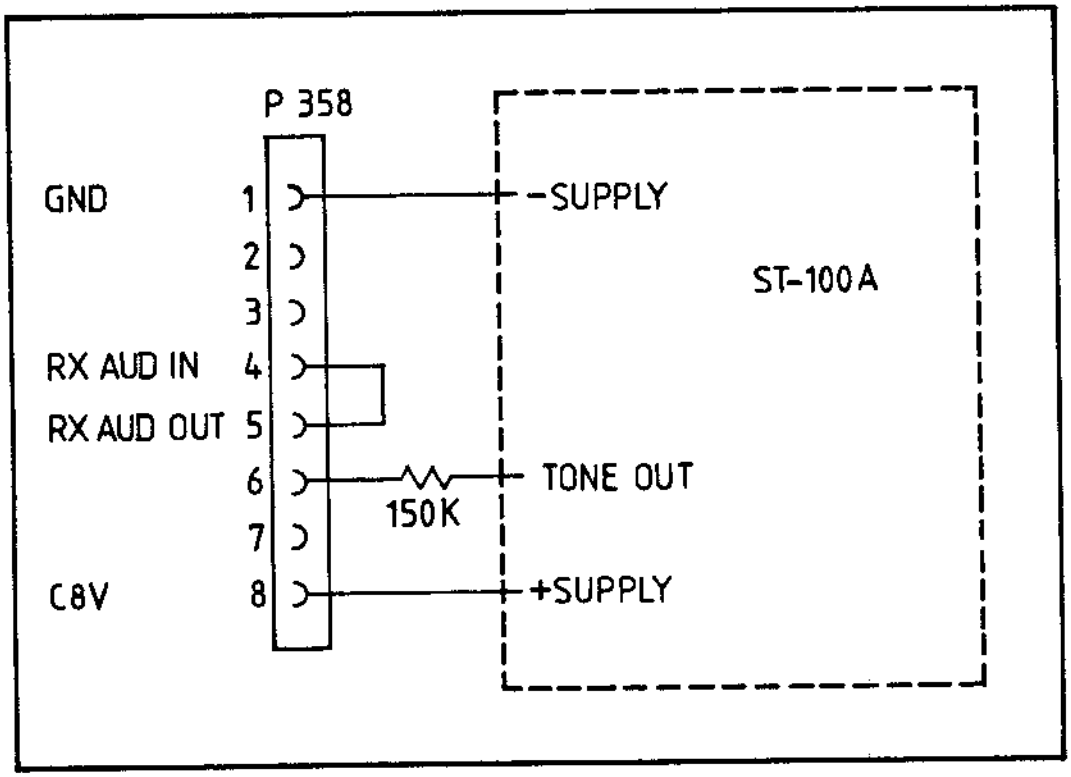
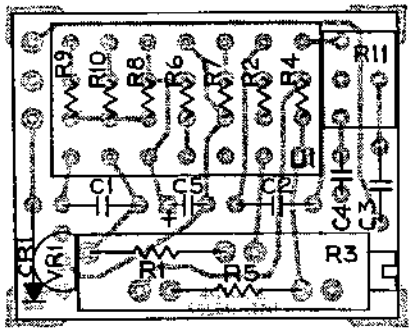
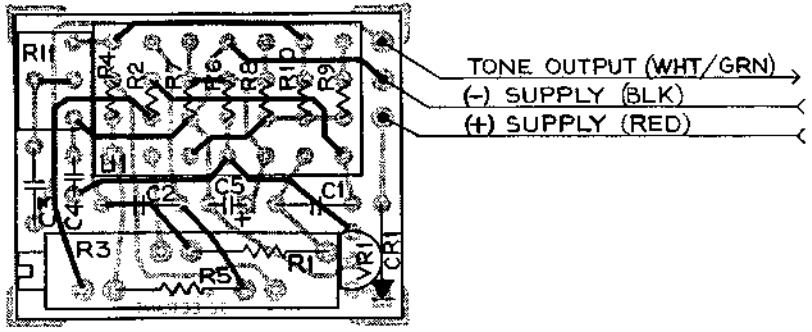


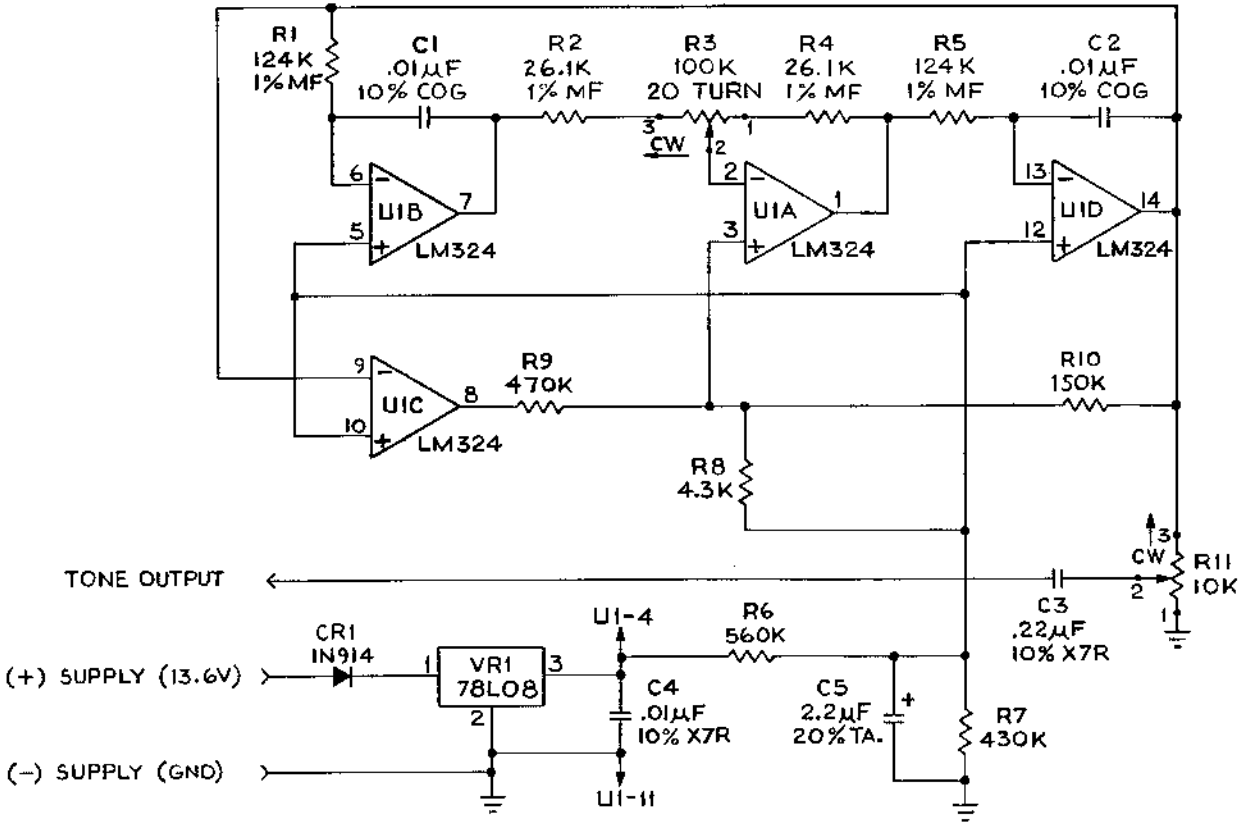
Fig. B-5 ST-100A/Receiver PCB Connection

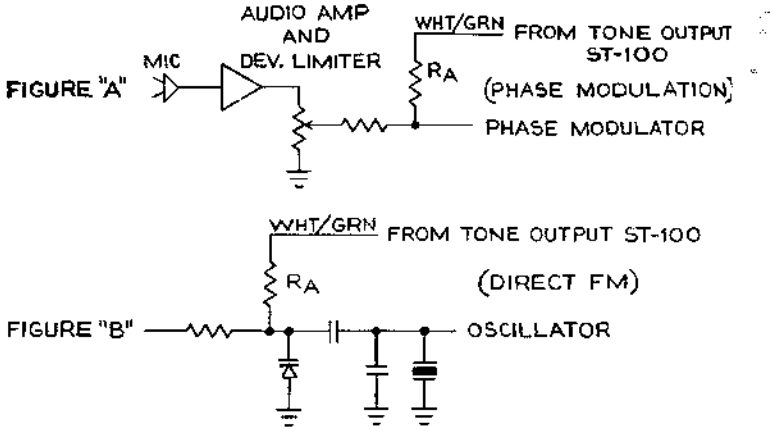


SOLDER SIDE



COMPONENT SIDE





NOTE: UNLESS OTHERWISE INDICATED
ALL RESISTORS ARE 1/8W, ±5%

ASSEMBLY & SCHEMATIC
ST-100 CTCSS ENCODER

B.7 - CTCSS ENCODER/DECODER Z-281

The description below refers to the circuit diagram which follows this section.

The Z-281 Encoder/Decoder is an optionally fitted printed circuit board that mounts on the underside of the transceiver, and plugs directly into connector J358 on the Receiver PCB and J901 on the EPROM module.

ENCODER/DECODER

IC3 is a CMOS circuit containing dedicated CTCSS encoder and decoder circuitry. The sub-audible tones are programmed from the EPROM module, and are crystal derived (X1) for high stability. The receiver discriminator output is fed directly into IC3 pin 21 where the signal is initially filtered by switched capacitor elements tuned by the programming code. The output is then limited and digitally processed to set or reset a detector output latch (pin 15). R13 and C4 integrate this signal and a comparitor provides a low output (pin 12) when the required reference input is achieved (pin 13). This reference is set on pin 11. When pin 12 is low, Q2 output is high, enabling the audio through the receiver.

If the TX TM input (P358 pin 7) switches low, IC3 generates a low distortion sine wave at a frequency determined by the programmed code. The presence of R35 ensures that there is no dc transient on the output when the tone switches on or off.

The tone output level is adjusted in RV1, and R14 & C8 ensure constant deviation for all generated frequencies. The tone is fed into the IDC circuit on the TX exciter after the peak clipper.

FREQUENCY SELECTION

Whenever the channel is changed or the unit switches to transmit or receive, the EPROM puts out 24 bits of information (see the circuit description in Section B.1). Of these, 17 bits are used for setting the channel frequency, 5 bits are for CTCSS frequency and 2 bits supply a parity check.

The 5 CTCSS bits appear at P903 pins 3/7 (D0/D4), and when these are steady, a pulse on P903 pin 2 strobes these into IC1 on the Z-281.

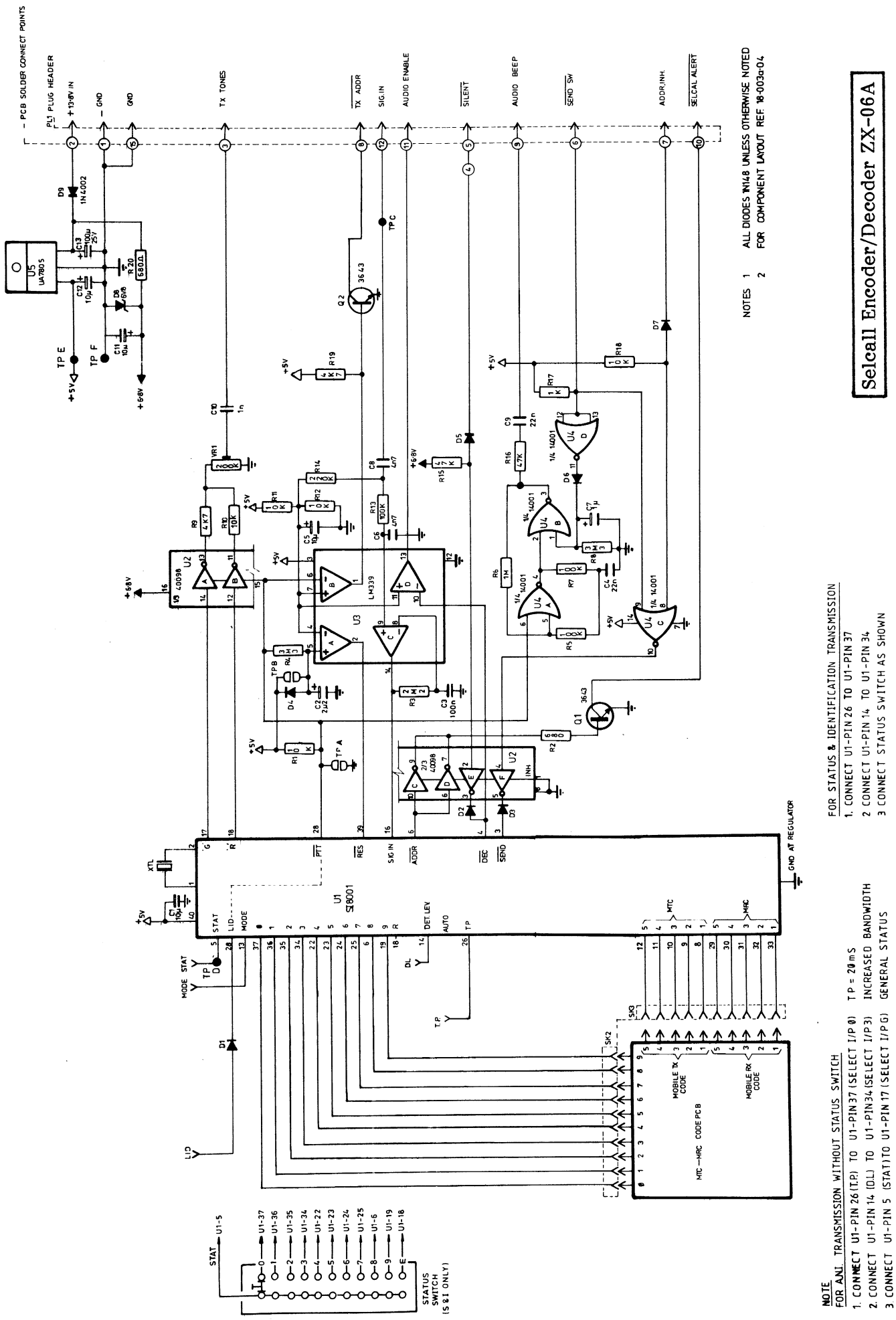
IC1 is a 6-way latch, and information on its 6 inputs is retained on its 6 outputs following receipt of the strobe pulse. The outputs of IC1 immediately program the frequency of IC3. However for code "0" all outputs will be low, causing IC2 pin 13 to switch high. This inhibits tone generation, since D2 holds pin 17 high. On receive for code "0", Q1 switches on holding the base of Q2 low, which in turn opens the receiver - i.e. noise squelch only, no tone squelch.

HIGH PASS FILTER

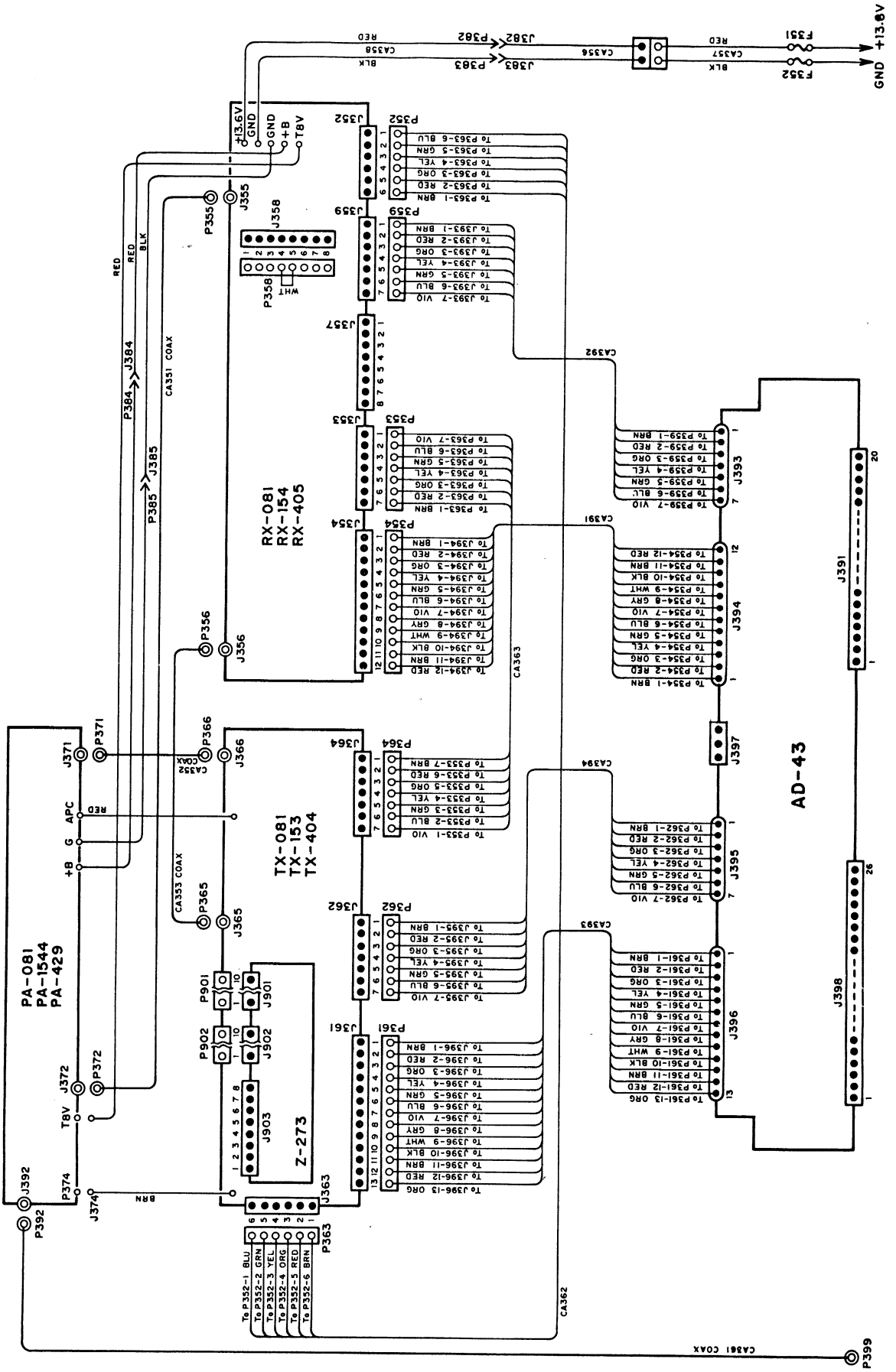
IC4 is an 8-pole high pass filter with sharp cut-off below 300Hz. This is used to filter received CTCSS tones from the loudspeaker. The bridge between pins 4 & 5 of P358 is removed to allow operation of this filter.

Programmable CTCSS Frequency Table

CTCSS Freq. (Hz)	Prog. Code	Group	P903 pin IC3 Input	3 D0 "X"	4 D1 "1"	5 D2 "2"	6 D3 "4"	7 D4 "8"
None	0	-		0	0	0	0	0
241.8	1	B		1	0	0	0	0
233.6	2	A		0	1	0	0	0
225.7	3	B		1	1	0	0	0
218.1	4	A		0	0	1	0	0
210.7	5	B		1	0	1	0	0
203.5	6	A		0	1	1	0	0
192.8	7	B		1	1	1	0	0
186.2	8	A		0	0	0	1	0
179.9	9	B		1	0	0	1	0
173.8	10	A		0	1	0	1	0
167.9	11	B		1	1	0	1	0
162.2	12	A		0	0	1	1	0
156.7	13	B		1	0	1	1	0
151.4	14	A		0	1	1	1	0
146.2	15	B		1	1	1	1	0
141.3	16	A		0	0	0	0	1
136.5	17	B		1	0	0	0	1
131.8	18	A		0	1	0	0	1
127.3	19	B		1	1	0	0	1
123.0	20	A		0	0	1	0	1
118.8	21	B		1	0	1	0	1
114.8	22	A		0	1	1	0	1
110.9	23	B		1	1	1	0	1
107.2	24	A		0	0	0	1	1
103.5	25	B		1	0	0	1	1
100.0	26	A		0	1	0	1	1
94.8	27	B		1	1	0	1	1
88.5	28	A		0	0	1	1	1
82.5	29	B		1	0	1	1	1
77.0	30	A		0	1	1	1	1
71.9	31	B		1	1	1	1	1



B.10 - SYSTEM INTERCONNECTION DIAGRAM



B.8 - SELCALL ENCODER/DECODER ZX-06A

The description below refers to the circuit diagram which follows this section.

The ZX-06A Selcall Encoder/Decoder is an optionally fitted PCB which mounts on the underside of the transceiver. Connection is made to the Transmitter PCB (J367), the Receiver PCB (J357) and the Adaptor PCB (J397) using wiring harness WH-1.

A 5-tone sequential code format is employed in the Selcall unit, and send and receive codes can be programmed by applying solder bridges to the plug-in code PCB. Wire bridges under the ZX-06A allow selection of the Lead In Delay (LID), Tone Period (TP), Decode Bandwidth (D) and Send Repetition Rate (SRR). The unit may be configured to respond to group calls, and expansion is possible for sending a status digit (see Status option in Section B.9).

Bridging Chart

Add wire between the appropriate select line and identified pad under the PCB:

Select Lines No.	U1 pin	Mode	LID "L"	TP "T" ms	SRR "S" sec	Decode Bandwidth "D" %
0	37	EIA	0	20	0	3.0
1	36	EIA+Gp	50ms	30	1	2.8
2	35	CCIR	100ms	40	2	2.6
3	34	CCIR+Gp	200ms	50	3	2.4
4	22	ZVEI1	350ms	60	4	2.2
5	23	ZVEI1+Gp	600ms	70	5	2.0
6	24	ZVEI3	1sec	80	6	1.8
7	25	ZVEI3+Gp	1.6sec	90	7	1.6
8	6	EEA	2.5sec	100	8	1.4
9	19	EEA+Gp	4sec	110	9	1.2
R	18	ZVEI2		120	10	1.0
G	17	ZVEI2+Gp		130	11	0.8

Default values (open circuit)

LID: 500ms.

TP: 33ms for modes 0 & 1;
40ms for modes 3, 8 & 9;
70ms for modes 4, 5, 6, 7, R & G;
100ms for mode 2.

SRR: 1sec

D: 1.3% for mode 2;
1.6% for modes 3, 8 & 9;
2% for modes 0, 1, 4, 5, 6, 7, R & G.

Any one of the following tone sets may be chosen by selecting the appropriate mode:

Tone	CCIR	EEA	EIA	ZVEI-1	ZVEI-2	ZVEI-3
0	1981	1981	600	2400	2400	2200
1	1124	1124	741	1060	1060	970
2	1197	1197	882	1160	1160	1060
3	1275	1275	1023	1270	1270	1160
4	1358	1358	1164	1400	1400	1270
5	1446	1446	1305	1530	1530	1400
6	1540	1540	1446	1670	1670	1530
7	1640	1640	1587	1830	1830	1670
8	1747	1747	1728	2000	2000	1830
9	1860	1860	1869	2200	2200	2000
R	2110	2110	459	2600	970	2400
G	2400	1055	2151	2800	885	885

CIRCUIT DESCRIPTION

U1 is a dedicated microprocessor able to perform a variety of encode and decode functions.

DECODER

On receive, signals from the discriminator (J357 pin 2) are fed into U3C which amplifies and clips the signal.

If U1 decodes a valid tone sequence (i.e. the MRC code), then:

(a) The ZX-06A replies with auto acknowledge (except for group calls).
After the "LID" delay, the MRC code is generated from U1 pin 17 and U1 pin 18, which synthesize a stepped sine wave, which is fed via J367 pin 1 into the IDC amplifier. U1 pin 28 switches low, and this signal is inverted in U3B and Q2. This signal then operates the ADRS TX line (J367 pin 4), bringing on the PTT.

(b) The RT-85 receiver is opened if the OPEN LED is off.
U1 pin 4 switches low, causing the U3D output to switch high. This is connected to J357 pin 3 (AUDIO ENABLE), and incoming calls may be heard in the loudspeaker.

(c) The CALL LED flashes.
U1 pin 6 pulses low, which also pulses the ALERT line (J397 pin 2) low. This signal flashes the CALL LED, and is also available at the rear of the control unit for driving external signalling devices.

(d) An audible "beep" is generated in the loudspeaker.
Whenever the PTT is on, U4 pin 6 is low, which enables U4A and U4B to run in a self oscillating mode. This tone is transferred via J357 pin 4 to the input of the speaker amplifier.

ENCODER

If the SEND button is pressed, J397 pin 3 (J367 pin 2 for Status version) switches low. This signal is inverted in U4D, charging C7 and thus inhibiting the Beep oscillator. In addition, the output of U4C switches high provided that the ADDR INH line (J397 pin 1) is low, indicating that the BUSY LED is off. U2F pulls U1 pin 3 low, which initiates a Selcall send sequence provided that the SILENT input is high (i.e. the OPEN LED is on).

This sequence brings on the PTT, and synthesizes the MTC code after the "LID" delay.

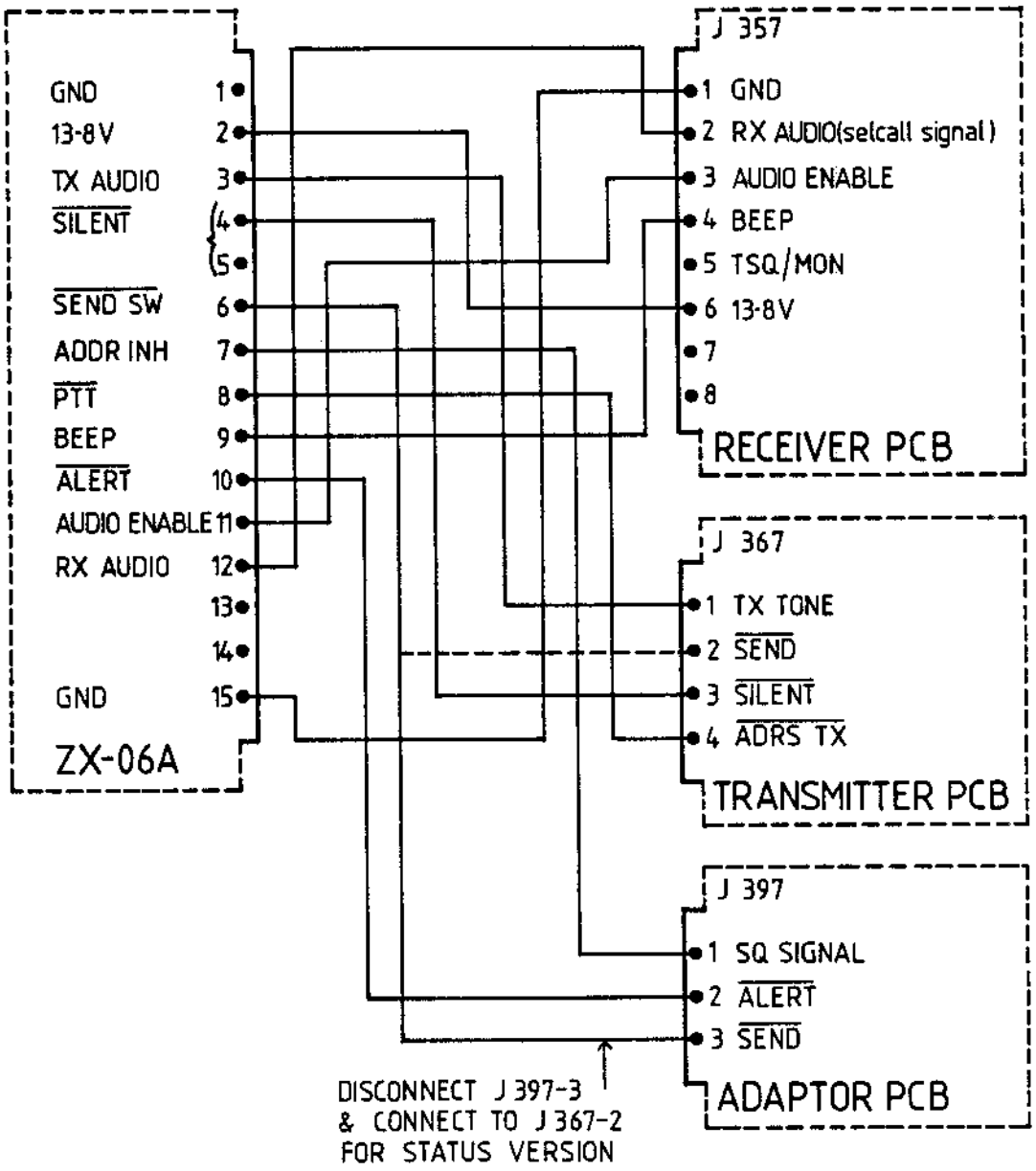
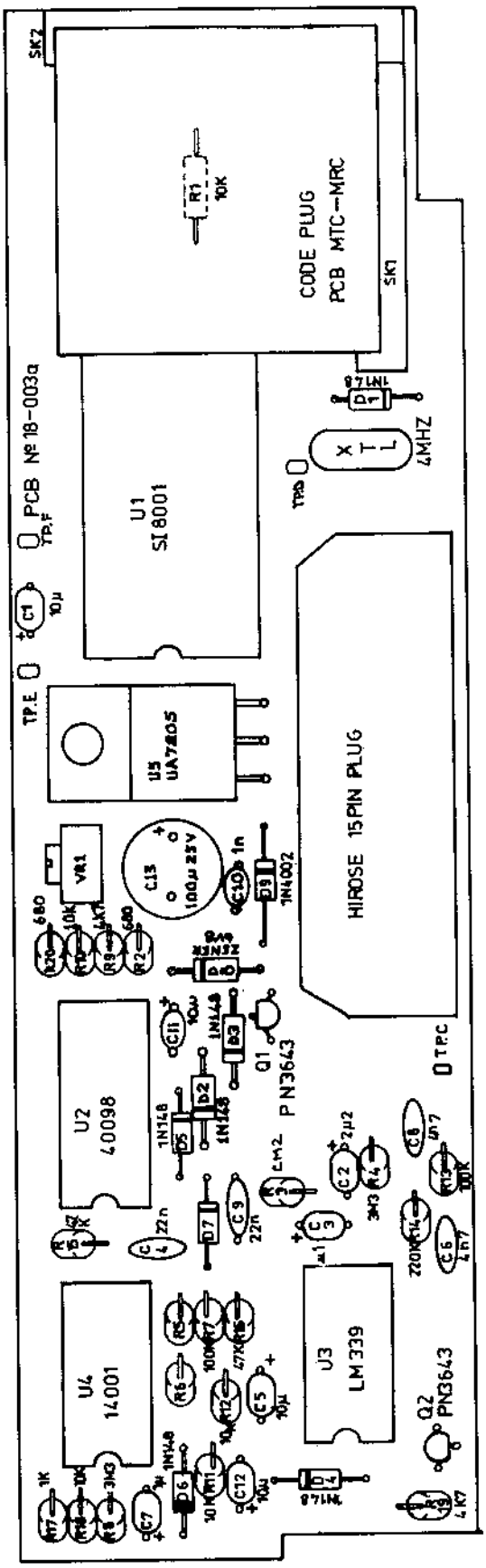


Fig. B-6 Wiring Harness WH-1



ZX-06A TOP SIDE

B.9 - SELCALL ENCODER/DECODER ZX-06C

(with STATUS/CAR-to-CAR CALLING FACILITY)

The ZX-06C option incorporates a ZX-06A unit plus the Selcall/Status Conversion PCB Assembly shown in Fig. B-7 (page B.9 - 2). This PCB assembly replaces the code PCB in the ZX-06A.

The Conversion PCB includes a coding matrix to allow selection of MRC and MTC codes for normal Selcall. Additional connections are made to DSP0/DSP3 and Status Strobe on the Adaptor PCB.

A bridging link LK1 on this PCB allows selection of the two modes of operation: Status or Car-to-Car Selcall.

In the Status mode, a 6th tone is added whenever the ZX-06C sends out a code. This 6th tone is selected to correspond to the digit displayed on the control unit when the STATUS/SEND button is pressed. A suitable base decoder is required to decode the status digit.

In the Car-to-Car mode, the 5th tone of the 5-tone sequence of the MTC is dependent on the digit displayed on the control unit when the STATUS/SEND button is pressed. This allows selection of one of nine other cars with the same first four digits in their MRC code.

CIRCUIT DESCRIPTION

Whenever the status number on the control unit is changed, the central microprocessor sets up the BCD equivalent of that number on lines DSP0/DSP3, and then sends a positive strobe pulse on the STATUS/STROBE line.

On the Conversion PCB, IC1 latches in this BCD code, and its output code selects one output from either IC2 or IC3 (each one of eight demultiplexing analog gates). The common input to these gates (IC2 pin 3 or IC3 pin 3) are switched to one of the ten Selcall select lines.

In the Status version, the common line is connected to the ZX-06A status output (U1 pin 5), while for the Car-to-Car version, it is connected to MTC-5 (U1 pin 12).

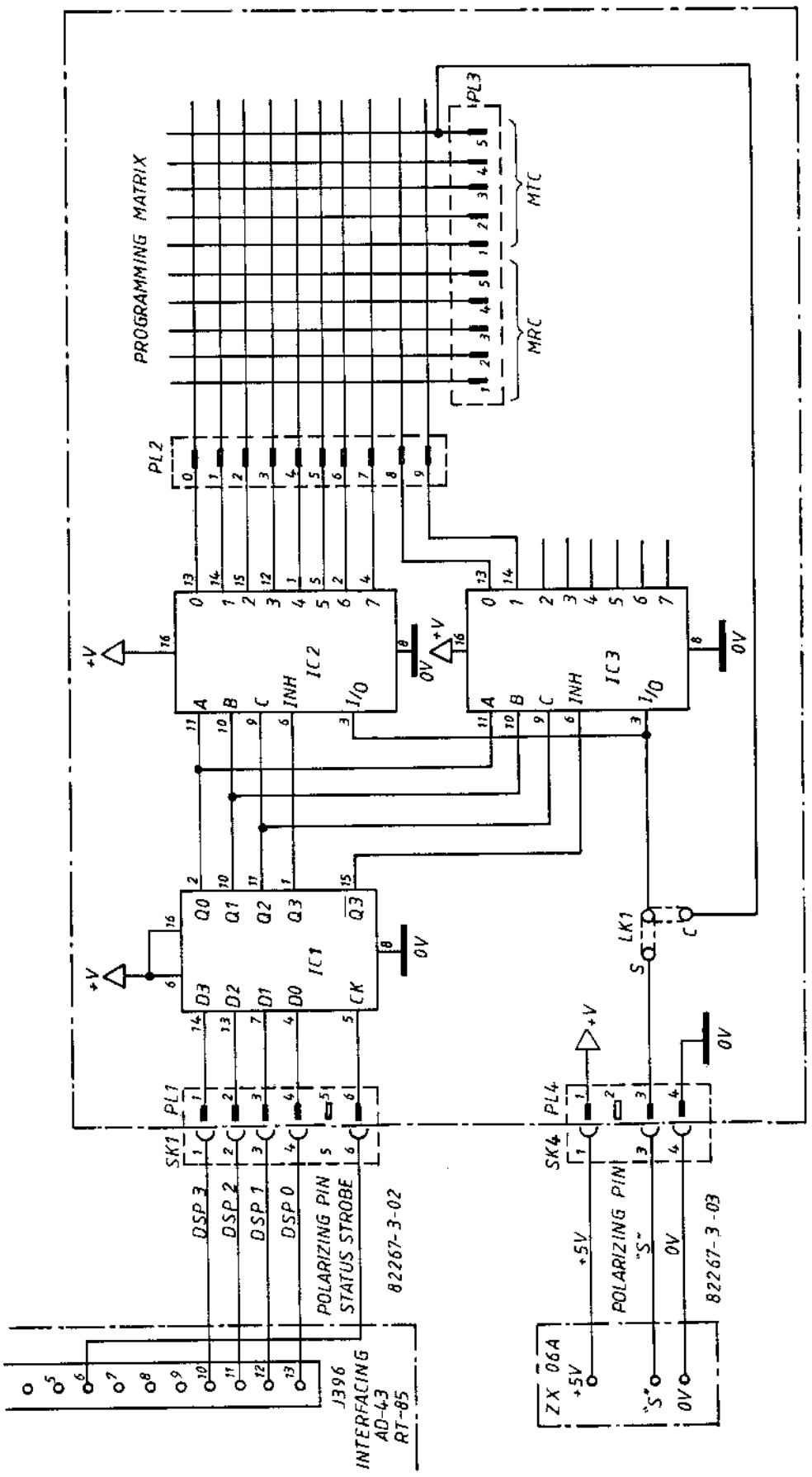
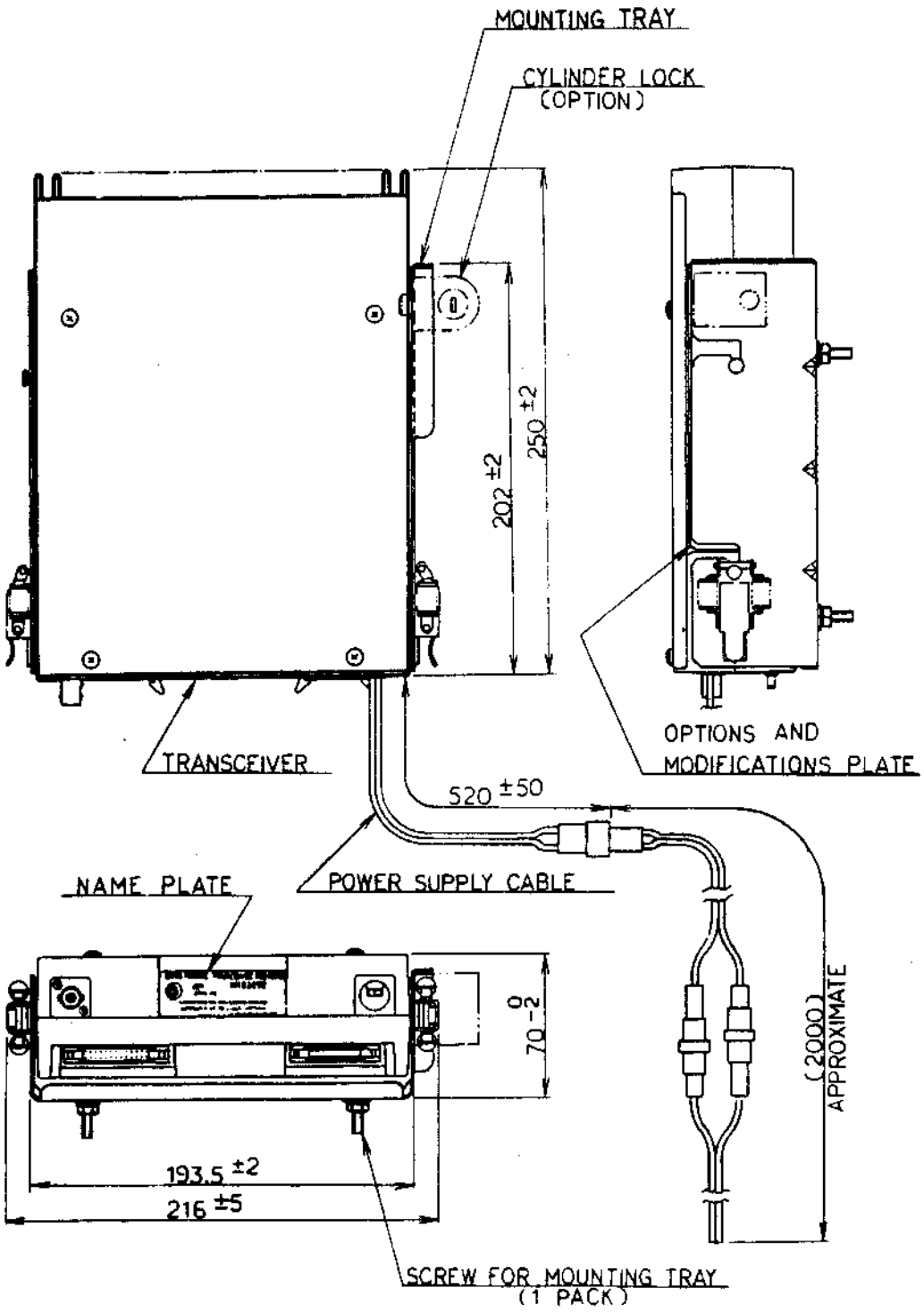


Fig. B-7 Selcall/Status Conversion PCB Assembly



TRANSCEIVER AND MOUNTING TRAY

Fig. C-1 Transceiver Dimensions

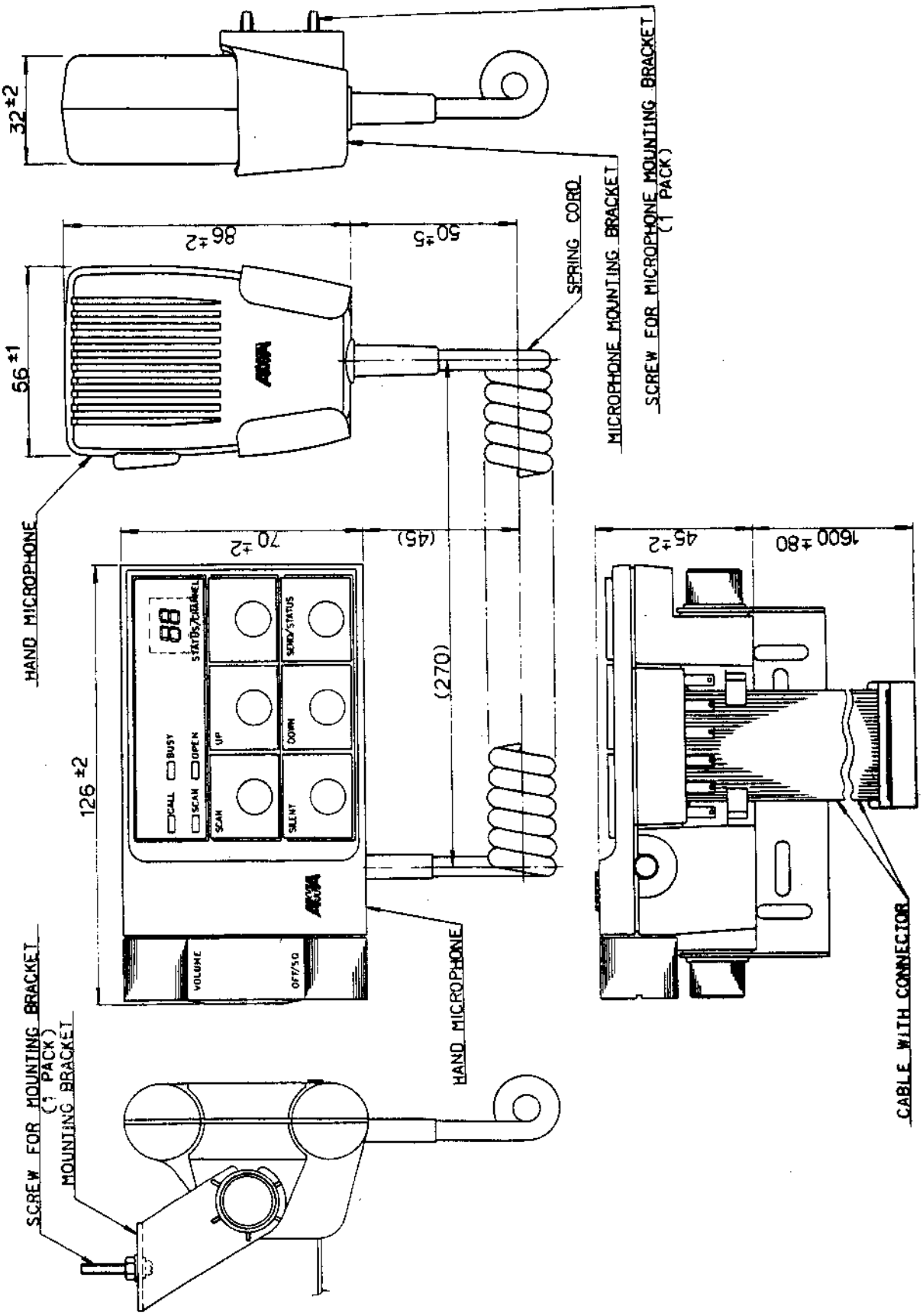


Fig C-2 Control Unit Dimensions

C.2 - INSTALLATION

TRANSCEIVER

SITING

The transceiver may be installed at any attitude within the vehicle and in any convenient location, e.g. under-seat, under-dash, behind-dash, in the boot (luggage compartment), etc. However, when choosing a suitable location, the following points should be noted:

(a) Locations of extreme heat should be avoided, e.g. immediately below front or rear windscreens, as the effects of high temperatures can seriously impair the reliability of the equipment;

(b) Sufficient space must be allowed between the location of the fixed mounting tray and other parts of the vehicle to allow insertion/removal of the transceiver - a minimum space of 100mm is recommended in the direction of insertion/removal;

(c) Sufficient space must be allowed between the location of the installed mounting tray/transceiver combination and other parts of the vehicle to avoid overdue bending of the cables connected to the transceiver, viz. control cable, antenna cable and supply voltage cable;

(d) If the optional anti-theft locking device is being used on the mounting tray, sufficient space must be allowed between the key aperture and other parts of the vehicle to allow insertion and operation of the key;

(e) Since the control unit will be installed somewhere convenient to the driver, e.g. under-dash, the siting of the transceiver should be such as to allow the 2m control cable from the control unit to easily reach the transceiver (if this is not possible, the optional 4m extension control cable can be used).

FITTING

Install the transceiver as follows:

1. Drill four 6mm holes (1/4 in. drill) in the vehicle body according to the format shown in Fig. C-3 (page C.2 - 2).

2. Secure the mounting tray to the vehicle body using the bolts, nuts and washers supplied.

3. Insert the transceiver into the mounting tray, ensuring that the two locating pins at the front of the transceiver engage the corresponding snap-action catches on the mounting tray.

4. If the optional anti-theft locking device is being used on the mounting tray, use the key to ensure that the plunger moves freely to engage the corresponding cavity in the transceiver case.

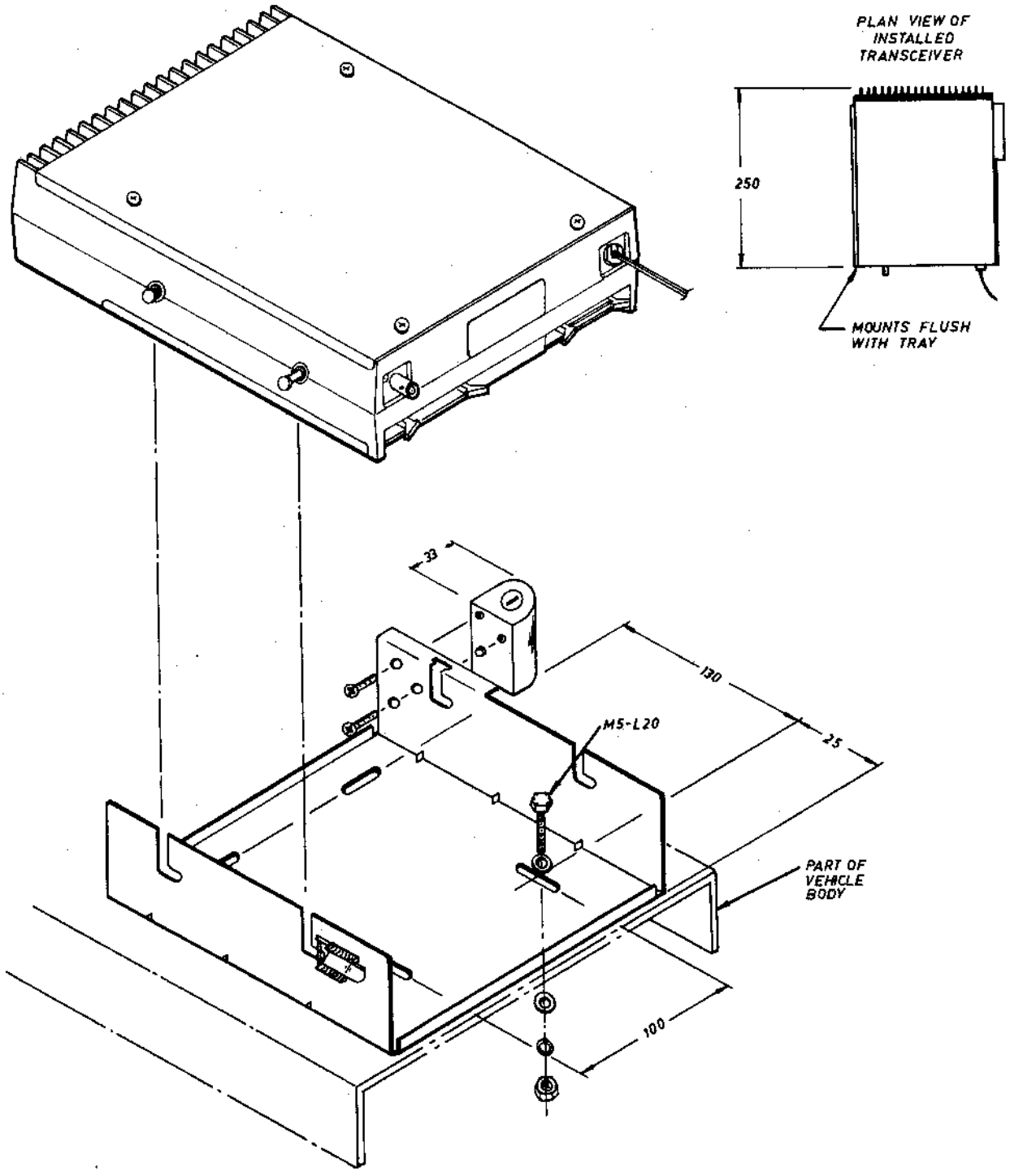


Fig. C-3 Transceiver Installation

CONTROL UNIT

SITING

The control unit, by virtue of its swivel mounting bracket, may be mounted at any attitude within the vehicle, i.e. the bracket may be positioned above, behind or below the final intended position of the control unit. Any location convenient to the driver may be chosen, e.g. under-dash or above-dash, but in selecting a location, due consideration should be given to current safety regulations governing the location of such equipment within a vehicle.

FITTING

Install the control unit as follows:

1. Drill two 4mm holes (5/32 in. drill) in the vehicle body, noting the range of centre-to-centre dimensions shown in Fig. C-4 below.

2. Remove the swivel bracket from the control unit by loosening the knurled locking nuts.

3. Secure the swivel bracket to the vehicle body using the screws, nuts and washers supplied.

4. Insert the control unit into the swivel bracket and lock it into the desired position using the knurled locking nuts.

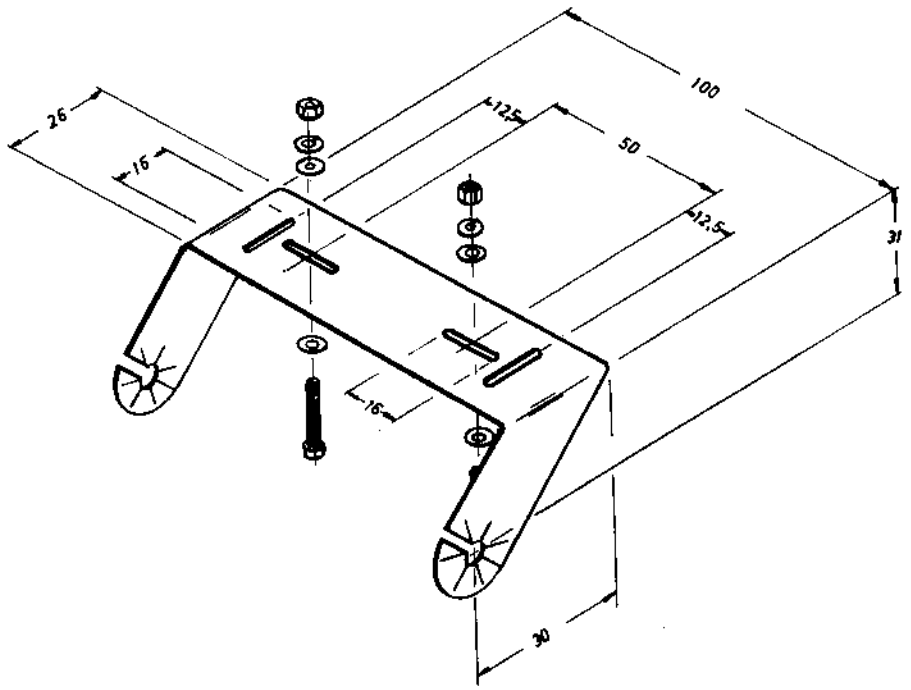


Fig. C-4 Control Unit Installation

MICROPHONE

SITING

When not in use, the microphone is held in place by a microphone holder which, in turn, is secured to the vehicle body. The holder should be attached to a vertical surface with its wider opening uppermost. It should be located within easy reach of the driver but, when selecting a suitable position, due consideration should be given to current safety regulations governing the location of such equipment within a vehicle.

FITTING

Install the microphone holder as follows:

1. Drill two 2.2mm holes (No. 44 drill), spaced 20mm centre-to-centre, one above the other, as shown in Fig. C-5 at right.

2. Secure the holder to the vehicle body using the two self-tapping screws and plain washers supplied.

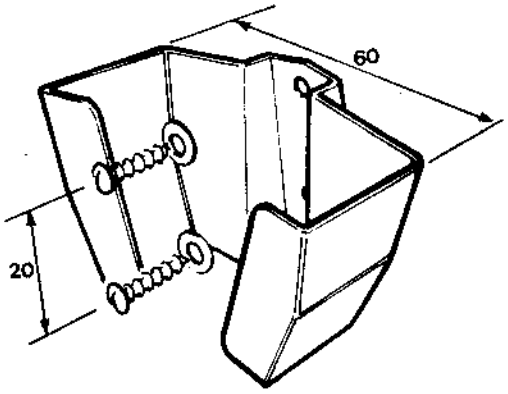


Fig. C-5 Microphone Installation

LOUDSPEAKER

SITING

The loudspeaker, by virtue of its swivel mounting bracket, may be mounted at any attitude within the vehicle, i.e. the bracket may be positioned above, behind or below the final intended position of the loudspeaker. Any convenient location may be chosen, e.g. under-dash or above-dash, but in selecting a location, due consideration should be given to current safety regulations governing the location of such equipment within a vehicle. Consideration should also be given to the relative installed positions of the control unit and loudspeaker to ensure that the leads attached to the loudspeaker will easily reach the appropriate terminals on the rear of the control unit.

FITTING

Two self-tapping screws and speed nuts are supplied for use in attaching the loudspeaker mounting bracket to the vehicle body. These screws may be used either as self tappers or as clearance screws in conjunction with the speed nuts. When used as self tappers, 3mm (1/8 in.) mounting holes are required in the vehicle body. When used as clearance screws, 5mm (3/16 in.) holes are required. The range of available centre-to-centre dimensions for these two mounting holes is shown in Fig. C-6 at right.

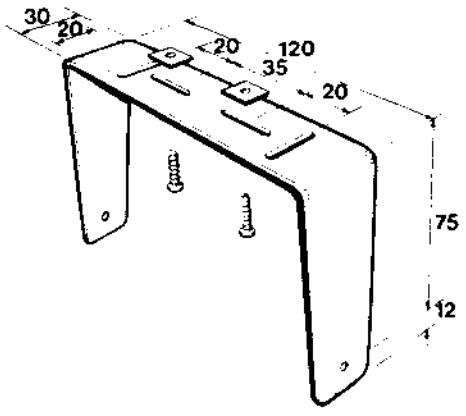


Fig. C-6 Loudspeaker Installation

ANTENNA

SITING

For optimum performance, the antenna is best sited at the centre of the vehicle's metal roof or canopy. In any other position, e.g. fron deck, rear deck, sun visor etc., both the efficiency of the antenna and its omni-directional characteristics will be impaired. These two factors, either singly or in combination, will severely limit the radius of communication in certain directions.

FITTING

Mount the antenna in accordance with the manufacturer's instructions supplied with the antenna. Following mounting of the antenna, run tha antenna cable via its shortest practical route to the transceiver and cut it to the required length. Fit the BNC connector supplied to the free end of the cable and check that this connector has negligible resistance from its shield to chassis, and a very high resistance from the centre conductor to chassis.

NOTE: When the complete system has been installed and interconnected, the antenna must be cut to its optimum length as described under "INTERCONNECTIONS and CABLING" below.

INTERCONNECTIONS and CABLING

GENERAL

When interconnecting the various pieces of equipment, ensure that all cables are run via the vehicle bodywork in such a way as to avoid exposure to accidental damage, undue wear or excessive stress. Also ensure that cables connected to the transceiver and control unit have sufficient slack to allow removal of these units from their mounting devices for "in-vehicle" adjustments and/or servicing.

CONTROL CABLE

Run the control cable from the control unit via a suitable route to the transceiver and plug it into socket J398, the larger of the two sockets on the front of the transceiver. Ensure correct polarisation by aligning the moulded key on the control cable connector to that on the transceiver socket. If the standard 2m control cable is not long enough, an Extension Cable Kit containing a 4m extension control cable can be obtained through the nearest AWA Service Centre.

BATTERY CABLE

Before connecting the transceiver to the battery supply, ensure that the equipment is turned off via the OFF/SQ control on the control unit. To connect the battery supply, run the battery cable from the transceiver via a suitable hole in the vehicle fire wall: a grommet should first be fitted to this hole. Cut the leads to the length required for connection directly to the battery terminals (preferred), or to the "hot side" of the starter motor and chassis earth. To these leads, fit the lugs supplied (either by crimping or soldering), and connect the leads to the battery supply : RED POSITIVE and BLACK NEGATIVE.

Under NO circumstances should the equipment be connected to the vehicle's accessory terminals, nor earthed to the vehicle's dashboard. Moreover, only vehicles having a negative earth system or fully floating electrical system can accommodate this equipment. Under NO circumstances can the equipment be connected to a vehicle using a positive earth system.

Following connection of the supply, ensure that the appropriate 10A fuses are in place in the battery supply leads. If the standard 2m battery cable supplied with the transceiver is not long enough, an Extension Cable Kit containing a 6m battery cable can be obtained through the neraest AWA Service Centre.

LOUDSPEAKER

Run the loudspeaker leads via a suitable route to the control unit, and connect them to terminals 4 and 5 on the rear of the control unit: spade-type connectors are already fitted to these leads for this purpose.

ANTENNA CABLE

Plug the antenna cable into the transceiver antenna socket.

CUTTING the ANTENNA TO LENGTH

After the antenna has been mounted in the preferred location (centre of the vehicle's roof or canopy), it is necessary for the whip section to be cut to the correct length to ensure satisfactory performance. For multi-channel installations, the antenna should be cut for the middle frequency, while for 2-frequency simplex installations, the transmitter frequency should be used as the reference. For best results, it should be cut for minimum voltage standing wave ratio (vswr) as indicated on a vswr meter or directional wattmeter. This is done by progressively reducing its length 3mm at a time until the minimum vswr is indicated on the meter - a ratio of not worse than 1.5 : 1 should be possible. The vehicle must be well clear of any metallic structures when measuring the voltage standing wave ratio. If it is intended to use an existing antenna, its length should be verified before connecting the transceiver.

C.3 - INSTALLATION of OPTIONS

CTCSS "Quietline" ENCODER ST-100A

FITTING

1. Remove the bridging socket from J358 on the Receiver PCB.

2. Stick the ST-100A to the area on the PCB adjacent to J358, and insert its contacts into the bridging socket as follows:

Red	into pin 8;
Black	into pin 1;
White/Green	into pin 6.

3. Replace the bridging socket into J358.

4. Mark off "1" on the option plate on the side of the RT-85.

CTCSS "Quietline" ENCODER/DECODER Z-281

FITTING

1. Plug P903 (8 pin) into J903 on the EPROM module.

2. Plug P358 (8 pin) into J358 on the Receiver PCB.

3. Mount the Z-281 on the 3 pillars above the Selcall mounting brackets (i.e. the plastic brackets on the centre web of the diecast RT-85 frame), using three 3mm screws.

4. Mark off "2" on the option plate on the side of the RT-85.

SELCALL ENCODER/DECODER ZX-06A

FITTING

1. Ensure that J397 pin 3 on the Adaptor PCB is grounded whenever the SEND button on the control unit is pressed. If not, check wire bridges in the control unit.

   Bridges W1 and W3 should be in and bridges W2 and W4 should be out.

Note: If the Status option is required, bridges W1 and W3 should be out and bridges W2 and W4 should be in.

Note: On some early units, these bridges were not fitted. In this case, modify the control unit and Adaptor PCB so that SW305 connects to pin 26 of the flat cable, and J397 pin 3 connects to J398 pin 26.

2. Mount the ZX-06A under the plastic mounting brackets on the centre web of the diecast RT-85 frame.

3. Plug in the connectors on the Selcall interface harness as follows:

15 way	into the Selcall unit;
8 way	into J357 on the Receiver PCB;
4 way	into J367 on the Transmitter PCB;
3 way	into J397 on the Adaptor PCB.

CODE SETTING

For information on code allocation, refer to AWA Handbook 3LH 82000.

Once a 5 digit code has been determined, proceed as follows:

1. Remove the programming card from the Selcall unit and add a blob of solder at the required junction points.

   e.g. to set

   Mobile Transmit Code (MTC) 11084 / Mobile Receive Code (MRC) 11084
   solder as shown in Fig. C-7 below:

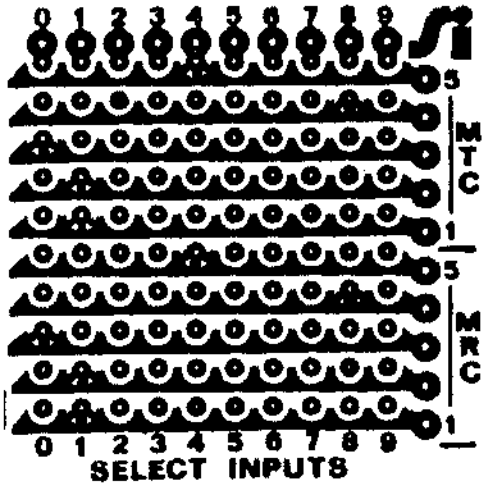


Fig. C-7 Selcall Code Setting

2. Replace the programming card in the Selcall unit.

3. Link the following pads under the PCB:

   A. "Mode" pad to pin 34 of UI (40 pin IC);

   B. "D" pad: to pin 34 of UI for 20ms tone period;
   leave open circuit for 40ms tone period;

   C. "T" pad: to programming socket pin 0 for 20ms tone period;
   leave open circuit for 40ms tone period;

   (40ms is standard, but 20ms is preferred if SEPAC status and/or vehicle identification is used).

   D. "S" pad: leave open circuit if status and vehicle ID not required;
   to pin 17 of UI if no status, but vehicle ID required;

   (If status is required, see section below).

4. Mark off "3" on the option plate on the side of the RT-85 and add an identification label to the side of the RT-85 showing the Selcall code number.

D.1 - TEST EQUIPMENT

The following test equipment is recommended for setting-up, alignment and testing of the RT-85 transceiver:

1. Control Unit

   Type 1LC82259;

2. Power Supply

   13.8 V at 8A (variable 10.5 V to 15.2 V);

3. Signal Generator

   Frequency range to suit transmission frequency, high short term stability, accuracy of attenuator calibration +-1dB, leakage less than 0.2u V, provision for external FM modulation by audio tones and 1KHz internal modulation,
   e.g. Marconi 2019, HP 8640B, IFR 10005;

4. Oscilloscope

   Frequency range dc to 3MHz, sensitivity 50m V/cm or better;

5. Audio Oscillator

   Frequency 50Hz to 10KHz, low distortion, low noise, level output down to 1m V, (600 ohm output impedance preferred);

6. Noise and Distortion Meter (N & D Meter)

   Voltmeter ranges 100m V to 5 V, distortion down to 1%, dB scale preferably with adjustable reference capability,
   e.g. AWA type F240, HP 333A;

7. Multimeter

   High resistance 20Kohm/V or greater on dc voltage range,
   e.g. SANWA U-60D (AVO model 8 50uA 2.5Kohm is suitable);

8. Ammeter

   8A dc;

9. Frequency Counter

   To suit frequency range, high input impedance, sensitivity 20m V or better;

10. RF Power Meter

    Frequency to suit equipment under test, ranges 50W and 1 or 2W,
    Low power range (100mW) for VHF exciter output;

11. RF T-OFF (Power Sniffer)

    Straight through loss 0dB, T-off loss greater than 30dB;

12. Modulation Meter

Frequency ranges to suit equipment under test, deviation accuracy 5%, response flat between 50Hz and 6KHz;

13. Loudspeaker

4 ohms (or 4 ohm 5W resistor for power measurements);

14. Tuning Tools

Hexagonal tool for VHF RX front end,
Non-metallic fine screwdriver point for ferrite slugs;

15. Co-axial Test Lead

HITACHI part No. 8390901;

16. Signal Source

21.7MHz (10.7MHz may be used) or 455KHz, accuracy +-100Hz,
(very useful for receiver frequency setting).

D.2 - ALIGNMENT PROCEDURES

SYNTHESIZER/RECEIVER ALIGNMENT SET-UP

1. Remove unit from cradle and take off top and bottom covers.
2. Set up test equipment as shown in Fig. D-1 below.

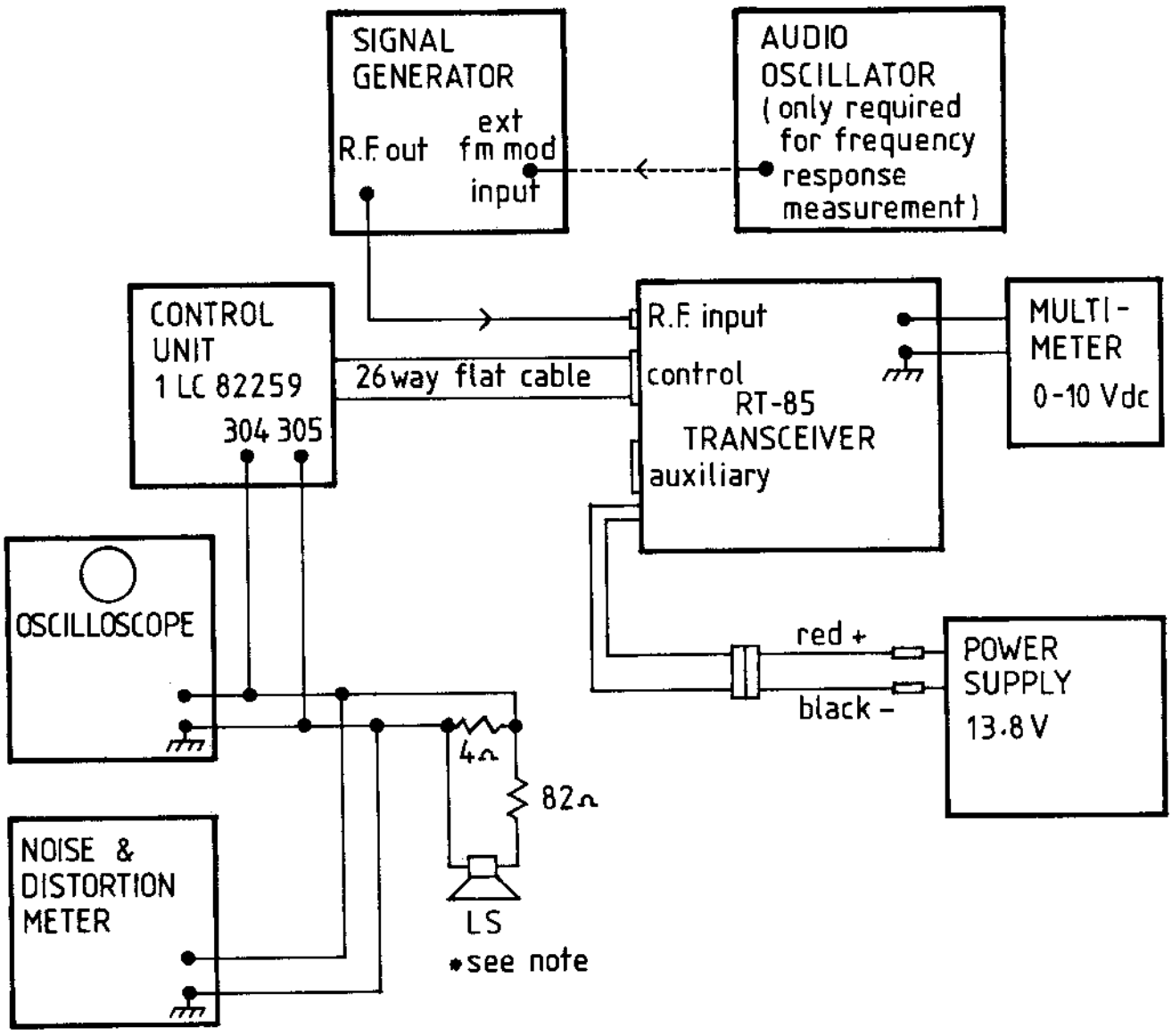


Fig. D-1 Synthesizer/Receiver Alignment Set-Up

Note : The loudspeaker may be connected directly to the system output except when measuring RX output power.

SYNTHESIZER ALIGNMENT

1. Plug programmed EPROM module Z-273 into the Transmitter PCB (refer to Section F for system programming details). Disconnect exciter output J366. Set dc supply to 13.8 V.

2. Switch on unit. Adjust squelch and volume controls so that the loudspeaker is muted.

   If the Phase Locked Loop (PLL) is unlocked, the display will show "95", alert tone will be sounded, and the dc voltage at TP701 will be 6 V or less than 1.7 V.

   If the PLL is locked, either the first channel number will be displayed or else the unit will wait blank on channel 00 until either the UP or DOWN button is pressed.

3. Adjust L702 such that the dc voltage at TP701 is centered on 3.5 V for all programmed channels (i.e. some above 3.5 V and some below 3.5 V). Ensuring that the exciter output is disconnected, operate the PTT button. Check the voltage at TP701 for all channels, and re-adjust L702 for the best balance of voltages around 3.5 V for TX and RX channels. Release the PTT button.

4. Connect the frequency counter to J365 and adjust CV701 for:

   f= (RX freq - 21.4MHz) +- 200Hz : for VHF(HB) and UHF

   or

   f= (RX freq + 21.4MHz) +- 200Hz : for VHF(LB)

   It is only necessary to check one channel, but this measurement may be made for all programmed channels.

   Note: For special requirements, high side injection may be employed for VHF(HB) and UHF, and low side injection for VHF(LB); however, a number of components must be changed for this.

RECEIVER ALIGNMENT

1. Re-connect J365. Connect multimeter to CM202 pin 4 (note pin 2 is missing key pin). Switch to centre channel.

2. Adjust L209 and L210 (for VHF) or CV202 and CV203 (for UHF) to obtain a maximum reading.

3. Connect multimeter to CM202 pin 3. The reading at this pin will be negative until sufficient RF input is available.

4. Adjust: L201, L202, L204 and L205 for VHF(LB)

   or L201, L202, L204, L205 and L206 for VHF(HB)

   or L201, L202, L203, L204, L205 and L206 for UHF,

   for maximum reading. Set signal generator level for positive meter reading below limiting. Repeat adjustments for optimum.

IF Frequency Response and 21.4MHz IF Alignment

The 21.4MHz IF filter is pre-aligned in the factory, and should not normally require alignment except following repair. The following test method observes the combined response of the 21.4MHz and 455KHz IF filter. The 455KHz IF response is fixed, and there is no means of adjusting it.

1. Connect the test set-up as shown in Fig. D-2 below, with the X time-base sawtooth output of the oscilloscope connected to the external FM modulation input of the signal generator. If the oscilloscope does not have a sawtooth output, use an external sawtooth oscillator and drive both the signal generator and CRO X input.

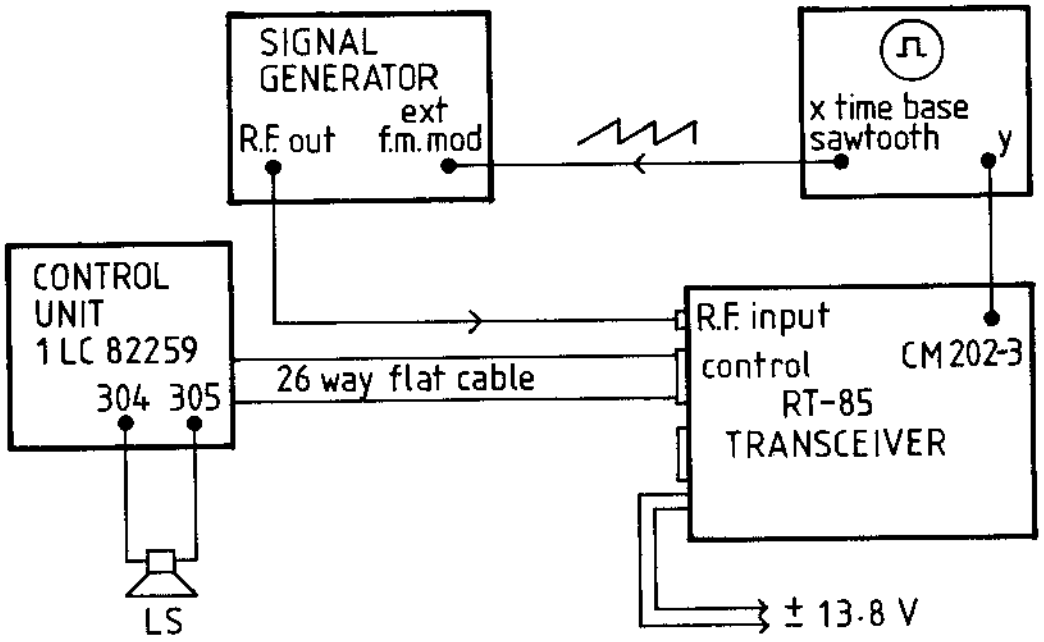


Fig. D-2 IF Alignment Set-Up

2. With the signal generator set for internal modulation of 1KHz tone, 3KHz deviation, tune the generator to the centre of the appropriate channel : any channel is suitable.

3. Set the oscilloscope to horizontal X time-base 10msec/div, Y sensitivity 50mV/div, line trigger and dc input.

4. Set the signal generator to external FM modulation. Adjust the generator modulation level, fine frequency controls and oscilloscope vertical position control to obtain a bandpass filter display on the oscilloscope. Adjust the display by using horizontal shift so that it is central on the screen.

5. Increase and decrease the signal generator RF level in 1dB steps while adjusting the oscilloscope vertical sensitivity so that 1dB change represents 1 vertical division. (The best linearity is usually obtained at a signal level well below limiting).

6. Connect a 21.4MHz (or 10.7MHz) source (error less than 100Hz) to test point CM202 pin 4, and adjust its level to obtain a beat blip on the bandpass display.

7. Adjust the oscilloscope horizontal shift and generator frequency to place the blip on the centre vertical graticule division.

8. Remove the 21.4MHz source.

9. Adjust L209 and L216 to obtain the most symmetrical display with peak-to-peak ripple less than 2dB (two vertical divisions) over the frequency range +-5KHz. (This is measured by noting the amount of frequency shift required when the generator incremental tuning is set to move the 2dB bandwidth points to the 21.4MHz calibration frequency line).

Frequency Discriminator

The frequency discriminator is pre-aligned in the factory, and should not normally require alignment except after repair of the discriminator circuits. Should alignment be required, use the following procedure.

1. Set up as in Fig. D-1. (page D.2 - 1).

2. Adjust signal generator to selected channel. Check that the IF frequency is correct by observing "zero beat" when 21.4MHz (or 10.7MHz) signal source is radiated into the region of the second IF on the Receiver PCB. Remove the 21.4MHz signal.

3. Adjust L252 so that the dc voltage at IC251 pin 9 is 3.5 to 4.0 Vdc.

Noise Squelch

For maximum squelch threshold sensitivity, RV251 should be adjusted to the fully anti-clockwise position. This produces minimum output from the discriminator into the noise amplifier, and is the normal factory adjustment position.

Audio Level Setting (Loudspeaker)

For loudspeaker adjustment, use the following procedure.

1. Set up as in Fig. D-1 (page D.2 - 1).

2. Set the VOLUME control fully clockwise.

3. Select the centre channel (i.e. the channel nearest the frequency midway between the highest and lowest programmed frequencies).

4. Adjust the signal generator to this channel with modulation 1KHz, +-3KHz deviation .

5. Adjust RV252 for 3.7 to 4.0V rms across the loudspeaker output on the Control Unit (P304 to P305 ground).

TRANSMITTER ALIGNMENT SET-UP

1. Remove unit from cradle and take off top and bottom covers.
2. Set up test equipment as shown in Fig. D-3 below.

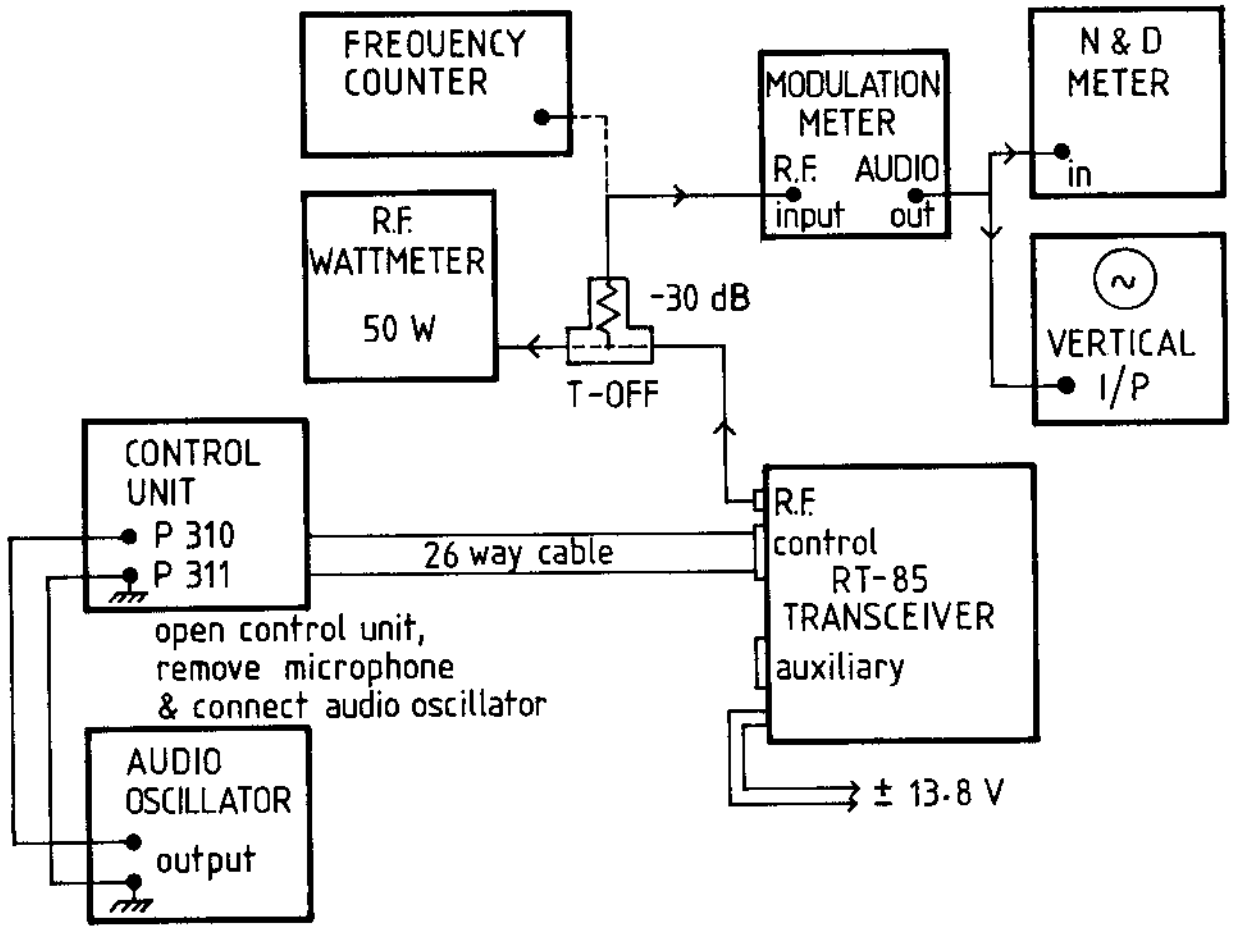


Fig. D-3 Transmitter Alignment Set-Up

TRANSMITTER ALIGNMENT

1. Connect a low level 50 ohm power meter to J366. Connect a multimeter to TP101, and operate the microphone PTT button.

2. Adjust L107 such that the multimeter reading is centered on 3.5Vdc for all programmed channels.

3. Adjust CV102 for maximum output into the power meter. Output should be 20mW to 40mW (for VHF) or 0.4W to 1.2W (for UHF). Release the PTT button.

4. Connect J366 to P366. Connect the 50W power meter to the antenna output. Set RV502 on the Power Amplifier PCB fully clockwise. Set the power supply to 13.8Vdc.

5. Operate the PTT and adjust CV501, then CV502, and finally CV503 for maximum power output. Repeat the adjustment of CV501, then CV502 and CV503. For UHF, also adjust CV504 for maximum power.

6. Adjust RV502 to obtain Po = 25W (High Power position). Note that the power rises slightly as the unit heats up, so adjust for 23 - 24W when cold.

7. If "depower" output is required, short P302 to P303 on the control unit and adjust RV501 for required output.

Transmitter Audio Adjustments

1. Set up as in Fig. D-3 (page D.2 - 5).

2. Adjust audio oscillator for a 600 ohm output level of 30mV rms.

3. Switch on the PTT and measure the deviation. Vary the frequency from 500Hz to 3KHz and find the maximum deviation. Adjust RV101 for +-5KHz maximum, testing for positive and negative deviation. Slight adjustment may be made to L101 and L102 (for VHF) or L101, L102 and L105 (for UHF) to obtain optimum symmetry and distortion.

4. Reduce the audio oscillator to 3mV rms at 1KHz.

5. Adjust RV102 for +-3KHz deviation. If necessary, repeat steps 2 and 3 above.

D.3 PERFORMANCE TESTING

RECEIVER PERFORMANCE TESTING

Set Up

1. Connect the unit under test as shown in Fig. D-1 (page D.2 - 1).
   Connect a dc ammeter in series with the power supply.

2. Turn on unit with dc supply 13.8 V. Operate the UP button and check that channels programmed are as required.

3. Adjust control unit squelch so that unit is muted (i.e. no RF input).
   Measure receiver current, and check that it is:

   With display ON : 400mA or less (for VHF), 420mA or less (for UHF);
   With display OFF: 350mA or less (for VHF), 370mA or less (for UHF).

   Note Display will automatically blank after 20 seconds.

   Note If CTCSS Decoder is fitted, operate the SILENT button to turn the OPEN LED on before further testing the receiver.

Audio Output and Distortion

1. Set control unit squelch fully off. Select centre channel, and set the signal generator to this RF frequency at output 1m V pd, 1KHz tone, +-3KHz deviation.

2. Adjust the VOLUME control for 3 Watts (3.4 +0.25 V -0 V rms into 4 ohms).

3. Measure the distortion. It should be less than 5%.

4. Connect the high impedance audio voltmeter (N & D Meter) to pre-squelch output J391 pin 2, with ground J391 pin 3 (see Fig. D-4 on page D.3 - 2).

5. Check that the audio output is 340m V +-50m V rms.

6. Connect the high impedance audio voltmeter (N & D Meter) to post-squelch output J391 pin 4, with J391 pin 3 ground (see Fig. D-4 on page D.3 - 2).

   Note This point is also accessible at J358 pin 4.

7. Check that the audio output is 310m V +-50m V rms.

Sensitivity

1. Reduce signal input level to 0.35u V pd (1KHz tone, +-3KHz deviation).

2. Re-connect N & D meter to speaker output. Set VOLUME control for 2.5 V rms across speaker output.

3. Check that SINAD is 12dB or greater.

4. Repeat steps 1 to 3 above for all channels programmed.

D.3 Performance Testing (cont.)

Squelch Threshold

1. Re-connect N & D meter to speaker output. For centre channel, set VOLUME control for 2.5 V rms across speaker output. With no RF signal input, adjust squelch control so that receiver is just muted.

2. Set signal generator on centre channel frequency, 1KHz tone, +-3KHz deviation, and increase output level from zero until receiver is just unmuted.

3. Check that the signal level to unmute is 0.2uV or less.

4. Check that the BUSY LED is on only when the set is unmuted.

5. Connect a dc voltmeter to auxilary connector J391 pin 6 (positive) to ground pin 5 (negative), (see Fig. D-4 below).

6. Check that the dc voltage is 5 V when the BUSY LED is on and 0 V when the BUSY LED is off.

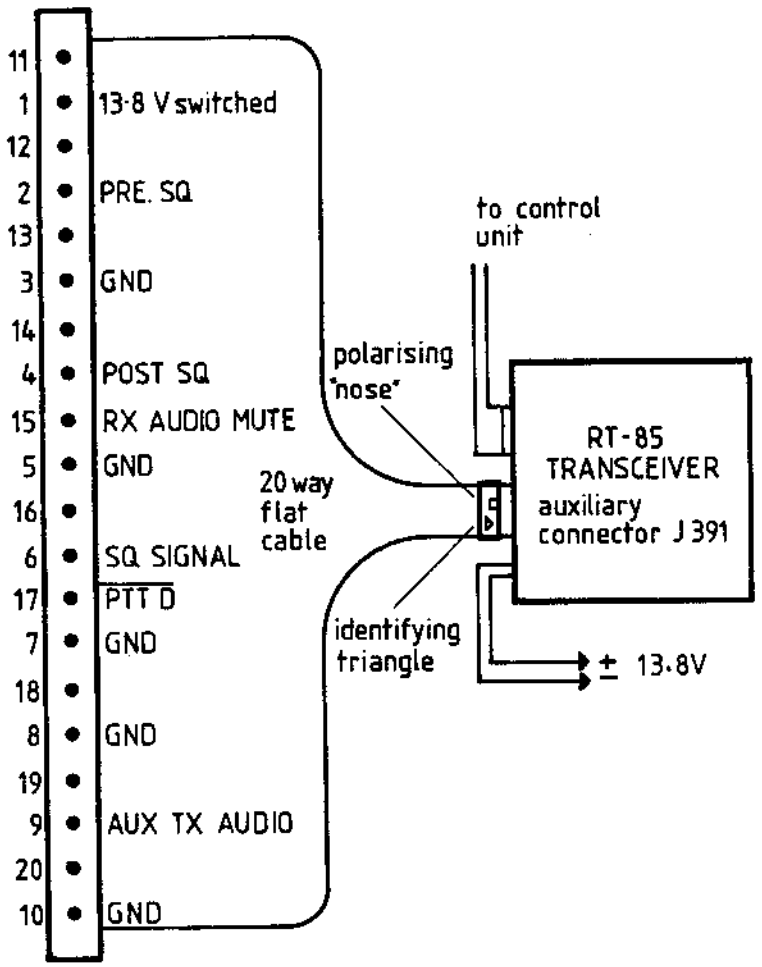


Fig. D-4 Auxiliary Connector Outputs

Scanning

1. With no carrier input, and the unit on the first scanning channel, operate the SCAN button.

   SCANNING NOT REQUIRED:
   In this case, at least one channel is programmed as a scan channel, so the unit should lock onto this channel, and the SCAN LED should come on.

   SCANNING PROGRAMMED:
   The unit should step through the channels as programmed, and should stop on a channel with carrier and/or CTCSS tone present, and the SCAN LED should come on.

2. If scanning is programmed, with the unit scanning as described above, switch on carrier from the signal generator at a level of 0.35uV pd on the first scan channel. (Include CTCSS tone if so programmed).

3. Check that the unit locks onto the first scan channel.

4. Switch off carrier.

5. Check that scanning resumes after programmmed hold-on period.

6. Press SCAN button again.

7. Check that SCAN LED goes off, and that the unit will again operate on the first scan channel as selected in step 1 above.

TRANSMITTER PERFORMANCE TESTING

Set Up

1. Connect unit under test as shown in Fig. D-3 (page D.2 - 5). Connect an ammeter (10A) between the power supply and transceiver.

2. Turn on unit with dc supply 13.8V. Operate UP or DOWN button to select required first channel as programmed.

3. Adjust control unit squelch so that the BUSY LED is off and (if programmed), set the OPEN LED on.

Transmit Power

1. Set dc input at 13.8V and operate the PTT button and measure output power.

2. Check that output power is within +-10% of 25 watts and that the CALL LED comes on when the PTT button is operated.

3. Set dc input to 10.5Vdc.

4. Check that output power is not less than 10 watts.

5. If required, measure output power on "depower" setting by shorting P302 to P303 on control unit. Set dc input to 13.8V.

6. Check that output power is within +-10% of required power.

7. With 13.8Vdc input, check the total transmit current with 25 watts output. It should be:

   VHF: not more than 6.0A

   UHF: not more than 7.5A.

Transmit Frequency

1. Measure the transmit frequency with dc input 13.8V.

2. Check that transmit frequency is within +-400Hz of specified frequency.

Deviation and Limiting

1. Set the unit to the centre channel. Adjust the audio oscillator connected to the microphone audio to 1KHz.

2. Adjust the oscillator output for +-3KHz deviation. Measure oscillator output (600 ohms) into microphone input.

3. Check that the oscillator level is 3mV +-2dB (2.4 to 3.8mV).

4. Measure modulation meter AF distortion.

5. Check that distortion is not greater than 5% (fm 1KHz, deviation +-3KHz).

   Note — If CTCSS tone is present, use 1KHz HPF in N & D meter, otherwise turn down CTCSS output during this test.

6. Increase input from oscillator to obtain 30mV (600 ohms) output into microphone input. Vary the frequency from 500Hz to 3KHz to find the maximum deviation. Check both (+) and (-) deviation.

7. Check that the maximum deviation is not greater than +-5KHz for the higher of (+) or (-), and not greater than +-4KHz for the opposite deviation.

8. Disconnect the oscillator, and reconnect the hand microphone. Observe transmitter parameters aurally and visually. Speak into the microphone with normal voice, then loudly.

9. Check that speech is clear, distinct, and with no background hum or hiss. At any time, deviation should not exceed +-5KHz.

Multi Channel Check

Perform the following tests for each channel programmed:

1. Set dc input at 13.8V, operate the PTT button and measure output power.

2. Check that output power is within +-10% of 25 watts. Check also that the CALL LED comes on when the PTT button is operated.

3. If required, measure output power on "depower" setting by shorting P302 to P303 on control unit. Set dc input to 13.8V.

4. Check that output power is within +-10% of required power.

5. Measure the TX frequency with dc input 13.8V.

6. Check that TX frequency is within +-400Hz of specified frequency.

Transmit Inhibits

1. If programmed, check that TX is inhibited when the BUSY LED is on (turn the squelch control on the control unit).

2. If programmed, check that TX is inhibited when the OPEN LED is off (press the SILENT button).

Transmit Timer

1. If programmed, check that the TX time-out timer is operational. Hold the PTT button and measure the time period before TX power cuts off.

2. The period should be within +-5% of the period programmed in the EPROM. A "beep" should be sounded from the loudspeaker at the moment of cut-off.

D.4 - PERFORMANCE TESTING of OPTIONS

CTCSS DECODER PERFORMANCE TESTING

1. Connect the unit under test as shown in Fig. D-1 (page D.2 - 1).

   Connect synthesizer and AF oscillator to the signal generator as shown in Fig. D-5 below.

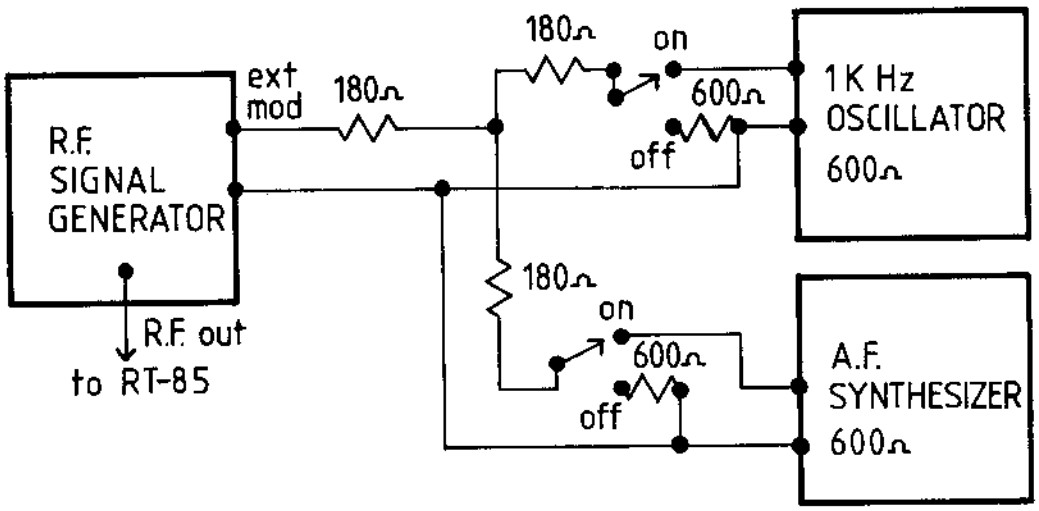


Fig. D-5 CTCSS Performance Testing Set-Up

2. Switch unit to the first programmed channel. Set the signal generator to this channel at a level of 1mV pd. Externally modulate it with 1KHz tone deviating +-3KHz, as well as the required CTCSS tone deviating +-700Hz. Ensure that the CTCSS tone can be independently switched on and off.

3. With 1KHz tone only, adjust volume control for 500mV into the N & D meter across the loudspeaker.
   (Press the SILENT button to turn the OPEN LED on).

4. Switch off 1KHz tone, and switch on CTCSS tone, set to 100Hz deviating +-700Hz. Measure the level in the loudspeaker with the OPEN LED on.

5. Check that the level is no more than 25mV pd into the N & D meter.

6. Switch off the CTCSS tone, and switch on 1KHz. Reduce the signal generator level for 12dB SINAD with the OPEN LED on.

7. Press the SILENT button, and check that the level into the N & D meter is not greater than 2.0mV.

8. With the OPEN LED off, switch on the required CTCSS tone for this channel with +-700Hz deviation, in addition to the 1KHz tone.

9. Check that the receiver unmutes, and that 11dB SINAD signal is measured in the N & D meter (with +-1dB tolerance).

10. Switch off the CTCSS tone and check that the loudspeaker is muted.

11. For multi-channel units, repeat steps 6, 8, 9 and 10 above for each channel, changing the CTCSS frequency and RF frequency as specified.

    Note If a channel is programmed "NO CTCSS", then the unit will not mute as indicated in steps 7 or 10 above.

CTCSS SCANNING PERFORMANCE TESTING

If the unit is programmed so that when scanning, the receiver only stops on channels when the correct CTCSS tone is received, then the following procedure will check this operation:

1. Connect unit under test as shown in Fig. D-1 (page D.2 - 1).

   Connect synthesizer and AF oscillator to signal generator as shown in Fig. D-5 (page D.4 - 1).

2. Switch off carrier from the signal generator and depress the SCAN button. Check that the unit scans through the programmed channels (but does not stop), and that the BUSY LED remains off.

   Note Nearby bases or mobiles transmitting will cause a problem during this test.

3. Switch on signal generator at 1uV pd level and set to required channel frequency. Switch on 1KHz tone and switch off CTCSS tone. Ensure that the OPEN LED is off.

4. Check that the unit does not stop on the required channel, but that the BUSY LED momentarily flashes each time it passes through the channel.

   Note If "NO CTCSS" is programmed for a particular channel, the receiver will lock onto that channel.

5. Switch on CTCSS tone and check that the receiver locks on to the required channel.

6. Switch off carrier and check that scanning resumes after the programmed delay period.

7. Repeat steps 3, 4, 5 and 6 for other channels as required.

CTCSS ENCODER PERFORMANCE TESTING

1. Set up as in Fig. D-3 (page D.2 - 5).

   Switch on with 13.8 V supply and select the required channel.

2. Reduce AF oscillator output to zero. Operate the PTT button.

3. Check that the CTCSS tone deviation is +-700Hz +-75Hz.

   Adjust the encoder module output level preset if required (i.e. adjust R11 on ST100 or "MOD" preset R V1 on Z-281).

4. Connect counter to modulation meter AF output. Measure CTCSS tone frequency and check that it is within +-3% of the required frequency.

5. Adjust the multi-turn pot for encode frequency if the ST100 encode only module is fitted. There is no adjustment for the programmable CTCSS module.

6. For multi-channel units fitted with the Z-281 decoder, repeat steps 2 to 4 for each channel. If a channel is programmed "NO CTCSS", then the unit will only transmit carrier with no CTCSS tone on that channel.

SELCALL ENCODER/DECODER PERFORMANCE TESTING

Additional Equipment Required

The following equipment is also required for testing the Selcall Encoder/Decoder:

* Sepac Base Console 2LC82178 (Sepac 80A18CU);
* 20dB 25W 50 ohm RF attenuator; and
* Test Jig shown in Fig. D-6 below.

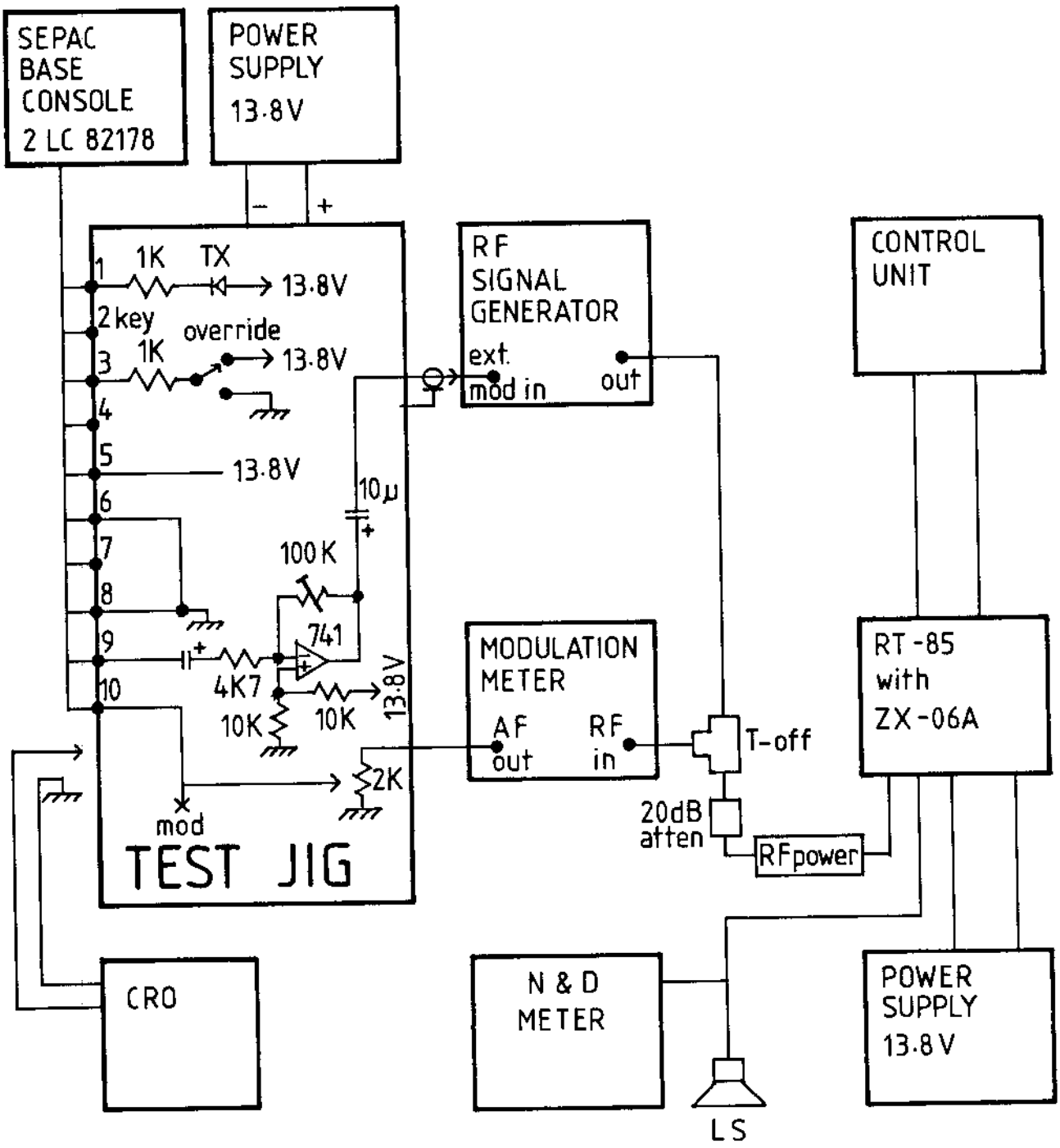


Fig. D-6 Selcall Performance Testing Set-Up

Set Up

1. Connect equipment as shown in Fig. D-6 (page D.4 - 4).
2. Program the base console to accommodate the required code format.

Base Console Output Calibration

1. Short out links A and B on the base console.
2. Switch on dc supply, and after 5 seconds, punch in any mobile number.
3. Operate the SEND button, and adjust the RF signal generator on the RT-85 frequency with output 1m V pd for code deviation of +-3KHz, averaged over 5 tones sent.
4. Adjust the output preset on the base console so that the signal generator can still be switched to internal modulation of 1KHz, +-3KHz deviation without altering levels.
5. Remove links A and B on the base console.

Modulation Meter Output Setting

1. Connect the RF signal generator output directly into the modulation meter, and set the generator deviation to 1KHz tone, +-3KHz deviation.
2. Adjust the preset pot on the modulation meter output for 1V pp tone level (or other suitable reference) at the "MOD" test point.
3. Reconnect as shown in Fig. D-6 (page D.4 - 4) and adjust the modulation meter to the RT-85 transmit frequency and level.

RT-85 Level Setting

1. Switch off carrier from the signal generator. Depress the SILENT button and adjust the squelch control so that the OPEN LED is on and the BUSY LED is off.
2. Operate the SEND button, and upon releasing the button, check that the CALL LED lights for approximately 1 sec.

   After approximately 0.5 sec, the sent tone code burst should be visible on the CRO connected to "MOD" on the Test Jig.
3. Check that the code burst on the CRO is approximately 1V pp (or the level set in step 2 of "Modulation Meter Output Setting" above). If required, set RV103 on Transmitter PCB to maximum and adjust VR1 on the Selcall unit.
4. With the signal generator output set to 1KHz tone, +-3KHz deviation, check that the signal into the CRO connected to TPC on the Selcall unit is 0.4V pp +- 50mV. Adjust RV253 in the RT-85 if required.

Send Code Tests

1. Switch off the Test Jig OVERRIDE switch. Switch off signal generator output. Adjust RT-85 squelch control so that the receiver is muted.

2. Operate the SEND button, and check that the display flashes "88" on the base console.

3. Reset the base console by switching the Test Jig OVERRIDE switch on and then off.

Transpond Tests

1. Adjust the signal generator output for 12dB SINAD with 1KHz tone, +-3KHz deviation.

2. Turn the Test Jig OVERRIDE switch on.

3. Operate the SILENT button, so that the OPEN LED goes off. Check that the speaker output is muted.

4. Switch the signal generator to external modulation, and send mobile code from the Selcall base unit. Check that:

   * A "beep" tone is sounded from the loudspeaker for approximately 1 sec.;
   * The CALL LED flashes; and
   * The base console display blanks.

5. Send the adjacent upper code from the base unit (e.g. if the code is 11023, punch in 024).
   The code should be heard in the loudspeaker, no decoding should occur, and the display on the base console should return. If, however, the correct code is sent, the code should be heard in the loudspeaker, the call should be decoded, and the base console display should blank.

6. To reset the flashing CALL LED, press the SILENT button twice, so that the OPEN LED goes off again.

7. If a group call is sent (e.g. if the code is 11023, and 02G or 0GG or GGG is sent), then the unit should decode by unmuting the receiver. There will be no "beep" or flashing of the CALL LED.

SELCALL ENCODER/DECODER with Status/Car-to-Car FACILITY TESTING

Additional Equipment Required

For STATUS readout, a Sepac 80S240CU Status and Identification unit is required. Otherwise, an 80AC8CU console is sufficient.

Set Up

Set up equipment as shown in Fig. D-6 (page D.4 - 4).

For this equipment, the tests described above under SELCALL ENCODER/DECODER PERFORMANCE TESTING are applicable.

For car-to-car calling, set the base decode code of the base console to agree with the sending code of the unit under test. Note that the last digit will be the number displayed on the RT-85 control unit window.

Status Testing

For this configuration, a 6th digit is added to all codes sent from the RT-85.

Thus, when a call is sent from the RT-85, the status number selected will appear in the base console window, in addition to the mobile identification number.

During a transpond call from the base, the mobile will "handshake" back to the base with the status number.

Note The status number can only be sent if that number is displayed on the RT-85 control unit. Once a status has been sent, the channel number will appear and then blank after 20 seconds. To recall the status number, press the SEND/STATUS button.

E.1 - CHIP COMPONENT INFORMATION

Chip components used in RT-85 transceivers can be identified as follows:

COLOUR	COMPONENT TYPE
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

e.g. 105 = 10 00000 = 1M Ohm.

CHIP COMPONENT REMOVAL/REPLACEMENT

Note: The temperature of the soldering iron must be maintained near 270°C.

Chip Component Removal

1. Place soldering iron tip directly on component in order to melt solder and glue as shown in Fig. E-1 below. Remove component with tweezers or long nose pliers.

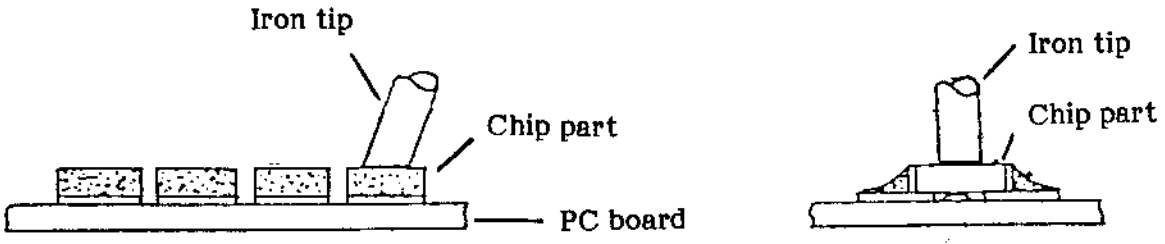


Fig. E-1 Chip Component Removal

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

1. After component has been removed and PC pattern cleaned, apply a small amount of solder to PC pattern.

2. Position new component, and apply soldering iron tip to PC pattern as shown in Fig. E-2 (page E.1 - 2). Solder should flow to the end of the chip component, as shown in Fig. E-3 (page E.1 - 2).

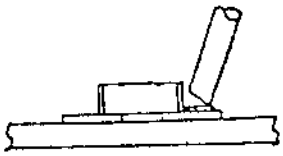


Fig. E-2 Component Soldering

Fig. E-3 Solder Flow

CAUTION As patterns and components are close to each other, extreme care must be exercised not to damage components or bridge PC pattern paths when soldering. High soldering iron temperatures can cause component damage.

DO NOT apply the soldering iron tip to a new component during installation.

IC COMPONENT REMOVAL/REPLACEMENT

IC Component Removal

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

IC Component Replacement

If it is necessary to bend IC leads, firmly hold and bend the leads 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. To avoid component damage due to static electrical discharge, connect the soldering iron to the RT-85 ground using an earthing strap before soldering an IC.

E.2 - TROUBLESHOOTING TABLES

The following tables present an orderly procedure for troubleshooting the RT-85 system. Enter the table indicated by the major symptom, and follow the diagnostic sequence listed in the table.

If, for a particular test, a satisfactory result is not achieved and the "BAD" column is blank, then the unit must be repaired to that stage before proceeding.

1. UNIT DEAD

	SYMPTOM	ACTION	NEXT IF OK	BAD
1	Unit dead	Check fuse. Press UP button.		1A
1A	DC supplies	Check IC901 pin 20 & IC402 pin 2 = 5V dc. Check J363, pin 3 = 13.8V, pin 4 = 8V, pin 5 = 8V pin 6 = 13.8V. Check IC402 pin 2 = 5V.	1B	
1B	No display	Check IC302 pin 2 = 5V.	1C	
		Short IC311 pin 4 to ground. Should display "88".	8A	
1C	Error code 95	Main VCO out of lock. Check VCO (TP 701).	1D	
1D		Substitute EPROM module.		6A
1E	Error code 90	Check EPROM is installed & programmed correctly.	1D	
1F	Error code 94	Check EPROM programming. Substitute EPROM module.		7A

2. RECEIVER PROBLEM

	SYMPTOM	ACTION	NEXT IF OK	BAD
2A	Dead	Check IC401, pin 6 = 8V, pin 5 = 0V.	2B	
2B	No audio	Check signal progressively at: J359 pin 5 & pin 4, J354 pin 5, pin 6 & pin 10.		
2C	No squelch	Check IC251 pins 10 to 14. Check Q252.		
2D	Distortion	Check IC252.	2E	
2E	Weak signal	Check IC251, X251, & alignment of L252.	2G/ 2H	
2F	No signal	Check main VCO, TP1 voltage, J365 frequency & level.	2G	6A
2G		Check CM202 pin 1 for voltage.	2E	
2H		Check Q201, Q202, Q251, FL251 and front end tuning.		

3. TRANSMITTER PROBLEM

	SYMPTOM	ACTION	NEXT IF OK	BAD
3A	No output	Check IC401 pin 8 TX +8V.	3B	
3B	Error code 95	Check main VCO. TP701 = 1.5V - 5V.	3C	6A
3C		Check TX VCO. TP101 = 1.5V - 5V.	3D	5B
3D	Low power	Check exciter output, Q110, & CV102 alignment.	3E	
3E	Low PA output	Set RV502 fully clockwise. Check Q504 collector = 13.6V.	3F	
3F		Check Check Q501, Q502, Q503, D501, D503 & PA alignment.	3G	
3G	Poor PA regulation	Check J373 = 8V. Check 50 ohm load, Q505, Q506 & RV502 adjustment.		

4. MODULATOR PROBLEM

	SYMPTOM	ACTION	NEXT IF OK	BAD
4A	Power OK but no audio	Check alignment of L101, L102 (L105), RV101 & RV102. Check IC101, Q103, D101, & D102 (D110).		4B
4B	No drive	Check X701, Q701, Q703 for output: 5.12MHz (VHF), 12.8MHz (UHF).	4C	
4C	Phase mod. level	Check IC702 & JP104 setting for output: 1.28MHz (VHF), 1.6MHz (UHF).	4D	
4D	Phase mod. output	Confirm IC103 input: 1.28MHz to pin 3 for VHF, 1.6MHz to pin 1 for UHF. Check Q101 & Q102.	5F	

5. TX PLL LOOP PROBLEM

	SYMPTOM	ACTION	NEXT IF OK	NEXT IF BAD
5A	No output	Adjust L107 for 0.5 - 5V at TP101.	5H	5B/ 4D
5B	No lock	Check VCO Q108, Q109, D104 & confirm RF output into IC104 at freq near TX freq.	5C	
5C	PLL drive	Check TX freq at IC104 pin 6. Check for TX freq RF into double balanced mixer.	5D	
5D	Main VCO output	Confirm main VCO freq at J365 and pin 1 of mixer D108.	5E	6K
5E	TX IF output	Check IC108 pin 8 for 20.48MHz (VHF) or 19.2MHz (UHF) RF.	5F	
5F	TX IF divider	Confirm 1.28MHz (VHF), 1.6MHz (UHF) at IC106 pin 11 and IC103 pins 1 & 3.	5G	4B
5G	Phase detector	Check pulses at IC103 pins 8, 9 & 10. Check D105 and Q106.	5A	
5H	Exciter output	Check TX freq at IC104 pin 11. Check Q110 (Q112, Q113). Adjust CV102 for output from J366 into 50 ohms.		5J
5J	Out of lock detector	Check Q111 collector = 1.3V (VHF), 4V (UHF).		5K
5K	Out of lock signal	Check D106 anode = 5V.	5L	
		Check D107 anode = 5V. Check IC706 pins 8, 9, 10 & 11.	6B	
5L		Check for pulses at IC102 pin 11.	5B	4B

6. MAIN PLL PROBLEMS

	SYMPTOM	ACTION	NEXT IF OK	NEXT IF BAD
6A	Main PLL out of lock	Check alignment of L702. TP701 should be between 1.5 and 5V.		6B
6B	Out of lock indicator	Check IC701 pin 10 for 0V.	6D	
		Check IC701 pin 10 for 5V.	6F	
6C	Reference oscillator	Check IC701 pin 17 for 2V pp at 5.12MHz (VHF) or 12.8MHz (UHF).	6D	
6D	Serial data from CPU	Check for pulses in IC701 pins 1, 6 & 7 by switching from RX to TX to RX.	6H	
6E		Check IC706 pin 11 for 0V.	6G	
		Check IC706 pin 11 for 5V.	6F	
6F	CPU reset	Check Q405 & D901.		
6G		Check IC706.		
6H	Prescaler output	Check for pulses on IC701 pins 4 & 5.		6J
6J	Prescaler input	Check RF into IC703 pin 2.		6K
6K	VCO	Check for RF at VCO oscillator Q707, Q708, Q710, and at J365.	6L	
6L	Phase detector output	Check DC amp Q704, Q705, Q706 and IC701 pin 11.	6A	

7. CPU PROBLEMS

	SYMPTOM	ACTION	NEXT IF OK	NEXT IF BAD
7A	Serial data timing	Check for pulses at IC901 pins 1, 40 & 42 by switching from RX to TX to RX.	7B	7F
7B	Serial data output	Check for pulses at IC901 pin 41 by switching from RX to TX to RX.		7C
7C	Shift register	Check for pulses at IC902 pins 1, 4, 5, 6, 7, 13, 14 & 15 by switching from RX to TX to RX.		7D
7D	EPROM	Substitute EPROM module.		7E
7E	Address data	Check for pulses at IC901 pins 32 to 39 by switching from RX to TX to RX.		7F
7F	Manual CPU reset	Turn off radio. Momentarily ground IC901 pin 21. Turn on radio again.		7G
7G	5V supply	Check for 5V at IC901 pins 15, 19, 20 & 21.	7H	
7H	CPU clock	Check for 400KHz clock on IC901 pins 17 & 18.	7J	
7J	CPU inputs	Check IC901 input control pins (DC). Pins 4, 5, 6, 30 & 31 should be low (below 1Vdc) in receiver standby state. Pin 30 should be 5V when PTT button pressed.	8A	

8. CONTROL UNIT PROBLEMS

	SYMPTOM	ACTION	NEXT IF OK	NEXT IF BAD
8A	Control unit lines	Check for pulses at J361 pins 10, 11, 12 & 13.	8C	8B
8B	CPU	Replace CPU if tests 7A to 7J checked OK.		
8C	Switch return	Check for pulse at J361 pin 9 when channel UP or DOWN button pressed.	8G	8D
8D	Switch decoder in	Check for pulses at IC313 pins 10, 11, 12 & 13.	8E	
8E	Switch decoder out	Check for pulses at IC313 pins 1, 2, 3, 9 & 14.	8F	
8F	Switch return	Check for pulses at D316 cathode and IC315 pin 12 when switches operated.	8C	
8G	Display commands	Check for pulses at J361 pins 3 & 4 when: - UP or DOWN buttons are pressed; or - display blanks; or - SCAN or OPEN LEDs are on.	8H	
8H	Display drivers	Check IC311 & IC312 for correct display.	1B	
8J	LED drivers	Check pulse at IC313 pin 15 when SCAN button is pressed, & that IC314 pins 3 & 11 latch HI or LO. Check pulse at IC313 pin 6 when SILENT button is pressed, & that IC314 pins 6 & 8 latch HI or LO. Check that IC313 pin 4 pulses when SCAN &/or SILENT is pressed to switch appropriate LED off.		

F.1 - SYSTEM PROGRAMMING

GENERAL

The EPROM module Z-273 uses a 2716 ultra violet light erasable programmable read only memory which contains the following information for the operation of the RT-85 system (see Section A.2 for a full description of features and options):

1. Receiver frequency information (1 to 64 channels)
2. Transmitter frequency information (1 to 64 channels)
3. Auxiliary information for CTCSS frequency selection on TX and RX
4. Channel scanning order
5. TX time-out timer period selection
6. PTT release hold-on delay selection
7. Scan hold-on delay selection
8. Scan stepping rate selection
9. CTCSS decode enable
10. Selcall decode enable
11. Status option enable
12. BUSY lamp delay enable
13. Inhibit TX when BUSY LED on enable
14. Inhibit TX when OPEN LED off enable
15. SILENT switch enable.

An EPROM programmer model EAY-06EK is available to allow field programming of the above information into the Z-273 module.

To change an existing program in the Z-273, it is necessary to erase all the information in the EPROM before programming new information. A suitable eraser is a SPECTROLINE PE-14 or PE-14T EPROM erasing lamp. Twenty minutes exposure under this lamp is sufficient to erase the contents of the EPROM.

EPROM PROGRAMMING SCHEDULE

A copy of the blank EPROM programming schedule is shown in Fig. F-1 (page F.1 - 3).

To complete the programming schedule:

1. Tick the appropriate box for FREQUENCY BAND. * ITEM 1

2. Fill in receive and transmit frequencies for all channels.
   Column 1 : RX FREQUENCY. * ITEM 2
   Column 3 : TX FREQUENCY. * ITEM 3

3. Fill in CTCSS/AUX CODE for both RX and TX for all required channels.
   If CTCSS is not required, mark in "0".
   Refer to the auxiliary code chart on the back of the programming schedule and select the code number corresponding to the required CTCSS frequency.
   Column 2 : RX CTCSS/AUX CODE. * ITEM 4
   Column 4 : TX CTCSS/AUX CODE. * ITEM 5

e.g. if channel 1 is on 166.54MHz and receive CTCSS frequency is 103.5Hz while transmit CTCSS frequency is 94.8Hz, fill in the schedule as follows:

CHANNEL	RX FREQ. (MHz)	RX/AUX CODE	TX FREQ. (MHz)	TX/AUX CODE
1	166.54	25	166.54	27

4. Mark the required scan order into the right hand column, remembering that the numbers 0 to 21 are order numbers, NOT channel numbers.
Beside "0", mark in the first channel number to be scanned.
Beside "1", mark in the second channel number, etc.

e.g.

ORDER	CHANNEL
0	3
1	2
2	4
3	1
4	7
5	-

In this case, the RT-85 will start scanning on channel 3, then 2, 4, 1, 7 and back to 3.
SCAN ORDER. * ITEM 6

Note At least one channel must be entered against "0", even if scanning is not required.

5. Mark down the number of the highest channel programmed beside PERSONALITY CODE "3F0". * ITEM 7

6. Following the table on the rear of the schedule, determine digit 1 of personality code "3F1". This is a number between 0 and 7.
e.g. if CTCSS decoder is fitted, Selcall is not fitted, and the BUSY Lamp delay is not required, then select code number 4.
Also select the second digit for personality code "3F1" from the next table.
Write down both digits to make PERSONALITY CODE "3F1". * ITEM 8

7. From the tables, determine & write down both digits for PERSONALITY CODE "3F2". * ITEM 9

8. From the tables, determine & write down both digits for PERSONALITY CODE "3F3". * ITEM 10

EPROM PROGRAMMING SCHEDULE

AWA CARPHONE RT-85

CUSTOMER: ..... DATE .....

TYPE NO: ..... REF NO: .....

FREQ. BAND VHF (LB) 1 ☐ VHF (HB) 2 ☐ UHF 3 ☐ (Tick box required)

CHANNEL	1 RX FREQUENCY (MHz)	2 RX CTCSS/AUX CODES	3 TX FREQUENCY (MHz)	4 TX CTCSS/AUX CODES
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

SCAN ORDER

Ch		Ch	
0	.....	11	.....
1	.....	12	.....
2	.....	13	.....
3	.....	14	.....
4	.....	15	.....
5	.....	16	.....
6	.....	17	.....
7	.....	18	.....
8	.....	19	.....
9	.....	20	.....
10	.....	21	.....

PERSONALITY CODES

3F0 .....

3F1 .....

3F2 .....

3F3 .....

Use link sheet if more than 20 channels required

Note: See other side for information on personality codes and Rx & Tx CTCSS/ Auxiliary Codes.

Other Comments:

BP5/7

PERSONALITY PROGRAMMING CODES

3F0 Maximum Channel No.

3F1 Digit 1

	7	6	5	4	3	2	1	0
CTCSS Decoder fitted?	✓	✓	✓	✓				
Busy lamp delay?	✓	✓			✓	✓		
Selcall fitted?	✓		✓		✓		✓	
Programming code								

3F1 Digit 2

	E	C	A	8	6	4*	2	0
Status No. required?	✓	✓	✓	✓				
Inhibit Tx when BUSY LED ON?	✓	✓			✓	✓		
Inhibit Tx when OPEN LED OFF?	✓		✓		✓		✓	
Code No: Silent switch Active								
Code No: Silent switch Inhibited	F	D	B	9	7	5	3	1

3F2 Digit 1

PTT release (ms) hold-on delay	0*	50	100	150	200	250	300	350
Code number	0	1	2	3	4	5	6	7

3F2 Digit 2

Tx Time out period Sec	30	60	90	120	150	180	210	No time out
Code number	1	2	3	4	5	6	7	0

3F3

SCAN STOPS WITH	CTCSS TONE				BUSY CHANNEL			
Scan hold-on delay Sec	1.3	2.5	5	7.5	1.3	2.5	5	7.5
CODE No: Scan 0.2sec/Ch	41	51	61	71	42	52	62	72
CODE No: Scan 0.4sec/Ch	01	11	21	31	02	12	22	32

Use code 0 if no scanning

* Usual value.

AUXILIARY CODES

CODE NO	CTCSS Freq.Hz	GROUP
0	NO CTCSS	-
1	241.8	B
2	233.6	A
3	225.7	B
4	218.1	A
5	210.7	B
6	203.5	A
7	192.8	B
8	186.2	A
9	179.9	B
10	173.8	A
11	167.9	B
12	162.2	A
13	156.7	B
14	151.4	A
15	146.2	B
16	141.3	A
17	136.5	B
18	131.8	A
19	127.3	B
20	123.0	A
21	118.8	B
22	114.8	A
23	110.9	B
24	107.2	A
25	103.5	B
26	100.0	A
27	94.8	B
28	88.5	A
29	82.5	B
30	77.0	A
31	71.9	B

Fig. F-1 Blank EPROM Programming Schedule

USE of EPROM PROGRAMMER model EAY-06EK

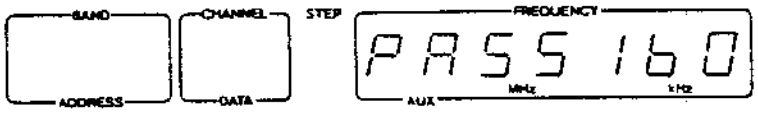
The EAY-06EK is a portable programmer which can perform the following operations:

1. Load transceiver programming data into the programmer memory (buffer RAM);
2. Transfer contents of the programmer memory into an erased EPROM;
3. Read contents of an EPROM into the programmer memory;
4. Compare and verify contents of an EPROM against the programmer memory; and
5. Check an erased EPROM.
6. Output contents of the buffer RAM to a parallel printer port on the rear of the programmer.

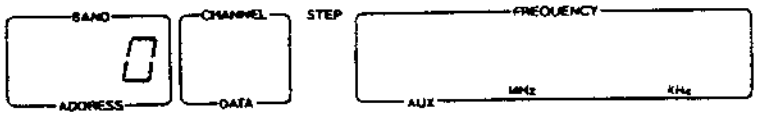
The EAY-06EK uses 110V AC power input, and thus a 240/110V transformer is required.

SWITCHING PROGRAMMER ON

Ensure that the Z-273 module is NOT plugged into the programmer. Switch on power and note the following display:



then:



LOADING TRANSCEIVER PROGRAMMING DATA INTO the PROGRAMMER MEMORY

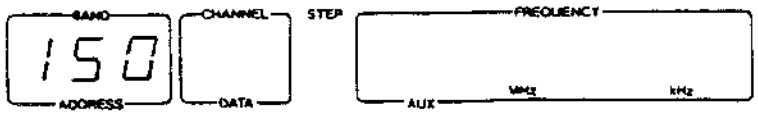
Press the (FUNC) key followed by (CLEAR): the display will be the same as that when switching programmer on (see above).

BAND SELECTION

Enter a single digit, i.e. ITEM 1 from the programming schedule. The frequency band will be displayed as follows:

No.	Band	Display
1	VHF(LB)	80
2	VHF(HB)	150
3	UHF	400

e.g. Press (2)



Press (ENTER)

FREQUENCY PROGRAMMING

In the channel window, set the required first channel number. Use the (▽) key to step on to the next channel, and the (△) key to step back a channel.

In the "STEP" window, there are four possible numbers:

Step=1 Receiver Frequency

e.g. To set receiver frequency of 166.54MHz:
(ITEM 2 of the programming schedule)

Press (1) (6) (6) (F/.) (5) (4)

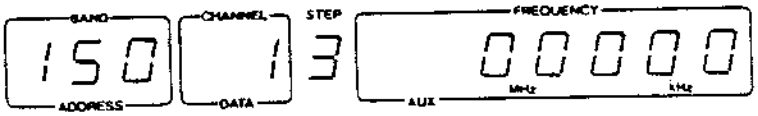
Press (ENTER)

Step=2 Receive CTCSS

e.g. To set CTCSS frequency of 167.9Hz:
(ITEM 4 code is 11)

Press (1) (1)

Press (ENTER)



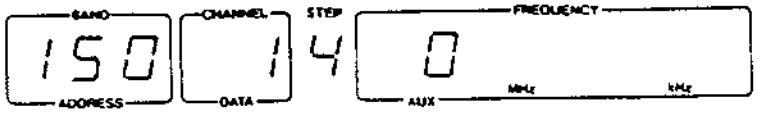
F.1 System Programming (cont.)

Step=3 Transmit Frequency

e.g. To set transmit frequency to 165.54MHz (ITEM 3):

Press (1) (6) (5) (F/.) (5) (4)

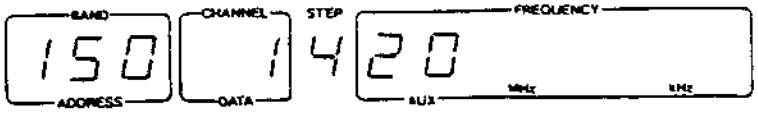
Press (ENTER)



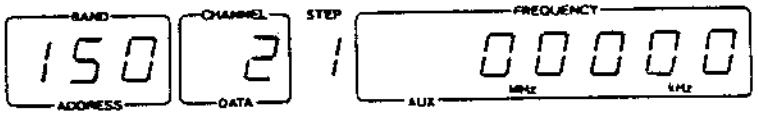
Step=4 Transmit CTCSS Option

e.g. ITEM 5 = 20:

Press (2) (0)



Press (ENTER)



The programmer is now ready for the receiver and transmitter information to be entered for channel 2.

When the frequencies entered are not correct, e.g. if a frequency is out of band or not an integer multiple of the reference frequency, the frequency indication LEDs will flash to alert the operator.

If the frequency indication LEDs flash, press (CLEAR) or re-enter the correct frequency.

Frequencies or the auxiliary data already entered into the buffer RAM can be read by pressing the (▽) or (△) and (ENTER) keys, in that order. The (▽) and (△) keys are used for increasing or decreasing the channel numbers, respectively.

Repeat this frequency programming procedure for as many channels as required.

PROGRAMMING SCAN ORDER

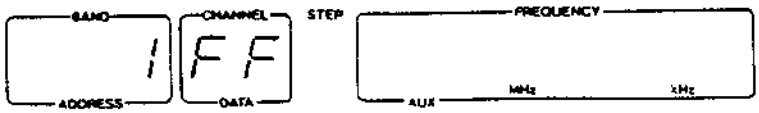
Press (SCAN)

The number in the "BAND" window is the order position in the scanning sequence. Enter the numbers from ITEM 6 of the programming schedule against the appropriate "BAND" number.

e.g. If the first channel to be scanned is 1:

Press (1)

Press (ENTER)



Channel 1 is entered into the buffer RAM and the programmer is ready for the next channel number to be entered.

Punch in all the channel numbers from ITEM 6, each followed by (ENTER).

Press (△) or (▽) to read the channels already entered.

Press (CLEAR) to clear the channel displayed.

Press (RESET) to revert to channel programming.

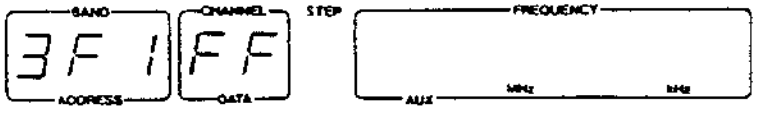
PROGRAMMING OPTIONAL FUNCTIONS (PERSONALITY PROGRAMMING)

Press (RESET), then (MANUAL): The display will blank.

Press (3) (F) (0): "3F0" will appear above "ADDRESS".

Press (ENTER): "0" will appear above "DATA".

Punch in ITEM 7 (2 digit number), followed by (ENTER).
(Note that leading zeros need not be entered).



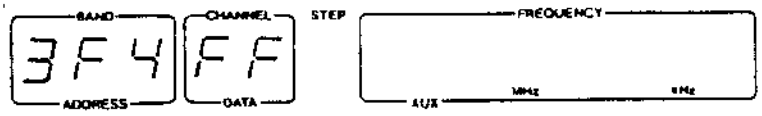
Punch in ITEM 8, then (ENTER): "ADDRESS" will be "3F2".

Punch in ITEM 9, then (ENTER): "ADDRESS" will be "3F3".

Punch in ITEM 10, then (ENTER).

e.g. If ITEM 10 is 51:

Press (5) (1) (ENTER)



Press (△) or (▽) to read the data already entered.

Press (RESET) if no corrections are necessary.

BLANK EPROM CHECK

1. Plug in EPROM module.
2. Press (RESET) (FUNC) (7).

   The programmer will check that the EPROM is blank, and will indicate "PASS" if OK. If not, erase the EPROM under U V light.

EPROM MODULE PROGRAMMING

Ensure that the correct data has been entered into the buffer RAM.

1. Carry out the blank EPROM check (above).

2. Press (RESET) (FUNC) (4).

   The programmer will check that the EPROM is blank, write the program into the EPROM, and verify that the data written in the EPROM is correct. If so, the display will indicate "PASS". If not, the module may be faulty. Remove the EPROM module from the unit.

VERIFICATION of EPROM MODULE CONTENTS

This function only applies if the contents of the buffer RAM are the same as those of the EPROM module:

1. Plug the EPROM module into the programmer.

2. Press (RESET) (FUNC) (9):

   The unit will display "PASS" if the EPROM data is correct.

3. Remove the EPROM module.

COPYING

This function transfers the contents of an EPROM module into the buffer RAM of the programmer.

1. Plug the EPROM module into the programmer.

2. Press (RESET) (FUNC) (A).

   When the copy is completed, the unit will display "PASS".

3. Remove the EPROM module.

4. Press (RESET) to revert to channel programming mode.

   Data may be checked and/or altered using the procedures listed above under "LOADING TRANSCEIVER PROGRAMMING DATA INTO the PROGRAMMER MEMORY".

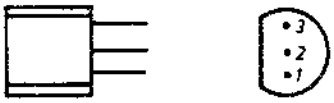
PRINTING CONTENTS of BUFFER RAM

1. Plug printer with Centronics type (parallel) interface into the printer port on the rear of the programmer.

2. Press (RESET) (FUNC) (PRINT).

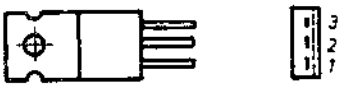
   The contents of the buffer RAM will be output to the printer.

G.1 - SEMICONDUCTOR PIN LAYOUTS

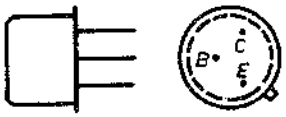


1 E	2SC460B, 2SC535B, 2SC458C,		
2 C	2SC1906, 2SC1213C, 2SA673C,		
3 B	2SC535C		
1 B		1 D	
2 C	2SC2538	2 G	2SK117BL
3 E		3 S	
1 B			
2 E	2SC2026, 2SC2407		
3 C			
1 D		1 S	
2 S	2N5668	2 G	2SK125
3 G		3 D	

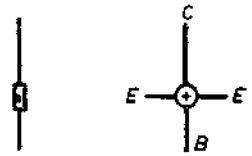
2SK192ABL, 2SK241GR



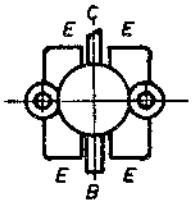
1 E		1 B	
2 C	2SB834Y	2 E	2SC1971
3 B		3 C	



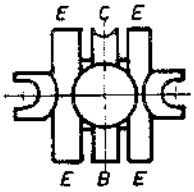
2SC2131



2SC2369

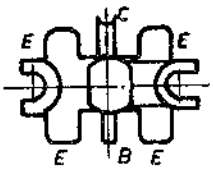


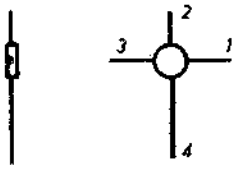
2SC2496A, 2SC2630



2SC3539, 2SC2097

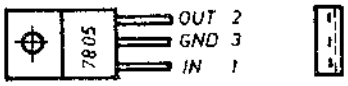
2SC2283KA, 2SC2285B



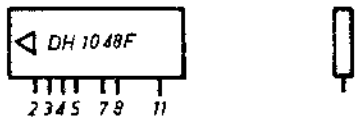


ND487C1-3R

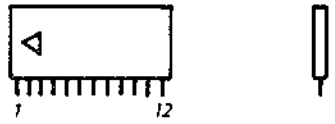
MPC7805H



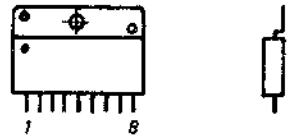
DH2503



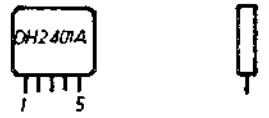
DH1048F



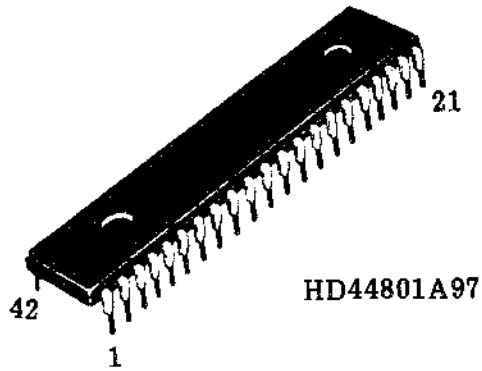
DH2501, DH2502, DH2506A



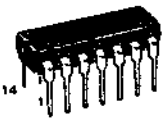
MB3712, MB3756



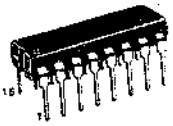
DH2401A



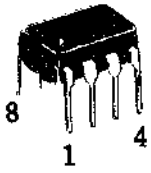
HD44801A97



HD74LS93P, HD74LS02P, MC4344L, HD14069UBP, HD74LS37P, HD14078, HD74LS92P, HD74LS37P

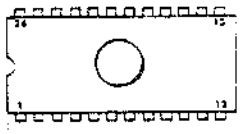


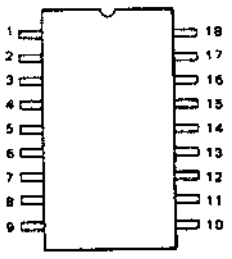
MC3357P, HD14021BP, HD14511BP, HD14028BP, HD14049BP, HD14174BP



UBP555C, UBP571C

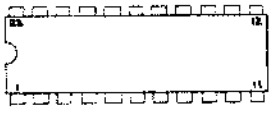
UPD2716D





UPD3805C

FX325



G.2 - MASTER PART REFERENCE

Key	Component	Description	Part No.
101	C, CERAMIC	50V 47pF +-10%	CCC0442
102	C, CERAMIC	50V 100pF +-10%	CCC1025
103	C, CERAMIC	50V 150pF +-10%	CCC1026
104	C, CERAMIC	50V 330pF +-10%	CCC1160
107	C, CERAMIC	50V 1000pF +-20%	CCC0624
108	C, CERAMIC	50V 1000pF +-10%	CCC1029
110	C, CERAMIC	50V 0.01uF +-10%	CCC1030
111	C, CERAMIC	500V 1000pF +-10%	CCC1035
113	C, CERAMIC	50V 1.5pF +-0.25pF CK	CCG0191
115	C, CERAMIC	50V 2pF +-0.25pF CK	CCG0116
116	C, CERAMIC	50V 3pF +-0.25pF CJ	CCG0117
117	C, CERAMIC	50V 3pF +-0.025pF CH	CCG0117CA
118	C, CERAMIC	50V 4pF +-0.25pF CH	CCG0118
119	C, CERAMIC	50V 5pF +-0.25pF CH	CCG0119
120	C, CERAMIC	50V 6pF +-0.5pF CH	CCG0120
121	C, CERAMIC	50V 7pF +-0.5pF CH	CCG0121
122	C, CERAMIC	50V 8pF +-0.05pF CH	CCG0122
123	C, CERAMIC	50V 9pF +-0.5pF CH	CCG0123
124	C, CERAMIC	50V 10pF +-0.5pF CH	CCG0124
126	C, CERAMIC	50V 12pF +-5%	CCG0126
127	C, CERAMIC	50V 13pF +-5% CH	CCG0127
128	C, CERAMIC	50V 15pF +-5% CH	CCG0128
130	C, CERAMIC	50V 18pF +-5% CH	CCG0130
131	C, CERAMIC	50V 20pF +-5% CH	CCG0131
132	C, CERAMIC	50V 22pF +-5% CH	CCG0132
133	C, CERAMIC	50V 24pF +-5% CH	CCG0133
134	C, CERAMIC	50V 27pF +-5% CH	CCG0134
136	C, CERAMIC	50V 33pF +-5% CH	CCG0136
137	C, CERAMIC	50V 36pF +-5pF CH	CCG0137
139	C, CERAMIC	50V 47pF +-5% CH	CCG0139
140	C, CERAMIC	50V 56pF +-20% W5R	CCG0140
141	C, CERAMIC	50V 68pF +-5% CH	CCG0141
143	C, CERAMIC	50V 100pF +-5% CH	CCG0143
144	C, CERAMIC	50V 220pF +-5% CH	CCG0144
145	C, CERAMIC	50V 1000pF +-20% W5R	CCG0145
175	C, CERAMIC	50V 0.5pF +-0.25pF CK	CCG0175
176	C, CERAMIC	50V 1pF +-0.25pF CK	CCG0176
177	C, CERAMIC	50V 47pF +-5% CH	CCG0177
178	C, CERAMIC	50V 100pF +-5% SL	CCG0178
179	C, CERAMIC	50V 150pF +-5% SL	CCG0179
180	C, CERAMIC	50V 330pF +-5% CH	CCG0180
181	C, CERAMIC	50V 470pF +-5% SL	CCG0181
182	C, CERAMIC	50V 2200pF +-20% W5R	CCG0182
183	C, CERAMIC	50V 4700pF +-20% W5R	CCG0183
184	C, CERAMIC	50V 6800pF +-20% W5R	CCG0184
185	C, CERAMIC	50V 0.01uF +-20% W5R	CCG0185
186	C, CERAMIC	50V 0.022uF +-20% W5R	CCG0186
187	C, CERAMIC	50V 0.047uF +-20% W5R	CCG0187
193	C, CERAMIC	50V 150pF +-5% CH	CCG0193
195	C, CERAMIC	50V 220pF +-5% SL	CCG0190
199	C, CERAMIC	50V 330pF +-5% SL	CCG0199
201	C, CERAMIC	50V 470pF +-5% CH	CCG0201
221	C, CERAMIC	50V 0.033uF +-10% W5R	CCG0221
222	C, CERAMIC	50V 1000pF +-5% CH	CCG0222
230	C, AL, ELYC	10V 10uF +-20%	CEC0052
258	C, AL, ELYC	10V 47uF +-20%	CES0028

Key	Component	Description	Part No.
259	C, AL, ELYC	10V 100uF +-20%	CES0029
262	C, AL, ELYC	25V 47uF +-20%	CES0032
263	C, AL, ELYC	25V 100uF +-20%	CES0033
264	C, AL, ELYC	50V 22uF +-20%	CES0034
266	C, AL, ELYC	25V 22uF +-20%	CES0036
267	C, AL, ELYC	50V 1uF +-20%	CES0037
268	C, AL, ELYC	50V 4.7uF +-20%	CES0039
270	C, AL, ELYC	50V 10uF +-20%	CES0040
284	C, AL, ELYC	16V 220uF +-20%	CES0094
285	C, AL, ELYC	25V 470uF +-20%	CES0095
296	C, AL, ELYC	16V 470uF, +-20%	CES0156
297	C, AL, ELYC	25V 220uF +-20%	CES0157
299	C, AL, ELYC	16V 10uF +-20% BP	CEX0189
301	C, MICA	500V 12pF +-5%	CMU0001
302	C, MICA	500V 15pF +-5%	CMU0002
303	C, MICA	500V 18pF +-5%	CMU0003
304	C, MICA	500V 22pF +-5%	CMU0004
305	C, MICA	500V 27pF +-5%	CMU0005
306	C, MICA	500V 33pF +-5%	CMU0006
307	C, MICA	500V 39pF +-5%	CMU0007
309	C, MICA	500V 75pF +-5%	CMU0009
310	C, MICA	500V 82pF +-5%	CMU0010
312	C, MICA	500V 4pF +-0.5pF	CMU0012
315	C, MICA	500V 7pF +-0.5pF	CMU0015
316	C, MICA	500V 8pF +-0.5pF	CMU0016
317	C, MICA	500V 9pF +-0.5pF	CMU0017
318	C, MICA	500V 10pF +-5%	CMU0018
322	C, MICA	500V 20pF +-5%	CMU0022
323	C, MICA	500V 30pF +-5%	CMU0023
328	C, MICA	100V 150pF +-5% CH	CMU0028
329	C, MICA	100V 180pF +-5%	CMU0029
330	C, MICA	100V 220pF +-5%	CMU0030
332	C, MICA	500V 3pF +-0.25pF	CMU0032
333	C, MICA	500V 2pF +-0.25pF	CMU0033
342	C, PLASTIC	50V 1000pF +-10%	CQA0091
343	C, PLASTIC	50V 1500pF +-10%	CQA0092
345	C, PLASTIC	50V 6800pF +-10%	CQA0096
346	C, PLASTIC	50V 0.01uF +-10%	CQA0097
347	C, PLASTIC	50V 0.033uF +-10%	CQA0100
348	C, PLASTIC	50V 0.047uF +-10%	CQA0101
350	C, PLASTIC	50V 0.1uF +-10%	CQA0103
353	C, PLASTIC	50V 0.22uF +-10%	CQA0110
355	C, PLASTIC	50V 0.01uF +-10%	CQA0113
360	C, TA, ELYC	16V 10uF +-20%	CSC0173
362	C, TA, ELYC	16V 2.2uF +-20%	CSC0175
364	C, TA, ELYC	35V 0.22uF +-20%	CSC0184
367	C, TA, ELYC	35V 0.1uF +-20%	CSC0189
368	C, TA, ELYC	35V 1uF +-20%	CSC0190
370	C, TA, ELYC	35V 2.2uF +-20%	CSC0193
374	C, TA, ELYC	35V 3.3uF +-20%	CSC0194
390	C, VARIABLE	TZ03R200E	8337929-3
392	C, VARIABLE	TZ03Z050E (max 5pF)	8337929-5
394	C, VARIABLE	TMC-210SEWD (20pF)	CVT0024
395	C, VARIABLE	2222-808-11229	CVX0024
396	C, VARIABLE	2222-809-08003	CVX0011
397	C, VARIABLE	2222-808-32809 (80pF)	CVX0025
398	C, VARIABLE	2222-808-32409	CVX0023

Key	Component	Description	Part No.
399	C, VARIABLE	2222-808-11109 (10pF)	CVX0027
410	CABLE, CON	HIF2.3A-26D-AA(L) 2M	8310961-3
412	CORD	BRN L=150	8355704-41
413	CORD	RED L=150	8355704-42
414	RF CABLE	L=100	8377856-3
416	RF CABLE	L=200	8377856-5
417	RF CABLE		8390901
418	CABLE, COAX	L=240	8390909-B
419	CABLE		8392158-A
421	CABLE		8392158-B
422	CABLE		8392158-C
423	CABLE		8392158-D
424	CABLE		8392158-F
426	CABLE		8392158-G
427	CABLE		8392158-H
428	CABLE		8393312-1
429	CABLE		8393312-2
431	CABLE		8394947-D
432	CABLE, COAX	L=100 (W)	8396229-C
433	CABLE, COAX	L=120 (W)	8396229-E
434	CABLE		8396780-E
455	CERA-OSC	CSB400P	8386463
460	DIODE	GL-9HY2	8392133-1
461	DIODE	GL-9NG2	8392133-2
462	DIODE	GL-9PG2	8392133-3
463	DIODE	GL-9PR2	8392133-4
480	DIODE	HZ11-1B	HDH0012
482	DIODE	HZ9A	HDH0045
484	DIODE	HZ5C1	HDH0154
486	DIODE	MC301	HDM0006
496	DIODE	MI301	HDM0016
500	DIODE	MI407	HDM0114
510	DIODE	ND487C1-3R	HDN0101
514	DIODE	1S2075K	HDS0108
516	DIODE	HZ5C1	HDS0154
518	DIODE	1SS106	HDS0459
520	DIODE	1SV50	HDS0461
521	DIODE	1SV134	HDS0462
531	DIODE	UM9401	HDU0039
541	DIODE	V06C	HDV0019
543	DIODE	GL-6P202	8392132
550	CORE	BF07-3.5 x 5 x 1.3	8342392-7
560	FILTER	21.4-15C	8389993
562	FILTER	CFU455D2	8390851
564	FILTER	CFU455E2	AFC0009
580	IC	MC3357P	8331842
582	IC	DH2401A	8333044
584	IC	MB3712	8334036
586	IC	MB3756	8334037
590	IC	HD44801A97	8392151
591	IC	MX325	8394990
600	IC	MPC7805H	ICM0331
602	IC	HD74LS93P	IDH0625
604	IC	HD74LS02P	IDH0646
606	IC	HD14174BP	IDH0736
608	IC	HD14028BP (MC14028BCP)	IDH0793
610	IC	HD14049BP (MC14049UBCP)	IDH0799

Key	Component	Description	Part No.
612	IC	HD14069UBP	IDH0804
613	IC	HD14078	IDH0807
614	IC	HD14021BP	IDH0849
616	IC	HD14511	IDH0850
620	IC	HD74LS92P	IDH0859
622	IC	HD74LS37P	IDH0871
624	IC	UPD3805C-003	IDM0425
626	IC	UPB555C	IDM0426
628	IC	UPB571C	IDM0428
629	IC	UPD2716D	IDM0429
630	IC	MC4344	IDM0430
631	IC	HA17902P	ILH0116
632	IC	HD74LS93P	IDM0625
634	IC	UPC7805H	ILM0331
636	IC	DH2502	IZD0068
638	IC	DH2503	IZD0069
640	IC	DH2501	IZD0070
641	IC	DH2506	IZD0071
642	IC	DH1048F	IZD0072
660	RLY, MINI	LC1N-1347D	SRM0343
680	XFMR	22L014	3133912-1
681	XFMR	23L030	3171571-1
682	XFMR	23L032	3171571-3
683	XFMR	22L014	3173912-1
684	XFMR	24L091	3173913-3
685	XFMR	24L092	3173913-4
686	XFMR	42L051	3173931-1
687	XFMR	22L015	3175743-1
688	XFMR	28L034S	3181581-2
689	XFMR	27L004S	3181581-3
690	XFMR	28L035S	3181581-4
691	XFMR	27L005S	3181581-5
694	COIL	52L004	329312-4
695	COIL	52L006	329312-6
697	COIL	52230001 1.5mH	8134169-71
701	COIL	Z0.8C5D 0.5T	8377999-1
703	COIL	Z0.8C5D 10.5T	8377999-11
705	COIL	Z0.8C5D 1.5T	8377999-2
706	COIL	Z0.8C5D 2.5T	8377999-3
707	COIL	Z0.8C5D 3.5T	8377999-4
708	COIL	Z0.8C5D 4.5T	8377999-5
709	COIL	Z0.8C5D 5.5T	8377999-6
710	COIL	Z0.8C5D 6.5T	8377999-7
712	COIL	Z0.8S5D 3.5T	8378006-3
714	COIL	Z1.2C5D 0.5T	8386470-1
715	COIL	Z1.2C5D 1.5T	8386470-2
716	COIL	Z1.2C5D 2.5T	8386470-3
717	COIL	Z1.2C5D 5.5T	8386470-6
719	COIL	L=5.5	8386496-2
721	COIL	3.5T	8389053-3
723	COIL	5.5T	8389053-5
725	COIL	MC111S 3.5T	8390870-14
726	COIL	MC111S 4.5T	8390870-15
728	COIL	MC111C 5.5T	8390870-21
730	XFMR	17L004	8390892
732	COIL	Z0.8C3D 0.5T	8393022-1
733	COIL	Z0.8C3D 1.5T	8393022-2

Key	Component	Description	Part No.
735	COIL	Z0.8C3D 4.5T	8393022-5
737	COIL	6.5T	8394955-1
738	COIL	7.5T	8394955-2
739	COIL	7T	8394955-3
741	COIL	2.5T (with tap)	8402162-1
742	COIL	1.5T (with tap)	8402162-2
744	COIL	MC108 1.5T	8402190
746	COIL	ELE-Y 2R2MA	TLE0091
747	COIL	ELE-Y 331KA	TLE0092
748	COIL	ELE-Y 102KA	TLE0093
750	INDUCTOR	FL-3H R22M	TLF0003
752	INDUCTOR	FS1012S-174K	TLF0011
754	INDUCTOR	FL-4H 4R7K	TLF0092
756	COIL	FL-4H 2.2 uH	TLF0102
758	COIL	BL02RN1-R62	TLX0175
770	MICROPHONE	HM-08A	8377923
780	TRANSISTOR	2SC2369	8341261
782	TRANSISTOR	2SA673C	HTA0085
784	TRANSISTOR	2SB834-Y	HTB0126
788	TRANSISTOR	2SC1213C	HTC0057
792	TRANSISTOR	2SC458C	HTC0148
794	TRANSISTOR	2SC460B	HTC0154
796	TRANSISTOR	2SC535B	HTC0167
798	TRANSISTOR	2SC1906	HTC0338
799	XFMR	22L004	8251642-3
800	TRANSISTOR	2SC2026	HTC0400
802	TRANSISTOR	2SC2131	HTC0402
804	TRANSISTOR	2SC1971	HTC0645
806	TRANSISTOR	2SC2538	HTC0678
807	TRANSISTOR	2SC2539	HTC0679
808	TRANSISTOR	2SC2630	HTC0680
809	TRANSISTOR	2SC2097	HTC0681
810	TRANSISTOR	2SC2407	HTC0693
811	TRANSISTOR	2SC2283KA	HTC0694
813	TRANSISTOR	2SC2496A	HTC0696
815	TRANSISTOR	2SC2285B	HTC0720
817	TRANSISTOR	2SK117BL	HTK0054
819	TRANSISTOR	2SK125	HTK0083
820	TRANSISTOR	2SK241GR	HTK0084
821	TRANSISTOR	2SK192ABL	HTK0085
823	TRANSISTOR	2N5668	HTM0078
839	R, CARBON	1/8W 33 OHM +-5%	RCE0612
840	R, METAL	1/8W 680K OHM +-5%	RCE0617
841	R, CARBON	1/6W 220 OHM +-5%	RCE0624
842	R, CARBON	1/6W 330 OHM +-5%	RCE0626
843	R, CARBON	1/6W 680 OHM +-5%	RCE0631
844	R, CARBON	1/6W 1K OHM +-5%	RCE0633
846	R, CARBON	1/6W 1.5K OHM +-5%	RCE0635
847	R, CARBON	1/6W 2K OHM +-5%	RCE0637
848	R, CARBON	1/6W 3.3K OHM +-5%	RCE0639
849	R, CARBON	1/6W 22K OHM +-5%	RCE0649
851	R, CARBON	1/6W 47K OHM +-5%	RCE0653
852	R, CARBON	1/6W 100K OHM +-5%	RCE0657
853	R, CARBON	1/6W 220K OHM +-5%	RCE0659
854	R, CARBON	1/4W 68 OHM +-5%	RCR3024
856	R, CARBON	1/4W 220 OHM +-5%	RCR3036
857	R, CARBON	1/4W 1.5K OHM +-5%	RCR3056

Key	Component	Description	Part No.
858	R, CARBON	1/4W 2.2K OHM +-5%	RCR3060
859	R, CARBON	1/4W 4.7K OHM +-5%	RCR3068
861	R, CARBON	1/4W 10K OHM +-5%	RCR3076
862	R, CARBON	1/4W 22K OHM +-5%	RCR3084
863	R, CARBON	1/4W 330K OHM +-5%	RCR3103
864	R, CARBON	1/4W 6.8 OHM +-5%	RCR3226
866	R, CARBON	1/4W 10 OHM +-5%	RCR3230
869	R, METAL	1/8W 10 OHM +-5%	RME0852
871	R, METAL	1/8W 12 OHM +-5%	RME0853
872	R, METAL	1/8W 15 OHM +-5%	RME0854
873	R, METAL	1/8W 22 OHM +-5%	RME0856
874	R, METAL	1/8W 33 OHM +-5%	RME0858
876	R, METAL	1/8W 47 OHM +-5%	RME0860
877	R, METAL	1/8W 56 OHM +-5%	RME0861
878	R, METAL	1/8W 68 OHM +-5%	RME0862
879	R, METAL	1/8W 82 OHM +-5%	RME0863
881	R, METAL	1/8W 100 OHM +-5%	RME0864
882	R, METAL	1/8W 10 OHM +-5%	RME0866
883	R, METAL	1/8W 180 OHM +-5%	RME0867
884	R, METAL	1/8W 220 OHM +-5%	RME0868
885	R, METAL	1/8W 150 OHM +-5%	RME0866
886	R, METAL	1/8W 270 OHM +-5%	RME0869
887	R, METAL	1/8W 330 OHM +-5%	RME0870
888	R, METAL	1/8W 470 OHM +-5%	RME0872
889	R, METAL	1/8W 560 OHM +-5%	RME0873
891	R, METAL	1/8W 680 OHM +-5%	RME0874
892	R, METAL	1/8W 820 OHM +-5%	RME0875
893	R, METAL	1/8W 1.0K OHM +-5%	RME0876
894	R, METAL	1/8W 1.2K OHM +-5%	RME0877
896	R, METAL	1/8W 1.5K OHM +-5%	RME0878
897	R, METAL	1/8W 2.2K OHM +-5%	RME0880
898	R, METAL	1/8W 2.7K OHM +-5%	RME0881
899	R, METAL	1/8W 3.3K OHM +-5%	RME0882
901	R, METAL	1/8W 3.9K OHM +-5%	RME0883
902	R, METAL	1/8W 4.7K OHM +-5%	RME0884
903	R, METAL	1/8W 5.6K OHM +-5%	RME0885
904	R, METAL	1/8W 6.8K OHM +-5%	RME0886
906	R, METAL	1/8W 8.2K OHM +-5%	RME0887
907	R, METAL	1/8W 10K OHM +-5%	RME0888
908	R, METAL	1/8W 15K OHM +-5%	RME0890
909	R, METAL	1/8W 22K OHM +-5%	RME0892
910	R, METAL	1/8W 18K OHM +-5%	RME0891
911	R, METAL	1/8W 33K OHM +-5%	RME0894
912	R, METAL	1/8W 47K OHM +-5%	RME0896
913	R, METAL	1/8W 22K OHM +-5%	RME0897
914	R, METAL	1/8W 68K OHM +-5%	RME0898
916	R, METAL	1/8W 82K OHM +-5%	RME0899
917	R, METAL	1/8W 100K OHM +-5%	RME0900
918	R, METAL	1/8W 120K OHM +-5%	RME1175
919	R, METAL	1/8W 150K OHM +-5%	RME0901
921	R, METAL	1/8W 220K OHM +-5%	RME0902
922	R, METAL	1/8W 330K OHM +-5%	RME0903
923	R, METAL	1/8W 470K OHM +-5%	RME0904
924	R, METAL	1/8W 820K OHM +-5%	RME1176
926	R, METAL	1/8W 1M OHM +-5%	RME0906
927	R, METAL	ZERO OHM RESISTOR	RME0912
928	R, METAL	1W 220 OHM	RMR2772

Key	Component	Description	Part No.
929	R, METAL	RSF2B 2.2 OHM	RMR3141
931	R, METAL	1W 3.3 OHM +-5%	RMR3471
940	RV, CARBON	K12141-5N1211-50KB L=15	RDK0010
941	RV, CARBON	V12L(PH2D) N15KCB 10K OHM	RDV0518
942	RV, METAL	EVN-39C 00Y B13 (1K OHM)	RNE0041
943	RV, METAL	EVN-39C 00Y B14 (10K OHM)	RNE0042
944	RV, METAL	EVN-39C 00Y B53 (5K OHM)	RNE0044
946	RV, METAL	EVN-39C 00Y 1314	RNE0047
950	SW, PB	KEF10906 (TACT, SW)	8396207
954	XTAL	20.945MHz (43U)	8389992-2
955	XTAL	1MHz +-500ppm	8390899
956	XTAL	5.12MHz	8397690-1
957	XTAL	12.8MHz +-5ppm	8397690-2
960	CONNECTOR	HIF3-26P-2.54DSA	8298459-10
961	CONNECTOR	HIF-3-20D-2.54R (without contact)	8298459-9
963	CONNECTOR	EMCS0452M	JBE0003
964	CONNECTOR	EMCS0552M	JBE0004
965	CONNECTOR	EMCS0652M	JBE0005
966	CONNECTOR	EMCS0752M	JBE0006
967	CONNECTOR	EMCS0852M	JBE0007
968	CONNECTOR	EMCS1252M	JBE0009
969	CONNECTOR	EMCS1352M	JBE0010
970	CONNECTOR	EMCS0352M	JBE0027
971	CONNECTOR	EMCS0351ML	JBE0031
972	CONNECTOR	EMCS0851ML	JBP0011
974	CONNECTOR	PS-10SD-S4TS1-1	JBP0152
975	CONNECTOR	PS-11SD-S4TS1-1	JBP0153
976	CONNECTOR, COAX	JACK V	JHX0022
980	CONNECTOR	HIF3-20D-2.54R (without contact)	8310996
981	PIN	171255-1	ETP0002
982	TERMINAL	61134-1	ETP0050
983	CONNECTOR	PS-10PA-S4T1-PKL1	JBP0150
984	CONNECTOR	PS-11PA-S4T1-PKL1	JBP0151
985	CONNECTOR	5048-3A	JBX1895
986	CONNECTOR	5048-3A-RE	JBX1896
990	PCB	CX-09/10	119694
991	PC JOINER	JVU(UL2760) 16.1-50-5.0P2.5	8363205-3
992	TEST POINT	IPS-1136 DHPIN	8391000
994	CABLE ASSY		8394947-N
995	CABLE ASSY		8394947-L

G.3 - VHF(LB) PARTS LIST

Ref.	Key	Ref.	Key	Ref.	Key	Ref.	Key
C100	187	C169	144	C274	185	C522	307
C101	264	C170	346	C275	145	C523	185
C102	186	C171	187	C276	183	C524	110
C103	139	C176	185	C277	270	C525	306
C104	187	C178	185	C278	362	C526	134
C105	181	C179	185	C279	362	C527	185
C106	187	C181	130	C280	364	C528	185
C107	128	C182	124	C281	185	C531	306
C108	139	C201	121	C282	348	C532	309
C109	187	C202	126	C284	348	C533	310
C110	187	C203	176	C285	259	C534	309
C111	262	C205	126	C286	262	C535	305
C112	184	C206	121	C287	296	C538	185
C113	270	C207	145	C288	350	C539	185
C114	267	C208	139	C289	297	C541	185
C115	132	C209	145	C290	185	C542	185
C116	368	C210	134	C291	185	C543	185
C117	299	C211	176	C292	297	C554	117
C118	186	C212	127	C293	145	C701	132
C119	221	C213	120	C294	145	C702	346
C121	185	C217	145	C295	263	C703	134
C122	268	C218	145	C296	111	C704	201
C123	268	C219	145	C297	268	C705	199
C124	187	C220	119	C298	268	C706	183
C125	348	C221	130	C299	285	C707	144
C126	186	C222	175	C391	360	C709	120
C127	262	C223	119	C393	348	C710	186
C128	186	C224	176	C403	270	C711	186
C129	350	C225	145	C405	270	C712	345
C132	343	C226	145	C406	145	C713	353
C133	343	C227	270	C407	145	C714	350
C134	134	C228	145	C408	145	C716	346
C137	123	C230	145	C409	262	C717	183
C141	268	C245	145	C410	262	C720	122
C142	186	C245	145	C411	262	C721	124
C143	124	C251	145	C412	259	C722	120
C144	126	C252	185	C413	268	C723	126
C146	123	C253	145	C414	185	C725	139
C148	126	C254	136	C415	259	C726	183
C149	183	C255	136	C416	348	C727	258
C150	185	C256	367	C501	145	C728	258
C151	183	C257	367	C503	185	C729	183
C152	139	C258	132	C504	185	C730	345
C154	145	C259	186	C505	132	C731	183
C155	145	C260	185	C506	132	C732	183
C156	145	C261	186	C507	270	C733	183
C157	136	C262	145	C508	143	C734	183
C158	185	C263	187	C509	185	C735	134
C159	145	C265	181	C511	141	C736	140
C160	136	C266	362	C512	132	C737	134
C161	141	C267	145	C513	180	C738	183
C162	136	C268	368	C515	222	C739	183
C163	141	C269	185	C516	222	C740	119
C164	186	C270	364	C517	110	C741	183
C165	182	C271	186	C518	270	C742	184
C166	183	C272	183	C519	329	C743	284
C167	186	C273	259	C521	307	C901	258

Ref.	Key	Ref.	Key	Ref.	Key	Ref.	Key
C902	185	D105	514	J351	964	L504	709
C904	185	D106	514	J352	965	L505	758
C905	259	D107	514	J353	966	L506	705
C906	182	D108	510	J354	968	L507	705
C907	181	D201	486	J357	967	L510	703
C908	178	D202	486	J358	967	L511	705
C910	178	D204	518	J359	966	L512	714
C911	178	D251	514	J361	969	L513	715
C912	181	D252	514	J362	966	L514	695
C913	145	D253	514	J363	965	L515	717
C916	178	D254	514	J364	966	L516	717
C917	178	D256	514	J365	976	L517	717
C920	186	D259	514	J366	976	L518	717
C921	270	D260	514	J367	963	L519	717
C922	181	D263	514	J371	976	L701	754
C923	179	D391	514	J372	976	L702	726
C924	179	D392	514	J391	961	L703	754
C925	179	D394	541	J392	976	L705	709
C926	179	D402	484	J397	971	L706	709
C927	179	D403	514	J398	960	L707	682
C932	178	D404	514	J901	975	L708	682
C933	145	D405	482	J902	974	L709	682
C951	185	D406	514	J903	972	P251	985
C952	177	D501	531	K201	660	P358	431
C953	177	D503	500	L101	686	P368	986
C954	177	D504	518	L102	686	P391	980
C955	177	D505	514	L103	752	P901	984
C956	177	D702	520	L104	752	P902	983
C957	177	D703	514	L106	754	Q101	794
CA351	416	D704	514	L107	728	Q102	796
CA352	414	D705	514	L108	754	Q103	792
CA353	416	D706	514	L110	682	Q104	792
CA354	413	D707	514	L111	682	Q105	792
CA355	412	D709	514	L112	684	Q106	794
CA356	434	D901	514	L114	708	Q107	792
CA357	434	FL251	560	L116	710	Q108	821
CA358	428	FL252	564	L117	710	Q109	820
CA359	429	FL253	562	L118	685	Q110	798
CA360	429	IC101	642	L119	730	Q111	792
CA361	417	IC102	604	L120	730	Q112	798
CA362	422	IC103	630	L201	723	Q201	819
CA363	424	IC104	640	L202	723	Q202	819
CA364	431	IC106	602	L203	746	Q203	798
CA391	419	IC108	638	L204	723	Q204	782
CA392	421	IC251	580	L205	723	Q205	792
CA393	422	IC252	584	L208	683	Q251	796
CA394	423	IC401	586	L209	690	Q252	792
CL901	455	IC402	634	L210	691	Q253	792
CV102	395	IC701	624	L251	687	Q254	782
CV501	397	IC702	602	L252	799	Q256	792
CV502	397	IC703	626	L253	748	Q257	792
CV503	396	IC704	640	L254	747	Q259	817
CV701	390	IC706	612	L255	747	Q260	792
D101	521	IC901	590	L256	697	Q261	792
D102	521	IC902	614	L501	707	Q391	792
D103	514	IC951	629	L502	709	Q392	792
D104	520	IC952	606	L503	706	Q393	792

Ref.	Key	Ref.	Key	Ref.	Key	Ref.	Key
Q394	792	R142	917	R258	912	R506	854
Q395	792	R144	874	R260	898	R507	854
Q402	792	R145	891	R261	899	R508	881
Q403	792	R146	874	R262	916	R509	877
Q404	788	R147	877	R263	907	R510	884
Q405	792	R148	884	R264	916	R511	929
Q501	806	R149	877	R265	917	R512	856
Q502	804	R150	906	R266	916	R513	884
Q503	809	R151	899	R267	908	R514	912
Q504	784	R152	883	R268	881	R515	909
Q505	792	R153	881	R269	893	R516	914
Q506	792	R154	878	R270	902	R517	898
Q507	792	R155	881	R272	902	R518	897
Q701	796	R156	876	R274	909	R519	876
Q703	792	R161	902	R275	896	R520	876
Q704	817	R162	893	R276	908	R521	888
Q705	792	R163	927	R277	926	R522	869
Q706	792	R164	927	R278	923	R701	881
Q707	821	R166	893	R279	907	R702	903
Q708	820	R167	927	R280	908	R703	907
Q709	792	R168	891	R281	902	R704	893
Q710	798	R171	878	R282	889	R706	888
Q901	792	R172	899	R283	881	R707	919
R101	893	R173	914	R284	874	R708	891
R102	906	R174	891	R286	908	R709	906
R103	878	R175	876	R287	909	R710	894
R104	906	R176	909	R288	926	R711	891
R106	909	R177	899	R289	923	R712	902
R107	908	R190	927	R290	916	R713	904
R108	893	R191	927	R291	909	R714	897
R109	896	R192	927	R292	912	R715	893
R110	888	R201	884	R293	921	R716	882
R112	907	R202	881	R294	909	R718	874
R113	899	R203	888	R295	904	R719	876
R114	907	R204	881	R296	904	R720	917
R116	896	R205	912	R297	902	R721	874
R117	917	R206	891	R298	907	R722	917
R118	921	R207	909	R391	861	R724	891
R119	896	R208	898	R393	862	R725	874
R120	914	R209	902	R394	862	R726	927
R121	888	R210	887	R395	857	R728	926
R122	911	R211	907	R396	859	R734	906
R123	902	R213	927	R397	858	R735	899
R124	893	R214	927	R398	863	R736	883
R126	907	R215	927	R401	888	R738	879
R127	902	R239	851	R403	874	R739	874
R128	897	R240	927	R404	874	R741	876
R129	896	R242	927	R405	888	R742	927
R131	893	R246	927	R406	911	R743	881
R132	902	R250	912	R407	893	R744	881
R133	899	R251	921	R408	902	R745	876
R134	902	R252	899	R409	904	R746	909
R136	909	R253	916	R410	902	R747	909
R137	876	R254	896	R501	927	R901	917
R138	891	R255	896	R503	899	R902	926
R139	917	R256	912	R504	882	R904	904
R141	874	R257	909	R505	887	R905	907

Ref.	Key
R907	917
R908	907
R909	909
R911	909
R912	917
R913	909
R914	902
R915	893
R920	902
R921	902
R922	911
R923	911
R924	907
R925	917
R926	917
R927	893
R930	909
R931	909
R932	902
R933	902
R934	902
R935	902
R936	912
R937	912
R938	909
R939	909
R940	909
R941	909
R942	911
R943	911
R944	911
R945	911
R946	904
R947	904
R949	907
R951	927
RV101	943
RV102	943
RV103	943
RV251	943
RV252	943
RV253	943
RV501	944
RV502	942
TP101	992
TP701	992
X251	954
X701	956

VHF(HB) - PARTS LIST

Ref.	Key	Ref.	Key	Ref.	Key	Ref.	Key
C100	187	C168	144	C268	368	C512	144
C101	264	C170	346	C269	185	C513	132
C102	186	C171	187	C270	364	C514	110
C103	139	C176	185	C271	186	C515	270
C104	187	C178	145	C272	183	C517	305
C105	181	C179	185	C273	259	C518	145
C106	187	C181	119	C274	185	C519	330
C107	128	C182	137	C275	145	C520	328
C108	139	C183	145	C276	183	C521	302
C109	187	C184	185	C277	270	C522	126
C110	187	C201	116	C278	362	C523	145
C111	262	C202	118	C279	362	C524	145
C112	184	C203	175	C280	364	C525	303
C113	270	C205	118	C281	185	C526	306
C114	267	C206	116	C282	348	C527	306
C115	132	C207	145	C284	348	C528	305
C116	368	C208	132	C285	259	C529	301
C117	299	C209	145	C286	262	C530	134
C118	186	C210	120	C287	296	C531	145
C119	187	C211	176	C288	350	C532	145
C121	185	C212	120	C289	297	C533	145
C122	268	C213	175	C290	185	C534	145
C123	268	C214	176	C291	185	C535	145
C124	187	C215	116	C292	297	C536	306
C125	348	C216	120	C293	145	C537	144
C126	186	C217	145	C294	145	C538	318
C127	262	C218	145	C295	263	C539	115
C128	186	C219	145	C296	111	C701	130
C129	350	C220	123	C297	268	C702	346
C132	343	C221	145	C298	268	C703	134
C133	343	C222	175	C299	285	C704	201
C134	126	C223	124	C391	360	C705	199
C137	115	C224	176	C393	348	C706	183
C141	268	C225	145	C403	270	C707	144
C142	186	C226	145	C405	270	C709	115
C143	118	C227	270	C406	145	C710	183
C144	121	C228	145	C407	145	C711	186
C146	116	C230	145	C408	145	C712	345
C148	123	C245	145	C409	262	C713	353
C149	145	C245	145	C410	262	C714	350
C150	145	C246	126	C411	262	C716	346
C151	145	C251	145	C412	259	C717	183
C152	139	C252	185	C413	268	C720	120
C154	145	C253	145	C414	185	C721	121
C155	145	C254	136	C415	259	C722	118
C156	145	C255	136	C416	348	C723	123
C157	121	C256	367	C501	132	C725	139
C158	185	C257	367	C502	126	C726	183
C159	145	C258	132	C503	145	C727	258
C160	128	C259	186	C504	145	C728	258
C161	136	C260	185	C505	132	C729	183
C162	128	C261	186	C506	140	C730	345
C163	141	C262	145	C507	270	C731	183
C164	186	C263	187	C508	134	C732	183
C165	182	C265	181	C509	145	C733	183
C166	183	C266	362	C510	139	C734	183
C167	186	C267	145	C511	132	C735	130

Ref.	Key	Ref.	Key	Ref.	Key	Ref.	Key
C736	137	CV102	395	IC701	624	L208	680
C737	130	CV501	398	IC702	602	L209	688
C738	183	CV502	398	IC703	628	L210	689
C739	183	CV503	398	IC704	636	L251	687
C740	119	CV701	390	IC706	612	L252	799
C741	183	D101	521	IC901	590	L253	748
C742	184	D102	521	IC902	614	L254	747
C743	284	D103	514	IC951	629	L255	747
C901	258	D104	520	IC952	606	L256	697
C902	185	D105	514	J351	964	L501	706
C904	185	D106	514	J352	965	L502	707
C905	259	D107	514	J353	966	L504	706
C906	182	D108	510	J354	968	L507	758
C907	181	D201	486	J355	976	L508	701
C908	178	D202	486	J356	976	L509	719
C910	178	D204	518	J357	967	L510	694
C911	178	D251	514	J358	967	L511	707
C912	181	D252	514	J359	966	L512	716
C913	145	D253	514	J361	969	L513	716
C916	178	D254	514	J362	966	L514	716
C917	178	D256	514	J363	965	L515	716
C920	186	D259	514	J364	966	L516	703
C921	270	D260	514	J365	976	L701	756
C922	181	D263	514	J366	976	L702	725
C923	179	D391	514	J367	963	L703	756
C924	179	D392	514	J371	976	L705	707
C925	179	D394	541	J372	976	L706	707
C926	179	D402	484	J391	961	L707	681
C927	179	D403	514	J392	976	L708	681
C932	178	D404	514	J397	971	L709	681
C933	145	D405	482	J398	960	P251	985
C951	185	D406	514	J901	975	P358	431
C952	177	D501	531	J902	974	P368	986
C953	177	D503	500	J903	972	P391	980
C954	177	D504	518	K201	660	P901	984
C955	177	D505	514	L101	686	P902	983
C956	177	D702	520	L102	686	Q101	794
C957	177	D703	514	L103	752	Q102	796
CA351	416	D704	514	L104	752	Q103	792
CA352	414	D705	514	L106	756	Q104	792
CA353	416	D706	514	L107	725	Q105	792
CA354	413	D707	514	L108	756	Q106	794
CA355	412	D709	514	L110	681	Q107	792
CA356	434	D901	514	L111	681	Q108	821
CA357	434	FL251	560	L112	684	Q109	820
CA358	428	FL252	564	L114	701	Q110	798
CA359	429	FL253	562	L116	712	Q111	792
CA360	429	IC101	642	L117	712	Q112	798
CA361	417	IC102	604	L118	685	Q201	819
CA362	422	IC103	630	L119	730	Q202	819
CA363	424	IC104	636	L120	730	Q203	798
CA364	431	IC106	602	L201	721	Q204	782
CA391	419	IC108	638	L202	721	Q205	792
CA392	421	IC251	580	L203	746	Q251	796
CA393	422	IC252	584	L204	721	Q252	792
CA394	423	IC401	586	L205	721	Q253	792
CL901	455	IC402	634	L206	721	Q254	782

Ref.	Key	Ref.	Key	Ref.	Key	Ref.	Key
Q256	792	R131	893	R253	916	R410	902
Q257	792	R132	902	R254	896	R501	927
Q259	817	R133	899	R255	896	R503	899
Q260	792	R134	902	R256	912	R504	904
Q261	792	R136	909	R257	909	R505	854
Q391	792	R137	876	R258	912	R506	854
Q392	792	R138	891	R260	898	R507	871
Q393	792	R139	917	R261	899	R508	881
Q394	792	R141	874	R262	916	R509	931
Q395	792	R142	917	R263	907	R510	869
Q402	792	R144	874	R264	916	R512	856
Q403	792	R145	889	R265	917	R513	881
Q404	788	R146	874	R266	916	R514	912
Q405	792	R147	877	R267	908	R515	913
Q501	806	R148	884	R268	881	R516	914
Q502	807	R149	877	R269	893	R517	899
Q503	808	R150	906	R270	902	R518	897
Q504	784	R151	899	R272	902	R519	881
Q505	792	R152	883	R274	909	R520	881
Q506	792	R153	881	R275	896	R521	888
Q507	792	R154	878	R276	908	R522	927
Q701	796	R155	881	R277	926	R701	881
Q703	792	R156	876	R278	923	R702	903
Q704	817	R161	902	R279	907	R703	907
Q705	792	R162	893	R280	908	R704	893
Q706	792	R163	927	R281	902	R706	888
Q707	821	R164	891	R282	889	R707	919
Q708	820	R166	893	R283	881	R708	891
Q709	792	R167	927	R284	874	R709	906
Q710	798	R168	927	R286	908	R710	894
Q901	792	R169	927	R287	909	R711	891
R101	893	R171	878	R288	926	R712	902
R102	906	R172	899	R289	923	R713	901
R103	878	R173	914	R290	916	R714	897
R104	906	R174	891	R291	909	R715	893
R106	909	R175	876	R292	912	R716	882
R107	908	R176	909	R293	921	R718	874
R108	893	R190	927	R294	909	R719	876
R109	896	R201	884	R295	904	R720	917
R110	888	R202	881	R296	904	R721	874
R111	896	R203	888	R297	902	R722	917
R113	899	R204	881	R298	907	R724	888
R114	907	R205	912	R391	861	R725	884
R116	896	R206	891	R393	862	R726	927
R117	917	R207	909	R394	862	R728	926
R118	921	R208	898	R395	857	R734	906
R119	896	R209	902	R396	859	R735	899
R120	914	R210	840	R397	858	R736	883
R121	888	R211	907	R398	863	R738	884
R122	911	R213	927	R401	888	R739	881
R123	902	R239	851	R403	874	R741	876
R124	893	R240	927	R404	874	R743	881
R125	927	R242	927	R405	888	R744	881
R126	907	R246	927	R406	911	R745	876
R127	904	R250	912	R407	893	R746	909
R128	897	R251	921	R408	902	R747	909
R129	896	R252	899	R409	904	R901	917

Ref.	Key
R902	926
R904	904
R905	907
R907	917
R908	907
R909	909
R911	909
R912	917
R913	909
R914	902
R915	893
R920	902
R921	902
R922	911
R923	911
R924	907
R925	917
R926	917
R927	893
R930	909
R931	909
R932	902
R933	902
R934	902
R935	902
R936	912
R937	912
R938	909
R939	909
R940	909
R941	909
R942	911
R943	911
R944	911
R945	911
R946	904
R947	904
R949	907
R951	927
RV101	943
RV102	943
RV103	943
RV251	943
RV252	943
RV253	943
RV501	944
RV502	942
TP101	992
TP701	992
X251	954
X701	956

UHF - PARTS LIST

Ref.	Key	Ref.	Key	Ref.	Key
C100	187	C156	195	C224	144
C101	264	C163	139	C225 (A/B)	115
C102	186	C164	186	C225 (C/D)	119
C103	136	C165	182	C226	145
C104	187	C166	183	C227	145
C105	181	C167	186	C228	144
C106	187	C168	144	C229	120
C107	124	C170	185	C230	145
C108	136	C171	187	C240 (C/D)	115
C109	187	C176 (A/B)	122	C241	145
C110	187	C176 (C)	132	C242	145
C112	184	C176 (D)	128	C245	145
C113	270	C177 (A/B)	124	C246	126
C114	267	C177 (C)	120	C247	145
C115	124	C177 (D)	122	C251	145
C116	368	C178 (A)	120	C252	185
C117	299	C178 (B/C)	119	C253	145
C118	186	C178 (D)	118	C254	136
C119	221	C179	195	C255	136
C121	185	C180	195	C256	367
C122	268	C181	268	C257	367
C123	268	C184	182	C258	132
C124	183	C185	128	C259	186
C125	348	C186	145	C260	185
C126	186	C187 (A/B)	126	C261	186
C127	262	C187 (C/D)	132	C262	145
C128	186	C188	195	C263	187
C129	353	C189	268	C265	181
C130	141	C190	182	C266	362
C131	195	C191	175	C267	145
C132	343	C192	195	C268	368
C133	343	C193	145	C269	185
C134 (A)	121	C194	182	C270	364
C134 (B)	120	C195	195	C271	186
C134 (C/D)	119	C197	195	C272	183
C137 (A)	115	C198	144	C273	259
C137 (B)	175	C199	144	C274	185
C137 (C)	176	C201	132	C275	145
C138 (A/B)	115	C202	145	C276	183
C138 (C/D)	113	C203	145	C277	270
C139	145	C204	145	C278	362
C140	132	C205	132	C279	362
C141	268	C207	132	C280	364
C142	186	C208	144	C281	185
C143 (A)	123	C209	270	C282	348
C143 (B/C/D)	122	C210	124	C284	348
C144 (A)	120	C211	145	C285	259
C144 (B/C)	119	C212	145	C286	262
C144 (D)	118	C214	270	C287	296
C145	119	C218	145	C288	350
C146	124	C219	145	C289	297
C147	145	C220	144	C290	185
C148	136	C221	120	C291	185
C149	136	C222	144	C292	297
C154	195	C223	175	C293	145

* A=UHF(LB); B=UHF(MB); C=UHF(HB); D=UHF(SHB) models

Ref.	Key	Ref.	Key	Ref.	Key
C294	145	C519 (A)	307	C701 (D)	119
C295	263	C519 (B)	305	C702	346
C296	111	C519 (C)	322	C703	139
C297	268	C519 (D)	303	C704	193
C298	268	C523	145	C705	143
C299	285	C524	330	C706	183
C391	360	C525 (A)	312	C707	144
C392	348	C525 (B/C/D)	332	C709 (A/C/D)	176
C393	347	C526 (A)	124	C709 (B)	175
C403	270	C526 (B/C/D)	122	C710	350
C405	270	C527	201	C711	183
C406	145	C529	145	C712	350
C407	145	C531 (A)	312	C713	374
C408	145	C531 (B/C/D)	332	C714	350
C409	262	C532 (A)	301	C715	374
C410	262	C532 (B)	318	C716	346
C411	262	C532 (C)	317	C717	145
C412	259	C532 (D)	316	C719 (A)	121
C413	268	C533 (A)	301	C719 (B)	119
C414	185	C533 (B)	318	C719 (C)	122
C415	259	C533 (C)	317	C719 (D)	126
C416	348	C533 (D)	316	C720 (A/B)	116
C501 (A)	120	C534 (A)	312	C720 (C/D)	115
C501 (B)	118	C534 (B/C/D)	332	C721 (A)	124
C501 (C)	116	C536	144	C721 (B/C/D)	122
C501 (D)	115	C537	145	C722 (A)	121
C502 (A)	133	C539	268	C722 (B)	119
C502 (B)	131	C541	144	C722 (C)	118
C502 (C/D)	128	C542	145	C722 (D)	116
C503 (A)	133	C545	144	C723	124
C503 (B)	131	C546	145	C724	136
C503 (C/D)	128	C547	262	C725	136
C504 (A/B/C)	116	C552	145	C726	145
C505 (A/B/C)	116	C553	145	C727	258
C506	122	C554	145	C728	258
C507 (A/B/C)	132	C555	145	C729	183
C507 (D)	131	C556	330	C730	345
C508 (A)	137	C557	145	C732	145
C508 (B)	134	C558	145	C733	144
C508 (C/D)	133	C559	145	C734	144
C509	128	C560	107	C738	144
C514	304	C561 (A)	118	C739	144
C515	305	C561 (B/C/D)	116	C740	119
C516 (A)	304	C562	128	C741	183
C516 (B)	322	C563	330	C742	184
C516 (C)	315	C564	145	C743	284
C516 (D)	333	C565	348	C745	144
C517 (A)	304	C566	263	C746	187
C517 (B)	322	C570 (A)	113	C747	144
C517 (C)	315	C570 (B)	176	C748	186
C517 (D)	333	C571	350	C901	258
C518 (A)	307	C572	107	C902	185
C518 (B)	304	C573	107	C904	185
C518 (C)	322	C701 (A)	122	C905	259
C518 (D)	303	C701 (B/C)	120	C906	182

* A=UHF(LB); B=UHF(MB); C=UHF(HB); D=UHF(SHB) models

Ref.	Key	Ref.	Key	Ref.	Key
C907	181	D102	521	IC401	586
C908	178	D104	520	IC402	634
C909	178	D105	514	IC701	624
C910	178	D106	514	IC702	632
C911	178	D107	514	IC703	628
C912	181	D108	510	IC704	641
C913	145	D109	514	IC705	641
C916	178	D110	521	IC706	612
C917	178	D201	496	IC901	590
C920	186	D202	496	IC902	614
C921	270	D203	518	IC951	629
C922	181	D204	518	IC952	606
C923	179	D251	514	J351	964
C924	179	D252	514	J352	965
C925	179	D253	514	J353	966
C926	179	D254	514	J354	968
C927	179	D256	514	J357	967
C932	178	D259	514	J358	967
C933	145	D260	514	J359	966
C951	185	D263	514	J361	969
C952	177	D391	514	J362	966
C953	177	D392	514	J363	965
C954	177	D394	541	J364	966
C955	177	D402	516	J365	976
C956	177	D403	514	J366	976
C957	177	D404	514	J371	976
CA351	433	D405	482	J372	976
CA352	432	D406	514	J391	961
CA353	433	D501	531	J392	976
CA354	413	D502	500	J397	971
CA355	413	D503	518	J398	960
CA356	434	D504	514	J901	975
CA357	434	D505	500	J902	974
CA358	428	D702	520	J903	972
CA359	429	D703	514	K201	660
CA360	429	D704	514	L101	686
CA361	418	D705	514	L102	686
CA362	422	D706	514	L103	752
CA363	424	D707	514	L104	752
CA364	431	D709	514	L105	686
CA391	419	D710	496	L106	750
CA392	421	D901	514	L107	744
CA393	422	FB501	550	L108	750
CA394	423	FL251	560	L114	701
CORD	413	FL252	564	L118	685
CV102	399	FL253	562	L119	730
CV202	392	IC101	642	L120	730
CV203	392	IC102	604	L121	750
CV501	395	IC103	630	L201 (A)	738
CV502	394	IC104	641	L201 (B)	739
CV503	394	IC105	641	L201 (C/D)	737
CV504	395	IC106	620	L202 (A)	738
CV701	390	IC108	638	L202 (B)	739
CV701	390	IC251	580	L202 (C/D)	737
D101	521	IC252	584	L203 (A)	738

* A=UHF(LB); B=UHF(MB); C=UHF(HB); D=UHF(SHB) models

Ref.	Key	Ref.	Key	Ref.	Key
L203 (B)	739	Q111	792	R114	909
L203 (C/D)	737	Q112	810	R116	896
L204 (A)	738	Q113	802	R117	917
L204 (B)	739	Q201	780	R118	921
L204 (C/D)	737	Q202	800	R119	896
L205 (A)	738	Q203	823	R120	914
L205 (B)	739	Q204	810	R121	888
L205 (C/D)	737	Q205	792	R122	911
L206 (A)	738	Q206	782	R123	904
L206 (B)	739	Q251	796	R124	893
L206 (C/D)	737	Q252	792	R125	927
L210	687	Q253	792	R126	907
L211 (A/B)	741	Q254	782	R127	904
L211 (C/D)	742	Q256	792	R128	897
L212 (A/B)	741	Q257	792	R129	891
L212 (C/D)	742	Q259	817	R131	893
L251	687	Q260	792	R132	902
L252	799	Q261	792	R133	899
L253	748	Q391	792	R134	902
L254	747	Q392	792	R136	909
L255	747	Q393	792	R137	899
L256	697	Q394	792	R138	891
L502	758	Q395	792	R139	902
L504	758	Q402	792	R141	886
L507	705	Q403	792	R142	874
L509	694	Q404	788	R143	874
L511	733	Q405	792	R144	874
L512	733	Q501	811	R145	903
L513	733	Q502	815	R146	874
L514	733	Q503	813	R147	884
L517	703	Q504	784	R148	873
L518	735	Q505	792	R149	884
L519	732	Q506	792	R150	897
L520	732	Q507	792	R152	876
L521	732	Q701	796	R157	884
L522	733	Q703	792	R158	883
L701	750	Q704	817	R159	874
L702	744	Q705	792	R160	883
L703	750	Q706	792	R161	902
P251	985	Q707	780	R162	893
P358	431	Q708	800	R163	927
P368	986	Q709	792	R164	891
P391	980	Q901	792	R166	893
P901	984	R101	893	R168	927
P902	983	R102	906	R169	927
Q101	794	R103	878	R170	897
Q102	796	R104	906	R171	893
Q103	792	R105	906	R172	893
Q104	792	R106	909	R173	899
Q105	792	R107	908	R174	896
Q106	794	R108	893	R175	891
Q107	792	R109	896	R177	897
Q108	780	R110	888	R178	876
Q109	800	R112	896	R179	881
Q110	810	R113	898	R180	881

* A=UHF(LB); B=UHF(MB); C=UHF(HB); D=UHF(SHB) models

Ref.	Key	Ref.	Key	Ref.	Key
R190	927	R280	908	R703	907
R194	927	R281	902	R704	893
R199	882	R282	889	R706	888
R200	884	R283	881	R707	919
R201	912	R284	874	R708	892
R202	888	R286	908	R709	884
R203	888	R287	909	R710	884
R204	884	R288	926	R711	887
R205	916	R289	923	R712	902
R206	884	R290	916	R713	893
R207	881	R291	909	R714	897
R210	891	R292	912	R715	896
R211	897	R293	921	R716	885
R212	881	R294	909	R718	874
R216	902	R295	904	R720	902
R217	908	R296	904	R721	886
R218	902	R297	902	R722	897
R220	911	R298	907	R723	884
R221	888	R391	861	R725	884
R222	888	R393	862	R726	927
R223	893	R394	862	R727	899
R224	927	R395	857	R728	926
R225 (A/B)	882	R396	859	R729	872
R225 (C/D)	927	R397	858	R730	872
R239	851	R398	863	R731	903
R240	927	R401	888	R732	879
R242	927	R403	874	R733	879
R246	927	R404	874	R737	879
R250	912	R405	888	R743	874
R251	921	R406	911	R744	874
R252	899	R407	893	R745	879
R253	916	R408	902	R746	909
R254	896	R409	904	R747	909
R255	896	R410	902	R748	888
R256	912	R502	856	R750 (A/B/C)	878
R257	910	R503	887	R750 (D)	881
R258	912	R504	912	R751 (A/B/C)	885
R260	898	R507	898	R751 (D)	878
R261	899	R508 (A/B)	892	R752 (A/B/C)	878
R262	916	R508 (C/D)	926	R752 (D)	881
R263	907	R509	881	R753	885
R264	916	R511	881	R754	874
R265	917	R512	886	R755	885
R266	916	R513	864	R901	917
R267	908	R514	931	R902	926
R268	881	R515	866	R903	907
R269	893	R516	928	R904	907
R270	902	R517	914	R905	907
R272	902	R518	909	R907	917
R274	909	R519	882	R908	907
R275	896	R520	927	R909	909
R276	908	R521	839	R910	909
R277	926	R522	848	R911	909
R278	923	R701	881	R912	917
R279	907	R702	903	R913	909

* A=UHF(LB); B=UHF(MB); C=UHF(HB); D=UHF(SHB) models

G.3 UHF Parts List (cont.)

Ref.	Key
R914	902
R915	893
R916	909
R917	909
R918	912
R919	912
R920	902
R921	902
R922	911
R923	911
R924	907
R925	917
R926	917
R927	893
R928	909
R929	917
R930	909
R931	909
R932	902
R933	902
R934	902
R935	902
R936	912
R937	912
R938	909
R939	909
R940	909
R941	909
R942	911
R943	911
R944	911
R945	911
R946	904
R947	904
R949	907
R950	927
RV101	943
RV101	946
RV102	943
RV102	946
RV103	946
RV251	943
RV252	943
RV253	943
RV501	944
RV502	943
X251	954
X701	957

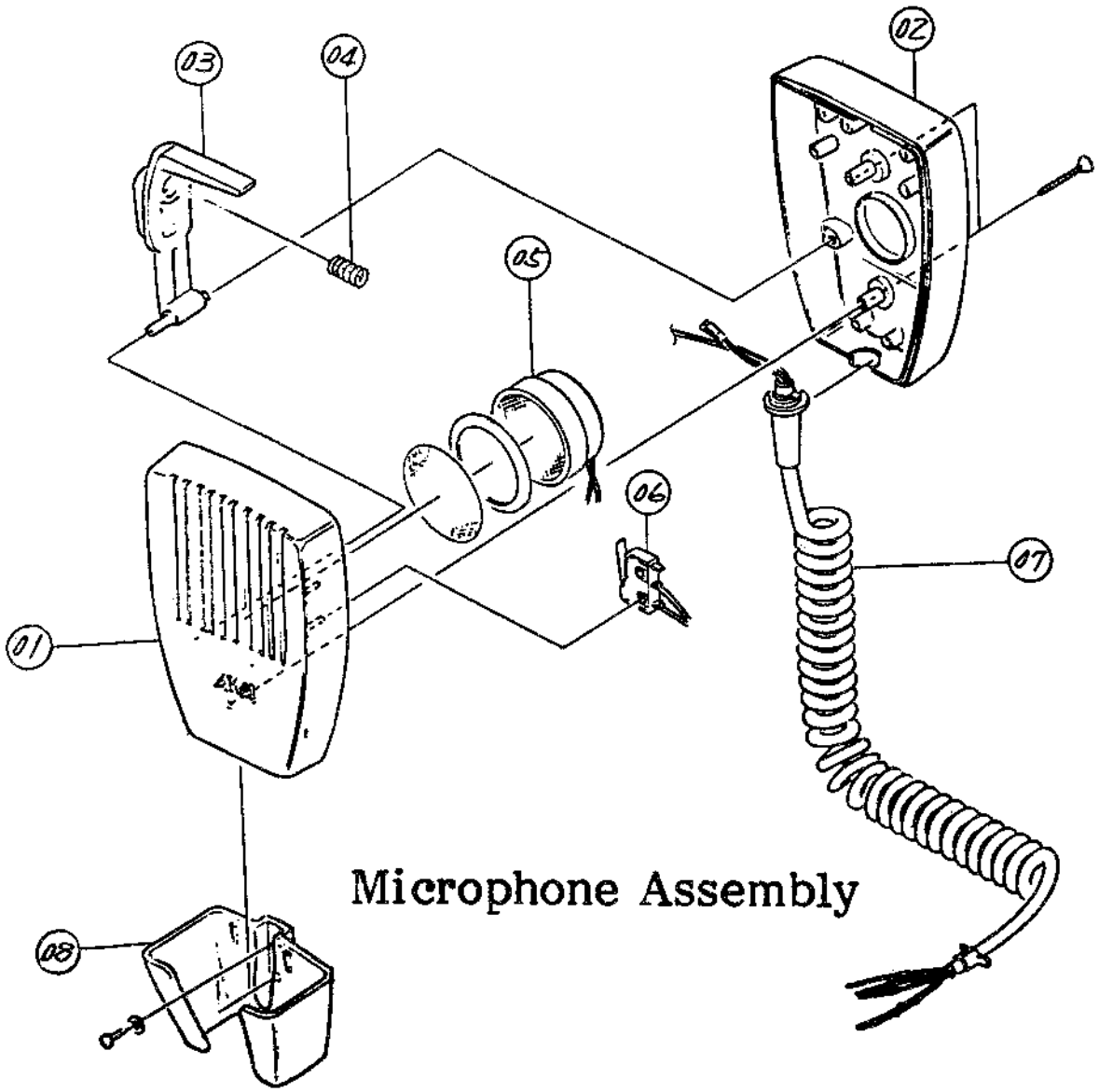
* A=UHF(LB); B=UHF(MB); C=UHF(HB); D=UHF(SHB) models

CONTROL UNIT PARTS LIST

Ref.	Key	Ref.	Key
C301	270	R304	846
C302	342	R311	843
C303	268	R312	843
C304	108	R313	843
C305	262	R314	843
C306	262	R315	843
C307	270	R316	843
C308	266	R317	843
C312	101	R318	843
C313	101	R319	843
C314	101	R320	843
C315	230	R321	843
C316	103	R322	843
C317	104	R323	843
C318	102	R324	843
CA301	426	R325	846
CA302	427	R326	848
CABL	410	R327	842
D301	480	R328	842
D302	514	R329	853
D303	514	R330	851
D311	460	R331	849
D312	463	R332	849
D313	461	R333	849
D314	462	R334	849
D315	514	R335	849
D316	514	R336	849
D317	514	R337	849
IC301	582	R338	852
IC302	600	R339	852
IC311	616	R340	852
IC312	616	R341	858
IC313	608	RV301	941
IC314	622	RV302	940
IC315	610	SW301	950
IC316	543	SW302	950
J305	963	SW303	950
J306	970	SW304	950
MIC	770	SW305	950
P301	982		
P302	982		
P303	982		
P304	982		
P305	982		
P306	982		
P307	981		
P308	981		
P309	981		
P310	981		
P311	981		
P312	981		
P313	981		
PC-J	991		
PCB	990		
R301	844		
R302	841		
R303	842		

CTCSS PARTS LIST

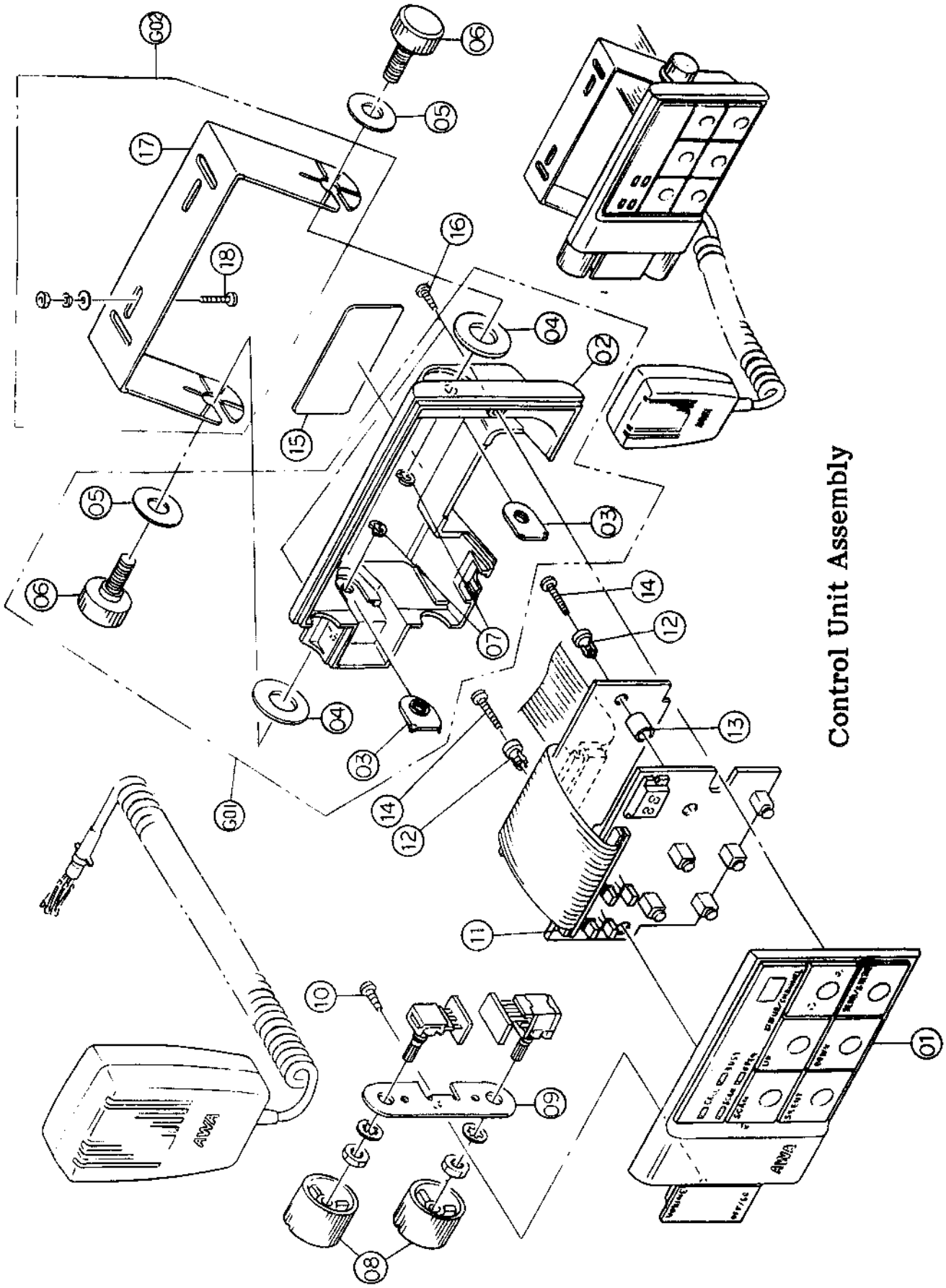
Ref.	Key	Ref.	Key
C1	368	R24	906
C2	134	R25	922
C3	134	R26	903
C4	367	R27	926
C5	368	R28	924
C6	270	R29	896
C7	185	R30	918
C8	370	R31	906
C9	299	R32	886
C10	185	R33	917
C11	355	R34	917
C12	355	R35	907
C13	355	R36	926
C14	355	R37	917
C16	355	RV1	943
C17	355	X1	955
C19	355		
C20	355		
C21	368		
C22	185		
C23	270		
C24	185		
CA1	995		
CA2	994		
D1	514		
D2	514		
D4	514		
D5	514		
D6	514		
D7	514		
IC1	606		
IC2	613		
IC3	591		
IC4	631		
JP3-6	927		
Q1	792		
Q2	792		
R1	909		
R2	909		
R3	909		
R4	909		
R5	909		
R6	909		
R7	909		
R8	912		
R10	912		
R11	912		
R12	926		
R13	923		
R14	897		
R15	916		
R16	912		
R17	912		
R18	919		
R19	917		
R20	892		
R23	909		



Microphone Assembly

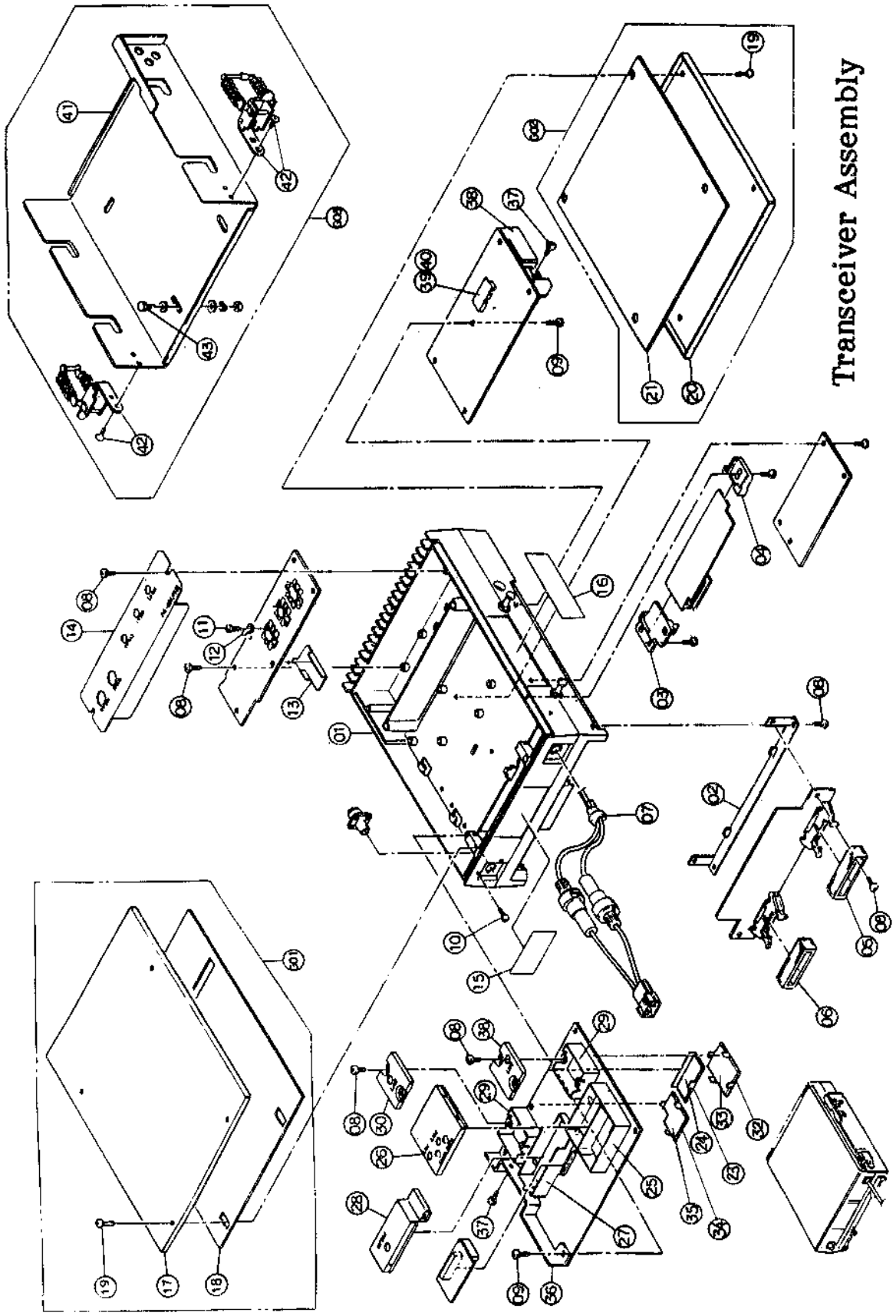
MODEL HM-08A MICROPHONE

CODE	SYMBOL	SPEC	Q
2106166-A	01	CASE FRONT	1
3180089-A	02	CASE REAR	1
8298469-A	05	MICROPHONE UNIT	1
8298470-A	06	SWITCH P.T.T.	1
8326030-A	04	SPRING COIL	1
8401609-A	03	PUSH-BUTTON	1
8401610-A	07	CORD SPRING	1
8401611-A	08	HOLDER	1



MODEL 1LC 82259 CONT.UNIT

CODE	SYMBOL	SPEC	Q	L
XCA0501	07	RETAINING RING E TYPE	2	
XCA1287	05	WASHER	2	
118313-A	02	COVER REAR	1	
3133862-T	15	NAME PLATE	1	
3162969-A	11	JOINER HOLDER	2	
3176016-A	17	MOUNTING BRACKET	1	
3177946-A	01	COVER FRONT	1	
8286813-C	06	SCREW	2	
8355608-A	04	RUBBER	2	
8355629-A	18	SCREW	1	
8364158-L	16	SCREW	2	
8364158-L	10	SCREW	1	
8364158-R	14	SCREW	2	
8393113-A	09	BRACKET	1	
8393114-A	08	KNOB	2	
8393117-A	03	NUT PLATE	2	
8397606-A	12	BUSHING	2	
8397607-A	13	COLLAR	2	
XCA0501	07	RETAINING RING E TYPE	2	
XCA1287	05	WASHER	2	
118313-A	02	COVER REAR	1	
33M0005	G01	COVER REAR ASSY	1	
8286813-C	06	SCREW	2	
8355608-A	04	RUBBER	2	
8393117-A	03	NUT PLATE	2	
3176016-A	17	BRACKET	1	A
8355629-A	18	SCREW	1	A
33M0006	G02	BRACKET ASSY	******	



MODEL 1LM 82271

CODE	SYMBOL	SPEC	Q	L
XCA6008	10	SCREW +M2.6X8	2	
XCA6306	08	SCREW +M3X6	16	
XCA6308	09	SCREW +M3X8	19	
118304-A	01	CASE	1	
2104381-A	40	MOUNTING TRAY CASE	1	
3133862-V	15	NAME PLATE	1	
3175121-A	14	COVER SHIELD PA	1	
4054721-A	07	BUSH CORD	1	
8242054-B	22	SCREW +M4X16	4	
8242054-B	19	SCREW +M4X16	8	
8293961-A	41	CLIP CATCH	2	
8298321-A	16	NAME PLATE	1	
8309403-A	42	SCREW	1	
8345937-D	11	SCREW +M3X10	4	
8389428-B	36	HEAT SINK TX	1	
8389436-A	37	HEAT SINK RX	1	
8391053-A	05	PACKING	1	
8391053-B	06	PACKING	1	
8391056-A	17	COVER TOP	1	
8391057-A	20	COVER BOTTOM	1	
8391076-A	27	CASE SHIELD SYN	1	
8391077-A	28	COVER SHIELD SYN	1	
8391078-A	25	CASE SHIELD MIX MOD	1	
8391079-A	26	COVER SHIELD MIX MOD	1	
8391081-A	29	CASE SHIELD VCO	2	
8391082-A	30	COVER SHIELD VCO	1	
8391082-B	31	COVER SHIELD VCO	1	
8391876-A	32	PLATE SHIELD VCO	1	
8391876-B	34	PLATE SHIELD VCO	1	
8391877-A	33	INSULATING PLATE	1	
8391877-B	35	INSULATING PLATE	1	
8393121-A	38	PLATE SHIELD	1	
8393122-A	39	INSULATING PLATE	1	
8393737-A	02	BRACKET	1	
8393778-AA	24	INSULATING PLATE	1	
8393790-A	23	PLATE SHIELD	1	
8396873-A	03	HOLDER 1	1	
8396874-A	04	HOLDER 2	1	
8397601-A	21	PACKING	1	
8397610-A	18	PACKING	1	
8242054-B	19	SCREW +M4X16	8	A
8391056-A	17	COVER TOP	1	A
8397610-A	18	PACKING	1	A
33M0008	G01	COVER TOP ASSY	******	
8242054-B	22	SCREW +M4X16	4	A
8391057-A	20	COVER BOTTOM	1	A
8397601-A	21	PACKING	1	A
33M0009	G02	COVER BOTTOM ASSY	******	
2104381-A	40	MOUNTING TRAY CASE	1	A
33M0007	G03	MOUNTING TRAY ASSY	1	
8293961-A	41	CLIP CATCH	2	A
8309403-A	42	SCREW	1	A