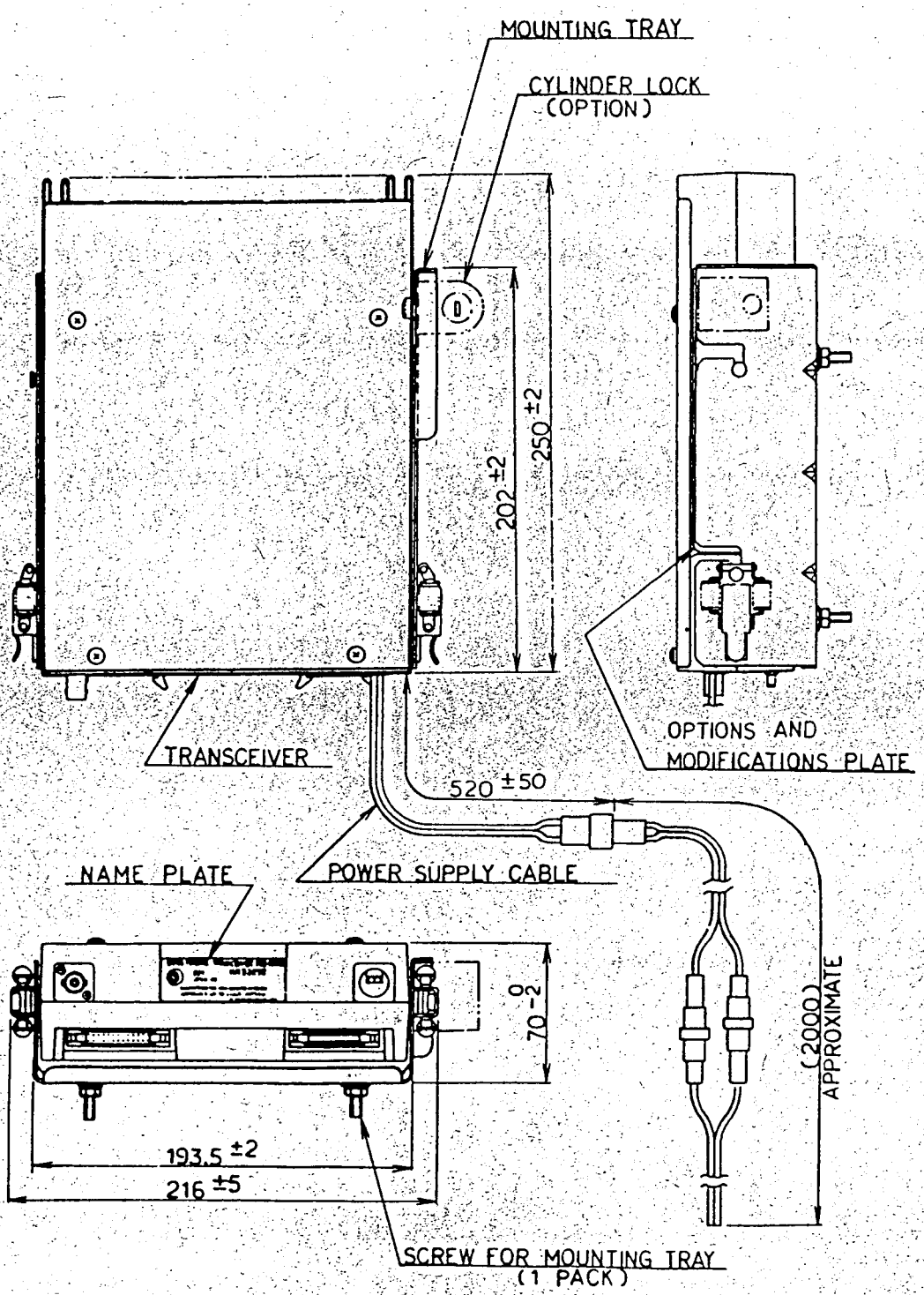
C.1 - DIMENSIONAL DRAWINGS



TRANSCEIVER AND MOUNTING TRAY

Fig. C-1 Transceiver Dimensions

C.2 Dimensional Drawings (cont.)

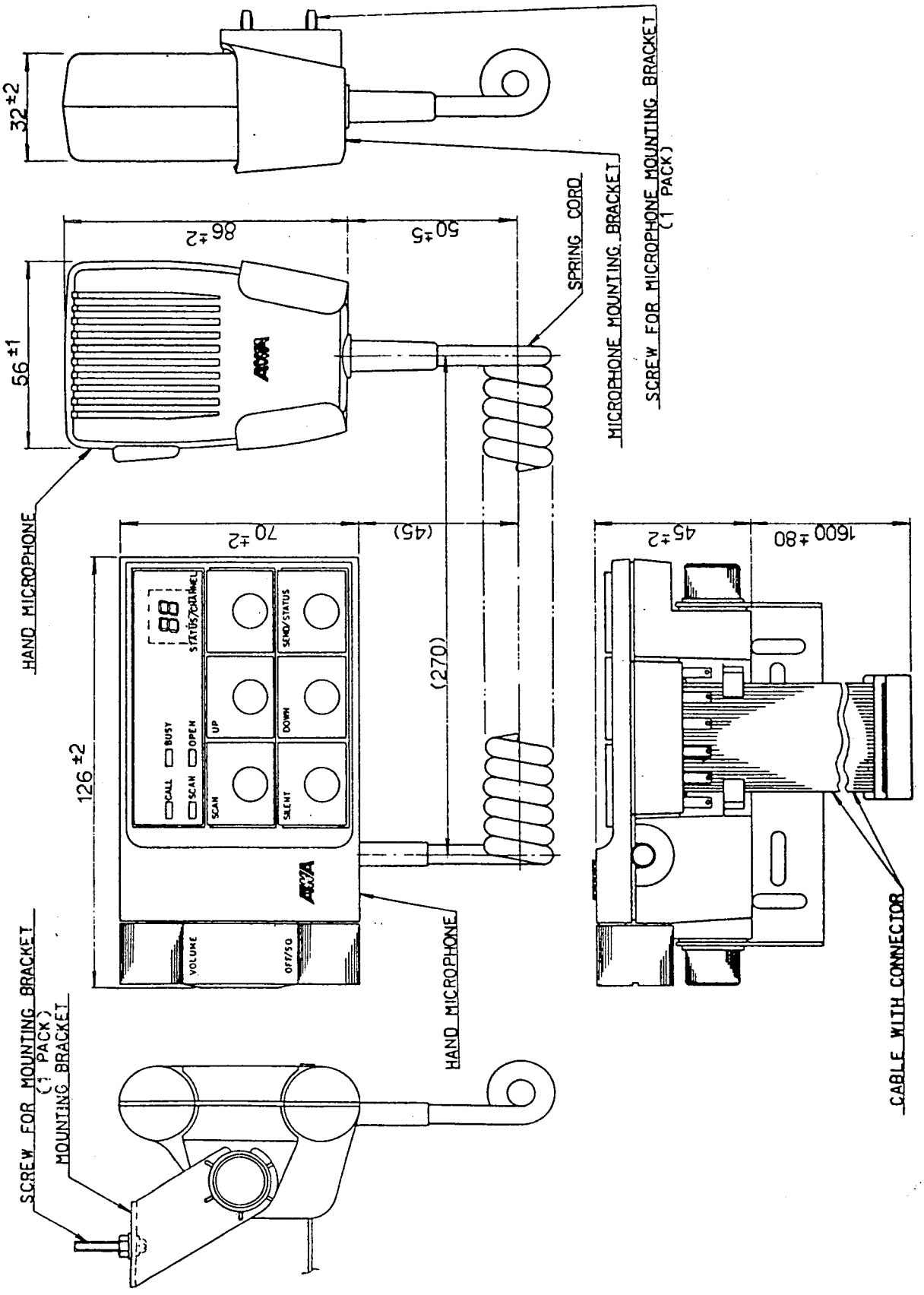


Fig C-2 Control Unit Dimensions

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.

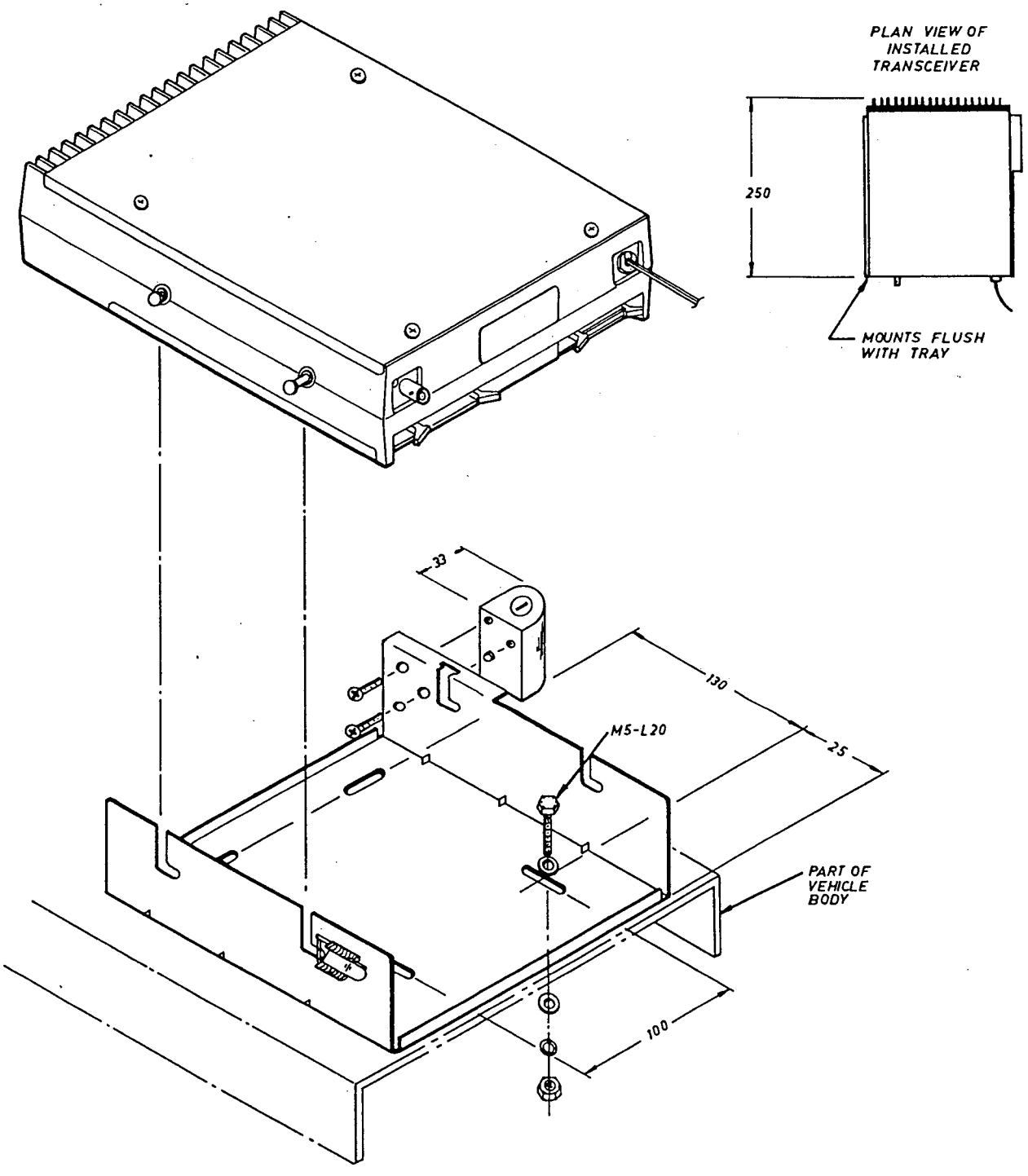


Fig. C-3 Transceiver Installation

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.

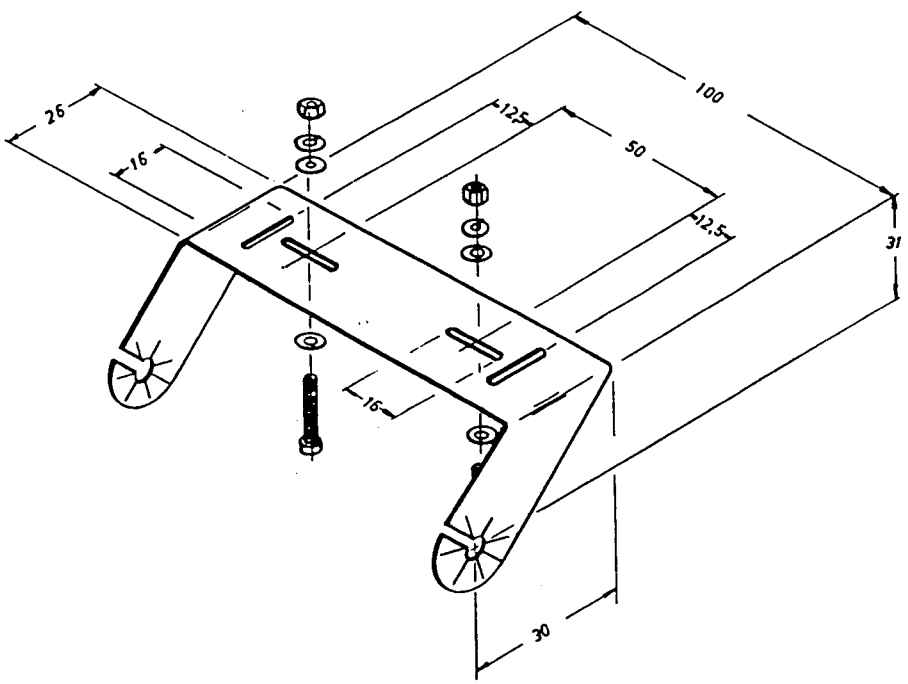


Fig. C-4 Control Unit Installation

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.

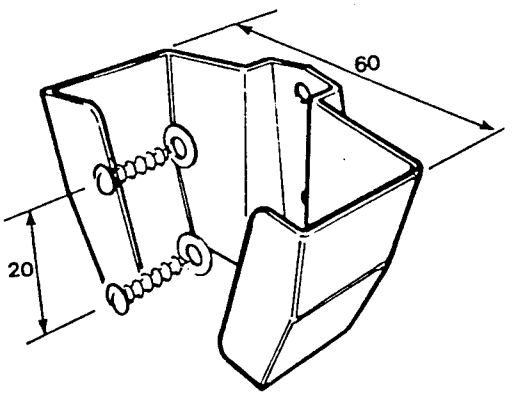


Fig. C-5 Microphone Installation

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.

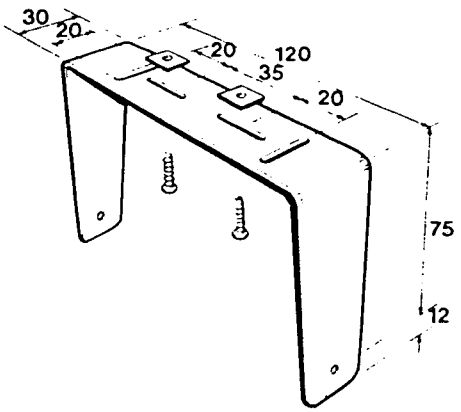


Fig. C-6 Loudspeaker Installation

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.

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 0.2uV, 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 50mV/cm or better;

5. Audio Oscillator

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

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

   Voltmeter ranges 100mV to 5V, 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 20mV 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.

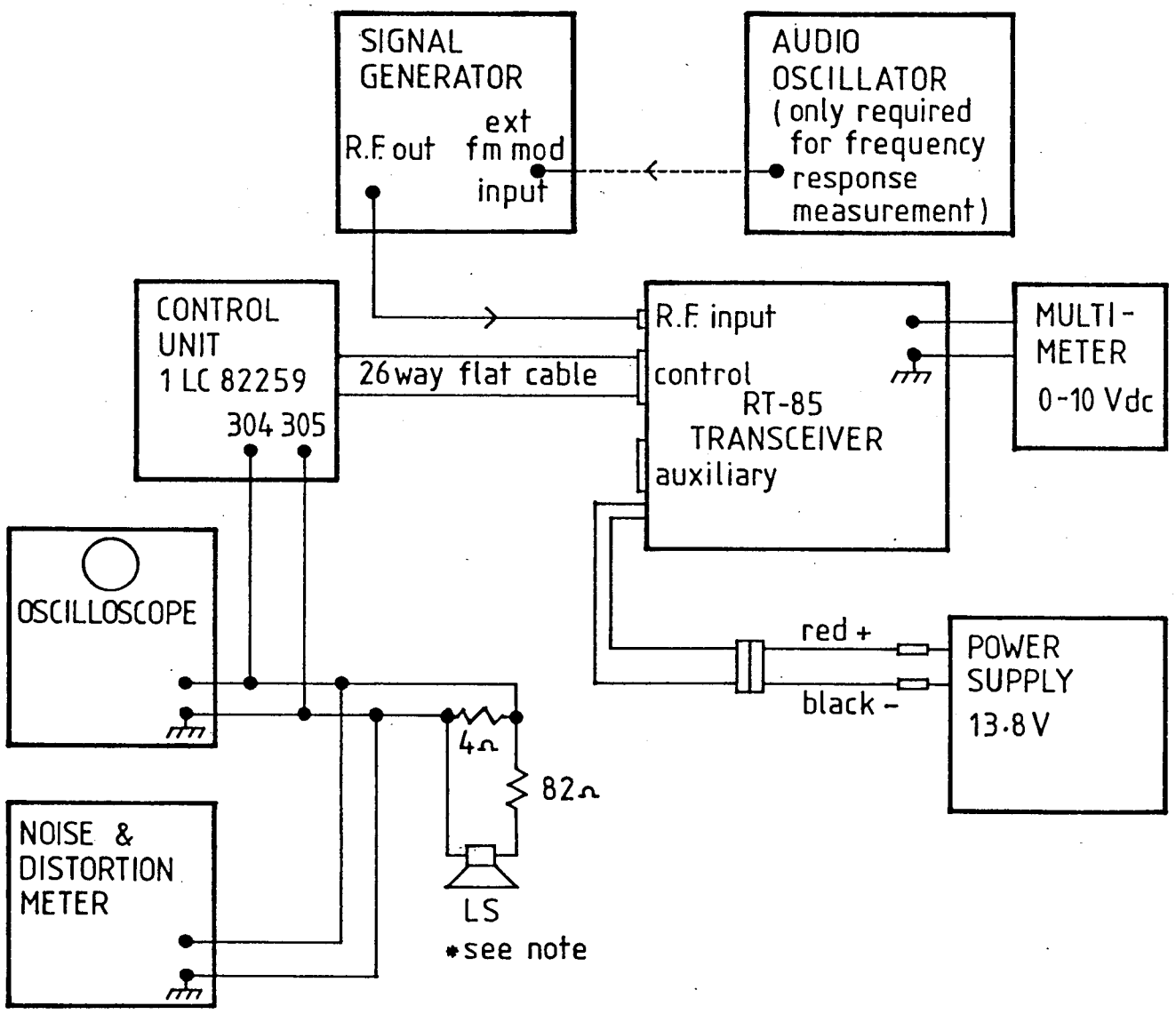


Fig. D-1 Synthesizer/Receiver Alignment Set-Up

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.

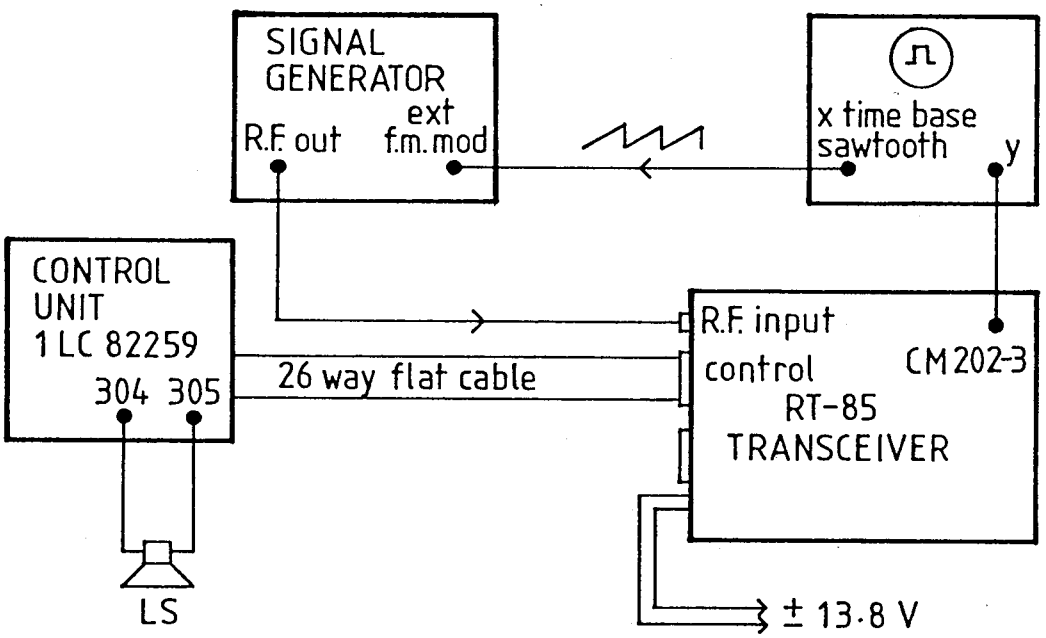


Fig. D-2 IF Alignment Set-Up

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.

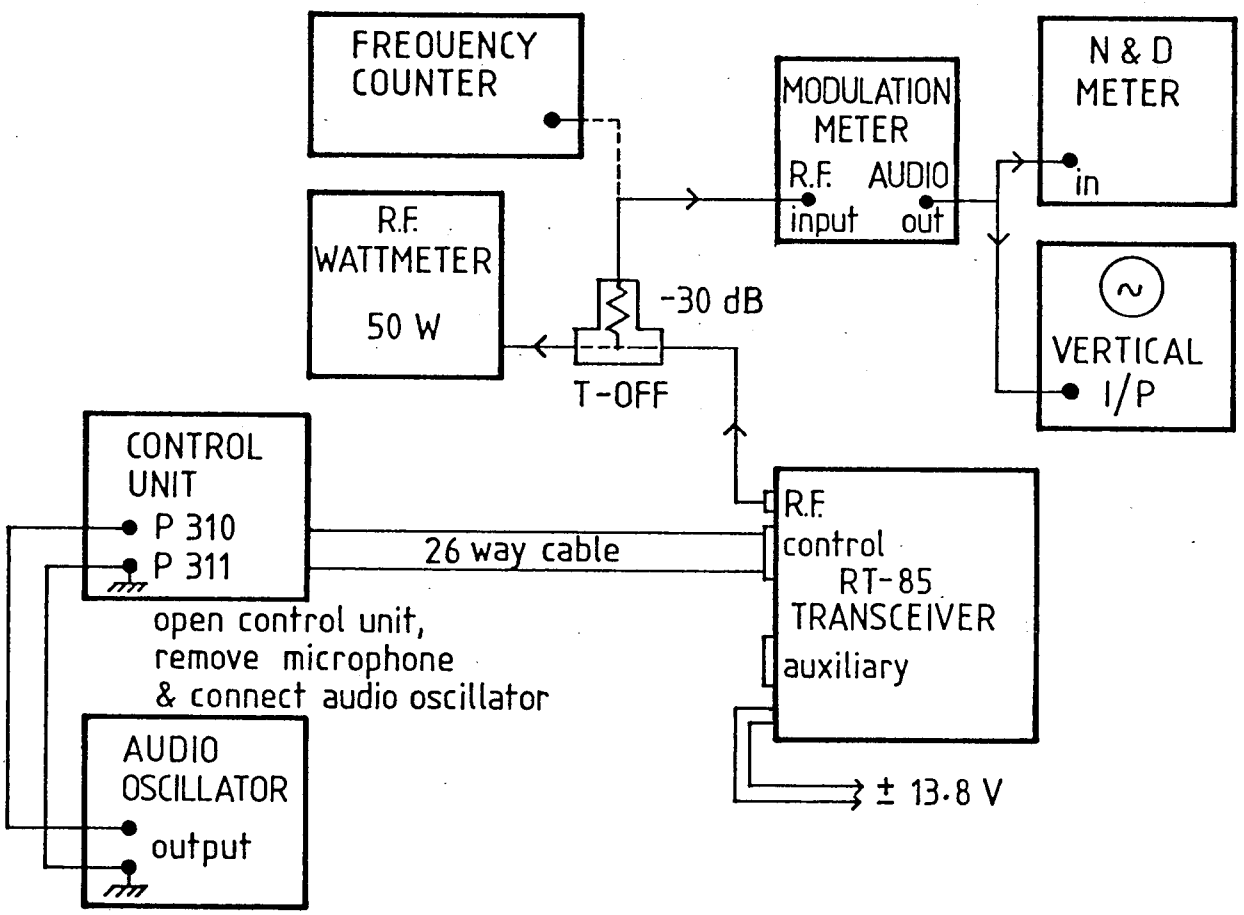


Fig. D-3 Transmitter Alignment Set-Up

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 1mV 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 340mV +-50mV 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 310mV +-50mV rms.

Sensitivity

1. Reduce signal input level to 0.35uV 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 2.5V 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 5V when the BUSY LED is on and 0V when the BUSY LED is off.

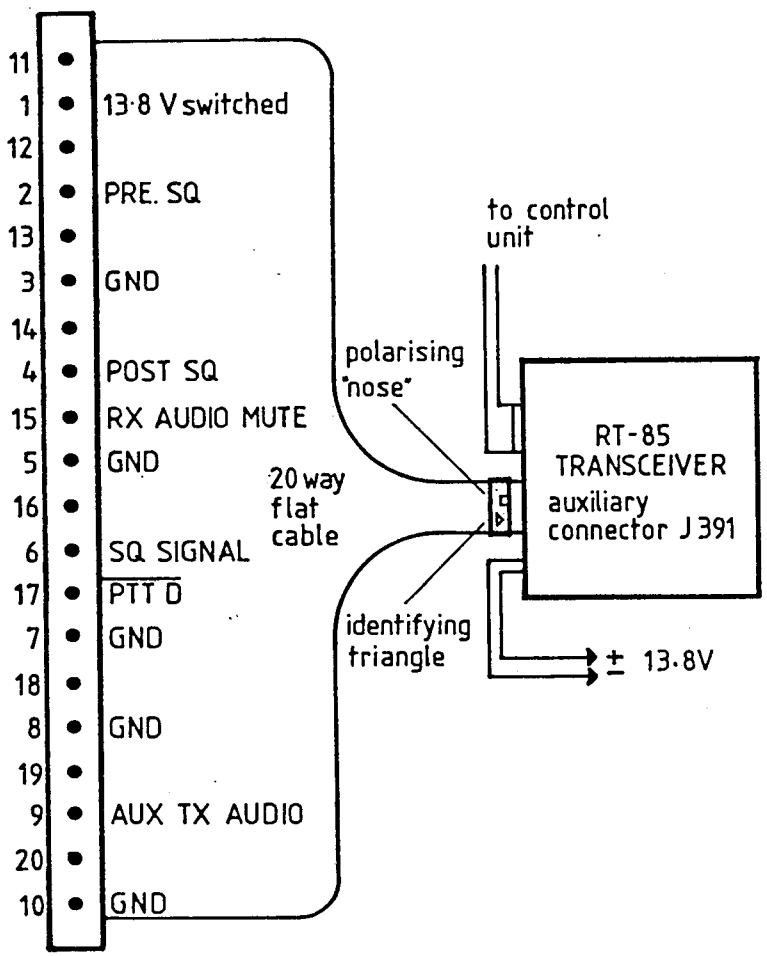


Fig. D-4 Auxiliary Connector Outputs

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. Low Pwr 12w
5. If required, measure output power on "depower" setting by shorting P302 to P303 on control unit. Set dc input to 13.8V. link
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.

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	NEXT IF BAD
1	Unit dead	Check fuse. Press UP button.		1A
1A	DC supplies	Check IC901 pin 20 & IC402 pin 2 = 5 V dc. Check J363, pin 3 = 13.8 V, pin 4 = 8 V, pin 5 = 8 V pin 6 = 13.8 V. Check IC402 pin 2 = 5 V.	1B	
1B	No display	Check IC302 pin 2 = 5 V.	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	NEXT IF BAD
2A	Dead	Check IC401, pin 6 = 8 V, pin 5 = 0 V.	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:

BR517

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

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

3F2 Digit 1

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

Digit 2

	1	2	3	4	5	6	7	0
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

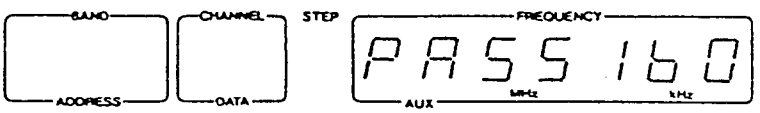
The EAY-06EK is a portable programmer which can perform the following operations:

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.

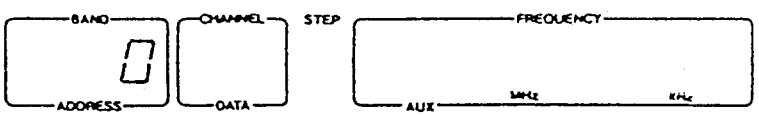
The EAY-06EK uses 110V AC power input, and thus a 240/110V transformer is required.

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

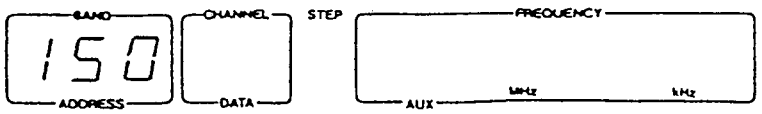
Press the (FUNC) key followed by (CLEAR): the display will be the same as that when switching programmer on (see above).

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.

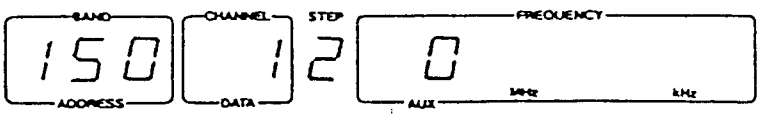
In the "STEP" window, there are four possible numbers:

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)

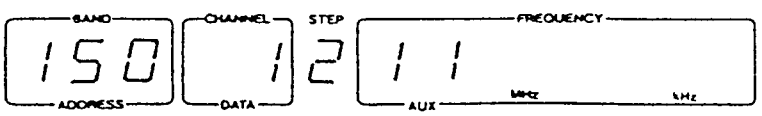
Press (ENTER)



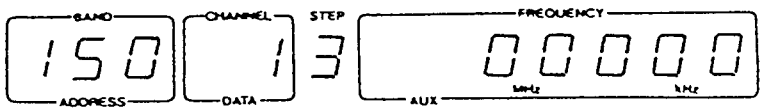
Step=2 Receive CTCSS

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

Press (1) (1)



Press (ENTER)

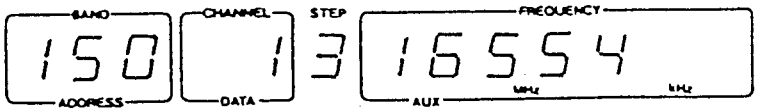


F.1 System Programming (cont.)

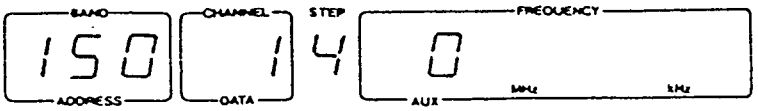
Step=3 Transmit Frequency

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

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



Press (ENTER)

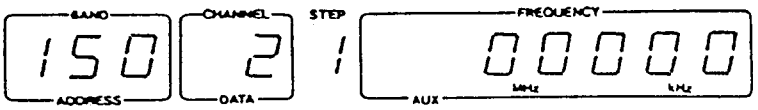


Step=4 Transmit CTCSS Option

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.

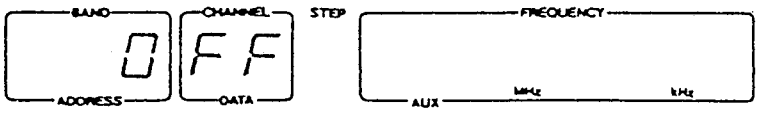
If the frequency indication LEDs flash, press (CLEAR) or re-enter the correct frequency.

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

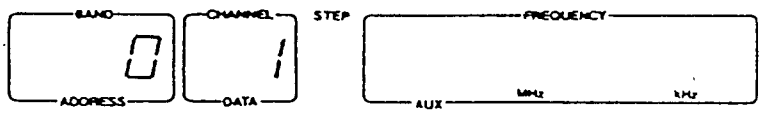
Press (SCAN)



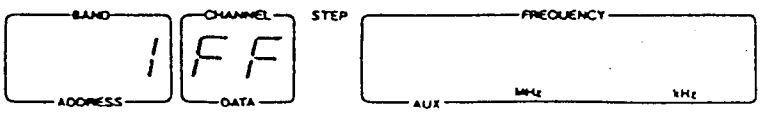
The number in the "BAND" window is the order position in the scanning sequence. Enter the numbers from ITEM 6 of the programming schedule against the appropriate "BAND" number.

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.

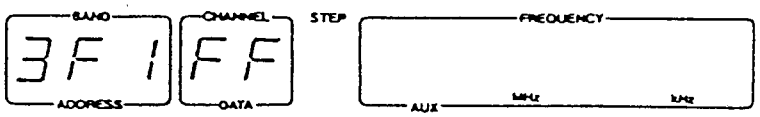
PROGRAMMING OPTIONAL FUNCTIONS (PERSONALITY PROGRAMMING)

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).



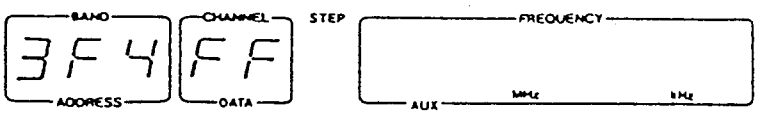
Punch in ITEM 8, then (ENTER): "ADDRESS" will be "3F2".

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 UV 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".

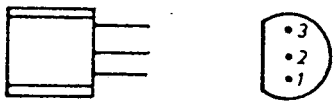
PRINTING CONTENTS of BUFFER RAM

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
2 C
3 B

2SC460B, 2SC535B, 2SC458C,
2SC1906, 2SC1213C, 2SA673C,
2SC535C

1 B		1 D	
2 C	2SC2538	2 G	2SK117BL
3 E		3 S	

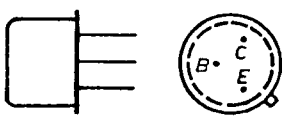
1 B
2 E
3 C

2SC2026, 2SC2407

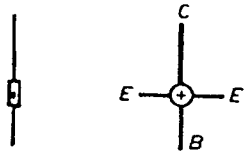
1 D		1 S	
2 S	2N5668	2 G	2SK125
3 G		3 D	

2SK192ABL, 2SK241GR

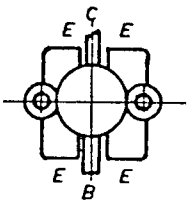
1 E		1 B	
2 C	2SB834Y	2 E	2SC1971
3 B		3 C	



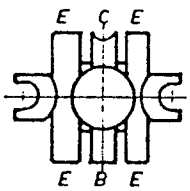
2SC2131



2SC2369

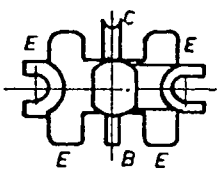


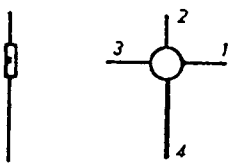
2SC2496A, 2SC2630



2SC3539, 2SC2097

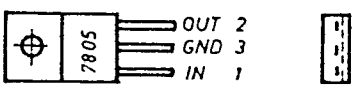
2SC2283KA, 2SC2285B

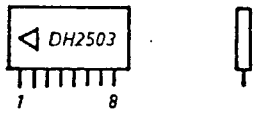




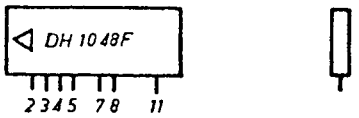
ND487C1-3R

MPC7805H

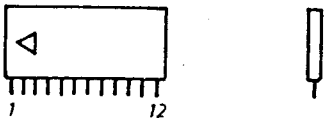




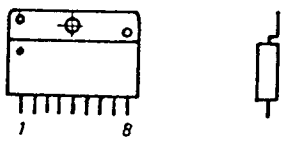
DH2503



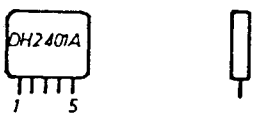
DH1048F



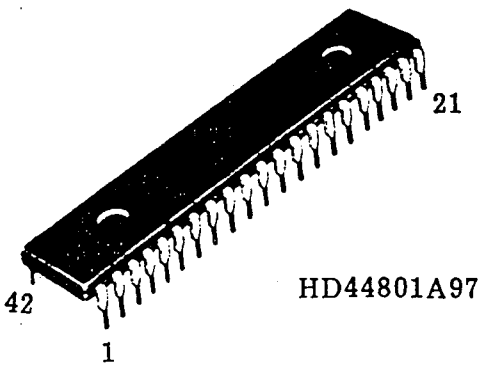
DH2501, DH2502, DH2506A



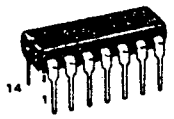
MB3712, MB3756



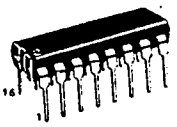
DH2401A



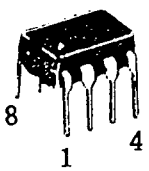
HD44801A97



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

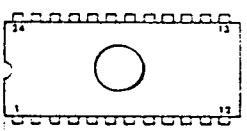


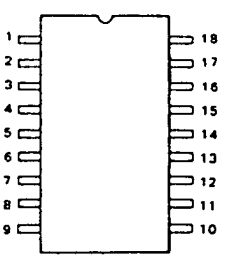
MC3357P, HD14021BP, HD14511BP, HD14028BP, HD14049BP, HD14174BP



UBP555C, UBP571C

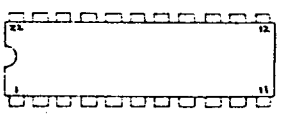
UPD2716D

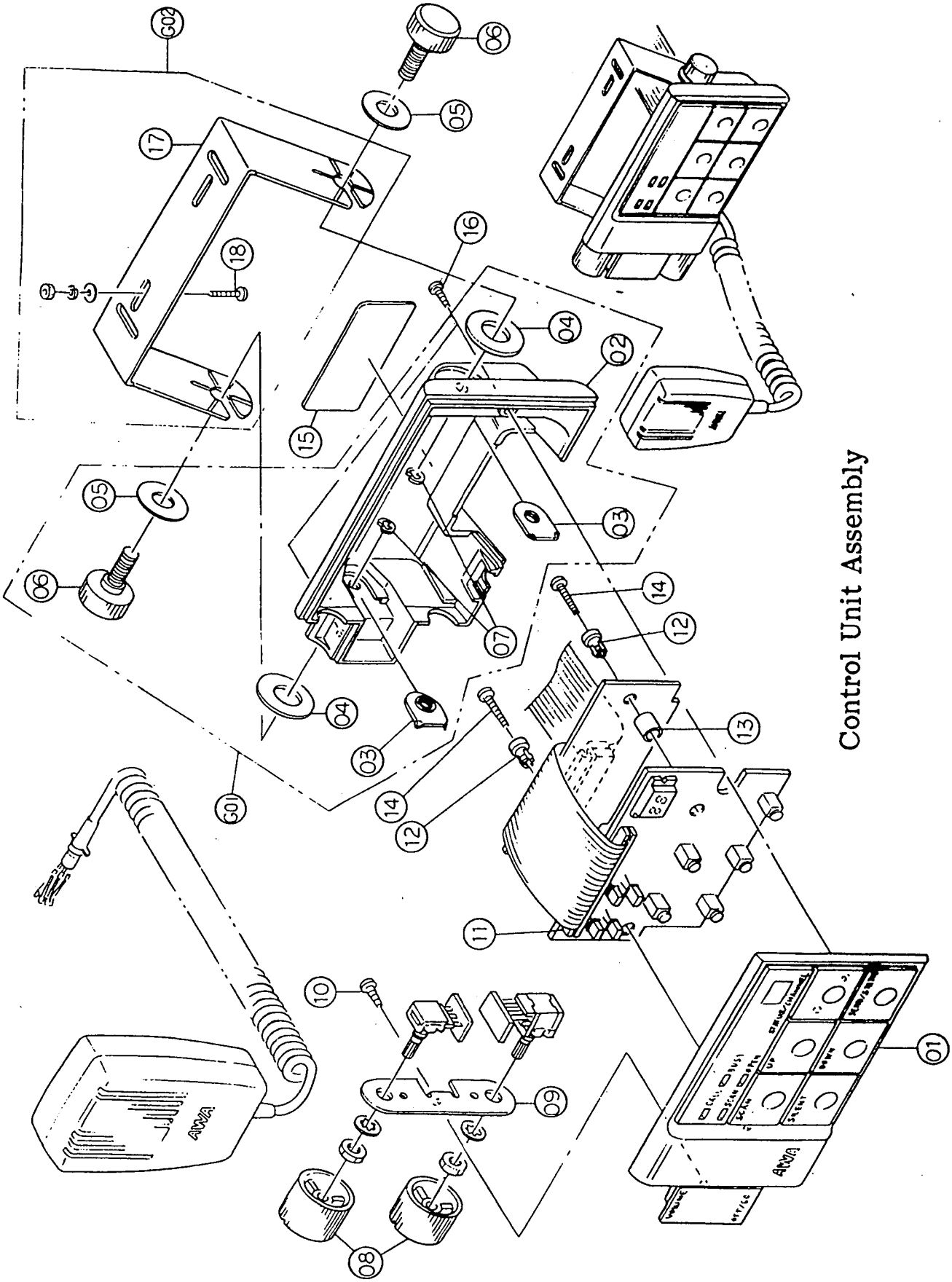




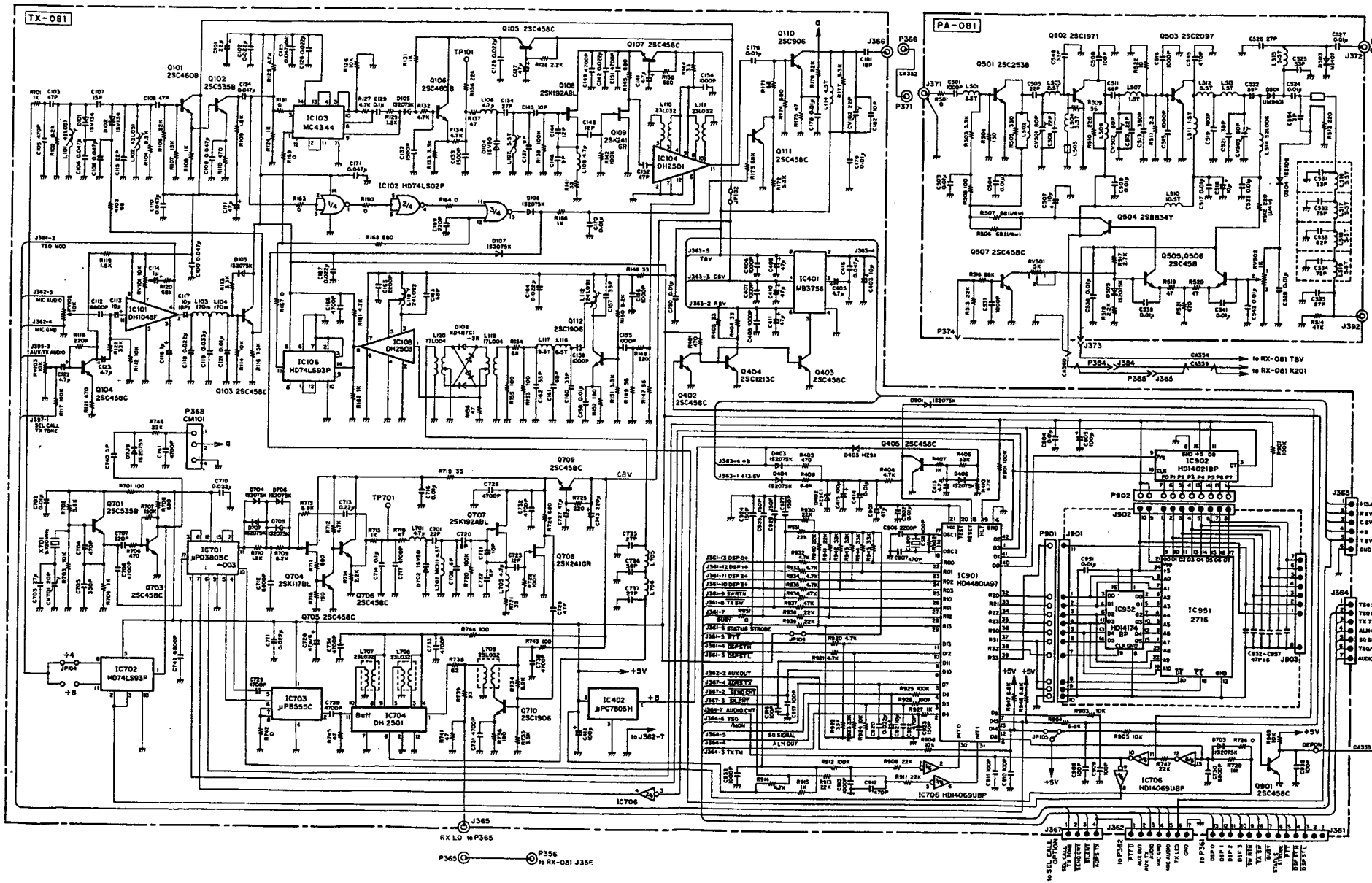
UPD3805C

FX325





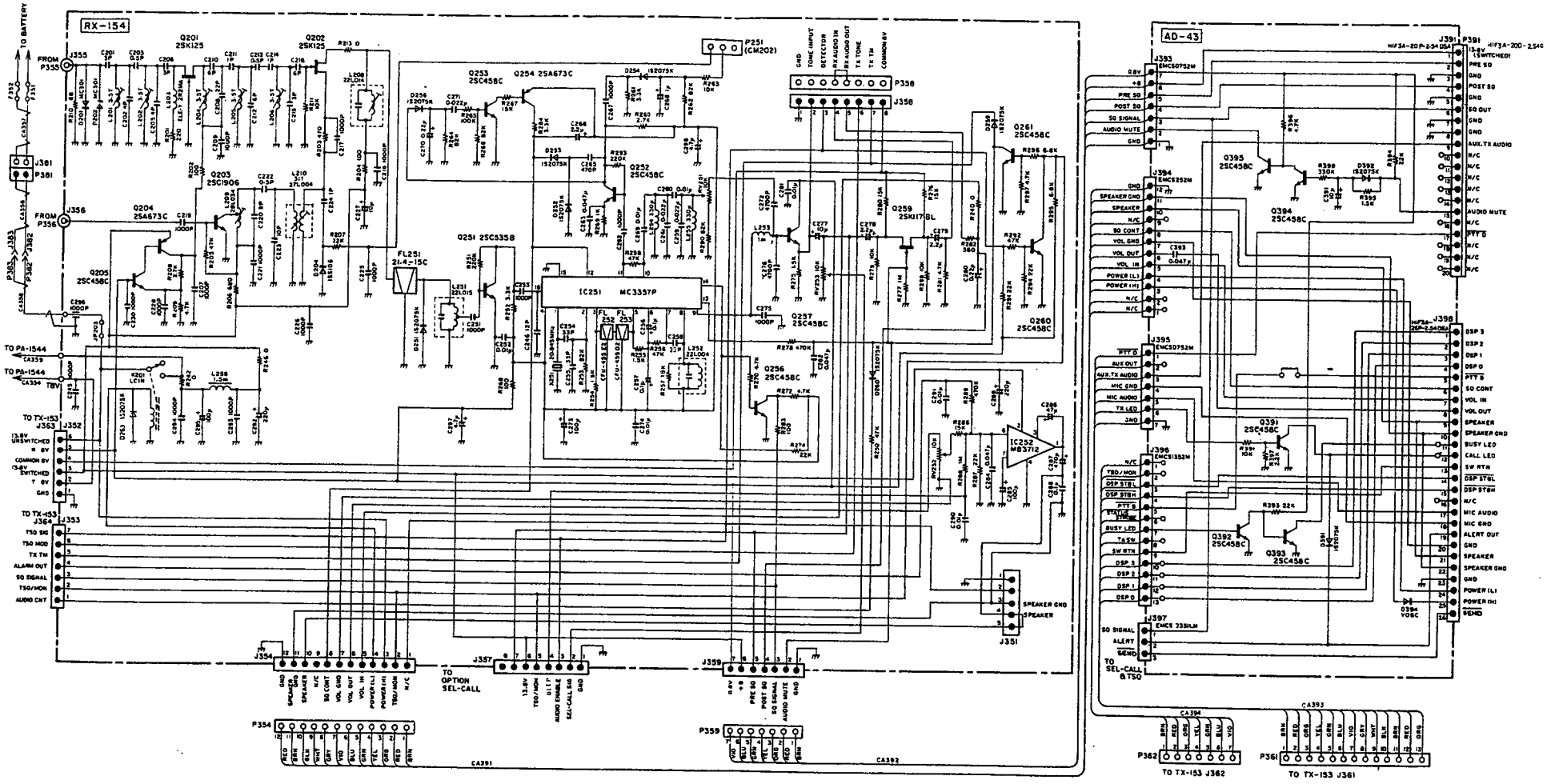
Control Unit Assembly



TRANSMITTER RT-85 VHF (LB) 1LM82271

AWA Drawing 82271-1-02

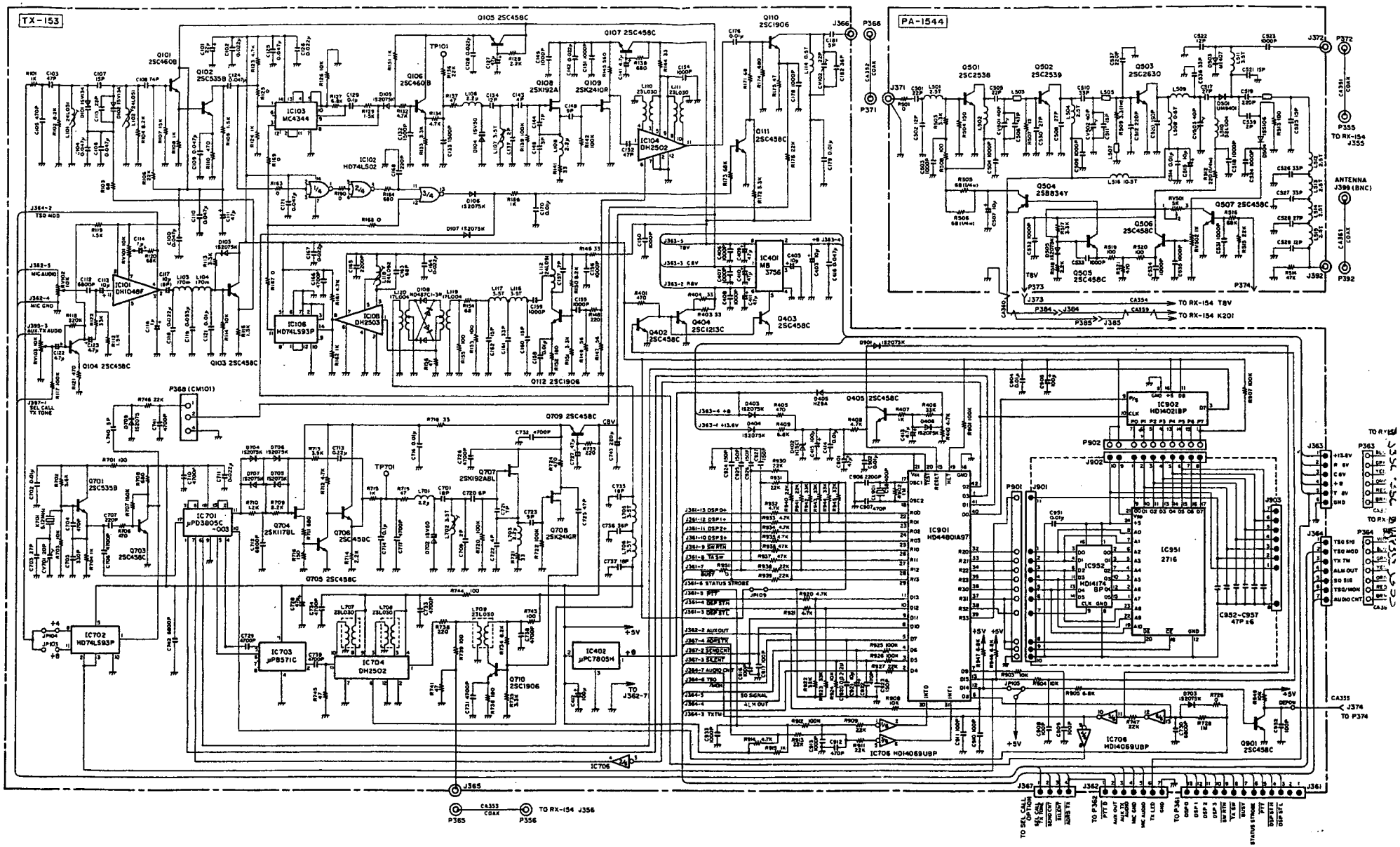
E-band



RECEIVER RT-85 VHF (HB) 1LM82272

AWA Drawing 82272-1-01

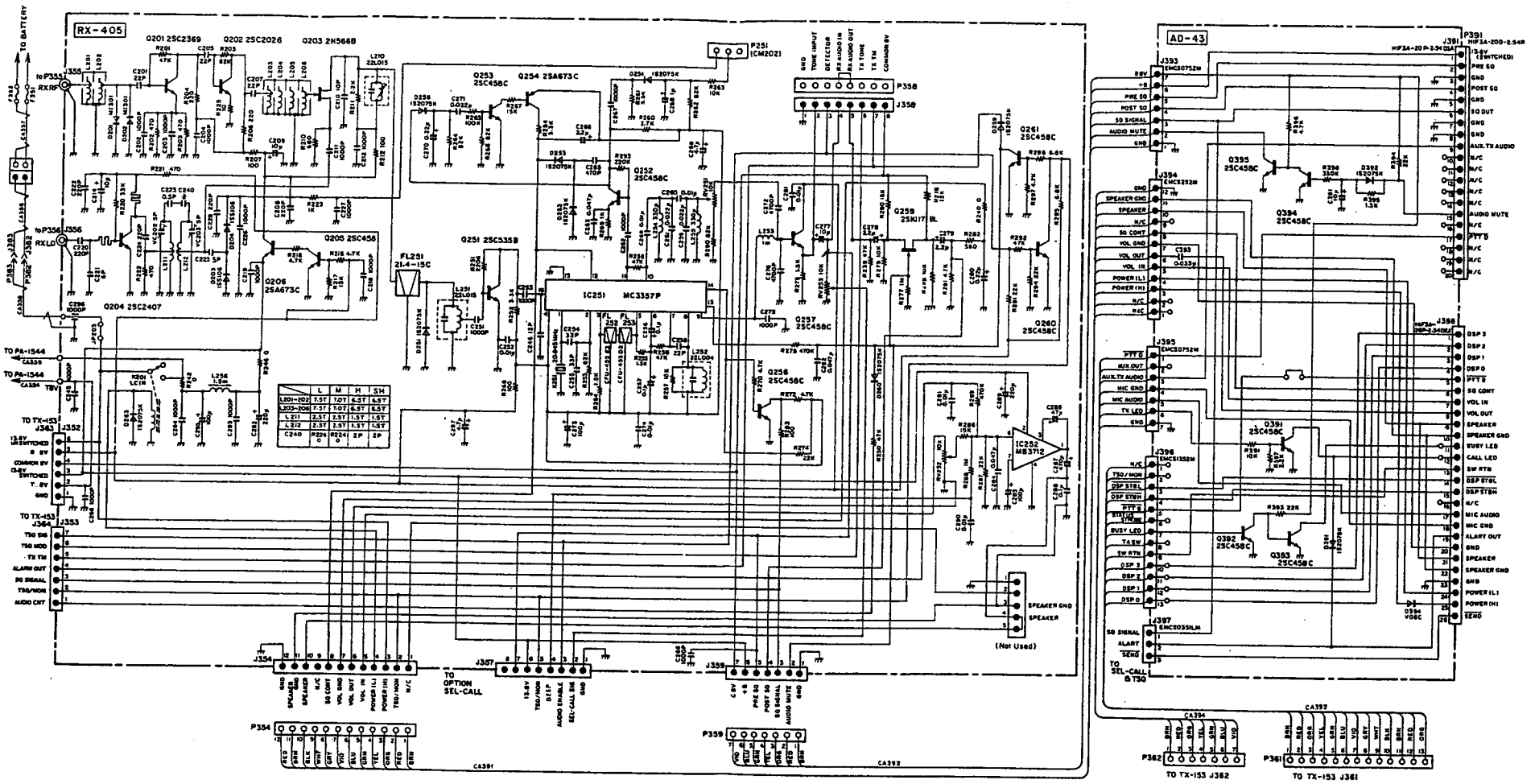
A-band



TRANSMITTER RT-85 VHF (HB) 1LM82272

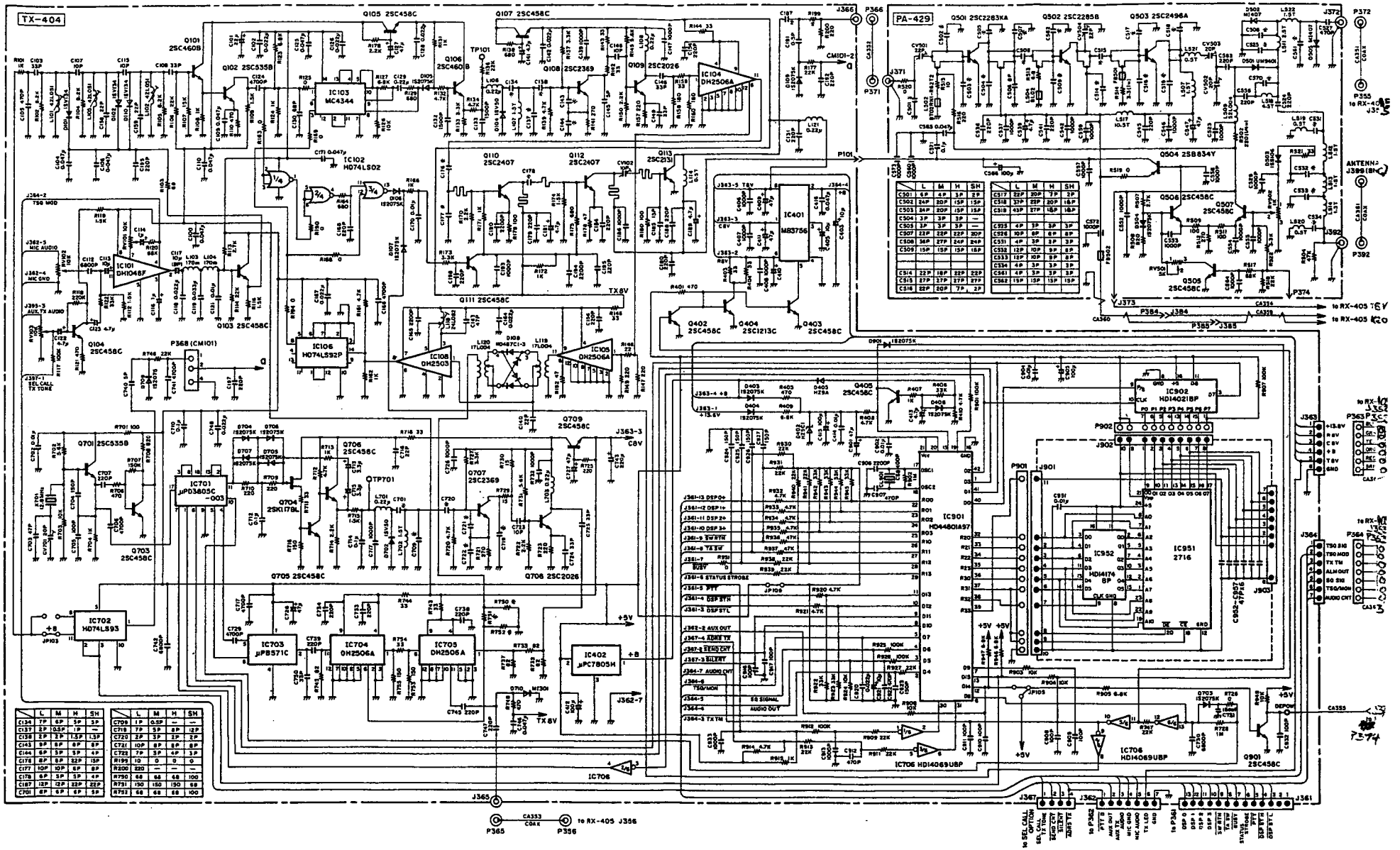
AWA Drawing 82272-1-02

A-band



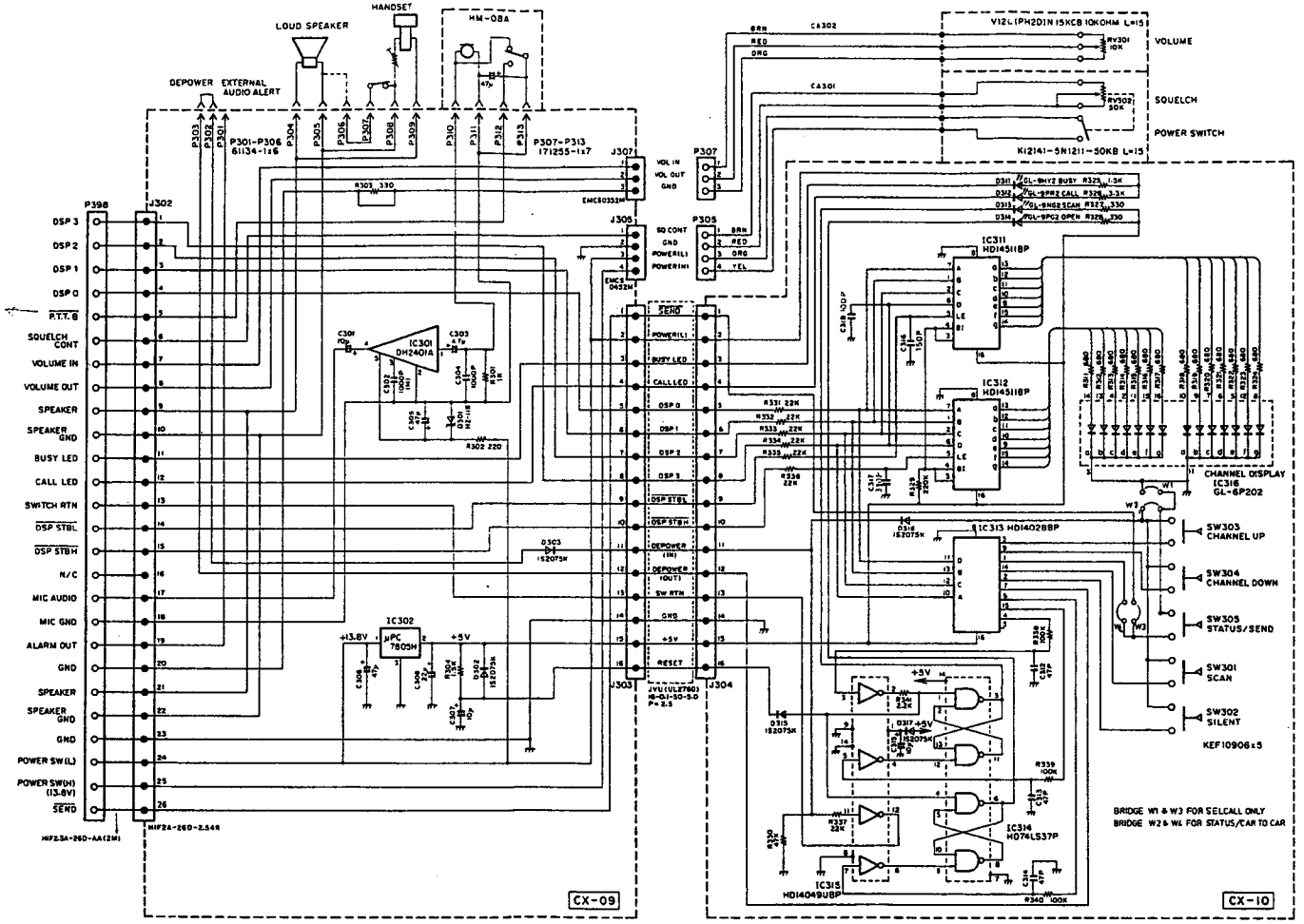
RECEIVER RT-85 UHF 1LM82273, 1LM82274, 1LM82275 & 1LM82276

AWA Drawing 82273-1-01



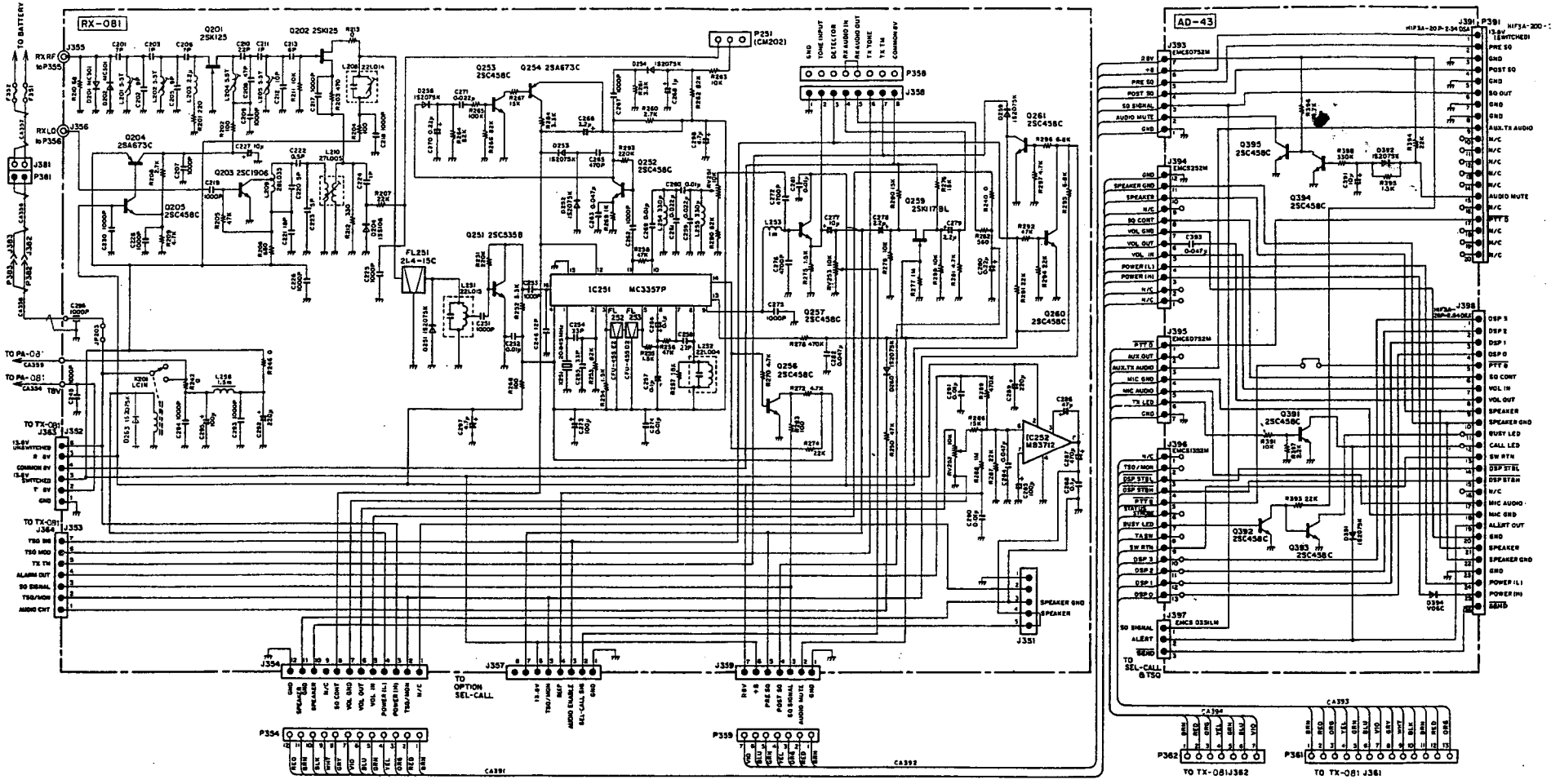
TRANSMITTER RT-85 UHF 1LM82273, 1LM82274, 1LM82275 & 1LM82276

AWA Drawing 82273-1-02



RT-85 MOBILE CONTROL UNIT 1LC82259

AWA Drawing 82259-1-01



RECEIVER RT-85 VHF (LB) 1LM82271

AWA Drawing 82271-1-01

E-band