

REALISTIC[®]

Service Manual

21-1545/9441

CB 40-CHANNEL TRANSCEIVER TRC-441/441-18

Catalog Number: 21-1545/9441



CUSTOM MANUFACTURED FOR RADIO SHACK  A DIVISION OF TANDY CORPORATION

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1. SPECIFICATIONS

GENERAL SPECIFICATIONS

Description

Transmitter	Crystal controlled PLL synthesizer, amplitude modulation
Receiver	Crystal controlled double conversion, superheterodyne system
Communicating frequencies	All 40 CB channels (26.965 to 27.405 MHz) *All 18 CB channels (27.015 to 27.225 MHz)
Voltage operation	AC 120 V, 60 Hz *AC 240 V, 50 Hz
Temperature and Humidity range	-30°C to +60°C and 10% to 80%
Transmitter/Receiver switching	Electronic * For Australian models only

STANDARD TEST CONDITIONS

Power supply voltage	AC 120 V, 60 Hz (240 V, 50 Hz for Australian models only)
Modulation	1000 Hz, 30%
Receiver output power	500 mW at external SP.
Receiver output impedance	8 ohms, non-inductive
Ant. load impedance of transmitter	50 ohms, non-inductive
Ambient conditions	
temperature	17 to 23°C
humidity	40 to 70%

TRANSMITTER SPECIFICATIONS

Description	Nominal	Limit
RF power output	4.0 watts (maximum)	3.6-4.4 watts
Emission	8A3 (6A3 for Australian models)	
Modulation Capabilities	+90%, -100%	
AMC Range at 1 kHz	56 dB	> 50 dB
Frequency accuracy	0.002%	0.005%
Spurious radiation & Harmonic signal radiation ratio from fundamental.	At least -65 dB	-60 dB
Envelope distortion	3-8% max. 1000 Hz, 50% mod.	
Hum and Noise level	40 dB min. below max. mod.	
Stability against variation of antenna impedance ..	Satisfactory when dummy antenna is varied from 40 ohms to 200 ohms.	

RECEIVER SPECIFICATIONS

Description	Nominal	Limit
Intermediate frequency		
1st IF	10.695 MHz	
2nd IF	455 kHz	
Sensitivity for 500 mW output	0.3 μ V	0.5 μ V
Sensitivity at 10 dB S + N/N	0.5 μ V	1.4 μ V
Adjacent Channel Rejection	80 dB (at 10 kHz), 100 dB (at 20 kHz)	> 60 dB
Image Rejection (5.7 MHz)	50 dB	> 40 dB
Bandwidth (–6 dB) at 10 dB S + N/N	7.6 kHz	5 – 9 kHz
Signal-to-Noise ratio		
at 1000 μ V input	40 dB	35 dB
Distortion at 1 mV input, 500 mW output	2.0%	< 4.0%
AGC Figure of merit	100 dB	> 90 dB
Power output at 5000 μ V input		
Undistorted (10% THD)	4.5 W	> 3.5 W
Maximum	5.0 W	> 4.0 W
Electrical fidelity compared to 1000 Hz		
450 Hz	–6 dB	–6 \pm 3 dB
2500 Hz	–6 dB	–6 \pm 3 dB
Cross Modulation	At least 50 dB	> 46 dB
Squelch	Adjustable from 0.5 μ V to 1000 μ V	

OTHER ITEMS

Fuse	2 Amp. (1 Amp. for Australian models)
General power requirement	AC 120 V, 60 Hz, (240 V, 50 Hz for Australian models)
Dimensions	(H)4-3/4" (121 mm) \times (W)11-13/16" (300 mm) \times (D)9-3/4" (247 mm)
Weight	7 Lbs. 1 oz. (3.2 kg)

NOTE: Nominal Specs represent the design specs; all units should be able to approximate these — some will exceed and some may drop slightly below these specs. Limit Specs represent the absolute worst condition which still might be considered acceptable; in no case should a unit perform to less than within any Limit Spec.

2. DISASSEMBLY INSTRUCTIONS

Removal of cabinet

1. Remove (13) screws from the Cabinet [3 screws marked A, 8 screws marked B and 2 (*5) screws marked C]. *For Australian models

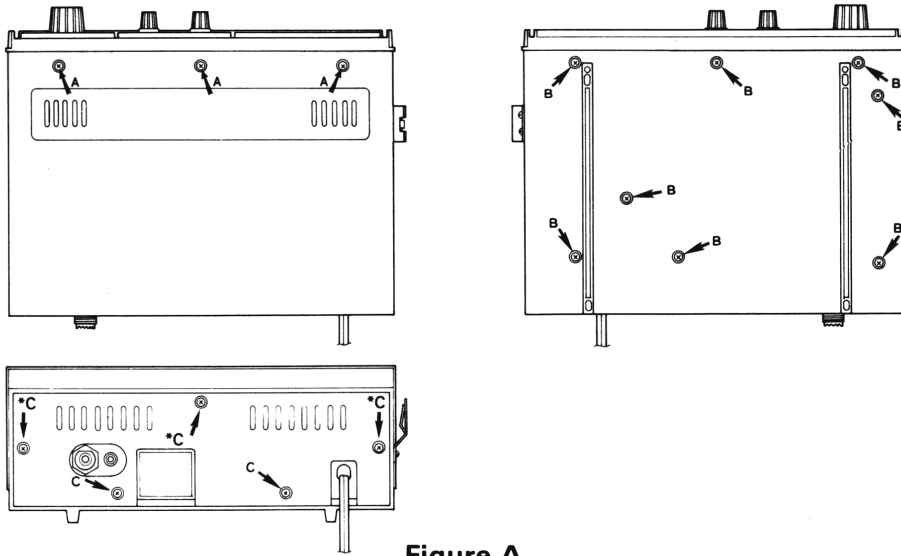


Figure A

Removal of Main P.C.B.

1. Remove (15) screws from P.C.B., Heat Sink and Front Panel. (7 screws marked →, 6 screws marked ↯ and 2 screws marked →).
2. Unsolder the point marked ⊛.
3. Remove the one * Antenna connector Nut.
4. Remove the one ★ Nut for EXT SP Jack.
5. Carefully remove P.C.B. from chassis.

Caution: Some wires are attached to Front Panel.

Removal of Power Supply P.C.B.

1. Remove (4) screws marked ↯
2. Carefully remove P.C.B. from chassis.

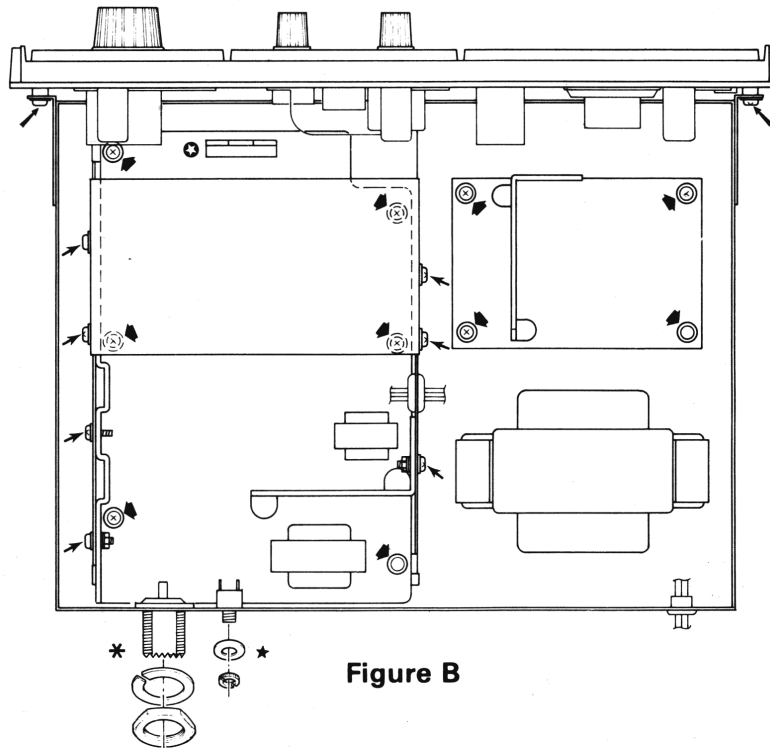
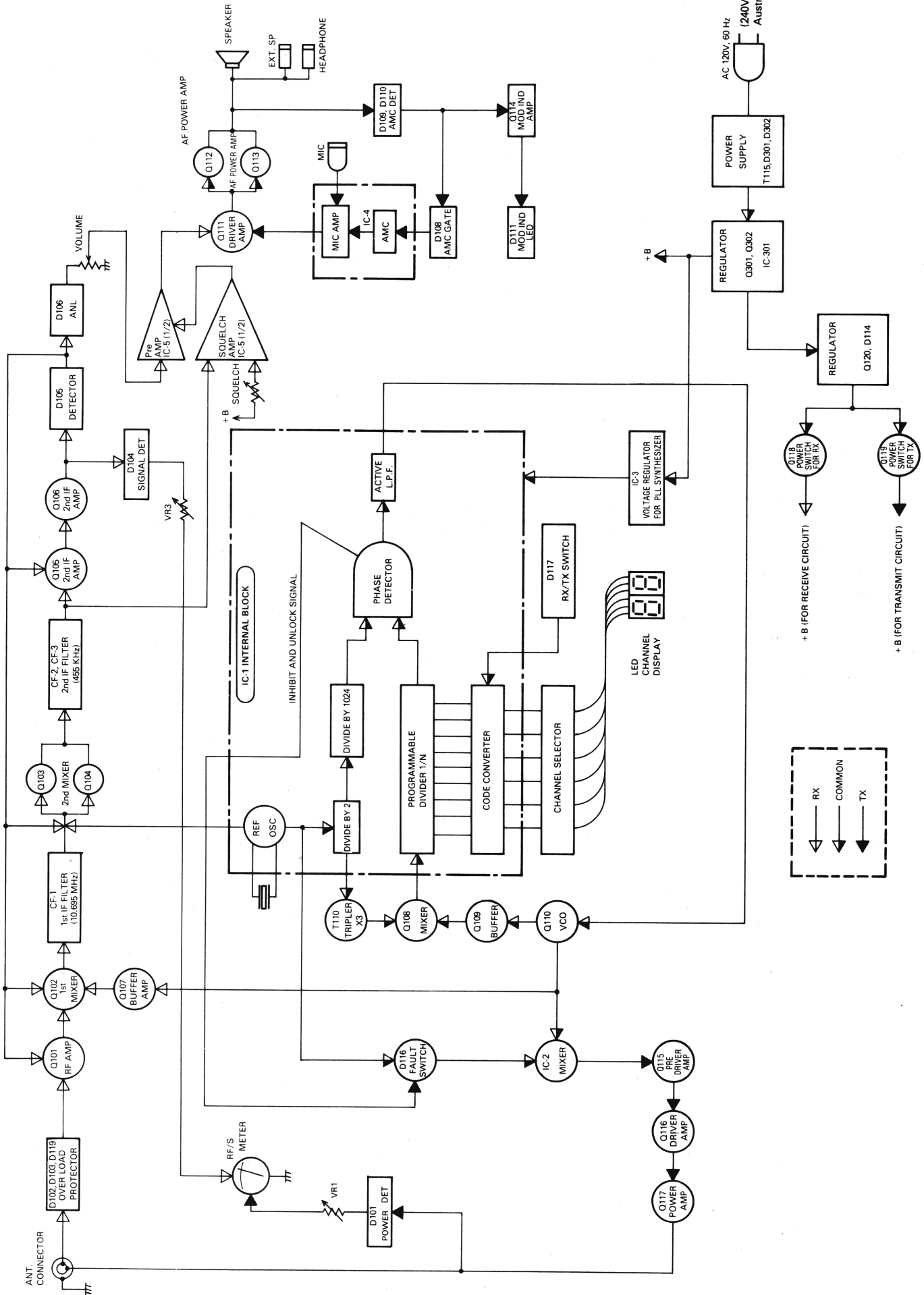
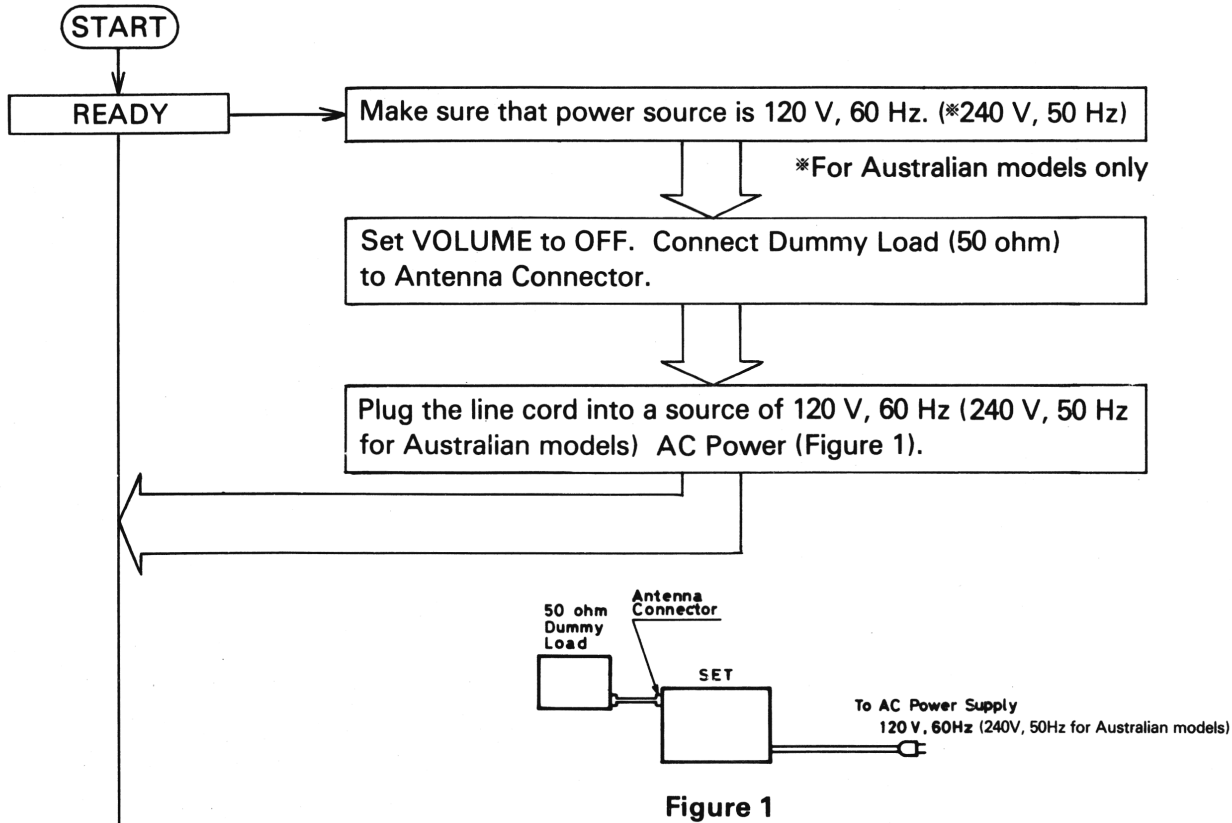


Figure B

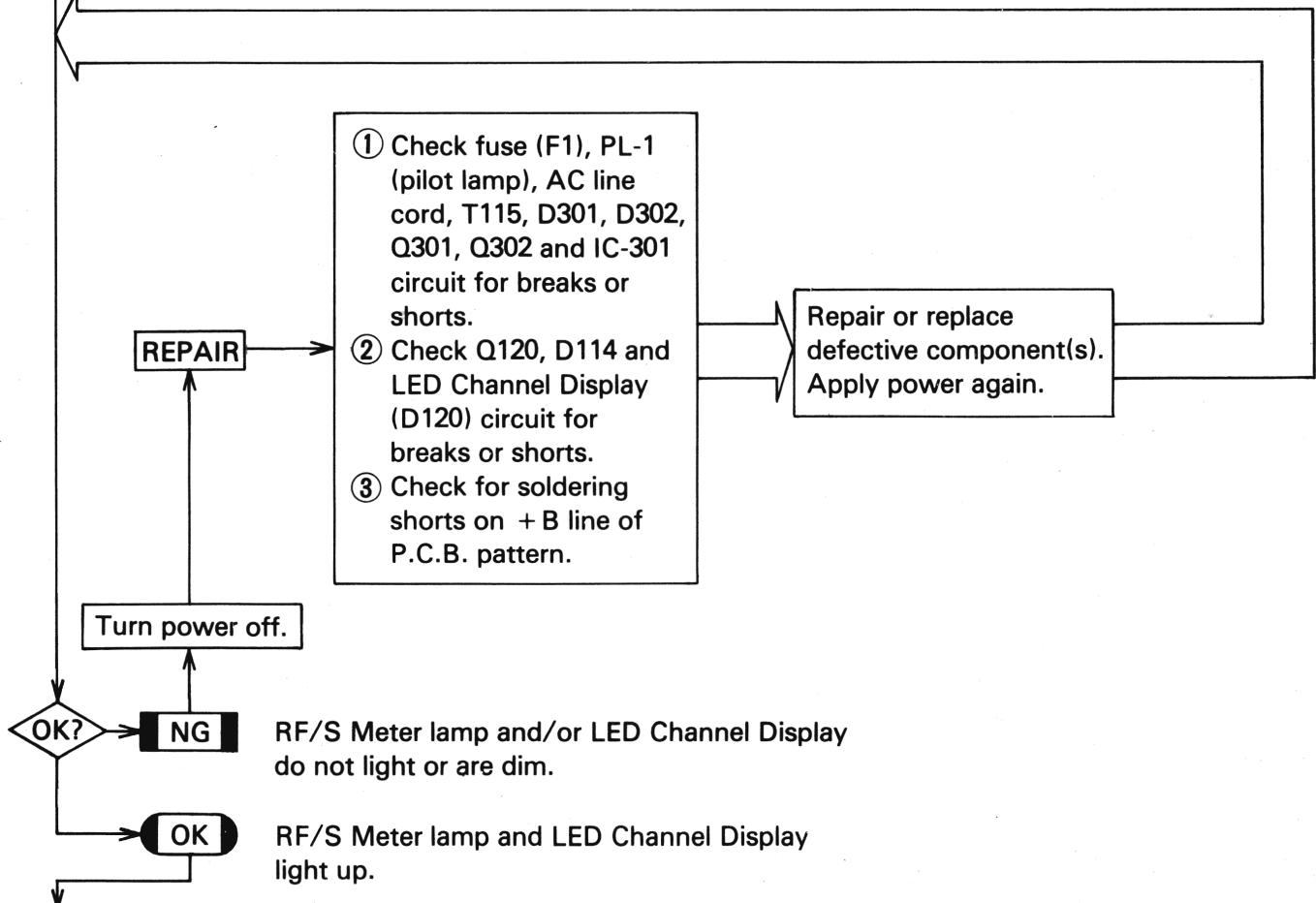
3. BLOCK DIAGRAM



4. CHECK OF POWER SUPPLY CIRCUIT

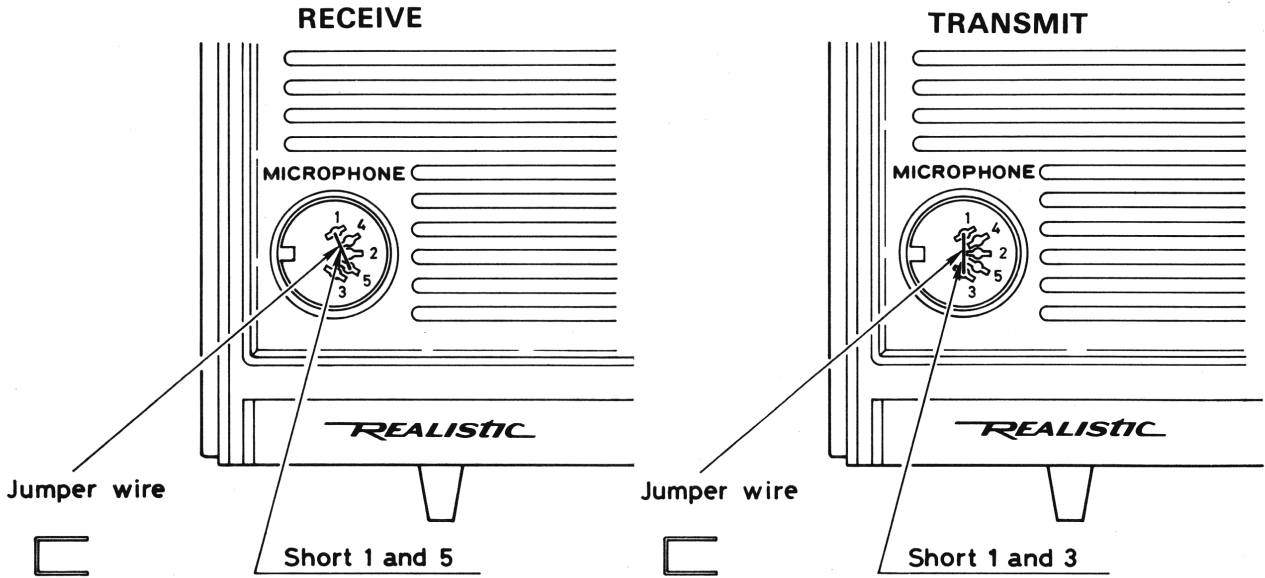
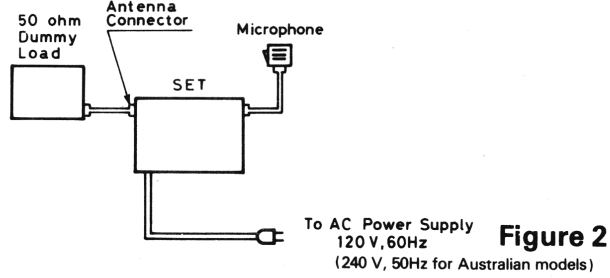


STEP 1 Turn power "ON" by rotating VOLUME clockwise (level setting is optional). Check if the RF/S Meter lamp and LED Channel Display come "ON".



CONNECTION

Same as Figure 1 and connect the Microphone to Mic connector on set (see Figure 2). If you are not using a Microphone, refer to Figure 3.



STEP 2

Check DC Bias Voltage of Q301 and Q120 with no signal (refer to Table 1).

Control Setting: VOLUME (minimum)
SQUELCH (fully counterclockwise)
RECEIVE or TRANSMIT mode

REFERENCE

DC Bias Voltage of Q120 and Q301

	Q120			Q301		
	E (V)	C (V)	B (V)	E (V)	C (V)	B (V)
RECEIVE (NO SIGNAL)	8.1	13.6	8.8	13.6	19.7	14.2
TRANSMIT (NO MOD)	8.1	13.4	8.8	13.4	17.5	14.2

Table 1

REPAIR

Check the power regulator circuit (D301, D302, IC-301, Q301, Q302, Q120) for breaks or shorts. Repair or replace defective component(s).

NG

DC Bias Voltages of Q120 and Q301 are not per Table 1.

OK

DC Bias Voltages of Q120 and Q301 are per Table 1.

END

Proceed to the next section.

5. AF OPERATION CHECK BEFORE ALIGNMENT

START
CONNECTION

Same as Figure 2 and connect Audio Generator and V.T.V.M. through Electrolytic Capacitor ($1\mu\text{F}/16\text{V}$) to base of Q111. Connect Oscilloscope and V.T.V.M. to EXT. Speaker Jack across 8 ohm Dummy Load (see Figure 4).

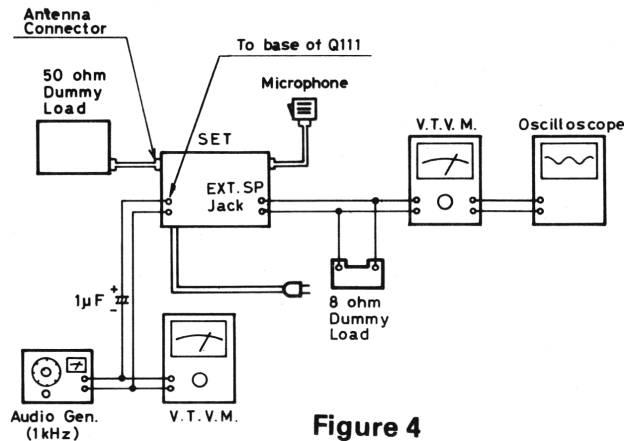


Figure 4

STEP 1

Check AF Output Power with 10 mV Input (must be above 500 mW)
Control Setting: VOLUME (maximum)
SQUELCH (fully counterclockwise)
Channel (optional)
RECEIVE mode

REFERENCE

AF Output Power is 600 mW – 700 mW.

REPAIR

Check Q111, Q112 and Q113 circuit.
Repair or replace defective component(s).

OK?

NG

AF Output Power is below 500 mW.

OK

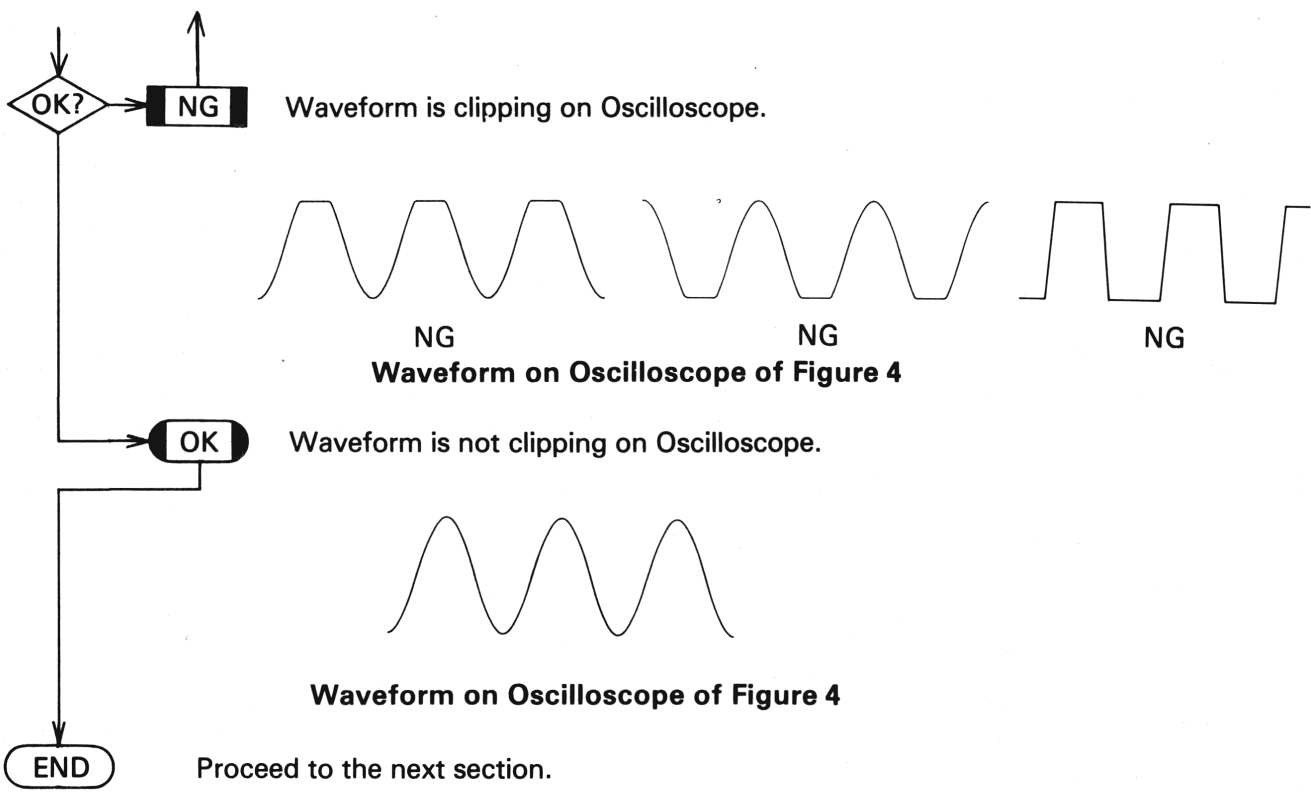
AF Output Power is above 500 mW.

STEP 2

Make sure waveform on Scope shows no clipping.

REPAIR

Check the bias voltage of Q111, Q112 and Q113. Repair or replace defective component(s).



6. PLL SYNTHESIZER OPERATION CHECK BEFORE ALIGNMENT

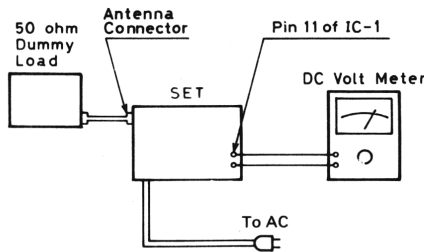
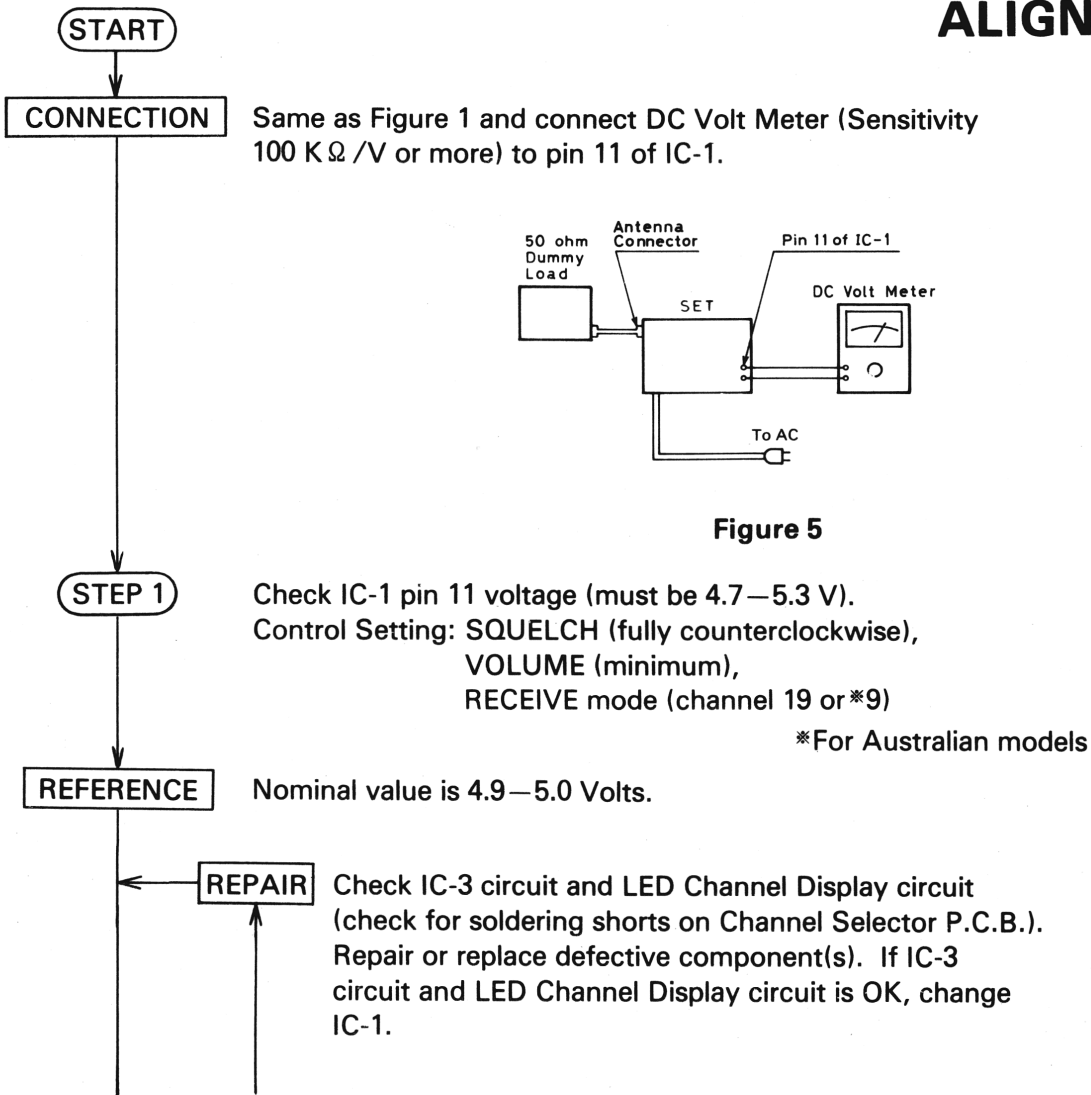
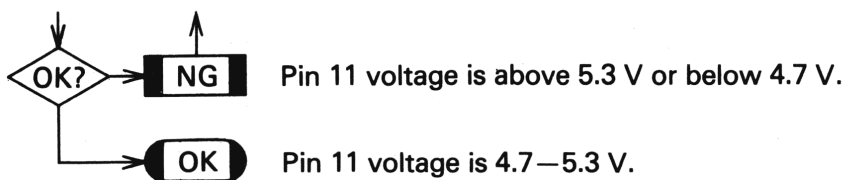


Figure 5



CONNECTION Same equipment connection as Figure 1 and connect Frequency Counter and Oscilloscope to pin 14 of IC-1.

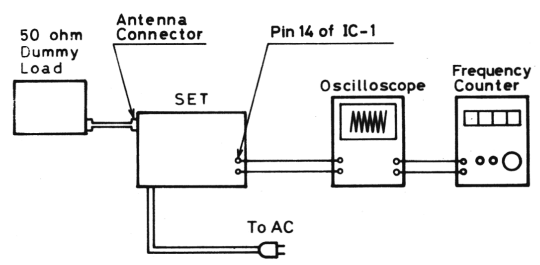
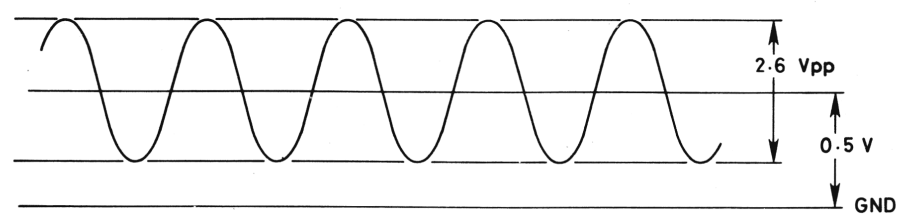


Figure 6

STEP 2 Check the Frequency at pin 14 of IC-1 (must be $10.240 \text{ MHz} \pm 50 \text{ Hz}$). Control Setting: Same as STEP 1.

REFERENCE Nominal Frequency is 10.240 MHz. Waveform is shown below.



Waveform on Oscilloscope of Figure 6

- REPAIR**
- ① If frequency (fr) is not $10.240 \text{ MHz} \pm 50 \text{ Hz}$, readjust CT. If "fr" is still not remain $10.240 \text{ MHz} \pm 50 \text{ Hz}$, replace crystal and readjust CT.
 - ② If oscillation level is very weak or oscillator stops, replace IC-1.

OK? **NG** The frequency at pin 14 on IC-1 is not $10.240 \text{ MHz} \pm 50 \text{ Hz}$ and/or waveform is NG.

OK The frequency at pin 14 on IC-1 is $10.240 \text{ MHz} \pm 50 \text{ Hz}$ and waveform is OK.

CONNECTION Same as Figure 1 and connect DC Volt Meter to R179/C157.

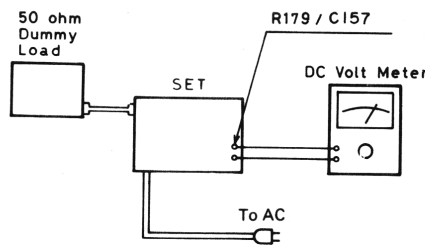


Figure 7

STEP 3

Check DC Output Voltage of PLL Low Pass Filter (Vd).
Control Setting: SQUELCH (fully counterclockwise),
VOLUME (minimum), Receive or Transmit
mode (See Figure 3).

REFERENCE

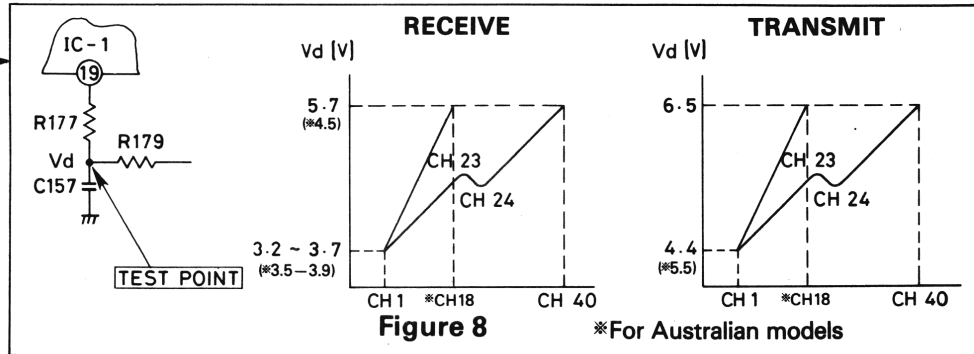


Figure 8

*For Australian models

Check VCO circuit (bias voltage of Q110, D118, C157, T111 and D117 and for soldering shorts). Repair or replace the defective component(s).

NG

OK

In Receive mode channel 1, make sure that Vd is 3.2–3.7 (*3.5–3.9) Volts.

OK

REPAIR

In transmit mode Channel 40 (*Channel 18), readjust T111 to obtain 6.5 Volt reading on Voltmeter. Can you adjust to 6.5 Volt?

NG

*For Australian models

OK?

NG

DC Output Voltage of PLL Low Pass Filter (Vd) is NG. (Tx: 40 CH (*18 CH) is not 6.5 V, Rx: 1 CH is above 3.7 V (*3.9V) or below 3.2V (*3.5V). *For Australian models

OK

DC Output Voltage of PLL Low Pass Filter (Vd) is OK. [Tx: 40 CH (*18 CH) is 6.5 V, Rx: 1 CH is 3.2–3.7 V (*3.5–3.9V)]

CONNECTION

Same equipment as Figure 7 and connect Frequency Counter and Oscilloscope to C190/C191.

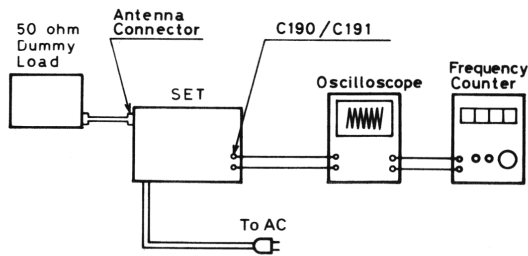


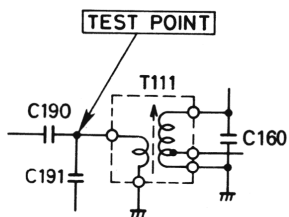
Figure 9

STEP 4

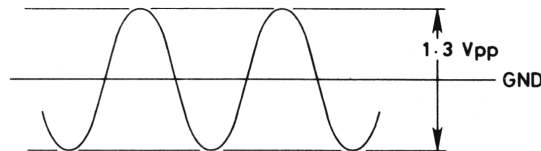
Check frequency of VCO oscillator. (See FREQUENCIES GENERATED AND MIXED TO OBTAIN EACH CHANNEL)

Control Settings: Same as step 3.

REFERENCE



Rx: 16.270–16.710 MHz (*16.320–16.530 MHz)
Tx: 16.725–17.165 MHz (*16.775–16.985 MHz)



(*For Australian models)

Waveform of TEST POINT
Figure 10

- ① Recheck the reference frequency (STEP 2).
- ② Recheck the VCO controlled voltage (STEP 3).
- ③ Check the VCO circuit and D117. Repair or replace defective component(s).

REPAIR

OK?

NG

VCO-Frequency is NG.

OK

VCO Frequency is OK.

CONNECTION

Same Equipment Connection as Figure 9 and connect Frequency Counter, Oscilloscope and RF V.T.V.M. to pin 22 of IC-1.

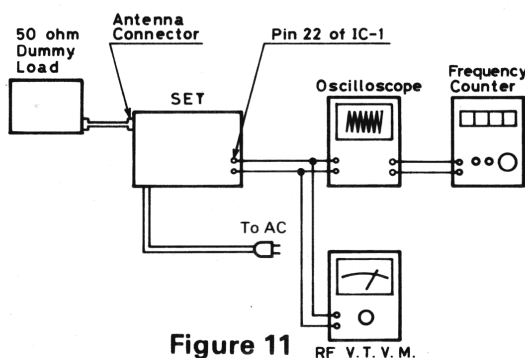


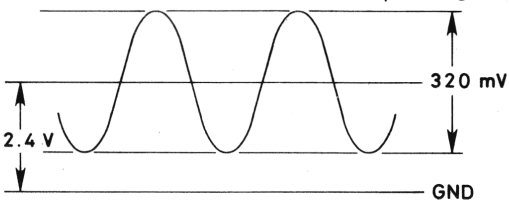
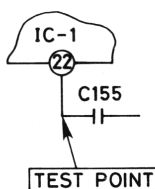
Figure 11
RF V.T.V.M.

STEP 5

Check the frequency at IC-1 pin 22.

Rx: 0.91–1.35 MHz (*0.96–1.17 MHz)

Tx: 1.365–1.805 MHz (*1.415–1.625 MHz)



*For Australian models

Waveform of TEST POINT
Figure 12

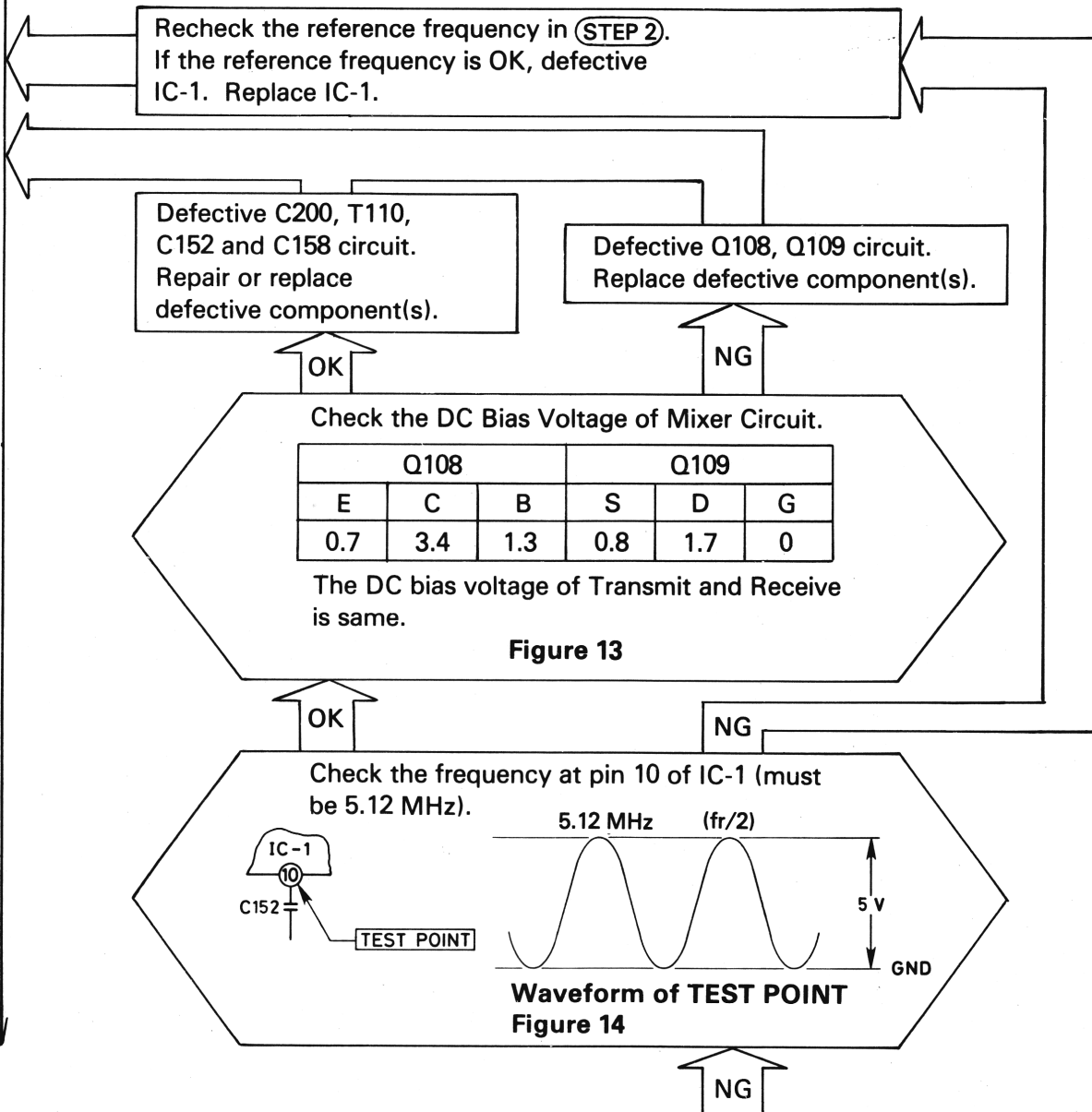
Table of Frequency (pin 22 of IC-1)

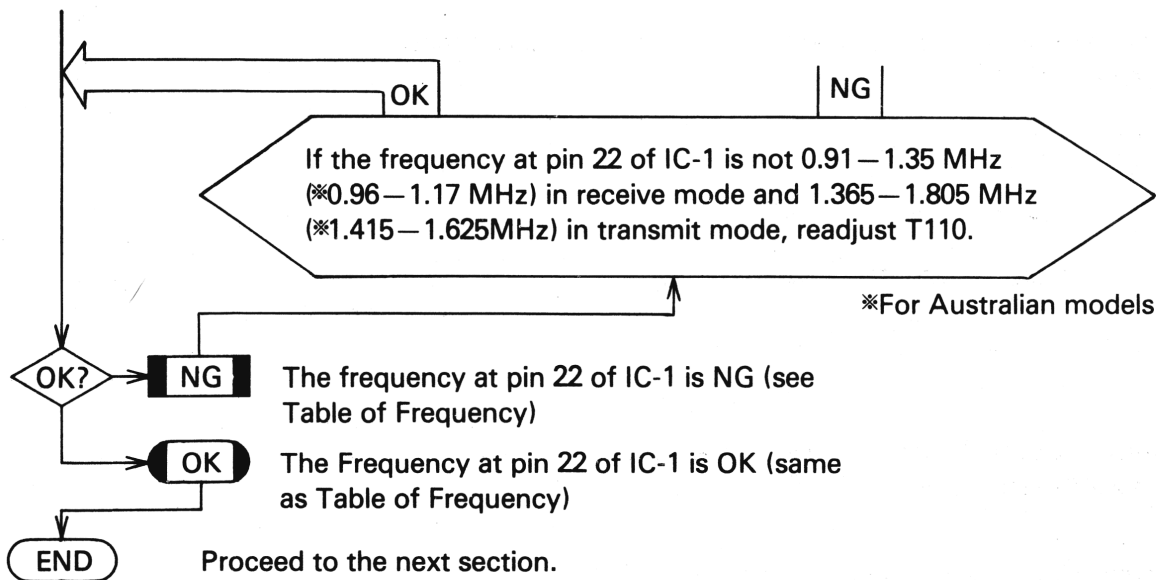
For USA & Canadian models

CHANNEL	RECEIVE (MHz)	TRANSMIT (MHz)	CHANNEL	RECEIVE (MHz)	TRANSMIT (MHz)
1	0.91	1.365	21	1.16	1.615
2	0.92	1.375	22	1.17	1.625
3	0.93	1.385	23	1.20	1.655
4	0.95	1.405	24	1.18	1.635
5	0.96	1.415	25	1.19	1.645
6	0.97	1.425	26	1.21	1.665
7	0.98	1.435	27	1.22	1.675
8	1.00	1.455	28	1.23	1.685
9	1.01	1.465	29	1.24	1.695
10	1.02	1.475	30	1.25	1.705
11	1.03	1.485	31	1.26	1.715
12	1.05	1.505	32	1.27	1.725
13	1.06	1.515	33	1.28	1.735
14	1.07	1.525	34	1.29	1.745
15	1.08	1.535	35	1.30	1.755
16	1.10	1.555	36	1.31	1.765
17	1.11	1.565	37	1.32	1.775
18	1.12	1.575	38	1.33	1.785
19	1.13	1.585	39	1.34	1.795
20	1.15	1.605	40	1.35	1.805

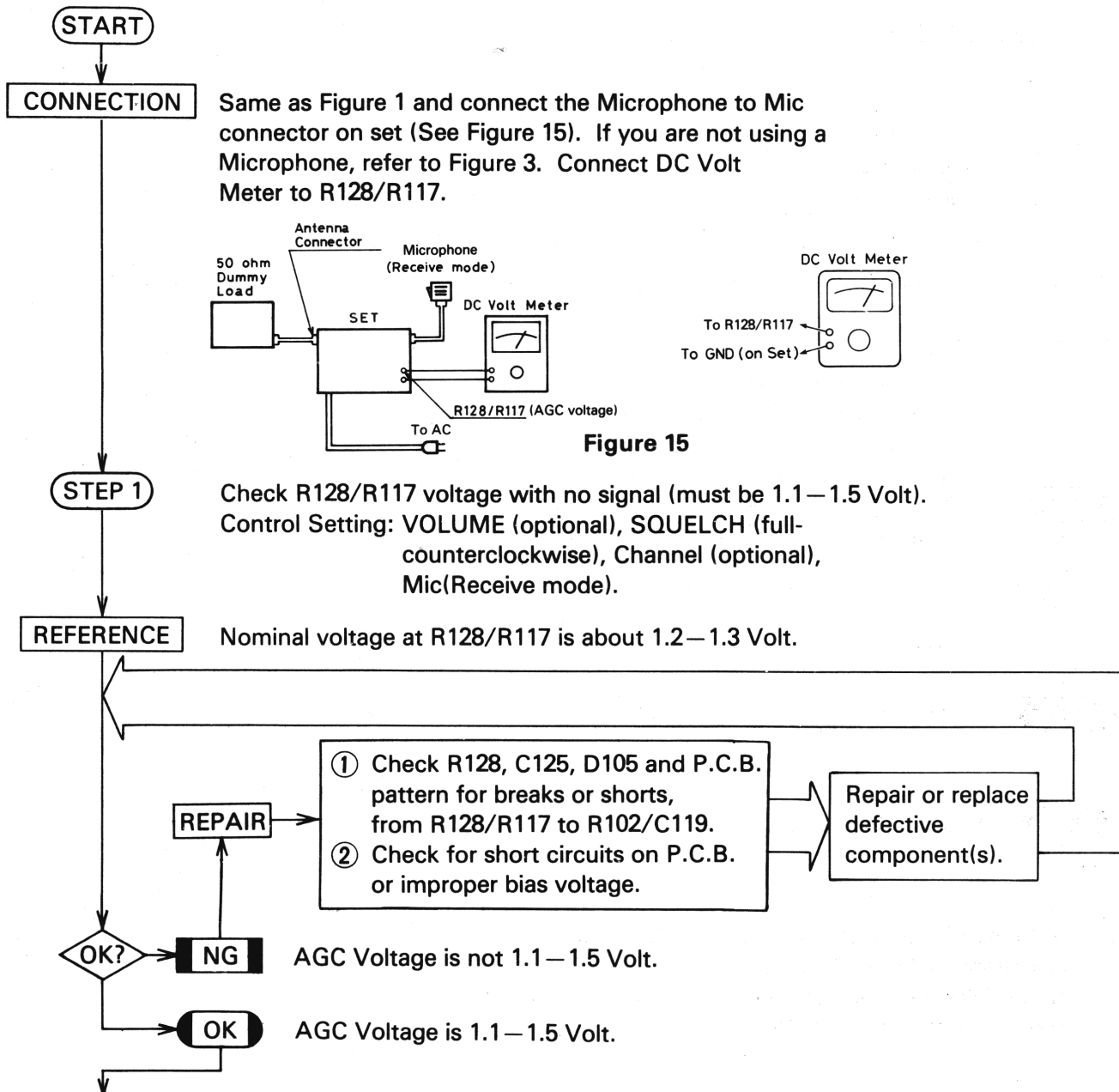
For Australian models

CHANNEL	RECEIVE (MHz)	TRANSMIT (MHz)
1	0.96	1.415
2	0.97	1.425
3	0.98	1.435
4	1.00	1.455
5	1.01	1.465
6	1.03	1.485
7	1.04	1.495
8	1.05	1.505
9	1.06	1.515
10	1.07	1.525
11	1.08	1.535
12	1.10	1.555
13	1.11	1.565
14	1.12	1.575
15	1.13	1.585
16	1.14	1.595
17	1.15	1.605
18	1.17	1.625





7. IF OPERATION CHECK BEFORE ALIGNMENT



CONNECTION

Same as Figure 15 and connect RF V.T.V.M. (or Oscilloscope) to base of Q102.

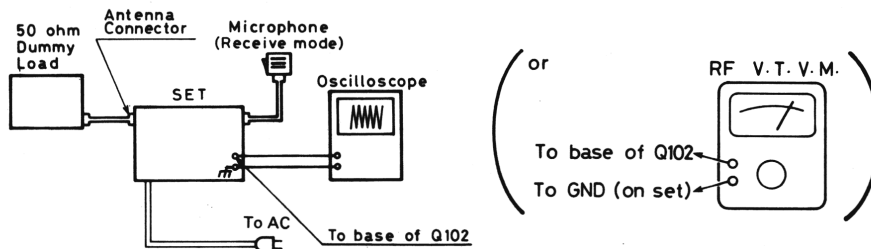


Figure 16

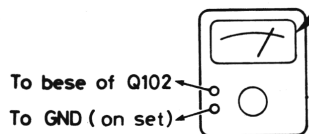
STEP 2

Check 1st Local Oscillator level at base of Q102.
Control Setting: Same as STEP 1.

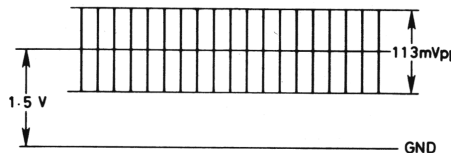
REFERENCE

Nominal 1st Local Oscillator level is about 40 mV (or 113 mVpp).
1st Local Oscillator frequency is the same as VCO frequency in receive mode (See FREQUENCIES GENERATED AND MIXED TO OBTAIN EACH CHANNEL).

About 40 mV indication on RF V.T.V.M.



RF V.T.V.M. of Figure 16



Waveform on Oscilloscope of Figure 16

REPAIR

- ① Readjust T109.
- ② If 1st Local Oscillator level is still not $40\text{ mV} \pm 10\text{ mV}$ (or $113\text{ mVpp} \pm 28\text{ mVpp}$), check Q102, T109, Q107 and T111.
- ③ If 1st Local Oscillator frequency is NG, repeat steps of PLL SYNTHESIZER OPERATION CHECK BEFORE ALIGNMENT.

Repair or replace defective component(s).

OK?

NG

1st Local Oscillator level is not $40\text{ mV} \pm 10\text{ mV}$ (or $113\text{ mVpp} \pm 28\text{ mVpp}$).

OK

1st Local Oscillator level is $40\text{ mV} \pm 10\text{ mV}$ (or $113\text{ mVpp} \pm 28\text{ mVpp}$).

CONNECTION

Same as Figure 15 and connect RF SG through $0.01\ \mu\text{F}$ Capacitor (Mylar or Ceramic) to the center-tap of T103 on set. Connect Oscilloscope through $0.01\ \mu\text{F}$ Capacitor (Mylar or Ceramic) to D105/R128 on set.

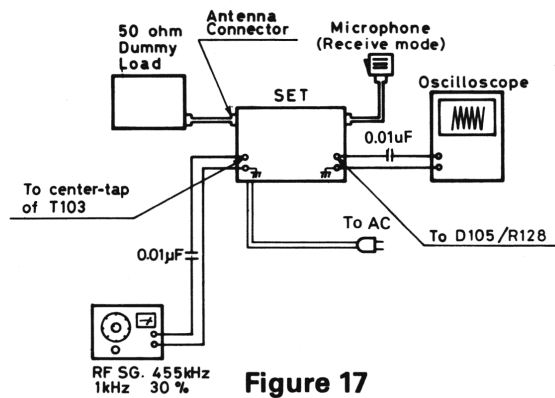


Figure 17

STEP 3

Decrease level of RF Generator to the point where you just obtain an output indication on the Scope (use maximum Scope gain if necessary and use least possible RF input level).

STEP 4

Using non-metallic tuning tool, adjust T104, T105 and T106 for maximum output (if necessary, reduce the input level of the RF Generator so you just obtain a usable output indication).

STEP 5

As you adjust the I.F. Transformers, note the scope waveform.

REPAIR

Check the IFT or IFT Circuit.

OK?

NG

Waveform does not vary smoothly.

OK

Waveform varies smoothly.

STEP 6

While adjusting the I.F. Transformers, check for spurious oscillations on the Scope waveform.

REPAIR

Check the IFT circuit.

OK?

NG

There are some oscillations on the waveform.

OK

Waveform is clean and no oscillations are present.



Oscilloscope Waveform (Figure 17)



Oscilloscope Waveform (Figure 17)

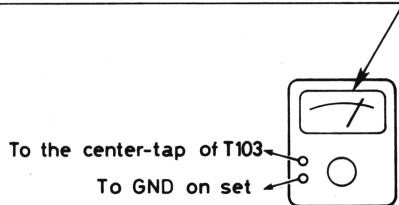
STEP 7

Check 2nd Local Oscillator level at center-tap of T103.

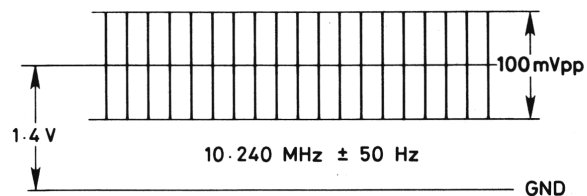
REFERENCE

Nominal 2nd Local Oscillator level is about 35 mV (or 100 mVpp).

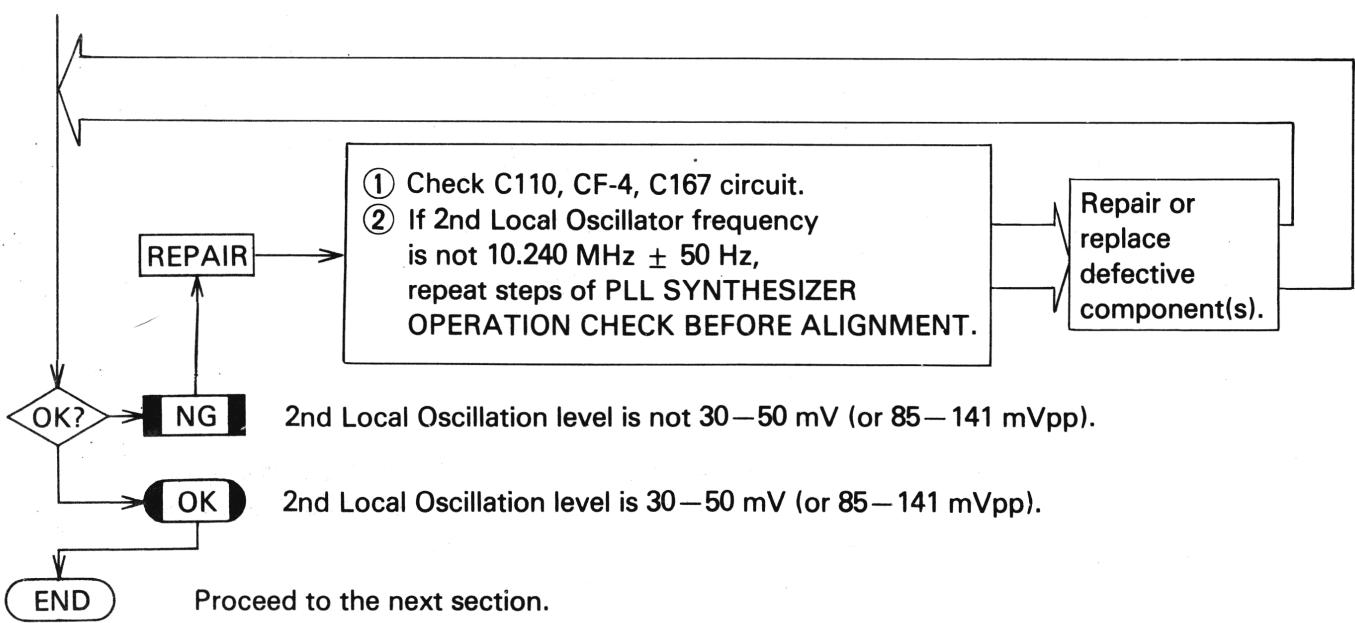
About 30 mV indication on RF V.T.V.M.



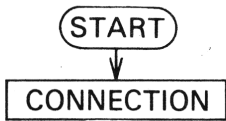
RF V.T.V.M. of Figure 17



Waveform on Oscilloscope of Figure 17



8. CHECKING A.M.C. (Automatic Modulation Control)



Connect Dummy Load through RF Power Meter to Coupler. Connect Oscilloscope through Coupler to ANT. Connector on set. Connect AF Generator through Decade Attenuator to Pin 4 and Pin 1 on Mic Connector across V.T.V.M.

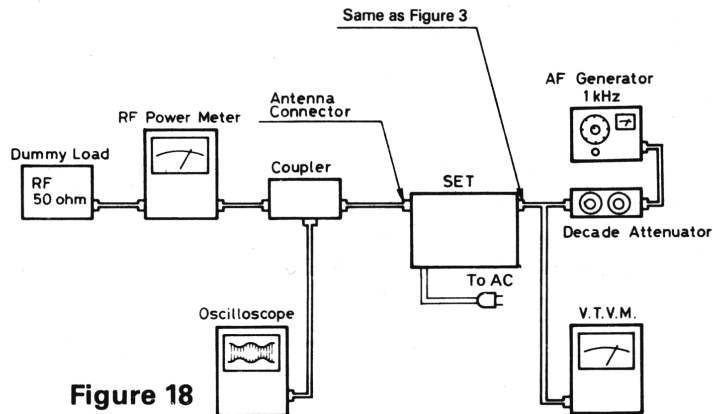
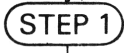


Figure 18

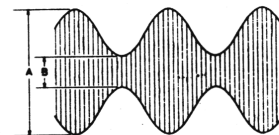


Adjust AF Generator (1 kHz) and Decade Attenuator, so the waveform on oscilloscope shows 50 % modulation. (Should be around 0.8 mV at Pin 4 Input.)

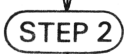
[Calculation of Modulation Degree]

$$MD = \frac{A - B}{A + B} \times 100$$

MD (%): Modulation Degree



Modulation Waveform



Increase Input level (Pin 4 on Mic Connector) gradually and check level at which AMC turns "ON".

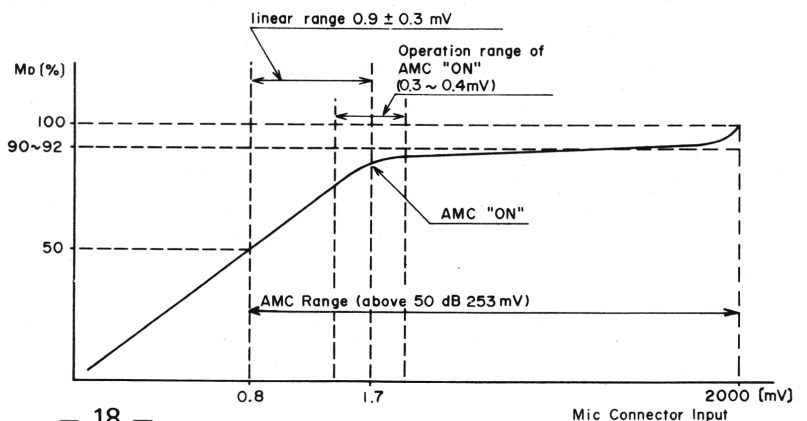


Figure 19

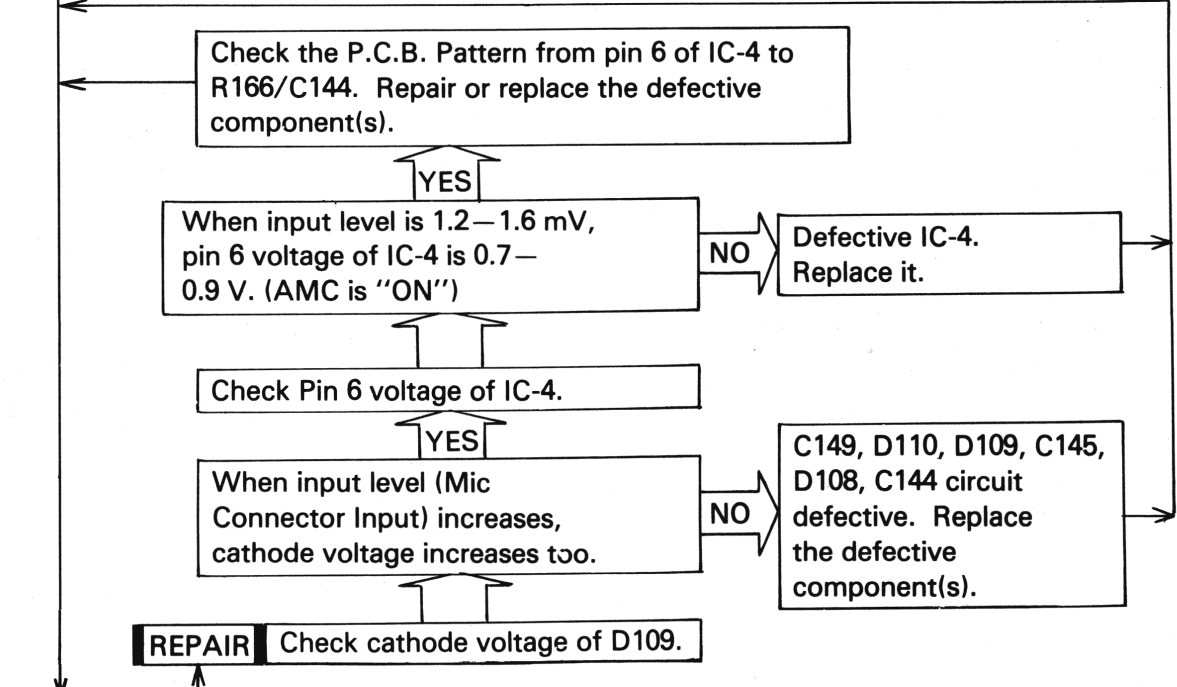
REFERENCE Nominally AMC will turn "ON" with 0.9 ± 0.3 mV increase in input level (from 50% modulation input level). And Nominal AMC Range is about 68 dB (2V).

[Calculation of AMC Range]

$$\text{AMC Range} = 20 \log \frac{\text{Input of 100 \% Modulation}}{\text{Input of 50 \% Modulation}}$$

= about 68 dB (must be above 50 dB)

Input for 50 % Modulation must be below 1 mV Input.



AMC will turn "ON" with input increase of less than 0.9 ± 0.3 mV or greater than 0.9 ± 0.3 mV (from 50% modulation input level). AMC Range is less than 50 dB. (See Figure 20)

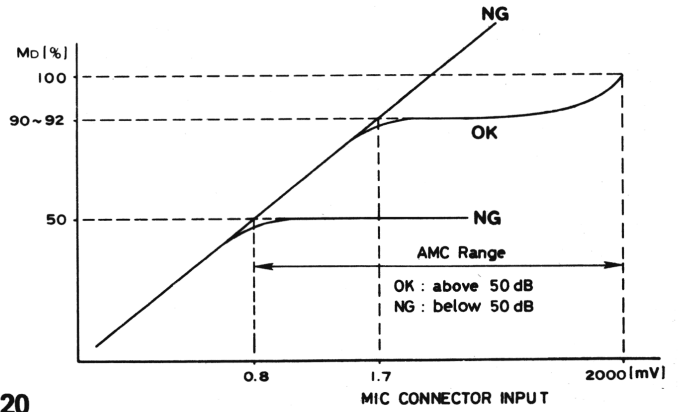
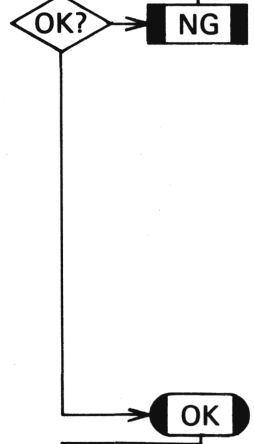
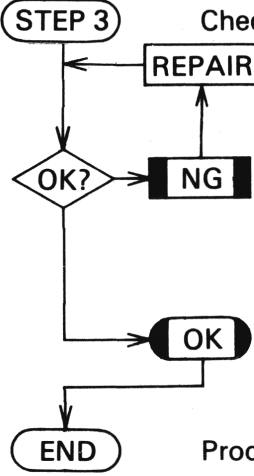


Figure 20



AMC turns "ON" with input increase of 0.9 ± 0.3 mV and AMC Range is above 50 dB.



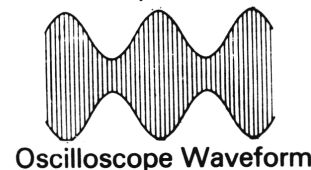
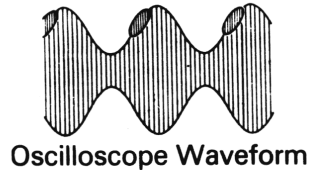
Check for spurious oscillation on the scope waveform.

REPAIR Readjust L107, L104 or change R200 to larger value (within the range shown in Parts List). Be sure RF Output Power does not exceed 4.0 W.

NG There are some oscillations on the waveform.

OK Waveform is clean and no oscillations are present.

Proceed to Alignment



9. ALIGNMENT INSTRUCTIONS

A. PLL SECTION

1. Test Equipment Required

- a. Frequency Counter
- b. RF V.T.V.M.
- d. DC Volt Meter (above 100 K Ω /V)

NOTE: Figure 21 provides test point and alignment location information.

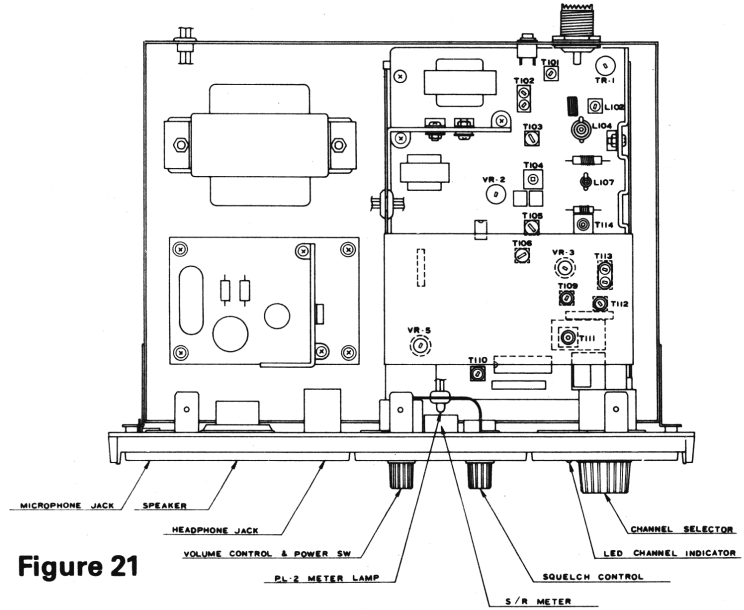


Figure 21

2. Alignment Procedure

STEP	CONTROL SETTING	OUTPUT INDICATOR CONNECTION	ADJUST	ADJUST FOR
1	MIC: Receive POWER: "on" VOLUME: Optional SQUELCH: Optional Channel Selector: Optional	Connect Frequency Counter to CF-4/R174 (Figure 22)	CT-1	Alignment of REF OSC Adjust for 10.240 MHz \pm 50 Hz indication on Frequency Counter.
2	MIC: Transmit POWER: "on" VOLUME: Optional SQUELCH: Optional Channel Selector: Channel 40 (*Channel 18)	Connect DC Volt Meter to R177/R179. Connect Frequency Counter to Drain of Q109. (Figure 23)	T111	Alignment of VCO Adjust for 6.5 Volt indication on DC Volt Meter.
3	MIC: Receive POWER: "on" VOLUME: Optional SQUELCH: Optional Channel Selector: Channel 1	Same as step 2		Check for indication on DC Volt Meter (must be 3.2–3.7 Volt or *3.5–3.9 Volt). If DC Volt Meter does not indicate 3.2–3.7 (*3.5–3.9 Volt) Volt, readjust T111; then return to step 2.
4	Same as step 1.	Connect RF V.T.V.M. to pin 22 of IC-1. (Figure 24)	T110	Alignment of Tripler Coil Adjust for maximum indication on RF V.T.V.M.

*For Australian models

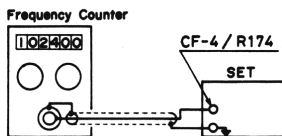


Figure 22

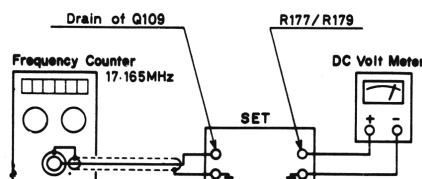


Figure 23

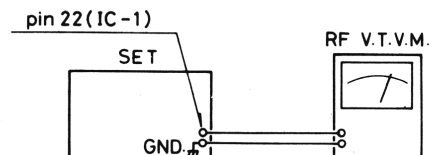


Figure 24

B. RECEIVER SECTION

NOTE: Figure 21 provides alignment location information.

1. Test Equipment Required

- a. RF Signal Generator
- b. V.T.V.M.
- c. Oscilloscope
- d. RF V.T.V.M.
- e. Distortion Meter

2. General Alignment Conditions

1. Signal input must be kept as low as possible, to avoid overload and clipping.
(Use highest possible sensitivity of output indicator.)
2. Standard modulation is 1000 Hz at 30% amplitude.
3. A non-metallic alignment tool must be used for all adjustments.

3. Alignment Procedure

STEP	SIGNAL SOURCE CONNECTION	OUTPUT INDICATOR CONNECTION	SET SIGNAL	ADJUST	ADJUST FOR
1	Set Channel Selector to Channel 19 (*Channel 9).				
2	Turn VR-6 (SQUELCH) fully counterclockwise.				
3	Turn VR-4 (VOLUME) fully clockwise.				
4	Connect RF Signal Gen. to center-tap of T103 through 0.01 μ F Capacitor.	Connect V.T.V.M. across EXT. Speaker Jack with 8 Ω load. (Figure 25)	455 kHz 1 kHz 30 % Modulation. Adjust output of RF Signal Generator to a minimum level to avoid saturation of IF circuit.	T104	Alignment of 2nd IF Set VR-2 to center. Adjust for maximum output.
5				T105	
6				T106	
7	Set Channel Selector to Channel 20 (*Channel 9).				
8		Connect RF V.T.V.M. to base of Q102 (Figure 26)		T109,	Alignment of 1st Local OSC Adjust for maximum output. (reference 40 mV)

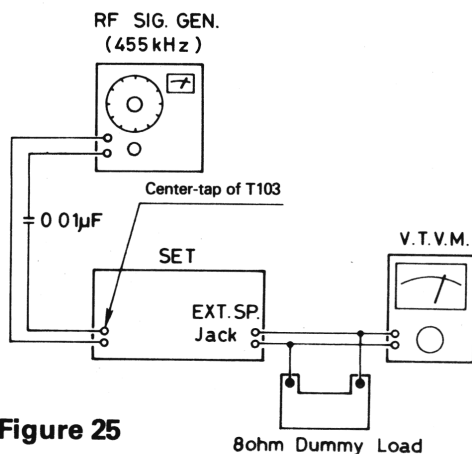


Figure 25

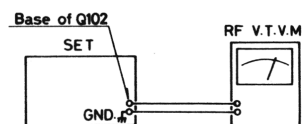


Figure 26

*For Australian models

STEP	SIGNAL SOURCE CONNECTION	OUTPUT INDICATOR CONNECTION	SET SIGNAL	ADJUST	ADJUST FOR
9	Connect RF Signal Generator to Antenna Connector.	Connect V.T.V.M. and Distortion Meter across EXT. Speaker Jack with 8 Ω load. (Figure 27)	27.205 MHz (*27.115 MHz) 1 kHz, 30 % Mod.	T101	Overall Alignment Adjust for maximum indication on V.T.V.M. Also, reduce output of RF SG to maintain audio output of 500 mW (2 V).
10				T102	
11				T103	
12				T104	
13				T105	
Repeat steps 9 to 13 as necessary to obtain maximum output.					
15	Same as step 9	Same as step 9	27.205 MHz, (*27.115 MHz) 1 kHz, 30 % Mod. Set Output of RF SG to 1 mV.	T106	Alignment of T106 Adjust for minimum indication on Distortion Meter.
16	Same as step 9	Same as step 9	27.205 MHz (*27.115 MHz) 1 kHz, 30 % Mod. Set output of RF SG to 0.3 μ V.	VR2	Adjustment of IF Gain Adjust for 2V indication on V.T.V.M.
17	Same as step 9	Same as step 9	27.205 MHz (*27.115 MHz) 1 kHz, 30% Mod. Set Output of RF SG to 500 μ V,	VR5	Adjustment of SQUELCH Turn VR6 (SQUELCH) fully-clockwise. Adjust VR-5 so squelch just opens/closes with 500 μ V input.
18	Same as step 9	Same as step 9	27.205 MHz (*27.115 MHz) 1 kHz, 30 % Mod. Set Output of RF SG to 100 μ V.	VR3	Adjustment of S-Meter Adjust for S-9 indication on S/RF Meter.

*For Australian models

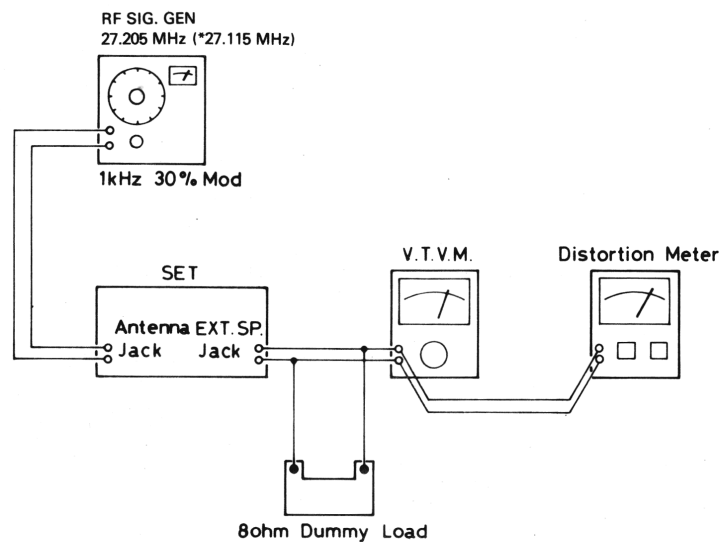


Figure 27

C. TRANSMITTER SECTION

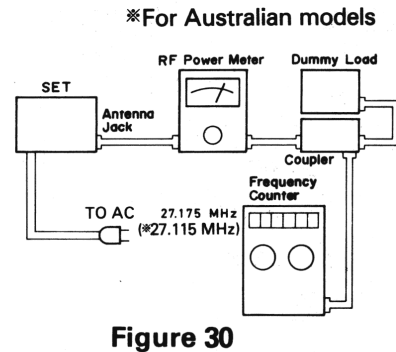
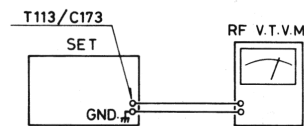
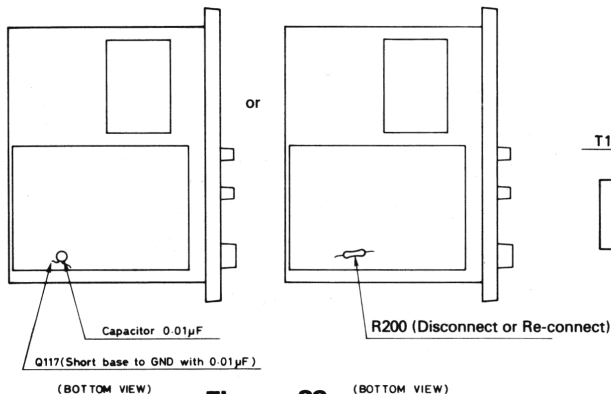
1. Test Equipment Required

- a. RF Output Power Meter
- b. 50 Ohm Load (non-inductive)
- c. RF Attenuator
- d. Oscilloscope
- e. Audio Generator
- f. Field Strength Meter (or Spectrum Analyzer)
- g. Frequency Counter
- h. Coupler

NOTE: Figure 21 provides test point and alignment location information.

2. Alignment Procedure

STEP	SIGNAL SOURCE CONNECTION	OUTPUT INDICATOR CONNECTION	ADJUST	ADJUST FOR
1	Set Channel Selector to Channel 18 (*Channel 9).			
2	Disconnect R200 (or short base of Q117 to ground with 0.01 μ F). (Figure 28)			
3		Connect RF V.T.V.M. to T113/C173 (Figure 29)	T112	Alignment of Pre-driver Stages
4			T113	Adjust for maximum indication on RF V.T.V.M.
5	Make sure that the differential level of Channel 1 and Channel 40 (*18) is below 20 mV on RF V.T.V.M. If the differential level is above 20 mV, repeat Steps 3 and 4 as necessary to obtain maximum output.			
6	Re-connect R200 (or remove shorting capacitor). (Figure 28)			
7		Connect Dummy Load and Frequency Counter through Coupler to RF Power Meter. Connect RF Power Meter to EXT. ANT. Jack on Set. (Figure 30)	T114	Alignment of Driver and Final Stages
8			L107	Adjust for maximum indication on RF Power Meter.
9			L104	
10	Repeat steps 7 through 9 as necessary to obtain maximum output.			
11		Connect Dummy Load and Frequency Counter through Coupler to RF Power Meter. Connect RF Power Meter to EXT. ANT. Jack on Set. (Figure 30)	Check that RF output power is 3.6 to 4.4 W on all channels with no modulation. If it is not within the above range, go back to steps 7 through 9 and readjust. If still improper, change R200 value (1-8.2 ohms).	

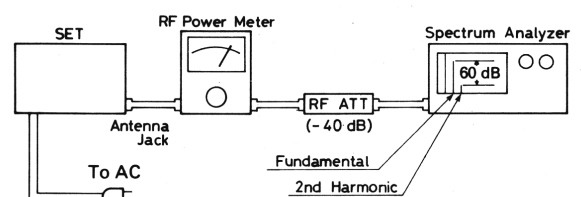
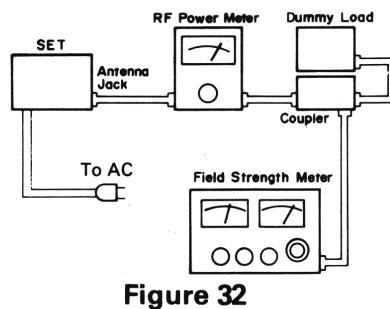
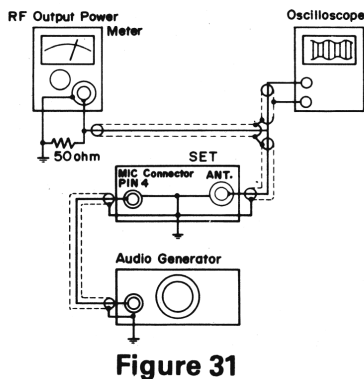


STEP	SIGNAL SOURCE CONNECTION	OUTPUT INDICATOR CONNECTION	ADJUST	ADJUST FOR
12	Audio Generator (1 kHz) across C147 or to Microphone Connector, pin 4. (Figure 31) Adjust audio signal level to obtain 80-100% modulation level.	Connect Dummy Load and Oscilloscope through Coupler to RF Power Meter. Connect RF Power Meter to EXT. ANT Jack on Set. (Figure 31)		Check scope pattern for proper modulation
*13		Connect Dummy Load and Field Strength Meter through Coupler to RF Power Meter. Connect RF Power Meter to EXT. ANT Jack on set. (Figure 32) Tune to 2nd harmonic frequency (54.35 MHz or *54.23 MHz) on Field Strength Meter.	L102	Alignment of 2nd harmonic frequency Adjust for min. (54.35 MHz or *54.23 MHz) indication on Field Strength Meter.
14	Check level of fundamental and 2nd harmonic frequency (54.35 MHz or *54.23 MHz).			
15	Check suppression of 2nd harmonic frequency (54.35 MHz or *54.23 MHz) compared to fundamental (must be better than -60 dB).			
16	Check all Channels and if necessary, repeat steps 13 through 15 to obtain more than -60 dB on all channels with no modulation.			
17	(Return to Channel 19. *9)	Same as step 11.		Alignment of transmitter Frequency Make sure that the transmitter frequency is 27.185 MHz (*27.115 MHz) \pm 100 Hz (on Frequency Counter). If the transmitter frequency is not 27.185 MHz (*27.115 MHz) \pm 100 Hz, readjust CT.
18		Same as step 11.	VR1	Adjustment of RF Meter Adjust for 4 W Indication on RF Meter.

* : If you have a Spectrum Analyzer, you can obtain more precise readings with it.

STEP	SIGNAL SOURCE CONNECTION	OUTPUT INDICATOR CONNECTION	ADJUST	ADJUST FOR
A		Connect Spectrum Analyzer and RF Attenuator through RF Power Meter. Connect RF Power Meter to EXT. ANT Jack on Set. (Figure 33)	L102	Adjust for min (54.35 MHz or *54.23 MHz) indication on Spectrum Analyzer.
B	Go to step 14			

*For Australian models



10. FREQUENCIES GENERATED AND MIXED TO OBTAIN EACH CHANNEL

RECEIVE

• VCO FREQUENCY = $[(N/2048 + 1.5)] \times [\text{REFERENCE FREQUENCY (10.240 MHz)}]$

TRANSMIT

• VCO FREQUENCY = $[(N/2048 + 1.5)] \times [\text{REFERENCE FREQUENCY (10.240 MHz)}]$

• TRANSMIT FREQUENCY
= (VCO FREQUENCY) + [REFERENCE FREQUENCY (10.240 MHz)]

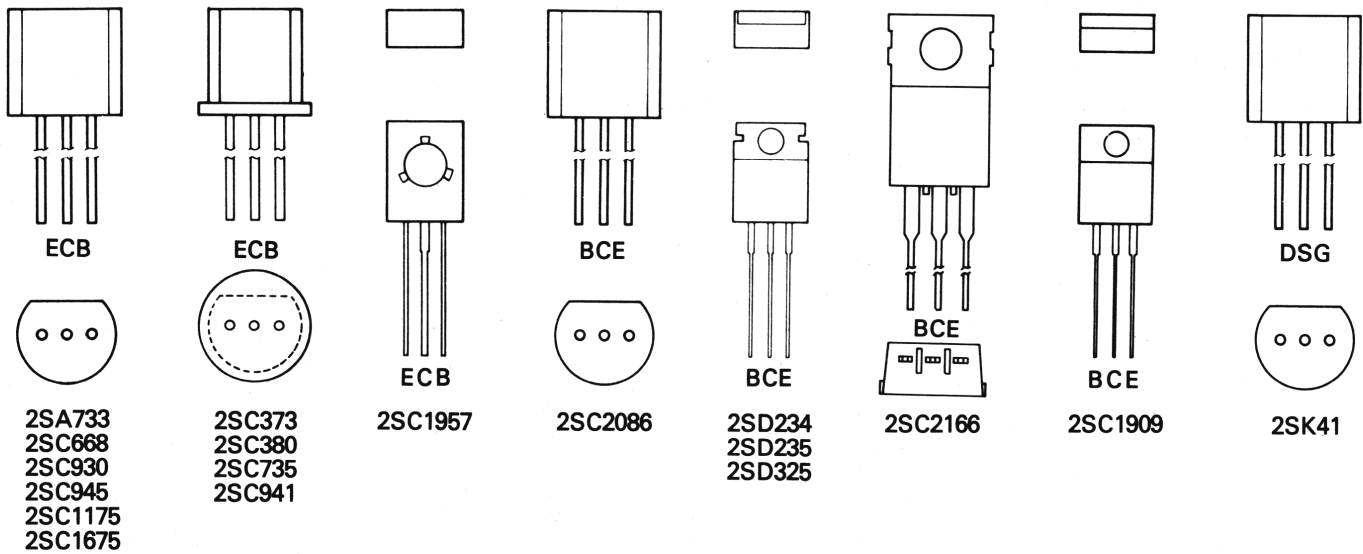
For USA & Canadian models

CHANNEL NUMBERS	BCD INPUT TO IC-1		RECEIVE		TRANSMIT		
	IC-1 PIN NUMBERS		N	VCO FREQUENCY (MHz)	N	VCO FREQUENCY (MHz)	TRANSMIT FREQUENCY (MHz)
	8 7 6 5	4 3 2 1					
1	0000	0001	182	16.270	273	16.725	26.965
2	0000	0010	184	16.280	275	16.735	26.975
3	0000	0011	186	16.290	277	16.745	26.985
4	0000	0100	190	16.310	281	16.765	27.005
5	0000	0101	192	16.320	283	16.775	27.015
6	0000	0110	194	16.330	285	16.785	27.025
7	0000	0111	196	16.340	287	16.795	27.035
8	0000	1000	200	16.360	291	16.815	27.055
9	0000	1001	202	16.370	293	16.825	27.065
10	0001	0000	204	16.380	295	16.835	27.075
11	0001	0001	206	16.390	297	16.845	27.085
12	0001	0010	210	16.410	301	16.865	27.105
13	0001	0011	212	16.420	303	16.875	27.115
14	0001	0100	214	16.430	305	16.885	27.125
15	0001	0101	216	16.440	307	16.895	27.135
16	0001	0110	220	16.460	311	16.915	27.155
17	0001	0111	222	16.470	313	16.925	27.165
18	0001	1000	224	16.480	315	16.935	27.175
19	0001	1001	226	16.490	317	16.945	27.185
20	0010	0000	230	16.510	321	16.965	27.205
21	0010	0001	232	16.520	323	16.975	27.215
22	0010	0010	234	16.530	325	16.985	27.225
23	0010	0011	240	16.560	331	17.015	27.255
24	0010	0100	236	16.540	327	16.995	27.235
25	0010	0101	238	16.550	329	17.005	27.245
26	0010	0110	242	16.570	333	17.025	27.265
27	0010	0111	244	16.580	335	17.035	27.275
28	0010	1000	246	16.590	337	17.045	27.285
29	0010	1001	248	16.600	339	17.055	27.295
30	0011	0000	250	16.610	341	17.065	27.305
31	0011	0001	252	16.620	343	17.075	27.315
32	0011	0010	254	16.630	345	17.085	27.325
33	0011	0011	256	16.640	347	17.095	27.335
34	0011	0100	258	16.650	349	17.105	27.345
35	0011	0101	260	16.660	351	17.115	27.355
36	0011	0110	262	16.670	353	17.125	27.365
37	0011	0111	264	16.680	355	17.135	27.375
38	0011	1000	266	16.690	357	17.145	27.385
39	0011	1001	268	16.700	359	17.155	27.395
40	0000	0000	270	16.710	361	17.165	27.405

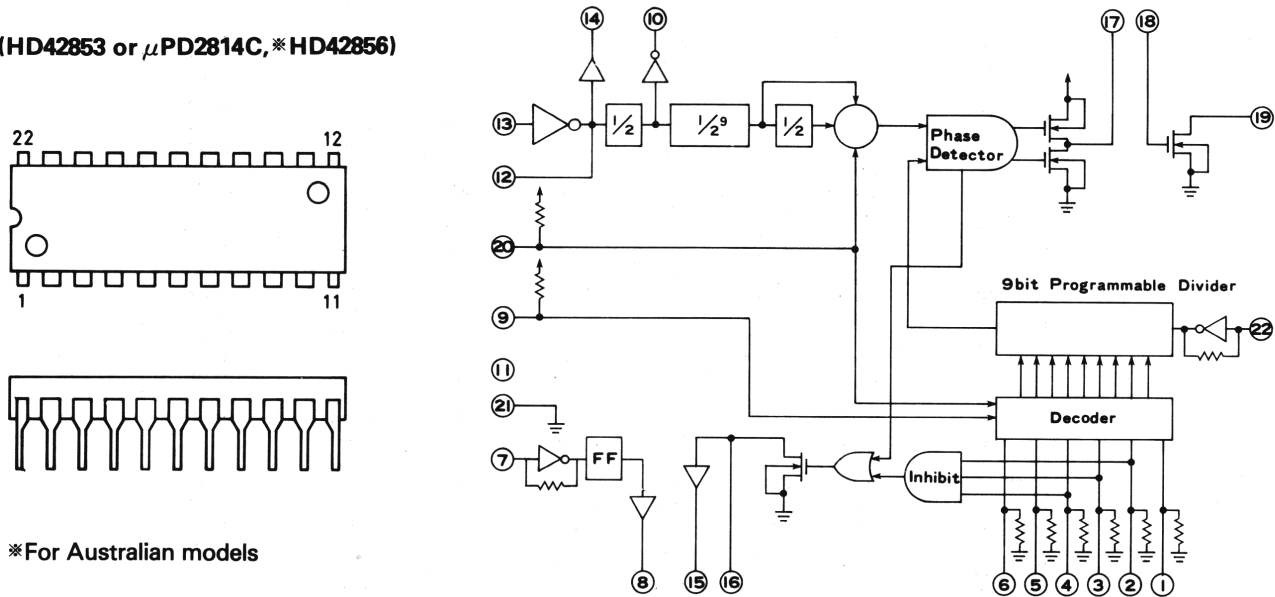
For Australian models

CHANNEL NUMBERS	BCD INPUT TO IC-1		RECEIVE		TRANSMIT		
	IC-1 PIN NUMBERS		N	VCO FREQUENCY (MHz)	N	VCO FREQUENCY (MHz)	TRANSMIT FREQUENCY (MHz)
	8 7 6 5	4 3 2 1					
1	0000	0001	192	16.320	283	16.775	27.015
2	0000	0010	194	16.330	285	16.785	27.025
3	0000	0011	196	16.340	287	16.795	27.035
4	0000	0100	200	16.360	291	16.815	27.055
5	0000	0101	202	16.370	293	16.825	27.065
6	0000	0110	206	16.390	297	16.845	27.085
7	0000	0111	208	16.400	299	16.855	27.095
8	0000	1000	210	16.410	301	16.865	27.105
9	0000	1001	212	16.420	303	16.875	27.115
10	0001	0000	214	16.430	305	16.885	27.125
11	0001	0001	216	16.440	307	16.895	27.135
12	0001	0010	220	16.460	311	16.915	27.155
13	0001	0011	222	16.470	313	16.925	27.165
14	0001	0100	224	16.480	315	16.935	27.175
15	0001	0101	226	16.490	317	16.945	27.185
16	0001	0110	228	16.500	319	16.955	27.195
17	0001	0111	230	16.510	321	16.965	27.205
18	0001	1000	234	16.530	325	16.985	27.225

11. TRANSISTOR LEAD IDENTIFICATIONS AND IC INTERNAL CONNECTION

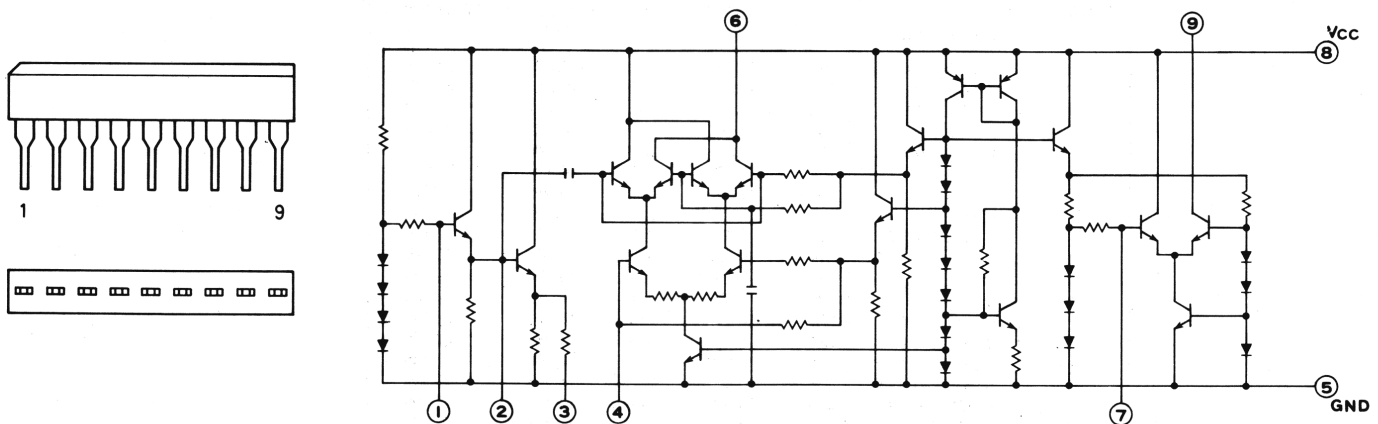


IC-1 (HD42853 or μ PD2814C, *HD42856)



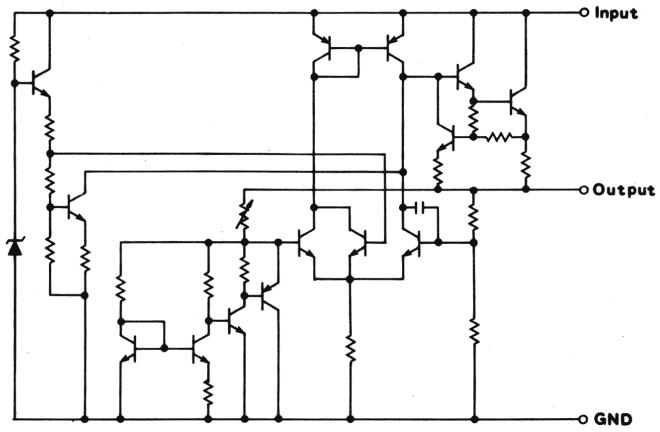
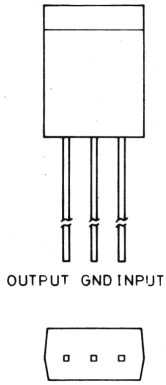
*For Australian models

IC-2 (TA7310P)

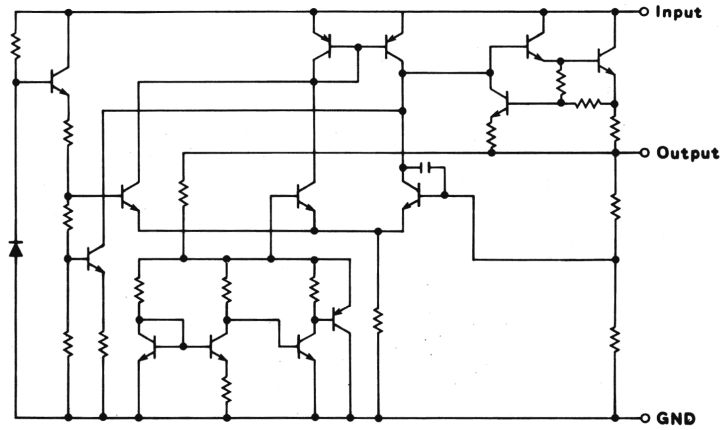
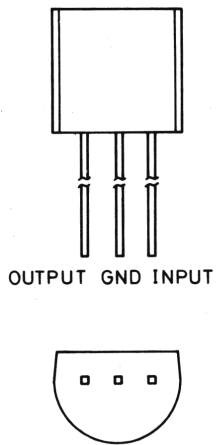


IC-3 (NJM78L05 or μ PC78L05), IC-301 (NJM78L12 or μ PC78L12)

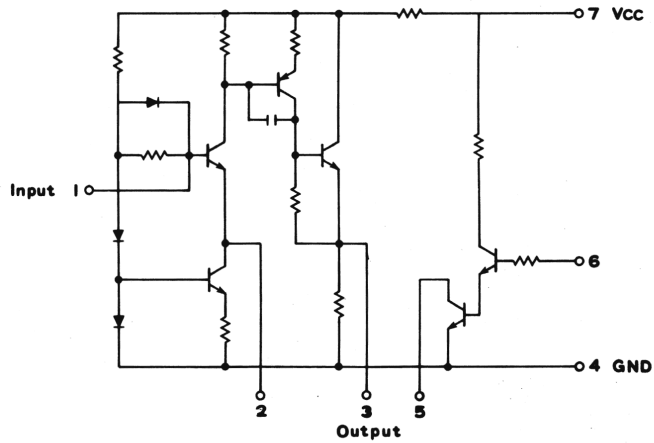
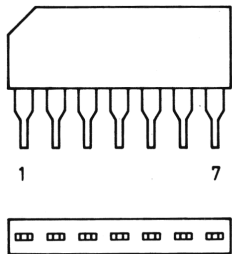
IC-3 (NJM78L05), IC-301 (NJM78L12)



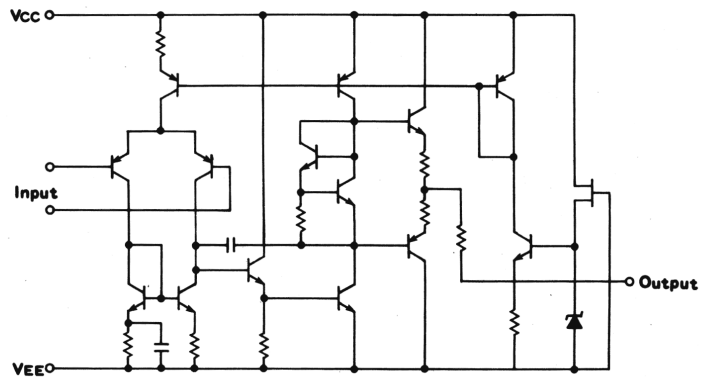
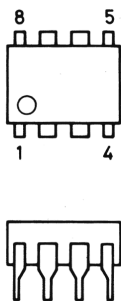
IC-3 (μ PC78L05), IC-301 (μ PC78L12)



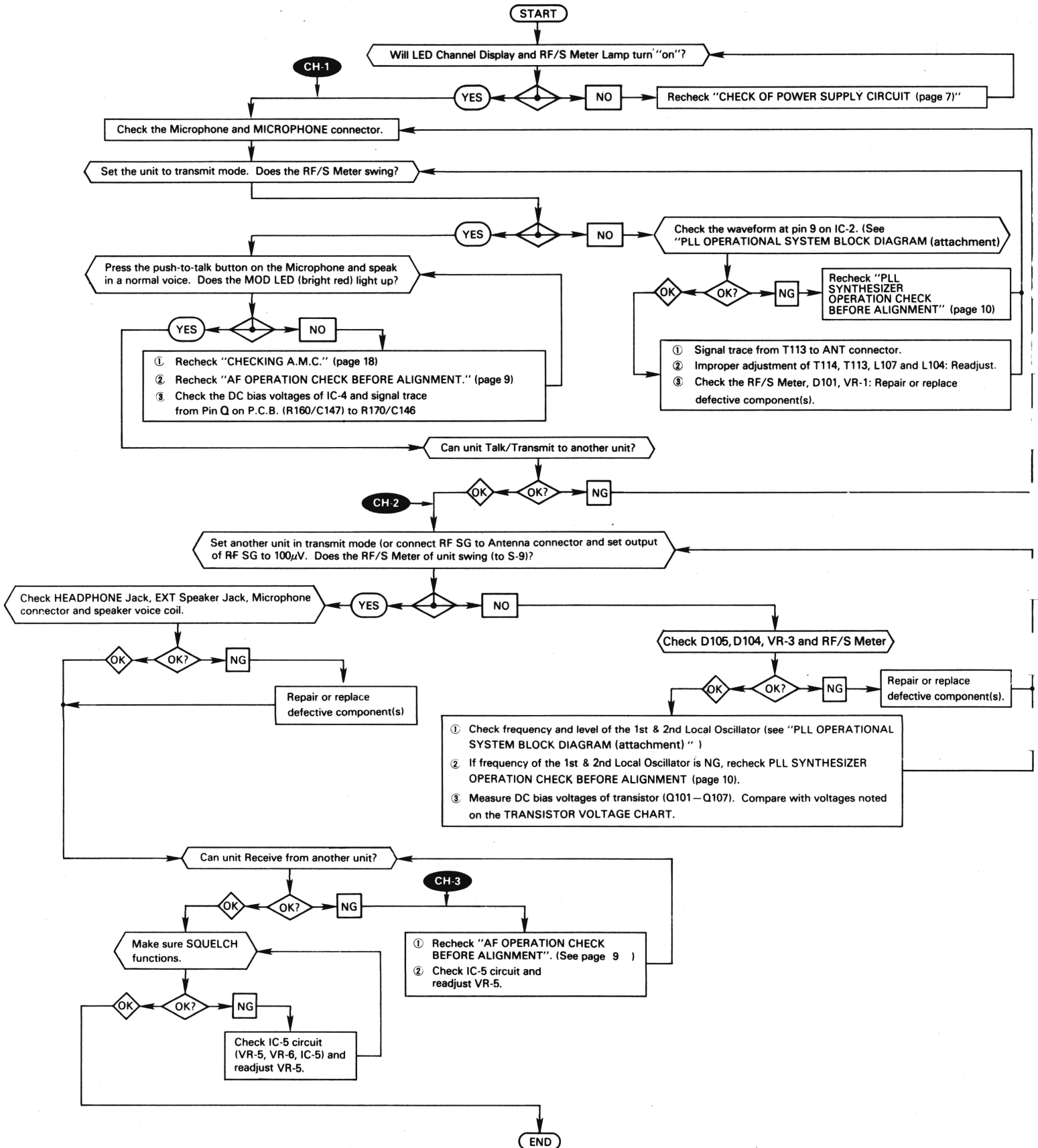
IC-4 (μ PC1158H2)



IC-5 (NJM4558)



12. TROUBLESHOOTING CHECKING SYSTEM



13. TROUBLESHOOTING HINTS

Symptom	Check Procedure (See TROUBLESHOOTING CHECKING SYSTEM)	Defective Component(s)
A) UNIT WILL NOT TURN ON.	Check from start to CH-1 .	Power Switch, AC Line Cord Defective PL-1, Q301, Q302, IC-301, Q120, D114, IC-3, Q118, Q119, D301, D302, T115, F1(Fuse), Channel LED Display circuit (D120).
B) CAN NEITHER RECEIVE NOR TRANSMIT	Check from start to END.	IC-1, D117, MIC, T109, Microphone connector, ANT connector, IC-3, Q108, Q109, D118, Q110, CF-4, T110, T111, CT, X-1, L101, Q107
C) NO RECEIVE SOUND (TRANSMIT OK) D) NO NOISE (TRANSMIT OK)	Check from CH-2 to END.	Q101—Q107, T101—T106, VR-2, Q107, T109, D117, MIC connector, Q118, IC-5, Headphone Jack, EXT Speaker, Speaker voice coil, D105, D106, VR-4, VR-6, VR-5.
E) NO TRANSMIT (RECEIVER OK)	Check from CH-1 to CH-2	IC-2, T112, T113, Q115, T114, Q116, L107, R200, Q117, L104, L102, Q119, MIC, MIC connector, D117
F) NO MODULATION (RECEIVER OK, TRANSMIT CARRIER OK)	Check from CH-1 to CH-2	MIC, MIC Connector, IC-4, D112, C133, T108, C147, R160
G) NO SQUELCH (OTHERWISE OPERATES NORMALLY)	Check from CH-3 to END.	R139, VR-6, VR-5, IC-5, R138, C129, R140, R141, R142, R143.
H) METER DOES NOT OPERATE BUT OTHERWISE OPERATES NORMALLY	Check RF/S Meter, D104, VR-3, D101 and VR-1 and readjust VR-1, VR-3.	RF/S Meter, D104, VR-3, D101, VR-1, C124, C188, R202.
I) MODULATION INDICATOR DOES NOT LIGHT (BUT EVERYTHING ELSE OPERATES NORMALLY)	Check Q114 and D111 circuit. Replace defective component(s).	Q114, D111, R168, C146, R169, R170, D110.

14. TRANSISTOR AND IC VOLTAGE CHART

TRANSISTOR VOLTAGE CHART

TRANSISTOR NUMBER	RECEIVE			TRANSMIT		
	EMITTER (SOURCE)	COLLECTOR (DRAIN)	BASE (GATE)	EMITTER (SOURCE)	COLLECTOR (DRAIN)	BASE (GATE)
Q101	0.3	6.7	0.9	0.4	0	-0.9
Q102	0.4	6.7	1.1	0	0	-0.1
Q103	0.8	7.0	1.4	0	0	-0.1
Q104	0.8	7.0	1.3	0	0	-0.1
Q105	0.8	6.6	1.6	0	0	-0.1
Q106	0.8	6.6	1.5	0	0	-0.1
Q107	0.5	7.1	0	0	0	0
Q108	0.7	3.4	1.3	0.7	3.4	1.3
Q109	0.8	1.7	0	0.8	1.7	0
Q110	0.4	7.8	0	0.4	7.8	0
Q111	1.3	11.1	1.9	1.2	11.0	1.8
Q112	0	13.6	0.6	0	13.3	0.6
Q113	0	13.6	0.6	0	13.3	0.6
Q114	0.3	13.6	0	0	13.4	0.1
Q115	0	1.0	0.3	0.8	7.8	0.9
Q116	0	13.3	0	3.6	12.4	-0.4
Q117	0	13.3	0	0	12.4	-0.2
Q118	7.4	8.1	8.1	0	8.1	0
Q119	8.1	1.0	8.1	8.1	8.0	7.4
Q120	8.1	13.6	8.8	8.1	13.4	8.8
Q301	13.6	19.7	14.2	13.4	17.5	14.2
Q302	14.2	19.7	14.9	14.2	17.5	14.8

NOTE: All voltage values are indicated in volts with no signal, measured with V.T.V.M.

IC VOLTAGE CHART

*For Australian models

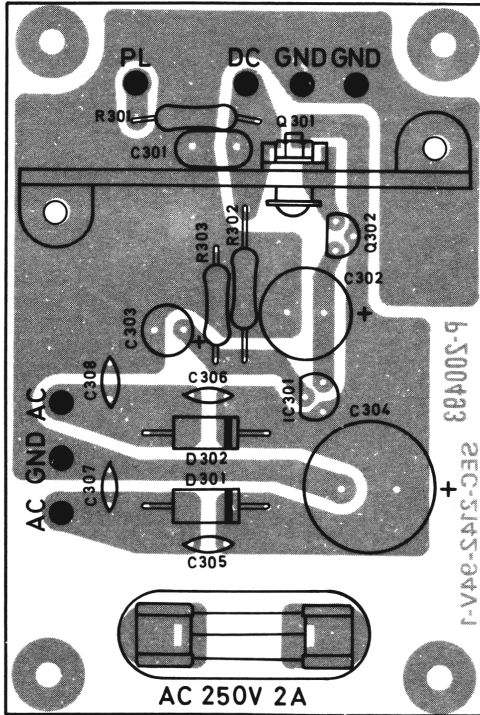
IC-1 HD42853 (*HD42856)	PIN NO.	1	2	3	4	5	6	7	8	9	10	11
	RECEIVE	5.0	0	0	5.0	5.0 (*0)	0	-	-	5.0	0.6 (*0.8)	5.0
	TRANSMIT	5.0	0	0	5.0	5.0 (*0)	0	-	-	0.4	0.6 (*0.8)	5.0
	PIN NO.	12	13	14	15	16	17	18	19	20	21	22
RECEIVE	2.4 (*2.2)	2.4	1.4 (*1.1)	4.9	4.9	1.7 (*1.5)	1.7 (*1.5)	3.7 (*4.0)	0	0	2.4 (*2.3)	
TRANSMIT	2.4 (*2.2)	2.4	1.4 (*1.1)	4.9	4.9	1.4 (*1.3)	1.4 (*1.3)	5.4 (*6.0)	0	0	2.4 (*2.3)	
IC-2 TA7310P	PIN NO.	1	2	3	4	5	6	7	8	9		
	RECEIVE	2.6	-	-	1.5	0	1.0	2.0	8.1	13.0		
TRANSMIT	2.6	-	-	2.4	0	7.6	2.0	8.1	13.0			
IC-3 NJM78L05	PIN NO.	1	2	3								
	RECEIVE	5.0	0	13.6								
TRANSMIT	5.0	0	13.4									
IC-4 μ PC1158H2	PIN NO.	1	2	3	4	5	6	7				
	RECEIVE	1.4	2.5	0.3	0	0	0.3	12.3				
TRANSMIT	1.4	1.0	4.9	0	0	4.9	10.8					
IC-5 NJM4558D SQUELCH ON/OFF	PIN NO.	1	2	3	4	5	6	7	8			
	RECEIVE	1.3/3.5	1.3/3.5	0.7/3.5	0/0	1.6/3.0	1.8/1.8	1.3/6.5	7.1/7.2			
TRANSMIT	0.2	0.3	0.1	0	3.0	-0.1	0	0				

NOTE: All voltage values are indicated in volts with no signal, measured with V.T.V.M.

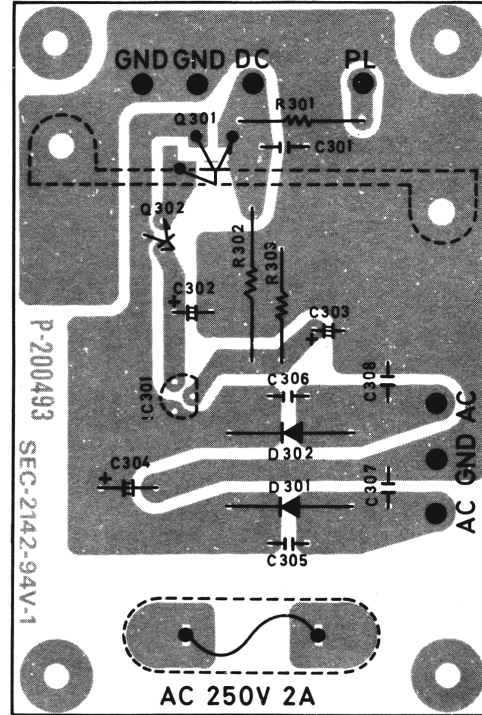
Channel is 19 (9 for Australian models).

16. POWER SUPPLY P.C.B. (TOP & BOTTOM VIEW)

TOP VIEW

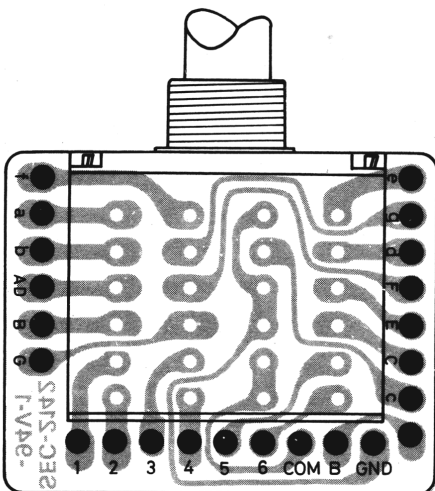


BOTTOM VIEW

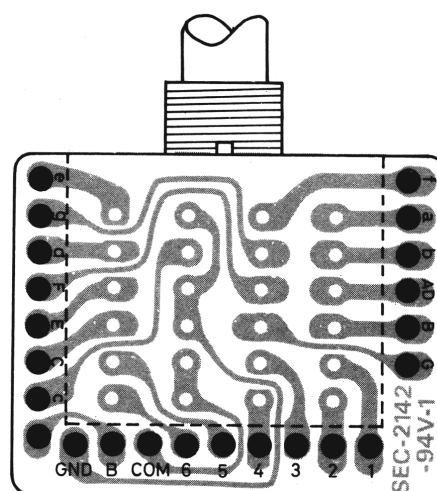


17. CHANNEL SELECTOR SWITCH P.C.B. (TOP & BOTTOM VIEW)

TOP VIEW

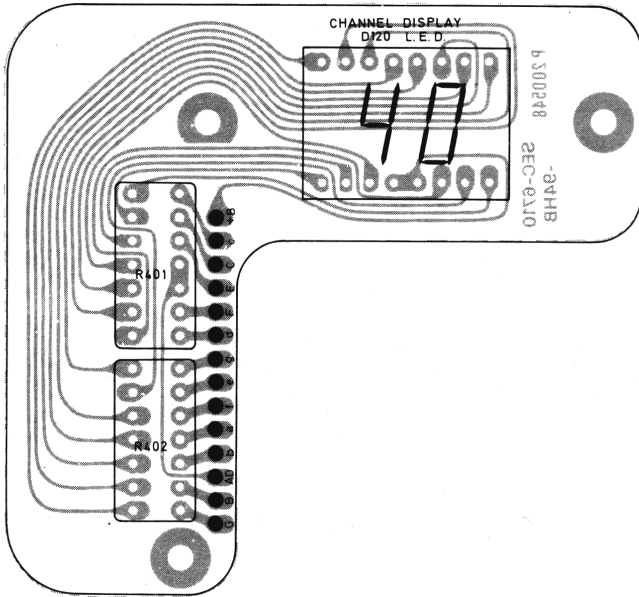


BOTTOM VIEW

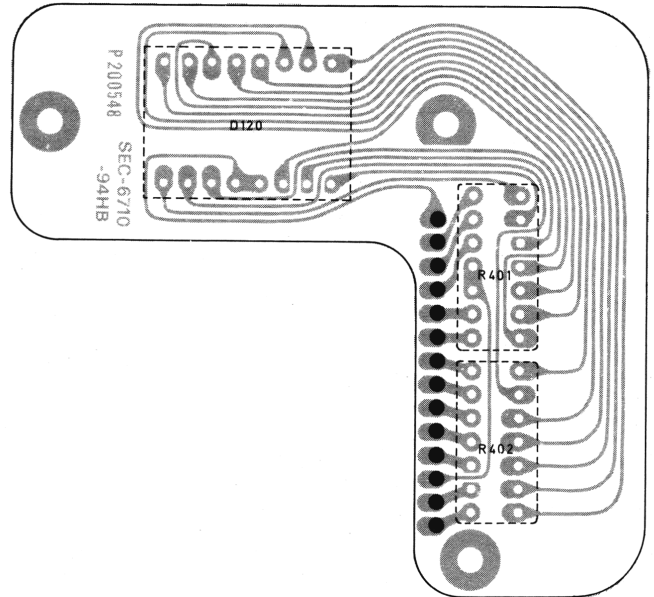


18. CHANNEL DISPLAY P.C.B. (TOP & BOTTOM VIEW)

TOP VIEW

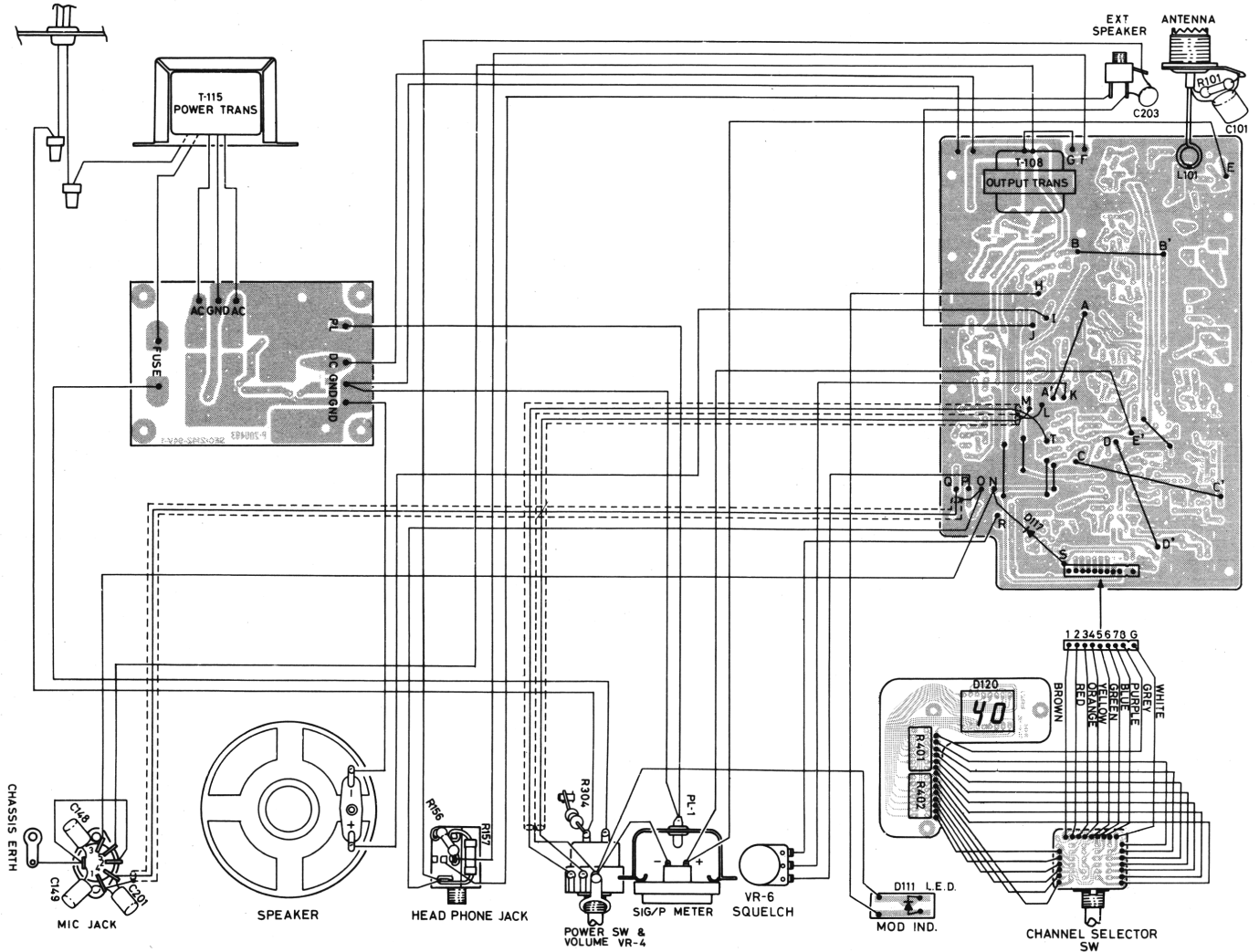


BOTTOM VIEW



19. WIRING DIAGRAM

AC 120V, 60Hz (240V, 50Hz for Australian models only)



20. ELECTRICAL PARTS LIST

REF. NO.	DESCRIPTION	RS PART NO.	MFR'S PART NO.
CAPACITORS SL: 350 – 1000 ppm/°C			
C101	Mica 250 pF ± 10%	50 WV	
C102	Mica 39 pF ± 5%	50 WV	
C103	Mica 22 pF ± 5%	50 WV	
C104	Ceramic 1 pF ± 0.3 pF	50 WV (SL)	
C105	Ceramic Barrier 0.01 μF	25 WV	
C106	Ceramic Barrier 0.01 μF	25 WV	
C107	Ceramic Barrier 0.022 μF	25 WV	
C108	Ceramic 10 pF ± 0.5 pF	50 WV (SL)	
C109	Ceramic Barrier 0.01 μF	25 WV	
C110	Ceramic 10 pF ± 0.5 pF	50 WV (SL)	
C111	Ceramic Barrier 0.022 μF	25 WV	
C112	Ceramic Barrier 0.022 μF	25 WV	
C113	Electrolytic 33 μF/25 V		
C114	Ceramic Barrier 0.022 μF	25 WV	
C115	Ceramic Barrier 0.022 μF	25 WV	
C116	Ceramic 1 pF ± 0.3 pF	50 WV (SL)	
C117	Ceramic Barrier 0.022 μF	25 WV	
C118	Ceramic Barrier 0.022 μF	25 WV	
C119	Electrolytic 4.7 μF/50 V		
C120	Ceramic Barrier 0.022 μF	25 WV	
C121	Mylar 0.047 μF ± 10%	50 WV	
C122	Ceramic Barrier 0.022 μF	25 WV	
C123	Ceramic Barrier 0.01 μF	25 WV	
C124	Electrolytic 10 μF/16 V		
C125	Mylar 0.001 μF ± 10%	50 WV	
C126	Alsicon 0.22 μF/25 V		
C127	Mylar 0.0047 μF ± 10%	50 WV	
C128	Mylar 0.015 μF ± 10%	50 WV	
C129	Electrolytic 10 μF/16 V		
C130	Electrolytic 3.3 μF/50 V		
C131	Electrolytic 4.7 μF/50 V		
C132	Electrolytic 0.47 μF/50 V		
C133	Tantalum 0.33 μF/10 V		
C134	Electrolytic 100 μF/10 V		
C135	Electrolytic 220 μF/16 V		
C136	Mylar 0.047 μF ± 10%	50 WV	
C137	Mylar 0.047 μF ± 10%	50 WV	
C138	Ceramic 0.047 μF	50 WV	
C139	Electrolytic 22 μF/16 V		
C140	Alsicon 0.1 μF/25 V		
C141	Mylar 0.0082 μF ± 10%	50 WV	
C142	Electrolytic 0.47 μF/50 V		
C143	Mylar 0.0047 μF ± 10%	50 WV	
C144	Electrolytic 22 μF/16 V		
C145	Electrolytic 10 μF/16 V		
C146	Electrolytic 1 μF/50 V		

REF. NO.	DESCRIPTION	RS PART NO.	MFR'S PART NO.
C147	Mylar 0.001 μ F \pm 10%	50 WV	
C148	Mylar 0.0033 μ F \pm 10%	50 WV	
C149	Mylar 0.0033 μ F \pm 10%	50 WV	
C150	Ceramic Barrier 0.022 μ F	25 WV	
C151	Electrolytic 100 μ F/10 V		
C152	Ceramic 4 pF \pm 0.3 pF	50 WV (SL)	
C153	Ceramic 150 pF \pm 5%	50 WV	
C154	Ceramic 100 pF \pm 5%	50 WV	
C155	Mylar 0.01 μ F \pm 10%	50 WV	
C156	Ceramic Barrier 0.022 μ F	25 WV	
C157	Mylar 0.01 μ F \pm 10%	50 WV	
C158	Mica 22 pF \pm 5%	50 WV	
C159	Ceramic 100 pF \pm 5%	50 WV	
C160	Ceramic 39 pF \pm 5%	50 WV	
C161	Ceramic 47 pF \pm 5%	50 WV	
C162	Ceramic Barrier 0.022 μ F	25 WV	
C163	Ceramic 33 pF \pm 5%	50 WV (SL)	
C164	Electrolytic 1 μ F/50 V		
C165	Mylar 0.022 μ F \pm 10%	50 WV	
C166	Ceramic 10 pF \pm 0.5 pF	50 WV	
C167	Mica 39 pF \pm 5%	50 WV	
C168	Mica 15 pF \pm 5%	50 WV	
C169	Mica 22 pF \pm 10%	50 WV	
C170	Ceramic 330 pF \pm 5%	50 WV	
C171	Ceramic Barrier 0.022 μ F	25 WV	
C172	Ceramic Barrier 0.022 μ F	25 WV	
C173	Ceramic 100 pF \pm 5%	50 WV	
C174	Ceramic Barrier 0.01 μ F	25 WV	
C175	Mica 39 pF \pm 5%	50 WV	
C176	Ceramic Barrier 0.01 μ F	25 WV	
C177	Ceramic 220 pF \pm 5%	50 WV	
C178	Ceramic Barrier 0.01 μ F	25 WV	
C179	Mica 27 pF \pm 5%	50 WV	
C180	Mica 56 pF \pm 5%	50 WV	
C181	Mica 33 pF \pm 5%	50 WV	
C182	Ceramic 0.047 μ F	50 WV	
C183	Ceramic 0.0047 μ F	50 WV	
C184	Mica 220 pF \pm 5%	50 WV	
C185	Mica 39 pF \pm 5%	50 WV	
C186	Mica 220 pF \pm 5%	50 WV	
C187	Ceramic Barrier 0.01 μ F	25 WV	
C188	Electrolytic 4.7 μ F/50 V		
C189	Tantalum 1 μ F/10 V		
C190	Ceramic 8 pF \pm 0.5 pF	50 WV (SL)	
C191	Ceramic 3 pF \pm 0.5 pF	50 WV (SL)	
C192	Electrolytic 47 μ F/10 V		
C193	Electrolytic 470 pF/16 V		
C194	Ceramic 2 pF \pm 0.3 pF	50 WV (SL)	

REF. NO.	DESCRIPTION	RS PART NO.	MFR'S PART NO.
C195	Ceramic Barrier 0.022 μ F	25 WV	
C196	Ceramic Barrier 0.022 μ F	25 WV	
C197	Not used		
C198	Electrolytic 22 μ F/16 V		
C199	Ceramic 1 pF \pm 0.3 pF	50 WV (SL)	
C200	Ceramic 33 pF \pm 5%	50 WV (SL)	
C201	Mylar 0.0047 μ F \pm 10%	50 WV	
C202	Ceramic Barrier 0.01 μ F	25 WV	
C203	Ceramic Barrier 0.01 μ F	25 WV	
C301	Mylar 0.047 μ F	50 WV	
C302	Electrolytic 470 μ F/16 V		
C303	Electrolytic 10 μ F/16 V		
C304	Electrolytic 2200 μ F/25 V		
C305	Ceramic 0.01 μ F	50 WV	
C306	Ceramic 0.01 μ F	50 WV	
C307	Ceramic 0.01 μ F	50 WV	
C308	Ceramic 0.01 μ F	50 WV	
CERAMIC FILTERS			
CF-1	Ceramic Filter SFE 10.7 MJ-Z	C-0913	P-130056
CF-2	Ceramic Filter CFU 455 kHz	C-0754	P-130050
CF-3	Ceramic Filter CFU 455 kHz	C-0754	P-130050
CF-4	Ceramic Filter 10.240 MA	C-0914	P-130053
TRIMMER			
CT-1	Trimmer	C-0751	P-160010
DIODES			
D101	Germanium Diode 1S188FM-1 or 1N60P	DX-0162	
D102	Silicon Diode WG-713 or 1S953	DX-0543	
D103	Silicon Diode WG-713 or 1S953	DX-0543	
D104	Germanium Diode 1S188FM-1 or 1N60P	DX-0162	
D105	Germanium Diode 1S188FM-1 or 1N60P	DX-0162	
D106	Silicon Diode WG-713 or 1S953	DX-0543	
D107	Silicon Diode WG-713 or 1S953	DX-0543	

REF. NO.	DESCRIPTION	RS PART NO.	MFR'S PART NO.
D108	Zener Diode WZ140 or MZ314B	DX-0713	
D109	Silicon Diode WG-713 or 1S953	DX-0543	
D110	Silicon Diode WG-713 or 1S953	DX-0543	
D111	Light Emitting Diode GL-30PR	L-0899	
D112	Silicon Diode 10E-1	DX-1039	
D113	Silicon Diode WG-713 or 1S953	DX-0543	
D114	Zener Diode WZ090 or RD9.1EB or MZ309B	DX-0533	
D115	Not used		
D116	Silicon Diode WG-713 or 1S953	DX-0543	
D117	Silicon Diode WG-713 or 1S953	DX-0543	
D118	Silicon Diode ITT-310S	DX-1080	
D119	Germanium Diode 1S188FM-1 or 1N60P	DX-0162	
D120	Light Emitting Diode SL1221 or TLR321	L-0898	
D301	Silicon Diode S3V-20 or 3BZ61 or 30D-1	DX-0990	
D302	Silicon Diode S3V-20 or 3BZ61 or 30D-1	DX-0990	
INTEGRATED CIRCUITS			
IC-1	HD42853 or μ PD2814C, *HD42856	MX-3540	
IC-2	TA7310P-YELLOW	MX-3256	
IC-3	NJM78L05 or μ PC78L05	MX-3541	
IC-4	μ PC1158H2	MX-3542	
IC-5	NJM4558D	MX-3438	
IC-301	NJM78L12 or μ PC78L12	MX-3543	
FUSE			
F1	Fuse (Tube Type) 250 V 2A	HF-0043	P-250079
*F1	Fuse 5.2 ϕ \times 20, 250 V 1A		P-250089
JACKS			
J1	Antenna Connector	J-0843	P-190111
J2	5P DIN Jack	J-6572	P-190131
J3	Headphone Jack	J-0956	P-190134
J4	EXT. SP. Jack	J-0683	P-190047

*For Australian Models Only

REF. NO.	DESCRIPTION	RS PART NO.	MFR'S PART NO.
COILS			
L101	Filter Coil	CA-3548	P-380043
L102	Trap Coil	CA-3908	P-380132
L103	Filter Coil	CA-3547	P-380044
L104	Filter Coil	CA-3909	P-380133
L105	Choke Coil	CB-2284	P-380048
L106	Choke Coil	CB-2318	P-380098
L107	Filter Coil	CA-3910	P-380134
L108	Choke Coil	CB-2283	P-380047
L109	Choke Coil	CB-2319	P-360026
LAMP			
L1		L-0900	P-240095
TRANSISTORS			
Q101	2SC930(D), (E) or 2SC668		
Q102	2SC1675(M), (L) or 2SC941		
Q103	2SC1675(M), (L) or 2SC941		
Q104	2SC1675(M), (L) or 2SC941		
Q105	2SC930(D), (E) or 2SC373		
Q106	2SC930(D), (E) or 2SC373		
Q107	2SK41(F)		
Q108	2SC380(O) or (Y)		
Q109	2SK41(F)		
Q110	2SK41(E1)		
Q111	2SC1175(D), (E) or 2SC735(O), (Y)		
Q112	2SD325(D), (E)		
Q113	2SD325(D), (E)		
Q114	2SC945(P), (Q)		
Q115	2SC1175(D), (E) or 2SC735(O), (Y)		
Q116	2SC1957 or 2SC2086		
Q117	2SC1909 or 2SC2166		
Q118	2SC945(P), (Q)		
Q119	2SA733(P), (Q)		
Q120	2SC1175(D), (E) or 2SC735		
Q301	2SD234(O), (Y) or 2SD235(O), (Y)		
Q302	2SC735 or 2SC1175(D), (E)		

REF. NO.	DESCRIPTION	RS PART NO.	MFR'S PART NO.
RESISTORS (): Typical Value, UY: Radial Type, PY: Axial Type			
R101	Carbon PY 1.5 K Ω 1/2W	NFE-0206	
R102	Carbon UY 10 K Ω 1/4W	NFE-0281	
R103	Carbon UY 1 K Ω 1/4W		
R104	Carbon UY 1 K Ω 1/4W		
R105	Carbon UY 330 Ω 1/4W		
R106	Carbon UY 10 K Ω 1/4W	NFE-0281	
R107	Carbon UY 220 K Ω 1/4W	NFE-0396	
R108	Carbon UY 220 Ω 1/4W	NFE-0149	
R109	Carbon UY 330 Ω 1/4W	NFE-0159	
R110	Carbon UY 330 Ω 1/4W	NFE-0159	
R111	Carbon UY 8.2 K Ω 1/4W	NFE-0271	
R112	Carbon UY 220 K Ω 1/4W	NFE-0396	
R113	Carbon UY 1 K Ω 1/4W	NFE-0196	
R114	Carbon UY 470 Ω 1/4W	NFE-0169	
R115	Carbon UY 2.2 K Ω 1/4W	NFE-0216	
R116	Carbon UY 2.2 K Ω 1/4W	NFE-0216	
R117	Carbon UY 10 K Ω 1/4W	NFE-0281	
R118	Carbon UY 6.8 K Ω 1/4W	NFE-0262	
R119	Carbon UY 180 K Ω 1/4W	NFE-0402	
R120	Carbon UY 1 K Ω 1/4W	NFE-0196	
R121	Carbon UY 470 Ω 1/4W	NFE-0169	
R122	Carbon UY 470 Ω 1/4W	NFE-0169	
R123	Carbon UY 33 K Ω 1/4W	NFE-0324	
R124	Carbon UY 10 K Ω 1/4W	NFE-0281	
R125	Carbon UY 470 Ω 1/4W	NFE-0169	
R126	Carbon UY 470 Ω 1/4W	NFE-0169	
R127	Carbon UY 10 K Ω 1/4W	NFE-0281	
R128	Carbon UY 39 K Ω 1/4W	NFE-0303	
R129	Carbon UY 68 K Ω 1/4W	NFE-0354	
R130	Carbon UY 100 K Ω 1/4W	NFE-0354	
R131	Carbon UY 68 K Ω 1/4W	NFE-0354	
R132	Carbon UY 68 K Ω 1/4W	NFE-0354	
R133	Carbon UY 1.2 M Ω 1/4W	NFE-0447	
R134	Carbon UY 100 Ω 1/4W	NFE-0132	
R135	Carbon UY 150 Ω 1/4W	NFE-0142	
R136	Carbon UY 47 K Ω 1/4W	NFE-0340	
R137	Carbon UY 5.6 K Ω 1/4W	NFE-0257	
R138	Carbon PY 100 Ω 1/4W	NFE-0132	
R139	Carbon UY 10 K Ω 1/4W	NFE-0281	
R140	Carbon UY 3.3 M Ω 1/4W	NFE-0458	
R141	Carbon UY 2.2 K Ω 1/4W	NFE-0216	
R142	Carbon UY 39 K Ω 1/4W	NFE-0330	
R143	Carbon UY 47 K Ω 1/4W	NFE-0340	
R144	Carbon UY 10 K Ω 1/4W	NFE-0281	
R145	Carbon UY 470 K Ω 1/4W	NFE-0423	
R146	Carbon PY 470 Ω 1/4W	NFE-0169	
R147	Carbon PY 560 Ω 1/4W	NFE-0176	

REF. NO.	DESCRIPTION	RS PART NO.	MFR'S PART NO.
R148	Carbon UY 33 K Ω 1/4W	NFE-0324	
R149	Carbon UY 6.8 K Ω 1/4W	NFE-0262	
R150	Carbon UY 100 Ω 1/4W	NFE-0132	
R151	Carbon UY 220 Ω 1/4W	NFE-0149	
R152	Carbon PY 1.8 K Ω 1/2W	NFE-0210	
R153	Carbon PY 82 Ω 1/2W	NFE-0122	
R154	Metal Oxide 0.22 Ω 1W		
R155	Metal Oxide 0.22 Ω 1W		
R156	Carbon PY 390 Ω 1/2W	NFE-0162	
R157	Metal Oxide 56 Ω 1W		
R158	Metal Oxide 5.6 Ω 2W		
R159	Carbon UY 560 Ω 1/4W	NFE-0176	
R160	Carbon UY 10 K Ω 1/4W	NFE-0281	
R161	Carbon UY 330 Ω 1/4W	NFE-0159	
R162	Carbon UY 22 K Ω 1/4W	NFE-0311	
R163	Carbon UY 2.2 K Ω 1/4W	NFE-0216	
R164	Carbon PY 12 K Ω 1/4W	NFE-0288	
R165	Carbon UY 15 K Ω 1/4W	NFE-0297	
R166	Carbon PY 2.2 K Ω 1/4W	NFE-0216	
R167	Carbon UY 680 Ω 1/4W	NFE-0183	
R168	Carbon UY 47 K Ω 1/4W	NFE-0340	
R169	Carbon UY 390 Ω 1/4W	NFE-0162	
R170	Carbon UY 6.8 K Ω 1/4W	NFE-0262	
R171	Carbon UY 10 K Ω 1/4W	NFE-0281	
R172	Carbon UY 470 K Ω 1/4W	NFE-0423	
R173	Carbon UY 330 Ω 1/4W	NFE-0159	
R174	Carbon UY 330 Ω 1/4W	NFE-0159	
R175	Carbon UY 3.3 K Ω 1/4W	NFE-0230	
R176	Carbon UY 3.3 K Ω 1/4W	NFE-0230	
R177	Carbon PY 10 K Ω 1/4W	NFE-0281	
R178	Carbon PY 10 K Ω 1/4W	NFE-0281	
R179	Carbon UY 82 K Ω 1/4W	NFE-0360	
R180	Carbon UY 47 K Ω 1/4W	NFE-0340	
R181	Carbon UY 220 Ω 1/4W	NFE-0149	
R182	Carbon UY 100 Ω 1/4W	NFE-0132	
R183	Carbon UY 560 Ω 1/4W	NFE-0176	
R184	Carbon UY 2.2 K Ω 1/4W	NFE-0216	
R185	Carbon UY 2.2 K Ω 1/4W	NFE-0216	
R186	Carbon UY 18 K Ω 1/4W	NFE-0303	
R187	Carbon UY 6.8 K Ω 1/4W	NFE-0262	
R188	Carbon UY 1 K Ω 1/4W	NFE-0196	
R189	Carbon UY 15 K Ω 1/4W	NFE-0297	
R190	Carbon UY 100 Ω 1/4W	NFE-0132	
R191	Carbon UY 100 Ω 1/4W	NFE-0132	
R192	Carbon UY 3.3 K Ω 1/4W	NFE-0236	
R193	Carbon UY 10 K Ω 1/4W	NFE-0281	
R194	Carbon UY 39 Ω 1/4W	NFE-0132	

REF. NO.	DESCRIPTION	RS PART NO.	MFR'S PART NO.
R195	Carbon UY 10 Ω 1/4W	NFE-0132	
R196	Carbon UY 220 Ω 1/4W	NFE-0149	
R197	Carbon PY 47 Ω 1/2W		
R198	Carbon PY 560 Ω 1/4W	NFE-0176	
R199	Carbon PY 15 Ω 1/4W	NFE-0074	
R200	Carbon PY 1—8.2 (4.7) 1/2W	NFE-0047	
R201	Metal Oxide 220 Ω 1W		
R202	Carbon UY 5.6 K Ω 1/4W	NFE-0257	
R203	Carbon UY 1.2 K Ω 1/4W	NFE-0199	
R204	Carbon UY 10 K Ω 1/4W	NFE-0281	
R205	Carbon UY 1 K Ω 1/4W	NFE-0196	
R206	Metal Oxide 10 Ω 1W		
R207	Carbon UY 330 K Ω 1/4W	NFE-0423	
R208	Carbon UY 68 K Ω 1/4W	NFE-0371	
R209	Carbon UY 10 K Ω 1/4W	NFE-0281	
R210	Carbon UY 3.9 K Ω 1/4W		
R301	Carbon PY 15 Ω 1/2W	NFE-0074	
R302	Carbon PY 1.2 K Ω 1/2W	NFE-0199	
R303	Carbon PY 150—220 (220) Ω 1/2W		
R304	Carbon PY 2.2 M Ω 1/2W	NFE-0454	
R304*	Not used		
R401	Resistor Array 2.2K Ω \times 7	RX-0068	P-210006
R402	Resistor Array 2.2K Ω \times 7	RX-0068	P-210006

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REF. NO.	DESCRIPTION	RS PART NO.	MFR'S PART NO.
SWITCHES			
S1	Power Switch (with VR-4)	P-1757	P-170258
S2	Channel Selector Switch	S-1306	P-180294
S2*	Channel Selector Switch		P-180364
TRANSFORMERS			
T101	Antenna Coil	CA-3543	P-380038
T102	RF Coil	CA-4938	P-380135
T103	IFT Coil	CA-7602	P-140031
T104	IFT Coil	CA-7603	P-130033
T105	IFT Coil	CA-7513	P-130026
T106	IFT Coil	CA-7514	P-130027
T107	Input Transformer	TN-0100	P-100346
T108	Output/Modulation Transformer	TD-0139	P-100347
T109	RF Coil	CA-4939	P-380136
T110	RF Coil	CA-4939	P-380136
T111	VCO Coil	CA-3911	P-380137
T112	Tuning Coil	CA-3912	P-380138
T113	Tuning Coil	CA-3913	P-380139
T114	Pre Driver Coil	CA-3788	P-380115
T115	Power Transformer	TA-0670	P-100510
T115*	Power Transformer		P-100561

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REF. NO.	DESCRIPTION	RS PART NO.	MFR'S PART NO.
VARIABLE RESISTORS			
VR-1 VR-2 VR-3 VR-4 VR-4* VR-4* VR-5 VR-6	Semi Fixed Resistor 47K Ω Semi Fixed Resistor 1K Ω Semi Fixed Resistor 47K Ω VOLUME 5K Ω 10A (with S1) VOLUME 5K Ω 10A (with S1) VOLUME 5K Ω 10A (with S1) Semi Fixed Resistor 10K Ω SQUELCH 10K Ω C	P-6492 P-6493 P-6492 P-1757 P-6494 P-1750	P-170307 P-170297 P-170307 P-170258 P-170344 P-170340 P-170303 P-170240
CRYSTAL			
X1	Crystal HC-18/U 10.240 MHz or Crystal HC-18/U 10.240 MHz	MX-2295	P-390047 P-390049

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21. EXPLODED VIEW PARTS LIST

REF. NO.	DESCRIPTION	RS PART NO.	MFR'S PART NO.
1	FCC Plate	HB-7852	P-730218
1*	DOC Plate		P-730226
1*	Standard Plate		P-730257
2	Panel, Back	Z-3483	P-630062
2*	Panel, Back		P-630100
2*	Panel Back		P-630102
3	Net	HB-7576	P-690225
4	Cabinet	Z-4034	P-600122
5	Microphone Hanger (with Microphone)	M-2222	P-270062 or P-270063
6	Rubber Foot	F-0237	P-680168
7	Transformer Bracket	HB-3669	P-410027
8	Power Transformer (T115)	TA-0670	P-100510
8*	Power Transformer (T115)		P-100561
9	Clamp Connector	H-3305	P-320006
10	Heat Sink "A"	HH-0270	P-411314
11	Insulator, Fiber	HB-6132	P-690207
12	Heat Sink "B"	HH-0204	P-411053
13	Main P.C.B.		P-200492
14	Chassis		P-400173
14*	Chassis		P-400173A
14*	Chassis		P-400231
15	AC Line Cord		P-310093
15*	AC Line Cord		P-310079
15*	AC Line Cord		P-310041
16	Strain Relief	HB-0598	P-480010
16*	Strain Relief		P-480165
16*	Strain Relief		P-480037
17	Antenna Connector	J-0843	P-190111
18	EXT. SP. Jack	J-0683	P-190047
19	Rubber Bushing (B)	HB-6124	P-680150
20	Shield Plate "A"	HB-7574	P-411529
21	Bracket for Panel (Right)	HB-6137	P-411123
22	Bracket for Panel (Left)	HB-6138	P-411124
23	Heat Sink "C"	HH-0272	P-411315
24	Fuse 250V 2A	HF-0043	P-250079
24*	Fuse 250V 1A		P-250089
25	Power P.C.B.		P-200493
25*	Power P.C.B.		P-200647
26	LED P.C.B. (Channel Display)	X-7715	P-200548
27	Switch P.C.B.	X-7716	P-200518
28	Channel Selector Switch	S-1306	P-180294
28*	Channel Selector Switch		P-180364
29	Cabinet Holder	HB-7580	P-411341
30	LED P.C.B. (MOD)		P-200517
31	LED (Modulation)	L-0902	
32	Cabinet Holder	HB-6136	P-411126
33	SQUELCH Control (VR-6)	P-1750	P-170240

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REF. NO.	DESCRIPTION	RS PART NO.	MFR'S PART NO.
34	Signal Meter	M-0338	P-230058
35	Shield Plate "B"	HB-7575	P-411530
36	Lamp for Meter	L-0900	P-240095
37	Lamp Rubber Bushing	HB-6130	P-680148A
38	Lamp Holder	HB-7570	P-411337
39	Meter Holder	HB-6131	P-440110
40	VOLUME Control (VR-4/S1)	P-1757	P-170258
40*	VOLUME Control (VR-4/S1)		P-170344
40*	VOLUME Control (VR-4/S1)		P-170340
41	Lug		P-411172
42	Bracket for Speaker	HB-6071	P-410278
43	Speaker	S-4676	P-270058 or P-270051
44	Cabinet Holder	HB-6136	P-411126
45	Bracket for Headphone Jack	HB-6128	P-411127
46	Headphone Jack	J-0906	P-190134
47	Mic Connector, 5P DIN	J-6572	P-190131
48	Bracket for Mic Connector	HB-6127	P-411125
49	Side Trim Panel, Left	HB-6141	P-710109
50	Front Panel	Z-4033	P-600121
51	Side Trim Panel, Right	HB-6141	P-710109
52	Dress Plate for LED	HB-7579	P-730217
53	Dress Plate for Meter	HB-7578	P-730216
53*	Dress Plate for Meter		P-700369
54	Channel Selector Knob	K-2892	P-650264
55	VOLUME & SQUELCH Knob	K-2554	P-650230A
56	Trim Panel with Name Plate	HB-7577	P-700254
56*	Trim Panel with Name Plate		P-700368
57	Fuse Holder		P-260017
57*	Fuse Holder		P-260008
58*	Block Terminal		P-320223
59*	Bracket for Block Terminal		P-411745
F1	Blind Rivet YB-320		
F2	Tapping Screw (Tap Tight) 3 ϕ \times 12		
F3	Screw (Black) 3 ϕ \times 6P		
F4	Tapping Screw (Poly Wave) 3 ϕ \times 8PTII		
F5	Nut 4N		
F6	Spring Washer 4SW		
F7	Screw 3 ϕ \times 10P		
F8	Washer 3W		
F9	Spring Washer 3SW		
F10	Nut 3N		
F11	Triple Screw 3 ϕ \times 6P		
F12	Triple Screw 3 ϕ \times 8PTII		
F13	Fiber Washer 6.2 ϕ \times 10 ϕ \times 1t		
F14	Triple Screw 4 ϕ \times 10P		
F15	Triple Screw 3 ϕ \times 8P		
F16	Lug 3 ϕ		P-411172
F17	Nylon Washer 3.5 ϕ \times 8 ϕ \times 0.5t		
F18	Blind Rivet YB-420		
F19*	Tooth Lock Washer 3 ϕ		
F20*	Screw 3 ϕ \times 20B		
F21	Tapping Screw 3 ϕ \times 8PTII		

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