

AWA RT85
&
Midland 70-066
Conversion
To
6 Meters

Ver 1.4 – 25 Jan 2009

Part 1

Rod McCosker VK2DOT

AWA RT85 & Midland 70-066 low Band Conversion to 6 Meters:

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Acknowledgment:

This project was started in June 2008 on behalf of the Central Coast Amateur Radio Club [CCARC] for members and other amateurs interested in the use of the AWA85 low band commercial radio transceiver. The conversion of the said transceiver to 6 Meters for amateur radio. Acknowledgement must be given to:- Steve VK2KFJ, Peter VK2ZZA, Roger Baker VK3BKR, Mark Detering VK3TLW, Phil Rice VK3BHR, Mark VK3BYY, & Phil VK1PL for the information gained from their past documentation and generous guidance.

Modifications:

The modifications contained within this document should take the average non technical amateur, the following time's:->

	Modifications	Alignment	
EPROM board	1 hour	Nil	
The Synthesizer board	1 hour	1 hour	
The Receiver board	1 hour	1 hour	
The Transmitter PA board	1 hour	1 hour	
Total:	4 hours	3 hours	Overall 7 hours.

Parts Needed:

IC Socket – Low profile 24 pin.

Capacitors.	Jaycar	Dick Smith	Dick Smith
1.5pf - 3 of	RC-5302	R2217	
5.6pf - 3 of	RC-5309	R2219	
8.2pf - 3 of	RC-5311	R2233	
15pf - 2 of	RC-5314	R2239	R1982
22pf - 3 of	RC-5216	R2243	
33pf - 2 of	RC-5318	R2247	R1984
100pf - 1 of	RC-5324	R2285	R1987
1000pf - 1 of	RC-5336	R2307	R1996

Note: If you acquire your capacitors from “Jaycar Electronics”, then please check the capacitor values in each packet. It has been found the wrong values has been added to packets of capacitors.

Wire.

Approximately 10cm of 0.5mm (**NOTE:** 0.63mm wire will do the job)
Approximately 1 meter of 0.63mm [22bs] enameled coated wire [Jaycar WW4018].

Markers.

Masking Tape.
Marking Pen. [for putting coil numbers on Masking tape in Tx PA section]

Test Equipment needed:

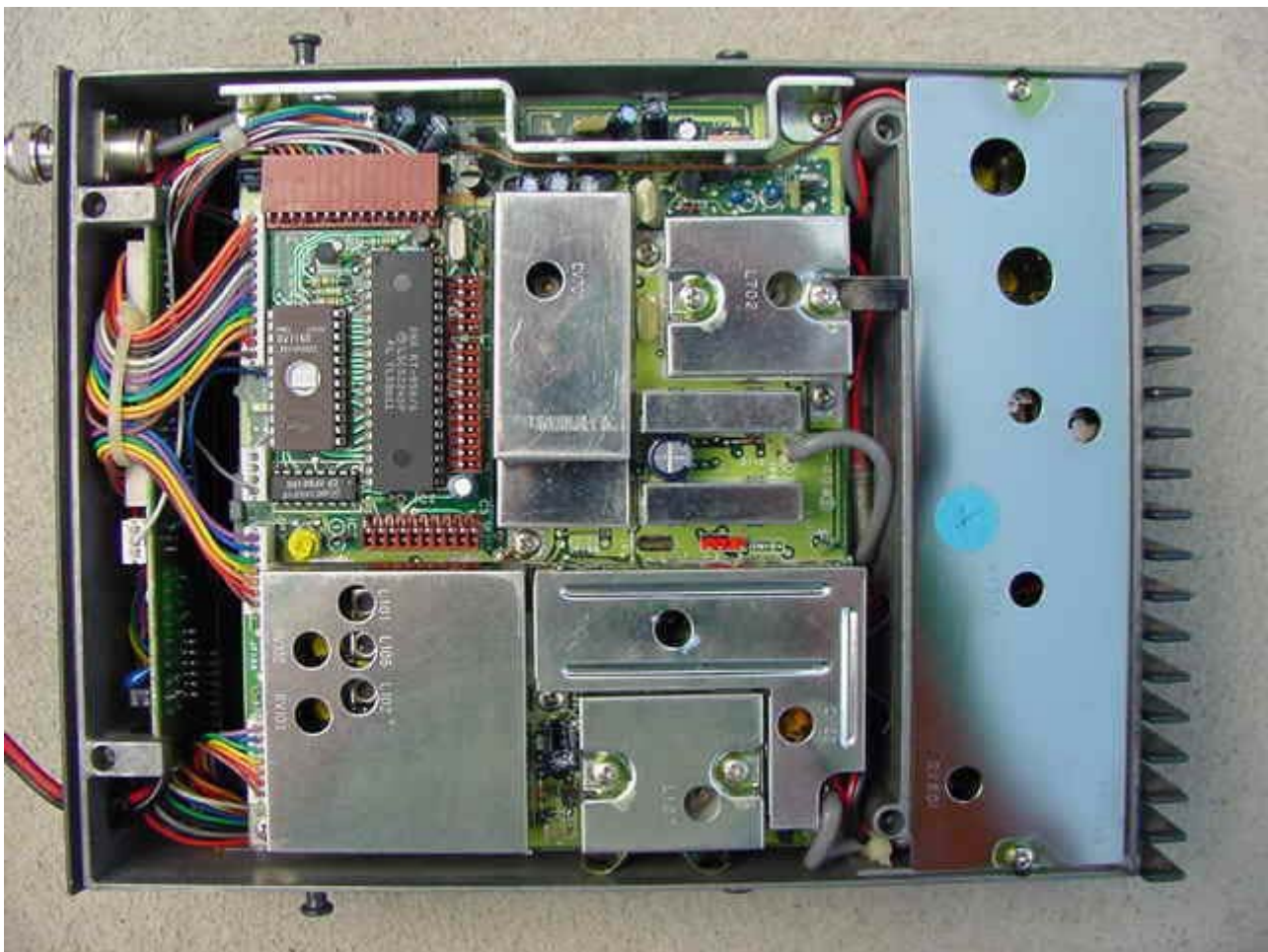
Hex tuning tool.
Flat blade tuning tool.
Voltmeter.
Signal Generator.
VSWR Meter and/or RF Power meter
Soldering Iron.
De-soldering equipment.
Sharp knife or scalpel.
Philips screwdriver
Wire cutters.
Needle nose pliers – small size.
Drill Bit. Size –

Information about AWA RT-85:

The RT-85 is characterized as a mobile base unit, approx 25cm Length, 20cm Wide, 6cm Depth, with heat sink at one end, two IDC connectors at the other end, one 26 pin for remote head connection a 20 pin connector, a BNC antenna socket and 13.8V DC power lead. The remote head, includes twin 7 segment displays for channel indication and several buttons for channels selection, scan facilities, plus Volume and Mute controls, TX & RX indication LEDs. A RT-80 ten channel head can be used on the RT-85's.

- Channel Capacity - 80 Channels 00-79 (**NOTE:** depends on head used)
- Options that can be fitted - Selcall, CTCSS, Data Control Head.
- Options already in radio - Scanning Variable rate, 80 Channels in one bank, Status.

The AWA RT85:





AWA RT85 80 Channel Head: Above



AWA RT80 10 Channel Remote Head: Above

The AWA RT80 remote head can be used with the AWA RT85 transceiver; However you are restricted to 10 channels. There is a special EPROM for voice repeaters and packet frequencies at the web site that you can download. No modifications are necessary when using the AWA RT80 remote head with the AWA RT85 transceiver.

Information about Midland 70-066

Syntech I & 8 Channel

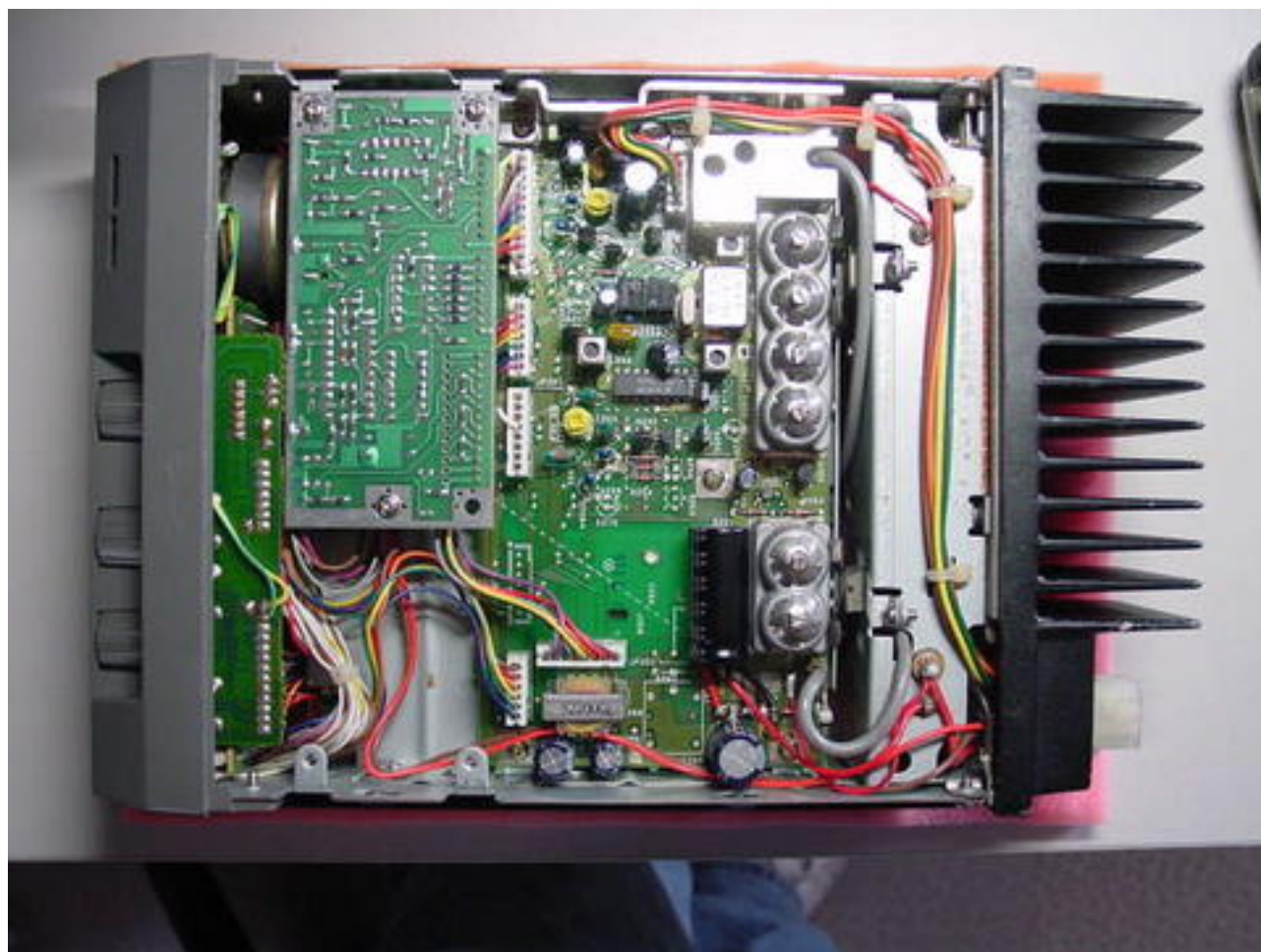
<u>Model</u>	<u>Type</u>	<u>Split</u>	<u>Power</u>	<u>Channels</u>	<u>Comments</u>
70-066	ST1	66-80 mhz	40 watt	80	Dash Mount mid band
A-66-80 Mhz					
B-75-88 Mhz					



Above - Front View,



Above – Bottom View



Above – Top View

6 METER AWA RT85 & Midland 70-066 FM FREQUENCIES – Normal EPROM:

Ch	Scan	Rx	Tx	CTCSS	Callsign	Service Area
00	1	52.525	52.525		Voice	Main Calling Frequency
01	1	53.550	52.550		Repeater	VK2RAY NSW Albury VK2RIC NSW Lismore-Casino VK3RMH Vic NE Melbourne
02	1	53.575	52.575		Repeater	VK2RSM NSW Walcha & Snowy VK3RDD Vic Dandenong
03	1	53.600	52.600		Repeater	VK2RNW NSW Narrabri VK3RMR Vic Gippsland
04	1	53.625	52.625		Repeater	VK2RSN NSW Newcastle VK3RHF Vic East Melbourne VK4RXD Qld Sunshine Coast NZ Otago
05	1	53.650	52.650		Repeater	VK2RMP NSW Wollongong
06	1	53.675	52.675		Repeater	VK2RMB NSW Terry Hills Sydney VK3RAD Vic Melbourne East & NE Vic
07	1	53.700	52.700		Repeater	VK2RGN NSW Goulburn VK4RSN Qld Sunshine Coast
08	1	53.725	52.725	123	Repeater	VK2RAG NSW Central Coast VK4RGA Qld Gladstone VK4RLB Qld Woodridge/BrisbaneSouth
09	1	53.750	52.750		Repeater	VK5RSB SA Summertown/Adelaide NZ Wellington
10	1	53.775	52.775		Repeater	VK5RAD SA Crafers/Adelaide VK4RRC Qld Redcliffe/N Brisbane VK4RBG Qld Bundaberg VK4RBP Qld Atherton Tableland
11	1	53.800	52.800		Repeater	VK6RAP WA Roleystone/Perth VK4RGO Qld Gold Coast NZ Mt Climie [NE Wellington]
12	1	53.825	52.825		Repeater	VK7RAD Tas Hobart VK7RNW Tas Ulverstone N/W Coast
13	1	53.850	52.850		Repeater	VK2RWI NSW Dural/Sydney NZ Christchurch
14	1	53.875	52.875	123	Repeater	VK2RBM NSW Lawson/Blue Mts VK7RAA Tas Mt Barrow/N Tas
15	1	53.900	52.900		Repeater	VK3RMS Vic East Melbourne
16	1	53.925	52.925		Repeater	VK1RGI ACT Mt Ginini ACT & SE NSW VK4RBX Qld Ipswich
17	1	53.950	52.950		Repeater	VK4RBL Qld Brisbane South
18	1	53.975	52.975		Repeater	VK3RGM Vic Mt Buller NE Vic VK4RBR Qld Mt Gravatt Brisbane
19	0	52.500	52.500		Voice	International calling frequency
20	0	52.525	52.525		Voice	National Calling Frequency
					Repeater	Reverse Channels
21	0	52.550	53.550			Reverse channel # 1
22	0	52.575	53.575			Reverse channel # 2
23	0	52.600	53.600			Reverse channel # 3
24	0	52.625	53.625			Reverse channel # 4
25	0	52.650	53.650			Reverse channel # 5
26	0	52.675	53.675			Reverse channel # 6
27	0	52.700	53.700			Reverse channel # 7
28	0	52.725	53.725			Reverse channel # 8
29	0	52.750	53.750			Reverse channel # 9
30	0	52.775	53.775			Reverse channel #10
31	0	52.800	53.800			Reverse channel #11
32	0	52.825	53.825			Reverse channel #12
33	0	52.850	53.850			Reverse channel #13
34	0	52.875	53.875			Reverse channel #14
35	0	52.900	53.900			Reverse channel #15
36	0	52.925	53.925			Reverse channel #16
37	0	52.950	53.950			Reverse channel #17
38	0	52.975	53.975			Reverse channel #18

Data Channels

39 0 53.000 53.000
 40 0 53.025 53.025
 41 0 53.050 53.050
 42 0 53.075 53.075
 43 0 53.100 53.100

Voice Simplex Channels

44 0 53.125 53.125
 45 0 53.150 53.150
 46 0 53.175 53.175
 47 0 53.200 53.200
 48 0 53.225 53.225
 49 0 53.250 53.250
 50 0 53.250 53.275
 51 0 53.300 53.300
 52 0 53.325 53.325
 53 0 53.350 53.350
 54 0 53.375 53.375
 55 0 53.400 53.400
 56 0 53.425 53.425
 57 0 53.450 53.450
 58 0 53.475 53.475
 59 0 53.500 53.500
 60 0 53.525 53.525

WICEN

Repeater Simplex

61 0 53.559 53.550

6 METER AWA RT85 & Midland 70-066 FM FREQUENCIES - 10 Channel EPROM

Ch	Scan	Rx	Tx	CTCSS	Callsign	Service Area
00	1	52.525	52.525		Voice	Main Calling Frequency
01	0	53.150	53.150		Voice	WICEN
02	1	53.625	52.625		Repeater	VK2RSN NSW Newcastle VK3RHF Vic East Melbourne VK4RXD Qld Sunshine Coast NZ Otago
03	1	53.650	52.650		Repeater	VK2RMP NSW Wollongong
04	1	53.675	52.675		Repeater	VK2RMB NSW Terry Hills Sydney VK3RAD Vic Melbourne East & NE Vic
05	1	53.725	52.725	123	Repeater	VK2RAG NSW Central Coast VK4RGA Qld Gladstone VK4RLB Qld Woodridge/BrisbaneSouth
06	1	53.850	52.850		Repeater	VK2RWI NSW Dural/Sydney NZ Christchurch
07	1	53.875	52.875	123	Repeater	VK2RBM NSW Lawson/Blue Mts VK7RAA Tas Mt Barrow/N Tas
08	0	52.500	52.500		Voice	International calling frequency
09	1	53.925	52.925		Repeater	VK1RGI ACT Mt Ginini ACT & SE NSW VK4RBX Qld Ipswich

6 Meter AWA RT85 & Midland 70-066 FM Frequencies –

Rx only for F calls & non licensed amateurs:

Ch	Scan	Rx	Callsign	Service Area
00	1	52.525	Voice	Main Calling Frequency
01	1	53.550	Repeater	VK2RAY NSW Albury VK2RIC NSW Lismore-Casino VK3RMH Vic NE Melbourne
02	1	53.575	Repeater	VK2RSM NSW Walcha & Snowy VK3RDD Vic Dandenong
03	1	53.600	Repeater	VK2RNW NSW Narrabri VK3RMR Vic Gippsland
04	1	53.625	Repeater	VK2RSN NSW Newcastle VK3RHF Vic East Melbourne VK4RXD Qld Sunshine Coast NZ Otago
05	1	53.650	Repeater	VK2RMP NSW Wollongong
06	1	53.675	Repeater	VK2RMB NSW Terry Hills Sydney VK3RAD Vic Melbourne East & NE Vic
07	1	53.700	Repeater	VK2RGN NSW Goulburn VK4RSN Qld Sunshine Coast
08	1	53.725	Repeater	VK2RAG NSW Central Coast VK4RGA Qld Gladstone VK4RLB Qld Woodridge/BrisbaneSouth
09	1	53.750	Repeater	VK5RSB SA Summertown/Adelaide NZ Wellington
10	1	53.775	Repeater	VK5RAD SA Crafers/Adelaide VK4RRC Qld Redcliffe/N Brisbane VK4RBG Qld Bundaberg VK4RBP Qld Atherton Tableland
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13	1	53.850	Repeater	VK2RWI NSW Dural/Sydney NZ Christchurch
14	1	53.875	Repeater	VK2RBM NSW Lawson/Blue Mts VK7RAA Tas Mt Barrow/N Tas
15	1	53.900	Repeater	VK3RMS Vic East Melbourne
16	1	53.925	Repeater	VK1RGI ACT Mt Ginini ACT & SE NSW VK4RBX Qld Ipswich
17	1	53.950	Repeater	VK4RBL Qld Brisbane South
18	1	53.975	Repeater	VK3RGM Vic Mt Buller NE Vic VK4RBR Qld Mt Gravatt Brisbane
19	0	52.500	Voice	International calling frequency
20	0	52.525	Voice	National Calling Frequency
			Repeater	Reverse Channels
21	0	52.550		Reverse channel # 1
22	0	52.575		Reverse channel # 2
23	0	52.600		Reverse channel # 3
24	0	52.625		Reverse channel # 4
25	0	52.650		Reverse channel # 5
26	0	52.675		Reverse channel # 6
27	0	52.700		Reverse channel # 7
28	0	52.725		Reverse channel # 8
29	0	52.750		Reverse channel # 9
30	0	52.775		Reverse channel #10
31	0	52.800		Reverse channel #11
32	0	52.825		Reverse channel #12
33	0	52.850		Reverse channel #13
34	0	52.875		Reverse channel #14
35	0	52.900		Reverse channel #15
36	0	52.925		Reverse channel #16

37 0 52.950 Reverse channel #17
 38 0 52.975 Reverse channel #18

Data Channels

39 0 53.000
 40 0 53.025
 41 0 53.050
 42 0 53.075
 43 0 53.100

Voice Simplex Channels

44 0 53.125
 45 0 53.150
 46 0 53.175
 47 0 53.200
 48 0 53.225
 49 0 53.250
 50 0 53.250
 51 0 53.300
 52 0 53.325
 53 0 53.350
 54 0 53.375
 55 0 53.400
 56 0 53.425
 57 0 53.450
 58 0 53.475
 59 0 53.500
 60 0 53.525

WICEN

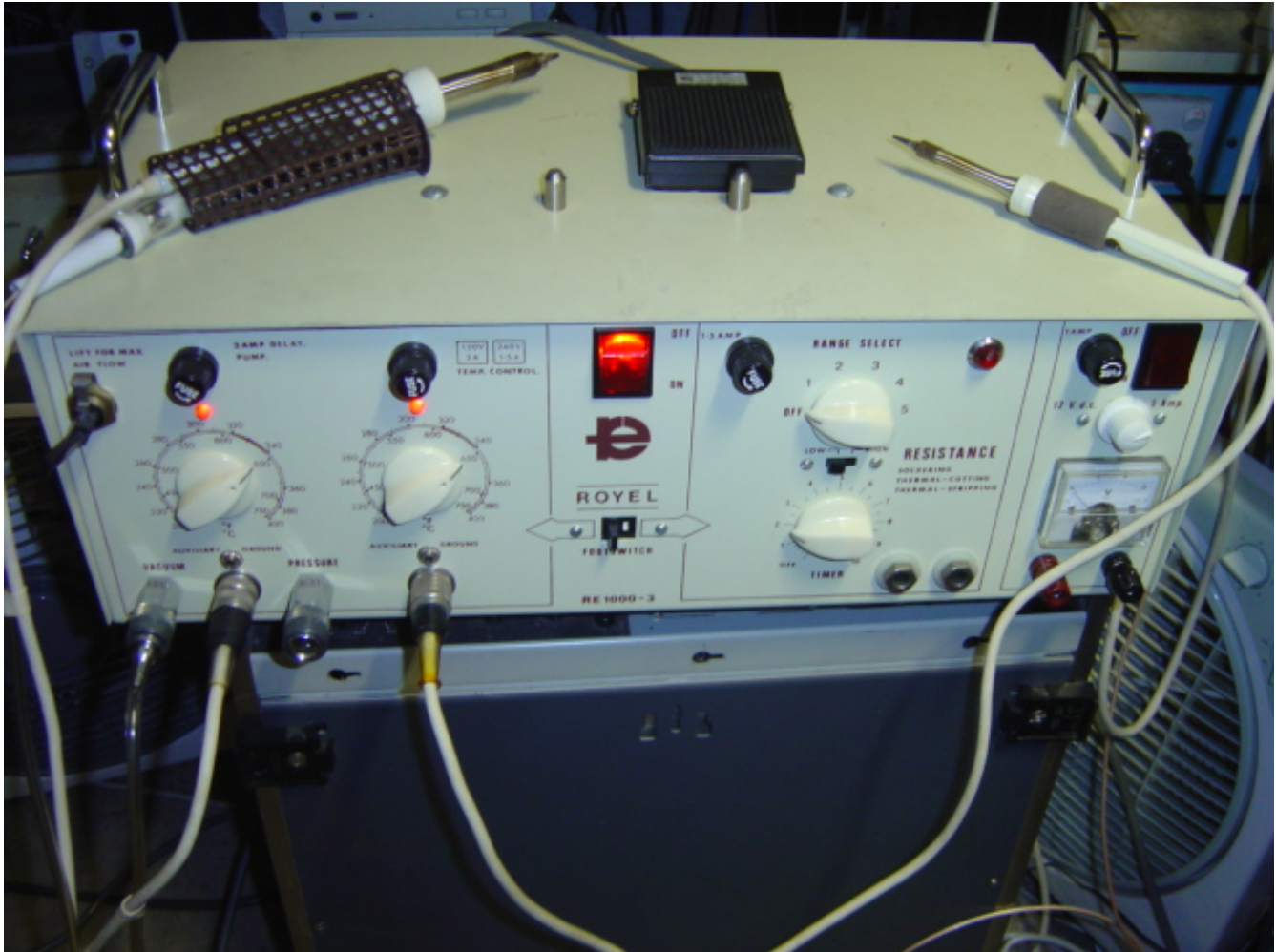
Repeater Simplex

61 0 53.559

6 METER AWA RT85 FM FREQUENCIES - 10 Channel EPROM for F calls

Ch	Scan	Rx	CTCSS	Callsign	Service Area
00	1	52.525		Voice	Main Calling Frequency
01	0	53.150		Voice	WICEN
02	1	53.625		Repeater	VK2RSN NSW Newcastle VK3RHF Vic East Melbourne VK4RXD Qld Sunshine Coast NZ Otago
03	1	53.650		Repeater	VK2RMP NSW Wollongong
04	1	53.675		Repeater	VK2RMB NSW Terry Hills Sydney VK3RAD Vic Melbourne East & NE Vic
05	1	53.725	123	Repeater	VK2RAG NSW Central Coast VK4RGA Qld Gladstone VK4RLB Qld Woodridge/BrisbaneSouth
06	1	53.850		Repeater	VK2RWI NSW Dural/Sydney NZ Christchurch
07	1	53.875	123	Repeater	VK2RBM NSW Lawson/Blue Mts VK7RAA Tas Mt Barrow/N Tas
08	0	52.500		Voice	International calling frequency
09	1	53.925		Repeater	VK1RGI ACT Mt Ginini ACT & SE NSW VK4RBX Qld Ipswich

Using the Club's De-soldering Station:



Plug in de-soldering tool [Vacuum & power] (left top in above picture) and soldering iron (right top in above picture) into the **Royal de-soldering** Station, then plug into 240V and turn on. Set both to approximately 340 degrees Centigrade. Place vacuum foot control (center top in above picture) on floor and make sure that the foot-switch [on front panel of de-soldering station] is in the left position. Make sure that the de-soldering iron sucks ok when heated up [ie solder is sucked into barrel when foot switch is pressed, (which leaves a hole at the end of the iron tip, barrel)].

The instructions below are based on a right handed person, reverse the instructions if you are left handed. If you have problems using two hands, then get another person to help you with one of their hands.

With left hand pick up soldering iron and place onto the side of the pin to be extracted, then with the right hand feed solder onto the pin [ensure solder flows around pin] then;

Keep the left hand & soldering iron on the side of the pin and, pick up the de-soldering iron with the right hand and place over the pin to be extracted.

With a foot [left or right], press the suction [vacuum] pedal to enable solder to be extracted from around the pin by the de-soldering iron [tool].

Check that the solder has been extracted from around the pin; If not redo the above operation.

Make sure pin is loose and not stuck to the side of the hole. If it is stuck, gently with the de-soldering iron move it to the center of the hole and free.

Do all pins for each module. Then unscrew the two holding screws for each module and gently lever each module off the receiver board. Note: Too much pressure can break a pin or several pins.

“Bugs Juice” The original brew from Bruce VK2ZAD but text modified by Rod VK2DOT.

The following concoction is recommended for users of this document to brew up, this brew will enable your de-soldering to become easier.

Rosin and Methylated Spirits are purchased from your local hardware store.

To brew up this **“Bugs Juice”**:

- Crush lumps of rosin and place in a jar or a small tin can with an air tight lid.
- Cover the rosin in the jar or can with methylated spirits.
- Apply the air tight lid and allow to dissolve.
- If the final solution is too thick, then thin with more methylated spirits.
- If the final solution is too thin, then thicken by adding more rosin.
- Apply to the surface to be de-soldered with a small brush, old toothbrush or icy pole stick. We have found that a wooden **tooth pick** has been the most successful method of applying the Bugs Juice to the pin requiring de-soldering.

Midland Land Mobile Model and Features Table:

The Syntech I (AKA Syntech 1 or ST1) uses a "Z-273" module to hold the codeplug in a UV-erased PROM - i.e. the frequency and tone information. Changing anything requires erasing the PROM chip under a UV light and then reprogramming it with the 70-1000 stand alone programmer, or the 70-1000c programmer which uses a PC to reprogram the eeprom module.

The Syntech II (AKA Syntech 2 or ST2) and XTR have a programming connector for programming by a PC using the the 70-1308A cable. The ST1s were made in the early 1980s.....the XTR was the transition model between the I and the II, it and the ST2s came out in very late 80s/early 90s. The ST1 control head has blue push buttons, the ST2 head has white buttons.

The newest models are the Bantam and Titan models. The Bantam radios are the smallest, programmed through the RJ-45 microphone connector with the 70-1309 programmer in line between the radio and a PC serial port. The Titan models are their current production units. The Securicor radios are Titans that were manufactured during the time Midland was owned by Securicor (Midland is now back under it's own name).

Model Type Split Power Channel Count Comments

Syntech I & 8 Channel

70-336	ST-1	150-174	35 watts	8	dash mount VHF
70-526	ST-1	470-470	25 watts	8	dash mount UHF
70-343*	ST-1	150-174	20-40 watt	80	Marine use, dash mount
70-443*	ST-1	150-174	20-40 watt	80	Marine use, trunk mount
70-343A*	ST-1	150-174	1-25 watt	80	Marine use, dash mount
70-443A*	ST-1	150-174	1-25 watt	80	Marine use, trunk mount
* These are type accepted for off shore and harbor use					
70-050	ST-1	30-50	50 watt	80	Dash Mount low band
70-055	ST-1	30-50	50 watt	80	trunk mount low band
70-052	ST-1	30-50	50 watt	80	Dash Mount low band
70-056	ST-1	30-50	110 watt	80	trunk mount low band
"A"=29-37mhz, "B"=35-44mhz, "C"=40-54mhz					
70-066	ST1	66-80 mhz	40 watt	80	Dash Mount mid band
70-076	ST1	66-80 mhz	40 watt	80	Trunk Mount mid band
"A"=66-80mhz, "B"=75-88mhz					
70-340	ST-1	136-174	40 watt	80	dash mount VHF
70-440	ST-1	136-174	40 watt	80	trunk mount VHF
70-342XL	ST-1	136-174	40 watt	80	dash mount wide band VHF
70-442XL	ST-1	136-174	40 watt	80	trunk mount wide band VHF
70-380	ST-1	136-174	80 watt	80	dash mount VHF
70-480	ST-1	136-174	80 watt	80	trunk mount VHF
70-382B	ST-1	136-174	80 watt	80	dash mount wideband VHF*
70-482B	ST-1	136-174	80 watt	80	trunk mount wideband VHF*
70-385	ST-1	136-174	110 watt	80	dash mount VHF
70-485	ST-1	136-174	110 watt	80	trunk mount VHF

"A"=136-156mhz, "B"=148-174mhz

The 70-382 and 70-482 radios are noted as "B" models because they were not available in A range.

70-530	ST-1	406-512	30watt	80	UHF Dash Mount
70-630	ST-1	406-512	30watt	80	UHF Trunk Mount

70-565	ST-1	406-512	65watt	80 UHF Dash Mount
70-665	ST-1	406-512	65watt	80 UHF Trunk Mount

"A"=406-430mhz, "B"=450-470mhz, "C"=470-494mhz, "D"=494-512mhz, "E"=430-450mhz

Conventional 800 radios

70-915	ST-1	806-870	15watt	800mhz Dash Mount
70-970	ST-1	806-870	15watt	800 mhz Trunk Mount
70-935	ST-1	806-870	35 watt	800 mhz Dash Mount
70-980	ST-1	806-870	35 watt	800mhz Trunk Mount

Trunked 800 radios

70-9015	ST-1	806-870	15watt	Dash Mount
70-9035	ST-1	806-870	30watt	Dash Mount
70-9115	ST-1	806-870	15watt	Trunk Mount
70-9135	ST-1	806-870	30watt	Trunk Mount

Desktop Base Stations

70-058	ST-1	30-50	25-50 watts	80
70-840	ST-1	150-174	20-40 watts	80
70-842XL	ST-1	150-174	20-40 watts	80
70-930	ST-1	450-470	15-30 watts	80
70-908	ST-1	806-870	>5-15 watts	80
70-909	ST-1	806-870	20-53 watts	80

Table Top Repeaters

70-805b	ST-1	150-174	2-5 watts
70-834b	ST-1	150-174	5-35 watt
70-905b	ST-1	450-470	2-5 watts
70-924b	ST-1	450-470	5-25 watts

XTR & 8 Channel

70-0351A	XTR	30-36	60 W	22	Dash Mount
70-0351B	XTR	36-42	60 W	22	Dash Mount
70-0351C	XTR	42-50	60 W	22	Dash Mount
70-0355A	XTR	30-36	60 W	22	Trunk Mount
70-0355B	XTR	36-42	60 W	22	Trunk Mount
70-0355C	XTR	42-50	60 W	22	Trunk Mount
70-0371A	XTR	30-36	110 W	22	Dash Mount
70-0371B	XTR	36-42	110 W	22	Dash Mount
70-0371B	XTR	36-42	110 W	22	Dash Mount
70-0371C	XTR	42-50	110 W	22	Dash Mount
70-0375A	XTR	30-36	110 W	22	Trunk Mount
70-0375B	XTR	36-42	110 W	22	Trunk Mount
70-0375C	XTR	42-50	110 W	22	Trunk Mount
70-1066A		66-77	30 W	8	Dash Mount
70-1066B		77-88	30 W	8	Dash Mount
70-1070A	XTR	66-77	40 W	22	Dash Mount
70-1070B	XTR	77-88	40 W	22	Dash Mount
70-1075A	XTR	66-77	40 W	22	Trunk Mount
70-1075B	XTR	77-88	40 W	22	Trunk Mount
70-1336A		136-160	25W	8	Dash Mount

70-1336B		150-174	30 W	8	Dash Mount
70-1340A	XTR	136-160	40 W	22	Dash Mount
70-1340B	XTR	150-174	40 W	22	Dash Mount
70-1342A	XTR	136-162	40 W	22	Dash Mount
70-1342B	XTR	148-174	40 W	22	Dash Mount
70-1395A	XTR	136-160	110 W	22	Dash Mount
70-1395B	XTR	150-174	110 W	22	Dash Mount
70-1440A	XTR	136-160	40 W	22	Trunk Mount
70-1440B	XTR	150-160	40 W	22	Trunk Mount
70-1442A	XTR	136-162	40 W	22	Trunk Mount
70-1442B	XTR	148-174	40 W	22	Trunk Mount
70-1495A	XTR	136-160	110 W	22	Trunk Mount
70-1495B	XTR	150-174	110 W	22	Trunk Mount
70-1526A		403-430	25W	8	Dash Mount
70-1526B		450-470	25W	8	Dash Mount
70-1530A	XTR	403-430	30 W	22	Dash Mount
70-1530B	XTR	450-470	30 W	22	Dash Mount
70-1530C	XTR	470-500	30 W	22	Dash Mount
70-1530D	XTR	490-520	30 W	22	Dash Mount
70-1532A	XTR	403-430	30 W	22	Dash Mount
70-1532B	XTR	450-470	30 W	22	Dash Mount
70-1595A	XTR	403-430	100W	22	Dash Mount
70-1595B	XTR	450-470	100W	22	Dash Mount
70-1630A	XTR	403-430	30 W	22	Trunk Mount
70-1630B	XTR	450-470	30 W	22	Trunk Mount
70-1630C	XTR	470-500	30 W	22	Trunk Mount
70-1630D	XTR	490-520	30 W	22	Trunk Mount
70-1632A	XTR	403-430	30 W	22	Trunk Mount
70-1632B	XTR	450-470	30 W	22	Trunk Mount
70-1695A	XTR	403-430	100W	22	Dash Mount
70-1695B	XTR	450-470	100W	22	Dash Mount
70-9020		806-870	15W	200	LTR Trunked
70-9160	XTR	806-870	35W	22	Conventional
70-9170		806-870	15W	8	Conventional
70-9170		806-870	5W	8	Conventional
70-9180	XTR	806-870	35W	22	Conventional

Syntech 2 Low Band

70-0501	ST-2	30-54	50watt	320	dash mount
70-0502	ST-2	30-54	50watt	320	dash mount w/deluxe head
70-0551	ST-2	30-54	50watt	320	trunk mount
70-0552	ST-2	30-54	50watt	320	trunk mount w/deluxe head
70-0557	ST-2	30-54	50watt	320	trunk mount w/small head
70-0521	ST-2	30-54	110watt	320	dash mount
70-0522	ST-2	30-54	110watt	320	dash mount w/deluxe head
70-0561	ST-2	30-54	110watt	320	trunk mount
70-0562	ST-2	30-54	110watt	320	trunk mount w/deluxe head
70-0567	ST-2	30-54	110watt	320	trunk mount w/small head

"A"=30-36mhz, "B"=36-42mhz, "C"=42-50mhz CWB indicates 11 mhz T & R The deluxe head has an LCD display

Syntech 2 VHF (wideband, 24mhz)

70-3421	ST-2	136-174	40 watt	320	dash mount
70-3422	ST-2	136-174	40 watt	320	dash mount deluxe head
70-4421	ST-2	136-174	40 watt	320	trunk mount

70-4422 ST-2 136-174 40 watt 320 trunk mount deluxe head
 70-4427 ST-2 136-174 40 watt 320 trunk mount small head
 70-3851 ST-2 136-174 110watt 320 dash mount
 70-3852 ST-2 136-174 110watt 320 dash mount deluxe head
 70-4851 ST-2 136-174 110watt 320 trunk mount
 70-4852 ST-2 136-174 110watt 320 trunk mount deluxe head
 70-4857 ST-2 136-174 110 watt 320 trunk mount small head
 "A"=136-160mhz, "B"=150-174mhz

Syntech 2 UHF

70-5301 ST-2 406-470 30 watt 320 dash mount wideband 24 mhz T & R
 70-5302 ST-2 406-470 30 watt 320 dash mount wideband 24 mhz T & R, deluxe head
 70-6301 ST-2 406-470 30 watt 320 trunk mount wideband
 70-6302 ST-2 406-470 30 watt 320 trunk mount wideband, deluxe head
 70-6307 ST-2 406-470 30 watt 320 trunk mount wideband, small head
 "A"=406-430mhz, "B"=450-470mhz

Continuous duty repeaters

70-0700 ST-2 148-174 45-70 watts VHF
 70-1500 ST-2 148-174 100-150 watts VHF
 70-2500 ST-2 148-174 250 watts VHF
 70-4050 ST-2 450-512 30-50 watt UHF
 70-4120 ST-2 450-512 90-120 watts UHF
 70-8030 ST-2 806-870 30 watt 800 mhz
 70-8100 ST-2 806-870 100 watt 800mhz

Data collected by Bill Janes, N9SII and provided to www.repeater-builder.com for presentation Hand coded HTML by Mike WA6ILQ
 Page created 03-Nov-2003 Last revised 01-Aug-2008

EPROM Software:

Firmware.

6m-10ch.fre Frequency input file for RT85 10 channel EPROM.
6m-10ch.bin Binary file for EPROM burning using 10 Channel frequency listing.

6meters.fre Frequency input file for RT85 62 channel EPROM.
6meters.bin Binary file for EPROM burning using 62 Channel frequency listing.

Software.

Software Description:

The RT85 6 meter firmware generator Software has the following functions & restrictions:-

- § You can only use file 6meters.fre as the input frequency file for generating the firmware.
- § The firmware binary file defaults to file 6meters.bin.
- § Software will operate under DOS or Windows & from a floppy or hard drive or from a USB stick.
- § Will only generate at present RT85 2716 EPROMs.
- § Some of the following Functions are working but has to be updated:-

- F1 – key to Display Software HELP & Information. [has to be finished]
- F2 – key to View EPROM 2716 Memory Allocation. [has to be finished]
- F3 - key to View EPROM 2764 Memory Allocation. [has to be checked]
- F4 - key to Select 2716 or 2764 EPROM. [not finished]
- F5 - key to Change Input File Name. [not finished]
- F6 - key to Edit Input File. [not finished]
- F7 - key to Generate 6 Meter EPROM Bin File.
- F8 - key to Display Directory Files. [not finished]
- F10 – key to QUIT program. [finished]

- Shift F1 - key to Tx Timeout in seconds. [has to be checked]
- Shift F2 - key to Enable display blanking after 20 seconds. [has to be checked]
- Shift F3 - key to Select Tx timeout in seconds. [has to be checked]
- Shift F2 - key to Select enable display blanking after 20 sec. [has to be checked]
- Shift F3 - key to Enable Tx inhibit on BUSY . [has to be checked]
- Shift F4 - key to Enable Tx inhibit on OPEN. [has to be checked]
- Shift F5 - key to Select Tx Hi/Lo output Power link. [has to be checked]

- Shift F6 - key to Select Scan / No Scan. [has to be checked]
- Shift F7 - key to Enable Rx Scan stop on CTCSS. [has to be checked]
- Shift F8 - key to Enable channel down key to delete. [has to be checked]
- Shift F9 - key to Enable hang up resets scan. [has to be checked]

- Cnt F1 - key to Enable self programming. [has to be checked]
- Cnt F2 - key to Select Scan Hold time in seconds. [has to be checked]
- Cnt F3 - key to Enable silent switch. [has to be checked]
- Cnt F4 - key to enable tone squelch [CTCSS on Rx]. [has to be checked]

Initial Testing:

Equipment Needed.

AWA RT85 or Midland 70-066 transceiver [with EPROM installed],

Frequency Counter. Reads up to 88Mhz

Power or VSWR/Power Meter to cover 50Mhz to 88Mhz.

12 Volt power supply

Signal Generator to cover 50Mhz to 88Mhz.

Testing.

Hopefully, your AWA RT85 or Midland 70-066 has an installed EPROM. And the EPROM has not been erased, If this is TRUE then;

Connect your transceiver to a 12 Volt power supply and the antenna to power meter and dummy load. Go to channel 0; Press the transmit button to allow the power out to be loosely coupled to a Frequency counter. Measure the Frequency and power out.

Frequency -

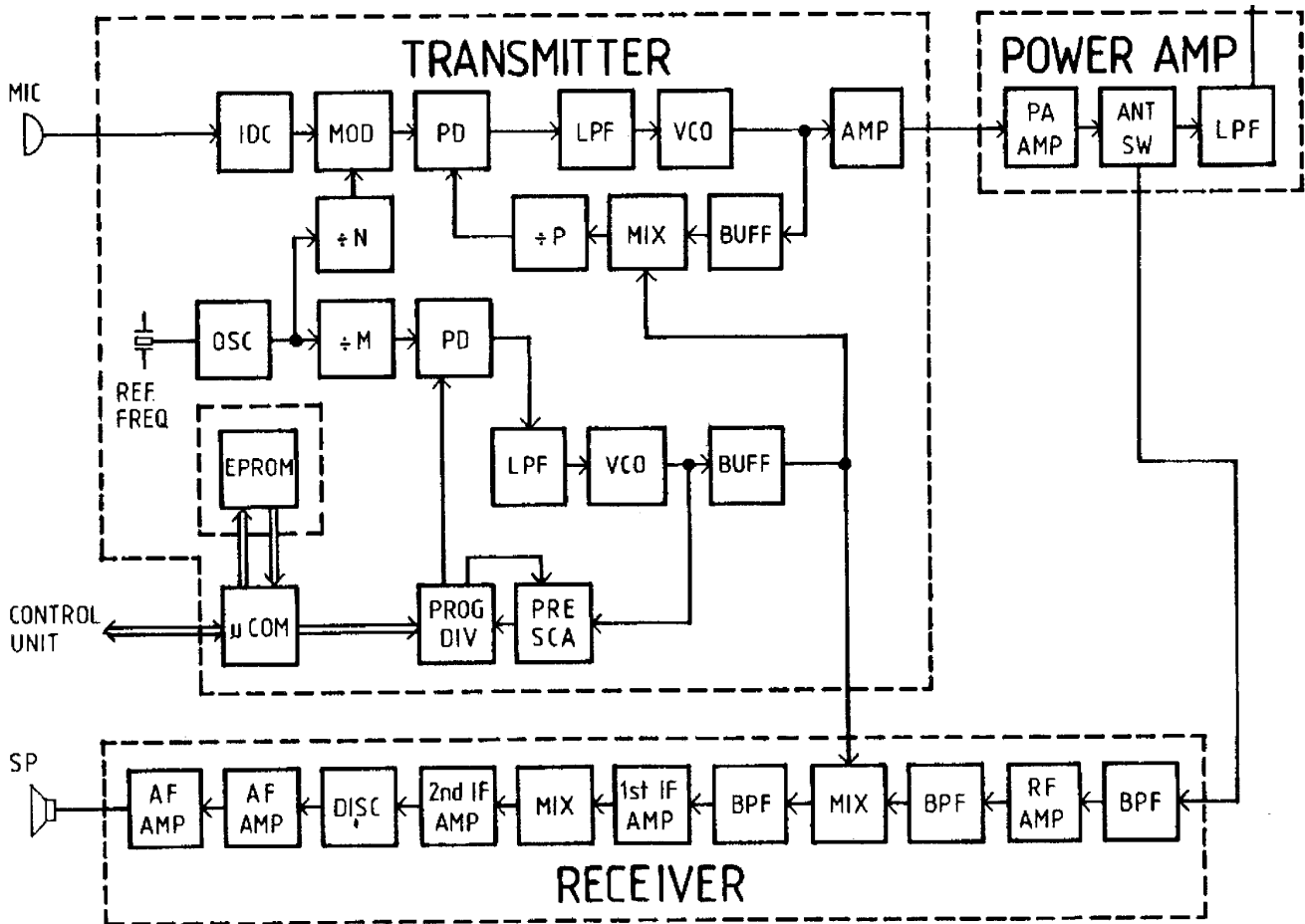
Power Out -

Then - Connect your transceiver to a signal generator and, adjust the signal generator to the above noted frequency; Adjust the mute to just close; then - measure the micro-volts for mute opening, for receiver sensitivity.

Rx Sensitivity –

If all of the above are OK then you may continue with the conversion or repair your transceiver before conversion.

The AWA RT-85 Transceiver: - Theory of Operation.



SYNTHESIZER

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

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

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

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

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

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

TRANSMITTER

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

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

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

RECEIVER

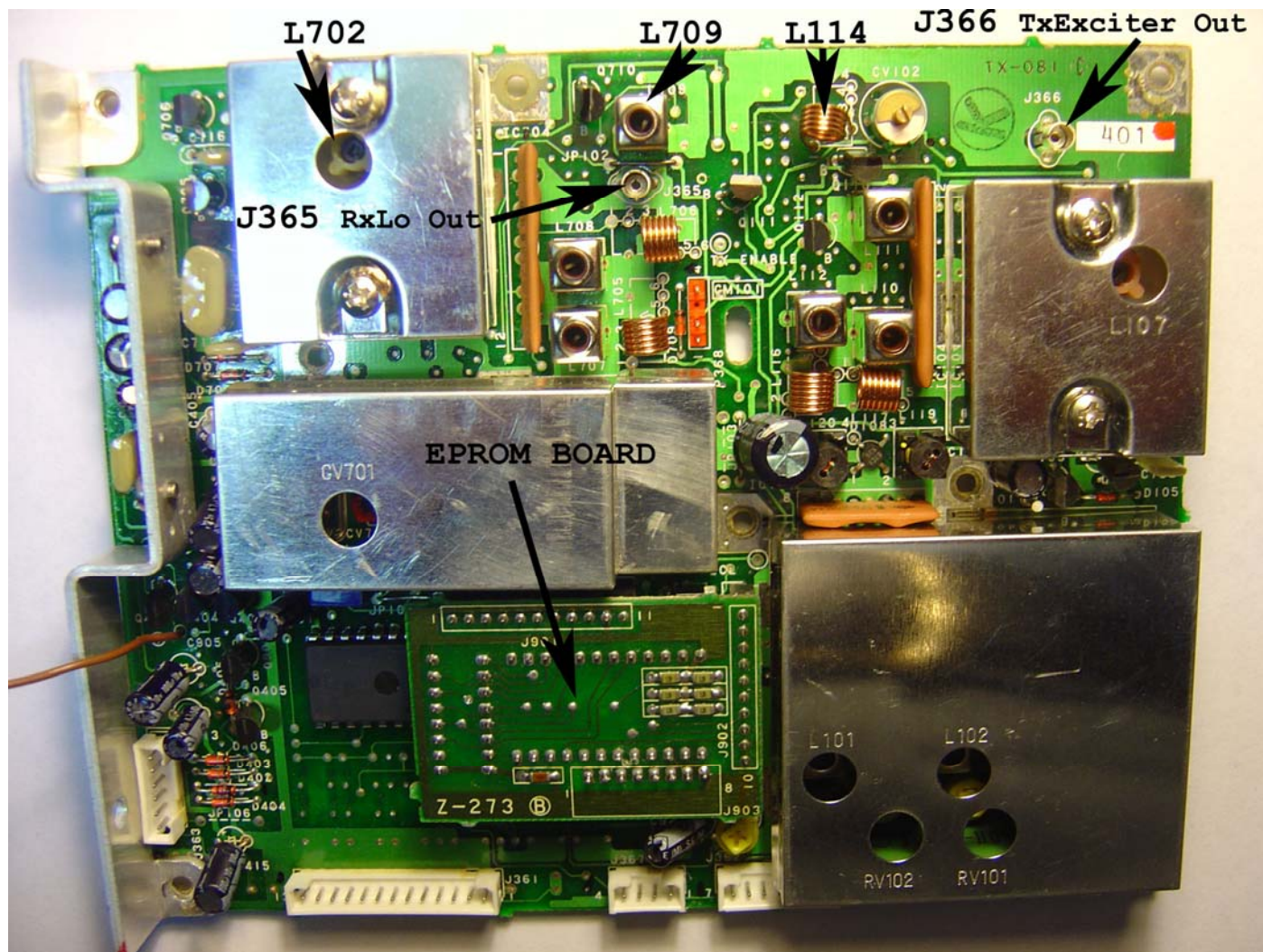
The RT-85 contains a double conversion superheterodyne receiver with 21.4MHz first IF and 455KHz second IF.

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

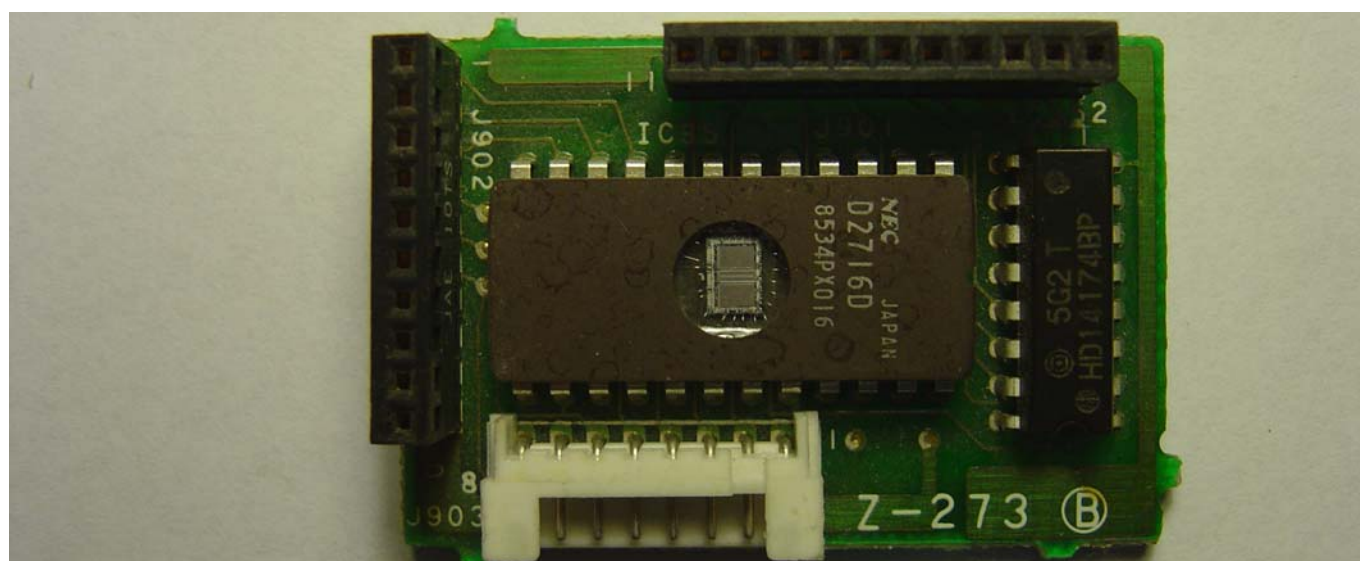
A narrow band crystal filter provides selectivity prior to amplification and mixing to 455KHz, where ceramic resonators provide the final selectivity filtering. A quadrature detector produces audio output which is gated by the noise squelch circuitry before being amplified up to the level required to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

The Synthesizer including EPROM Board.

RT85 Sync Board Top View - below:



Remove the EPROM board [above as **Z-273**], reverse view below.



Z-273 EPROM Board:

There are three methods of changing the EPROM data for different frequencies,

1. Using a MRP70-1000C (MRP-70) programmer box and software. This method allows you to program the EPROM on the Z-273 board, without de-soldering the EPROM from the Z-273 board. You must purchase the MPR70-1000C from the US.
2. Remove the Z-273 board from the Synthesizer Board. Then remove the 2716 EPROM using de-soldering equipment from the EPROM board. Then solder a low profile 24 pin socket to the EPROM board.

Reprogram EPROM with 6 meter firmware, by using the VK2DOT RT85 software of any other software.

3. Using the VK2DOT Z-273 adapter [as shown below]

Remove the Z-273 board from the Synthesizer Board.

Erase the EPROM on the Z-273 Board.

Place the Z-273 board on to the top of the VK2DOT Z-273 adapter;

Then insert the adapter into the EPROM zero insertion burning socket.

Burn the EPROM on the Z-273 Board using conventional EPROM burning software, of the file [eg 6meters.bin] containing the new frequencies. Which has been generated by the VK2DOT software.

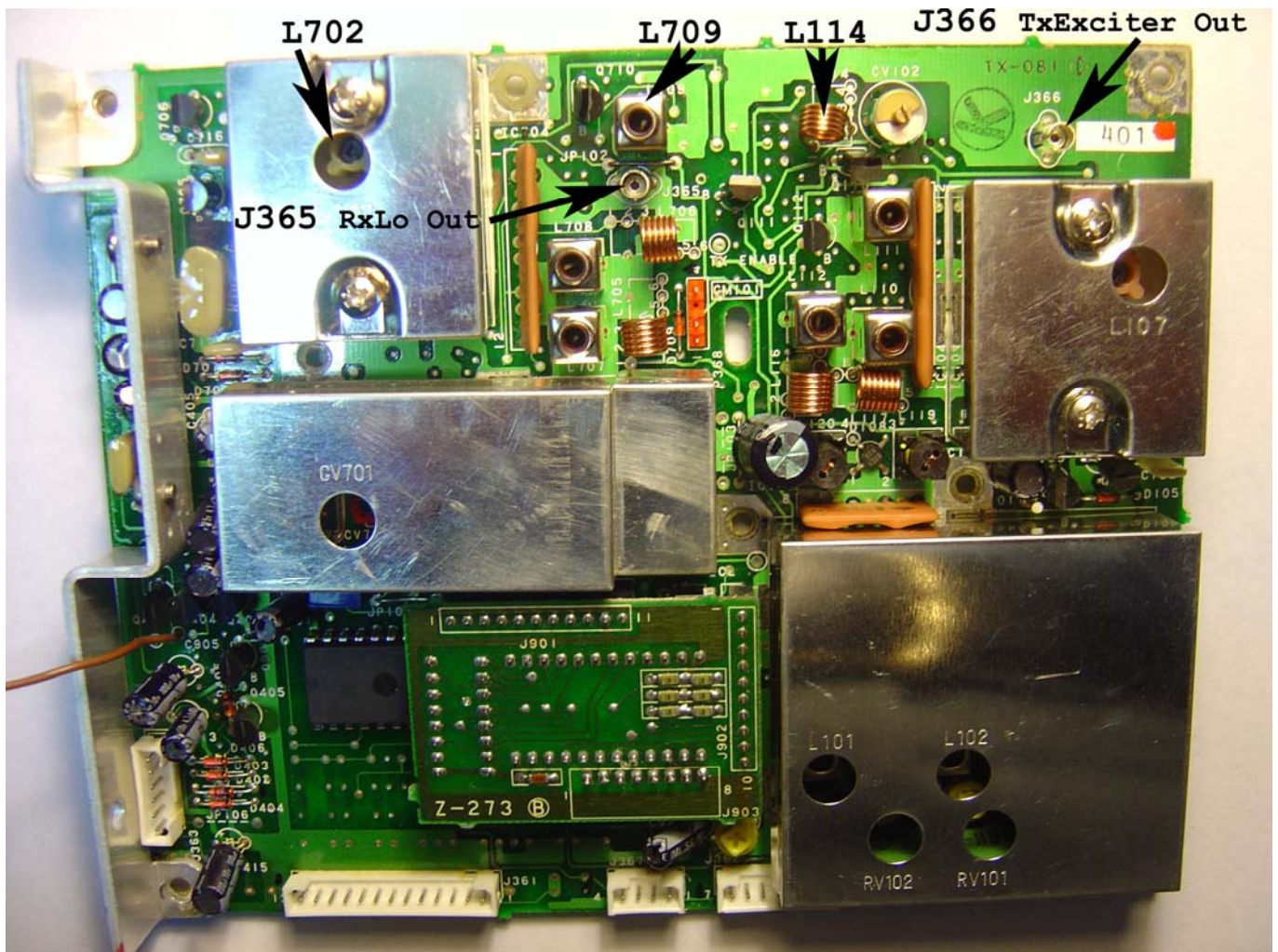
VK2DOT Z-273 adapter:

The VK2DOT Z-273 adapter was built by Peter McNab VK2NE.

The Synthesizer Board.

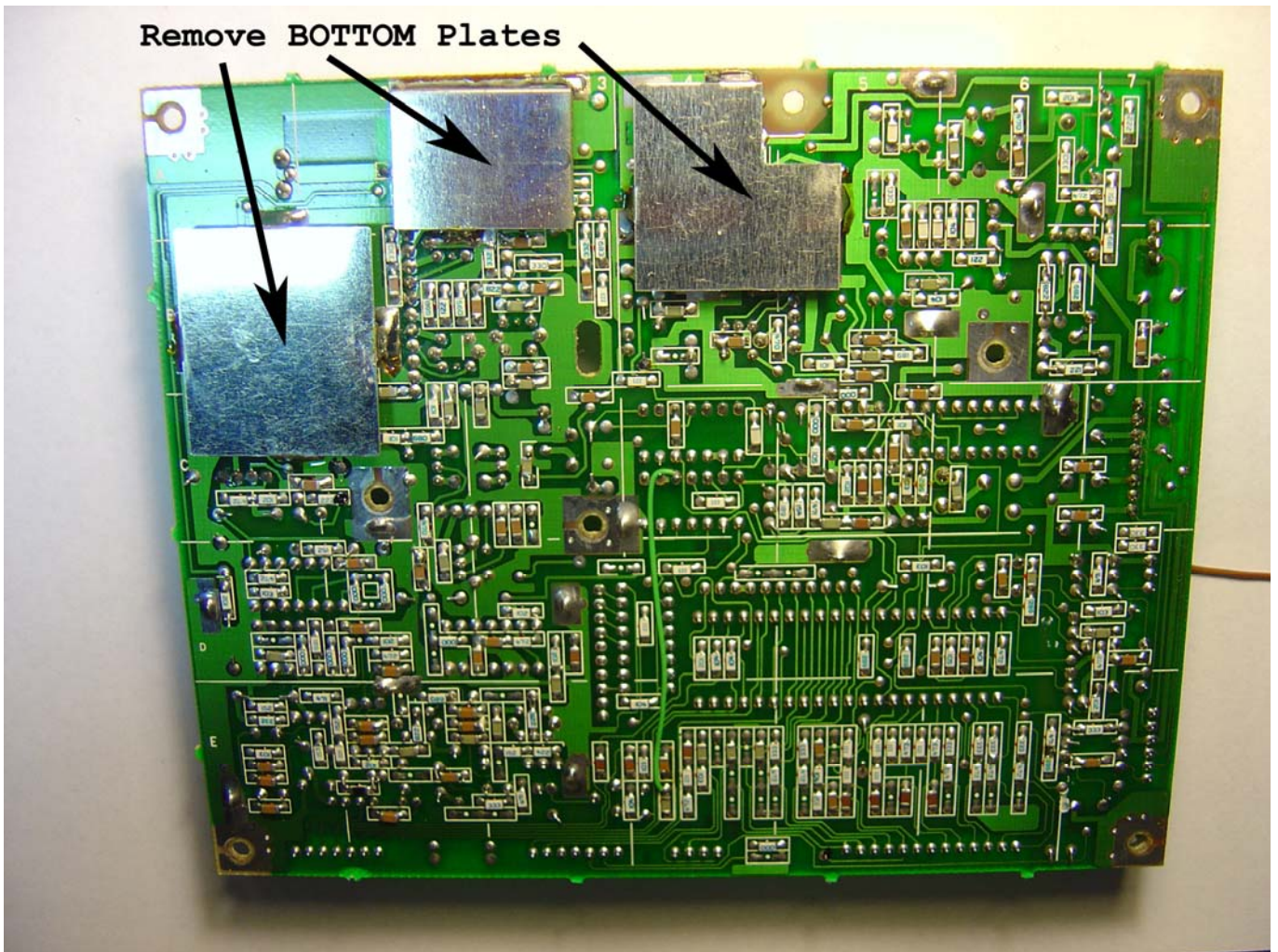
Remove the synthesizer board from the transceiver assembly.

RT85 Sync Board Top View below:

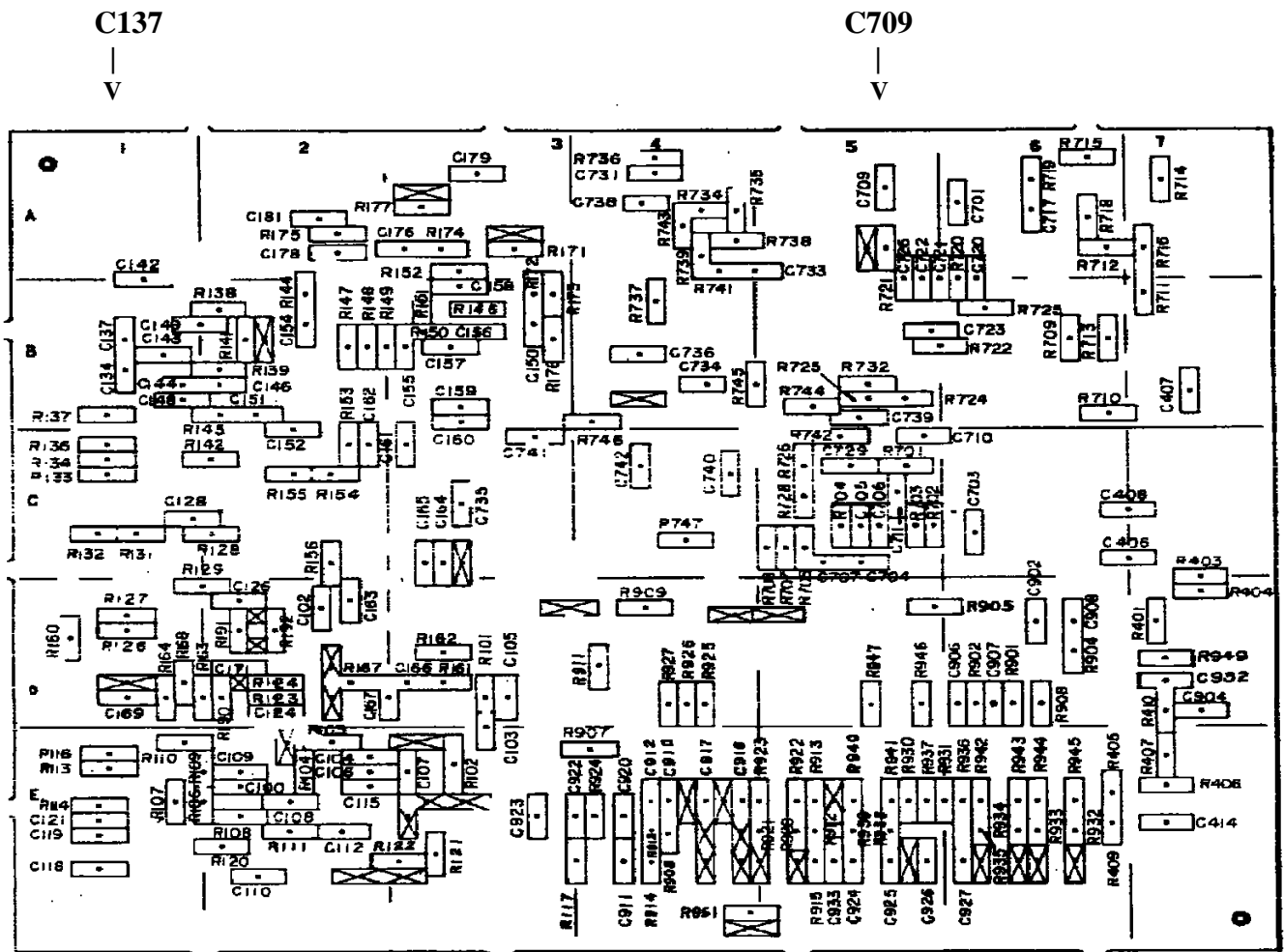


TX buffer, remove L114 and keep for use on the PA board; replace with 7.5 turns of 0.5mm wire, same diameter former.

RT85 Sync Board Bottom – Unsolder Bottom Plates:



RT85 Sync Board Bottom View Capacitors - below:

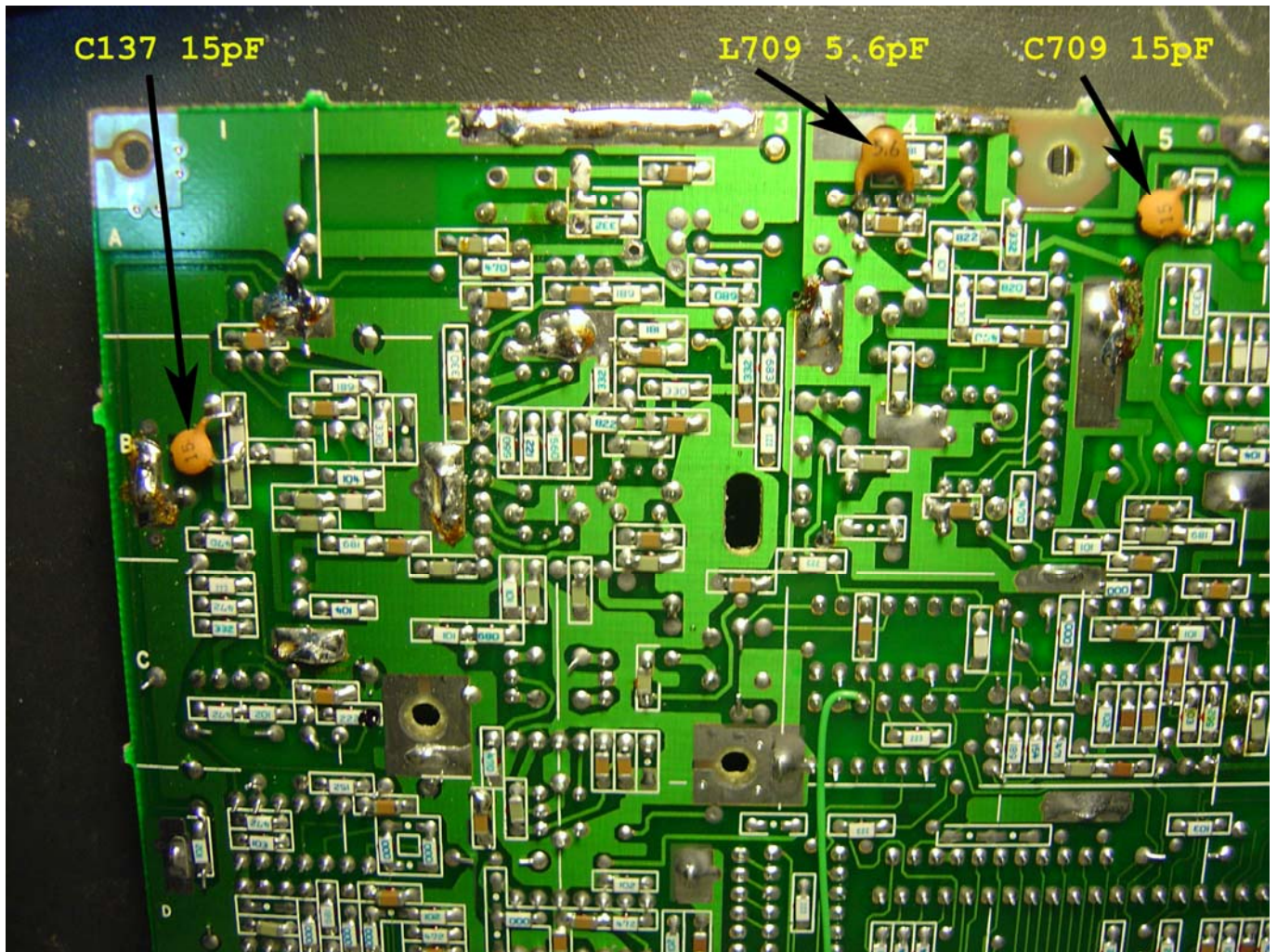


RX (main) VCO, add 15pF to C709.

TX (offset) VCO, add 15pF to C137, located under VCO cover on the track side of the board. Some transceivers may require more.

RX buffer amp, add 5.6pF to primary of L709

RT85 Sync Board Bottom View New Capacitors - below:



Re-solder bottom plates back onto bottom of Sync Board.

SYNTHESIZER ALIGNMENT

1. Plug the 6 meters programmed EPROM into the EPROM module Z-273, into the Synthesizer PCB. Disconnect the Transmitter exciter output J366; And the Receiver Local Oscillator output J365. Set the supply to 13.8 V.

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

If the Phase Locked Loop (PLL) is unlocked, the channel display will show "95", alert tone will be sounded, and the dc voltage at TP741 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.

NOTE: If you are using the old RT-80 ten channel head, then above channel numbers displayed are not applicable.

3. Use the correct alignment tool – the ferrite slugs are easily broken.

Adjust L702 such that the dc voltage at TP701 is centered on 3.5V for all programmed channels (i.e. some above 3.5V and some below 3.5V). 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 3.5V for TX and RX channels. Release the PTT button.

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

$$f = (\text{RX freq} - 21.4\text{MHz}) \pm 244\text{Hz} : \text{for V HF(HB) and UHF}$$

or

$$f = (\text{RX freq} + 21.4\text{MHz}) \pm 244\text{Hz} : \text{for VHF(LB)}$$

$$52.525\text{Mhz} = \text{Tx frequency} \quad \text{then} \quad 73.925\text{Mhz} = \text{Oscillator frequency.}$$

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.