Midland 70-066 Conversion To 6 Meters

Introduction

Ver 1.8 – 07 Nov 2009

Part 1

Rod McCosker VK2DOT

Midland 70-066 low Band Conversion to 6 Meters:

Index:

Acknowledgment:

This project was started in June 2008 on for amateurs interested in the use of the Midland 70-066 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 & Andrew VK4OX 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 16 pin.

Capacitors.		**Jaycar**
2.2pf	- 2 of	RC-5304
5.6pf	- 3 of	RC-5309
8.2pF	- 2 of	RC-5311
22pf	- 5 of	RC-5216
100pf	- 1 of	RC-5324
1000pf	- 1 of	RC-5336

Note: All capacitors are 50V Ceramic

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.

For the first few weeks of the conversion - you will need a box or A4 plastic bag to hold your screws and plates of the transceivers. Plus a 16 pin low profile IC socket [if you do not have a Z-273 board burner], 2 of 22pf capacitors, a 5.6pf capacitor, approximately 1 meter of about 0.63mm enamel coated wire & a reel of solder wick. On the first night bring along a Philips screwdriver. Later on, you will need a 5mm drill bit to wind your coils on.

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]

Drill Bit. Size – 5mm

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.

The Project.

There are five major events to modify your raw low band transceiver.

- **Initially - Test transceiver.** [This has to be done before any other operation.] This operation should take one night for all users to be satisfied that their transceiver **works!!**

  If you not happy with your soldering, then become a partner with somebody that is competent with soldering. Remember that if you break or burn something, we cannot replace the transceiver If you are not sure what you are doing, ask somebody.

- **Z-273 EPROM Modifications**. If you do not have a Z-273 board burner then remove the Z-273 PCB and the associated 2716 EPROM. Then burn the EPROM & return it to the Z-273 PCB via a 2 pin socket; Else program the Z-273 via the Z-273 PCB programmer.
- **Synthesizer Modification.** Remove PCB board, remove coil, make coil, replace board, place capacitors onto underside of board, synthesizer alignment and replace PCB board into transceiver. In this part, you will use test equipment. [Ie Frequency counter & DC meter. Plus tuning tools.]
- **Receiver Modification.** Remove PCB board, solder place capacitors onto underside of board, alignment of Receiver and replace PCB board into transceiver. In this part, you will use test equipment. [Ie Signal Generator & DC meter. Plus tuning tools.]
- **Transmitter PA Modifications.** Remove PCB board, remove coils, make coils, solder capacitors and coils onto underside of board, alignment of Transmitter and replace PCB board into transceiver. In this part, you will use test equipment. [Ie RF Power meter & DC meter. Plus tuning tools.]

The Z-273 EPROM Modifications and Synthesizer Modification must be done first, before alignment can be done. It is advisable that members split into groups, doing an event for each group.

Information about Midland 70-066

Syntech I & 8 Channel

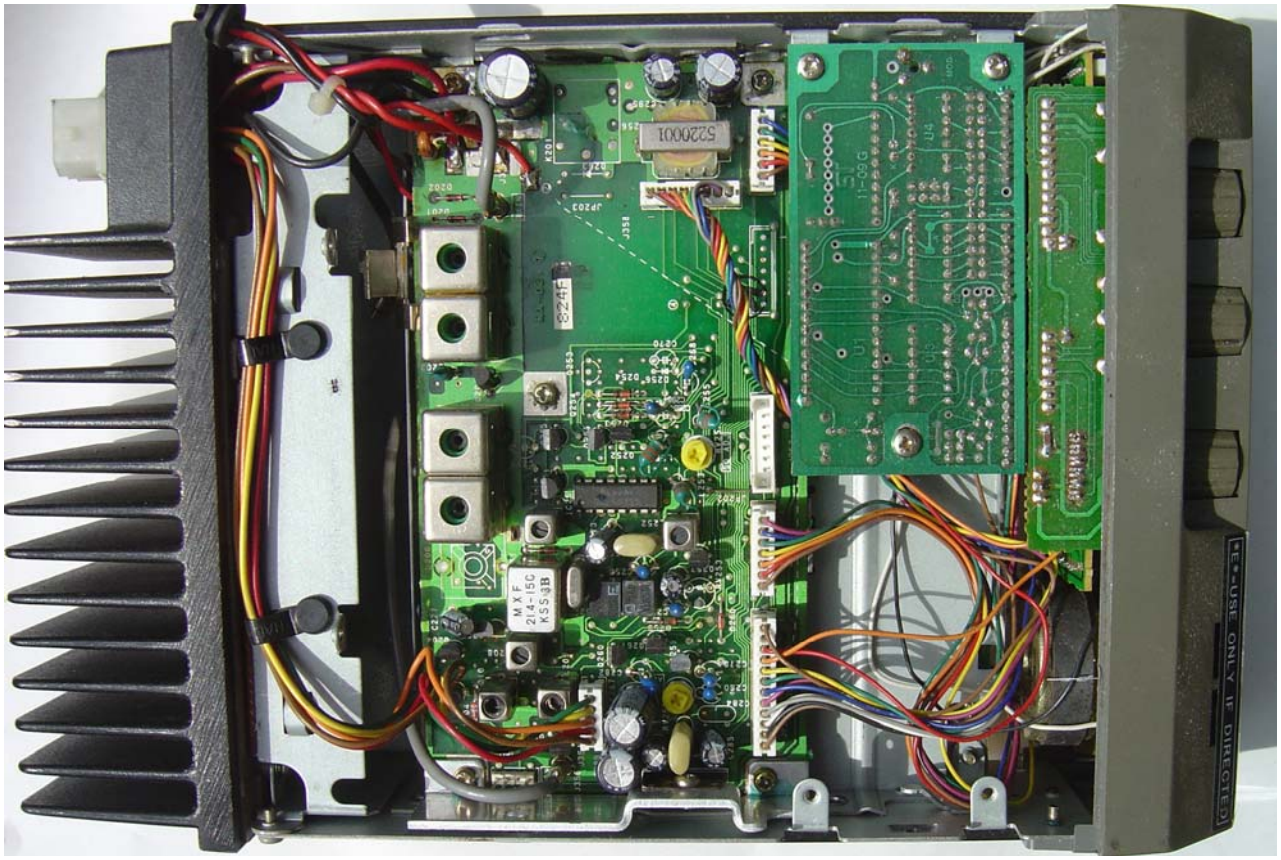
Model	Type	Split	Power	Channels	Comments
70-066	ST1	66-80 mhz	40 watt	80	Dash Mount mid band
70-076	ST1	66-80 mhz	40 watt	80	Trunk Mount mid band

Models = A-66-80 Mhz B-75-88 Mhz

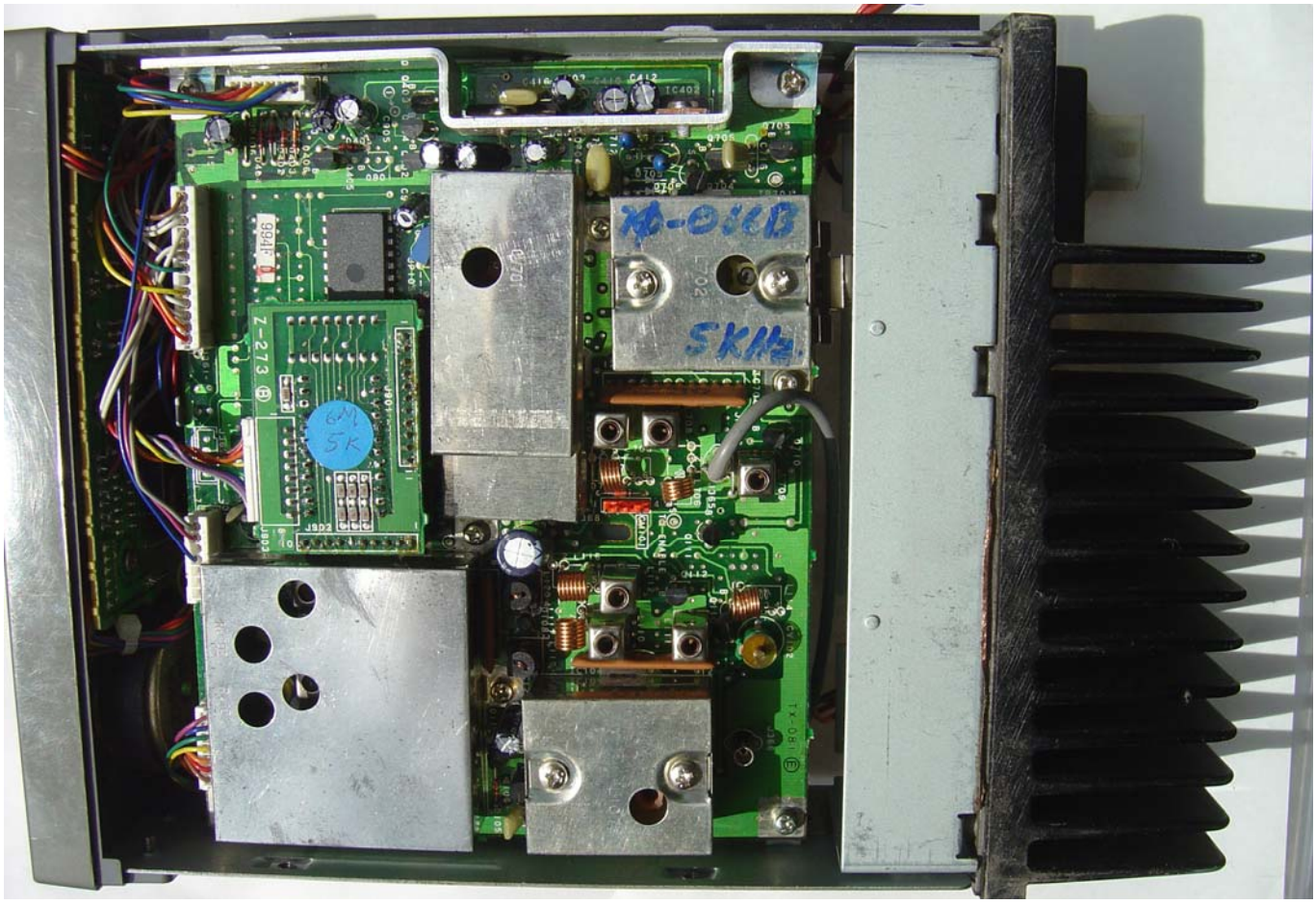
Above –Midland 70-066 Front View,

Above –Midland 70-076 Front View,

Above –Midland 70-076 Case View,



Above – Bottom View



Above – Top View

6 METER Midland 70-066 FM FREQUENCIES – 2716 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       WICEN
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
                         Repeater Simplex
61 0 53.559 53.550
```

Bugs Juice:

Bug Juice is used in conjunction with your de-soldering gun or iron to enable quick and clean de-soldering of components of the transceiver. The original brew is 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 for 70-066 & 70-076:

Syntech I

Model	Type	Split	Power	Channel Count	Comments
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

EPROM Software:

Firmware.

6meters.fre	Frequency input file for Midland 70-066 62 channel EPROM in text format.
6meters.bin	Binary file for EPROM burning using 62 Channel frequency listing.

Software.

Software Description:

The VK2DOT Midland 6 meter firmware generator Software has the following functions and restrictions:-

- Software will operate under DOS or Windows & from a floppy or hard drive or from a USB stick.
- Software works for AWA RT85 Low Band and Midland 70-066 for 6 Meters.
- The 10Khz and 12.5Khz Frequency step has not been checked.
- The other bands other than 6 Meters has to be checked.

Initial Testing:

Equipment Needed.

Midland 70-066 transceiver [with 66-88Mhz EPROM installed],
Frequency Counter. Reads up to 88Mhz
Power or VSWR/Power Meter to cover 50Mhz to 88Mhz.
12 Volt power supply. 10 Amps capacity.
Signal Generator to cover 50Mhz to 88Mhz.

Testing.

Hopefully, your 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 1; Press the transmit button to allow the power out to be loosely coupled to a Frequency counter. Measure the Frequency and power out.

Callsign - **Date -**

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.

INITIAL TRANSCEIVER REMOVAL of COVERS:

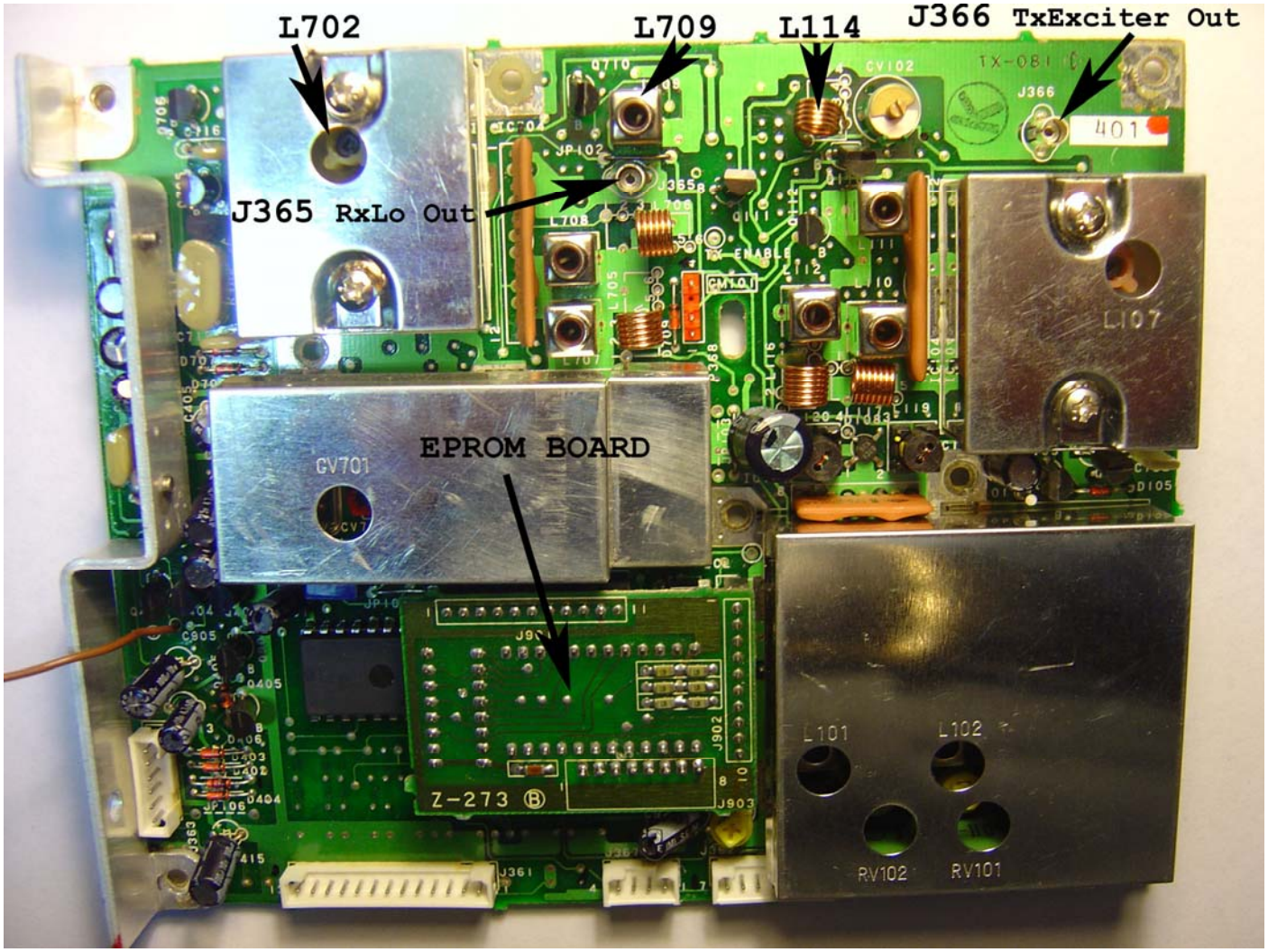
- Remove four screws from each side of the transceiver, then remove the top and bottom covers.
- With a black felt marker pen – Write your callsign on each cover and inside the top and bottom of the transceiver chassis.
- Then – Modify the Z-273 EPROM PCB [part 1], the synthesizer [part 1], the receiver [part 2], and the transmitter PA [part 3].

TEST CABLE's to be BUILT:

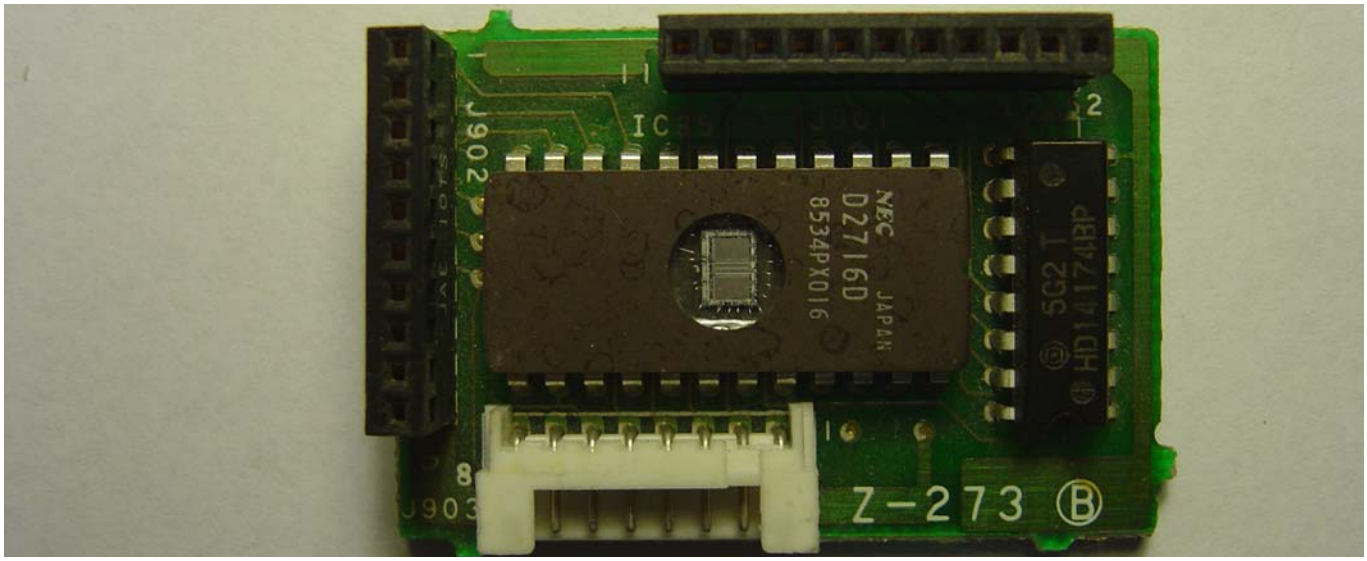
- RF cable Transceiver to Power Meter. RG58 – Type N to UHF connectors.
- RF cable Transceiver to Signal Generator. RG58 – BNC to UHF connectors.
- DC cable for receiver testing. 2 pin connector to 2 of red banana plugs [for DC meter].
- DC cable for synthesizer testing. 1 cable - black banana plug to alligator clip.
  1 cable - red banana plug to red clip.
- UV Light assembly for bulk erasing of Z-273's 2716 EPROM's.

The Synthesizer including EPROM Board.

Midland70-066 Sync Board Top View - below:



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



Z-273 EPROM Board:

NOTE: For the CTCSS and receiver to work properly [ie audio out to speaker to work] on the Midland 70-066 transceivers – Make sure the 8 pin plug is plugged into the white 8 pin socket **J903** on the 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. The programmer box can be purchased in Australia for approx $300 or from the US for approx $450 US; **or**;

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 Midland software or any other software.

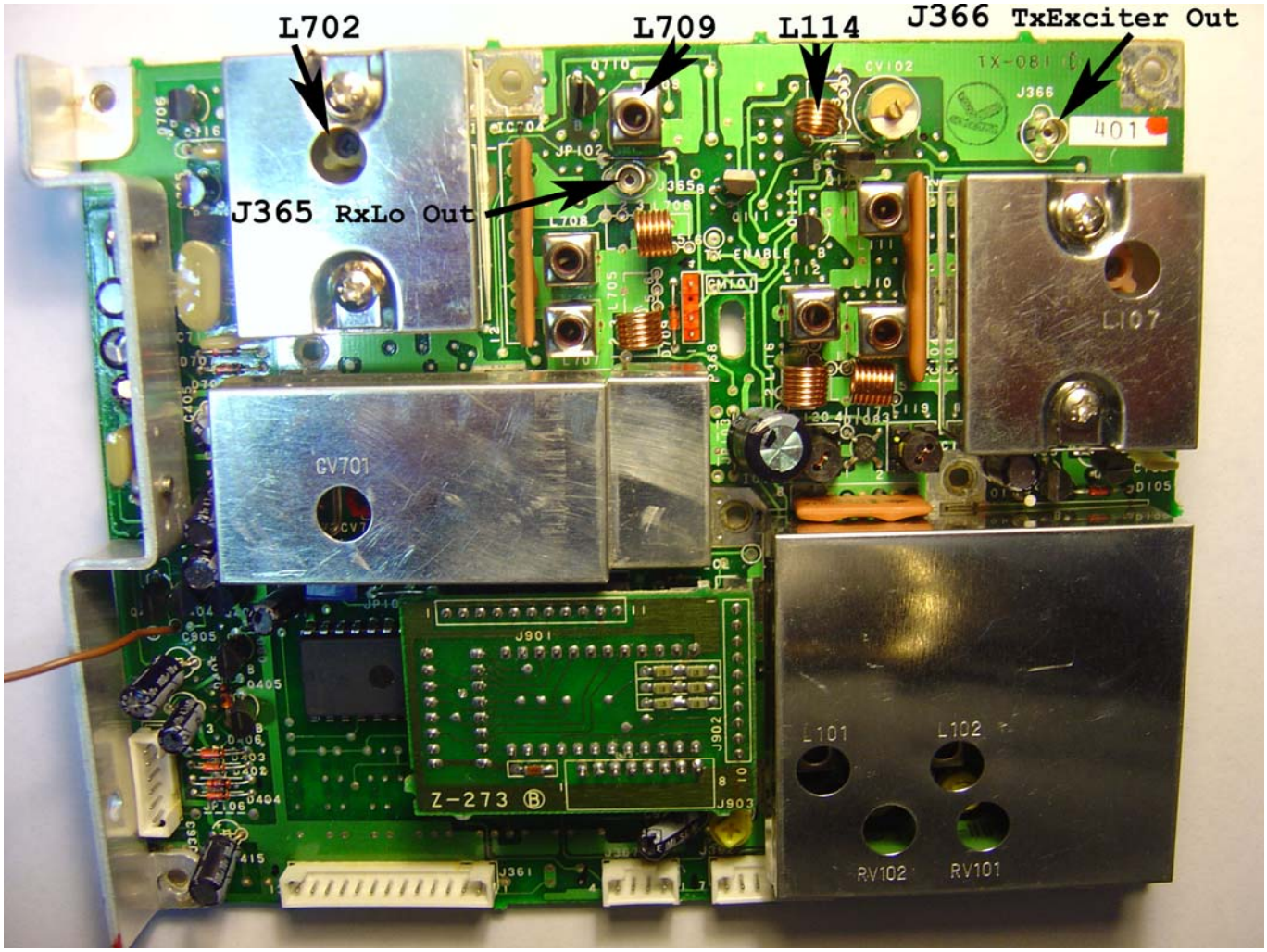
3. Using the VK2DOT Z-273 adapter [as shown in section 5.]

   Remove the Z-273 board from the Synthesizer Board.
   Amend the Z-273 board as described in section 5.
   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.

The Synthesizer Board.

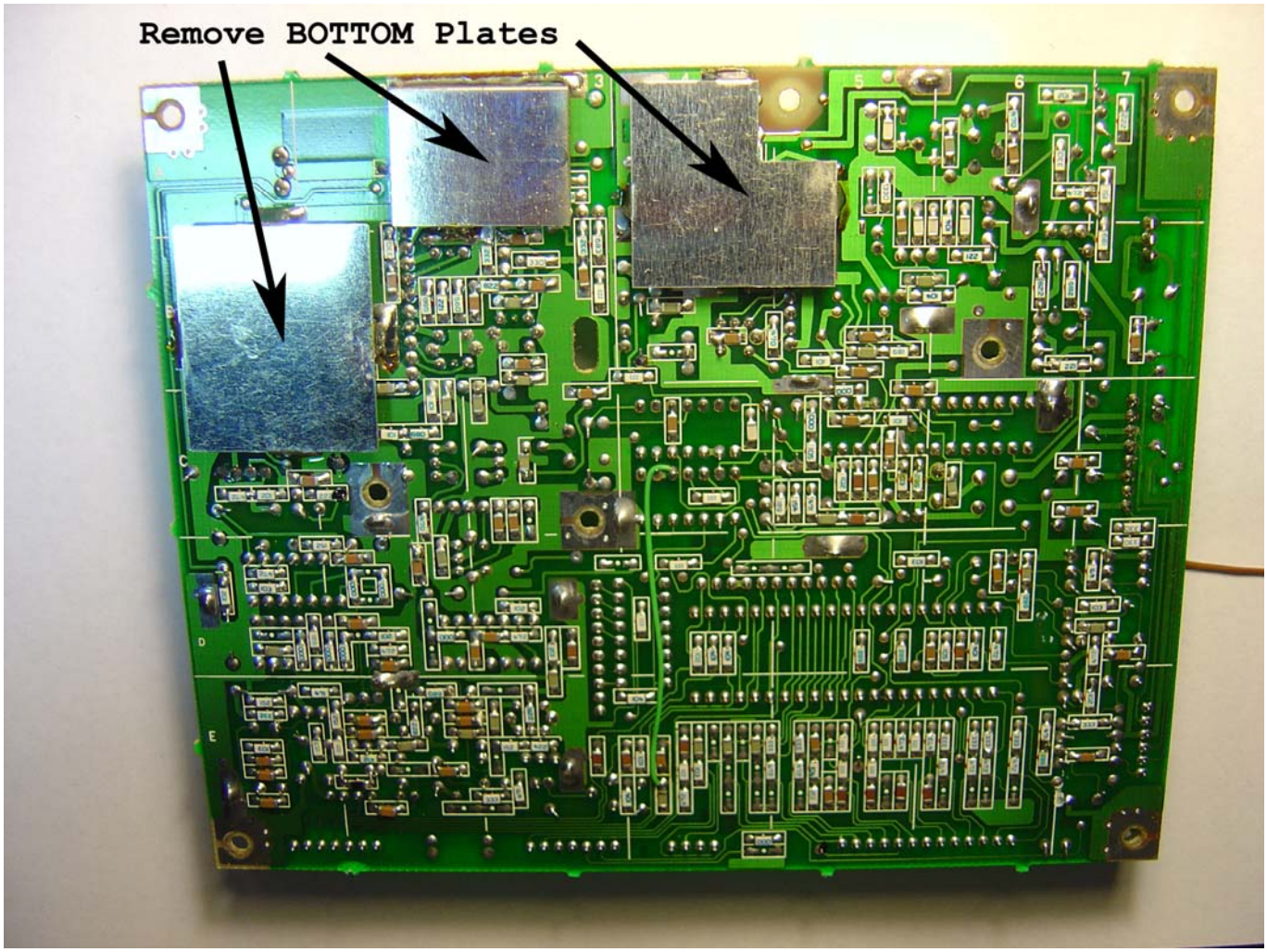
Remove the synthesizer board from the transceiver assembly.

Midland 70-066 Sync Board Top View below:



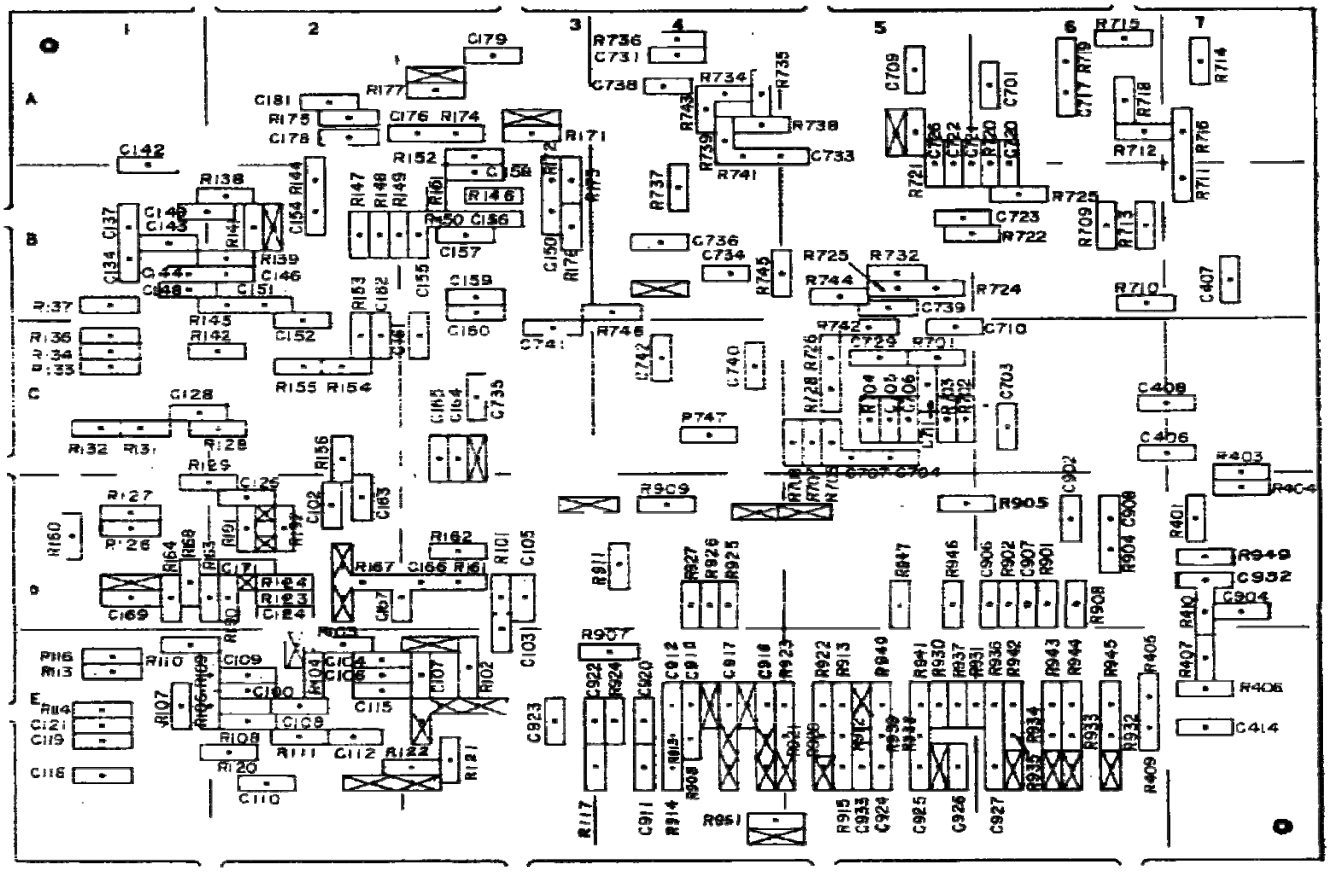
TX buffer, remove L114 and keep for use on the PA board; replace with 7.5 turns of 0.5mm wire, same diameter former.

Midland 70-066 Sync Board Bottom – Unsolder Bottom Plates:



Midland 70-066 Sync Board Bottom View Capacitors - below:

C137 **C709**

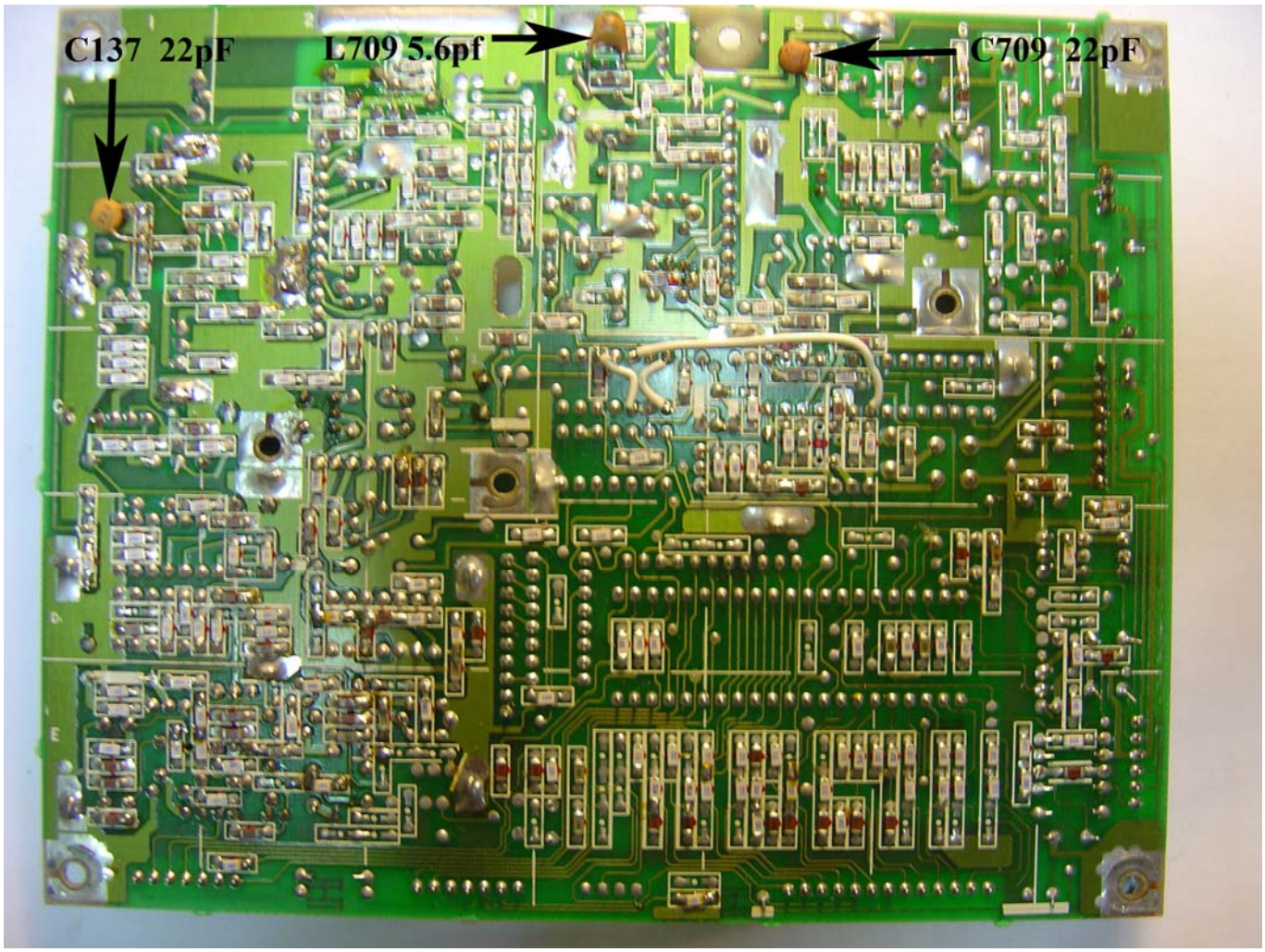


RX (main) VCO, add **22pF** to **C709**.

TX (offset) VCO, add **22pF** to **C137** [for Midland 70-066],
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**

Midland 70-066 Sync Board Bottom View New Capacitors - below:



SYNTHESIZER ALIGNMENT

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.

1: 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 [for RT85] or 01 [for Midland 70-066A] 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.

2: The main Receiver VCO is set to a frequency which is center of the programmed frequencies, By using the 6meters.bin EPROM – set to **channel 48** [53.225Mhz].

3: Use the correct alignment tool on all ferrite cores – the ferrite slugs are easily broken.

Connect DC Voltmeter between ground and TP701. On 10 Volt Range.

Adjust L702 such that the de voltage at **TP701** is centered on 3.5V for all programmed channels (i.e. some above 3.5V and some below 3.5V). Voltages will swing between 2 Volts and 4 Volts.

4: 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.

5: Connect the frequency counter to **J365** and adjust **CV701** for:

f= (RX freq - 21.4MHz) +- 244Hz : for V HF(HB) and UHF

or

f= (RX freq + 21.4MHz) +- 244Hz : for VHF{LB}

52.525Mhz = Tx frequency then 73.925Mhz = Oscillator frequency.

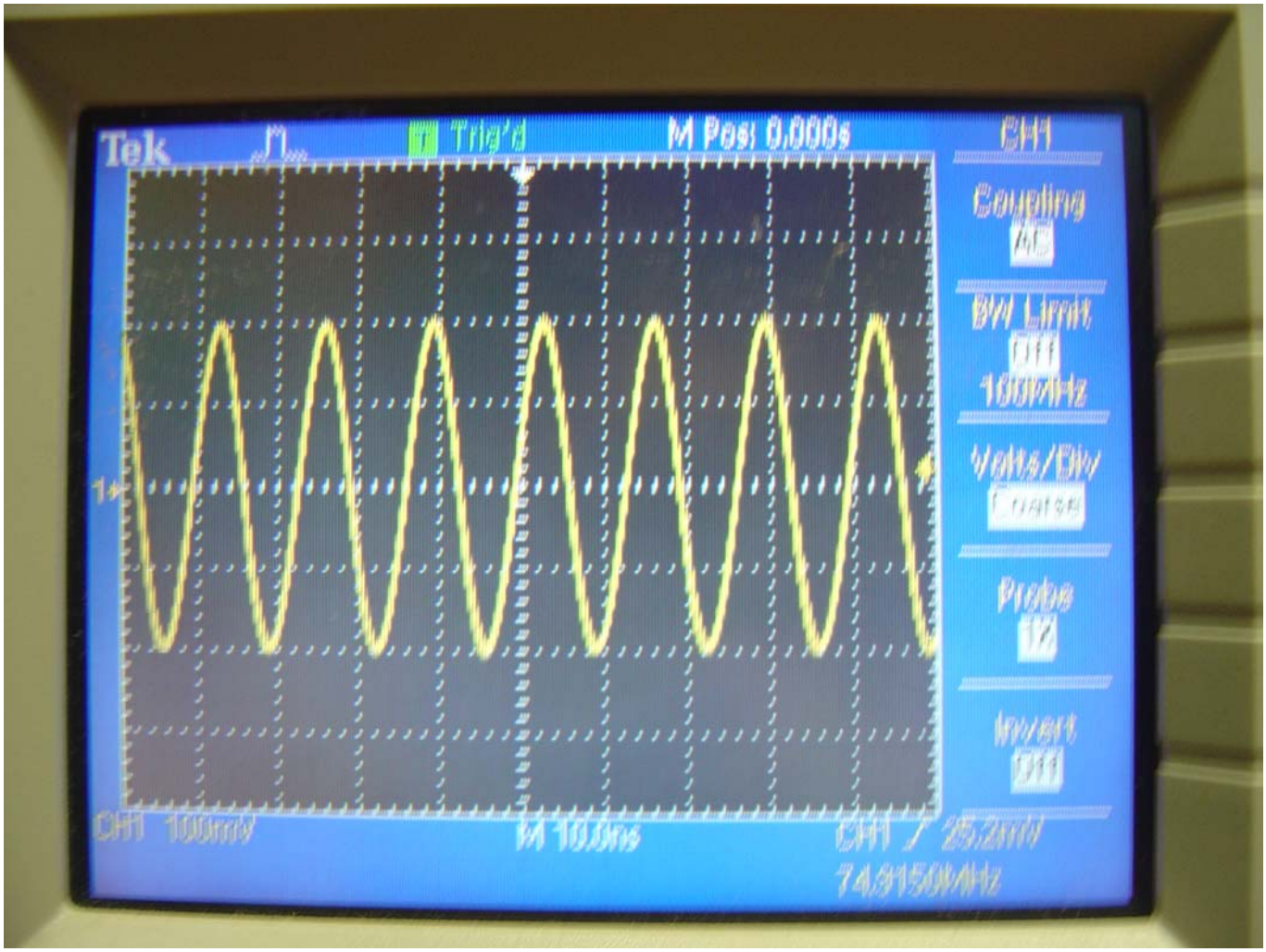
It is only necessary to check one channel, but this measurement may be made for all programmed channels.

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.

5.

The main transmitter VCO should be adjusted on the **highest** programmed frequency.

Select channel



Receiver Local Oscillator output from J365.

Midland 70-066

Conversion

To

6 Meters

Ver 2.9 – 16 Nov 2009

Part 1

Rod McCosker VK2DOT

Midland 70-066 low Band Conversion to 6 Meters:

Index:

NOTE:

PLEASE READ THIS

DOCUMENT.

It has been noted that the majority of mistakes have been caused by users NOT reading this documentation before or during the conversion.

If any mistakes are found, or a suggestion for a better document, please send your comments to:-

vk2dot@tpg.com.au

Acknowledgment:

This project was started in June 2008 by John Cain VK7CEJ suggesting that one tries to convert an AWA RT85 low band commercial radio transceiver to 6 meters. John also forwarded a number of AWA85's to me. Acknowledgement must be given to:- Steve VK2KFJ, Peter VK2ZZA, Roger Baker VK3BKR, Mark Detering VK3TLW, Phil Rice VK3BHR, Mark VK3BYY, Phil VK1PL who converted me to the Midland family of transceivers, Andrew VK4OX for the information gained from their past documentation and generous guidance. Warwick VK4NW for the PA Modifications.

Modifications Time:

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.**

All Parts Needed:

IC Socket – Low profile 24 pin - 1 of [Jaycar `PI-6506`] (If you do not have a Z-273 burner)

All Midland 70-066 Parts Needed:

Capacitors.		**Jaycar**
2.2pF	- 2 of	RC-5304
4.7pF	- 1 of	RC-5308
5.6pF	- 3 of	RC-5309
8.2pF	- 3 of	RC-5311
22 pF	- 7 of	RC-5316
27 pF	- 2 of	RC-5217
33 pF	- 1 of	RC-5218
39 pF	- 2 of	RC-5219
100 pF	- 1 of	RC-5324
1000 pF	- 1 of	RC-5336

Note: All capacitors are 50V Ceramic

Note: If you acquire your capacitors from "Jaycar Electronics", then please check the capacitor values in each packet. It has been found that**, incorrect values** have been added to packets of capacitors.

For the first few weeks of the conversion - you will need a box or A4 plastic bag to hold your screws and plates of the transceivers. Plus a 24 pin low profile IC socket [if you do not have a Z-273 board burner, 2 of 22pf capacitors, a 5.6pf capacitor, approximately 1 meter of about 0.63mm enamel coated wire & a reel of solder wick. On the first night of conversion you will need a Philips screwdriver. Later on, you will need a 5mm drill bit to wind your coils on.

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]

Drill Bit. Size – 5mm

If your transceiver has no FUSE attached to the power cable, you are advised to purchase & install one before you test the transceiver.

Parts needed First Night:

For Synthesizer:

2 of **22pF** ceramic Capacitors Jaycar `RC-5216`

1 of **5.6pF** ceramic Capacitor Jaycar `RC-5309`

1 of **24 pin** low profile socket Jaycar `PI-6506`

Approximately 100 mm of **0.63mm** [22bs] enameled coated wire [Jaycar WW4018].

Masking Tape.

Marking Pen. [for putting coil numbers on Masking tape in synthesizer section and marking panels & PCB's]

Drill Bit Size – 5mm

Small plastic bag to keep screws and coils in.

A4 plastic bag to keep covers in.

12 volt **power cable** with Molex plug [approx 1 meter] if a Midland 70-066 and an in-line 10Amp **fuse**, will be needed in aprox three weeks for testing the transceiver.

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.

Conversion Project Overview.

There are five major events to modify your raw low band transceiver.

- **Initially - Test transceiver.** [This has to be done before any other operation.] This operation should take one night for all users to be satisfied that their transceiver **works!!**

  If you not happy with your soldering, then become a partner with somebody that is competent with soldering.

- **Z-273 EPROM Modifications.** Either use a Z-273 board programmer or; remove the EPROM from the Z-273 PCB, solder in a low profile 22 pin socket into the 2716 EPROM holes, reprogram the 2716 EPROM & place into the 22 pin socket.

- **Synthesizer Modification.** Remove PCB board, remove coil, make coil, replace board, place capacitors onto underside of board, synthesizer alignment and replace PCB board into transceiver. In this part, you will use test equipment. [ie Frequency counter & DC meter. Plus tuning tools.]

- **Receiver Modification.** Remove PCB board, solder place capacitors onto underside of board, alignment of Receiver and replace PCB board into transceiver. In this part, you will use test equipment. [ie Signal Generator & DC meter. Plus tuning tools.]

- **Transmitter PA Modifications.** Remove PCB board, remove coils, make coils, solder capacitors and coils onto underside of board, alignment of Transmitter and replace PCB board into transceiver. In this part, you will use test equipment. [ie RF Power meter & DC meter. Plus tuning tools.]

The Z-273 EPROM Modifications and Synthesizer Modification must be done first, before alignment can be done

For members not savvy with the use of Test Equipment, please find an amateur who will be available to guide you in alignment procedures.

Midland 70-066 Conversion to 6 Meters - Procedures:

- **Transceiver.**

  Clean transceiver.
  Add power cables & speaker link.
  Make sure that you have a microphone.
  --- Test out the transceiver on its original frequency.

- **Z-273 boards.**

  Z-273 boards should be programmed or;

  ### Solder 24pin low profile socket to Z-273 Module.
  Burn 2716 EPROM with 6 meter frequencies.
  Plug in 2716 EPROM into 22 pin socket on Z-273 PCB.

- **Synthesizer Board.**

  Remove Synthesizer Board from transceiver.
  Wind new Synthesizer Coil.
  *** De-solder synthesizer coil from Synthesizer PCB.
  ### Add new L114 coil & Capacitors C137, C709 & C across L709
  Place synthesizer board back into transceiver.
  Insert Z-273 PCB into Synthesizer board & attach cable to PCB.
  --- Align synthesizer.

- **Receiver board.**

  Partially remove receiver board from the transceiver. Leave power connections connected.
  ### Add capacitors to receiver PCB.
  Place receiver PCB back into transceiver.
  --- Align receiver.

- **Transmitter PA.**

  Totally remove transmitter PA PCB from transceiver.
  *** Remove coils from PA PCB.
  Wind new coils for PA PCB.
  ### Add new coils & capacitors to PA PCB.
  Place transmitter PA PCB back into transceiver.
  --- Align transmitter PA.

- Check on air.

*** = Use of de-soldering station.
= Use of soldering iron.
--- = Use of test equipment.

Midland Land Mobile Model and Features Table for 70-066 & 70-076:

Syntech I

Model	Type	Split	Power	Channels	Comments
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

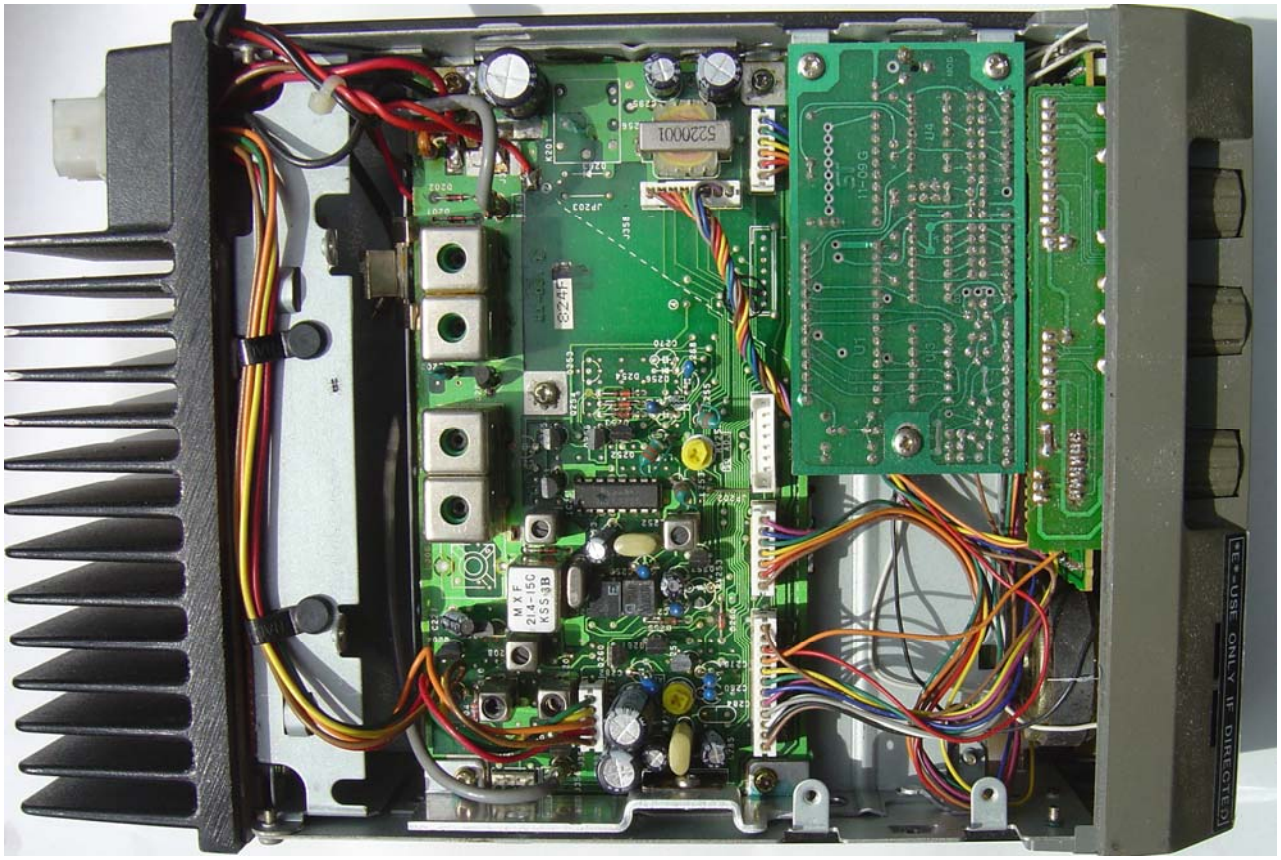
Models = A-66-80 Mhz B-75-88 Mhz

Above - Front View of Midland 70-066A with Local Head,

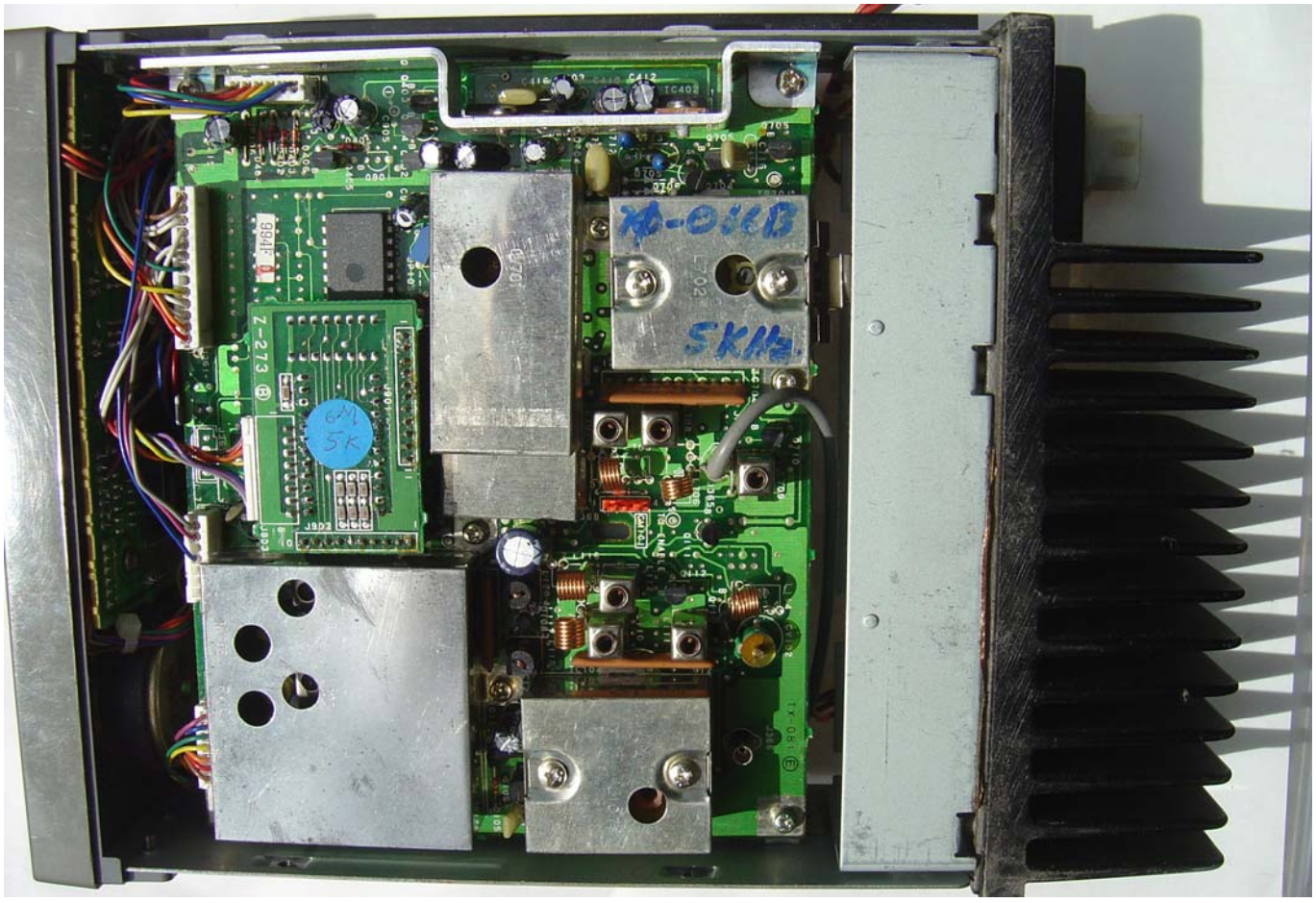
Above – Bottom View of Midland 70-066A with Local Head:

Above –Midland 70-076 Case View,

Above – Midland 70-076 with Remote Head:



Above – Bottom View of Midland 70-066 Receiver side with Local Head:



Above – Top View of Midland 70-066 Receiver side with Local Head:

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

VK2DOT Midland 70-066 & AWA RT85 Frequency Source File - 6m-5k.fre

```
70-066 [RT85, 70-066 or BLANK    ]        Transceiver Type
5      [2.5, 5, 10, 12.5 or BLANK]        Khz Frequency Step
HIGH   [LOW, HIGH or BLANK       ]        Local Oscillator Injection
21.4   [10.7, 21.4, 47.0 or BLANK]        Mhz Rx IF Frequency
20.48  [9.6, 10.24, 19.2, 20.48 or BLANK] Mhz Tx IF Frequency
```

Ch	Scan	Rx	Tx	CTCSS		Callsign	Service Area
01	0	53.5500	52.5500		Repeater	VK2RIC	NSW Lismore-Casino
						VK3RMH	Vic NE Melbourne
02	0	53.5750	52.5750	123	Repeater	VK2RSM	NSW Snowy Mountain no-123
				123		VK2RPW	NSW Walcha
						VK3RDD	Vic Dandenong
03	0	53.6000	52.6000		Repeater	VK2RNW	NSW Narrabri
						VK3RMR	Vic Gippsland
04	1	53.6250	52.6250		Repeater	VK2RSN	NSW Newcastle
						VK3RHF	Vic East Melbourne
						VK4RXD	Qld Sunshine Coast ???
						NZ	Central Otago
05	1	53.6500	52.6500	123	Repeater	VK2RMP	NSW Wollongong
						VK3RWZ	Vic Grampians Proposed
06	1	53.6750	52.6750	123	Repeater	VK2RMB	NSW Terry Hills Sydney Broken
						VK3RAD	Vic Melbourne East
						VK3RTN	Vic NE Vic
07	0	53.7000	52.7000		Repeater	VK2RGN	NSW Goulburn ???
						VK4RSN	Qld Sunshine Coast ???
08	1	53.7250	52.7250	123	Repeater	VK2RAG	NSW Central Coast 2012 we think
		VK4RGA	Qld Gladstone				
						VK4RLB	Qld Woodridge/BrisbaneSouth
						VK3RGV	Vic Shepparton
						NZ	Auckland
09	0	53.7500	52.7500		Repeater	VK5RSB	SA Summertown/Adelaide
						NZ	Wellington
10	0	53.7750	52.7750		Repeater	VK5RLZ	SA Adelaide North
						VK4RRC	Qld Redcliffe/N Brisbane ???
						VK4RBG	Qld Bundaberg
						VK4RBP	Qld Atherton Tableland
11	0	53.8000	52.8000	123	Repeater	VK6RAP	WA Roleystone/Perth no-123
				123		VK4RGO	Qld Gold Coast
						NZ	Mt Climie [NE Wellington]
12	0	53.8250	52.8250		Repeater	VK7RAD	Tas Hobart/Derwent Valley
						VK7RNW	Tas Ulverstone N/W Coast
13	1	53.8500	52.8500	123	Repeater	VK2RWI	NSW Dural/Sydney
						NZ	Christchurch
14	1	53.8750	52.8750	123	Repeater	VK2RBM	NSW Lawson/Blue Mts
						VK7RAA	Tas Mt Barrow/N Tas
15	0	53.9000	52.9000		Repeater	VK3RMS	Vic East Melbourne
16	0	53.9250	52.9250		Repeater	VK1RGI	ACT Mt Ginini ACT & SE NSW
						VK4RBX	Qld Ipswich
17	0	53.9500	52.9500		Repeater	VK4RBL	Qld Brisbane South
18	0	53.9750	52.9750		Repeater	VK3RGM	Vic Mt Buller NE Vic
						VK4RBR	Qld Mt Gravatt Brisbane
19	1	52.5000	52.5000		Voice		International calling frequency
20	1	52.5250	52.5250		Voice		National Calling Frequency
					Repeater		Reverse Channels
21	0	52.5500	53.5500				Reverse channel # 1
22	0	52.5750	53.5750				Reverse channel # 2
23	0	52.6000	53.6000				Reverse channel # 3
24	0	52.6250	53.6250				Reverse channel # 4

```
25 0 52.6500 53.6500              Reverse channel # 5
26 0 52.6750 53.6750              Reverse channel # 6
27 0 52.7000 53.7000              Reverse channel # 7
28 0 52.7250 53.7250              Reverse channel # 8
29 0 52.7500 53.7500              Reverse channel # 9
30 0 52.7750 53.7750              Reverse channel #10
31 0 52.8000 53.8000              Reverse channel #11
32 0 52.8250 53.8250              Reverse channel #12
33 0 52.8500 53.8500              Reverse channel #13
34 0 52.8750 53.8750              Reverse channel #14
35 0 52.9000 53.9000              Reverse channel #15
36 0 52.9250 53.9250              Reverse channel #16
37 0 52.9500 53.9500              Reverse channel #17
38 0 52.9750 53.9750              Reverse channel #18
                        Data Channels
39 0 53.0000 53.0000
40 0 53.0250 53.0250
41 0 53.0500 53.0500
42 0 53.0750 53.0750
43 0 53.1000 53.1000
                        Voice Simplex Channels
44 0 53.1250 53.1250
45 0 53.1500 53.1500       WICEN
46 0 53.1750 53.1750
47 0 53.2000 53.2000
48 0 53.2250 53.2250
49 0 53.2500 53.2500
50 0 53.2500 53.2750
51 0 53.3000 53.3000
52 0 53.3250 53.3250
53 0 53.3500 53.3500
54 0 53.3750 53.3750
55 0 53.4000 53.4000
56 0 53.4250 53.4250
57 0 53.4500 53.4500
58 0 53.4750 53.4750
59 0 53.5000 53.5000
60 0 53.5250 53.5250
                         Repeater Simplex
61 0 53.5500 53.5500
```

"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.

VK2DOT EPROM Software: [other than Z-273 programmer]

Firmware.

m6m-5k.bin Binary file for EPROM burning using Midland 70-066B 61 Channel frequency step 5Khz.
m6m-25k.bin Binary file for EPROM burning using Midland 70-066A 61 Channel frequency step 2.5Khz.

Software.

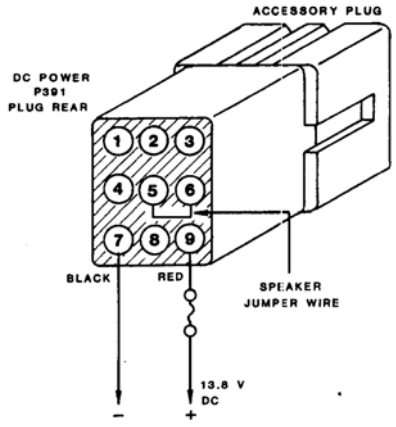
Software Description:

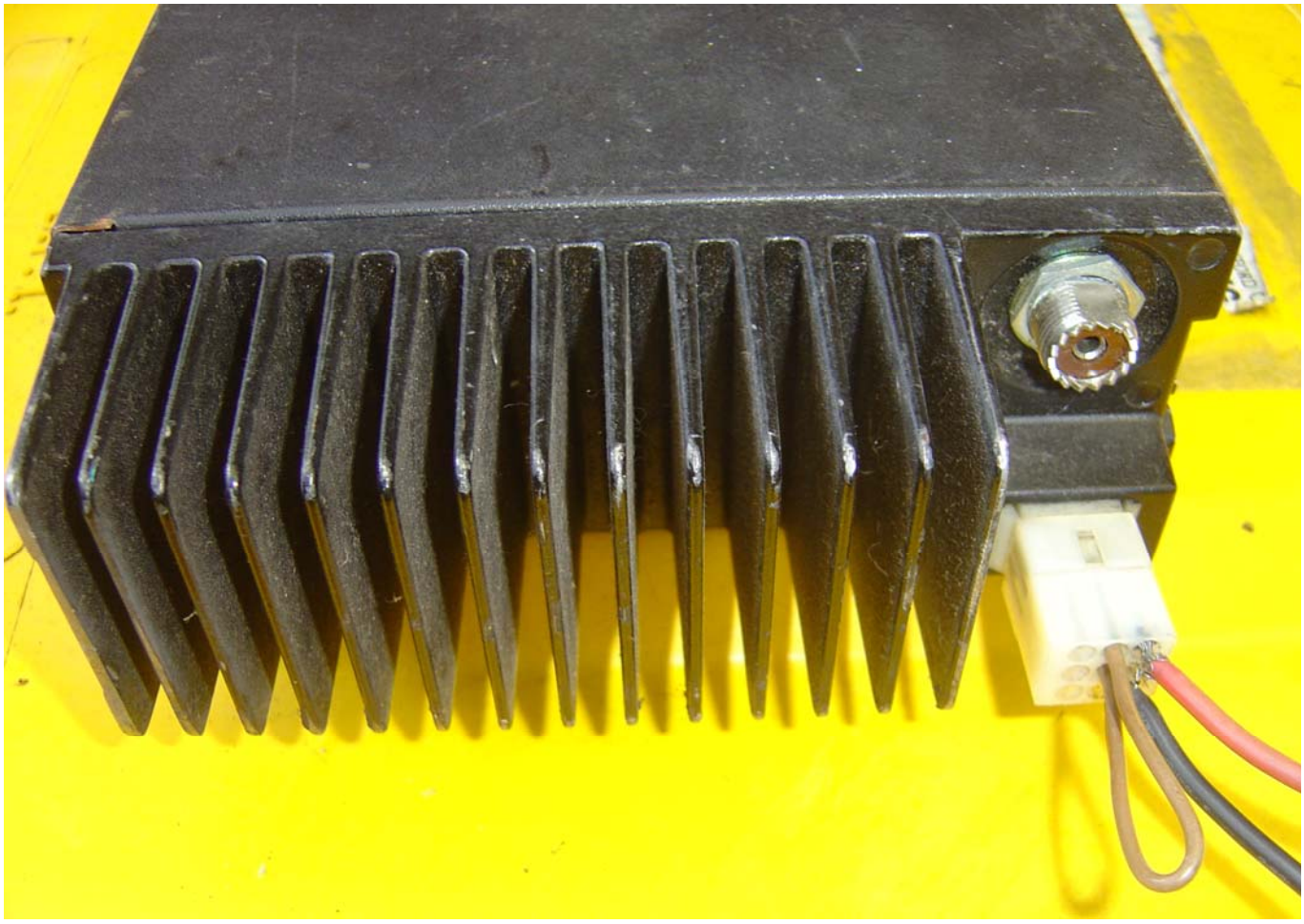
The RT85 6 meter firmware generator Software has the following functions and restrictions:-

- Software will operate under DOS or Windows & from a floppy or hard drive or from a USB stick.
- Software works for AWA RT85 Low Band and Midland 70-066A or B for 6 Meters.
- The CTCSS for the Midland 70-066 works.
- The CTCSS for the AWA RT85 has to be checked.
- The 10Khz and 12.5Khz Frequency step has not been checked.
- Bands other than 6 Meters have to be checked.

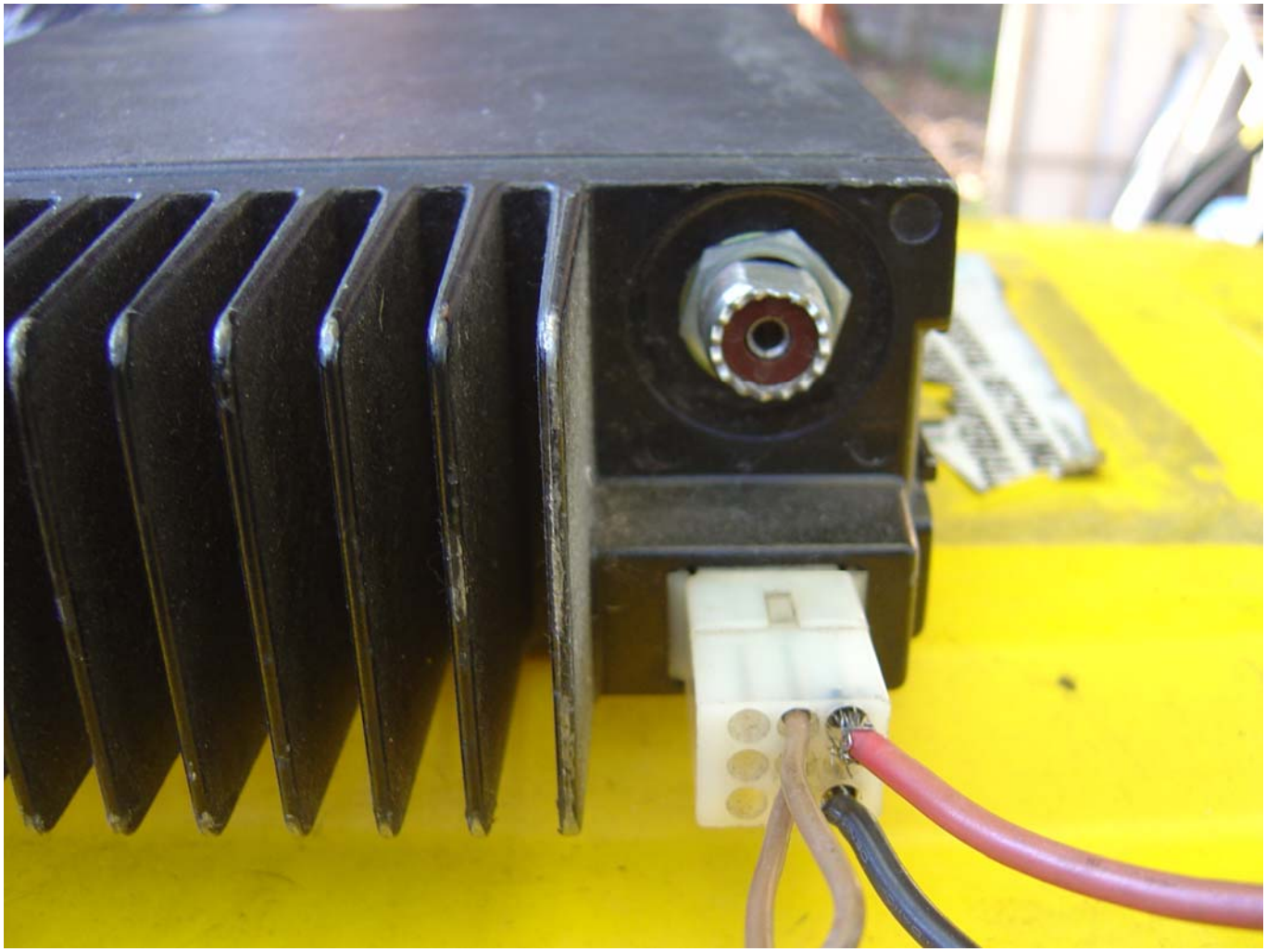
Power Plug:

NOTE: If you do not jumper pins 5 & 6, your internal speaker will not work. The CCARC Midland 70-066B transceivers **do not** have power plugs.





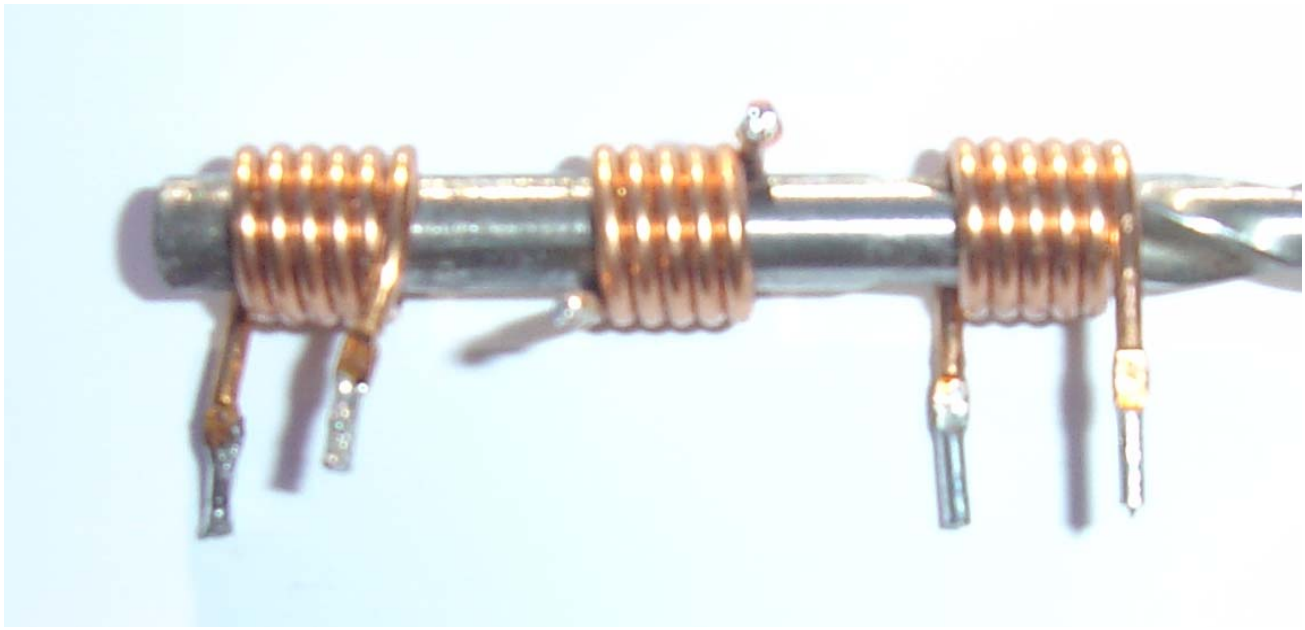
NOTE: Connector WW's are opposite red & black power leads. Brown lead is internal speaker loop. In the photo above, the WW's are closest to the heat fins.



It has been suggested by Ken VK2KJ, that if you cannot locate a Molex plug for the midland 70-066 transceiver - Remove the power socket female pins by using a very small jeweler's screwdriver to bend back the locking fins. This is made easier by reshaping the pin socket diameter to gain access to the fins.

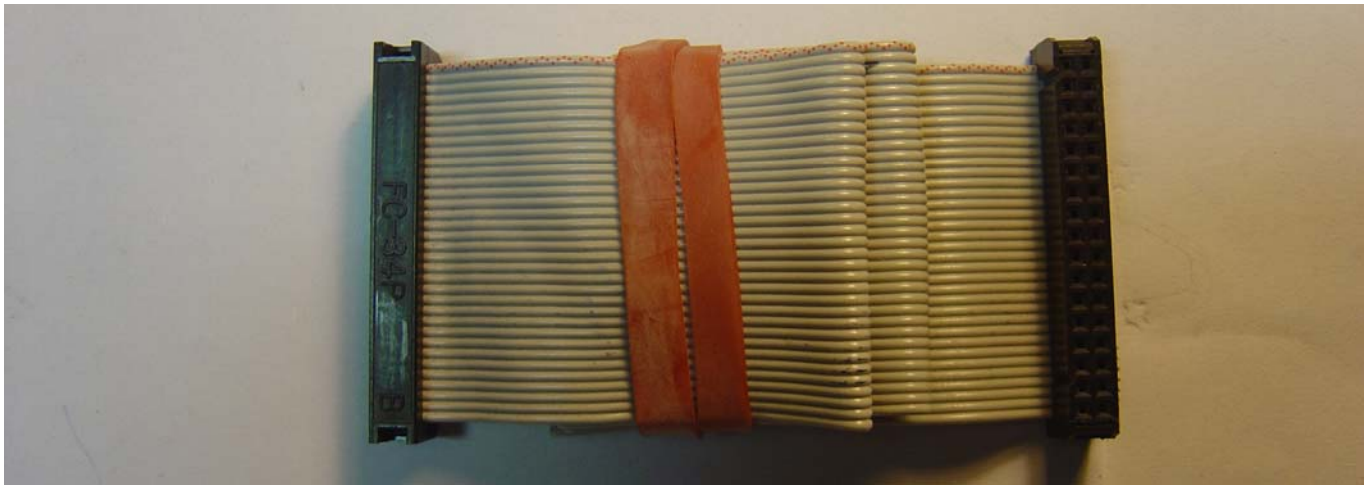
When both fins are pushed down the pin will retract from the rear of the socket. Feed the new power cable through the Molex socket and through the socket end of the pin soldering the cable to crimp area. Now open the fins slightly and pull cable back to lock the pin into position. The same can be carried out for the speaker jumper for those who are not using remote speaker.

COUNTING COIL TURNS:



Look at center coil above, run sharp object between legs. That is how you count turns on a coil.

Remote cable for Midland 70-076 Head:



NOTE: Connectors are reversed at the ends of the cable. [Computer cables work OK]

Parts needed for Synthenizer modifications to 6 Meters:

IC Socket – Low profile 24 pin. - 1 of [Jaycar PI-6506]

Capacitors. **Jaycar**

5.6pf	- 1 of	RC-5309
22pf	- 2 of	RC-5216

Note: All capacitors are 50V Ceramic

Wire.

Approximately 200 mm of 0.63mm [22bs] enameled coated wire [Jaycar WW4018].

Initial Testing:

Equipment Needed.

Midland 70-066 transceiver [with 66-88Mhz EPROM installed],
Frequency Counter. Reads up to 88Mhz
Power or VSWR/Power Meter to cover 50Mhz to 88Mhz.
12 Volt power supply. 10 Amps capacity.
Signal Generator to cover 50Mhz to 88Mhz.

Testing.

Hopefully, your 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 1; Press the transmit button to allow the power out to be loosely coupled to a Frequency counter. Measure the Frequency and power out.

Callsign - **Date -**

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.

INITIAL TRANSCEIVER REMOVAL of COVERS:

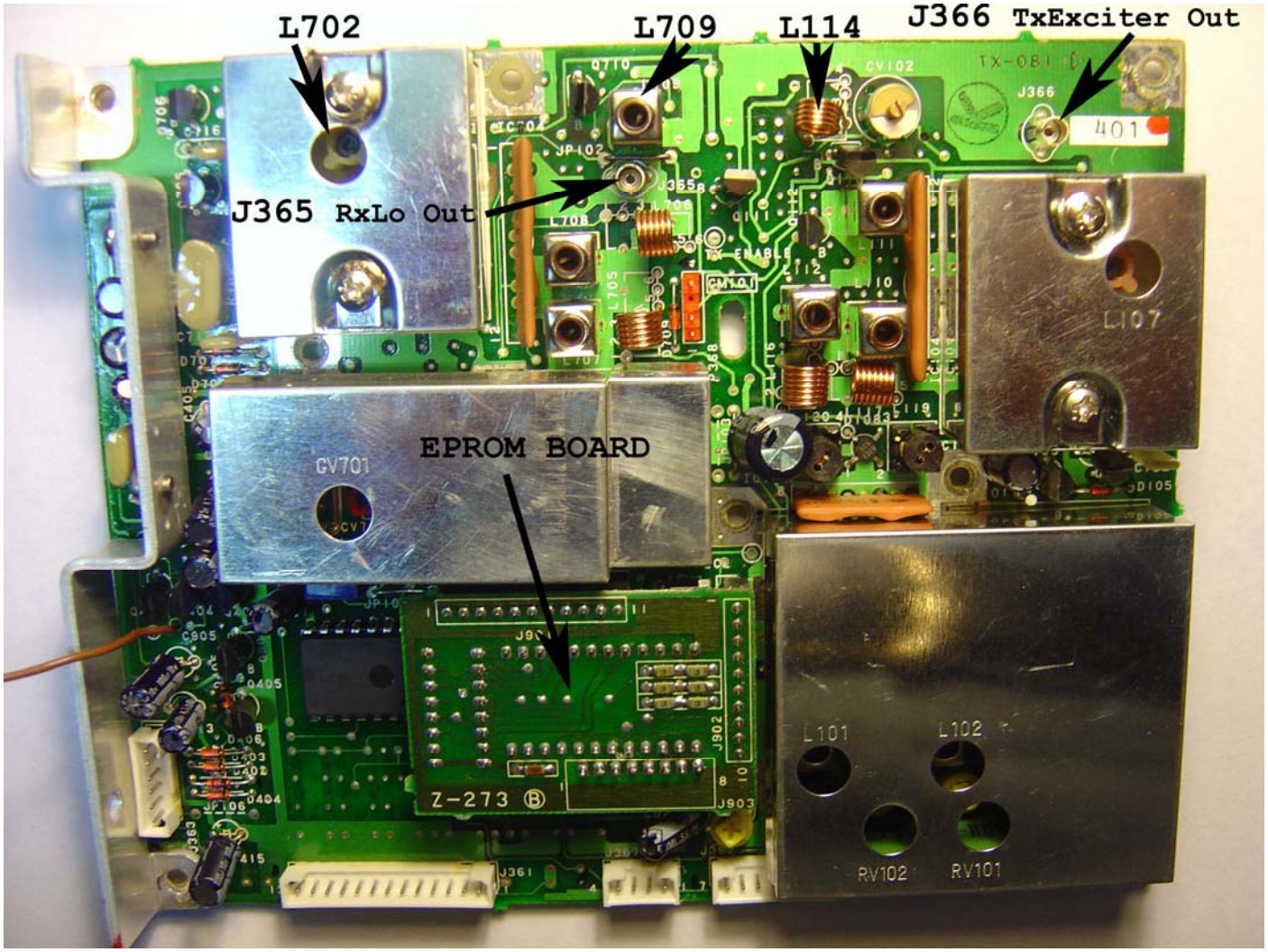
- Remove four screws from each side of the transceiver, then remove the top and bottom covers.
- With a black felt marker pen – Write your call-sign on each cover and inside the top and bottom of the transceiver chassis.
- Then – Modify the Z-273 EPROM PCB [part 1], the synthesizer [part 1], the receiver [part 2], and the transmitter PA [part 4].

CCARC TEST CABLE's to be BUILT:

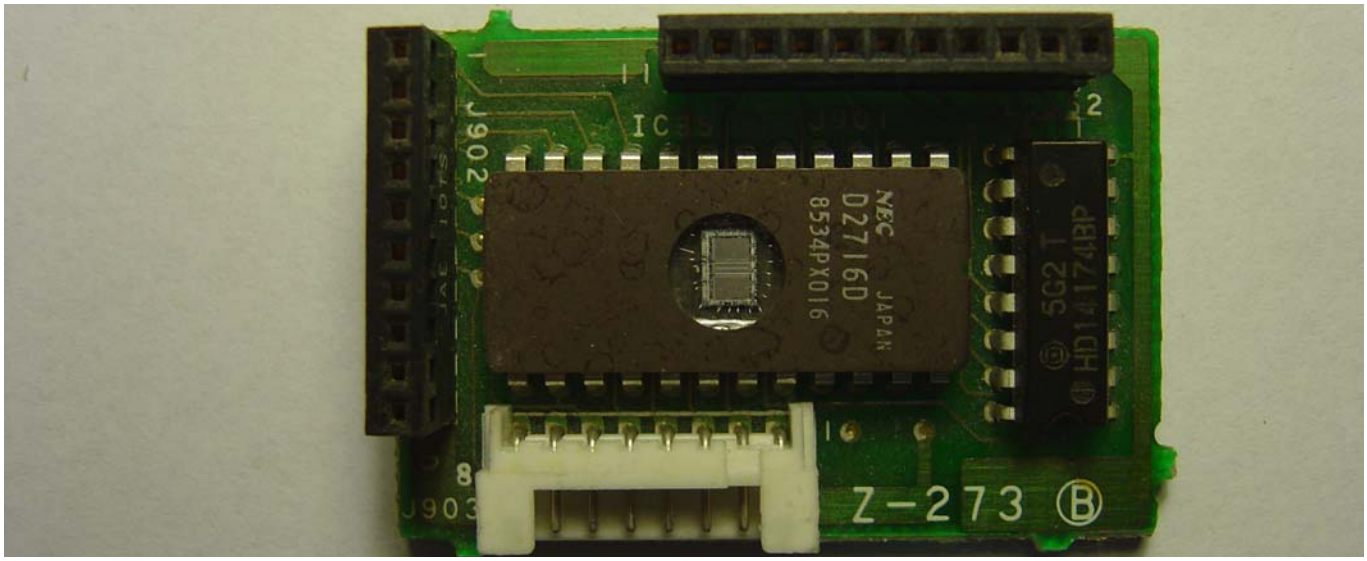
- RF cable Transceiver to Power Meter. RG58 – Type N to UHF connectors.
- RF cable Transceiver to Signal Generator. RG58 – BNC to UHF connectors.
- DC cable for receiver testing. 2 pin connector to 2 of red banana plugs [for DC meter].
- DC cable for synthesizer testing. 1 cable - black banana plug to alligator clip.
  1 cable - red banana plug to red clip.
- UV Light assembly for bulk erasing of Z-273's 2716 EPROM's.

The Synthesizer including EPROM Board.

Midland 70-066 Sync Board Top View - below:



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



REMEMBER

to

REPLACE

the

EPROM

in the

RIGHT WAY on the Z-273

or the

EPROM will blow & be USELESS

Previous converters have done this.

Z-273 EPROM Board:

NOTE: For the CTCSS and receiver to work properly [ie audio out to speaker to work] on the Midland 70-066 transceivers – Make sure the 8 pin plug is plugged into the white 8 pin socket **J903** on the Z-273 EPROM board.

There are two 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. The programmer box can be purchased in Australia for approx $300 or from the US for approx $450 US; **or**;

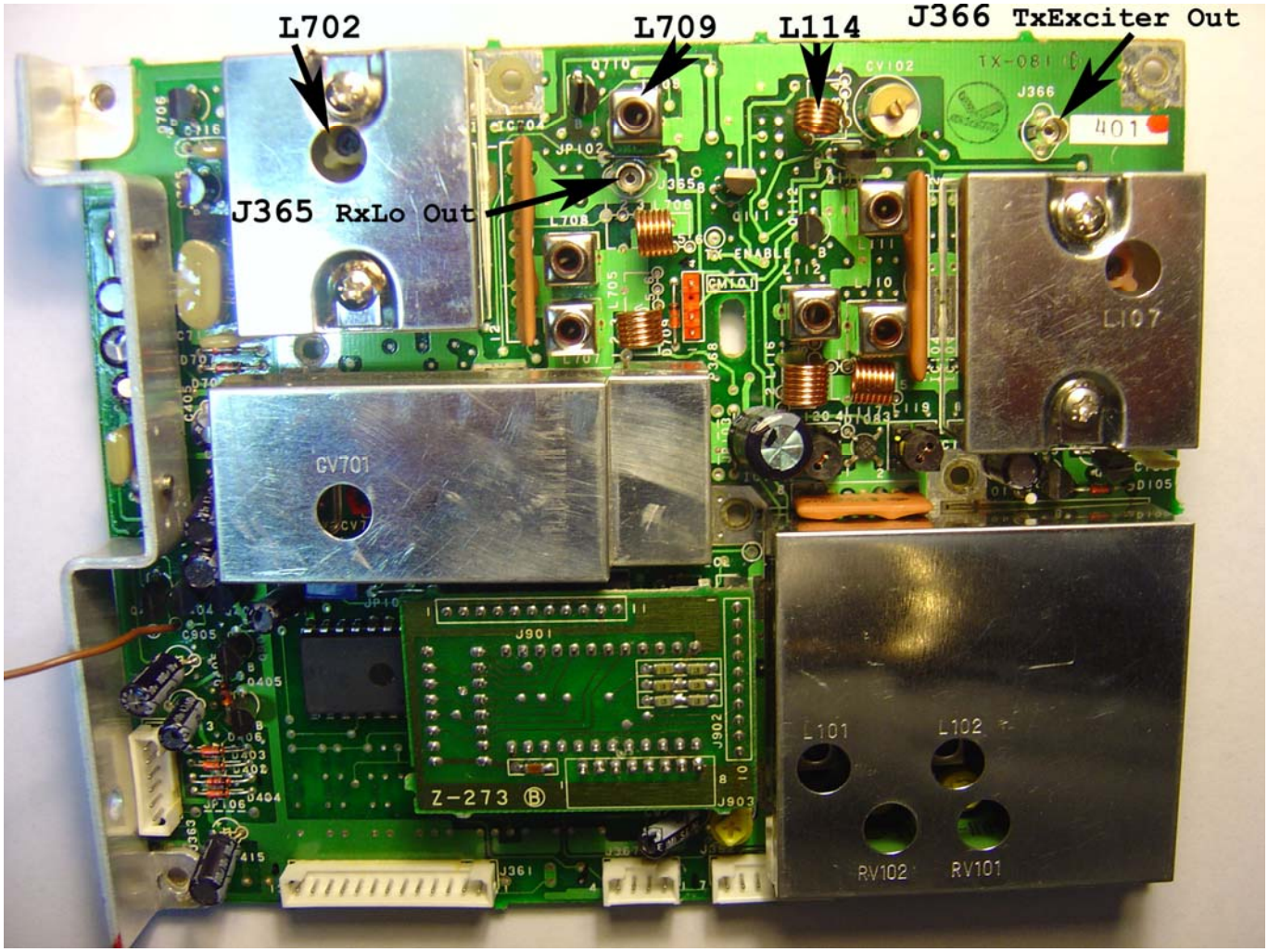
2. Remove the Z-273 board from the Synthesizer Board. Then remove the 2716 EPROM using de-soldering equipment from the EPROM board. Then solder a low profile 24 pin socket to the EPROM board.

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

The Synthesizer Board.

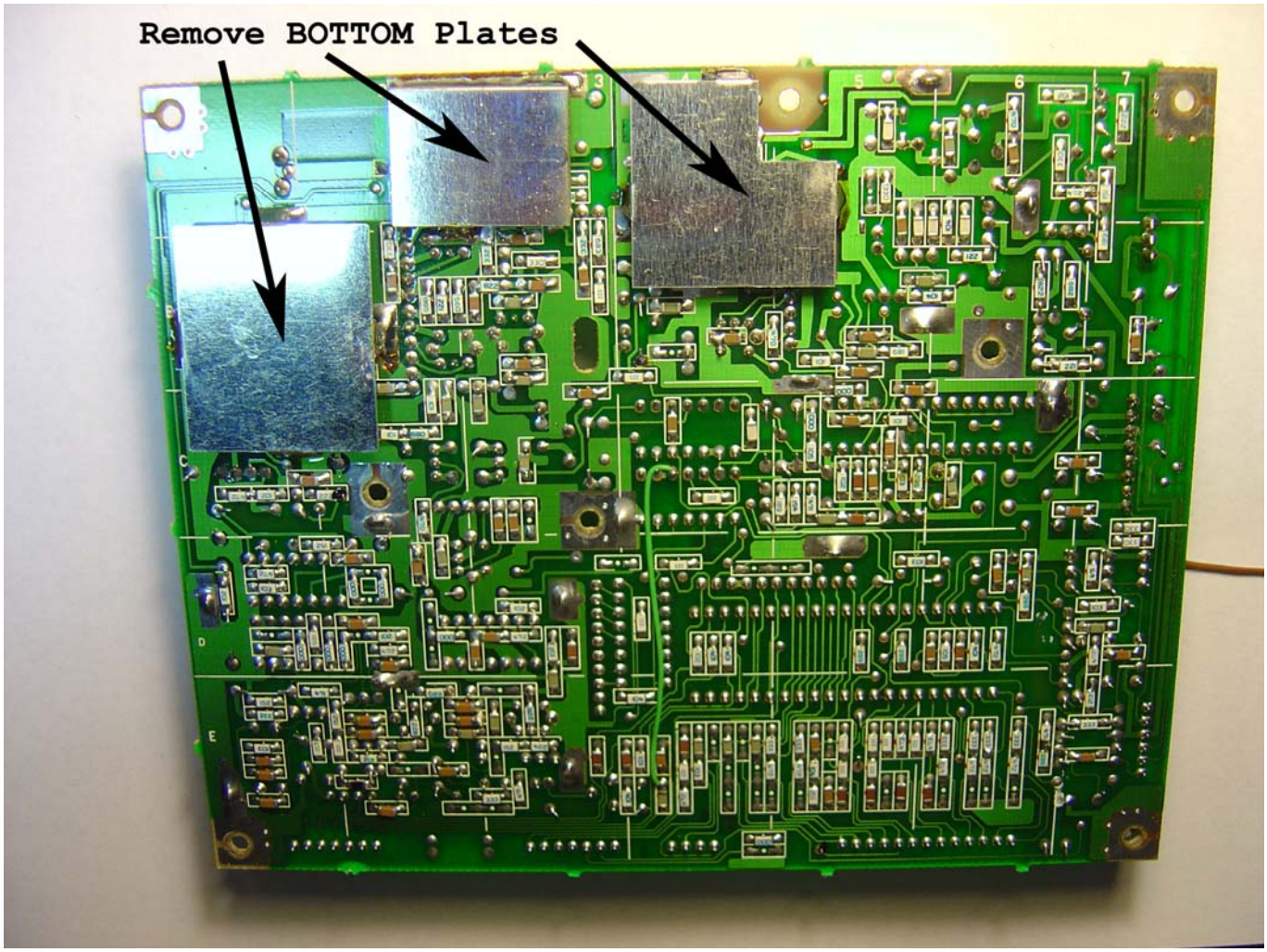
Remove the synthesizer board from the transceiver assembly.

Midland 70-066 Sync Board Top View below:



TX buffer, remove **L114** and keep for use on the PA board; replace with 7.5 turns of 0.63mm wire, same diameter former. [Use a 5mm drill bit to wind the new coil on.]

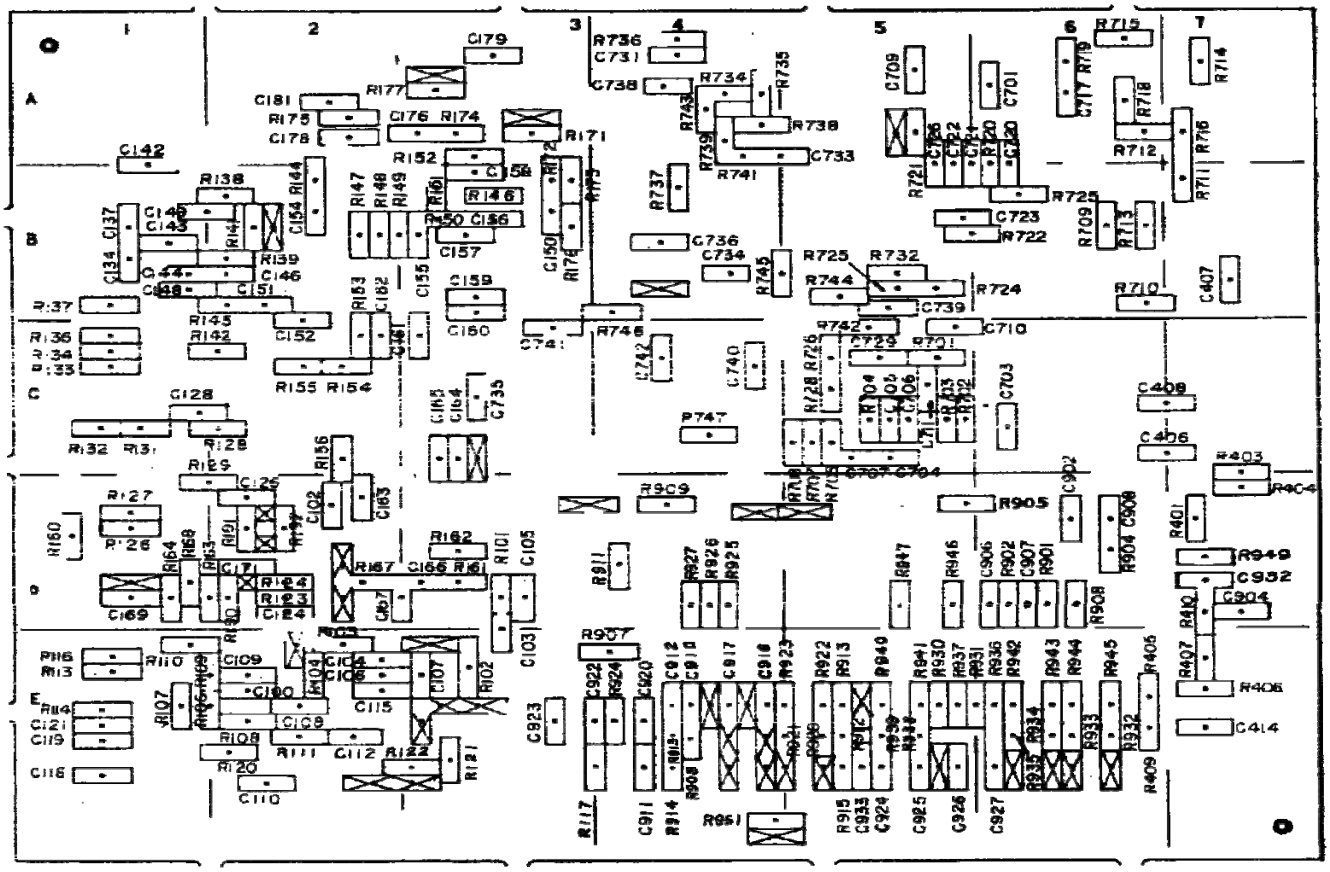
Midland 70-066 Sync Board Bottom – Unsolder Bottom Plates:



It is noticed that the Midland 70-066A & B models have only one shield on the bottom of the synthesizer board, the left one above.

Midland 70-066 Sync Board Bottom View Capacitors - below:

C137 **C709**

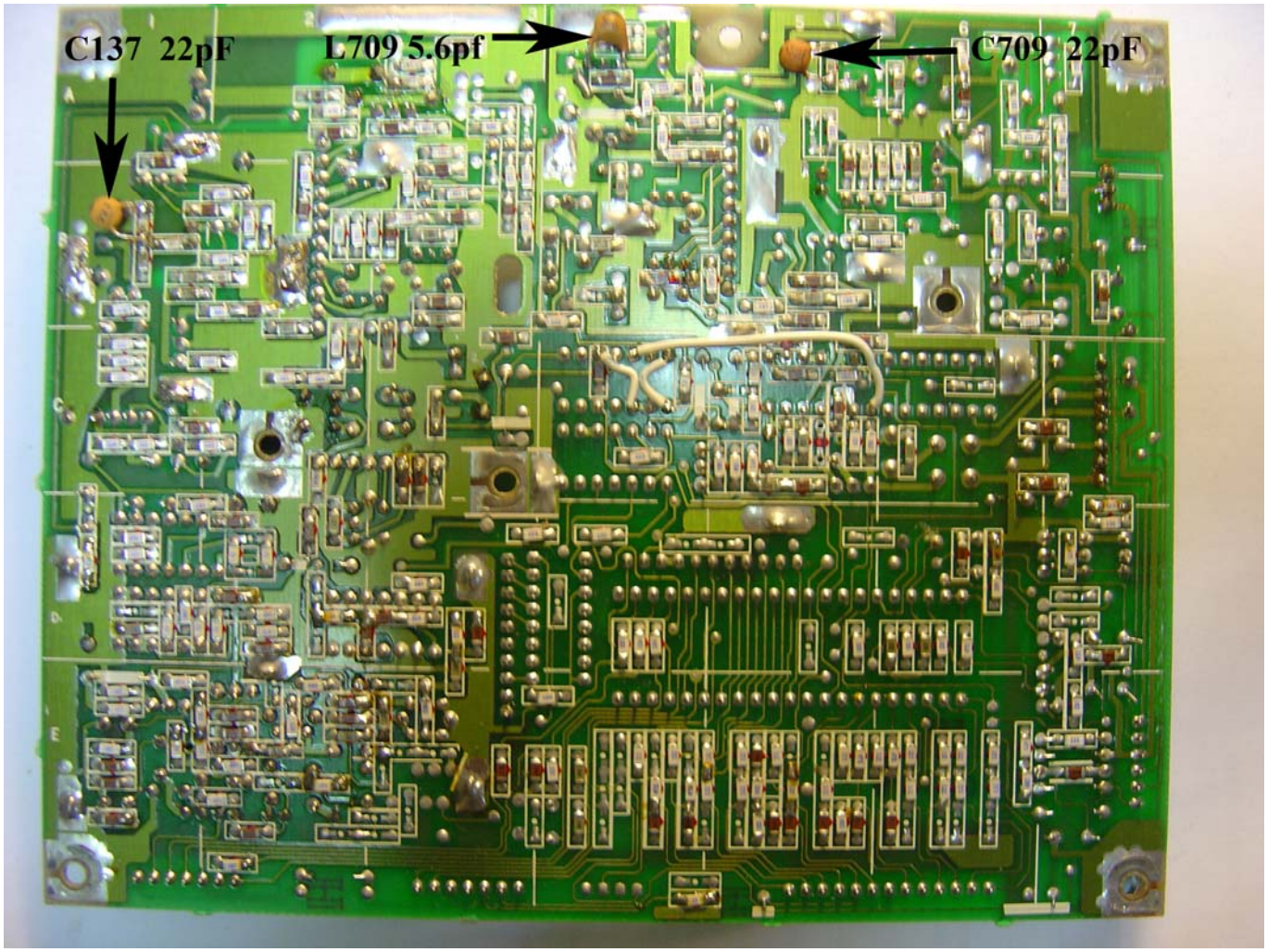


RX (main) VCO, add **22pF** to **C709**.

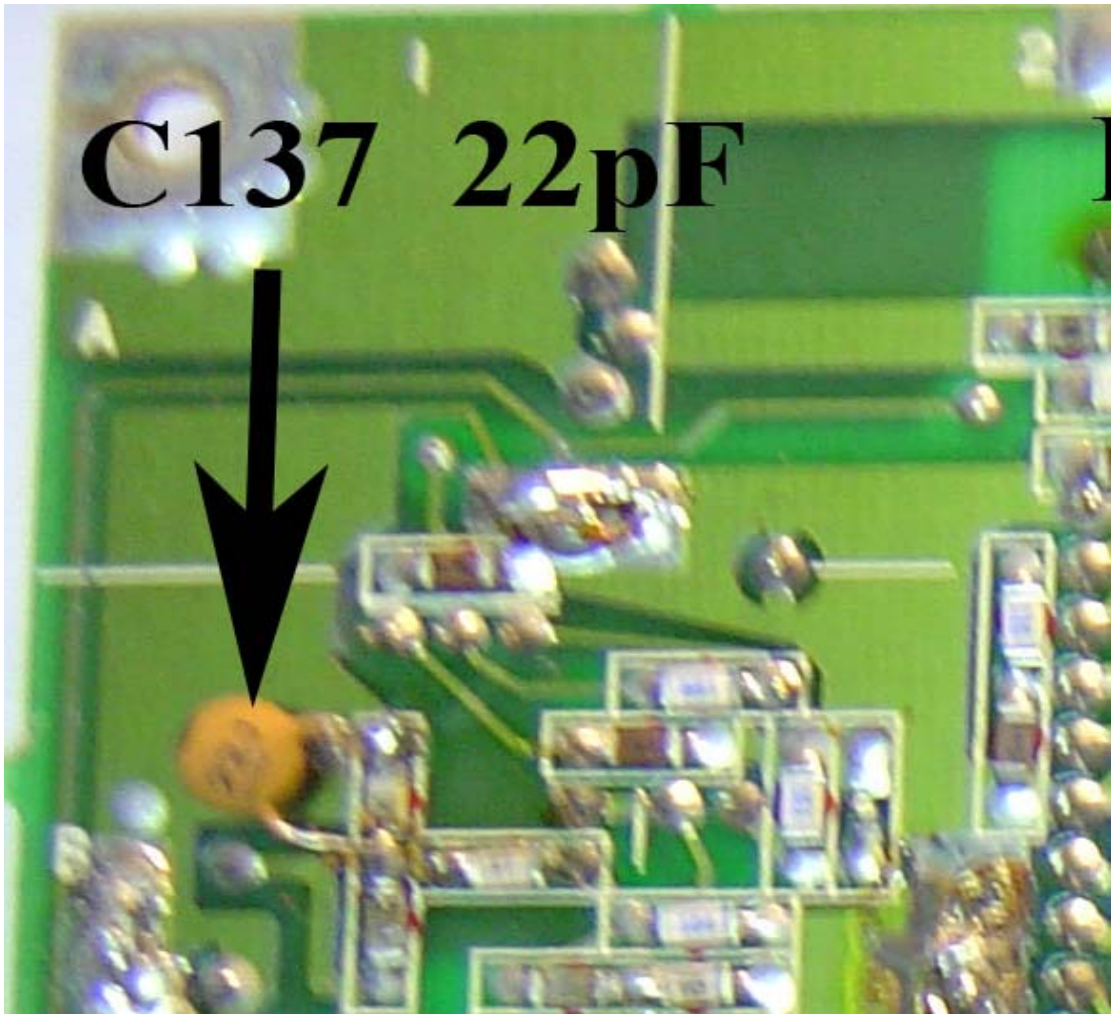
TX (offset) VCO, add **22pF** to **C137** [for Midland 70-066],
located under VCO cover on the track side of the board. Some transceivers may require more.

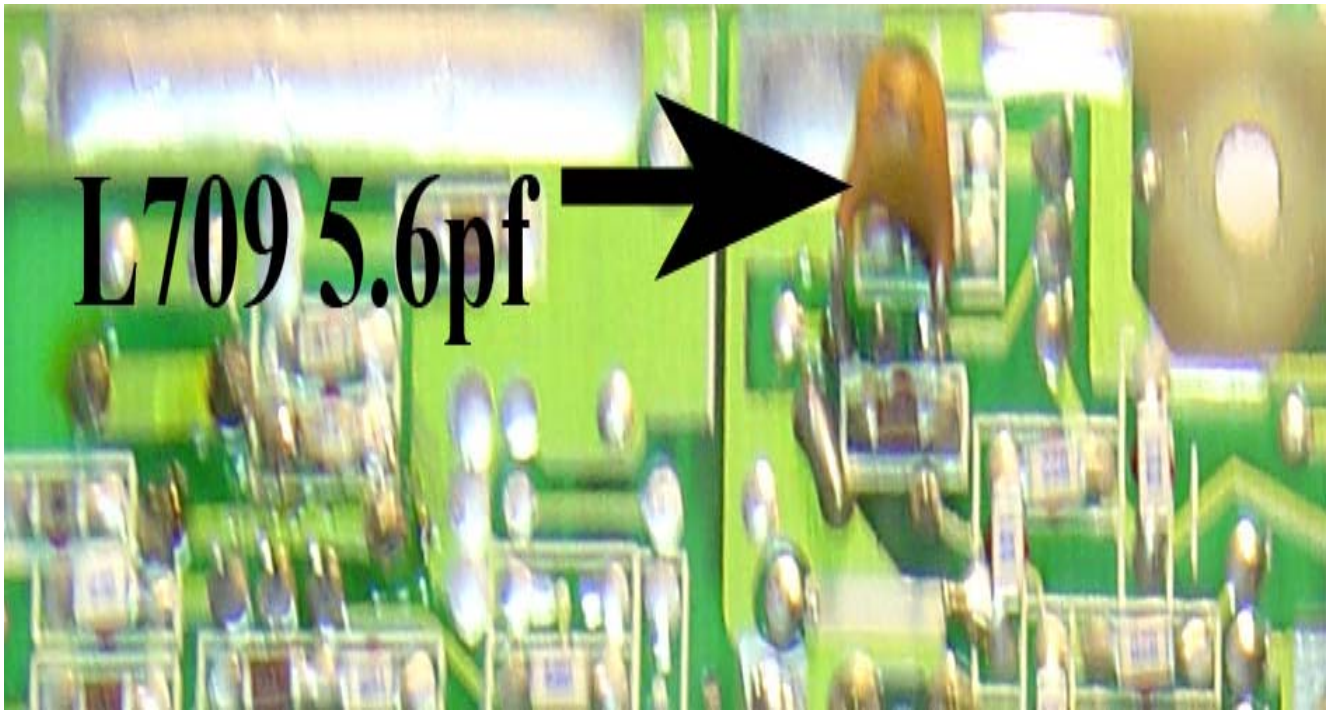
RX buffer amp, add **5.6pF** to primary of **L709**

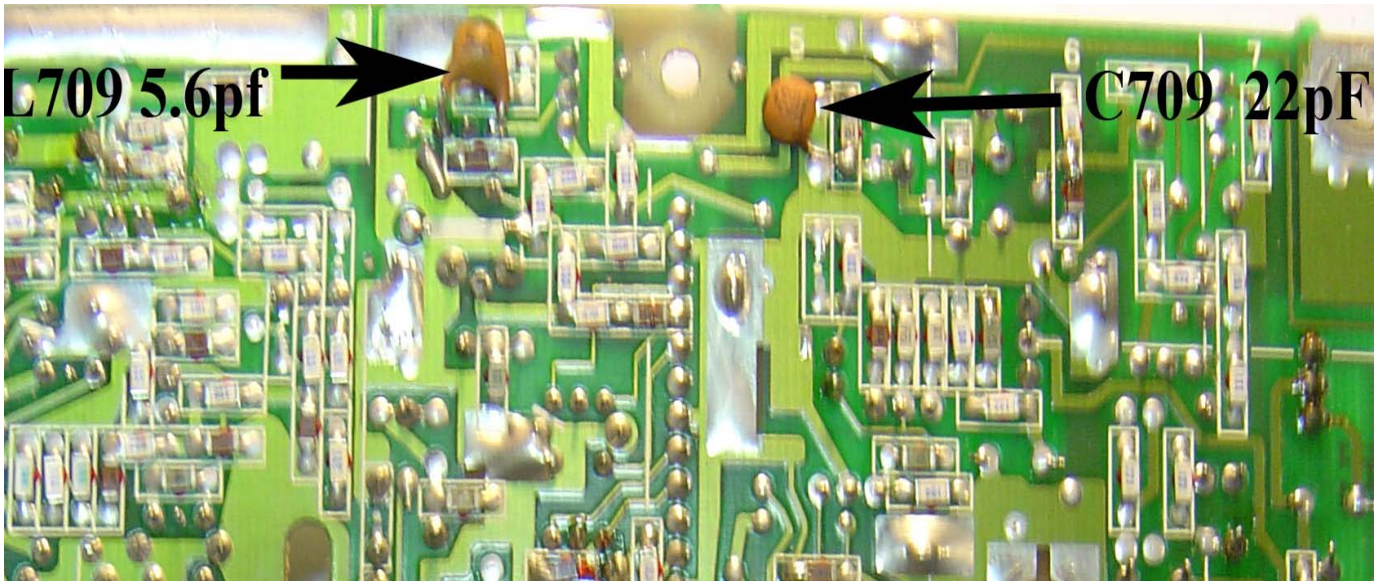
Midland 70-066 Sync Board Bottom View New Capacitors - below:

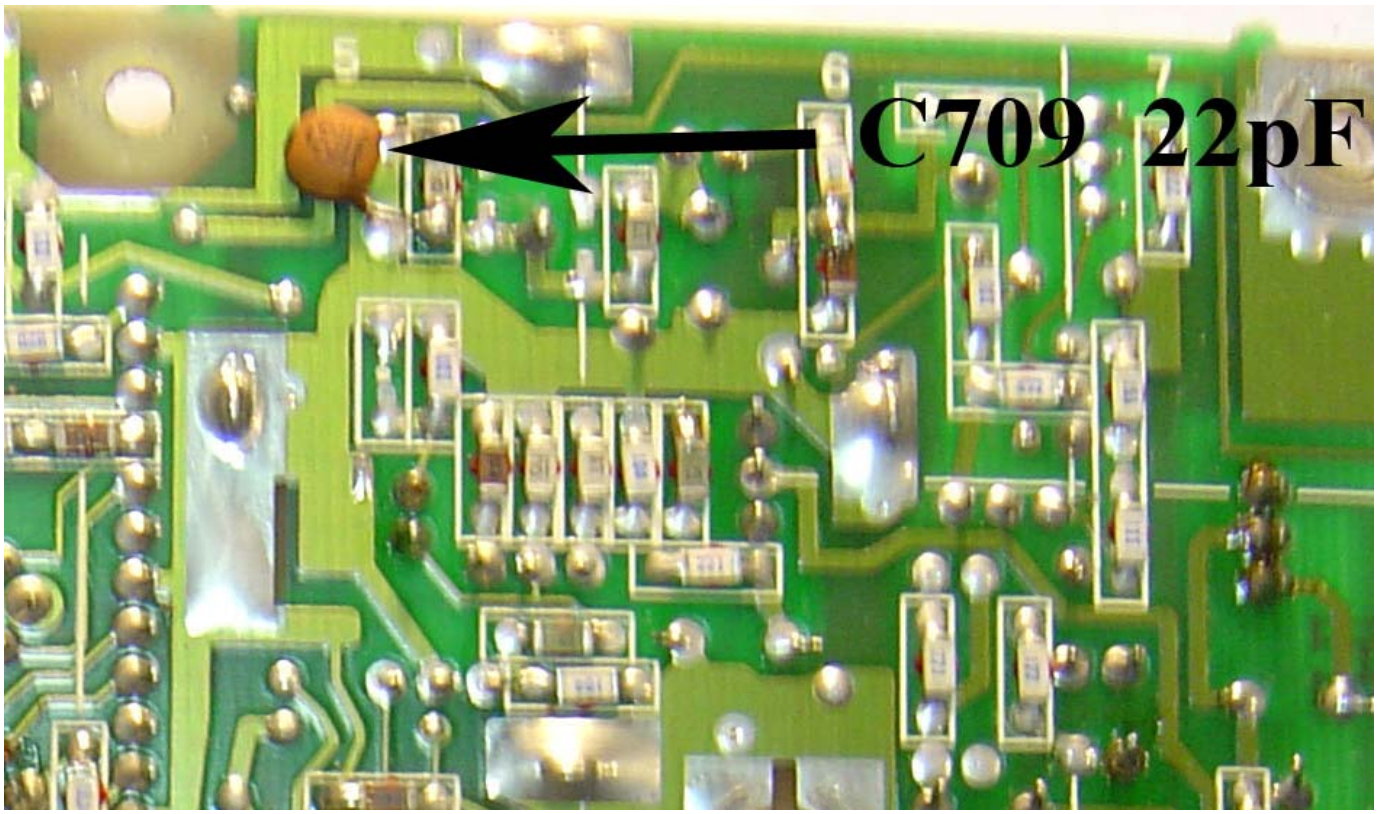


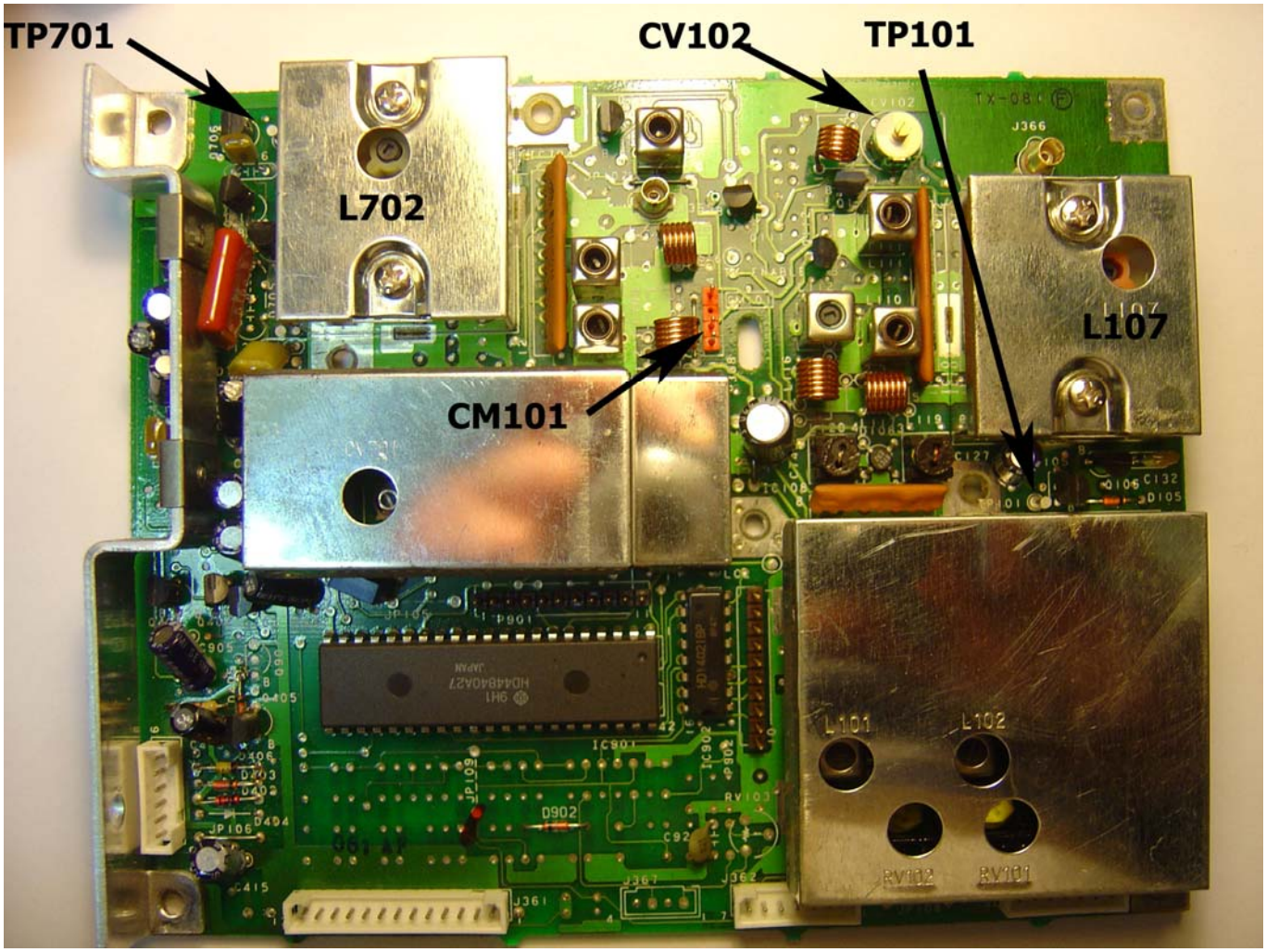
Re-solder bottom plates back onto bottom of Sync Board.


C137 22pF


L709 5.6pf


L709 5.6pf
C709 22pF


C709 22pF



SYNTHESIZER ALIGNMENT:

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.

1: **General Setup:**

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 **TP701** will be 6 V or less than 1.7 V. You have a problem.

If the PLL is locked, either the first channel number will be displayed or else the unit will wait blank on channel **01** [for Midland 70-066A] until either the UP or DOWN button is pressed.

2: **Receiver Local Oscillator Alignment:**

The main Receiver VCO is set to a frequency which is center of the programmed frequencies, By using the **m6m-5k.bin** EPROM [Generated from VK2DOT RT85 Software or other software] – set to **channel 48** [53.225Mhz].

Connect the frequency counter to **J365.** The frequency counter should read **74.625Mhz**.

Connect DC Voltmeter between ground and **TP701**. On 10 Volt Range.

With the correct alignment tool on all ferrite cores adjust the ferrite cores – 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). Voltages will swing between 2 Volts and 4 Volts.

NOTE:

f= (RX freq - 21.4MHz) +- 244Hz : for V HF(HB) and UHF

or

f= (RX freq + 21.4MHz) +- 244Hz : for VHF{LB}

52.525Mhz= Tx frequency then **73.925Mhz** = Rx Oscillator frequency.

3: **Transmitter VCO Alignment:**

Ensure that the exciter output is disconnected at J366.

Connect the frequency counter to **J366.** The transmitter output local oscillator frequency will be at the transmitter frequency. Ie for channel **48** will be **53.225Mhz** when transmitting.

****

A: The main transmitter VCO should be adjusted on the **highest** transmitter programmed frequency. Adjust channel to channel **38** [**53.975Mhz**].

With DC Voltmeter still connected between ground and **TP701** and on 10 Volt Range; Key the transmitter and adjust L702 to give 4.0 Volts at TP701.

B: Connect DC Voltmeter between ground and **TP101**. On 10 Volt Range.

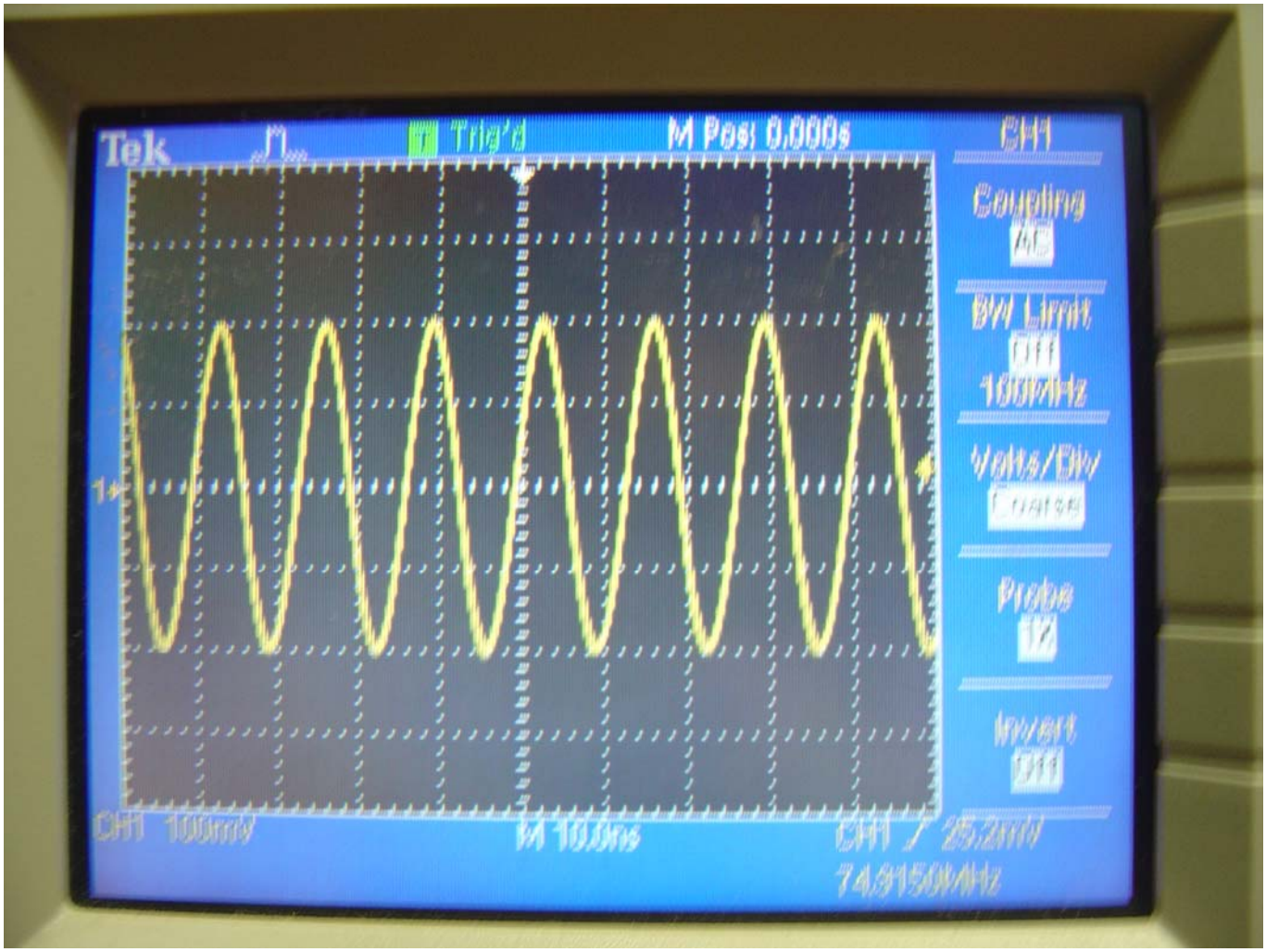
With the correct alignment tool on all ferrite cores adjust the ferrite cores – the ferrite slugs are easily broken.

Operate the PTT button. Check the voltage at **TP101** and re-adjust L107 for a voltages around 4.5V for the TX channel. Release the PTT button.

4: **Transmitter Driver Alignment:**

Connect a DC voltmeter to pin 2 of **CM101.** Set channel to center frequency. Ie. **channel 48** [53.225Mhz].

Adjust CV102 for a dip between two peaks.



Receiver Local Oscillator output from J365.

Parts Needed for 6 Meter conversion of Receiver Board:

Midland 70-066 Parts:

Capacitors.		Jaycar
2.2pf	- 2 of	RC-5304
5.6pf	- 2 of	RC-5309
8.2pF	- 3 of	RC-5311
22pf	- 3 of	RC-5216

Note: All capacitors are 50V Ceramic

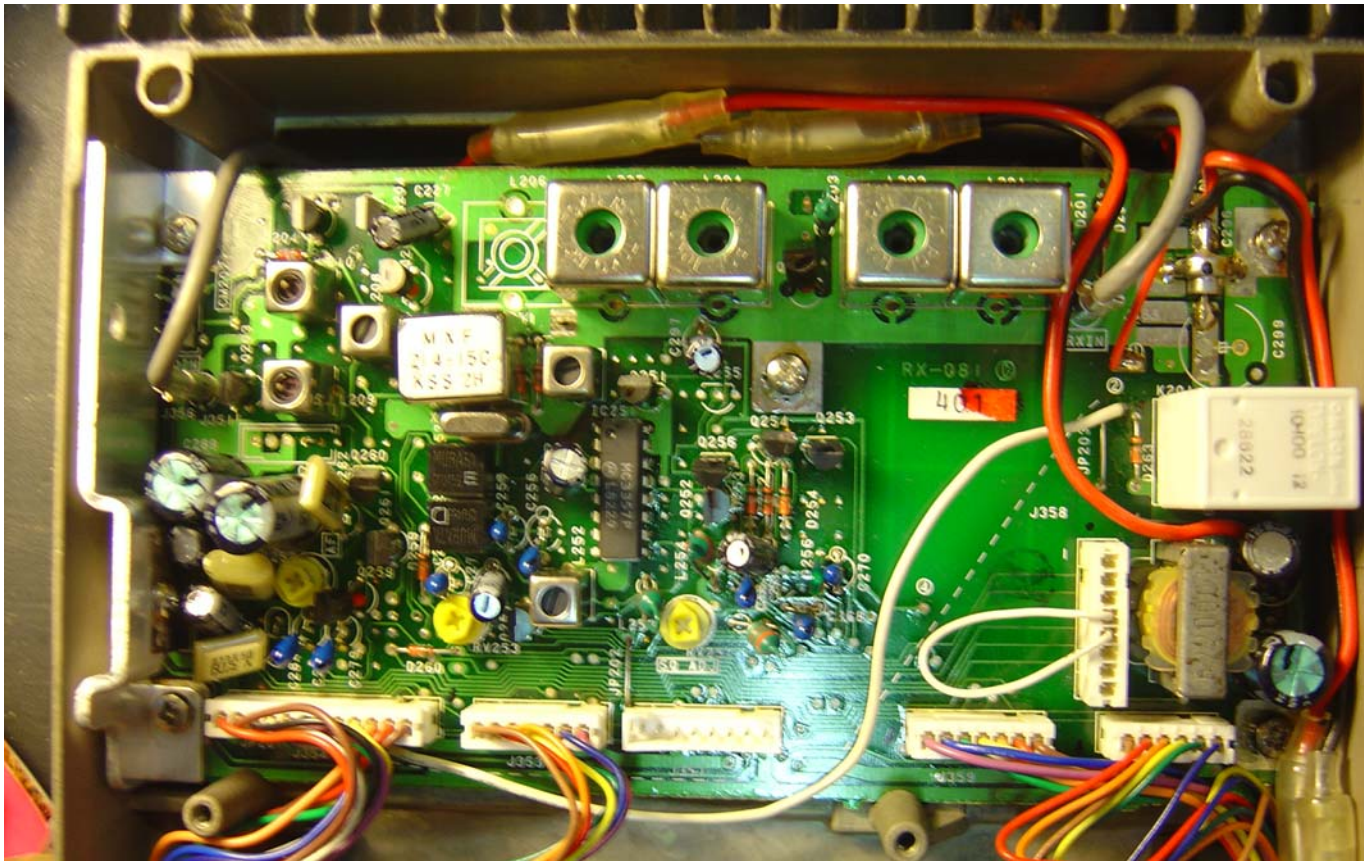
NOTES:

If your transceiver has a 2.5 Khz step frequency, then your receiver should have a narrow pass filter, eg 5 Khz. Thus when you receive normal 10 Khz deviation signals – they will sound distorted, get the sending operator to back off from the microphone.

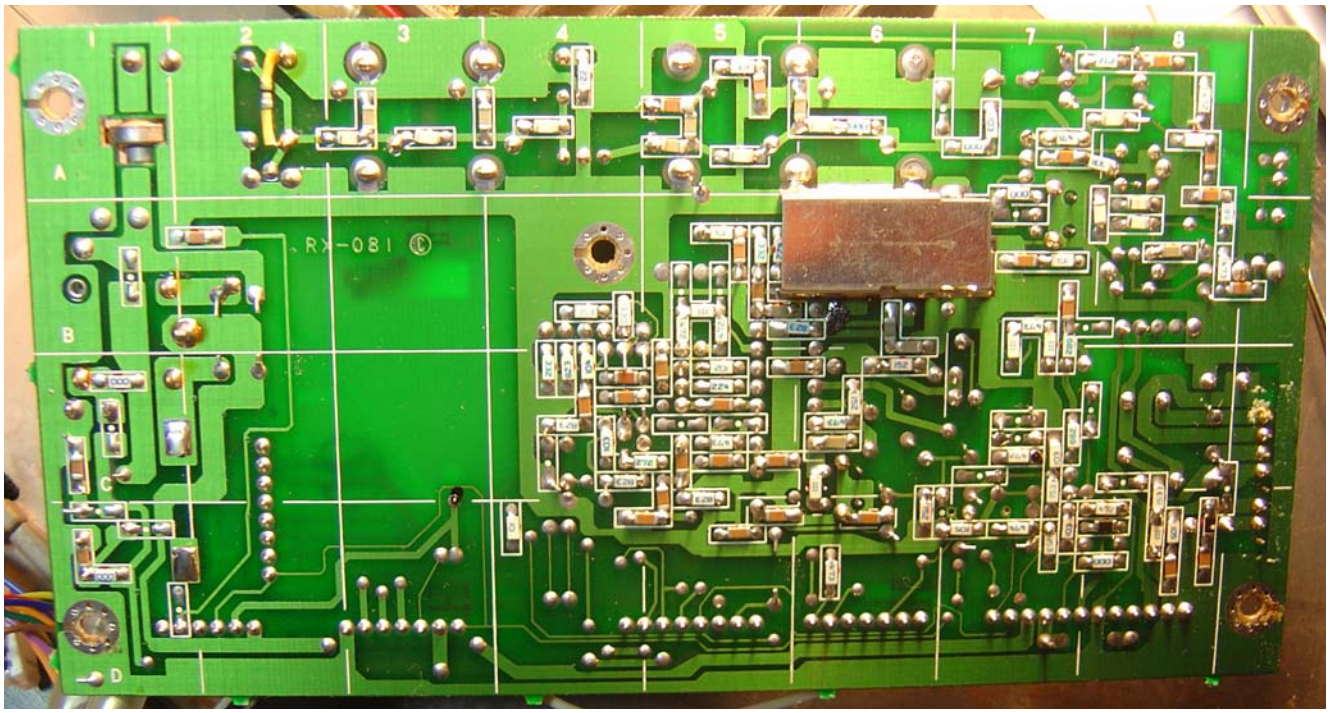
The Receiver Board:

Partially remove the receiver board from the Midland 70-066 transceiver below. ie. Remove all white plugs connected to the white sockets on the board. Then remove all screws holding the receiver board to the transceiver chassis. NOTE: - Do not unsolder the power cables to the receiver board.

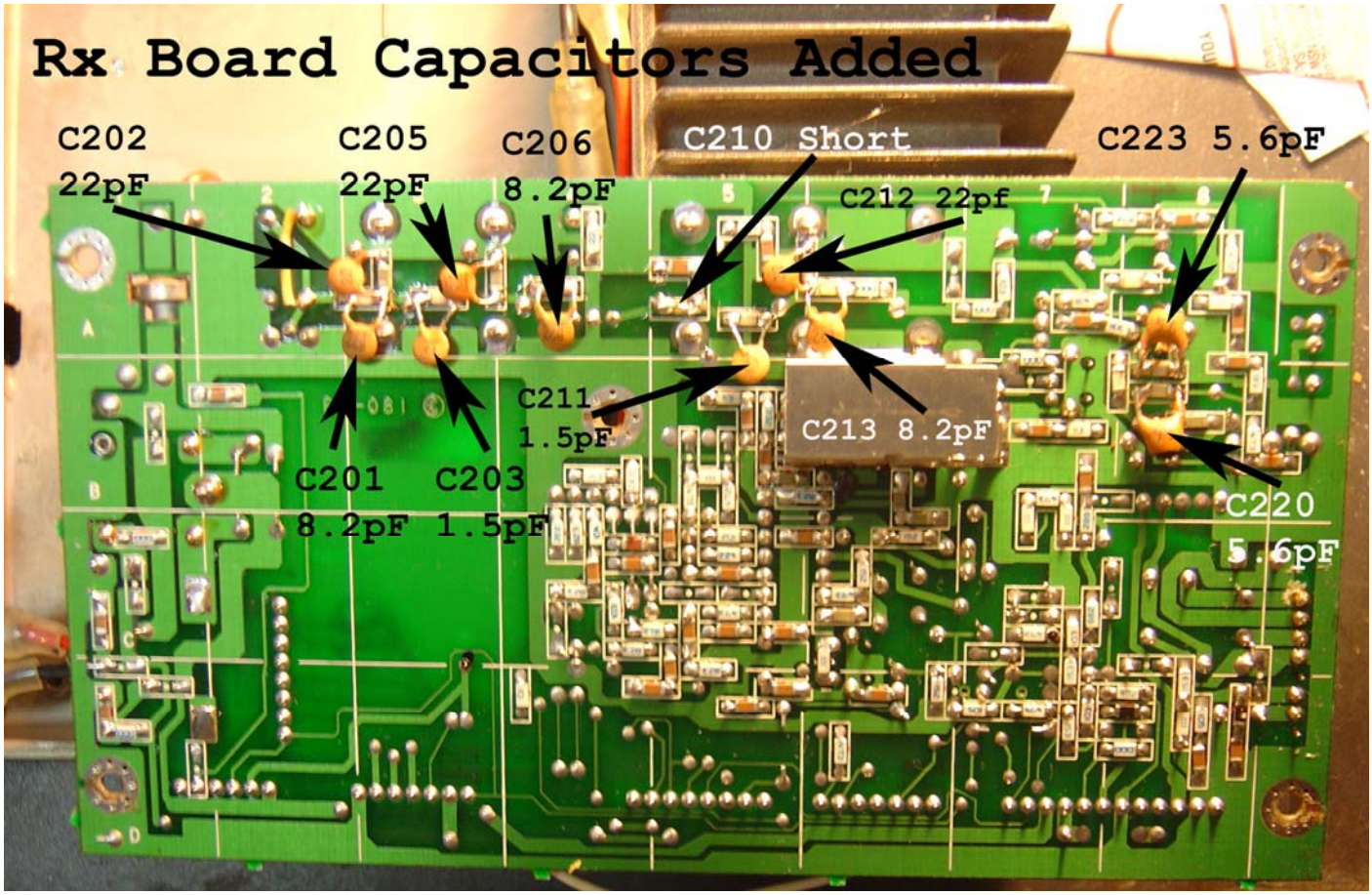
Midland 70-066 Receiver Board - below.



RT85 Receiver Board Bottom below.

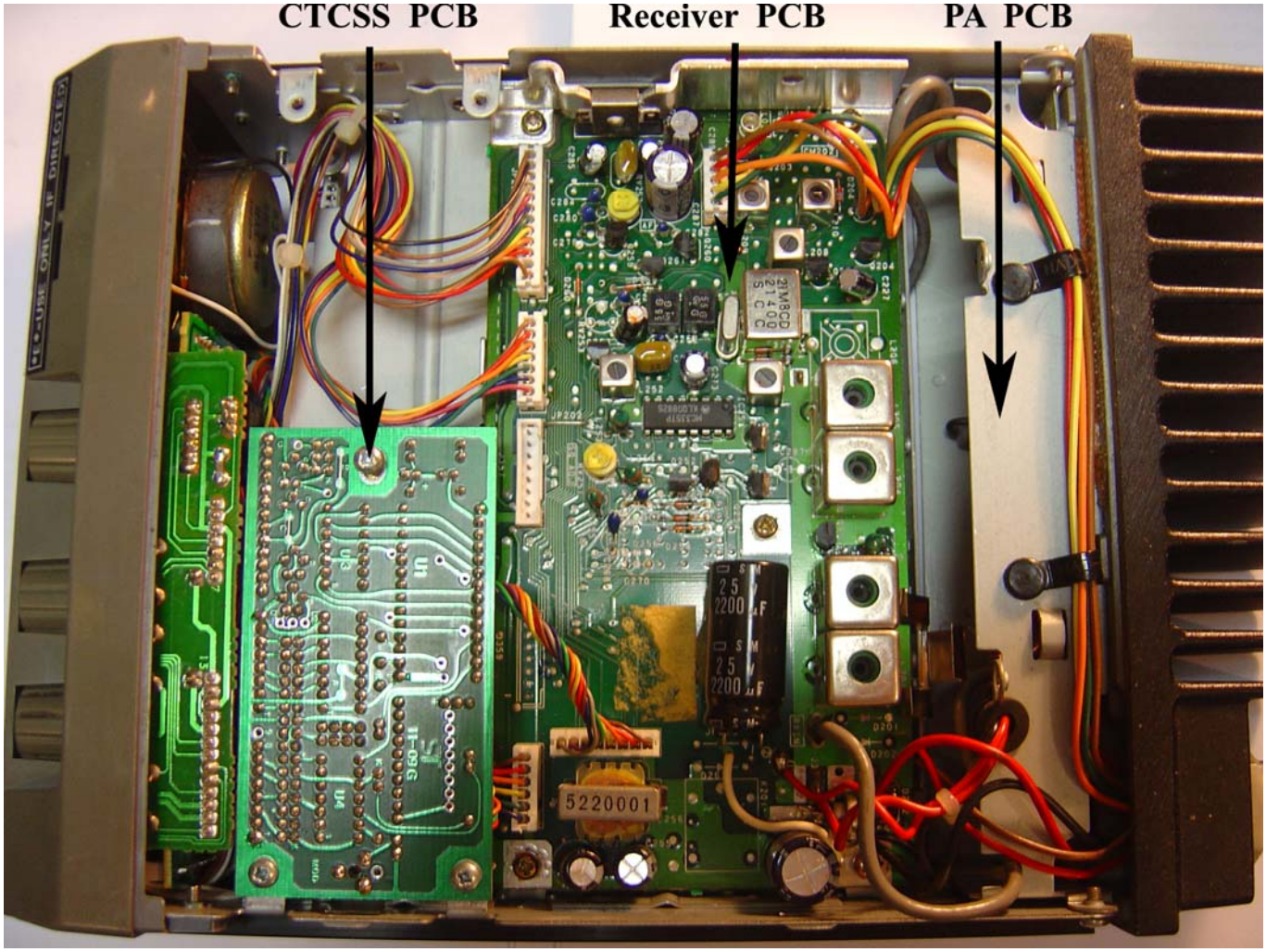


Midland 70-066A Receiver Board Bottom Capacitors Added below.



NOTE Above: C203 & C211 has been changed to 2.2pF for the Midland 70-066A

Midland 70-066A Top View of PCB below:



Remove CTCSS PCB from transceiver chassis by unscrewing and bending back away from the receiver PCB.

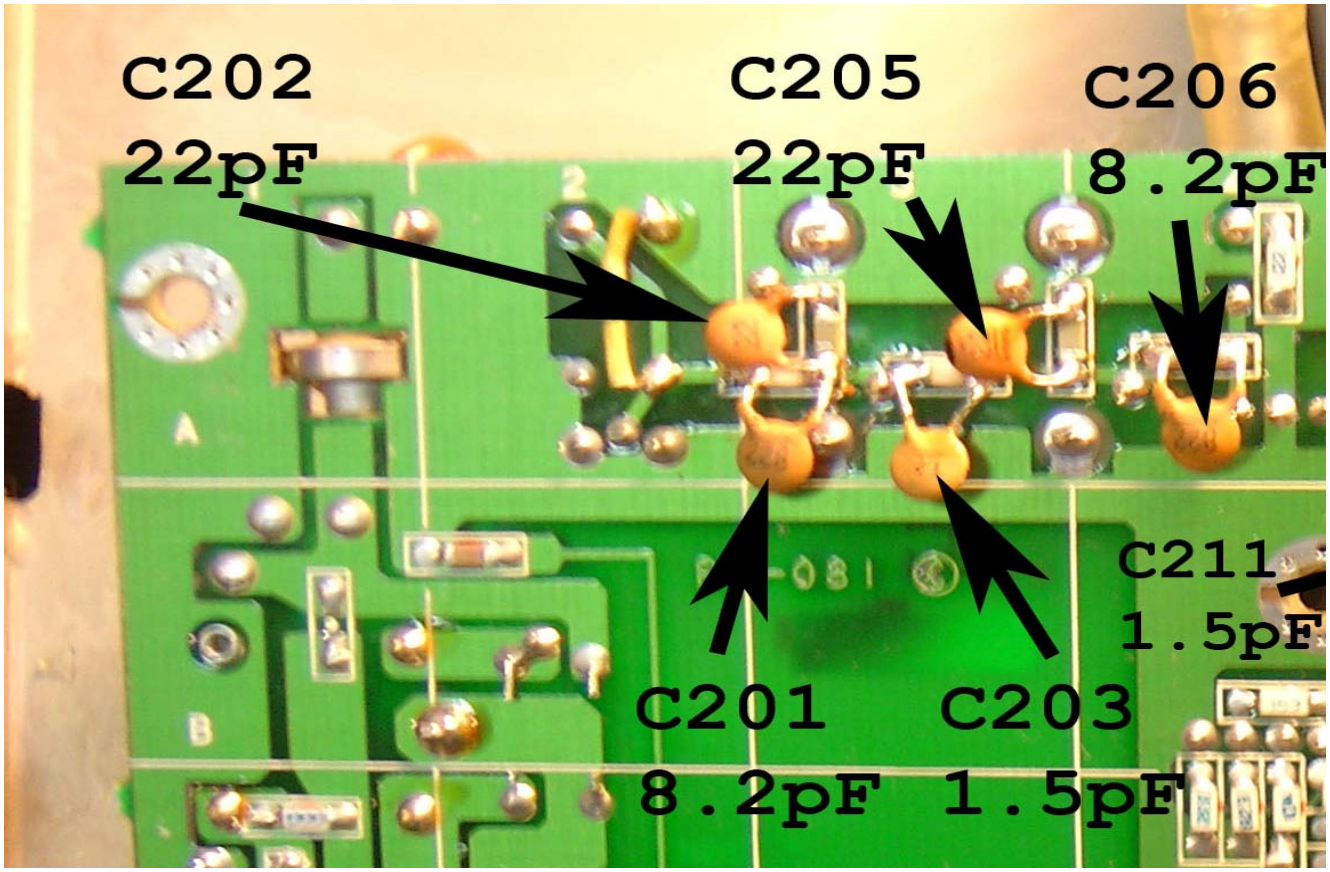
Unplug the two RF leads from the Receiver PCB.

Unplug all plugs from the Receiver sockets. NOTE: The power cables are left

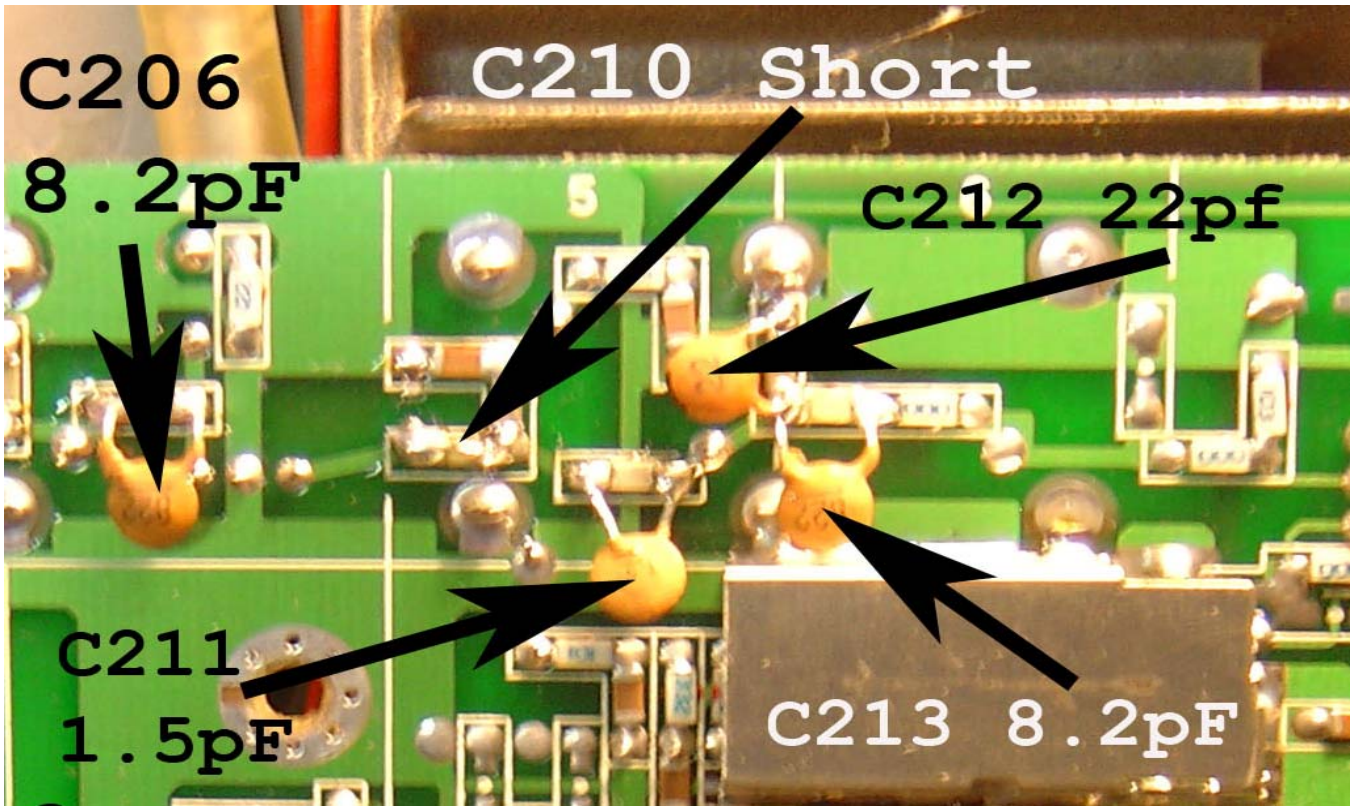
Remove Receiver PCB and bend back to view bottom of board.

Rx Front end. Add 22pF to C202, C205, and C212.
Short C210.
Add 2.2pF to C203 and C211.
Add 8.2pF to C201, C206, and C213.

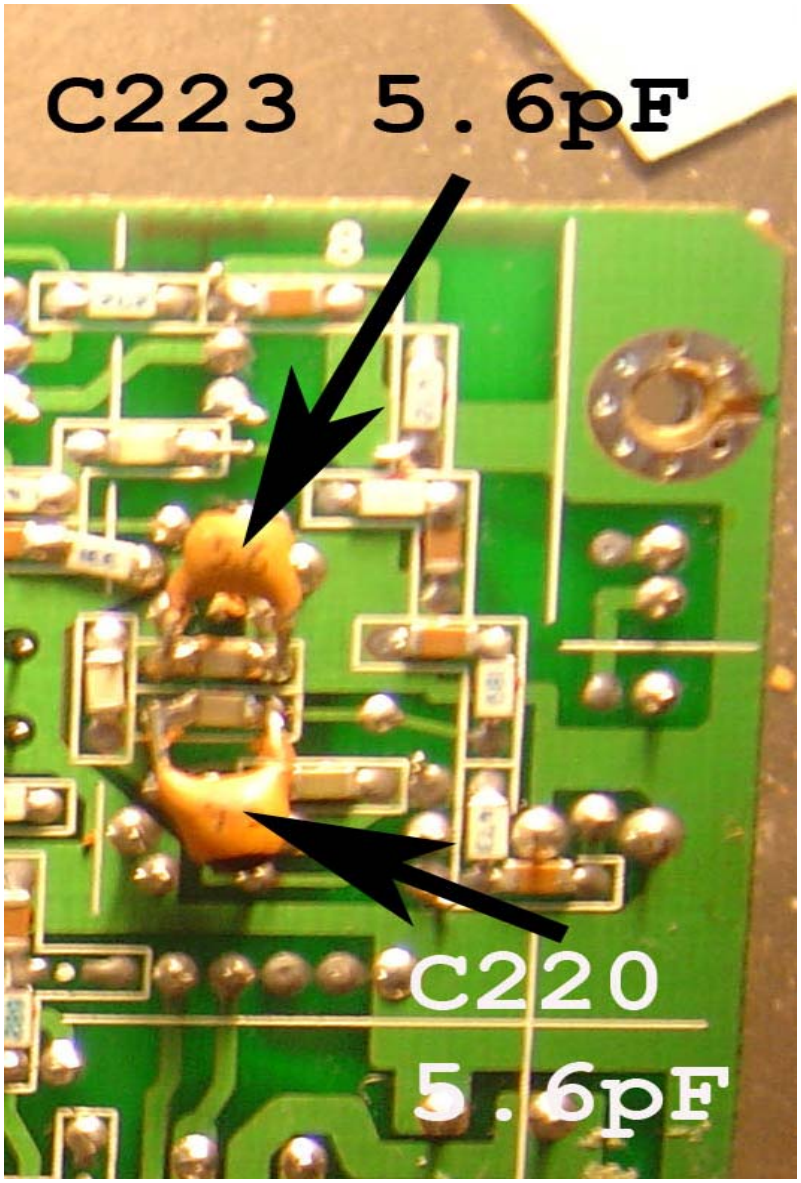
LO tuned buffer. Add 5.6pF to C220 and C223.



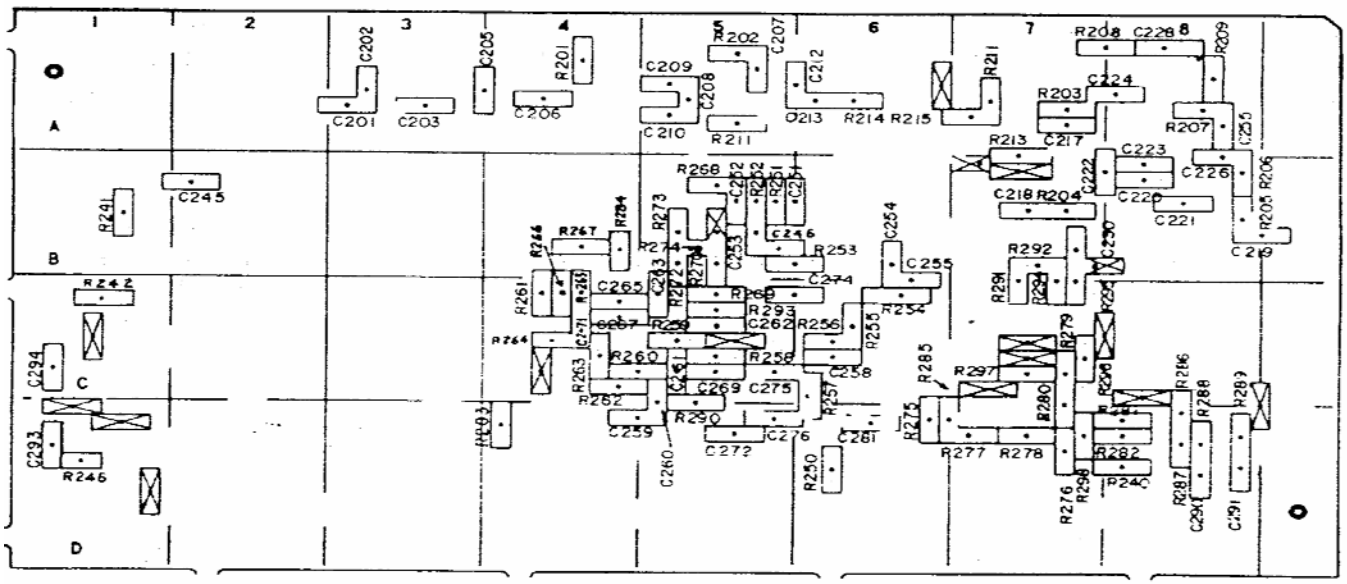
NOTE Above: C203 & C211 has been changed to 2.2pF for the Midland 70-066A



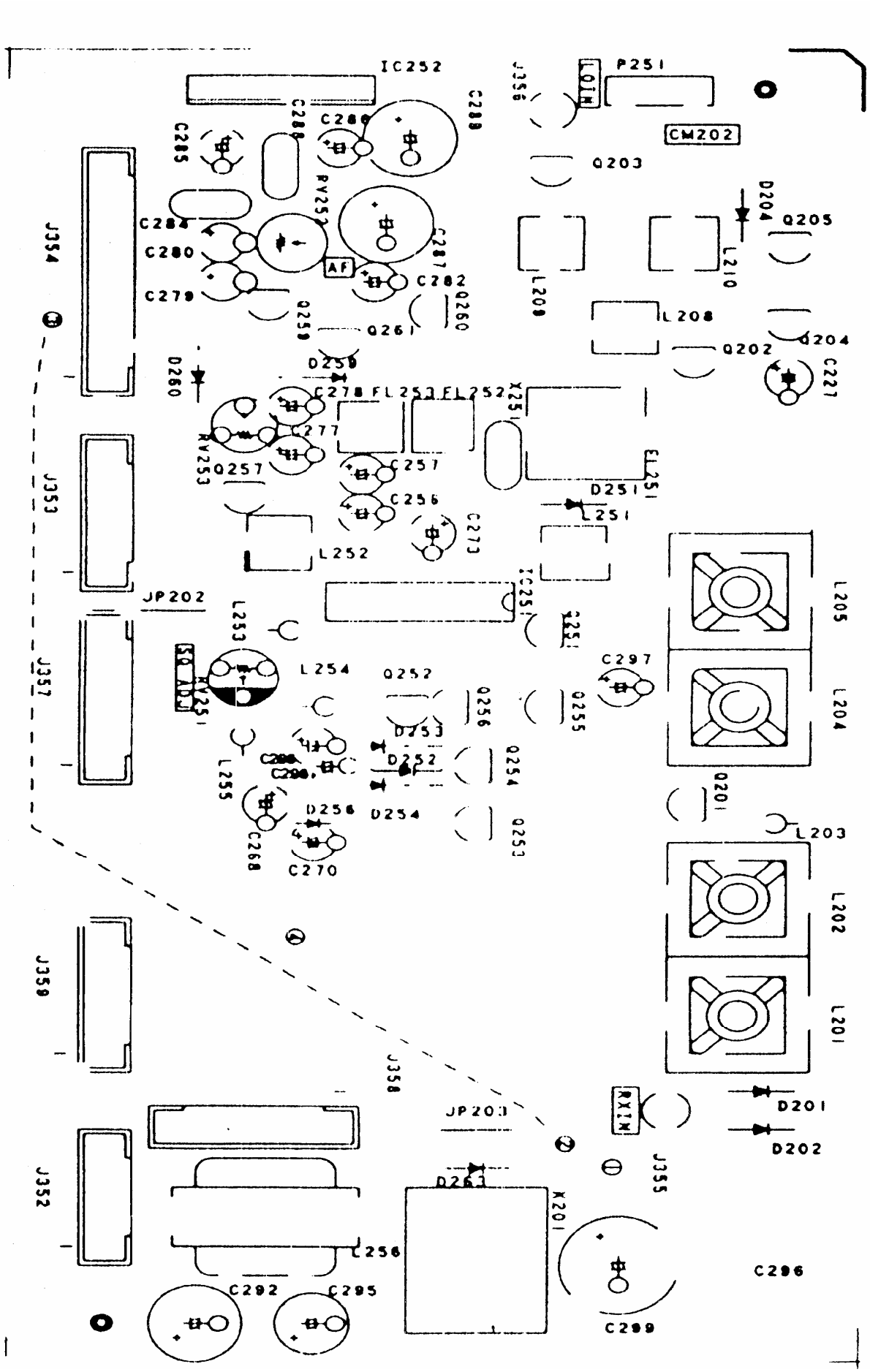
NOTE Above: C211 has been changed to 2.2pF for the Midland 70-066A


C223 5.6pF
C220
5.6pF

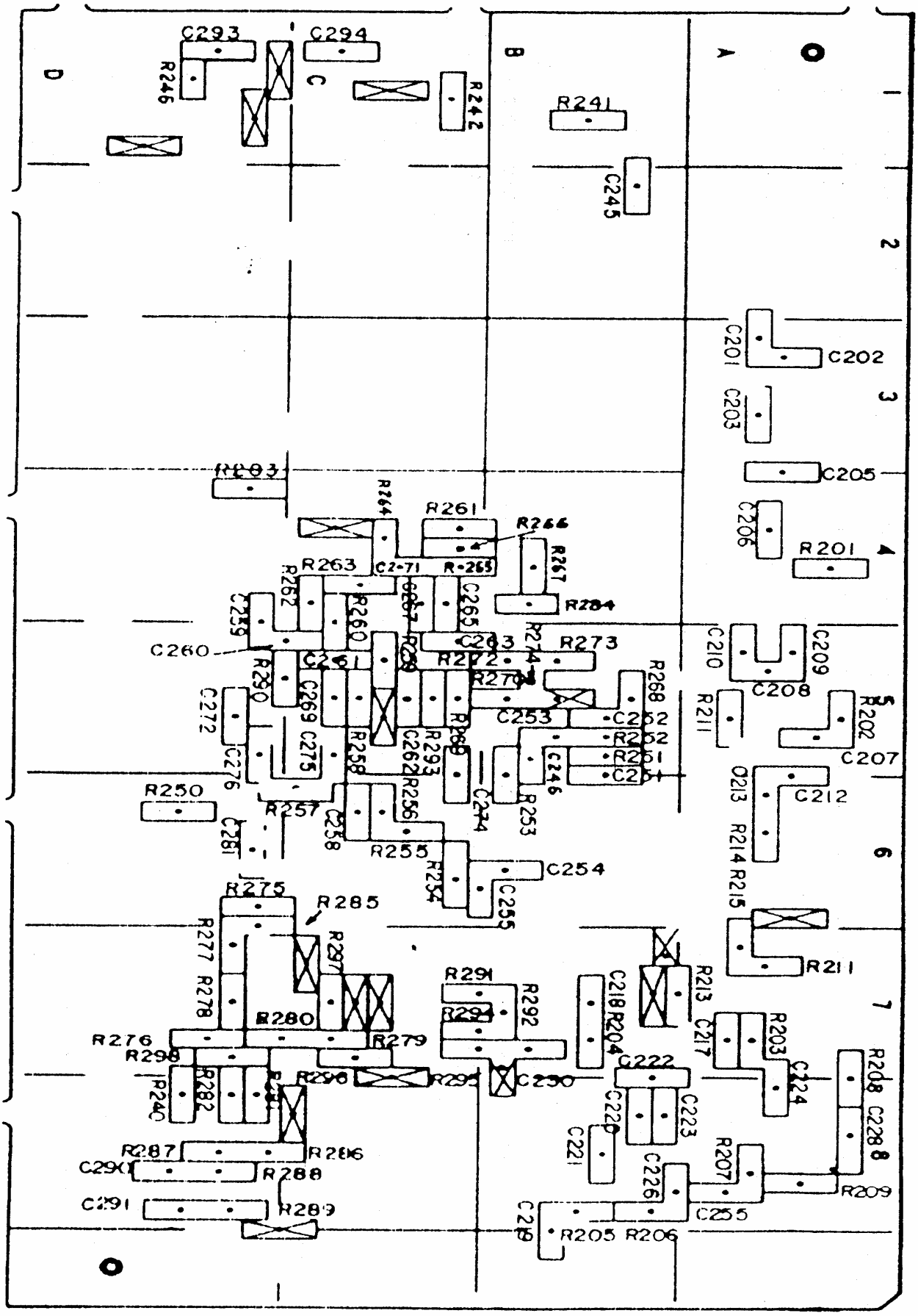
Midland 70-066 Receiver Board Bottom Capacitors below. [see larger diagram at end for printout]



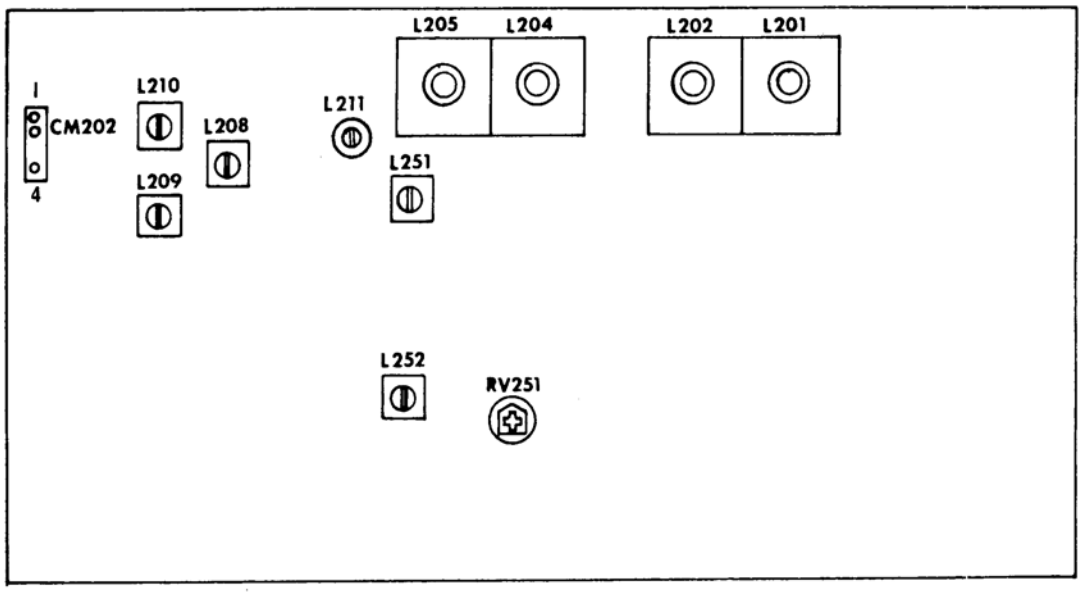
Midland 70-066 Receiver Board Top Assembly View - below:



Midland 70-066 Receiver Board Bottom Capacitor View - below:



Rx Tune Up.



Midland 70-066 Receiver Alignment Points Above:

Receiver tune up is straight forward. Reconnect the Receiver Local Oscillator J365 cable to the synthesizer board.

LO Amplifier Alignment:

Connect multi-meter or DVM to Monitor CM202 pin 1. Note pin 2 is missing key pin). Switch to center frequency – **Channel 49 - 53.250Mhz** [center between 53.975Mhz and 52.500Mhz.]

To tune the local oscillator multipliers - Adjust **L209 and L210** for maximum reading. A typical reading is 0.4 V. A common problem with these transceivers is lack of LO injection if they are not modified and tuned correctly.

RF-IF Alignment:

Tuning the RF front end - On a mid frequency channel (**Channel 49 - 53.250Mhz**) feed a signal in from a signal generator to the Midland 70-066 antenna socket. Connect a multi-meter or DVM to Monitor CM202 pin 2 and peak **L201, L202, L204 and L205** for maximum reading while remaining in the linear range [ie Set signal generator level for positive meter reading before limiting occurs.. Note the reading at this pin will be negative until sufficient RF input signal is available. Repeat adjustments for optimum.

An alternative method is to use a Sinad meter or tune for maximum quieting. When correctly aligned the sensitivity is typically 0.35uV for 12db sinad over the range 52.5 to 54 MHz.

Tests have concluded that the Midland 70-066 should lift the mute at 0.1uV for a reasonable audio quality.

Quadrature Coil Alignment:

Adjust **L252** for maximum audio output.

Tight Squelch Alignment:

Adjust **RV251** for the desired tight squelch sensitivity.

Parts required for conversion to 6 Meters for the Transmitter PA PCB:

Parts for Midland 70-066

Capacitors. **Jaycar**

4.7pF	- 1 of	RC-5308
22 pF	- 2 of	RC-5316
27 pF	- 2 of	RC-5217
33 pF	- 1 of	RC-5218
39 pF	- 2 of	RC-5219
100 pF	- 1 of	RC-5324
1000 pF	- 1 of	RC-5336

Note: All capacitors are 50V Ceramic

Wire.

Approximately 200 mm of 0.63mm [22bs] enameled coated wire [Jaycar WW4018].

NOTES:

1: Use the proper power meter to measure the output power. For example, if you use a 140 to 525Mhz power/SWR meter – you will get false readings. Such as 6 watts instead of 25 watts.

2: The voltage applied to the PA stage will determine your output power. Eg

25 Watts with 12.0 Volts
38 Watts with 13.8 Volts

3: It has been noticed that some converters have accidentally removed a, or some Surface Mounted Components while de-soldering coils etc from Printed Circuit Boards.

This has resulted in circuits not tuning correctly or, especially the PA board self oscillating on another frequency other than the 6 meter band.

Especially look at the Surface Mounted capacitor across CV502. You will have to check with the Midland Service Manual.

Also remember to have capacitor legs as short as possible. When bending the capacitors over, make sure that the legs have not shorted onto the board.

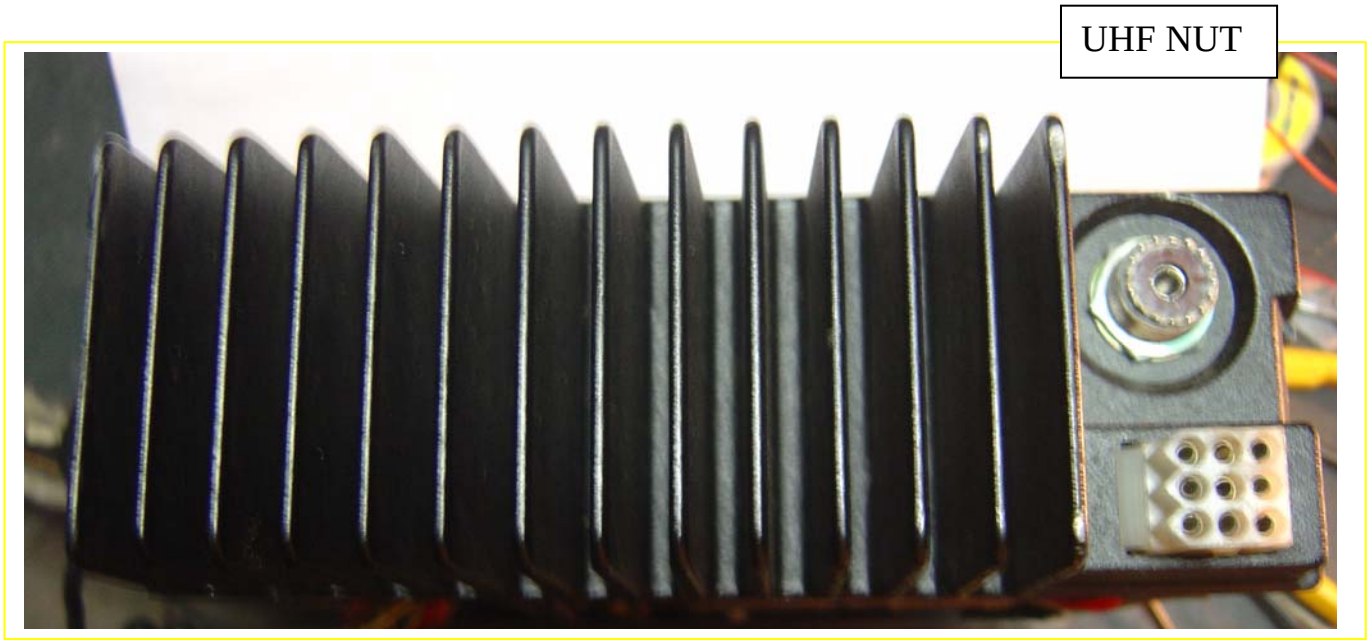
4: At this point in time, it looks like the following amendment will be necessary for the capacitor across CV502:-

22pF for Midland 70-066A
33pF for Midland 70-066B

The Midland 70-066 Transmitter PA Board:

Before you remove the PA PCB board, unscrew the nut from the UHF RF socket at the rear of the Midland 70-066 transceiver.

REMOVE UHF NUT:



Midland 70-066 PA module above:

The Midland 70-066 Transmitter PA stage swings down by unscrewing the two screws on the side of the PA stage. Then remove the top PA cover, by unscrewing the two screws at the bottom of the cover.

The RT85 Transmitter PA PCB [**P**rinted **C**ircuit **B**oard] is fixed to the chassis; Remove the top cover from the PA PCB.

Unscrew the three screws from transistors Q503 & Q502. [Remember when placing PA PCB back into housing to use **temperature transfer compound** on bottom of transistors.]

Remove the 6 screws from the side of the PA PCB.

Remove the PA PCB from its enclosure.

Unsolder the 3 wires from the PCB –> **T8V**, **+B** & **G**.

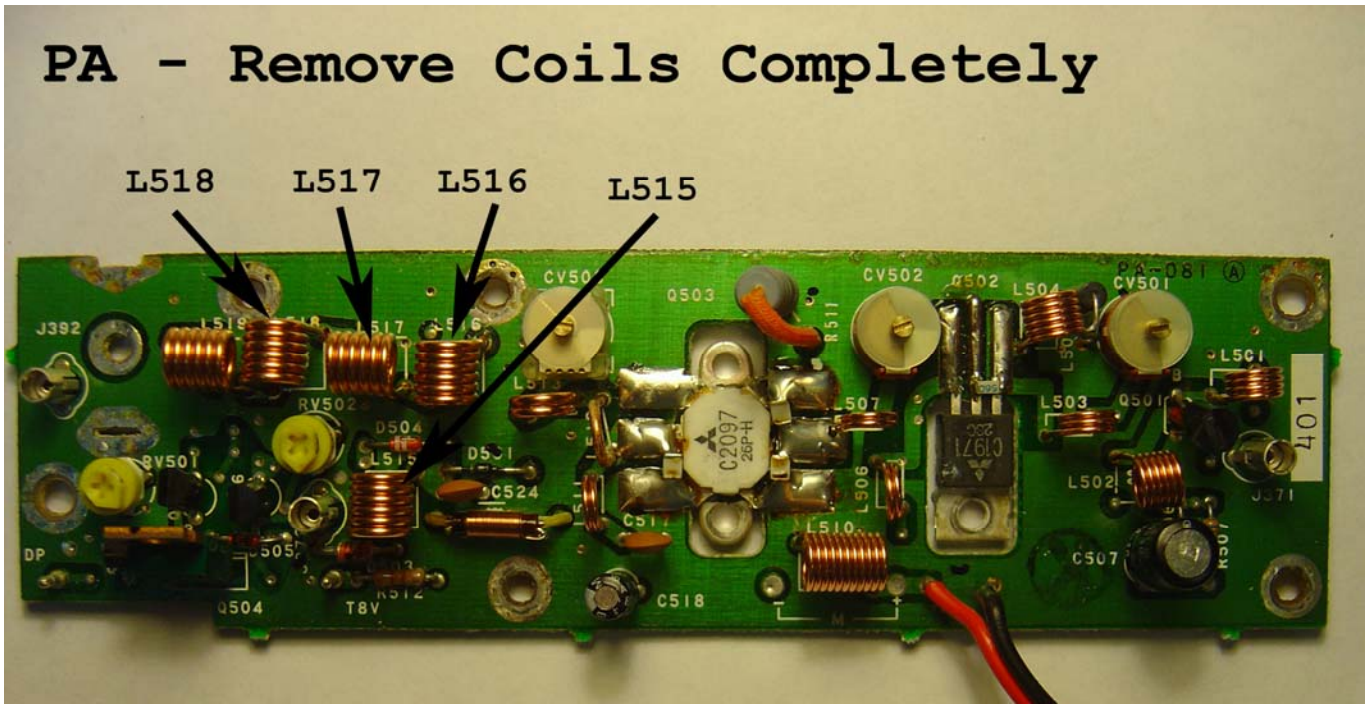
Mark the PCB with your call-sign by using your felt pen. Your PA PCB can now be freely un-soldered. Don't forget to unsolder the holes where the three wires were connected.

PA Coils – Midland 70-066B – Overview:

Coil	Original	Action	New Replacement		Notes
L114	*4.5T*	*Remove*	*7.5T*		*0.5mm Enamel Wire Synthesizer Board*
L501	3.5T	Remove	4.5T	old L114	
L502	5.5T	Leave in			
L503	2.5T	Remove	3.5T	old L501	
L504	5.5T	Leave in			
L506	1.5T	Leave in			
L507	1.5T	Remove	2.5T	old L503	
L510	10.5T	Leave in			
L511	1.5T	Leave in			
L512	0.5T	Remove	1.5T	old L513	
L513	1.5T	Remove	**2.5T**	old L519 cut	1.25mm Enamel Wire
L515	5.5T	Remove	6.5T		0.63mm Enamel Wire
L516	5.5T	Remove	6.5T		0.63mm Enamel Wire
L517	5.5T	Remove	6.5T		0.63mm Enamel Wire
L518	5.5T	Remove	6.5T		0.63mm Enamel Wire
L519	5.5T	Remove	6.5T		0.63mm Enamel Wire

Note: T = Turns

You may de-solder all coils to be removed in one sitting [eg using a de-soldering station]. You may wind all new coils or use the old removed coils. If you intend to insert old coils, then, on de-soldering the coils, mark each old coil with marking pen and label [masking tape tag] attached to the old coil.



Remove **L515, L516, L517** and **L518**.

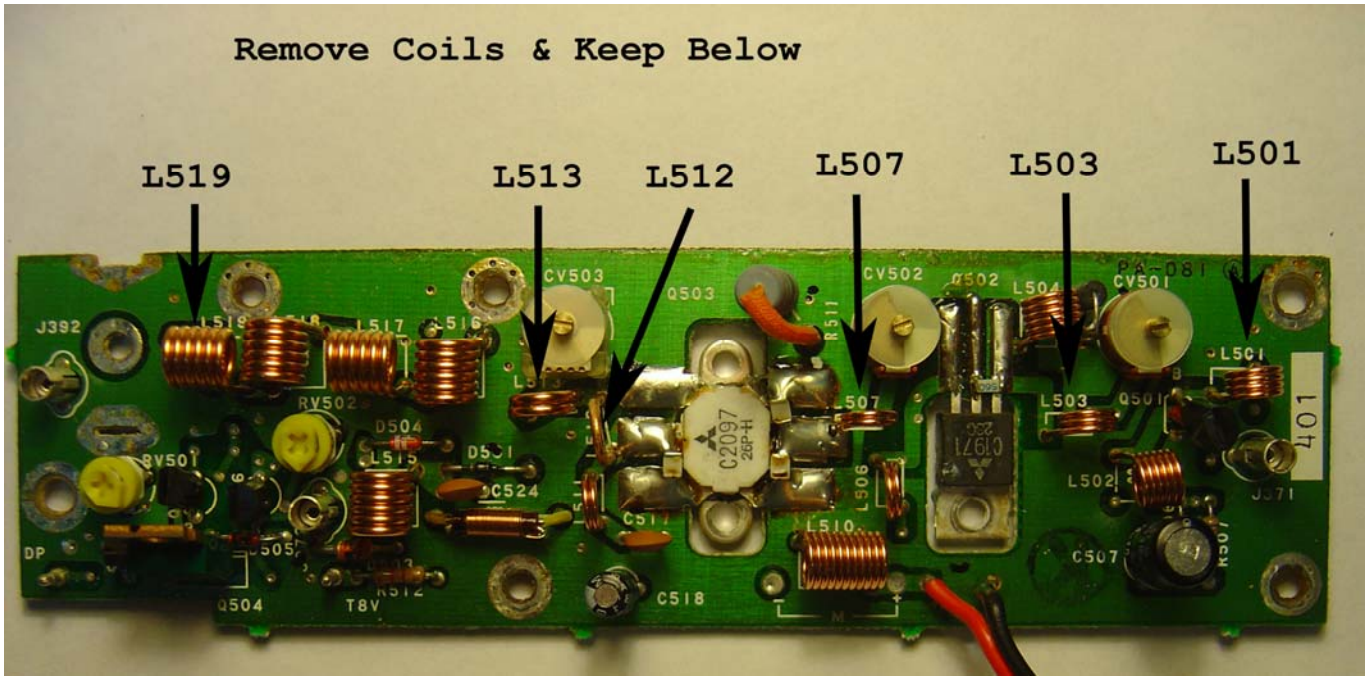
Since these coils will not be reused, use side-cutters to cut them in half and then remove the pieces by heating the joint from the underside and carefully removing the part coil from the top.

Remove **L519** and hold with tag. [To be used later on to replace L513.]

Cut 5 of pieces of 0.63mm [22bs] of enameled coated wire, 143mm long. Scrape off enamel at each end of wire for approximately 5mm. [**NOTE:** The new Jaycar wire, the enamel can be removed by heat. So instead of scraping wire, tin ends of wire with a soldering iron.) Wind onto a 5mm drill bit [the drill bit

should have the same size diameter of the coil retracted from L515 – 5mm]. Each piece of wire should wind for 6.5 turns [with long ends.]

Solder in five of new wound coils into **L515, L516, L517, L518** and **L519**.



Transmitter PA Modifications to 6 Meters:

Remove **L501** and keep; replace with original **L114** from the synthesizer board. [**4.5 Turns**]

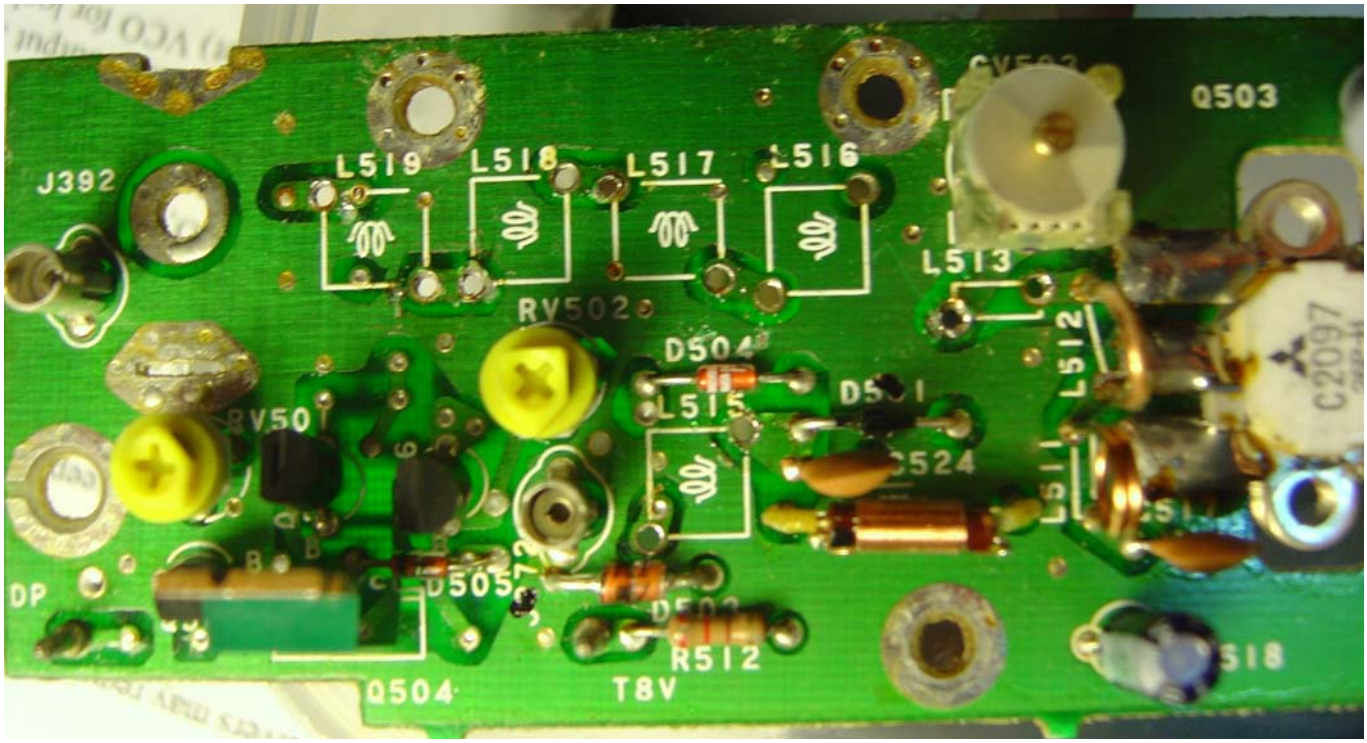
Remove **L503** and keep; replace with original **L501**. [**3.5 Turns**]

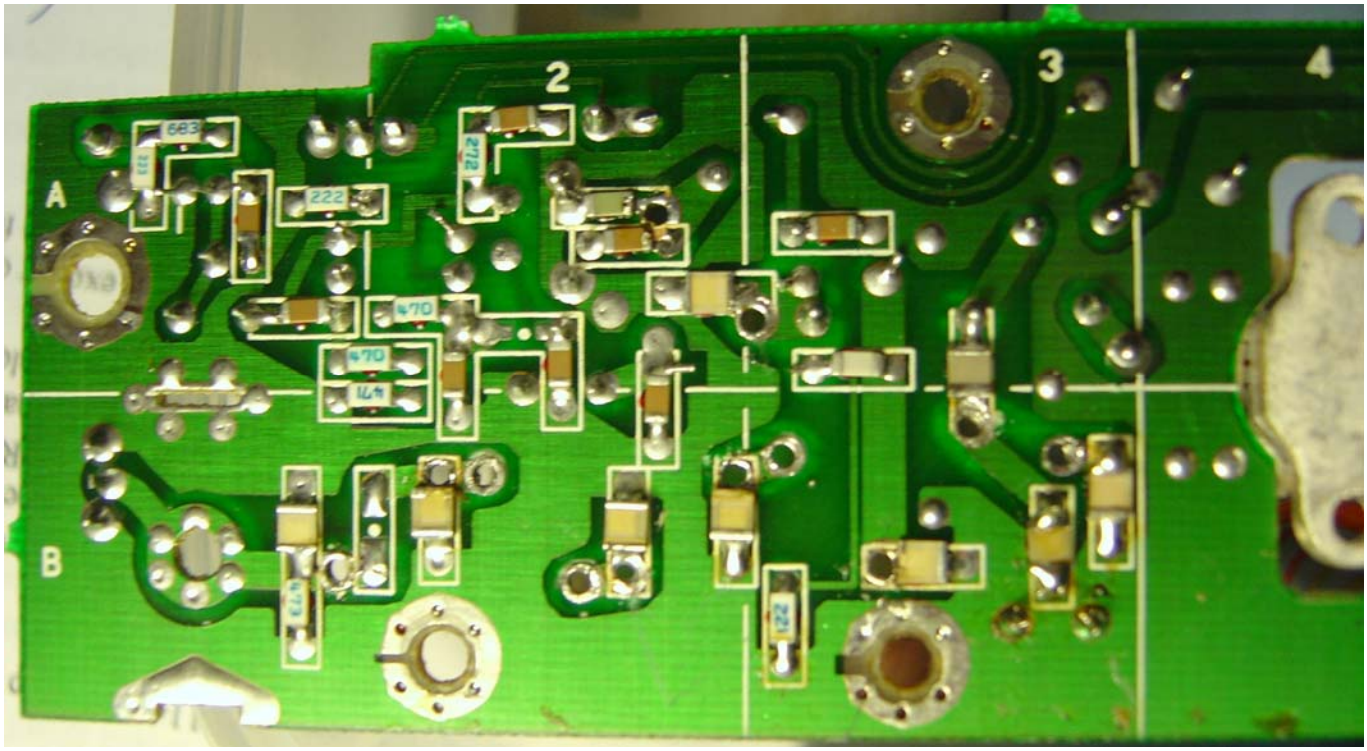
Remove **L507** then replace with original **L503**. [do not keep coil **L507** just removed] [**2.5 Turns**]

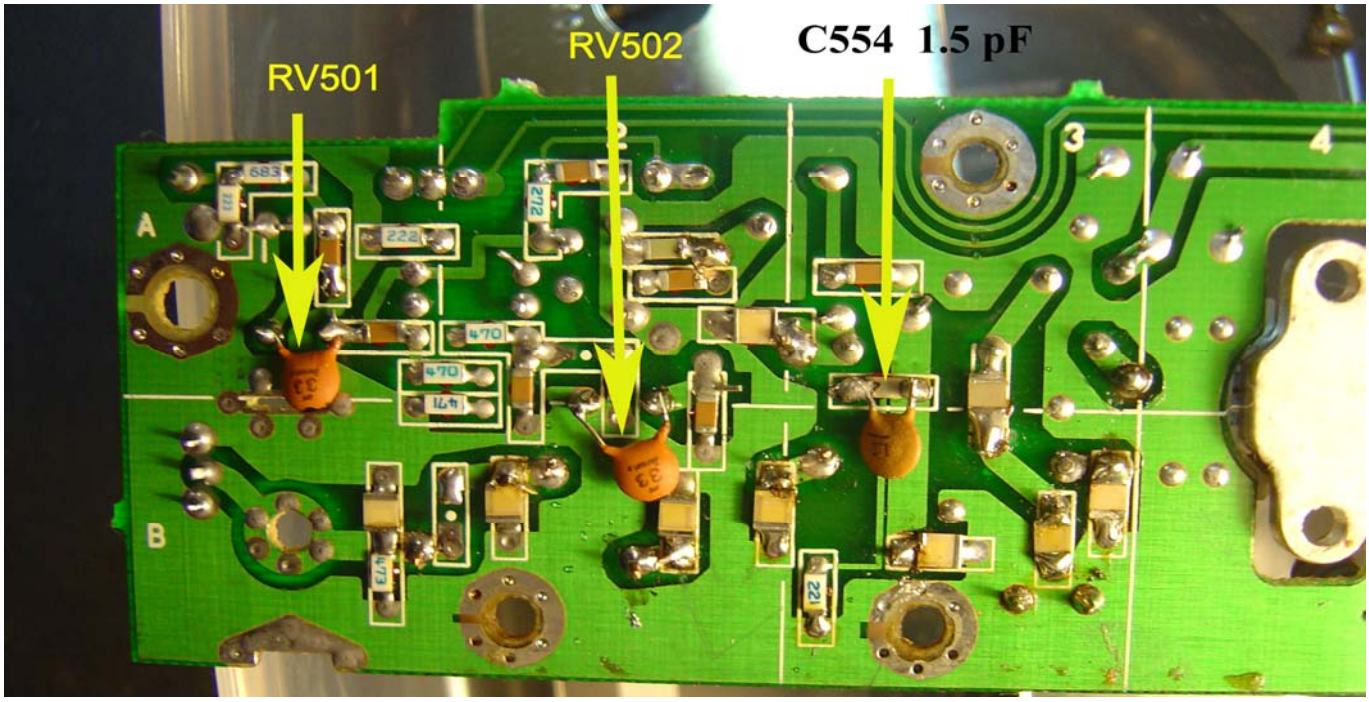
Remove **L519.** Cut back to 2.5 turns and keep coil to replace coil **L513**.

Remove **L513** and keep; replace with old cut back 2.5 turns of coil L519. [**2.5 Turns**]

Remove original **L512**; replace with original L513. [**1.5 Turns**]


J392
L519
L518
L517
L516
Q503
L513
RV502
D504
L515
L512
C2097
RV501
C524
DP
D505
R512
Q504
T8V


2
3
4
A
B
683
222
272
470
470
22



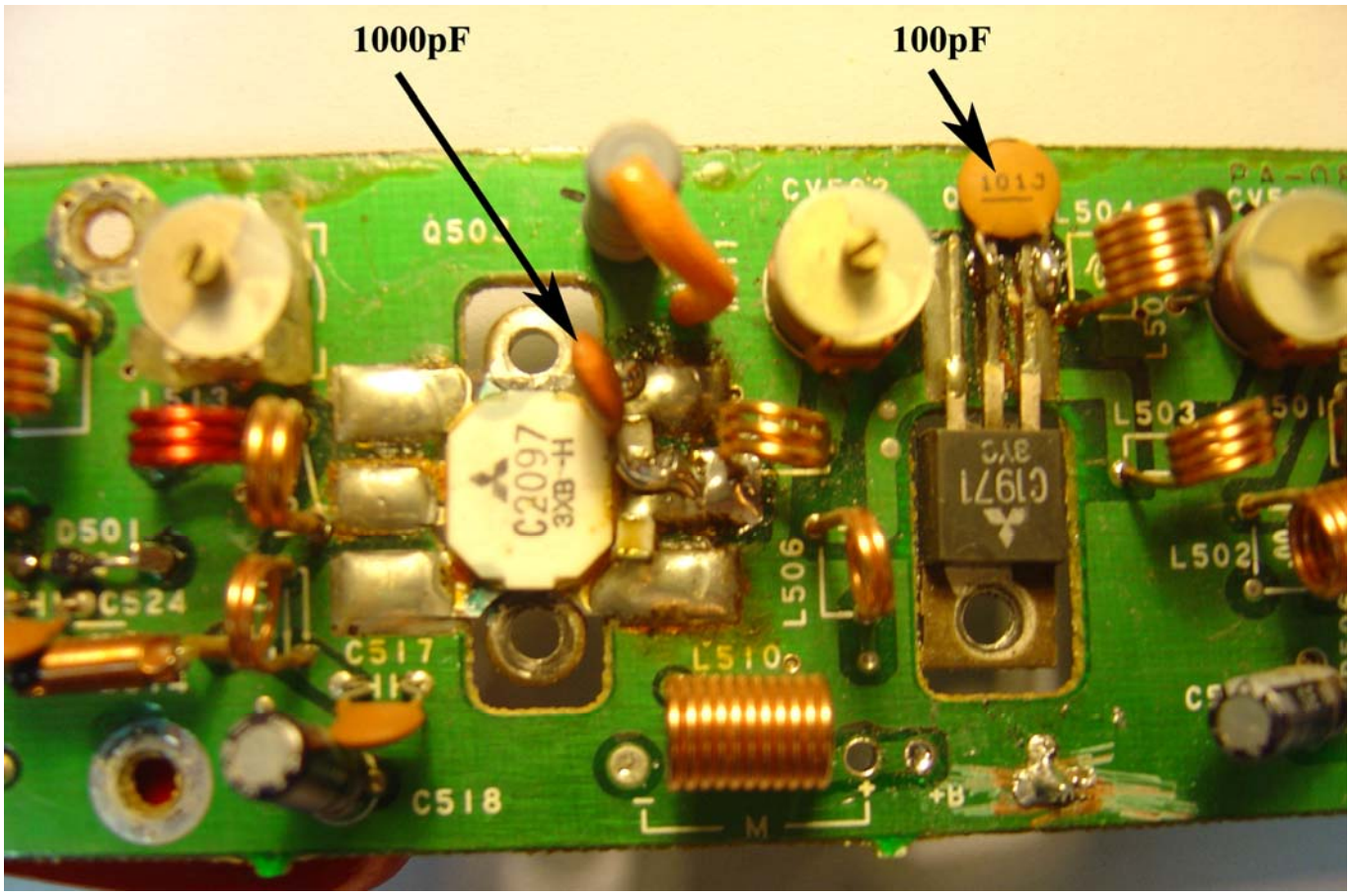
RT85 above:

Add **33pF** to bottom of **RV501** and **RV502** on the underside of the board for an **AWA RT85** As photo above.

Add **33pF** to bottom of **RV502** on the underside of the board for a Midland 70-066.

Add 1.5pF to the RF sensor circuit (C554) on the underside of the board as per the photo. On the RT85 this capacitor is already fitted.

Midland 70-066 PA Modifications:



Large Caps – Midland 70-066 above:

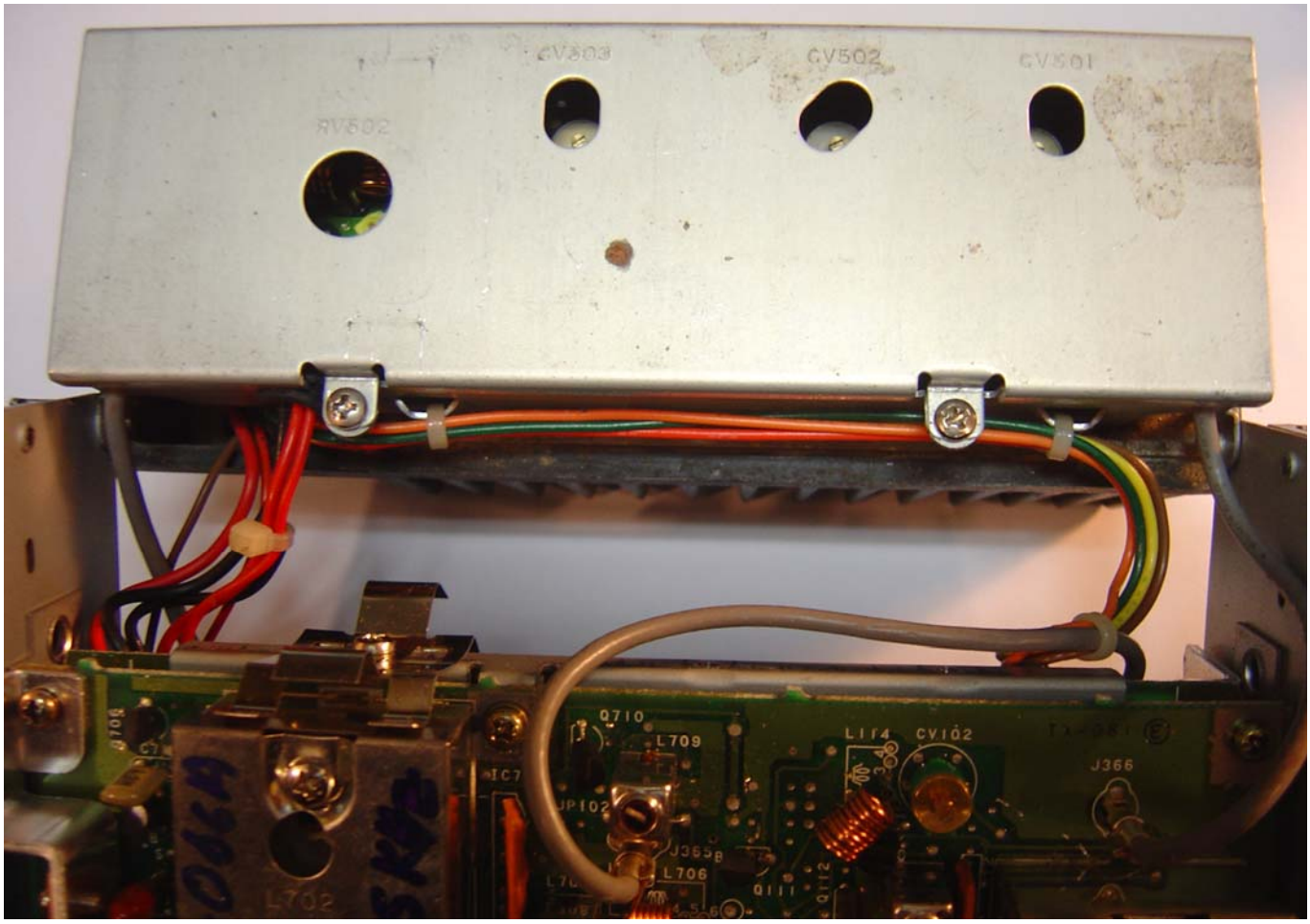
Add 100pF between B and E of Q502 on the component side of the board as per the photo.

Add 1000pF between B and E of Q503 on the component side of the board as per the photo.

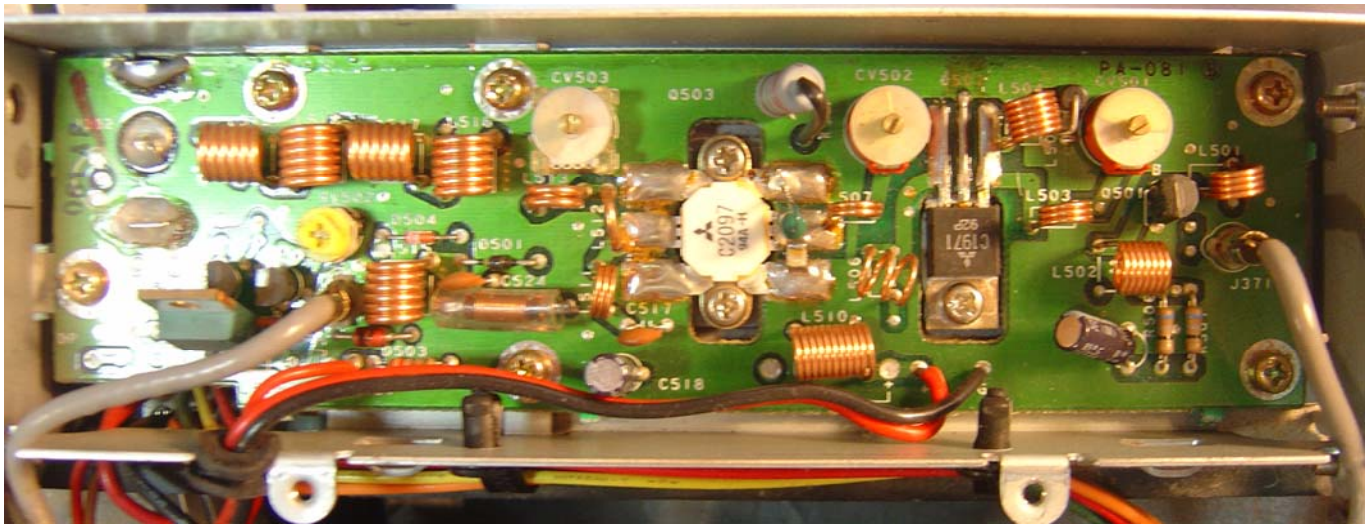
Adding the capacitors B-E on the driver and PA transistor is required to stabilize the amplifier. It is necessary to replace the coils in the LPF to get the second harmonic output of the transmitter down to an acceptable level.

Having made the modifications, reassemble the PA and apply power. Terminate the output in a good dummy load with a power meter – **not an antenna!** Set RV502 fully clockwise for maximum power out. Key the transmitter and adjust for maximum power starting from the output end and working back towards the synthesizer. Don't forget CV102 on the synthesizer board. After modification and tuning it is normally possible to get 50W out of the transmitter with no sign of instability, do not run it at this power for long – there is not enough heat sink on the PA. When you have maximum power out adjust RV502 for no more than 30 Watts out. If you wish to run 50 watts, then attach a 12 Volt fan to the rear heat sink. Allow the fan to blow across the rear fins.

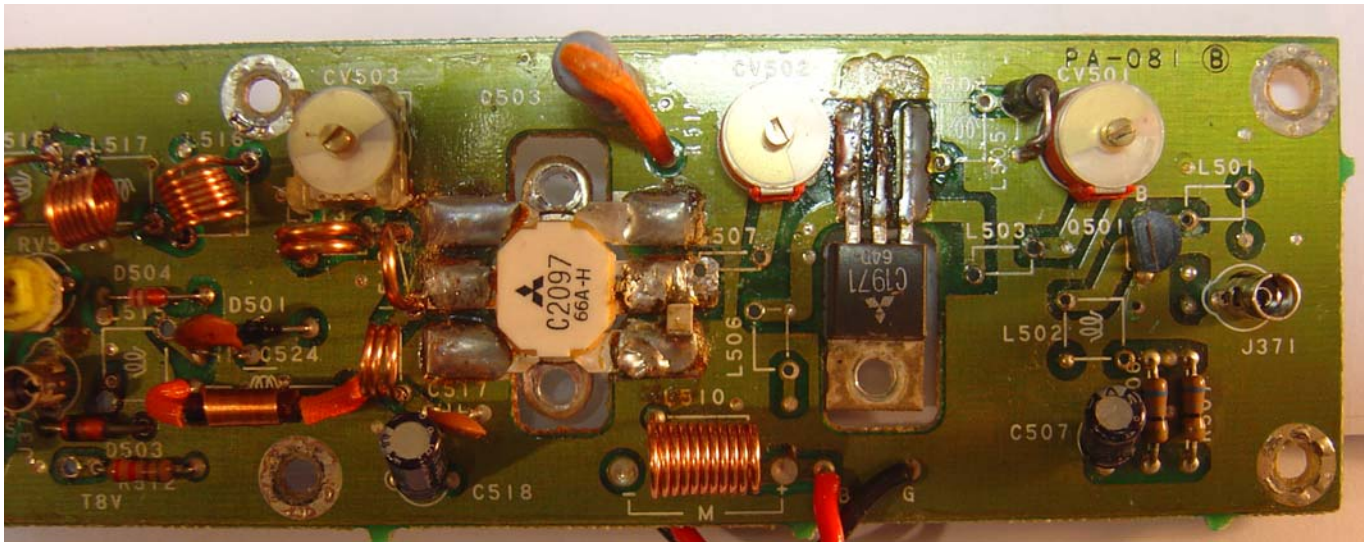
PA Modifications for Midland 70-066 Transceiver to 6 Meters:



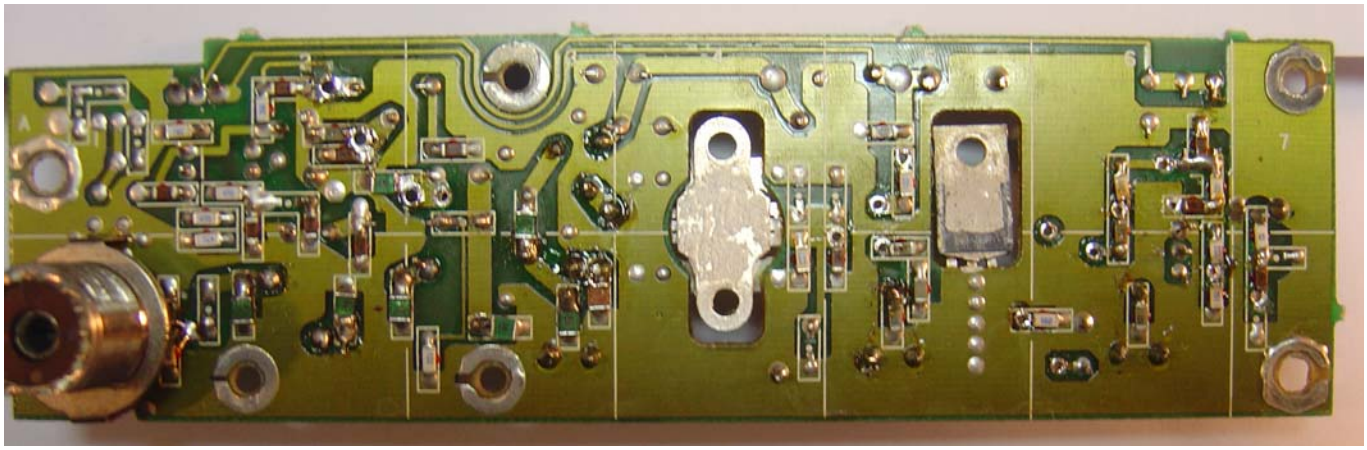
PA Swung Back. Midland 70-066A Top cover still on – Above:



PA Top View – Midland 70-066A Original Setup – Cover Removed - Above:



PA Top View – Midland 70-066A Driver Coils Removed – Above:



PA Bottom View – Midland 70-066A Coils Removed – Above:

Remove **L501** and keep; replace with original **L114** from the synthesizer board.

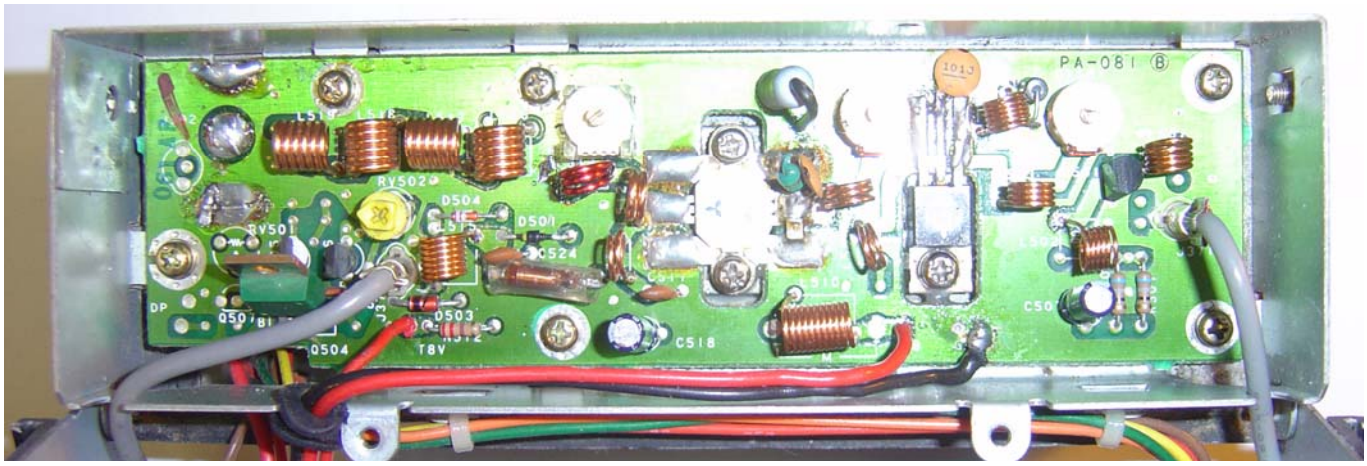
Remove **L503** and keep; replace with original **L501**.

Remove **L507**; replace with original **L503**. [do not keep coil **L507** just removed]

Remove **L519.** Cut back to 2.5 turns and keep coil to replace coil **L513**.

Remove **L513** and keep; replace with old cut back 2.5 turns of coil L519.

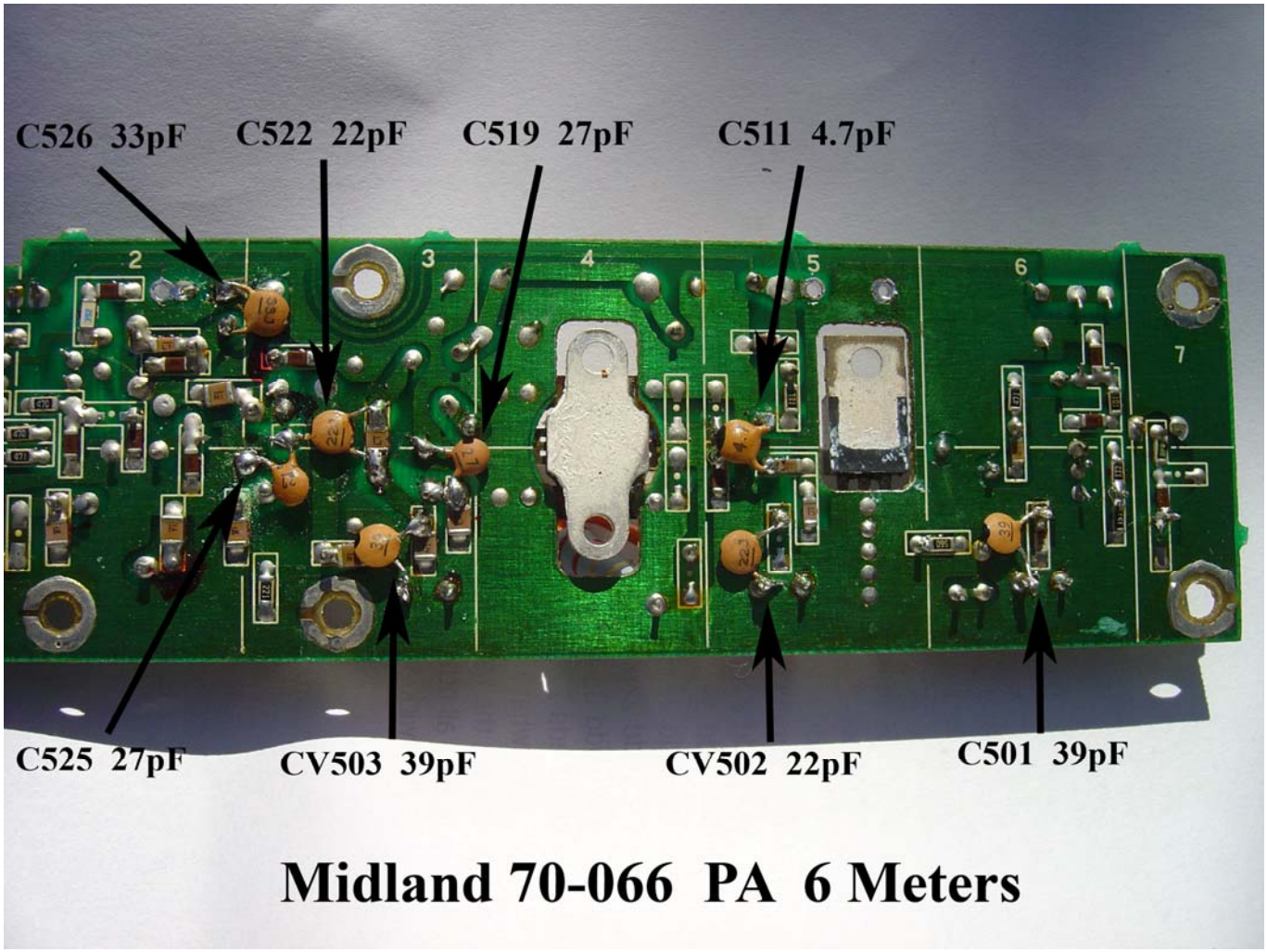
Remove original **L512**; replace with original L513.



PA Midland 70-066 New coils inserted:

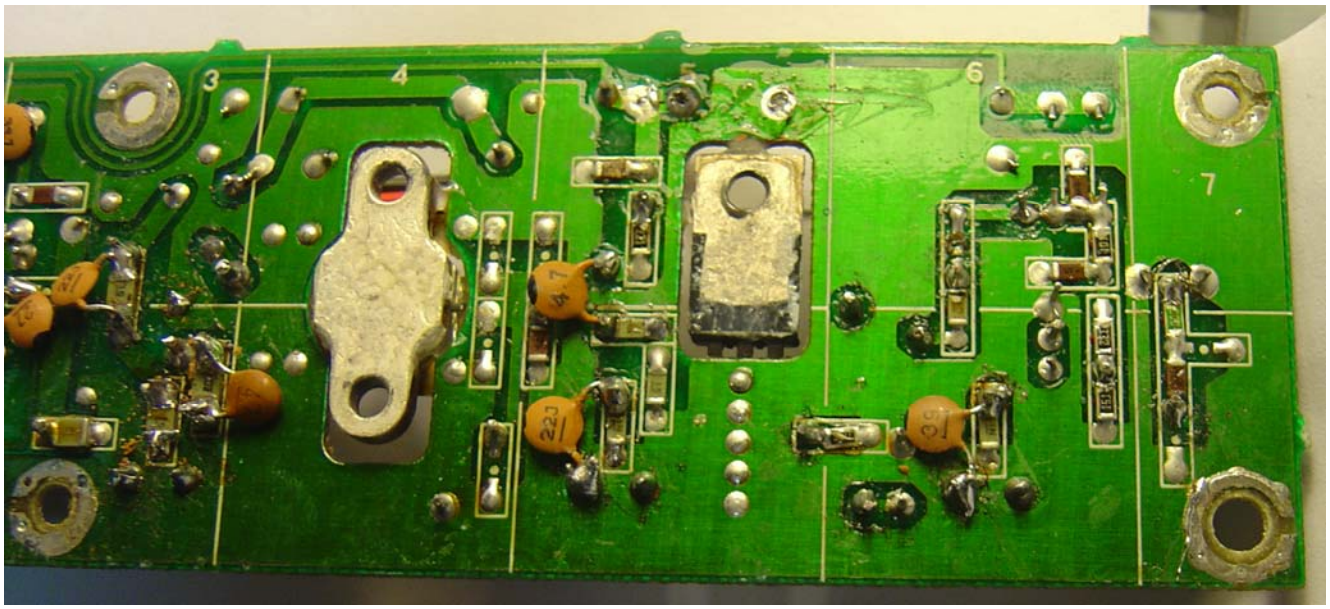
Place **4.7**pF across **C511**
Place **27** pF across **C519**
Place **22** pF across **C522**
Place **27** pF across **C525**
Place **33** pF across **C526**
Place **100** pF across base & ground of **Q502** [2S**C1971**]
Place **1000** pF across base & ground of **Q503** [2S**C2097**]

Place **39** pF across **CV501**
Place **22** pF across **CV502**
Place **39** pF across **CV503**

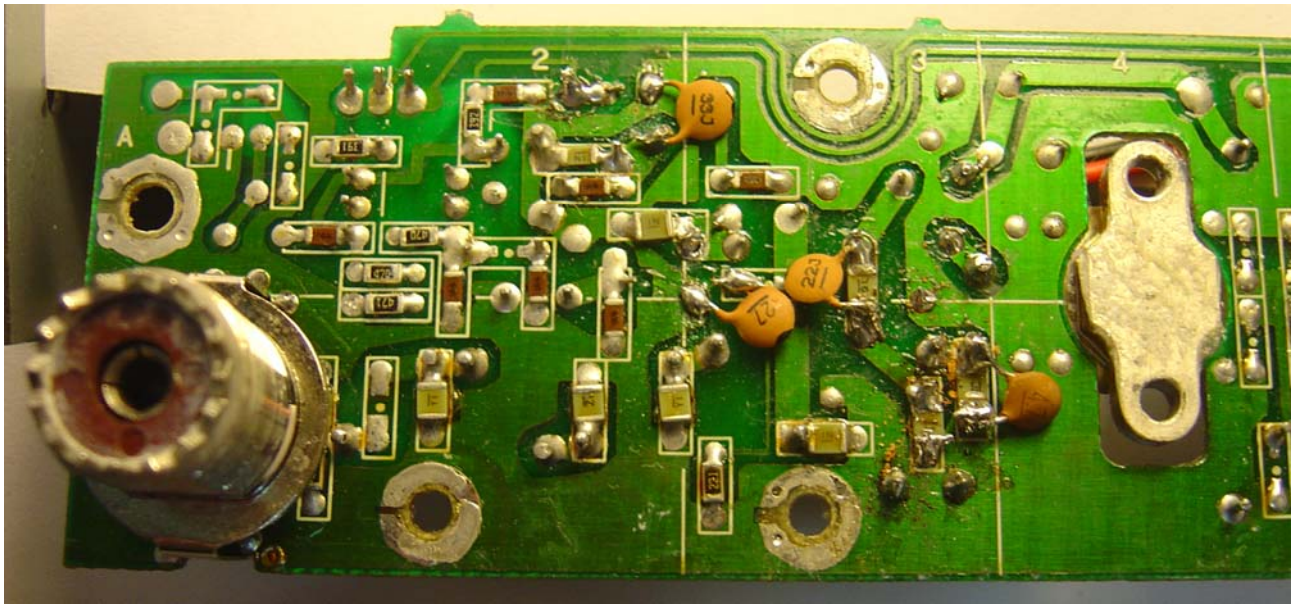


PA Bottom View – New Capacitors for Midland 70-066 - Above:

Top of C526 [33pf] - scrape green off copper layer.

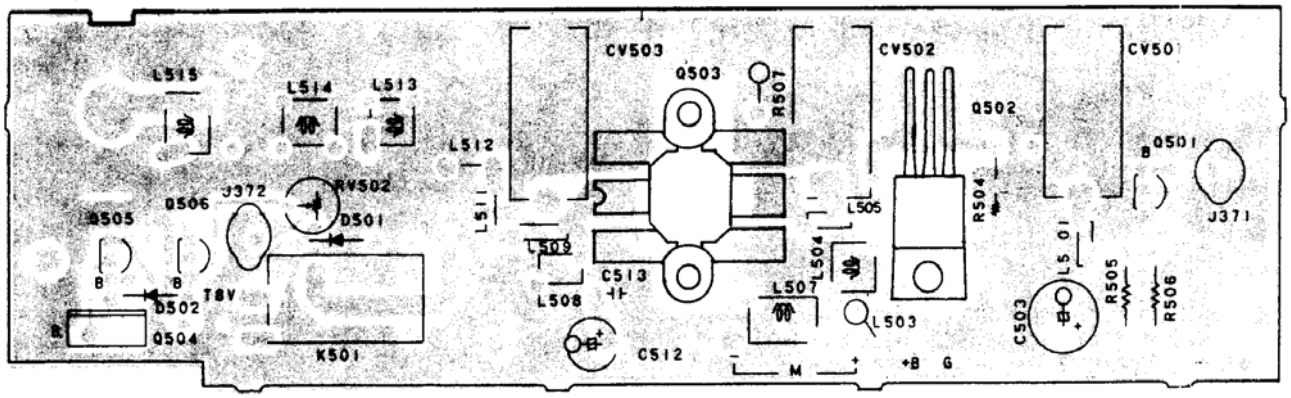


PA Bottom View – New Capacitors for Midland 70-066 - Above:

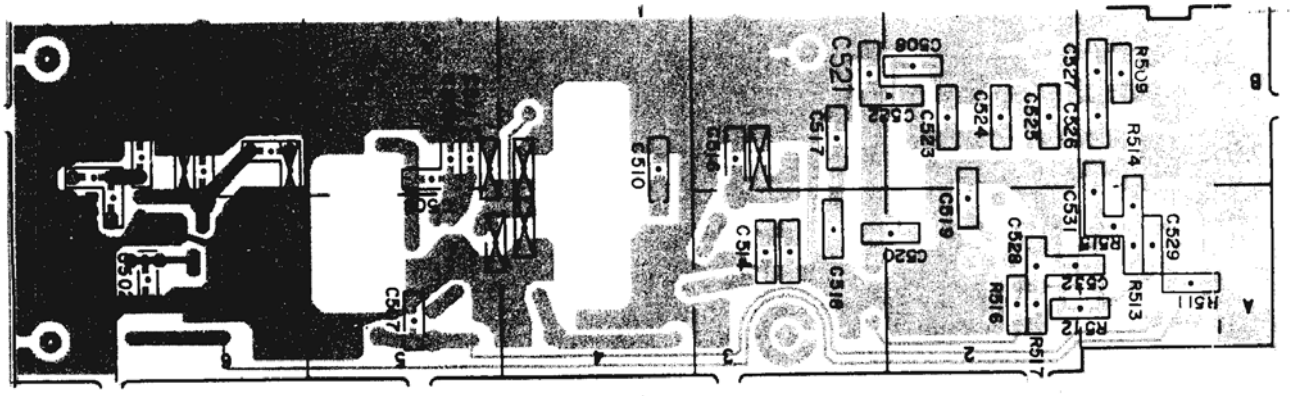


PA Bottom View – New Capacitors for Midland 70-066 - Above:

Top of C526 [33pf] - scrape green off copper layer.

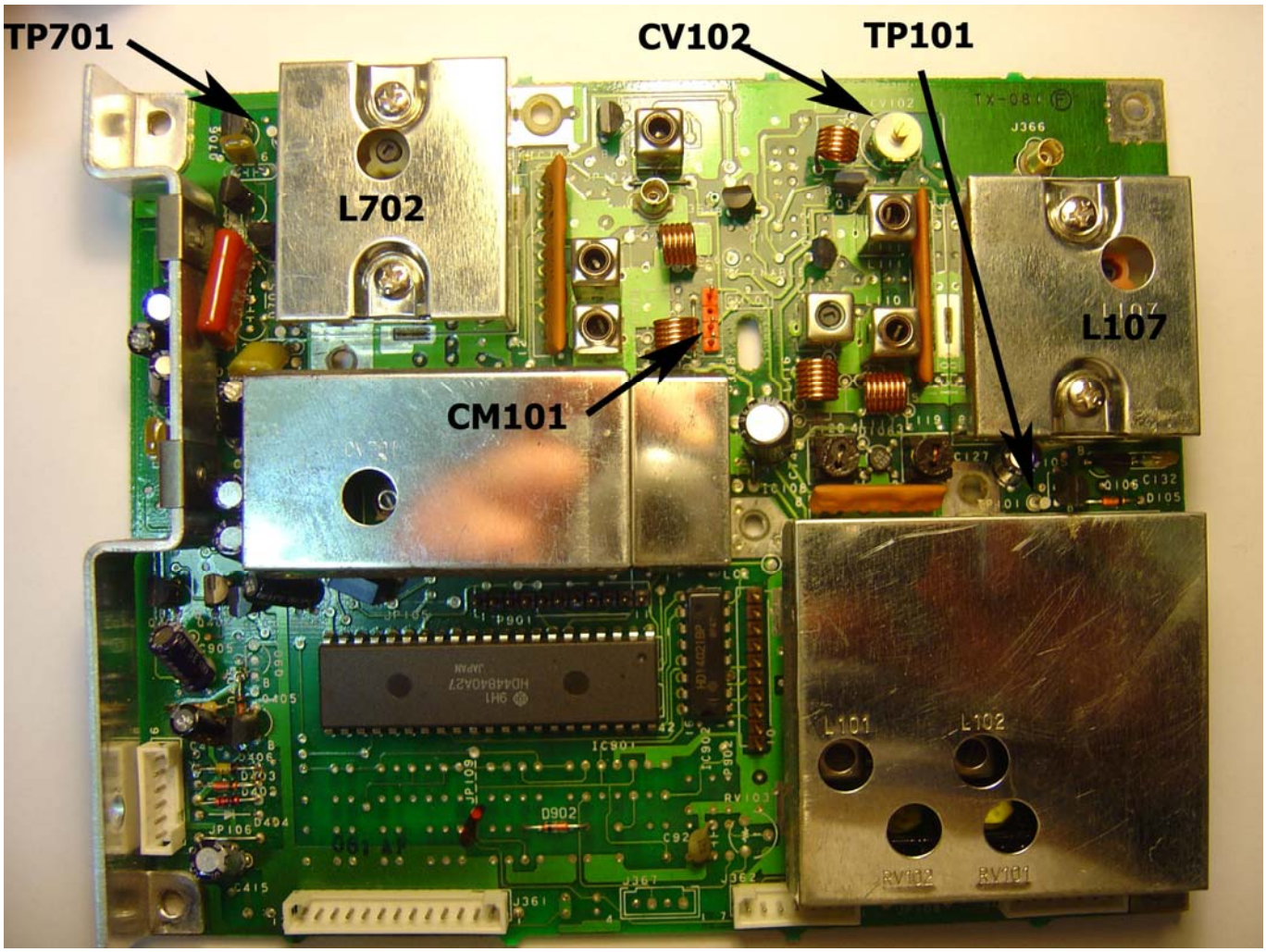


PA PC Board – Top View – Above:

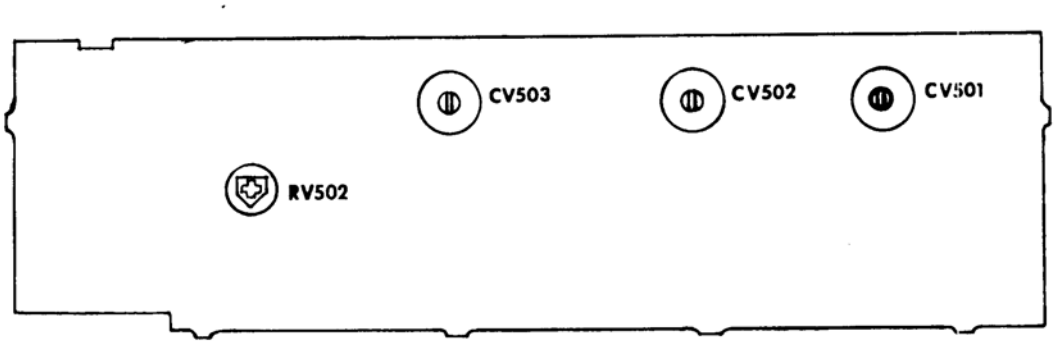


PA PC Board – Top View – Above:

TRANSMITTER ALIGNMENT



The Synthesizer Board – Above



Midland 70-066 Transmitter PA Alignment Points above:

1. Connect a lower power 50 ohm power meter to J366 [exciter output]. Go to channel 48 for center frequency. Connect a multimeter to TP101, [refer to the diagram above – The Synthesizer Board] and operate the microphone PTT button.

2. Adjust L107 [refer to the diagram above – The Synthesizer Board] such that the multimeter reading is centered on 3.5 Volts for all programmed channels.

3. Adjust CV102 for maximum output into the power meter. output should be 20mW to 40mW (for VHF). Release the PTT button.

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

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

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

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

8: Also check at the lowest & highest frequencies – channel 19 [52.500Mhz] an channel 38 [53.975Mhz].

Transmitter Audio Adjustments:

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

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

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

4. Adjust RV102 for +-3KHz deviation. If necessary, repeat steps 1 and 2 above.