

## FIELD SERVICE REPAIR AID FOR 640-ML-5145-50/75ohm RF GENERATORS

## TEST EQUIPMENT NECESSARY

- 1) RF probe (see fig. 1)



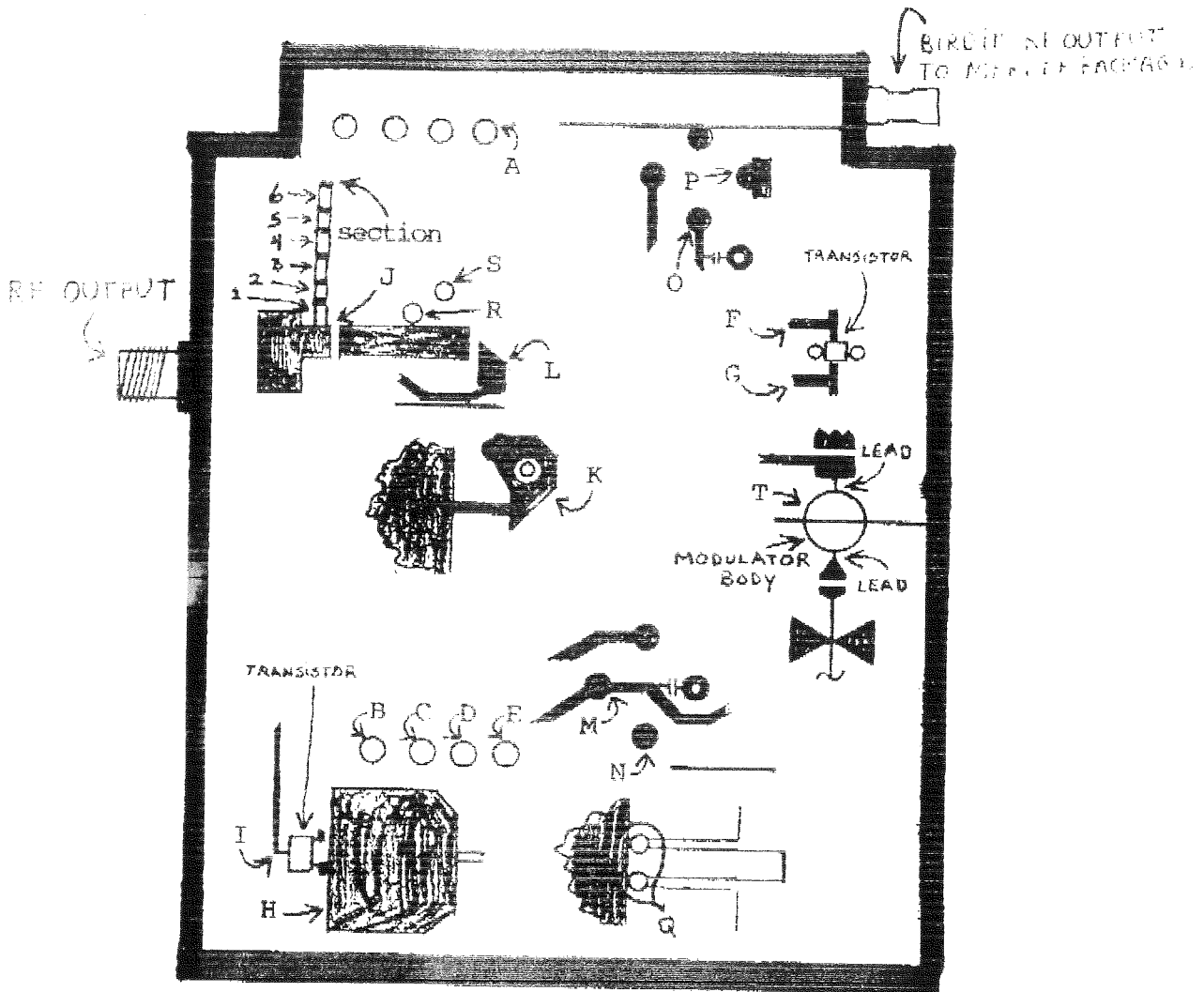
- a) Obtain a BNC female barrel adaptor and a capacitor (1pf to 100pf). Leave one lead of the capacitor about 2cm. long and cut other lead to a length of about 1cm. Insert short lead of capacitor into one end of the BNC barrel. RF probe is ready to use.
- 2) 640 mainframe and the 640G with the suspect RF generator
- 3) 640E and the appropriate detector (7N50, 7R50, 7N75, 7B75) or one of the following
  - a) A 640T50 or a 640T75 or a 640R50 or a 640R75 a 2ft. long type N or type BNC cable. (Ensure correct impedance)
- 4) 640-ML-5282 extender cable
- 5) Spectrum analyzer (frequency range of 3.5 to 5.0GHz)
- 6) DVM
- 7) Type N female to BNC male adaptor if using 7N50 or 7N75ohm detectors.

## PROCEDURE

- 1) Plug one end of 640-ML-5282 extender cable into 640 mainframe (right hand slot) and other end of extender cable onto 640G. ENSURE PROPER PIN ORIENTATION. Orient plug-in with its front panel to the left and the RF package/marker package sections facing up. Remove lid (12 screws) of ML-5145 RF section. Install 640 log plug-in in mainframes center or left hand slot and perform voltage checks as follows. (see fig. 2 for location of measurement points)
- 2) Set 640G front panel to:
  - a) RF out attenuator to +10, vernier full CW
  - b) SWEEP RATE to MANUAL, vernier full CCW
  - c) Trigger to AUTO
  - d) SWEEP WIDTH to CW
- 3) Turn 640 on and with DVM ground lead to the RF box body check for: (go to page 2)

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FIGURE 2



POINT	VOLTAGE
F	-15
G	+24 +/- .5
C	+15 (if 0volts replace shorted diode (P/N 10-1N4745) on under side of RF box)
D	1Mhz LO VTO voltage located on side of RF box 22,88
E	1Mhz HI VTO voltage located on side of RF box 6,82

(turn 640G SWEEP RATE vernier full CW)

D	1500Mhz LO VTO voltage located on side of RF box 6,59
E	1500Mhz HI VTO voltage located on side of RF box 28,13
F	approximately +.65 volts +/- .2 volts
G	approximately +6.5 to 9.5 volts (if wrong voltage replace transistor (P/N 20-1))
H	approximately +.80 to +1.2 volts
I	approximately +7 to 10.5 volts (if wrong voltage replace transistor (P/N 20-2))

## COMMON PROBLEMS OF THE 640 RF BOX

1) No power level control (RF out power vernier has no effect on display)

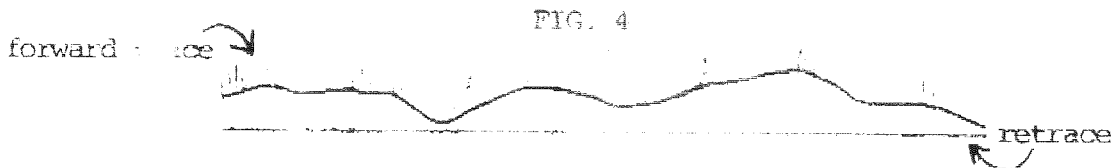
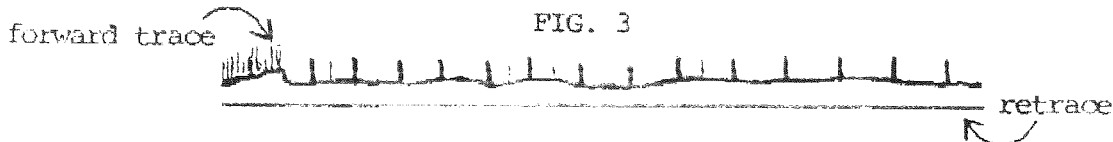
a) Connect 640G RF out to the log plug-in and set log plug-in front panel to:

- 1) dB/DIV set to 10
- 2) OFFSET control set to 10.0
- 3) SMOOTHING off
- 4) +/- switch set to + position
- 5) dB/dBm switch set to dBm

b) Set 640G front panel to:

- 1) SWEEP RATE switch set to FAST
- 2) SWEEP WIDTH switch set to FULL
- 3) MARKER SPACING set to 100

c) If the display looks similar to Fig. 3 or Fig. 4

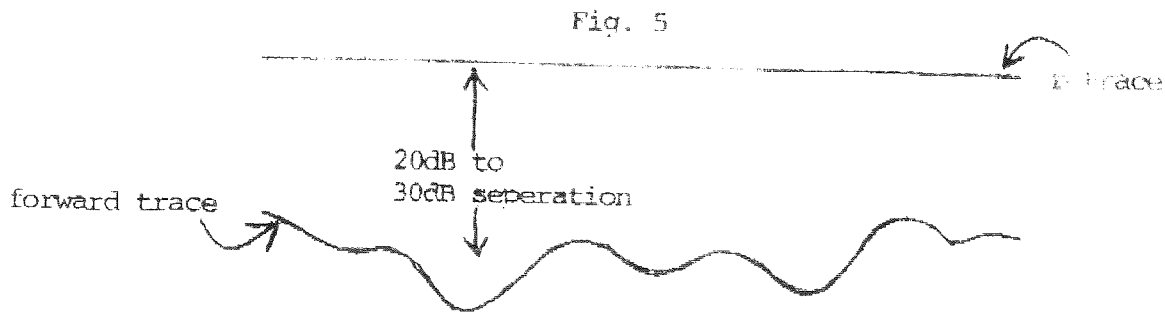


then the problem is in the level detector circuit, (see Fig. 2) section J and is most likely a cracked chip resistor or capacitor or a faulty solder joint between two adjacent chips.

Using a wooden toothpick, Q-tip or a similar non-conducting device press at solder connections along the line of chips and observe display on 640 CRT. At some point the display will probably return to normal. While applying pressure at the suspect joint exercise the 640G RF power vernier and observe normal operation. Inspect section J (page 2 Fig. 2) carefully for faulty solder joints or cracked chips and replace or resolder the appropriate chip(s). (see page 9 for part number)

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- 2) Very low and unlevelled power and little or no power level control.
  - a) Set the 640G and log plug-in front panel controls the same as in step 1a and 1b (page 3)
  - b) If display looks similar to Fig. 5



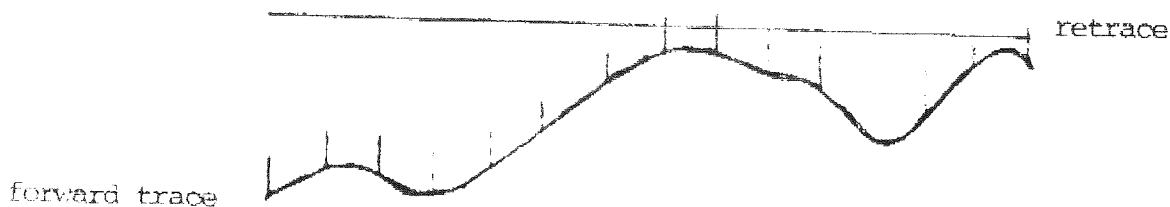
then problem is most likely to be the main power amplifier or possibly the LO or HI VTO.

- 3) Disconnect external detector or cable from 640G RF output port and install RF probe at input to external detector or cable leading to log plug-in. Touch probe to point K (see Fig. 2, page 2) and observe a display similar to Fig. 5. Touch probe to point L (see Fig. 2) and if main amplifier is OK you will observe approximately 20 to 30dB of gain (especially at higher frequencies) similar in appearance to Fig. 6 or Fig. 7.

Fig. 6



Fig. 7



- 4) If the amplifier is faulty, then at point L you will see a display similar to Fig. 5 with little or no gain. If this is the case then replace main amplifier. (see page \_\_\_ for P/N).
- 5) If the display at point L looks similar to Fig. 6 or Fig. 7 then the amplifier is OK and the problem is with the LO VTO or the HI VTO and here it is usually the HI VTO that is bad. Do not replace the main amplifier until you have

checked out the VTO's.

6) Obtain a spectrum analyzer and set controls as follows:

- a) BANDWIDTH set to 300Khz
- b) SCANWIDTH set to 200Mhz/DIV
- c) MAX INPUT LEVEL set to 100mW
- d) INPUT ATTENUATION set to 30dB
- e) SCAN TIME set to about 5mSec/DIV

Attach the RF probe to an appropriate cable and have other end of cable going to the (RF) INPUT of the analyzer. Set 640G front panel controls as follows:

- a) SWEEP WIDTH set to CW
- b) SWEEP RATE switch set to MANUAL, vernier set full CCW

Have spectrum analyzer set to cover 4.2 to 3.5Ghz frequency range and touch RF probe to point P (see Fig. 2, page 2) and locate and identify the fundamental signal at approximately 4.2Ghz. With analyzer controls set as described in paragraph 6, steps a through e, turn 640G MANUAL vernier slowly CW and observe fundamental signal tracking DOWN in frequency to approximately 3.5Ghz. The observed fundamental signal should remain at about the same level from 4.2 to 3.5Ghz and look something like Fig. 8. (see page 6)

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Fig. 8

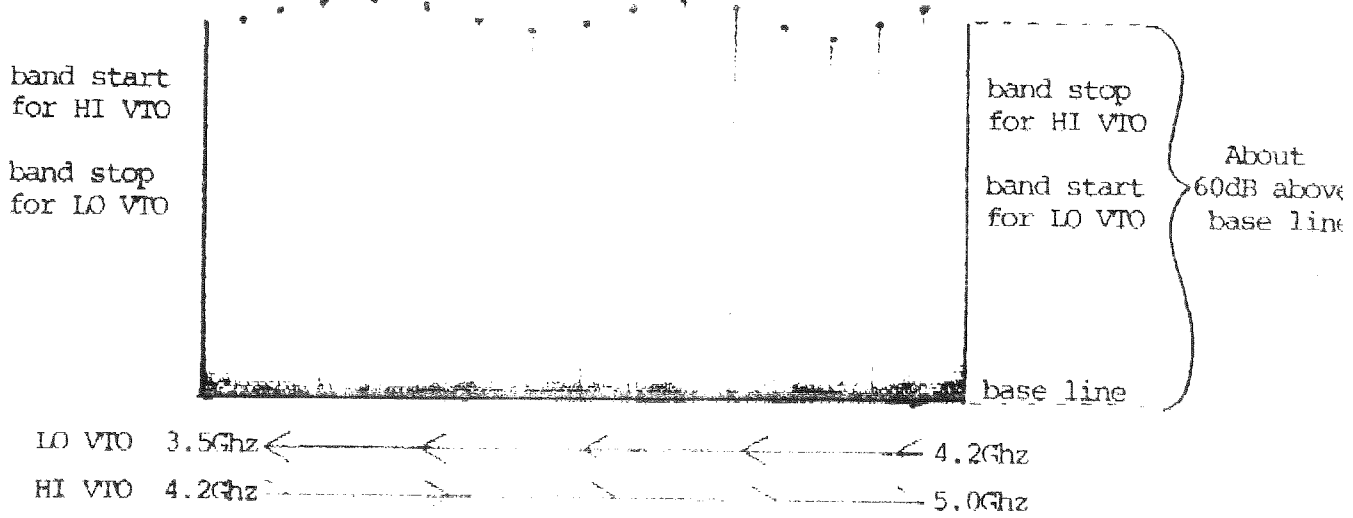
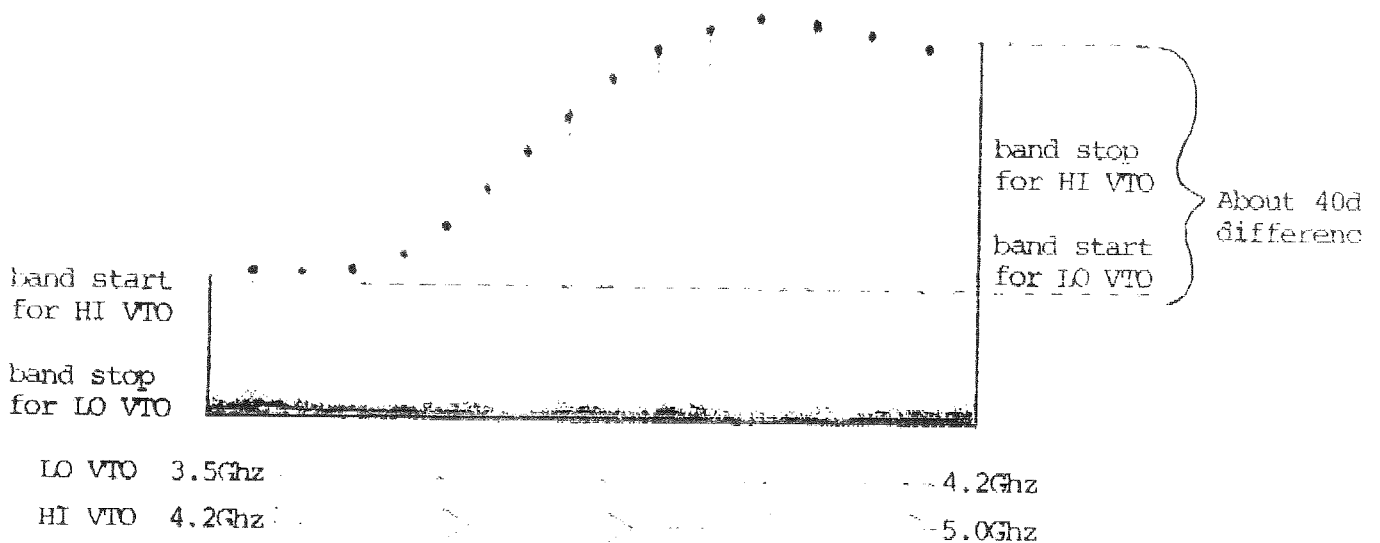


Fig. 9



Fig. 10



If observed fundamental signal is very low or is much lower at one end of band than at the other end, as in Fig. 9 or Fig. 10 (see page 6), then the LO VTO is bad and needs to be replaced. (see page 9 for P/N).

- 7) Set spectrum analyzer to cover 4.2 to 5.0GHz frequency range, turn 640G SWEEP RATE vernier full CCW and touch the RF probe to point N (see Fig. 2, page 2) and locate and identify fundamental signal at approximately 4.2GHz. With analyzer controls set as described in paragraph 6, steps a through e, turn the 640G MANUAL vernier slowly CW and observe fundamental signal tracking up in frequency to approximately 5.0GHz. Fundamental signal should remain at about the same level from 4.2 to 5.0GHz and look similar to Fig. 8. If observed fundamental signal is very low or is much lower at one end of the band than at the other end, as in Fig. 9 or Fig. 10, then the HI VTO is bad and needs to be replaced. (see page 9 for P/N).

NOTE: WHENEVER A VTO HAS BEEN REPLACED IT WILL BE NECESSARY TO RETUNE THAT VTO'S START-STOP VOLTAGES!!! (see paragraph 8 for procedure)

- 8) On the 640G front panel set SWEEP WIDTH to FULL and the SWEEP RATE switch to MANUAL. On the 640G PCB remove jumper J1 (it is not necessary to turn off power) located directly above R135 and below Q21. Connect DVM positive lead to TP 17 (common lead to TP 2), ensure SWEEP RATE vernier is turned fully CW and adjust R130 for 10V +/- 10mV. Remove DVM leads.
- 9) Obtain spectrum analyzer and set controls as in paragraph 6, steps a through e. (see page 5) Connect the RF probe to the analyzer via a suitable cable and while holding the probe close to but not touching point Q (Fig. 2, page 2) turn the 640G SWEEP RATE vernier fully CCW and locate and identify signal at approximately 4.2GHz on the spectrum analyzer. Reduce analyzer SCANWIDTH to 50MHz per division and on 640G tune R162 if a HI VTO has been replaced, R172 if a LO VTO has been replaced, to set fundamental signal to 4.2GHz. Turn 640G SWEEP RATE vernier fully CW and locate and identify fundamental signal at approximately 5.0GHz. Tune R157 if the HI VTO has been replaced to set the signal at 5.0GHz. If the LO VTO has been replaced locate and identify the fundamental signal at approximately 3.5GHz. Tune R167 to set the signal at 3.5GHz.
- 10) Re-connect jumper J1 on 640G PCB and proceed with the linearizer adjustments instructions, paragraph 4-3.8 in the 640 operations manual.

PERSONAL NOTES:

## SOME QUICK DC CHECKS OF DIODES AND THE MODULATOR

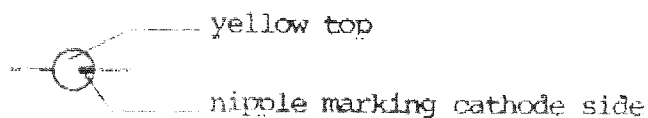
1) Turn 640 off and remove the lid of the RF package ML-5145

2) Use a DVM set to:

a) FUNCTION set to K ohm

b) RANGE set to 2K ohm

There are four (4) diodes located on the top of the ML-5145 PCB (see Fig. 2, page 2) points Q (two diodes) and one diode each at points R and S. They are round and yellow on top and have a small nipple along one edge to mark the cathode side of the diode. Lift one side of each diode and with DVM common to the diode cathode and the positive lead of the DVM to the other side of the diode all four diodes should read 400 ohms +/- 40 ohms. Reverse the DVM leads and the diodes should read greater than 20Meg ohms. If any diodes are reading otherwise, replace them. (see page 9 for P/N) Diodes look like this.



4) Place the DVM common lead to the modulator body (see Fig. 2, page 2) and the positive lead of the DVM to either lead of the modulator. DVM should read about 680 ohms +/-50 ohms. If not replace the modulator. (see page 9 for P/N)

PERSONAL NOTES:



## 640-ML-5145 RF SECTION PARTS LIST

1) Chip resistors and capacitors in section J (see Fig. 2, page 2)

ITEM	DEFINITION	WILTRON PART NO.	DESCRIPTION	PRICES	
1	Chip capacitor	228-10	.01uF	\$1.21	1.21
2	Chip resistor	122-47	47ohm	\$3.74	3.28
3 and 4	Chip resistors	122-180 (if 50 ohm RF box)	180ohm	\$3.80	4.30
3 and 4	Chip resistors	122-220 (if 75 ohm RF box)	220ohm	\$4.60	2.30
5	Chip resistor	122-56	56ohm	\$2.84	4.10
6	Chip capacitor	228-39	.0047uF	\$1.34	1.34

2) Main Amplifier-----	part no. 60-1	\$351.00	
3) LO VTO-----	part no. 60-2	\$161.00	
4) HI VTO-----	part no. 60-3	\$183.50	
5) Mixer diodes (point O)---	part no. 10-2	\$3.50	3.50
6) Level circuit diodes (points R and S)---	part no. 10-2	\$3.50	
7) Modulator part no.-----	part no. 1020-29	\$73.00	

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