

TD-3 MICROWAVE RADIO
J68386A AND J68386B TRANSMITTER-RECEIVER BAYS
IF RETURN LOSS MEASUREMENTS
USING PORTABLE TEST EQUIPMENT

This section is issued to make various corrections to Section 411-402-901 LL, Issue A, and replaces it in its entirety. This section describes the procedures for measuring the return loss of the various IF units in the receiver portion of the radio bay.

The preliminary checks in Section 411-402-500 must be completed before performing the tests in this section.

The recommended maintenance interval for these tests is given in the Equipment Test List.

This issue does not affect the Equipment Test List.

Caution: These tests are performed on an out-of-service basis. Obtain a release from the designated control office and remove the channel from service as directed by local practice.

CHART	PAGE
1—IF Main Amplifier	2
2—AGC Amplifier	3
3—Receiver Modulator and IF Preamplifier	4
4—IF Networks	4
5—IF Limiter	6
6—IF Carrier Resupply	6
7—IF Driver Amplifier and Transmitter Modulator	7

CHART 1
IF MAIN AMPLIFIER

APPARATUS:

1—Set of portable test equipment per BTL Drawing L-802190

STEP	PROCEDURE
	<p>IF INPUT</p> <p>1 On the receiver control panel, press the AGC switch to light the pushbutton indicating MANUAL. Open the IF door by loosening the captive fastener located above the AGC unit.</p> <p>2 On the receiver panel, press the AGC REF pushbutton and adjust the MANUAL GAIN control for a meter indication of 60.</p> <p>3 Prepare the test sets in accordance with Figure 1.</p> <p>4 At the IF main amplifier, remove the cables from the IF OUT and MON OUT jacks and insert 368A plugs. Disconnect the cable between the IF IN jack and filter FL7 (repeater station) or FL8 (main station) at the filter end.</p> <p>5 Measure the return loss through the cable connected to the IF IN jack using a P49Q681 back-to-back adapter.</p> <p>Requirement: 34 dB minimum over the 60- to 80-MHz band</p> <p>If the requirement is not met, adjust the IN RL1 and IN RL2 controls on the IF main amplifier. If the requirement still is not met, measure the return loss at the IF IN jack.</p> <p>If the requirement is now met, replace the interconnecting cable. If the requirement still is not met, replace the IF main amplifier and repeat Steps 2 through 5.</p> <p>IF OUTPUT</p> <p>6 Terminate the IF IN and MON jacks and measure the return loss at the IF OUT jack.</p> <p>Requirement: 32 dB minimum over the 60- to 80-MHz band</p> <p>Note: The return loss bridge can be connected directly to the IF OUT jack by partially closing the swinging panel.</p> <p>If the requirement is not met, adjust the OUT RL control on the IF main amplifier. If the requirement still is not met, replace the IF main amplifier and repeat Steps 2 through 6.</p>

CHART 1 (Cont)	
STEP	PROCEDURE
7	<p>IF MONITOR</p> <p>Terminate the IF IN and IF OUT jacks and measure the return loss at the MON jack.</p> <p>Requirement: 29 dB minimum over the 60- to 80-MHz band</p> <p>Note: The return loss bridge can be connected directly to the IF MON jack by partially closing the swinging panel.</p> <p>If the requirement is not met, adjust the MON RL control. If the requirement is still not met, replace the IF main amplifier and repeat this chart.</p>
8	Remove the 368A plugs and restore the cable connections to the IF main amplifier.
<p>CHART 2</p> <p>AGC AMPLIFIER</p>	
<p>APPARATUS:</p> <p>1—Set of portable test equipment per BTL Drawing L-802190</p>	
STEP	PROCEDURE
1	<p>IF INPUT</p> <p>Prepare the test sets in accordance with Figure 1.</p>
2	Disconnect the cable between the AGC amplifier IF IN jack and the IF main amplifier MON jack at the MON jack end.
3	<p>Measure the return loss at the input to the cable using a P-49Q681 back-to-back adapter.</p> <p>Requirement: 29 dB minimum over the 60- to 80-MHz band</p> <p>If this requirement is not met, adjust the IN RL1 and IN RL2 controls on the AGC amplifier. If the requirement still is not met, measure the return loss with the return loss bridge connected directly to the IF IN jack. If the requirement is now met, replace the interconnecting cable. If the requirement still is not met, replace the AGC amplifier and repeat Step 3.</p>
4	Restore the normal connections to the IF IN jack.

CHART 3

RECEIVER MODULATOR AND IF PREAMPLIFIER

APPARATUS:

1—Set of portable test equipment per BTL Drawing L-802190

STEP	PROCEDURE
	<p>IF OUTPUT</p> <p>1 Prepare the test sets in accordance with Figure 1.</p> <p>2 Remove the 1322-type filter FL1 between channel dropping Network Z1 and 8A Isolator A1 ahead of the receiver modulator and IF preamplifier unit. Attach a 24A transducer (supplied with the test set) to Isolator A1. Place a shorting plate on the drop arm of the channel dropping network.</p> <p>3 Remove the cable from the IF OUT jack on the IF PREAMP.</p> <p>4 Measure the return loss at the IF OUT jack (Fig. 1).</p> <p>Requirement 1: 34 dB minimum over the 60- to 80-MHz band for the J68387P modulator</p> <p>If the requirement is not met, adjust the RL control. If the requirement still is not met, replace the defective unit in accordance with Section 411-402-503 and return the defective unit to the maintenance center.</p> <p>Requirement 2: 29 dB minimum over the 60- to 80-MHz band for the J68387C receiver modulator</p> <p>If the requirement is not met, replace the defective unit in accordance with Section 411-402-504 and return the defective unit to the maintenance center.</p> <p>5 Reconnect the cable to the IF OUT jack on the IF PREAMP unit.</p>

CHART 4

IF NETWORKS

APPARATUS:

1—Set of portable test equipment per BTL Drawing L-802190

CHART 4 (Cont)

STEP	PROCEDURE
1	Prepare the test sets in accordance with Figure 1.
2	Connect the return loss bridge to the appropriate port of the network to be tested through the coaxial cable normally connected to the network.
3	Terminate the other port of the network with a 368A plug.
4	Measure the return loss and check for conformance with the requirements listed in Table A. If any of the requirements are not met, measure the return loss directly at the port in question. It may be necessary to remove the network for access. If the requirement still is not met, replace the network.
5	Restore all connections to normal.

TABLE A
IF NETWORK - RETURN LOSS REQUIREMENTS

Network	Frequency	Minimum Requirement - dB	
		Input	Output
747A Filter	Between 64 and 76 MHz Between 60 and 80 MHz	27 24	27 24
745A Filter	Between 64 and 76 MHz Between 62 and 78 MHz Between 61 and 79 MHz	26 24 17	25 24 17
793A or 794A Equalizer	Between 62 and 78 MHz Between 60 and 80 MHz	25 22	25 22
919A	Between 62 and 78 MHz Between 60 and 80 MHz	30 27	30 27
918B	Between 62 and 78 MHz Between 60 and 80 MHz	30 27	30 27
918C	Between 60 and 80 MHz	30	30
919A	Between 62 and 78 MHz Between 60 and 80 MHz	30 27	30 27
919B	Between 62 and 78 MHz Between 60 and 80 MHz	30 27	30 27
920A	Between 62 and 78 MHz Between 60 and 80 MHz	30 27	30 27

CHART 5
IF LIMITER

APPARATUS:

1—Set of portable test equipment per BTL Drawing L-802190

STEP	PROCEDURE
1	Prepare for the return loss test in accordance with Figure 1.
2	Remove the cable from the IF IN jack of the IF limiter and connect a 63A (20 dB) pad to the cable using the 190A adapter. Remove the cables from the IF OUT and MON OUT jacks and terminate the jacks with 368A plugs.
3	<p>Measure the return loss at the IF IN jack of the IF limiter.</p> <p>Requirement: 34 dB minimum between 60 and 80 MHz</p> <p>If the requirement is not met, adjust the IN RL1 and IN RL2 controls for the best return loss. If the requirement still is not met, replace the IF limiter with a spare and repeat Steps 2 and 3.</p>
4	<p>Measure the return loss at the IF OUT jack with terminations on the IF IN and MON OUT jacks.</p> <p>Requirement: 29 dB minimum between 60 and 80 MHz</p> <p>If the requirement is not met, adjust the OUT RL1 and OUT RL2 controls for the best return loss. If the requirement still is not met, replace the IF limiter with a spare and repeat Steps 2 through 4.</p>
5	Restore the normal connections to the IF IN, IF OUT, and MON OUT jacks on the IF limiter.

CHART 6
IF CARRIER RESUPPLY

APPARATUS:

1—Set of portable test equipment per BTL Drawing L-802190

CHART 6 (Cont)

STEP	PROCEDURE
1	Prepare for the return loss test in accordance with Figure 1.
2	Remove the normal connection from the IF OUT jack and insert a 368A plug. Connect option (V) in Figure 1.
3	<p>Measure the return loss at the input of the cable connected to the carrier resupply IF IN jack. (Use the P-49Q681 adapter.)</p> <p>Requirement: 34 dB minimum between 60 and 80 MHz</p> <p>If the requirement is not met, check the return loss at the IF IN jack. If the requirement is now met, replace the connecting cable with a new cable.</p> <p>If the requirement still is not met, remove the IF carrier resupply from the bay and remove the cover on the side nearest the IF jacks. Connect the test set to measure the return loss at the end of the cable which is normally connected to the IF IN jack. Apply power to the IF carrier resupply. Adjust capacitor C42 for the best return loss when the cover is in place.</p> <p>If the requirement still is not met, replace the carrier resupply with a spare unit and repeat Steps 2 and 3.</p>
4	<p>Measure the return loss at the IF OUT jack with the IF IN jack terminated.</p> <p>Requirement: 34 dB minimum between 60 and 80 MHz</p> <p>If the requirement is not met, replace the carrier resupply unit and repeat Steps 1 through 4.</p>
5	Restore the normal connection between the IF IN jack on the carrier resupply and the IF OUT jack on the IF limiter. Remove the option (V) connection from the test set and IF limiter.

CHART 7

IF DRIVER AMPLIFIER AND TRANSMITTER MODULATOR

APPARATUS:

1—Set of portable test equipment per BTL Drawing L-802190

CHART 7 (Cont)	
STEP	PROCEDURE
1	Prepare for the return loss test in accordance with Figure 1.
2	<p>Measure the return loss at the input to the cable normally connected to the IF driver amplifier IF IN jack. (Use the P-49Q681 adapter.)</p> <p>Requirement: 34 dB minimum between 60 and 80 MHz</p> <p>If the requirement is not met, adjust RL1 and RL2 for the best return loss. If the requirement still is not met, check the return loss at the IF IN jack. If the requirement is now met, replace the connecting cable with a new one. If the requirement still is not met, replace the IF driver amplifier with a spare (see Section 411-405-503) and repeat Step 1.</p>
3	Restore the normal connections between the IF IN jack on the IF driver amplifier and the IF OUT jack on the carrier resupply.

PREPARATION FOR TEST

1. OPERATE THE CONTROLS ON THE TEST SETS AS FOLLOWS

OSCILLATOR

INSERT IF PLUG-IN 5007-1 AND ATTACH PROPER SCALE

F1 START	60MC
F2 STOP	80MC
MARKER 1	64MC
MARKER 3	76MC
MARKER 2FC	70MC
VERNIER	MAX CCW
RF LEVEL	MIDSCALE
1KHZ-OFF	OFF
LEVELER	LEVELER OR INT (NOTE 4)
RETRACE	RETRACE OR ON
MARKERS	MARKERS OR ON
MARKERS ADJ	MIDSCALE
RECUR-TRIG-LINE	RECUR
MODE	C.W.
PC ± F VERNIER	CALIBRATE
SWEEP SECONDS	.01
SWEEP SECONDS VERNIER	MAX CW

1202 A OSCILLOSCOPE

VERTICAL	MIDSCALE
OFFSET COURSE	MIDSCALE
HORIZONTAL	MIDSCALE
INPUT SELECTOR +	DC
INPUT SELECTOR -	OFF
BAND WIDTH LIMIT	DEPRESSED
VERTICAL SENSITIVITY	20 MV/DIV
POLARITY + -	+
INPUT SELECTOR	+
MODE	NORMAL
SLOPE	+
TRIGGER LEVEL	MAX CCW
COUPLING	DC
SOURCE	INTERNAL
HORIZ SELECTOR (OUTER)	EXT HORIZ .5
HORIZ SELECTOR (MIDDLE)	ANY POSITION
HORIZ SELECTOR (INNER)	MID RANGE

NOTE 1: KEEP 368A TERMINATION IN SPLITTING JACK WHEN (V) OPTION IS NOT SPECIFIED.

NOTE 2: CONNECT UNIT UNDER TEST TO IF RETURN LOSS BRIDGE USING ADAPTERS AND/OR CORD SPECIFIED IN TEST CHARTS.

NOTE 3: USE OPTION (V) WHEN TESTING CARRIER RESUPPLY.

NOTE 4: ON OSCILLATORS HAVING LEVELER SWITCH DESIGNATED "LEVELER-EXT" OPERATE IT TO "LEVELER;" ON OSCILLATORS HAVING LEVELER SWITCH DESIGNATED "INT-OFF-EXT" OPERATE IT TO "INT."

POWER METER

SET TO -25DBM SCALE AND ZERO METER WITH ZERO MTRCONTROL. RESET TO -5DBM SCALE

COUNTER

TIME	MAX CCW
GAIN	MAX CW
FREQUENCY	IMS
INPUT B	INT OSC
COUNT A	NORMAL

- ARRANGE THE TEST APPARATUS AS SHOWN USING OPTION (U). ADJUST THE OSCILLATOR RF LEVEL CONTROL FOR A POWER LEVEL OF -7DBM.
- REARRANGE THE TEST APPARATUS FOR OPTIONS (Y) AND (Z). REFERRING TO THE TABLE BELOW, USE ONE OR MORE 63A PADS PRECEDING THE J683875 AMPLIFIER TO MAKE UP THE DESIRED REFERENCE LOSS. THE REFERENCE LOSS SHOULD BE WITHIN ABOUT 5 DB OF THE REQUIRED RETURN LOSS OF THE UNIT UNDER TEST.

63A PAD (DB)	REFERENCE LOSS
25	30
30	30
35	35

- SET THE ATTN CONTROL TO 8 DB.
- ADJUST THE EXT IF AMPL GAIN CONTROL FOR A POWER LEVEL OF -7DBM.
- CHANGE THE ARRANGEMENT OF THE TEST APPARATUS TO OPTIONS (Y) AND (W).
- OPERATE OSCILLATOR MODE TO WIDE F1-F2.
- ADJUST THE SCOPE OFFSET CONTROL UNTIL THE TRACE APPEARS ON THE CENTER OF THE OSCILLOSCOPE. THIS IS THE REFERENCE TRACE.
- ADJUST THE OSCILLOSCOPE HORIZONTAL POSITION AND DEFLECTION SENSITIVITY CONTROLS TO POSITION THE TWO ENDS OF THE TRACE AT EACH EXTREME END OF THE HORIZONTAL SCALE. ADJUST OSCILLOSCOPE DC BALANCE.
- WHILE SWITCHING THE ATTN CONTROL BETWEEN 8 AND 9 DB, ADJUST THE OSCILLOSCOPE VERTICAL SENSITIVITY CONTROLS TO OBTAIN A DEFLECTION OF ONE DIVISION. THIS CALIBRATES THE DISPLAY FOR 1 DB PER DIVISION. RETURN THE ATTN CONTROL TO 8 DB.
- CHANGE THE ARRANGEMENT OF THE TEST APPARATUS TO OPTIONS (X) AND (W).
- MEASURE THE RETURN LOSS BY CONNECTING THE UNKNOWN PLUG OF THE RETURN LOSS BRIDGE INTO THE UNIT TO BE TESTED. IF THE DISPLAY OBTAINED APPEARS ABOVE THE REFERENCE TRACE, THE RETURN LOSS IS LESS THAN THE REFERENCE RETURN LOSS PREVIOUSLY SELECTED IN STEP 10 BY 1 DB PER DIVISION. IF THE DISPLAY IS LOCATED BELOW THE REFERENCE TRACE, THE RETURN LOSS IS GREATER THAN THAT OF THE REFERENCE RETURN LOSS BY 1 DB PER DIVISION.

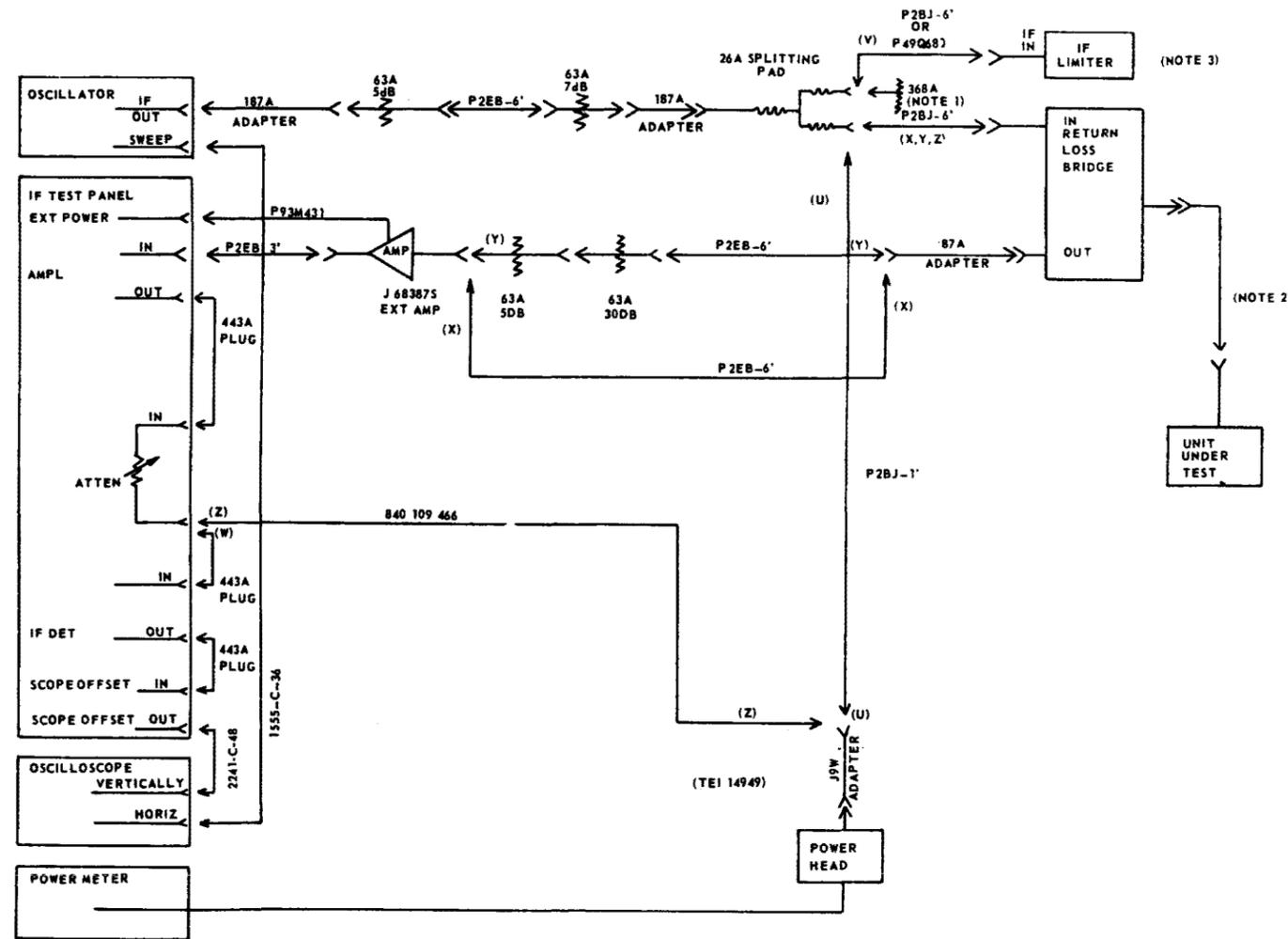


Fig. 1—TD-3—IF Return Loss Measurement Setup