TD-3 MICROWAVE RADIO

TRANSMITTER - RECEIVER BAY

COMMON EQUIPMENT TESTS USING PORTABLE TEST EQUIPMENT

1. GENERAL

1.01 This section describes procedures for making tests on the microwave generator, voltage regulator and 40 MC oscillator and shift modulator.

2. CONTENTS

2.02 CHART 1 - PREPARATION FOR TESTS
CHART 2 - -19 VOLT REGULATOR CHECK
CHART 3 - MICROWAVE GENERATOR CHECKS (FREQUENCY AND OUTPUT POWER)
CHART 4 - 40MHZ OSCILLATOR - SHIFT MOD.

3. APPARATUS

3.01 IF TEST PANEL (J68425A-1)
POWER METER (GENERAL MICROWAVE 460-N420C)
OSCILLOSCOPE (HEWLETT PACKARD H02-1202A)
FREQUENCY COUNTER (SYSTRON DONNER 7018-8)
IF, RF SWEEPER (KRUSE - STROKE, 5000)
MISCELLANEOUS GENERAL PURPOSE TEST COMPONENTS
IF MAIN AMPLIFIER (J68387S-1)

CHART 1

PRELIMINARY CHECKS

PREPARATION FOR TESTS

STEP	PROCEDURE
1.	Determine that the transmitter or receiver has been removed from service.
2.	If the transmitter is to be tested, remove the transmitted signal by removing the IF cable from the IF IN jack of the IF DRIVER AMP-TRMTR MOD unit. (A transmitter alarm results). Silence the audible alarm by pressing the ACO pushbutton on the common alarm panel. Remove the transmitter 1322-type bandpass filter, (FL4) located above the 24B directional coupler. Connect a 522A termination at the output of the directional coupler. Place a ED 50536-50G2 shorting plate on the flexible waveguide attached to the channel combining network 24.
	CAUTION:
3.	Reconnect the IF cable to the IF DRIVER AMP-TRMTR MOD unit.

CHART 2

-19 VOLT REGULATOR CHECK

STEP	PROCEDURE
1.	Repeater Station radio bays use a common -19 Volt Regulator for the transmitter and receiver sections. Main station radio bays utilize separate -19 Volt Trgulator units for the transmitter and receiver sections. The transmitter regulator is the right hand unit located behind the front cover and below the microwave generators. (See Figure 1, Sketch C)
2.	Read the -19 VOLT CHECK on the transmitter a/o receiver control panel (main station bay) or on the receiver control panel for a repeater station bay.

Requirement: Red Line Reading (70) on panel meter.
If this requirement is not met adjust the ADJ VOLTS control on the -19 volt regulator unit. For initial alarm adjustment, if trouble is experienced adjusting the voltage, if alarms are present due to the regulator, or if alarm problems are suspected, refer to BSP 411-402-502.

CHART 3

MICROWAVE GENERATOR CHECKS

STEP PROCEDURE

1. The following is a check of the frequency and power output of the microwave generator. Repeater Station bays use a single generator common to both the transmitter and receiver. Main Station bays have generators for the transmitter and receiver units with the upper unit being associated with the transmitter. If initial installation, refer to Section 411-402-504.

FREQUENCY CHECK

2. Set up the connections for the microwave generator in accordance with Figure 1.

3. Adjust the IF Test Panel ATTEN control for a power meter reading of 0 ± 1.0 dBm.

4. Change to option (S) and measure the frequency, after reading first 3 digits on counter - change frequency A selector to 1.0 S. Read last six digits. Note the frequency measured for entry in the transmitter log.

   Requirement: The frequency shall be within the limits shown in Table A, B or C.

   If the requirement is not met adjust the FREQ ADJ control to bring the frequency to within 10 HZ of nominal.

   NOTE: The P48Q352 adjusting tool has a slight frequency detuning effect when used on the FREQ ADJ control on the J68387R generator. Adjust the control for ± 10 Hz with the tool inserted. Remove the tool and note the frequency drift.

TABLE A

RECEIVER MICROWAVE GENERATOR FREQUENCIES

FOR BAYS EQUIPPED WITH THE J68387D1 40-MC OSCILLATOR AND SHIFT MODULATOR UNIT

RECEIVER		MICROWAVE GENERATOR LOW-FREQUENCY OSCILLATOR	
FREQUENCY (MHz)	CHANNEL	NOMINAL FREQUENCY (MHz)	LIMITS (MHz)
3730	1A	120.0000	119.999880 - 120.000120
3770	1B	118.7500	118.749881 - 118.750119
3810	2A	122.5000	122.499878 - 122.500122
3850	2B	121.2500	121.249879 - 121.250121
3890	3A	120.6260*	120.624879 - 120.625121
3930	3B	119.3750*	119.374881 - 119.375119
3970	4A	123.1250	123.124877 - 123.125123
4010	4B	121.8750	121.874878 - 121.875122
4050	5A	125.6250	125.624874 - 125.625126
4090	5B	124.3750	124.374876 - 124.375124
4130	6A	128.1250	128.124872 - 128.125128
4170	6B	126.8750	126.874873 - 126.875127

TABEL A (CONT'D)

RECEIVER		MICROWAVE GENERATOR LOW-FREQUENCY OSCILLATOR	
FREQUENCY (MHz)	CHANNEL	NOMINAL FREQUENCY (MHz)	LIMITS (MHz)
3710	7A	119.3750	119.374881 - 119.375119
3750	7B	118.1250	118.124882 - 118.125118
3790	8A	121.8750	121.874878 - 121.875122
3830	8B	120.6250	120.624879 - 120.625121
3870	9A	120.0000*	119.999880 - 120.000120
3910	9B	118.7500*	118.749881 - 118.750119
3950	10A	122.5000	122.499878 - 122.500122
3990	10B	121.2500	121.249879 - 121.250121
4030	11A	125.0000	124.999875 - 125.000125
4070	11B	123.7500	123.749876 - 123.750124
4110	12A	127.5000	127.499872 - 127.500128
4150	12B	126.2500	126.249874 - 126.250126

TABLE B

RECEIVER MICROWAVE GENERATOR FREQUENCIES

FOR BAYS NOT EQUIPPED WITH THE J68387D-1 40-MC OSCILLATOR AND SHIFT MODULATOR UNIT

RECEIVER		MICROWAVE GENERATOR LOW-FREQUENCY OSCILLATOR	
FREQUENCY (MHz)	CHANNEL	NOMINAL FREQUENCY (MHz)	LIMITS (MHz)
3730	1A	118.7500	118.749881 - 118.750119
3770	1B	120.0000	119.999880 - 120.000120
3810	2A	121.2500	121.249879 - 121.250121
3850	2B	122.5000	122.499878 - 122.500122
3890	3A	119.3750	119.374881 - 119.375119
3930	3B	120.6250	120.624879 - 120.625121
3970	4A	121.8750	121.874878 - 121.875122
4010	4B	123.1250	123.124877 - 123.125123
4050	5A	124.3750	124.374876 - 124.375124
4090	5B	125.6250	125.624874 - 125.625126
4130	6A	126.8750	126.874873 - 126.875127
4170	6B	128.1250	128.124872 - 128.125128
3710	7A	118.1250	118.124882 - 118.125118
3750	7B	119.3750	119.374881 - 119.375119
3790	8A	120.6250	120.625121 - 120.625121
3830	8B	121.8750	121.874878 - 121.875122
3870	9A	118.7500	118.749881 - 118.750119
3910	9B	120.0000	119.999880 - 120.000120
3950	10A	121.2500	121.249879 - 121.250121
3990	10B	122.5000	122.499878 - 122.500122
4030	11A	123.7500	123.749876 - 123.750124
4070	11B	125.0000	124.999875 - 125.000125
4110	12A	126.2500	126.249874 - 126.250126
4150	12B	127.5000	127.500128 - 127.500128

TABLE C

MICROWAVE GENERATOR FREQUENCIES

TRANSMITTER			MICROWAVE GENERATOR LOW-FREQUENCY OSCILLATOR	
FREQUENCY (MHZ)	CHANNEL	GENERATOR OUTPUT (MHZ)	NOMINAL FREQUENYC (MHZ)	LIMITS (MHZ)
3710	7A	3780	118.1250	118.124882 - 118.125118
3730	1A	3800	118.7500	118.749881 - 118.750119
3750	7B	3820	119.3750	119.374881 - 119.375119
3770	1B	3840	120.0000	119.999880 - 120.000120
3790	8A	3860	120.6250	120.624879 - 120.625121
3810	2A	3880	121.2500	121.249879 - 121.250121
3830	8B	3900	121.8750	121.874878 - 121.875122
3850	2B	3920	122.5000	122.499878 - 122.500122
3870	9A*	3800	118.7500	118.749881 - 118.750119
3890	3A*	3820	119.3750	119.374881 - 119.375119
3910	9B*	3840	120.0000	119.999880 - 120.000120
3930	3B*	3860	120.6250	120.624879 - 120.625121
3950	10A	3880	121.2500	121.249879 - 121.250121
3970	4A	3900	121.8750	121.874878 - 121.875122
3990	10B	3920	122.5000	122.499878 - 122.500122
4010	4B	3940	123.1250	123.124877 - 123.125123
4030	11A	3960	123.7500	123.749876 - 123.750124
4050	5A	3980	124.3750	124.374876 - 124.375124
4070	11B	4000	125.0000	124.999875 - 125.000125
4090	5B	4020	125.6250	125.624874 - 125.625126
4110	12A	4040	126.2500	126.249874 - 126.250126
4130	6A	4060	126.8750	126.874873 - 126.875127
4150	12B	4080	127.5000	127.499872 - 127.500128
4170	6B	4100	128.1250	128.124872 - 128.125128

STEP PROCEDURE

4. Readjust, taking the shift into account, so that the ± Hz requirement is met with the tool removed.

MICROWAVE GENERATOR OUTPUT POWER CHECK

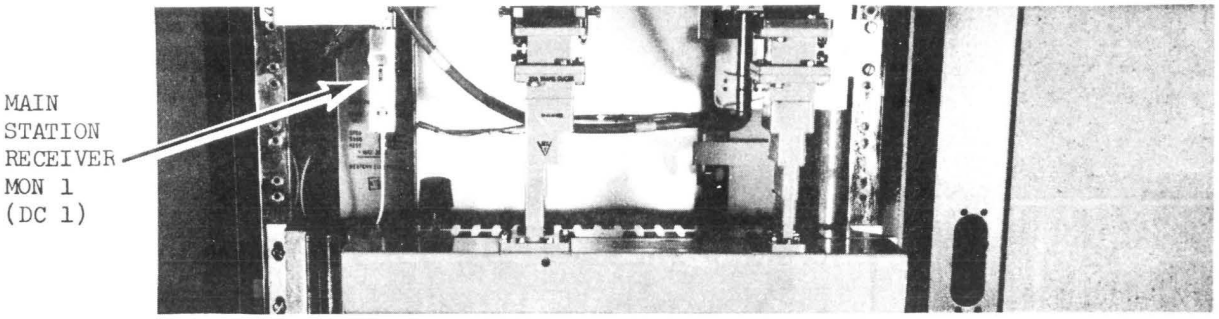
5. Press the MWV GEN OUT pushbutton and if necessary adjust attenuator AT5 (main station transmitter), or AT1, (repeater or main station receiver) to obtain the recorded meter reading.

6. If unable to obtain recorded meter reading with all attenuation removed from AT5 or AT1, refer to BSP 411-402-504 on MWG J68387R.

7. Remove the MON 1 (for repeater station or main station receiver) or MON 2 (for main station transmitter) detector from the 24A directional coupler. Make connection in accordance with Figure 1 - option X and measure the power. See Sketch A for location of Det. Mon.

Requirement 1: The TRMTR or RCVR MWV GEN sensitrol shall trip.

TD-3 MICROWAVE GENERATOR OUTPUT MONITOR POINTS



STEP PROCEDURE

7. Requirement 2: The power meter shall indicate a MWG OUTPUT power of +20.6 ±0.2 dBm. into the directional coupler. (+20.6, less the combined losses of the Coupler, RF Pads and KS19986 Adapter Equals the meter reading).

   NOTE: The calibrated coupler loss for the frequency nearest that of the microwave generator must be used.

   EXAMPLE: 20.6, -118 coupler loss, -20.0 RF pad, -0.8 KS19986 Adptr. loss, = meter reading.

   This corresponds to a power of + 20.6 dBm + 0.2 dB in the through arm of the directional coupler. If requirement 2 is met, proceed to step 12. If initial installation or if requirement 2 is not met continue with step 8.

8. Adjust AT5 (or AT1 for repeater or main station receiver) for a power meter indication 2 dB below requirement 2 of step 7.

9. Reconnect MON 1 or MON 2 detector to 24A directional coupler - slowly adjust the MWV GEN ALM SET control (Located at the rear of the control panel door) until the sensitrol just trips.

10. Remove the detector from DC1 or DC2 and reconnect the power meter per option X - Figure 1.

11. Adjust AT5 (main station transmitter) or AT1 to restore the level required in step 7. (for repeater station or main station receiver)

12. Reconnect the MON 1 or MON 2 detector to the 24A directional coupler and operate the ALARM RESET pushbutton on the common alarm panel.

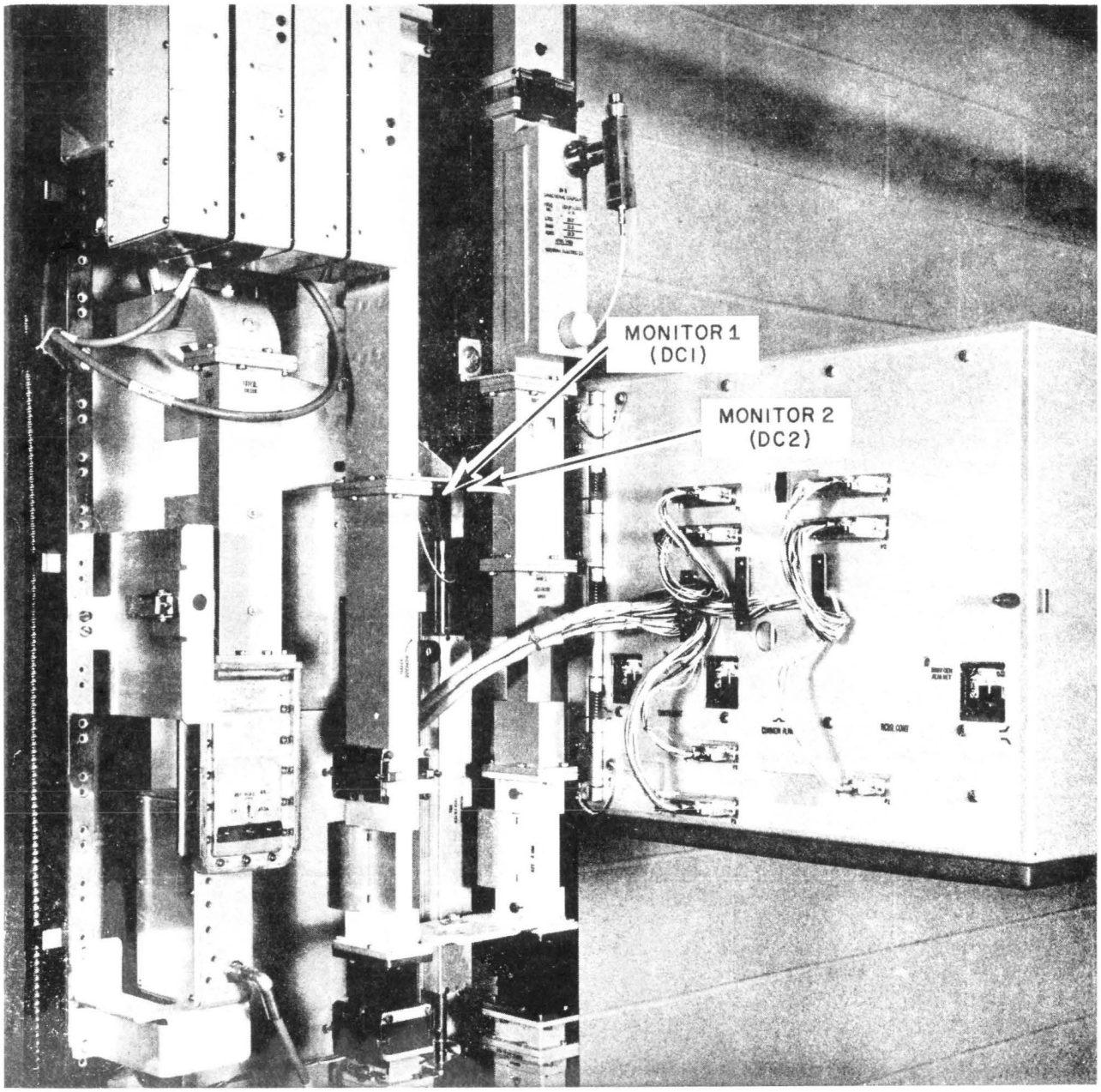
13. Operate pushbutton MWV GEN OUT and record the meter reading in the space provided on the control panel. Remove test connections.

14. If channel is equipped with a 40 MC OSC and SHIFT MOD proceed to Chart 4; otherwise, continue with step 15.

15. Press the RCVR MOD 1 pushbutton

   Requirement: The meter shall indicate within ± 0.5 divisions of the value recorded adjacent to the pushbutton.

   NOTE: The recorded value on the front panel should be equal to the sum of the REF BIAS value stamped on the receiver modulator block and the correction factor given in Table D Chart 4. If the requirement is not met, adjust the DIODE BIAS control on the IF pre-amplifier for the correct value. If the requirement is not met by adjusting the diode bias control, refer to BSP 411-404-503.



SKETCH B

CHART 4

40 MHZ OSCILLATOR AND SHIFT MODULATOR CHECKS

NOTE: Chart 4 establishes the correct BO power for the receiver modulator if the bay is equipped with a J68387D 40 MHZ oscillator and shift modulator unit.

STEP	PROCEDURE
1.	Remove the 368A plug from the OSC MON jack on the 40 MHz oscillator.
2.	Prepare the test setup in accordance with Fig. 2.
3.	Observe the frequency indicated by the counter. Requirement: 40 MHz ± 400 Hz (reading 39,999,6 to 40,000,4). If this requirement is not met, proceed with Step 6.
4.	Connect Option Y and measure the power. Requirement: -12.5 dBM.
5.	If requirements of both Steps 3 and 4 are met, proceed to Step 11. If either requirement is not met, continue with Step 6.
6.	Turn the level control fully clockwise. Adjust the oscillator tune and amplitude tune controls for maximum power output.
7.	Adjust the level control for a -12.5 ± 0.2 dBm meter reading.
8.	Change the test connections to Option X. Adjust the FREQ ADJ control to obtain 40 MHz ± 50 Hz (limits 39,999,950 to 40,000,050 Hz).
9.	Repeat Steps 7 and 8 until the requirements are met.
10.	Replace the 368A plug in the OSC MON jack and reconnect the cables.
11.	Press the shift oscillator pushbutton on the receiver control panel and adjust the MTR CAL control on the 40 MHz oscillator for an indication of 50 on the control panel meter.
12.	On the receiver control panel, press the SHIFT MOD 1 and SHIFT MOD 2 pushbuttons and observe the meter indications. Requirement: 80 ± 20 divisions for both positions. If the requirements are not met, refer to BSP 411-402-503.
13.	Perform Step 3 on Fig. 1 and connect Option W.
14.	Adjust attenuator AT2 (repeater station bays) or AT3 (main station bays) for a power meter indication of + 6.3 -L dBm ± 0.2 dB. L is the calibrated coupler loss at the frequency nearest the receiver channel frequency.
15.	Remove Option W on Fig. 1.
16.	Press the RCVR MOD 1 pushbutton on receiver control panel.

Requirement: The meter shall indicate within ± 0.5 divisions of the value recorded adjacent to the pushbutton.

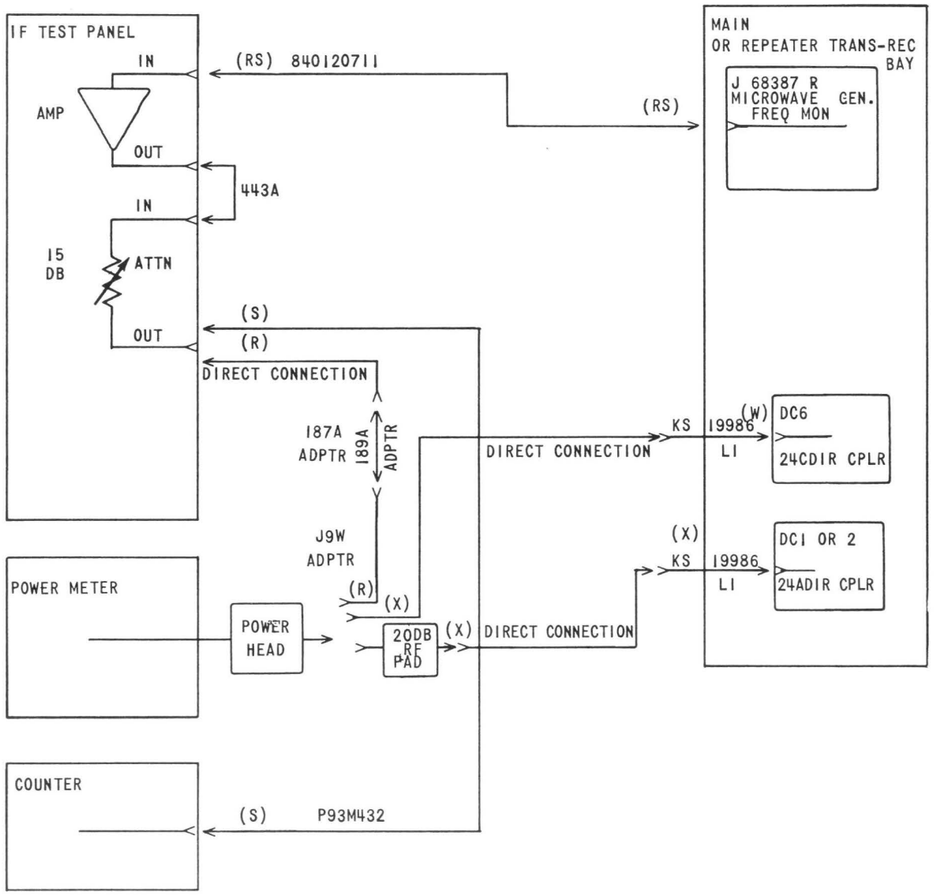
NOTE: The recorded value on the front panel should be equal to the sum of the REF BIAS value stamped on the receiver modulator block and the correction factor from Table D for the code stamped on the 1337 Filter above the IF PREAMP. If the requirement is not met, adjust the DIOBE BIAS control on the IF PREAMPLIFIER for the correct value. If the requirement is not met by adjusting the diode bias control, refer to BSP 411-404-503.

TABLE D

**1337 FILTER CODE	BO FREQ (MHz)	CHANNEL NUMBER	CORRECTION FACTOR
A	3780	7A	+7.0 divisions
B	3800	1A 9A*	+6.0
C	3820	7B 3A*	+5.0
D	3840	1B 9B*	+4.0
E	3860	8A 3B*	+3.0
F	3880	2A 10A	+2.0
G	3900	8B 4A	+1.5
H	3920	2B 10B	+0.5
J	3940	9A* 4B	0
K	3960	3A* 11A	-1.0
L	3980	9B* 5A	-2.0
M	4000	3B* 11B	-3.0
N	4020	5B	-4.0
P	4040	12A	-5.0
R	4060	6A	-6.0
S	4080	12B	-7.0
T	4100	6B	-8.0

* Depends on BO frequency arrangement. Determine correct position from BO frequency or 1337 letter code stamped on the filter.

* The 1337 filter is connected to the receiver-modulator unit.

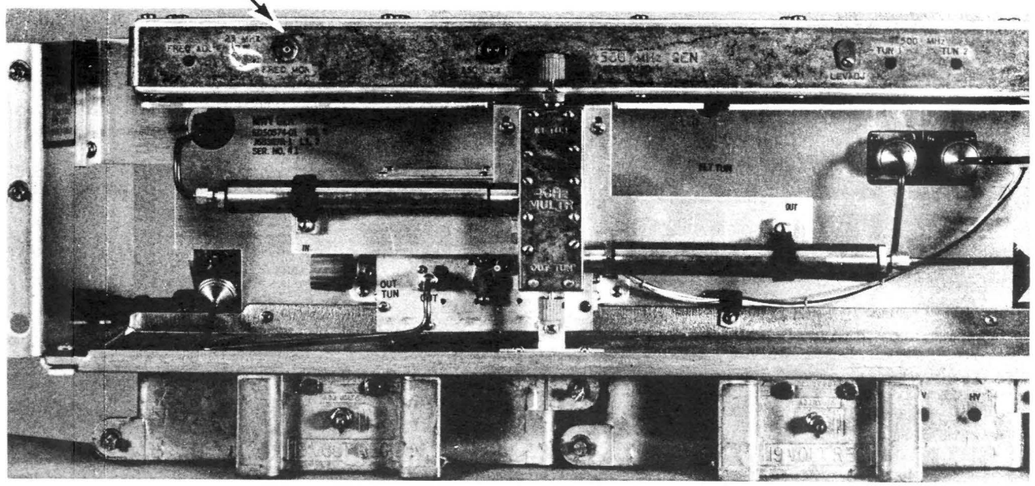


PREPARATION FOR TEST

1. ZERO POWER METER: WITH NO INPUT, SET METER RANGE ON -25 DBM SCALE AND USING ZERO ADJUST KNOB, ZERO METER (BLACK SCALE) RESET METER RANGE FOR 0 DBM READING.
2. SET FUNCTION SWITCH ON COUNTER TO TEST. PLACE MODE SWITCH TO FREQUENCY IMS POSITION; COUNTER SHOULD READ 001000±1 COUNT. RETURN FUNCTION SWITCH TO NORMAL
3. SET ATTEN IN IF TEST PANEL TO 15 DB.
4. ESTABLISH TEST CONNECTIONS USING OPTION (R)

NOTES

1. DC6 IS LOCATED BEHIND THE I.F PREAMP.



SKETCH C (MAIN STATION TRANSMITTER-19V REG.)

FIGURE 1 - TD-3 MICROWAVE GENERATOR FREQUENCY AND POWER MEASUREMENTS

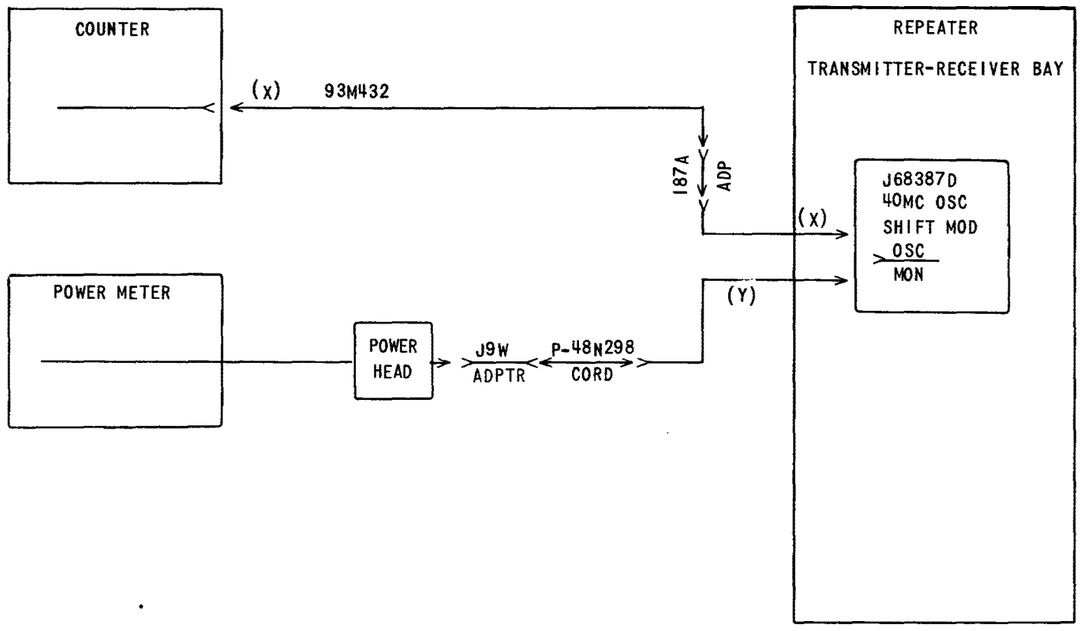


FIGURE 2 - TD-3-40MHZ
OSCILLATOR-SHIFT
MODULATOR FREQUENCY
AND POWER MEASUREMENTS

PREPARATION FOR TEST

1. ZERO POWER METER: WITH NO INPUT SET METER RANGE ON-25 DBM SCALE AND USING ZERO ADJUST KNOB ZERO METER (BLACKSCALE) THEN PUSH-10DB SCALE SELECTOR.
2. SET FUNCTION SWITCH ON COUNTER TO TEST PLACE MODE SWITCH TO FREQUENCY IMS POSITION COUNTER SHOULD READ 001000±1 COUNT
3. ESTABLISH TEST CONNECTIONS USING OPTION (X)