APPLICATION		REVISIONS			
NEXT ASSY	USED ON	SYM	DESCRIPTION	DATE	APPROVED

TEST PROCEDURE AND LIMITS FOR THE VARIABLE FREQUENCY OSCILLATOR PART OF R-390A/URR

1.0 SCOPE

The purpose of this procedure is to provide a procedure for testing the Variable Frequency Oscillator for Calibration, RF Output, and Backlash.

2.0 REFERENCE INFORMATION

2.1 Specifications

2.1.1 Equipment Specification MIL-R-13947(SigC).

2.2 Publications

2.2.1 R-390A Instruction Book (TM11-856A).

3.0 TEST EQUIPMENT REQUIRED

3.1 Power Supply SM-D-58789.

3.2 Hewlett Packard 524B Frequency Counter or equal.

3.3 Hewlett Packard 410B VTVM or equal.

3.4 VFO Test Fixture SM-D-58788.

Unless otherwise specified	AUTHENTICATION	TEST PROCEDURE AND LIMITS FOR THE VARIABLE FREQUENCY OSCILLATOR PART OF R-390A/URR	U. S. ARMY SIGNAL MATERIEL SUPPORT AGENCY
Dimensions are in inches Tolerances on Fractions decimals angles	DRAWN fmB TRACED CHECKED VERIFIED APPROVED REVIEWED DATE 11/2/60	SCALE	Ft. Monmouth, N. J. SC-A-46585A

3.5 1000 ohm load.

3.6 Associated cables.

3.7 Standard Variable Frequency Oscillator.

4.0 STANDARD TEST CONDITIONS

4.1 Unless otherwise specified, all tests shall be conducted under the following conditions:

4.1.1 Temperature: Normal room ambient.

4.1.2 Humidity: Normal room ambient.

4.1.3 Power Supply Voltages:

4.1.3.1 215 V DC, Pin A (unregulated).

4.1.3.2 150 V DC, Pin B (regulated).

4.1.3.3 6.3 V AC, 60 cps.

4.1.3.4 26 V AC, 60 cps. (This voltage is used only when the VFO is tested with the oven on).

5.0 TEST CONNECTIONS

5.1 Remove the metal plug which covers the adjustment screw of L701.

5.2 Mount the VFO on the VFO Test Fixture and tighten the set screws in the end of the bellows next to the VFO.

NOTE: Caution must be taken to be sure that the phenolic sleeve is over the VFO lead screw shaft to prevent scoring. (Extra sleeves are furnished with the fixture).

5.3 Connect the cable from the Power Supply to J709 on the VFO.

5.4 Connect one end of the coaxial cable to the VFO output lead P717 and the other end to the "T" connector.

5.5 Connect the "T" connector to the frequency counter (Hewlett Packard model 524B or equal).

5.6 Connect the 1000 ohm load to the other end of the "T" connector.

5.7 Turn on all associated equipment (Power Supply, Frequency Counter, etc.), and set the controls for proper operation. (e.g. Frequency counter controls set for 10 mc, Voltmeter range set to 3 V AC, etc.)

6.0 TEST PROCEDURE

6.1 Calibration

6.1.1 Loosen the set screws in the end of the bellows next to the index head.

6.1.2 Disengage the phenolic gear rack from the index wheel by lifting the large front knob (rack release knob) on the index head.

6.1.3 Rotate the index wheel until '0' appears under the index line and engage the phenolic gear rack by pressing on the rack release knob on the index head.

6.1.4 Loosen the carriage lock screw by turning the small middle screw on the index head counter-clockwise.

6.1.5 Rotate the large rear knob (carriage adjust knob) on the index head until the carriage is approximately centered in the block.

6.1.6 Set the micrometer to '0'. (The center vernier marking is the '0' mark on the vernier barrel).

6.1.7 Rotate the shaft of the VFO, by turning the bellows by hand, until 2.455000 mc ±300 cycles reading is indicated on the counter and tighten the set screws in the end of the bellows nearest the index wheel.

6.1.8 Turn the carriage adjust know on the index head clockwise so that the carriage is moved to the left to approximately the end of travel. Now rotate the same knob counter-clockwise until the frequency of 2.455000 mc ±25 cycles is indicated on the frequency counter.

6.1.9 Rotate the micrometer clockwise approximately .025" and return to zero. Check to ascertain that the frequency is still within 2.455000 mc ±25 cycles.

NOTE: All settings for frequency readings should be approached from the high frequency end to eliminate any erroneous readings due to backlash.

6.1.10 Raise the rack release knob to disengage the gear rack and rotate the index wheel counter-clockwise 10 turns. Engage the gear rack by depressing the rack release knob.

6.1.11 Rotate the micrometer clockwise approximately .025" and return to zero.

6.1.12 Note the frequency. This frequency should be 3.455000 mc ±25 cycles.

NOTE: If the frequency in 6.1.12 is not as specified, continue with 6.1.13. If frequency is as specified in 6.1.12 continue with paragraph 6.1.23.

6.1.13 Multiply the frequency error above or below 3.455000 by 1.70.

6.1.14 Subtract or add this product to the actual measured frequency at the high frequency end.

NOTE: If the error is above 3.455000 mc, subtract the product. If the error is below 3.455000 mc, add the product.

6.1.15 Adjust the trimmer L701 on the VFO until the calculated frequency is indicated on the frequency counter within ±25 cycles. The L701 adjustment screw is accessible from the front of the test fixture.

6.1.16 Raise the rack release knob to disengage the gear rack and rotate the index wheel clockwise 10 turns. Engage the gear rack by depressing the rack release knob.

6.1.17 Rotate the micrometer clockwise approximately .025" and return to zero.

6.1.18 Note the frequency. This frequency should be 2.455000 mc ±25 cycles.

6.1.19 If the frequency obtained in paragraph 6.1.18 is 2.455000 ±300 cycles, repeat paragraphs 6.1.8 thru 6.1.18. If the frequency obtained in paragraph 6.1.18 is more than 2.455000 ±300 cycles, loosen the set screws in the end of the bellows nearest the index wheel and repeat paragraphs 6.1.7 thru 6.1.18.

6.1.20 If the frequency meets the requirements of paragraph 6.1.18, raise the rack release knob to disengage the gear rack and rotate the index wheel counter-clockwise 10 turns. Engage the gear rack by depressing the rack release knob.

6.1.21 Rotate the micrometer clockwise approximately .025" and return to zero.

6.1.22 This frequency should be 3.455000 mc ±25 cycles. Note the error.

6.1.23 Raise the rack release knob to disengage the gear rack and rotate the index wheel clockwise 90° and engage the gear rack by depressing the rack release knob.

6.1.24 Rotate the micrometer clockwise approximately .025" and return to zero.

6.1.25 Repeat paragraphs 6.1.23 thru 6.1.25 for a total of 10 turns noting the error at each 90° point.

6.1.26 Check the data against the limits given in paragraph 7.1.

6.2 R. F. Output

6.2.1 Adjust the VFO to the 2.455000 mc point, set up previously.

6.2.2 Connect the R. F. output connector of the VFO (P717) to one side of the 'T' connector.

6.2.3 Connect the 1000 ohm load to the other side of the 'T' connector.

6.2.4 Using the adapter supplied with the fixture, connect the AC probe of the H.P. 410B VTVM into the center connection of the 'T' connector.

CAUTION: Do not use the long coaxial lead from the VFO to the load. Connect P717 directly to the 'T' connector.

6.2.5 Note the R. F. output voltage indicated on the H. P. 410B

6.2.6 Turn the index wheel 10 turns counter-clockwise to the 3.455000 mc point.

6.2.7 Note the R. F. output voltage indicated on the H. P. 410B.

6.2.8 Calculate the db change from the 2.455000 mc point to the 3.455000 mc point.

6.2.9 Check the data against the limits in paragraph 7.2.

6.3 Backlash

6.3.1 Connect the R. F. output connector of the VFO (F717) to the input of a frequency counter (Hewlett Packard 524B or equal) thru a 'T' connector. Connect the 1000 ohm load to the other end of the 'T' connector.

6.3.2 Engage the gear rack by pressing on the rack release knob at any point on the index wheel.

6.3.3 Rotate the micrometer clockwise approximately .025" and return to zero.

6.3.4 Note the frequency.

6.3.5 Rotate the micrometer counter-clockwise approximately .025" and return to zero.

6.3.6 Note the frequency.

6.3.7 The difference between the frequency reading obtained in paragraphs 6.3.4 and 6.3.6 is the backlash of the VFO under test.

6.3.8 Check the difference against the limits in paragraph 7.1.3.

7.0 VFO DATA SHEET ** VFO SERIAL NO. 2960

7.1 Calibration

Frequency	Error	Error Diff. Low Check Point (*) to 25 kc and 50 kc point.	Error Diff. High Check Point (*) to 25 kc and 50 kc point.
*2.4550 mc	-5 cy		
2.4800	8	13 cy	
2.5050	66	71	15 cy
2.5300	27		54
*2.5550	81		
2.5800	46	35	
		6	

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Frequency	Error	Error Diff. Low Check Point (*) to 25 kc and 50 kc point.	Error Diff. High Check Point (*) to 25 kc and 50 kc point.
2.6050	86	5	21
2.6300	75		10
*2.6550	65 cy		
2.6800	40	25 cy	
2.7050	45	20	24 cy
2.7300	77		8
*2.7550	69		
2.7800	17	52	
2.8050	43	26	49
2.8300	84		8
*2.8550	92		
2.8800	83	9	
2.9050	41	51	49
2.9300	59		31
*2.9550	90		
2.9800	81	9	
3.0	139	49	33
3.0300	153		47
*3.0550	106		
3.0800	96	10	
3.1050	89	17	13
3.1300	66		10
*3.1550	76		
3.1800	96 cy	20 cy	
3.2050	116	40	34 cy
3.2300	141		59
*3.2550	82		
3.2800	11	71	
3.3050	37	65	1
3.3300	16		0
*3.3550	[illegible]		
3.3800	-43	59	
3.4050	-49	65	46
3.4300	-20		17
*3.4550	-3		

*100 kc Check Points. **This data is typical.

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TEST LIMITS: Maximum calibration error shall not exceed 750 cycles when measured between any two points in the frequency range. Deviation from calibration linearity shall not exceed 250 cps when measured at 25 KC/S and 50 KC/S from the adjacent 100 KC check points (*) in the tuning range.

7.2 R. F. Output

R. F. Output at 2.455 mc	2.24	1.7 volts rms minimum.
R. F. Output at 3.455 mc	2.22	across a 1000 ohm load.
R. F. Output Ration	.1	db · Zero db ±.5 db.

7.3 Backlash

Test Limits

Frequency f_1	3.454956	
Frequency f_2	3.454922	
Difference	34	100 cycles maximum

8.0 CALIBRATION INSTRUCTIONS FOR TEST FIXTURES

8.1 To check the gage for proper operation and calibration, use the standard VFO furnished with the gage as the' unit under test' and test according to paragraphs 5.0 thru 7.0.

9.0 MAINTENANCE INSTRUCTIONS FOR TEST FIXTURE

9.1 Preservation of metal parts subject to corrosion and wear.

9.1.1 A drop of watch oil or light machine oil should be applied to moving parts approximately every six (6) months.

9.1.2 The metal parts comprising the micrometer head should be wiped with an oil dampened cloth approximately every six (6) months.

9.2 Electrical Repair

9.2.1 In the event that the gage should become electrically inoperative, the standard furnished with the gage should be tested to ascertain that the gage is inoperative and not the unit under test.

9.2.2 Replace the face with the spare fuse mounted on the front panel.

9.2.3 Should the gage still prove inoperative the voltages in the power supply should be compared to the voltage readings as they appear on the schematic.

9.3 Accessibility of the Power Supply Chassis

9.3.1 Remove the screws from around the outer edge of the front panel and remove the one screw from the back of the cabinet.

9.3.2 The front panel with the chassis attached can now be removed from the cabinet exposing the component parts for voltage checks or replacement.

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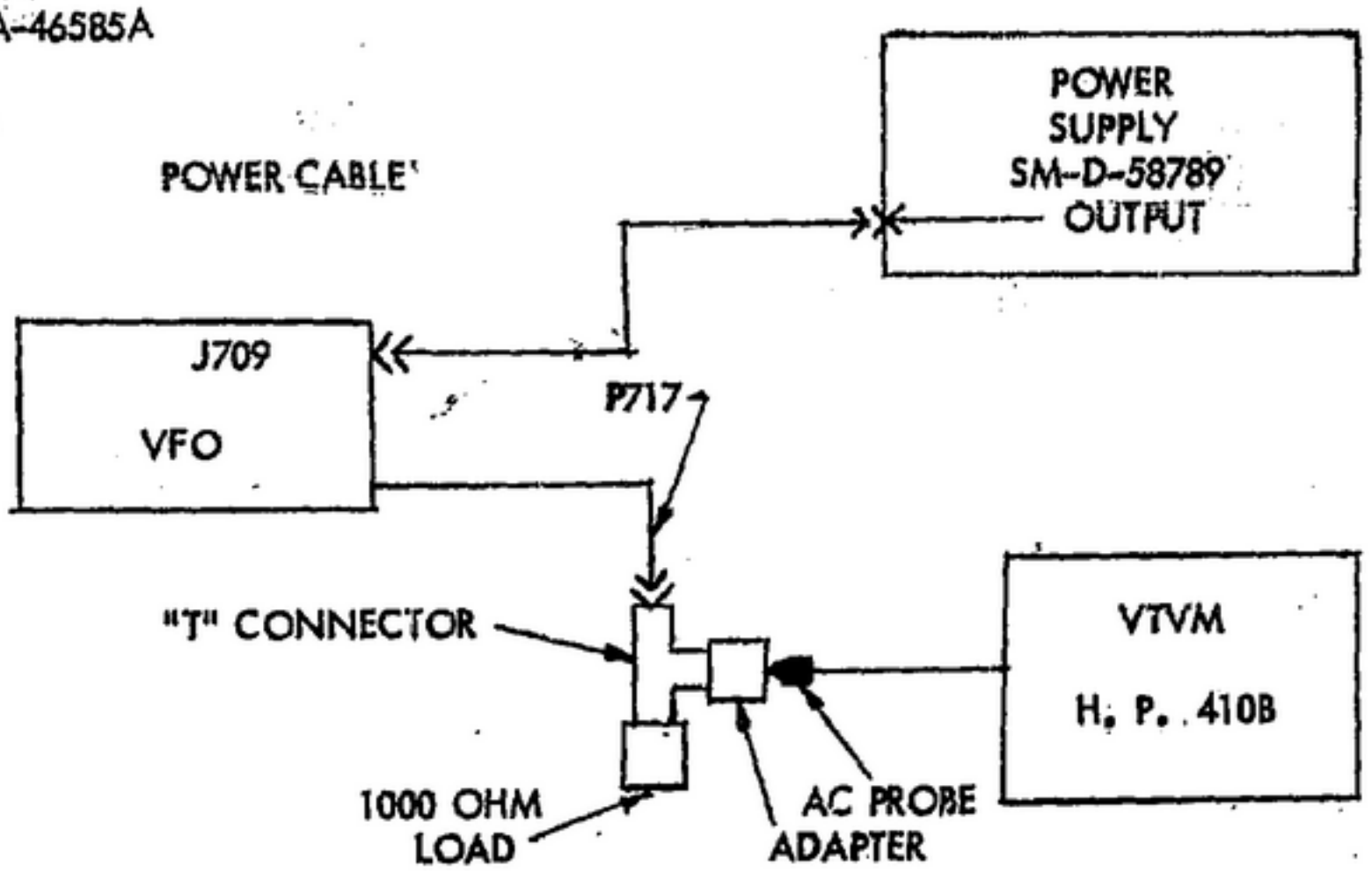
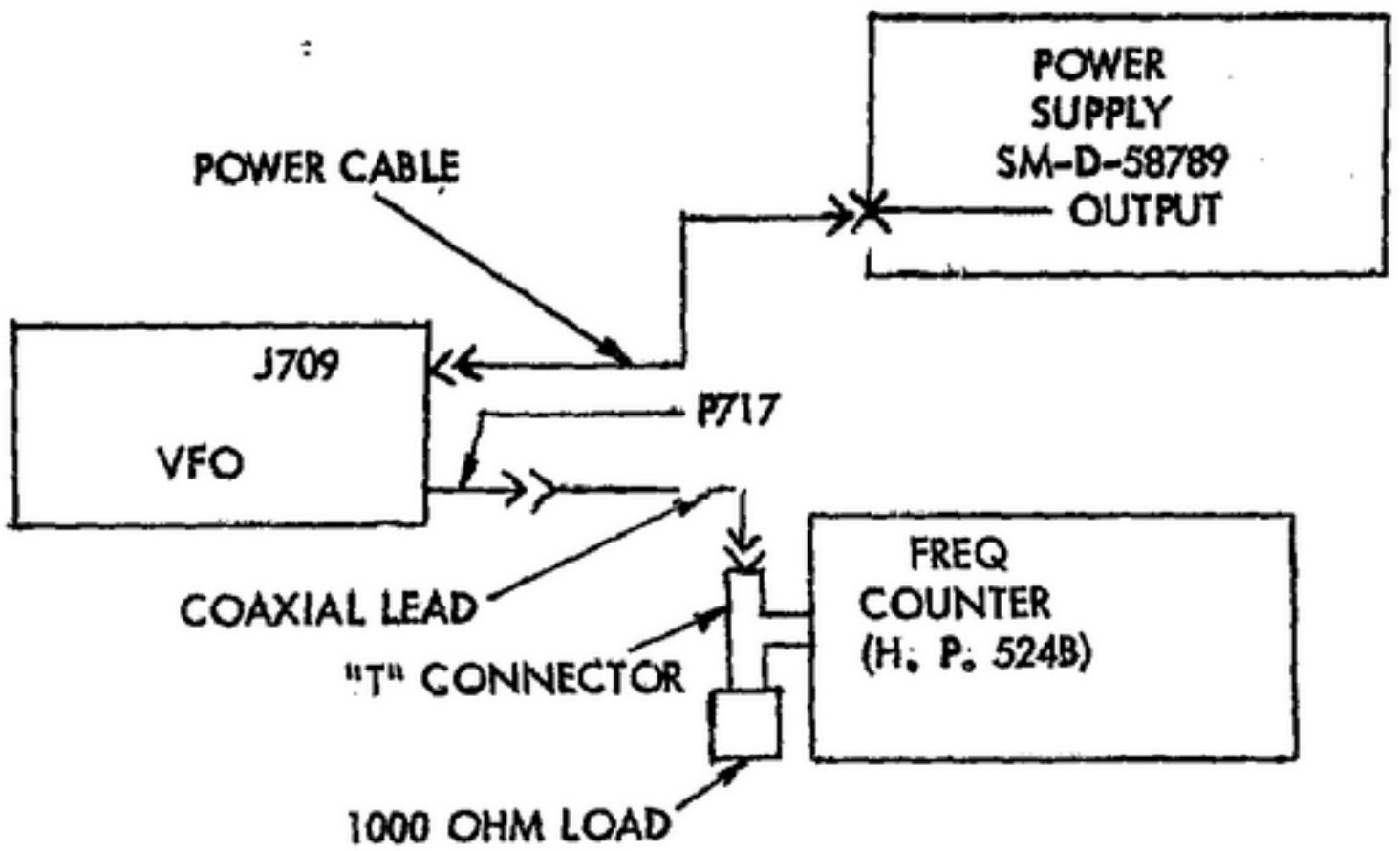


BLOCK DIAGRAM HOOK UP
FOR
VFO R. F. OUTPUT TEST



BLOCK DIAGRAM HOOK UP
FOR
VFO CALIBRATION & BACK LASH TEST