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GPR-92A TEST PROCEDURE

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A. **TEST EQUIPMENT REQUIRED**

1. A-C VTVM Ballantine Model 314 or equivalent.

2. 16 ohm, 2 watt resistor (LOAD).

3. RF Generator - Measurements Model 82 or equivalent.

4. 455 KC Sweep Generator.

5. Oscilloscope - Tektronix Model 545A with type "L" plug-in head.

6. 4 ohm speaker and earphones (600 ohms).

7. VOM - Simpson Model 260, Series 3.

8. Counter - Hewlett-Packard Model 524C or equivalent.

9. 455 KC crystal

10. Crystal Calibrator - Measurements Model 111B or equivalent.

11. Attenuator Box - Daven Model 651-73 or equivalent.

B. **PRELIMINARY**

1. Check set for mechanical defects.

2. Check for wiring errors.

3. Check for B+ shorts with ohmmeter between junction of R101, L101 and ground. The meter should read 25K +10%.

4. Turn slugs all the way out on T122, T125, T126, T127, T128, T129 and T130.

C. **SETTINGS**

BANDSPREAD	Locked at 100 log.
TUNING	Gang half open. (50 on log scale)
HFO TRIM	Half mesh. (Set knob to 0)
AVC switch	OFF
SEND/REC. switch	REC
BFO PITCH	0
MODE switch	AM

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C. SETTINGS - Cont'd

NOISE LIMITER	OFF
LIMITER switch	OFF
IF GAIN (R150)	MAXIMUM (CW)
RF GAIN	MAXIMUM (CW)
IF SELECTIVITY switch	15 KC
INT/EXT switch	INT
MONITOR AUDIO	MINIMUM (CCW)
TONE	MINIMUM (CCW)
LINE LEVEL	MIDDLE POSITION
SQUELCH	MAXIMUM (CCW)
RANGE SELECTOR	.54-1.4 (BAND 1)

D. POWER SUPPLY

1. Turn power on, check B+ at junction of R103 and L101. Meter should read 250V D-C ±10%.

2. Connect meter to TP71-72. Meter should read 105V D-C ±5%.

E. 455 KC IF ALIGNMENT

1. Connect RF generator to TP90.

2. Connect A-C VTVM to TP99.

3. Adjust generator for 455 KC, no modulation. Set attenuator for an indication on the VTVM.

4. Adjust bottom slug on T130 for maximum output. Adjust top slug for dip (6-8 db).

5. Connect generator to junction of R153 and C229.

6. Connect A-C VTVM to TP50.

7. Adjust top slug of T126 for maximum gain. Adjust T127 for dip (6-8 db).

E.   <u>455 KC IF ALIGNMENT</u> - Cont'd

     8.   Connect generator to TP51.   Connect VTVM to P65.   Adjust generator for indication on VTVM.   Adjust top slug on T128 for maximum indication.   Connect a jumper between TP62 and TP61.

     9.   Connect generator to junction of C192 and terminal 3 of S102F, (front). Connect A-C VTVM to TP8.

    10.   Adjust top slug of T122 for maximum gain, and bottom slug for dip (6-8 db).

F.   <u>3.955 MC IF ALIGNMENT</u>

     1.   Set range selector to 5.6-9.5 range.   Set EXT/INT to EXT.   Connect A-C VTVM to junction of R143 and R142.   Connect generator to "hot" side of T116 on top.   Set generator to 3.955 mc and adjust the attenuator for an indication on the VTVM.

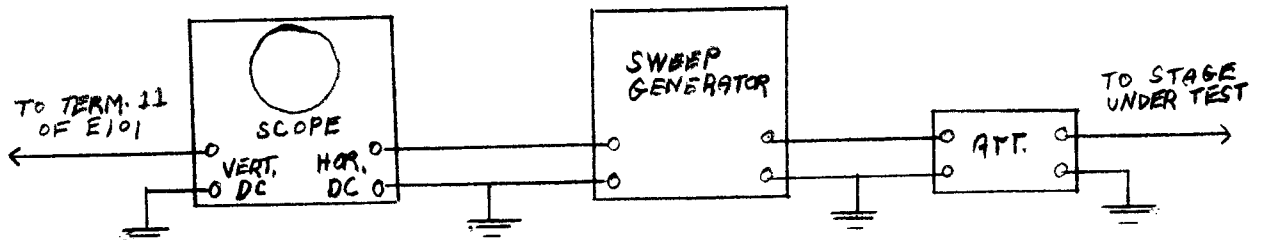   2.   Adjust top and bottom slug of T125 for maximum output.

G.   <u>IFO IN ALIGNMENT</u>

     1.   Connect RF generator to J106.   Set generator to 3.5 mc and the output for an indication on VTVM.

     2.   Adjust T129 for maximum indication on VTVM at junction of R142 & R143.

H.   <u>IF SWEEP ALIGNMENT</u>

<u>FIG. 1</u>

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H. **IF SWEEP ALIGNMENT** - Cont'd

1. Connect instruments as shown in Fig. 1. Set RANGE SELECTOR to .54-1.4.

2. Connect ATT. to TP90. Connect the 455 KC crystal between TP100 and ground, using clip leads.

3. Adjust top and bottom slug of T130 for maximum amplitude, and flatness of curve so that the 455 KC marker is in the center of the curve.

4. Connect ATT. to junction of R153 and C229. Adjust top slug of T126 and T127 for maximum amplitude and *flatness of curve keeping the 455 KC marker in the center of the curve.

5. Connect ATT. to junction of R147 and C221. Remove cover on FL102. Adjust T132 for maximum amplitude so that the marker is in the center of the curve. Use a non-metalic tool. Replace FL102 cover. (Adjustment of T132 can be omitted if marker is in the center of the curve.)

6. Set IF SELECTIVITY switch to 3 KC position, and adjust T131 for maximum flatness.

7. Set IF SELECTIVITY switch to 7.5 KC position, and adjust C227 so that the marker is in the center of the curve.

8. Repeat Step 6, then set IF SELECTIVITY switch to 15 KC position.

9. Connect ATT. to junction of C192 and terminal 3 of S102F (front). Adjust top and bottom slug of T122 for maximum amplitude, and *flatness of curve so that the 455 KC marker is in the center. (A 3 db ripple is allowed in the pass band.)

10. Remove 455 KC crystal marker. Check selectivity curve for all positions of the SELECTIVITY switch. The bandwidth should be reduced according to the position of the SELECTIVITY switch.

*MAXIMUM FLATNESS MAY HAVE A DIP IN THE CENTER OF THE CURVE.

I. **IF SELECTIVITY**

1. Set IF SELECTIVITY switch to 15 KC position. Connect the RF generator to the attenuator box and the box to the junction of C192 and terminal 3 of S102F (front). Connect the counter to the RF generator output. Connect the A-C VTVM to TP104 and switch to the 1 volt scale.

2. Set generator for 455 KC, no modulation. Adjust the output for an indication on the VTVM. Use this indication as a reference point.

I.   IF SELECTIVITY - Cont'd

3.   Check band pass. It should not vary more than ±3 db for a bandwidth of 15 KC minimum.

4.   Repeat Step 3 for the rest of the positions on the IF SELECTIVITY switch. See Test Data Sheet for frequency tolerance.

5.   Remove test equipment.

J.   IF OSCILLATOR

1.   Set RANGE SELECTOR to BAND 4. Set EXT/INT switch to INT.

2.   Connect A-C VTVM to junction of R143 and R142. It should read between 1 and 1 1/2 volts.

K.   RF ALIGNMENT

1.   Fasten bottom RF cover in place. Connect RF generator through a 20 db matching pad (Fig. 3) to J104 (75 ohm antenna input). Set generator for 1000 cycles modulation. Connect A-C VTVM to terminal 11 of E101, AVC switch to MANUAL, MODE switch to AM.

2.   Set RANGE SELECTOR to BAND 1.

3.   Set RF generator and TUNING dial for .60 mc (LOW END) and adjust T118, T113 and T109 for maximum output.

4.   Set ANTENNA TUNE for minimum capacity. Set RF generator and TUNING dial for 1.3 mc, and adjust C170, C164 and C146 for maximum output.

5.   Repeat Steps 2, 3 and 4 for the other bands. Refer to Fig. 2 for proper tuning of bands.

FIG 2

BAND	LOW END MC	ADJUST			HIGH END MC	ADJUST		
		OSC	MIX	RF		OSC	MIX	RF
1	.60	T118	T113	T109	1.3	C170	C164	C146
2	1.5	T119	T114	T110	3.2	C171	C165	C147
3	3.4	T120	T115	T111	5.4	C172	C166	C148
4	6.0	T121	T116	L102	9.0	C173	C167	C149
5	10.00	T123	L114	L103	17.0	C174	C168	C150
6	18.0	T124	T117	T112	32.0	C175	C169	C151

L. OSCILLATOR CALIBRATION

1. Connect crystal calibrator to J104 (ANT. INP.), MOD. switch to OFF position, and MEGACYCLE switch to 0.1 position, (1 mc position where needed).

2. Connect 4 ohm speaker to 4 ohm output. Set AVC switch to AVC position. Set MODE switch to CW position.

3. Set RANGE SELECTOR to BAND 1 (.54-1.4).

4. Set TUNING dial to .6 mc and adjust T118 slug for zero beat.

5. Set TUNING dial to 1.3 mc, and adjust C170 for zero beat.

6. Repeat Steps 4 & 5 until there is no variation at the low and high end of the band.

7. Repeat Steps 3, 4, 5 and 6 for the other bands. Refer to Fig. 2 for proper tuning of OSC section on the rest of the bands.

8. Check dial calibration. The error should not be more than 3/4 of a division. If it is, bend oscillator plates to correct for error.

M. OSCILLATOR BAND SPREAD CALIBRATION

1. Set RANGE SELECTOR to BAND 5. Switch crystal calibrator to 0.1 mc position.

2. Set TUNING dial to 20 M (14.5 mc on TUNING dial). Find zero beat and lock TUNING dial. Unlock BAND SPREAD dial.

3. Check 100 KC points throughout the dial for calibration. If calibration is not correct, bend OSCILLATOR BAND SPREAD plates to correct for error.

4. Set RANGE SELECTOR to BAND 6 and TUNING dial to 15 M (21.8 mc on TUNING dial). Lock dial and repeat Step 3.

5. Set TUNING dial to 10 M (30.0 mc); lock dial. Repeat Steps 3 and 4.

6. Set RANGE SELECTOR to BAND 3, and TUNING dial to 80 M (4.1 mc on TUNING dial). Lock dial and repeat Step 3.

7. Set BAND SPREAD dial to 100 log and lock it.

N. FINAL RF ALIGNMENT

1. Connect RF generator through a 20 db matching pad (Fig. 3) to J104. Set the generator for 1000 cycle modulation. Connect A-C VTVM to terminal 11 of E101, AVC switch to MANUAL, MODE switch to AM.

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N. FINAL RF ALIGNMENT - Cont'd

2. Set RANGE SELECTOR to BAND 1.

3. Set RF generator and TUNING dial for .55 mc (LOW END), and adjust T113 and T109 for maximum output.

4. Set ANTENNA TUNE for minimum capacity. Set RF generator and TUNING dial for 1.39 mc (HIGH END) and adjust C164 and I46 for maximum output.

5. Repeat Steps 3 and 4 until there is no variation at the low and high end of the band.

6. Repeat Steps 2, 3, 4 and 5 for the other bands. Refer to Fig. 2 for proper tuning of MIX and RF sections on the rest of the bands.

7. DELETED.

8. Check the dial calibration at the low, middle, and high end of each band. Record on test data chart.

9. To check the 10 db noise figure at the low, middle and high end of each band, set the attenuator on the generator for zero output. Connect AC VTVM across 600 ohm audio output of receiver. Read the A-C VTVM in db, then increase the output on the generator until the VTVM reads 10 db above the original reading. Record the attenuator reading on test data chart. It should be 1 microvolt or less. Repeat this procedure for all bands and frequencies shown on test data chart (except band 1 and low end of band 2).

10. To check the image rejection at the low, middle and high ends of each band, set generator and TUNING dial to basic frequency (see test data chart), and attenuator to one microvolt output. Read VTVM, then increase generator frequency to 2 x IF + the basic frequency. Increase attenuator until the VTVM reads the same as before (the HF FINE control on the generator may be used to find the image frequency). This will give the voltage ratio, which should not be less than 1000/1. Check all bands and record as per test data chart (except BAND 1 and low end of BAND 2).

NOTE: THE IF FREQUENCY FOR BANDS 1, 2 AND 3 IS 455 KC; FOR BANDS 4, 5 AND 6, IT IS 3.955 MC. PEAK ANT. TUNE CONTROL BEFORE EACH MEASUREMENT, BUT NOT ON THE IMAGE FREQUENCY.

O. BFO ADJUSTMENT

1. Set MODE switch to CW position, SEND/REC switch to SEND position. Disconnect RF generator. Connect Ballantine A-C VTVM to junction of pin 6 of V115A and R189. Connect counter to AMPLIFIER OUTPUT connector on Ballantine.

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O.   BFO ADJUSTMENT - Cont'd

   2.   Loosen stop on BFO slug. Adjust slug to read exactly 455 KC on counter.
Loosen knob, and set to zero on panel (do not move slug), and fasten set screw
on knob. Fasten stop on slug so that BFO can read 3 KC +10% on each of zero.
Set MODE switch to ISB position and repeat 3 KC check on each side of zero. Set
MODE switch to AM position, and SEND/REC switch to REC position.

P.   100 KC ADJUSTMENT

   1.   Connect Ballantine A-C VTVM to junction of C123 and R105. Connect
counter to AMPLIFIER OUTPUT connector on Ballantine.

   2.   Press CAL switch and adjust C124 to read exactly 100 KC on counter.

Q.   BFO ISOLATION AMP

   1.   Connect RF generator to J107, no modulation. Connect A-C VTVM to TP80.

   2.   Set RF generator to 455 KC. Set attenuator on generator for 3/4 volt
output. The A-C VTVM will read 1 volt or better.

   3.   Remove jumper between TP62 and TP61.

R.   HFO IN OPERATION

   1.   Connect RF generator to J105. Connect A-C VTVM to P2 of V106. Set
generator to 5 mc and attenuator for indication on VTVM.

S.   METER CALIBRATION

   1.   Set AVC switch to AVC and EXT/INT switch to INT position. Connect RF
generator to J104. Set generator for 5.0 mc at one microvolt output and 1 KC,
30% modulation, R196 maximum clockwise position.

   2.   Set RF GAIN and AUDIO GAIN controls to minimum position. Press red
button, and adjust R200 for zero on black scale. (When red button is released,
the "S" meter pointer will NOT be on zero; this is normal.) Set RF GAIN control
to maximum position.

   3.   Tune receiver to 5.0 mc, and adjust R150 until there is a slight deflec-
tion on "S" meter pointer.

S.   <u>METER CALIBRATION</u> - Cont'd

4. Set output of generator for 1000 microvolts and adjust R196 to read 60 db on "S" meter. Set output of generator to 100 microvolts. The meter should drop to 40 db $\pm$10%.

5. Set output of RF generator to 30 microvolts. Connect 600 ohm load across terminals 1 and 2. Connect Simpson VOM between terminals 1 and 2 of E101. Set VOM to 2.5V A-C scale. Connect earphones.

6. Press red button and hold in this position for the remainder of the test. Adjust LINE LEVEL to read zero db on VOM scale. Adjust R210 for zero center on red scale of "S" meter. Increase LINE LEVEL to read +5 db on "S" meter (it should read +5 db on the VOM $\pm$10%). Decrease LINE LEVEL to read -5 db on "S" meter (it should read -5 db on the VOM $\pm$10%).

T.   <u>SEND/REC SWITCH OPERATION</u>

1. Switch to SEND position. The receiver is disabled. Switch in REC position. The receiver will operate.

U.   <u>AVC SWITCH OPERATION</u>

1. Remove earphones. Connect 16 ohm load across terminals 4 and 7. Connect A-C VTVM across load. Set RF generator and TUNING dial to 5 mc.

2. Set generator attenuator for 1 microvolt. Set LINE LEVEL control for 2 volts on A-C VTVM. Set attenuator for 10,000 microvolts. The output should remain constant within 2 db.

3. Set attenuator on generator for 100 microvolts. Set MODE switch to CW position. Remove RF generator input. The pointer on the "S" meter will move fast towards zero db.

4. Reconnect RF generator. Set MODE switch to SSB position. Remov RF generator. The pointer on the "S" meter will move slowly toward zero db. Return MODE switch to AM position.

V.   <u>HUM LEVEL</u>

1. Set RF generator attenuator to 5 microvolts. Set AUDIO LEVEL control for 4 volts on A-C VTVM.

2. Turn RF GAIN control to full CCW position. The hum level should be 50 db down or better.

W.   <u>SQUELCH OPERATION</u>

    1. Set RF generator attenuator to 50 microvolts. Connect VOM to terminals 13 and 14 of E101, and switch to OHMS scale. Set SQUELCH control to full CW position.

    2. Carefully turn SQUELCH control in CCW direction until SQUELCH relay pulls in (VOM indicates open circuit). Set generator attenuator to 5 microvolts. The SQUELCH relay should open (VOM indicates closed circuit).

X.   <u>RF AND AUDIO NOISE LIMITERS</u>

    1. Remove A-C VTVM and connect oscilloscope across 16 ohm load. Set RF generator for 50% modulation.

    2. Turn RF NOISE LIMITER control toward full CW position. The waveform will be clipped, depending on the position of the control. Turn NOISE LIMITER control OFF.

    3. Set LIMITER toggle switch to LIMITER position (the waveform will be clipped). Return LIMITER toggle switch to OFF position. Remove oscilloscope and return modulation to 30%.

Y.   <u>MONITOR AUDIO CONTROL OPERATION</u>

    1. Plug earphones into PHONES jack. Vary MONITOR AUDIO control. The amplitude should vary with the position of the control. Remove earphones from PHONES jack.

Z.   <u>SPURIOUS BEATS</u>

    1. Ground ANT connector. Set MODE switch to CW, RF GAIN and LINE LEVEL control for maximum. Tune through each band listening for spurious beats. There should be no beats of appreciable magnitude.

AA. <u>INTERMODULATION</u>

    1. Connect A-C VTVM to TP104. Connect RF generator to J104 ANT input. Set generator to 9.5 mc, no modulation, and adjust attenuator for .35 volts on VTVM.

    2. Connect two RF generators to a 20 db "T" pad. Connect output of "T" pad to attenuator box and the box to J104.

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AA.   **INTERMODULATION** - Cont'd

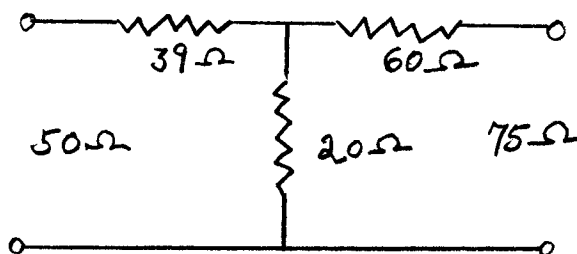3.   Set one generator to 31 mc, the other to 21.5 mc, and both generator attenuators for .1 volt output.

4.   Adjust attenuator box for .35 volts on VTVM.   Read db of attenuator box. The intermodulation should be 70 db or better.

BB.   **LISTENING TEST**

1.   Connect an outside antenna to the ANT input of the receiver and listen in on all bands throughout the range.

FIG. 3

50 to 75 ohms matching pad with 20 db loss.

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MAMARONECK, N.Y.
- - -
GPR-92A TEST DATA SHEET #1

SERIAL NO.: _____

MFG. NO.: _____

B. 1. Mechanical Check   _____ OK
    2. Wiring Check   _____ OK
D. 1. 250V D-C line +10%   _____ VOLTS
    2. 150V D-C line ±5%   _____ VOLTS
F. 2. 3.955 mc IF alignment   _____ OK
G. 2. IFO IN alignment   _____ OK
I.   IF Selectivity

IF SELECTIVITY CONTROL SETTING	BANDWIDTH AT 3 db
15 KC - MINIMUM	
7.5 KC +15%	
3 KC +15%	
2 KC +15%	
1 KC +15%	
.5 KC +15%	

J. 2. IFO Oscillator, voltage at junction of R143 and R142 (1-1 1/2 volts).
        _____ VOLTS.

M. BAND SPREAD

AMATEUR BAND	TUNING DIAL CHECK POINTS	BANDSPREAD DIAL CHECK POINTS	MAX. FREQUENCY ERROR
160 M	1.28 MC	Every 100 KC	
80 M	4.1 MC	Every 100 KC	
40 M	7.4 MC	Every 100 KC	
20 M	14.5 MC	Every 100 KC	
15 M	21.8 MC	Every 100 KC	
10 M	30.0 MC	Every 100 KC	

GPR-92A TEST DATA SHEET #2

N.   FINAL RF ALIGNMENT

BAND	FREQ. MCS.		MICROVOLT INPUT FOR 10DB SIGNAL TO NOISE RATIO	IMAGE RATIO	MAX. FREQ. ERROR
1	.60				
	1.00				
	1.3				
2	1.5				
	2.40				
	3.2				
3	3.4				
	4.40				
	5.4				
4	6.0				
	7.5				
	9.0				
5	10.00				
	14.0				
	17.0				
6	18.0				
	24.00				
	32.0				

O. 2. BFO Adjustment _____ OK

P. 2. 100 KC Adjustment _____ OK

Q. 2. BFO Isolation Amp.Check _____ OK

R. 1. HFO IN Operation _____ OK

S. 2-6. Meter Calibration _____ OK

T. 1. SEND/REC Switch Operation _____ OK

U. 2-4 AVC Operation _____ OK

V. 2. HUM LEVEL (should be
        50 db down or better) _____ DB

W. 2. SQUELCH Operation _____ OK

X. 2. NOISE LIMITER Operation _____ OK

    3. LIMITER Operation _____ OK

Y. 1. Monitor Audio Control
        Operation _____ OK

Z. 1. Check for beats at 7.0 and 10.5 MC _____ OK

        Check for beats at 1.82 MC, 2.275MC, 2.73MC, 3.18MC
            and 3.64 MC _____ OK

AA. 4. Intermodulation at 31.0 MC-21.5 MC = 9.5 MC (70
            db or better) _____ DB

DATE: _____   TESTER: _____

DATE	REV.	SHEET	EMN #	DESCRIPTION	APP.
1/25/66	∅			ORIGINAL RELEASE FOR PROD	
3/4/66	A	6,8,14	15897	Revised per EMN	
				THE TECHNICAL MATERIEL CORP. MAMARONECK NEW YORK	
	∅			ORIGINAL RELEASE FOR PROD	

TMC FORM MLR-1 2-65-AINS.