

**AIR-GROUND RADIO  
PRIVATE SYSTEMS  
ECHO-FOX UHF RADIO SYSTEM  
BASE TRANSMITTER GE-MASTR PROGRESS LINE  
TESTS**

***Warning: This equipment uses high voltages. Observe the safety precautions described in Section 010-110-001.***

This section outlines the procedures for the maintenance testing of the Echo-Fox UHF base station transmitter. The transmitter in this radio system is operated with primary power applied on a continuous, 24-hour per day basis. A release must be obtained from the operational control office before work may be performed which would interrupt or impair communications service.

This section is reissued to reflect the deletion of wideband service.

***Equipment Test Lists are affected.***

A record of meter indications should be logged and maintained at the station location. A record should be maintained of all adjustments, replacements, repair, or apparatus modifications. A sample maintenance log is shown in Fig. 1.

Many stations are not equipped with an electronic counter for frequency measurement. The frequency of the station must be measured at least on an annual basis. A service organization should be called or an electronic counter obtained to measure the frequency.

In applying the information contained in this section, it is necessary that maintenance personnel understand the equipment and test apparatus required in testing the transmitter.

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**APPARATUS:**

The following test apparatus is required for the performance of the tests in this section. Before performing any tests, ensure that each item of test equipment is properly calibrated in accordance with the manufacturer's specifications.

- 1—KS-14510 L1 Volt-Ohm-Milliammeter (VOM) with Test Probes
- 1—FM Deviation Meter, Oscilloscope type
- 1—J94021A Transmission Measuring Set (21A TMS)
- 1—Frequency Counter, accurate to 1 part in 10 million; Hewlett-Packard 5245L with 5253B Frequency Converter
- 1—Test Cable Set, Amphenol C133-216
- 3—Dummy Plugs, 258-type

**CHART 1**  
**FREQUENCY**

STEP	PROCEDURE
1	Verify that permission has been obtained from the control office to remove the station from service for the tests that follow.
2	On the jack field, insert a dummy plug in the TC1 LINE jack and 2 dummy plugs in the transmitter audio LINE jacks.
3	Set up the electronic frequency counter according to the manufacturer's specifications.  <i>Note:</i> At many stations, an electronic counter is not supplied with Echo-Fox service. It is therefore necessary to secure the services of a service organization at least at annual intervals to measure the frequency of the transmitter.
4	Connect the electronic counter to the RF sniffer jack on the power amplifier front panel.  <i>Note:</i> Do not overdrive the counter; however, the signal must be of sufficient amplitude to drive the level indicator meter on the counter specified into the green region.
5	Key the transmitter by plugging a 1P2A test cord into TC1 EQUIP and into the -48V test jack <i>in that order</i> .  <i>Note:</i> Reverse order may blow a fuse.
6	Measure and record the frequency.  <i>Requirement:</i> Within $\pm 2000$ Hz of the station frequency.

## CHART 1 (Cont)

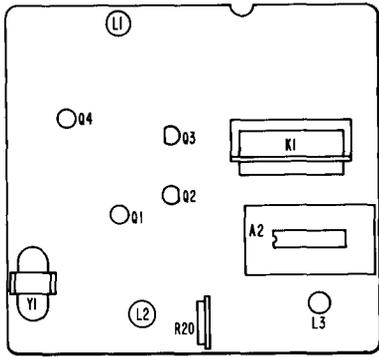
STEP	PROCEDURE
7	<p>If the requirement in Step 6 is not met, adjust the top slug of L2 (Fig. 2) until the proper frequency is obtained. If the frequency is unstable, refer to Section 406-116-502.</p>  <p>The diagram shows a rectangular circuit board layout. At the top left is a circular component labeled L1. Below it are four circular components labeled Q4, Q3, Q2, and Q1 arranged in a vertical line. To the left of Q1 is a component labeled Y1. At the bottom left is a circular component labeled L2. To its right is a component labeled R20. At the bottom right is a circular component labeled L3. In the center-right area, there are two rectangular components labeled K1 and A2, with K1 positioned above A2.</p>

Fig. 2—Wideband Modulator Board

CHART 2  
DEVIATION

STEP	PROCEDURE
1	Perform Steps 1 and 2, Chart 1.
2	Prepare the FM deviation monitor by connecting it to the RF sniffer jack on the power amplifier front panel and adjusting it to the frequency of the transmitter.
3	Connect a 21A transmission measuring set (21A TMS) to the TRS—EQPT jacks on the jack field. Set the controls to provide a $-6$ dBm 1000-Hz signal at the OSC OUT 600-ohm output.
4	<p>Key the transmitter by plugging a 1P2A cord into the TC1 EQUIP jack <i>first</i> and <i>then</i> into the <math>-48</math>V test jack.</p> <p><b>Requirement:</b> <math>\pm 10</math> kHz deviation, symmetrical and without distortion (Fig. 3).  <b>Note:</b> A small amount of limiting is acceptable.</p>
5	If the requirement in Step 4 is not met, refer to Section 406-116-502.
6	Remove the 1P2A test cord from the $-48$ V test jack <i>first</i> and <i>then</i> from the TC1 EQUIP jack to unkey the transmitter.
7	Remove the 21A TMS and the three dummy plugs.

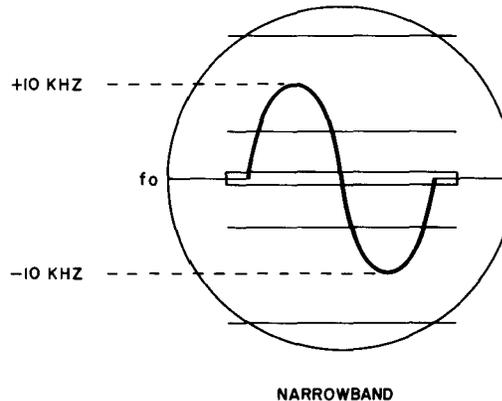


Fig. 3—Deviation Pattern

<b>CHART 3</b>	
<b>POWER AND VSWR</b>	
<b>STEP</b>	<b>PROCEDURE</b>
1	Verify that permission has been obtained from the control office to remove the station from service.
2	Insert a dummy plug into the transmitter TC1 LINE jack.
3	Key the transmitter by plugging a 1P2A test cord into the TC1 EQUIP jack <i>first</i> and <i>then</i> into the -48V test jack.
4	Locate the Station Guardian SWR switch on the dummy load panel and set it in the DUP position.
5	On the Station Guardian, set the RF POWER switch to CALIBRATE and adjust the STANDING WAVE RATIO CALIBRATE control for a full-scale indication on the bottom scale of the meter.
6	Set the RF POWER switch to SWR.  <b>Requirement:</b> 1.05 or less.
7	If the requirement of Step 6 is not met, check the diplexer, the transmitter tuning, and the RF cable between the transmitter and the diplexer.
8	On the Station Guardian, set the RF POWER switch to INCIDENT.
9	Observe the meter for power indication.

CHART 3 (Cont)

STEP	PROCEDURE
	<b>Requirement:</b> 200 watts.
10	Set the SWR switch to an ANT position.
11	Calibrate the Station Guardian for SWR (Step 5).
12	Measure the SWR.
	<b>Requirement:</b> 1.5 or less
13	If the requirement in Step 12 is not met, check the RF cabling, RF connectors, and the antenna. (Refer to Section 406-116-514, Chart 2.)
14	On the Station Guardian, set the RF POWER switch to INCIDENT.
15	Observe the meter for power indication.
	<b>Requirement:</b> 180 watts. (Represents .4 dB diplexer insertion loss.)
16	Unkey the transmitter. Remove the 1P2A test cord from the -48V test jack <b>first</b> .
17	Remove the dummy plug from the transmitter TC1 LINE jack.
18	Leave the SWR switch on the dummy load panel in the ANT position.

CHART 4

FILTERS AND BLOWERS

The blower which is installed on the power supply and which is used to cool the power amplifier tube on the power amplifier should be cleaned periodically to maintain its efficiency. The motor bearings must be oiled with an oil similar to Gulferest A (WCR) low viscosity every 2000 hours. **Do not allow oil to get on the impeller blades.** If the impeller blades become coated with oil, the blades should be removed and washed in a grease solvent and hot water; then replaced. Cabinet filters may be replaced with metal type, media coated.

Replacement part numbers for fans and blowers are as follows:

Power Amplifier Power Supply:

Blower Housing GE Part No. 5490323-P1

Similar to Detroit Stamping Type 350

**CHART 4 (Cont)**

Fan Impeller GE Part No. 7484137-P3

Centrifugal, clockwise rotation

Similar to Torrington Type 326-128

Motor GE Part No. 5490269-P1

115 Vac  $\pm$ 20 percent, 50/60 Hz, 1.10/1.30 A,

3450/2850 r/min, 1/20 HP, clockwise rotation,

Similar to GE 5KH14CG44A

Station Power Supply:

Fan GE Part No. 5493477-P1

Single phase, 115 Vac, 60 Hz, 14 W, counterclockwise rotation,

Similar to Rotron "Gold Seal Venturi Muffin Fan".

**CHART 5**

**METER INDICATIONS**

**Note:** Meter indications must be read with the transmitter keyed.

The indications should be read during each 30-day routine and compared from routine to routine. This may be used as a relative measure of equipment deterioration.

STEP	PROCEDURE
1	Remove the station from service.
2	On the jack field, insert dummy plugs in the TC1 LINE jack and the two transmitter audio LINE jacks.
3	Key the transmitter by plugging a 1P2A test cord into the TC1 EQUIP jack <i>first</i> and then into the -48V test jack.
4	Measure and record the exciter and power amplifier readings called for on the maintenance log (Fig. 1). Use the built-in meter switching panel, referring to Table A as a guide.

**TABLE A**  
**METER SWITCHING PANEL**  
**ECHO-FOX BASE STATION**  
**TRANSMITTER-RECEIVER**

POSITION TRANSMITTER SWITCH	TRANSMITTER FUNCTION	TRANSMITTER METER RANGE F.S.
(J102)		
A 10	MULT 1	1V
B 2	MULT 2	1V
C 3	AMPL 3	1V
D 4	MULT 3	1V
E 5	AMPL/MULT 4	1V
F 6	EXCT. PA GRID	1V
G 1	EXCT. PA PLT. 1	1V
H 11	EXCT. PWR OUT	1V
I 12	120 VOLTS	30V
J 9	EXCT. PA PLT. E	1,000V
K	EXTERNAL PROBE	3V
L/VM	REC. 2ND IF	1V

POSITION RECEIVER SWITCH	RECEIVER FUNCTION	RECEIVER METER RANGE F.S.
(J442)		
A 10	DISC	* 1V
B 2	2nd IF	* 1V
C 3	1st LIM	* 1V
D 4	MULT 1	* 1V
E 5	MULT 2	* 1V
G 1	AUDIO PA	* 1V
J 13	10 VOLTS	15V

\* Meter range may be increased to 3V by switch S1003.

**Note:**

1. Test probe P1003 is used to measure the high voltage power amplifiers
  - (a) control grid E/I (b) screen grid E/I.

CHART 5 (Cont)	
STEP	PROCEDURE
5	The PA PLATE I and PA PLATE E appear on dedicated meters mounted in the meter panel.
6	The indication for REL. PWR OUT (Pos H) and PA SCR.N. GRID (Pos K) will depend on transmitter alignment and equipment condition.
7	Unkey the transmitter. Remove the 1P2A test cord from the -48V test jack <i>first</i> .
8	Remove the dummy plugs inserted in Step 2.
9	Return the station to service.