PERFORMANCE REQUIREMENTS
TYPE LE-R1 RADIO RECEIVER
GENERAL EQUIPMENT REQUIREMENTS
RADIO SYSTEMS

1. GENERAL

1.01 This section covers the performance requirements which Type LE-R1 Radio Receivers shall meet before turnover to the Telephone Company. It is expected that the tests will be made by the Telephone Company.

1.02 This section is reissued to change limits in 3.02(4), 4.01(8) and 4.02(8).

1.03 Reference shall be made to Section 800-630-180 covering General Requirements and Definitions for additional information necessary for the proper application of the requirements.

1.04 ***Test Equipment:*** The requirements are based on the use of the following test equipment, or its equivalent:

1—*AC voltmeter, rated sensitivity not less than 1000 ohms per volt, accurate to ±0.3 volt at 6.4 volts and ±7.5 volts at 115 volts. (Suggest Weston Analyzer, Model 772, Type 6 or Model 779, Type 1).

1—*Generator, Standard Signal—For operation on 115 volts, 40 to 60 cycles with standard accessories, plus one type 774M cable jack—also one flexible coaxial cable, W.E. Type 724, eight feet long, with a W.E. 337A plug on one end and the above 774M cable jack on the other end—General Radio Company Type 805C—**OR**

*Generator, Standard Signal—for operation on 115 volts, 50 or 60 cycles as required, plus one output pad to match at one end an amphenol 83-ISPN (Navy #49195) coaxial plug and containing a 62-ohm ±5% non-inductive resistor—also, one flexible coaxial cable, W.E. Type 724, eight feet long, with a W.E. 337A plug on one end and an amphenol 83-ISPN coaxial plug on the other end—Measurements Corporation No. 65B—**OR**

*Generator, Standard Signal—For operation on 115 volts, 50 or 60 cycles as required, with accessories, plus one dummy antenna containing a 22 ohm non-inductive resistor and one dummy antenna containing a 62 ohm non-inductive resistor, and one type 187-58 jack—also, one flexible coaxial cable, W.E. type 724, eight feet long, with a W.E. 337A plug on one end and the above type 187-58 jack on the other end—Federal Manufacturing and Engineering Corporation No. 605-CS or General Radio No. 605B—**OR**

*Generator, Signal—For operation on 115 volts, 50 or 60 cycles as required, equipped with amphenol 83-1R coaxial connector, one dummy antenna model 440A containing a 43 ohm ±5% non-inductive resistor, one standard cable for high voltage output, and one 30 ohm cable with output box containing a 30 ohm termination to fit amphenol 83-1R output jack. Also, one flexible coaxial cable, W.E. type 724, eight feet long, with a W.E. 337A plug on one end and an amphenol 83-ISPN coaxial plug on the other end—Ferris Instrument Company No. 22D.

1—217D Plug, 600-ohm termination

1—Special 1002C Headset, consisting of:

2 — 509 Receivers
1 — 1B Headband
1 — R2FG Cord, 3 feet 6 inches long
1 — 289B Plug

1—122 Tool, 7/16-inch end wrench

1—Screwdriver, 3-1/2 inch x 3/16 inch blade, Yankee No. 95

1—367 Tool, 7/16 inch Socket Wrench

Note: *It is recommended that these items be ordered suitable for tropical service (specified as "tropicalized") if equipment is to be used in such an environment. Tropical environment may be defined for this purpose as one in which the lowest mean monthly temperature is 64°F or above and the mean daily relative humidity is 75% or above for a period of a month or more.

2. GENERAL

2.01 A check should be made on whether all the vacuum tubes are installed in their sockets and that the AC power supply and ground are connected. With the AC POWER toggle switch in the OFF position, the two heating lamps should be operated.

3. PRELIMINARY ADJUSTMENTS

3.01 *AC Power Tests*

(1) Operate the AC POWER toggle switch to ON. The heating lamps should now be extinguished and the white indicator lamp AC POWER should light.

(2) Using the test analyzer, measure the AC voltage across terminals 1 and 2 of transformer T301 located on the MV and AC POWER panel. The voltage reading should be between 109 and 121 volts.

(3) Measure the voltage across terminals 3 and 4 of transformer T301. The voltage reading should be between 5.8 and 7.0 volts.

(4) Adjust the DC output voltage of the regulated rectifier to 150 volts by means of the screwdriver adjustment on the rectifier panel located at the bottom of the cabinet. The meter mounted on the rectifier panel should be used as the indicator.

3.02 *DC Metering Tests*

(1) Remove the coaxial plug from ANT-REC jacks and insert the 217D (600-ohm termination) plug in the REC OUT jacks on the front panel.

(2) Set the receiver controls as follows:

VF GAIN knob—Maximum counterclockwise (this control is on the L.F. panel)

PRIVACY knob—OFF

AFC knob—A & B

MVC knob—Maximum clockwise

AVC-MVC toggle switch—MVC

PILOT AMP GAIN knob—5

PILOT ALARM toggle switch—OFF

HF CRYSTAL switch—1

(3) Insert an HY crystal into the jacks of position 1.

(4) The tube currents and DC voltage as indicated on the DC METERING microammeter shall lie within the following limits when the DC METERING knob is thrown to the indicated positions:

POSITION OF DC METERING KNOB	TUBE	METER READING	SPECIAL CONDITIONS
HF AMP 1	V201	60-115	
HF AMP 2	V202	60-115	
HF DEMOD	V203	60-115	
MF AMP 1	V204	60-115	
MF AMP 2	V205	60-115	
MF DEMOD	V206	60-115	
PILOT AMP	V207	60-115	
LF AMP	V501	60-115	
VF AMP	V502	60-115	
HF OSC	V208	14-32	
MF OSC CONT	V209	10-40	Toggle switch AFC - OFF
MF OSC	V209	90-150	
CAR A OSC	V520	15-28	
CAR B OSC	V520	15-28	
PILOT A AMP 1	V503	60-115	
PILOT A LIM 1	V504	8-22	
PILOT A AMP 2	V506	60-115	
PILOT A LIM 2	V507	8-22	
PILOT B AMP 1	V508	60-115	
PILOT B LIM 1	V509	8-22	
PILOT B AMP 2	V510	60-115	
PILOT B LIM 2	V511	8-22	
RATE CONT AMP	V301	8-15	Knob SW RATE max. C.W. - Switch PRIVACY SYNC - OFF
		20-45	Knob SW RATE max. C.C.W. - Switch PRIVACY SYNC - OFF
RATE MV	V302	30-55	Maximum
GATING MV DRIVER	V303	Swing from 0 to 30-70	
SWITCHING A MV	V304	Swing from 0 to 45-85	
SWITCHING B MV	V304	Swing from 0 to 45-85	
GATING MV	V305	Swing from 0 to 15-40	
CAR A SW AMP	V518	50-90	
CAR B SW AMP	V519	50-90	
ALARM DET	V517	70-125	Screwhead PILOT ALARM DET ADJ - max. C.W.
		0-7	Screwhead PILOT ALARM DET ADJ - max. C.C. W. MVC-O
PILOT A GATED LIM	V513	4-22	Knob MVC-0
PILOT B GATED LIM	V515	4-22	Knob MVC-0
DC AMP	V516	Swing from 0 to 25-50	Screwhead SYNC DISABLING ADJ - max. C.W. Knob MVC-0
DC SUPPLY VOLTS		145-155	

4. HF MEASUREMENTS

4.01 *Overall Gain*

(1) Remove the coaxial plug from the ANT-REC jacks, plug a headset into the MON jacks and plug the 217D (600 ohm) plug into REC OUT jacks

(2) Set the receiver controls as follows:

VF GAIN knob—Maximum clockwise (this control is on the LF panel).

PRIVACY knob—OFF

MVC knob—5 (Check that the knob fastened to the MVC potentiometer shaft reads 10 when rotated full clockwise).

AVC-MVC toggle switch—MVC

PILOT AMP GAIN knob—5 (Check that the knob reads 10 when rotated full clockwise)

(3) Connect the signal generator (using a series resistance, if necessary, to build up its output impedance to 72 ohms) to the REC jack.

(4) Set the HF CRYSTAL knob to the position for the lowest operating frequency and the HF RANGE knob for the range given below. Set the HF TUNING dial to an approximately correct position, by remembering that in each range the frequency settings increase with calibration. If the Bell System Practice R20.310 is available, the HF TUNING dial settings may be read from the calibration curve in the practice.

POSITION	FREQUENCY RANGE MC
1	2.7 - 5.5
2	5.5 - 11.4
3	11.4 - 25.0

(5) Set the signal generator for the operating frequency.

(6) Turn the MF OSC ZERO ADJ knob until an audio note (approximately 1000 cycles) is heard in the headset.

(7) Tune the HF TUNING—COARSE and FINE knobs for a maximum indication on the OUTPUT VOLUME meter.

(8) ***Requirement:*** With the input to the receiver set at 50 microvolts, the MVC control shall be set for zero level on the OUTPUT VOLUME meter. The setting of the MVC knob shall be 4.8 or less for frequencies below 17.8 megacycles and 5.8 or less for frequencies above 17.8 megacycles.

(9) Turn off the signal generator. The OUTPUT VOLUME meter shall read less than −10 VU.

(10) Record the settings of the HF RANGE, HF TUNING (COARSE and FINE) and HF CRYSTAL on the FREQ CALIBRATION dial drum.

4.02 ***AVC Test***

(1) Set the receiver controls as follows:

PILOT METERING knob—PILOT A

PRIVACY knob—OFF

AFC knob—A & B

MVC knob—5

AVC-MVC toggle switch—MVC

PILOT AMP GAIN knob—5

(2) Connect the signal generator (using a series resistance, if necessary, to build up its output impedance to 72 ohms) to the REC jacks.

(3) Set the HF CRYSTAL knob to the position for the lowest operating frequency. Set the HF RANGE knob and the HF TUNING dial to their correct positions corresponding with the operating frequency chosen.

(4) Set the signal generator for the operating frequency.

(5) Move the AFC toggle switch to OFF and turn the MF OSC ZERO ADJ knob until an audio note of approximately 1000 cycles is heard in the headset. Release the AFC toggle switch and adjust the HF TUNING—COARSE and FINE knobs for a maximum indication on the OUTPUT VOLUME meter.

(6) Set the input to the receiver to 5 microvolts, set the AFC toggle switch to OFF and adjust the MF OSC ZERO ADJ knob for a peak indication on the PILOT METERING meter. Release the AFC toggle switch when the peak is obtained. The MVC key may be changed in this set-up.

(7) Set the AVC-MVC toggle switch to AVC and turn the MVC knob slowly to maximum clockwise.

(8) Increase the input to the receiver in steps to 50,000 microvolts. The PILOT METERING meter shall read less than 90 microamperes. If the HF RANGE knob is on positions 1 or 2, the plate currents of V201, V202, V203, V204 and V205 as indicated on the DC METERING meter shall not exceed 10 microamperes. If the HF RANGE knob is on position 3, the plate

currents of V201 and V202 shall be between 60-115 and the plate currents of V203, V204 and V205 shall not exceed 10. In carrying out this test, care should be taken to prevent a sudden shift of the signal generator frequency due to vibration or jarring. Otherwise, it may be necessary to retune the receiver with the 50,000 microvolt input.

(9) Repeat steps (5) to (8) inclusive with the PILOT METERING knob on PILOT B.

4.03 ***AFC Holding***

Repeat steps (1) to (6) inclusive of 4.02 as steps (1) to (6) of this section.

(7) Adjust the MVC knob to obtain a reading of 50 microamperes on the PILOT METERING meter.

(8) Move the MF OSC ZERO ADJ knob slowly to a position 1/4 of a division above its last setting and observe on the PILOT METERING meter that the AFC keeps the receiver in tune. Move the MF OSC ZERO ADJ knob slowly to a position 1/2 of a division below the last setting and observe, as before, that the AFC keeps the receiver in tune.

(9) Throw the PILOT METERING knob to PILOT B and repeat steps (6) to (8) inclusive.

4.04 ***Privacy Switching***

(1) Connect a headset to the MON jacks, insert the 217D (600 ohm) plug in the REC OUT jacks, and set the receiver control as follows:

PILOT METERING knob—PILOT A

PRIVACY knob—OFF

AFC knob—PILOT A

MVC knob—5

AVC-MVC toggle switch—MVC

PILOT AMP GAIN knob—5

(2) Connect the signal generator (using a series resistance, if necessary, to build up its output impedance to 72 ohms) to the REC jacks.

(3) Set the HF CRYSTAL knob to the position for the lowest operating frequency. Set the HF RANGE knob and the HF TUNING dial to their correct positions corresponding with the operating frequency chosen.

(4) Set the signal generator for the operating frequency.

(5) Move the AFC toggle switch to OFF and turn the MF OSC ZERO ADJ knob until an audio note of approximately 1000 cycles is heard in the headset. Release the AFC toggle switch and adjust the HF TUNING—COARSE and FINE knobs for a maximum indication on the OUTPUT VOLUME meter Adjust the receiver input to obtain 0 VU indication on the OUTPUT VOLUME meter.

(6) Operate the PRIVACY knob to INV and observe that an audio note (not necessarily at the same frequency) is heard in the headset.

(7) Operate the PRIVACY knob to SW and observe that two audio notes are heard, switched regularly from one to the other.

(8) Operate the SW RATE knob to the maximum counterclockwise position. Depress the PRIV SYNC toggle switch to OFF and count the number of switches occurring in 10 seconds. This count shall be 18 or less.

(9) Repeat (8) with the SW RATE knob in the maximum clockwise position. The number of switches occurring in 10 seconds shall be 22 or more.

(10) Observe that the rotation of the SW RATE knob affects the rate of the switching.

4.05 ***Audio Frequency Characteristic***

Repeat steps (1) to (6) inclusive of 4.04 as steps (1) to (6) of this section.

(7) Vary the MF OSC ZERO ADJ knob so that the audio note heard in the headset changes from a low frequency (about 250 cycles) to a high frequency (about 3250 cycles) and observe that the VU meter remains within ± 2 db. A sharp dip in the VU meter indicates a trouble condition in the crystal channel filter YF501.

4.06 ***Pilot Alarm***

Repeat steps (1) to (6) inclusive of 4.04 as steps (1) to (6) of this section.

(7) Set the input to the receiver to 5 microvolts. Depress the AFC toggle switch to OFF and turn the MF OSC ZERO ADJ for a peak indication on the PILOT METERING meter. Release the AFC toggle switch when the peak is obtained.

(8) Adjust the MVC knob until a reading of 50 microamperes is obtained on the PILOT METERING meter.

(9) Reduce the input to the receiver to 1 microvolt.

(10) Operate the PILOT ALARM toggle switch to ON. Slowly turn the PILOT ALARM DET ADJ screwdriver adjustment (on the lower portion of the right-hand side of the cabinet) clockwise until the pilot alarm buzzer just operates.

(11) Increase the input to the receiver to 5 microvolts. The pilot alarm buzzer shall cease operating.