

**AIR-GROUND RADIO
PRIVATE SYSTEMS
ERCO 362-R RECEIVER
TESTS**

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1. GENERAL

1.01 This section covers maintenance methods for the Erco type 362-R UHF receiver and associated equipment.

1.02 This section is reissued to provide information on the preamplifier, carrier operated relay and receiver muting units, modifications and relay adjustment. Marginal arrows have not been used to indicate changes.

1.03 Safety Precautions: It is essential that all personnel performing work on this receiver be aware of possible shock hazards and be thoroughly familiar with Standard Safety Practices. Before making resistance measurements or replacing components, make sure that primary power is disconnected and all filter capacitors are discharged.

1.04 Receivers are operated on a twenty-four hour basis, with power applied. A release must be obtained from the control location before any work is performed which could interrupt or impair service. Most installations provide duplicate equipment operating on the same frequency which may be used by the control location while maintenance is being performed on the alternate equipment.

2. TEST EQUIPMENT

2.01 The following test equipment, or equivalent, is required to perform the tests and adjustments of this section:

- (a) Signal Generator, Model 80 with Model 80-ZH Matching Pad, 6 db (Measurements Corporation) or Model 608D (Hewlett-Packard).
- (b) Vacuum Tube Voltmeter, Model 410B (Hewlett-Packard).
- (c) Transmission Measuring Set, 13A (W.E. Co.).
- (d) Frequency Meter for correct carrier frequency, accurate to $\pm 0.001\%$ or better.
- (e) Resistor, 2200-ohm 1-watt carbon with alligator clips.
- (f) Meter, 0-2 or 0-2.5 milliamperes dc.
- (g) Meter, 0-10 volts ac.
- (h) Oscillator, 19C (W.E.Co.).
- (i) Attenuator, 5A (W.E.Co.).
- (j) Adapter, coaxial tee, Amphenol 82-36.
- (k) Headphones, 2000 ohm.

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2.02 The following special test cords will be required and should be made locally.

CORD NO.	TYPE WIRE & LENGTH	END 1	END 2
1	3' coaxial	N plug	N plug
*2	3' coaxial	N plug	alligator clips
3	3' coaxial	N plug	alligator clips (300-ohm series resistor)
4	3' coaxial	N plug	alligator clips (2.2 mmf series capacitor)
5	3' two conductor	spade tips	alligator clips
6	tee connector		

* Two required.

3. PERFORMANCE TESTS

3.01 These tests will check the over-all operating condition of the receiver. A test of the preamplifier, codan relay, and receiver muting units should also be made when the receiver is so equipped.

3.02 If the receiver and associated equipment meet the requirements of Part 3, no further tests are required.

3.03 Procedure:

Note: Turn signal generator ON and allow at least 1/2-hour warmup time.

- (a) Connect output of signal generator through 6 db pad and tee connector to receiver input.
- (b) Remove connections to output terminals on TS-1 of receiver.
- (c) Connect headphones to PHONE jack.
- (d) Adjust signal generator to approximate receiver frequency.
- (e) Adjust generator output to 100 microvolts.
- (f) Adjust signal generator to 1000 cycles at 30% modulation.
- (g) Operate SQUELCH switch on receiver to OFF. Do not disturb RF GAIN control. Adjust AUDIO GAIN control as required.

- (h) Adjust generator frequency dial until 1000-cycle modulation is heard.
- (i) Remove 1000-cycle modulation from signal generator.
- (j) Connect output of frequency meter to tee connector.
- (k) Connect 600-ohm input of transmission measuring set to terminals 2 and 3 of TS-1.
- (l) Operate the frequency meter for RF output and adjust signal generator frequency for zero beat.
- (m) Disconnect frequency meter.
- (n) Adjust signal generator to 1000 cycles at 30% modulation.
- (o) Observe frequency dial reading on signal generator and reading on transmission measuring set. Slowly rock dial on signal generator and observe that maximum reading on transmission measuring set occurs at same dial reading as zero beat with frequency meter was obtained.
- (p) Operate receiver SQUELCH control to ON.

Note: Where the receiver is equipped with an adjustable squelch control, it is assumed it has been adjusted in accordance with instructions. (Refer to Paragraph 7.02.)

3.04 Adjust the signal generator as specified below and modulate with 1000 cycles at 30% where indicated. As output of generator is increased above 50 microvolts, readjust generator frequency for each step by adjusting for maximum reading on the transmission measuring set. Adjust AUDIO GAIN control fully clockwise. Remove headphone from receiver.

REQUIREMENT TABLE

REC. INPUT MICROVOLTS	REC. INPUT dbm	SQUELCH	COR UNIT
1 (no mod.)		Closed	Released
3 (no mod.)		Open	Operated
3 (mod.)	+25 ± 1.5	"	"
10 (mod.)	+31.5 ± 1.5	"	"
100 (mod.)	+33 ± 1.5	"	"
1,000 (mod.)	+33 ± 1.5	"	"
10,000 (mod.)	+33 ± 1.5	"	"

Note: When using a signal generator with high incidental frequency modulation, readings will be approximately 4 db higher. The readings listed are those obtained with a generator with low incidental frequency modulation such as the Hewlett-Packard Model 608D.

3.05 For a test of the signal plus noise-to-noise ratio:

- (a) Turn squelch off and adjust RF GAIN control fully clockwise.
- (b) Adjust signal generator to operating frequency and adjust for 30% modulation at 1000 cycles.
- (c) Adjust RF signal from generator to minimum.
- (d) Connect 600-ohm input of transmission measuring set to terminals 2 and 3 of TS-1.
- (e) Adjust AUDIO GAIN control for convenient reference on noise.
- (f) Increase RF output of signal generator until transmission measuring set reads 10 db more than in Step (e).
- (g) Read value of RF input from generator dial. This value is the RF input required for 10 db signal plus noise-to-noise ratio.

Requirement: The value of RF input shall be $5 \text{ microvolts} \pm 1.5 \text{ microvolts}$ for 10 db $\frac{S + N}{N}$ for the receiver only.

3.06 Where the receiver is equipped with the preamplifier, proceed as follows:

- (a) Adjust signal generator to operating frequency and adjust for 30% modulation at 1000 cycles.
- (b) Connect transmission measuring set to terminals 2 and 3 of TS-1.
- (c) With signal generator connected to receiver input, provide an RF input signal of 10 microvolts, and adjust AUDIO GAIN control for a reading of 0 dbm on transmission measuring set.
- (d) Disconnect signal generator from receiver input. Connect output of preamplifier to receiver input and connect signal generator to preamplifier input.

(e) Read transmission measuring set.

Requirement: The reading on the transmission measuring set shall be $+10 \text{ dbm} \pm 2 \text{ db}$.

3.07 If the receiver and preamplifier meet performance requirements, reconnect the antenna and connections to TS-1. Set RF GAIN and SQUELCH as required. Adjust AUDIO GAIN in accordance with local practice for correct line level.

4. MAINTENANCE TESTS AND ADJUSTMENTS

Caution: The following tests require that the receiver be out of service. A release must be obtained from the control location before making these tests.

4.01 Maintenance tests and adjustments are to be made only when the receiver and preamplifier are installed or fail to meet the performance tests.

A. Operating Frequency

4.02 Adjust signal generator to receiver frequency (Paragraph 3.03) and check receiver output. Adjust signal generator for maximum reading on transmission measuring set. Read frequency of signal generator and compare with setting when zero beat with frequency meter. A significant difference in the two frequency settings indicates that the receiver crystal frequency is outside the tolerance limit.

B. Sensitivity and Squelch

4.03

- (a) Adjust signal generator to receiver frequency and set output to 1.0 microvolt unmodulated.
- (b) Adjust RF GAIN control to the point where receiver squelch just closes.
- (c) Increase generator output until squelch opens.
- (d) Reading on generator output dial shall be between 3 and 5 microvolts.
- (e) If the receiver is equipped with a preamplifier, proceed as specified in Paragraph 4.13.

C. Audio Output

4.04

- (a) Adjust signal generator to receiver frequency and set output to 50 microvolts modulated 30% at 1000 cycles.
- (b) Adjust receiver AUDIO GAIN control for output level specified in local instructions.

4.05 Remove all test equipment connections to preamplifier and receiver.

4.06 Reconnect antenna and connect audio output line and control lines to TS-1.

D. Alignment

4.07 Failure of the receiver to meet performance requirements does not necessarily mean that the receiver is misaligned. Normally, alignment of the receiver is not required and should not be attempted unless components have been replaced which affect the RF or IF circuits or after tests in Part 5 indicate incorrect alignment. If an alignment of the IF stages is made, a check must be made to insure that the required bandwidth of 100 kc at the 6 db points and a center frequency of 9 megacycles are maintained.

Oscillator

4.08 This procedure should be used only if the oscillator section is so far out of alignment that the receiver will not pass a signal or if the receiver is to be aligned to a different operating frequency.

- (a) Connect positive lead of VTVM to pin jack G and negative lead to pin jack TP1. Set meter range to 3 volts dc.
- (b) Adjust C-11, C-20, and C-21 to maximum capacity.
- (c) Adjust C-20 to FIRST maximum reading on meter as capacitor is rotated from maximum to minimum.
- (d) Adjust C-11 to FIRST maximum reading on meter as capacitor is rotated from maximum to minimum.
- (e) Adjust C-21 to FIRST minimum reading on meter as capacitor is rotated from maximum to minimum. This is a preliminary adjustment. (Refer to Paragraph 4.09.)

First IF Amplifier

4.09

- (a) Connect 0-10 ac voltmeter to terminals 2 and 3 of TS-1.
- (b) Operate receiver RF GAIN and AUDIO GAIN controls fully clockwise and SQUELCH to OFF.
- (c) Connect output of signal generator through special test cord #3 to point "C", the holder of CR-1.
- (d) Adjust generator frequency to the first IF frequency modulated 30% at 1000 cycles.

Note: Generator may be set to the correct frequency by using an output modulated 30% at 1000 cycles of sufficient level to produce a usable reading on the 0-10 ac voltmeter. Rock generator dial to obtain maximum reading on voltmeter. Reduce generator output as required to keep reading at less than one-half scale.

- (e) Adjust T-1 and T-2 for maximum reading on meter.
- (f) Adjust C-21 for maximum reading on meter. (Refer to Paragraph 4.08.)
- (g) Repeat Steps (e) and (f) until maximum reading is obtained.
- (h) Remove signal generator connections.

Second IF Amplifier

4.10 This alignment is a very precise adjustment and must be performed accurately.

- (a) Connect headphones to PHONE jack.
- (b) Connect 0-10 ac voltmeter to terminals 2 and 3 of TS-1.
- (c) Connect frequency meter to receiver antenna jack using special test cord #2.
- (d) Connect signal generator to pin 4 of V3 and ground using special test cord #4.
- (e) Operate RF GAIN and AUDIO GAIN controls fully clockwise and SQUELCH to OFF.
- (f) Adjust signal generator frequency to approximately 9.0 megacycles and output to approximately 100 microvolts unmodulated.

- (g) Operate frequency meter and rock generator frequency dial to obtain zero beat.
- (h) Remove frequency meter connection from receiver.
- (i) Remove signal generator connection from pin 4 of V3 and connect to test point "A", the junction of C-21 and C-22, using special test cord #4.
- (j) Disable the AVC by connecting test point "B", the junction of R-35 and R-36, to ground.
- (k) Adjust signal generator to 1000 cycles at 30% modulation.
- (l) Adjust generator output to give usable reading on 0-10 voltmeter.
- (m) Connect 2200-ohm resistor with clip leads across TF-7.
- (n) Adjust tuning slug of TF-8 for maximum indication on 0-10 voltmeter.
- (o) Remove resistor from TF-7 and connect across TF-8. Adjust TF-7 for maximum indication on meter.
- (p) Repeat adjustments (m), (n), and (o) for TF-5, TF-6; TF-3, TF-4; and TF-1, TF-2 in that order.
- (q) Remove 2200-ohm resistor and connection at test point "B" and ground.

AVC Amplifier

4.11

- (a) With signal generator connected and operating as in Paragraph 4.10, adjust output for minimum usable indication on 0-10 voltmeter. Rock frequency dial on generator for maximum reading on meter.
- (b) Operate receiver AUDIO GAIN control fully counterclockwise.
- (c) Connect VTVM probe to test point "B", the junction of R-35 and R-36, with common lead connected to the chassis. Set meter range switch to 3-volt range.
- (d) Adjust generator output to approximately 1000 microvolts.

- (e) Adjust tuning slug of TF-9 for maximum negative voltage reading on VTVM.
- (f) Remove all connections from receiver except the 0-10 voltmeter.

Preselector and 2nd Multiplier

4.12

- (a) Disconnect RFC-2 from ground by removing the 4-40 screw located on the preselector unit and connect a 0-2 milliamperere dc meter in series with RFC-2 and ground.
- (b) Set the preselector tuning capacitors ANTENNA, INTERSTAGE and OUTPUT to the approximate values for the receiver operating frequency as follows:

OPERATING FREQUENCY MC	CAPACITOR SETTING
220	Maximum
230	3/4 Mesh
250	1/2 Mesh
320	1/4 Mesh
400	Minimum

- (c) Adjust receiver RF GAIN and AUDIO GAIN controls fully clockwise and SQUELCH to OFF.
- (d) Connect signal generator to receiver antenna jacks through 6 db pad. Adjust frequency to approximately the receiver operating frequency.
- (e) Adjust generator output to approximately 100 microvolts and modulate with 1000 cycles at 30% modulation.
- (f) Rock frequency dial on generator to obtain maximum reading on 0-10 voltmeter. Reduce generator output to keep reading on meter to lowest usable indication as correct frequency is approached.
- (g) Remove modulation from generator.
- (h) Connect VTVM to receiver test point "D", the junction of R-44 and R-45, and ground. Set range switch to 10 volts.
- (i) Adjust C-4 for maximum reading on 0-2 milliamperere meter. The reading should be between 0.5 and 2.0 milliamperes.

- (j) Retune the following controls in sequence for maximum reading on VTVM.

Note: Reduce generator output as required to keep reading on meter to the minimum usable indication.

SEQUENCE	DESCRIPTION	ADJUST
1	1st IF Plate Transformer	T-2
2	2nd MIXER Capacitor	C-21
3	Oscillator Capacitor	C-20
4	1st Multiplier Capacitor	C-11
*5	2nd Multiplier Capacitor	C-4
6	Preselector Antenna, Inter-stage and Output	
7	1st IF Grid Transformer	T-1

* Under certain conditions when tuning C-4 the reading on the VTVM will reach a maximum, then go through a dip and return to maximum. This dip occurs at the maximum reading on the 0-2 milliamperes meter. The best signal plus noise-to-noise ratio usually occurs when C-4 is tuned to this dip.

Note: Selection of 1N21B diodes will provide a better signal plus noise-to-noise ratio. In general, the 1N21B which produces the highest reading on the 0-2 milliamperes meter not exceeding 2 milliamperes, will produce the best signal plus noise-to-noise ratio.

- (k) Remove all connections from receiver.

Note: The preselector design of the receiver does not produce any gain. Do not attempt to align the preselector after the antenna is connected, except to peak the ANTENNA adjustment when the preamplifier is used.

Preamplifier (When Equipped)

4.13

- (a) Connect output of preamplifier to receiver antenna connector.
- (b) Connect signal generator to input of preamplifier using 6 db pad.
- (c) Adjust signal generator to receiver frequency. Adjust to 3.0 microvolt output modulated 30% at 1000 cycles.
- (d) Connect 600-ohm input of transmission measuring set to terminals 2 and 3 of TS-1.

(e) Adjust TUNE adjustment on preamplifier for maximum reading on transmission measuring set.

(f) Adjust the ANTENNA adjustment on preselector for maximum reading on transmission measuring set.

(g) Repeat Steps (e) and (f) until no further increase is obtained.

(h) Disconnect signal generator and connect antenna to input of preamplifier.

5. TROUBLE LOCATING AND CORRECTION

5.01 When a receiver fails to meet the requirements in Part 3 or 4 and the cause of the trouble is not apparent, the procedures in this part should aid in localizing the trouble.

5.02 Tube substitution, along with voltage and resistance measurements, should in general, localize the trouble. Tube substitution should be made one at a time with tubes known to be good. If the new tube does not correct or improve the trouble condition, replace the original tube in its socket.

5.03 In all cases after trouble is corrected the receiver shall meet the performance tests in Part 3.

5.04 Voltage Supply

- (a) Measure dc voltage between the following points. (RF GAIN full clockwise, no signal input. Line voltage 120.)

Note: Replacement of V-10 and V-11 with a silicon rectifier unit requires installation of an 80-ohm 10-watt resistor from pin 8 of rectifier to the positive terminal of C-60B.

TEST POINTS	VOLTS DC
V-11(8) and Chassis	190 ±10
Junction of CH-1 and C-57B and Chassis	160 ±15
Across CH-1	30 ±5

5.05 Stage Gain

- (a) Connect receiver test point "B" to ground.
- (b) Connect VTVM to receiver test point "D" and ground.
- (c) Connect 0-10 ac voltmeter to terminals 2 and 3 of TS-1.
- (d) Connect and operate signal generator as required in following chart:

INJECTION POINT	METHOD OF GENERATOR CONNECTION	GENERATOR FREQUENCY	SIGNAL INPUT (μ V) for TEST POINT "D" VOLTAGE (Note 4)		
			6 Volts	2 Volts	1 Volt
J2	6 db pad	Receiver Frequency (Note 1)	5		
TP "C"	300-ohm resistor in series with generator (do not use 6 db pad)	1st IF (Note 2)	3		
V2(1)	Direct (do not use 6 db pad)	1st IF (Note 2)	220	70	
TP "A"	"	9 Mc (Note 3)	750	220	85
V3(4)	"	"	1,300	350	140
V4(4)	"	"	22,000	7,000	3,000
V5(4)	"	"			48,000
*V7(2)	"	"			50,000

* Remove ground from test point "B" and connect VTVM from "B" to ground. Connect signal generator across R-30.

Note 1: Adjust generator to correct frequency by method shown in Paragraph 4.12 (c), (d), (e), and (f).

Note 2: Adjust generator to correct frequency by method shown in Paragraph 4.09 (b), (c), and (d).

Note 3: Adjust generator to correct frequency by method shown in Paragraph 4.10 (a), (c), (d), (e), (f), and (g).

Note 4: The values listed are for the receiver without the preamplifier.

(e) The signal inputs listed are average values. If any stage requires excessive input (approx. double) while the following stage is average, trouble in that stage is indicated.

(f) Greater gain at a frequency slightly above or below the correct operating frequency may indicate incorrect alignment of the 2nd IF. (Refer to Paragraph 4.07.)

(g) Gain of the preamplifier may be determined by procedure in Paragraph 3.06.

5.06 Audio Gain

(a) Adjust receiver AUDIO GAIN control fully clockwise.

(b) Connect transmission measuring set to terminals 2 and 3 of TS-1, using special test cord #5.

(c) Connect audio oscillator adjusted for 1000 cps through attenuator and adjust levels and attenuation as follows:

INPUT POINT	OSCILLATOR OUTPUT	ATTENUATOR LOSS	READING TMS
V-13(4) and V-15(3) (across R-52)	+5 dbm	26 db	-6 dbm to 0 dbm
V-12(1) and Ground	+5 dbm	0	-6 dbm to 0 dbm

5.07 Voltage Measurements: Nominal voltage measurements made with a VTVM between ground and tube socket pins are shown in Table 1. Measurements may differ from the values shown $\pm 10\%$ due to variations in supply voltage, resistor tolerances, differences in tubes and meter accuracy. (See Paragraph 5.04.)

5.08 Resistance Measurements: Nominal resistance measurements made with an ohmmeter between ground and tube socket pins are shown in Table 2. Measurements on a receiver may differ from the values shown $\pm 10\%$ due to tolerances of components.

TABLE 1
TYPE 362-R — SOCKET PIN VOLTAGES

Typical values between chassis and tube socket pins measured with VTVM. All voltages dc, positive except where otherwise noted.

SYMBOL	PIN NUMBER								
	1	2	3	4	5	6	7	8	9
V1	0	2.2	F	0	140	95	2.2	—	—
V2	0	2.5	F	0	150	90	2.5	—	—
V3	0	0	4.0	0	4.5	100	F	150	—
V4	0	0	4.0	0	4.5	100	F	150	—
V5	0	0	4.0	0	4.5	100	F	150	—
V6	0	0	*	*	*	TP	F	*	—
V7	0	3.5	6	100	*	140	0	F	—
V8	−0.5 to −1.0	0	0	F	55	35	0	—	—
V9	65	1.0**	1.5	F	0	70	0	1.0	0
V10	TP	0	175 ac	NC	175 ac	NC	F	175	—
V11	TP	0	175 ac	NC	175 ac	NC	F	175	—
V12	0	0	15	TP	140	NC	F	150	—
V13(SO)	*	150	*	42	110	50	F	0	—
V13(SC)	*	150	*	30	150	47	F	0	—
V14(SO)	*	150	*	*	90	0	F	0	—
V14(SC)	*	150	*	*	35	0	F	0	—
V15	0	0	35-60	50	*	TP	F	*	—

NC — No connection.

TP — Tie Point.

F — Filament voltage 6.3v ac, one side grounded.

* — Varies with signal level.

** — Measurement of this voltage may cause oscillator to fail, resulting in no reading.

SO — SQUELCH switch OFF.

SC — SQUELCH switch ON.

Receiver controls — full clockwise and SQUELCH switch ON unless otherwise noted.

TABLE 2
TYPE 362-R — OHMIC RESISTANCE MEASUREMENTS

Typical values between chassis and tube socket pins measured with an ohmmeter. In all cases 10% deviation may be expected without indicating a defect.

SYMBOL	PIN NUMBER								
	1	2	3	4	5	6	7	8	9
V1	900 K	1000	F	GND	18 K	120 K	1000	—	—
V2	940 K	1000	F	GND	15 K	140 K	1000	—	—
V3	GND	GND	400	1 M	500	36 K	F	15 K	—
V4	GND	GND	400	1 M	500	36 K	F	15 K	—
V5	GND	GND	400	800 K	500	36 K	F	15 K	—
V6	GND	GND	2.5 M	500	0	2.0 M	F	250 K	—
V7	GND	1 M	450	30 K	800 K	15 K	GND	F	—
V8	100 K	GND	GND	F	90 K	130 K	GND	—	—
V9	25 K	5700	250	F	GND	24 K	GND	280	GND
V10	TP	GND	25	NC	25	NC	F	15 K	—
V11	TP	GND	25	NC	25	NC	F	15 K	—
V12	*	GND	280	15 K	15 K	NC	F	15 K	—
V13	4.5 M	15 K	5500	1 M	140 K	11 K	F	GND	—
V14	3 M	15 K	*	3 M	500 K	GND	F	GND	—
V15	GND	GND	8.2 K	8.2 K	170 K	75 K	F	5 K	—

NC — No Connection.

TP — Tie Point.

F — Filament, one side grounded.

* — Varies with control setting.

Receiver controls — full clockwise and SQUELCH switch OFF.

K — Kilohms.

M — Megohms.

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6. REPLACEMENT PARTS

6.01 Parts which may require replacing other than tubes and items readily identified are listed in the parts list.

6.02 Orders for parts which must be obtained from Erco Radio Laboratories should include the equipment type designation and serial

number. The code number listed, together with the description, is the order number for that particular part. The key to the manufacturer designations follows the parts list. Parts not designated are available from a number of suppliers.

6.03 Parts List

362-R Receiver

SYMBOL	DESCRIPTION	CODE
C-1-2-9-30 -35-41-48	470 mmfd X 500WV, mica capacitor	BPD*AX
C-3	10 mmfd X 600WV, ceramicon capacitor	NPOK-100*EE
C-4	20 mmfd variable capacitor; modified, 5 plates and grounded rotor	SP*ER
C-5	5 mmfd X 600WV, ceramicon capacitor	NPO*AX
C-6-8-10-12 -13-14-15-16 -19-23-24-25 -26-28-29-31 -33-34-36-39 -40-43-45-46 -47-50-51-52 -54-56-59	.005 mfd X 500WV, disc capacitor	BPD*AX
C-7-37	50 mmfd X 600WV, disc capacitor	N750*AX
C-11-21	25 mmfd variable capacitor (one with lug on right side & one with lug on left)	APC-25*HL
C-17-44	.0001 mfd X 500WV, silver mica capacitor	5R5T1*CD
C-18	20 mmfd X 600WV, disc ceramic capacitor	TCZ20*CL
C-20	50 mmfd variable capacitor (lug on left side)	APC50*HL
C-22	2.2 mmfd X 500WV, $\pm 10\%$ tubular ceramic capacitor	GA-4*SE
C-27-42	1.5 mmfd X 500WV, $\pm 10\%$ tubular ceramic capacitor	GA-3*SE
C-32-38	1 mmfd X 500WV, $\pm 10\%$ tubular ceramic capacitor	GA-2*SE
C-38	After Ser. No. 4756 & up may use a .47 mmfd X 500WV, tubular ceramic capacitor $\pm 10\%$	GA-2*SE
C-49A-B-C	.1- .1- .1 mfd X 600WV, triple bathtub capacitor	YAB*CD
C-53-58	.02 mfd X 600WV, tubular capacitor (strap mounting)	689D*AX
C-55-62	.00025 mfd X 500WV, mica capacitor	5W5T25*CD
C-57A-B	20-20 mfd X 250WV, dual electrolytic capacitor	UP*CD
C-60A-B	20-20 mfd X 300-25WV, dual electrolytic capacitor	UP*CD
C-61	.01 mfd X 500WV, mica capacitor	1W5S1*CD

SYMBOL	DESCRIPTION	CODE
C-61-62	Added to Ser. No. 5143 & up	
C-63	.05 mfd X 500WV, disc ceramic capacitor	
R-1-4-5	47K ohm 1/2 watt resistor	
R-2-6-10 -15-34	1K ohm 1/2 watt resistor	
R-2	Becomes 75K ohm 1/2 watt resistor from Ser. No. 4576 & up	
R-3-9-16 -17-21-25-45	100K ohm 1/2 watt resistor	
R-7-11-58-62	270 ohm 1/2 watt resistor	
R-8-48	5.6K ohm 1/2 watt resistor	
R-12-50	3.3K ohm 1/2 watt resistor	
R-13-56	10K ohm 2 watt resistor (Note: R-56 eliminated with carrier operated relay modification)	
R-14-30-40 -41-42-52	1 megohm 1/2 watt resistor	
R-18-22-26	47 ohm 1/2 watt resistor	
R-19-23-27	390 ohm 1/2 watt resistor	
R-20-24-28	22K ohm 1/2 watt resistor	
R-29	470K ohm 1/2 watt resistor	
R-31	150 ohm 1/2 watt resistor	
R-32	330 ohm 1/2 watt resistor (was 1K ohm 1/2 watt below Ser. No. 5096)	
R-33	15K ohm 1/2 watt resistor	
R-35	10K ohm 1/2 watt resistor	
R-36	150K ohm 1/2 watt resistor (was 330K ohm 1/2 watt below Ser. No. 5096)	
R-37	680K ohm 1/2 watt resistor	
R-38	2K ohm potentiometer; wirewound resistor	WW-202*CL
R-39	470 ohm 1/2 watt resistor (eliminated with squelch modification)	
R-43	2.2 megohm 1/2 watt resistor	
R-44-46	75K ohm 1/2 watt resistor	
R-47	4.7 megohm 1/2 watt resistor	
R-49	120K ohm 1/2 watt resistor	
R-51	10K ohm 1 watt resistor	
R-53-57	22K ohm 2 watt resistor	
R-54	500K ohm potentiometer	1010207*CL
R-55	270 ohm 2 watt resistor	
R-59-63	270 ohm 1 watt resistor	

SECTION 406-101-500

SYMBOL	DESCRIPTION	CODE
R-60-61	33 ohm 1/2 watt resistor	
R-64	500 ohm potentiometer (added with squelch modification)	
R-65	47 ohm 1/2 watt resistor	
R-66, R-67	5000 ohm 10 watt wirewound resistor	
CH-1	Choke, Filter	14014*ER
CR-1	Diode, 1N21B	1N21B*SY
F-1	Fuse; 2 amp, type 3AG	312002*LT
I-1	Pilot lamp, 6.3 volt	47*
L-1	Inductor	SP*ER
L-2	Inductor	SP*ER
L-3-4	Inductor	SP*ER
L-5	Inductor	SP*ER
RFC-1	Choke, RF	5163*ER
RFC-2-3-4	Choke, RF	4057*ER
RFC-5-6-7-8	Choke, RF	5164*ER
T-1-2	Transformer, 1st & 2nd IF	4061*ER
T-3	Transformer, audio output	14013*ER
T-4	Transformer, Power	14012*ER
TF-1-2-3-4 -5-6-7-8	Tuned Filter, 9 Mc	4059*ER
TF-9	Transformer, AVC	4058*ER
V-1, V-2, V-8	Electron Tube, 6AK5	
V-3, V-4, V-5	Electron Tube, 6SK7 (Metal)	
V-6, V-15	Electron Tube, 6H6 (Metal)	
V-7	Electron Tube, 6SF7 (Metal)	
V-9	Electron Tube, 6BQ7A	
*V-10, V-11	Electron Tube, 6X5GT	
V-12	Electron Tube, 6AU5GT	
V-13, V-14	Electron Tube, 6SL7GT	

* **Note:** Replacement of V-10 and V-11 with a silicon rectifier requires the installation of an 80-ohm 10-watt resistor from pin 8 of the rectifier socket to C-60B.

362-RPA PREAMPLIFIER

SYMBOL	DESCRIPTION	CODE
C-1	220 mmfd X 500WV, tubular capacitor	D-6*CL
C-2-4	.001 mfd X 500WV, feed-through capacitor	327-102*EE
C-3	2.7 to 19.6 mmfd, variable capacitor	20M11*JH
C-5-6	10 mfd X 150 volt, electrolytic capacitor	TVA-1504*SP
*R-1	82 ohm 1/2 watt resistor	
R-2	120 ohm 1/2 watt resistor	
R-3	3.9K ohm 2 watt resistor	
R-4	6.8 ohm 1 watt resistor	
CR-1	Silicon diode, 1N3195	1N3195*RC
F-1	Fuse, 1/8 ampere, type 3AG	313-125*LT
J-1	Connector, Coaxial	UG-1098/U*AM
J-2	Connector, Coaxial	UG-1094/U*AM
	Adapter for J-1	UG-349/U*AM
**L-1	Inductor, 4 turns #12 silver-plated buss wire	SP*ER
L-1A	Inductor, 6 turns #12 silver-plated buss wire	SP*ER
L-2	Inductor, 1 turn #16 silver-plated buss wire	SP*ER
RFC-1	RF choke, bifilar wound	SP*ER
RFC-2	RF choke	Z-460*OM
T-1	Transformer, power	PS-8415*ST
X-1	Socket, 9 pin miniature, ceramic	TS-103C01*EB
V-1	Tube, EC86/6CM4	EC86/6CM4*AR

* Not used in 225- to 300-megacycle units.

** Used above 300 megacycles.

2016-LL CARRIER OPERATED RELAY

V-1	6C4 electron tube
R-1	1 megohm 1/2 watt resistor
C-1	.01 mfd X 500WV, disc capacitor
Ry	Sigma #4F8000S

SECTION 406-101-500

2016-LLM CARRIER OPERATED RELAY

SYMBOL	DESCRIPTION	CODE
C-1	.01 mfd X 500WV ceramic disc capacitor	BPD*AX
R-1	1 megohm, 1/2 watt resistor	
R-2	1800 ohm, 1 watt resistor	
R-3	500 ohm potentiometer; 2 watt linear	
R-4, R-5	220K ohm, 1/2 watt resistor	
R-6	390 ohm, 1/2 watt resistor	
R-7	5000 ohm, 10 watt wirewound resistor	10WBD*OM
I-1	NE-2 neon lamp	NE-2*GE
K-1	Relay, DPDT, 10,000 ohm coil	KCP-11*PB
P-1	Plug, male, 8 contact	86-CP8*AM
X-1	Socket, 9 pin miniature	9713-28*EB
X-2	Socket, octal	51B13490*CI
V-1	Electron Tube, 12AU7	

2026 RECEIVER MUTING UNIT

C1, C2	8 mfd X 150WV tubular electrolytic capacitor	TVA-1405*SP
R-1	5000 ohm, 10 watt wirewound resistor	10WBD*OM
R-2	5 ohm, 5 watt wirewound resistor	5WBD*OM
R-3	500 ohm, 5 watt wirewound resistor	5WBD*OM
R-4	10 ohm, 1 watt carbon resistor	
J-1	Pin jack, red	105-602*JH
K-1	Relay, 6500 ohm coil	2QA422E*PC
SR-1	Selenium rectifier	5M1*RR
TS-1	Terminal strip	10-141-Y*JO
	Phone tip, red, used with J-1	105-302*JH

ORIGINAL SUPPLIERS

AM — Amphenol-Borg Electronics Corporation
AR — Amperex Electronic Corporation
AX — Aerovox Corporation
CD — Cornell-Dubilier Division, Federal Pacific Electric Company
CI — Cinch Manufacturing Corporation, H. B. Jones Division
CL — Centralab Division, Globe-Union Corporation
EB — EBY Sales Company
EE — Erie Resistor Corporation
ER — Erco Radio Laboratories
GE — General Electric Company
HL — Hammarlund Manufacturing Company
JH — E. F. Johnson Company
JO — Cinch Manufacturing Corporation, H. B. Jones Division
LT — Littelfuse, Inc.
OM — Ohmite Manufacturing Company
PB — Potter Brumfield, Inc.
PC — Phillips Control Company
RC — Radio Corporation of America
RR — Radio Receptor Corporation
SE — Stackpole Carbon Company
SP — Sprague Products Company
SP — Special (When used with ER)
ST — Stancor Electronics, Inc.
SY — Sylvania Electric Products

7. MODIFICATIONS

7.01 The type 362-RPA preamplifier may be used where an increase in sensitivity is required. No modification of the receiver circuitry is required. The preamplifier mounts with two of the screws used to secure the type 2026 receiver muting relay unit to the 361-TB transmitter cabinet. Connections to the receiver are made with the cable provided. Addition of the preamplifier requires tuning the preamplifier and peaking the ANT adjustment of the receiver preselector. The 362-RPA preamplifier provides approximately 8 to 10 db gain. A schematic diagram of the unit is shown in Fig. 6.

7.02 A modification of the squelch circuit provides a more positive action and control of the squelch level. This modification consists of the addition of a potentiometer and fixed resistor, R-64 and R-65 in place of R-39. This control is provided on receivers manufactured after serial No. 6941. Squelch adjustment is as follows:

- (a) Remove antenna connection and operate SQUELCH switch to ON.
- (b) Turn RF GAIN control fully clockwise.
- (c) Squelch should open on random noise. If it does not, adjust 500-ohm potentiometer as required.
- (d) Adjust RF GAIN control to 9 on scale. The squelch should just close.
- (e) Check to determine that squelch opens on approximately 5 microvolts input signal for the receiver alone or approximately 2 microvolts input signal for the preamplifier-receiver combination. Repeat Steps (b), (c), and (d) as required.

7.03 The 2026 Receiver Muting Unit may be used where positive muting of the receiver is required. The 2026 unit opens the ground return for the RF GAIN control and shorts the audio output of the receiver when the associated 361-TB transmitter is keyed. A schematic of the unit is shown in Fig. 11 and interconnections are shown in Fig. 12.

7.04 Where received carrier is required to operate a signal or key a transmitter, COR units 2016-LL and 2016-LLM are available. Schematic diagrams of the units are shown in Figs. 9 and 10. Installation of either carrier operated relay unit requires a minor modification of the cabling to the receiver. Connector J-4 should be disassembled and the cable positioned so it does not interfere with the installation of the COR unit.

7.05 Where short life of V-10 and V-11 is experienced a Sarkes-Tarzian S-5017 silicon rectifier unit may be used to replace both tubes. The modification consists of removing V-10 and V-11, installing the S-5017 unit in one of the vacant sockets and connecting an 80-ohm 10-watt resistor from pin 8 of the rectifier to the positive terminal of C-60B.

7.06 An under-chassis shield is available to eliminate the detuning effect when the receiver is removed from the metal-drawer compartment and should be installed on all receivers. The part number is 0097.

8. RELAY ADJUSTMENT

8. RELAY ADJUSTMENT

8.01 Requirements for relays used in the 362-R receiver and associated units regarding cleaning and contact follow are, in general, the same as for telephone type relays. Trouble in units may be due to tubes or improper operating or keying voltages. A check of tubes and voltages should be made before relay adjustment is attempted.

8.02 The relay used in the 2016-LL carrier operated relay unit is a Sigma #4F8000S. The current through the contacts should be limited to 150 milliamperes ac or 50 milliamperes dc. When required, adjust the relay as follows:

- (a) Back off the make contact and adjust until the armature closes to leave an air gap at the pole piece of 0.003 inch.
- (b) Adjust the break contact for 0.003-inch armature travel.
- (c) Adjust the hairspring until the armature rests lightly against the break contact.
- (d) Install the 2016-LL unit in the receiver. Check with a signal generator for proper operation. Adjust hairspring as required.
- (e) When correctly adjusted the relay should operate on 1.15 milliamperes and release on 0.75 milliamperes.

8.03 The potentiometer of the 2016-LLM unit should be adjusted for positive release of the KCP-11 relay at the desired level of input signal. Check operation of the 2016-LLM unit to determine that the external signal is actuated when the squelch circuit opens the audio circuit of the receiver. The KCP-11 relay is rated at an

operate current of 6 milliamperes and a release current of 2 to 3 milliamperes.

8.04 The Phillips Control Company #2QA422E relay used in the 2026 Receiver Muting Unit is rated at an operate current of 6 milliamperes and a release current of 2 milliamperes.