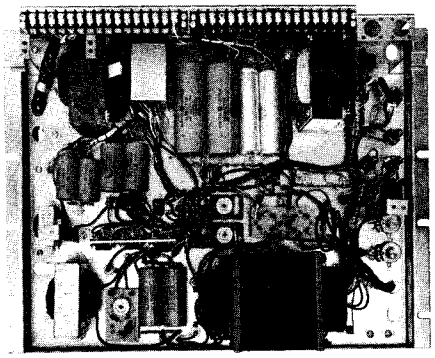
MOBILE RADIO

MASTR Progress Line

TRANSMITTER-RECEIVER POWER SUPPLY MODEL 4EP38A10



SPECIFICATIONS *

MODEL NUMBER: 4EP38A10

DIMENSIONS (W x H): 19" x 14"

INPUT: 117 VAC ±20%, 50/60 Hz, 2.4 amps

OUTPUT:

	132 — 174 MHz 30 WATTS	25 — 50 MHz & 66 — 88 MHz 35/30 WATTS	406 — 470 MHz 35 WATTS	132 — 174 MHz 80 WATTS	25 — 50 MHz 100 WATTS	406 — 470 MHz 60 WATTS
Bias	-45 V @ 10 mA	-45 V @ 10 mA	-45 V @ 10 mA	-45 V @ 10 mA	-45 V @ 10 mA	-45 V @ 10 mA
Low B+	300 V @ 55 mA	300 V @ 52 mA	300 V @ 52 mA	300 V @ 105 mA	300 V @ 69 mA	300 V @ 105 mA
High B+	450 V @ 160 mA	450 V @ 150 mA	300 V @ 200 mA	680 V @ 220 mA	665 V @ 280 mA	665 V @ 270 mA
Regulated	-20 V @ 80 mA	-20 V @ 60 mA	-20 V @ 80 mA	-20 V @ 80 mA	-20 V @ 60 mA	-20 V @ 100 mA
Regulated	10 V @ 100 mA	10 V @ 100 mA	10 V @ 100 mA	10 V @ 100 mA	10 V @ 100 mA	10 V @ 100 mA
Regulated	13.4 V @ 3 amps	13.4 V @ 3 amps	13.4 V @ 3 amps	13.4 V @ 3 amps	13.4 V @ 3 amps	13.4 V @ 3 amps

FUSES:
F501 - 5 amps, 125 volts
F502 - 1/2 amp, 250 volts
F503 - 3/4 amp, 250 volts
F504 - 3 amps, 250 volts

DUTY CYCLE: Continuous

AMBIENT TEMPERATURE RANGE: -30°C (-22°F) to +60°C (+140°F)

METERING: All voltages measured at terminal strips on wiring side of power supply board with a 20,000 ohm-per-volt multimeter.

*These specifications are intended primarily for the use of the serviceman. Refer to the appropriate Specification Sheet for the complete specifications.

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ILLUSTRATIONS

WARNING

No one should be permitted to handle any portion of the equipment that is supplied with high voltage; or to connect any external apparatus to the units while the units are supplied with power. KEEP AWAY FROM LIVE CIRCUITS.

DESCRIPTION

The General Electric Transistorized Power Supply Model 4EP38A10 is a combined transmitter and receiver power supply for MASTR Progress Line Base Stations. The power supply provides:

- High B-plus for transmitter PA
- Low B-plus for the transmitter multiplier stages
- -45 volts bias for the transmitter power amplifier
- Regulated -20 volts for the transmitter exciter board
- Regulated 13.4 volts for heaters, receiver audio, relays and lamps
- Regulated 10 volts for the transmitter Channel Guard and receiver RF stages

The transmitter and receiver units are mounted on the front side of the Power Supply Panel. Power supply output voltages are connected to the transmitter and receiver through power cable plugs P103 and P443 respectively. All power supply components (except Q502) are located on the rear side of the transmitter/receiver "shared" power supply.

A fan is mounted on the front panel to provide air-cooling for the transmitter and 13.4-volt regulator transistor (Q502). The fan turns on when the ambient temperature rises enough to operate thermostat switch S502, or when the station is keyed.

CIRCUIT ANALYSIS

When the power supply ON-OFF switch S501 is turned on, 117 volts AC at 50/60 Hz from TB502-14 and -15 is applied across the primary (black leads) of power transformer T501. Fuse F501 is in series with switch S501 and TB502-14 to protect the power supply from overload.

The power transformer secondary consists of four windings (two with adjustable taps) to provide AC for the high and low B-plus supplies, bias and regulated supplies.

HIGH VOLTAGE SUPPLY (450-650 VOLTS)

The AC voltage developed across the high voltage secondary winding (green-white, white and green wires) is rectified by the bridge circuit silicon rectifiers CR1, CR2, CR3 and CR4. The rectified voltage is filtered by the pi-filter choke L501, capacitors C501, C502, C503 and C504. The 300 volts B-plus from the low B-plus supply is

POWER TRANSFORMER HIGH & LOW VOLTAGE TAP CHART

Secondaries for the high voltage and low voltage supplies are tapped and are connected according to the high voltage B-plus required by the transmitter as shown in the chart below.

TRANSMITTER RATING	POWER TRANSFORMER SECONDARY TAPS	READING AT HIGH B+ OUTPUT TERMINAL TB1-4
132-174 MHz, 30 Watts	TB8-3 to -5 TB7-2 to -3	450 volts
25-88 MHz, 30 Watts	TB8-3 to -5 TB7-2 to -3	450 volts
132-174 MHz, 80 Watts	TB8-4 to -5 TB7-4 to -3	685 volts
25-50 MHz, 100 Watts	TB8-4 to -5 TB7-4 to -3	665 volts
406-470 MHz, 60 Watts	TB8-4 to -5 TB7-4 to -3	665 volts
132—174 MHz and 450-MHz limited 120-Watt input	TB7-4 to -3 Interchange white wire at TB8-3 and green wire at H4 (A501)	480 volts
450 MHz Limited 60-Watt Input	TB7-2 to -3 Remove F502	300 volts
250/330-Watt Exciter	TB7-4 to -3 Remove F502	300 volts

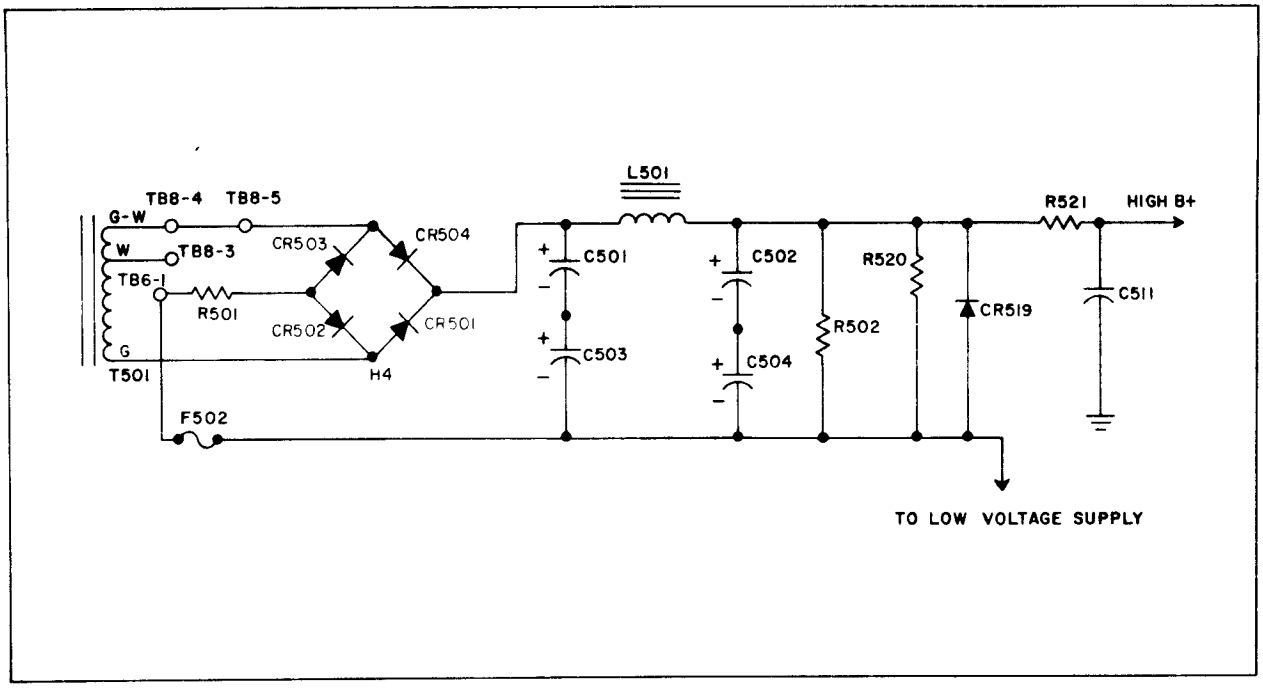


Figure 1 - High Voltage Supply Circuit

"stacked" with the 150- or 350-volt high B-plus supply (depending on tap setting) to provide the 450- or 650-volt output of the high voltage supply.

300 volts from the low voltage supply is connected into the high voltage bridge rectifier circuit at H1 through resistor R501.

Silicon rectifier CR519 is a protective device for the electrolytic filter capacitors. If fuse F502 should blow, reverse voltage across C501-C504 will be shorted by CR519, thereby preventing damage to the capacitors. Resistors R502 and R520 are bleeder resistors.

LOW VOLTAGE SUPPLY (300 VOLTS)

T501 red, red-white, and orange secondary windings provide the 300-volt AC voltage which is rectified by the bridge circuit

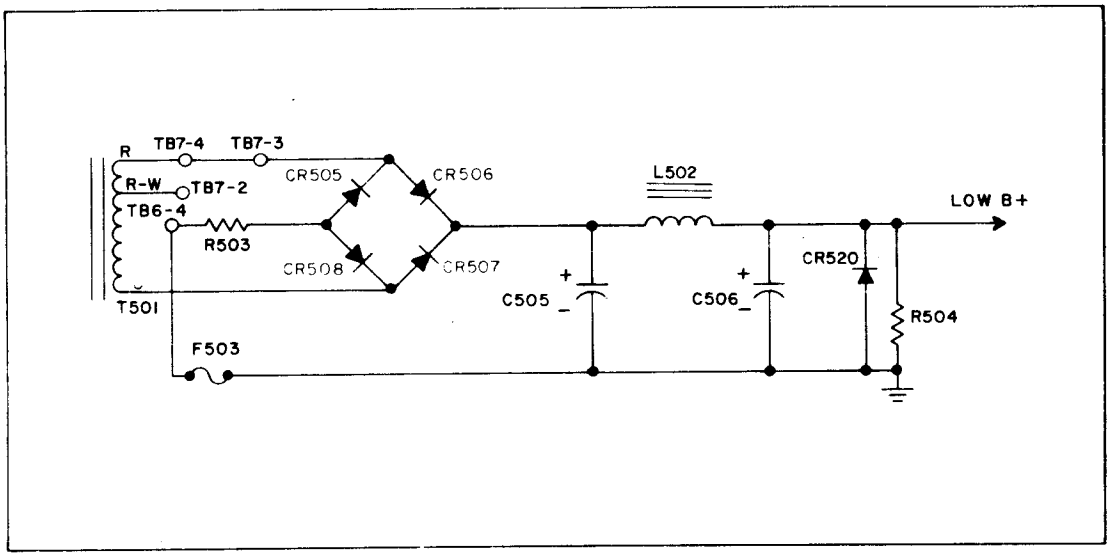


Figure 2 - Low Voltage Supply

of silicon rectifiers CR5, CR6, CR7 and CR8. The rectified output voltage is filtered by pi-filter consisting of choke L502, capacitors C505 and C506. The output is in series with the high B-plus circuit to provide "stacking" for the high voltage circuit. Silicon rectifier CR520 is used as a protective device for the electrolytic filter capacitors. If fuse F503 should blow, reverse voltage across C505 and C506 will be shorted by CR520, thereby preventing damage to the capacitors (see Figure 2).

-45 VOLT BIAS SUPPLY

The AC developed across the two blue wires (with center tap to ground) of the T501 secondary is rectified by full-wave silicon rectifiers CR9 and CR10. The rectified voltage is filtered by pi-filter choke L503 and capacitors C507 and C508 to supply a negative 45-volt bias.

REGULATED -20 VOLT SUPPLY

The -45 volts unregulated is also taken off at the minus side of filter capacitor C507 and connects to the normally open contact 6R on relay K501. When the transmitter is keyed, K501 energizes and contacts 6R and 7R close, feeding the -45 volts into regulator circuit A504. Voltage dropping resistor R1 provides the negative bias to turn on Q501. Zener diode VR1 provides reference for the regulator.

When the output voltage attempts to go more negative, the voltage at the base of Q1 also goes more negative. This causes a change in the base-emitter bias on Q1, making it to conduct more heavily. When Q1 conducts, there is less base bias on Q501, and less base current flow. With less base current flow, the voltage drop across Q501, and less base current flow. With less base current flow, the voltage drop across Q501 is larger; and the output voltage tends to remain constant.

When the output voltage starts to go less negative, the forward bias on Q1 decreases; Q1 conducts less and reduces the voltage drop across R1 so that the forward bias on Q501 is increased and the output voltage remains constant.

Capacitor C512 prevents high frequency oscillation and also helps to filter the input voltage. R2 provides voltage to operate the Zener® diode VR1. R3 and R4 form a voltage divider that can be varied by potentiometer R3 to adjust the base voltage of Q1 and thus adjust the output to exactly 20 volts. This output is measured at jacks J1 and J2 on the regulator board. The voltage is regulated to -20 volts ±5%.

REGULATED 13.4-VOLT SUPPLY

The AC developed across the two brown secondary wires of T501 is rectified by a full-wave rectifier circuit, CR515 and CR516. The output is taken off at the center tap of T501 and is filtered by choke input filter L504 and capacitors C509 and C510. The output of the filter circuit is applied through voltage dropping rectifier CR517 to the emitters of Q502 and Q505. When the output of Q502 and Q505 tries to rise, the base of Q3 is made more positive. This increases the current flow through R2 and R7, decreasing the positive voltage at the base of the driver transistor (Q504). Q504 will then conduct more heavily, causing a greater voltage drop across R508. The bases of Q502 and Q505 will become more positive, thus tending to cut off Q502 and Q505 thereby keeping the voltage at the output terminal at the regulated voltage level. R522 and R523 equalize current through Q502 and Q505.

When the output of Q502 and Q505 tries to drop, Q3 will conduct less; this decreases the forward bias on Q504 to reduce the voltage drop across R508. This will cause Q502 and Q505 to conduct more heavily and hold the output voltage constant. Zener

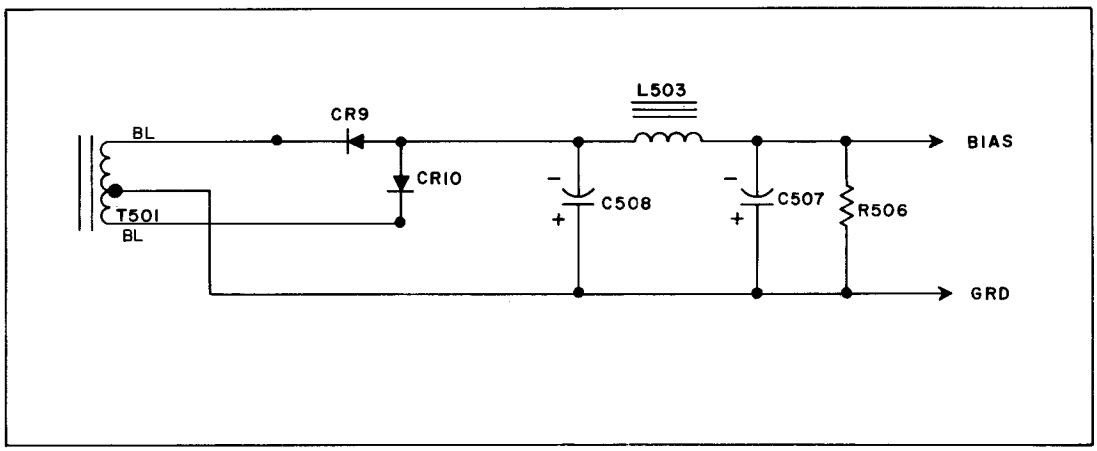


Figure 3 - -45 Volt Bias Supply

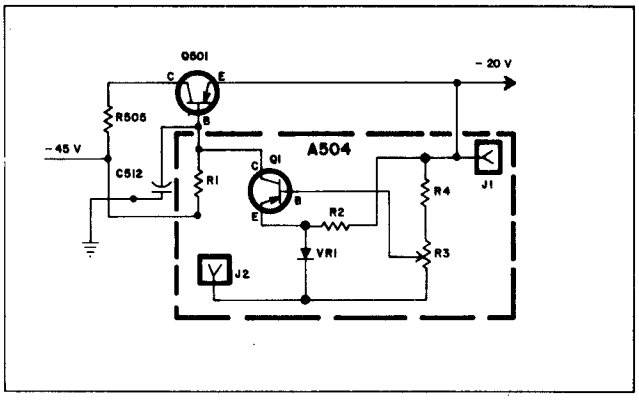


Figure 4 - Regulated -20 Volt Supply

diode VR1 provides a voltage reference for the regulator Q3.

The output is varied by potentiometer R6 to produce a +13.4-volt reading. The output is measured at J1 and J2 on the regulator board. This voltage is regulated to +13.4 volts, ±5%.

REGULATED +10-VOLT SUPPLY

The input voltage to the 10-volt regulator board A502 is taken from the 13-volt regulated supply.

When the supply voltage (or output) starts to increase, the voltage at the base of Q5 also increases. As the emitter voltage of Q5 is kept constant by zener diode VR4, the emitter-base voltage increases. This causes Q5 to conduct more which means less base current for Q503. The voltage drop across Q503 becomes larger and the output remains constant.

When the input voltage starts to drop, the output voltage also tends to drop and Q5 will conduct less. This increases the forward bias on Q503 and reduces the voltage drop across Q503 to keep the output constant.

Diode CR3 provides reverse polarity protection for the regulator. Potentiometer R11 is used to set the emitter-base voltage of Q5 for the desired 10-volt ±5% output. R8 and R10 limit maximum current through Q5. R9 provides bias current for zener diode VR4, and lamp DS1 provides bias for Q503. C4 and C5 prevent high frequency oscillation. The output voltage is metered at TB501-7 and -12 (GND).

RECEIVER MUTING

Transistor Q506 operates as a switch for the receiver muting +10 volts. A continuous +10 volts is applied to the collector of Q506. When the transmitter is unkeyed, +13.4 volts is applied to the base of the transistor, causing it to conduct. When conducting, the +10 volts at the emitter of Q506 is coupled through P443-2 to the base of receiver DC amplifier Q9, turning it on. When Q9 conducts, DC amplifier Q10 is turned off, and the receiver operates normally.

Keying the transmitter grounds the base of Q506, turning it off. This removes the +10 volts to receiver DC amplifier, turning if off. Turning off Q9 causes Q10 to turn on, which turns off the receiver audio amplifiers and mutes the receiver.

VOLTAGE SUPPLY RELAY (K501)

When the transmitter is keyed, K501 becomes energized and the following connections are made:

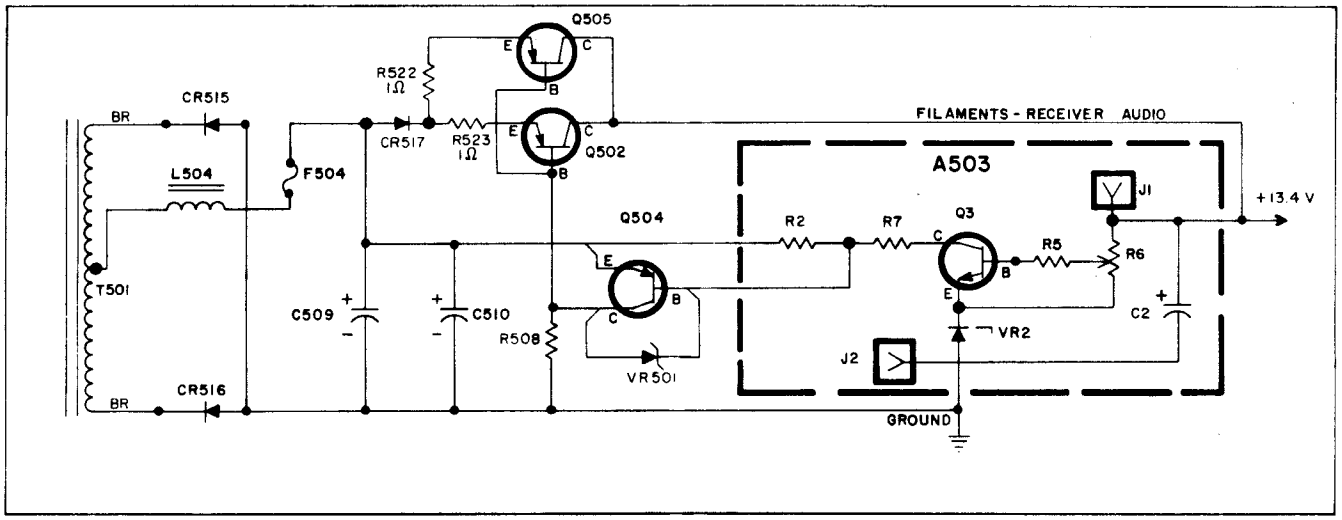


Figure 5 - Regulated 13.4-Volt Supply

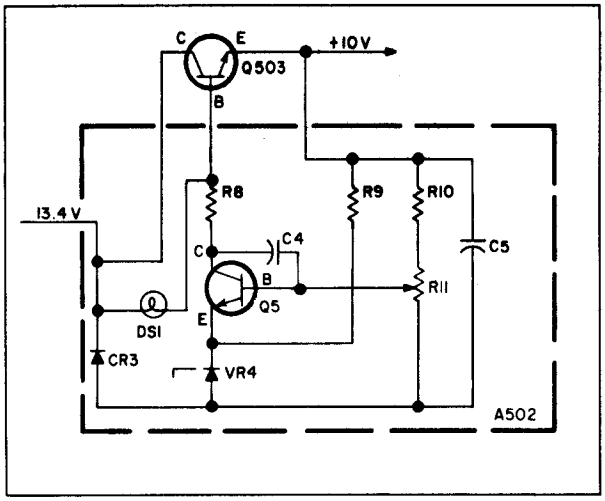


Figure 6 - Regulated +10-Volt Supply

- High voltage supply stacked on low voltage supply
- Low voltage to transmitter
- Input to 20-volt regulator
- 13 volts is applied to TB501-15 to light the red transmitter pilot lamp (also mutes additional receivers if used)
- Starts blower

ANTENNA RELAY (K502)

In the normally closed position, antenna relay K502 connects the receiver to the antenna system. The relay becomes energized when the transmitter is keyed, thereby opening the receiver antenna circuit and connecting the transmitter into the antenna system.

Jack J503 is connected to the common lead of K502 and is mounted into the left hole in the antenna mounting bracket. The incoming antenna transmission line plugs into J503. The receiver antenna cable from K502 plugs into J441 on the receiver and transmitter antenna lead from K502 plugs into J103 on the transmitter.

MICROPHONE INPUT CIRCUIT

In Local/Remote, Remote or Repeater applications, the circuit connected to mike jack J902 is used to isolate the high impedance mike and the control panel which acts as a 600-ohm impedance across TB502-12 and -13.

CR518 is a back-biased diode in series with the audio input from the control panel. A +9-volt drop across R517 provides +1 volt with respect to ground at the cathode of CR518 which reverse biases the diode. The mike is then loaded only by the transmitter and R518 (both are relatively high impedances).

The control unit attached to TB502-12 and -13 supplies +10 volts (when keyed) which is divided by voltage divider R515 and R516 producing 4.5 volts on the anode of the diode, forward biasing the diode and thus allowing the audio from the control unit to modulate the transmitter.

C513, R515 and R516 are also used to equalize the high frequency response when the control panel is the audio source.

AUDIO LINE-MATCHING TRANSFORMER

In Local/Remote or Remote Control applications, line-matching transformer T502 is used for matching the receiver output (when loaded with a 3.5-ohm speaker or resistor) to a 600-ohm telephone pair in remote control installations. The 100-ohm impedance between the R-G and BL leads of the secondary is "built out" to 600 ohms by resistors R509 and R510. One watt delivered to the 3.5-ohm primary to T502 will apply +18 dBm to the telephone line pair.

INITIAL ADJUSTMENT

VOLUME & SQUELCH CONTROLS

VOLUME Control R511 should be set approximately to mid-range. Turn the SQUELCH Control R512 fully clockwise. By making these adjustments, the VOLUME and SQUELCH controls on the Station Control Panel can be adjusted approximately in mid-range.

MAINTENANCE

TEST CABLE

A 26-inch coax transmitter test cable is clipped to the outside of the fan ventilating cover on the front side of the power supply so that the transmitter can be swung out for servicing.

To troubleshoot the transmitter, disconnect the cable plug P103 from transmitter jack J103 (refer to Outline Diagram); then remove the extension cable from the ventilating cover and plug one end of the extension cable into J103 on the transmitter and the other end into P103 on the cable that was connected to the transmitter.

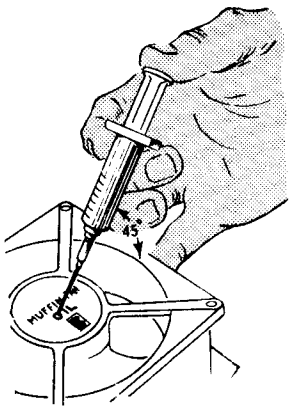
MUFFIN FAN LUBRICATION

The muffin fan used in the power supply should be lubricated at least once a year. At high ambient temperatures, lubrication will be required more frequently. A good grade of light instrument oil, such as

OILING INSTRUCTIONS

To inject oil in the bearing:

1. Position the needle at an angle of 45° to the seal on the label
* 2. Pierce gold seal label and the concealed self-sealing rubber cap under the label.
3. Depress plunger firmly until oil has gone down one calibration line.
4. Withdraw the needle and wipe off excess oil. Oil may be left in the syringe for future use.



Aeroshell Fluid No. 12 or Esso Univis® P-38 should be used.

Oiler Kit No. 19263 (list price $2.50, subject to change) is recommended for oiling the muffin fan. This kit permits oiling without removing the fan from its mounting. A syringe and a supply of oil are provided in the kit.

RELAY SERVICING

The relays in these units require little care. However, they should be inspected periodically to assure maximum operating efficiency. If the contacts become pitted, they should be cleaned with a burnishing tool to smooth out any metallic deposits. When relay contacts carry little or no current, the contacts do not clean themselves and an insulating coating is apt to form. This coating may be removed by cleaning the contacts with a burnishing tool. Do not oil the relay bearings. When relays are in dusty locations, lubricated bearings will collect dust and grit, and will wear more rapidly than non-lubricated bearings.

Some of the relays used are of the multiple-contact type and, in the unenergized position, should have contact spacings of approximately .010 to .020 inch. More important, the contact spacings on any multiple-contact relay should be equal so that the contact pressures will be equal when the relay is energized. The back pressure of the antenna relay should be at least 15 grams. Low back pressure will shorten the life of contacts, due to excessive arcing, and may also cause noise in the receiver due to chatter of the antenna relay contact under vibration.

POWER SUPPLY MODIFICATIONS (Fig. 7)

Power supply modifications are required whenever the station is used in local/remote or remote stations equipped with the Intercom-Compressor board. Modification Kit 19A122271-G1 provides connections for the +18-volt relay supply and a regulated +13.4 volts for the amplifier stages on remote control panel Type KC-16-A.

Modification Kit 7145278-G2 (part of 19A122271-G1) provides a 3.5-ohm, 5-watt resistor (R1) that is connected from the receiver audio high to ground. This resistor is used as the receiver load, and is required in all Intercom-Compressor application.

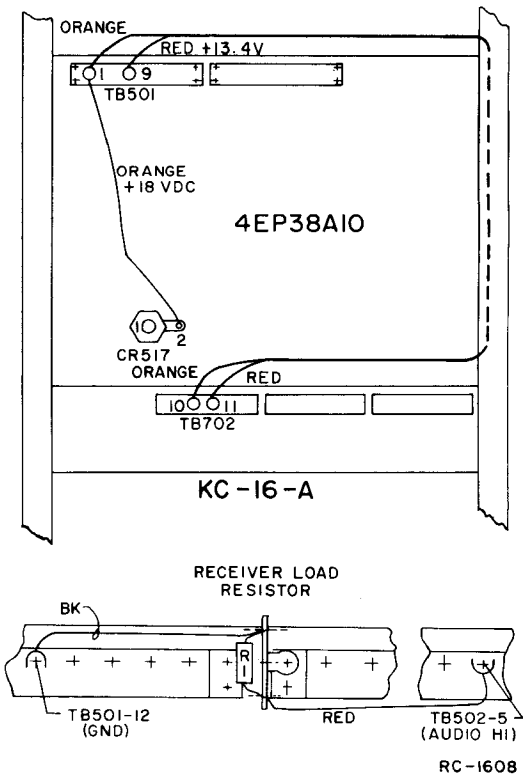


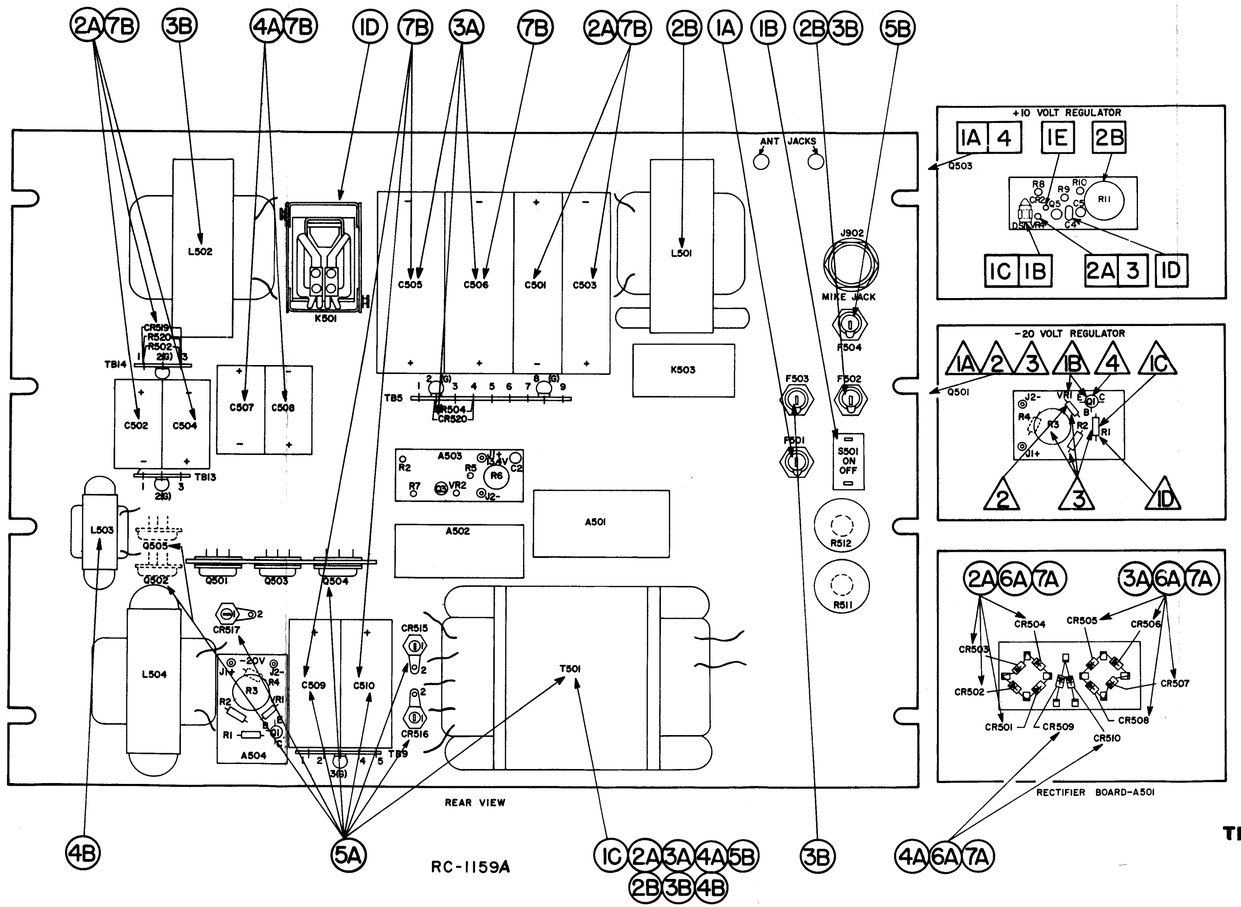
Figure 7 - Intercom-Compressor Modification

CARRIER OPERATED RELAY (Option 7610)

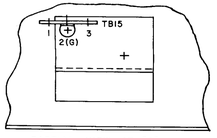
A Carrier Operated Relay (COR) assembly is available for use with MASTR stations. The COR assembly provides four form C contacts for controlling external circuits whenever a carrier is received. Complete information on the COR is contained in LBI-3855.

QUICK CHECKS

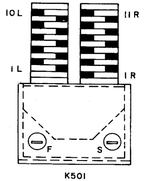
SYMPTOM	PROCEDURE
No output voltages at P101 and P443	1. Check the following: A. Fuse F501. B. Defective switch S501. C. T501 primary short or open. D. Relay contacts K501.
No high B+	2. A. Shorted CR519, C501, C502, C503, C504, CR501 through CR504, T501. B. Open fuse F502, L501, T501.
No low B+	3. A. Shorted CR520, CR505 through CR508, C505, C506, T501. B. Open F502, F503, L502, T501.
No -45 volts	4. A. Shorted CR509, CR510, C508, C507, T501 B. Open L503, T501.
No 13.4 volts	5. A. Shorted CR515, CR516, CR517, Q502, Q504, C509, C510, T501. B. Open F504, T501.
Output voltages low	6. A. Open diodes. B. Excessive load.
Excessive output ripple voltage	7. A. Open diodes. B. Open C501, C502, C503, C504, C505, C506, C507, C508, C509, C510, CR519.
10-VOLT REGULATOR	
No 10-volt regulated output	1. Check the following: A. Open Q503. B. 12 volts input. C. Open DS1. D. Shorted C4.
Output voltage too high, cannot be adjusted by R11.	2. A. Check for open VR4. B. Defective R11.
Very low output voltage	3. Check for shorted VR4.
Output voltage equals input voltage	4. Shorted Q503.
-20 VOLT REGULATOR	
No -20 volt regulated output	1. Check for the following: A. Open Q501. B. Shorted Q1 and/or VR1. C. Open R1. D. -45 volts at TB11-2 (R1).
Very low output voltage	2. Shorted Q501 or VR1.
Output voltage too high, cannot be adjusted by R3	3. Open VR1, Q501, R1, R2, R3.
Output voltage equals input voltage	4. Shorted Q1.



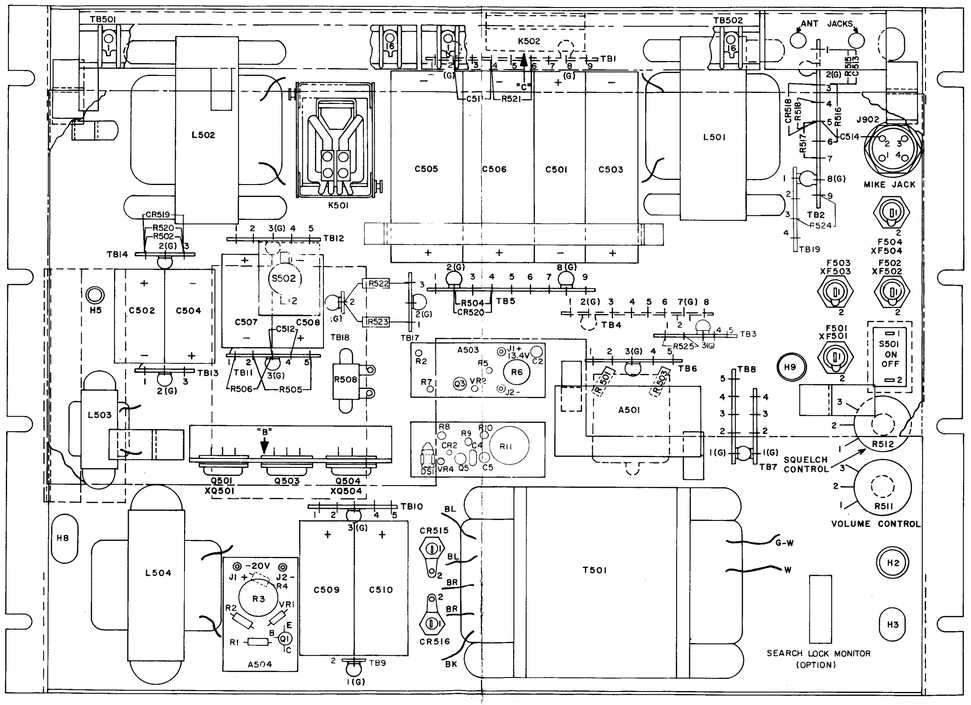
PARTIAL VIEW AT "B"



PARTIAL VIEW AT "C"



K501



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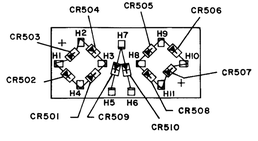
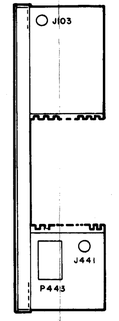
CONTINUITY-VOLTAGE CHECKS		
CONTINUITY CHECKS- MAKE THE FOLLOWING CONTINUITY CHECKS WITH POWER SWITCH (S501) IN OFF POSITION AND P101 AND P443 DISCONNECTED:		
FROM	TO	RESISTANCE
T8501-6	P101-14	0
T8501-5	P101-12	0
T8501-4	P101-16	0
T8501-3	P101-17	0
T8501-2	P101-18	0
T8501-12	GROUND	0
T8502-11	P443-18	0
T8502-10	P101-7	0
T8501-16	P443-2	0
T8502-5	P443-16	0
T8502-3	T8502-4	500
P443-16	P443-17	5
T8502-9	P443-6	0
T8502-8	P443-7	0
T8502-7	P443-8	0
T8502-6	P443-9	0
T8501-14	P443-4	2.5 K SQUELCH POT MAX
T8501-11 & -12	GROUND	0
T8502-2	T8502-1	5 K VOL. CONT. POT MAX
T8601-8	P443-11	0
T812-5	P443-12	0
R507-2	P101-3	0
K501-2L	P101-4	0
T81-4	P101-5	0
T811-1	P101-8	0
A504-J1	P101-15	0

VOLTAGES ARE MEASURED AS SHOWN BELOW WITH RECEIVER AND TRANSMITTER AT FULL LOAD CONDITIONS. USE A 20,000 OHM-PER-VOLT VOLTMETER TO MEASURE ALL VOLTAGES. CALIBRATION OF THE TEST METER SHOULD BE WITHIN ± 1% OF THE VOLTAGE MEASURED.

VOLTAGE CHECKS-		
RECEIVER	TEST POINT	READINGS
	T8501-16	10 V
	T8501-8	13.4 V
	T812-5	10 V
TRANSMITTER	R507-2	13.4 V
	K501-2L	300 V
	T81-4	450,650,665,680 V
	T811-1	-45 V
	A504-J1-J2	-20 V

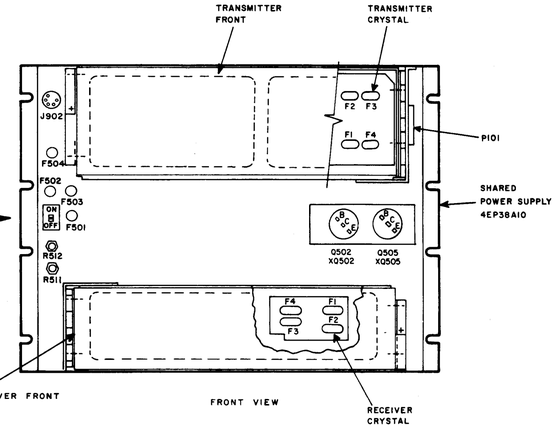


RECTIFIER MOUNTING BOARD A501



END VIEW AT "A"

"A"



FRONT VIEW

(19C303717, Rev. 1)

OUTLINE DIAGRAM

TRANSMITTER-RECEIVER POWER SUPPLY
MODELS 4EP38A10

PARTS LIST

LBI-3552G

TRANSMITTER/RECEIVER SHARED POWER SUPPLY
MODEL 4EP38A10

SYMBOL	G-E PART NO.	DESCRIPTION
A501		COMPONENT BOARD ASSEMBLY 19A121044-G1
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR501 thru CR508	4037822-P2	Silicon.
CR509 and CR510	4037822-P1	Silicon.
A502*		10-VOLT REGULATOR COMPONENT BOARD ASSEMBLY 19C303420-G6
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C4	7774750-P1	Ceramic disc: .00047 µf +100% -0%, 500 VDCW.
C5	5496267-P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR3	4037822-P1	Silicon.
		- - - - - - - INDICATING DEVICES - - - - - - - -
DS1	4034664-P1	Lamp.
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q5	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - - RESISTORS - - - - - - - - - -
R8*	3R77-P680K	Composition: 68 ohms ±10%, 1/2 w.
	3R77-P161J	In Models of Rev E and earlier: Composition: 160 ohms ±5%, 1/2 w.
R9	3R77-P331J	Composition: 330 ohms ±5%, 1/2 w.
R10	3R77-P101J	Composition: 100 ohms ±5%, 1/2 w.
R11	19A115681-P1	Variable, wirewound: 1000 ohms ±20%, 3 w.
		- - - - - - - - - VOLTAGE REGULATORS - - - - - - -
VR4	4036887-P6	Silicon, Zener.
		In Models of Rev B and earlier:
		10-VOLT REGULATOR COMPONENT BOARD ASSEMBLY 19C303420-G3
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1	5496267-P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1	4037265-P2	Jack, tip: stake-in, red molded phen.
J2	4037265-P1	Jack, tip: stake-in, black molded phen.
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	4037993-P1	Germanium, PNP; sim to Type 2N1303.
Q2	19C300073-P2	Germanium, PNP; sim to Type 2N1414.
Q3	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R77-P680J	Composition: 68 ohms ±5%, 1/2 w.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SYMBOL	G-E PART NO	DESCRIPTION
R3	3R77-P242J	Composition: 2400 ohms ±5%, 1/2 w.
R4	3R77-P331J	Composition: 330 ohms ±5%, 1/2 w.
R5	3R77-P681J	Composition: 680 ohms ±5%, 1/2 w.
R6	19B209113-P1	Variable, wirewound: 250 ohms ±20%, 2.5 w.
R7		- - - - - - - - VOLTAGE REGULATORS - - - - - - - -
VR1	4036887-P9	Silicon, Zener.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	4036555-P1	Insulator, washer: nylon. (Used with Q1 and Q2).
A503		13-VOLT REGULATOR COMPONENT BOARD ASSEMBLY 19C303420-G2
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C2	5496267-P16	Tantalum: 100 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
		- - - - - - - - - JACKS AND RECEPTACLES - - - - - -
J1	4037265-P2	Jack, tip: stake-in, red molded phen.
J2	4037265-P1	Jack, tip: stake-in, black moled phen.
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q3	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - - RESISTORS - - - - - - - - - -
R2*	3R77-P470J	Composition: 47 ohms ±5%, 1/2 w.
	3R77-P221J	In Models of Rev C and earlier: Composition: 220 ohms ±5%, 1/2 w.
R5	3R77-P681J	Composition: 680 ohms ±5%, 1/2 w.
R6	19B209113-P1	Variable, wirewound: 250 ohms ±20%, 2.5 w.
R7	3R77-P301J	Composition: 300 ohms ±5%, 1/2 w.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - - -
VR2*	19A115528-P3	Silicon, Zener.
	4036887-P8	In Models of Rev C and earlier: Silicon, Zener.
A504		20 VOLT REGULATOR COMPONENT BOARD ASSEMBLY 19B204458-G1
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1	4037265-P1	Jack, tip: stake-in, black molded phen.
J2	4037265-P2	Jack, tip: stake-in, red molded phen.
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	4037993-P1	Germanium, PNP; sim to Type 2N1303.
		- - - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R77-P822J	Composition: 8200 ohms ±5%, 1/2 w.
R2	3R77-P222J	Composition: 2200 ohms ±5%, 1/2 w.
R3	19B209113-P3	Variable, wirewound: 1000 ohms ±10%, 2.5 w.
R4	3R77-P102J	Composition: 1000 ohms ±5%, 1/2 w.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - -
VR1	4036887-P6	Silicon, Zener.
		- - - - - - - - - MISCELLANEOUS - - - - - - - -
	4036555-P1	Insulator, washer: nylon. (Used with Q1).
		- - - - - - - - - - - MOTORS - - - - - - - - - -
B501	5493477-P1	Fan, single phase: 115 VAC, 60 cps, 14 w, ccw rotation; sim to Rotron "Gold Seal Venturi Muffin Fan".

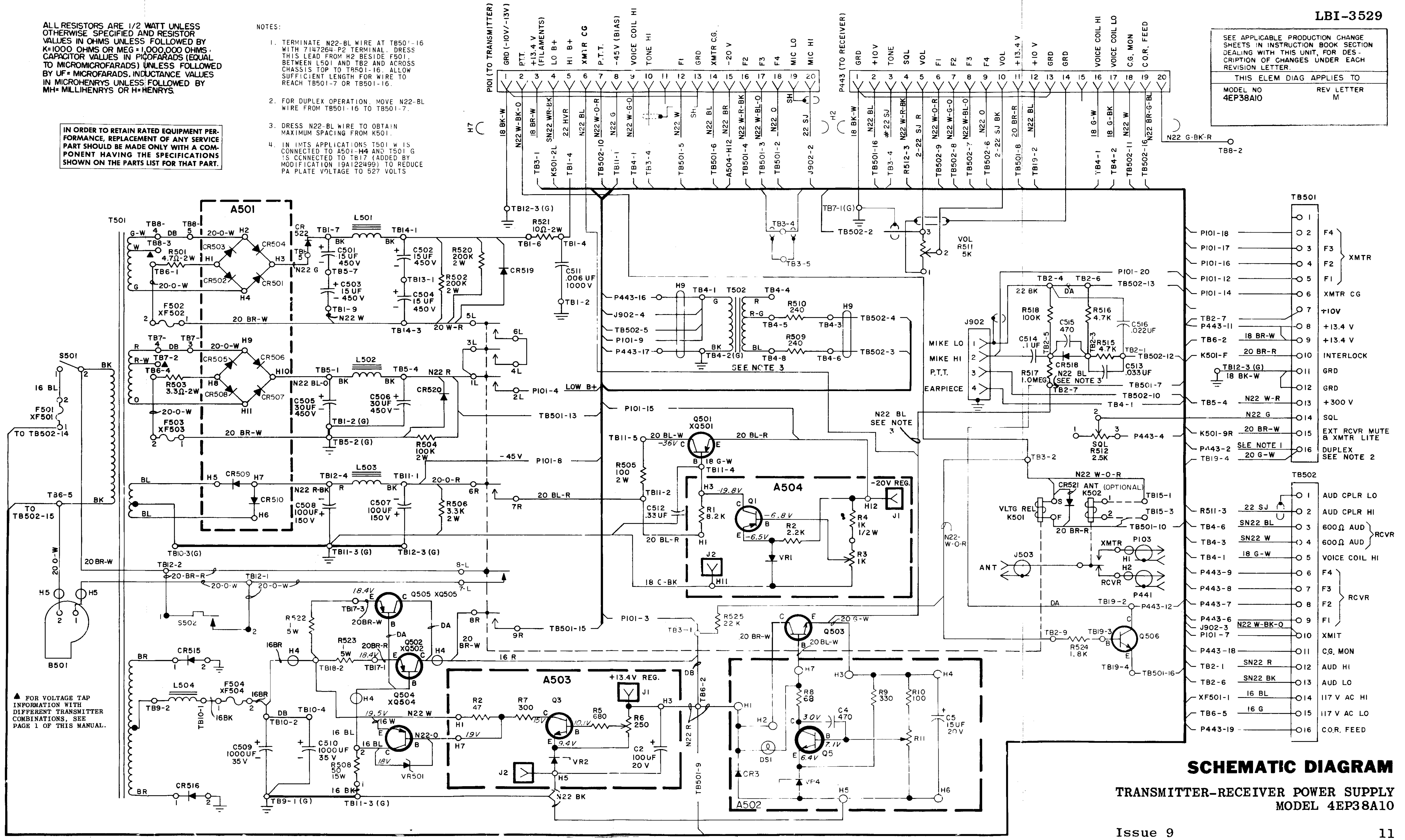
ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H= HENRYS.

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

NOTES:

1. TERMINATE N22-BL WIRE AT TB501-16 WITH 7147264-P2 TERMINAL. DRESS THIS LEAD FROM H2 BESIDE F501, BETWEEN L501 AND TB2 AND ACROSS CHASSIS TOP TO TB501-16. ALLOW SUFFICIENT LENGTH FOR WIRE TO REACH TB501-7 OR TB501-16.
2. FOR DUPLEX OPERATION, MOVE N22-BL WIRE FROM TB501-16 TO TB501-7.
3. DRESS N22-BL WIRE TO OBTAIN MAXIMUM SPACING FROM K501.
4. IN IMTS APPLICATIONS T501 W IS CONNECTED TO A501-H4 AND T501 G IS CONNECTED TO TB17 (ADDED BY MODIFICATION 19A122499) TO REDUCE PA PLATE VOLTAGE TO 527 VOLTS

SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.	
THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
4EP38A10	M



▲ FOR VOLTAGE TAP INFORMATION WITH DIFFERENT TRANSMITTER COMBINATIONS, SEE PAGE 1 OF THIS MANUAL.

(19D402421, Rev. 28)

SCHEMATIC DIAGRAM

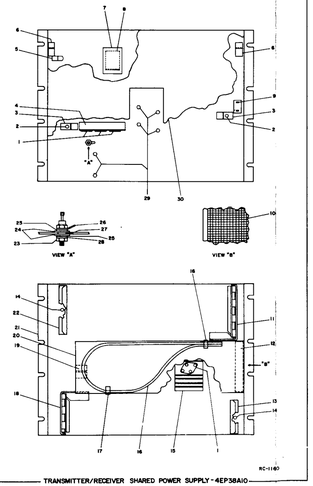
TRANSMITTER-RECEIVER POWER SUPPLY
MODEL 4EP38A10

SYMBOL	G-E PART NO	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C501	5493132-P6	Electrolytic: 15 µf +50% -10%, 450 VDCW.
C502	7774786-P42	Electrolytic: 15 µf +50% -10%, 450 VDCW.
C503	5493132-P6	Electrolytic: 15 µf +50% -10%, 450 VDCW.
C504	7774786-P42	Electrolytic: 15 µf +50% -10%, 450 VDCW.
C505 and C506	5493132-P5	Electrolytic: 30 µf +50% -10%, 450 VDCW.
C507 and C508	7774786-P17	Electrolytic: 100 µf +100% -10%, 150 VDCW.
C509 and C510	5493132-P1	Electrolytic: 1000 µf +250% -15%, 35 VDCW.
C511	19C301693-P20	Ceramic disc: .006 µf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C512	19A115028-P17	Polyester: 0.33 µf ±20%, 100 VDCW.
C513	19A115028-P210	Polyester: .033 µf ±10%, 200 VDCW.
C514	19A115028-P214	Polyester: 0.1 µf ±10%, 200 VDCW.
C515*	5494481-P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap. Added by Rev A.
C516*	19B209243-P3	Polyester: .022 µf ±20%, 50 VDCW. Added by Rev E.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR515 and CR516	19A115202-P2	Silicon.
CR517	4037898-P1	Silicon.
CR518	19A115050-P1	Germanium.
CR519 thru CR521	4037822-P2	Silicon.
CR522*	4037822-P2	Silicon. Added by Rev C.
		- - - - - - - - - - FUSES - - - - - - - - - -
F501	5491272-P8	Cartridge, medium blowing: 5 amps at 125 v; sim to Bussman MDX-5.
F502	1R16-P1	Cartridge, quick blowing: 1/2 amp at 250 v; sim to Littelfuse 312,500 or Bussman AGC-1/2.
F503	1R16-P2	Cartridge, quick blowing: 3/4 amp at 250 v; sim to Littelfuse 312,750 or Bussman AGC-3/4.
F504*	1R16-P8	Cartridge, medium blowing: 5 amps at 125 v; sim to Bussman MDX-5.
	1R16-P6	In Models earlier than Rev A: Cartridge, quick blowing: 3 amps at 250 v; sim to Littelfuse 312003 or Bussman AGC-3.
J902	19A116061-P1	Connector, chassis: 4 female contacts.
		- - - - - - - - - - RELAYS - - - - - - - - - -
K501	19C307092-P1	Armature, open: 12 VDC nominal, 3 w max operating 9 form A and 1 form C contacts rated at 3 amps at 115 VAC or 28 VDC; sim to Potter-Brumfield LS2641.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L501	5490104-P1	Reactor: 5 h ind min at 0.3 amp DC, 80 ohms DC res max, 1000 VDC operating.
L502	19B209071-P1	Reactor: 3 h ind min at 0.4 amp DC, 30 ohms DC res max, 600 v peak, 300 VDC operating.
L503	19B209142-P1	Reactor: 800 mh ind min at 0.1 amp DC, 30 ohms DC res max, 100 v peak, 45 VDC operating.
L504	19B209080-P1	Reactor: 12 mh ind min at 4 amps DC, 0.3 ohm DC res max, 150 v peak, 18 VDC operating.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P101	19C303506-P1	Connector, phen: 20 contacts rated at 5 amps.
P443	19C303506-P1	Connector, phen: 20 contacts rated at 5 amps.

SYMBOL	G-E PART NO	DESCRIPTION
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q501	19A115267-P1	Germanium, PNP.
Q502	19A115268-P1	Germanium, PNP.
Q503*	19A115527-P1	Germanium, PNP.
	19A115267-P1	In Models of Rev C and earlier: Germanium, PNP.
Q504	19A115376-P1	Germanium, PNP.
Q505*	19A115268-P1	Germanium, PNP. Added by Rev A.
Q506*	19A115123-P1	Silicon, NPN; sim to Type 2N2712. Added by Rev J.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R501	19B209022-P31	Wirewound, phen: 4.7 ohms ±5%, 2 w; sim to IRC Type BWH.
R502	3R79-P204J	Composition: 0.2 megohm ±5%, 2 w.
R503	19B209022-P27	Wirewound, phen: 3.3 ohms ±5%, 2 w; sim to IRC Type BWH.
R504	3R79-P104K	Composition: 0.1 megohm ±10%, 2 w.
R505	3R79-P101K	Composition: 100 ohms ±10%, 2 w.
R506	3R79-P332K	Composition: 3300 ohms ±10%, 2 w.
R507	5496941-P13	Wirewound: 1.6 ohms ±5%, 15 w; sim to Tru-Ohm Type MOR-15.
R508*	5496941-P28	Wirewound: 50 ohms ±10%, 10 w; sim to Tru-Ohm Type MOR-15.
	5490297-P6	In Models earlier than Rev A: Wirewound: 100 ohms ±10%, 10 w; sim to Tru-Ohm Type MOR-10.
R509* and R510*	3R77-P241J	Composition: 240 ohms ±5%, 1/2 w.
	3R77-P101K	In Models earlier than Rev K: Composition: 100 ohms ±10%, 1/2 w.
and R511	3R77-P241K	In Models earlier than Rev A: Composition: 240 ohms ±10%, 1/2 w.
R512	2R75-P10	Variable, carbon film: 5000 ohms ±20%, 3/8 w; sim to CTS Series 45.
R515 and R516	3R77-P473J	Composition: 4700 ohms ±5%, 1/2 w.
R517	3R77-P105J	Composition: 1 megohm ±5%, 1/2 w.
R518	3R77-P104J	Composition: 0.1 megohm ±5%, 1/2 w.
R520	3R79-P204J	Composition: 0.2 megohm ±5%, 2 w.
R521	3R79-P100K	Composition: 10 ohms ±10%, 2 w.
R522* and R523*	5493035-P2	Wirewound: 1 ohm ±10%, 5 w.
	5493035-P16	In Models of Rev C and earlier: Wirewound: 0.2 ohms, ±10%, 5 w; sim to Tru-Ohm Type X-60.
R524*	3R77-P182K	Composition: 1800 ohms ±10%, 1/2 w. Added by Rev J.
R525*	3R77-P223K	Composition: 22,000 ohms ±10%, 1/2 w. Added by Rev L.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S501	7144140-P1	Toggle: SPST, 10 amps at 250 v or 15 amps at 115 v; sim to Hart 164.
S502*	19A115687-P2	Thermostat switch. Added by Rev B.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T501*	19C307137-P1	Power, step-down and step-up: Pri: 117 VRMS, 50/60 Hz.
	19C307119-P1	In Models earlier than Rev A: Power, step-down and step-up: Pri: 117 VRMS, 50/60 Hz.
T502	7487236-P1	Audio frequency: Pri: 2.5 ohms imp, Sec 1: 600 ohms ±10% imp, Sec 2: 100 ohms ±10% imp.
		- - - - - - - - - TERMINAL BOARDS - - - - - - - - -
TB1 and TB2	7775500-P25	Phen: 9 terminals.

SYMBOL	G-E PART NO	DESCRIPTION
TB3*	7775500-P11	Phen: 5 terminals. In Models of Rev F and earlier: Phen: 3 terminals. In Models earlier than Rev A: Phen: 8 terminals.
	7775500-P7	
	7775500-P24	
TB4	7775500-P24	Phen: 8 terminals.
TB5	7775500-P25	Phen: 9 terminals.
TB6	7775500-P11	Phen: 5 terminals.
TB7	7775500-P6	Phen: 4 terminals.
TB8	7775500-P203	Phen: 5 terminals.
TB9 thru TB12	7775500-P11	Phen: 5 terminals.
TB13 thru TB15	7775500-P7	Phen: 3 terminals.
TB16	7775500-P44	Phen: 1 terminal.
TB17*	7775500-P44	Phen: 1 terminal. Added by Rev A.
TB18*	7775500-P11	Phen: 5 terminals. Added by Rev A.
TB19*	7775500-P6	Phen: 4 terminals. Added by Rev J.
TB501 and TB502	19C301086-P10	Feed-thru, phen: 16 terminals; sim to GE CR151D.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - - -
VR501*	4036887-P2	Silicon, Zener. Added by Rev D.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XF501 thru XF504	19B209005-P1	Fuseholder, post type, phen: 15 amps at 250 v; sim to Littelfuse 342012.
XQ501 thru XQ504	5491888-P1	Transistor, power, phen: sim to Cinch 133-92-10-034.
		ANTENNA RELAY KIT 19A121260-G1 (1-FREQUENCY)
K502	19B204628-G1	Relay assembly. Includes:
	19C307103-P1	Relay, armature, coaxial: 12 VDC nominal, 2 w max operating, 100 ohms ±15%, coil res, 1 form C contact rated at 100 w RF at 470 MC; sim to FXR 300-10977.
	19B209044-P16	Antenna cable, RF: 1900 VRMS max, approx 10 inches long; sim to Amphenol 421-055. (Used with J503).
	5491689-P52	Receiver cable assembly, RF coaxial: includes phono type Plug (P441), 350 VRMS max, approx 27 inches long.
	19B209044-P16	Transmitter cable, RF: 1900 VRMS max, approx 12 inches long; sim to Amphenol 421-055. (Used with P103).
J503	2R22-P3	Receptacle, panel, coaxial: mica-filled insert, UHF contact. Signal Corps SO-239 or sim to Amphenol 83-1R.
	4029082-P1	Hood, UHF connector: 1 x 1 x 3/4 inches, used with RG-58A/U cables; sim to Amphenol 83-705. (Used with J503).
P103	19A121302-G1	Connector: phono type plug.
		ANTENNA RELAY KIT 19A121260-G2 (2-FREQUENCY)
K504	19B204628-G2	Relay assembly. Includes:
	19C307103-P1	Relay, armature, coaxial: 12 VDC nominal, 2 w max operating, 100 ohms ±15%, coil res, 1 form C contact rated at 100 w RF at 470 MC; sim to FXR 300-10977.
	19B209044-P16	Antenna cable, RF: 1900 VRMS max, approx 10 inches long; sim to Amphenol 421-055. (Used with J503).
	5491689-P52	Receiver cable assembly, RF coaxial: includes panel receptacle (J504), 350 VRMS max, approx 27 inches long.
	19B209044-P16	Transmitter cable, RF: 1900 VRMS max, approx 12 inches long; sim to Amphenol 421-055. (Used with P103).

SYMBOL	G-E PART NO	DESCRIPTION
J503 and J504	2R22-P3	Receptacle, panel, coaxial: mica-filled insert, UHF contact. Signal Corps SO-239 or sim to Amphenol 83-1R.
	4029082-P1	Hood, UHF connector: 1 x 1 x 3/4 inches, used with RG-58A/U cables; sim to Amphenol 83-765. (Used with J503 and J504).
P103	19A121302-G1	Connector: phono type plug.
		REPEATER CABLES (WITHOUT DUPLEXER)
	19A121309-G1	Transmitter Antenna Cable. Includes:
	19B209044-P16	RF cable: approx 5 inches long.
	7104941-P17	Connector (Transmitter side).
	4029082-P1	Hood, UHF Connector.
	2R22-P3	Receptacle; sim to Signal Corp SO-239.
		REPEATER CABLES (WITH DUPLEXER)
	19B205895-G3	Transmitter Antenna Cable. Includes:
	19B209044-P16	RF Cable: approx 14 inches long.
	19B209018-P5	Connector (To Duplexer).
	7104941-P17	Connector (To Transmitter).
	19B205895-G4	Receiver Antenna Cable. Includes:
	19B209044-P16	RF Cable: approx 22 inches long.
	19B209018-P5	Connector (To Duplexer).
	7104941-P17	Connector (To Receiver).
		MECHANICAL PARTS (SEE MC-1160)
1	4029974-P1	Transistor insulator. (Used with Q501 thru Q505).
2	4035267-P1	Drive fastener: nylon; sim to Fastex 239-090601-00.
3	19B204990-P1	Shield support.
4	19B204380-P1	Heat sink. (Used with Q501, Q503 and Q504).
5	7763541-P5	Cable clamp. (Located near TB501).
6	19A121775-G1	Support.
7	19A121245-G1	Dust cover. (Used with K501).
8	19A121032-P1	Relay support. (Used with K501).
9	7878455-P1	Lug terminal. (Used with S501).
10	4038581-G2	Fan guard. (Used with B501).
11	19B204375-G1	Hinged support. (Used with Transmitter).
12	19A121039-P1	Support. (Used with B501).
13	19A121788-G1	Support. (Used with Receiver).
14	5490195-P102	Stud. (Locks Transmitter and Receiver units in operating position).
15	19B204378-P1	Heat sink. (Used with Q502 and Q505).
16	5491689-P55	Antenna coaxial cable: includes phono type plug and jack, 350 VRMS max, approx 26 inches long.
17	4034208-P1	Cable clip.
18	19B204374-G1	Hinged support. (Used with Receiver).
19	19A121027-P1	Support.
20	19B204373-G1	Tunnel cover. (Used with B501).



TRANSMITTER/RECEIVER SHARED POWER SUPPLY-4EP38A1O

SYMBOL	G-E PART NO	DESCRIPTION
21	19C303371-G1	Chassis.
22	19A121787-G1	Support. (Used with Transmitter).
23	X207P16C13	Nut: 10-32. (Used with CR517).
24	19A115276-P1	Mica washer: No. 10. (Used with CR517).
25	X401P9C13	Flat washer: No. 10. (Used with CR517).
26	4036835-P1	Lug terminal. (Used with CR417).
27	19A115275-P1	Teflon washer: No. 10. (Used with CR517).
28	X414P19C13	Lockwasher: No. 10. (Used with CR517).
29	7142162-P54	Hex spacer: 4-40. (Used with A502, A503 and A504).
30	19D402505-P1	Shield.

PRODUCTION CHANGES

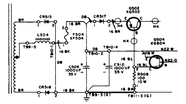
Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter", which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

REV. A — To reduce remote audio distortion. Changed R509 and R510. To improve FM noise characteristics of the Local/Remote transmit audio circuit. Added C515.

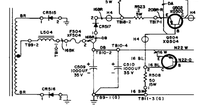
To increase current rating of the 13.4 volt regulator. Added Q505, R522, R523, TB17, TB18, and changed T501, F504, and R508. Connected blower B501-1 to S501-2.

SCHEMATIC DIAGRAM CHANGE

WAS



CHANGED TO

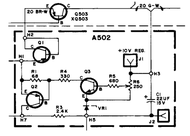


REV. B — To eliminate continuous operation of blower. Added thermostat S502.

REV. C — To improve reliability of the 10 volt regulator. Changed 10 volt regulator board (A502) and Q303. Added CR522.

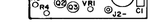
SCHEMATIC DIAGRAM CHANGE

A502 WAS



OUTLINE DIAGRAM CHANGE

A502 WAS



REV. D — To improve reliability of the 13.4 volt regulator. Changed R522, R523, A503-R2 and A503-VR2. Added VR501.

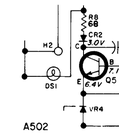
REV. E — To reduce A.M. broadcast pickup. Added C516.

REV. F — To improve operation of 10-volt regulator A502. Changed R8.

REV. G — To permit operation with solid state Channel Guard encoder-decoder. Added tone connection from P443-3 to P101-10 and -13, and changed terminal board TB5.

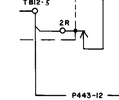
REV. H — To protect 10-volt regulator A502 from reverse polarity and voltage transients. Deleted CR2 and added diode CR3.

Schematic Diagram Was:



REV. J — To replace relay contacts K501-1R and -2R with a transistor switch for receiver muting voltage. Added Q506, R524 and TB19.

Schematic Diagram Was:

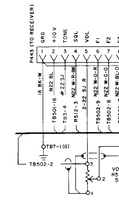


REV. K — To provide a 600-ohm audio output impedance. Changed R509 and R510. Removed the Green-White wire connected from TB12-5 to A502-H3, and moved the Blue wire from TB12-5 to TB19-2.

REV. L — To prevent receiver from muting when station inter-lock switch is opened. Added R525.

Rev. M — To reduce audio distortion. Changed volume control wiring..

SCHEMATIC DIAGRAM WAS:



ORDERING SERVICE PARTS

Each component appearing on the schematic diagram is identified by a symbol number, to simplify locating it in the parts list. Each component is listed by symbol number, followed by its description and GE Part Number.

Service parts may be obtained from Authorized GE Communication Equipment Service Stations or through any GE Radio Communication Equipment Sales Office. When ordering a part, be sure to give:

1. GE Part Number for component
2. Description of part
3. Model number of equipment
4. Revision letter stamped on unit

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance.

Should further information be desired, or should particular problems arise which are not covered sufficiently for the purchaser's purposes, contact the nearest Radio Communication Equipment Sales Office of the General Electric Company.

MAINTENANCE MANUAL

LBI-3529

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