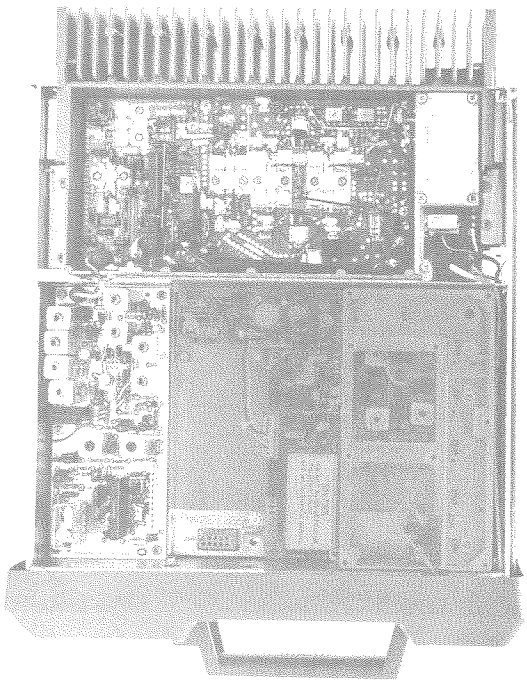
MOBILE RADIO

MASTR® *Executive II* MAINTENANCE MANUAL

138-174 MHz, 100-WATT TRANSMITTER

Maintenance Manual LBI30758
(DF3163, THIS SHEET ONLY)



138-174 MHz 100-WATT
MASTER EXECUTIVE II TRANSMITTER

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GENERAL ELECTRIC

SPECIFICATIONS*

Power Output	100 Watts (Adjustable from 20 to 100 Watts
Crystal Multiplication Factor	12
Frequency Stability	±0.0005%
Spurious and Harmonic Emission: (Per EIA RS-152-B, Para. 4)	
138-155 MHz	At least 75 dB below maximum rated power output.
150.8-174 MHz	At least 80 dB below maximum rated power output.
Modulation	Adjustable from 0 to ±5 kHz swing with instantaneous modulation limiting.
Audio Sensitivity	75 to 120 Millivolts
Audio Frequency Characteristics	Within +1 to -3 dB of a 6-dB/octave pre-emphasis from 300 to 3000 Hz per EIA standards. Post limiter filter per FCC and EIA.
Distortion	Less than 3% (1000 Hz) Less than 5% (300 to 3000 Hz)
Deviation Symmetry	0.5 kHz maximum

Maximum Frequency Spread:

	Full Specifications	1 dB Degradation
138-155 MHz	1.8 MHz	2.25 MHz
150.8-174 MHz	2.0 MHz	2.5

Duty Cycle	EIA 20% Intermittent
RF Output Impedance	50 ohms

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

WARNING

Although the highest DC voltage supplied to the transmitter is +12 VDC, high currents may be drawn under short circuit conditions. These currents can possibly heat metal objects such as tools, rings, watchbands, etc., enough to cause burns.

High-level RF energy in the transmitter Power Amplifier assembly can cause RF burns upon contact. Keep away from these circuits when the transmitter is energized!

MOBILE RADIO

DESCRIPTION AND MAINTENANCE

138—174 MHz, 100 WATT MASTR® EXECUTIVE II TRANSMITTER

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ILLUSTRATIONS

DESCRIPTION

MASTR® Executive II 100 Watt transmitters are crystal controlled, phase modulated transmitters designed for one through four frequency operation in the 138-174 MHz frequency band. The solid state transmitter utilizes both integrated circuits (ICs) and discrete components, and consists of the following assemblies:

- Exciter Board; with audio, modulator, amplifier and multiplier stages.
- Power Amplifier Assembly; with amplifiers, driver, PA, power control, filter and antenna switch.
- Multi-frequency Board; used with multi-frequency radios only (common to transmitter and receiver).

Figure 1 is a block diagram of the MASTR Executive II transmitter showing the exciter, PA board and multi-frequency board.

The PA assembly uses five RF power transistors to provide 100 Watts output power. The output power is adjustable over a range of 20 to 100 watts. A directional coupler, transistor and power control IC are used in the power control circuit.

MAINTENANCE

The PA assembly is insulated from vehicle ground to permit operation in positive or negative ground vehicles.

Note

In positive ground vehicles, A- is "hot" with respect to vehicle ground. Shorting the transmitter PA printed wiring board ground pattern to the radio case may cause one of the in-line fuses to blow.

EXCITER DISASSEMBLY

To service the transmitter remove the two retaining screws from the front cap assembly and pull radio out of case assembly.

To remove exciter board:

(1) Unplug cables W216 (exciter output and when present W2601 (multi-frequency cable).

(2) Remove the six screws holding the exciter board to the mounting frame and gently lift exciter board out of radio.

PA DISASSEMBLY

PA Assembly

To remove the PA assembly:

(1) Remove the PA top cover and unplug the exciter/PA cable, the antenna, receiver and PTT cables.

(2) Remove the four side-rail screws, and unsolder the power cables from the bottom of the PA assembly if desired.

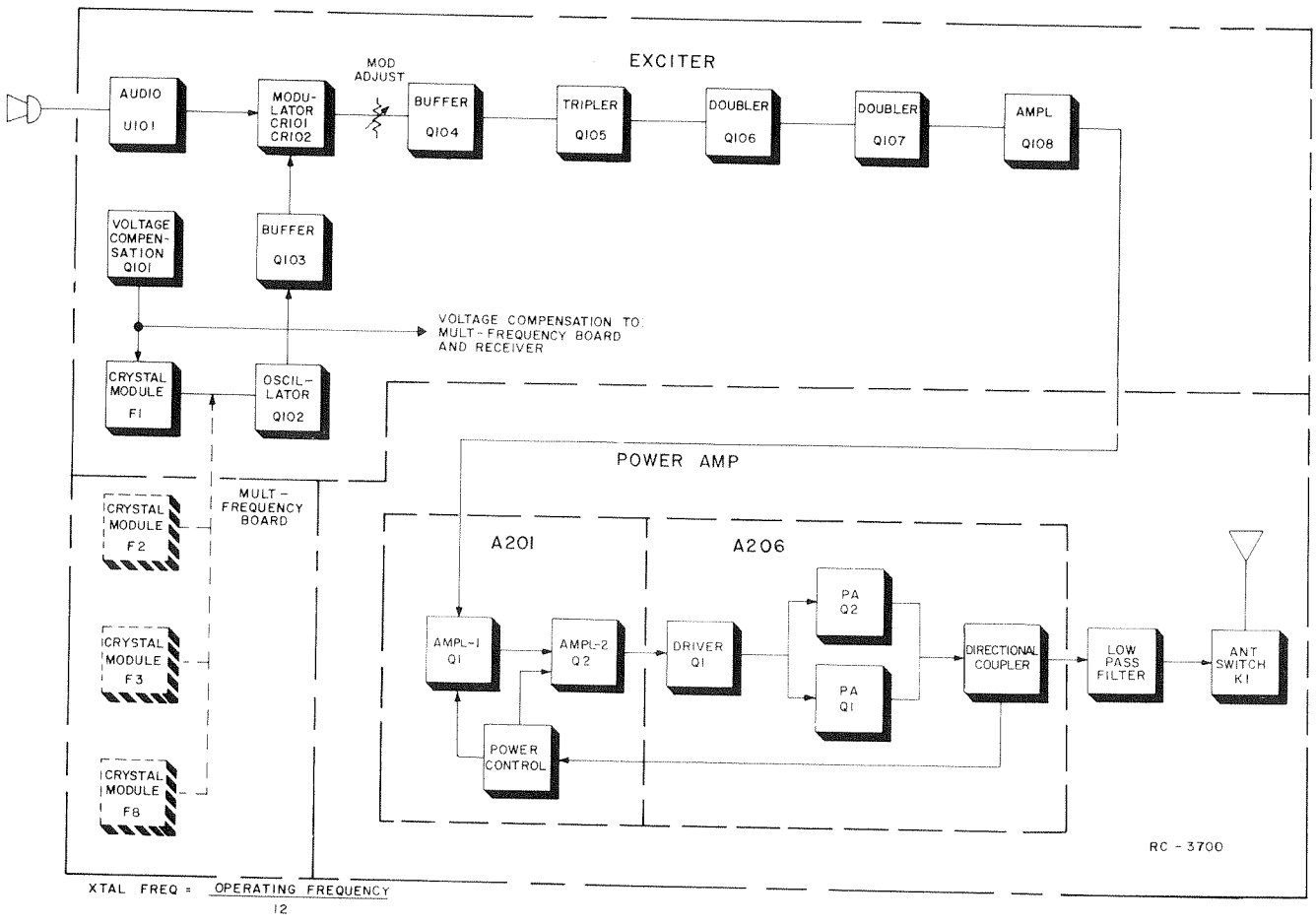


Figure 1 - Transmitter Block Diagram

PA Driver Module (A201)

To remove PA Driver module: (See PA assembly Outline Diagram).

1. Remove the PA top cover and unplug the Exciter/PA cable.
2. Unsolder and remove power feed cables W207 and W206.

CAUTION

Extreme care must be taken to prevent damage to the printed circuit runs of the PA module when removing W30.

3. Carefully unsolder and remove straps and cables W30, W203, W204, W211 and leads of W210 between the PA Driver module and the PA module. Remove the excess solder from the ground connections with a desoldering tool such as a SOLDA-PULLT®; then lift the connections from the PA Driver module with a scribe or X-acto® knife.
4. Unsolder thermistor (RT201) leads.
5. Remove Q215 retaining screw, nut and washer from heat sink assembly.
6. Remove A201-Q1 and A201-Q2 transistor mounting screws (2 each), and nuts and washers on bottom of the PA assembly.
7. Remove the four PA Driver board mounting screws (including the one securing W204) and lift the board out.

PA Module (A206)

To remove PA module: (See PA assembly Outline Diagram).

1. Remove the PA top cover.
2. Unsolder and remove power feed cables W207 and W206.

CAUTION

Extreme care must be taken to prevent damage to the printed circuit runs on the PA module and the Low Pass Filter module when unsoldering W30 and W31.

3. Carefully unsolder and remove straps W30, W203 and W204 between the PA Driver module and the PA module. Remove the excess solder from the ground connections with a de-soldering tool such as a SOLDA-PULLT®; then lift the connections from the PA Driver module with a scribe or X-acto® knife.

4. Carefully unsolder and remove strap W31 between the PA module and the Low Pass Filter module.

5. Unsolder leads of W210 from H3, H4 and H5 on PA Module A206.

6. Remove A206-Q1 through Q3 transistor mounting screws (2 each), and nuts and washers on bottom of the PA assembly.

7. Remove the six PA board mounting screws, and lift the board out.

To remove Low Pass Filter/Antenna Switch module:

1. Remove the PA top cover.

2. Remove antenna and receiver plugs, and disconnect PTT cables.

3. Carefully unsolder and remove strap W31 between the PA module and the Low Pass Filter module.

4. Remove the seven mounting screws, lift off the filter casting, and lift the board out.

PA TRANSISTOR REPLACEMENT

WARNING

The RF Power Transistors used in the transmitter contain Beryllium Oxide, a TOXIC substance. If the ceramic or other encapsulation is opened, crushed, broken or abraded, the dust may be hazardous if inhaled. Use care in replacing transistors of this type.

To remove RF PA transistors:

1. With a 50-Watt soldering iron and a de-soldering tool such as the SOLDA-PULLT®, remove the excess solder from the leads. Use a scribe or X-acto® knife to hold the leads away from the printed circuit board until the solder cools.

2. Turn the PA Assembly over.

3. Hold the nuts on the bottom of the heat sink with a 3/16-inch nutdriver and remove the two retaining screws. Lift out the transistor and remove the old solder from the printed circuit board with a de-soldering tool such as a SOLDA-PULLT®.

   Special care should be taken to prevent damage to the printed circuit board runs because part of the matching network is included in the base and collector runs.

To replace RF PA transistors:

1. Trim the new transistor leads (if required) to the lead length of the removed transistor. The collector lead is identified by the smaller center lead (See Figure 2). The letter "C" on top of each transistor also identifies the collector.

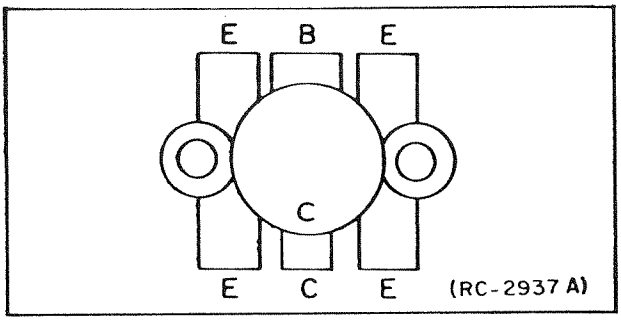


Figure 2 - Lead Identification

2. Apply a coat of silicone grease to the transistor surface and heat sink.

   Assemble all hardware loose and align the leads as shown on the Outline Diagram. Then hold the body of the transistor and replace the two retaining screws. Hand tighten then torque to 6 inch-pounds. A torque wrench must be used for this adjustment since transistor damage can result if too little or too much torque is used.

3. Solder the leads to the printed circuit pattern. Start at the inner edge of mounting hole and solder the remaining length of transistor lead to the board. Do not use excessive heat which causes the printed wire runs to lift up from the board. Check for shorts and solder bridges with an ohmmeter before applying power.

CAUTION

Failure to solder the transistor leads as directed may result in the generation of RF loops that could damage the transistor or may cause low power output.

DIRECTIONAL COUPLER ADJUSTMENT

The directional coupler adjustment (A206-R6, Forward Power and A206-R7, Reflected Power) controls are preset at the factory and normally do not require readjustment. Should it become necessary to replace A206-CR1, CR2 or the PA transistors, it may be desirable to reset A206-R6 and A206-R7. The following procedure applies.

1. Connect a 50 ohm wattmeter capable of measuring 150 watts to the antenna jack.

CAUTION

ADJUSTING DIRECTIONAL COUPLER POTENTIOMETERS A206-R6 and R7 may destroy them and require their replacement.

2. Turn power adjust potentiometer A201-R8 and forward power sensor potentiometer A206-R6 fully clockwise. Set reflected power sensor potentiometer A206-R7 fully counterclockwise.

3. Key transmitter on each channel and determine which channel produces the highest output.

4. With the channel producing the highest output selected, adjust forward power sensor A206-R6 to 10% above rated output power.

5. Set power adjust potentiometer for rated output power and unkey transmitter.

6. Remove wattmeter and double terminate the antenna jack with two paralleled 50 ohm wattmeters. Connect the wattmeters directly to antenna jack using tee connectors and adaptors as required.

7. Set reflected power sensor potentiometer A206-R7 fully clockwise.

8. Key transmitter on each channel and determine which channel produces the lowest output.

9. If PA provides 80% or more of rated power on all channels, no further adjustment is required. If less than 80% of rated power is present on any channel, set the frequency selector to the channel with lowest output and adjust A206-R7 to provide 80% of rated output power.

10. Re-cement forward and reflected power potentiometers A206-R6 and R7 using RTV.

TROUBLESHOOTING

A Troubleshooting Procedure, including QUICK CHECKS, permits rapid fault location in the exciter and power amplifier.

MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502

GENERAL ELECTRIC

? FREQUENCY ADJUSTMENT

to determine if any adjustment is required. The frequency meter or counter with an absolute accuracy that is 5 to 10 to be maintained, and with the entire radio as near as ire of 30°C (86°F).

:set only when the frequemcy shows deviation in excess of the

lio is at 30°C (86°F).

mperature within the range of -30°C to +75°C (-22°F to

d, proceed as follows:

nt temperature of 30°C (86°F), set the oscillator for the

mbient temperature of 30°C, setting errors can be minimized

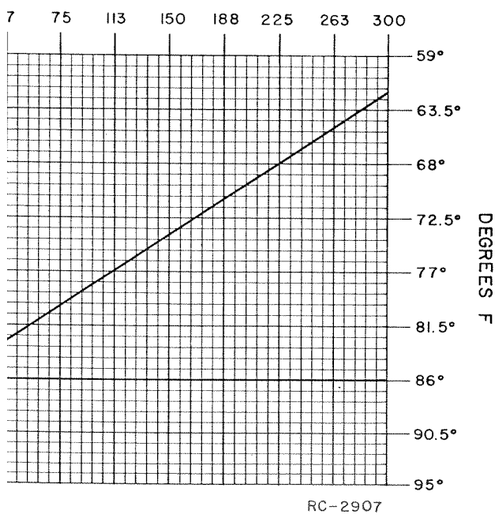
ror to ±0.6 PPM (which is considered reasonable for 5 PPM

o at 30°C and set the oscillator to desired frequency, or

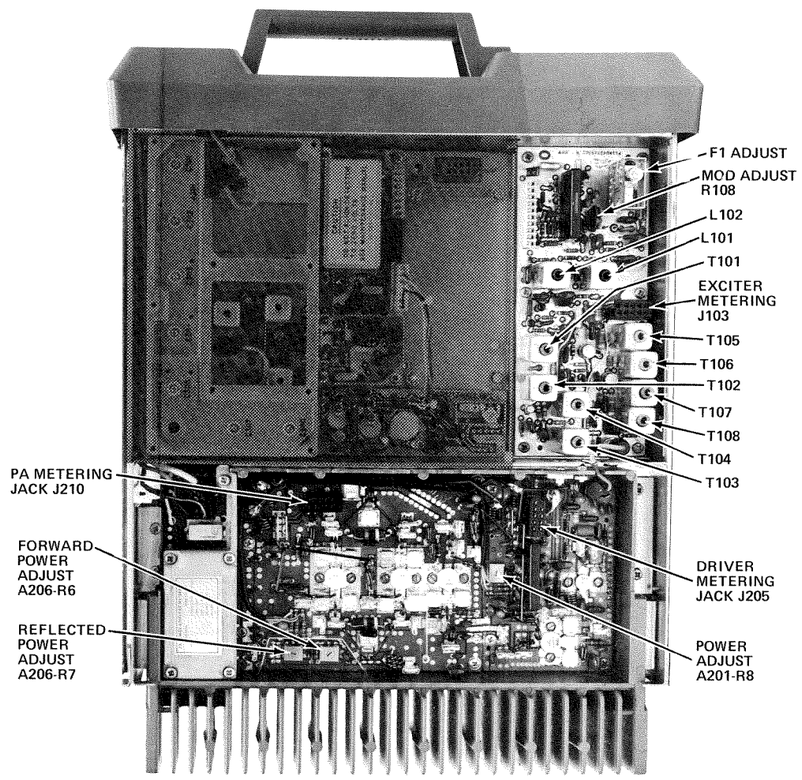
o at 30°C (+5°C, -15°C) offset the operating frequency as a l temperature, by the amount shown in Figure 3.

bient temperature of the radio is 20°C (68°F). At that orrection factor of 225 Hz.

tal module for a reading of 225 Hz higher than the f a negative correction factor is obtained (at temperatures for the indicated frequency lower than the licensed operating



Characteristics Vs. Temperature



TRANSMITTER ALIGNMENT

EQUIPMENT

1. GE Test Set Model 4EX3A11 or Test Kit 4EX8K12.
2. A 50-ohm wattmeter connected to antenna jack.
3. A frequency counter.
4. Deviation Monitor.

PRELIMINARY CHECKS AND ADJUSTMENTS

1. Place crystal modules for F1 on Exciter Board and F2-F4 on multi-frequency board. (Crystal frequency = operating frequency ÷ 12).
2. For a large change in frequency or a badly mis-aligned transmitter, preset all slugs to the top of the coil form.
3. For multi-frequency transmitters with a frequency spacing less than .900 MHz for frequency between 138-155 MHz or less than 1.00 MHz for frequencies between 150.8-174 MHz tune the transmitter (except L101 and L102) on the lowest frequency. See Step 1 below.

   For multi-frequency transmitters with a frequency spacing up to 1.8 MHz for frequencies between 138-155 MHz or 2.0 MHz for frequencies between 150.8-174 MHz. Tune the transmitter using a center frequency tune-up crystal module. These limits can be extended to 2.25 MHz and 2.5 MHz respectively with 1 dB degradation in power output.
4. Connect the red plug on the GE Test Set to the SAS board metering jack, and the black plug to the Exciter metering jack. Set the polarity to +, and set the range to the Test 1 position (1-Volt position for 4EX8K12) for all adjustments.

   NOTE: With the Test Set connected to driver metering jack J205, the voltage reading at position "G" with the HIGH SENSITIVITY button pressed may be converted to driver collector current by reading the current as 10 amperes full scale. The voltage reading at position "G" on PA Metering Jack J210, with the HIGH SENSITIVITY button pressed, may be converted to PA collector current by reading the current as 30 amperes full scale.
5. All adjustments are made with the transmitter keyed. Unkey the transmitter between steps to avoid unnecessary heating.
6. Set tuning slugs in L101, L102 and T101 through T108 to top of coil form.

ALIGNMENT PROCEDURE

STEP	METER POSITION	TUNING CONTROL	METER READING	PROCEDURE
1.	A (MULT-1)	L101, L102 & T101	See Procedure	Tune L101 then L102 for maximum meter reading on highest frequency. Then with lowest frequency selected, tune T101 for a dip in meter reading.
2.	A	L102	See Procedure	Using a deviation monitor, check the symmetry of the modulator at 300 Hz using the highest and lowest assigned operating frequencies. If more than 0.5 kHz dis-symmetry exists, tune L102 to optimize symmetry exists, tune L102 to optimize symmetry. NOTE: L102 should not be adjusted more than ±1/8 turn from previous setting. If a deviation monitor is not available, adjust L102 1/8 turn counterclockwise.
3.	B (MULTI-2)	T102, T101 & T103	See Procedure	Tune T102 for maximum meter reading and re-adjust T101 for maximum meter reading. Then tune T103 for a dip in meter reading.
4.	C (MULTI-3)	T104, T103 & T105	See Procedure	Tune T104 for maximum meter reading and re-adjust T103 for maximum meter reading. Then tune T105 for a dip in meter reading.
5.	F (AMPL-1)	T106 & T105	Maximum	Tune T106 for maximum meter reading, then re-adjust T105 for maximum meter reading.
6.	G (Rel. Power Out)	T107 & T108	Maximum	Tune T107 and then T108 for maximum meter reading. Then, alternately re-tune T107 and T108 for maximum meter reading.
7.	F (AMPL-1 DRIVE)	T105 & T106	Maximum	Readjust T105 and T106 for maximum meter reading.
8.	G (Rel. Power Out)	T107 & T108	Maximum	Readjust T107 and T108 for maximum meter reading.
9.		A201-R8		Set Power Adjust potentiometer A201-R8 for the desired power output from 20 to 100 Watts.
	ADDITIONAL STEPS FOR TRANSMITTERS USING CENTER FREQUENCY TUNE-UP CRYSTAL MODULE			
10.	B (MULT-2)	T101 & T102	See Procedure	Check drive on highest and lowest frequency. If drive is lower on lowest frequency, preset the tuning slugs of T101 and T102 to top of coil form and retune for maximum meter reading. (0.1 Volt typical difference between lowest and highest frequency).
11.	C (MULT-3)	T103	See Procedure	Check drive on highest and lowest frequency. If drive is lower on lowest frequency, retune T103 for maximum meter reading on lowest freq.
12.	G (Rel. Power Out)	T105	See Procedure	Retune T105 for equal drive on highest and lowest frequency. NOTE: For two frequency spread approaching maximum limits, a difference in drive may exist. If this occurs, be sure the lower frequency has greater drive. Repeat Step 8.

CAUTION

Before bench testing the radio, be sure of the output voltage characteristics of your bench power supply.

To protect the transmitter power output transistors from possible instant destruction, the following input voltages must not be exceeded:

Transmitter unkeyed: 20 Volts
Transmitter keyed (50 ohm resistive load): 18 Volts
Transmitter keyed (no load or non-resistive load): 15.5 Volts

These voltages are specified at the normal vehicle battery terminals of the radio and take the voltage drop of standard cables into account. The voltage limits shown for a non-optimum load is for "worst case" conditions. For antenna mismatches likely to be encountered in practice, the actual limit will approach the 18 Volt figure.

Routine transmitter tests should be performed at EIA Standard Test Voltages (13.4 VDC for loads of 16 to 36 amperes: Input voltages must not exceed the limits shown, even for transient peaks of short duration.

Many commonly used bench power supplies cannot meet these requirements for load regulation and transient voltage suppression. Bench supplies which employ "brute force" regulation and filtering (such as Lapp Model 73) may be usable when operated in parallel with a 12-Volt automotive storage battery.

TEST EQUIPMENT

1. An audio oscillator
2. A deviation monitor
3. A Multimeter and AC voltmeter
4. GE Test Set Models 4EX3A11 or 4EX8K12
5. Wattmeter, 50 ohm
6. Frequency Counter
7. Oscilloscope

MODULATION LEVEL ADJUSTMENT

MOD ADJUST Control R108 has been adjusted to the proper setting before shipment andsshould not normally require readjustment. This setting permits approximately 75% modulation for the average voice level.

NOTE

The Channel Guard Deviation Adjustment should be repeated every time the Tone Frequency is changed.

PROCEDURE

1. Connect the audio oscillator and the AC meter across audio input terminals J10 (Green-Hi) and J11 (Black-Lo) on GE Test Set, and connect red Test Setplug to the System red metering plug. Connect black plug to Exciter metering jack. If not using GE Test Set, connect audio oscillator and meter across P902-6 (Mike High) through a 0.5 microfarad (or larger) DC blocking capacitor, and P902-5 (Mike-Low) on the System Board.

2. Adjust the audio oscillator for 1-Volt RMS at 1000 Hz.

DEVIATION ADJUSTMENT

1. For transmitters without Channel Guard, set MOD ADJUST R108 for a 4.5 kHz swing with the deviation polarity which gives the highest reading as indicated on the frequency modulation monitor.

NOTE

If the deviation reading plus (+) or minus (-) differs more than 0.5 kHz, recheck Step 1 as shown in the Transmitter Alignment Chart.

2. For transmitters with Channel Guard, set CHANNEL Guard MOD ADJUST R643 for zero tone deviation. Next, with the 1-Volt signal at 1000 Hz applied, set MOD ADJUST R108 for 3.75 kHz deviation. Then remove the signal from the audio oscillator and set Channel Guard MOD ADJUST R643 for 0.75 kHz tone deviation.

3. For multi-frequency transmitters, set the deviation as described in Steps 3 or 4 on the channel producing the largest amount of deviation.

PA POWER INPUT

For FCC purposes, the PA power input can be determined by measuring the PA supply voltage and PA current using the following formula:

$$P_i = \text{PA voltage} \times \text{PA current}$$

where:

P_i is the power input in watts,

PA voltage is measured with Test Set Model 4EX3A11 in Position G on the 15-Volt range (read as 15 Volt full scale), and with the polarity switch in the (-) position. With Test Set Model 4EX8K12, use the B+ position and the 1-Volt range (read as 15 Volts full scale), with the HIGH SENSITIVITY button and the polarity switch in the (-) position.

PA current is measured with the Test Set in Position G in the Test 1 position, and with the HIGH SENSITIVITY button pressed (read as 30 amperes full scale).

Example:

P_i = 12.4 Volts x 16 amperes = 198.4 Watts

OSCILLATOR FREQUENCY ADJUSTMENT

First, check the frequency to determine if any adjustment is required. The frequency should be set using a frequency meter or counter with an absolute accuracy that is 5 to 10 times better than the tolerance to be maintained, and with the entire radio as near as possible to an ambient temperature of 30°C (86°F).

The oscillator should be reset only when the frequemcy shows deviation in excess of the following limits:

A. ±0.6 PPM, when the radio is at 30°C (86°F).

B. ±5 PPM at any other temperature within the range of -30°C to +75°C (-22°F to +167°F)

If an adjustment is required, proceed as follows:

If the radio is at an ambient temperature of 30°C (86°F), set the oscillator for the correct operation frequency.

If the radio is not at an ambient temperature of 30°C, setting errors can be minimized as follows:

A. To hold the setting error to ±0.6 PPM (which is considered reasonable for 5 PPM crystal oscillators):

   1. Maintain the radio at 30°C and set the oscillator to desired frequency, or

   2. Maintain the radio at 30°C (+5°C, -15°C) offset the operating frequency as a function of actual temperature, by the amount shown in Figure 3.

For example: Assume the ambient temperature of the radio is 20°C (68°F). At that temperature, the curve shows a correction factor of 225 Hz.

Set C3 on the selected crystal module for a reading of 225 Hz higher than the licensed operating frequency. If a negative correction factor is obtained (at temperatures above 30°C), set the oscillator for the indicated frequency lower than the licensed operating frequency.

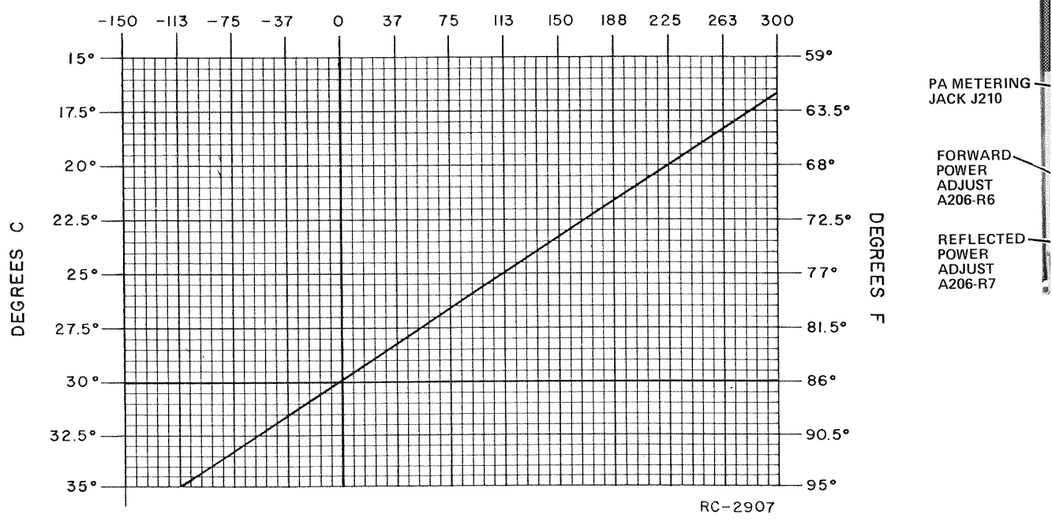
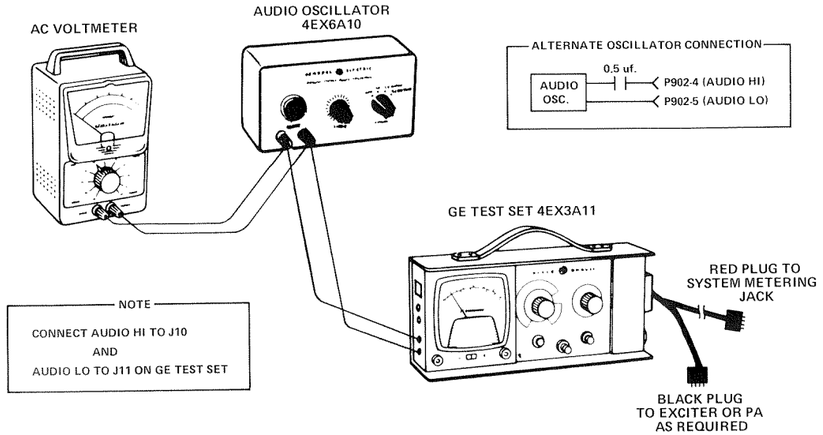
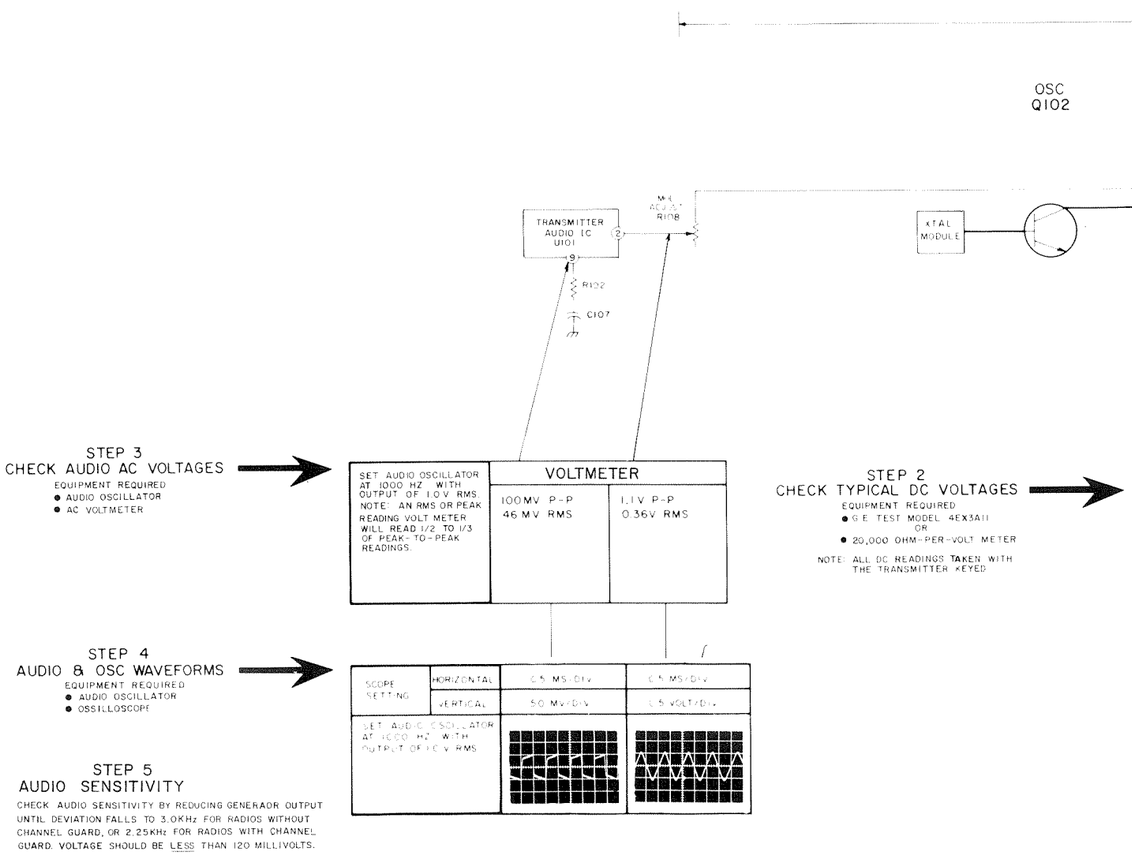
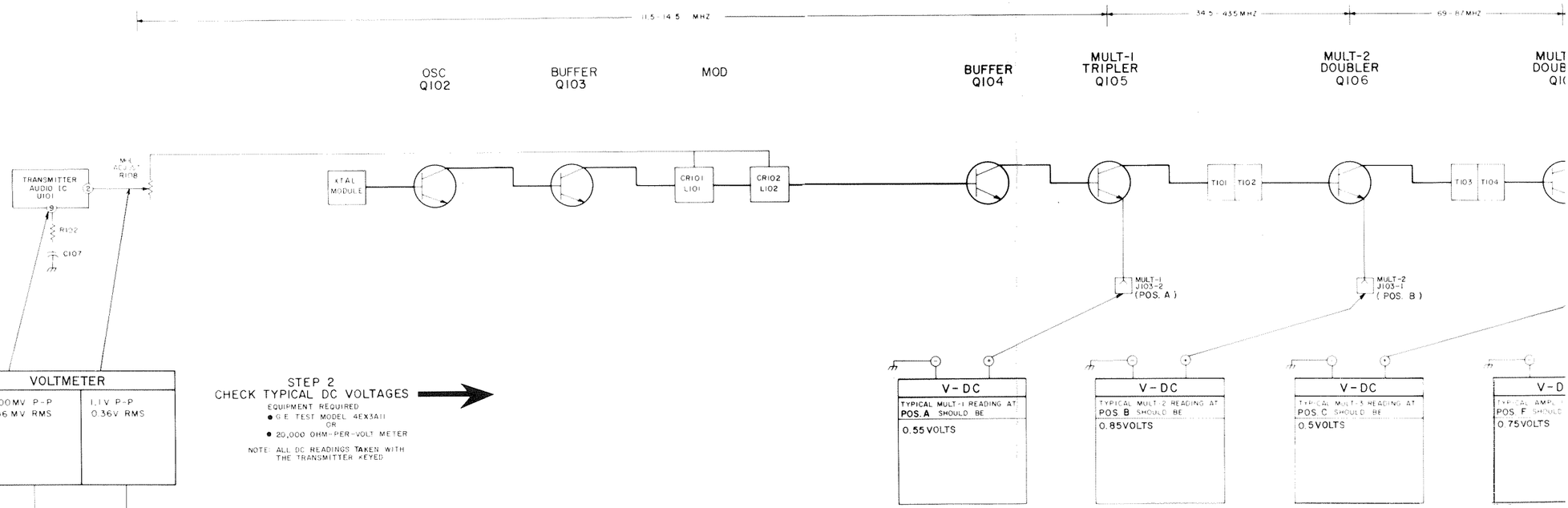


Figure 3 - Frequency Characteristics Vs. Temperature

TEST EQUIPMENT SETUP







TROUBLESHOOTING PROCEDURE

138—174 MHz, 100 WATT TRANSMITTER

34.5 - 43.5 MHZ

69 - 87 MHZ

48 - 74 MHZ

MULT-1
TRIPLER
Q105

MULT-2
DOUBLER
Q106

MULT-3
DOUBLER
Q107

AMPL-1
Q109

AMPL-1
Q1

AMPL-2
Q2

DRIVER
Q1

PA
Q2 / Q3

T101 T102

T103 T104

T105 T106

T107 T108

POWER OUTPUT
250 MW MIN

POWER OUTPUT
10 WATTS

W30

POWER OUTPUT
100 WATTS

W31

DIRECTIONAL
COUPLER

LOW
PASS
FILTER

ANT
SWITCH

J203 ANT

J202 RX

POWER CONTROL
Q215

MULT-1
J103-2
(POS. A)

MULT-2
J103-1
(POS. B)

MULT-3
J103-3
(POS. C)

AMPL-1
J103-9
(POS. F)

REL - PWR OUT
J103-4
(POS. G)

AMPL-1 DRIVE
J205-4
(POS. D)

POWER CONTROL
J205-3
(POS. C)

AMPL-2 CURRENT
J205-7 (+)
J205-9 (-)
(POS. F)

DRIVER CURRENT
J205-6 (+)
J205-5 (-)
(POS. G)

PA CURRENT
J210-6 (+)
J210-5 (-)
(POS. G)

V - DC
TYPICAL MULT-2 READING AT POS. B SHOULD BE:
0.85 VOLTS

V - DC
TYPICAL MULT-3 READING AT POS. C SHOULD BE:
0.5 VOLTS

V - DC
TYPICAL AMPL-1 READING AT POS. F SHOULD BE:
0.75 VOLTS

V - DC
TYPICAL AMPL-1 READING AT POS. G SHOULD BE:
0.15 VOLTS

V - DC
TYPICAL AMPL-1 READING AT POS. D SHOULD BE:
0.65 VOLTS

V - DC
TYPICAL POWER CONT READING AT POS. C SHOULD BE:
5.5 VOLTS (READING ON 15 VOLT SCALE)

Q215-E

V - DC
TYPICAL AMPL-2 IC READING AT POS. F SHOULD BE:
1.0 VOLTS (READING ON 10 VOLT SCALE WITH HIGH SENS BUTTON PUSHED)
CURRENT = VOLTAGE READING

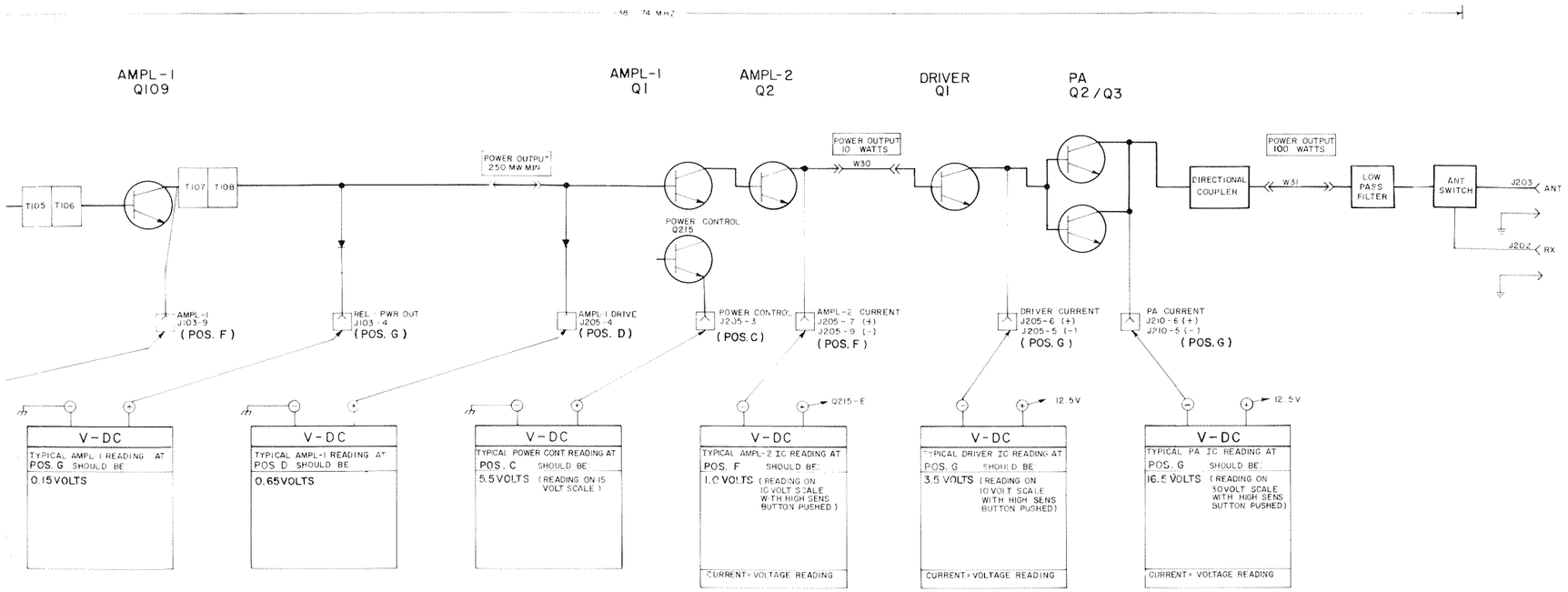
12.5V

V - DC
TYPICAL DRIVER IC READING AT POS. G SHOULD BE:
3.5 VOLTS (READING ON 10 VOLT SCALE WITH HIGH SENS BUTTON PUSHED)
CURRENT = VOLTAGE READING

12.5V

V - DC
TYPICAL PA IC READING AT POS. G SHOULD BE:
16.5 VOLTS (READING ON 30 VOLT SCALE WITH HIGH SENS BUTTON PUSHED)
CURRENT = VOLTAGE READING

RC - 3701



RC-3701

STEP 1 - QUICKCHECKS

METER POSITION GE TEST SET	PROBABLE DEFECTIVE STAGE		
	HIGH METER	LOW METER	ZERO METER
	EXCITER		
A (MULT-1)	Q104, Q105, T101	Q104, Q105	Q104, Q105, T101
B (MULT-2)	Q106, T103	Q106, T101, T102	T101, T102, Q106, T103
C (MULT-3)	Q107, T105	T103, T104, Q107	T103, T104, Q107, T105
F (AMPL-1)	Q108, C149	T105, T106, Q108	T105, T106, Q108, L108
G (REL. PWR. OUT)		Q108, T107, T108	Q108, T107, T108, CR103

POWER AMPLIFIER

POWER AMPLIFIER					
METER POSITION GE TEST SET	TEST POINT	NORMAL METER READING	PROBABLE DEFECTIVE STAGE		
			HIGH METER READING	LOW METER READING	ZERO METER READING
"D" (AMPL-1 DRIVE)	J205-4	+0.65 VDC		Low Output from Exciter	No output from Exciter, A201-C1
"C" (POWER CONTROL VOLTAGE)	J205-3	+5.5 VDC	Q215, U1	Q215, U1	No Exciter output, Q215, CR1
"F" (AMPL-2 CURRENT	J205-7 (+) J205-9 (-)	1.0 VDC (NOTE 1)	A201, Q2	A201, Q2, Low Output from A201, Q1	A201, Q1, Q2. Check Pos. D&C Q215
J205 "G" (DRIVER CURRENT)	J205-6 (+) J205-5 (-)	3.5 VDC (NOTE 1)	A206-Q2, Q3	A201,-Q1,-Q2 A206,-Q1, Q2, Q3	A201-Q1, Q2 A206-Q1, Q2, Q3 Q215
J210 "G" PA CURRENT	J210-6 (+) J210-5 (-)	16.5 VDC (NOTE 2)	A206-Q2 A206-Q3	A201-Q1, Q2 A206-Q1, Q2, Q3	A201-Q1, Q2 A206-Q1, Q2, Q3 Q215

NOTES

1. Current - voltage reading x 10, HIGH SENS Button Pressed
2. Current - voltage reading x 30, HIGH SENS Button Pressed