138—174 MHz, 25/1 WATT MASTR® II TRANSMITTER (MARINE HIGH-LOW POWER)

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DESCRIPTION

MASTR® II transmitters for Marine Service are crystal-controlled, phase modulated transmitters designed for one through eight-frequency operation in the 138 to 174 megahertz 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 amplifier, PA, power control IC, Coupler board, low pass filter and antenna switch.

Figure 1 is a block digram of the transmitter, showing the Exciter board coupler board and Power Amplifier Assembly.

The exciter uses nine transistors and one integrated circuit to drive the PA assembly. The exciter can be equipped with up to eight Integrated Circuit Oscillator Modules (ICOMs). The ICOM crystal frequency ranges from approximately 11.5 to 14.5 megahertz, and the crystal frequency is multiplied 12 times.

The PA assembly uses two RF power transistors to provide up to 25 Watts output power. The output power is adjustable over a range of 5 to 25 Watts when operating in the high power mode or 0.5 to 5 Watts when operating in the low power mode. A directional coupler, transistor, power control IC and two power adjust Potentiometers are used in the power control circuit.

OPERATION

A HI-LO power option switch on the control unit selects the transmitted RF output power. When the option switch is in the HI position, the RF transmitted power is 25 Watts and the power indicator LED is on. When the option switch is in the LO position, the RF transmitter output power is 1 Watt and the power indicator is off.

MAINTENANCE

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

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 inline fuses to blow.

MOBILE DISASSEMBLY

To service the transmitter from the top:

1. Pull the locking handle down, then pry up the top cover at the front notch and lift off the cover.

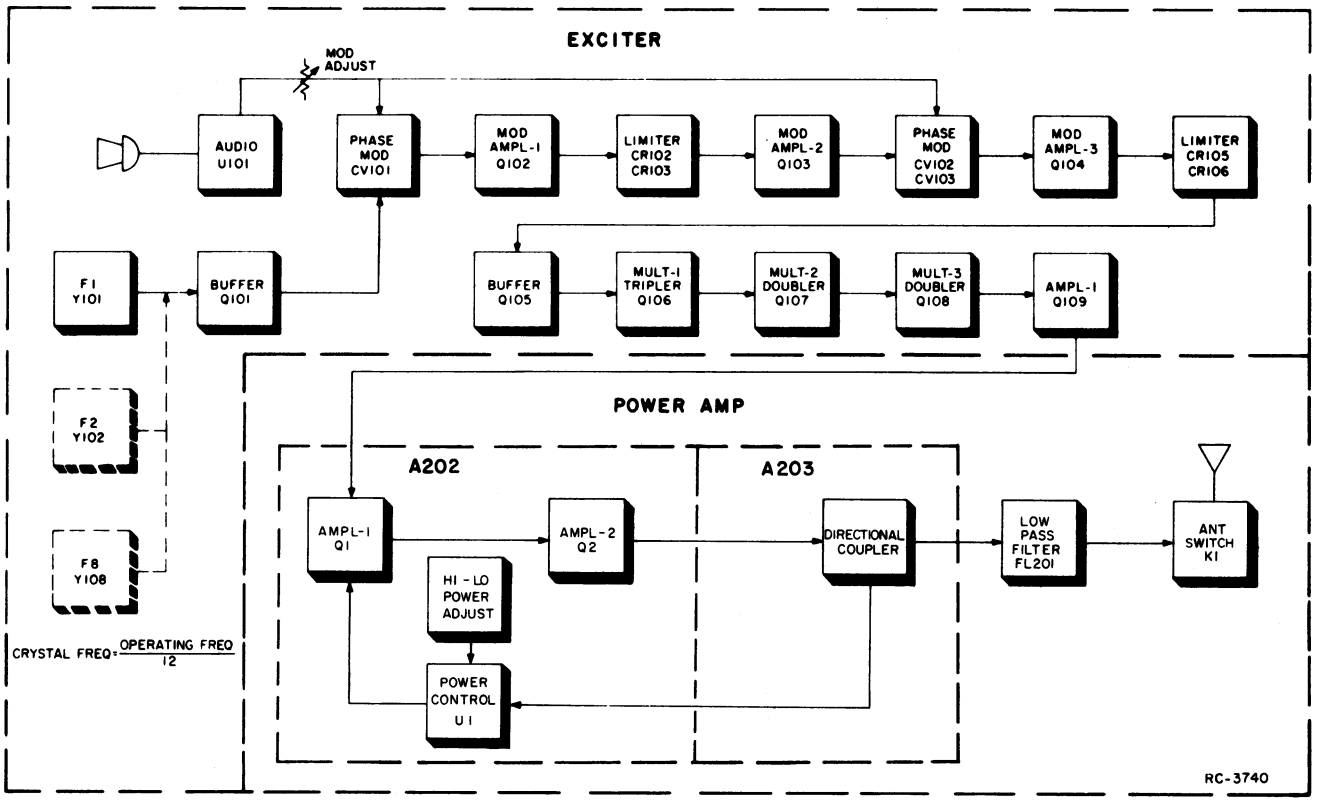


Figure 1 - Transmitter Block Diagram

To service the transmitter from the bottom:

1. Pull the locking handle down and pull the radio out of the mounting frame.
2. Remove the top cover, then loosen the two bottom cover retaining screws and remove the bottom cover (See Figure 2).
3. To gain access to the bottom of the exciter board, remove the six screws (A) holding the exciter board and its bottom cover to the module mounting frame, and remove the bottom cover (See Figure 3).

EXCITER DISASSEMBLY

To remove the exciter board from the radio:

1. Unplug the exciter/PA cable (B). (Figure 2).
2. Remove the six screws (A) holding the exciter board and its bottom cover to the module mounting frame. (Figure 3)
3. Press straight down on the plug-in exciter from the top to avoid bending the pins when unplugging the board from the system board jack.

PA DISASSEMBLY

PA Assembly

To remove the PA assembly: (See Figure 2).

1. Remove the PA top cover and unplug the exciter/PA cable (B), the antenna, receiver and PTT cables (C).
2. Remove the six side-rail screws (D), and unsolder the power cables from the bottom of the PA assembly if desired.

PA Module (A202)

To remove the PA module: (See PA Assembly Outline Diagram).

1. Remove the PA top cover and unplug the Exciter/PA cable.
2. Unsolder power feed cables W208 from A202-E1 and W209 from A202-G1.

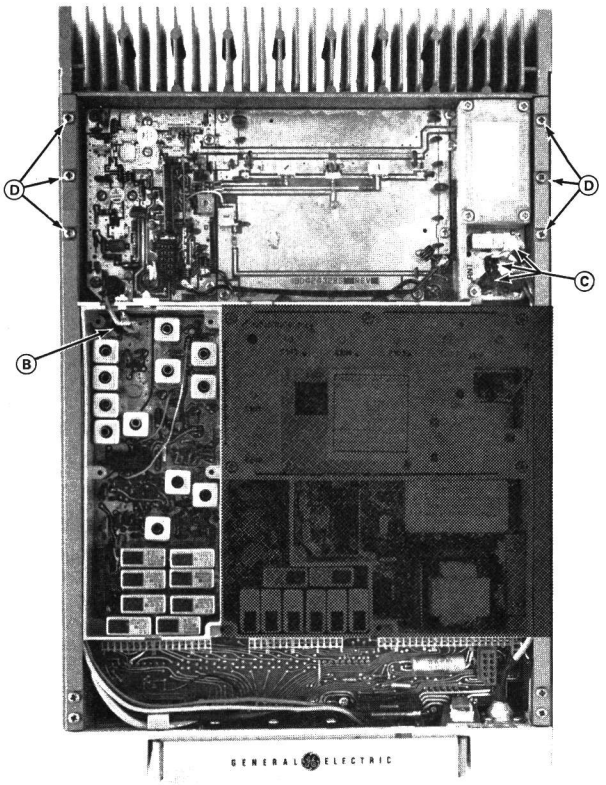


Figure 2 - Disassembly Procedure Top View

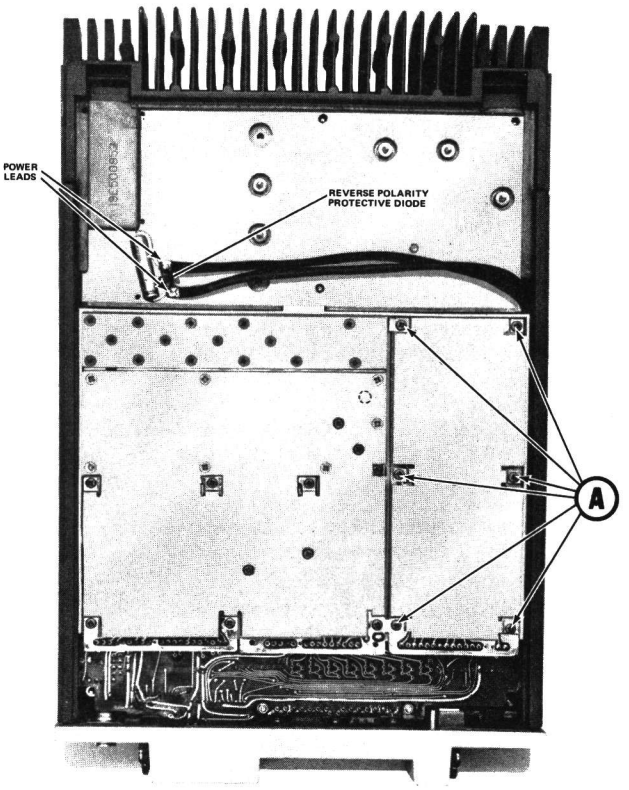


Figure 3 - Disassembly Procedure Bottom View

CAUTION

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

3. Remove screw on W204. Carefully unsolder and remove straps and cables W30, W203, W204 and leads (H3, H4, H5) between the PA module and the coupler 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 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 A202-Q1 and A202-Q2 transistor mounting screws (2 each), and nuts and washers on bottom of the PA assembly.

7. Remove the three remaining PA board mounting screws (including the one securing W204) and lift the board out.

COUPLER BOARD (A203)

To remove Coupler board: (See PA Assembly Outline Diagram).

1. Remove the PA top cover.

2. Unsolder power feed cables W208 from A202-E1 and W209 from A202-G1.

CAUTION

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

3. Carefully unsolder and remove strap W30 between the PA module and the coupler board. 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 module with a scribe or X-acto® knife.

4. Carefully unsolder and remove strap W31 between the coupler board and the Low Pass Filter.

5. Unsolder leads from holes H3, H4 and H5 on coupler board A203. Unsolder lead from H8 to C2102.

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 coupler board and the Low Pass Filter.

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 desoldering 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 4.) The letter "C" on top of each transistor also identifies the collector.

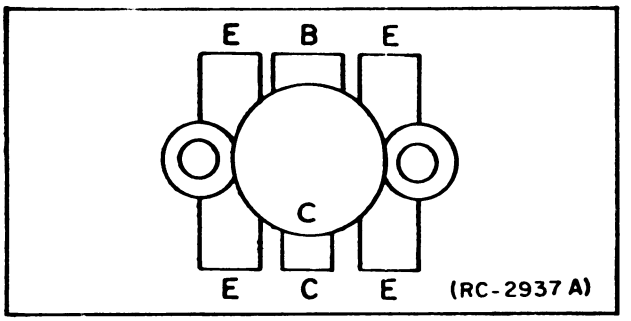


Figure 4 - Lead Identification

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 using moderate torque, 6 inch-pounds. A torque wrench must be used for this adjustment since transistor damage can result if too little or to 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 since this may cause 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 A203-R1, Forward Power and A203-R2, Reflected Power) controls are preset at the factory and normally do not require readjustment. Should it become necessary to replace A203-CR1, CR2 or the PA transistor, it may be desirable to reset A203-R1 and A203-R2. The following procedure applies.

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

CAUTION

ADJUSTING DIRECTIONAL COUPLER POTENTIOMETERS A203-R1 and R2 may destroy them and require their replacement.

2. Turn power adjust potentiometer A202-R8 and forward power sensor potentiometer A203-R1 fully clockwise. Set reflected power sensor potentiometer A203-R2 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 A203-R1 to 10% above rated output power.

5. Set power adjust potentiometer for 25 Watts 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 A203-R2 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 A203-R2 to provide 80% of rated output power.

10. Re-cement forward and reflected power potentiometers A203-R1 and R2 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

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 (13.8 VDC for loads of 0 to 6 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 may be unable 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 R106 has been adjust to the proper setting before shipment and should 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.

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 Set plug 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.
3. For transmitters without Channel Guard, set MOD ADJUST R105 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.

4. For transmitters with Channel Guard, set CHANNEL Guard MOD ADJUST R105 for zero tone deviation. Next, with the 1 Volt signal at 1000 Hz applied, set MOD ADJUST R105 for 3.75 kHz deviation. Then remove the signal from the audio oscillator and set Channel Guard MOD ADJUST R105 for 0.75 kHz tone deviation.
5. 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, and using the following formula:

P_i = PA voltage x PA current

where:

P_i is the DC power input in watts, to the final transistor power amp.

PA voltage is measured with Test Set Model 4EX3A11 in Position F on the 15 Volt range (read as 15-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 pressed and the polarity switch in the (+) position.

PA current is measured with the Test Set in Position F in the Test 1 position, and with the HIGH SENSITIVITY button pressed (10 amperes full scale).

Example:

P_i = 13.6 Volts x 4.8 amperes = 62.5 watts

ICOM FREQUENCY ADJUSTMENT

First, check the frequency to determine if any adjustment is required. The frequency should be set with 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 26.5°C (79.8°F).

MASTR II ICOMs should be reset only when the frequency shows deviation in excess of the following limits:

A. ±0.5 PPM when the radio is at 26.5°C (79.8°F).

B. ±2 PPM at any other temperature within the range of -5°C to +55°C (+25°F to +131°F).

C. The specification limit (±2 PPM or ±5 PPM) at any temperature within the ranges of -30°C to -5°C (-40°F to +25°F) or +55°C to +70°C (+131°F to +158°F).

If an adjustment is required, use one of the following procedures:

If the radio is at an ambient temperature of 26.5°C (79.8°F), set the oscillator for the correct operating frequency.

If the radio is not at an ambient temperature of 26.5°C, setting errors can be minimized as follows:

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

1. Maintain the radio at 26.5°C (±5°C) and set the oscillator to desired frequency, or-

2. Maintain the radio at 26.5°C (±10°C) and offset the oscillator, as a function of actual temperature, by the amount shown in Figure 5.

B. To hold setting error to ±0.35 PPM (which is considered reasonable for 2 PPM ICOMs): Maintain unit at 26.5°C (±5°C) and offset the oscillator as a function of actual temperature, by the amount shown in Figure 5.

For example: Assume the ambient temperature of the radio is 18.5°C (65.4°F). At that temperature, the curve shows a correction factor of 0.5 PPM. (At 158 MHz, 1 PPM is 158 Hz. At 174 MHz, 1 PPM is 174 Hz).

With an operating frequency of 150 MHz, set the oscillator for a reading of 45 Hz (0.5 x 150 Hz) higher than the licensed operating frequency. If a negative correction factor is obtained (at temperatures above 26.5°C), set the oscillator for the indicated PPM lower than the licensed operating frequency.

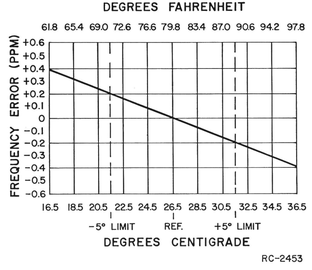
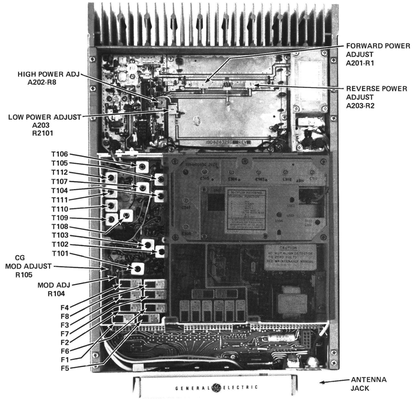


Figure 5 - Frequency Characteristics Vs. Temperature



TRANSMITTER ALIGNMENT

EQUIPMENT REQUIRED

1. GE Test Set Model 4EX3A11 or Test Kit 4EX8K12.
2. A 50 ohm wattmeter connected to antenna jack J203.
3. A frequency counter.

PRELIMINARY CHECKS AND ADJUSTMENTS

1. Place ICOMs on Exciter Board (crystal frequency - operating frequency ÷ 12).
2. For a large change in frequency or a badly mis-aligned transmitter, pre-set the slugs in T104 and T105 to the bottom of the coil form. Pre-set all of the other slugs to the top of the coil form.
3. For multi-frequency transmitters with a frequency spacing less than .900 MHz for frequencies between 138-155 MHz or less than 1.00 MHz for frequencies between 150.8-174 MHz tune the transmitter on the lowest frequency. For multi-frequency transmitters with a frequency spacing up to 1.8 MHz for frequencies between 138-155 MHz on 2.0 MHz for frequencies between 150.8-174 MHz, tune the transmitter using a center frequency tune-up ICOM. These limits can be extended to 2.75 MHz and 3.0 MHz respectively with 1 dB degradation in power output.
4. Connect the red plug on the GE Test Set to the System 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 the PA metering jack, the voltage reading at position "F" with the HIGH SENSITIVITY button pressed may be converted to PA collector current by reading the current as 10 amperes full scale.

5. All adjustments are made with the transmitter keyed. Unkey the transmitter between steps to avoid unnecessary heating.

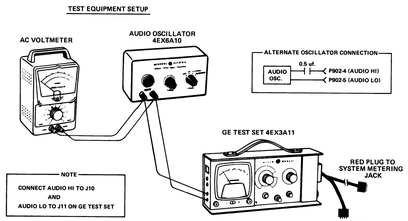
STEP	METER POSITION	TUNING CONTROL	METER READING	PROCEDURE
1.	A (MOD-1)	T101	Maximum	Tune T101 for maximum meter reading on the lowest frequency.
2.	B (MOD-2)	T102 & T103	Maximum	Tune T102 and then T103 for the maximum meter reading on the lowest frequency.
3.	C (MULT-1)	T104	Minimum	Tune T104 for a dip in meter reading.
4.	D (MULT-2)	T105, T104 & T106	See Procedure	Tune T105 for maximum meter reading and re-adjust T104 for maximum meter reading. Then tune T106 for a dip in meter reading.
5.	F (MULT-3)	T107, T106, T108 & T109	See Procedure	Tune T107 for maximum meter reading and re-adjust T106 for maximum meter reading. Then tune T108 for a dip in meter reading and T109 for maximum meter reading.
6.	G (AMPL-1)	T110, T108 & T109	Maximum	Tune T110 for maximum meter reading, and then re-adjust T108 and T109 for maximum meter reading.
7.	D (AMPL-1 DRIVE on PA)	T111 & T112	Maximum	Move the black metering plug to the Power Amplifier metering jack and tune T111 and then T112 for maximum meter reading.
8.	G (AMPL-1)	T108, T109 & T110	Maximum	Move the black metering plug back to the exciter metering jack and re-adjust T108, T109 and T110 for maximum meter reading.
9.	D (AMPL-1 DRIVE on PA)	T111 & T112	Maximum	Move the black metering plug back to the Power Amplifier metering jack and re-adjust T111 and T112 for maximum meter reading.
10.	A202-R8 A203-R2101			With the PA collector voltage at 13.6 Volts, set Power Adjust potentiometer A202-R8 on the PA board for 25 Watts. Short C2102 to A-. Adjust A203-R2101 for 1 Watt output. Remove short.
11.	D (MULT-2)	T105	See Procedure	Move the black metering plug to the exciter metering jack and re-adjust T105 for equal drive on the highest and lowest frequency
12.	G (AMPL-1)	T110 & T108	Maximum	Re-adjust T110 and then T108 for maximum meter reading on the lowest frequency.

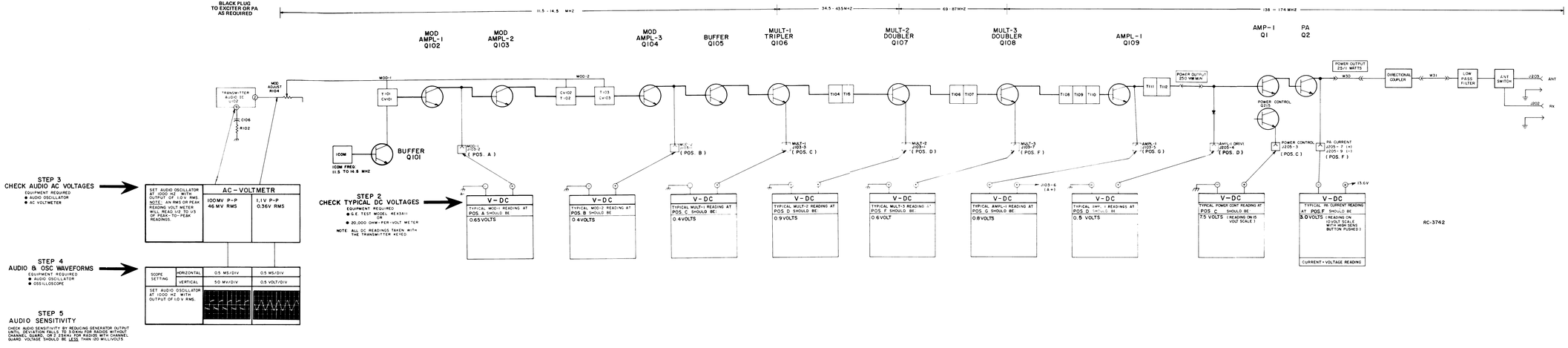
STEP 1 - QUICK CHECKS

METER POSITION GE TEST SET	PROBABLE DEFECTIVE STAGE		
	HIGH METER READING	LOW METER READING	ZERO METER READING
EXCITER			
A (MOD-1)	Q102, 10 Volt Regulator	Q102, CV101, T101, 10 Volt regulator	ICOM, Q101, Q102, CR101, 10 Volt regulator or Channel Selector switch ground.
B (MOD-2)	Q104, 10 Volt Regulator	Q103, T102, T103, CV102, CV103, CR104, Q104	Q103, T102, CV102, T103, CV103, CR104, Q104
C (MULT-1)	Q105, Q106 T104	Q105, Q106	Q105, Q106, T104
D (MULT-2)	Q107, T106	T104, T105, Q107	T104, T105, Q107, T106
F (MULT-3)	Q108, T108	T106, T107, Q108	T106, T107, Q108, T108
G (AMPL-1)	Q109, C157	T108, T109 T110, Q109	T108, T109, T110, Q109, L106
POWER AMPLIFIER			
"DP" (AMPL-1 DRIVE)		Low Output from Exciter	No output from Exciter, CR1
"C" (AMPL-1 POWER CONTROL VOLTAGE)	Q215	Q215	No Exciter output, Q215, Q2, CR1
"P" (PA CURRENT)	Q2	Low Output from Q1, Q2	Q1, Q2. Check Pos. D & C

TROUBLESHOOTING PROCEDURE

138—174 MHz, 25/1 WATT TRANSMITTER





THESE INSTALLATION INSTRUCTIONS COVER THE INSTALLATION OF THE MARINE HI-LO POWER OPTION KIT IN THE MASTR II MOBILE, STANDARD OR SYSTEM PACKAGE, 25 WATT HIGH BAND PA ASSEMBLY (19D424583G1 & G5).

INSTALLATION

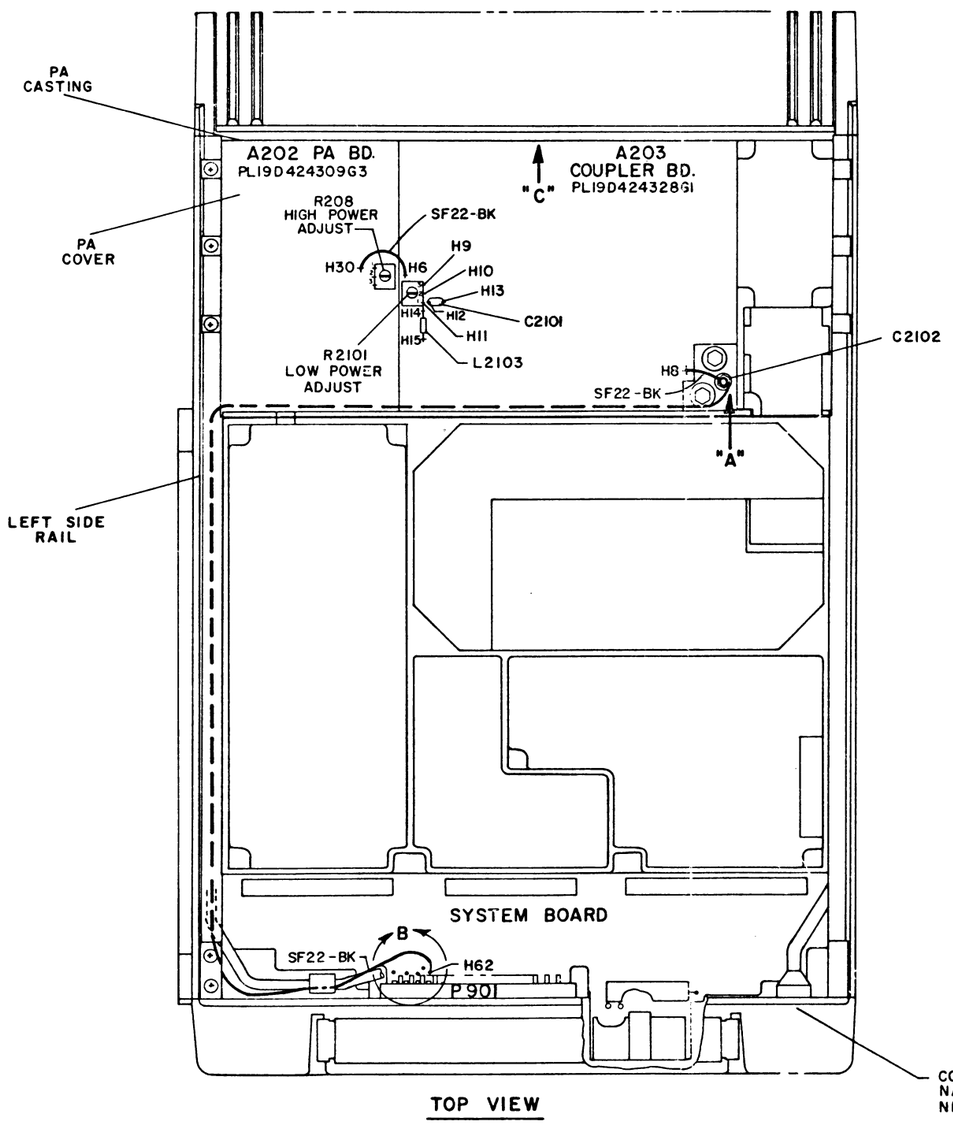
1. REMOVE THE TOP AND BOTTOM COVERS OF THE RADIO. REMOVE THE PA COVER.
2. ON BOTTOM OF PA CASTING (REFER TO VIEW A) INSTALL C2102 AS SHOWN USING #8 LOCKWASHER.
3. STRIP, TIN & SOLDER BLACK LEAD SUPPLIED TO C2102-2.
4. REMOVE LEFT SIDE RAIL OF THE RADIO (5 SCREWS FOR THE STANDARD PACKAGE, 7 SCREWS FOR THE SYSTEMS PACKAGE).
5. PLACE THE BLACK LEAD IN THE CABLE TROUGH OF THE SIDE RAIL ALONG WITH THE RED AND BLACK POWER LEADS, REPLACE THE SIDE RAIL, AND DRESS LEAD AS SHOWN.
6. CUT, STRIP, TIN AND SOLDER THE BLACK LEAD TO H62 ON THE SYSTEM BOARD. DRESS WIRE AS SHOWN. SEE VIEW "B". RETAIN EXCESS WIRE FOR ITEMS 7 AND 8 (JUMPERS).
7. CUT, STRIP, TIN AND SOLDER JUMPER WIRE FROM H30 ON A202 TO H6 ON A203.
8. CUT, STRIP, TIN AND SOLDER JUMPER WIRE FROM H8 ON A203 TO PIN 1 OF C2102.
9. PLACE AND SOLDER THE FOLLOWING COMPONENTS ON THE COUPLER BOARD. KEEP LEADS SHORT AS POSSIBLE ABOVE AND BELOW BOARD.

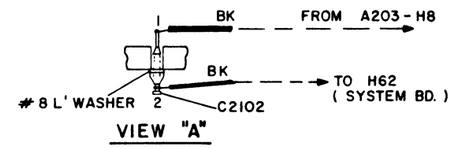
R2101 (50K POT)	PIN 3 TO H9 PIN 2 TO H10 PIN 1 TO H11
C2101 (680 PF)	FROM H12 TO H13
L2103 (10 MH)	FROM H14 TO H15

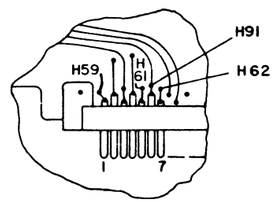
10. IF A FIELD INSTALLATION, TYPE THE COMBINATION NAMEPLATE SUPPLIED WITH THE PROPER COMBINATION NUMBER, SERIAL NUMBER, FCC TYPE NUMBER, AND OPTION NUMBERS AND STICK OVER EXISTING NAMEPLATE.
11. INSTALL LABEL 19A130309P1 ON P. A. CASTING WALL AS SHOWN.
12. REPLACE PA COVER, BOTTOM AND TOP COVER OF THE RADIO.

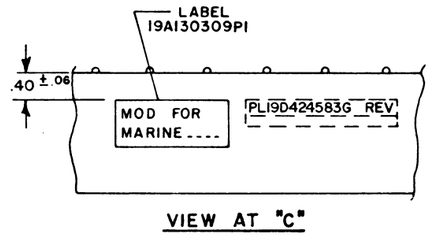
TEST

1. SWITCH THE CONTROL UNIT HI-LO TRANSMIT CONTROL TO HI. THE OPTION LED (UPPER RIGHT CORNER OF NAMEPLATE) MUST LIGHT.
2. KEY THE TRANSMITTER AND SET HIGH POWER ADJUST ON PA BOARD (A202) FOR 25 WATTS OUTPUT.
3. SWITCH THE TRANSMIT CONTROL TO LO. THE OPTION LED MUST EXTINGUISH.
4. KEY THE TRANSMITTER AND SET LOW POWER ADJUST ON A203 FOR 1 WATT OUTPUT.









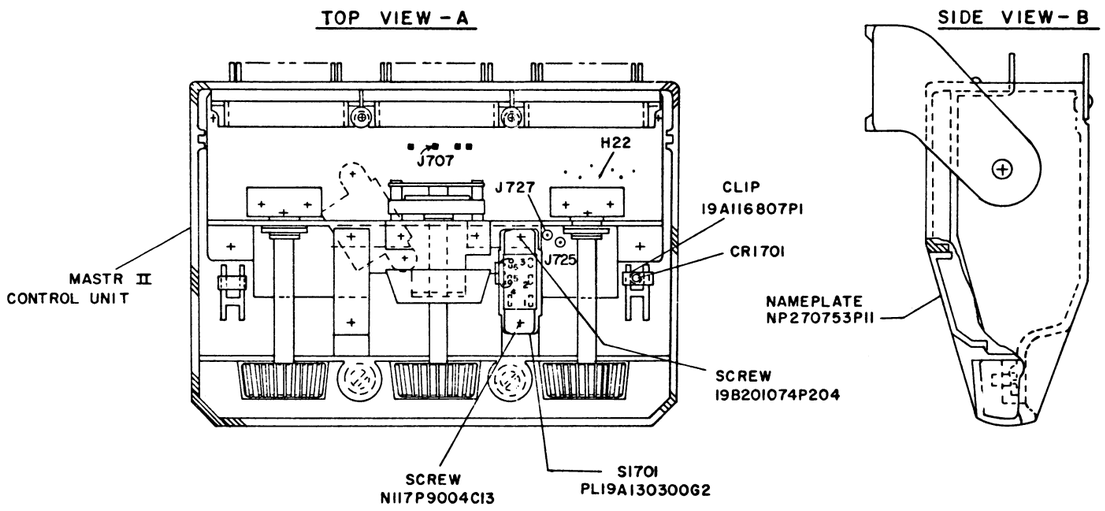
(19D424731, Sh. 1, Rev. 2)

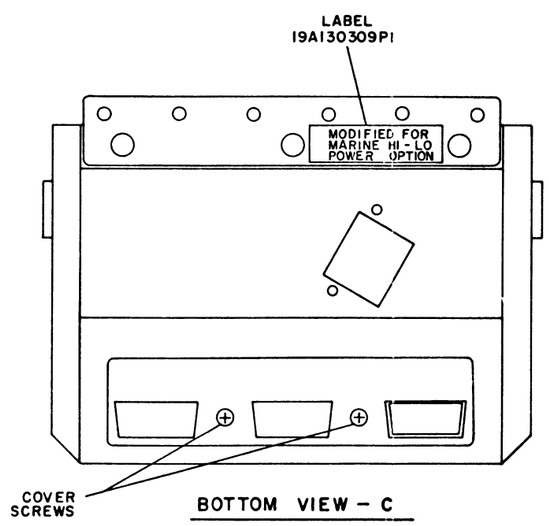
THESE INSTRUCTIONS COVER THE MODIFICATION OF THE MASTR II CONTROL UNIT FOR USE WITH THE MARINE HI-LO POWER OPTION (1 WATT AND 25 WATT SWITCHABLE TRANSMITTER).

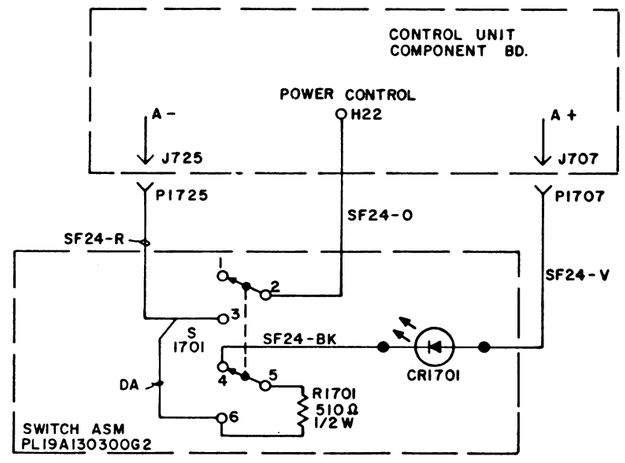
1. REMOVE TOP COVER OF THE CONTROL UNIT BY REMOVING 2 SCREWS (VIEW C).
2. SNAP OUT OLD NAMEPLATE FROM TOP COVER AND REPLACE WITH NAMEPLATE SUPPLIED IN KIT. (VIEW B)
3. INSTALL S1701 AS SHOWN IN VIEW A USING TWO SCREWS SUPPLIED.
4. INSTALL CR1701 WITH CLIP AS SHOWN IN VIEW A.
5. MAKE THE FOLLOWING CONNECTIONS:

CONNECTIONS CHART		
FROM	TO	WIRE COLOR
P1725	J725	SF24-R
S1701-2	H22	SF24-O AND SOLDER
P1707	J707	SF24-V

6. ATTACH LABEL AS SHOWN IN VIEW C.
7. REPLACE TOP COVER OF CONTROL UNIT. MAKE SURE CR1701 LINES UP WITH THE WINDOW IN THE NAMEPLATE.







(19D424731, Sh. 2, Rev. 2)

INSTALLATION INSTRUCTIONS

138—174 MHz MARINE
HIGH-LOW POWER OPTION