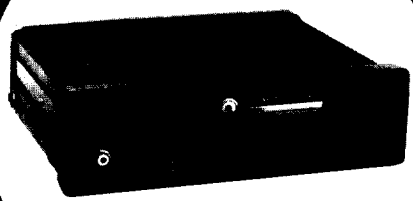
MOBILE RADIO

MASTR® *Executive II*

MAINTENANCE MANUAL LBI 30042C

DATAFILE FOLDER – DF 9040

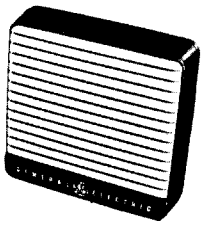


Mobile Radio

Control Unit

30–50 MHz

TWO-WAY FM RADIO MOBILE COMBINATIONS



Speaker

GENERAL ELECTRIC

TABLE OF CONTENTS

FCC FILING NUMBER

TRANSMITTER	POWER OUTPUT
KT-120-A	50-Watts
KT-138-A	100-Watts

WARNING

Although the highest DC voltage in MASTR Executive II Mobile Equipment is supplied by the vehicle battery, 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. Be careful when working near energized circuits!

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.

SYSTEM SPECIFICATIONS*

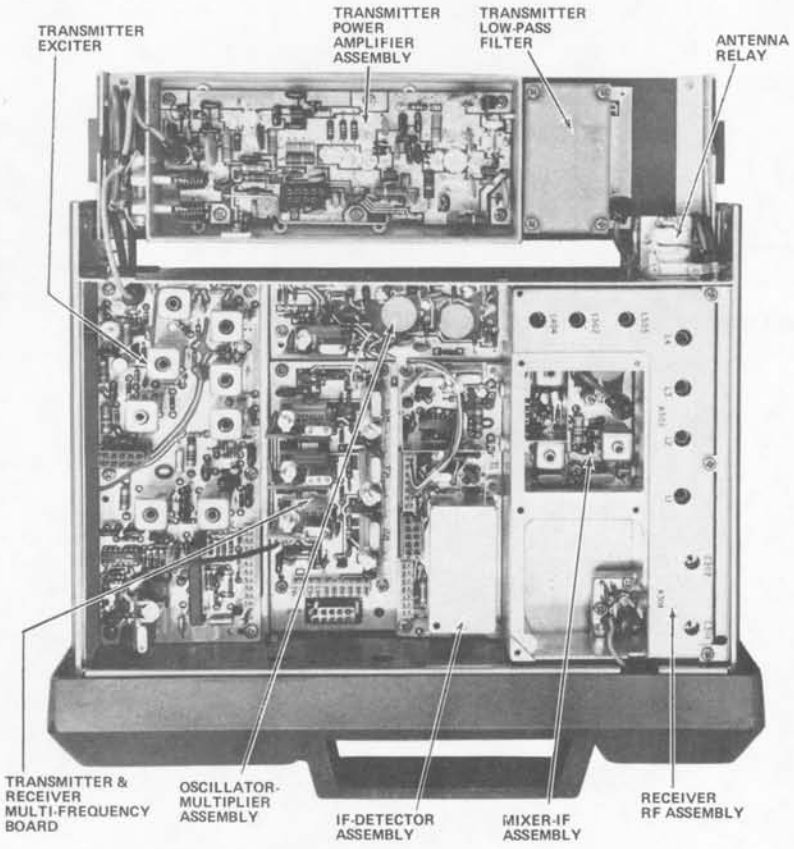
FREQUENCY RANGE	30-50 MHz
BATTERY DRAIN	
Receiver	
Squelched	0.30 Amperes
Unsquelched	1.40 Amperes
Transmitter	11 Amperes at 13.6 VDC (50 Watts) 26 Amperes at 13.4 VDC (100 Watts)
DIMENSIONS (H X W X D)	
Two-Way Radio	3.9" x 13.5" x 13.4"
Control Unit (less bracket)	5.3" x 3.1" x 2.9"
Speaker (less bracket)	5.1" x 5.1" x 2.8"
WEIGHT	
Two-Way Radio (includes mounting plate)	20 pounds
Control Unit	1 pound, 10 ounces
Speaker	1 pound, 8 ounces
TEMPERATURE RANGE	-30°C to +60°C (-22°F to +140°F)
DUTY CAPABILITY	
Intermittent	20% transmit, 100% Receive
Continuous	100% transmit at reduced power

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

COMBINATION NOMENCLATURE

1st Digit	2nd Digit	3rd Digit	4th Digit	5th Digit	6th Digit	7th Digit	8th & 9th Digits	10th Digit	11th Digit
Mechanical Package	System Voltage	Power Output	Channel Spacing	Frequency Capacity	Number of Freq.	Options	Frequency Range	Oscillator Stability	PA Type
R Exec II Standard	**T** +12 Volts with Accessories	**6** 41-80 Watts	**4** 20 kHz	**A** 1 Freq	**A** 1-Freq Tx 1-Freq Rx	**S** Standard	**13** 30-36 MHz	**A** ±5 PPM	**H** High Power
S Exec II Systems	**X** +12 Volts Less Accessories	**7** 81-128 Watts		**F** 4 Freq	**B** 2-Freq Tx 1-Freq Rx	**N** Noise Blanker	**23** 36-42 MHz		
					C 2-Freq Tx 2-Freq Rx	**U** Channel Guard	**33** 42-50 MHz		
					D 1-Freq Tx 2-Freq Rx	**W** Channel Guard & Noise Blanker			
					E 3-Freq Tx 3-Freq Rx				
					F 4-Freq Tx 4-Freq Rx				
					G 5-Freq Tx 5-Freq Rx				
					H 6-Freq Tx 6-Freq Rx				
					J 7-Freq Tx 7-Freq Rx				
					K 8-Freq Tx 8-Freq Rx				

TOP VIEW



BOTTOM VIEW

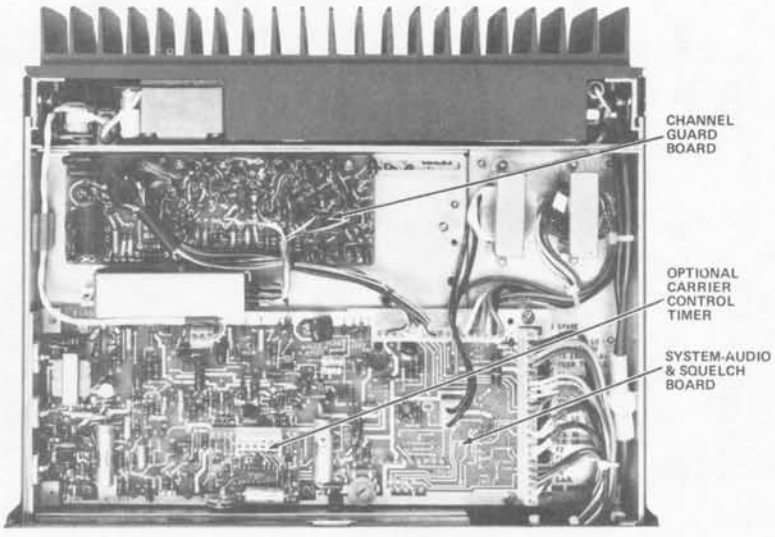


Figure 1 - MASTR Executive II Module Layout

DESCRIPTION

MASTR Executive II mobile radio combinations are compact, highly reliable and ruggedly-constructed units that are designed to meet the most stringent requirements in the two-way radio field.

The radios are fully transistorized -- utilizing both discrete components and integrated circuits (IC's) for highest reliability. Since no tubes are used, the radio is ready to use the instant it is turned on. The standard combination may be equipped with the following:

- One through eight frequencies
- Plug-in crystal oscillator modules for ±0.0005% oscillator stability
- Channel Guard (tone squelch)
- Noise Blanker

The combination is contained in a "slide-rail" mounting frame and is designed for trunk-mount installations. The radio is tamperproof when locked in the mounting frame. When unlocked, the unit can be easily pulled out of its frame for servicing.

The transmitter and receiver modules may be used interchangeably in mobile and station installations. No modifications are required when transferring the module from one type of installation to another.

No power supply is required since the highest supply voltage used in the radio is supplied by the vehicle battery. The radio is shipped for operation in 12-Volt, negative ground vehicle systems. An optional polarity converter is available for operating the radio in 12-Volt, positive ground systems.

The radio is of modular construction. All major modules and tuning adjustments except for the system-audio-squelch (SAS) board, Channel Guard and Carrier Control Timer option are easily accessible from the top of the radio (see Figure 1).

Centralized metering jacks for the transmitter, receiver and SAS board are provided for simplified alignment and trouble-shooting.

TRANSMITTER

The transmitter consists of an exciter board and a power amplifier assembly. The PA assembly mounts on a hinged heatsink casting that swings down for easy access. A low-pass filter mounts on the heatsink next to the PA assembly.

RECEIVER

The receiver consists of an oscillator/multiplier assembly (Osc-Mult), RF assembly, mixer/IF assembly (MIF), and IF-detector assembly (IF-DET). The audio and squelch circuitry for the receiver is located on the SAS board. In receivers with noise blankers, the noise blanker circuit replaces the standard MIF board.

SYSTEM-AUDIO & SQUELCH BOARD

The system-audio and squelch board is mounted on the underside of the radio chassis. The board contains the 10-Volt regulator, transmitter and receiver system control circuits,and the receiver audio and squelch circuitry. The SAS board contains jacks to provide plug-in interface for the transmitter and receiver modules. The board also has jacks for Channel Guard, multi-frequency board and Carrier Control Timer option.

CONTROL UNIT

In "R" Series Combinations, the control unit contains the OFF-ON Volume control, pushbutton MONITOR switch, a frequency selector switch in multi-frequency models, and a red transmit indicator light.

In "S" Series Combinations, other types of control units can be used with the radio. For these applications, refer to the appropriate control unit Maintenance and Operator's Manual.

INITIAL ADJUSTMENT

After the MASTR Executive II radio has been installed (as described in the INSTALLATION Manual), the following adjustments should be made by an electronics technician who holds a 1st or 2nd Class FCC Radiotelephone license.

Make sure that a RADIO TRANSMITTER IDENTIFICATION form (FCC Form 452-C or General Electric Form NP270303) has been filled out and attached to the transmitter.

CAUTION

Before bench testing the MASTR Executive II Mobile 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 limit 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 (13.6 VDC for loads of 6 to 16 amperes; 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.

TRANSMITTER ADJUSTMENT

The adjustment for the transmitter includes measuring the forward and reflected power and adjusting the antenna length for optimum ratio, then setting the transmitter to rated power output (or to the specific output or input which may be required by the FCC station authorization). Next, measuring the frequency and modulation and entering these measurements on the FCC-required station records. For the complete transmitter adjustment, refer to the ALIGNMENT PROCEDURE in the MAINTENANCE MANUAL for the transmitter.

RECEIVER ADJUSTMENT

The initial adjustment for the receiver includes tuning the input circuit to match the antenna. For the Receiver Initial Adjustment Procedure, refer to the FRONT END ALIGNMENT PROCEDURES in the MAINTENANCE MANUAL for the receiver.

OPERATION

Complete operating instructions for the Two-Way Radio are provided in the separate OPERATOR's MANUAL. The basic procedures for receiving and transmitting messages in "R" Series combinations is as follows:

TO RECEIVE A MESSAGE

1. Turn the radio on by turning the OFF-VOLUME control halfway to the right.

2. Press in the MONITOR button and adjust the VOLUME control for a comfortable listening level.

The radio is now ready to receive messages from other radios in the system.

TO TRANSMIT A MESSAGE

1. Turn the radio on as directed in the "To Receive a Message" section.

2. Press the push-to-talk button on the microphone and speak across the face of the microphone in a normal voice. Release the button as soon as the message has been given. The red GE indicator light on the control unit will glow each time the microphone button is pressed, indicating that the transmitter is on the air. The receiver is muted whenever the transmitter is keyed.

MAINTENANCE

REMOVING IC's (and all other soldered-in components) can be easily accomplished by using a de-soldering tool such as a SOLDA-PULLT® or equivalent. To remove an IC, heat each lead separately on the solder side and remove the old solder with the de-soldering tool.

An alternate method is to use a special soldering tip that heats all of the pins simultaneously.

PREVENTIVE MAINTENANCE

To insure high operating efficiency and to prevent mechanical and electrical failures from interrupting system operations, routine checks should be made of all mechanical and electrical parts at regular intervals. This preventive maintenance should include the checks as listed in the table of Maintenance Checks.

TEST AND TROUBLESHOOTING PROCEDURES

The individual Maintenance Manual for the transmitter and receiver describe standard test procedures which the serviceman can use to compare the actual performance of the transmitter or receiver against the specifications of the unit when shipped from the factory. In addition, specific troubleshooting procedures are available to assist the serviceman in troubleshooting the transmitter and receiver.

NOTE

In positive ground operation only, 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.

DISASSEMBLY

To gain access to the unit for servicing:

1. Unlock the radio (see Figure 2).
2. Loosen the two captive screws shown in Figure 2.
3. Pull the radio forward about two inches out of the mounting frame, and lift off top cover.
4. To gain access to the bottom side, pull the radio all the way out of mounting frame.

MECHANICAL PARTS BREAKDOWN

A mechanical parts breakdown diagram of the two-way radio is provided in this manual. The diagram shows the placement and GE Part Number of mechanical items on the two-way radio set (see Table of Contents).

RE-INSTALLATION

If the mobile combination is ever moved to a different vehicle, always check the battery polarity of the new system. If necessary, install the optional polarity converter in positive ground vehicles to maintain current polarity.

NOISE SUPPRESSION

After completing the initial adjustment of the transmitter and receiver, the serviceman should determine whether additional noise suppression is required. The following information should assist the serviceman in identifying and eliminating undesirable noise interference.

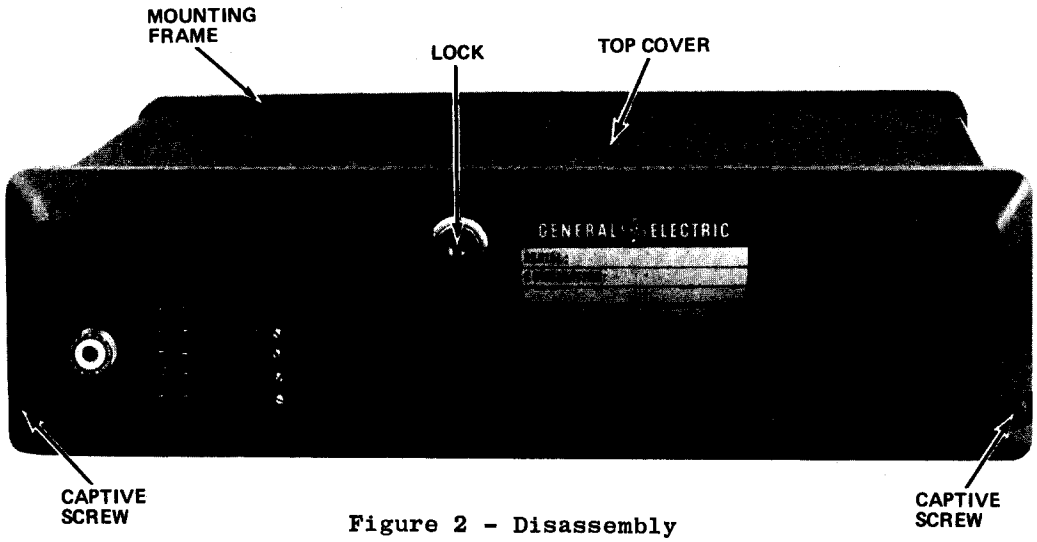


Figure 2 - Disassembly

MAINTENANCE CHECKS	INTERVAL	
	6 Months	As Required
CONNECTIONS - Ground connections and connections to the voltage source should be periodically checked for tightness. Loose or poor connections to the power source will cause excessive voltage drops and faulty operation. When ground connections are not made directly to the battery, the connection from the battery to vehicle chassis must be checked for low impedance. A high impedance may cause excessive voltage drops and alternator noise problems.	X	
ELECTRICAL SYSTEM - Check the voltage regulator and alternator or generator periodically to keep the electrical system within safe and economical operating limits. Over-voltage is indicated when the battery loses water rapidly. Usage of 1 or 2 ounces of water per cell per week is acceptable for batteries in continuous operation. A weak battery will often cause excessive noise or faulty operation.		X
MECHANICAL INSPECTION - Since mobile units are subject to constant shock and vibration, check for loose plugs, nuts, screws and parts to make sure that nothing is working loose.	X	
ANTENNA - The antenna, antenna base and all contacts should be kept clean and free from dirt or corrosion. If the antenna or its base should become coated or poorly grounded, loss of radiation and a weak signal will result.	X	
ALIGNMENT - The transmitter and receiver meter readings should be checked periodically, and the alignment "touched up" when necessary. Refer to the applicable ALIGNMENT PROCEDURE and troubleshooting sheet for typical voltage readings.		X
FREQUENCY CHECK - Check transmitter frequency and deviation as required by FCC. Normally, these checks are made when the unit is first put into operation, after the first six months and once a year thereafter.		X

Ignition Noise

Ignition noise sounds like a "popping" sound in the speaker, whose frequency varies with engine speed while a weak signal is being received. This type of interference is generated by the spark plugs, distributor and any poor connections in the high-voltage system which might cause arcing. Ignition noise may be identified by noting that the noise disappears as soon as the ignition switch is turned off.

1. If the vehicle does not have a resistance lead from the coil to the center of the distributor cap, disconnect the lead at the distributor and cut the lead so that a Cable-Type Suppressor may be inserted in it close to the distributor. Screw the cut ends of the lead into the suppressor.

NOTE

A resistance lead operates as a very effective noise suppressor as long as there are no breaks anywhere along its length. Never cut a resistance lead to insert a suppressor. A loose knot is often tied in the lead to prevent excess flexing, which might break the conductor.

2. Check to see that:

-- the distributor points and condenser are in good condition.

-- the high-voltage leads from the distributor are not broken and are making good contact at each end.

-- the spark plugs have clean, dry insulators and their electrodes are clean and properly adjusted.

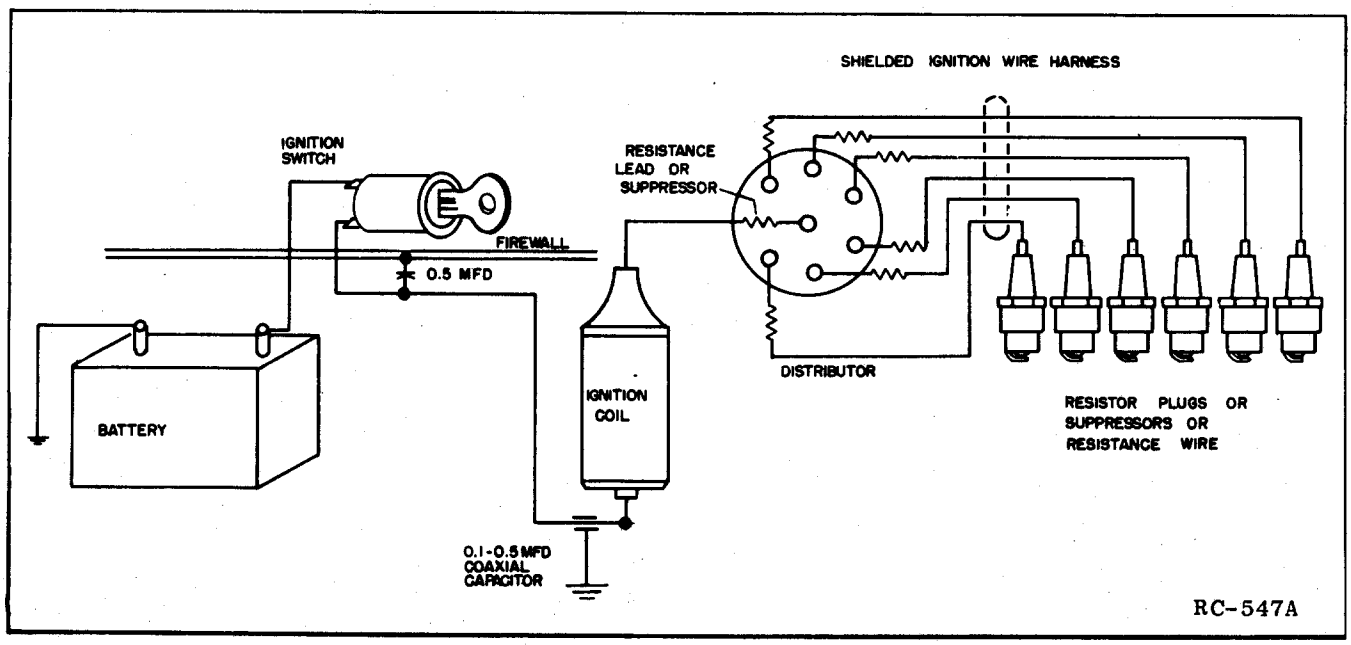


Figure 3 - Ignition Circuit with Noise Suppression Components

-- the timing has been properly adjusted.

3. Use a 0.5-mFd by-pass capacitor to by-pass the battery lead to the ignition coil. Mount the capacitor under a screw which will provide a good ground and connect the capacitor lead to the terminal of the coil which is connected to the ignition.

4. Remove the ignition coil and its mounting bracket. Clean paint from coil (where the bracket mounts), from the bracket and from the engine block. Remount the coil so as to obtain a good ground for the coil case.

5. If the vehicle has been driven 30,000 or 40,000 miles or more, the cap and rotor of the distributor will probably need replacing. This will not only reduce ignition noise, but also improve the overall performance of the engine.

6. High-voltage ignition wires can become capacitively coupled to the low-voltage systems, causing ignition noise to appear in the low-voltage system. This coupling can be minimized by separating the high- and low-voltage leads, or if necessary, separately shielding the leads.

7. If one of the ignition leads happens to have the critical length for radiating at the receiver's frequency, the noise can be reduced by changing the length of the lead. A noise source of this type is not common and can only be found by using a noise meter or by trial and error.

8. If the preceding steps fail to reduce ignition noise to a satisfactory level, it may be necessary to install resistance-type spark plugs, individual suppressors on each spark plug, or a shielded ignition wire harness.

Alternator Noise

Alternator noise shows up as a high-pitched "whine", whose pitch varies with engine speed. To check for this type of noise, run the engine at a moderate speed and then shut off the engine, while listening to the noise on the receiver. Alternator noise will continue as long as the engine turns, lowering in pitch as the engine slows down.

It may be necessary to install a coaxial type, 0.5 microfarad filter capacitor from the ungrounded alternator terminal to ground.

CAUTION

Do not install this capacitor on alternators that are equipped with a factory-supplied capacitor for protecting the rectifiers and suppressing noise.

NOTE

In certain vehicles, the alternator noise level is excessive at the ignition switch terminal. In these cases, connections should be made directly to the battery.

Generator Noise

Generator noise shows up as a high-pitched "whine", whose pitch varies with engine speed. To check for this type of noise, run the engine at a moderate speed and then shut off the engine, while listening to the noise on the receiver. Generator noise will continue as long as the engine turns, lowering in pitch as the engine slows down.

By-pass the armature terminal on the generator to ground with a 0.5-mFd, 40 or 50-amp coaxial capacitor. Be sure to scrape the area where the capacitor is to be mounted so that its case will be well grounded.

CAUTION

Do not by-pass the field terminal (F), as this will damage the voltage regulator contacts.

Generator Regulator Noise

Generator regulator noise shows up as a "raspy" sound which is generated by the contacts in the regulator and radiated by the leads coming out to the regulator. If suppression of regulator noise is necessary, connect a 5-ohm resistor in series with a .002-mFd capacitor from the field, terminal (F) of the regulator to ground. If possible, these components should be mounted inside regulator case. The battery terminal (BAT) and armature terminal (ARM) can be by-passed to ground with 0.5-mFd capacitors.

CAUTION

If the regulator is opened to install the capacitor or resistor, remember that one wrong connection or shorted wire can damage the regulator or generator.

Gauge noise produces a "hissing" or "crackling" sound. Tapping the face of each guage while the engine is running usually shows up which guage is at fault. By-pass the guage lead to ground with a 0.5-mFd capacitor, connected close to the sensing element.

Static and Arcing Noise

The following suggestions may help to cure other unusual types of interference:

1. Use bonding braid to electrically bond the hood and each corner of the engine block to the vehicle's frame. Scrape paint and dirt from bonding points to obtain a good ground.
2. Treat noisy tires with anti-static powder.
3. Use front-wheel static collectors for irregulator "popping" noise which disappears when the brakes are applied.
4. Use heavily graphited penetrating oil on the exhaust pipe and muffler supports if they are producing noise.

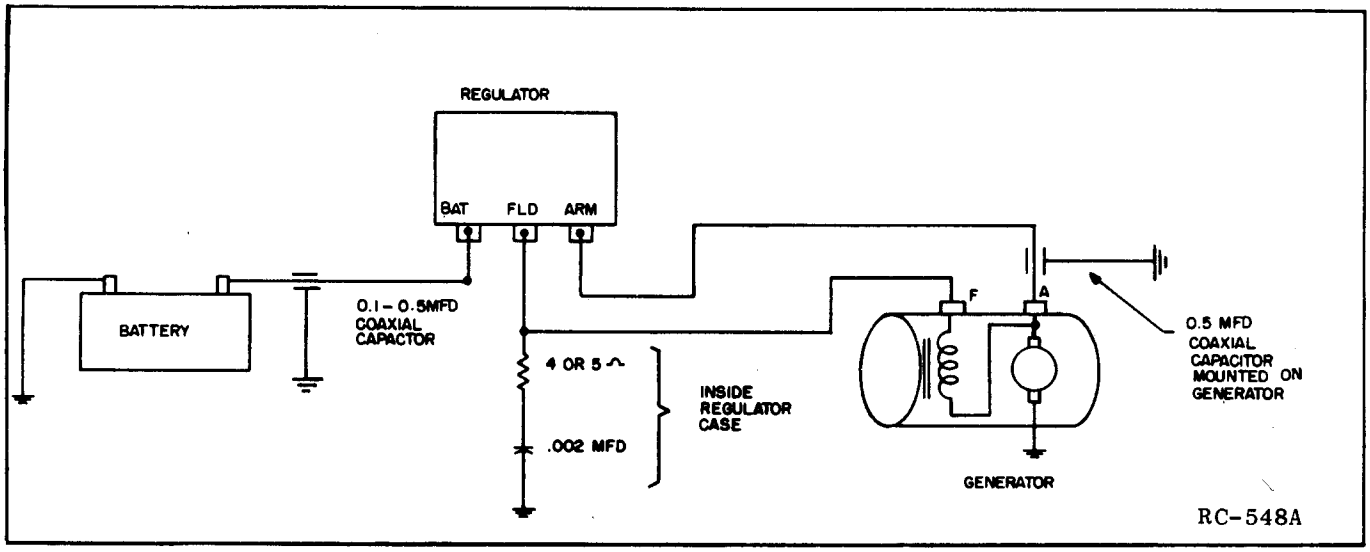
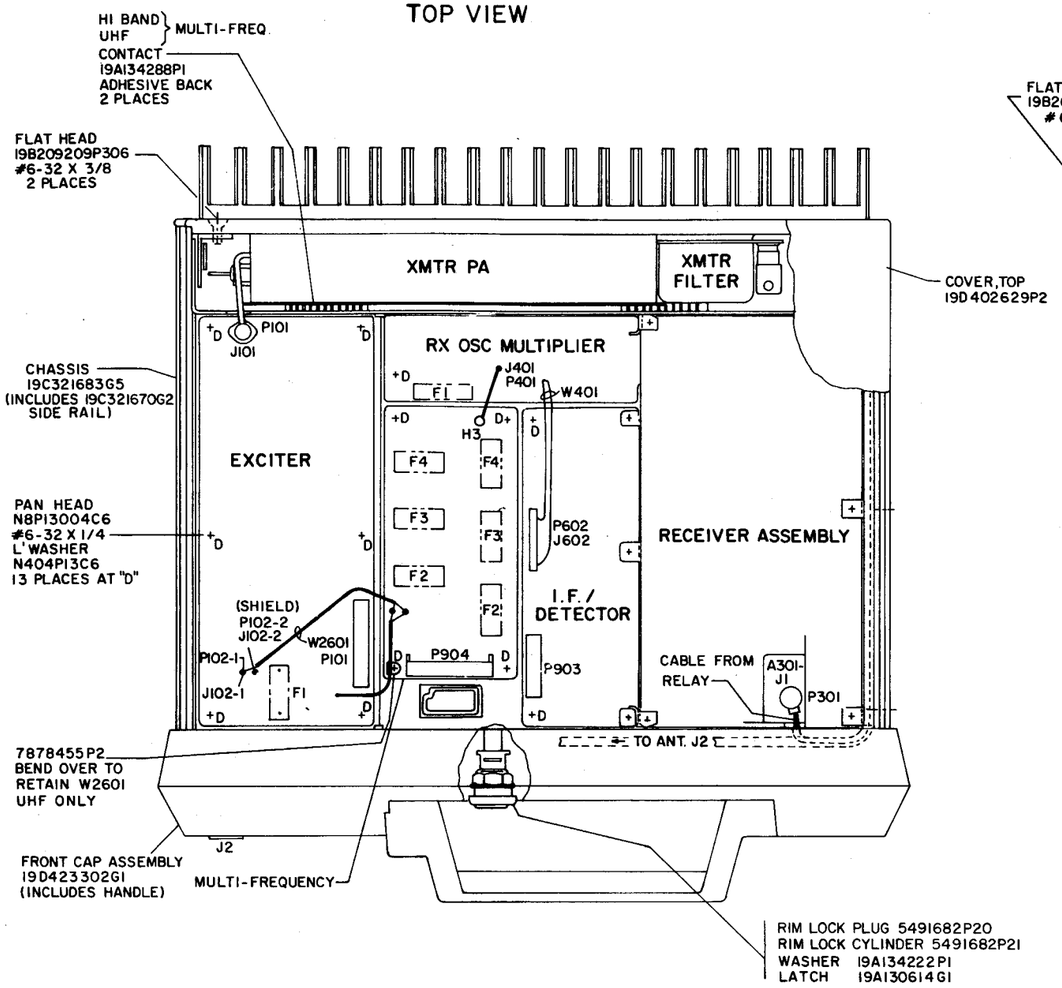
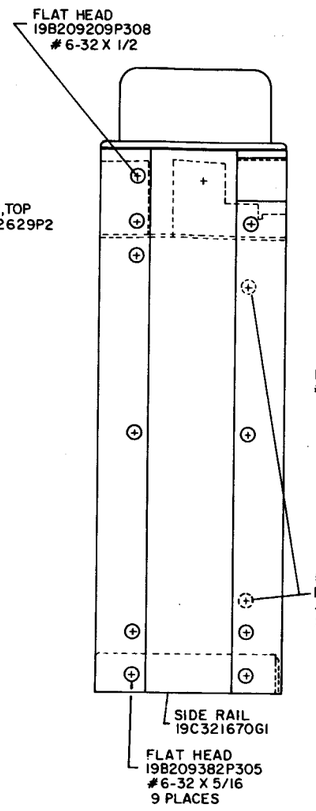


Figure 4 - Generator Circuit with Noise Suppression Components

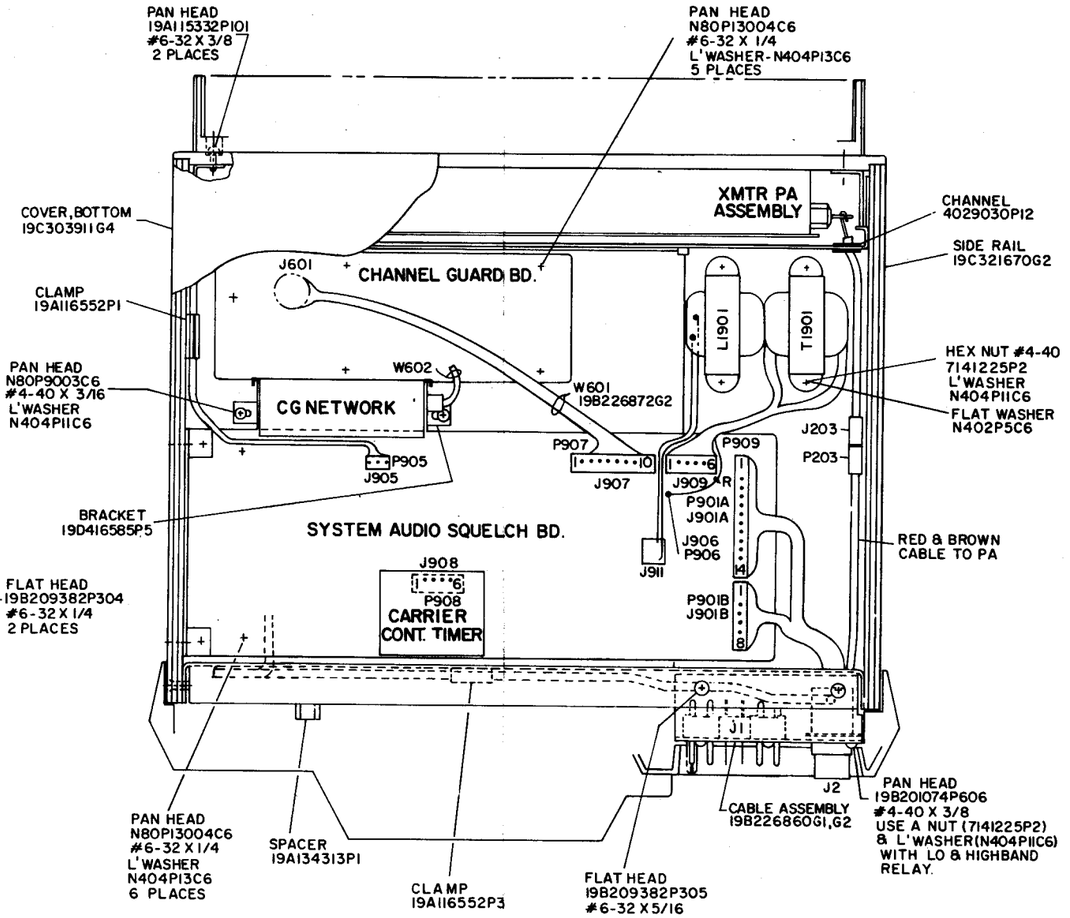
TOP VIEW

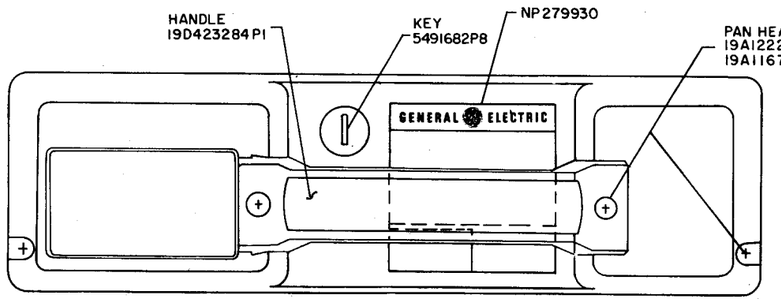


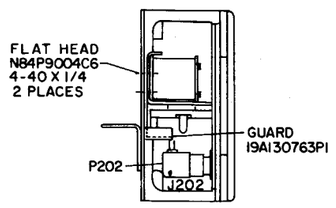
SIDE VIEW



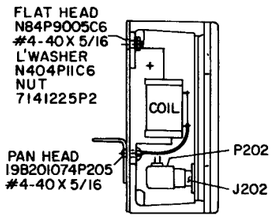
BOTTOM VIEW





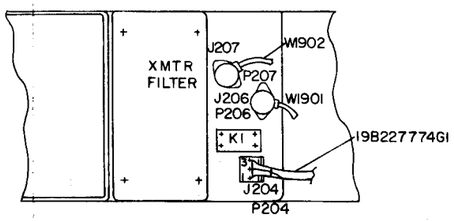


EXTERNAL
ANT. TRANSFER RELAY
HIGH BAND & LOW BAND



EXTERNAL
ANT. TRANSFER RELAY
UHF

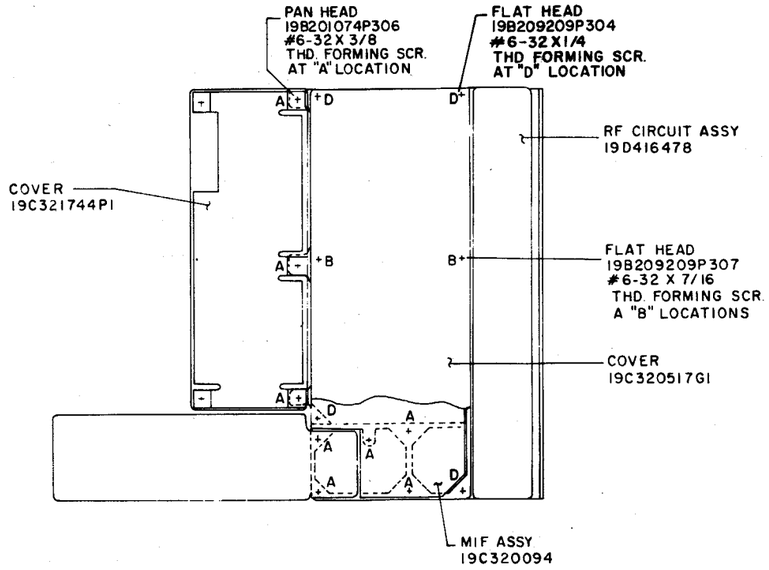
RC-2905 B
(19D423470, SH 1, REV 10)



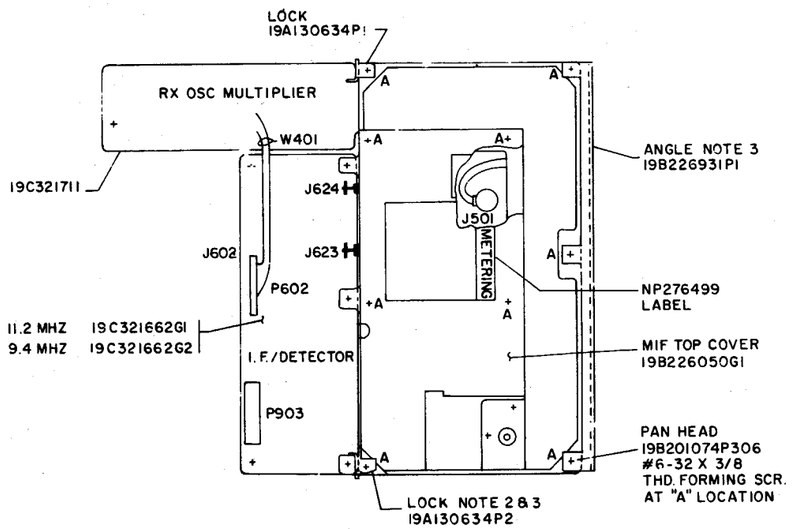
INTEGRAL ANTENNA
TRANSFER RELAY

MECHANICAL PARTS BREAKDOWN

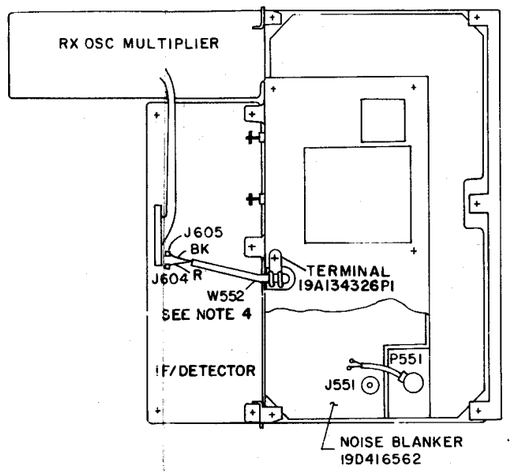
MAIN CHASSIS



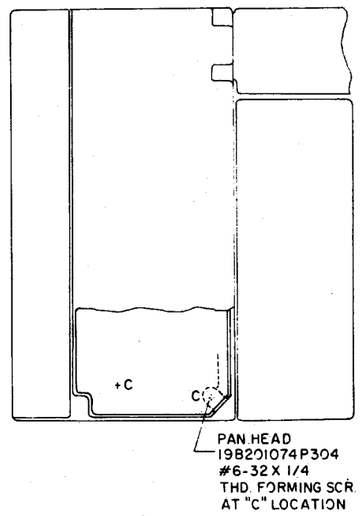
BOTTOM VIEW



RECEIVER LOW BAND
TOP VIEW



TOP VIEW



BOTTOM VIEW

NOISE BLANKER FOR LOW BAND

NOTES:
1. HARDWARE LIST PL19A130750G2 CALLED FOR ON OSC/MULT ASSY.
2. ASSEMBLE WITH SCREWS LOOSE.
3. PART OF HARDWARE LIST PL19A130750G2.
4. PLACE UNUSED LENGTH OF NOISE BLANKER CABLE INSIDE R F CIRCUIT ASSY.

(19D423499, Sh. 1, Rev. 3)