MOBILE RADIO

U.H.F.

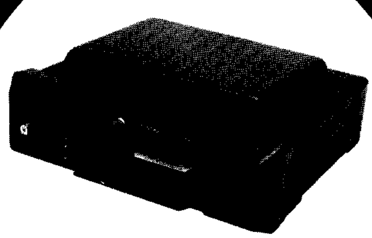
12 FREQ

MASTR™ *Executive II*

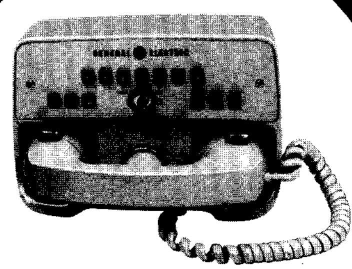
MAINTENANCE MANUAL LBI-30357A

DATAFILE FOLDER DF-9040

LEW MOBILE SHOP



Mobile Radio



Control Unit

RADIO
COMMON CARRIER
(RCC)
MOBILE COMBINATIONS

GENERAL ELECTRIC

TABLE OF CONTENTS

ILLUSTRATIONS

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	**FCC FILING NUMBERS**	
150.8-174 MHz 450.0-470 MHz 470.0-476 MHz	KT-143-A (DUPLEX) KT-144-A (DUPLEX) KT-145-A (DUPLEX)	 KT-146-A (SIMPLEX)
Transmitter Mode	10 Amperes	11 Amperes
Receiver Mode	0.4 Amperes	0.4 Amperes
TEMPERATURE RANGE	-30°C to +60°C (-22°F to +140°F)	
DIMENSIONS (HXWXD)	5.15" x 13.5" x 13.4"	
WEIGHT	23 Pounds	
DUTY CAPABILITY	EIA - Continuous	

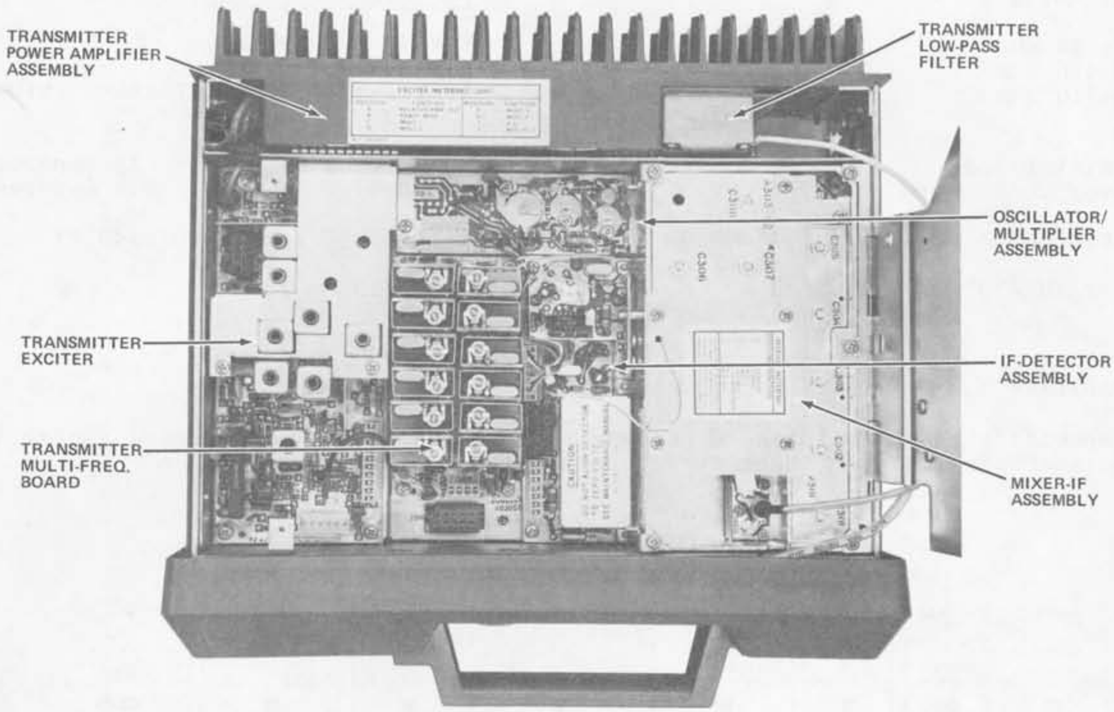
* These specifications are intended primary for the use of the serviceman. Refer to the appropriate Specification Sheet for the complete specifications.

COMBINATION NOMENCLATURE

1st Digit	2nd Digit	3rd Digit	4th Digit	5th Digit	6th Digit	7th Digit	8th Digit	9th & 10 Digit	11th Digit
Mechanical Package	System Voltage	Power Output	Channel Spacing	Frequency Capacity	Number of Frequencies	Control Unit	Control Description	Frequency Range	Oscillator Stability
Y RCC Duplexer	**C** 12 Volts DC Neg. Grd. only	**5** 21-40 Watts	**5** 25 MHz	**R** 13	**X** 0 Freq. Tx 0 Freq. Rx	**X** None	**X** Binary Freq. Control	**66** 150.8-174 MHz	**A** 5 PPM
X			**6** 30 MHz		**A** 1 Freq. Tx 1 Freq. Rx	**A** VP-1 (High Band)	**Y** Standard Freq. Control	**88** 450-470 MHz	
					C 2 Freq. Tx 2 Freq. Rx	**C** VP-2 (UHF)	**A** Black	**89** 470-494 MHz	
					E 3 Freq. Tx 3 Freq. Rx	**J** RCC IMTS (High Band)	**B** Beige	**91** 494-512 MHz	
					F 4 Freq. Tx 4 Freq. Rx	**L** RCC IMTS (UHF)	**C** Black (Rotary Dial)		
					G 5 Freq. Tx 5 Freq. Rx		**D** Black (Touch Tone)		
					H 6 Freq. Tx 6 Freq. Rx		**E** Beige (Rotary Dial)		
					J 7 Freq. Tx 7 Freq. Rx		**F** Beige (Touch Tone)		
					K 8 Freq. Tx 8 Freq. Rx				
					L 9 Freq. Tx 9 Freq. Rx				
					M 10 Freq. Tx 10 Freq. Rx				
					N 11 Freq. Tx 11 Freq. Rx				
					P 12 Freq. Tx 12 Freq. Rx				
					R 13 Freq. Tx 13 Freq. Rx				

* Combination shipped without Duplexer or Duplexer selected by special option.

TOP VIEW



BOTTOM VIEW

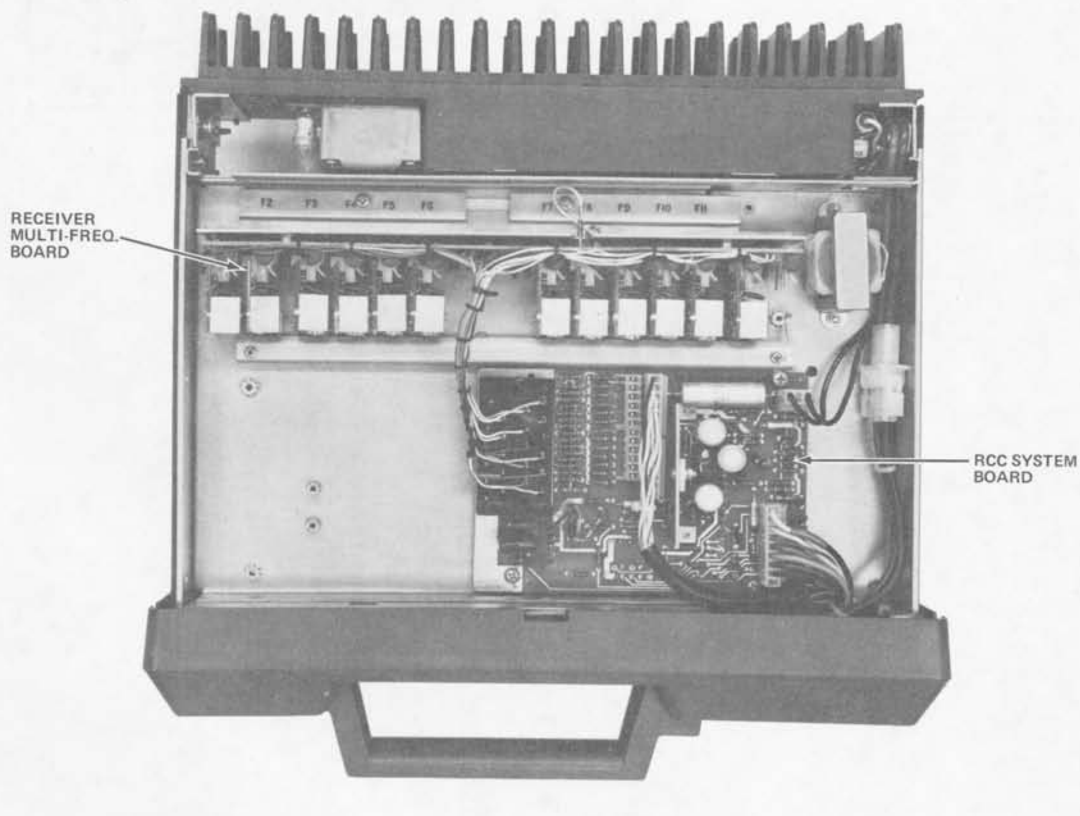


Figure 1 - MASTR Executive II RCC Module Layout

DESCRIPTION

The General Electric RCC MASTR Executive II mobile radios are designed for full simultaneous duplex operation in Radio Common Carrier (RCC) systems. The radios are fully transistorized, utilizing both discrete components and integrated circuits (IC's) for highest reliability. The radios may be equipped with up to 12 frequencies, using individual plug-in crystal modules for both transmit and receive.

The radio 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 radio is of modular construction. All major modules and tuning adjustments (except for the system board and receiver oscillator board) are easily accessible from the top of the radio (see Figure 1).

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.

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 (IFD). The receive multi-frequency module is located on the bottom side of the radio chassis and connects to the System Board by means of a harness and connector. This connector provides RF bypassing of the channel leads.

DUPLEXER

The Duplexer Assembly consists of a transmitter noise filter and three cavities. No adjustments are required for the Duplexer.

The transmitter filter is connected in series with the transmitter output and provides more than 70 dB of isolation at the receive frequency. The receiver cavity is connected in the line between the antenna and the receiver and provides more than 20 dB of isolation at the transmitter frequency.

The Duplexer mounting plate is hinged to allow access to the receiver modules. The top cover of the radio contains a "bubble" to accommodate the duplexer.

CONTROL UNIT

The telephone-type control unit contains all tone and logic circuitry for the RCC system. The control unit is equipped with a telephone-type handset. The VP-1 control unit is used with high-band (MJ) RCC units and the VP-2 control unit is used with UHF (MK) RCC units.

SYSTEM BOARD

The system board is mounted on the underside of the radio chassis. The board contains the 10-Volt regulator, keying circuit and the receiver de-emphasis and earpiece audio amplifier. The system board contains jacks for plug-in interface for the transmitter and receiver modules and system interconnection between the radio and the control unit.

INITIAL ADJUSTMENT

After the MASTR Executive II RCC 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 Radio-telephone 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 RCC 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):	14 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.

INPUT IMPEDANCE STRAPPING

The Secode Control Unit is shipped from the factory strapped for a low (3.2-16 ohm) impedance input. Refer to the Secode Control Unit Manual for instructions to change the impedance strapping if necessary.

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.

CONTROL UNIT ADJUSTMENT

Initial adjustment of the control unit includes checking the code strapping, checking volume and the earpiece level. Refer to the CONTROL UNIT ADJUSTMENT PROCEDURE in the control unit maintenance manual for complete instructions.

OPERATION

Complete operating instructions for the Two-Way Radio are provided in the separate OPERATOR'S MANUAL.

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.

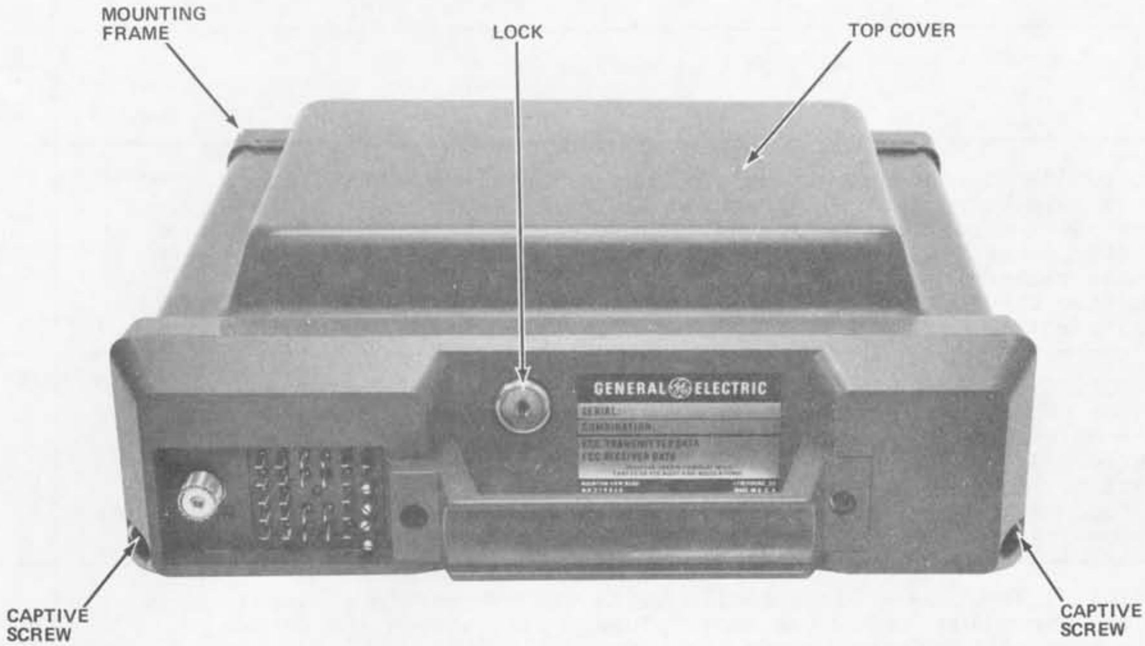
DISASSEMBLY

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).



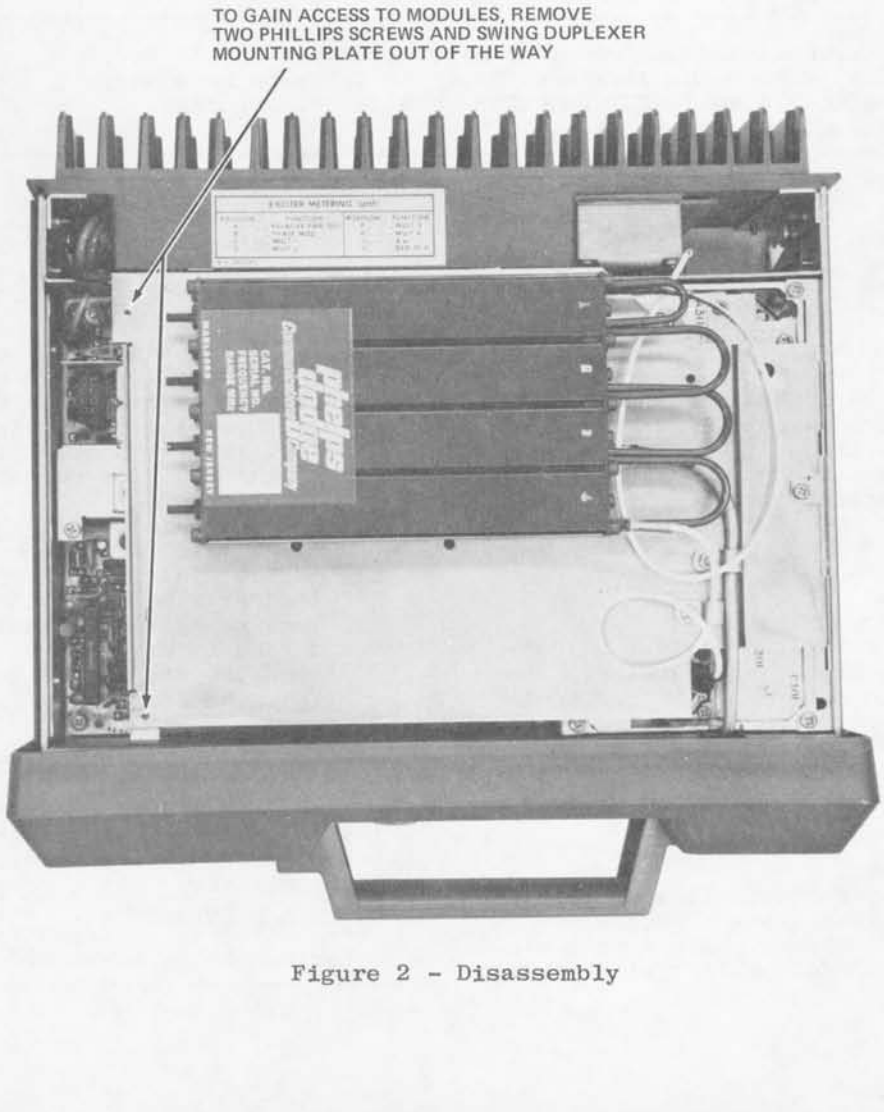


Figure 2 - Disassembly

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

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.

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.

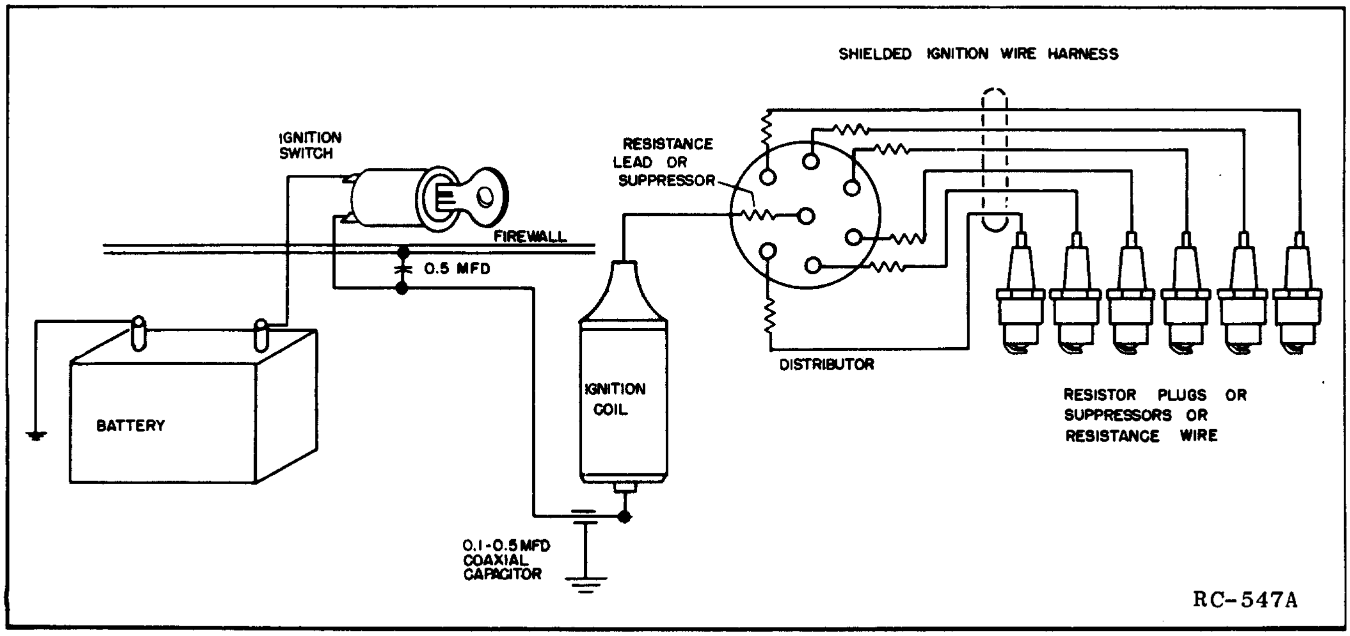


Figure 3 - Ignition Circuit with Noise Suppression Components

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.

   -- the timing has been properly adjusted.

3. Use a 0.5-mFd by-pass capacitor to bypass 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 sastifactory 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 mFd 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 gauge while the engine is running usually shows up which gauge is at fault. By-pass the gauge lead to ground with a 0.5-mFd capacitor, connected close to the sensing element.

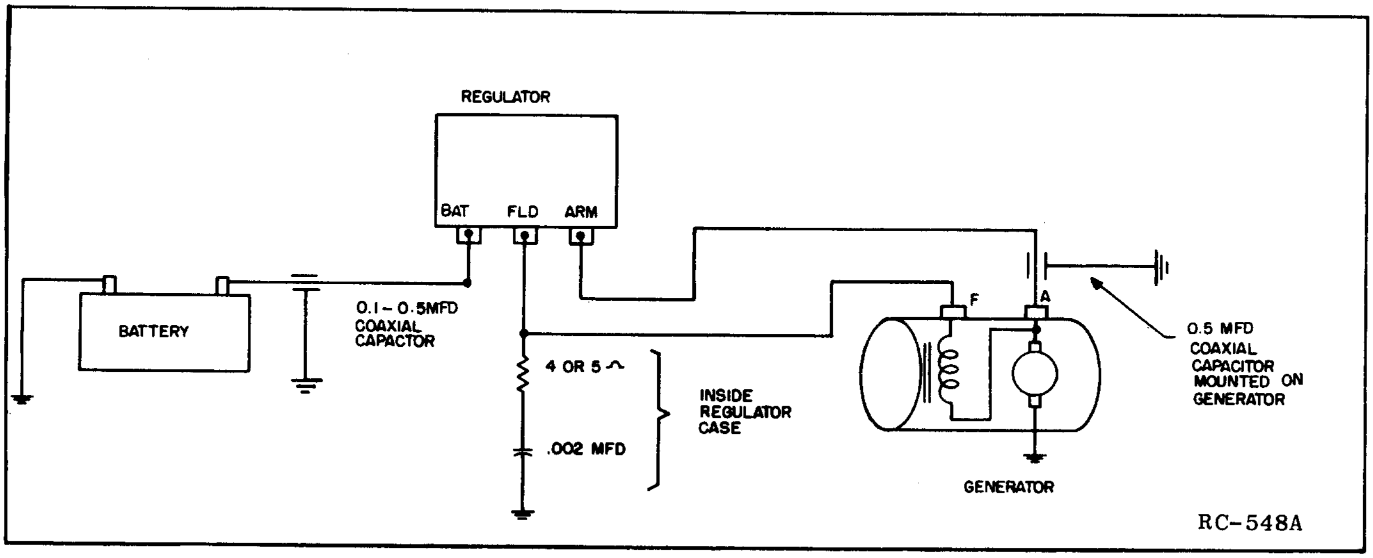


Figure 4 - Generator Circuit with Noise Suppression Components

Static and Arcing Noise

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

1. Using 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 irregular "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.

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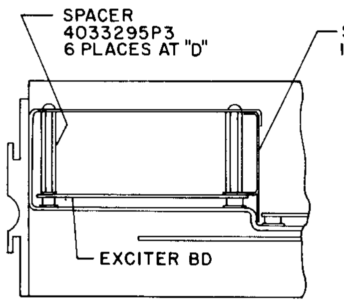
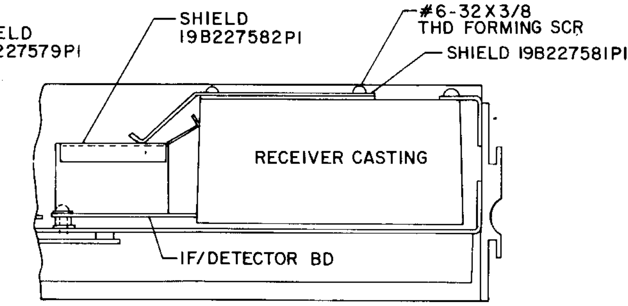
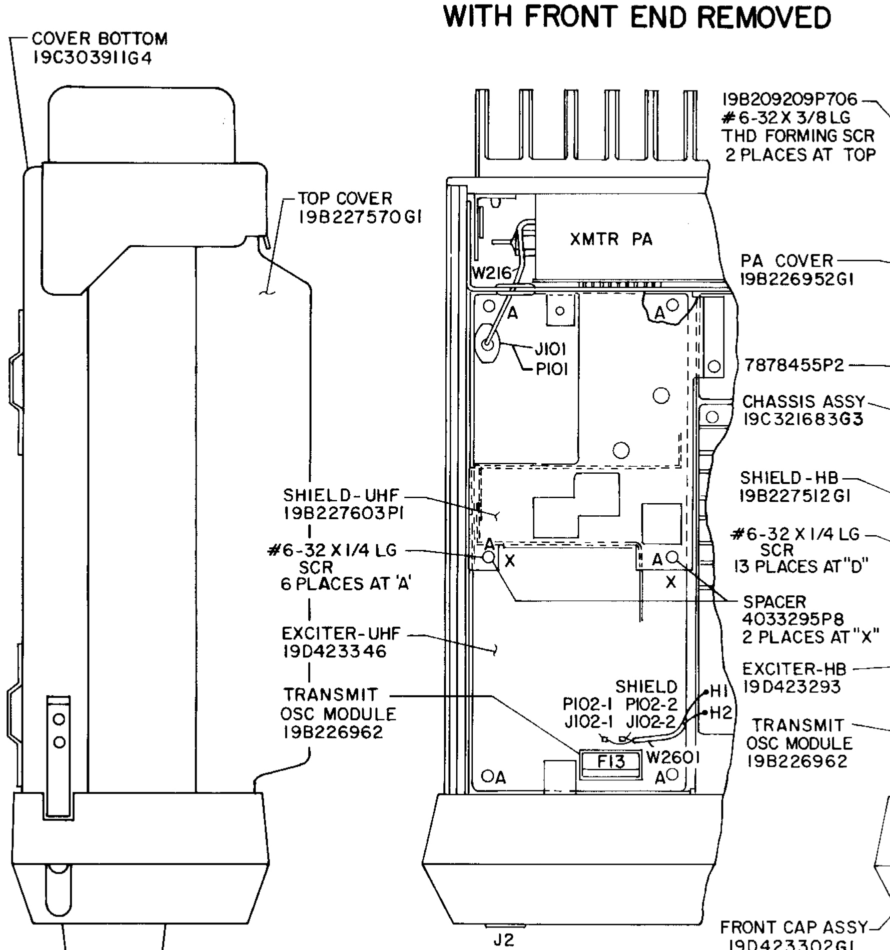


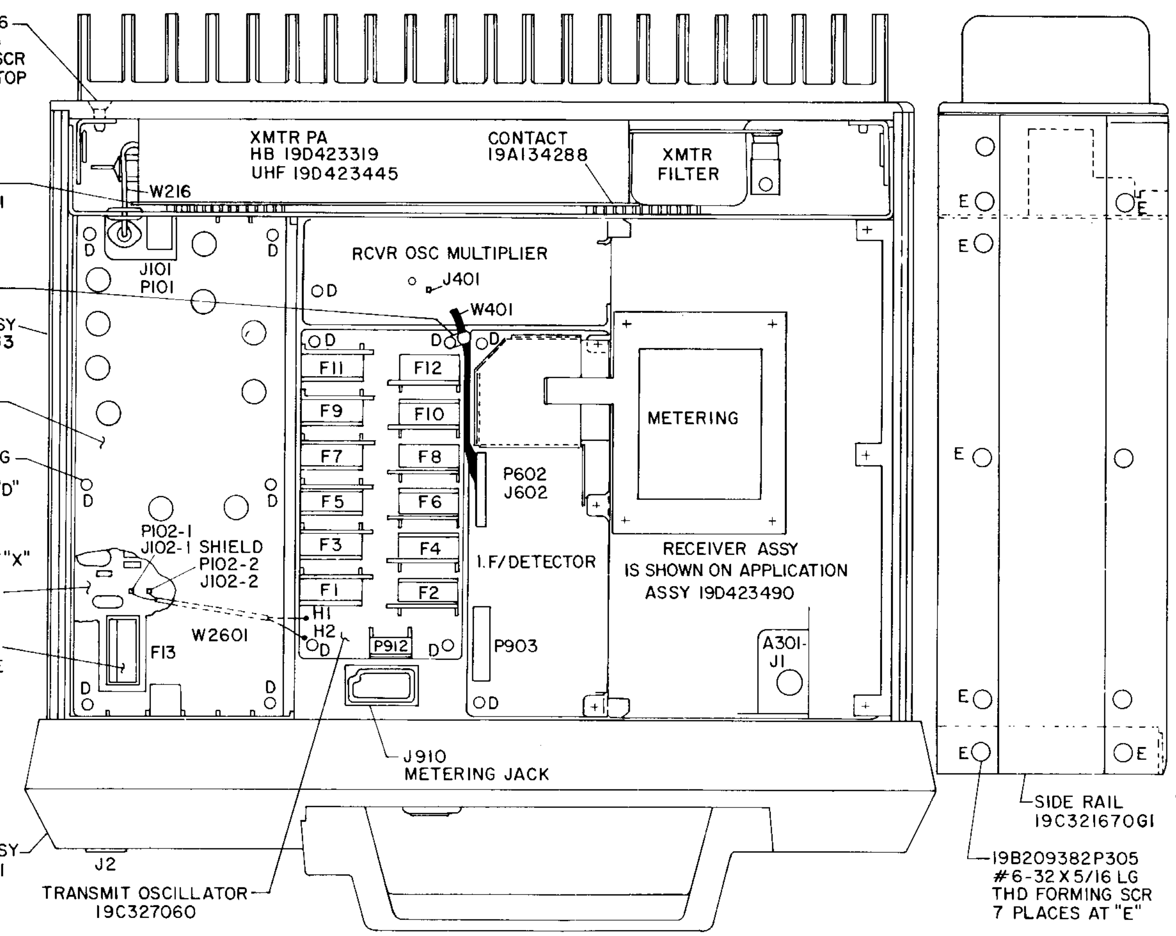
H.B. EXCITER SHIELDS



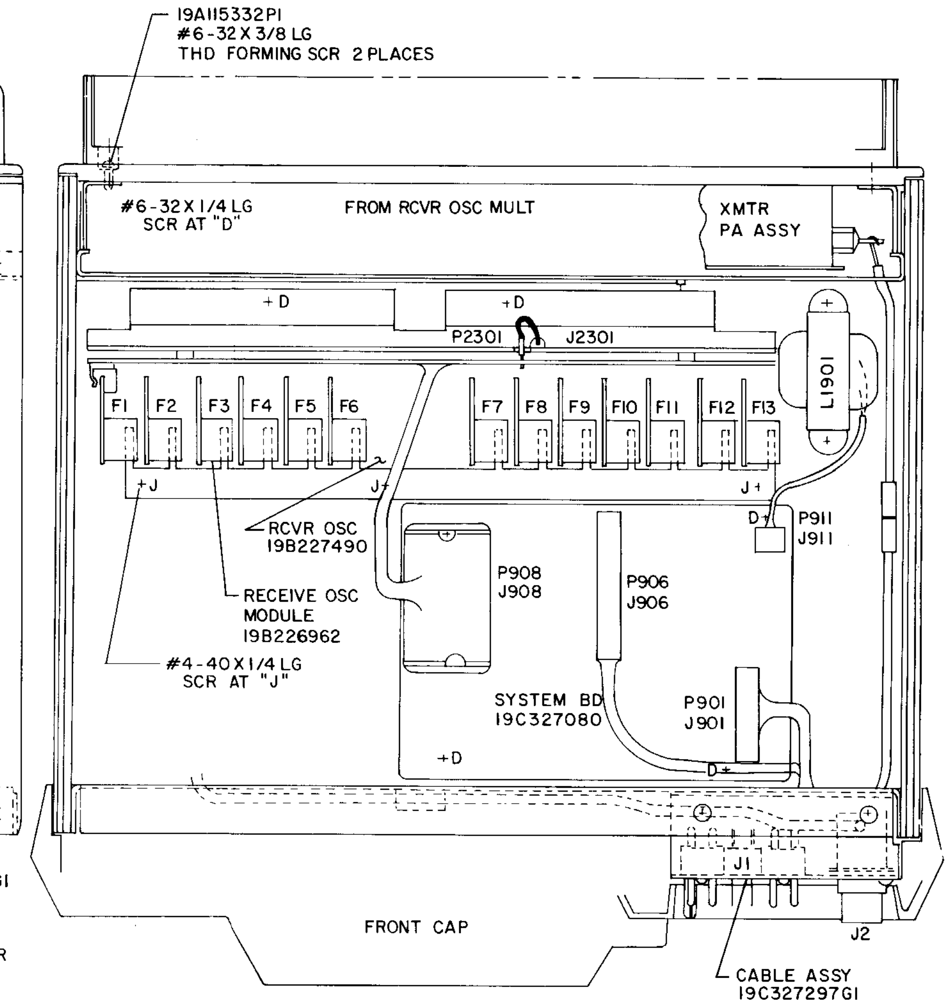
H.B. I.F. DETECTOR SHIELDS
WITH FRONT END REMOVED



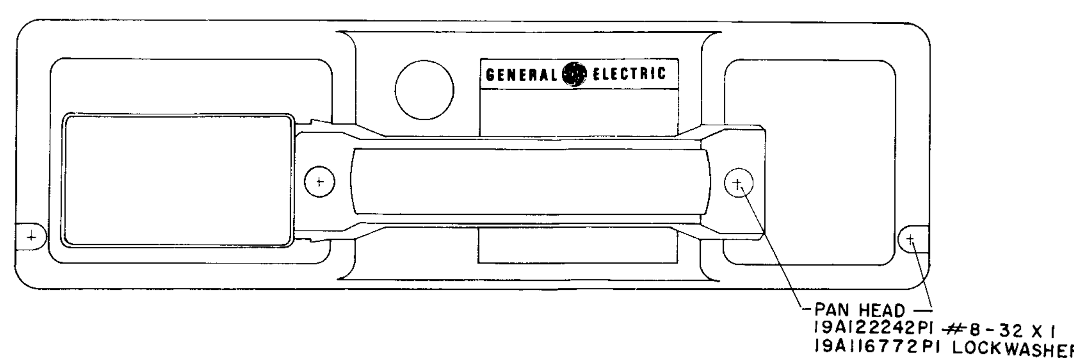
EXCITER-U.H.F.
WITH SHIELD

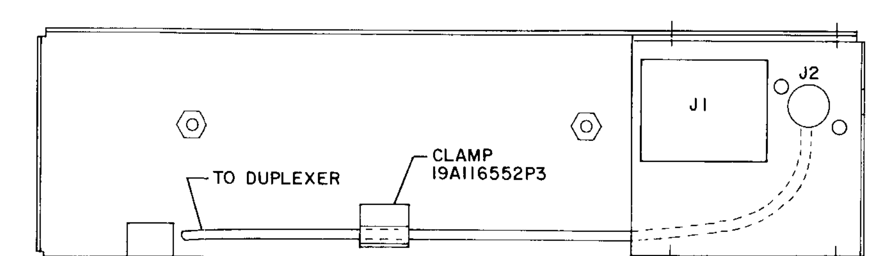


TOP VIEW WITH COVER REMOVED



BOTTOM VIEW



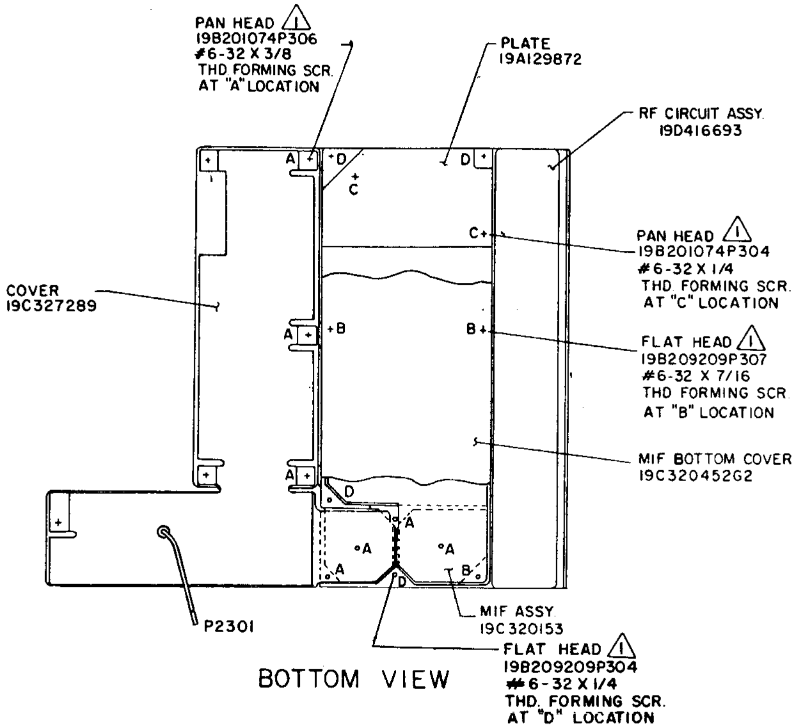


VIEW WITH FRONT CAP REMOVED

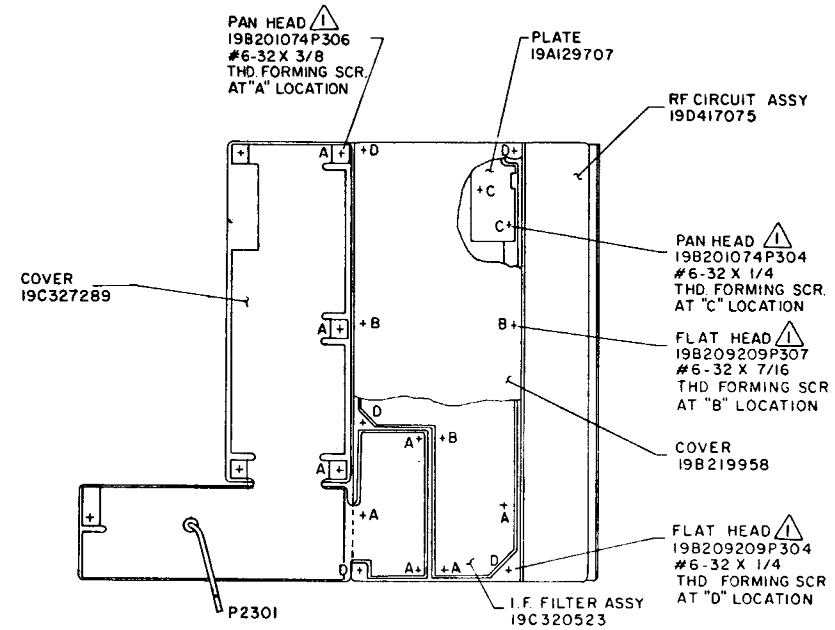
RC-3048A

MECHANICAL PARTS BREAKDOWN

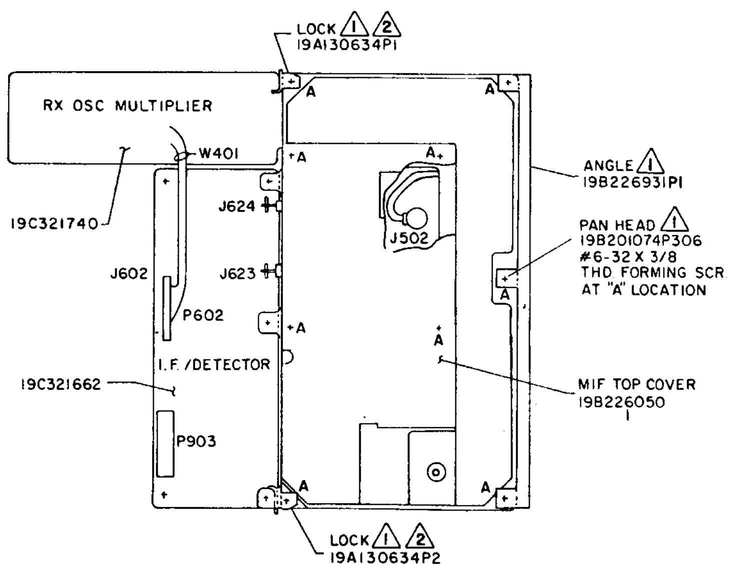
MASTR EXECUTIVE II RCC CHASSIS



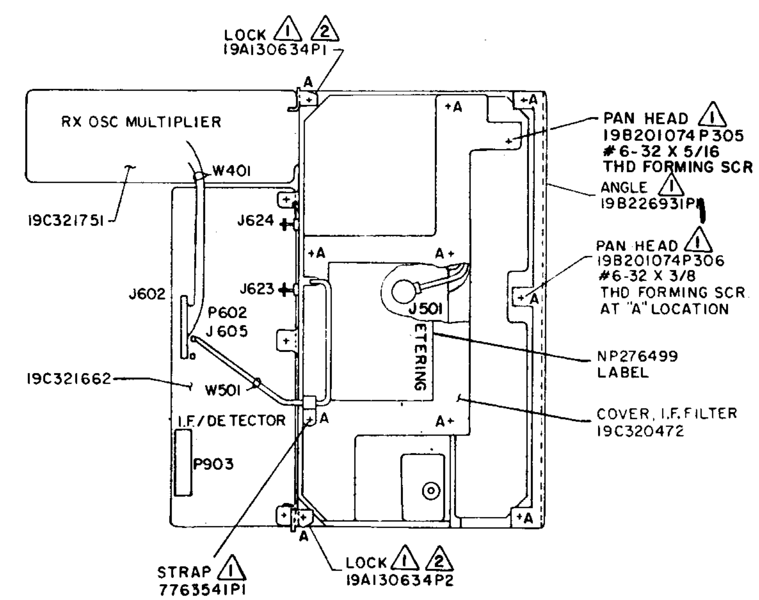
BOTTOM VIEW



BOTTOM VIEW



4 RECEIVER HIGH BAND
TOP VIEW

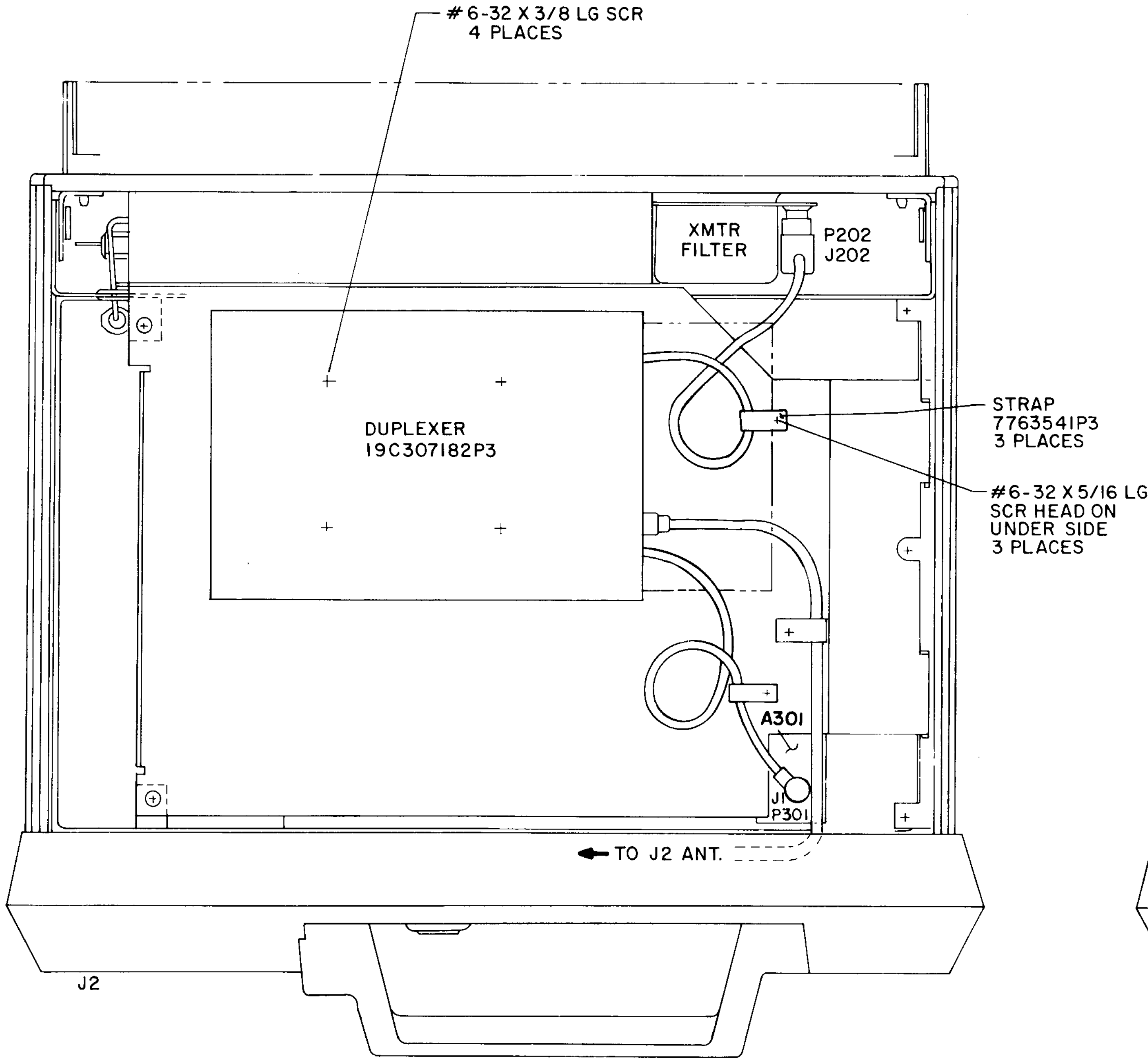


5 RECEIVER UHF
TOP VIEW

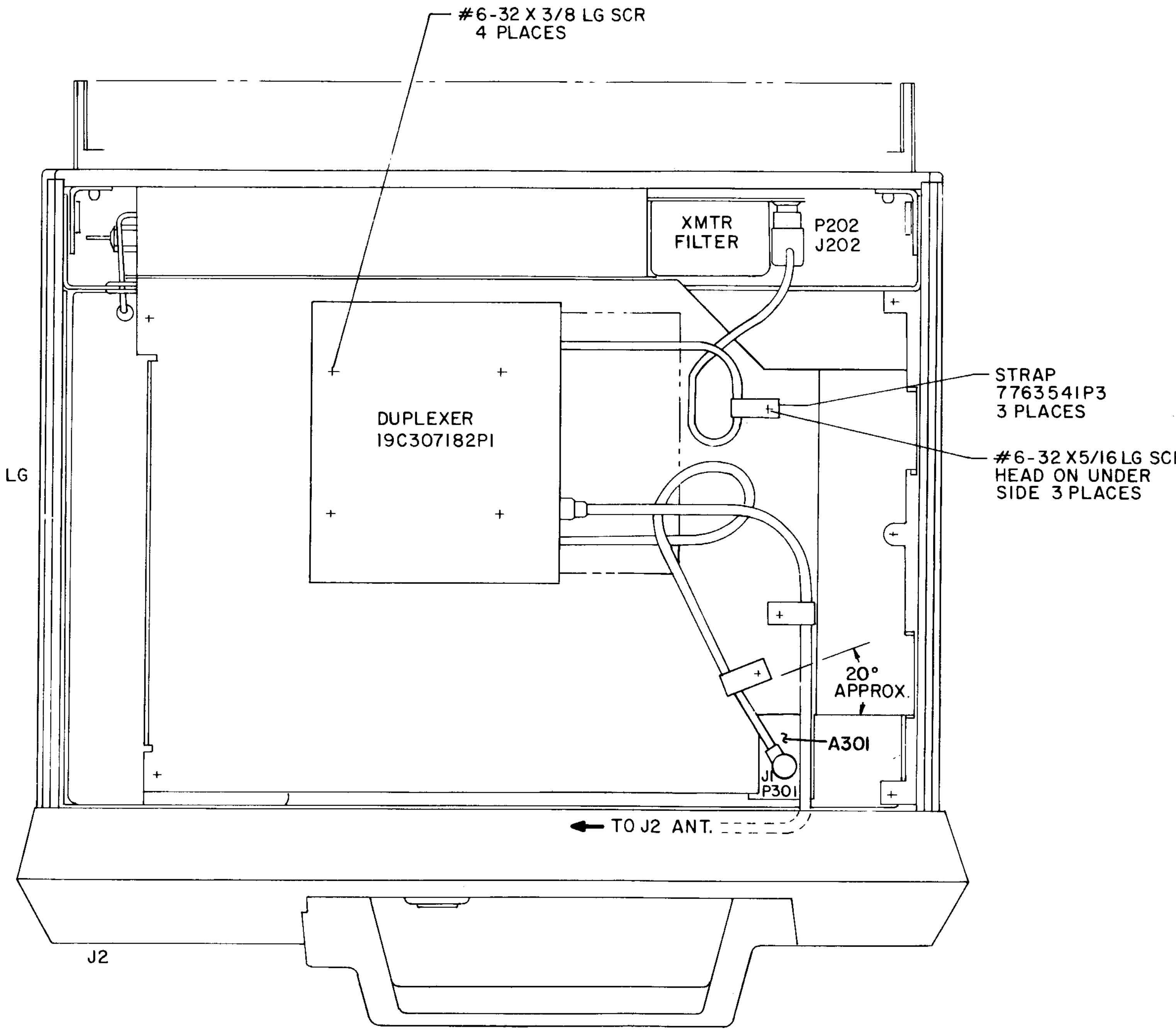
(19D423490, Sh. 4, Rev. 4)

MECHANICAL PARTS BREAKDOWN

HIGH BAND & UHF RCC RECEIVERS



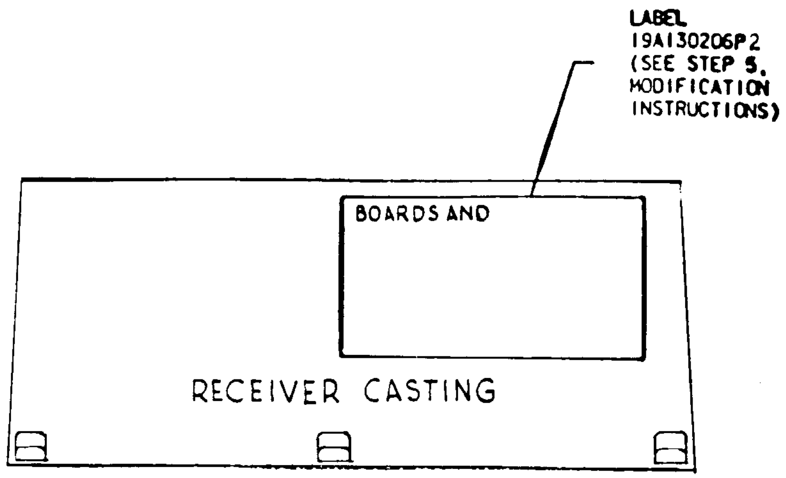
UHF DUPLEXER
& CONNECTIONS

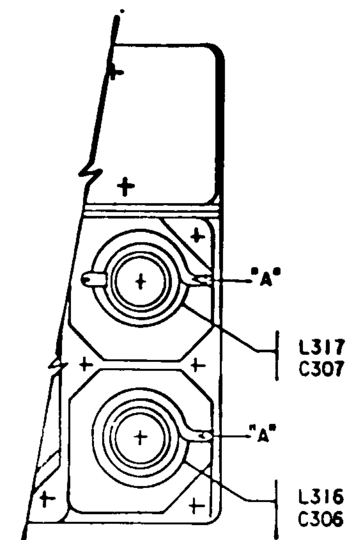


HB DUPLEXER
& CONNECTIONS

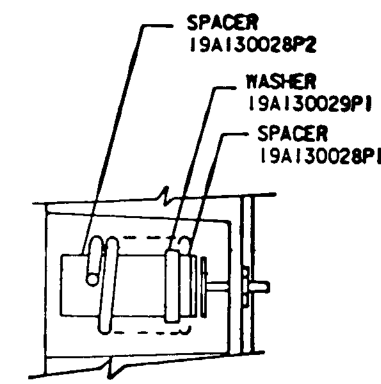
RC-3049A

DUPLEXER CONNECTIONS





PARTIAL VIEW
R.F. CKT PL19D416693



VIEW AT "A"
(PARTIAL)
(TYP TWO PLACES)

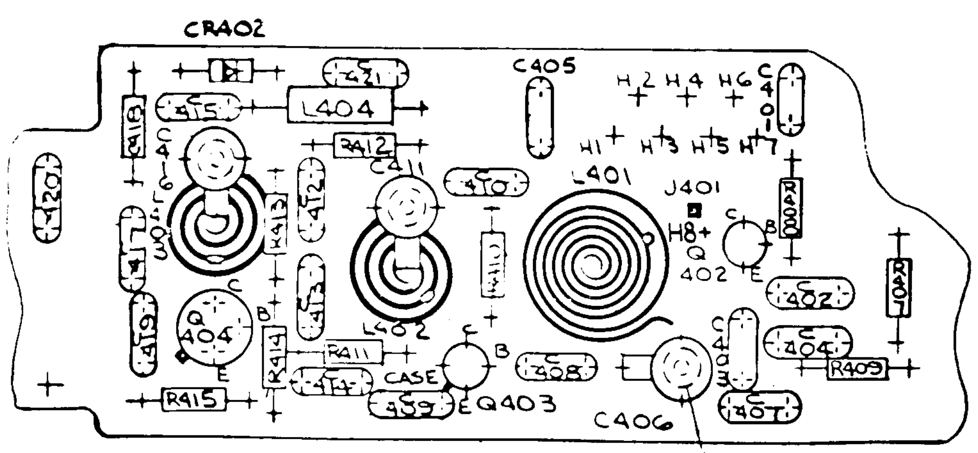
PARTS LIST

LBI-30365

HIGH BAND RECEIVER
MODIFICATION KIT
19A130045G3

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - CAPACITORS - - - - - - - - -
C2312	19A116656P3J0	Ceramic disc: 3 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C2314	19A116656P4J0	Ceramic disc: 4 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
		- - - - - - - - - MISCELLANEOUS - - - - - - -
	19A130028P1	Spacer: 1/8 inch long.
	19A130028P2	Spacer: 3/4 inch long.
	19A130029P1	Washer: brass.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.



PARTIAL VIEW
OSC/MULT BD 19C321740

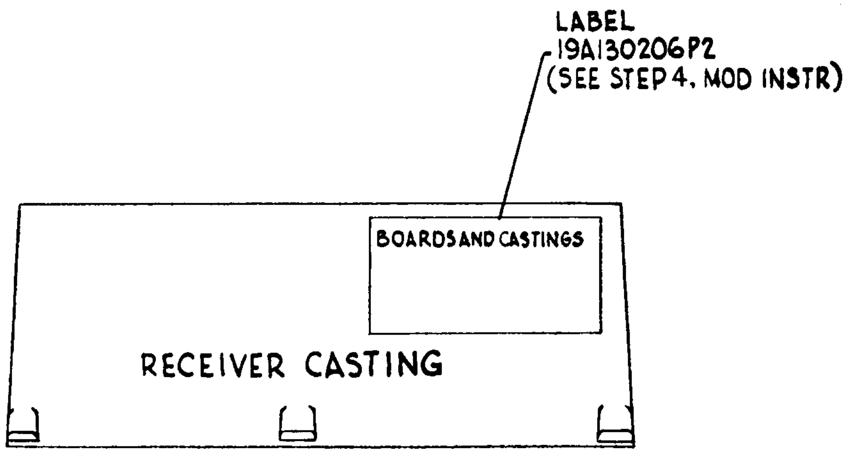
(5) MODIFICATION INSTRUCTIONS FOR HIGH BAND RCC OPERATION APPLYING 19A130045G3 KIT.

1. ON OSC/MULT BD 19C321740G2 (HIGH SPLIT) REMOVE C407, C412 AND Q402. REPLACE C419 WITH C2312 (3pf,NPO), REPLACE C420 WITH C2314 (4pf,NPO). CLIP J401 WITHIN .06 ON COMPONENT SIDE OF PWB. SOLDER CABLE 19A129947G2 AT H8 ON SOLDER SIDE OF PWB. SOLDER ALL ELECTRICAL CONNECTIONS.
2. MODIFY RF CKT ASSY PL19D416693 BY ADDING 19A130028P1 SPACER, 19A130029P1 WASHER AND 19A130028P2 SPACER AS SHOWN, TO L316 & L317 (HIGH SPLIT). SLIDE SPACERS AND WASHER ON CERAMIC POST FROM TOP IN ORDER SHOWN.
3. IN APPLICATION OF THIS KIT THE CRYSTAL OSCILLATOR FREQUENCY MUST BE CHANGED PER THE FOLLOWING FORMULA: $FX = \frac{Fo + 11.2}{9}$
4. MARK ALL OSC/MULT BD'S 19C321740 WITH A BLUE COLOR DOT IN THE AREA OF THE PL DRAWING NO. PER 19A115740P1. MARK ALL RECEIVER CASTINGS WITH A BLUE COLOR DOT IN THE AREA OF THE PL DRAWING NO. PER 19A115740P1.
5. APPLY LABEL (19A130206P2) TO SIDE OF RCVR CASTING.
6. TEST AND ALIGN PER NORMAL PROCEDURE WITH THE FOLLOWING EXCEPTION: PRE-ADJUST C411 & C416 TO MINIMUM CAPACITY, THEN TUNE IN SLOWLY. TUNE C406 FOR LARGEST PEAK ON POSITION "C".

MODIFICATION INSTRUCTIONS

HIGH BAND RCC RECEIVER

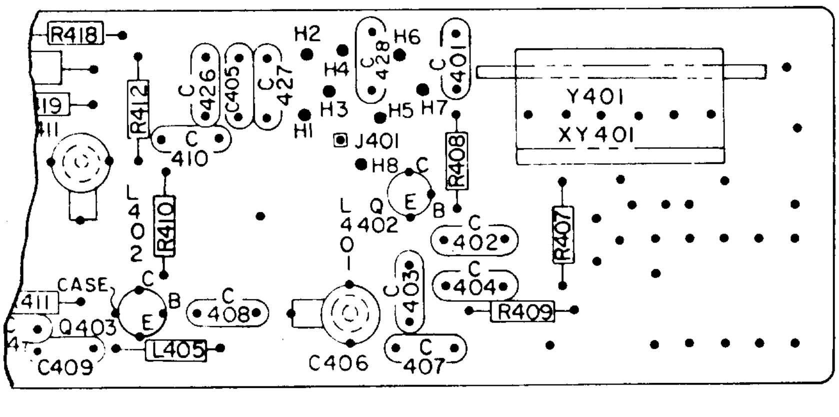
(19C320883, Sh. 5, Rev. 0)



MODIFICATION INSTRUCTION FOR UHF RCC OPERATION APPLYING 19A130045G4 KIT.

1. CLIP J401 WITHIN .06 OF PWB, REMOVE Q402.
2. SOLDER CABLE 19A129947G2 IN H8 ON SOLDER SIDE OF PWB.
3. MARK ALL OSC/MULT BD'S 19C321751 WITH A BLUE COLOR DOT IN THE AREA OF THE PL DRAWING NO. PER 19A115740P1.
4. APPLY LABEL (19A130206P2) TO SIDE OF THE RCVR CASTING.

6. TEST & ALIGN PER NORMAL PROCEDURE.



PARTIAL ENLARGED VIEW
OSC/MULT BD 19C321751

MODIFICATION INSTRUCTIONS

(19C327393, Rev. 1)

UHF RCC RECEIVER