MOBILE RADIO

# CUSTOM MVP

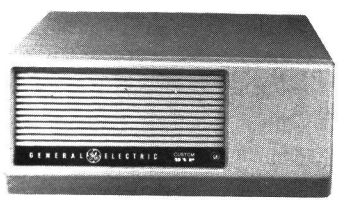
## TWO-WAY FM RADIO COMBINATIONS

## MAINTENANCE MANUAL LBI 30606 A

DATAFILE FOLDER – DF-9041

MOBILE RADIO

806–870 MHz



AC POWER SUPPLY OPTION

GENERAL ELECTRIC

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## ILLUSTRATIONS



# COMBINATION NOMENCLATURE

| 1st Digit | 2nd Digit | 3rd Digit | 4th Digit | 5th Digit | 6th Digit | 7th Digit | 8th & 9th Digits | 10th Digit |
|---|---|---|---|---|---|---|---|---|
| Mechanical Package | System Voltage | Power Output | Channel Spacing | Frequency Capacity | Number of Freq. | Options | Frequency Range | Oscillator Stability |
| **C** Front Mount | **T** +12 VDC (Negative Ground Only) | **4** 8-20 Watts | **5** 25 kHz | **A** Single Freq. | **A** 1 Freq. Tx 1 Freq. Rx | **S** Standard | **92** 806-871 MHz | **B** 2 PPM |
| | | | | **F** Multi-Freq. | **C** 2 Freq. Tx 2 Freq. Rx | **U** Channel Guard | | |
| | | | | | **E** 3 Freq. Tx 3 Freq. Rx | | | |
| | | | | | **F** 4 Freq. Tx 4 Freq. Rx | | | |

**WARNING**

Although the highest DC voltage in Custom MVP 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** | |
| Transmit | 806-825 MHz |
| Receive | 851-870 MHz |
| **BATTERY DRAIN** | |
| Receiver | |
| Squelched | 0.27 Amperes |
| Unsquelched | 0.8 Amperes |
| Transmitter | 4.5 Amperes at 13.8 VDC |
| **DIMENSIONS (H X W X D)** | |
| Two-Way Radio | 3.5" x 8.4" x 10.6" |
| AC Power Supply Option | 3.5" x 8.4" x 10.6" |
| Mobile Speaker (less bracket) | 5.1" x 5.1" x 2.8" |
| **WEIGHT** | |
| Two-Way Radio | 8.0 Pounds |
| AC Power Supply Option | 13.0 Pounds |
| Speaker | 1.0 Pound, 8 ounces |
| **TEMPERATURE RANGE** | -30°C to +60°C (-22°F to +140°F) |
| **DUTY CAPABILITY** | |
| Intermittent | 20% transmit, 100% receive |

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

| TRANSMITTER FCC FILING NUMBER | POWER OUTPUT |
|---|---|
| KT-153-C | 10 Watts |

GENERAL ELECTRIC COMPANY • MOBILE COMMUNICATIONS DIVISION
WORLD HEADQUARTERS • LYNCHBURG, VIRGINIA 24502 U.S.A.

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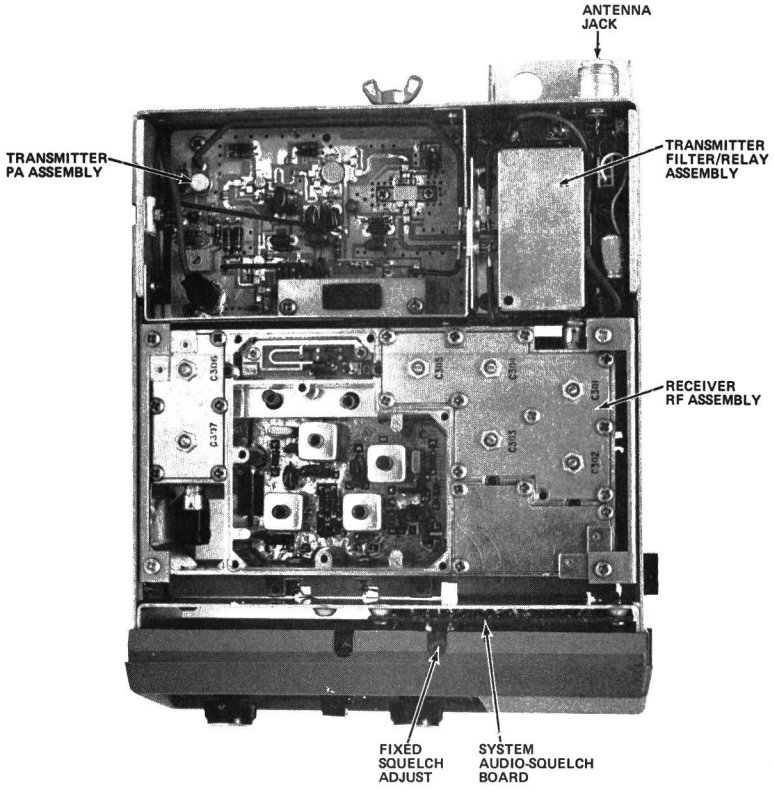
TOP VIEW




BOTTOM VIEW

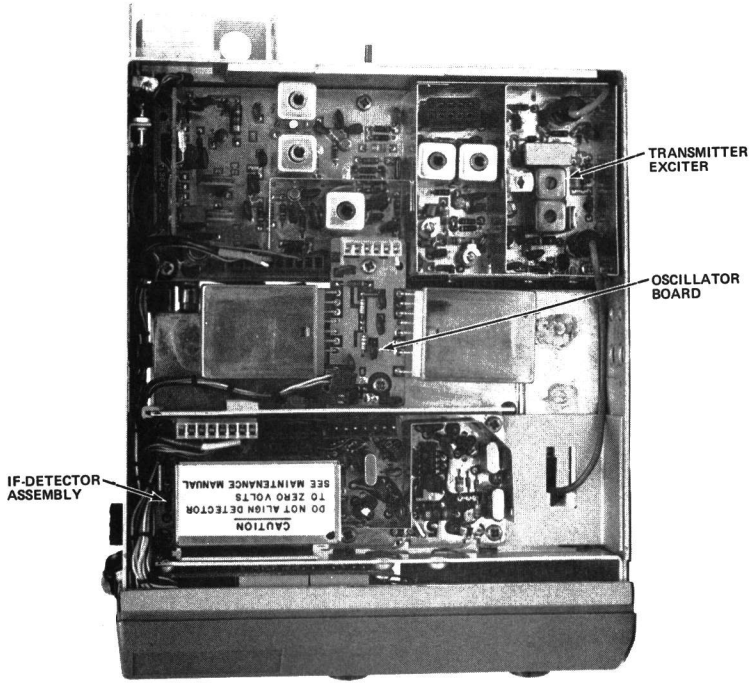





Figure 1 - Typical Module Layout

# DESCRIPTION

The General Electric Custom MVP radio combinations are fully transistorized-utilizing both discrete components and integrated circuits (IC's) for high reliability. The standard combinations may be equipped with the following:

- One through four frequencies
- Plug-in FM ICOMs for ±0.0002% oscillator stability
- Channel Guard (tone squelch)

The combination consists of a front cap attached to a module mounting frame which slides into a box-type cover. The frame is retained in the cover by one wing nut at the rear of the unit. Threaded nut fasteners are provided in the sides of the cover to secure the mounting bracket. The radio is designed for front-mount installations in mobile applications.

The control panel located on the front cap of the radio contains an ON/OFF VOLUME control, Squelch and Channel Guard monitor slide switch, an optional 4-frequency control switch and a red transmit Light Emitting Diode (LED) indicator.

No power supply is required since the highest supply voltage used in the radio is provided by the vehicle battery. The radio is designed for operation only in 12-Volt, negative ground vehicle systems.

The radio is of modular construction. All major modules and tuning adjustments are easily accessible. Removal of one wing nut at the rear allows the radio to be removed from the cover. (See Figure 1) The transmitter PA and filter boards, RF Assembly and Mixer-IF Board are accessible from the top of the radio. The exciter, receiver oscillator/multiplier, IF/Detector and multi-frequency boards are accessible when the radio is turned over.

Removing two screws at each side of the front cap allows the front cap to be removed, exposing the radio System-Audio-Squelch (SAS) board and Channel Guard Board (when used). The fixed squelch control and Channel Guard modulation control are accessible through slots in the top edge of the front cap without removing the cap. Centralized metering jacks for the transmitter and receiver are provided for simplified alignment and troubleshooting.

## TRANSMITTER

The transmitter consists of an exciter board and a power amplifier assembly. The power amplifier assembly is composed of the PA and low-pass filter. The antenna relay is mounted on the filter module.

In the receive mode, the exciter also serves as the receiver first oscillator.

## RECEIVER

The receiver consists of an RF assembly and IF-Detector assembly (IFD). The audio and squelch circuitry for the receiver is located on the SAS board.

## SYSTEM-AUDIO-SQUELCH BOARD

The System-Audio-Squelch (SAS) board mounts on the front of the radio frame behind the front control panel. The board contains the 10-Volt regulator, transmitter and receiver control circuits and the receiver audio and squelch circuits. The optional Channel Guard board or Carrier Defeat Timer mounts along-side and connects to the SAS board by means of a harness. The optional Carrier Control Timer mounts directly to the SAS board.

## AC POWER SUPPLY OPTION

To use the radio as a base station, an optional AC power supply is required. This supply is housed similar to the radio. The radio and power supply may be stacked or located side-by-side. A 15-inch 6-conductor cable connects between the power supply and the radio. A speaker and green POWER ON LED are provided with the supply.

# INITIAL ADJUSTMENT

After the Custom MVP radio has been installed (as described in the Installation Manual), the following adjustments should be made by an electronics technician who holds a First or Second 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 Custom MVP Mobile Radio, be sure of the output voltage characteristic 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 (13.8 VDC for loads up 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 (such as Lapp Model 73) may be usable when operated in parallel with a 12-Volt automotive storage battery. It is recommended that the AC Power Supply (Option 1901) be used for bench testing the Custom MVP.

### 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 follows:

### TO RECEIVE A MESSAGE

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

2. Slide the Squelch Switch on the Control panel to the TEST position 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 indicator light on the control panel 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 procedure should include the checks 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

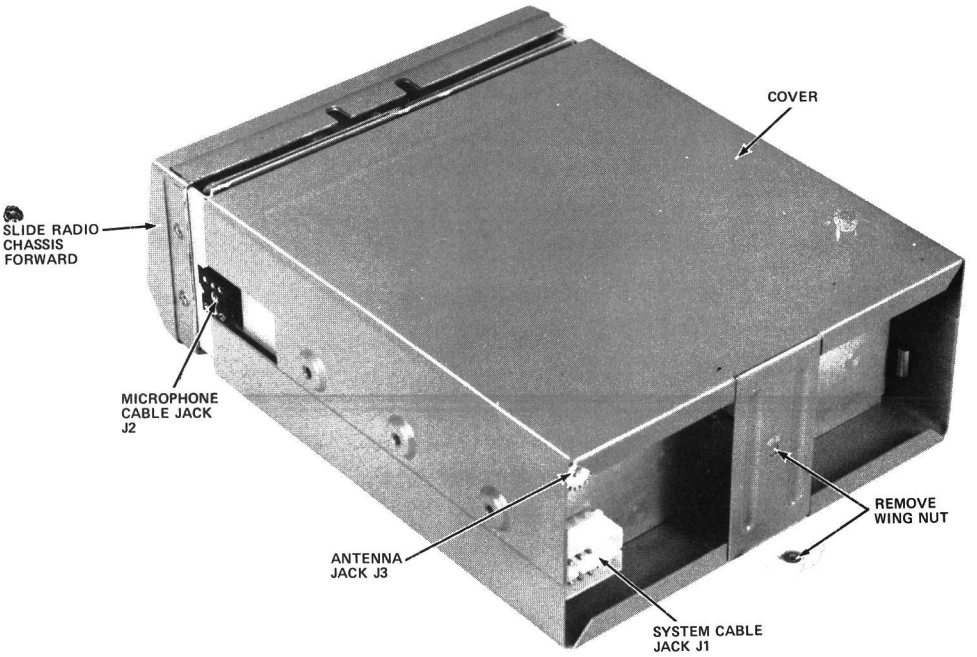


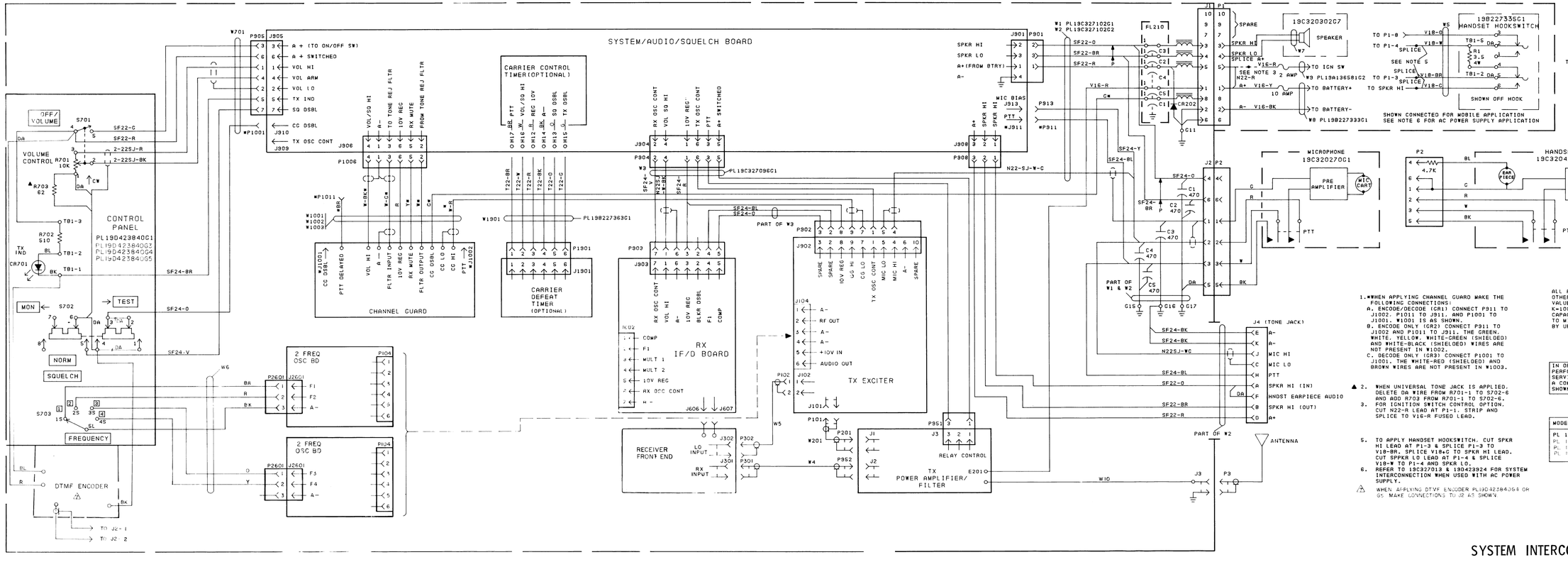

Figure 2 - Disassembly Procedure

when shipped from the factory. In addition, specific troubleshooting procedures are available to assist the serviceman in troubleshooting the transmitter and receiver.

RE-INSTALLATION

If the mobile combination is ever moved to a divverent vehicle, always check the battery polarity of the new system.

| 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 drop 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 |




1. ▲WHEN APPLYING CHANNEL GUARD MAKE THE FOLLOWING CONNECTIONS:
   A. ENCODE/DECODE (GR1) CONNECT P311 TO J1002, P1011 TO J911, AND P1001 TO J1001. W1001 IS AS SHOWN.
   B. ENCODE ONLY (GR2) CONNECT P311 TO J1002 AND P1011 TO J911. THE GREEN, WHITE, YELLOW, WHITE-GREEN (SHIELDED) AND WHITE-BLACK (SHIELDED) WIRES ARE NOT PRESENT IN W1002.
   C. DECODE ONLY (GR3) CONNECT P1001 TO J1001. THE WHITE-RED (SHIELDED) AND BROWN WIRES ARE NOT PRESENT IN W1003.

▲ 2. ▲WHEN UNIVERSAL TONE JACK IS APPLIED, DELETE DA WIRE FROM R701-1 TO S702-6 AND ADD R703 FROM R701-1 TO S702-6.

3. FOR IGNITION SWITCH CONTROL OPTION, CUT N22-R LEAD AT P1-1. STRIP AND SPLICE TO V16-R FUSED LEAD.

5. TO APPLY HANDSET HOOKSWITCH, CUT SPKR HI LEAD AT P1-3 & SPLICE P1-3 TO V18-BR. SPLICE V18-C TO SPKR HI LEAD. CUT SPPKR LO LEAD AT P1-4 & SPLICE V18-W TO P1-4 AND SPKR LO.

6. REFER TO 19C327013 & 19D423924 FOR SYSTEM INTERCONNECTION ▲WHEN USED ▲WITH AC POWER SUPPLY.

⚠ WHEN APPLYING DTMF ENCODER PL19D425840G4 OR G5 MAKE CONNECTIONS TO J2 AS SHOWN.

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

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

| MODEL NO | REV LETTER |
|---|---|
| PL 19D423840G1 | A |
| PL 19D423840G3 | A |
| PL 19D423840G4 | |
| PL 19D423840G5 | |

(19B622307, Rev. 5)

# SYSTEM INTERCONNECTION DIAGRAM

806—870 MHz

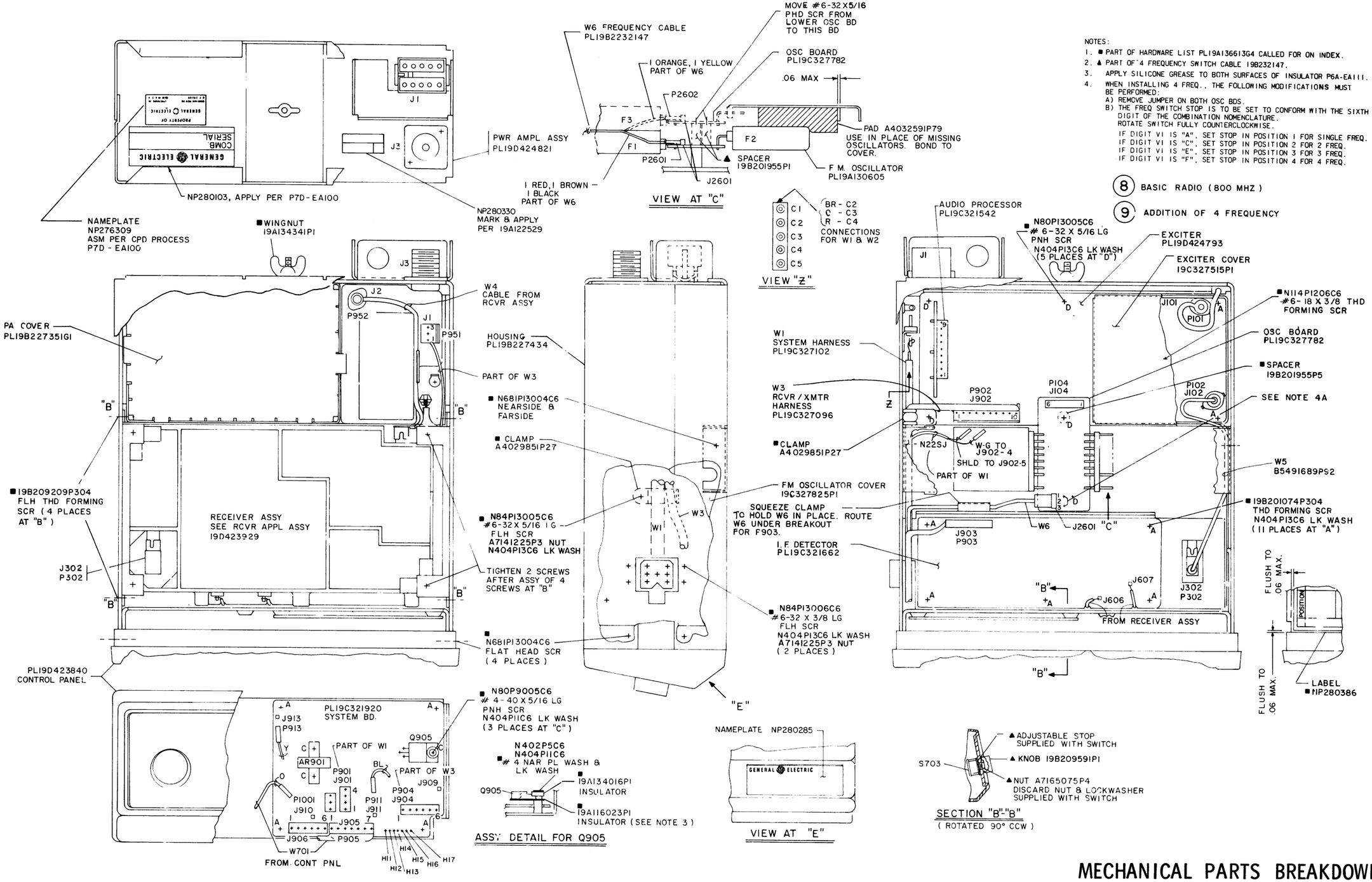
## PARTS LIST

LBI-30607

W6
806-870 MHz CUSTOM MVP
4 FREQUENCY CABLE ASSEMBLY
19B232147G1

| SYMBOL | GE PART NO. | DESCRIPTION |
|---|---|---|
| | | - - - - - - - - - - - - PLUGS - - - - - - - - - - |
| P2601 | | Connector. Includes: |
| | 19A134152P1 | Shell. (Quantity 2). |
| | 19A134152P10 | Contact, electrical: sim to Molex 08-50-0114. (Quantity 5). |
| | | - - - - - - - - - - SWITCHES - - - - - - - - - - |
| S703 | 5495454P45 | Rotary: 1 section, 1 pole, 2 to 4 with adj stop positions, non-shorting contacts, 2 amps at 25 VDC or 1 amp at 110 VAC; sim to Oak Type "A". |
| | | - - - - - - - - - - MISCELLANEOUS - - - - - - - |
| | 19B201955P1 | Spacer, threaded. (Quantity 2). |
| | 7165075P4 | Hex nut, brass: thd. size No. 3/8-32. (Secures S703 to mounting surface). |

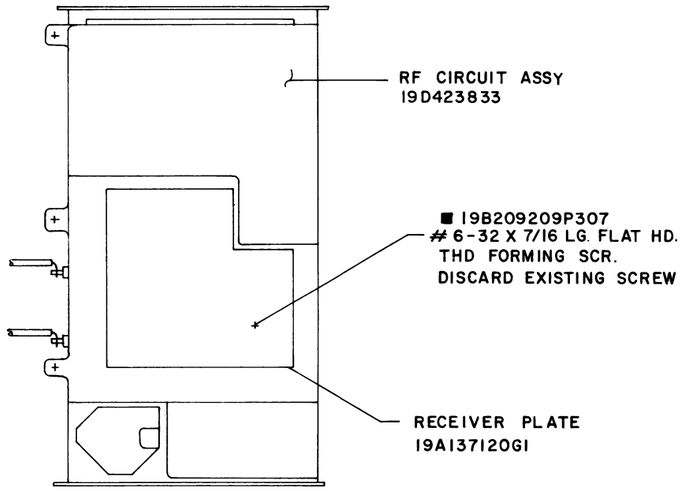
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



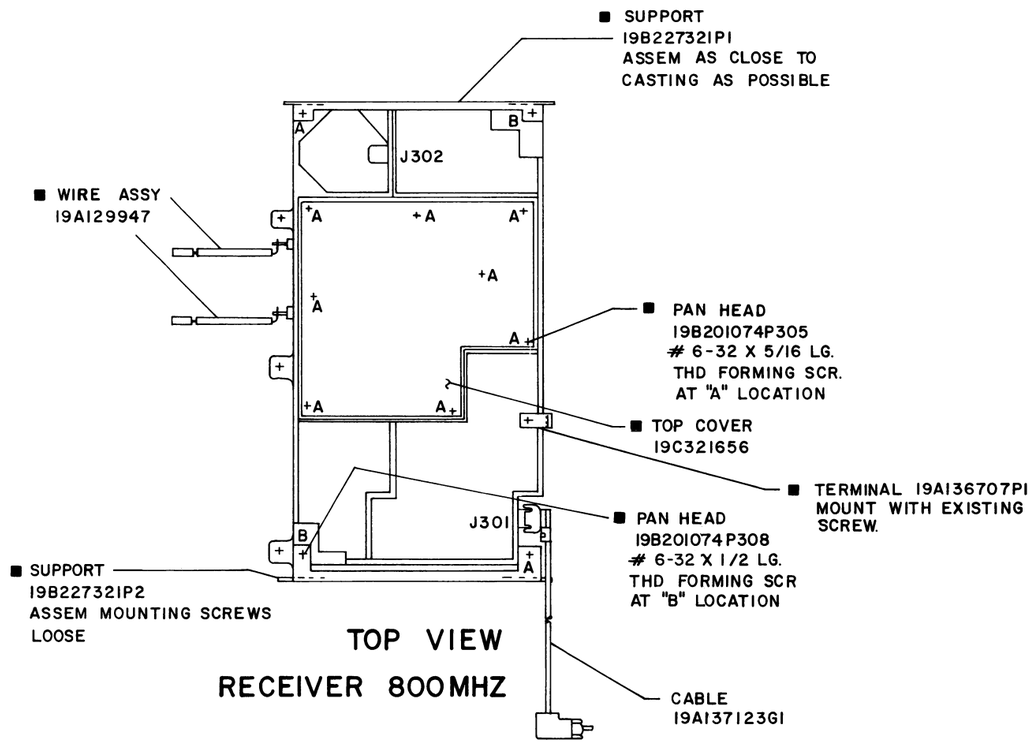

(19D423962, Sh. 4, Rev. 9)

# MECHANICAL PARTS BREAKDOWN

## CUSTOM MVP RADIO CHASSIS




BOTTOM VIEW




TOP VIEW

RECEIVER 800MHZ

(8) ASSEMBLY OF 800MHZ RECEIVER

NOTES:
1. ■ PART OF HARDWARE LIST PL19A136613G3 CALLED FOR ON RECEIVER PLATE.

## MECHANICAL PARTS BREAKDOWN

(19D423929, Sh. 4, Rev. 1)

806—870 MHz RECEIVER