MOBILE RADIO

GE-MARC V™ CORONA/CENTURA

TRUNKED MOBILE RADIO COMMUNICATIONS SYSTEM

MAINTENANCE MANUAL LBI31109A

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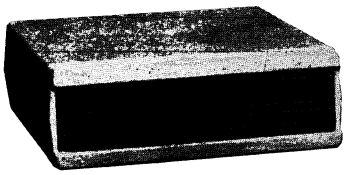

GE-MARC V™ CORONA

MICROPHONE

800 MHz 30-WATT TWO-WAY FM TRUNKED RADIO COMBINATION

SPEAKER

GENERAL ELECTRIC

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ILLUSTRATIONS

WARNING

Although the highest DC voltage in GE-MARC V Mobile Equipment is supplied by the vehicle battery, high currents may be drawn under short circuit conditions. These currents can possibly heat 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	
Transmitter	811.0125-815.9875 MHz (USA-2)
Receiver	856.0125-860.9875 MHz (USA-2)
Transmitter	816.0125-820.9875 MHz (USA-1), (USA-1, ZT)
Receiver	861.0125-865.9875 MHz (USA-1), (USA-1, ZT)
Transmitter	820.0125-824.9875 MHz (AUSTRALIA)
Receiver	865.0125-869.9875 MHz (AUSTRALIA)
BATTERY DRAIN	
Receiver	
Squelched	0.7 Amperes (Maximum)
Unsquelched	1.1 Amperes (Maximum)
Transmitter	11 Amperes
FREQUENCY STABILITY	0.00025%
TEMPERATURE RANGE	-30°C (-22°F) to +60°C (140°F)
DUTY CYCLE	100% Receive, 20% Transmit (EIA)
DIMENSION, LESS ACCESSORIES (H X W X D)	65 mm X 190 mm X 240 mm (2.5 X 7.5 X 9.4 inches)
WEIGHT, LESS ACCESSORIES	2.7 kg (5.0 pounds)
NO. OF FREQUENCIES	25 CORONA (Maximum) 20 CENTURA (Maximum)

TRANSMITTER KT-197-C (CORONA) KT-197-D (CENTURA)

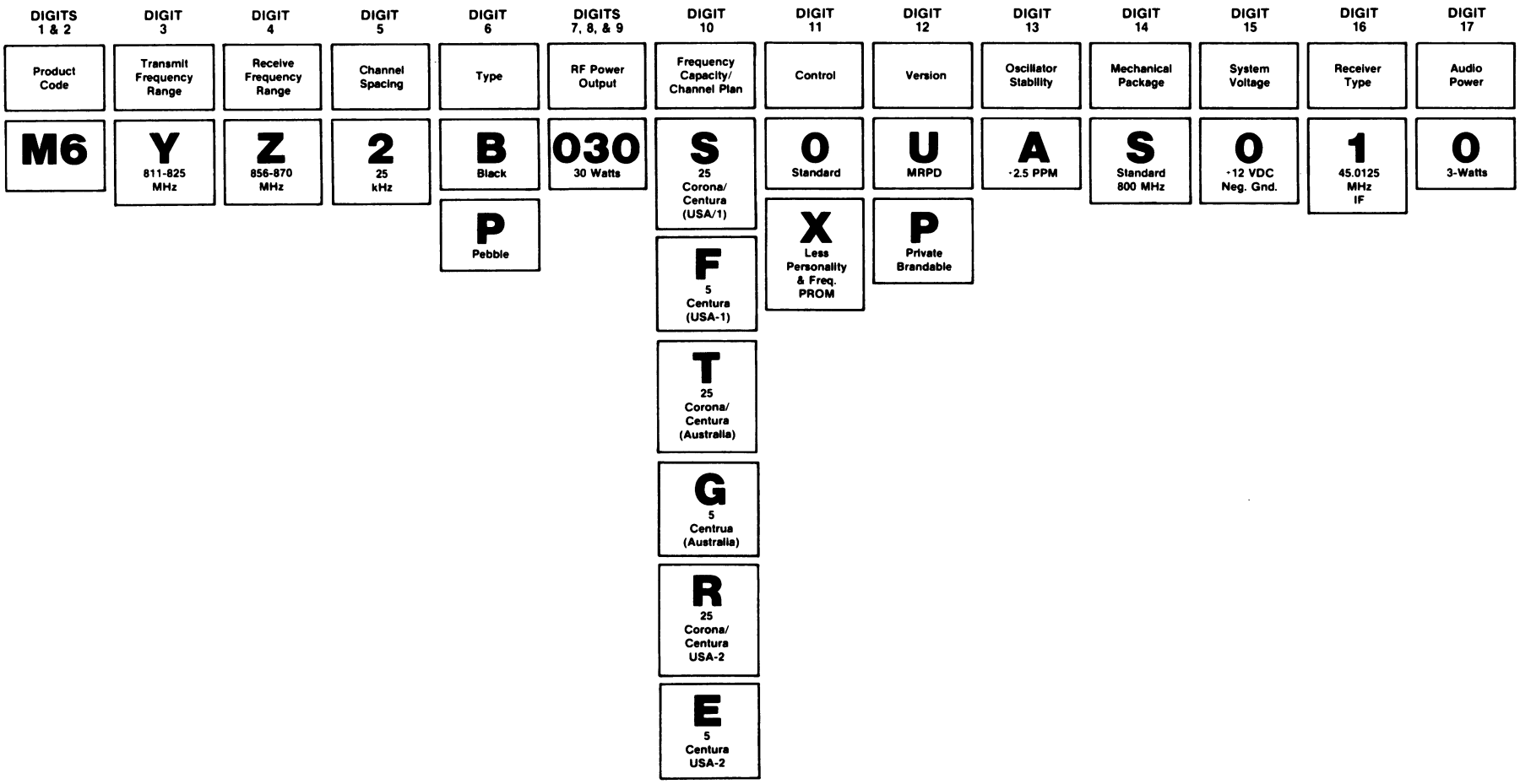
POWER OUTPUT	30 WATTS
CHANNEL SPACING	25 kHz
CONDUCTED SPURIOUS	-60 dB
MODULATION	±4.5 kHz
AUDIO SENSITIVITY	55 to 120 Millivolts
AUDIO FREQUENCY CHARACTERISTICS (Per RS-152-B)	Within +1 dB to -3 dB of a 6 dB/ octave pre-emphasis from 300 to 3000 Hz per EIA standards.
DISTORTION	Less than 3% (1000 Hz) Less than 5% (300 to 3000 Hz)
DEVIATION SYMMETRY	0.5 kHz maximum
RF OUTPUT IMPEDANCE	50 ohms

RECEIVER (ER-128-A)

AUDIO OUTPUT (to 4.0 ohms speaker)	3 Watts (less than 5% distortion) EIA
SENSITIVITY	
12 dB SINAD (EIA Method)	0.30 uV
20 dB Quieting Method	0.4 uV
SELECTIVITY	
EIA Two-Signal Method	-75 dB @ ±25 kHz
SPURIOUS RESPONSE	-70 dB
INTERMODULATION	-70 dB
MODULATION ACCEPTANCE	±7 kHz
SQUELCH SENSITIVITY	12 dB SINAD
FREQUENCY RESPONSE	Within +2 and -8 dB of a standard 6 dB per octave de-emphasis curve from 300 to 3000 Hz EIA
RF INPUT IMPEDANCE	50 ohms

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

COMBINATION NOMENCLATURE



STRUCTURED OPTIONS

DIGIT A	DIGIT B	DIGIT C	DIGIT F	DIGIT H	DIGIT J	DIGIT K	DIGIT M	DIGIT N	DIGIT P	DIGIT T	DIGIT U	DIGIT V	DIGIT W	DIGIT Z
Group Select	Base/Tel Sw.	Carrier Control Timer	Area Select	Collect Tone Length	Indiv. Call	Ext. Alarm Switch	Alert Tone	Busy Tone	Voter Compatibility	Universal Tone Cable	Call Light	Call Monitor	Area Select Rx Scan	Frequency Shift
0 1 GP Tone/ (Standard)	**0** None	**0** 2.5 Min. (Std.)	**0** 1 Area	**0** Standard	**0** None	**0** None	**0** 2 Note Alert for Call Orig. and Rx	**0** 3051.9 Hz Standard	**0** None	**0** None	**0** Standard	**0** None	**0** Normal Scan (All Channels)	**0** None
2 2 BP Tones 1-Ind. Enc. Tn.	**B** Base	**1** 1 Min.	**2** 2 Areas	**A** 5 Channels	**D** Indiv. Call Decode	**A** Ext. Alarm Indiv. Call	**1** 2 Note Alert for Call Orig. Only	**1** 2918.7 Alternate	**1** Extended Tone Burst	**1** Tone Cable	**1** Selectable	**1** Call Monitor	**1** Scan Area Selected Channels	**T** 2-Channel Offset
3 3 GP Tones 2-Ind. Enc. Tns.	**T** Tel	**2** 2 Min.	**3** 3 Areas	**B** 10 Channels		**B** Ext. Alarm All Call	**2** 7 Note Alert for Call Orig. & 2 Note Rx							
4 4 GP Tones 3-Ind. Enc.		**3** 3 Min.	**4** 4 Areas	**C** 15 Channels			**3** 7 Note Alert for Call Orig. and Rx							
5 5 GP Tones 4-Ind. Enc. Tns.		**4** 4 Min.	**5** 5 Areas	**D** 20 Channels										

GENERAL DESCRIPTION

GE-MARC V™ CORONA, and CENTURA trunked mobile radio combinations are 100% solid state -- utilizing both discrete components and integrated circuits (IC's) for high reliability. The radio is a self-contained FM transmitter/receiver with frequency synthesizer and built-in controls and speaker. Its small size makes it ideal for front mounting in conventional vehicles.

The GE-MARC V™ trunked mobile radio enables the user to share up to 25 half-duplex communications channels (CORONA, or 20 half-duplex channels CENTURA). The GE-MARC V radio(s), repeater(s) and control station comprise a basic private channel communications system. A logic board in each mobile radio and control station signals, accesses and controls all communications channels through a repeater and alerts the user to incoming calls.

Standard combinations may use up to 25 different RF frequencies. A plug-in ICOM and a synthesized oscillator provide for ±0.00025% oscillator stability. Channel selection is determined by the logic board and frequency synthesizer. RF frequency codes are stored in the RF frequency PROM.

GE MARC V radio may operate on one of three available channel plans, USA-1, USA-2 or the Australia. Frequencies associated with these channel plans are identified in the table below.

Channel Plan	Transmit Freq (MHz)	Receive Freq (MHz)
USA-1/ USA-1,ZT	816.0125-820.9875	861.0125-865.9875
USA-2	811.0125-815.9875	856.0125-860.9875
AUSTRALIA	820.0125-824.9875	865.0125-869.9875

The radio consists of an effective, heat-dissipating, aluminum die cast chassis similar to an "H" frame on which three circuit boards are mounted. The casting contains a horizontal flat plate located midway between the vertical sides. A back plate, with fins, is attached to the rear of the chassis and provides a means of heat dissipation. The transmitter/receiver board is mounted on the bottom of the chassis and includes the exciter, a separate PA module and receiver circuitry. The synthesizer/interconnect board is mounted in the top section of the chassis. This board contains the audio processor, FM ICOM, I/O expanders, frequency synthesizer, and provides all interconnections. The logic board is mounted on the top section of the chassis just above the synthesizer/interconnect board.

The circuit boards plug into each other, eliminating the need for interconnecting wires. The only wires used are for the plug-in leads on the internal speaker. Interchangeable top and bottom covers enclose the "H" frame and provide optimum protection for the radio.

The front control panel is made of highly durable plastic and houses the speaker. It has rounded corners and recessed controls for passenger safety requirements.

The panel provides access to two standard operator controls: A POWER ON/OFF pushbutton, and a rotary, edge mounted VOLUME control. A red TX (transmit) indicator LED (Light Emitting Diode), a green mode indicator LED (WAIT/READY), a red CALL received indicator and a green PWR (power on) LED are provided.

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 in 12 Volt, negative ground vehicle systems.

NOTE

The 30 Watt GE MARC V radio is not available as an AC mobile due to the limited capability of the power supply. It therefore is not FCC type accepted as such.

The radio is of modular construction. All major modules and tuning adjustments are easily accessible. Loosening the two screws in the rear of the top cover provides access to the logic and synthesizer/interconnect boards. The synthesizer board is removed by removing the logic board, the front cap, the synthesizer shield, and the mounting screws. Loosening two screws at the rear of the bottom cover provides access to the transmitter/receiver board. An optional set of test probes can be plugged onto the the test pins on the board for alignment and troubleshooting using the Microprocessor Test Set TL5B.

A test jack, J2506, located on the synthesizer/interconnect board facilitates system test, checkout and troubleshooting.

Various structured options are provided as standard equipment. These options are controlled by the microprocessor with specific related information stored in the personality PROM. Any changes to these options or to the RF frequency structure requires that a new personality PROM be programmed to reflect the specific

information for all desired options listed in the structured option nomenclature table. (The personality PROM is located on the logic board.) Structured options provided include:

- Carrier Control Timer-2.5 min. standard
- Area Select ----------1-Area
- Group Tones ----------1-Tone
- Alert Tone ----------2-Note Alert
- Call Light ----------All Calls
- Area Select Scan ----Scans All Channels

Structured options provided in the radio may include any of the following variations. Those options that apply only to the CORONA model are identified as such.

Carrier Control Timer - Turns off the transmitter after the microphone push-to-talk switch has been keyed for an adjustable period of time. The timer is PROM adjustable from 2.5 seconds to 4.0 minutes. In CENTURA model radios the CCT is fixed at 2.5 minutes.

Area Select Option (CORONA) - Permits a customer to operate his system on more than one GE-MARC V system with the following limitations:

- Total number of different frequencies available is 25.
- 5 areas (systems maximum).
- 15 channels maximum in each area.
- Total number of channels in 5 areas is 25.

Area Select Receiver Scan (CORONA) - Allows the receiver to scan all frequencies programmed in the radio independent of the area position selected, or scan only the channels in the area selected. (This option must be selected if the total number of channels exceeds 20.)

Group tones two through five are selective call encodes. These tones may be decoded by individual mobiles or groups of mobiles. A group of mobiles may include all assigned to a given area or as assigned. A fifth selective call encode is assigned as a special call (SPL) and is assigned to group tone six.

SPL Call - (CORONA) Special call allows the mobile to selectively signal the control station or another mobile by adding another encode tone combination.

Individual Call - Allows the mobile to be signalled by two GE-MARC V tone combinations (additional decode tone combination).

External Alarm - (CORONA) For selected calls, it alerts the operator to a call by blowing the vehicles horn, or activating other alarm devices.

Selectable Call Light - On standard radios a CALL light will turn on when a call is received. Optionally, the radio may be programmed to turn the CALL light on only for selected calls.

Call Monitor - Permits the operator to hang the microphone in the hookswitch after receiving a call without returning the radio to idle mode. Normally the hookswitch is used to initiate calls and reset the radio to idle. This option disables the reset function.

Alert Tone Option - There are 2 audible alert tone sequences available to alert the operator to an incoming call or to indicate CALL origination. One of four combinations may be used. They are:

- Two-note alert for call originate and receive
- Two-note alert for call originate, None for receive
- Seven-note alert for call originate Two-note for receive
- Seven-note alert for both call originate and receive

This option is compatible with any combination of encode/decode tones.

Alternate Busy Tone - Prevents radio communications interference between mobiles operating in adjacent areas when using the same RF frequency.

Voter Compatibility Option (CORONA) - The voter compatibility option extends the duration of the initial busy tone burst to 180 milliseconds to allow the voting circuitry to select the best RF path available.

TRANSMITTER

The transmitter consists of an audio processor, synthesizer, exciter and a broadband, fixed-tuned power amplifier module. In the receive mode, the exciter also serves as the receiver first mixer injection.

The RF power output level is adjustable for rated power. After the level is

set, a sensing control circuit holds the power constant over temperature and/or voltage variations within specified limits.

Drive for the transmitter PA and the receiver 1st mixer injection are derived from a phase lock loop (PLL) circuit.

Frequency stability for both the transmitter and receiver is maintained by an electronic compensation network in the 2 PPM FM ICOM and a compensated reference oscillator in the synthesizer.

RECEIVER

The dual conversion receiver consists of a front end section and two mixer/IF sections operating at 45.0125 MHz and 455 kHz. The receiver also contains the audio section. Only the CAS function in the squelch circuit is used. The audio section provides a 3 Watt audio output into a 4 ohm load.

SYNTHESIZER

The synthesizer consists of a synthesizer chip, dual modulus counter, a reference oscillator, and a voltage controlled oscillator (VCO). The synthesized frequency is controlled by the RF frequency PROM and applied to the transmit/receive board.

LOGIC

The logic board controls the operation of the radio and contains the microprocessor, personality PROM, tone encoder/decoder, voice tone filtering and I/O expanders. The I/O expanders are located on the synthesizer/interconnect board and the microprocessor, personality PROM, etc., are located on the logic board.

MICROPHONE

GE-MARC V™ trunked mobile radio combinations use a dynamic microphone with a built-in transistorized microphone preamplifier. The microphone is housed in a sturdy case, and the extendable coiled cord plugs into a jack at the back of the radio. The microphone is secured to the radio by means of a strain relief hook on the microphone cable.

EXTERNAL SPEAKER (OPTIONAL)

The five-inch 3-watt speaker, contained in a LEXAN® housing, has an impedance of 3.2 ohms. A LEXAN® bracket is supplied for mounting. The speaker leads are connected to pins 3 and 7 of Systems Plug P910. When the external speaker is used, certain jumper modifications are required. Refer to the notes on the Schematic Diagram.

UNIVERSAL TONE CABLE

A Universal Tone Cable is available for use with external encoders and decoders.

When used with external decoders, the speaker muting function is obtained by removing the jumper from H15 to H16 on the Interconnect/Multi-frequency board.

SYSTEM DESCRIPTION

The GE-MARC V CORONA/CENTURA trunked mobile radio system permits improved access to available RF channels, freedom from annoyance by other users' conversations and a degree of privacy for the user. The GE-MARC V™ trunked mobile radio system consists of a repeater for each channel and the users' mobile radio units. The system uses tone signalling, with each mobile being assigned a two-tone combination. Groups or fleets of mobiles are assigned the same tones, so that any unit can talk to all the other units in the group. A system block diagram is shown in Figure 1.

When originating a call, the mobile identifies an idle repeater channel and interrogates it with a single burst of "busy" tone. Upon receipt of the first (busy) tone, the repeater keys its transmitter and sends a burst of "acquisition" tone back to the mobile unit. When the interrogating mobile receives the acquisition tone, it then transmits a "collect" tone and "group" tone, which the repeater passes to all idle mobile units in the system. The idle mobiles, which continually scan all channels, will stop on the active channel if they recognize the collect tone, and wait for the group tone. If the correct group tone is detected, the mobiles will open their audio circuits and alert the operator of an incoming call. If either the collect or group tone is not recognized, the idle units will resume their scan of the channels. Once a mobile is "locked" on a channel, it will remain there until the repeater times out or the operator hangs up the microphone.

The radio will always be in one of three operational modes: idle, wait, or ready. The radio enters the idle mode when power is turned on and begins scanning channels for incoming calls. The wait mode is entered when the user places a call. The radio remains in the wait mode until a channel is acquired or it determines that all channels are busy. The ready mode or conversation mode is indicated by an alert tone and the mode indicator.

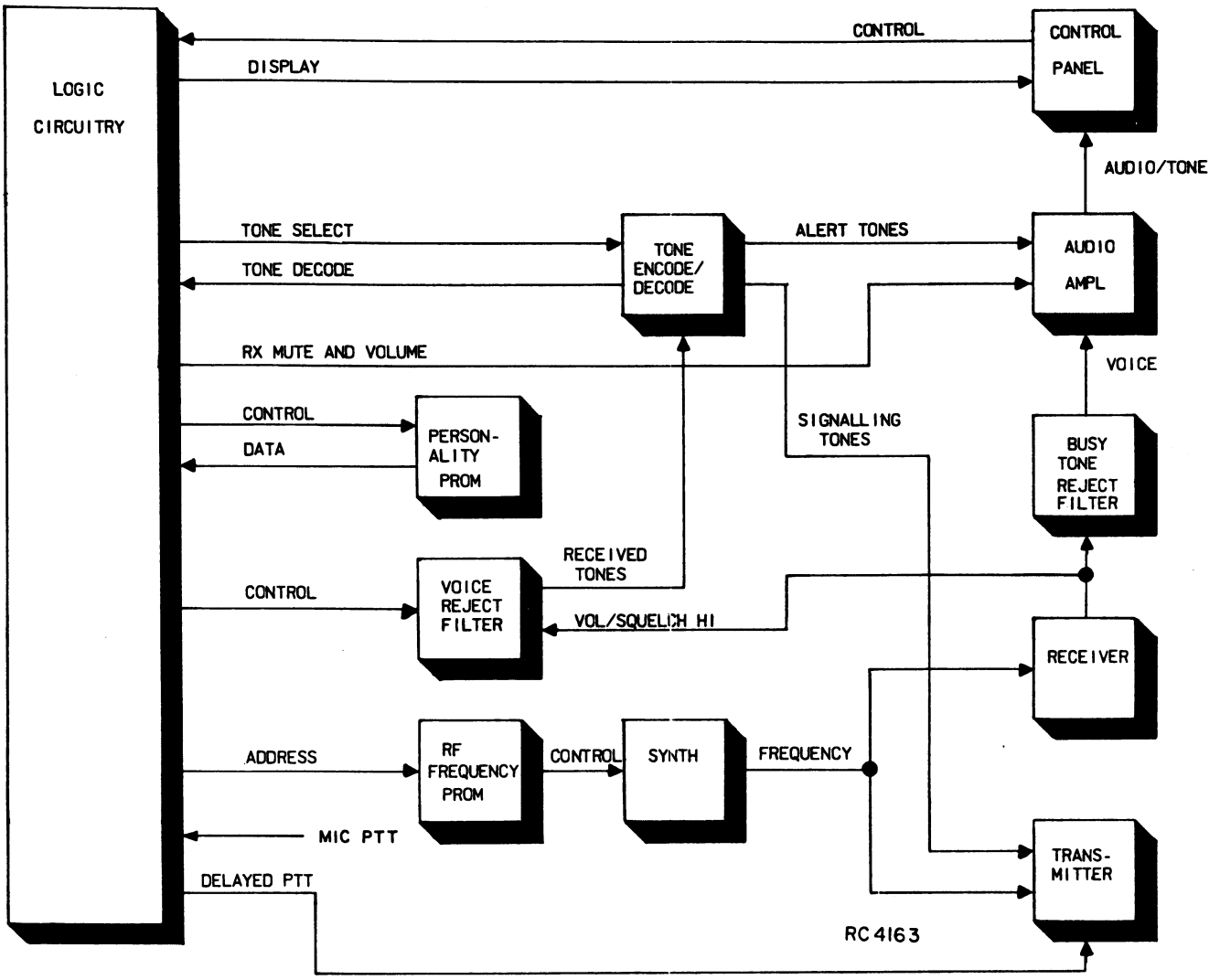


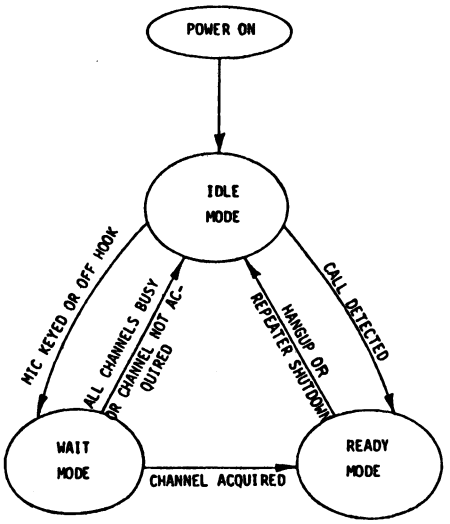
Figure 1 - GE-MARC V Mobile Radio Block Diagram

Figure 2 identifies the three operational modes and the conditions that cause the radio to transfer from one mode to another. Figure 3 defines the signal timing when originating and receiving a call. Figures 4 through 6 are the sequence flow charts for each operational mode.

IDLE MODE

When the radio is in the idle mode, the speaker is muted and all channels are sequentially scanned for an incoming call. An incoming call is first identified by the presence of a collect tone on one of the channels. Upon receipt of a collect tone, the mobile looks for a group or individual tone on the channel for a brief interval. if the group or individual tones are not detected, the mobile will advance to the next channel an continue looking for an incoming call.

If both the collect and group or individual tones are detected, the mobile then looks for a busy tone. (Detection of an individual tone establishes a personal "line" between the mobile radio and the control station.) If a busy tone is detected, the mobile sounds the alert tone, turns on the RDY indicator and CALL light (if programmed) and enters the ready mode. The radio may now be used in the conventional push-to-talk mode, and will remain on the channel until the operator hangs up or until the repeater drops the busy tone causing the radio to revert to the idle mode. If busy tone is not detected, the mobile unit remains in the idle mode and



IDLE MODE - UNIT IS SCANNING CHANNELS FOR CALLS.

WAIT MODE - UNIT ACQUIRES A CHANNEL AND TRANSMITS SIGNALLING TONES.

READY MODE - UNIT IS LOCKED ON A CHANNEL, ALLOWING VOICE COMMUNICATION.

RC4158

Figure 2 - Operational Modes

continues scanning the channels for an incoming call.

WAIT MODE

When the mobile is in the "idle" mode either depressing the push-to-talk switch or lifting the microphone off-hook will transfer the unit immediately to wait mode, initiating execution of a sequence which scans for an idle channel. In the "wait" mode, the mobile looks for busy tone on the channel for a brief interval; if busy tone is detected, the unit advances to the next channel. If an idle channel is not found, the unit reverts to the idle mode.

When a idle channel is found, the mobile transmits a burst of busy tone to acquire the repeater, to which the repeater responds with a burst of acquisition tone. Upon receipt of the acquisition tone, the mobile proceeds with transmission of collect tone and group tone, after which it once again looks for busy tone from the repeater. If busy tone is detected, the unit alerts the operator and enters the ready mode. If busy tone is not detected, the unit advances to the next channel and tries again. If no channel can be acquired, the radio reverts to the idle mode and a steady one-second tone will alert the operator that a channel was not acquired.

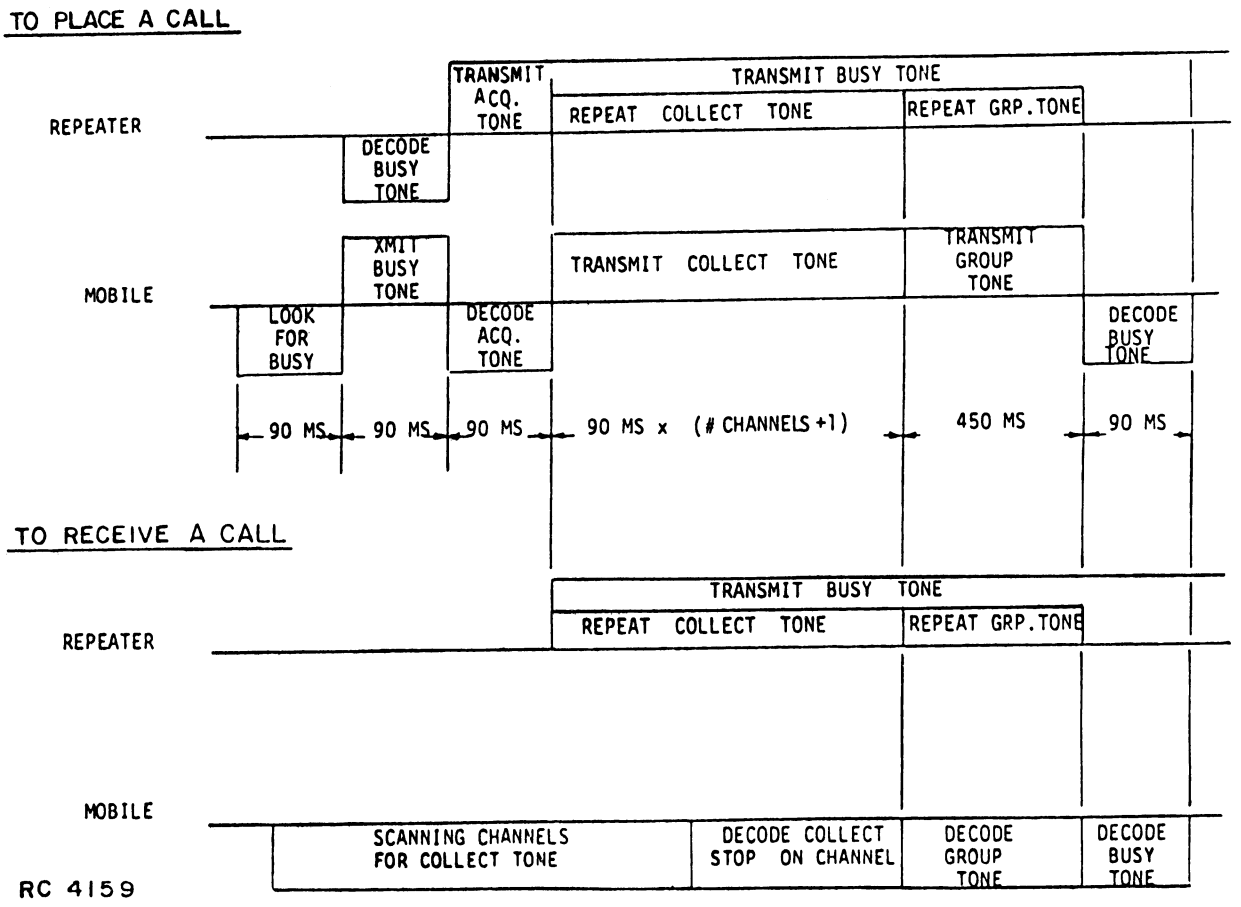


Figure 3 - Signal Timing

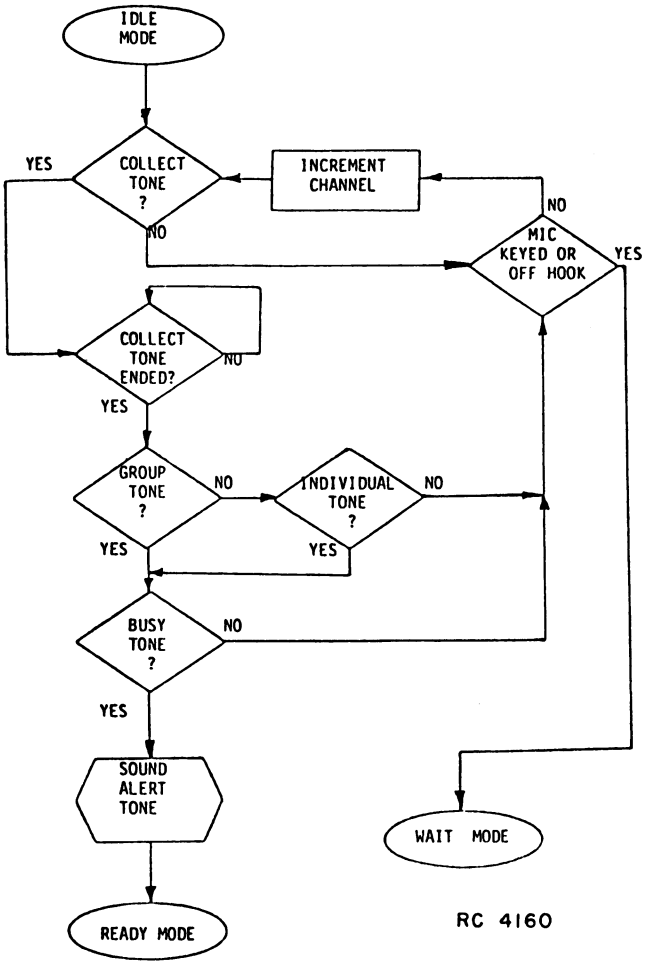


Figure 4 - Idle Mode

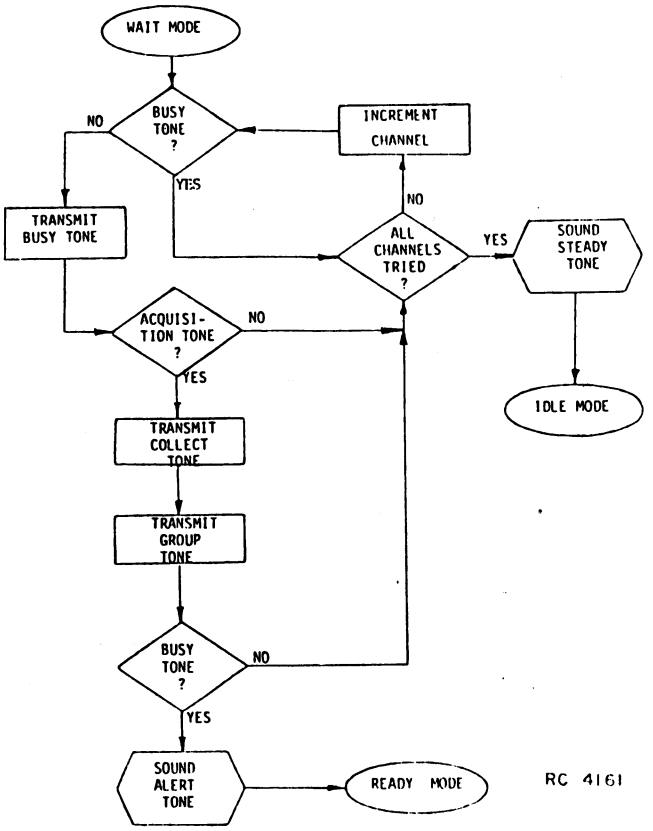


Figure 5 - Wait Mode

READY MODE

When an incoming call has been detected, or an idle channel has been acquired, the mobile enters the ready mode. In this mode the audio and push-to-talk circuits are enabled, the speaker is unmuted, and the operator is alerted by a READY light and an alert tone. The radio can then be used in the conventional push-to-talk manner, and will remain on the channel until the operator hangs up or the repeater drops busy tone causing the unit to revert to idle mode.

POWER DISTRIBUTION SYSTEM

Battery voltage enters the radio through J910-1 (Receive) and J910-11 (Transmit) on the synthesizer/interconnect board. Both inputs are connected to reverse polarity protection diodes. The ground lead passes through J910-6 to a "fusable" PWB run which will open if the ground wire is connected to A+ BATT accidently. A power distribution diagram is shown in Figure 7.

The A+ input goes directly from the synthesizer/interconnect board through a feed through capacitor and Molex connector to the RF PA. The receive A+ input from the synthesizer/interconnect board feeds through to the Tx/Rx board and serves two functions. One branch supplies the audio amplifier and passes through an RC-ripple filter and one section of the on/off switch. The other section of the on/off switch controls the voltage to a voltage regulator consisting of a fixed monolithic 8V regulator adjusted to 8.5V and a second 5 volt regulator for the logic circuitry and display current. Unswitched A+ is also fed to a second 5 volt regulator on the logic board to provide memory for volume, area, or group select when the radio is turned off. Regulated 8.5V is switched to either 8.5V Rx or 8.5V Tx by the antenna relay. The antenna relay is also supplied

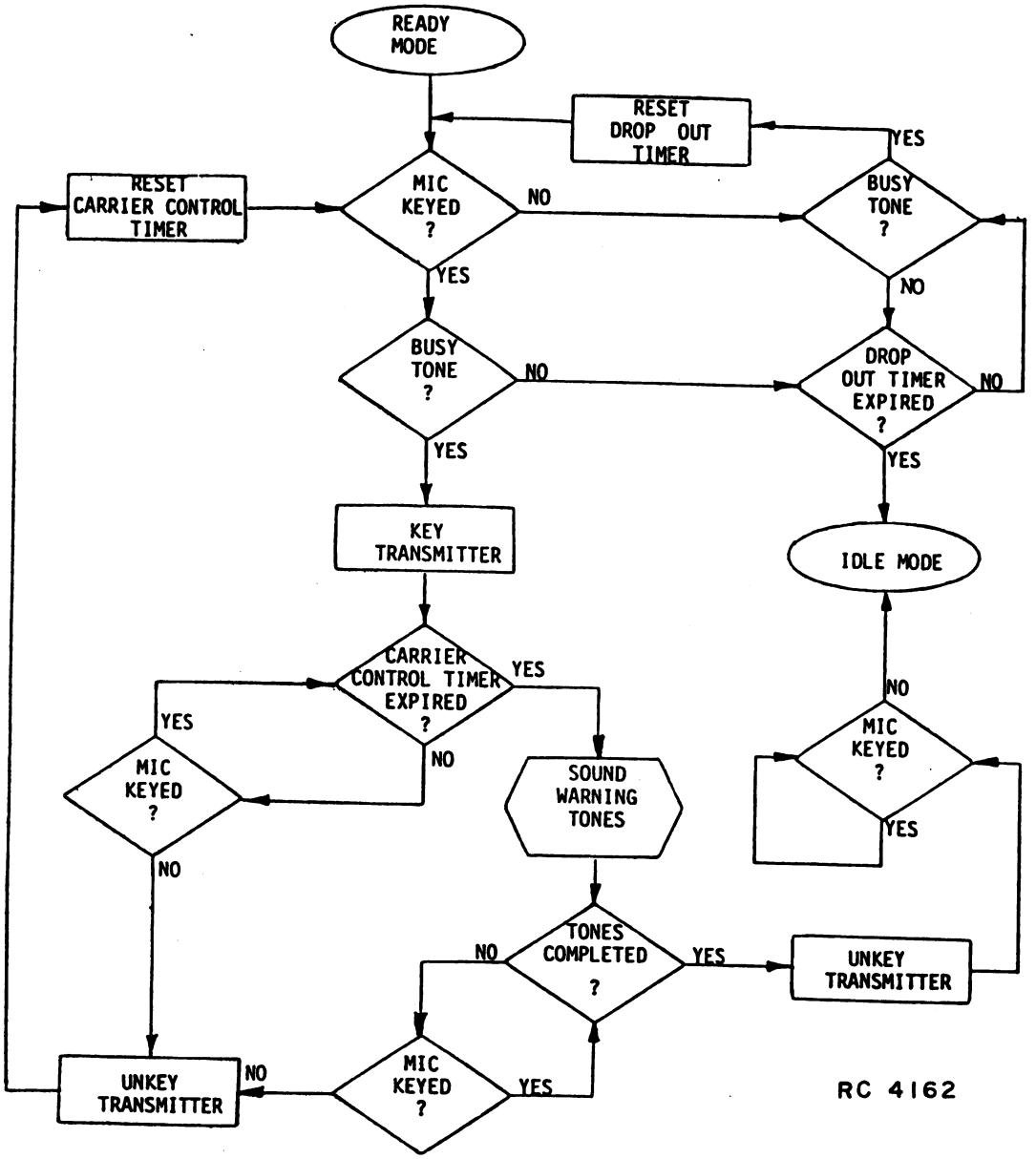


Figure 6 - GE-MARC V Mobile Radio Ready Mode

by the 8.5V regulated supply. The PTT function is controlled by the logic board.

GLOSSARY OF GE-MARC V SYSTEM TERMS (AS APPLIED TO MOBILES AND CONTROL STATIONS)

IDLE MODE - The "standby" condition for a mobile or control station, inactive, but prepared to call or be called. Trunked radios are IDLE upon turn-on, and remain IDLE until they enter another mode or are turned off.

WAIT MODE - The "attempting origination" condition. WAIT mode is entered from IDLE mode (only) as the user presses PTT or comes "off-hook". If successful, the unit becomes READY. Otherwise, the unit is IDLE after all channels are tried.

READY MODE - The "operating" condition. READY is entered from IDLE via WAIT when calling, and directly from IDLE when called. READY mode ends (the radio reverts to IDLE) with loss of received Busy Tone from the repeater. This normally occurs when the repeater shuts down after communication is complete.

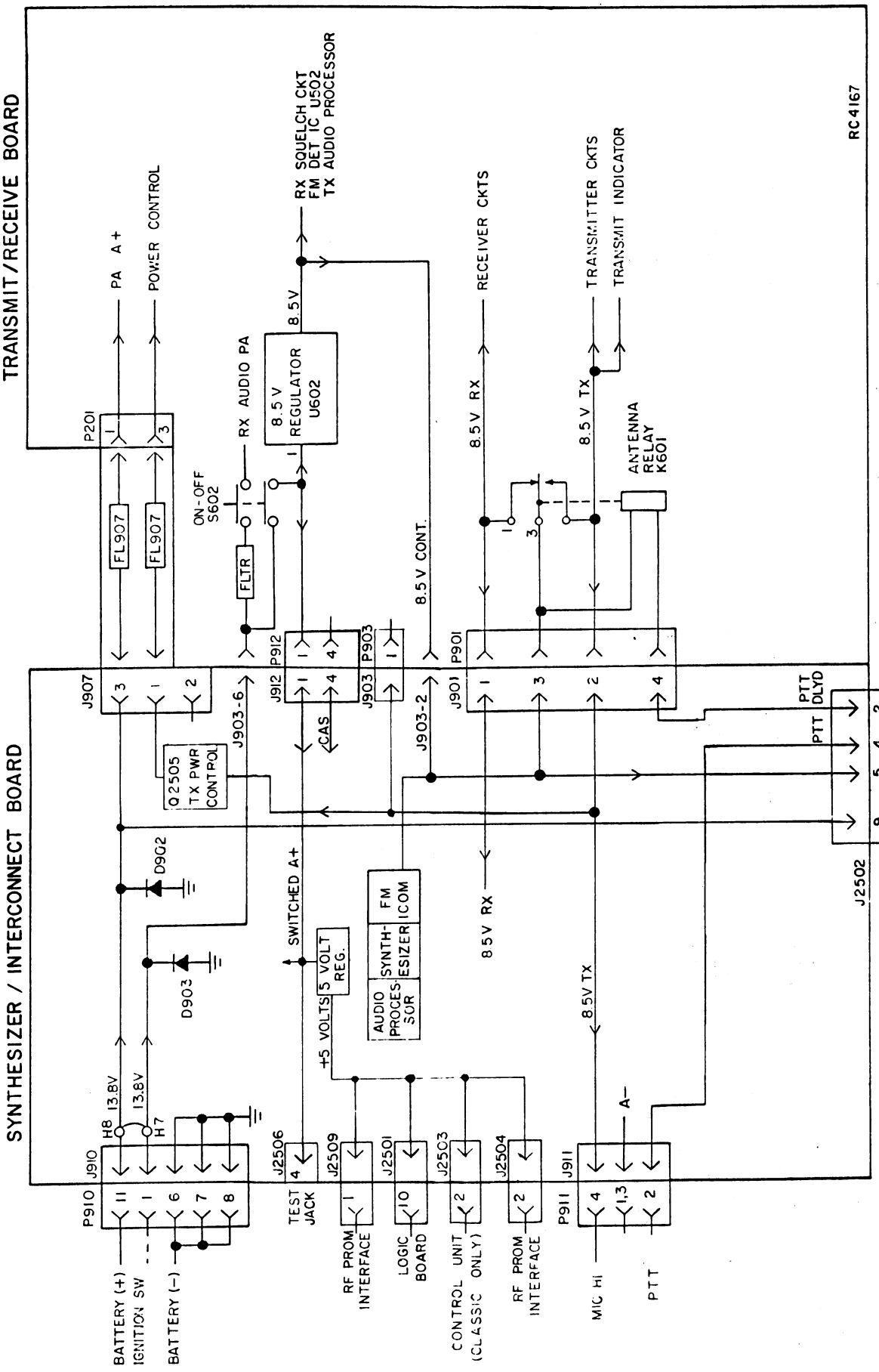


Figure 7 - Power Distribution Diagram

BUSY TONE- A "voice-plus" tone (3051.9 Hz standard; 2918 Hz alternate) which modulates mobile (also control station) and repeater transmitters at low level (+/- 1 kHz deviation) continuously. This tone, like Channel Guard is filtered from received audio. Busy Tone "holds" communicating units to their channel and excludes "outsiders" from the channel.

ACQUISITION TONE - A tone (1962.9 Hz) sent at full deviation (duration 50 ms) by the repeater transmitter. It is used as acknowledgement (handshake) from the repeater to a calling unit.

COLLECTION TONE - A tone (chosen from 33 standardized frequencies ranging from 604.2 Hz to 2672.9 Hz) used as the FIRST tone in a two-tone addressing sequence. Collection Tone is encoded (full deviation) by the calling unit, repeated by the repeater, and decoded by the called unit. Duration varies with the number of channels in the GE-MARC V trunked system.

GROUP TONE OR INDIVIDUAL TONE - A tone (chosen from frequencies also used as Collection Tones) which is the SECOND tone of the address. This tone is also encoded (full deviation) by the calling unit, repeated by the repeater, and decoded by the called unit. Duration is 450 ms.

OPERATION

ALERT TONES

CALL RECEIVED - The "Call Received" tone consists of a musical 2-tone or 7-tone alert.

CHANNEL ACQUISITION - Same as "Call Received".

CARRIER CONTROL TIMER - The Carrier Control (CCT) timer is a pulsed tone that is sounded when the microphone has been keyed continuously for the preprogrammed time of 2.5 seconds to 4.0 minutes (CORONA). When the time expires the microphone is muted and approximately 18 seconds of alert tone is sounded to notify you that you have timed out. Just unkey and key again to continue talking. CENTURA radios are programmed for 2.5 minutes for CCT.

CHANNEL BUSY/OUT-OF-RANGE - The channel "busy" out-of-range tone is a continuous 1 second tone burst.

WARNING TONE - The "warning tone" consists of approximately 12 seconds of beeps from the repeater and is sounded after the channel has been in use beyond an allowed period, if all channels are busy. The warning tone indicates that other users may need the channel, and that your conversation will be cut off.

CHANNEL DISCONNECT

The repeater continually looks for a busy tone from the mobile or station, to determine if the channel is busy or idle. If a busy tone is not received for approximately five seconds, the repeater assumes the channel is idle and disconnects. If the conversation was not completed, the call must be placed again. It is suggested that a procedure be established that designates the originator of a call be the one to re-establish communications.

NOTE

Its possible for two or more operators originating a call simultaneously to come up on two different channels. Communications under these conditions are impossible. Initiate the call again.

Complete operating instructions for the two-way radio are provided in a separate Operator's Manual. The basic procedure for receiving and transmitting messages is as follows:

TO RECEIVE A MESSAGE

Turn the radio on by pressing the POWER switch.

Adjust VOLUME control one fourth turn clockwise from full counterclockwise position. Adjust for desired listening level upon receipt of first message.

NOTE

An audible alert tone normally precedes each incoming message.

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

TO TRANSMIT A MESSAGE

1. Turn the radio on.
2. Select the desired group (Optional).

3. Select the appropriate area (Optional).

4. Select the desired mode of operation.

   SPECIAL CALL (Optional) - Depends on option provided.

5. Remove microphone from the hookswitch and, when a channel is acquired, press the PTT switch.

NOTE

When a channel is acquired, the ready mode indicator will light and an alert tone will be sounded.

INITIAL ADJUSTMENT

After the radio has been installed (as described in the Installation Manual), the following adjustments should be made by an electronics technician who holds an appropriate FCC license (where required).

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. For complete transmitter adjustment, refer to the Alignment Procedure (see Table of Contents).

RECEIVER ADJUSTMENT

The initial adjustment for the receiver includes tuning the input circuit to match the antenna. Refer to the Alignment Procedure (see Table of Contents) for receiver adjustments.

RE-INSTALLATION

If the mobile combination is moved to a different vehicle, be sure to check the battery polarity of the new system.

SYSTEM CHECKOUT

See instruction manual for Microprocessor Control Set TL5B.

MAINTENANCE

CAUTION

The CMOS destroyed by static discharges. Before handling one of these devices, the serviceman should discharge himself by touching the case of a bench test instrument that has a 3-prong power cord connected to an outlet with a known good earth ground. When soldering or desoldering a CMOS device, the soldering iron should also have a 3-prong power cord connected to an outlet with a known good earth ground. A battery-operated soldering iron may be used in place of the regular soldering iron.

PREVENTIVE MAINTENANCE

To ensure 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. Preventive Maintenance should include the checks listed in the table of Maintenance Checks.

DISASSEMBLY

- To service the transmitter receiver (Tx/Rx) board, remove the two screws securing the bottom cover at the rear of the radio. Then slide the cover out from under the edge of the front panel and lift off.

- To service the synthesizer/interconnect board, remove the two screws at the rear of the radio and slide the cover out from the edge of the front control panel and lift off. Remove the synthezizer shield.

- To remove the Tx/Rx board:

  1. Remove the top and bottom covers.

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 antennas 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

2. Remove the three screws holding the antenna connector and unsolder the connector from the board.
3. Remove the four screws securing the front panel to the "H" frame. Disconnect the speaker plug and remove the panel.
4. Remove the eight screws securing the RF shield.
5. Remove the screw in the receiver front end casting.
6. Remove the two screws securing the driver module and two screws securing the PA transistor.

CAUTION

When removing the Tx/Rx board, be sure the seal (silicon grease) between the driver module and casting is broken to prevent damage to the driver module. Use a scribe (or equivalent) to loosen the module from the casting and slowly lift the transmit/receive board out of the radio.

7. Remove the nine screws securing the Tx/Rx board and carefully lift the board up off of the interconnection pins.

- To remove the synthesizer/interconnect board:

1. Remove the top cover.
2. Remove the front cap, logic board and synthesizer shield.
3. Remove the 11 screws securing the board and carefully lift the board up to disconnect the interconnection pins.

DRIVER MODULE REPLACEMENT

NOTE

Always check out the associated circuitry carefully before replacing the module. The module is a very reliable device and normally will not need to be replaced.

To remove the module:

1. Remove two screws securing U201 to printed wire board.
2. Unsolder the ground strap across the end of U201 and located next to Q201. Leave A201 in place.
3. Unsolder the five leads bridging U201 to the PWB while lifting each lead. NOTE: These leads are soft and can be bent very easily.
4. Lift U201 on the Q201 (PA transistor) side and slip out from under A201. Be careful not to lose the spacer under U201. It may also stick to the chassis. Clean all old silicone grease from chassis and spacer.
5. To install U201, apply silicone grease to both mounting surfaces of the spacer.
6. Position spacer properly on the chassis.
7. Position U201 properly by slipping the end under A201 and aligning the screw holes and the leads of U201 with the PWB.
8. Replace ground strap across the end of U201.
9. Replace the two screws securing U201 to the PWB and tighten to 0.5 $\pm$0.1 Newton meters (5 inch pounds).
10. Solder ground strap and the five leads of U201.
11. Apply a small amount of silicone seal (or an acceptable substitute) between the case of U201 and the ground strap. This prevents the leads of U201 bending if the PWB is removed from the chassis.

WARNING

The module contains Beryllium Oxide, a TOXIC substance. If the ceramic or other encapsulation is opened, crushed, broken or abraded, exercise caution since the dust may be hazardous if inhaled. Use care when replacing the module.

PA TRANSISTOR REPLACEMENT

1. Remove two retaining screws securing PA transistor to chassis assembly.
2. Unsolder and remove capacitors C208-C211. Use a desoldering tool as necessary while lifting up using a small screwdriver or pick. Discard old capacitors.
3. Unsolder emitter, base and collector leads of transistor and remove.
4. Remove all excess solder from board and clean the holes to allow the new transistor to be positioned properly and the capacitors to snap into proper locations. Refer to Figure 8 and trim leads of Q201 as shown.
5. Apply silicone grease to back of Q201.
6. Position new transistor as close to the PA board as possible on the C210 and C211 side while retaining clearance to assemble C210 and C211. Center emitter and collector leads on pattern of PA board.
7. Install and tighten transistor retaining screws to 0.5 $\pm$0.1 Newton meters (5 inch pounds).
8. Tack solder transistor leads to PA board using a minimum amount of solder to allow capacitors C208-C21 to seat properly.
9. Install capacitors C208-C211 as shown on installation diagram snapping each one in place (flush with top of board).
10. Carefully solder the capacitor bodies to the PWB by first soldering the outside edge, then holding the iron to the outside edge, touch the solder to the inside edge of the capacitor.
11. Solder the emitter and collector connections and capacitor tabs.
12. Remove any flux left on board.

NOTE

Take care in all soldering not to create solder bridges on the front and rear of caps.

REMOVING IC's

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

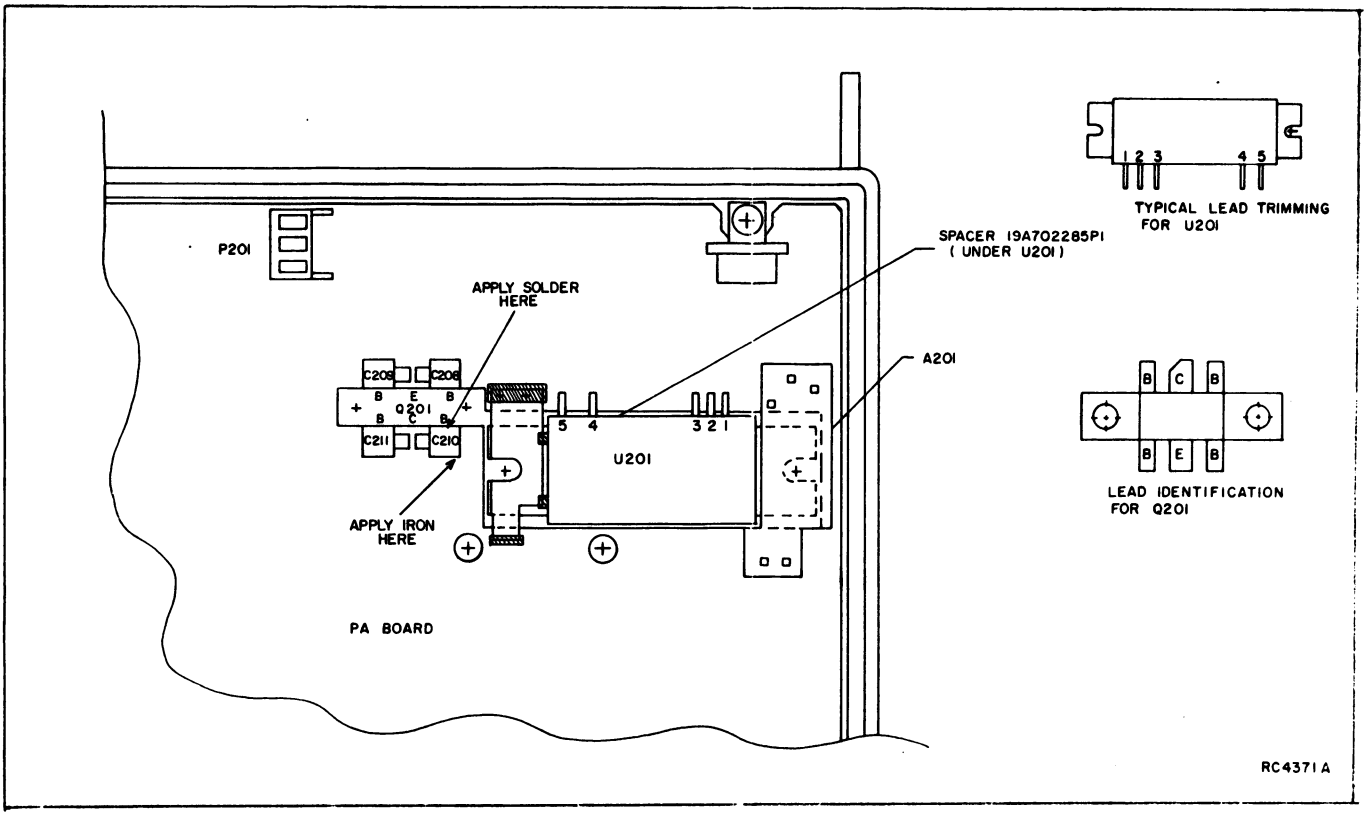


Figure 8 - Lead Forming and Identification

TEST AND TROUBLESHOOTING PROCEDURES

Maintenance of your GE-MARC V radio is facilitated by use of the Troubleshooting Flow Charts and servicing techniques unique to this radio. The Troubleshooting Chart is designed to lead you rapidly to the defective component or circuit. Typical voltage readings are provided on the Schematic Diagram where applicable.

Troubleshooting charts are provided for most major problems that might arise in the radio. Refer to the Table of Contents for information when servicing the tranmitter or receiver.

SERVICING TECHNIQUES

The high density plug-in design of the modular radio lends itself well to rapid isolation of malfunctions in the voltage and signal paths. Due to the modular construction of the radio, i.e., transmit/receive board, synthesizer/interconnect board, logic board, etc., a majority of the signals and voltages pass through the connectors on the synthesizer/interconnect board.

To isolate a signal or voltage path to determine loading effects, locate short circuits, etc., carefully insert an insulator (plastic wand, toothpick) between the appropriate pins of the related molex connector or to create and open circuit. Signal paths that may be isolated include: CAS, MIC HI, VOLUME SQ HI, filtered VOLUME SQUELCH HI, PTT, Rx MUTE, and SPKR HI. Voltage paths may also be opened.

A test probe kit is available to aid in servicing the radio. The kit includes an RF signal probe, Rx RF detector probe, DC probe, various tuning tools and test cables used in conjunction with the Microprocessor Control Set TL5B. (The test set is equipped with a cable and plugs into radio Test Jack J2506).

CHANNEL PLANS AND FREQUENCIES

GE-MARC V radios may operate on one of there channel plans, USA-1, US1-3 or AUSTRALIA and use one of two high IF frequencies. The IF Frequency depends on which synthesizer/interconnect board is used. Tables 1 and 2 below identifies the channel plan, and associated RF and crystal frequencies associated with the different groups of synthesizer/interconnect boards.

FREQUENCY PLAN	TRANSMIT FREQ (MHz)	RECEIVE FREQ (MHz)	IF FREQ (MHz)	SYNTH/ INT. BD.	ICOM FREQ (MHz) U2603	ICOM PART NUMBER	RADIO
USA-1	816.0125-820.9875	861.0125-865.9875	45.0125	19D900241G3	61.067708	19A701712G9	CENTURA CORONA
AUST	820.0125-824.9875	865.0125 824.9875	45.0125	19D900241G5	61.40104	19A701712G10	CENTURA CORONA
USA-2	811.0125-815.9875	856.0125 860.9875	45.0125	19D900241G7	60.642708	19A701712G11	CENTURA CORONA
USA-1 (ZT*)	816.0125-720.9875	861.0125 865.9875	45.0125	19D900241G9	61.063542	19A701712G12	CENTURA CORONA

* OPTION - Alternate RF Channel Frequencies for USA-1 Channel Plan

TABLE 1 - FREQUENCY PLAN VERSUS SYNTHESIZER/INTERCONNECT BOARD

USA-1 (Standard)	USA-1 WITH OPTION ZT
19A701922G1	19A701922G2

TABLE 2

TEST POINTS

Test points are provided to aid in troubleshooting the radio and to facilitate alignment of the transmitter and receiver. The test points are located on the synthesizer/interconnect board and the transmitter/receiver board and are identified in Table 1.

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 13.6 VDC for loads of 6 to 16 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 regulations and transient voltage suppression. Bench supplies which employ "brute force" regulation and filtering may be usable when operated in parallel with a 12 Volt automotive storage battery.

TEST POINT	LOCATION	FUNCTION	TYPICAL READING
TP2601	Synth/int.	Synthesizer Control	4.10 - 6.0 Volts
TP2602	Synth/int.	Tx FREQ Monitor	41.6 MHz (Freq 30 on test set)
TP2603	Synth/int.	Tx AMPL Tuning	0.7 Volts
TP2604	Synth/int.	Tx Tripler Tuning	0.5 Volts
TP101	Tx/Rx	Tx Doubler Tuning	5.6 Volts
TP103	Tx/Rx	Exciter Tuning	1.6 Volts
TP401	Tx/Rx	1st MIXER	0.16 VRMS (No Signal Input)
TP501	Tx/Rx	2nd IF	2.7 VDC (No Signal Input
TP2401	Logic Bd.	ALE	238.636 kHz asymmetrical clock (crystal frequency ÷15)
TP2402	Logic Bd.	Vol/Sq. Hi	Approximately 4.25 VDC
TP2403	Logic Bd.	Voice Rej. Fil out	Approximately 4.25 VDC, 1000 Hz - 35 dB below level at TP2402. 3051/2918 Hz - ±3 dB with reference to level at TP2402.
TP2404	Logic Bd.	Tone Rej. Filter	Approximately 4.25 VDC, 1000 Hz - +3, -1 dB referenced to level at TP2402 3051/2918 - 30 dB below level at TP2402
TP2405	Logic Bd.	Filtered Vol/Sq. Hi	Approximately 4.25 VDC. Audio signals dependent on mode of operation.
TP2406	Logic Bd.	Tone Hi	
TP2407	Logic Bd.	Tone Det.	Digital Signal - Detected = 0.6 VDC Non Detected = 5.0 VDC

	Collector	Base	Emitter	Gate 1	Gate 2	Source	Drain
Q401	3.2 VDC	0.8	GRD				
Q402	-----	---	---	GRD	3.3	0.7	7.3
Q501	-----	---	---	GRD	4.2	0.9	8.4

IC U501		
U501-1,14	7.4 VDC	
U501-2,13	7.1 VDC	
U501-3	3.9 VDC	
U501-4	3.2 VDC	
U501-6,9	4.1 VDC	
U501-7	6.1 VDC	
U501-8	7.7 VDC	
U501-5,10	GRD	
U501-11	2.2 VDC	
U501-12	1.4 VDC	

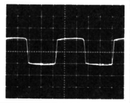
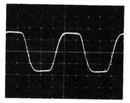
RECEIVER DC BIAS VOLTAGES

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

GENERAL ELECTRIC*
U.S.A.

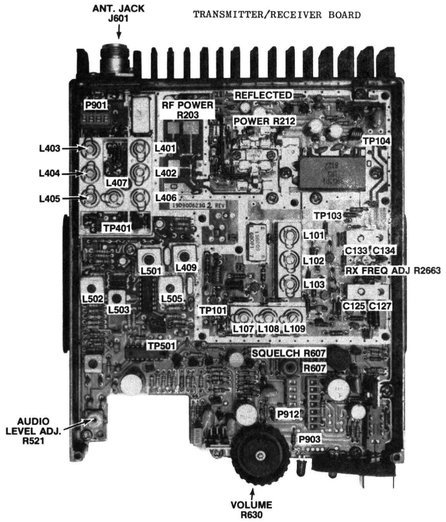
AUDIO AC VOLTAGES

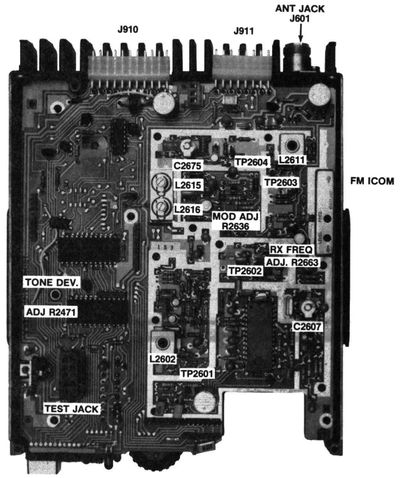
1. Connect audio oscillator output across J911-4 (MIC HI) and J911-3 (MIC LO).
2. Connect TL5B to test jack. Select channel 30 and tone 00.

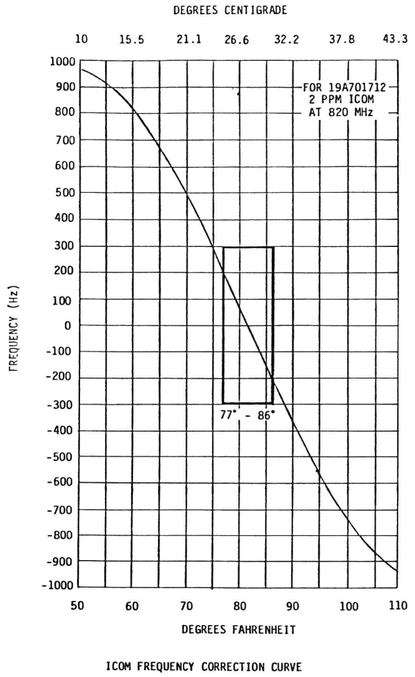
		U2604-7	C2656 (+)
SCOPE SETTING	HORIZONTAL	200 U SEC/DIV	200 U SEC/DIV
	VERTICAL	2 VOLTS/DIV	2 VOLTS/DIV
SET AUDIO OSCILLATOR AT 1000 Hz WITH OUTPUT OF 1.0 VRMS. MOD CONTROL ADJUSTED FOR 3.5 kHz DEVIATION. NOTE: AN RMS OR PEAK READING VOLTMETER WILL READ 1/2 TO 1/3 OF PEAK-TO-PEAK READINGS.			

AUDIO SENSITIVITY

1. Connect audio oscillator output across J911-4 (MIC HI) and J911-3 (MIC LO). Adjust output for 1000 Hz at 1.0 VRMS.
2. Reduce generator output until deviation falls to 2.25 kHz. Voltage should be less than 120 millivolts.







ICOM FREQUENCY CORRECTION CURVE

RC-4455

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 27.0°C (81.5°F). Refer to Steps 17 thru 19 of the Transmitter Alignment Procedure.

TEST EQUIPMENT

1. 50 ohm load
2. Microprocessor control set TL5B
3. Frequency counter
4. RF Signal Probe (19C330129G1)

To set the frequency:

1. Connect wattmeter and frequency counter to antenna jack.
2. Connect Microprocessor Control Set TL5B to test jack and set controls for frequency 30 and tone select to 00.
3. Install the RF signal probe on TP2602 and connect it to a counter.
4. Adjust C2607 to obtain 41.6 MHz ±10 Hz on the counter. When complete remove the signal probe.
5. Adjust L2602 to obtain 4.10 ±.1 volts on TP2601.
6. Tune L3 of U2603 for a peak voltage reading on TP2603.
7. Key the transmitter and tune 12 (FREQ) of U2603 to 816.0125 MHz (USA-1) or 820.0125 MHz (AUSTRALIA).
8. Retune L3 (LEVEL) of U2603 for a peak voltage reading at TP2603 and again check the frequency.

MODULATION LEVEL ADJUSTMENT

TEST EQUIPMENT

1. Audio Oscillator
2. Deviation Monitor
3. Microprocessor Control Set TL5B

PROCEDURE

1. Plug microprocessor control set into test jack on synthesizer/interconnect board and set controls for frequency 30 and tone select to 00.
2. Connect the audio oscillator and the AC voltmeter across audio input terminals J911-4 (Hi) and J911-3 (Lo) on the synthesizer/interconnect board.
3. Adjust the audio oscillator for a 1 Volt RMS at 1000 Hz.
4. Connect 50 ohm load to antenna jack.

AUDIO DEVIATION ADJUSTMENT

NOTE

MOD ADJUST CONTROL R2636 has been adjusted to the proper setting before shipment and normally does not require readjustment. This setting permits approximately 75% modulation for the average voice level.

Using the test set, set the tone select to tone "0" for zero tone deviation. Key transmitter and set MOD ADJUST control R2636 for 3.5 kHz deviation using the deviation polarity that provides the highest reading on the deviation monitor.

TONE DEVIATION ADJUSTMENT

1. On microprocessor control set select tone "9" for busy tone.
2. Key the transmitter and adjust DEV control R2471 on the logic board for 1.0 kHz ±0.1 kHz deviation.
3. Reset the select to 00 (no tone) and step through each tone present in the radio checking deviation for 2.5 kHz to 5.0 kHz. (Deviation for Tone 9 will be as set in Step 2.)

AUDIO CHECKS

TEST EQUIPMENT

- Audio Oscillator
- Oscilloscope
- Microprocessor Control Test Set TL5B
- AC Voltmeter
- Deviation Monitor

TRANSMITTER ALIGNMENT

TEST EQUIPMENT

1. 50 ohm Wattmeter
2. DC Probe (19C330165G1)
3. Voltmeter
4. Power supply (13.8 V Regulated)
5. Audio Signal Generator
6. Frequency Counter
7. RF Signal Probe (19C330129G1)
8. FM Communications Monitor
9. Microprocessor Control Test Set TL5B
10. Thruline Wattmeter

PRELIMINARY CHECKS AND ADJUSTMENT

NOTE

Refer to photographs to locate CONTROLS, TEST POINTS and FM ICOM.

1. Make sure that FM ICOM U2603 is installed.
2. Connect thruline wattmeter and 50 ohm load to antenna jack.
3. Pre-set the following controls:
   a. Set slug in L2602 on the synthesizer/interconnect board to center of coil form.
   b. Set slug of L2611 so top of slug is flush with the top of the coil form.
   c. Set C2675 to minimum capacitance.
   d. Set L2615 and L2616 so that the slugs are tuned out of the casting.
   e. Set slugs of L101, L102 and L103 flush with top of helical casting and then set 1 1/4 turns down.
   f. Set slugs of L107, L108 and L109 out of casting.
   g. Set C125, C127, C133 and C134 to minimum capacitance (plates unmeshed).
   h. Install the RF signal probe on TP2602 and connect it to the frequency counter.
4. Set power adjust control R203 to minimum (fully counterclockwise).
5. Plug the microprocessor control Test Set TL5B into the radio synthesizer/interconnect board test jack. Set the controls to frequency 30 (6 on 5 channel radios) and tone 00 in the tone select mode.

NOTE

All adjustments are made with the transmitter unkeyed unless directed to key the transmitter.

ALIGNMENT PROCEDURE

STEP	TEST POINT	TUNING CONTROL	INDICATION	PROCEDURE
SYNTHESIZER ADJUSTMENTS				
				NOTE: The following controls and test points are located on the synthesizer/interconnect board.
1.				Apply +13.8 Volts to J910-1 and 11. Connect A- to J910-6.
2.	TP2602	C2607	Ref. Osc Frequency*	Adjust C2607 to obtain the correct reference oscillator on the counter. When complete remove the signal probe.
3.	TP2601	L2602	4.1 VDC	Adjust L2602 to obtain 4.10 ±.1 volts on TP2601.
4.	TP2603	L3 (U2603)	Peak	Tune L3 (Level) of U2603 for a peak voltage reading on TP2603.
5.	TP2604	L2611	Peak	Tune L2611 for a peak voltage reading on TP2604.
6.	TP2604	C2675	Dip	Tune C2675 for a dip in voltage reading on TP2604. The dip will be sharp and of small deviation.
7.	TP2604	L2615	Peak	Tune L2615 for peak in voltage at TP2604. The peak will be sharp and of small deviation.
8.	TP2604	L2616	Dip	Tune L2616 for a dip in voltage at TP2604. The dip will be sharp and of small deviation.

ALIGNMENT PROCRDURE (Cont'd)

STEP	TEST POINT	TUNING CONTROL	INDICATION	PROCEDURE
EXCITER TUNING				
				NOTE: The following controls and test points are located on the transmit/receive board.
9.	TP101	L101, L102, L103	Dip	Select Channel 31 and tone 00. Alternately tune L101 then L102 and L103 for a dip in meter reading.
10.	TP101	L101, L102 L103	Dip	Carefully re-tune L101, L102, and L103 for a maximum dip in meter reading.
11.	TP101	L107	Dip	Tune L107 for a small but sharp dip in meter reading.
12.	TP101	L108	Peak	Tune L108 for a small but sharp peak in meter reading.
13.	TP101	L109	Dip	Tune L109 for a small dip in meter reading. Do NOT retune L107, L108 or L109.
14.	TP103	C125, C127 C133 and C134	Maximum	Key the transmitter and tune C125, C127, C133 and C134 for maximum meter reading. Unkey the transmitter between adjustments to avoid overheating.
15.	TP103	C125, C127 C133 and C134	Maximum	Key the transmitter and slightly retune C125, C127, C133 and C134 for maximum meter reading. Unkey the transmitter between adjustments to avoid overheating.
POWER AMPLIFIER ADJUSTMENT				
16.	Wattmeter at ANT jack J601	R212, R205 POWER CONTROL	See Procedure	Key the transmitter and adjust R203 for rated power output. NOTE: R212 is factory preset and normally does not require field adjustment. Should it be necessary to adjust R212, disconnect the 50 ohm load from the thruline wattmeter and replace with a shorted connector. Key the transmitter and set R212 for 10 watts forward power. Supply current should not exceed 5 amperes. Reconnect wattmeter.
FINAL SYNTHESIZER ADJUSTMENTS				
17.	Antenna-jack	L2 (U2603)	Transmit* Frequency	Select Channel 30 and tone 00. Key the transmitter and tune L2 (Freq) of the ICOM to correct transmitter frequency shown in Table 2.
18.	TP2603	L3 (U2603)	Peak	Retune L3 (level) of the ICOM for a peak voltage reading at TP2603 and again check the frequency.
19.	TP401	R2663	RF Injection Frequency*	Unkey the transmitter and monitor TP401 on the Tx/Rx board. Adjust R2663 on the Synthesizer/ Interconnect board for the correct RF injection frequency.
20.	Antenna	R2636	3.5 kHz	Apply a 1 volt RMS signal at 1 kHz to J911-4. Key the transmitter and adjust R2636 for 3.5 kHz ±0.1 kHz deviation at the transmitter output.

*

Synthesizer/Int. Bd.	Reference Osc. Freq (C2607)	ICOM Transmit Frequency (L2-U2603)	Receiver Offset Freq (R2663)
19D900241G1-4	41.6 MHz	816.0125 MHz	816.000 MHz
19D900241G5, 6	41.6 MHz	820.0125 MHz	820.000 MHz
19D900241G7, 8	41.65 MHz	811.0125 MHz	811.000 MHz
19D900241G9, 10	41.625 MHz	816.0125 MHz	816.000 MHz

TABLE 2 - FREQUENCY IDENTIFICATION

TRANSMITTER ALIGNMENT PROCEDURES

RECEIVER ALIGNMENT

EQUIPMENT REQUIRED

1. RF Signal Generator (45.0125 MHz and 851-870 MHz)
2. Analog DC Voltmeter (with high input impedance and millivolt scale)
3. Frequency counter (up to 1000 MHz with 0.05 Volt sensitivity)
4. Receiver RF Detector Probe 19C330130G1
5. RF Signal Probe 19C330129G1
6. Microprocessor Control Set TL5B
7. AC Voltmeter

PRELIMINARY ADJUSTMENTS

1. Connect RF Detector Probe from TP501 to the DC Voltmeter.
2. Connect RF Signal Probe from TP401 to the RF Signal Generator.
3. Preset the slugs in L409, L412, L501, L502 and L505 eight complete turns up from the top of the coil.
4. Preset the slugs in front end coils L401 through L408 flush with the top rim of the casting. Set the Signal Generator for 45.0125 MHz output with ±3 kHz deviation and 1 kHz modulation.
5. Set Microprocessor Control Set to frequency 31 (6 on 5 channel radios) and tone 00.

NOTE

Keep the Signal Generator adjusted so that the DC voltage reading will remain between 0.5 to 1.0 volt during the alignment procedure.

STEP	TEST POINT	TUNING CONTROL	METER READING	PROCEDURE
		NOTE: MAKE SURE THAT THE TRANSMITTER IS PROPERLY ALIGNED AND OPERATING BEFORE ALIGNING THE RECEIVER.		
1.	TP501	L412	Maximum	Tune L412 for maximum meter reading.
2.	TP501	L409, L501	Maximum	Alternately tune L409 and L501 for maximum meter reading.
3.	TP501	L502, L503	Maximum	Alternately tune L502 and L503 for maximum meter reading.
4.	TP501	L505	See Procedure	Remove RF detector probe from TP501. Connect RF signal probe from TP501 and to the frequency counter. Remove the modulation from input signal and set the RF signal level to 1 millivolt. Next, tune L505 for a reading of 455 kHz on the counter, and then remove the RF signal probe from TP501.
5.	TP401	L407, L408	Maximum	Remove the RF signal probe from TP401, and connect the RF detector probe from TP401 to the DC voltmeter. Next, alternately tune L407 and L408 for maximum voltage reading (normally a few hundred millivolts).
6.			See Procedure	Re-connect the RF detector probe to TP501. Apply an 863.5125 MHz, USA-1, (858.5125 MHz (USA-2) or 867.5125 MHz, Australia (Channel 31) signal to the antenna jack with 3 kHz deviation and 1 kHz modulation. Keep voltmeter reading between 0.5 and 1 volt DC.
7.	TP501	L401, L402 L403, L404 and L405	Maximum	Alternately tune L403, L404 and L405 for maximum meter reading, then alternately tune L401 and L402 for maximum. Recheck L403-L405.
8.	TP501		See Procedure	Remove the RF detector probe from TP501 and connect the RF signal probe from TP501 to the frequency counter. Remove the modulation from the input signal and increase the input level to 1 millivolt. The frequency counter should read 455 kHz. Service Note: If reading is not 455 kHz ±200 Hz, check the transmitter alignment.
9.	TP501	L409, L412 L501, L502 and L503	Maximum	Remove the RF signal probe and reconnect the RF detector probe to TP501. Re-apply 1 kHz modulation to the input signal and retune L409, L412, L501, L502 and L503 for maximum meter reading, keeping meter reading between 0.5 and 1 volt DC.
10.		VOLUME CONTROL (on front (panel)	See Procedure	Disconnect speaker plug P905 and connect a 4 ohm resistor across the audio output jack J905 and connect an RMS voltmeter across the resistor. Set Audio Level control R521 to mid range. Apply a 1 millivolt on-frequency signal with ±3 kHz deviation and 1 kHz modulation to the antenna jack. Adjust VOLUME Control for a meter reading 1 volt RMS.
11.		L504	Maximum	Tune L504 for maximum audio output voltage on RMS voltmeter.
12.	P903-3	Audio Level Control R521	See Procedure	Connect the RMS voltmeter to P903-3 (VOL/SQ HI) and adjust R521 for a meter reading of 300 millivolts RMS. With RMS voltmeter across the 4 ohm resistor, adjust VOLUME control for 3 Watts (3.46 VRMS across 4 ohm load. Measure audio distortion using Distortion Analyzer. Distortion should be less than 5%. Disconnect all test equipment.

TEST PROCEDURES

These Test Procedures are designed to help you to service a receiver that is operating---but not properly. The problems encountered could be low power, poor sensitivity, distortion, limiter not operating properly, and low gain. By following the sequence of test steps starting with Step 1, the defect can be quickly localized. Once the defective stage is pin-pointed, refer to the "Service Check" listed to correct the problem. Additional corrective measures are included in the Troubleshooting Procedure. Before starting with the Receiver Test Procedures, be sure the receiver is tuned and aligned to the proper operating frequency.

TEST EQUIPMENT REQUIRED

- Distortion Analyzer
- Signal Generator
- 6 dB attenuation pad, and 4.0 ohm, 5 Watt resistor
- Test Set TL5B

PRELIMINARY ADJUSTMENTS

NOTE

These procedures are written around the Heathkit Distortion Analyzer. If a Distortion Analyzer other than the Heath IM-12 is used, measure the sensitivity and modulation acceptance bandwidth in accordance with manufacturer's instructions.

Plug in Test Set and Select RF frequency for test. There are three test frequencies in every Frequency PROM that are for the USA-1 or Australia channel plans.

NOTE

The receive frequency is 45 MHz above the transmit frequency.

TEST SET	USA-1/ USA-1, ZT	USA-2	AUSTRALIA
FREQ 30	816.0125 MHz	811.0125 MHz	820.0125 MHz
FREQ 31	818.5125 MHz	813.5125 MHz	822.5125 MHz
FREQ 32	820.9875 MHz	815.9875 MHz	824.9875 MHz

STEP 1

AUDIO POWER OUTPUT AND DISTORTION

TEST PROCEDURE

Measure Audio Power Output as follows:

A. Apply a 1000 microvolt, on-frequency test signal modulated by 1,000 Hz with ±3.5 kHz deviation to antenna jack J601.

B. With 3 Watt Speaker

Disconnect speaker plug if present.

Connect a 4.0 ohm, 5 Watt load resistor across J910-3 & 7.

Connect the Distortion Analyzer input across the resistor.

C. Adjust the VOLUME control for 3 Watt output 3.46 VRMS using the Distortion Analyzer as a voltmeter.

D. Make distortion measurements according to manufacturer's instructions. Reading should be less than 5%. If the receiver sensitivity is to be measured, leave all controls and equipment as they are.

SERVICE CHECK

If the distortion is more than 5%, or maximum audio output is less than 3 Watts, make the following checks:

E. Battery and regulator voltage---low voltage will cause distortion. (Refer to Receiver Schematic Diagram for voltages.)

F. Audio Gain (Refer to Receiver Troubleshooting Procedure).

G. FM Detector Alignment (Refer to Receiver Alignment).

STEP 2

USABLE SENSITIVITY (12 DB SINAD)

If STEP 1 checks out properly, measure the receiver sensitivity as follows:

A. Apply a 1000 microvolt, on-frequency signal modulated by 1000 Hz with 3.5 kHz deviation to J601.

B. Place the RANGE switch on the Distortion Analyzer in the 200 to 2000 Hz distortion range position (1000 Hz filter in the circuit). Tune the filter for minimum reading or null on the lowest possible scale (100%, 30%, etc.)

C. Place the RANGE switch to the SET LEVEL position (filter out of the circuit) and adjust the input LEVEL control for a +2 dB reading on a mid range (30%).

D. Set signal generator output to 0.3 V. Switch the RANGE control from SET LEVEL to the distortion range. Readjust Distortion Analyzer SET LEVEL as required until a 12 dB difference (+2 dB to -10 dB) is obtained between the SET LEVEL and distortion range positions (filter out and filter in).

E. The 12 dB difference (Signal plus Noise and Distortion to noise plus distortion ratio) is the "usable" sensitivity level. The sensitivity should be less than rated 12 dB SINAD specifications with an audio output of at least 1.5 Watts (0.56 Volts RMS across the 4.0 ohm receiver load using the Distortion Analyzer as a Voltmeter).

F. Leave all controls as they are and all equipment connected if the Modulation Acceptance Bandwidth test is to be performed.

SERVICE CHECK

If the sensitivity level is more than rated 12 dB SINAD, check the alignment of the RF stages as directed in the Alignment Procedure.

STEP 3

MODULATION ACCEPTANCE BANDWIDTH (IF BANDWIDTH)

If STEPS 1 and 2 check out properly, measure the bandwidth as follows:

A. Set the Signal Generator output for twice the microvolt reading obtained in the 12 dB SINAD measurement.

B. Set the Range control on the Distortion Analyzer in the SET LEVEL position (1000 Hz filter out of the circuit), and adjust the input LEVEL control for a +2 dB reading on the 30% range.

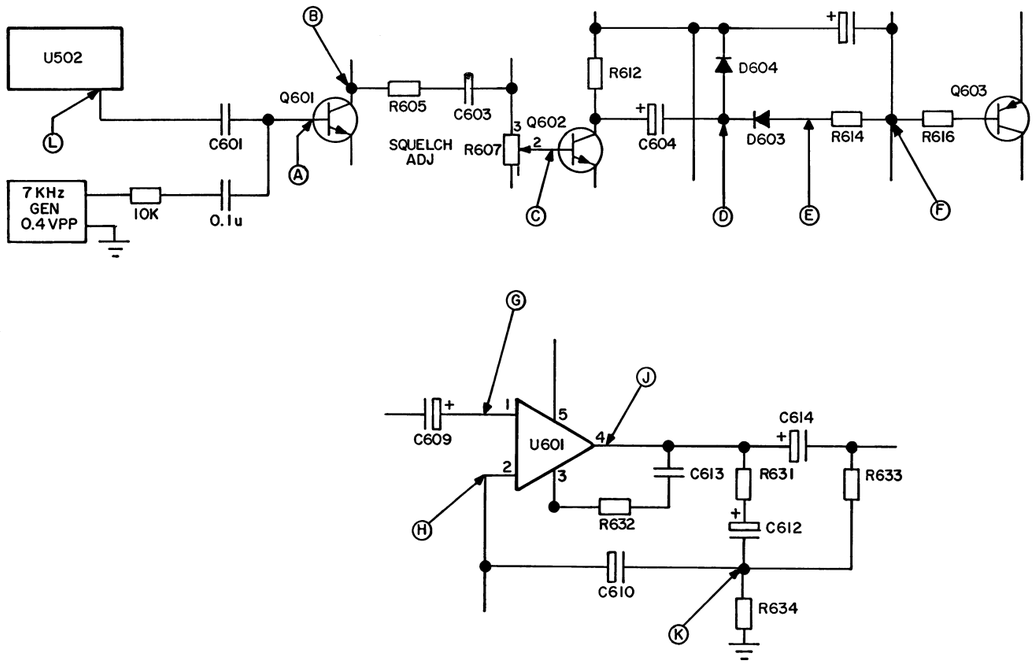
C. While increasing the deviation of the Signal Generator, switch the RANGE control from SET LEVEL to distortion range until a 12 dB difference is obtained between the SET LEVEL and distortion range readings (from +2 dB to -10 dB).

D. The deviation control reading for the 12 dB difference is the Modulation Acceptance Bandwidth of the receiver. It should be more than ±6.5 kHz.

SERVICE CHECK

If the Modulation Acceptance Bandwidth test does not indicate the proper width, refer to the Receiver Troubleshooting Procedure.

AUDIO AND SQUELCH WAVEFORMS

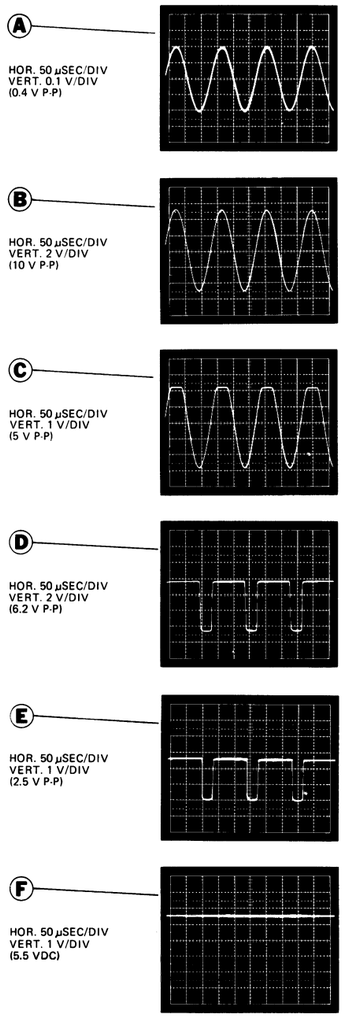


RC-4198

SQUELCH CIRCUIT TEST WITH 7 kHz SIGNAL

PRELIMINARY STEPS

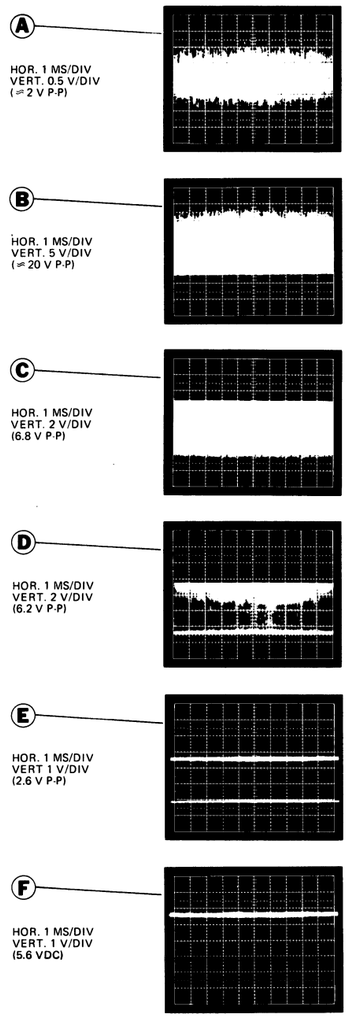
1. Quiet receiver with 1000 uV unmodulated signal.
2. Squelch Adjust R607 to maximum (Rotate control toward rear of radio.)
3. Squelch pushbutton in OUT position.
4. Use 10 megohm probe.



SQUELCH CIRCUIT CHECKS WITH NOISE

PRELIMINARY STEPS

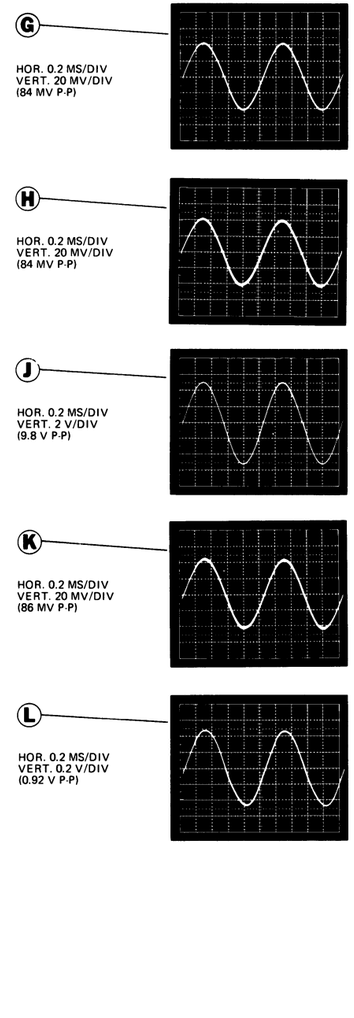
1. No input signal applied.
2. Squelch Adjust R607 to maximum (Rotate toward rear of radio.)
3. Squelch pushbutton in OUT position.
4. Use 10 megohm probe.



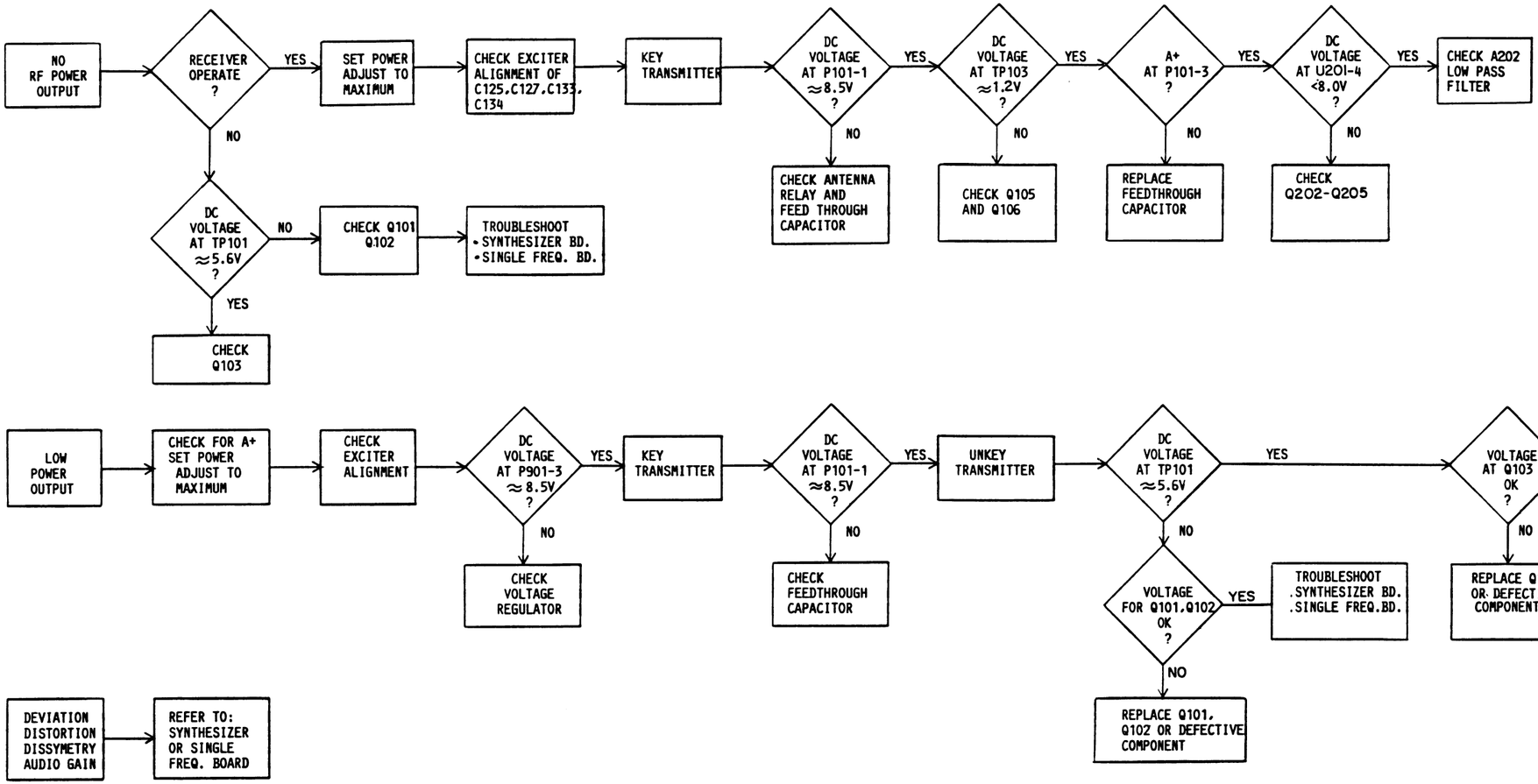
AUDIO CIRCUIT CHECKS

PRELIMINARY STEPS

1. Apply 1000 uV on frequency signal with 1000 Hz modulation and 3 kHz deviation to antenna jack J601.
2. Squelch pushbutton "IN".
3. Output set for 3-Watts (3.46 VRMS) into 4-ohm load.
4. Use 1 megohm probe.



RECEIVER AUDIO AND SQUELCH WAVEFORM CHECKS



TEST PROCEDURE

1. CONNECT AUDIO OSCILLATOR OUTPUT ACROSS J911-4 (MIC HI) AND J911-3 (MIC LO).
2. SET OSCILLATOR FOR 1000 HZ AT 1.0 VRMS AND DEVIATION TO 4.5KHz(CENTURY II 800 MHz RADIOS) OR 3.5KHz FOR GE MARC V RADIOS.

NOTE

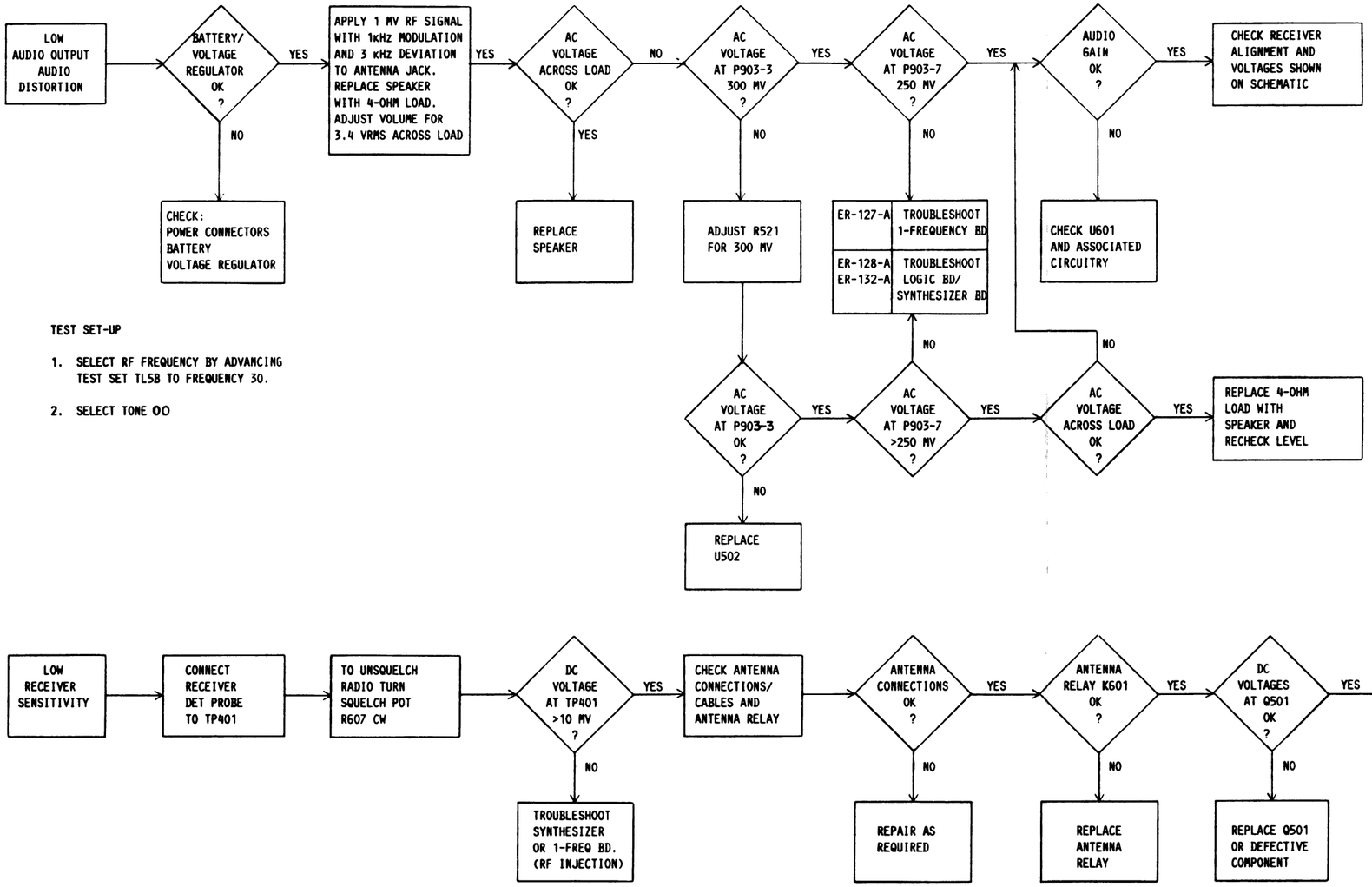
AN RMS OR PEAK READING VOLTOHMETER WILL READ 1/2 TO 1/3 OF PEAK-TO-PEAK READING

3. FOR GE MARC V ADVANCE CONTROL SET TL5B TO POSITION 30 AND TONE TO 00.

RC 4365A

TROUBLESHOOTING PROCEDURE

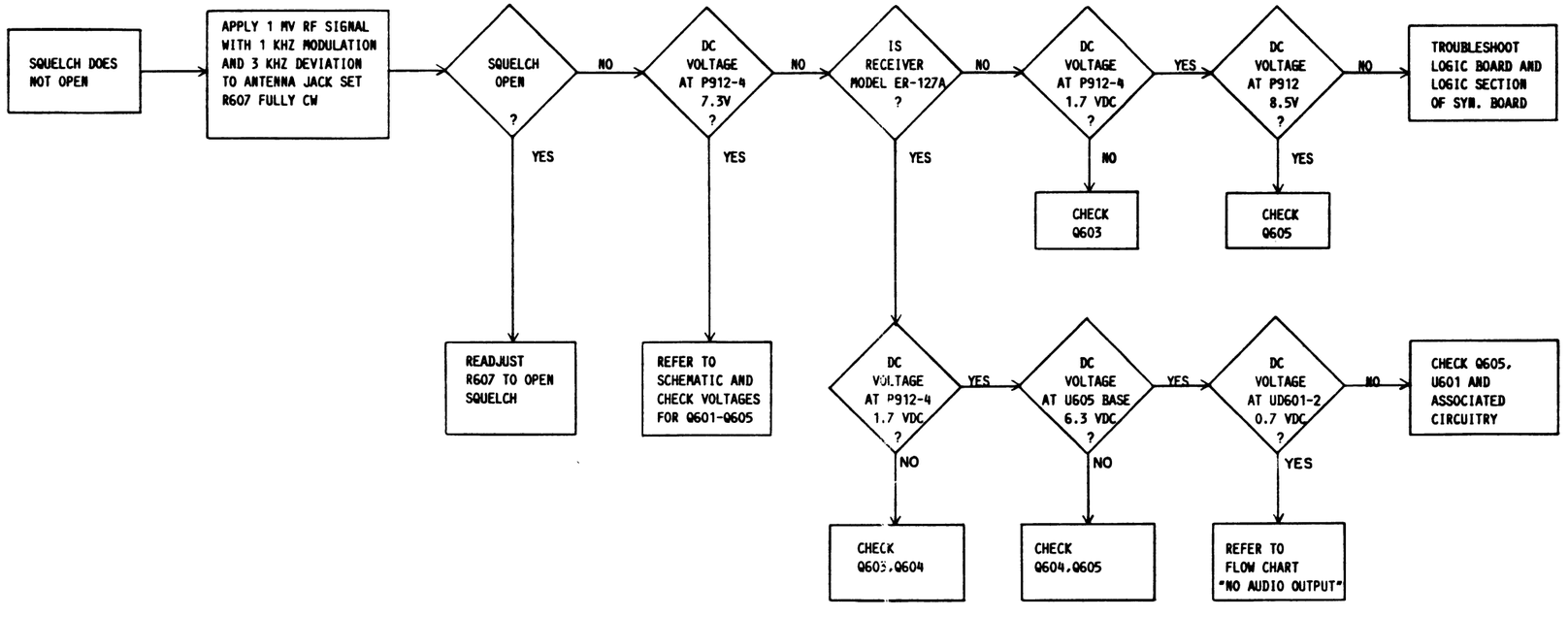
TRANSMITTER FLOW CHART



TROUBLESHOOTING PROCEDURE

(RC-4164, Sheet 1)
RECEIVER FLOW CHART

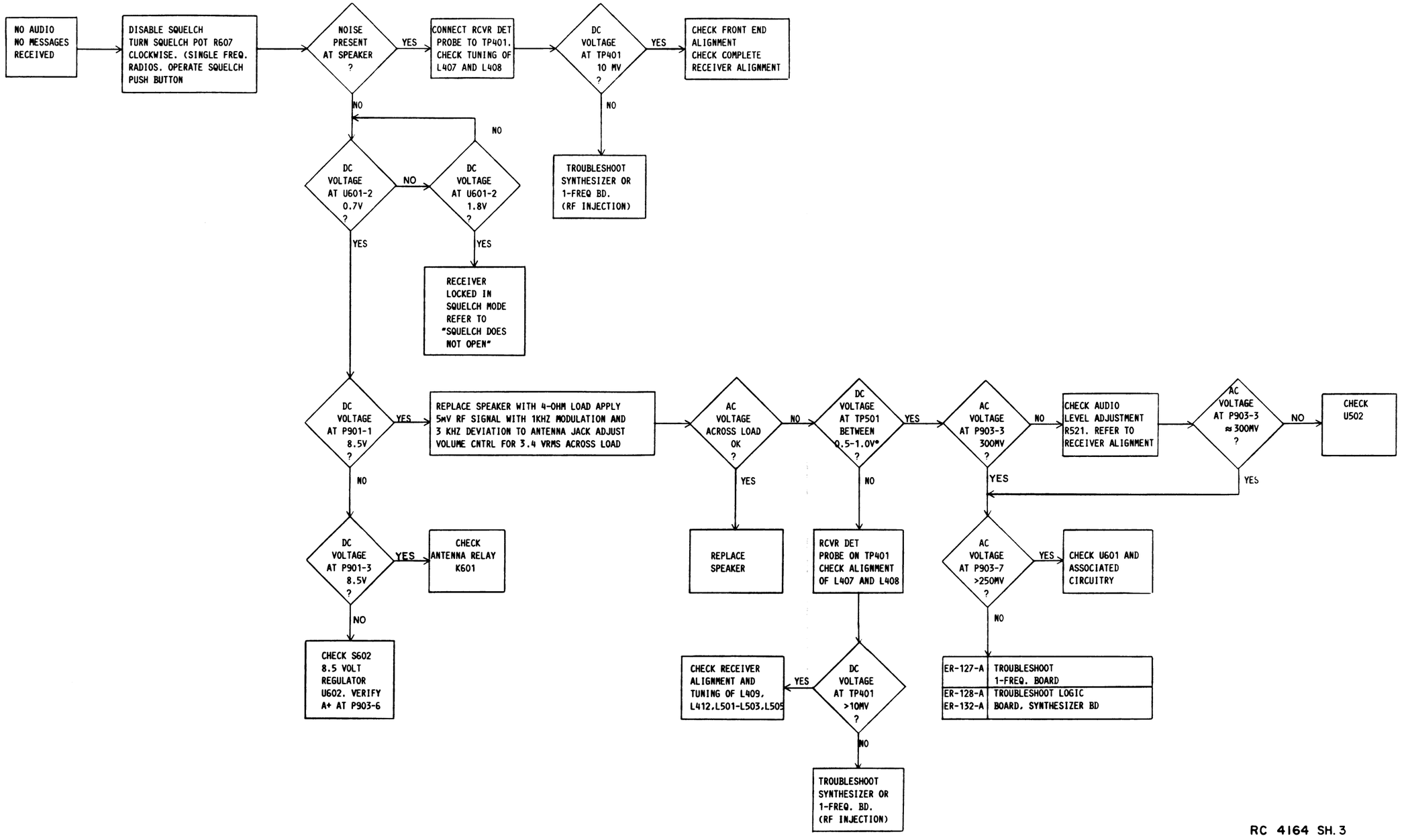
RC 4164A SH.1



RC 4164 SH 2B

TROUBLESHOOTING PROCEDURE

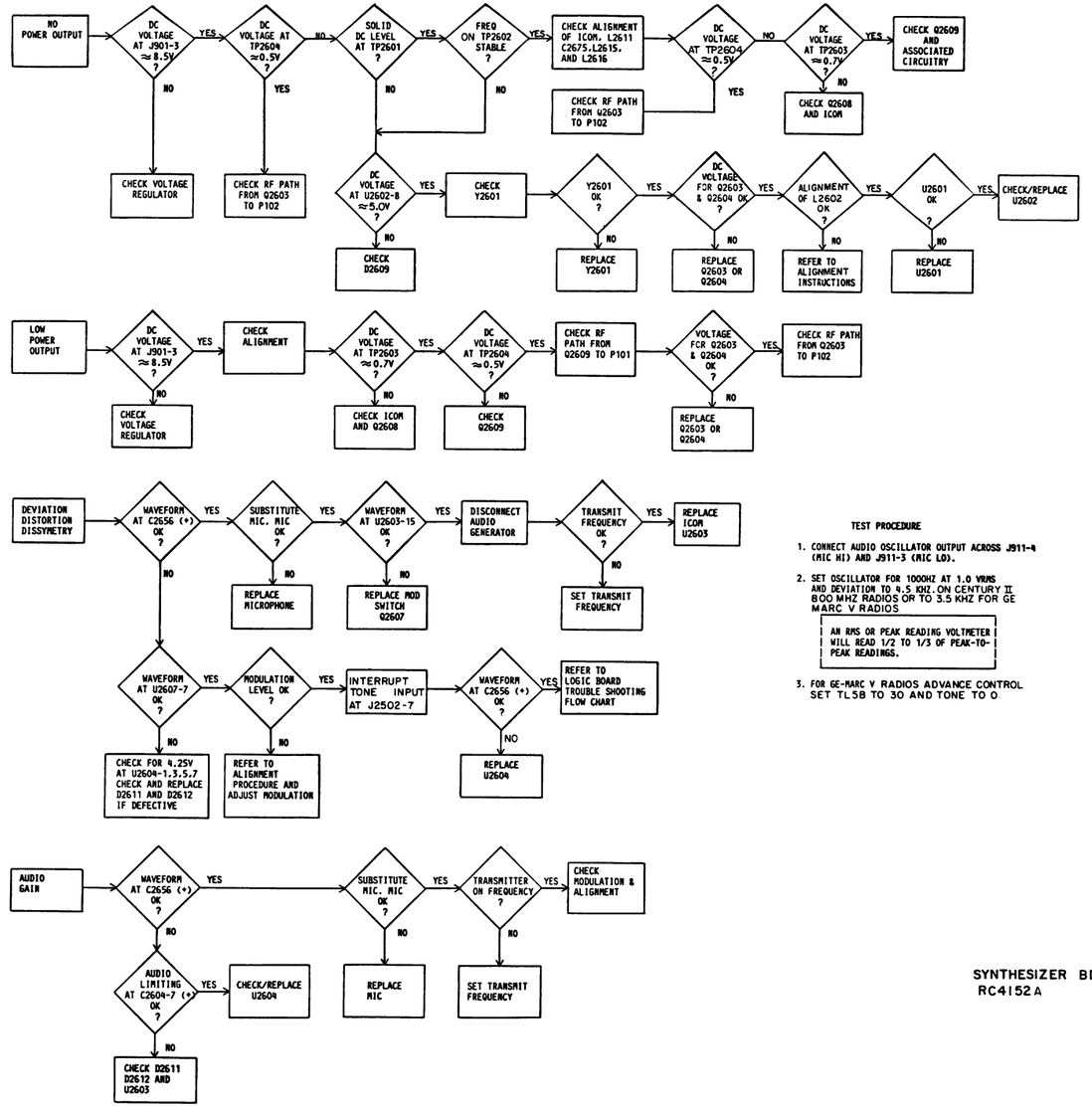
(RC-4164, Sheet 2B)
RECEIVER FLOW CHART



RC 4164 SH. 3

TROUBLESHOOTING PROCEDURE

(RC-4164, Sheet 3)
RECEIVER FLOW CHART



TEST PROCEDURE

1. CONNECT AUDIO OSCILLATOR OUTPUT ACROSS J911-4 (MIC HI) AND J911-3 (MIC LO).
2. SET OSCILLATOR FOR 1000HZ AT 1.0 VRMS AND DEVIATION TO 4.5 KHZ. ON CENTURY II 800 MHZ RADIOS OR TO 3.5 KHZ FOR GE MARC V RADIOS

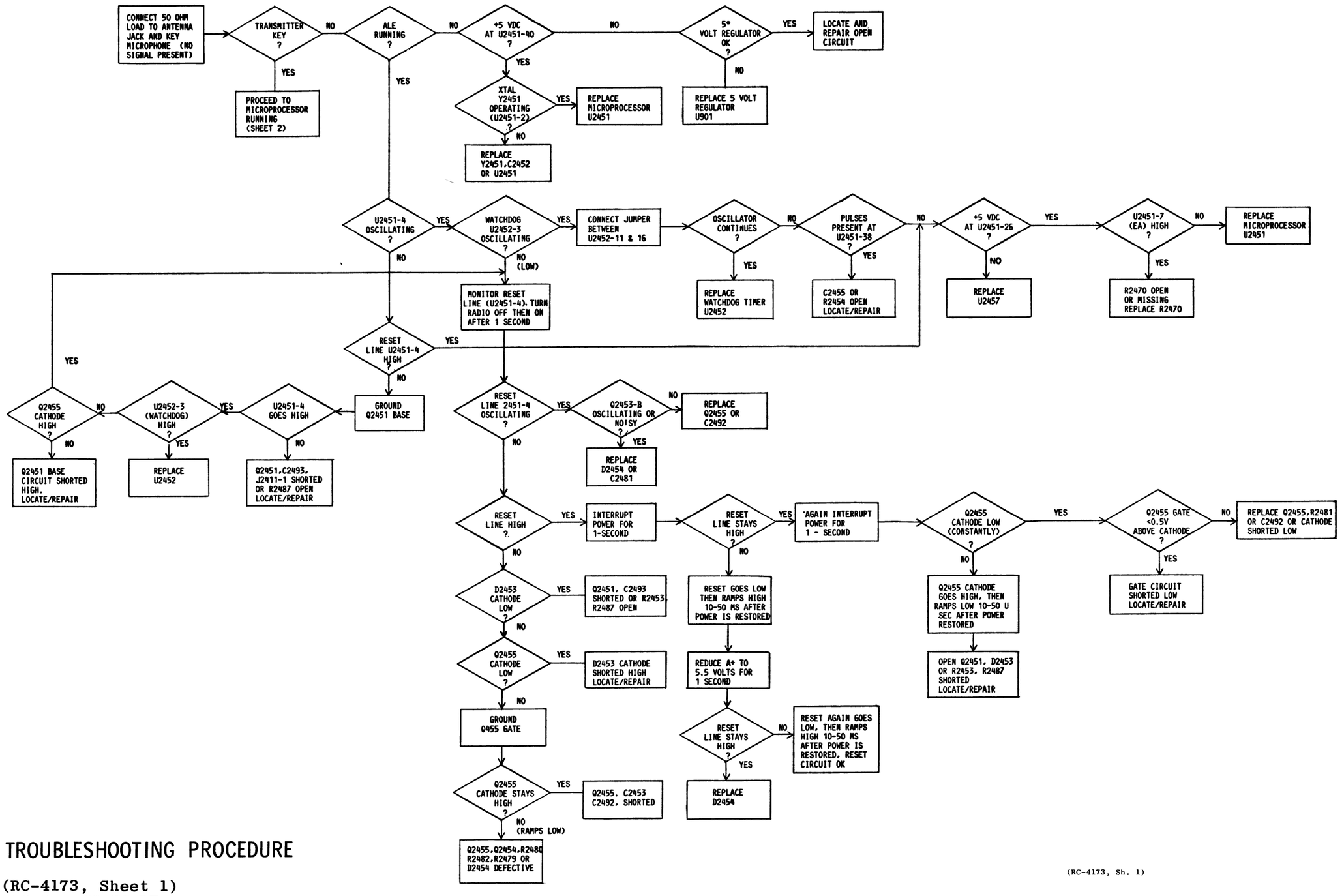
   AN RMS OR PEAK READING VOLTMETER WILL READ 1/2 TO 1/3 OF PEAK-TO-PEAK READINGS.

3. FOR GE-MARC V RADIOS ADVANCE CONTROL SET TL5B TO 30 AND TONE TO 0.

SYNTHESIZER BD. RC4152A

TROUBLESHOOTING PROCEDURE

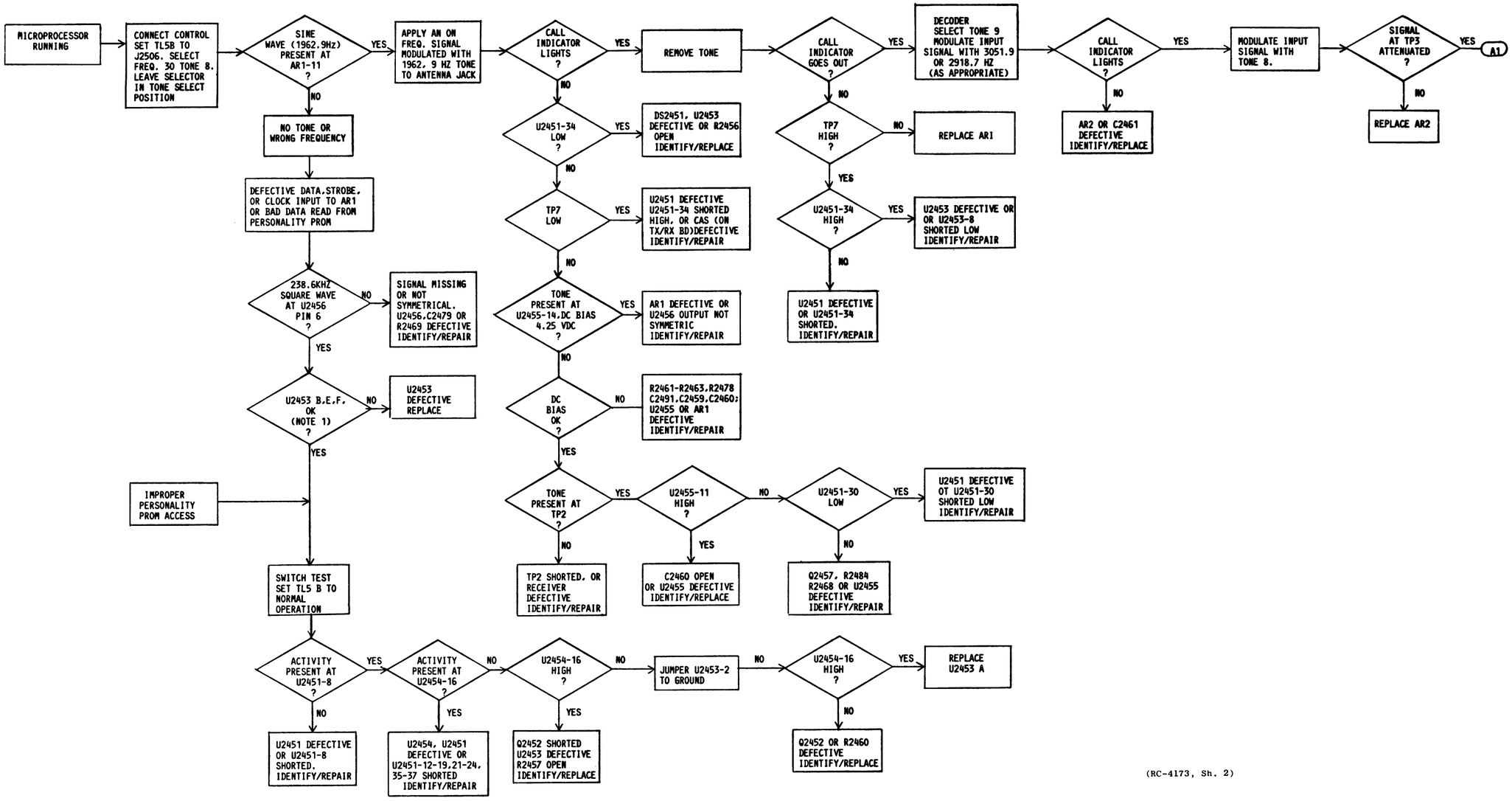
SYNTHESIZER FLOW CHART



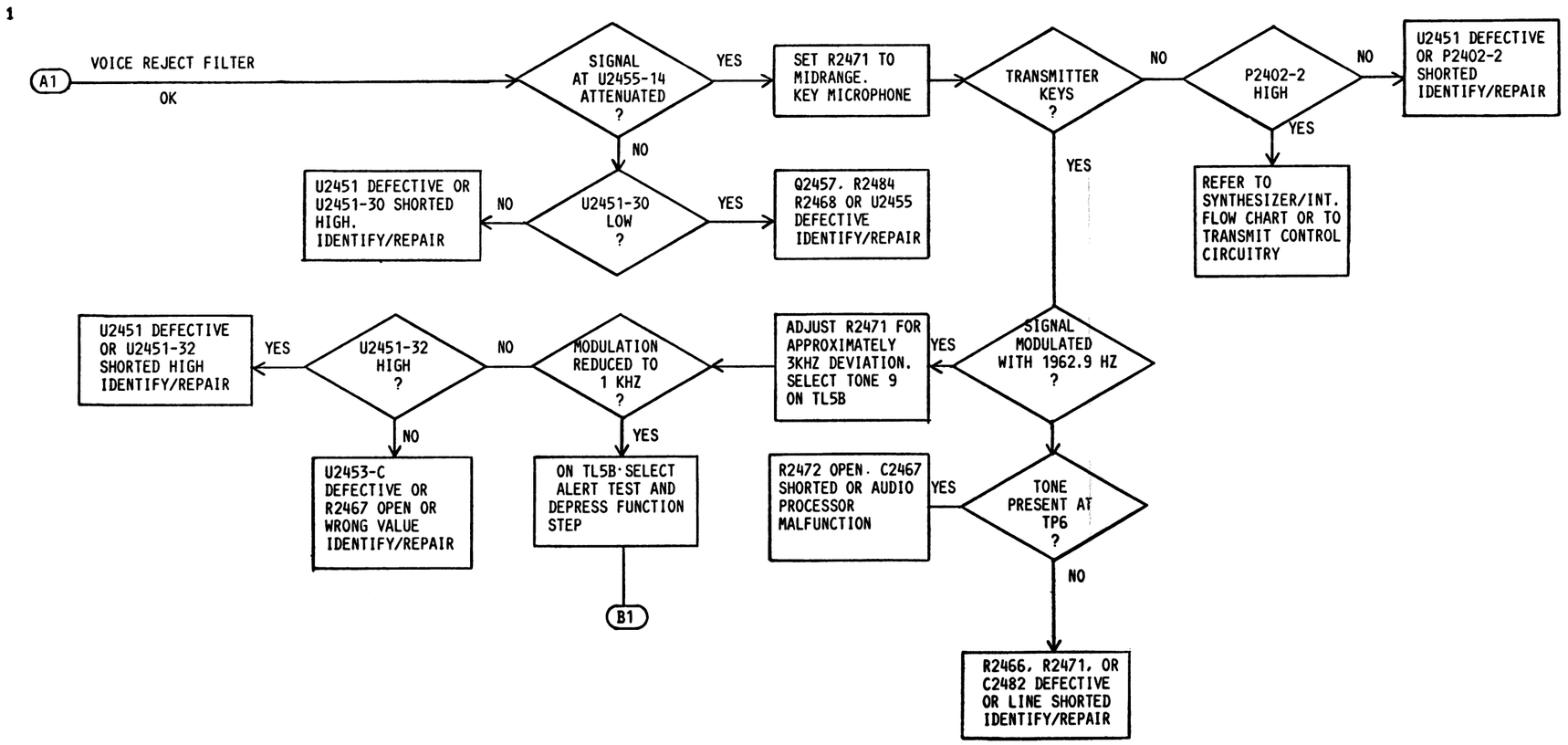
(RC-4173, Sh. 1)

TROUBLESHOOTING PROCEDURE

(RC-4173, Sheet 1)
LOGIC FLOW CHART


MICROPROCESSOR RUNNING
CONNECT CONTROL SET TL5B TO J2506. SELECT FREQ. 30 TONE 8. LEAVE SELECTOR IN TONE SELECT POSITION
SINE WAVE (1962.9Hz) PRESENT AT AR1-11 ?
YES
NO
APPLY AN ON FREQ. SIGNAL MODULATED WITH 1962. 9 HZ TONE TO ANTENNA JACK
NO TONE OR WRONG FREQUENCY
DEFECTIVE DATA.STROBE, OR CLOCK INPUT TO AR1 OR BAD DATA READ FROM PERSONALITY PROM
238.6KHZ SQUARE WAVE AT U2456 PIN 6 ?
NO
SIGNAL MISSING OR NOT SYMMETRICAL. U2456.C2479 OR R2469 DEFECTIVE IDENTIFY/REPAIR
YES
U2453 B.E.F. OK (NOTE 1) ?
NO
U2453 DEFECTIVE REPLACE
YES
IMPROPER PERSONALITY PROM ACCESS
SWITCH TEST SET TL5 B TO NORMAL OPERATION
ACTIVITY PRESENT AT U2451-8 ?
YES
NO
U2451 DEFECTIVE OR U2451-8 SHORTED. IDENTIFY/REPAIR
ACTIVITY PRESENT AT U2454-16 ?
NO
YES
U2454, U2451 DEFECTIVE OR U2451-12-19,21-24, 35-37 SHORTED IDENTIFY/REPAIR
U2454-16 HIGH ?
NO
YES
Q2452 SHORTED U2453 DEFECTIVE R2457 OPEN IDENTIFY/REPLACE
JUMPER U2453-2 TO GROUND
CALL INDICATOR LIGHTS ?
YES
NO
REMOVE TONE
U2451-34 LOW ?
YES
NO
DS2451, U2453 DEFECTIVE OR R2456 OPEN IDENTIFY/REPLACE
TP7 LOW
YES
NO
U2451 DEFECTIVE U2451-34 SHORTED HIGH, OR CAS (ON TX/RX BD)DEFECTIVE IDENTIFY/REPAIR
TONE PRESENT AT U2455-14.DC BIAS 4.25 VDC ?
YES
NO
AR1 DEFECTIVE OR U2456 OUTPUT NOT SYMMETRIC IDENTIFY/REPAIR
DC BIAS OK ?
NO
YES
R2461-R2463,R2478 C2491,C2459,C2460; U2455 OR AR1 DEFECTIVE IDENTIFY/REPAIR
TONE PRESENT AT TP2 ?
YES
NO
TP2 SHORTED, OR RECEIVER DEFECTIVE IDENTIFY/REPAIR
U2455-11 HIGH ?
NO
YES
C2460 OPEN OR U2455 DEFECTIVE IDENTIFY/REPLACE
U2451-30 LOW
YES
NO
U2451 DEFECTIVE OT U2451-30 SHORTED LOW IDENTIFY/REPAIR
Q2457, R2484 R2468 OR U2455 DEFECTIVE IDENTIFY/REPAIR
CALL INDICATOR GOES OUT
YES
NO
DECODER SELECT TONE 9 MODULATE INPUT SIGNAL WITH 3051.9 OR 2918.7 HZ (AS APPROPRIATE)
TP7 HIGH ?
NO
YES
REPLACE AR1
U2451-34 HIGH ?
YES
NO
U2453 DEFECTIVE OR OR U2453-8 SHORTED LOW IDENTIFY/REPAIR
U2451 DEFECTIVE OR U2451-34 SHORTED. IDENTIFY/REPAIR
U2454-16 HIGH ?
YES
NO
REPLACE U2453 A
Q2452 OR R2460 DEFECTIVE IDENTIFY/REPLACE
CALL INDICATOR LIGHTS ?
YES
NO
AR2 OR C2461 DEFECTIVE IDENTIFY/REPLACE
MODULATE INPUT SIGNAL WITH TONE 8.
SIGNAL AT TP3 ATTENUATED ?
YES
NO
A1
REPLACE AR2

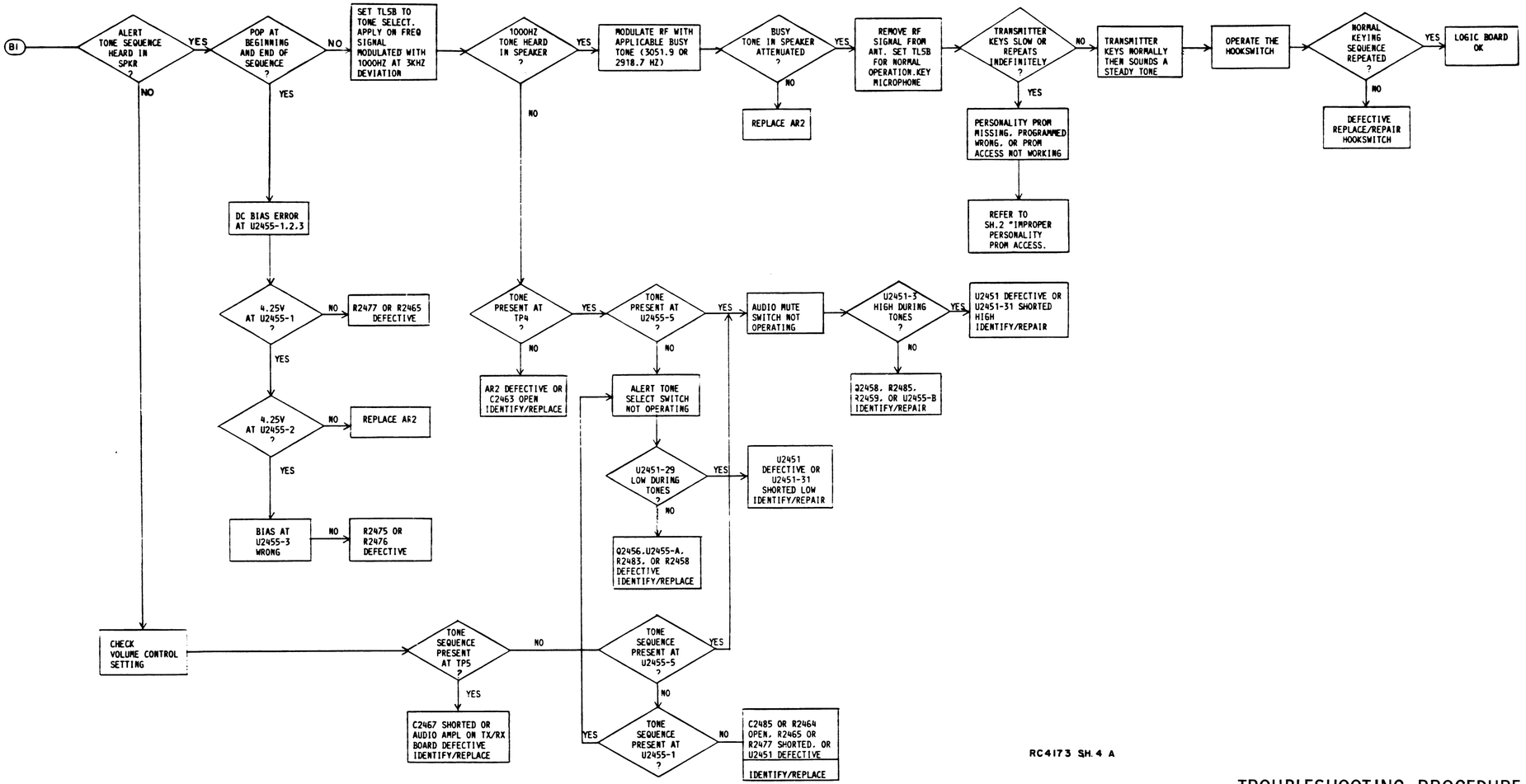
(RC-4173, Sh. 2)



(RC-4173, Sh. 3)

TROUBLESHOOTING PROCEDURE

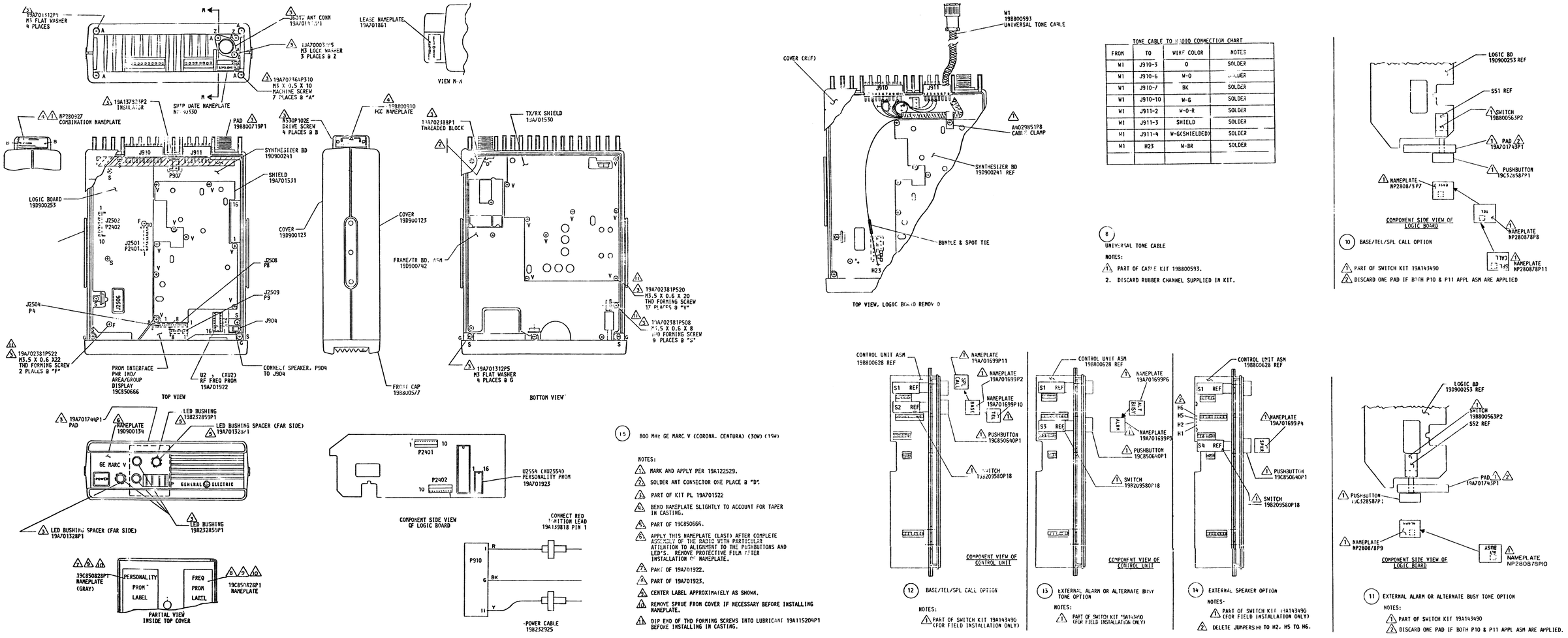
(RC-4173, Sheet 3)
LOGIC FLOW CHART



RC4173 SH.4 A

TROUBLESHOOTING PROCEDURE

(RC-4173, Sheet 4A)
LOGIC FLOW CHART



(15) 800 MHz GE MARC V (CORONA, CENTURA) (30W) (15W)

NOTES:

1. MARK AND APPLY PER 19A122529.
2. SOLDER ANT CONNECTOR ONE PLACE @ "D".
3. PART OF KIT PL 19A701522.
4. BEND NAMEPLATE SLIGHTLY TO ACCOUNT FOR TAPER IN CASTING.
5. PART OF 19C850666.
6. APPLY THIS NAMEPLATE (LAST) AFTER COMPLETE ASSEMBLY OF THE RADIO WITH PARTICULAR ATTENTION TO ALIGNMENT TO THE PUSHBUTTONS AND LED'S. REMOVE PROTECTIVE FILM AFTER INSTALLATION OF NAMEPLATE.
7. PART OF 19A701922.
8. PART OF 19A701923.
9. CENTER LABEL APPROXIMATELY AS SHOWN.
10. REMOVE SPRUE FROM COVER IF NECESSARY BEFORE INSTALLING NAMEPLATE.
11. DIP END OF THD FORMING SCREWS INTO LUBRICANT 19A115204P1 BEFORE INSTALLING IN CASTING.

(19D900386, Sh. 5, Rev. 3)

TOP VIEW, LOGIC BOARD REMOVED

TONE CABLE TO J910 CONNECTION CHART

FROM	TO	WIRE COLOR	NOTES
W1	J910-5	O	SOLDER
W1	J910-6	W-O	SOLDER
W1	J910-7	BK	SOLDER
W1	J910-10	W-G	SOLDER
W1	J911-2	W-O-R	SOLDER
W1	J911-3	SHIELD	SOLDER
W1	J911-4	W-G(SHIELDED)	SOLDER
W1	H23	W-BR	SOLDER

(8) UNIVERSAL TONE CABLE

NOTES:

1. PART OF CABLE KIT 19B800593.
2. DISCARD RUBBER CHANNEL SUPPLIED IN KIT.

(10) BASE/TEL/SPL CALL OPTION

1. PART OF SWITCH KIT 19A143490
2. DISCARD ONE PAD IF BOTH P10 & P11 APPL ASM ARE APPLIED

(12) BASE/TEL/SPL CALL OPTION

NOTES:

1. PART OF SWITCH KIT 19A143490 (FOR FIELD INSTALLATION ONLY)

(13) EXTERNAL ALARM OR ALTERNATE BUSY TONE OPTION

NOTES:

1. PART OF SWITCH KIT 19A143490 (FOR FIELD INSTALLATION ONLY)

(14) EXTERNAL SPEAKER OPTION

NOTES:

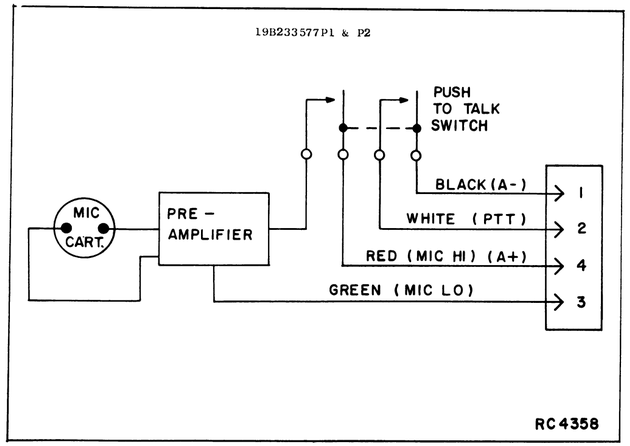
1. PART OF SWITCH KIT 19A143490 (FOR FIELD INSTALLATION ONLY)
2. DELETE JUMPERS H1 TO H2, H5 TO H6.

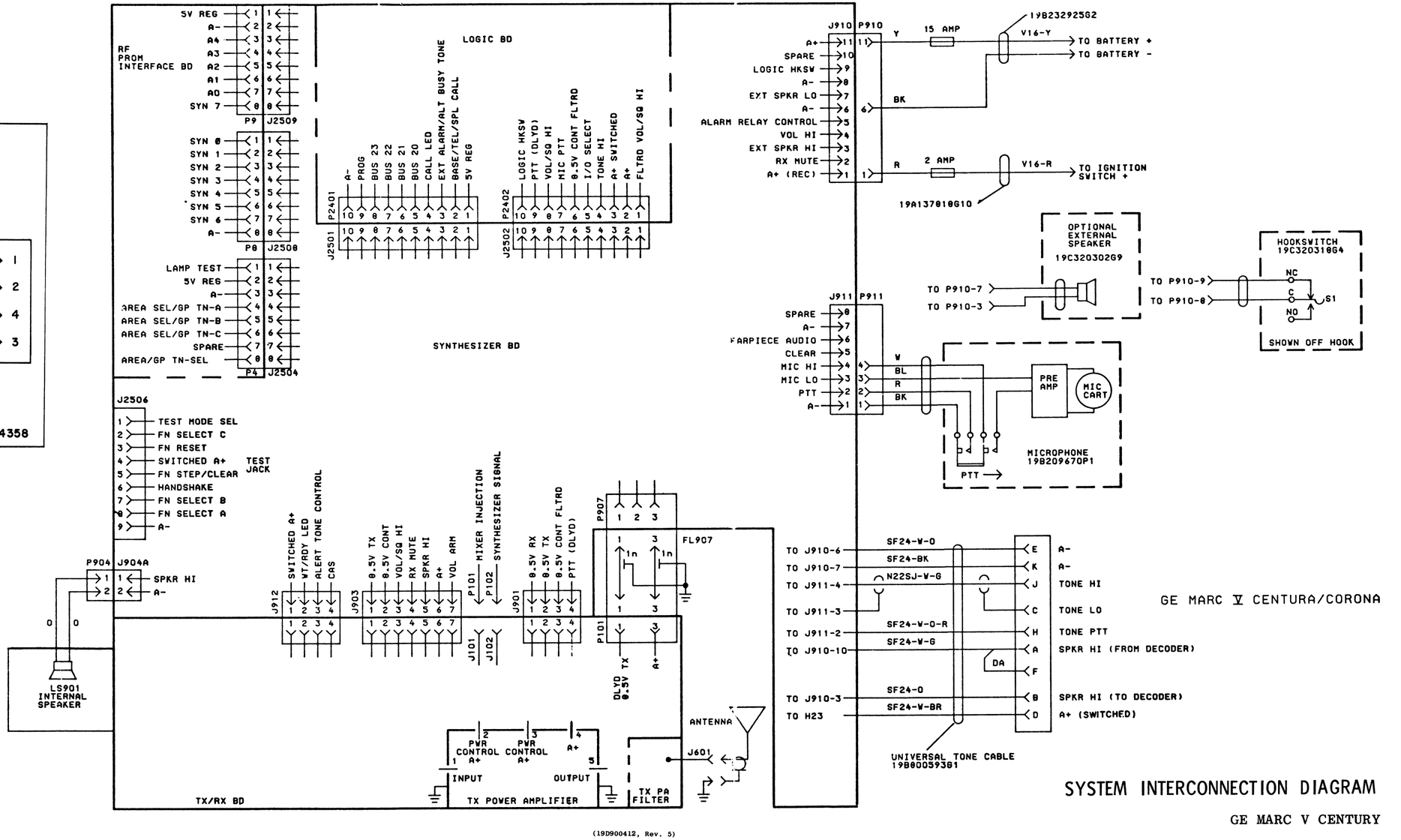
(11) EXTERNAL ALARM OR ALTERNATE BUSY TONE OPTION

NOTES:

1. PART OF SWITCH KIT 19A143490
2. DISCARD ONE PAD IF BOTH P10 & P11 APPL ASM ARE APPLIED.

(19D900386, Sh. 4, Rev. 5)





(19D900412, Rev. 5)

GE MARC Ⅴ CENTURA/CORONA

SYSTEM INTERCONNECTION DIAGRAM

GE MARC V CENTURY

PARTS LIST

LBI31130D

800 MHz GE - MARC V CORONA & CENTURA RADIO

SYMBOL	GE PART NO.	DESCRIPTION
		TRANSMIT/RECEIVE ASSEMBLY (See Transmit/Receive Assembly Parts List Shown Separately)
		FRONT CAP ASSEMBLY 19B800577G1 BLACK (CENTURA) 19B800577G2 PEBBLE (CORONA)
		- - - - - - - - - - LOUDSPEAKERS - - - - - - - - -
LS901	19A134771P1	Permanent magnet: 4 ohms ±10% imp, resonant frequency 400 Hz at 1 VRMS, 3 watt max; sim to Storno 97.5038-00.
		- - - - - - - - - - - PLUGS - - - - - - - - - - -
P904		Connector. Includes:
	19A700041P28	Shell.
	19A700041P26	Contact: sim to Molex 08-50-0113. (Quantity 2).
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	4034221P1	Nut, push-on: sim to Tinnerman C1617-010-67. (Secures LS901 to front cap).
	19D900177P1	Grille. (Located on front cap).
	19D900123P1	Cover, top & bottom. (BLACK).
	19D900123P2	Cover, top & bottom. (PEBBLE).
	19A701530G1	Transmit/Receive shield.
	19A701531G1	Shield. (Located over Synthesizer Board).
	19A700036P508	Screw, thd. forming: No. 3.5-0.6 x 8. (Secures front cap).
	19A701312P5	Flatwasher: M3.5. (Secures front cap).
	19A700036P520	Screw, thd. forming: No. M3.5-0.6 x 20. (Secures shields).
	19A700031P410	Machine screw: No. M3-0.5 x 10. (Secures J601 & covers at rear of radio).
	19A701312P4	Flatwasher: 3.2 ID. (Secures covers at rear of radio).
	19A700032P5	Lockwasher, internal tooth: No. 3MM. (Secures J601).
	19A702388P1	Threaded block. (Located behind J601).
	19A700036P522	Screw, thd. forming: No. 3.5-0.6 x 22. (Secures Logic Board).
	19A701328P1	Spacer. (Used with POWER-ON LED).
	19B232859P1	Bushing. (Used with LED's on front cap).
	19A701744P1	Pad. (Located behind front cap).
	19B800719P1	Dust pad. (Located behind J601, J910, J911).
	19A137823P2	Plate, insulator. (Used with P907).
	N530P102E	Drive screw: No. 00 x 1/8. (Secures FCC & combination nameplates).
	19D900134P20	Nameplate.
		CHASSIS 19C850620G1
FL907		INTERCONNECT/CAPACITOR ASSEMBLY 19A703219G1
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1 and C2	19A116699P2	Ceramic, feed thru: 1000 pF ±20%, 250 VDCW; sim to Aerovox Style 7405.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19D900120G1	Frame.
	19A137823P1	Plate. (Mounts C1 & C2 on FL907 assembly).
	19A700144P2	Insert, threaded. (Quantity 6-located in frame).
	19A702364P104	Machine screw, TORX DRIVE®: M2-0.4 x 4. (Secures FL907).
	19A700032P1	Lockwasher, internal tooth: No. 2. (Secures FL907).
		POWER CABLE 19B232925G2
		- - - - - - - - - - - PLUGS - - - - - - - - - - -
P910		Connector. Includes:
	19A116659P143	Shell.
	19A116781P5	Contact, electrical: wire range No. 18-24 AWG; sim to Molex 08-50-0106.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19A137818G3	Lead, black. (Includes 19A116781P5 contact).
		LEAD ASSEMBLY 19A137818G9
	7484390P1	Cartridge, quick blow: 15 amp at 250 v; sim to Bussmann ABC10.
	19A115776P6	Fuseholder: sim to Bussmann 9835. (MATES WITH 19A115776P5 Knob).
	19A115776P5	Knob. (Mates with fuseholder to capivate fuse).
	19A115776P7	Spring: sim to Bussmann 1A1853. (Located inside fuseholder).
	19A115776P3	Contact, electrical: sim to Littlefuse 904-88. (Quantity 2 - crimped on wire inside fuseholder).
	19A116781P5	Contact, electrical: wire range No. 18-24 AWG; sim to Molex 08-50-0106.
		STANDARD MOUNTING HARDWARE KIT 19A138051G5 BLACK (CENTURA) 19A138051G6 PEBBLE (CORONA) 19A138051G8 DESK TOP
	19A134653P4008	Bolt, machine, hex: Metric, 8MM. (Secures radio to mounting bracket).
	19A700032P7	Lockwasher, internal tooth: No. M2.2. (Metric). (Secures ratio to mounting bracket).
	19J706152P9	Retaining strap; sim to Dennison BAR-LOK 08471. (Secures power leads under dash).
	N130P1610C6	Screw, thread forming: No. 10-16 x 5/8. (Secures mounting bracket to mounting surface with thin mounting surface).
	N130P1624C6	Screw, thread forming: No. 10-16 x 1-1/2. (Secures mounting bracket to mounting surface when thick carpet is on mounting surface).
	5490407P6	Rubber grommet. (Located in fire wall).
	19C850638P2	Mounting bracket. (Black).
	19C850638P3	Mounting bracket. (Pebble).
	19A702241G1	Mounting bracket. (Desk Top).
		SWITCH KITS 19A143490G3 BASE 19A143490G4 TEL 19A143490G5 ALARM
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S51 and S52	19B800563P2	Switch, push: DPDT, 1 station, alternate action; sim to Schadow Co. Series "P".

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19C328587P1	Pushbutton. (Used with S51 & S52).
	NP280878P7	Nameplate. (BASE).
	NP280878P8	Nameplate. (TEL).
	NP280878P9	Nameplate. (ALARM).
		MECHANICAL PARTS
	19A700031P508	Machine screw: No. M3.5-0.6 x 8MM. (Secures 800 MHz PA).
	19A700032P6	Lockwasher, internal tooth: No. 3.5MM. (Secures 800 MHz PA).
	N401P7C6	Flatwasher: No. 6. (Secures 800 MHz PA).
	19A700036P525	Screw, thd forming: No. M3.5-0.6 x 25. (Secures front end).
	19A700036P520	Screw, thd. forming: No. M3.5-0.6 x 20. (Secures shields located over printed board).
	19A700031P410	Machine screw: No. M3-0.5 x 10. (Secures J601, top & bottom covers).
	19A701312P4	Flatwasher: 3.2 ID. (Secures top & bottom covers).
	19A700036P522	Screw, thd. forming: No. 3.5-0.6 x 22. (Secures Logic Board).
	19A701328P1	Spacer. (Used with WAIT-READY LED'S).
	19B232859P1	Bushing. (Secures LED'S).
	19A700036P508	Screw, thd. forming: No. 3.5-0.6 x 8. (Secures front cap & printed boards).
	19A700032P5	Lockwasher, internal tooth: No. 3MM. (Secures J910).
	19A700034P4	Nut, hex: No. M3 x 0.5MM. (Secures J910).
	19B800719P1	Dust pad. (Located at J910 & J911).
	19D900134P15	Nameplate. BASE/NORM OR TEL/NORM, GROUP SELECT & 2ND OPTION SWITCH.
	19D900134P16	Nameplate. BASE/NORM OR TEL/NORM AND GROUP SELECT.
	19D900134P17	Nameplate. GROUP SELECT.
	19D900134P18	Nameplate. BASE/NORM OR TEL/NORM AND 2ND OPTION SWITCH.
	19D900134P19	Nameplate. BASE/NORM OR TEL/NORM.
	19D900134P20	Nameplate. NO OPTIONS.
	19D900134P21	Nameplate. BASE/NORM OR TEL/NORM, AREA SELECT & 2ND OPTION SWITCH.
	19D900134P22	Nameplate. BASE/NORM OR TEL/NORM AND AREA SELECT.
	19D900134P23	Nameplate. AREA SELECT.
	19D900134P28	Namplate. GROUP SELECT & 2ND OPTION SWITCH.
	19D900134P29	Nameplate. AREA SELECT & 2ND OPTION SWITCH.
	19D900134P30	Nameplate. 2ND OPTION SWITCH.
	19D900134P33	Nameplate. AREA-GROUP SELECT.
		ASSOCIATED PARTS
		- - - - - - - - - - - JACKS - - - - - - - - - - -
J601	19A701432P1	Receptacle: coax; sim to UG58AU.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST

800 MHz ANTENNA 19B209548P4 ISSUE 2

SYMBOL	GE PART NO.	DESCRIPTION
		Whip assembly. 068110-001.
		Whip nut assembly. 068047-001.
		Base nut assembly. 068048-001.
		"O" Ring (LARGE). 007059-122.
		Stud assembly. 068046-001.
	19B209018P5	Plug, Type N. sim to UG536A/U.
		Cable. (Included as part of complete antenna assembly only).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST

TRANSISTORIZED MICROPHONE 19B209670P1 ISSUE 2

SYMBOL	GE PART NO.	DESCRIPTION
	19A116659P20	Cable connector shell; sim to Molex 09-50-3081.
	19A116781P6	Contact, electrical: wire range No. 22-26 AWG; sim to Molex 08-50-0107. (Quantity 4- Used with 19A116659P20 connector shell).
	NP280575	Faceplate. (GENERAL ELECTRIC).
	4033271G1	Strain relief. (Located on cable 10 inches from connector).
	MP101	Case, front x back with push to talk switch.
	MP102	Cartridge, with leads.
	MP103	Cable assembly.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST

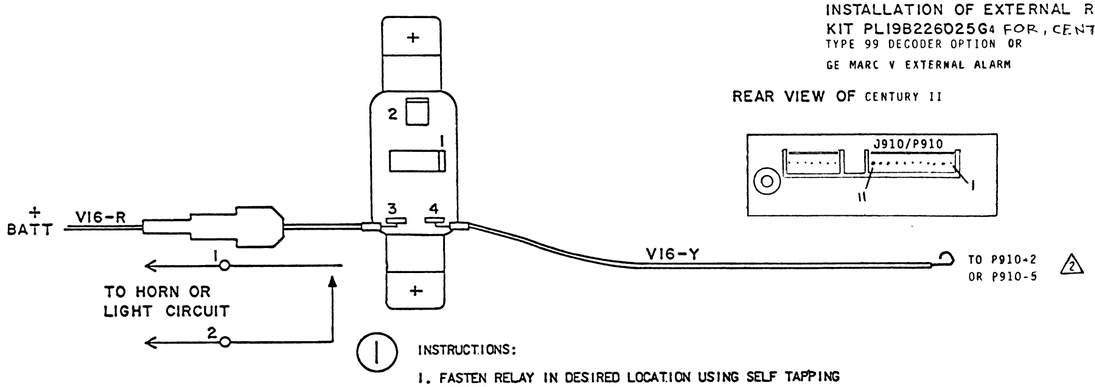
LBI31133 GE MARC V 30 WATT CORONA/CENTURA

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - - JACKS - - - - - - - - - - -
J601	19A701432P1	Receptacle: coax; sim to UG58AU.
		FRONT CAP 19B800577G1 BLACK 19B800577G2 PEBBLE 19B800577G3 SADDLE BROWN
		- - - - - - - - - - LOUDSPEAKERS - - - - - - - - -
LS901	19A134771P1	Permanent magnet: 4 ohms ±10% imp, resonant frequency 400 Hz at 1 VRMS, 3 watt max; sim to Storno 97.5038-00.
		- - - - - - - - - - - PLUGS - - - - - - - - - - -
P904		Connector. Includes:
	19A700041P28	Shell.
	19A700041P26	Contact, electrical: sim to Molex 08-50-0113. (Quantity 2).
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	4034221P1	Nut, push-on: sim to Tinnerman C1617-010-67. (Secures LS901).
	19D900177P1	Grille. (Located on front cap).
	19D900123P1	Cover, top & bottom. (BLACK).
	19D900123P2	Cover, top & bottom. (PEBBLE).
	19D900123P3	Cover, top & bottom. (SADDLE BROWN).
	19A701530G1	Transmit/Receive shield.
	19A701531G1	Shield. (Located over Synthesizer Board).
	19A700036P508	Screw, thd. forming: No. 3.5-0.6 x 8. (Secures front cap).
	19A701312P5	Flatwasher: M3.5. (Secures front cap).
	19A700036P520	Screw, thd. forming: No. M3.5-0.6 x 20. (Secures shields).
	19A700031P410	Machine screw: No. M3-0.5 x 10. (Secures J601 & covers at rear of radio).
	19A701312P4	Flatwasher: 3.2 ID. (Secures covers at rear of radio).
	19A700032P5	Lockwasher, internal tooth: No. 3MM. (Secures J601).
	19A702388P1	Threaded block. (Located behind J601).
	19A700036P522	Screw, thd. forming: No. 3.5-0.6 x 22. (Secures Logic Board).
	19A701328P1	Spacer. (Used with POWER-ON LED).
	19B232859P1	Bushing. (Used with LED's on front cap).
	19A701744P1	Pad. (Located behind front cap).
	19B800719P1	Dust pad. (Located behind J601, J910, J911).
	19A137823P2	Plate, insulator. (Used with P907).
	N530P102E	Drive screw: No. 00 x 1/8. (Secures FCC & comination nameplates).
	19D900134P20	Nameplate.

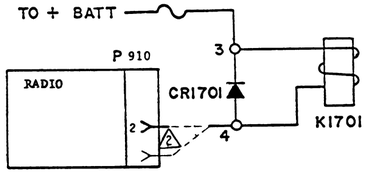
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

EXTERNAL ALARM RELAY

THESE INSTRUCTIONS COVER THE FIELD INSTALLATION OF EXTERNAL RELAY KIT PL19B226025G4 FOR, CENTURY II - TYPE 99 DECODER OPTION OR GE MARC V EXTERNAL ALARM



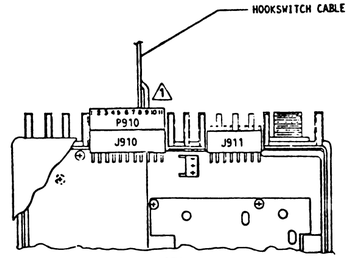
REAR VIEW OF CENTURY II



INSTRUCTIONS:

1. FASTEN RELAY IN DESIRED LOCATION USING SELF TAPPING SCREWS.
2. RUN YELLOW LEAD ATTACHED TO LUG 4 OF RELAY, TO P910-2 (TYPE 99 DECODER) OR P910-5 (GE MARC V EXT ALARM) OF POWER CABLE ON THE REAR OF THE RADIO. INSERT THE CONTACT ON LEAD FLAT SIDE DOWN INTO APPROPRIATE HOLE IN P910 UNTIL IT LOCKS.
3. CUT RED FUSED LEAD SO FUSE ASSEMBLY IS CLOSE TO VOLTAGE SOURCE. ATTACH THE SOLDERLESS TERMINAL WITH THE 0.197 INCH HOLE TO THE END OF THE LEAD GOING TO THE RELAY. USING #8-32 X 5/16 LG HARDWARE ATTACH THE TERMINAL TO LUG 3 OF THE RELAY. ATTACH OTHER END OF FUSED LEAD TO VOLTAGE SOURCE WITH APPROPRIATE HARDWARE.
4. CONNECT HORN OR LIGHT CIRCUIT TO LUGS 1 AND 2 OF RELAY.

(19B233673, Rev. 1)

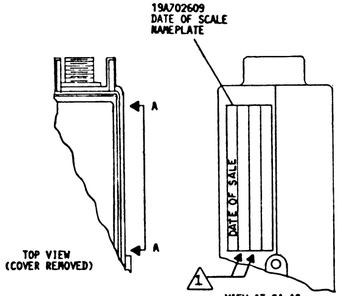


TOP VIEW

GE MARC V HOOKSWITCH APPLICATION

NOTES:

1. CONNECT HOOKSWITCH TO P910-8 AND P910-9.



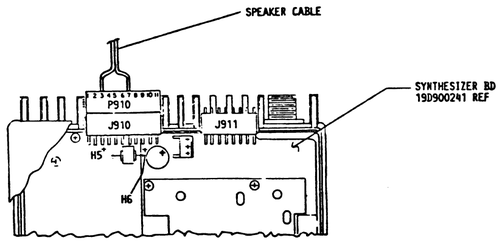
TOP VIEW
(COVER REMOVED)

VIEW AT "A-A"
(COVER REMOVED)

DEALER OPTION

1. STAMP THIS RADIO'S MICROCOMPUTER DRAWING AND PART NUMBER ON THE DATE-OF-SALE NP ON LINES SHOWN AND ON BOTTOM RIGHT HAND SECTION OF THE RADIO PRODUCTION TAG (PART THAT IS ATTACHED ON OUTSIDE OF SHIPPING CARTON). SEE SHEET 1 VIEW OF LOGIC BOARD FOR LOCATION OF DRAWING AND PART NUMBER.

EXAMPLE: MICROCOMPUTER 19J706206P4

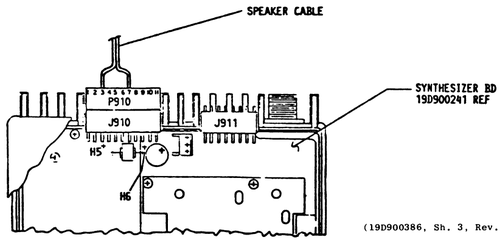


TOP VIEW

EXTERNAL SPEAKER APPLICATION

NOTES:

1. CONNECT SPEAKER LEADS TO P910-3 AND P910-7. TO DISCONNECT INTERNAL SPEAKER (GE MARC V AND FIELD ONLY) REMOVE JUMPER H5 TO H6.
2. FOR EXTERNAL SPEAKER WITH THE AC POWER SUPPLY, REMOVE JUMPER IN POWER CABLE BETWEEN P910-3 & P910-10 AND CONNECT PER NOTE 1.



(19D900386, Sh. 3, Rev. 5)

TOP VIEW

INSTALLATION INSTRUCTIONS

EXTERNAL ALARM RELAY,
EXTERNAL SPEAKER & HOOKSWITCH

PARTS LIST

EXTERNAL ALARM RELAY
19B226025G4
ISSUE 1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1701	4037822P2	Silicon, 1000 mA, 600 PIV.
		- - - - - - - - - - - RELAYS - - - - - - - - - -
K1701	7486515P2	Armature, enclosed: 12 VDC nominal, 85 to 90 ohms coil res, 1 form A contact, rated at 15 amps; sim to R.B.M. Co.
		FUSED LEAD 19B226454G1
	1R16P3	Quick blowing: 1 amp at 250 v; sim to Littelfuse 312001 or Bussmann AGC -1.
	19A115776P6	Fuseholder: sim to Bussmann 9835.
	19A115776P5	Knob: sim to Bussmann 99531/2.
	19A115776P7	Spring: sim to Bussmann 1A1853.
	19A115776P3	Contact, electrical: sim to Littelfuse 904-88. (Crimped on wires inside holder).
		WIRE ASSEMBLY 19A129937G2
	19B209260P12	Terminal, solderless: wire range No. 22-16; sim to AMP 41310.
	19A116781P5	Contact, electrical: wire range No. 18-24 AWG; sim to Molex 08-50-0106.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - -
	N80P13003C6	Machine screw: No. 6-32 x 5/16. (Secures relay to support).
	N404P13C6	Lockwasher, internal tooth: No. 6. (Secures relay to support).
	N402P37C13	Flatwasher: No. 6. (Secures relay to support).
	N80P15005C6	Machine screw: No. 8-32 x 5/16. (Secures wires to relay terminals).
	19A129833P1	Support. (K1701).
	N130P1608C6	Tap screw, thd. forming: No. 10-16 x 1/2. (Secures relay support).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST

RUGGEDIZED MICROPHONE
19B233577P1 BLACK
19B233577P2 BEIGE
ISSUE 3

SYMBOL	GE PART NO.	DESCRIPTION
	RP117	Transistorized cartridge.
	RP128	Switch assembly.
	RP261	Switch button, Black.
	RP277	Switch button, Beige.
	RP262	Case set, Black.
	RP275	Case set, Beige.
	RP263	Cable assembly. (Includes connector shell 19A116659P20 & 4 contacts 19A116781P6).
	RP276	Chassis assembly, inner module.

PARTS LIST

SPEAKER
OPTIONAL EXTERNAL - BLACK
19C320302G9
ISSUE 3

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - LOUDSPEAKERS - - - - - - - - -
LS2	19A116910P1	Permanent magnet: 5 inch, 3.2 ohms ±15% imp, 5 w. max operating; sim to Pioneer 002009.
		- - - - - - - - - - - CABLES - - - - - - - - - -
W1	19A129414G1	2 conductor cable: approx 5 feet long, includes (2) 19A116781P5 contacts.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19B227593G2	Housing.
	19B219692G2	Grille.
	19C320016P2	Mounting bracket. (Mounts speaker to mounting surface).
	N187P16010C6	Machine screw: No. 10-32 x 5/8. (Secures speaker to mounting bracket).
	N403P19C6	Lockwasher, internal tooth: No. 10. (Secures speaker to mounting bracket).
	N402P39C6	Flatwasher: No. 10. (Secures speaker to mounting bracket).
	N130P1610C6	Screw, thread forming: No. 10-16 x 5/8. (Secures mounting bracket to mounting surface).
	19A116986P108	Screw, thread forming, assembled washer: Phillips POZIDRIV®, HI-LO thread, No. 7-19 x 1/2. (Secures speaker to grille).
	19A116986P112	Screw, thread forming, assembled washer: Phillips POZIDRIV®, HI-LO thread, No. 7-19 x 3/4. (Secures housing to grille).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST

SPEAKER (BEIGE)
19C320302G11
ISSUE 4

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - LOUDSPEAKERS - - - - - - - - -
LS2	19A116910P1	Permanent magnet: 5 inch, 3.2 ohms ±15% imp, 5 w. max operating; sim to Pioneer 002009.
		- - - - - - - - - - - CABLES - - - - - - - - - -
W1	19A129414G1	2 conductor cable: approx 5 feet long, includes (2) 19A116781P5 contacts.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19B219692G4	Grille.
	19B227593G4	Housing.
	19C320016P3	Mounting bracket. (Located between housing & retaining bracket).
	19A116986P108	Screw, thread forming, assembled washer: Phillips POZIDRIV®, HI-LO thread, No. 7-19 x 1/2. (Secures speaker to housing).
	19A116986P112	Screw, thread forming, assembled washer: Phillips POZIDRIV®, HI-LO thread, No. 7-19 x 3/4. (Secures grille to housing).
	N187P16010C6	Machine screw: No. 10-32 x 5/8. (Quantity 2 - Secures mounting bracket to housing).
	N403P19C6	Lockwasher, external tooth: No. 10. (Quantity 2 - Secures mounting bracket to housing).
	N402P39C6	Flatwasher: No. 10. (Quantity 2 - Secures mounting bracket to housing).
	N130P1610C6	Screw, thread forming: No. 10-16 x 5/8. (Secures mounting bracket to mounting surface).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST

MIKE HANGER/HOOKSWITCH
19C320318G4
ISSUE 2

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S2	19A116676P1	Sensitive: SPDT, 5 amps at 24 VDC or 5 amps at 250 VRMS; sim to Microswitch 11ISM1-T2.
		- - - - - - - - - - - CABLES - - - - - - - - - -
W1	19A129414G1	2 conductor cable: approx 5 feet long, includes (2) 19A116781P5 contacts.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19B219694P1	Base plate.
	19B219698G5	Housing.
	19A702464P2	Strain relief. (W1).
	N193P1410C6	Tap screw, phillips head: No. 8-18 x 5/8. (Secures assembly to mounting surface).
		ASSOCIATED PARTS
		MIKE KIT 7141414G2
	4031457P1	Support.
	4031458P1	Spring.
	N193P1408C6	Tap screw, phillips head: No. 8-18 x 1/2.
	19A116773P105	Tap screw, phillips POZIDRIV®: No. 7-19 x 5/16.

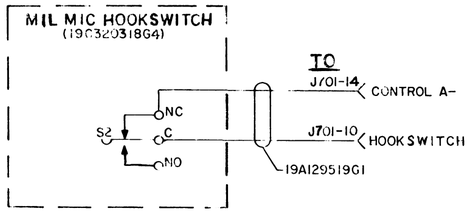
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST

UNIVERSAL TONE CABLE
19B800593G1
ISSUE 3

SYMBOL	GE PART NO.	DESCRIPTION
	7489183P7	Plug: 9 contacts rated at 7.5 amps max; sim to Winchester M9P-LS-H19CS.
	19A701863P4	Cable clip: sim to Weckesser Co. 3/16-4-128.
	19A701430G1	Rubber channel.
	19A700136P6	Insulated sleeving, electrical. (Specify length).
	7134854P4	Wire stranded. (Shield).
	19A115871P1	Wire, stranded, white-orange.
	19A115871P3	Wire, stranded, white-brown.
	19A115871P5	Wire, stranded, white-green.
	19A115871P9	Wire, stranded, white-orange-red.
	19A115871P29	Wire, stranded, orange.
	19A115871P30	Wire, stranded, black.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



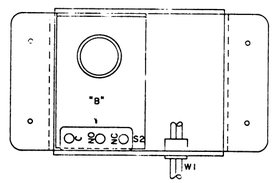
S2 - SHOWN OFF HOOK

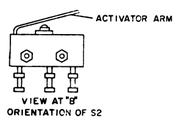
SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

THIS ELEM DIAG APPLIES TO

MODEL NO REV LETTER

(19A142554, Rev. 0)





(19B233291, Rev. 0)