MOBILE RADIO

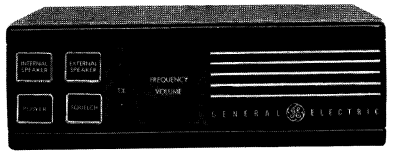
CENTURY II

MAINTENANCE MANUAL LBI30936

DATAFILE FOLDER — DF9049

420—512 MHz

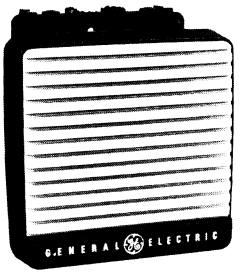
5—WATT TRANSMITTER
20—WATT TRANSMITTER



MOBILE RADIO

MICROPHONE

TWO-WAY FM MOBILE COMBINATIONS



EXTERNAL SPEAKER (OPTIONAL)

GENERAL ELECTRIC

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WARNING

Although the highest DC voltage in CENTURY II Mobile Equipment is supplied by the vehicle battery, high currents may be drawn under short circuit conditions. These currents can possibly heat metal objects such as tools, rings, watchbands, etc., enough to cause burns. Be careful when working near energized circuits!

High-level RF energy in the transmitter Power Amplifier assembly can cause RF burns upon contact. Keep away from these circuits when the transmitter is energized!

SYSTEM SPECIFICATIONS*
(EIA AND CEPT UNLESS OTHERWISE NOTED)

FREQUENCY RANGE	420-512 MHz
BATTERY DRAIN	
Receiver	
Squelched	200 milliamperes
Unsquelched	650 milliamperes
Transmitter	
KT-179-A	1.8 Amperes @ 13.8 Volts
KT-180-A, KT-198-A	5.5 Amperes @ 13.8 Volts
FREQUENCY STABILITY	0.0005%
TEMPERATURE RANGE	-30°C (-22°F) to +60°C (140°F)
DUTY CYCLE	20% Transmit, 80% Receive
DIMENSIONS, LESS ACCESSORIES (H X W X D)	60 mm X 180 mm X 190 mm (2.3 X 7.3 X 7.4 inches)
WEIGHT, LESS ACCESSORIES	1.7 kg (3.7 pounds)

TRANSMITTER

POWER OUTPUT	
KT-179-A	2 to 5 Watts (420-470 MHz)
KT-180-A	7 to 20 Watts (420-470 MHz)
KT-198-A	6 to 18 Watts (470-494 MHz)
KT-198-A	5 to 15 Watts (494-512 MHz)
SPURIOUS AND HARMONIC EMISSION	-50 dB (5 Watts) (FCC) -56 dB (20 Watts) (FCC)
MODULATION	±4.5 kHz
AUDIO SENSITIVITY	65 to 120 Millivolts
AUDIO FREQUENCY CHARACTERISTICS	Within +1 dB to -3 dB of a 6 dB/octave pre-emphasis from 300 to 3000 Hz per EIA standards. Post limiter filter per FCC and EIA.
DISTORTION	Less than 3% (1000 Hz) Less than 5% (300 to 3000 Hz)
DEVIATION SYMMETRY	0.5 kHz maximum

MAXIMUM FREQUENCY SPREAD

	Full Specifications	1 dB Degradation
420-470 MHz	5.5 MHz	10.5 MHz
470-494 MHz	5.5 MHz	7.0 MHz
494-512 MHz	6.0 MHz	7.0 MHz

RF OUTPUT IMPEDANCE	50 ohms

RECEIVER

ER-116-A (420-470 MHz)
ER-129-A (470-572 MHz)

AUDIO OUTPUT (to 4.0 ohms speaker)	3 Watts (less than 5% distortion) EIA 1.5 Watts (less than 5% distortion) CEPT
SENSITIVITY	
12 dB SINAD (EIA Method)	0.40 µV
20 dB Quieting Method	0.45 µV
20 dB SINAD (CEPT**)	0.75 µV
SELECTIVITY	
EIA Two-Signal Method	-85 dB @ ±25 kHz (EIA) -75 dB (CEPT)
SPURIOUS RESPONSE	-85 dB
INTERMODULATION	-75 dB
MODULATION ACCEPTANCE	±7.0 kHz
SQUELCH SENSITIVITY	<8 dB SINAD

MAXIMUM FREQUENCY SPREAD

	Full Specifications	3.0 dB Degradation
420-512 MHz	2.0 MHz	3.0 MHz

FREQUENCY RESPONSE	Within +1 and -1.5 dB of a standard CEPT 6 dB per octave de-emphasis curve from 400 to 2700 Hz (1000 Hz reference) Also fits +1 to -3 dB from 300 to 3000 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.

** ΔF 60% X ΔF Max. F mod = 1 kHz. Measured with psophometric filter.

ADDENDUM #1 TO LBI30936

This addendum lists the CUSTOMER PREFERRED PACKAGES covered in this manual.

CUSTOMER PREFERRED PACKAGES

M5A01 through M5A24, and M5A37 through M5A48.

DESCRIPTION	PACKAGE ORDERING NUMBER	PUBLICATION NUMBER
UHF MOBILE	M5A01 - M5A04	LBI30936
	M5A05 - M5A08	LBI30936 & LBI30893
	M5A09 - M5A12	LBI30936 & LBI30937
	M5A13 - M5A16	LBI30936, LBI30937 & LBI30893
	M5A17 - M5A20	LBI30936, LBI30939 & LBI30893
	M5A21 - M5A24	LBI30936, LBI30937 & LBI30893
UHF & POWER SUPPLY	M5A37 - M5A38	LBI30936 & LBI30777
	M5A39 - M5A40	LBI30936, LBI30893 & LBI30777
	M5A41 - M5A42	LBI30936, LBI30893 & LBI30777
	M5A43 - M5A44	LBI30936 & LBI30777
	M5A45 - M5A46	LBI30936, LBI30893 & LBI30777
	M5A47 - M5A48	LBI30936, LBI30893 & LBI30777

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

GENERAL ELECTRIC*
U.S.A.

COMBINATION NOMENCLATURE

DIGITS 1 & 2	DIGIT 3	DIGIT 4	DIGIT 5	DIGIT 6	DIGIT 7–9	DIGIT 10	DIGIT 11	DIGIT 12	DIGIT 13	DIGIT 14	DIGIT 15	DIGIT 16	DIGIT 17
Product Code	Transmit Frequency Range	Receive Frequency Range	Channel Spacing	Type	RF Power Output	Freq. Capacity	Control	Assembled	Oscillator Stability	Mechanical Package	System Voltage	Receiver Type	Audio Power
M5	**T** 420-450 MHz	**T** 420-450 MHz	**2** 25 kHz	**C** FCC Spec	**005** 5-watts	**A** 1 Tx 1 Rx	**0** Standard	**U** MRPD	**B** ±5 PPM	**0** Standard	**0** + 12 VDC (Neg. Gnd. only)	**0** Standard	**0** 3-watts
	U 440-470 MHz	**U** 440-470 MHz		**T***	**020** 20-watts	**B** 2 Tx 1 Rx					**1** AC Power Supply	**T** Alt. 2nd Osc. Crystal	
	V 470-494 MHz	**V** 470-494 MHz			**003** 3-watts	**C** 2 Tx 2 Rx					**2** AC Power Supply w/ DC Remote		
	W 484-512 MHz	**W** 484-512 MHz			**015** 15-watts	**D** 1 Tx 2 Rx							
					018 18-watts	**F** 4 Tx 4 Rx							
						H 6 Tx 6 Rx							

* Combinations with the sixth digit "T" are primarily for International use. These combinations have a frequency range of 146-174 MHz.

STRUCTURED OPTIONS

DIGIT A Transmit Frequencies	DIGIT B Receive Frequencies	DIGIT C Option Deck	DIGIT D Channel Guard	DIGIT H DTMF Encoder	DIGIT J Carrier Control Timer	DIGIT R Mounting Hardware	DIGIT S Front Cap	DIGIT T Universal Tone Cable
0 None	**0** None	**0** None	**0** None	**0** None	**0** None	**0** None	**0** Standard	**0** None
A 1–Tx	**A** 1–Rx	**A** T–99 Dec (2–Tone)	**C** 1-Freq. Enc/Dec	**1** DTMF Encoder	**1** CCT (1-minute)	**1** Standard Bracket	**1** Private Brandable	**1** Tone Cable
C 2–Tx	**C** 2–Rx	**B** T–99 Dec (4–Tone)	**D** 1–Freq. (Dec only)			**2** Front Access		
E 3–Tx	**E** 3–Rx	**C** T–99 Dec (2-Tone w/ Ext. Alarm)	**E** 1–Freq. (Enc only)			**3** Desk Top Stand		
F 4–Tx	**F** 4–Rx	**D** T–99 Dec (4-Tone w/ Ext. Alarm)	**F** Tone Reject Filter					
G 5–Tx	**G** 5–Rx	**G** PA Int. Spkr. Switch						
H 6–Tx	**H** 6–Rx	**H** PA Int.–Ext. Spkr. Switch						
		L Channel Busy Light						

DESCRIPTION

General Electric Century II mobile combinations are fully transistored -- utilizing both discrete components and integrated circuits (IC's) for high reliability. The radio is a self-contained, FM transmitter/receiver with built-in controls and speaker. Its small size makes it ideal for front mounting in conventional vehicles. The standard combinations may be equipped with the following:

- One through six frequencies.
- Plug-in crystals for ±0.0005% oscillator stability.
- Channel Guard (tone squelch).

The radio consists of an effective, heat-dissapating, aluminum die cast "H" frame on which two circuit boards are mounted. The transmitter/receiver board is mounted on the bottom of the "H" frame and includes all RF and audio circuitry for a single frequency radio. The top board contains all interconnections, and the multi-frequency oscillator circuits when present. In radios equipped with Channel Guard, the Channel Guard option also mounts in the top section of the "H" frame. All external connectors, controls and indicators are mounted directly on the two boards for reliability and ease of disassembly. A two section 7-segment display board is mounted on the multi-frequency board immediately behind the display window (multi-frequency units only).

The boards plug into each other, eliminating the need for interconnecting wires. In a standard single-frequency model, the only wires used in a single-frequency radio without options are for the plug-in leads for 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 three standard operator controls: A POWER On/Off pushbutton, a SQUELCH pushbutton (fixed squelch monitor), and a rotary, edge mounted Volume control. A red Transmit indicator LED (light Emitting Diode) and a green power on indicator are provided.

In multi-frequency radios, a 7-segment display board with a momentary push-to-select switch is provided. Each time the switch is operated, the channel selected advances by one. The LED display doubles as the Power On 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. Loosening the two screws in the rear of the top cover provides access to the interconnect or multi-frequency/interconnect board. Loosening the three screws in the rear of the bottom cover provides access to the transmitter/receiver board. An optional set of test probes can be plugged onto the test pins on the board for alignment and troubleshooting. Measurements can be made using GE Test Set 4EX3A11 or a multimeter.

TRANSMITTER

The transmitter consists of an FM exciter with an audio processor and a broadband, fixed-tuned power amplifier. The RF power output level is internally adjustable from 1/3 to rated power. Once the level is set, a sensing control circuit holds it constant as temperature and/or voltage vary within specified limits.

Frequency stability for both the transmitter and receiver is maintained by an electronic compensation network.

RECEIVER

The dual conversion receiver consists of a front end section and two mixer/IF sections operating at 21.4 MHz and 455 kHz. The receiver also contains a squelch and audio section. The audio section provides a 3 Watt audio output into a 4 ohm load.

AC POWER SUPPLY OPTION

To use the radio as a base station, an optional 121 Volt AC, 60 Hertz power supply is available. An eight foot cable connects the power supply to the radio. The cable length permits the power supply to be located away from the radio. A green Power On LED is located on the front panel of the power supply.

MICROPHONE

Century II mobile combinations use a dynamic microphone with a built-in transistorized pre-amplifier. 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.

HOOKSWITCH

In Channel Guard or Type 99 Decoder applications, a microphone hookswitch is supplied with the radio. The hookswitch is equipped with a Channel Guard disable switch.

Placing the switch in the "up" position (towards the small speaker symbol) disables the receive Channel Guard. With the switch in the "down" position, the Channel Guard is disabled when the microphone is removed from the hookswitch.

EXTERNAL SPEAKER (OPTIONAL)

A five-inch speaker, contained in a LEXAN® housing, provides an audio output of 3 Watts. The speaker impedance is 3.2 ohms. The speaker leads are connected to pins 3 and 7 of Systems Plug P910. When the External Speaker is used, the jumper from H15 to H16 on the Interconnect/Multi-frequency board is removed to disconnect the built-in speaker from the audio output circuit. A LEXAN® bracket is supplied for mounting.

OPERATION

Complete operating instructions for the Two-Way Radio are provided in a separate Operator's Manual. The basic procedures for receiving and transmitting messages follows:

TO RECEIVE A MESSAGE

1. Turn the radio on by pushing in the POWER pushbutton.
2. Push in the SQUELCH button to disable the squelch circuit (and tone option if present). Adjust the volume control for a comfortable listening level and then push the SQUELCH button in again and release it for normal operation.

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 PTT switch on the microphone and speak across the face of the microphone in a normal voice level. Release the PTT switch as soon as the message has been given. The red indicator light on the control panel will glow each time the microphone PTT switch is pressed, indicating that the transmitter is on the air. The receiver is muted when the transmitter is keyed.

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 a First or Second Class FCC Radiotelephone license (where required).

TRANSMITTER ADJUSTMENT

The adjustment for the transmitter includes measuring the forward and reflected power and adjusting the antenna length for optimum VSWR 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 or other authority). 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 (see Table of Contents).

RECEIVER ADJUSTMENT

The initial adjustment for the receiver includes tuning the input circuit to match the antenna. For the Receiver Adjustment Procedure, refer to the Alignment Procedure (see Table of Contents).

RE-INSTALLATION

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

CIRCUIT ANALYSIS

TRANSMITTER

Century II transmitters utilize a crystal controlled frequency modulated exciter, for 1 through 6 frequency operation in the 420-512 MHz frequency band. The solid state transmitter uses integrated circuits and discrete components for increased reliability. The transmitter consists of audio processor U101; oscillator Q151; exciter Q201 through Q204; PA Q205 and Q206, and power control circuit Q207 through Q210. The exciter provides approximately 100 milliwatts modulated RF to the PA which provides rated output power. Figure 1 is a block diagram of the Century II radio showing both the transmitter and receiver.

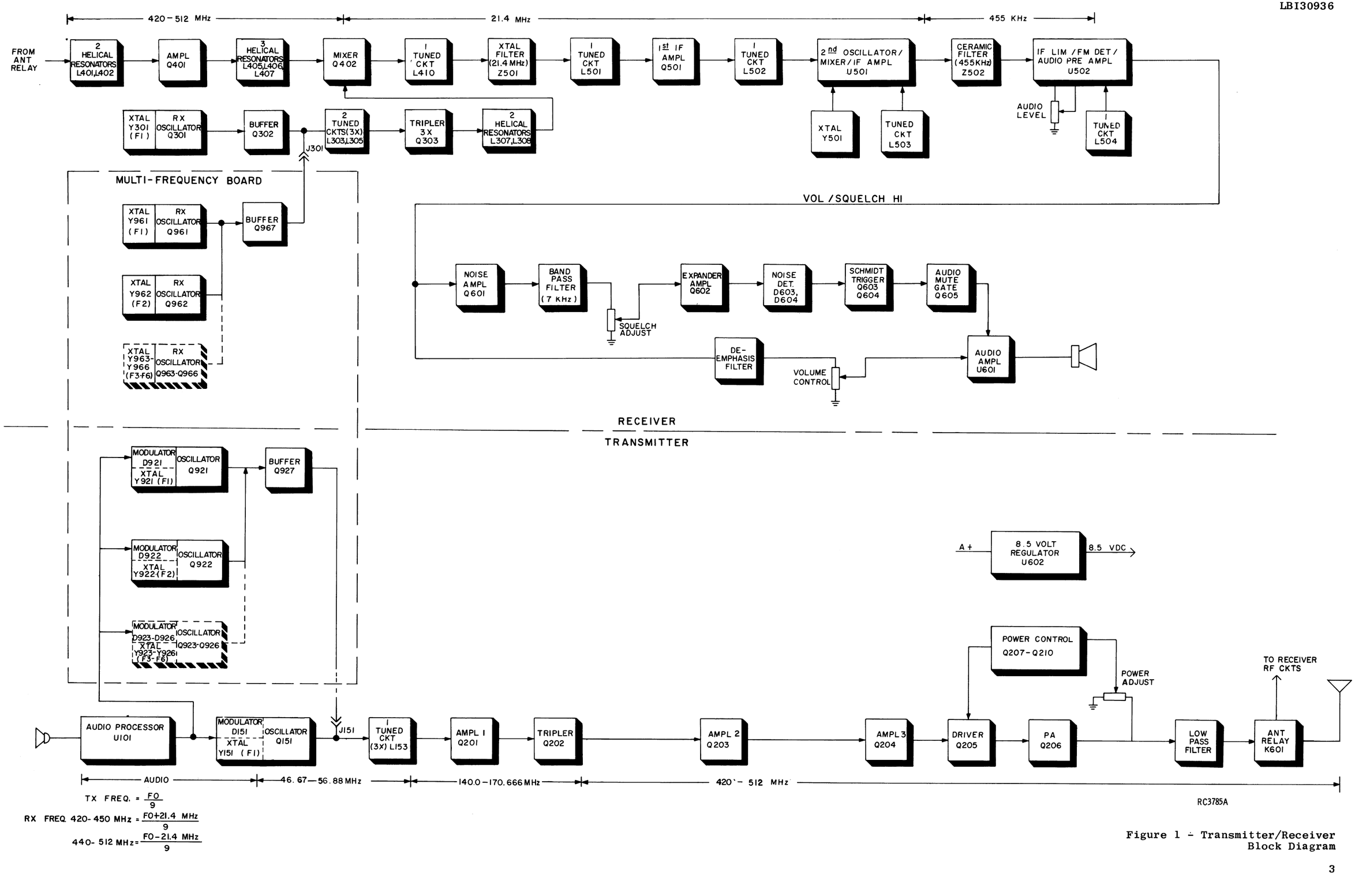


Figure 1 - Transmitter/Receiver Block Diagram

AUDIO PROCESSOR U101

The audio processor provides audio pre-emphasis with amplitude limiting and post limiter filtering. A total gain of approximately 24 dB is realized through the audio processor. 20 dB is provided by U101B and 4 dB by U101A.

The 8.5 Volt regulator powers the audio processor and applies regulated +8.5V through P903-2 to a voltage divider consisting of R108 and R110. The +4.25V output from the voltage divider establishes the operating reference point for both operational amplifiers. C107 provides an AC ground at the summing input of both operational amplifiers.

Resistors R105, R106 and R107 and diodes D101 and D102 provide limiting for U101B. Diodes D101 and D102 are reverse biased at +1.7 VDC. Voltage divider network R105, R106 and R107, provides +5.9 VDC at the cathode of D101 and +2.6 VDC at the anode of D102. The voltage at the junction of D101 and D102 is 4.25 VDC. C102 and C103 permit a DC level change between U101B-7 and the voltage divider network for diode biasing.

When the input signal to U101B-6 is of a magnitude such that the amplifier output at U101B-7 does not exceed 4 volts P-P, the amplifier provides a nominal 20 dB gain. When the audio signal level at U101B-7 exceeds 4 volts PP, diodes D101 and D102 conduct on the positive and negative half cycles providing 100% negative feedback to reduce the amplifier gain to 1. This limits the audio amplitude at U101B-7 to 5 volts PP.

Resistors R102, R103 and R104 and C104 comprise the audio pre-emphasis network that enhances the signal to noise ratio. R104 and C104 control the pre-emphasis curve below limiting. R103 and C104 control the cut-off point for high frequency pre-emphasis. As high frequencies are attenuated, the gain of U101 is increased.

Audio from the microphone is coupled to the audio processor through C904 and R903 on the interconnect board to the input of operational amplifier U101B-6.

The amplified output of U101B is coupled through audio MOD ADJ control R116, C106, R112 and R113 to a second operational amplifier U101A. Audio MOD ADJ control R116 is set for a deviation of 4.5 kHz.

The Channel Guard tone input is applied to U101A-6 through P101-2 and R113 to P102-5. The CG tone is then combined with the microphone audio. U101A provides a signal gain of approximately 4 dB.

A post limiter filter consisting of U101A, R112-R114, C108 and C109 provides 12 dB per octave roll-off. R109 and C111 provide an additional 6 dB per octave roll-off for a total of 18 dB.

SERVICE NOTE

R112-R114 are 1% resistors. This tolerance must be maintained to assure proper operation of the post limiter filter. Use exact replacements.

The output of the post limiter filter is coupled through C110 to the temperature compensated transmitter oscillator Q151, or through P101-4 to the multi-frequency board.

TRANSMIT OSCILLATOR

The output of the audio processor is coupled to transmit oscillator Q151 through R154 and C153. A temperature compensating network consisting of R151, R152, R153, R160, D152 and C151 maintains oscillator frequency over a temperature range of -30°C to +60°C. The temperature compensating DC voltage and audio is applied to FM modulator D151 through R154. The modulator varactor D151 varies the transmit frequency at the audio rate applied from the audio processor.

Q151, Y151 and associated circuitry comprise a Colpitts oscillator which generates the third subharmonic of the RF carrier frequency. The transmit oscillator frequency is adjusted to the assigned operating frequency by L151. A tuned circuit, L153, C157 and C158, selects the 3rd harmonic of the crystal frequency which is coupled through C201 to amplifier Q201.

EXCITER AMPLIFIERS

The output of amplifier Q201 is coupled to tripler Q202 through two tuned circuits, L203 and L204, and can be monitored at TP201. The voltage at TP201 is typically 0.2 VDC.

The output of tripler Q202 is coupled through two tuned circuits (L208 and C213, L209 and C215) and coupling capacitors C214 and C216 to the base of amplifier Q203. C213 and C215 are tuned to the operating frequency. The output of Q202 can be monitored at TP202 and typically is 0.65 VDC. The exciter output is taken from the collector of Q203 and coupled to the base of class C amplifier Q204 through an impedance matching network, a 50 ohm microstrip W201 and a second impedance matching network. The exciter output is a nominal 100 milliwatts. The first impedance matching network consisting of L211, L212, C219 and C221 through C225 matches the collector impedance of Q203 to microstrip W201. The second impedance matching network consisting of C230-C232 and L216 and L217 matches the 50 ohm microstrip to the base of amplifier Q204. The RF input

to Q204 can be monitored at TP204 and typically is 0.5 volts using the Tx RF Detector probe. TP204 may also be used to monitor the transmitter operating frequency. The output of amplifier Q203 can be monitored at TP203 and is typically 0.6 VDC. C221 and C223 are tuned to the operating frequency. The output is taken from the collector of Q204 and coupled through an impedance matching network consisting of L219-L222 and C234-C237 to the base of PA driver Q205.

POWER AMPLIFIER

The three stage power amplifier consists of Amplifier Q204, driver Q205 and power amplifier Q206 and associated circuitry. Collector voltage for driver Q205 is applied from A+ through power control transistor Q207 and Z201. The collector voltage for Q205 is a result of the output power setting and voltage variations at any given time. The output of driver Q205 is coupled to the base of Power Amplifier Q206 through an impedance matching network consisting of C241-C243, L225-L227. The output of the power amplifier is coupled to the antenna through a low pass filter and antenna Tx/Rx relay K601. Collector voltage for Q206 is provided from A+ through Z102. In the 5 Watt PA, Q206 and associated circuitry are removed. L234 is added.

RF POWER ADJUST CIRCUIT

The output power adjust circuit allows the output power to be set over a 3:1 range from rated to 1/3 of rated output power. The power adjustment is attained by controlling the DC collector voltage to driver Q205 through pass transistor Q207. The pass transistor is controlled by a feedback loop consisting of Q208-Q210. The power is set by potentiometer R215.

A change in output power is sensed by D201 causing the base voltage of Q210 to change accordingly. For example, if the output power increases, the base of Q210 goes more positive, causing it to increase conduction which lowers its collector voltage. Q210 controls Q209, therefore as Q210 increases conduction Q209 decreases conduction and raises the voltage applied to the base of Q208. The conduction of Q208 decreases proportionally, lowering the base voltage of pass transistor Q207. The resulting decrease in conduction of Q207 lowers the collector voltage of driver Q205, thereby lowering the output power in proportion to the excessive power originally sensed by the base circuit of Q210.

In multi-frequency applications (except radio operations in the 470-512 MHz range) the transmit and receive oscillators on the transmit/receive board are disabled - only the oscillators on the multi-frequency board are active. The single-frequency transmit oscillator is disabled by removing R157; the receive oscillator is disabled by removing R309. Both resistors are located on the transmit/receive board. In radios operating in the 470-512 MHz range, all oscillators are located on the multi-frequency board.

RECEIVER

Century II receivers are dual conversion, superheterodyne FM receivers designed for one through six frequency operation in the 420-512 MHz frequency range. A regulated 8.5 volts is used for all receiver stages except for the audio PA IC, which operates from the A+ supply.

The receiver is a dual conversion superheterodyne using intermediate frequencies of 21.4 MHz and 455 kHz. Adjacent channel selectivity is obtained by using two bandpass filters: 21.4 MHz crystal filter and a 455 kHz ceramic filter.

All of the receiver circuitry is mounted on the transmitter/receiver (Tx/Rx) board. The receiver consists of:

- Receiver Front End
- 21.4 MHz 1st IF circuitry
- 1st and 2nd Oscillators
- 455 kHz 2nd IF circuitry with FM Detector
- Audio PA Circuit
- Squelch Circuit

RECEIVER FRONT END

An RF signal from the antenna is coupled through antenna relay K601 and two helical resonators (L401 and L402) to the base of RF amplifier Q401. The output of Q401 is coupled through three more helical resonators consisting of L405-L407 to the gate of 1st Mixer Q402. The front end selectivity is provided by the five helical resonators.

OSCILLATOR & MULTIPLIER

In single frequency radios, Q301, Y301 and associated circuitry make up a Colpitts oscillator. The frequency is controlled by a third mode crystal operated at one ninth of the required output frequency. Voltage-variable capacitor D301, L301 and Y301 are connected in series to provide compensation capability. A compensated voltage from the transmitter audio processor is applied to D301 for greater stability. L301 is adjustable to set the oscillator frequency.

R305 is in parallel with Y301 to insure operation on the third overtone of the crystal.

The output of Q301 is coupled through C308 to the emitter of buffer Q302. The output of Q302 is tuned to the third harmonic of the crystal oscillator frequency and coupled to the base of tripler Q303 by two tuned circuits consisting of L303-C307 and L305-C310-C311. (In radios operating at 470-512 MHz range, the oscillator buffer output is derived from the multi-frequency board). The output of tripler Q303 is coupled to the source input of mixer Q402 through two helical resonators consisting of L307 and L308 and coupling capacitors C316 and C414. L307 and L308 are tuned to the operating frequency minus 21.4 MHz in the 450-512 MHz band (+21.4 MHz in the 420-450 MHz band) which is the ninth multiple of the crystal frequency.

The DC level of the oscillator/multiplier chain can be monitored at TP301. The meter reading at this point is typically 0.8 VDC. The RF frequency from the oscillator/multiplier chain and input level to the mixer can be measured at TP401. The meter reading at TP401 is typically 1-3 volts as measured using the Rx RF Detector Probe.

For multi-frequency applications, R309 in the collector circuit of Q302 is removed to disconnect the oscillator circuit on the Tx/Rx board. The output from the multi-frequency oscillator board connects to J301 on the Tx/Rx board.

1ST MIXER

The 1st mixer uses a FET (Q402) as the active device. The FET mixer provides a high input impedance, high power gain and an output relatively free of harmonics (low in intermodulation products).

In the mixer stage, RF from the tuned circuits is applied to the gate of the mixer. Injection voltage from the oscillator and multiplier stages is applied to the source of the mixer. The 21.4 MHz mixer 1st IF output signal is coupled from the drain of Q402 through an impedance matching network (L410 and C410-C413) to crystal filter Z501.

The highly-selective crystal filter provides the first portion of the receiver IF selectivity. The output of the filter is coupled through impedance-matching network L501 to the 1st IF amplifier.

1ST & 2ND IF & DETECTOR STAGES

1st IF Amplifier Q501 is dual-gate MOSFET. The filter output is applied to Gate 1 of the amplifier, and the output is taken from the drain. The biasing on Gate 2 and the drain load determines the gain of the stage. The amplifier provides approximately 20 dB of IF gain. The output of Q501 is coupled through an impedance matching network (L502) that matches the amplifier output to the input of IC U501.

U501 and associated circuitry consists of the 2nd oscillator, mixer and 2nd IF amplifier. The crystal for the oscillator is Y501, and the oscillator operates at 20.945 MHz for low side injection (21.855 for high side injection). This frequency is mixed with the 21.4 MHz input. The output of the mixer is limited by D501 and D502. L503 is tuned for the 455 kHz 2nd IF frequency.

The output of U501 is coupled through ceramic filter Z502 which provides the 455 kHz selectivity, and applied to U502. Test Point TP501 is used in aligning the receiver, and can be used to check the output of U501.

U502 and associated circuitry consists of a 455 kHz limiter, a quadrature type FM detector and an audio pre-amplifier. L504 is the quadrature detector coil. Audio Level potentiometer R521 is used to set the audio output level to the audio amplifier.

AUDIO AND SQUELCH CIRCUITS

Audio

In radios without Channel Guard, audio (VOL/SQ HI) is coupled through P903-3 to the interconnect board and then back to P903-7. The audio passes through the de-emphasis network (R902 on the interconnect board, R629, C607 and C608) to Volume Control R630. In radios with Channel Guard, audio is applied to the Channel Guard tone reject filter through P903-3 and back to the de-emphasis network through P903-7. For system interface with other options, refer to the applicable option Maintenance Manual.

The audio amplifier IC (U601) drives the speaker at the desired audio level (up to three watts). The feedback loop containing R633, R634 and C610 determines the amplifiers closed loop gain. R631 and C612 provide the high audio frequency roll-off above 6 kHz.

The audio amplifier can be muted by a DC voltage from the receiver mute gate (Q605) which uses different logic inputs. These inputs are 8.5 V Tx, Squelch Cancel or a squelch signal. In Channel Guard applications, the Rx MUTE function from the Channel Guard board is applied through P903-4.

Squelch

The squelch circuit operates on the noise components contained in the FM detector output. The output of U502 is applied to frequency selective noise amplifier Q601

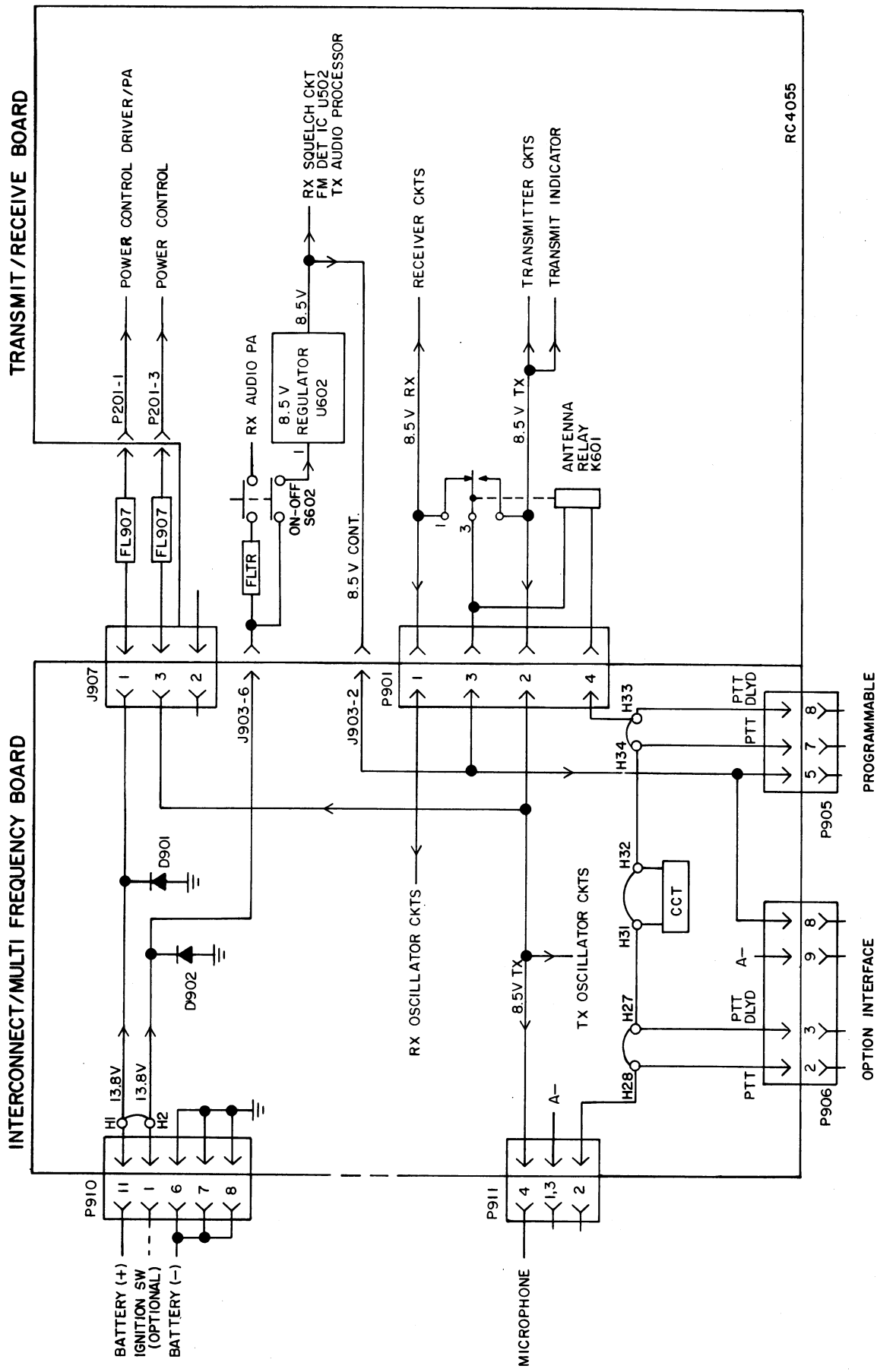


Figure 2 - Power Distribution

that has a resonant circuit (L601, R604 and C602) as the collector load. The output is noise in a band around 7 kHz.

The noise output is coupled through Squelch control R607 to expander amplifier Q602 which improves the level discrimination characteristics of the circuit. The output of Q602 is applied to a passive voltage doubler circuit (D603 and D604). This circuit has a high source impedance and operates as an average value rectifier.

Following the voltage doubler is a Schmidt Trigger (Q603-Q604). The Schmidt Trigger privides the necessary hysteresis and a well-defined output signal for Rx mute gate Q605.

With no RF signal present, the detected noise at the voltage doubler output turns on Q603, turning off Q604. This causes Q605 to turn on, applying +1.4 volts to pin 2 of audio amplifier U601. This voltage turns off U601 and mutes the receiver.

When an RF signal is received, the noise at the output of Q601 decreases and drive to Q603 is removed. This turns off Q603 and allows Q604 to turn on. With Q604 turned on, RX mute gate Q605 turns off. This turns on U601 so that audio is heard at the speaker.

The squelch sensitivity is adjusted by R607 in the base circuit of expander amplifier Q602.

Pressing in the SQUELCH Cancel pushbutton on the front of the radio grounds the base of Q601 and disables the squelch function.

POWER DISTRIBUTION

The battery voltage (A+) connects to the radio through J910-1 and J910-11 at the rear system connector to the interconnect board. Both inputs are connected to reverse polarity protection diodes D901 and D902. The ground lead is coupled through the same connector and is connected to chassis ground through a fusable printed wiring run which will open if the ground wire is accidently connected to A+.

One battery input goes directly from the interconnect board through a feed-through capacitor in FL907 to the transmitter PA stages. The other input feeds through P803-6 to the main board for two functions. One branch for the audio amplifier passes through an RC-ripple filter (R638, and C618) and one of the sections of POWER On/Off switch S602. The other section of the POWER On/Off switch controls the A+ to voltage regulator U602. The regulator output is fixed at 8.5 V by means of a selected resistor (R636). Refer to the Receiver Schematic Diagram for resistor selection instructions.

Regulated 8.5 Volts is switched to either the receiver or the transmitter by the antenna relay. The antenna relay is also powered by the 8.5 Volt regulated supply. The non-latching relay is operated by the PTT switch on the microphone, completing the path to A-.

The squelch circuit, the audio processor and parts of the IF amplifier U502 are supplied directly from the continuous 8.5 V supply.

The receiver front-end, the receiver oscillator, the 21.4 MHz IF stages and the second oscillator are supplied from 8.5 V Rx. The transmitter oscillator and the exciter are supplied from 8.5 V Tx.

CHANNEL BUSY INDICATOR

The Channel Busy Indicator turns on each time a carrier is received. When the receiver is unsquelched +1.7 V is applied to the base of Q1901 through J604 on the Tx/Rx board, Q1901 turning Q1901 on. Q1901 turns on Q1902 which grounds the cathode of Channel Busy Indicator D1902 causing it to light.

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.

CARRIER CONTROL TIMER

The Carrier Control Timer (CTT) shuts off the transmitter carrier after a pre-set timing cycle, and alerts the operator that the transmitter is off by an alert tone from the speaker.

The CCT consists of an integrated circuit (IC) and an external timing resistor mounted on the Interconnect/Multi-frequency board. The timing cycle can be set for a duration of 30 seconds to 3 minutes (in five steps) by changing the value of the timing resistor. The CCT is normally shipped from the factory with a one minute timing cycle. A simplified diagram of the CCT with a timing resistor chart is shown in Figure 3.

The CCT is connected in series with the PTT lead, and consists basically of an adjustable frequency oscillator and a counter. The counter consists of a gate latch circuit and a divider (divide by 2048).

Keying the microphone starts the counter, which takes approximately 60 seconds (with 1 minute timing resistor) to count 2048 periods.

When the counting function times out, the switched PTT stage in the IC opens the PTT function and places the radio in the receive mode. At the same time, the CG disable lead goes low to inhibit the CG receiver muting function (if Channel Guard is present). Also, the oscillator output switches to approximately 1000 Hz for the alert tone. The tone is applied to the receiver audio amplifier and then to the loudspeaker.

Releasing the PTT switch shuts off the alert tone and resets all of the circuits so that the sequence will start again each time the PTT switch on the microphone is pressed.

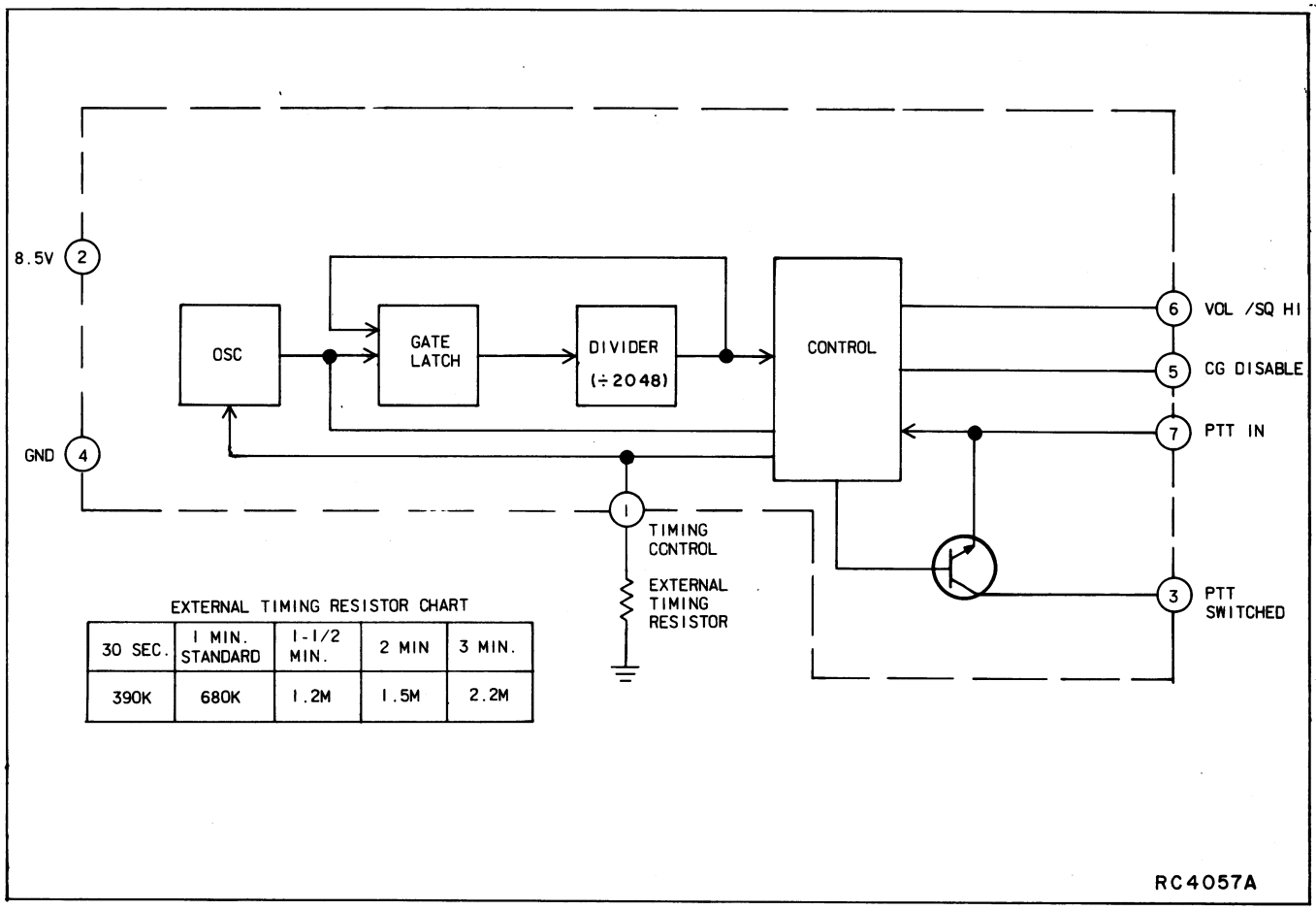


Figure 3 - Simplified Diagram of CCT

MAINTENANCE

PREVENTIVE MAINTENANCE

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

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 or other authority. Normally, these checks are made when the unit is first put into operation, after the first six months and once a year thereafter.		X

DISASSEMBLY

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

1. Remove the top and bottom covers.
2. Remove the four screws securing the front panel to the "H" frame. Disconnect the speaker, plug and remove the front panel.
3. Remove the six screws securing the RF shield.
4. Unplug the 7-segment leads as well as the option leads.
5. Remove the two screws in PA transistor Q206.
6. Turn the radio over and remove the hex screw post and washer from the stud of Driver transistor Q205.

7. Remove the 7 screws securing the Tx-Rx board and carefully lift up the board off of the interconnections pins.

- To remove the interconnect/multi-frequency board:

1. Remove the top cover.

2. In multi-frequency units, remove the five screws securing the RF shield.

3. Remove the five screws securing the board and carefully lift the board up to disconnect the interconnection pins.

DRIVER AND PA TRANSISTOR REPLACEMENT (Q205, Q206)

WARNING

The stud mounted RF Power Transistors used in the transmitter contain Beryllium Oxide, a TOXIC substance. If the ceramic or other encapsulation is opened, crushed, broken or abraded, the dust may be hazardous if inhaled. Use care in replacing transistors of this type.

To replace PA RF transistors Q205 and Q206:

1. Remove Tx/Rx board.

2. Unsolder one lead at a time with a 50 watt soldering iron. Use a scribe or X-acto® knife to hold the lead away from the printed circuit board until the solder cools.

3. Lift out the transistor, and remove the old solder from the printed circuit board with a de-soldering tool such as a SOLDA PULLT®. Special care should be taken to prevent damage to the printed circuit board runs because part of the matching network is included in the base and collector runs.

4. Trim the new transistor leads (if required) to the lead length of the removed transistor. The letter "C" on the top of the transistor also indicates the collector (See Figures 4 and 5 for transistor lead identification).

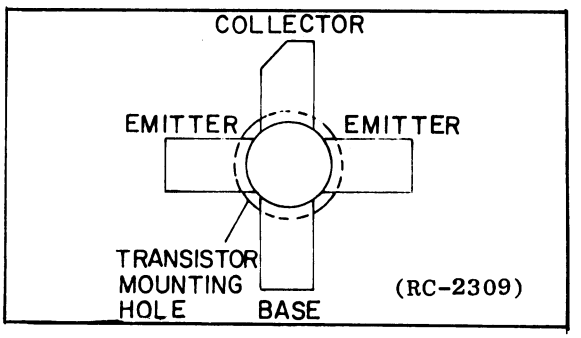
5. Apply a coat of silicon grease between the mounting surfaces of the spacer and to both sides of the insulator of Q205 and between the mounting surfaces of Q206 and the heat sink. Place the transistor in the mounting hole. Align the leads as shown on the Outline Diagram. Then hold the body of the transistor and replace the transistor mounting hardware, using moderate torque of 0.678 Newton meters (N.m) or 6 inch pounds) for No. 4 screw size or 0.9 N.m (8 inch pounds) for 8-32 nut. A torque wrench must be used for this adjustment since transistor damage can result if too little or too much torque is used.

6. Solder the leads to the printed circuit pattern. Start at the inner edge of mounting hold and solder the remaining length of transistor lead to the board. Use care not to use excessive heat that causes the printed wire board runs to lift up from the board. Check for shorts and solder bridges.

CAUTION

Failure to solder the transistor leads as directed may result in the generation of RF loops that could damage the transistor or may cause low power output.

7. Replace Tx/Rx board and reassemble radio.



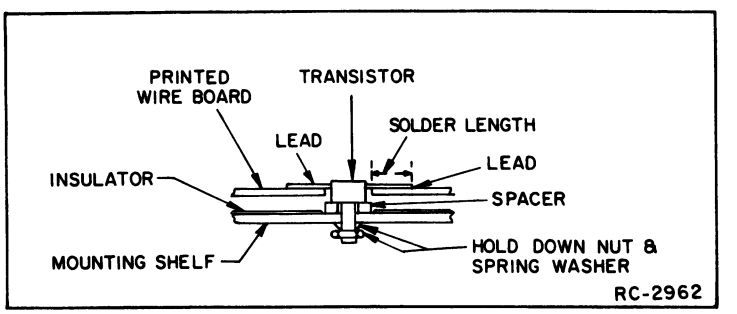


Figure 4 - Q205 Lead Identification

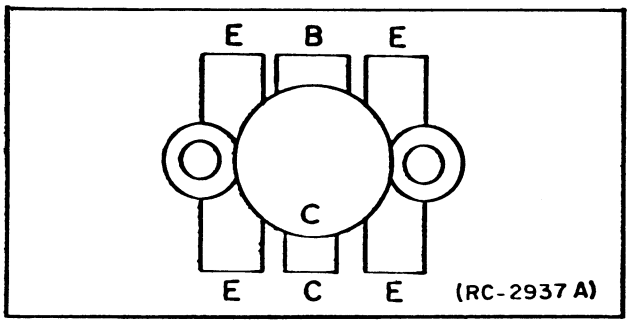


Figure 5 - Q206 Lead Identification

REMOVING IC'S

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.

TEST AND TROUBLESHOOTING PROCEDURES

Maintenance of your Century II 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 for your reference when troubleshooting.

Troubleshooting charts are provided for most major problems that might arise in the Transmitter/Receiver section of the radio. Refer to Figure 6 when servicing the transmitter and to Figure 7 when servicing the 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. A majority of the signals and voltages pass through the connectors on the interconnect/multi-frequency 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 to create an open circuit. Signals paths that may be isolated include: CG Tone, Volume SQ HI, filtered volume squelch HI PTT, Rx MUTE, CG DISABLE, SPKR HI and on multi-frequency radios the Tx/Rx oscillator compensation voltage.

TEST POINTS

RF Detector probes for the transmitter and receiver section are available for alignment purposes and to monitor the exciter output at TP204, 1st receiver injection at TP401 and the 2nd IF at TP501. An RF signal probe also is available to monitor the transmitter frequency.

Seven test points are provided at critical circuit locations to monitor operation.

They are as follows:

TRANSMITTER		RECEIVER	
TP201	Transmitter Oscillator/Exciter Ampl-1	TP301	Tripler Output - Q303
TP202	Tripler	TP401	Receiver 1st oscillator injection
TP203	Exciter Ampl-2	TP501	455 kHz IF
TP204	Exciter RF Input to Ampl-3		

CAUTION

Before bench testing the radio, be sure of the output voltage characteristics of your bench power supply.

To protect the transmitter power output transistors from possible instant destruction, the following input voltages must not be exceeded:

Transmitter unkeyed: 20 Volts

Transmitter keyed (50 ohm resistive load): 18 Volts

Transmitter keyed (no load or non-resistive load): 15.5 Volts

These voltages are specified at the normal vehicle battery terminals of the radio and take the voltage drop of standard cables into account. The voltage limits shown for a non-optimum load is for "worst case" conditions. For antenna mismatches likely to be encountered in practice, the actual limit will approach the 18 Volt figure.

Routine transmitter tests should be performed at EIA Standard Test Voltages (13.8 VDC for loads of 0 to 6 amperes: Input voltages must not exceed the limits shown, even for transient peaks of short duration.

Many commonly used bench power supplies cannot meet these requirements for load regulation and transient voltage suppression. Bench supplies which employ "brute force" regulation and filtering may be usable when operated in parallel with a 12 Volt automotive storage battery.

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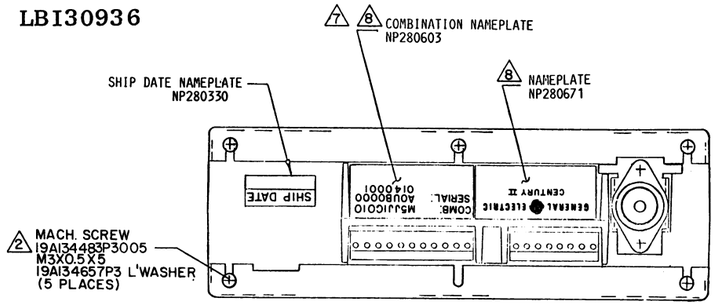
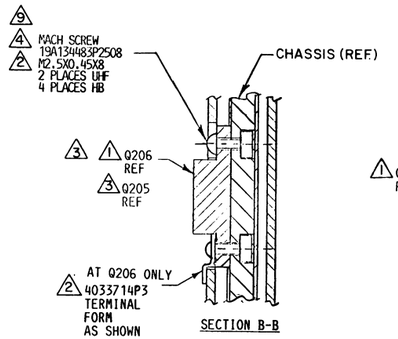
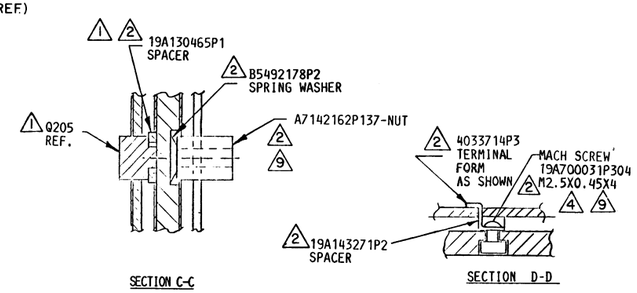
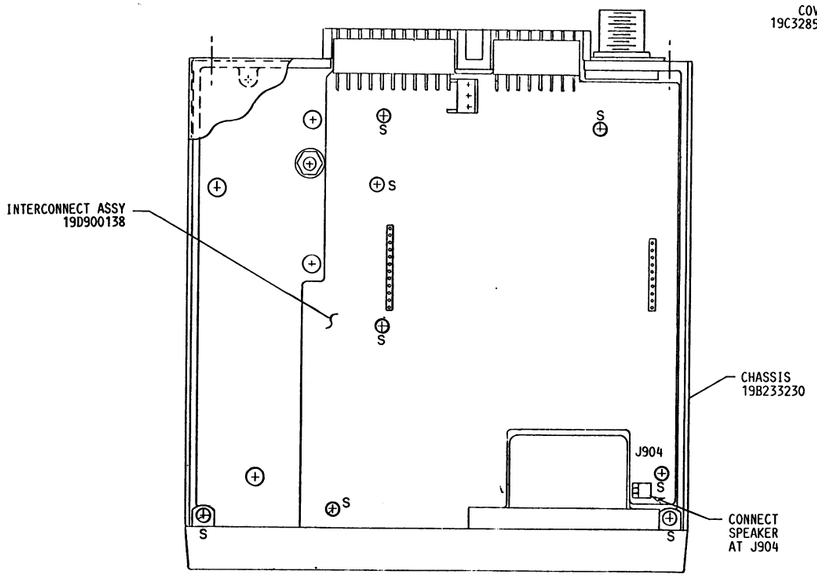
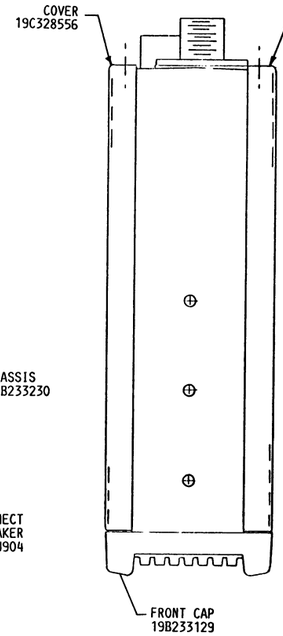
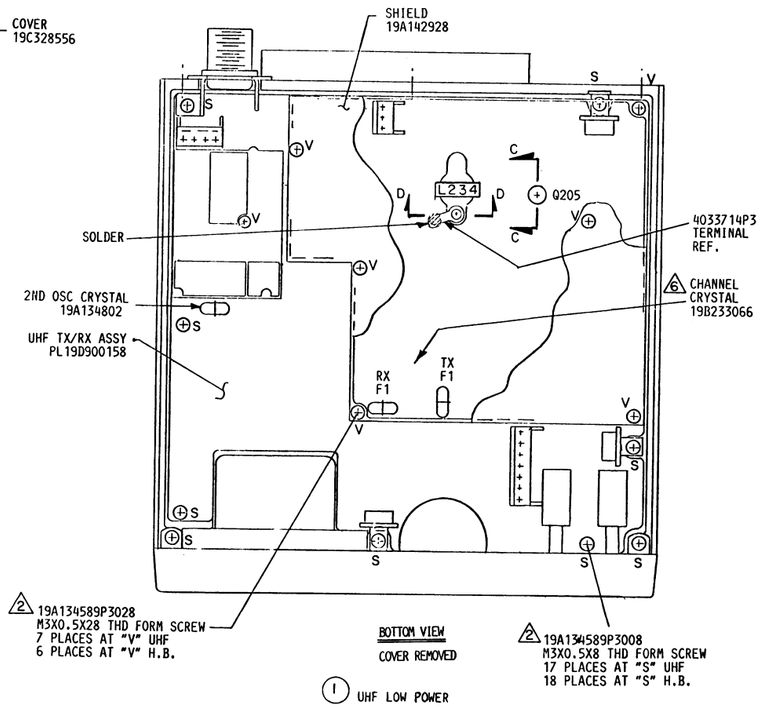


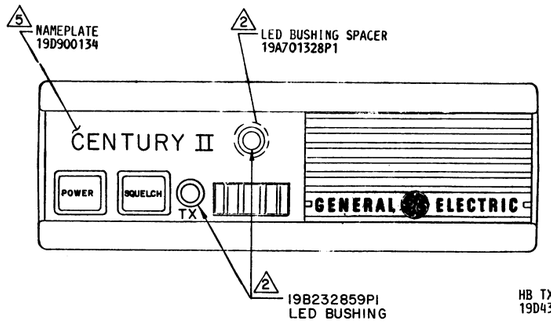


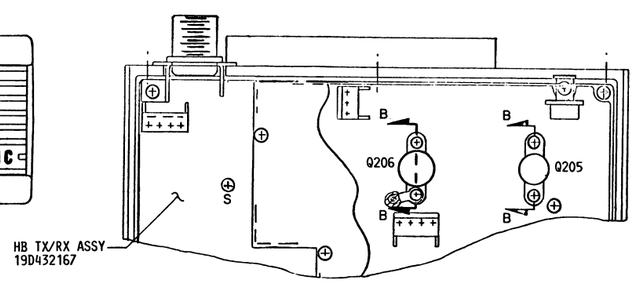


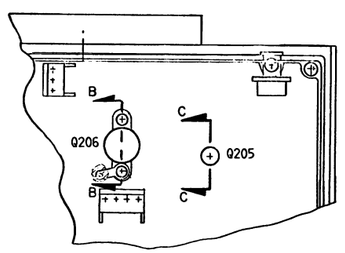












PART NO.	DISCRIPTION
1	UHF, LOW POWER
2	UHF, HIGH POWER
3	HB, LOW AND HIGH POWER
4	FREQ. CAPACITY 2 TX, 1 RX HB, UHF
5	FREQ. CAPACITY 2 TX, 2 RX HB, UHF
6	FREQ. CAPACITY 1 TX, 2 RX HB, UHF
7	FREQ. CAPACITY 4 TX, 4 RX HB, UHF
8	FREQ. CAPACITY 6 TX, 6 RX HB, UHF
9	PROGRAMMABLE ENCODE DECODE C.G.
10	PROGRAMMABLE DECODE ONLY C.G.
11	PROGRAMMABLE ENCODE ONLY C.G.
12	HOOKSWITCH APPLICATION
13	10 PPM MOD.
14	SHIELDING KIT FOR DOC RADIATION
15	DC REMOTE MOD.
16	DESK MICROPHONE, CG OR T99 DECODER
17	DTMF ENCODER
18	AC POWER SUPPLY MOD.
19	T99 DECODER, 2 TONE
20	T99 DECODER, 4 TONE
21	EXT ALARM SWITCH - T99 DEC.
22	PUBLIC ADDRESS
23	EXT SPKR SWITCH-PA
24	CHANNEL BUSY LIGHT
25	CARRIER CONTROL TIMER
26	UNIVERSAL TONE CABLE
27	EXTERNAL SPKR APPL
28	TONE REJECT FILTER ONLY
29	FREQ. CAPACITY 1 TX/1 RX UHF-X
30	FREQ. CAPACITY 2 TX/1 RX UHF-X
31	FREQ. CAPACITY 2 TX/2 RX UHF-X
32	FREQ. CAPACITY 1 TX/2 RX UHF-X
33	FREQ. CAPACITY 4 TX/4 RX UHF-X
34	FREQ. CAPACITY 6 TX/ 6 RX UHF-X

NOTES:

1. APPLY SILICON GREASE ON THE MOUNTING SURFACES OF SPACER (19A130465P1) AND BETWEEN THE MOUNTING SURFACE OF Q206 AND THE CHASSIS PER CPD PROCESS P6A-EA111. CARE MUST BE USED SO THAT NO GREASE IS APPLIED TO THE THREADED PORTION OF THE MOUNTING STUD OF Q205. (FOR UHF ONLY)
2. PART OF KIT PL19A137470.
3. APPLY SILICON GREASE BETWEEN THE MOUNTING SURFACES OF Q205 AND Q206 AND THE CHASSIS PER CPD PROCESS P6A-EA111. (FOR HIGH BAND ONLY)
4. APPLY THREAD LOCK TO M2.5 SCREWS PER PROC. P7C-EA108P2
5. APPLY THIS NAMEPLATE (LAST) AFTER COMPLETE ASSEMBLY OF THE RADIO WITH PARTICULAR ATTENTION TO ALIGNMENT TO THE MULTI-FREQUENCY SWITCH PUSHBUTTON. REMOVE PROTECTIVE FILM AFTER INSTALLATION OF THE NAMEPLATE.
6. NOT PRESENT FOR 1 FREQ UHF-X (P29)
7. MARK PER 19A122529.
8. APPLY PER P7D-EA100.
9. TIGHTEN TRANSISTOR MTG NUT TO WITHIN 1.0 + 0.1 N.M. FOR #8-32 NUT AND 0.6 ± 0.1 N.M. FOR M2.5 SCREWS.

Figure 6 - Mechanical Layout

CRYSTAL OSCILLATOR 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 (80.6°F).

The oscillator should be reset only when the frequency shows deviation in excess of the following limits:

- ±0.5 PPM, when the radio is at 27.0°C (80.6°F)
- The specification limit of ±5 PPM at any temperature within the ranges of -30°C (-22°F) to +60°C (+140°F).

If the radio is at an ambient temperature of 27.0°C (80.6°F), set the oscillator for the correct operating frequency.

If the radio is not at an ambient temperature of 27.0°C, offset the oscillator, as a function of actual temperature, by the amount shown in the Frequency Offset Chart.

For example: Assume the ambient temperature of the radio is 22°C (71.6°F). At that temperature, the curve shows a correction factor of +0.75 PPM. (At 406 MHz, 1 PPM is 406 Hz. At 512 MHz, 1 PPM is 512 Hz).

With an operating frequency of 450 MHz, set the oscillator for a reading of 337.5 Hz (0.75 x 450 Hz) higher than the licensed operating frequency. If a negative correction factor is obtained (at temperatures above 27.0°C), set the oscillator for the indicated PPM lower than the licensed operating frequency.

TRANSMIT FREQUENCY ADJUSTMENT

When setting the transmitter oscillator frequency, adjust L151 (single frequency unit) or L921-L926 (multi-frequency units) to the assigned operating frequency.

RECEIVER FREQUENCY ADJUSTMENT

To set the frequency of the receiver 1st injection oscillator, connect the RF signal probe to TP401 and adjust L301 for the assigned receiver frequency -21.4 MHz (low side injection) or +21.4 MHz (high side injection).

MODULATION LEVEL ADJUSTMENT

TEST EQUIPMENT REQUIRED

1. Audio Oscillator
2. Deviation Monitor
3. AC Voltmeter
4. Wattmeter, 50 ohm, 50 Watts
5. Frequency Counter
6. RF Signal Probe

CAUTION

DO NOT remove microphone from hanger or place CG Mon switch to MON position when making this adjustment. DAMAGE to equipment will result.

A Channel Guard Encode Disable circuit has been incorporated as a maintenance aid to allow the service technician to make transmitter distortion and modulation checks without removing the cover from the radio.

CAUTION

This feature is not compatible with the Type 99 decoder option.

The CG encode circuit can be easily disabled by temporarily connecting a jumper from J910-11 (A+) to the applicable CG DISABLE lead (see Schematic and Outline Diagram).

MOD ADJUST Control R116 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.

NOTE

The Channel Guard modulation level adjustment should be checked each time the tone frequency is changed.

PROCEDURE

1. Connect the audio oscillator and the AC voltmeter across audio input terminals J911-4 (Hi) and J911-3 (Lo) on the interconnect/multi-frequency board.
2. Adjust the audio oscillator for 1 Volt RMS at 1000 Hz.
3. Connect RF Wattmeter to antenna jack.

DEVIATION ADJUSTMENT

1. For single frequency transmitters without Channel Guard, set MOD ADJUST R116 for a 4.5 kHz swing with the deviation polarity which gives the highest reading as indicated on the deviation monitor.
2. For multi-frequency transmitter without Channel Guard set R956-T961 to mazimum then adjust R116 for 5.0 kHz deviation on channel with lowest deviation. Now, step through each channel and adjust R956-R961 to produce 4.5 kHz deviation on each channel.

NOTE

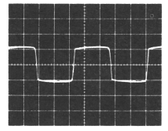
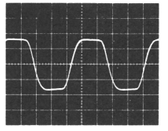
If the deviation reading plus (+) or minus (-) differs more than 0.5 kHz, recheck Step 1 as shown in the Transmitter Alignment Chart.

3. For single frequency transmitters with Channel Guard, set CHANNEL GUARD MOD ADJUST R1015 for zero tone deviation. Next, with the 1 Volt signal at 1000 Hz applied, set MOD ADJUST R116 for 3.75 kHz deviation. Then remove the signal from the audio oscillator and set Channel Guard MOD ADJUST R1015 for 0.75 kHz tone deviation.
4. For multi-frequency transmitters with Channel Guard set the deviation as described above for each channel. Refer to multi-frequency diagram for MOD ADJUST control designations. Refer to the Outline Diagram for control location.

AUDIO CHECKS

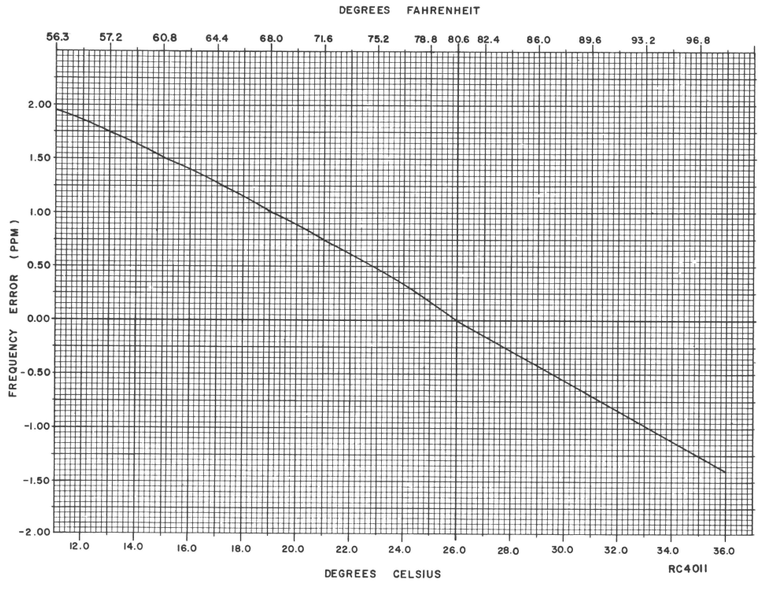
TEST EQUIPMENT REQUIRED

- Audio Oscillator
- AC Voltmeter
- Oscilloscope
- Deviation Monitor

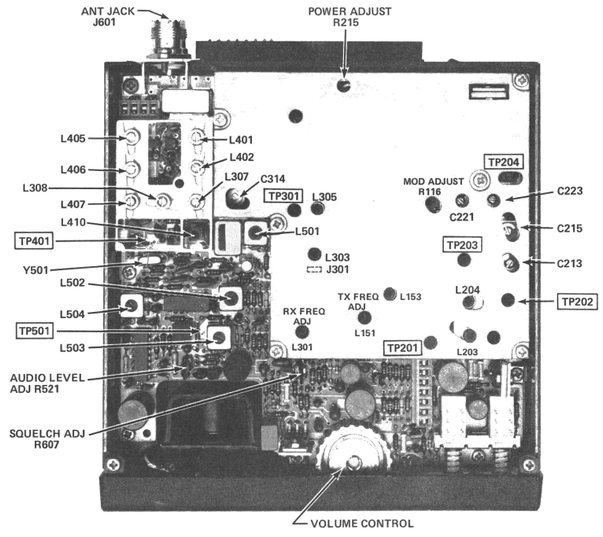
		U101-7	C110 (+)
SCOPE SETTING	HORIZONTAL	200 U SEC/DIV	200 U SEC/DIV
	VERTICAL	2 VOLTS/DIV	2 VOLTS/DIV
SET AUDIO OSCILLATOR AT 1000 Hz WITH OUTPUT OF 1.0 VRMS. R116 ADJUSTED FOR 4.5 kHz DEVIATION. NOTE: AN RMS OR PEAK READING VOLT METER WILL READ 1/2 TO 1/3 OF PEAK-TO-PEAK READINGS.			

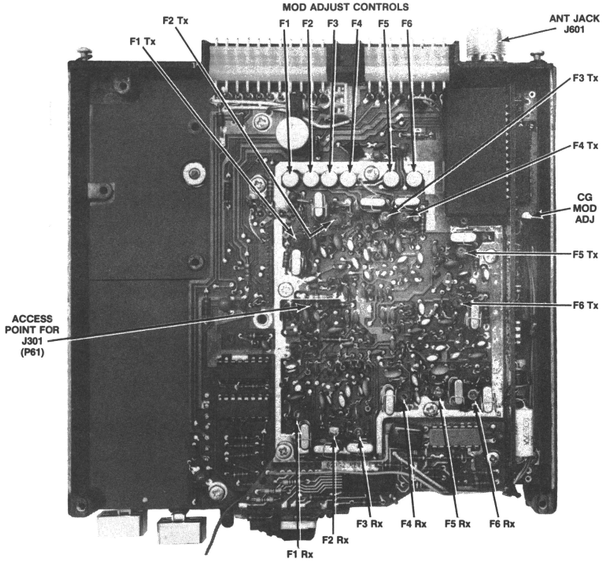
AUDIO SENSITIVITY

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 3.0 kHz for radios without Channel Guard or to 2.25 kHz for radios with Channel Guard. Voltage should be less than 120 millivolts.



Temperature Compensation Chart





TRANSMITTER ALIGNMENT

TEST EQUIPMENT

1. 50 ohm Wattmeter
2. Tx RF Detector Probe (19C330130G1)
3. RF Signal Probe
4. DC Probe
5. Voltmeter
6. Power Supply 13.8 V Regulated
7. Audio Signal Generator

PRELIMINARY CHECK AND ADJUSTMENTS

NOTE

Refer to photographs to locate CONTROLS, TEST POINTS and CRYSTALS.

1. Place crystal for single frequency units operating in the 420-470 MHz range on Transmitter/Receiver board. For multi-frequency units and radios operating in the 470-512 MHz range all transmitter crystals are installed on the multi-frequency board. In multi-frequency transmitters the frequency spread between the highest and lowest frequency channels determine the frequency to which the exciter is tuned for full specification operation. Refer to the chart below to determine if center tuning is required. As shown the limits may be extended to 10.5 MHz (420-470 MHz) or 7.0 MHz (470-494 MHz) with 1 dB degradation. If a center frequency is available on an existing channel, use it. If not, a center frequency crystal must be installed to properly align the transmitter.
2. For a large change in frequency or a badly misaligned transmitter, preset all slugs to the top of the coil form, and all variable capacitors for minimum capacitance (open).
3. Set power adjust control R215 to minimum - fully counterclockwise.
4. All adjustments are made with transmitter keyed. Unkey the transmitter between steps to avoid overheating.
5. The DC Probe and voltmeter set on the 1 Volt DC scale is used to monitor TP201 - TP203 when aligning the transmitter. The Transmit RF Detector probe connected to a VOM is used to monitor TP204.
6. Transmit Frequency is set by L151 with the RF Signal Probe connected to TP204 and a frequency counter. See Step 6.

ALIGNMENT PROCEDURE

STEP	TEST POINT	TUNING CONTROL	PROCEDURE
1.	TP201	L151, L153 L203 (L921-L926)	Tune L151 then L153 for peak meter reading. Then tune L203 for a dip. In multi-frequency units and radios operating in the 470-512 MHz range, tune L921-L926 for max. meter reading.
2.	TP202	L204, L151, L153, L203-C213	Tune L204 for maximum meter reading. Repeak L203, L153 and L151 (L921-L926). Tune C213 for a dip in meter reading.
3.	TP203	C215, C213 L204, C221	Tune C215 for maximum meter reading. Repeak C213 and L204. Tune C221 for a dip in meter reading.
4.	TP204	C221, C223	Tune C223 then C221 for maximum meter reading.
5.	WATTMETER	R215	Set R215 for maximum power output. Repeak all adjustments and then adjust R215 for rated output power.
6.	TP204	L151	Connect RF signal probe to TP204 and set L151 for assigned operating frequency (L921-L926 in multi-frequency radios and radios operating in the 470-512 MHz range). Repeak all adjustments.
7.	WATTMETER	R215	If necessary, readjust R215 for rated power output.

TRANSMITTER QUICK CHECKS

TEST POINT	PROBE	TYPICAL METER READING	PROBABLE DEFECTIVE STAGE		
			HIGH METER READING	LOW METER READING	ZERO METER READING
TP210	DC	0.15 Volts	Q201	Q151, Q201 Q202, Y151	Q201, Q151
TP202	DC	0.45 Volts	Q202	Q203, Q202	Q203
TP203	DC	0.35 Volts	Q203	Q202, Q203	Q203
TP204	Tx RF DET Probe	0.25 Volts		Q203	Q203

MULTI-FREQUENCY TUNING REQUIREMENTS

FREQUENCY RANGE	WITHOUT CENTER TUNING	WITH CENTER TUNING	1 dB DEGRADATION
420-470	2.75 MHz	5.5 MHz	10.5 MHz
470-494	2.75 MHz	5.5 MHz	7.0 MHz
494-512	3.0 MHz	6.0 MHz	7.0 MHz

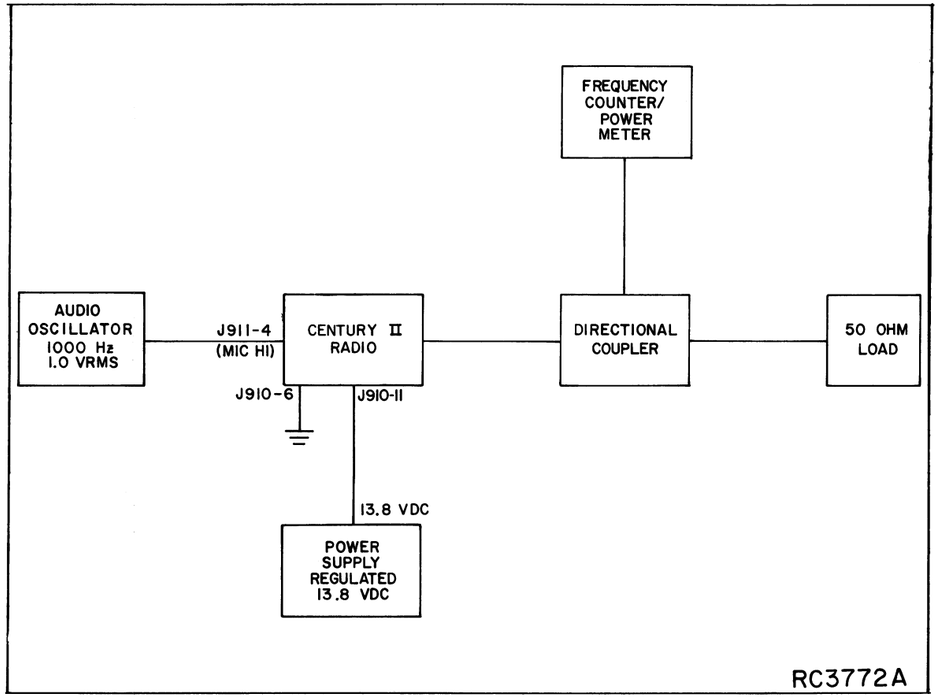


Figure 7 - Test Equipment Set Up

RECEIVER ALIGNMENT

EQUIPMENT REQUIRED

1. RF Signal Generator (420-512 MHz)
2. DC Voltmeter
3. AC Voltmeter
4. Receiver RF Detector Probe
5. RF Signal Probe
6. Power Supply 13.8 V Regulated
7. VOM (20K ohms/volt)

NOTE

Refer to photographs to locate CONTROLS, TEST POINTS AND CRYSTALS.

PRELIMINARY CHECKS

1. Verify all crystals are in place. In single frequency radios operating in the 420-470 MHz range, the crystal (Y301) is located on the Transmitter/Receiver board. In multi-frequency radios and radios operating in the 470-512 MHz range, all crystals for the 1st mixer injection oscillator are located on the multi-frequency board.
2. In multi-frequency receivers with a channel spacing greater than 1 MHz and less than 3 MHz, the receiver must be tuned to the center frequency. These limits can be extended to 3.0 MHz with 3 dB degradation. If a center frequency is available on an existing channel, use it. If not, a center frequency crystal must be installed to properly align the receiver.
3. Disable Channel Guard by removing microphone from hookswitch or by connecting ground to J910-5.
4. Disconnect internal speaker from J904 on Interconnect/Multi-frequency board. Terminate J904 with a 4 ohm, 5 Watt resistor.

ALIGNMENT PROCEDURE

STEP	METERING TEST POINT	PROBE	TUNING CONTROLS(s)	PROCEDURE
			1ST OSCILLATOR MULTIPLIER	
1.	TP301	DC Probe	L301	With voltmeter on lowest range adjust L301 for maximum meter reading (In Multi-frequency units and all radios in the 470-512 MHz range adjust L961-L966 for channels 1-6). NOTE If no meter indication is observed at TP301, connect positive lead of RF Detector probe (red dot) to J301 using a short piece of DA jumper wire (AWG #18 or smaller - 1.024 mm). See photograph of multi-frequency board for access to J301. Adjust L301 (L961-L966) for maximum meter reading then reconnect DC Probe to TP301.
2.	TP301	DC Probe	L303, L305	Alternately adjust L303 and L305 for maximum meter reading.
3.	TP301	DC Probe	C314, L307 L308	Adjust C314 for dip then peak L307 and dip L308.
4.	TP401	Rx RF Detector	C314, L307 L308	Adjust L308 then L307 and C314 for maximum meter reading. Continue peaking these controls until no further improvement is recorded. Typically 2-3 volts. (Peak VOM reading must exceed 1 volt).
5.	TP401	RF Signal	L301	Connect a frequency counter to TP401 using RF Signal Probe. Adjust L301 (Single Frequency Units) or L961-L966 (Multi-Frequency Units and radios operating in 470-512 MHz range) for channel operating frequency minus 21.4 MHz (For radios using high side injection set frequency controls to Rx operating frequency +21.4 MHz). NOTE It may be necessary to monitor TP301 with DC Probe and individually peak L961-L966 before setting frequency. If a peak cannot be obtained disconnect probe from TP301 and connect Rx RF Detector Probe to J301 using a short piece of solid hook up wire. Individually peak L961-L966. Adjust L303 for maximum and L305 for a dip. Set frequency for each channel as directed in Step 5.
6.	TP301	DC Probe	L303, L305	Alternately adjust L303, and L305 for maximum meter reading.
			IF ALIGNMENT	
7.	TP401, TP501	RF Signal RF DETECTOR	L410, L503 L502, L501	Connect RF signal generator to TP401 using RF Signal Probe. Connect RF DETECTOR Probe and VOM to TP501. Use 0.5 or 1.0 V scale. Set RF signal generator output to channel frequency at the minimum level sufficient to provide a mid scale meter indication. Reduce the output of the signal generator as required to keep the detected RF level within the 0.5 to 1.0 volt range. Adjust L410 first, then L503, L502 and L501 respectively for maximum indication on meter. Alternately adjust L410 and L501 to obtain maximum meter reading. Disconnect RF Signal Generator from TP401.
			FRONT END ALIGNMENT	
8.	TP501	Rx RF DETECTOR	---	Connect signal generator to Antenna input jack J601. Verify Rx RF Detector Probe is connected to TP501 and VOM. Adjust signal generator to RF channel frequency or to center frequency. Adjust output level of signal generator for a VOM reading between 0.5 and 1.0 Volts.
9.	TP501	Rx RF DETECTOR	L405, L406 L407	Detune L405 and L407 as much as possible. Tune L406 through entire range while noting peak readings on VOM. Adjust L406 for maximum meter reading reducing the output level of signal generator as required. DO NOT readjust. Alternately readjust L407 and L405 for maximum VOM reading.
10.	TP501	Rx RF DETECTOR	L402, L401	Alternately adjust L402 and L401 for maximum VOM reading. Reduce generator output to maintain a VOM reading of 0.5 to 1.0 Volts. NOTE Connect a 4 ohm resistor across J910-3 and J910-7. Set audio level control R521 and volume control R630 to mid position. Connect AC voltmeter/audio distortion analyzer across 4 ohm load. Set generator modulator to "OFF". Adjust generator output level to 1.0 volts as indicated on AC voltmeter.
11.	TP501	Rx RF DETECTOR	L308	Carefully adjust L308 (±1/4 turn) for maximum meter reading.
12.	TP501	Rx RF DETECTOR	L405, L410 L407, L402	Alternately adjust L410, L407 and L405 for maximum meter reading.
13.	---	---	---	Remove all test equipment. Replace center frequency crystal if used.
			DETECTOR/AUDIO ALIGNMENT	
14.	Audio Output	---	L504	Apply a 1000 µV RF signal modulated with 1000 Hz to antenna input jack J601. Connect external speaker leads J910-3, J910-7 to a four ohm resistive load. Set audio level control R521 and volume control R630 to mid position. Connect AC voltmeter/distortion analyzer across four ohm load. Adjust L504 for maximum meter reading. Reduce volume control as necessary to keep output voltage from exceeding 2.0 VRMS.
15.		---	L501, L406	Adjust volume control for a level of 2.0 VRMS on AC voltmeter. Note the position of tuning slugs in L501 and L410. Slowly adjust L501 and L410 ±1/4 turn for minimum distortion on distortion analyzer. If no improvement is noted return slugs to original position.
16.	P903-3	---	R521	Connect AC voltmeter having a minimum input impedance of 1 megohm (don't use the AC scale of VOM!) to P903-3. Adjust audio level control R521 for a meter reading of 300 mV RMS ±5 mV.
17.				Reconnect AC voltmeter across external speaker leads, J910-3 (SPKR HI) and J910-7 (SPEAKER LO). Adjust volume control for 3 Watts (3.46 VRMS across 4 ohm load).
18.				Measure audio distortion using Distortion Analyzer. Distortion should be less than 5%. Disconnect all test equipment.

FIXED SQUELCH ADJUSTMENT

1. Connect a signal generator to antenna jack J601 and adjust for a nominal 9 dB SINAD signal.
2. Set SQUELCH CONTROL pushbutton to its "out" position.
3. Adjust squelch control R607 to maximum squelch. Receiver must be muted.
4. Adjust squelch control R607 slowly until receiver unmutes.
5. Check that the squelch opens at an input signal level corresponding to 8 dB SINAD (±1 dBS).

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

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.

1. PUSH SQUELCH PUSHBUTTON "in" to defeat Squelch Circuit. Do not adjust squelch control.

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 hertz with ±3.0 kHz deviation to antenna jack J601.

B. With 3 Watt Speaker

Disconnect speaker J904.

Connect a 4.0 ohm, 5 Watt load resistor across J904-1 & 2.

Connect the Distortion Analyzer input across the resistor as shown.

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 3.0 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 0.4 µV. 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.

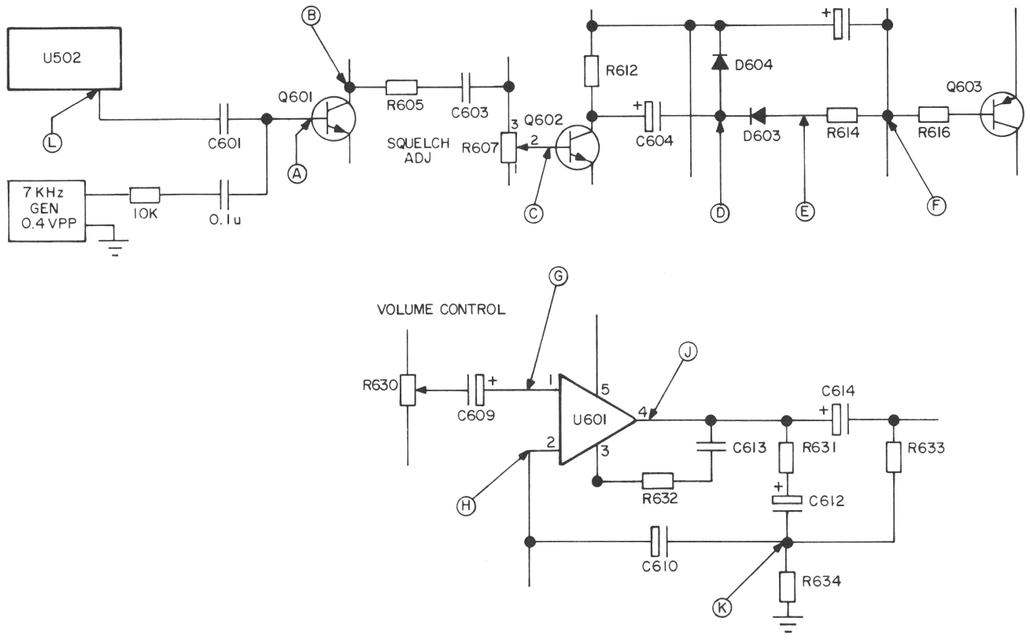
C. While increasing the deviation of the Signal Generator, switch the RANGE control from SET LEVEL to distortion range until a 12 dB difference is obtained between the SET LEVEL and distortion range readings (from +2 dB to -10 dB).

D. The deviation control reading for the 12 dB difference is the Modulation Acceptance Bandwidth of the receiver. It should be more than ±7 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



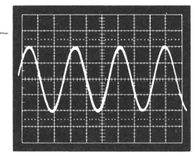
RC-3774

SQUELCH CIRCUIT TEST WITH 7 kHz SIGNAL

PRELIMINARY STEPS

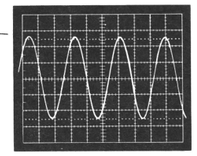
1. Quiet receiver with 1000 uV unmodulated signal.
2. Squelch Adjust R607 to maximum (Rotate control toward rear of radio.)
3. Squelch pushbutton in OUT position.
4. Use 10 megohm probe.

A



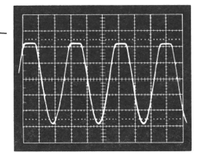
HOR. 50 µSEC/DIV
VERT. 0.1 V/DIV
(0.4 V P-P)

B



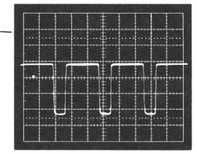
HOR. 50 µSEC/DIV
VERT. 2 V/DIV
(10 V P-P)

C



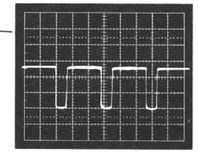
HOR. 50 µSEC/DIV
VERT. 1 V/DIV
(5 V P-P)

D



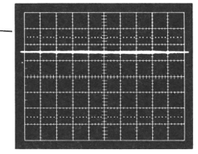
HOR. 50 µSEC/DIV
VERT. 2 V/DIV
(6.2 V P-P)

E



HOR. 50 µSEC/DIV
VERT. 1 V/DIV
(2.5 V P-P)

F



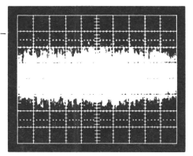
HOR. 50 µSEC/DIV
VERT. 1 V/DIV
(5.5 VDC)

SQUELCH CIRCUIT CHECKS WITH NOISE

PRELIMINARY STEPS

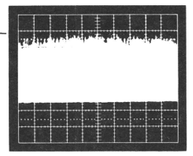
1. No input signal applied.
2. Squelch Adjust R607 to maximum (Rotate toward rear of radio.)
3. Squelch pushbutton in OUT position.
4. Use 10 megohm probe.

A



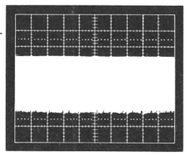
HOR. 1 MS/DIV
VERT. 0.5 V/DIV
(≃ 2 V P-P)

B



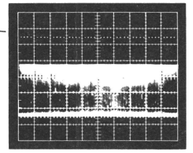
HOR. 1 MS/DIV
VERT. 5 V/DIV
(≃ 20 V P-P)

C



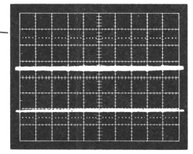
HOR. 1 MS/DIV
VERT. 2 V/DIV
(6.8 V P-P)

D



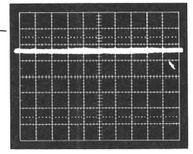
HOR. 1 MS/DIV
VERT. 2 V/DIV
(6.2 V P-P)

E



HOR. 1 MS/DIV
VERT 1 V/DIV
(2.6 V P-P)

F



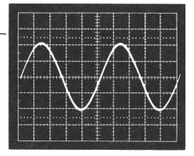
HOR. 1 MS/DIV
VERT. 1 V/DIV
(5.6 VDC)

AUDIO CIRCUIT CHECKS

PRELIMINARY STEPS

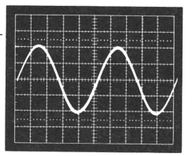
1. Apply 1000 uV on frequency signal with 1000 Hz modulation and 3 kHz deviation to antenna jack J601.
2. Squelch pushbutton "IN".
3. Output set for 3-Watts (3.46 VRMS) into 4-ohm load.
4. Use 1 megohm probe.

G



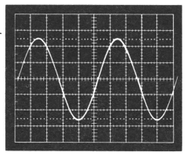
HOR. 0.2 MS/DIV
VERT. 20 MV/DIV
(84 MV P-P)

H



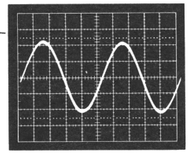
HOR. 0.2 MS/DIV
VERT. 20 MV/DIV
(84 MV P-P)

J



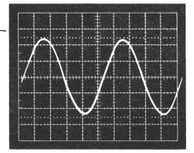
HOR. 0.2 MS/DIV
VERT. 2 V/DIV
(9.8 V P-P)

K



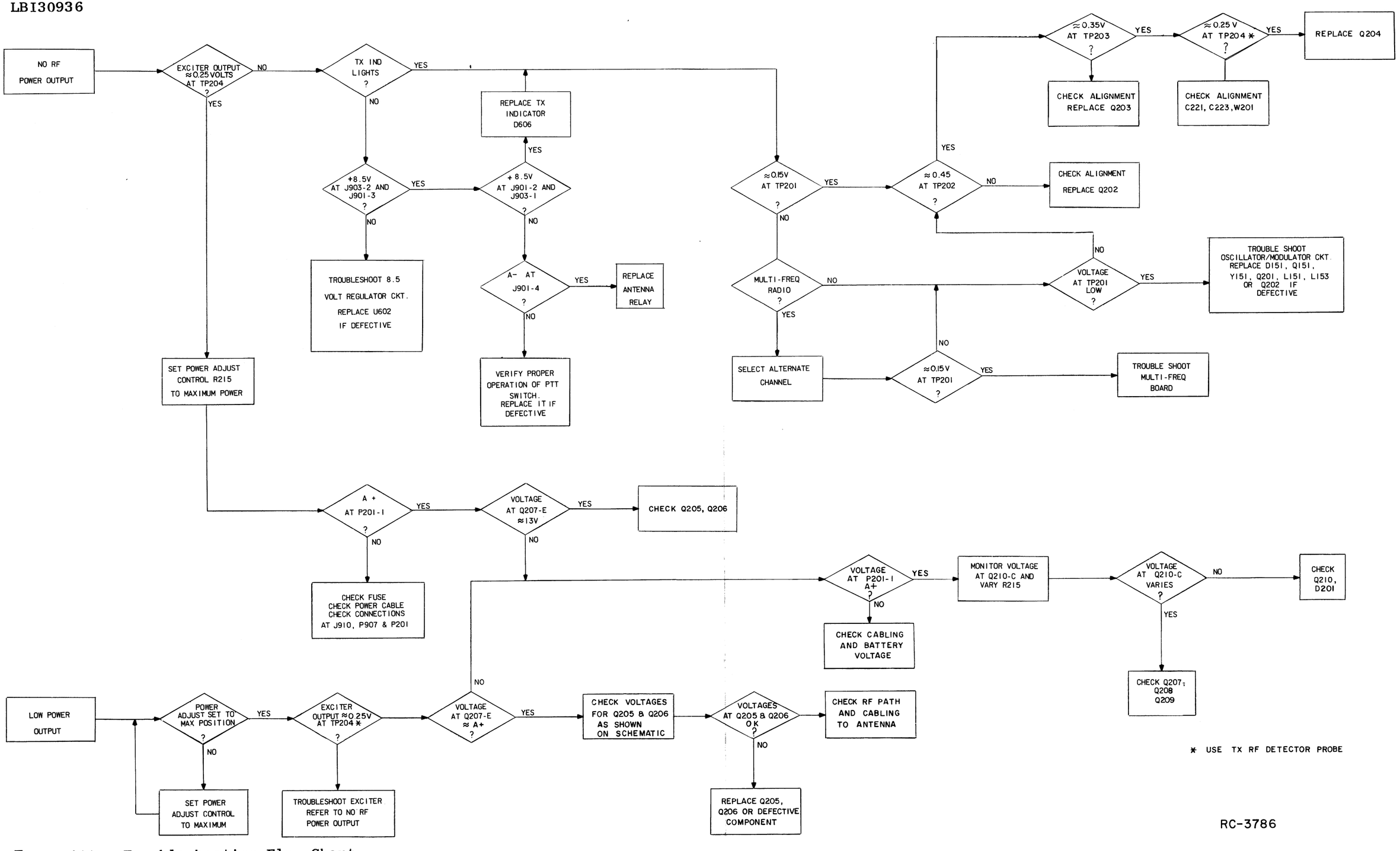
HOR. 0.2 MS/DIV
VERT. 20 MV/DIV
(86 MV P-P)

L



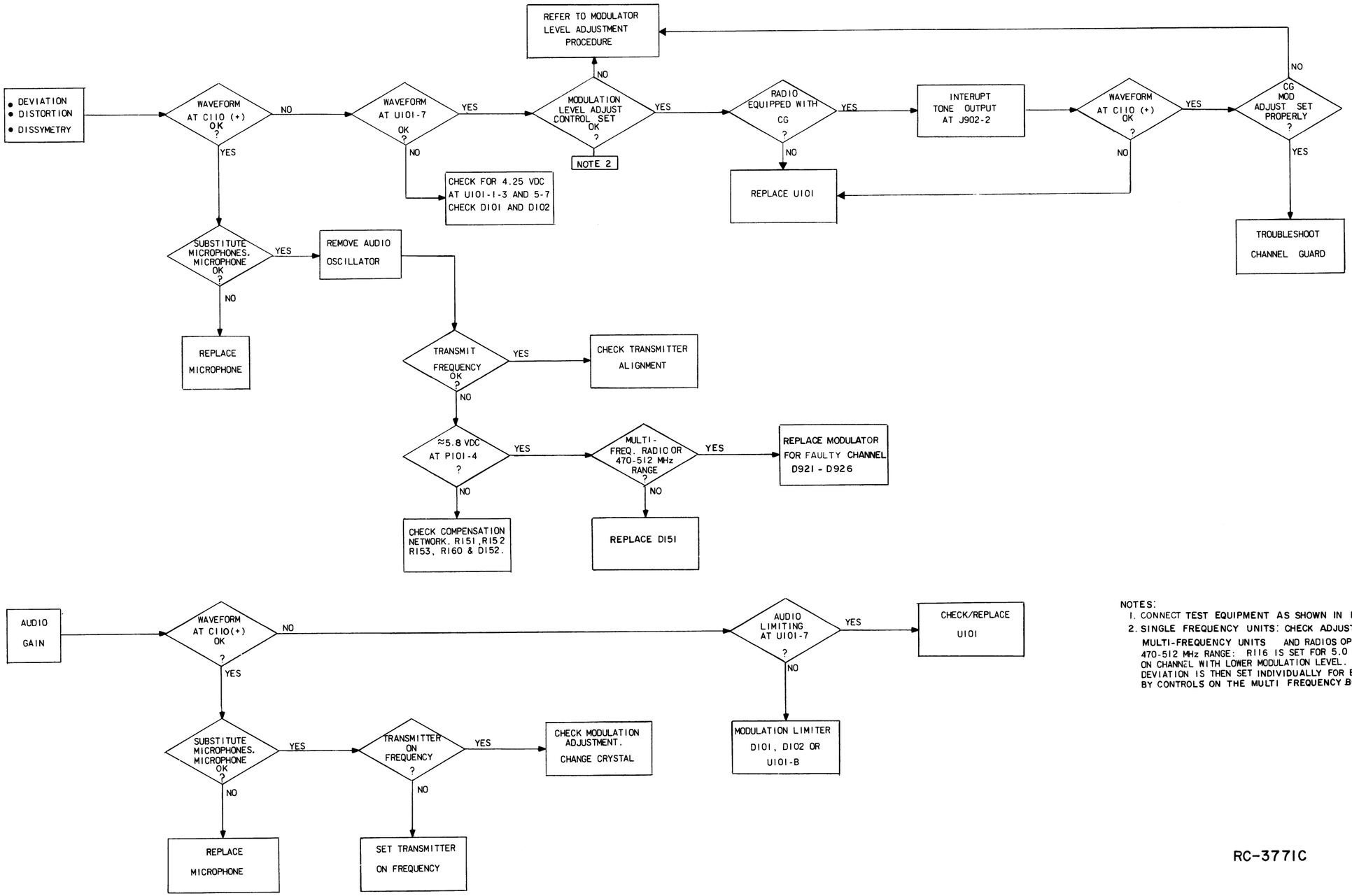
HOR. 0.2 MS/DIV
VERT. 0.2 V/DIV
(0.92 V P-P)

RECEIVER AUDIO AND SQUELCH WAVEFORM CHECKS



Transmitter Troubleshooting Flow Chart

 (Sheet 1) Figure 8

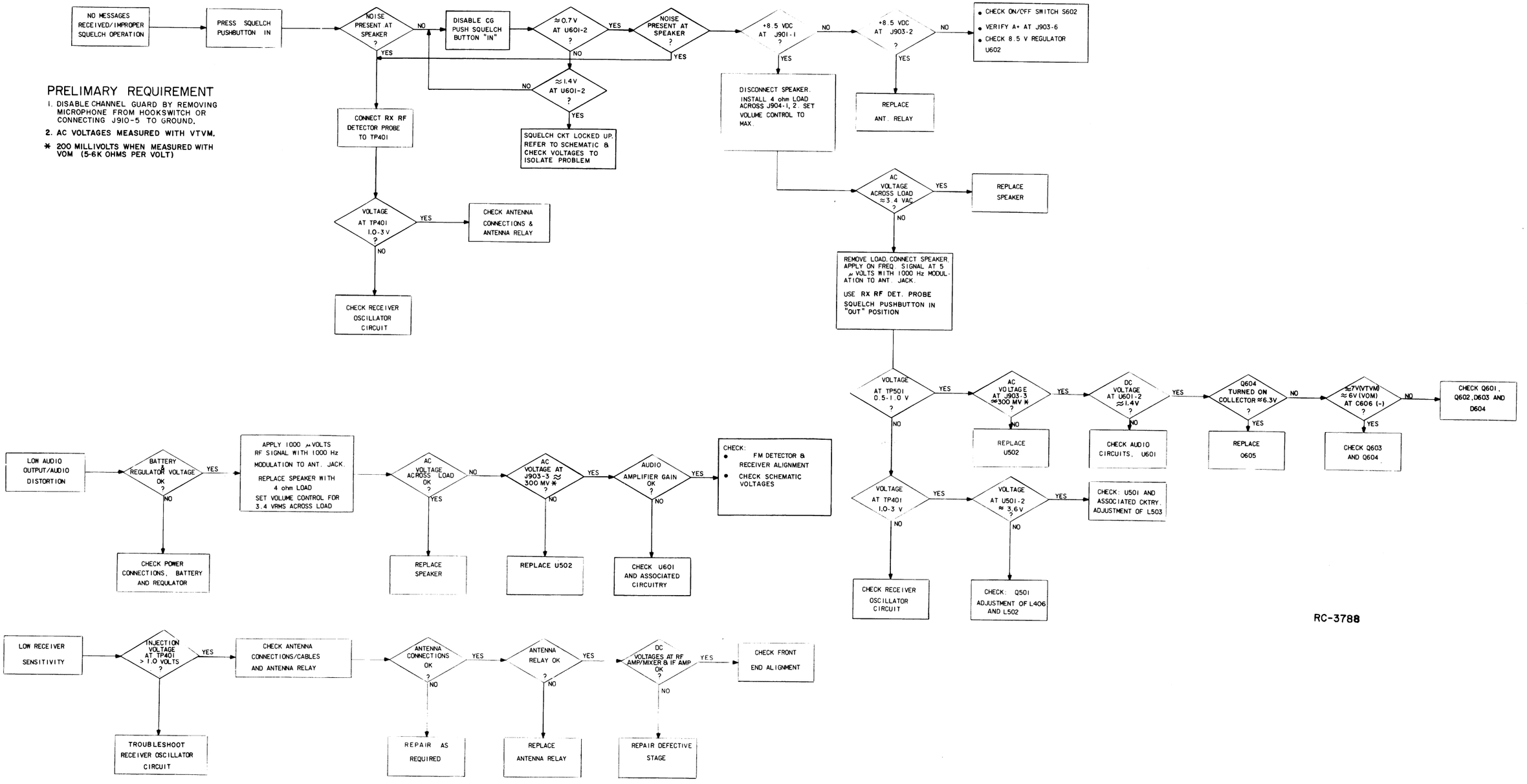


NOTES:
1. CONNECT TEST EQUIPMENT AS SHOWN IN FIGURE 7.
2. SINGLE FREQUENCY UNITS: CHECK ADJUSTMENT OF R116.
   MULTI-FREQUENCY UNITS AND RADIOS OPERATING IN THE 470-512 MHz RANGE: R116 IS SET FOR 5.0 KHz DEVIATION ON CHANNEL WITH LOWER MODULATION LEVEL. DEVIATION IS THEN SET INDIVIDUALLY FOR EACH CHANNEL BY CONTROLS ON THE MULTI FREQUENCY BOARD.

RC-3771C

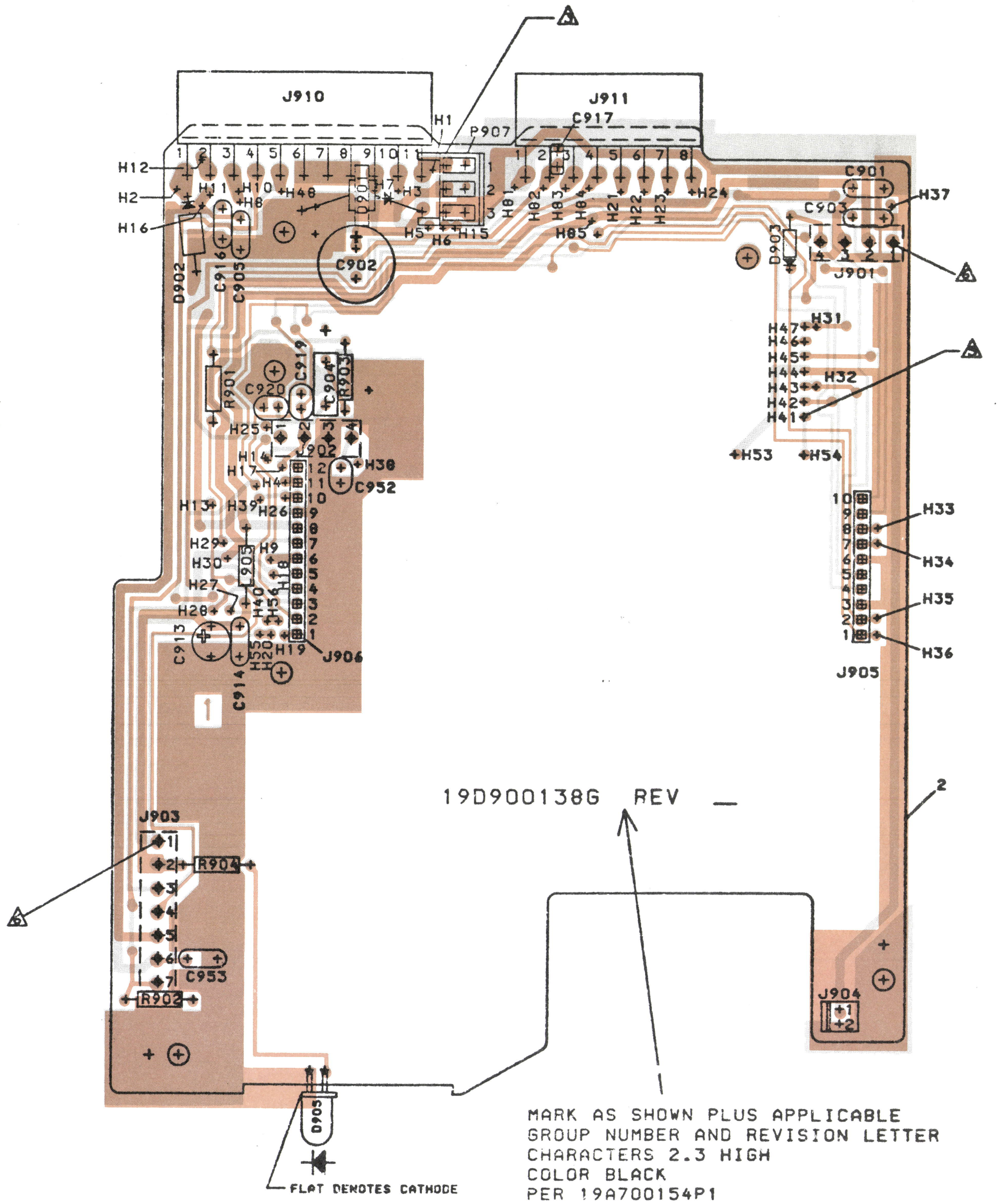
Transmitter Troubleshooting Flow Chart

Figure 8 (Sheet 2)



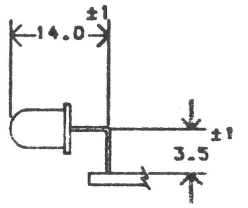
Receiver Troubleshooting Flow Chart

Figure 9

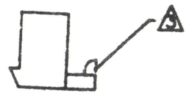


CONNECTIONS CHART			
FROM	TO	WIRE SIZE	COMMENT
H1	H2	ST22-W	
H10	H11	DA	
H15	H16	ST22-W	
H19	H20	DA	
H25	H26	DA	SLEEVE
H27	H28	DA	
H29	H30	DA	
H31	H32	DA	SLEEVE
H33	H34	DA	
H35	H36	DA	
H55	H56	DA	

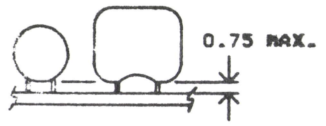
NOTES:
1. SOLDER ALL ELECTRICAL CONNECTIONS.
2. COMPONENT LEADS TO PROTRUDE 1.0 MAX. BELOW SOLDER SIDE OF BOARD.
3. CUT POINT OF CONNECTOR LEG OFF TO CLEAR PIN 11 OF J910. DO NOT CUT LEG OFF.
4. CLEAN ASSEMBLY PER P4C-EA101P1.
5. H41 - H47, H53, & H54 MUST BE FREE OF SOLDER.
6. TRIM PINS OF J901 AND J903 ON COMPONENT SIDE TO 1.0 MAX.



D905 REF



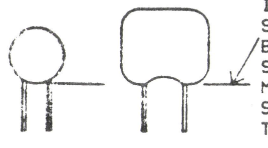
P907 REF.



TYP. MOUNTING FOR ALL CAPACITORS OF THIS TYPE

FLAT DENOTES CATHODE

MARK AS SHOWN PLUS APPLICABLE GROUP NUMBER AND REVISION LETTER CHARACTERS 2.3 HIGH COLOR BLACK PER 19A700154P1 FOR LATEST REVISION LETTER SEE 19C328950 SH.1



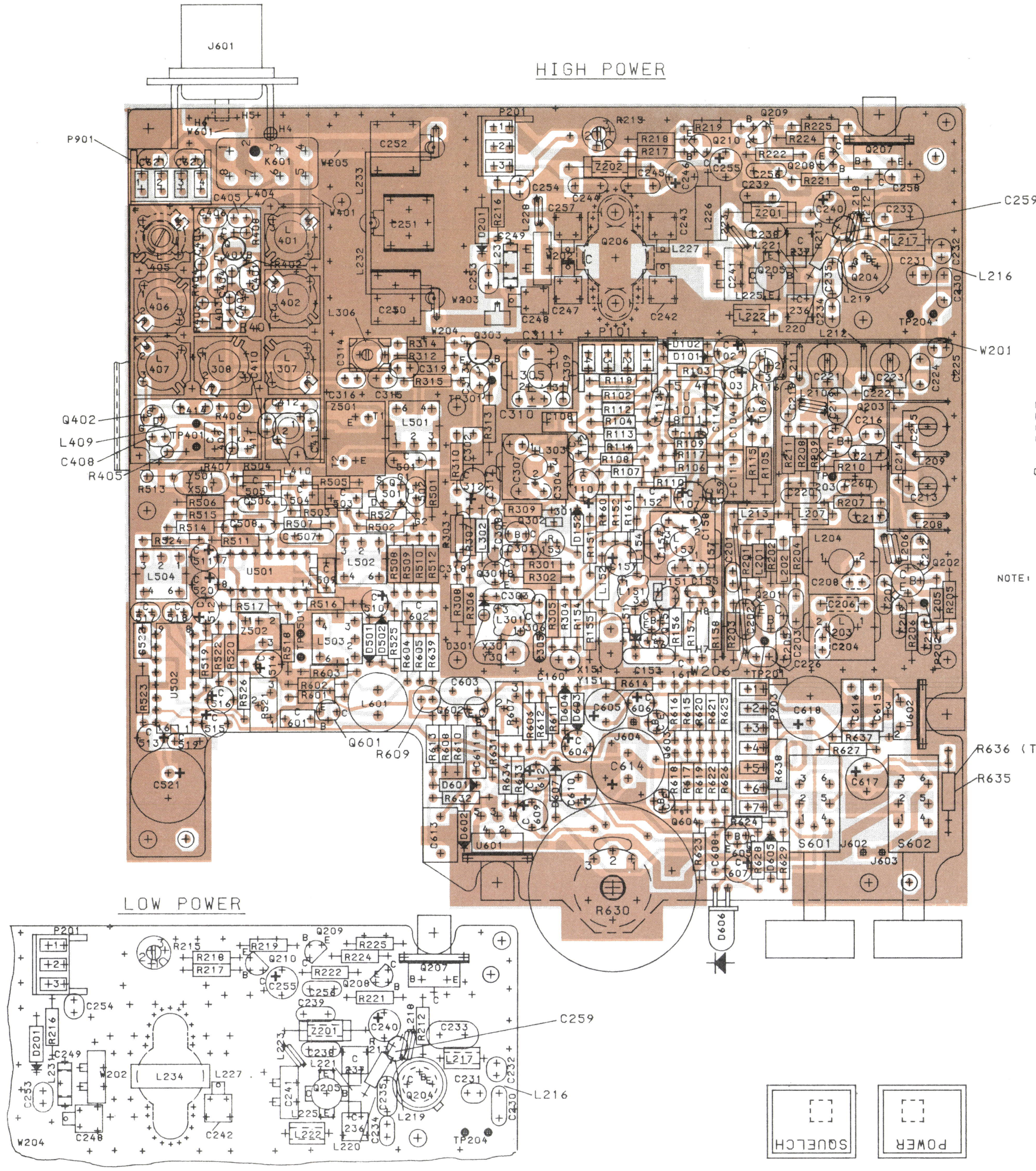
INSULATION ON LEADS SHALL NOT EXTEND BELOW THIS MOUNTING SURFACE. LEADS SHALL MEET SOLDERABILITY SPEC. 19A700094 UP TO THE MOUNTING SURFACE.

TYP. LEAD CLEANING OF CAPACITORS AS REQUIRED

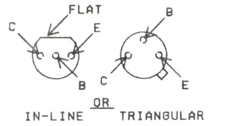
(19D900138, Rev. 1)
(19A701344, Sh. 1, Rev. 1)
(19A701344, Sh. 2, Rev. 1)

OUTLINE DIAGRAM

INTERCONNECT BOARD (SINGLE FREQUENCY)

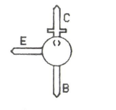


LEAD IDENTIFICATION FOR Q151, Q301, Q302, Q201, Q202, Q203, Q204, Q208, Q209, Q210, Q601, Q602, Q603, Q604 & Q405



NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

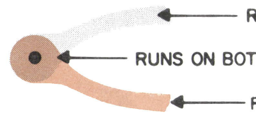
LEAD IDENTIFICATION FOR Q303 & Q401



TOP VIEW

NOTE: COLLECTOR LEAD MARKED EITHER WITH CROSS PIECE OR UNDERSIDE BODY DOT AS SHOWN.

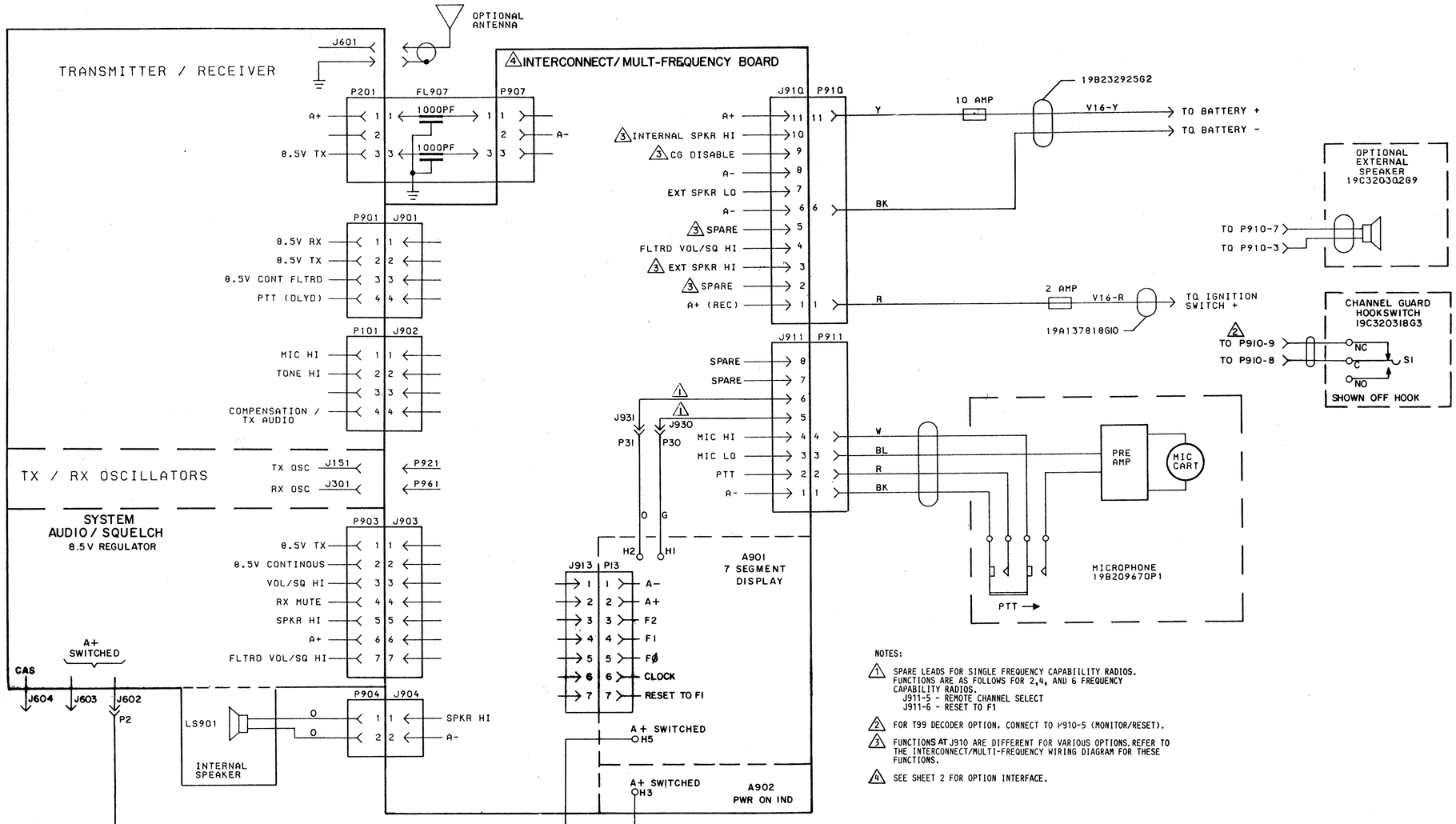
(19D900198, Rev. 3)
(19A701393, Sh. 1, Rev. 0)
(19A701393, Sh. 2, Rev. 0)



OUTLINE DIAGRAM

420—512 MHz UHF TRANSMITTER/RECEIVER BOARD

Issue 1



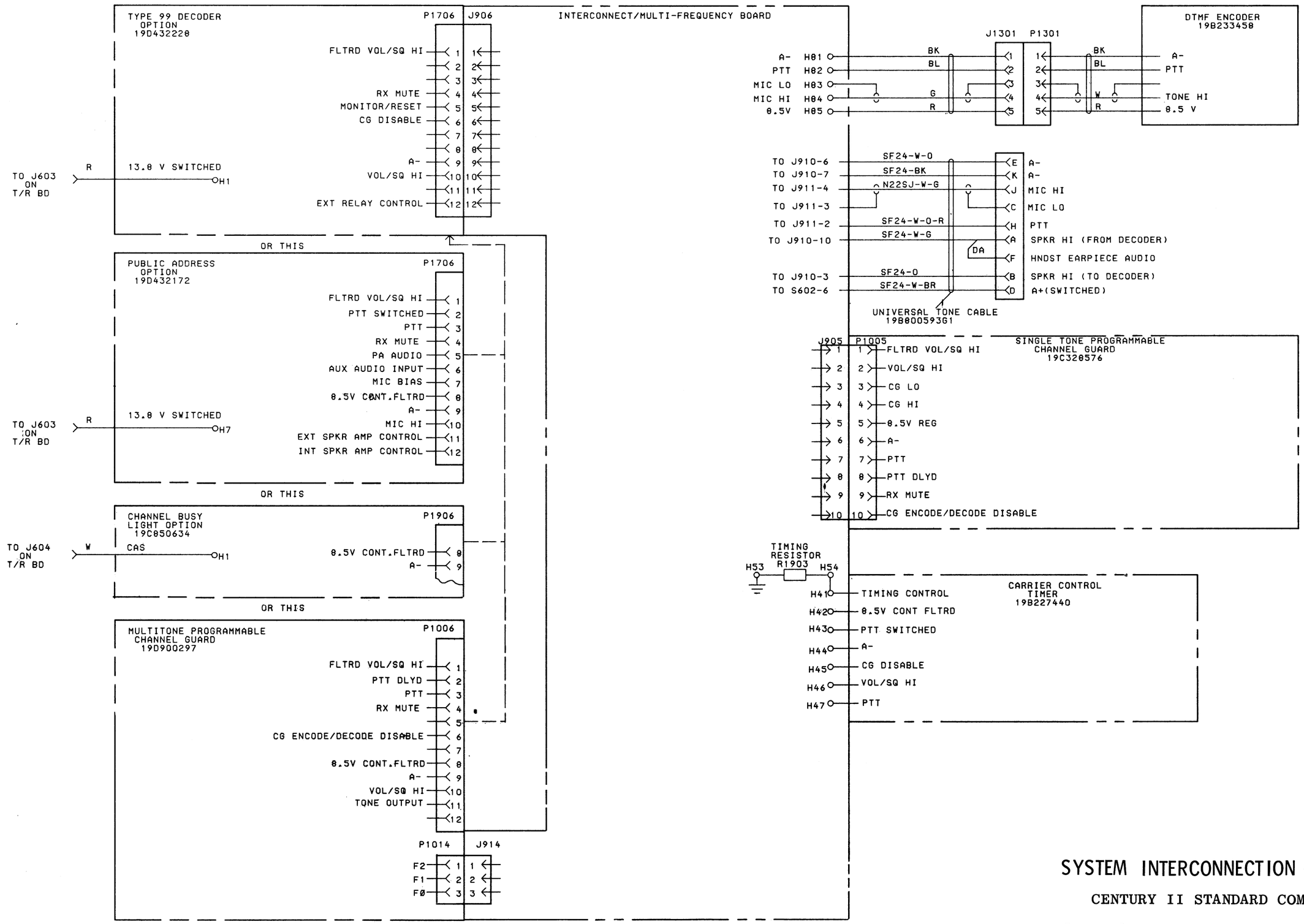
NOTES:

1. SPARE LEADS FOR SINGLE FREQUENCY CAPABILITY RADIOS. FUNCTIONS ARE AS FOLLOWS FOR 2,4, AND 6 FREQUENCY CAPABILITY RADIOS.
   J911-5 - REMOTE CHANNEL SELECT
   J911-6 - RESET TO F1
2. FOR T99 DECODER OPTION, CONNECT TO P910-5 (MONITOR/RESET).
3. FUNCTIONS AT J910 ARE DIFFERENT FOR VARIOUS OPTIONS. REFER TO THE INTERCONNECT/MULTI-FREQUENCY WIRING DIAGRAM FOR THESE FUNCTIONS.
4. SEE SHEET 2 FOR OPTION INTERFACE.

SYSTEM INTERCONNECTION DIAGRAM

CENTURY II STANDARD COMBINATIONS

(19D900180, Sh. 1, Rev. 1)



(19D900180, Sh. 2, Rev. 2)

SYSTEM INTERCONNECTION DIAGRAM

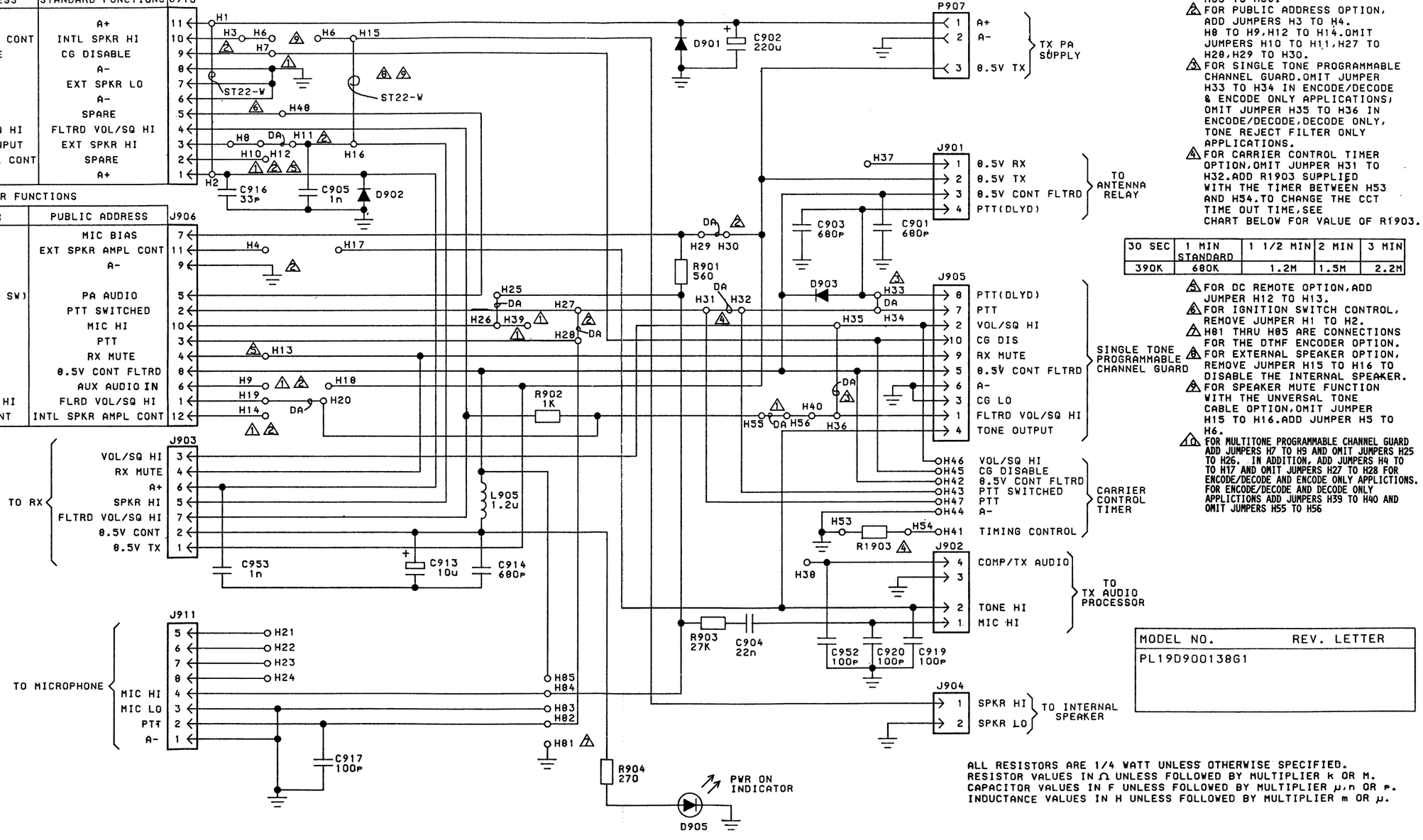
CENTURY II STANDARD COMBINATIONS

TO POWER CABLE

T99 DECODER	PUBLIC ADDRESS	STANDARD FUNCTIONS	J910
A+	A+	A+	11
INTL SPKR HI	EXT SPKR AMPL CONT	INTL SPKR HI	10
	CG DISABLE	CG DISABLE	9
A-	A-	A-	8
EXT SPKR LO	A-	EXT SPKR LO	7
A-	A-	A-	6
MON/RESET(HOOK SW)	PA AUDIO	SPARE	5
FLTRD VOL/SQ HI	FLTRD VOL/SQ HI	FLTRD VOL/SQ HI	4
EXT SPKR HI	AUX AUDIO INPUT	EXT SPKR HI	3
EXT RELAY CONT	INTR SPKR AMPL CONT	SPARE	2
A+	A+	A+	1

OPTION CONNECTOR FUNCTIONS

MULT. PROG. C.G.	T99 DECODER	PUBLIC ADDRESS	J906
		MIC BIAS	7
TONE OUTPUT		EXT SPKR AMPL CONT	11
A-	A-	A-	9
	MON/RESET(HOOK SW)	PA AUDIO	5
PTT(DLYD)		PTT SWITCHED	2
VOL/SQ HI	VOL/SQ HI	MIC HI	10
PTT		PTT	3
RX MUTE	RX MUTE	RX MUTE	4
8.5V CONT FLTRD		8.5V CONT FLTRD	8
CG DISABLE	CG DISABLE	AUX AUDIO IN	6
FLTRD VOL/SQ HI	FLTRD VOL/SQ HI	FLRD VOL/SQ HI	1
	EXT RELAY CONT	INTL SPKR AMPL CONT	12



⚠1 FOR T99 DECODER, ADD JUMPERS H7 TO H9, H12 TO H14, H39 TO H40. OMIT JUMPER H25 TO H26, H55 TO H56.

⚠2 FOR PUBLIC ADDRESS OPTION, ADD JUMPERS H3 TO H4, H8 TO H9, H12 TO H14. OMIT JUMPERS H10 TO H11, H27 TO H28, H29 TO H30.

⚠3 FOR SINGLE TONE PROGRAMMABLE CHANNEL GUARD. OMIT JUMPER H33 TO H34 IN ENCODE/DECODE & ENCODE ONLY APPLICATIONS; OMIT JUMPER H35 TO H36 IN ENCODE/DECODE, DECODE ONLY, TONE REJECT FILTER ONLY APPLICATIONS.

⚠4 FOR CARRIER CONTROL TIMER OPTION, OMIT JUMPER H31 TO H32. ADD R1903 SUPPLIED WITH THE TIMER BETWEEN H53 AND H54. TO CHANGE THE CCT TIME OUT TIME, SEE CHART BELOW FOR VALUE OF R1903.

30 SEC	1 MIN STANDARD	1 1/2 MIN	2 MIN	3 MIN
390K	680K	1.2M	1.5M	2.2M

⚠5 FOR DC REMOTE OPTION, ADD JUMPER H12 TO H13.

⚠6 FOR IGNITION SWITCH CONTROL, REMOVE JUMPER H1 TO H2.

⚠7 H81 THRU H85 ARE CONNECTIONS FOR THE DTMF ENCODER OPTION.

⚠8 FOR EXTERNAL SPEAKER OPTION, REMOVE JUMPER H15 TO H16 TO DISABLE THE INTERNAL SPEAKER.

⚠9 FOR SPEAKER MUTE FUNCTION WITH THE UNVERSAL TONE CABLE OPTION, OMIT JUMPER H15 TO H16. ADD JUMPER H5 TO H6.

⚠10 FOR MULTITONE PROGRAMMABLE CHANNEL GUARD ADD JUMPERS H7 TO H9 AND OMIT JUMPERS H25 TO H26. IN ADDITION, ADD JUMPERS H4 TO TO H17 AND OMIT JUMPERS H27 TO H28 FOR ENCODE/DECODE AND ENCODE ONLY APPLICTIONS. FOR ENCODE/DECODE AND DECODE ONLY APPLICTIONS ADD JUMPERS H39 TO H40 AND OMIT JUMPERS H55 TO H56

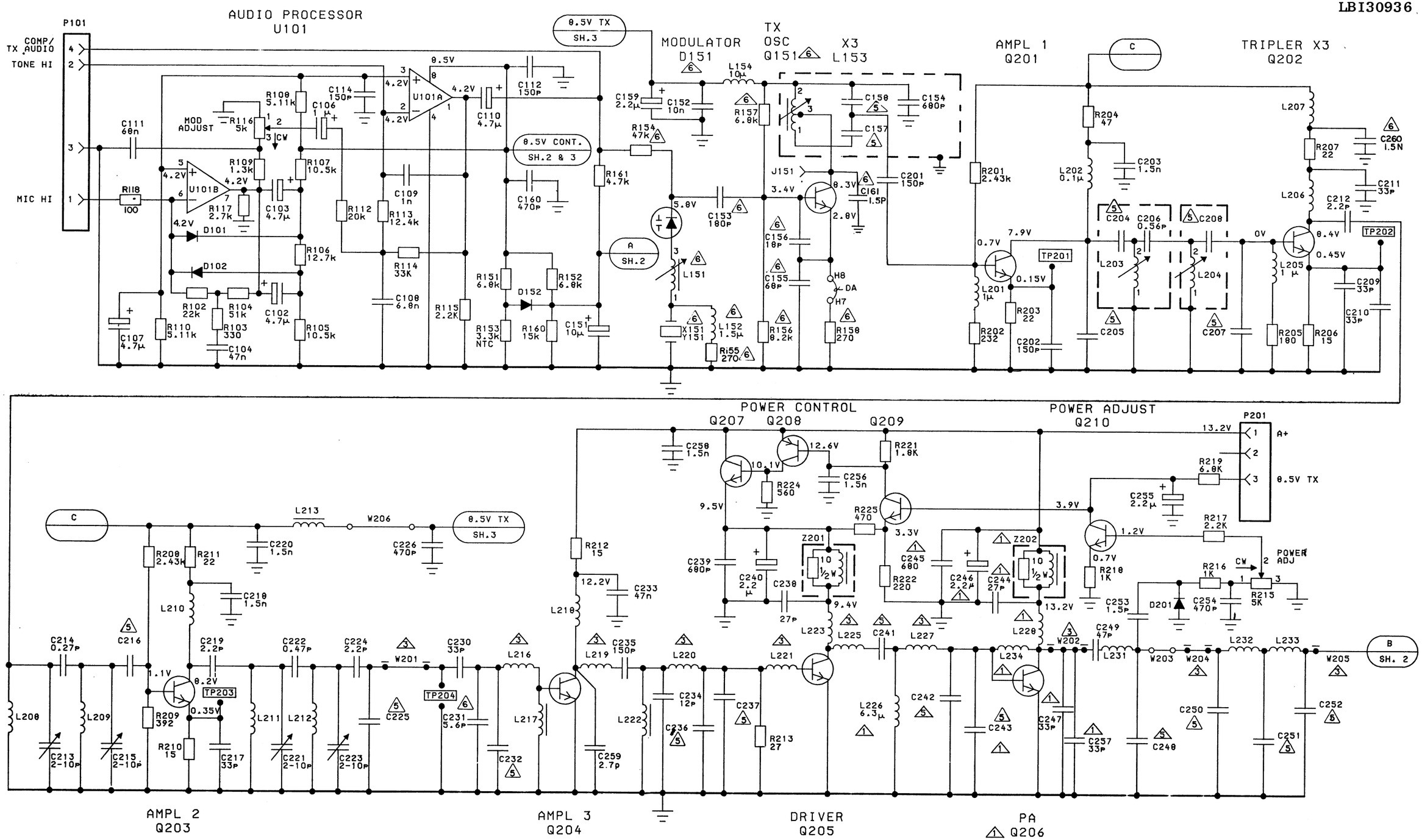
MODEL NO.	REV. LETTER
PL19D900138G1	

ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED.
RESISTOR VALUES IN Ω UNLESS FOLLOWED BY MULTIPLIER k OR M.
CAPACITOR VALUES IN F UNLESS FOLLOWED BY MULTIPLIER µ, n OR p.
INDUCTANCE VALUES IN H UNLESS FOLLOWED BY MULTIPLIER m OR µ.

(19D432327, Rev. 1)

SCHEMATIC DIAGRAM

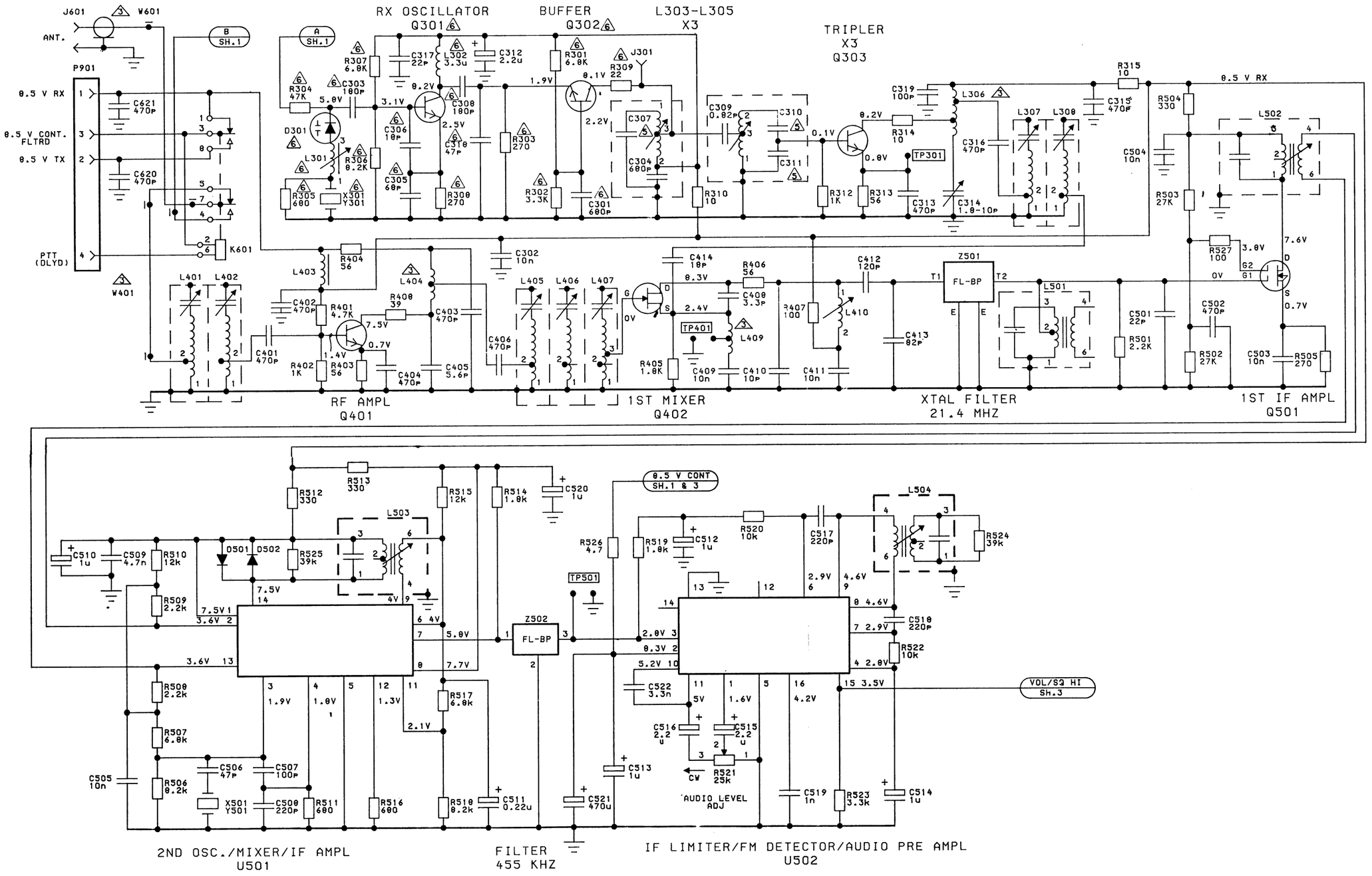
INTERCONNECT BOARD (SINGLE FREQUENCY)



(19D432423, Sh. 1, Rev. 2)

SCHEMATIC DIAGRAM

420—512 MHz UHF TRANSMITTER



SCHEMATIC DIAGRAM

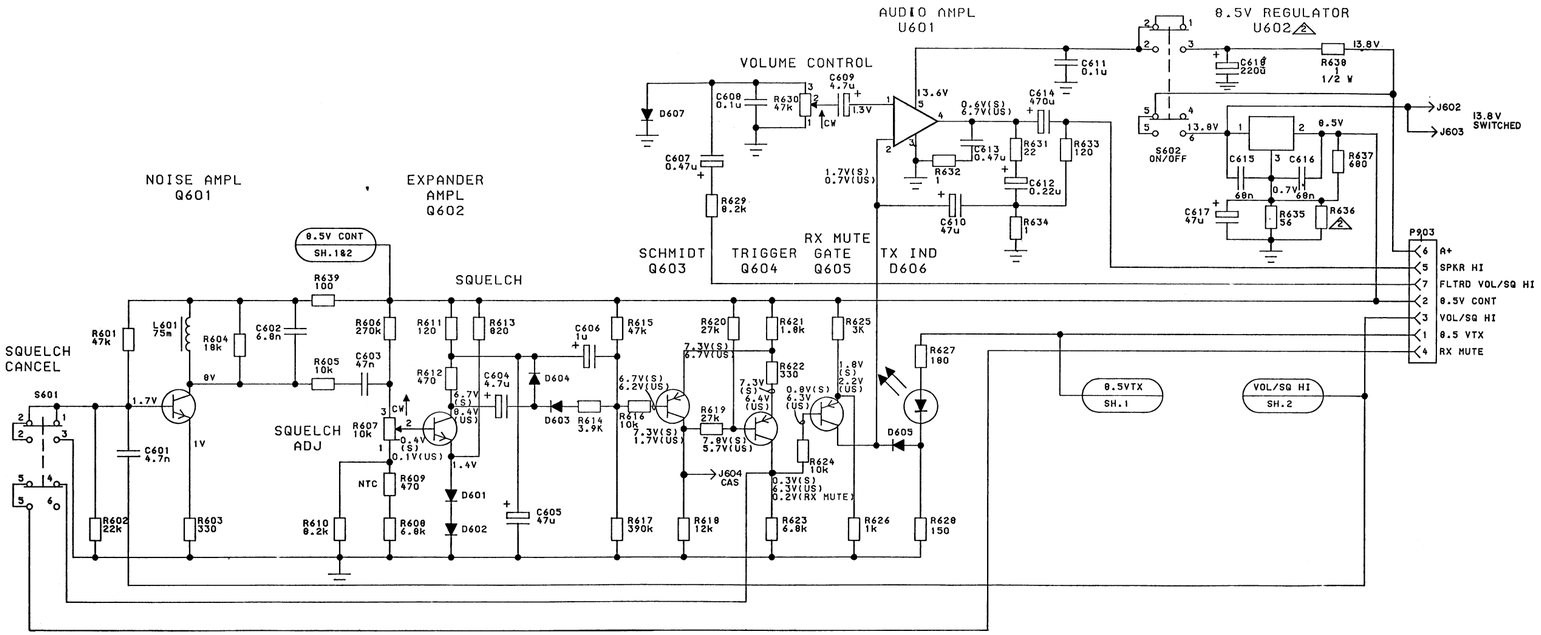
(19D432423, Sh. 2, Rev. 2)

420—512 MHz UHF RECEIVER

5. COMPONENT VALUES

COMP	GROUP 1 UHF 20W	GROUP 2 UHF 5W	GROUP 3 UHF-X 18/15W
C157	18P	18P	6.8P
C158	33P	33P	12P
C204	15P	15P	12P
C205	27P	27P	22P
C207	27P	27P	22P
C208	12P	12P	10P
C216	5.6P	5.6P	6.8P
C225	2.7P	2.7P	3.3P
C232	5.6P	5.6P	8.2P
C236	45P	45P	39P
C237	45P	45P	39P
C241	30P	47P	24P
C242	39P	27P	36P
C243	45P		36P
C248	13P	10P	10P
C250	12P	12P	10P
C251	20P	20P	16P
C252	11P	11P	9P
C307	8.2P	8.2P	6.8P
C310	18P	18P	15P
C311	22P	22P	18P

6. FOR UHF-X (GROUP 3) OMIT C153, C155, C156, C161, C231, C301, C303, C305, C306, C308, C318, D151, D301, L151, L152, L301,L302 Q151, Q301, Q302, R154-R158, R301-R309, X151, X301, Y151, Y301. DA JUMPER H7 TO H8. ADD C260, R214.



NOTES:

1. FOR 5 W TRANSMITTER (G2) REMOVE C243,C244,C245, C246,C247,C257,L226,L228,Q206 & Z202 AND ADD L234
2. VALUE OF R636 DEPENDS ON COLOR CODE ON U602.

U602 COLOR CODE	R636 VALUE Ω
BROWN	OMIT R636
RED	270
ORANGE	100
YELLOW	47
GREEN	22
BLUE	6.8

3. PART OF PRINTED CIRCUIT BOARD.
4. TO MODIFY FOR MULTIFREQUENCY, REMOVE R157 (DISABLES TX OSC) AND/OR R309 (DISABLES RX OSC). THIS NOTE DOES NOT APPLY TO UHF-X(GROUP 3).
5. COMPONENT VALUES SEE SHEET 4
6. SEE SHEET 4

ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED.
RESISTOR VALUES IN Ω UNLESS FOLLOWED BY MULTIPLIER K OR M.
CAPACITOR VALUES IN F UNLESS FOLLOWED BY MULTIPLIER u, n OR p.
INDUCTANCE VALUES IN H UNLESS FOLLOWED BY MULTIPLIER m OR u.

VOLTAGE READINGS
VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO SYSTEM NEGATIVE WITH A 20,000 OHM-PER-VOLT DC VOLTMETER UNDER THE FOLLOWING CONDITIONS:
1. NO SIGNAL INPUT
2. VOLUME CONTROL (R630) SET TO MINIMUM
3. SQUELCH CANCEL (S601) SWITCHED OFF
4. UNSQUELCHED (US)-SQUELCH ADJUST (R607) SET TO MINIMUM (CCW)
5. SQUELCHED (S)-SQUELCH ADJUST (R607) SET TO MAXIMUM (CW)

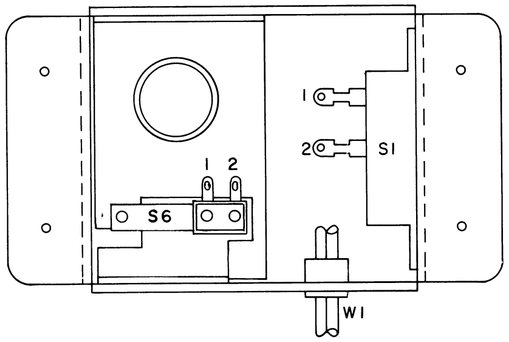
THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
19D900158G1	
19D900158G2	
19D900158G3	

(19D432423, Sh. 3, Rev. 2)

SCHEMATIC DIAGRAM

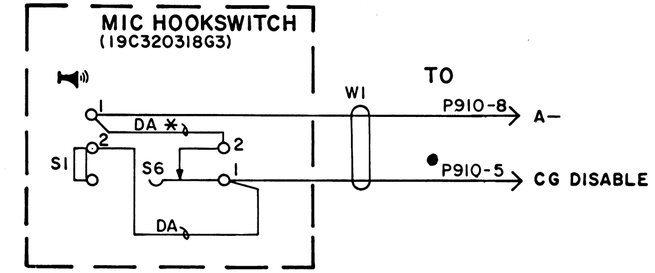
420—512 MHz UHF RECEIVER

OUTLINE DIAGRAM



(19B227626, Rev. 0)

SCHEMATIC DIAGRAM



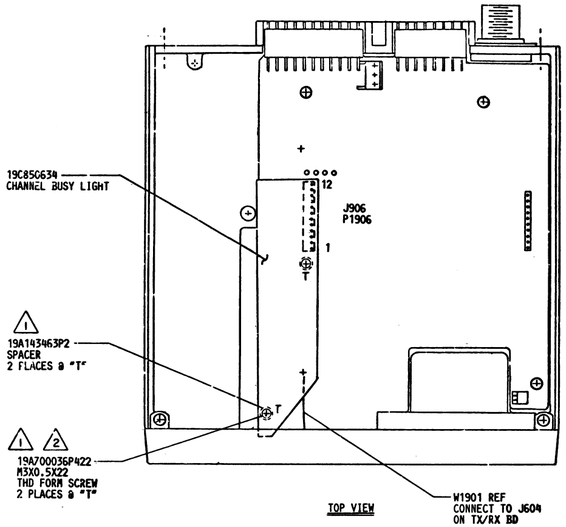
* REMOVE DA JUMPER TO DISABLE AUTOMATIC CHANNEL GUARD MONITOR
S6- SHOWN OFF HOOK
S1- SHOWN OFF MONITOR
● CONNECT TO P910-9 FOR CRYSTAL CHANNEL GUARD

(19A142809, Rev. 0)

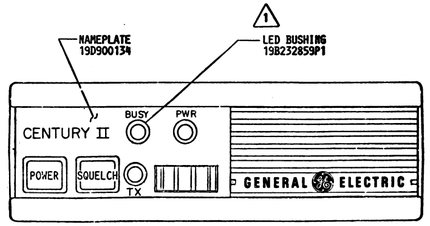
SERVICE SHEET

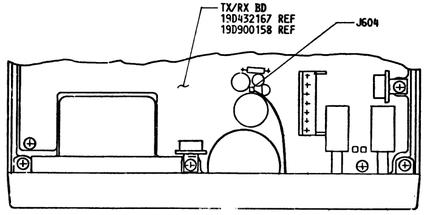
HOOKSWITCH 19C320318G3

INSTALLATION



TOP VIEW



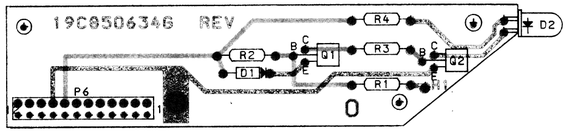


BOTTOM VIEW

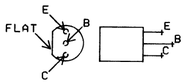
NOTES:
1. PART OF OPTION KIT PL19C850634.
2. DISCARD TWO 19A134589P3008 SCREWS AT "T" AND REPLACE WITH 19A700036P422.

(19D432543, Sh. 7, Rev. 0)

OUTLINE DIAGRAM

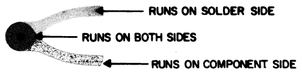


LEAD IDENTIFICATION FOR Q1 AND Q2

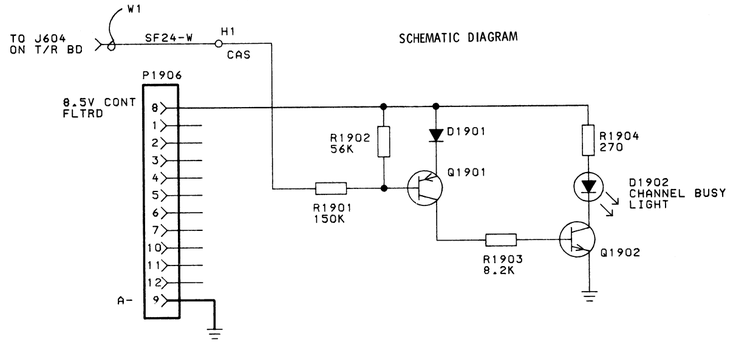


NOTE:
PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH 1900 SERIES.
EXAMPLE: R1=R1901 ETC.

(19C850636, Rev. 1)
(19A701379, Sh. 1, Rev. 0)
(19A701379, Sh. 2, Rev. 0)



SCHEMATIC DIAGRAM



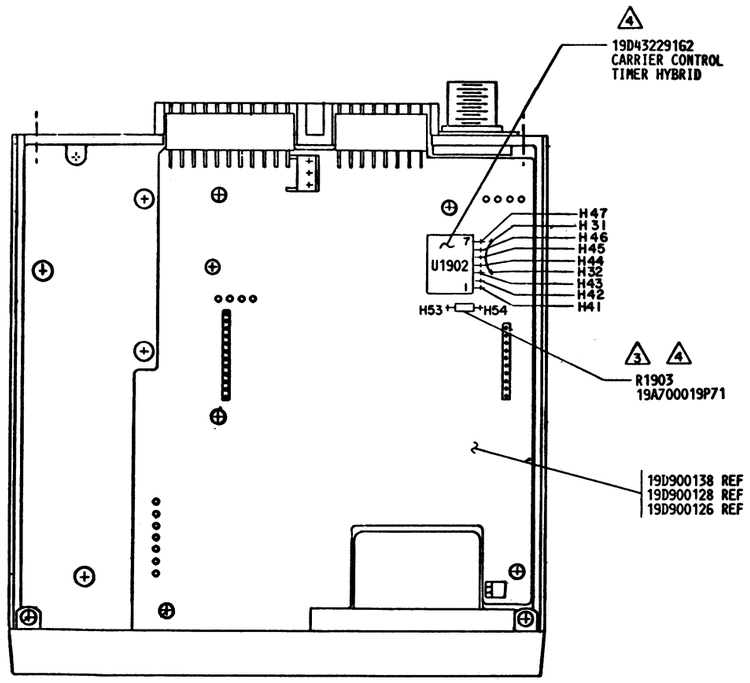
ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED.
RESISTOR VALUES IN Ω UNLESS FOLLOWED BY MULTIPLIER k OR M.
CAPACITOR VALUES IN F UNLESS FOLLOWED BY MULTIPLIER µ, n OR p.
INDUCTANCE VALUES IN H UNLESS FOLLOWED BY MULTIPLIER m OR µ.

(19B800592, Rev. 1)

SERVICE SHEET

CHANNEL BUSY LIGHT

CARRIER CONTROL TIMER



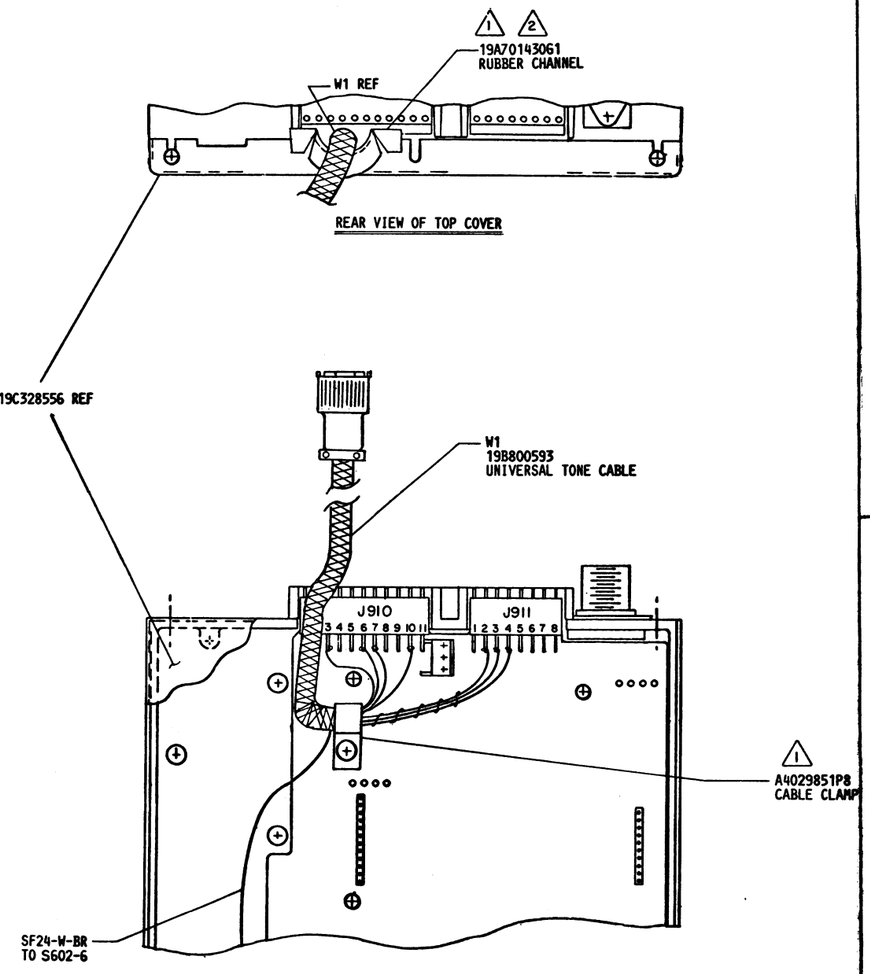
TOP VIEW

NOTES:

1. DELETE JUMPER BETWEEN H31 & H32.
2. INSTALL U1902 & R1903 AS SHOWN.
3. FIVE RESISTOR VALUES ARE SUPPLIED IN THIS KIT, 19B227440. THE STANDARD VALUE FOR FACTORY INSTALLATION IS 680K (BLUE, GRAY, YELLOW COLOR CODE) FOR ONE MINUTE. THE REMAINING FOUR RESISTORS ARE TO BE SHIPPED WITH THE RADIO FOR POSSIBLE FIELD MODIFICATION OF THE TIME OUT TIMER.
4. PART OF OPTION KIT PL19B227440.

(19D432543, Sh. 7, Rev. 0)

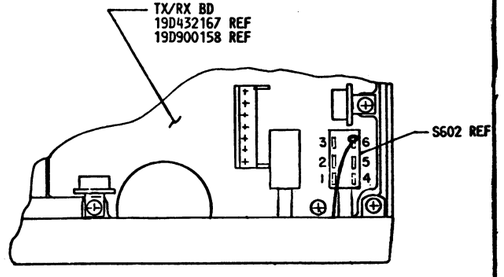
UNIVERSAL TONE CABLE



TOP VIEW

TONE CABLE TO RADIO CONNECTION CHART

FROM	TO	WIRE COLOR	NOTES
W1	J910-3	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	SHEILD	SOLDER
W1	J911-4	W-G (SHIELDED)	SOLDER
W1	S602-6	W-BR	SOLDER ON TX/RX BD



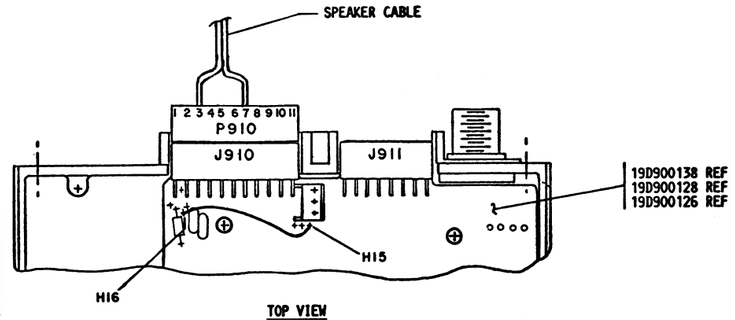
BOTTOM VIEW

NOTES:

1. PART OF CABLE KIT 19B800593
2. APPLY RUBBER CHANNEL WITH 4036022P1 PER PROCESS P7C-EA112.

(19D432543, Sh. 8, Rev. 0)

SPEAKER CABLE



TOP VIEW

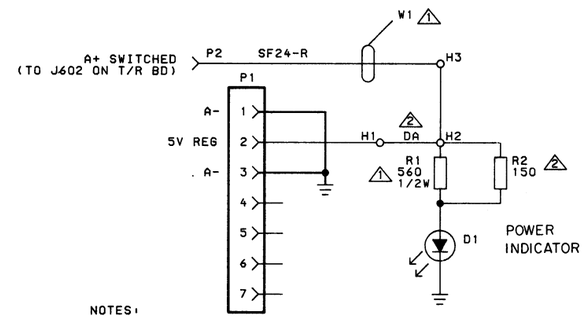
NOTES:

1. CONNECT SPEAKER LEADS TO P910-3 AND P910-7. TO DISASSEMBLE INTERNAL SPEAKER (FIELD ONLY) REMOVE JUMPER BETWEEN H15 & H16.
2. FOR EXTERNAL SPEAKER WITH THE AC POWER SUPPLY, REMOVE JUMPER IN POWER CABLE BETWEEN P910-3 & P910-10 AND CONNECT PER NOTE 1.

(19D432543, Sh. 8, Rev. 0)

POWER ON LED

ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED.
RESISTOR VALUES IN Ω UNLESS FOLLOWED BY MULTIPLIER k OR M.
CAPACITOR VALUES IN F UNLESS FOLLOWED BY MULTIPLIER µ,n OR p.
INDUCTANCE VALUES IN H UNLESS FOLLOWED BY MULTIPLIER m OR µ.



NOTES:

1. R1 AND W1 PRESENT IN GROUP 1 ONLY.
2. R2 AND DA JUMPER H1 TO H2 PRESENT IN GROUP 2 ONLY.

(19B800642, Rev. 2)

SERVICE SHEET

CARRIER CONTROL TIMER,
UNIVERSAL TONE CABLE,
SPEAKER CABLE & POWER ON LED

PARTS LIST

148-174 MHz AND 420-512 MHz CENTURY II RADIO
ISSUE 1

SYMBOL	GE PART NO.	DESCRIPTION
		TRANSMIT/RECEIVE ASSEMBLY (See Transmit/Receive Assembly Parts List shown separately)
		FRONT CAP ASSEMBLY 19B233129G2
		- - - - - - - - - LOUDSPEAKERS - - - - - - - - -
LS901	19A138181G1	Permanent magnet: 4 ohms ±10% imp, resonant frequency 400 Hz at 1 VRMS, 3 watt max.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - -
	19B800585G1	Grille.
	19B209572P1	Nameplate. (CENTURY II).
		CHASSIS 19B233230G1 420-512 MHz 19B233230G2 148-174 MHz
		CAPACITOR ASSEMBLY 19A138190G1
		- - - - - - - - - CAPACITORS - - - - - - - - - -
C1 and C2	19A116699P2	Ceramic, feed-thru: 1000 pf ±20%, 250 VDCW; sim to Aerovox Style 7405.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - -
	19D429801G1	Frame.
	19C328666P1	Insulator. (Locates under Transmit/Receive Board).
	19A134661P3	Nut, hex (Metric): M2.5. (Secures Q205 & Q206 on Transmit/Receive Board).
	19A134748P2004	Screw, machine, (Pozidriv, Metric): M2 x 0.4 x 4. (Secures capacitor assembly 19A138190G1).
	19A134657P1	Lockwasher, internal tooth, Metric: M2.2. (Secures capacitor assembly 19A138190G1).
		POWER CABLE 19B232925G2
P910	19A116659P143	Connector, printed wiring; sim to Molex 09-50-3111.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - -
	19A137818G3	Lead, black. (Includes 19A116781P5 contact).
		FUSED LEAD ASSEMBLY (RED) 19A137818G9
	19A116781P5	Contact, electrical: wire range No. 18-24 AWG; sim to Molex 08-50-0106. (Hung in wiring on red & yellow wires).
	19A115776P3	Contact, electric: sim to Littelfuse 904-88. (Located in fuseholder- Quantity 2).
	7484390P1	Fuse cartridge.
	19A115776P6	Fuseholder: sim to Bussman 9835. (Mates with 19A115776P5 knob).
	19A115776P7	Spring: sim to Bussman 1A1853. (Used with fuse-holder).
	19A115776P5	Spring: sim to Bussman 9953 1/2. (Used with fuse-holder).
		MIKE HANGER/HOOKSWITCH 19C320318G3
		- - - - - - - - - SWITCHES - - - - - - - - - - -
S6	19A134398P1	Push: sim to Chicago Switch S-1527-1.
		- - - - - - - - - - - CABLES - - - - - - - - - -
W1	19A129414G1	Cable: approx 5 feet. (Includes (2) contacts 19A116781P5).
		- - - - - - - - - - MISCELLANEOUS - - - - - - - -
S1	19B209261P18	Switch, slide: 1 pole, 2 positions, 0.5 amp VDC or 3 amp VAC at 125 v; sim to Switchcraft 46202LH.
	19B219694P1	Base plate.
	19B219698G4	Housing.
	19B219693P2	Spring.
	19A116768P6	Strain relief. (W1).
	N193P1410C	Tap screw, phillip head: No. 8-18 x 5/8. (Secures assembly to mounting surface).
	19A134398P101	Plate. (Located on S6).
		FRONT ACCESS MOUNTING HARDWARE KIT 19A138051G1
		- - - - - - - - - MISCELLANEOUS - - - - - - - -
	19A134653P4008	Bolt, machine, hex: Metric, 8MM (Secures radio to mounting bracket).
	19A134657P5	Lockwasher, internal tooth: No. M2.2 (Metric). (Secures radio to mounting bracket).
	N193P1210C	Tap screw, phillip head: No. 6-20 x 5/8. (Secures mounting bracket to mounting surface- with thin mounting surface).
	N193P1216C	Tap screw, phillip head: No. 6-20 x 1. (Secures mounting bracket to mounting surface- when thick carpet is on mounting surface).
	5490407P17	Rubber grommet: neoprene. (Located in fire wall).
	19A115185P9	Retaining strap: sim to Dennison BAR-LOK 08471. (Secures power leads under dash).
		DESK TOP STAND MOUNTING HARDWARE KIT 19A138051G2
	19A134653P4008	Bolt, machine, hex: Metric, 8MM. (Secures radio to mounting bracket).
	19A134657P5	Lockwasher, internal tooth: No. M2.2 (Metric) (Secures radio to mounting bracket).
		STANDARD MOUNTING HARDWARE KIT 19A138051G3
	19A134653P4008	Bolt, machine, hex: Metric, 8MM. (Secures radio to mounting bracket).
	19A134657P5	Lockwasher, internal tooth: No. M2.2 (Metric) (Secures radio to mounting bracket).
	19A115185P9	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).
	19C850638P1	Mounting bracket.
		LOCKING BRACKET MOUNTING HARDWARE KIT 19A138051G4
	19A134653P4008	Bolt, machine, hex: Metric, 8MM. (Secures radio to mounting bracket).
	19A115185P9	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).
	19A134653P4012	Bolt, machine, hex: Metric.
	19A701543G1	Spacer assembly.
	5491682P4	Rim lock.
	19D900104P1	Mounting bracket. (Inner).
	19C850645G1	Mounting bracket. (Outer- with lock).
		MECHANICAL PARTS
	19B232859P1	Bushing. (Secures Transmit LED Light).
	19A137825P1	Insulator. (Band Pass Filter).
	19C328661P1	Insulator. (Receiver - L Shape).
	19B232964P1	Insulator. (MULTI-FREQ).
	19B232927P1	Insulator. (P.A.).
	19B232962P1	Insulator. (Interconnect assembly).
	19B232928P1	Insulator. (Exciter).
	19A134589P3028	Tap screw, Metric: No. size 3-28MM. (Secures P.A. shield).
	19A134483P3005	Screw, machine, Metric: No. size 3-5MM. (Secures top & bottom covers).
	19A134589P3008	Tap screw, Metric: No. size 3-8MM. (Secures front cap & Transmit/Receive assembly).
	19A134657P3	Lockwasher, internal tooth: No. M3. (Secures top & bottom covers).
	19A134483P2508	Screw, machine, Metric: No. size 2.5-8MM. (Secures Q205 & Q206).
	19A138241P1	Pin. (Used with Multi-Freq. Knob).
	4038831P5	Alignment tool.
	19A142928G1	Transmit/Receive Shield.
	19C328556P1	Cover. (Top & Bottom).
	19B233372G1	Faceplate, standard. (Includes GENERAL ELECTRIC nameplate- 19B209572P3).
	19D430583P5	Faceplate, Multi-Frequency.
	19B209687P1	Mounting bracket. (Standard).
	19B209687P2	Mounting bracket. (Front Access- includes installation tool 19A134652P17).
	19B209687P3	Mounting bracket. (DESK).
	19A134652P17	Allen wrench. (Used with 19B209687P2 mounting bracket).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST

420-470 MHz TRANSMITTER/RECEIVER BOARD
19D900158G1 20 WATT UHF
19C900158G2 5 WATT UHF
19D900158G3 18 WATT 470-494 UHF-X
15 WATT 494-512 UHF-X
ISSUE 1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C102 and C103	19A700003P6	Tantalum: 4.7 µf ±20%, 35 VDCW.
C104	19A116080P205	Polyester: 0.047 µf ±5%, 50 VDCW.
C106	19A700003P4	Tantalum: 1 µf ±20%, 35 VDCW.
C107	19A700003P6	Tantalum: 4.7 µf ±20%, 35 VDCW.
C108	19A116080P216	Polyester: 0.0068 µf ±5%, 50 VDCW.
C109	19A116080P218	Polyester: 0.001 µf ±5%, 50 VDCW.
C110	19A700003P6	Tantalum: 4.7 µf ±20%, 35 VDCW.
C111	19A116080P206	Polyester: 0.068 µf ±5%, 50 VDCW.
C112	19A700001P2	Ceramic, disc: 150 pf ±20%, 50 VDCW.
C114	19A700001P2	Ceramic, disc: 150 pf ±20%, 50 VDCW.
C151	19A700003P7	Tantalum: 10 µf ±20%, 16 VDCW.
C152	19A700005P7	Polyester: 0.010 µf ±10%, 50 VDCW.
C153	19A700002P28	Ceramic, disc: 180 pf ±5%, 50 VDCW.
C154	19A700001P6	Ceramic, disc: 680 pf ±20%, 50 VDCW.
C155	19A134725P2	Ceramic, disc: 68 pf ±5%, 50 VDCW.
C156	19A134725P1	Ceramic, disc: 18 pf ±5%, 50 VDCW.
C157A	19A700002P16	Ceramic, disc: 18 pf ±5%, 50 VDCW.
C157B	19A700235P11	Ceramic, disc: 6.8 pf ±0.25 pf, 50 VDCW.
C158A	19A700002P19	Ceramic, disc: 33 pf ±5%, 50 VDCW.
C158B	19A700235P14	Ceramic, disc: 12 pf ±5%, 50 VDCW.
C159	19A700003P5	Tantalum: 2.2 µf ±20%, 35 VDCW.
C160	19A700001P5	Ceramic, disc: 470 pf ±20%, 50 VDCW.
C161	19A700002P3	Ceramic, disc: 1.5 pf ±0.25 pf, 50 VDCW.
C201	19A700001P2	Ceramic, disc: 150 pf ±5%, 50 VDCW.
C202	19A116655P7	Ceramic disc: 150 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C203	19A700001P8	Ceramic, disc: 1500 pf ±5%, 50 VDCW.
C204A	19A700002P15	Ceramic, disc: 15 pf ±5%, 50 VDCW.
C204B	19A700002P14	Ceramic, disc: 12 pf ±5%, 50 VDCW.
C205A	19A700002P18	Ceramic, disc: 27 pf ±5%, 50 VDCW.
C205B	19A700002P17	Ceramic, disc: 22 pf ±5%, 50 VDCW.
C206	19A700013P10	Phenolic: 0.56 pf ±5%, 500 VDCW.
C207A	19A700002P18	Ceramic, disc: 27 pf ±5%, 50 VDCW.
C207B	19A700002P17	Ceramic, disc: 22 pf ±5%, 50 VDCW.
C208A	19A700002P14	Ceramic, disc: 12 pf ±5%, 50 VDCW.
C208B	19A700002P13	Ceramic, disc: 10 pf ±5%, 50 VDCW.
C209 thru C211	19A700002P19	Ceramic, disc: 33 pf ±5%, 50 VDCW.
C212	19A134100P20	Ceramic disc: 2.2 pf ±0.1 pf, 100 VDCW, temp coef 0 ±120 PPM/°C.
C213	19A700008P1	Variable, air: 2.04 to 9.9 pf, 250 v; sim to E.F. Johnson Type T No. 187-0106-005.
C214	19A700013P6	Phenolic: 0.27 pf ±5%, 500 VDCW.
C215	19A700008P1	Variable, air: 2.04 to 9.9 pf, 250 v; sim to E.F. Johnson Type T No. 187-0106-005.
C216A	19A700002P10	Ceramic, disc: 5.6 pf ±0.25 pf 50 VDCW.
C216B	19A700002P11	Ceramic, disc: 6.8 pf ±0.25 pf 50 VDCW.
C217	19A700002P19	Ceramic, disc: 33 pf ±5%, 50 VDCW.
C218	19A700001P8	Ceramic, disc: 1500 pf ±20%, 50 VDCW.
C219	19A134100P20	Ceramic disc: 2.2 pf ±0.1 pf, 100 VDCW, temp coef 0 ±120 PPM/°C.
C220	19A700001P8	Ceramic, disc: 1500 pf ±5%, 50 VDCW.
C221	19A700008P1	Variable, air: 2.04 to 9.9 pf, 250 v; sim to E.F. Johnson Type T No. 187-0106-005.
C222	19A700013P9	Phenolic: 0.47 pf ±5%, 500 VDCW.
C223	19A700008P1	Variable, air: 2.04 to 9.9 pf, 250 v; sim to E.F. Johnson (Type T) 187-0106-005.
C224	19A134100P20	Ceramic disc: 2.2 pf ±0.1 pf, 100 VDCW, temp coef 0 ±120 PPM/°C.
C225A	19A700002P6	Ceramic, disc: 2.7 pf ±0.25 pf, 50 VDCW.
C225B	19A700002P7	Ceramic, disc: 3.3 pf ±0.25 pf, 50 VDCW.
C226	19A700001P5	Ceramic, disc: 470 pf ±5%, 50 VDCW.
C230	19A700002P19	Ceramic, disc: 33 pf ±5%, 50 VDCW.
C231	19A700002P10	Ceramic, disc: 5.6 pf ±0.25 pf, 50 VDCW.
C232A	19A700002P10	Ceramic, disc: 5.6 pf ±0.25 pf, 50 VDCW.
C232B	19A700002P12	Ceramic, disc: 8.2 pf ±0.25 pf, 50 VDCW.
C233	19A700005P11	Polyester: 0.047 µf ±10%, 50 VDCW.
C234	19A700002P14	Ceramic, disc: 12 pf ±5%, 50 VDCW.
C235	19A116655P7	Ceramic disc: 150 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C236A	19A700006P25	Mica: 45 pf ±5%, 250 VDCW.
C236B	19A700006P23	Mica: 39 pf ±5%, 250 VDCW.
C237A	19A700006P25	Mica: 45 pf ±5%, 250 VDCW.
C237B	19A700006P23	Mica: 39 pf ±5%, 250 VDCW.
C238	19A700002P18	Ceramic, disc: 27 pf ±5%, 50 VDCW.
C239	19A700001P6	Ceramic, disc: 680 pf ±5%, 50 VDCW.
C240	19A700003P5	Tantalum: 2.2 µf, ±20%, 35 VDCW.
C241A	19A700015P16	Metallized teflon: 30 pf ±5%, 250 VDCW.
C241B	19A700015P21	Metallized teflon: 47 pf ±5%, 250 VDCW.
C241C	19A700015P13	Metallized teflon: 24 pf ±5%, 250 VDCW.
C242A	19A700006P23	Mica: 39 pf ±5%, 250 VDCW.
C242B	19A700006P19	Mica: 27 pf ±5%, 250 VDCW.
C242C	19A700006P22	Mica: 36 pf ±5%, 250 VDCW.
C243A	19A700006P25	Mica: 45 pf ±5%, 250 VDCW.
C243B	19A700006P22	Mica: 36 pf ±5%, 250 VDCW.
C244	19A700002P18	Ceramic, disc: 27 pf ±5%, 50 VDCW.
C245	19A700001P6	Ceramic, disc: 680 pf ±5%, 50 VDCW.
C246	19A700003P5	Tantalum: 2.2 µf, ±20%, 35 VDCW.
C247	19A700006P21	Teflon/Mica: 33 pf ±5%, 250 VDCW.
C248A	19A700006P9	Mica: 13 pf ±5%, 250 VDCW.
C248B	19A700006P6	Mica: 10 pf ±5%, 250 VDCW.
C249	19A700015P21	Metallized teflon: 47 pf ±5%, 250 VDCW.
C250A	19A116952P12	Metallized teflon: 12 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C250B	19A700013P10	Phenolic: 0.56 pf ±5%, 500 VDCW.
C251A	19A116952P20	Metallized teflon: 20 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C251B	19A700131P16	Metallized teflon: 16 pf ±0.5 pf; sim to Underwood Type J1HF.
C252A	19A116952P11	Metallized teflon: 11 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C252B	19A700131P9	Metallized teflon: 9 pf ±0.5 pf; sim to Underwood Type J1HF.
C253	19A700002P3	Ceramic, disc: 1.5 pf ±0.25 pf, 50 VDCW.
C254	19A700001P5	Ceramic, disc: 470 pf ±20%, 50 VDCW.
C255	19A700003P5	Tantalum: 2.2 µf ±20%, 35 VDCW.
C256	19A700001P8	Ceramic, disc: 1500 pf ±20%, 50 VDCW.
C257	19A700006P21	Mica: 33 pf ±5%, 250 VDCW.
C258	19A700001P8	Ceramic, disc: 1500 pf ±20%, 50 VDCW.
C259	19A700002P6	Ceramic, disc: 2.7 pf ±0.25 pf, 50 VDCW.
C260	19A700001P8	Ceramic, disc: 1500 pf ±20%, 50 VDCW.
C301	19A700001P6	Ceramic, disc: 680 pf ±20%, 50 VDCW.
C302	19A700005P7	Polyester: 0.010 µf ±10%, 50 VDCW.
C303	19A700002P28	Ceramic, disc: 180 pf ±5%, 50 VDCW.
C304	19A700001P6	Ceramic, disc: 680 pf ±20%, 50 VDCW.
C305	19A134725P2	Ceramic, disc: 68 pf ±5%, 50 VDCW.
C306	19A134725P1	Ceramic, disc: 18 pf ±5%, 50 VDCW.
C307A	19A700002P12	Ceramic, disc: 8.2 pf ±0.25 pf, 50 VDCW.
C307B	19A700002P11	Ceramic, disc: 6.8 pf ±0.25 pf, 50 VDCW.
C308	19A700002P28	Ceramic, disc: 180 pf ±5%, 50 VDCW.
C309	19A700013P12	Phenolic: 0.82 pf ±5%, 500 VDCW.
C310A	19A700002P16	Ceramic, disc: 18 pf ±5%, 50 VDCW.
C310B	19A700235P15	Ceramic, disc: 15 pf ±5%, 50 VDCW.
C311A	19A700002P17	Ceramic, disc: 22 pf ±5%, 50 VDCW.
C311B	19A700002P16	Ceramic, disc: 18 pf ±5%, 50 VDCW.
C312	19A700003P5	Tantalum: 2.2 µf ±20%, 35 VDCW.
C313	19A700001P5	Ceramic, disc: 470 pf ±20%, 50 VDCW.
C314	19A134756P1	Variable, teflon: 1.8 to 10 pf, 300 VDCW, temp coef 0 ±150 Parts/M/°C.
C315 and C316	19A700001P5	Ceramic, disc: 470 pf ±20%, 50 VDCW.
C317	19A700002P17	Ceramic, disc: 22 pf ±5%, 50 VDCW.
C318	19A700002P21	Ceramic, disc: 47 pf ±5%, 50 VDCW.
C319	19A700001P1	Ceramic, disc: 100 pf ±20%, 50 VDCW.
C401 thru C404	19A700001P5	Ceramic, disc: 470 pf ±20%, 50 VDCW.
C405	19A700002P10	Ceramic, disc: 5.6 pf ±0.25 pf, 50 VDCW.
C406	19A700001P5	Ceramic, disc: 470 pf ±20%, 50 VDCW.
C408	19A700002P7	Ceramic, disc: 3.3 pf ±0.25 pf, 50 VDCW.
C409	19A700005P7	Polyester: 0.010 µf ±10%, 50 VDCW.
C410	19A700002P13	Ceramic, disc: 10 pf ±5%, 50 VDCW.
C411	19A700005P7	Polyester: 0.010 µf ±10%, 50 VDCW.
C412	19A700002P26	Ceramic, disc: 120 pf ±5%, 50 VDCW.
C413	19A700002P24	Ceramic, disc: 82 pf ±5%, 50 VDCW.
C414	19A700002P16	Ceramic, disc: 18 pf ±5%, 50 VDCW.
C501	19A700002P17	Ceramic, disc: 22 pf ±5%, 50 VDCW.
C502	19A700001P5	Ceramic, disc: 470 pf ±20%, 50 VDCW.
C503 thru C505	19A700005P7	Polyester: 0.010 µf ±10%, 50 VDCW.
C506	19A700002P21	Ceramic, disc: 47 pf ±5%, 50 VDCW.
C507	19A700002P25	Ceramic, disc: 100 pf ±5%, 50 VDCW.
C508	19A700002P29	Ceramic, disc: 220 pf ±5%, 50 VDCW.
C509	19A700005P5	Polyester: 4700 pf ±10%, 50 VDCW.
C510	19A700003P4	Tantalum: 1 µf ±20%, 35 VDCW.
C511	19A700003P2	Tantalum: 0.22 µf ±20%, 35 VDCW.

(Cont'd on Page 34)

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
C512 thru C514	19A700003P4	Tantalum: 1 µf ±20%, 35 VDCW.
C515 and C516	19A700003P5	Tantalum: 2.2 µf ±20%, 35 VDCW.
C517 and C518	19A700001P3	Ceramic, disc: 220 pf ±20%, 50 VDCW.
C519	19A700001P7	Ceramic, disc: 1000 pf ±20%, 50 VDCW.
C520	19A700003P4	Tantalum: 1 µf ±20%, 35 VDCW.
C521	19A134730P3	Electrolytic: 470 µf +100% -10%, 16 VDCW.
C522	19A700005P4	Polyester: 3300 pf ±10%, 50 VDCW.
C601	19A700005P5	Polyester: 4700 pf ±10%, 50 VDCW.
C602	19A700005P6	Polyester: 6800 pf ±10%, 50 VDCW.
C603	19A700005P11	Polyester: 0.047 pf ±10%, 50 VDCW.
C604	19A700003P6	Tantalum: 4.7 µf ±20%, 35 VDCW.
C605	19A134730P1	Electrolytic: 47 µf +100-10%, 16 VDCW.
C606	19A700003P4	Tantalum: 1 µf ±20%, 35 VDCW.
C607	19A700003P3	Tantalum: 0.47 µf ±20%, 35 VDCW.
C608	19A700004P2	Polyester: 0.1 µf ±10%, 63 VDCW.
C609	19A700003P6	Tantalum: 4.7 µf ±20%, 35 VDCW.
C610	19A700003P9	Tantalum: 47 µf ±20%, 6.3 VDCW.
C611	19A700004P2	Polyester: 0.1 µf ±10%, 63 VDCW.
C612	19A700003P2	Tantalum: 0.22 µf ±20%, 35 VDCW.
C613	19A700004P6	Polyester: 0.47 µf ±10%, 63 VDCW.
C614	19A134730P3	Electrolytic: 470 µf +100% -10%, 16 VDCW.
C615 and C616	19A700004P1	Polyester: 0.068 µf ±10%, 63 VDCW.
C617	19A134730P1	Electrolytic: 47 µf +100-10%, 16 VDCW.
C618	19A134730P2	Electrolytic: 220 µf +100-10%, 25 VDCW.
C620 and C621	19A700001P5	Ceramic, disc: 470 pf ±20%, 50 VDCW.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - -
D101 and D102	4037822P1	Silicon, 1000 mA, 400 PIV.
D151	19A116785P2	Silicon, capacitive.
D152	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
D201	19A115775P1	Silicon, fast recovery, 225 mA, 50 PIV.
D301	19A116785P2	Silicon, capacitive.
D501 and D502	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
D601 thru D605	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
D60	19A134738P1	Optoelectronic, red: sim to Siemans LD41/11.
D607	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - -
J151	19A116428P4	Contact, electrical: sim to AMP 86031-1 (Strip Form).
J301	19A116428P4	Contact, electrical: sim to AMP 86031-1 (Strip Form).
J601	19A700067P2	Connector, receptacle, coax: sim to Amphenol 83-876-1002.
J602 thru J604	19A142706P5	Contact, electrical.
		- - - - - - - - - - - RELAYS - - - - - - - - - -
K601	19A700061P1	Hermetic sealed: 180 to 341 ohms coil res, 8-16.3 VDC; sim to GE 3SAV1760A2.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L151	19A134728P2	Coil, RF: variable.
L152	19A700024P15	Coil, RF: 1.5 µh ±10%, 0.22 ohms DC res max.
L153A	19A134727P1	Coil, RF: variable.
L153B	19A134727P6	Coil, RF: variable.
L154	19A700024P25	Coil, RF: 10.0 µh ±10%, 3.70 ohms DC res max.
L201	19A700024P13	Coil, RF: 1.0 µh ±10%, 1.00 ohms DC res max.
L202	19B209420P101	Coil, RF: 0.10 µh ±10%, 0.08 ohms DC res max; sim to Jeffers 4416-1K.
L203 and L204	19A134727P2	Coil, RF: variable.
L205	19A700024P13	Coil, RF: 1.0 µh ±10%, 1.00 ohms DC res max.
L206	19A138195P1	Coil.
L207	19A129773G1	Coil.
L208	19A138193P2	Coil.
L209	19A138193P4	Coil.
L210	19A138196P3	Coil.
L211 and L212	19A138193P2	Coil.
L213	19A129773G1	Coil.
L216		(Part of printed board 19D900173P1).
L217	19A129773G1	Coil.
L218	19A138196P4	Coil.
L219 and L221		(Part of printed board 19D900173P1).
L222	19A129773G1	Coil.
L223	19A138196P1	Coil.
L225		(Part of printed board 19D900173P1).
L226	19A134740P1	Coil, RF.
L227		(Part of printed board 19D900173P1).
L228	19A138196P1	Coil.
L231	19A138191P2	Strap.
L232 and L233		(Part of jumper 19B233135P1).
L234	19A138192P1	Strap.
L301	19A134728P2	Coil, RF.
L302	19A700024P19	Coil, RF: 3.30 µh ±10%, 0.85 ohms DC res max.
L303	19A134727P8	Coil, RF: variable.
L305	19A134727P7	Coil, RF: variable.
L306		(Part of printed board 19D900173P1).
L307A	19B209729P1	Coil, helical: sim to Paul Smith SK 802-1.
L307B	19B209729P5	Coil, helical: sim to Paul Smith SK 802-1.
L308A	19B209729P1	Coil, helical: sim to Paul Smith SK 802-1.
L308B	19B209729P5	Coil, helical: sim to Paul Smith SK 802-1.
L401A	19B209729P1	Coil, RF, helical: sim to Paul Smith SK 802-1.
L401B	19B209729P5	Coil, RF, helical: sim to Paul Smith SK 802-1.
L402A	19B209729P1	Coil, RF, helical: sim to Paul Smith SK 802-1.
L402B	19B209729P6	Coil, RF, helical: sim to Paul Smith SK 802-1.
L403	19A138400G1	Coil.
L404		(Part of printed board 19D900173P1).
L405A	19B209729P1	Coil, RF, helical: sim to Paul Smith SK 802-1.
L405B	19B209729P5	Coil, RF, helical: sim to Paul Smith SK 802-1.

SYMBOL	GE PART NO.	DESCRIPTION
L406A	19B209729P1	Coil, RF, helical: sim to Paul Smith SK 802-1.
L406B	19B209729P6	Coil, RF, helical: sim to Paul Smith SK 802-1.
L407A	19B209729P1	Coil, RF, helical: sim to Paul Smith SK 802-1.
L407B	19B209729P3	Coil, RF, helical: sim to Paul Smith SK 802-1.
L409		(Part of printed board 19D900173P1).
L410	19A134729P2	Coil, RF: variable.
L501 and L502	19A134747P3	Coil, RF.
L503 and L504	19A134747P1	Coil, RF.
L601	19A134741P1	Reactor.
		- - - - - - - - - - PLUGS - - - - - - - - - - -
P101	19A116659P15	Connector, printed wiring: 4 contacts; sim to Molex 09-52-3042.
P201	19A116659P1	Connector, printed wiring: 3 contacts; sim to Molex 09-52-3032.
P901	19A116659P15	Connector, printed wiring: 4 contacts; sim to Molex 09-52-3042.
P903	19A116659P83	Connector, printed wiring: 7 contacts; sim to Molex 09-52-3072 (Special).
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q151	19A701351P1	Silicon, NPN.
Q201	19A116201P1	Silicon, NPN.
Q202	19A116201P3	Silicon, NPN.
Q203A	19A116201P1	Silicon, NPN.
Q203B	19J706012P2	Silicon, NPN.
Q204A	19A134237P1	Silicon, NPN.
Q204B	19A143682P1	Silicon, NPN.
Q205A	19A134164P2	Silicon, NPN.
Q205B	19A143683P1	Silicon, NPN.
Q206A	19A134239P3	Silicon, NPN.
Q206B	19A143684P1	Silicon, NPN.
Q207	19A116742P1	Silicon, NPN.
Q208	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q209 and Q210	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q301 and Q302	19A701351P1	Silicon, NPN.
Q303	19A134774P1	Silicon, NPN.
Q303	19A134774P1	Silicon, NPN.
Q401	19A134775P1	Silicon, NPN.
Q402	19A116154P1	N Type, field effect.
Q501	19A134760P1	N Channel, field effect.
Q601 and Q602	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q603 thru Q605	19A134749P1	Silicon, PNP; sim to Type 2N5087.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R102	19A700106P95	Composition: 22K ohms ±5%, 1/4 w.
R103	19A700106P51	Composition: 330 ohms ±5%, 1/4 w.
R104	3R152P513J	Composition: 51K ohms ±5%, 1/4 w.
R105	19C314256P21052	Metal film: 10.5K ohms ±1%, 1/4 w.
R106	19C314256P21272	Metal film: 12.7K ohms ±1%, 1/4 w.

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SYMBOL	GE PART NO.	DESCRIPTION
R107	19C314256P21052	Metal film: 10.5K ohms ±1%, 1/4 w.
R108	19C314256P25111	Metal film: 5.1K ohms ±1%, 1/4 w.
R109	3R152P132J	Composition: 1.3K ohms ±5%, 1/4 w.
R110	19C314256P25111	Metal film: 5.1K ohms ±1%, 1/4 w.
R112	19C314256P22002	Metal film: 20K ohms ±1%, 1/4 w.
R113	19C314256P21242	Metal film: 12.4K ohms ±1%, 1/4 w.
R114	19A700106P99	Composition: 33K ohms ±5%, 1/4 w.
R115	19A700106P71	Composition: 2.2K ohms ±5%, 1/4 w.
R116	19A116412P3	Variable, cermet: 5K ohms ±10%, 1/2 w;
R117	19A700106P73	Composition: 2.7K ohms ±5%, 1/4 w.
R118	19A700019P25	Deposited carbon: 100 ohms ±5%, 0.25 w.
R151 and R152	19A700106P83	Composition: 6.8K ohms ±5%, 1/4 w.
R153	19A134732P1	Thermal: 3300 ohms ±10% at 0 power; sim to Phillips 2322-642-12332.
R154	19A700106P103	Composition: 47K ohms ±5%, 1/4 w.
R155	19A700106P49	Composition: 270 ohms ±5%, 1/4 w.
R156	19A700106P85	Composition: 8.2K ohms ±5%, 1/4 w.
R157	19A700106P83	Composition: 6.8K ohms ±5%, 1/4 w.
R158	19A700106P49	Composition: 270 ohms ±5%, 1/4 w.
R160	19A700106P91	Composition: 15K ohms ±5%, 1/4 w.
R161	19A700106P79	Composition: 4.7K ohms ±5%, 1/4 w.
R201	19C314256P22431	Metal film: 2.4K ohms ±1%, 1/4 w.
R202	19C314256P22320	Metal film: 2.3K ohms ±1%, 1/4 w.
R203	19A700106P23	Composition: 22 ohms ±5%, 1/4 w.
R204	19A700106P31	Composition: 47 ohms ±5%, 1/4 w.
R205	19A700106P45	Composition: 180 ohms ±5%, 1/4 w.
R206	19A700106P19	Composition: 15 ohms ±5%, 1/4 w.
R207	19A700106P23	Composition: 22 ohms ±5%, 1/4 w.
R208	19C314256P22431	Metal film: 2.4K ohms ±1%, 1/4 w.
R209	19C314256P23920	Metal film: 3.9K ohms ±1%, 1/4 w.
R210	19A700106P19	Composition: 15 ohms ±5%, 1/4 w.
R211	19A700106P23	Composition: 22 ohms ±5%, 1/4 w.
R212	19A700106P19	Composition: 15 ohms ±5%, 1/4 w.
R213	19A700106P25	Composition: 27 ohms ±5%, 1/4 w.
R214	19A700019P41	Deposited carbon: 2.2K ohms ±5%, 0.25 w.
R215	19A116412P3	Variable, cermet: 5K ohms ±10%, 1/2 w; sim to Helipot Model 62 PR.
R216	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.
R217	19A700106P71	Composition: 2.2K ohms ±5%, 1/4 w.
R218	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.
R219	19A700106P83	Composition: 6.8K ohms ±5%, 1/4 w.
R221	19A700106P69	Composition: 1.8K ohms ±5%, 1/4 w.
R222	19A700106P47	Composition: 220 ohms ±5%, 1/4 w.
R224	19A700106P57	Composition: 560 ohms ±5%, 1/4 w.
R225	19A700106P55	Composition: 470 ohms ±5%, 1/4 w.
R301	19A700106P83	Composition: 6.8K ohms ±5%, 1/4 w.
R302	19A700106P75	Composition: 3.3K ohms ±5%, 1/4 w.
R303	19A700106P49	Composition: 270 ohms ±5%, 1/4 w.
R304	19A700106P103	Composition: 47K ohms ±5%, 1/4 w.
R305	19A700106P59	Composition: 680 ohms ±5%, 1/4 w.
R306	19A700106P85	Composition: 8.2K ohms ±5%, 1/4 w.
R307	19A700106P83	Composition: 6.8K ohms ±5%, 1/4 w.
R308	19A700106P49	Composition: 270 ohms ±5%, 1/4 w.
R309	19A700106P23	Composition: 22 ohms ±5%, 1/4 w.
R310	19A700106P15	Composition: 10 ohms ±5%, 1/4 w.
R312	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.
R313	19A700106P33	Composition: 56 ohms ±5%, 1/4 w.
R314 and R315	19A700106P15	Composition: 10 ohms ±5%, 1/4 w.
R401	19A700106P79	Composition: 4.7K ohms ±5%, 1/4 w.
R402	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.
R403 and R404	19A700106P33	Composition: 56 ohms ±5%, 1/4 w.
R405	19A700106P69	Composition: 1.8K ohms ±5%, 1/4 w.
R406	19A700106P33	Composition: 56 ohms ±5%, 1/4 w.
R407	19A700106P39	Composition: 100 ohms ±5%, 1/4 w.
R408	19A700106P29	Composition: 39 ohms ±5%, 1/4 w.
R501	19A700106P71	Composition: 2.2K ohms ±5%, 1/4 w.
R502 and R503	19A700106P97	Composition: 27K ohms ±5%, 1/4 w.
R504	19A700106P51	Composition: 330 ohms ±5%, 1/4 w.
R505	19A700106P49	Composition: 270 ohms ±5%, 1/4 w.
R506	19A700106P85	Composition: 8.2K ohms ±5%, 1/4 w.
R507	19A700106P83	Composition: 6.8K ohms ±5%, 1/4 w.
R508 and R509	19A700106P71	Composition: 2.2K ohms ±5%, 1/4 w.
R510	19A700106P89	Composition: 12K ohms ±5%, 1/4 w.
R511	19A700106P59	Composition: 680 ohms ±5%, 1/4 w.
R512 and R513	19A700106P51	Composition: 330 ohms ±5%, 1/4 w.
R514	19A700106P69	Composition: 1.8K ohms ±5%, 1/4 w.
R515	19A700106P89	Composition: 12K ohms ±5%, 1/4 w.
R516	19A700106P59	Composition: 680 ohms ±5%, 1/4 w.
R517	19A700106P83	Composition: 6.8K ohms ±5%, 1/4 w.
R518	19A700106P85	Composition: 8.2K ohms ±5%, 1/4 w.
R519	19A700106P69	Composition: 1.8K ohms ±5%, 1/4 w.
R520	19A700106P87	Composition: 10K ohms ±5%, 1/4 w.
R521	19A134755P2	Variable, carbon film: 25K ohms ±20%, 0.1 w.
R522	19A700106P87	Composition: 10K ohms ±5%, 1/4 w.
R523	19A700106P75	Composition: 3.3K ohms ±5%, 1/4 w.
R524 and R525	19A700106P101	Composition: 39K ohms ±5%, 1/4 w.
R526	19A700106P7	Composition: 4.7 ohms ±5%, 1/4 w.
R527	19A700106P39	Composition: 100 ohms ±5%, 1/4 w.
R601	19A700106P103	Composition: 47K ohms ±5%, 1/4 w.
R602	19A700106P95	Composition: 22K ohms ±5%, 1/4 w.
R603	19A700106P51	Composition: 330 ohms ±5%, 1/4 w.
R604	19A700106P93	Composition: 18K ohms ±5%, 1/4 w.
R605	19A700106P87	Composition: 10K ohms ±5%, 1/4 w.
R606	3R152P274J	Composition: 270K ohms ±5%, 1/4 w.
R607	19A134755P1	Variable, carbon film: 10K ohms ±20%, 0.1 w.
R608	19A700106P83	Composition: 6.8K ohms ±5%, 1/4 w.
R609	19A134732P2	Thermistor: 470 ohms ±20% at 0 power; sim to Phillips 2322-642-11471.
R610	19A700106P85	Composition: 8.2K ohms ±5%, 1/4 w.
R611	19A700106P41	Composition: 120 ohms ±5%, 1/4 w.
R612	19A700106P55	Composition: 470 ohms ±5%, 1/4 w.
R613	19A700106P61	Composition: 820 ohms ±5%, 1/4 w.
R614	19A700106P77	Composition: 3.9K ohms ±5%, 1/4 w.
R615	19A700106P103	Composition: 47K ohms ±5%, 1/4 w.
R616	19A700106P87	Composition: 10K ohms ±5%, 1/4 w.
R617	3R152P394J	Composition: 390K ohms ±5%, 1/4 w.
R618	19A700106P89	Composition: 12K ohms ±5%, 1/4 w.
R619 and R620	19A700106P97	Composition: 27K ohms ±5%, 1/4 w.
R621	19A700106P69	Composition: 1.8K ohms ±5%, 1/4 w.
R622	19A700106P51	Composition: 330 ohms ±5%, 1/4 w.
R623	19A700106P83	Composition: 6.8K ohms ±5%, 1/4 w.
R624	19A700106P87	Composition: 10K ohms ±5%, 1/4 w.
R625	3R152P302J	Composition: 3K ohms ±5%, 1/4 w.
R626	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.
R627	19A700106P45	Composition: 180 ohms ±5%, 1/4 w.
R628	19A700106P43	Composition: 150 ohms ±5%, 1/4 w.
R629	19A700106P85	Composition: 8.2K ohms ±5%, 1/4 w.
R630	19A134753P1	Variable, carbon film: 47K ±20%, 0.1 w.
R631	19A700106P23	Composition: 22 ohms ±5%, 1/4 w.
R632	19A116216P1R0J	Deposited carbon: 1.0 ohms ±5%, 1/4 w; sim to Mepco Electra Type CR25.
R633	19A700106P41	Composition: 120 ohms ±5%, 1/4 w.
R634	19A116216P1R0J	Deposited carbon: 1.0 ohms ±5%, 1/4 w; sim to Mepco Electra Type CR25.
R635	19A700106P33	Composition: 56 ohms ±5%, 1/4 w.
R636A	19A700106P49	Composition: 270 ohms ±5%, 1/4 w.
R636B	19A700106P39	Composition: 100 ohms ±5%, 1/4 w.
R636C	19A700106P31	Composition: 47 ohms ±5%, 1/4 w.
R636D	19A700106P23	Composition: 22 ohms ±5%, 1/4 w.
R636E	19A116216P6R8J	Deposited carbon: 6.8 ohms ±5%, 1/4 w; sim to Mepco Electra Type CR25.
R637	19A700106P59	Composition: 680 ohms ±5%, 1/4 w.
R638	7147161P19	Composition: 1.0 ohms ±5%, 1/2 w.
R639	19A700106P39	Composition: 100 ohms ±5%, 1/4 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S601 and S602	19B800563P1	Push: DPDT, single station, push-push (alternate action); sim to IEEE/Schadow No. 51281 (F2UEE).
		- - - - - - - - - - TEST POINTS - - - - - - - - - -
TP201 thru TP203	19A700152P1	Contact. (Quantity 1).
TP204	19A700152P1	Contact. (Quantity 2).
TP301	19A700152P1	Contact. (Quantity 1).
TP401	19A700152P1	Contact. (Quantity 2).
TP501	19A700152P1	Contact. (Quantity 2).
		- - - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U101	19A116297P6	Linear, Operational Amplifier; sim to μA741C.
U501	19A134759P1	Linear, Dual Differential Amplifier.
U502	19A134766P1	Linear, IF Amplifier & Detector; sim to AMPEREX TBA 750.
U601	19A134769P2	Linear, Audio Amplifier: sim to TDA 2002.
U602	19A138414G1	Regulator, 8.5 v.

(Cont'd on Page 36)

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CABLES - - - - - - - - - - -
W201 and W202		(Part of printed board 19D900173P1).
W203	19A129571P2	Strap.
W204 and W205		(Part of printed board 19D900173P1).
W206	19A138194P1	Strap.
W401		(Part of printed board 19D900173P1).
W601		(Part of printed board 19D900173P1).
		- - - - - - - - - - CRYSTALS - - - - - - - - - -
X151		Socket, crystal. Includes:
	19A134806P1	Pin.
	19B232322P1	Spring.
X301		Socket, crystal. Includes:
	19A134806P1	Pin.
	19B232322P1	Spring.
X501		Socket, crystal. Includes:
	19A134806P1	Pin.
	19B232322P1	Spring.
		- - - - - - - - - - CRYSTALS - - - - - - - - - -
		NOTE: When reordering give GE Part Number and specify exact frequency needed.
Y151	19B233066G5	Crystal: 5 PPM. Fx = $\frac{Fo}{9}$
Y301	19B233066G6	Crystal: 420-450 MHz. Fx = $\frac{Fo + 21.4}{9}$
	19B233066G7	Crystal: 450-470 MHz. Fx = $\frac{Fo - 21.4}{9}$
Y501	19A134802P3	Crystal, Quartz: 20945.0 KHz.
		- - - - - - - - - - FILTERS - - - - - - - - - - -
Z201 and Z202	19A138228G1	Filter. Includes:
L1	19A129773G1	Coil.
R1	3R77P100J	Resistor, composition: 10 ohms ±5%, 1/2 w.
Z501	19A134797P2	Filter, bandpass: freq. 21.4 MHz; sim to TOYO 21J3E5.
Z502	19A134742P1	Filter, bandpass: center freq. 455 ±1.5 KHz; sim to Murata CFU455D2 or Matsushita EFC-L455K41EA.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19B233524G1	Shield. (Located at L211 & R203).
	19B233136P1	Shield. (Located at C215 & L208).
	19D429946P1	Cover. (Located over L307, L308, L401, L402, L405-L407).
	19A134748P2008	Machine screw, Pozidriv, Metric: No. 2-0.4 x 6. (Secures cover over L307, L308, L308, L401, L402, L405-L407).
	19A138451P1	Tuning slug. (Used with L307A, L308A, L401A, L402A, L405A-L407A).
	19A138451P2	Tuning slug. (Used with L307B, L308B, L401B, L402B, L405B-L407B).
	19A138452P1	Spring. (Used with L307, L308, L401, L402, L405-L407).
	19A134772P1	Can. (Located over L153, L203, L204, L303 & L305).
	19A138274P1	Insulator. (Used with L153, L203, L204, L303, L305).

SYMBOL	GE PART NO.	DESCRIPTION
	19A134656P4	Flatwasher, Metric: 2.6(2.5) MM. dia. (Used with Q207 & U602).
	19A134657P2	Lockwasher, tooth, Metric: No. 2.5. (Used with Q207, U601, U602).
	19A134661P3	Hex nut, Metric: M2.5 x 0.45. (Used with Q207, U601 & U602).
	19A134483P2508	Machine screw, Metric: 2.5 -.45 x 8 MM. (Secures Q207, U601, U602).
	19B232901P1	Support. (Used with Q207, U601, U602).
	19A116023P3	Insulator, plate. (Used with Q207 & U602).
	19A134016P1	Insulator, bushing. (Used with Q207, U602).
	N330P1905F22	Metallic eyelet. (Located on corner of board at J601).
	19B232830P1	Cover. (Used with J601).
	19A134589P3006	Tap screw, thd forming, Metric: 3 -0.5 x 6MM. (Secures J601).
	19C328587P1	Push button. (Used with S601 & S602- POWER, SQUELCH).
	NP280878P2	Nameplate. (POWER- Located on S602 knob).
	NP280878P1	Nameplate. (SQUELCH- Located on S601 knob).
	4036555P1	Insulator, washer: nylon. (Used with Q204).
	19B209502P1	Stud terminal. (Used with C250-C252).
	19D429826P1	Knob. (R630).
	19A134753P5	Screw. (Secures R630).
	19A134751P1	Lockwasher. (Secures R630).
	19A134753P2	Flatwasher. (Secures R630).
	19B233135P1	Jumper. (Located between W202 & W203).
	19B233285P1	Spring, ground. (Located on edge of printed board).
	19A121252P1	Heat sink. (Used with Q204).

PARTS LIST

CENTURY II EXTERNAL SPEAKER OPTION
19C320302G9
ISSUE 1

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) 19A116781P3 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, external tooth: No. 10. (Secures speaker to mounting bracket).
	N402P39C6	Flatwasher: No. 10. (Secures speaker to mounting bracket).
	N130P1610C6	Tap screw, thread forming: No. 10-16 x 5/8. (Secures mounting bracket to mounting surface).
	19A116986P108	Tap screw, with lockwasher: No. 7-19 x 1/2. (Secures speaker to grille).
	19A116986P112	Tap screw, with lockwasher: No. 7-19 x 3/4. (Secures housing to grille).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

PARTS LIST

SYSTEM INTERCONNECT BOARD
19D900138G1
ISSUE 1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - -
C901	19A700001P6	Ceramic, high dielectric disc: 100 pf ±20%, 50 VDCW.
C902	19A134730P2	Electrolytic: 220 µf +100% -10%, 25 VDCW.
C903	19A700001P6	Ceramic, high dielectric disc: 680 pf ±20%, 50 VDCW.
C904	19A700005P9	Polyester: 0.022 µf ±10%, 50 VDCW.
C905	19A700001P7	Ceramic, high dielectric disc: 1000 pf ±20%, 50 VDCW.
C913	19A700003P7	Tantalum: 10 µf ±20%, 16 VDCW.
C914	19A700001P6	Ceramic, high dielectric disc: 680 pf ±20%, 50 VDCW.
C916	19A700002P19	Ceramic, temperature compensating disc: 33 pf ±5%, 50 VDCW.
C917	19A700226P65	Ceramic: 100 pf ±5%, 100 VDCW; temp coef -750 PPM/°C.
C919 and C920	19A700001P1	Ceramic, high dielectric disc: 100 pf ±20%, 50 VDCW.
C952	19A700001P1	Ceramic, high dielectric disc: 100 pf ±20%, 50 VDCW.
C953	19A700001P7	Ceramic, high dielectric disc: 1000 pf ±20%, 50 VDCW.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - -
D901	19A116783P1	Rectifier, silicon: 100 VDC blocking, 6 amps.
D902	4037822P1	Silicon, 1000 mA, 400 PIV.
D903	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
D905	19A134354P3	Diode, optoelectronic: green; sim to Hew. Packard 5082-4955.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - -
J901 and J902	19A134734P1	Contact, electrical: sim to Molex A 2461 (09-67-1042).
J903	19A134735P1	Contact, electrical: sim to Molex A 2461 (09-67-1072).
J904	19A134736P1	Contact, electrical: sim to Molex 6410 (22-27-2021).
J905	19A700072P9	Connector, printed wiring: sim to Molex 22-03-2101.
J906	19A134733P1	Contact, electrical: sim to Molex A4030 (22-03-2121).
J910	19A116659P151	Connector, printed wiring: sim to Molex 09-75-1111.
J911	19A116659P145	Connector, printed wiring: sim to Molex 09-75-1081.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L905	19B209420P114	Coil, RF: 1.20 µh ±10%, 0.18 ohms DC res max; sim to Jeffers 4436-1K.
		- - - - - - - - - - PLUGS - - - - - - - - - - -
P907	19A116659P1	Connector, printed wiring: 3 contacts; sim to Molex 09-52-3032.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R901	19A700106P57	Composition: 560 ohms ±5%, 1/4 w.
R902	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.
R903	19A700103P97	Composition: 27K ohms ±5%, 1/4 w.
R904	19A700106P49	Composition: 270 ohms ±5%, 1/4 w.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

PARTS LIST

MIKE HANGER/HOOKSWITCH
19C320318G3
ISSUE 1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - - - SWITCHES - - - - - - - - - -
S6	19A134398P1	Push: sim to Chicago Switch S-1527-1.
		- - - - - - - - - - - - CABLES - - - - - - - - - -
W1	19A129414G1	Cable: approx 5 feet. Includes (2) contacts 19A116781P5.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - -
S1	19B209261P18	Switch, slide: 1 pole, 2 positions, 0.5 amp VDC or 3 amp VAC at 125 v; sim to Switchcraft 46202LH.
	19B219694P1	Base plate.
	19B219698G4	Housing.
	19B219693P2	Spring.
	19A116768P6	Strain relief. (W1).
	N193P1410C6	Tap screw, phillip head: No. 8-18 x 5/8. (Secures assembly to mounting surface).
	19A134398P101	Plate. (Located on S6).
		ASSOCIATED PARTS MIKE KIT 7141414G2
	4031457P1	Support.
	4031458P1	Spring.
	N193P1408C6	Tap screw, phillip 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

CHANNEL BUSY LIGHT
19C850634G1
ISSUE 1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - - - DIODES - - - - - - - - - -
D1901	19A700028P1	Silicon, fast recovery, Fwd. current 75 mA, 75 PIV.
D1902	19A134354P2	Diode, optoelectronic: yellow; sim to HEW. Packard 5082-4555,
		- - - - - - - - - - - - PLUGS - - - - - - - - - -
P1906	19A134152P63	Connector, printed wiring: sim to Molex 22-02-2121.
		- - - - - - - - - - - - TRANSISTORS - - - - - - - - -
Q1901	19A700022P1	Silicon, PNP; sim to Type 2N3906.
Q1902	19A700023P1	Silicon, NPN; sim to Type 2N3904.
		- - - - - - - - - - - - RESISTORS - - - - - - - - - -
R1901	19A700019P63	Deposited carbon: 0.15M ohms ±5%, 0.25 w.
R1902	19A700019P58	Deposited carbon: 56K ohms ±5%, 0.25 w.
R1903	19A700019P48	Deposited carbon: 8.2K ohms ±5%, 0.25 w.
R1904	19A700019P30	Deposited carbon: 270 ohms ±5%, 0.25 w.
		- - - - - - - - - - - - CABLES - - - - - - - - - -
W1901	19A701340G4	Cable, includes 19A127042P2 terminal.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19B232859P1	Bezel. (Used with D1902).
	19A143463P2	Spacer, sleeve.
	19A700036P422	Screw, thd. forming, Pozidriv: M3-0.5.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST

UNIVERSAL TONE CABLE
19B800593G1
ISSUE 1

SYMBOL	GE PART NO.	DESCRIPTION
	7489183P7	Plug: 9 contacts rated at 7.5 amps max; sim to Winchester M9S-LR-H19C.
	4029851P8	Cable dip.
	19A701430G1	Rubber channel.
	19C301208P6	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.

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 & back with push to talk switch.
	MP102	Cartridge, with leads.
	MP103	Cable assembly.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

PARTS LIST

CARRIER CONTROL TIMER
19B227440G4
ISSUE 1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - - - RESISTORS - - - - - - - - - -
R1903A	19A700019P71	Deposited carbon: 0.68 megohm ±5%, 0.25 w.
R1903B	19A700019P68	Deposited carbon: 0.39 megohm ±5%, 0.25 w.
R1903C	3R152P125J	Composition: 1.2 megohms ±5%, 1/4 w.
R1903D	3R152P155J	Composition: 1.5 megohms ±5%, 1/4 w.
R1903E	3R152P225J	Composition: 2.2 megohms ±5%, 1/4 w.
		- - - - - - - - - - INTEGRATED CIRCUITS - - - - - -
U1902	19D432291G2	Carrier Control Timer, Century II.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

PARTS LIST

SYMBOL	GE PART NO.	DESCRIPTION
		132-512 MHz ANTENNA 19B209588P1
		Whip assembly. 068110-001.
		Whip nut assembly. 068047-001.
		Base nut assembly. 068048-001.
		"O" Ring (LARGE). 007059-122.
		Stud assembly. 068046-001.
		RG58/U Cable, 15 feet. 068115-001.