MOBILE RADIO

DL100

MAINTENANCE MANUAL LBI-31498

450 - 470 MHz
2/4 Watts

GENERAL ELECTRIC

TABLE OF CONTENTS

COMBINATION NOMENCLATURE

DIGITS 1&2	DIGIT 3	DIGIT 4	DIGIT 5	DIGIT 6	DIGIT 7	DIGIT 8	DIGIT 9	DIGIT 10
Product Code	Package	TX Frequency Range	RX Frequency Range	Channel Spacing	RF Power Output	Channel Config.	Control	Power Source
R2 DL100	**B** Enclosed	**R** 450-470 MHz	**R** 450-470 MHz	**5** 25 kHz	**5** 1.7-3.8 Watts	**A** 1-Tx 1-Rx	**E** Standard	**X** None Supplied
					6 3.9-6.4 Watts			

STRUCTURED OPTIONS

K Alt IF
O None
3 Alt IF

TYPICAL SPECIFICATIONS*

SYSTEM

FCC IDENTIFICATION NUMBER	
2-WATT	AXA9MZTR131-A
4-WATT	AXA9MZTR132-A
FREQUENCY RANGE	450-470 MHz
BATTERY DRAIN (MAXIMUM)	
Receiver	
Standby	15 milliamperes
Rated Audio	150 milliamperes (with audio option)
Transmitter	800 milliamperes @ 7.5 Volts (2-Watt) 1250 milliamperes @ 10 Volts (4-Watt)
TEMPERATURE RANGE	-30°C (-22°F) to +60°C (140°F)

TRANSMITTER

POWER OUTPUT	2 Watts/4 Watts
FREQUENCY STABILITY	0.0005%
CONDUCTED SPURIOUS AND HARMONIC EMISSION	-26 dBm
RATED SYSTEM DEVIATION	±5 kHz
FM HUM & NOISE	Greater than 50 dB
AUDIO FREQUENCY CHARACTERISTICS	Frequency Response per EIA RS 316-B. Post limiter filter per FCC and EIA.
AUDIO SENSITIVITY	50-100 millivolts
DISTORTION	Less than 5% (300 to 3000 Hz)
DEVIATION SYMMETRY	1.0 kHz maximum
RF OUTPUT IMPEDANCE	50 ohms

RECEIVER

AUDIO OUTPUT	150 millivolts into 600 ohms
SENSITIVITY (with Audio Option)	
12 dB SINAD	0.35 uV
20 dB Quieting	0.50 uV
FREQUENCY STABILITY	0.0005%
SELECTIVITY EIA Two-Signal Method	-70 dB @ ±25 kHz
SPURIOUS RESPONSE	-60 dB
INTERMODULATION	-65 dB
MODULATION ACCEPTANCE	±7 kHz
SQUELCH SENSITIVITY	<6 dB SINAD
FREQUENCY RESPONSE	0 to -2 dB
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.

DESCRIPTION

General Electric DL100 (Data Link) radios are extremely compact, high performance FM transmitter-receiver for use in systems requiring high quality, reliable data transmission and reception. This standard radio link provides two-way data communication in the 450-470 MHz range between remote data-collection sites and a control location. An optional audio board is available for voice communications.

The radio interface is through an access panel located at the end of the housing. Power for the radio is provided from an external supply. The radio requires a 10-Volt supply for 4-watt operation, or a 7.5-Volt supply for two-watt operation.

A ribbon cable adaptor board is provided with the radio to facilitate external connections. A BNC cable adaptor option is available for the antenna connection, if desired.

When the voice option is used, a speaker can be connected to the receiver output lead for monitoring the audio. Also, audio can be applied to the Transmit Audio Input lead to transmit voice messages on the radio data link.

CIRCUIT ANALYSIS

The Data Link radio interface is coupled through six feed-thru capacitors (C101 through C106) on Access Panel 19A148798G1. The capacitors supply access to the following functions:

- C101 - 10 Volts/7.5 Volts
- C102 - Transmit Audio In
- C103 - Ground
- C104 - Receive Audio Out
- C105 - PTT (closure to ground)
- C106 - Squelch Detect (from 0 VDC with receiver unsquelched to 10 VDC/7.5 VDC squelched).

Adaptor board 19C336504G1 may be soldered to the capacitors on the Access Panel to provide a jack (J1) for connection to a ribbon cable. Instructions for mounting the ribbon cable adaptor are listed in the Table of Contents.

TRANSMITTER

The Transmitter is a crystal-controlled, frequency modulated transmitter for single-frequency operation in the 450-470 MHz bands. The transmitter utilizes discrete components to provide a minimum RF power output of two watts. The transmitter consists of the following assemblies.

- Audio Board - with the transmitter amplifier/limiter, post-limiter filter and oscillator compensator circuits.
- Transmit/Receive (TR) Board - Oscillator, Multiplier stages, amplifier, driver and PA stages, TR switch, and low-pass filter.

All supply voltages for the transmitter are provided by an external power supply. The different transmitter voltages required are shown in the following chart:

Voltage	Used For
Continuous 10 Volts (7.5V for 2 Watts)	Post-limiter filter, driver and PA circuits
Switched TX 10 Volts (7.5V for 2 Watts)	Multipliers, 1st amplifier, and driver base voltage
Switched TX 5.4 Volts	Mic amp/limiter, microphone and oscillator
Regulated 5.4 Volts	Compensator and modulator circuits

References to symbol numbers mentioned in the following text are found on the Schematic Diagrams, Outline Diagrams and Parts List. A block diagram of the complete transmitter and receiver is shown in Figure 1.

DATA/AUDIO CIRCUITS

Data from a modem or audio from a microphone is coupled through TX Level Control R85 to a 6 dB pre-emphasis

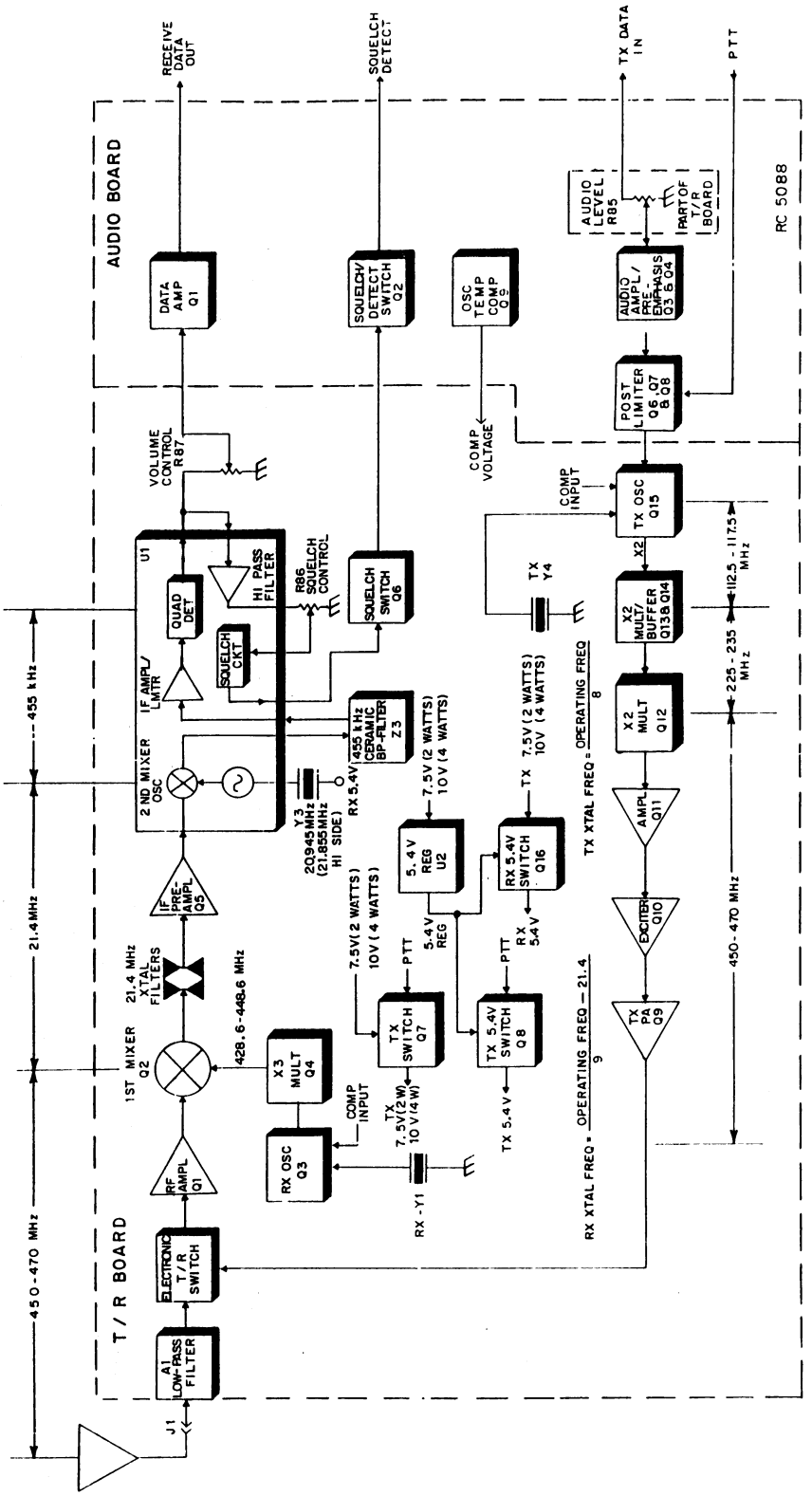

Figure 1 - DL100 Block Diagram

network (R16, D1, C15 and C18), and then to amplifier-limiters Q3 and Q4. The output of Q4 is applied to the post-limiter filter consisting of Q6, Q7, Q8 and associated circuitry.

The output of the post-limiter filter is coupled through C30 and the modulation circuitry to transmitter oscillator Q15.

A compensator circuit (Q9 and R36 through R40 and R80) provides frequency compensation at low temperatures for the transmitter and receiver oscillators.

T/R BOARD

OSCILLATOR

The temperature compensating DC voltage and audio is applied to FM modulator D6 through MOD ADJ R69. The modulator varactor varies the transmit frequency at the audio rate applied from the audio board.

Q15 and with Y4, associated circuitry comprise a Colpitts oscillator. The transmit oscillator is adjusted to the assigned operating frequency by L39. The oscillator output is applied to buffer Q14.

L37 in the collector circuit of Q15 is tuned to the second harmonic. L36 provides additional filtering before multiplier/buffer stages Q13 and Q14. Drive to the multiplier/buffer stages can be monitored at J10 (TP4).

OSCILLATOR CRYSTAL REPLACEMENT

Crystals Y1 and Y4 are plug-in types for ease of replacement. Note that one lead is grounded to the crystal can. This lead must be plugged into the socket which is connected to the ground plane of the Transmit/Receive Board.

MULTIPLIERS

The output of Q13 is tuned to the fourth harmonic by L34 and L35, and applied to the base of multiplier Q12.

The output of multiplier Q12 is tuned to the eighth harmonic by C78 and C81. The emitter voltage of Q12 can be monitored at J9 (TP5).

AMPLIFIERS AND PA

Following Q12 is Class B amplifier Q11. Emitter voltage can be monitored at J8 (TP6). The output of Q11 is tuned by C70 to provide maximum drive to Q10. The output of Q10 is applied to the base of PA transistor Q9. C63 is tuned to provide impedance matching to the PA stage.

A collector feed network consisting of L19, L20, L24, L25, C57, C61, C66, C68, R44 and R47 acts as a stablizing and decoupling network for Q9 and Q10.

Power adjust control C56 is used to set the rated output power. The PA output is applied to the antenna switch.

ANTENNA SWITCH

The solid state antenna switch consists of A1-D1, and C1, C2, L1 and D1 on the TR board. The circuit acts as a 1/4-wave line simulator.

Keying the transmitter applies approximately 1.6 volts to the anode of A1-D1, forward biasing the diode. When A1-D1 is forward biased, the 1/4-wave line appears as an open circuit to the RF output of the transmitter. This allows the transmitter output to be coupled through the low-pass filter to the antenna. L17, C102 and R43 provide bias and decoupling for the antenna switch.

The antenna switch acts as a 50-ohm line in the receiver mode (A1-D1 not forward biased).

RECEIVER

The receiver is a dual conversion, superheterodyne FM receiver designed for single-frequency operation in the 450-470 MHz frequency range. A regulated 5.4 volts is used for all receiver stages except for the audio PA IC, receiver RF amplifier and mixer which operate from the external supply (10/7.5 VDC).

The receiver has intermediate frequencies of 21.4 MHz and 455 kHz. Adjacent channel selectivity is obtained by using three band-pass filters: (2) 21.4 MHz two-pole crystal filters and a 455 kHz ceramic filter.

All of the receiver circuitry except the receive audio output, squelch detect stage and oscillator compensator is mounted on the transmitter/receiver (TR) 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
- Data Amplifier Circuitry
- Squelch Circuitry

RECEIVER FRONT END

An RF signal from the antenna is coupled through the low-pass filter, antenna switch, and image filter to the emitter of RF amplifier Q1. The image filter consists of C3, C4, C5, C108 and L2.

The output of Q1 is coupled through two tuned circuits that provide most of the front end selectivity. The tuned circuits are L3, R4, C8 and C9, L4 and L5.

OSCILLATOR AND MULTIPLIER

Q3, Y1, D2 and associated circuitry make up a Colpitts oscillator. The frequency is controlled by a third mode crystal operated at one ninth of the required injection frequency. Voltage-variable capacitor D2, L48 and Y1 are connected in series to provide compensation capability. The compensation voltage used to control the transmitter oscillators is applied to D2 to maintain stability. L48 is adjustable to set the oscillator frequency. R8 is in parallel with Y1 to insure operation on the third overtone of the crystal.

The oscillator output is coupled through two tuned circuits (L12-C25 and L13) to the base of tripler Q4. C25 and L13 are tuned to the third harmonic of the oscillator frequency. The output of tripler Q4 is coupled to the gate of first mixer Q2 through two tuned circuits (L14 and L15). L14 and L15 are tuned to the operating frequency minus 21.4 MHz which is the ninth multiple of the crystal frequency.

The DC level of the oscillator can be monitored at J6 (TP1). The meter reading at this point is typically 5.2 volts. The DC level of tripler Q4 can be measured at J7 (TP2). This meter reading is typically 5 volts.

1ST MIXER AND IF FILTER

The 1st mixer uses a FET (Q2) as the active device. The FET mixer provides a high input impedance, high power gain and an output relatively free of intermodulation products).

In the mixer RF from the front end filter is applied to the gate of the mixer. Injection voltage from the multiplier stages is also applied to the gate of the mixer. The 21.4 MHz mixer 1st IF output signal is coupled from the drain of Q2 to crystal filters Z1 and Z2. Tuneable capacitor C12 is used to match the mixer ohutput to the input of Z1.

The highly-selective crystal filter provides the first portion of the receiver IF selectivity. The output of the filter is coupled through R20 to the 1st IF amplifier.

Supply voltage for the RF amplifier and 1st mixer can be metered at J5 (TP3). The meter reading is typically 9.9/7.4 volts.

1ST AND 2ND IF AND DETECTOR STAGES

The 21.4 MHz IF output of the crystal filters is applied to the base of IF amplifier Q5. The amplifier provides approximately 12 dB of IF gain. The output of Q5 is coupled through C35 to the input of the 2nd Mixer IC.

U1A and associated circuitry consists of the 2nd oscillator and mixer. The crystal for the oscillator is Y3. The oscillator operates at 20.945 MHz for low side injection of the 2nd IF (standard), or 21.855 MHz for high side injection for those radios determined to be operating on a tweet frequency. This frequency is mixed with the 21.4 MHz input to provide the 455 kHz 2nd IF frequency.

The output of U1A is coupled through ceramic filter Z3 which provides the 455 kHz selectivity. The filter output is applied to U1B.

U1B and associated circuitry consists of an IF amplifier, 455-kHz limiter and a quadrature type FM detector. L16 is the quadrature detector coil. Volume control R87 is used to set the data/audio output level to the data/audio amplifier. R37 and C48 provide a low pass filter to remove 455 kHz from the data/audio.

DATA OUT & SQUELCH CIRCUIT

Data

Data from the Volume arm is coupled through C1 to the base of amplifier Q1. The data output of Q1 is coupled through C11 to the Receive Data/Audio Output (C104) on access panel 19A148798G1.

Squelch

The squelch circuit operates on the noise components contained in the FM detector output. The output of U1B is applied to a high-pass filter consisting of U1C, and associated circuitry. The output of U1C is noise in a band around 8 kHz.

With no RF signal present, the noise is rectified by D4 and a negative voltage is applied to the input of U1D, keeping it turned off and the receiver muted.

Pressing the external PTT switch (ground closure) also forward biases clamping diode D5, keeping U1D input bias at the correct standby voltage in the transmit mode.

When an RF signal is received (receiver unsquelches), no noise is rectified by D4 and the input voltage at pin 12 of U1D rises to approximately +1 volt. This positive voltage turns on U1D, causing the output at U1D-14 to go positive, turning on buffer Q6. When turned on, the collector voltage of Q6 goes low, turning on PNP audio board squelch switch Q2.

When turned off (receiver squelched), the collector of Q2 is at 0 VDC. When Q2 is turned on, the collector voltage is 10 VDC/7.5 VDC. The 10 Volt Squelch Detect voltage at C106-1 may be used to activate an external function.

VOLTAGE REGULATOR AND TR SWITCHES

Turning an external on-off power switch to the "ON" position applies 10 Volts/7.5 Volts to regulator module U2. The regulator output at U2-2 provides a continuous, stable output of 5.4 Volts.

TRANSMITTER SWITCHES

Applying a low to the PTT line turns on Q7 and Q14. When Q7 is turned on, 10/7.5 Volts from the external supply is applied to the transmitter multipliers and 1st amplifier stages. The supply voltage is also applied to the gate of receiver muting FET Q10. The positive voltage on the gate turns Q10 off and mutes the receiver in the transmit mode. The switched supply voltage is also applied to the base of RX 5.4 volt switch Q15, turning the switch off in the transmit mode.

Turning on Q14 applies 5.4 volts to the transmitter oscillator, multiplier, buffer, and TX driver base bias circuits.

RECEIVER SWITCH

Receiving the low on the PTT line turns off the transmitter switches and turns on receiver switch Q15. This applies 5.4 volts to the receiver oscillators, IF amplifier, audio and squelch stages.

DATA/VOICE AUDIO OPTION (DV10)

When the Data/Voice Audio Option is used, Audio Board 19D901123G5 must be replaced with the 19D901123G1 board.

Audio from the VOLUME arm is coupled through a twin-T Channel Guard notch filter that consists of Q1 and associated circuitry. The filter attenuates any audio frequency below 211 Hz.

The audio output from the filter is coupled through receiver muting switch Q10 to audio amplifier U1. Q10 is turned on in the receive mode to pass the audio. The 500 milliwatt audio output of U1 is coupled through C10 to the speaker and earphone jack.

A 6 dB/octave de-emphasis is provided by C12, C34, C6 and R10 in the audio feedback path. R7 and C5 provide additional de-emphasis at higher frequencies.

DISASSEMBLY

To remove the top cover for servicing, remove the four #4-40 x 1/4-inch flat-head screws in each corner of the cover, and lift off the cover.

SERVICE TOOLS

Option 4120 - (Replaced TS 10 Service Tool Kit)
- ST 2513 - Coil and Trim Pot Alignment Tool
- ST 2521 - Oscillator Coil Alignment Tool
- ST 2519 - Johanson Capacitor Alignment Tool (0.029" tip)
- ST 2520 - Johanson Capacitor Alignment Tool (0.025" tip)
- 19B800747P3 - Audio Board Jumper Cable (2 Required)
- 19A144745G1 - Receiver Audio Test Cable
- 19B800968G1 - RF Probe Assembly

TEST POINT CHART

TP	FUNCTION	TYP. V
1	RX INJ TUNING	5.2
2	(NOT USED)	
3	RX INJ TUNING	7.4
4	TX DRIVE TUNING	0.4
5	TX DRIVE TUNING	0.8
6	TX DRIVE TUNING	0.3
7	GROUND	0

VOLUME & SQUELCH ADJUST

Apply a standard, 1000-microvolt signal with 1 kHz tone and 3.0 kHz deviation to antenna jack J1.

For receivers with audio board 19D901123G5, set Volume Control R84 fully clockwise (140 millivolts minimum).

For receivers with audio board 19D901123G1, set Volume Control R84 for 2 volts RMS across 8-ohm load.

Set Squelch Control R83 fully clockwise. Then adjust the Squelch control counterclockwise for 1/4-turn past critical squelch.

REPLACING CHIP COMPONENTS

Replacement of chip capacitors should always be done with a temperature-controlled soldering iron, using a controlled temperature of 700°F (371°C). However, do NOT touch black metal flim of the resistors or the ceramic body of capacitors with the soldering iron.

NOTE

The metalized end terminations of the parts may be touched with the soldering iron without causing damage.

REMOVING CHIP COMPONENTS

1. Grip the component with tweezers or needle nose pliers.
2. Alternately heat each end of the chip in rapid succession until solder flows, and then remove and discard the chip.
3. Remove excess solder with a vacuum solder extractor or Solder-wick®.
4. Carefully remove the epoxy adhesive and excess flux to prevent damage to the printed board.

REPLACING CHIP COMPONENTS

1. Using as little solder as possible, "tin" one end of the component and one of the pads on the printed wiring board.
2. Place the "tinned" end of the component on the "tinned" pad on the board and simultaneously touch the component and the pad with a well "tinned" soldering iron while pressing the component down on the board.
3. Place the "tinned" soldering iron on the other end of the component and the pad simultaneously. Apply solder to the top of the end of the component until the solder starts to flow. Use as little solder as possible while getting a good joint.
4. After the component has cooled, remove all flux from the component and printed wiring board area with alcohol.

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SYMPTOM	PROCEDURE
No 10V/7.5V Supply	Check power connections and continuity of supply leads, and check fuse. If fuse is blown, check radio for shorts.
No 5.4V Regulated Supply	Check the 10V/7.5V supply at pin 3 of regulator U2. If a large standby current (i.e. >100 mA) is seen, check for a short to ground on the 5.4V output line.
No Rx 5.4V	Check the 5.4V regulated supply. Then check switching transistor Q16.
No Receive Output	Check audio board data amplifier transistor Q1. If Q1 is properly biased on, inject a 50 mV RMS, 1 kHz signal into the preceeding stages until the faulty stage is isolated as follows. This signal must be capacitively coupled from the audio generator using a 1 uF electrolytic capacitor to avoid shifting bias voltages. Sequentially inject signal into the following points on the audio board: Emitter of Q1, base of Q1, and P2-5 (volume control dependent). If the problem is not found on the audio board, check for recovered audio on the main board with an oscilloscope. Recovered data should be seen at Hole 7, and at Pin 3 of R87 (as well as the wiper depending upon position).
Low Data	Verify that at least 150 mV (424 peak-to-peak) is present at Hole 7 when a strong RF signal is applied to the radio with standard test modulation. Check quad coil (L16) setting.
Distorted Output	Apply a strong RF signal with standard test modulation and measure audio distortion into an 620 ohm dummy load. Distortion should be less than 5% at 1 kHz.
No or Incorrect Detector Output	Verify bias to Pins 4 and 8 of the main board IC, U1. Using a 50 ohm probe, inject a strong 21.4 MHz modulated signal into Pin 16 of U1. Recovered audio should be seen at Pin 9 and the level should vary with the setting of quad coil, L16. If none is seen, check the second oscillator for activity. At least 80 mV of RF should be seen on Pin 1 to ground.
No 2nd Oscillator Activity	Substitute a known good crystal for Y3. Check voltages on U1 pins 1 and 2.
Radio Permanently Squelched	Verify that main board IC, U1, is properly biased at Pins 4 and 8 and that quad coil L16 is correctly adjusted. The voltage at the Schmidt trigger input (U1 Pin 12) should rise and fall with the setting of R86. The output at pin 14 should switch bias on and off to the base of Q6 as the input threshold is crossed. The collector of Q6 should saturate and unsquelch the radio once the input (Pin 12) is above the threshold, approx. 0.8V.
Radio Won't Squelch	Verify that main board IC, U1, is properly biased at Pins 4 and 8, and that quad coil L16 is correctly adjusted. An oscilloscope should see high frequency (approx. 8 kHz) noise at the noise filter output, U1 pin 11. This noise should be seen at the wiper of R86 (dependent upon position) and should be negatively rectified by D4. The remainder of the squelch circuit is described under the "Radio Permanently Squelched" section.

SYMPTOM	PROCEDURE
Poor or No Sensitivity	Verify that proper injection power is present and at the correct frequency, (F_c-21.4)/9. This can be done by 50 ohm probing from the junction of C33 and C103 to ground. The power seen should be approximately 0 dBm. If OK, then use the 50 ohm probe with a signal generator to inject signal into various portions of the radio to isolate the bad section. Set the generator with standard modulation to the level and frequency indicated on the large service schematic and probe those points starting with the IC (U1) and moving forward to the antenna jack. In some cases parts must be adjusted for best sensitivity while probing. This is indicated on the schematic. Once the faulty stage is isolated, measure bias voltages.
No or Low Injection Power	Verify that tuning procedure has been done or tried. The oscillator string can be trouble shot by using a 50 ohm probe connected to a power meter capable of measuring power as low as -20 dBm. Probe the available power points to ground indicated on the large service schematic. The power seen should be approximately that shown on the schematic. Any adjustment needed during probing is indicated on the schematic. Start probing with the oscillator and proceed towards the mixer. Bias voltages are also shown on the schematic for both a running and non-running oscillator. To kill a running oscillator, place a .01 uF ceramic capacitor with short leads from the base to collector of the oscillator transistor Q3.
Frequency Won't Adjust Properly	Check compensator voltage at P3-2 and at varicap (D2 or D6). Check anode voltage of varicap.
No Transmit 5.4V	Check switching transistor Q8.
Radio Won't Go Into Transmit Mode	Verify that Hole 9 is going to ground when the PTT switch is pushed.
Low or No Transmit Power	If the total transmit current is >500 mA, check the low pass filter and T/R switch. 1.6 VDC at C102 indicates that the radio is in the transmit mode. If the total transmit current is >100 mA, measure the base bias of Q10. Check for proper test point readings at TP4, TP5, TP6.
Low TP6	0.5 - 0.8 VDC indicates proper drive into Q11. 0.3 VDC indicates no drive. Check the bias voltages.
Low TP5	0.6 - 0.8 VDC indicates proper drive into Q12. 0 VDC indicates no drive. Check the bias voltages.
High TP4	0.3 - 0.6 VDC indicates proper drive from the oscillator. With no oscillator activity TP4 will be 0.7 VDC.
Oscillator Frequency Will Not Adjust Properly	Check the compensator voltage at P3-2. Check the anode voltage of the varicap.
No Transmitter Deviation	Check mod adjust and mod input.

TRANSMITTER ALIGNMENT

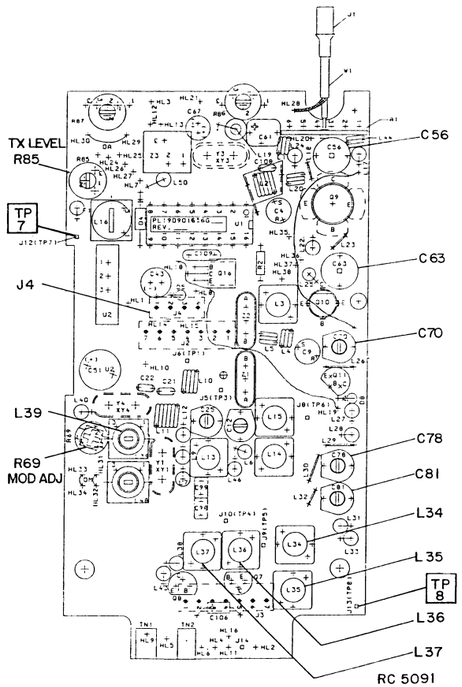
EQUIPMENT REQUIRED

1. Power Supply (6-12 Volts, 3 Amperes).
2. Ammeter (3 Amperes).
3. 50-ohm Wattmeter with 50 ohm load
4. Audio Oscillator
5. Deviation Monitor
6. Frequency Counter
7. Digital Voltmeter
8. Tune-up Kit Option 4120 (contains coil tuning tools, capacitor tuning tools, audio board jumper cables, and a 50 ohm probe).

PRELIMINARY STEPS AND ADJUSTMENTS

1. The radio must be held tight against the case at the lower right corner and top edge (e.g. use a 4-40 screw and nut).
2. Unplug the audio board from the main board.
3. Set Power Supply for 10 Volts for 4-Watt transmitter, or 7.5 Volts for 2-Watt transmitter. Ground and Power Supply connections may be made to Test Point 7(B+) and Test Point 8(GND).
4. Pre-set the top of tuning slugs in L34 through L37 even with the top of the coil form.
5. Pre-set the arrow on the rotors of C70, C78 and C81 pointing to the rounded end of the capacitors.
6. Pre-set the tuning slug in L39 to the center of the tuning range.

> NOTE
>
> All adjustments are made with the transmitter keyed.



ALIGNMENT PROCEDURE

STEP	METERING POINT	TUNING CONTROL	PROCEDURE
1.	TP4	L37 and L36	Adjust L37 and L36 in that order for a dip in meter reading.
2.	TP5	L35 and L34	Adjust L35 and L34 for a peak in meter reading. Repeat if necessary.
3.	TP6	C81 and C78	Adjust C81 and C78 in that order for a peak meter reading. Repeat if necessary.
4.	Wattmeter	C70, C63 C56	Adjust C70, C63 and C56 in that order for maximum power output.
5.	Wattmeter	C56	Turn C56 in the direction that causes both the power and current to decrease, and adjust C56 for rated power output of 2.0 Watts or 4.0 watts as applicable. NOTE The transmitter is designed to provide optional radiation efficiency (antenna matching) when the transmitter is adjusted for approximately rated power. Tuning for higher power will degrade both radiated power and battery life.
FREQUENCY ADJUSTMENT			
6.	Frequency Counter	L39	Plug the audio board onto the main board, and adjust L39 for the proper frequency.
MODULATION & TX LEVEL ADJUSTMENT			
7.		R85	Pre-set TX Level Control R85 to the fully clockwise position.
8.	Deviation Monitor	R69 and R85	Connect the adaptor to J4, and apply 3 Volts RMS at 1 kHz to J4-2. Adjust R69 for 4.5 kHz deviation. Next, reduce the input signal level to 780 millivolts RMS. Then adjust TX Level Control R85 for 2.2 kHz deviation.

RECEIVER ALIGNMENT

EQUIPMENT REQUIRED

1. 10-Volt Power Supply. (0.5 amps)
2. Floating terminal (non-grounded) multimeter with at least 3 1/2 digits and a 200 millivolt DC lowest range.
3. RF generator.
4. Distortion analyzer.
5. MPI Tune-up kit Option 4120 containing coil tuning tools, trimmer capacitor tuning tools, audio board jumper cables and a 50 ohm probe.

PRELIMINARY CHECKS AND ADJUSTMENTS

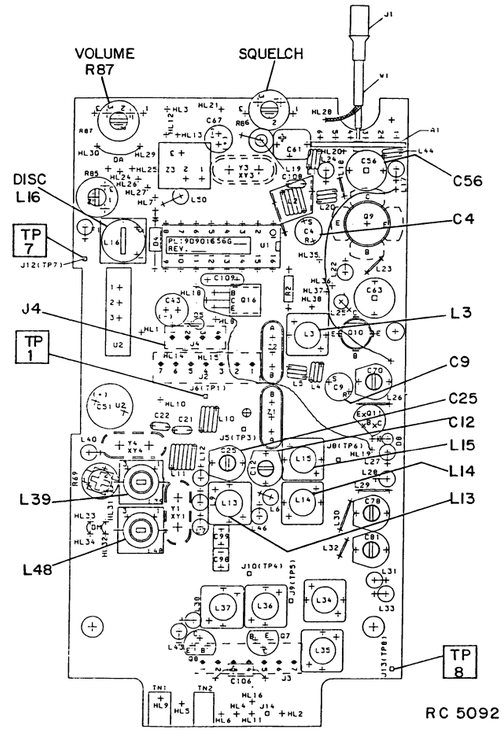
1. The radio must be held tight against the case at the lower right corner and top edge (e.g. use a 4-40 screw).
2. Remove the front cover and unplug the Audio board from the main board. Then connect the audio board to the main board with the jumper cables.
3. Set the Power Supply for 10 Volts for 4-Watt radio, or 7.5 Volts for 2-Watt radio.
4. Pre-set the tuning slugs in L3, L13, L14, L15, L48 and L49 to the top of the coil form. Next, set the arrow on the rotor of C12 and C25 so that it points towards the rounded end of the capacitor.
5. Connect an 620-ohm dummy load across C104 (Receive Out) and C103 (GND) for monitoring receiver output.

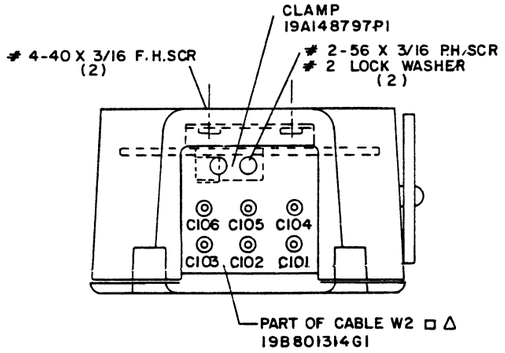
NOTE

When measuring sensitivity using the 19D901123G5 audio board, 12 dB SINAD and 20 dB quieting will be degraded by approximately 6 dB due to the flat audio response of this board.

ALIGNMENT PROCEDURE

STEP	METERING POINT	TUNING CONTROL	PROCEDURE
1.	Across 620-ohm load	L16	Set Volume Control R84 for an audio level of approximately 140 mV RMS. Using the 50 ohm probe, apply a strong modulated 21.4 MHz signal (>-50 dBm) to U1A-16 on T/R board and adjust L16 for maximum audio output. NOTE If a 21.4 MHz generator is not available, adjust L16 for maximum noise.
2.	J2-7 and TP1	L48 (Chan 1)	While measuring between J2-7 (regulator voltage) and TP1, adjust L48 for maximum meter reading (approximately 250 millivolts).
3.	Across 620-ohm load	C25, C9 and L13	Apply a strong (0 dBm) signal to the antenna jack. Adjust C25, C9 and L13 in that order for best load quieting. C25 may have more than two dips, so use only the stronger one. Then adjust C25 and L13 again in that order for best quieting.
4.	Across 620-ohm load	L14, L15, C4, L3 and C9	Adjust L14, L15, C4, L3 and C9 in that order for best quieting. NOTE If L15 has multiple dips, no dip, etc., set the arrow 180 degrees from the normal initial setting (arrow pointing at flat end of C12).
5.	Distortion Analyzer	L48 and C12	Add 1 kHz tone modulation at 5 kHz deviation to the carrier. Leave the Volume control as in Step 1. Adjust lowest frequency warp coil L48 and C12 until no improvement in SINAD is seen. This will insure that the match to the crystal filters is properly adjusted, and that the carrier is centered in the pass band (zero beating isn't required).
6.	Distortion Analyzer	C4	Set the signal generator to the image frequency (42.8 MHz below the carrier frequency) and increase the RF level to approximately -60 dBm. Then adjust C4 for the amount of image rejection desired by degrading the quieting on SINAD. Then reset the signal generator to 3 kHz before doing any standard measurements.

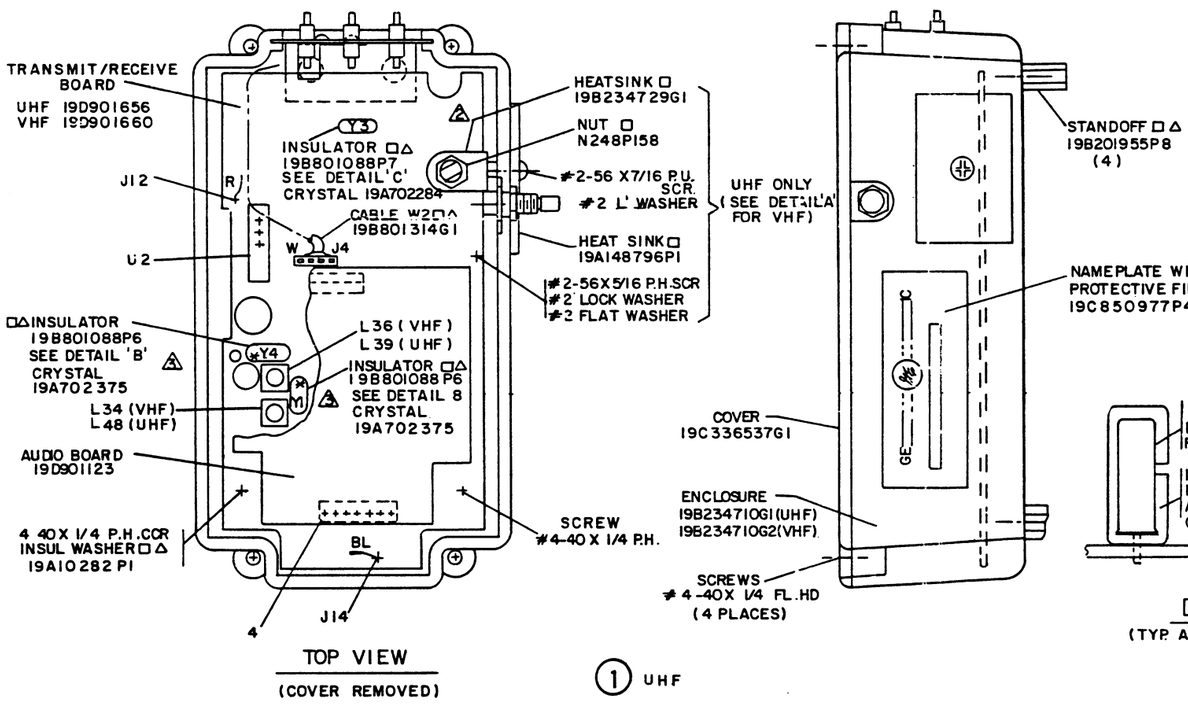


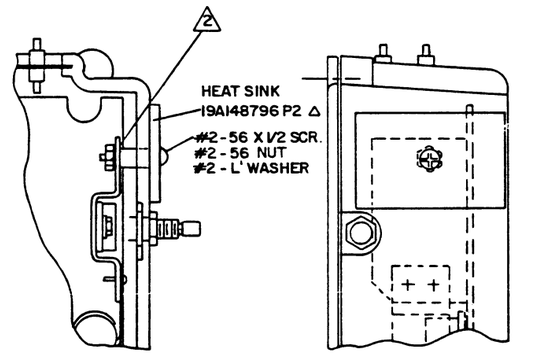


CONNECTION CHART

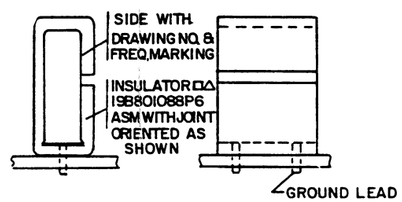
FROM CABLE W2	TO T/R BOARD	WIRE
P2	J14	BL
P3	J12	RED
P4	J4	LACED

NOTES:
1. ITEMS MARKED □ ARE PART OF HARDWARE KIT PL 19A148854G1 (UHF)
   ITEMS MARKED △ ARE PART OF HARDWARE KIT PL 19A148854G2 (VHF)
2. APPLY SILICON GREASE(19A701337P1 PER 19A701431) BETWEEN MATING SURFACES OF HEAT SINK, NUT, TRANSISTOR AND EXTERNAL HEATSINK. SCREW MUST BE TIGHTENED BEFORE NUT. NUT TIGHTENING TORQUE TO BE 0.6 ± 0.1 N-M.
3. ORIENT Y1 AND Y4 SO THAT DWG. NO. AND FREQ. MARKING IS AT SIDE INDICATED. GROUND LEAD MUST BE IN POSITION AS INDICATED BY *.
4. WHEN G5 AUDIO BOARD IS USED CUT THIS PIN OFF T/R BOARD. WHEN G1 AUDIO BOARD IS USED DO NOT CUT.

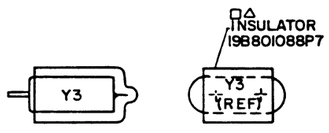




DETAIL A
TRANSISTOR TO HEATSINK ASM.
(VHF ONLY)



DETAIL B
(TYP. ASM FOR Y1 AND Y4)

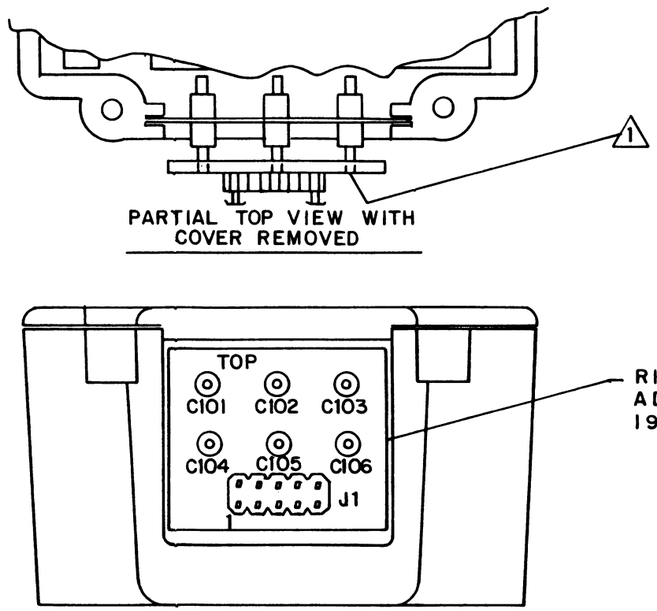


DETAIL C

(1) UHF

(2) VHF
SAME AS PART 1 EXCEPT AS NOTED IN TOP VIEW AND DETAIL A.

RC 5090
(19D437990 REV.2)



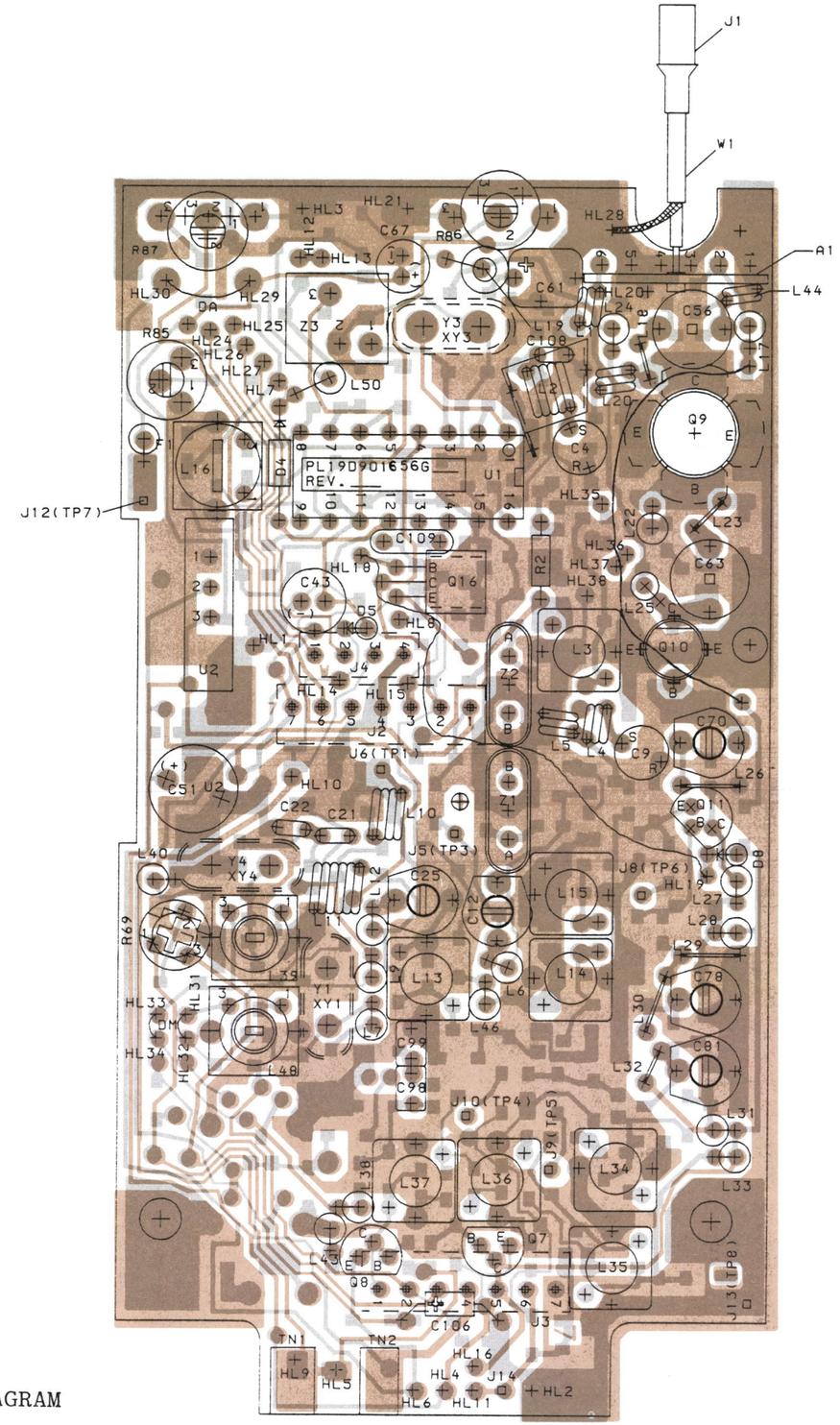
NOTES:

1. ASSEMBLE RIBBON CABLE ADAPTER BOARD 19C336504G1 AS SHOWN, AND SOLDER FLUSH TO ENDS OF CAPACITORS (6 PLACES).

CONNECTION CHART

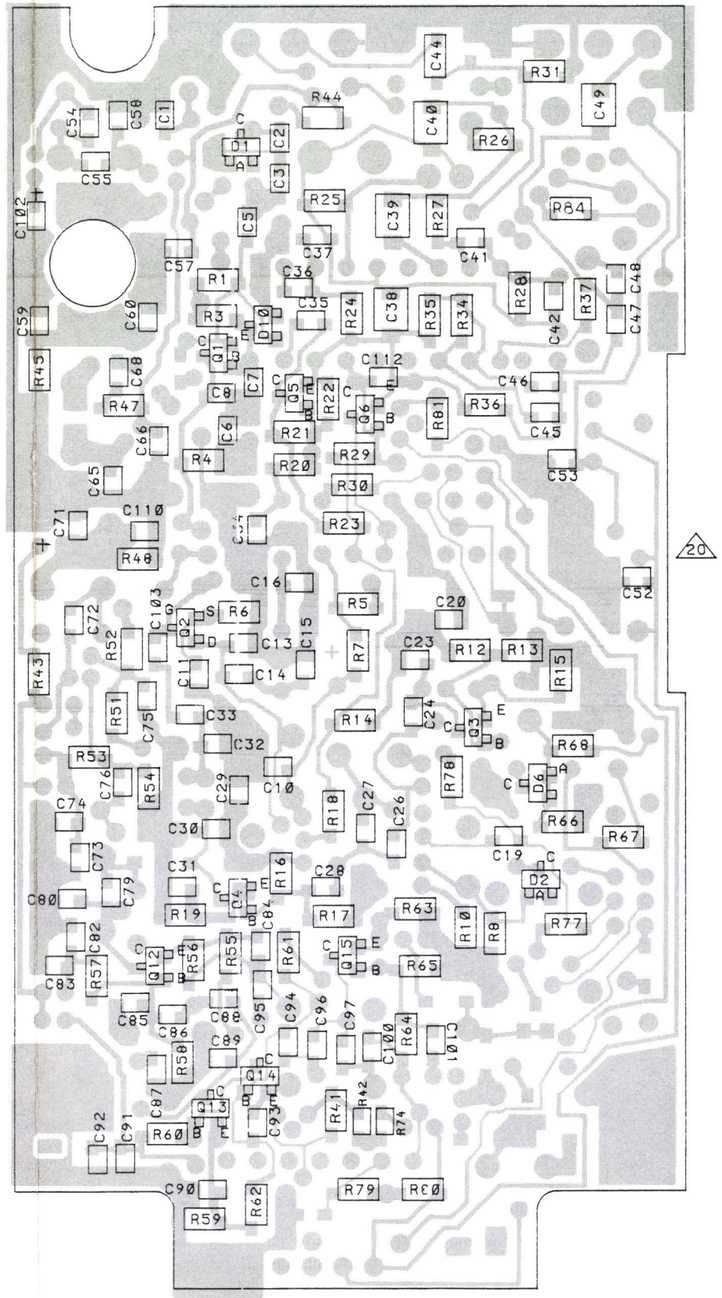
FUNCTION	PIN CONN.
+7.5 V	J1 - 3&5
TX AUDIO	J1 - 8
GROUND	J1 - 4&9
RX AUDIO	J1 - 10
PTT	J1 - 6
RX SQ.	J1 - 7
OPEN	J1 - 1&2

RC 5086
(19B234731, REV.1)



FRONT VIEW

(19D901493, Rev. 0)
(19A704667, Sh. 1, Rev. 0)
(19A704667, Sh. 2, Rev. 0)



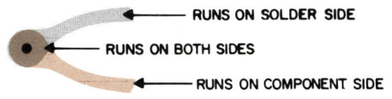
REAR VIEW

(19D901656, Sh. 2, Rev. 0)
(19A704667, Sh. 2, Rev. 0)

CAUTION

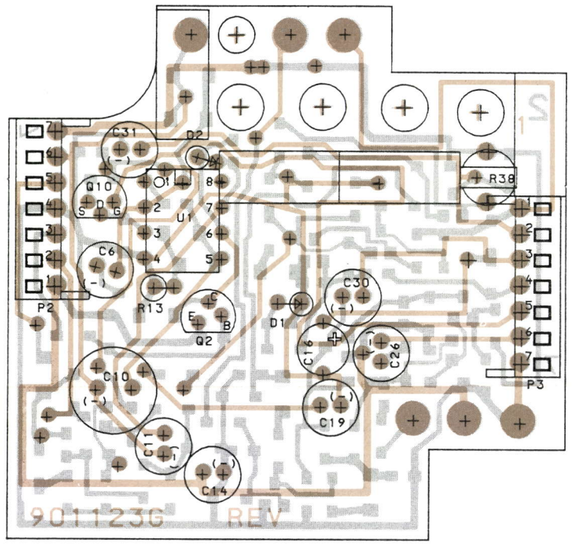
OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES

Q1 & Q2 on Main Board
Q10 on Audio Board

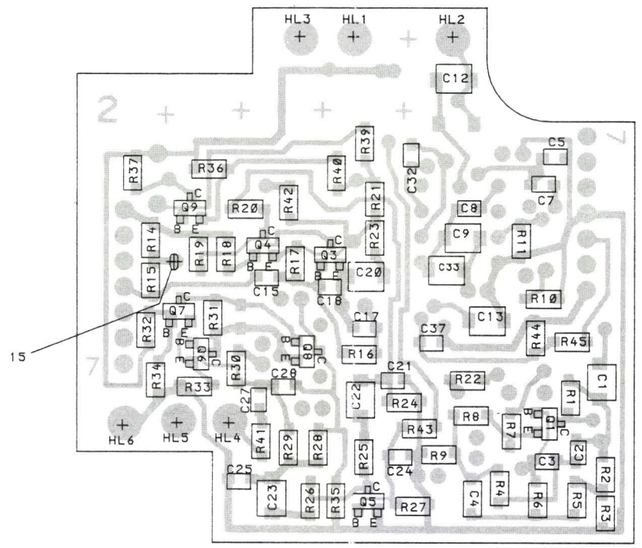


OUTLINE DIAGRAM

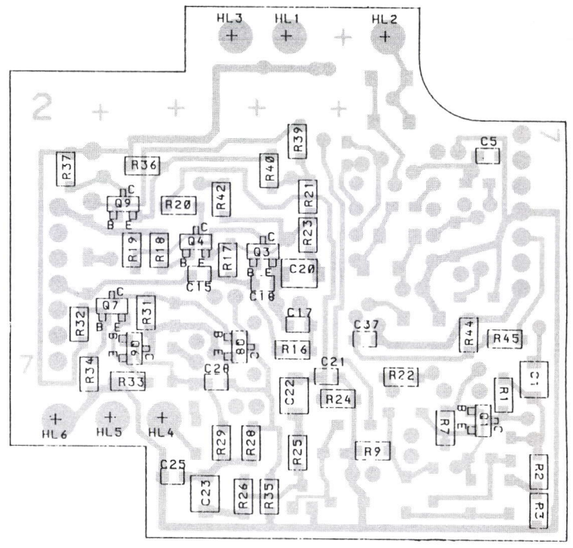
TRANSMITTER/RECEIVER BOARD



(19D901414, Rev. 1)
(19A703568, Sh. 1, Rev. 2)
(19A703568, Sh. 2, Rev. 2)

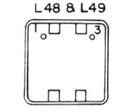


(19D901123, Rev. 4)
(19A703568, Sh. 2, Rev. 2)



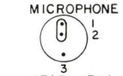
(RC-5103)
(19A703568, Sh. 2, Rev. 2)

L16, L39, L42, L48 & L49



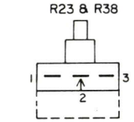
(BOTTOM VIEW)

MICROPHONE



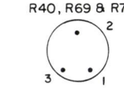
(REAR VIEW)

R23 & R38



(BOTTOM VIEW)

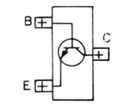
R40, R69 & R73



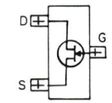
(BOTTOM VIEW)

STANDARD OUTLINE TRANSISTORS (SOTS)

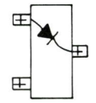
(TOP VIEW)



BIPOLAR



FET



DIODES & VARACTORS

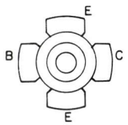
TO-92
(BOTTOM VIEW)

NPN

PNP

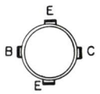
FET

Q9



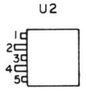
LEADS ON BOTTOM OF BOARD

Q10



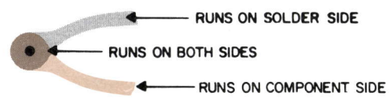
TOP OF BOARD

U2



TOP OF BOARD

RC 4372B



OUTLINE DIAGRAM
AUDIO BOARD

PARTS LIST

AUDIO BOARD
19D901123G1 STANDARD - REV D
19D901123G2 DTMF - REV D
ISSUE 3

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A702052P120	Ceramic: 0.033 uF ±5%, 50 VDCW.
C2 and C3	19A702052P112	Ceramic: 6800 pF ±5%, 50 VDCW.
C4	19A702052P128	Ceramic: 0.022 uF ±5%, 50 VDCW.
C5	19A702052P12	Ceramic: 6800 pF ±10%, 50 VDCW.
C6	19A702844P1	Tantalum: 22 uF ±20%, 6.3 VDCW.
C7	19A702052P10	Ceramic: 4700 pF ±10%, 50 VDCW.
C8	19A702052P4	Ceramic: 680 pF ±10%, 50 VDCW.
C9	19A702052P26	Ceramic: 0.1 uF ±10%, 50 VDCW.
C10	19B800755P7	Electrolytic: 100 uF ±20%, 10 VDCW.
C11	19B800755P4	Electrolytic: 10 uF ±20%, 16 VDCW.
C12 and C13	19A702052P26	Ceramic: 0.1 uF ±10%, 50 VDCW.
C14	19A703324P1	Electrolytic: 22 uF ±20%, 16 VDCW.
C15	19A702052P107	Ceramic: 2200 pF ±5%, 50 VDCW.
C16	315A6047P105U	Tantalum: 1 uF ±20%, 35 VDCW.
C17	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C18	19A702052P5	Ceramic: 1000 pF ±10%, 50 VDCW.
C19	19B800755P4	Electrolytic: 10 uF ±20%, 16 VDCW.
C20	19A702052P122	Ceramic: 0.047 uF ±5%, 50 VDCW.
C21	19A702052P110	Ceramic: 4700 pF ±5%, 50 VDCW.
C22 and C23	19A702052P122	Ceramic: 0.047 uF ±5%, 50 VDCW.
C24	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM. (G2 Only).
C25	19A702052P106	Ceramic: 1500 pF ±5%, 50 VDCW.
C26	19B800755P2	Electrolytic: 2.2 uF ±20%, 50 VDCW.
C27	19A702061P77	Ceramic: 470 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C28	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C30 and C31	19B800755P2	Electrolytic: 2.2 uF ±20%, 50 VDCW.
C32	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C33	19A702052P26	Ceramic: 0.1 uF ±10%, 50 VDCW.
C37	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
		- - - - - - - - - - DIODES - - - - - - - - - -
D1 and D2	19A700028P1	Silicon, fast recovery: fwd current 75 mA, 75 PIV; sim to Type 1N4148.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P2 and P3	19A700041P56	Printed wire: 7 contacts rated @ 2.5 amps; sim to Molex 22-02-2075.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A134739P2	Silicon, NPN.
Q2	19A700026P1	Silicon, PNP.
Q3 thru Q7	19A700076P2	Silicon, NPN.
Q8	19A700059P2	Silicon, PNP.
Q9	19A700076P2	Silicon, NPN.
Q10	19A702760P1	P type, field effect.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	19B800607P333	Metal film: 33K ohms ±5%, 200 VDCW, 1/8 w.
R2	19B800607P683	Metal film: 68K ohms ±5%, 200 VDCW, 1/8 w.
R3	19B800607P393	Metal film: 39K ohms ±5%, 200 VDCW, 1/8 w.
R4	19B800607P333	Metal film: 33K ohms ±5%, 200 VDCW, 1/8 w.
R5 and R6	19B800607P473	Metal film: 47K ohms ±5%, 200 VDCW, 1/8 w.
R7	19B800607P153	Metal film: 15K ohms ±5%, 200 VDCW, 1/8 w.
R8	19B800607P821	Metal film: 820 ohms ±5%, 200 VDCW, 1/8 w.
R9	19B800607P153	Metal film: 15K ohms ±5%, 200 VDCW, 1/8 w.
R10	19B800607P180	Metal film: 18 ohms ±5%, 200 VDCW, 1/8 w.
R11	19B800607P104	Metal film: 100K ohms ±5%, 200 VDCW, 1/8 w.
R13	19A702289P1	Metal film: 1 ohms ±5%, 1/4 w; sim to Corning FL55.
R14	19B800607P471	Metal film: 470 ohms ±5%, 200 VDCW, 1/8 w.
R15	19B800607P472	Metal film: 4.7K ohms ±5%, 200 VDCW, 1/8 w.
R16	19B800607P183	Metal film: 18K ohms ±5%, 200 VDCW, 1/8 w.
R17	19B800607P683	Metal film: 68K ohms ±5%, 200 VDCW, 1/8 w.
R18	19B800607P473	Metal film: 47K ohms ±5%, 200 VDCW, 1/8 w.
R19	19B800607P562	Metal film: 5.6K ohms ±5%, 200 VDCW, 1/8 w.
R20	19B800607P183	Metal film: 18K ohms ±5%, 200 VDCW, 1/8 w.
R21	19B800607P472	Metal film: 4.7K ohms ±5%, 200 VDCW, 1/8 w.
R22	19B800607P331	Metal film: 330 ohms ±5%, 200 VDCW, 1/8 w.
R23	19B800607P821	Metal film: 820 ohms ±5%, 200 VDCW, 1/8 w.
R24	19B800607P104	Metal film: 100K ohms ±5%, 200 VDCW, 1/8 w.
R25	19B800607P473	Metal film: 47K ohms ±5%, 200 VDCW, 1/8 w.
R26	19B800607P823	Metal film: 82K ohms ±5%, 200 VDCW, 1/8 w.
R27	19B800607P473	Metal film: 47K ohms ±5%, 200 VDCW, 1/8 w.
R28	19B800607P224	Metal film: 220K ohms ±5%, 200 VDCW, 1/8 w.
R29	19B800607P823	Metal film: 82K ohms ±5%, 200 VDCW, 1/8 w.
R30	19B800607P274	Metal film: 270K ohms ±5%, 200 VDCW, 1/8 w.
R31	19B800607P103	Metal film: 10K ohms ±5%, 200 VDCW, 1/8 w.
R32	19B800607P223	Metal film: 22K ohms ±5%, 200 VDCW. 1/8 w.
R33	19B800607P183	Metal film: 18K ohms ±5%, 200 VDCW, 1/8 w.
R34	19B800607P333	Metal film: 33K ohms ±5%, 200 VDCW, 1/8 w.
R35	19B800607P103	Metal film: 10K ohms ±5%, 200 VDCW, 1/8 w.
R36	19B800607P223	Metal film: 22K ohms ±5%, 200 VDCW, 1/8 w.
R37	19B800607P183	Metal film: 18K ohms ±5%, 200 VDCW, 1/8 w.
R38	19A701828P1	Thermistor: 3.3K ohms ±5%; sim to Philips 2322-642-63332.
R39	19B800607P124	Metal film: 120K ohms ±5%, 200 VDCW, 1/8 w.
R40	19B800607P273	Metal film: 27K ohms ±5%, 200 VDCW, 1/8 w.
R41	19B800607P224	Metal film: 220K ohms ±5%, 200 VDCW, 1/8 w.
R42	19B800607P223	Metal film: 22K ohms ±5%, 200 VDCW, 1/8 w.
R43	19B800607P473	Metal film: 47K ohms ±5%, 200 VDCW, 1/8 w.
R44	19B800607P102	Metal film: 1K ohms ±5%, 200 VDCW, 1/8 w.
R45	19B800607P471	Metal film: 470 ohms ±5%, 200 VDCW, 1/8 w.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U1	19A702410P1	Linear: Audio Amplifier; sim to TBA-820M.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19A701622P1	Cotter pin. (Located between R15 & R19 - G2 only).
	19B232682P11	Ensolite pad.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

FREQUENCY SENSITIVE COMPONENTS

REF. NO.	G11 450-470 MHZ
C1#	5.6P
C2#	6.8P
C3#	2.7P
C4	0.5-2.5P
C5#	2.7P
C8#	1.2P
C19#	100P
C22	68P
C23#	22P
C24#	3.3P
C27#	15P
C30#	2.7P
C32#	3.3P
C54#	10P
C55#	3.9P
C58#	15P
C59#	39P
C60#	39P
C65#	15P
C71#	10P
C85#	39P
C86#	22P
C87#	39P
C89#	10P
C93#	39P
C94#	18P
C95#	47P
C96#	2.7P
C97#	30P
C108	6.8P
C110#	10P
L1	2 1/2 TURNS 2.0mm ID
L4 & L5	2 1/2 TURNS 2.0mm ID
L7 & L8	1U
L9	680n
L11	5 1/2 TURNS 3.04mm ID
L12	150n
L38	270n
L44	1 1/2 TURNS 2.0mm ID
L45	3 3/4 TURNS 2.54mm ID
R4#	3.3K
R10#	120
R15#	560
R77#	22K
R78#	68K
R79#	47K
R80#	82K

VOLTAGE READINGS:

VOLTAGE READINGS ARE TYPICAL VALUES MEASURED WITH A HIGH IMPEDANCE (ea:10MΩ) MULTI-METER FROM THE INDICATED POINT TO GROUND. CONDITIONS FOR READINGS ARE INDICATED BY THE FOLLOWING KEY:

R INDICATES VOLTAGES ARE TO BE MEASURED DURING RECEIVE MODE
T INDICATES MEASUREMENT DURING TRANSMIT
C INDICATES CONTINUOUS VOLTAGE ALWAYS PRESENT WHEN RADIO IS ON

VOLTAGE READINGS ARE FOR 4 WATT RDL UNITS UNLESS ENCLOSED IN BRACKETS WHICH INDICATES VOLTAGES MEASURED ON 2 WATT RDL UNITS. (EXAMPLE: [+7.5V])

NOTES:

⚠1 PART OF PWB.

3. # IDENTIFIES "CHIP" COMPONENTS (EXAMPLE C57#) WHICH ARE LOCATED ON SOLDER SIDE OF PWB.

4. † FREQUENCY SENSITIVE COMPONENTS, SEE COMPONENT IDENTIFICATION CHART OR PARTS LIST. G11 PART VALUE SHOWN.

5. ALL CHIP RESISTORS ARE 1/8 WATT.
ALL OTHER RESISTORS ARE 1/8 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,u OR n.

⚠6 WHEN IT IS DESIRABLE TO HAVE THE SQUELCH CIRCUITRY CONTROLLING THE RECEIVE AUDIO ON/OFF PERFORM THE FOLLOWING:
a. ON THE 19D901656 SYSTEM BOARD, REMOVE PIN J2-2.
b. ON THE 19D901123 AUDIO BOARD, ADD A DM WIRE FROM HL11 TO P2-2.

DESCRIPTION	MODEL NO.	REV LTR
UHF 2W/4W MAIN BD 450-470 MHZ	PL19D901656G11	
AUDIO BOARD (RADIO DATA LINK)	PL19D901123G5	

(19D901424, Sh. 1, Rev. 0)

SCHEMATIC DIAGRAM
450-470 MHz T/R BOARD
Sheet 1

PROBING POINTS FOR RECEIVER FRONT END AND TRANSMITTER
(TUNE INDICATED PARTS FOR BEST READING):
AVAILABLE POWER (P_{AVL}) = PROBE CONN. TO PWR METER FOR USE AS A SENSOR.
SINAD = PROBE USED WITH A GENERATOR AS A SIGNAL INJECTOR, APPROX. 12 dB SINAD VALUE INDICATED.
⊣► = MEASURED TO GROUND.

-117 dBm SINAD @ F_c (C4, L31, C9, C12)
-119 dBm SINAD @ F_c (C4, L31, C9, C12)
-121 dBm SINAD @ F_c (C4, L31, C9, C12)
-90 dBm SINAD @ 21.4 MHz (C9, (C12)
-100 dBm SINAD @ 21.4 MHz
-107 dBm SINAD @ 21.4 MHz
-107 dBm SINAD @ 21.4 MHz

RX R.F. AMPL
MIXER
IF PRE-AMPL

ANTENNA J1
W1
HL28
L45
A1 LO-PASS FILTER 19B801039G1
C2 22P
C3 2.7P
L2
L1
HL1
C1 3.3P
C4 5.6P
D1
HL20
1 3 4 5 2
C1# 5.6P
L1
T 0.6V
C2# 6.8P
C3# 2.7P
D1#
C108 6.8P
C5# 2.7P
C4 0.5-2.5P
L2
R1# 1.2K
+10.0V [+7.5V] SH.3
R5# 75
R7# 75
J5 (TP3)
C 9.9V [7.4V]
C6# 220P
R2 33K
C 9.9V [7.4V]
L3I
R4# 3.3K
C 1.0V
Q1#
D10#
C 1.7V
C7# 220P
R3# 12K
C8# 1.2P
C9 1-5P
L4
L5
C10# 0.01U
L6 1.5U
C12 5-30P
C14# 22P
G
D
S
Q2#
R 2.4V W/INJ
2.2V NO INJ
R6# 1.5K
C11# 0.01U
C13# 15P
Z1 21.4 MHZ
C15# 27P
Z2 21.4 MHZ
C16# 16P
C34# 1.5P
R20# 1.0K
R 0.7V
Q5#
R21# 27K
R22# 10K
R 2.6V
C35# 4700P
R23# 8.2K
RX +5.4V SH.3
A SH.3
C103# 1P
R 5.4V
R10# 75
L46 1U
C29# 220P
R16# 100K
L14
C30# 2.7P
C33# 0.5P
C32# 3.3P
R 5.2V
R 0.4V WITH DRIVE
R 0V NO DRIVE
Q4#
C28# 10P
R17# 12K
R19# 100
C27# 15P
L13
L15
C31# 220P
R14# 75
J6 (TP1)
R 5.1V
R12# 8.2K
C20# 470P
L10
C23# 22P
C26# 1.2P
R 2.0V
Q3#
C24# 3.3P
C21 39P
R 1.8V OSC RUNNING
R1.4V OSC OFF
L12 150N
R13# 5.6K
C22 68P
R15# 560
L11
C25 2-7P
+5.4V REG SH.3,5
R77# 22K
R78# 68K
C19# 100P
L9 680N
COMP V SH.5
HL31
JUMPER
HL32
L48 1U
3
1
D2#
R 0V
L7 1.0U
XY1-1
Y1
XY1-2
R8# 1K
R10# 120
B SH.4
RX +5.4V SH.3

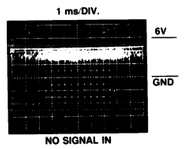
RX OSC
X3 MULT

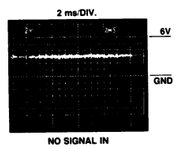
P_{AVL} APPROX -13 dBm
TUNE L48 OR L49 & C25

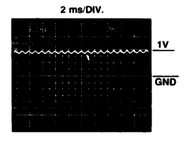
P_{AVL} APPROX 0 dBm
TUNE L48 (L49), C25, LI3, LI4, LI5

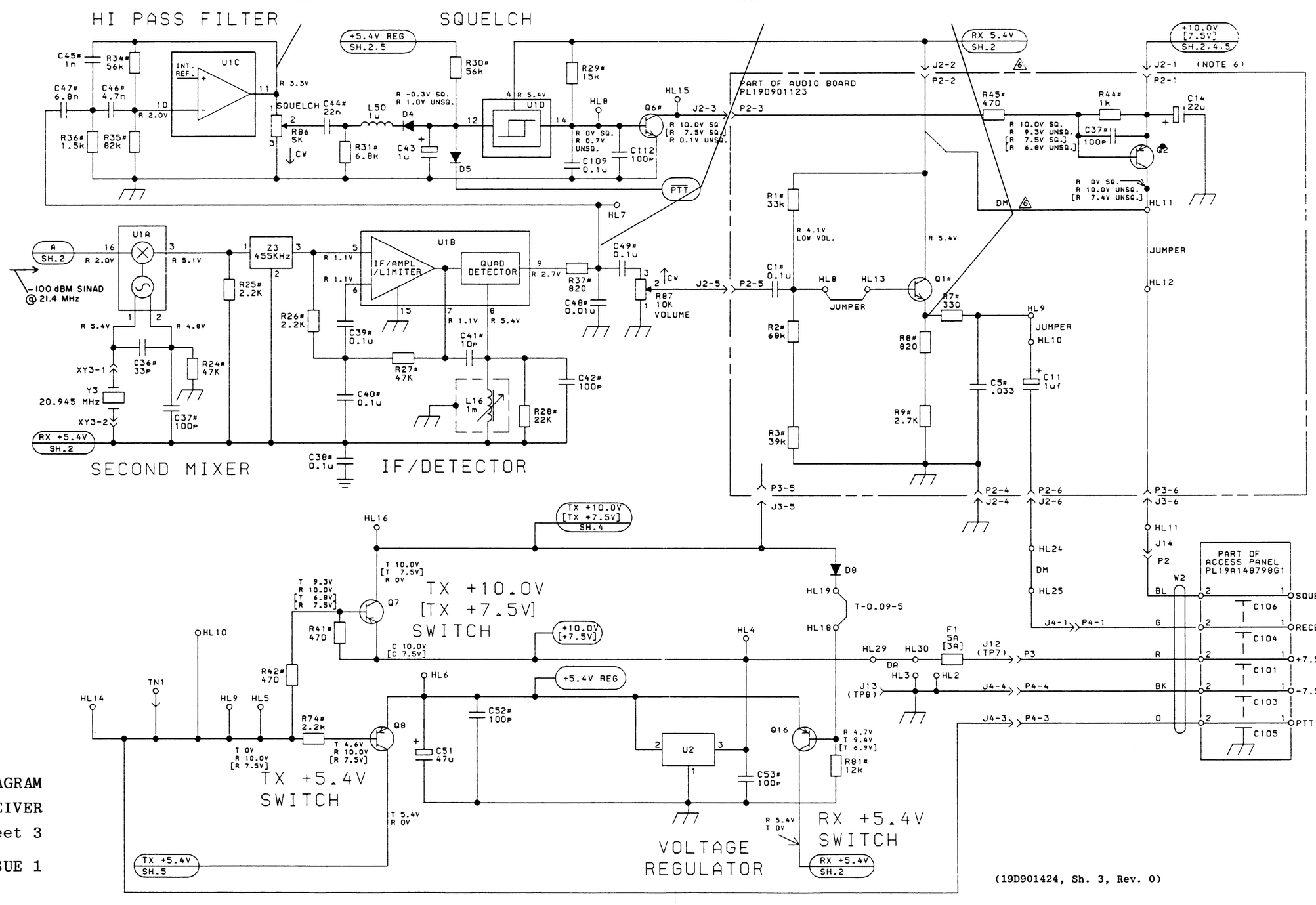
(19D901424, Sh. 2, Rev. 0)

SCHEMATIC DIAGRAM
RECEIVER
Sheet 2



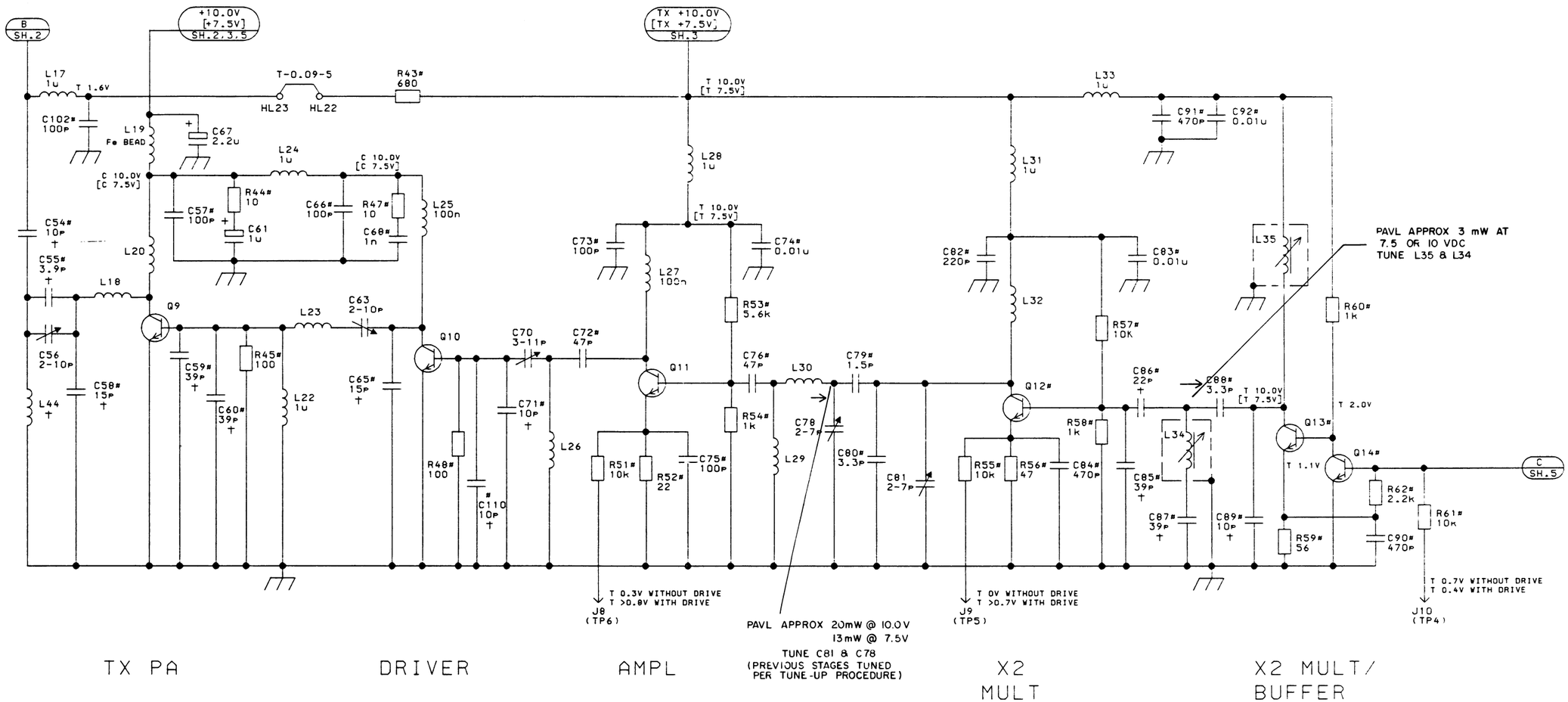






SCHEMATIC DIAGRAM
RECEIVER
Sheet 3

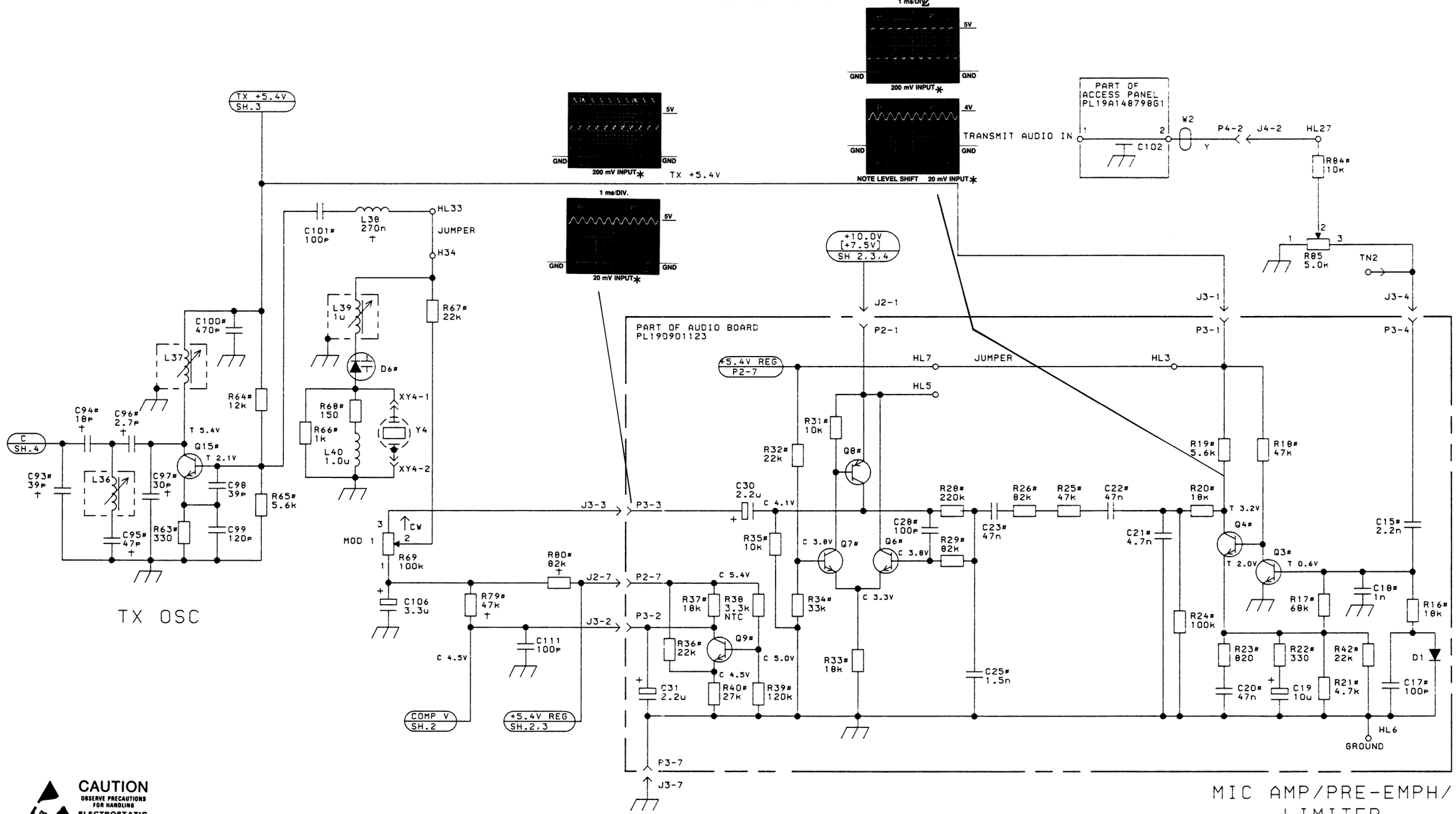
(19D901424, Sh. 3, Rev. 0)



(19D901424, Sh. 4, Rev. 0)

SCHEMATIC DIAGRAM
TRANSMITTER
Sheet 4

*INPUT LEVEL MEASURED AT TN2



TX OSC

COMPENSATOR

POST-LIMITER FILTER

MIC AMP/PRE-EMPH/ LIMITER

CAUTION
OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES

MAIN BOARD: Q2
AUDIO BOARD: Q10

SCHEMATIC DIAGRAM
TRANSMITTER
Sheet 5

(19D901424, Sh. 5, Rev. 0)

PARTS LIST

TRANSMIT/RECEIVE BOARD
19D901656G11 450-470 MHz

ISSUE 1

SYMBOL	GE PART NO.	DESCRIPTION
A1		FILTER BOARD 19B801039G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A700219P14	Ceramic: 3.3 pF ±5%, 100 VDCW, temp coef 0 PPM.
C2	19A700219P40	Ceramic: 22 pF ±10%, 100 VDCW, temp coef 0 PPM.
C3	19A700219P12	Ceramic: 2.7 pF ±5%, 100 VDCW, NPO.
C4	19A700219P20	Ceramic: 5.6 pF ±5%, 100 VDCW, temp coef 0 PPM.
		- - - - - - - - - - DIODES - - - - - - - - - -
D1	19A702411P1	Silicon; sim to Hewlett Packard 5082-3188.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19A702472P3	Coil.
L2	19A702472P1	Coil.
		- - - - - - - PART OF 19D901656G11 - - - - - - -
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A702061P10	Ceramic: 5.6 pF ±0.5 pF, 50 VDCW, temp coef 0 ±60 PPM.
C2	19A702061P11	Ceramic: 6.8 pF ±0.5 pF, 50 VDCW, temp coef 0 ±60 PPM.
C3	19A702061P906	Ceramic: 2.7 pF ±.25 pF, 50 VDCW, temp coef 0 ±120 PPM.
C4	19B800873P7	Variable, ceramic: 0.5 to 2.5 pF, 150 VDCW; sim to Johanson 9620.
C5	19A702061P906	Ceramic: 2.7 pF ±.25 pF, 50 VDCW, temp coef 0 ±120 PPM.
C6 and C7	19A702061P69	Ceramic: 220 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C8	19A702061P902	Ceramic: 1.2 pF ±0.25 pF, 50 VDCW, temp coef 0 ±250 PPM.
C9	19B800873P8	Variable, ceramic: 1 to 5 pF, 150 VDCW; sim to Johanson 9621.
C10 and C11	19A702052P14	Ceramic: 0.01 uF ±10%, 50 VDCW.
C12	19A702168P4	Variable, ceramic: 5.2 to 30 pF, 100 VDCW, temp coef N750+300 PPM; sim to JFD DV2SN30D.
C13	19A702061P21	Ceramic: 15 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C14	19A702061P29	Ceramic: 22 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C15	19A702061P33	Ceramic: 27 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C16	19A702061P23	Ceramic: 16 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C19	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C20	19A702061P77	Ceramic: 470 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C21	19A700226P50	Ceramic: 39 pF ±5%, 100 VDCW, temp coef -750 PPM.
C22	19A700228P59	Ceramic: 68 pF ±5%, 100 VDCW, temp coef -2200 PPM.
C23	19A702061P29	Ceramic: 22 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C24	19A702061P907	Ceramic: 3.3 pF ±.25 pF, 50 VDCW, temp coef 0 ±120 PPM.
C25	19A702168P1	Variable, ceramic: 2 to 7 pF, 100 VDCW; sim to JFD DV2SN7A.
C26	19A701061P902	Ceramic: 1.2 pF ±.25 pF, 50 VDCW, 0 ±250 PPM.
C27	19A702061P21	Ceramic: 15 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C28	19A702061P13	Ceramic: 10 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C29	19A702061P69	Ceramic: 220 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C30	19A702061P906	Ceramic: 2.7 pF ±.25 pF, 50 VDCW, temp coef 0 ±120 PPM.
C31	19A702061P69	Ceramic: 220 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C32	19A702061P907	Ceramic: 3.3 pF ±.25 pF, 50 VDCW, temp coef 0 ±120 PPM.
C33	19A702236P1	Ceramic: 0.5 pF ±.1 pF, 50 VDCW, temp coef 0 ±30 PPM.
C34	19A702061P903	Ceramic: 1.5 pF ±.25 pF, 50 VDCW, temp coef 0 ±250 PPM.
C35	19A702052P10	Ceramic: 4700 pF ±10%, 50 VDCW.
C36	19A702061P37	Ceramic: 33 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C37	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C38 thru C40	19A702052P26	Ceramic: 0.1 uF ±10%, 50 VDCW.
C41	19A702061P13	Ceramic: 10 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C42	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C43	19B800755P1	Electrolytic: 1 uF ±20%, 50 VDCW.
C44	19A702052P28	Ceramic: 0.022 uF ±10%, 50 VDCW.
C45	19A702052P105	Ceramic: 1000 pF ±5%, 50 VDCW.
C46	19A702052P110	Ceramic: 4700 pF ±5%, 50 VDCW.
C47	19A702052P112	Ceramic: 6800 pF ±5%, 50 VDCW.
C48	19A702052P14	Ceramic: 0.01 uF ±10%, 50 VDCW.
C49	19A702052P26	Ceramic: 0.1 uF ±10%, 50 VDCW.
C51	19A700003P9	Tantalum: 47 uF ±20%, 6.3 VDCW.
C52 and C53	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C54	19A702236P25	Ceramic: 10 pF ±.5 pF, 50 VDCW, temp coef 0 ±30 PPM.
C55	19A702236P15	Ceramic: 3.9 pF ±.25 pF, 50 VDCW, temp coef 0 ±30 PPM.
C56	19B800873P3	Variable, ceramic: 2.5 to 10 pF, 150 VDCW; sim to Johanson 9611.
C57	19A702236P50	Ceramic: 100 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C58	19A702236P30	Ceramic: 15 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C59	19A702236P40	Ceramic: 39 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C60	19A702236P40	Ceramic: 39 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C61	19A700003P4	Tantalum: 1 uF ±20%, 35 VDCW.
C65	19A702236P30	Ceramic: 15 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C66	19A702236P50	Ceramic: 100 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C67	19A703324P2	Electrolytic: 2.2 uF ±20%, 50 VDCW.
C68	19A702052P5	Ceramic: 1000 pF ±10%, 50 VDCW.
C70	19A702168P2	Variable, cermic: 3 to 11 pF 100 VDCW, temp coef N450+300 PPM; sim to JFD DV2SN11C.
C71	19A702236P25	Ceramic: 10 pF ±.5 pF, 50 VDCW, temp coef 0 ±30 PPM.
C72	19A702061P45	Ceramic: 47 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C73	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C74	19A702052P14	Ceramic: 0.01 uF ±10%, 50 VDCW.
C75	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C76	19A702061P45	Ceramic: 47 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C78	19A702168P1	Variable, ceramic: 2 to 7 pF, 100 VDCW; sim to JFD DV2SN7A.
C79	19A702061P3	Ceramic: 1.5 pF ±0.5 pF, 50 VDCW, temp coef 0 ±250 PPM.
C80	19A702061P7	Ceramic: 3.3 pF ±0.5 pF, 50 VDCW, temp coef 0 ±120 PPM.
C81	19A702168P1	Variable, ceramic: 2 to 7 pF, 100 VDCW; sim to JFD DV2SN7A.
C82	19A702061P69	Ceramic: 220 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C83	19A702052P14	Ceramic: 0.01 uF ±10%, 50 VDCW.
C84	19A702061P77	Ceramic: 470 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C85	19A702061P41	Ceramic: 39 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C86	19A702061P29	Ceramic: 22 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C87	19A702061P41	Ceramic: 39 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C88	19A702061P7	Ceramic: 3.3 pF ±0.5 pF, 50 VDCW, temp coef 0 ±120 PPM.
C89	19A702061P13	Ceramic: 10 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C90 and C91	19A702061P77	Ceramic: 470 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C92	19A702052P14	Ceramic: 0.01 uF ±10%, 50 VDCW.
C93	19A702061P41	Ceramic: 39 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C94	19A702061P25	Ceramic: 18 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C95	19A702061P45	Ceramic: 47 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C96	19A702061P906	Ceramic: 2.7 pF ±.25 pF, 50 VDCW, temp coef 0 ±120 PPM.
C97	19A702061P35	Ceramic: 30 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C98	19A700227P50	Ceramic: 39 pF ±5%, 100 VDCW, temp coef -1500 PPM.
C99	19A700229P68	Ceramic: 120 pF ±5%, 100 VDCW, temp coef -3300 PPM.
C100	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
C101 and C102	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C103	19A702236P6	Ceramic: 1.0 pF ±.25 pF, 50 VDCW, temp coef 0 ±30 PPM.
C106	19B800650P15	Tantalum: 3.3 uF ±20%, 10 VDCW.
C108	19A700219P22	Ceramic: 6.8 pF ±5%, 100 VDCW, temp coef 0 PPM.
C109	19A116192P14	Ceramic: 0.1 uF ±20%, 50 VDCW; sim to Erie USCC CW20C104-M2.
C110	19A702236P25	Ceramic: 10 pF ±.5 pF, 50 VDCW, temp coef 0 ±30 PPM.
C112	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
		- - - - - - - - - - DIODES - - - - - - - - - -
D1	19A700155P2	Silicon; sim to Bat 18.
D2	19A700079P3	Silicon; sim to BBY 31.
D4 and D5	19A702015P1	Silicon; sim to IN458A.
D6	19A700079P3	Silicon; sim to BBY 31.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
D8	19A702015P1	Silicon; sim to IN458A.
D10	19A700155P2	Silicon; sim to Bat 18.
		- - - - - - - - - - - FUSES - - - - - - - - - - -
F1	19A702169P9	Enclosed link: rated 3 amps @ 125 v; sim to Littelfuse 255003.
		- - - - - - - - - - - JACKS - - - - - - - - - - -
J1		Part of W1.
J2 and J3	19A703248P4	Contact, electrical. (Quantity 7 each).
J4	19A703248P1	Contact, electrical. (Quantity 4).
J5 and J6	19A703248P1	Contact, electrical.
J8	19A703248P1	Contact, electrical.
J9	19A703248P4	Contact, electrical.
J10	19A703248P1	Contact, electrical.
J12 thru J14	19A703248P1	Contact, electrical.
		- - - - - - - - - - - INDUCTORS - - - - - - - - - - -
L1	19A702472P3	Coil.
L2	19A702472P30	Coil.
L3	19C850826P211	Coil, RF: sim to Paul Smith SK-800-1.
L4 and L5	19A702472P3	Coil.
L6	H343CLP15922	Coil, RF: 1.5 uH ±10%.
L7	19A700024P13	Coil, RF: 1.0 uH ±10%.
L9	19A700024P11	Coil, RF: 680 nH ±10%.
L10	19A702472P24	Coil.
L11	19A702472P26	Coil.
L12	19A700024P3	Coil, RF: 1.0 uH ±10%.
L13	19C850826P322	Coil, RF: sim to Paul Smith SK-800-1.
L14	19C850826P221	Coil, RF: sim to Paul Smith SK-800-1.
L15	19C850826P211	Coil, RF: sim to Paul Smith SK-800-1.
L16	19A702213P1	Coil, RF: 1.0 mH ±6%; sim to TOKO 126AN-A5318HM.
L17	H343CLP10922	Coil, RF: 1.0 uH ±10%.
L18	19A702988P1	Coil.
L19	19A702473G1	Coil.
L20	19A702472P8	Coil.
L22	19A700024P13	Coil, RF: 1.0 uH ±10%.
L23	19A702472P3	Coil.
L24	H343CLP10922	Coil, RF: 1.0 uH ±10%.
L25	19A700024P1	Coil, RF: 100 nH ±10%, 0.08 ohms DC res max, 100 v.
L26	19A702474P4	Coil.
L27	19A700024P1	Coil, RF: 100 nH ±10%, 0.08 ohms DC res max, 100 v.
L28	H343CLP10922	Coil, RF: 1.0 uH ±10%.
L29 and L30	19A702474P5	Coil.
L31	H343CLP10922	Coil, RF: 1.0 uH ±10%.
L32	19A702474P1	Coil.
L33	H343CLP10922	Coil, RF: 1.0 uH ±10%.
L34 and L35	19C850826P212	Coil, RF: sim to Paul Smith SK-800-1.
L36	19C850826P612	Coil, RF; sim to Paul Smith SK-800-1.
L37	19C850826P312	Coil, RF: sim to Paul Smith SK-800-1.
L38	19A700024P6	Coil, RF: 270 nH ±10%.
L39	19A703602G1	Coil, RF. Includes 19B800827P24 tuning slug.
L40	19A700024P13	Coil, RF: 1.0 uH ±10%.
L44	19A702472P7	Coil.
L45	19A703161P2	Coil.
L46	H343CLP10922	Coil, RF: 1.0 uH ±10%.
L48	19A703602G1	Coil, RF. Includes 19B800827P24 tuning slug.
L50	H343CLP10922	Coil, RF: 1.0 uH ±10%.
		- - - - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A702413P2	Silicon, NPN.
Q2	19A703795P1	N Type: field effect; sim to MMBF4416.
Q3	19A700092P2	Silicon, NPN.
Q4	19A700236P2	Silicon, NPN; sim to BPS17.
Q5	19A700092P2	Silicon, NPN.
Q6	19A700076P2	Silicon, NPN.
Q7 and Q8	19A700026P1	Silicon, PNP.
Q9	19A702448P1	Silicon, NPN; sim to 2N5945.
Q10	19A701940P3	Silicon, NPN; sim to SRF-516.
Q11	19A701808P1	Silicon, NPN; sim to MPS 6595.
Q12 and Q13	19A700236P4	Silicon, NPN.
Q14 and Q15	19A700092P2	Silicon, NPN.
Q16	19A700026P1	Silicon, PNP.
		- - - - - - - - - - - RESISTORS - - - - - - - - - - -
R1	19B800607P122	Metal film: 1.2K ohms ±5%, 200 VDCW, 1/8 w.
R2	19A702585P99	Composition: 33K ohms ±5%, 150 VDCW, 1/8 w.
R3	19B800607P123	Metal film: 12K ohms ±5%, 200 VDCW, 1/8 w.
R4	19B800607P332	Metal film: 3.3K ohms ±5%, 200 VDCW, 1/8 w.
R5	19B800607P750	Metal film: 75 ohms ±5%, 200 VDCW, 1/8 w.
R6	19B800607P152	Metal film: 1.5K ohms ±5%, 200 VDCW, 1/8 w.
R7	19B800607P750	Metal film: 75 ohms ±5%, 200 VDCW, 1/8 w.
R8	19B800607P102	Metal film: 1K ohms ±5%, 200 VDCW, 1/8 w.
R10	19B800607P121	Metal film: 120 ohms ±5%, 200 VDCW, 1/8 w.
R11	19A702585P41	Composition: 120 ohms ±5%, 150 VDCW.
R12	19B800607P822	Metal film: 8.2K ohms ±5%, 200 VDCW, 1/8 w.
R13	19B800607P562	Metal film: 5.6K ohms ±5%, 200 VDCW, 1/8 w.
R14	19B800607P750	Metal film: 75 ohms ±5%, 200 VDCW, 1/8 w.
R15	19B800607P561	Metal film: 560 ohms ±5%, 200 VDCW, 1/8 w.
R16	19B800607P104	Metal film: 100K ohms ±5%, 200 VDCW, 1/8 w.
R17	19A702585P89	Composition: 12K ohms ±5%, 150 VDCW, 1/8 w.
R18	19B800607P750	Metal film: 75 ohms ±5%, 200 VDCW, 1/8 w.
R19	19B800607P101	Metal film: 100 ohms ±5%, 200 VDCW, 1/8 w.
R20	19B800607P102	Metal film: 1K ohms ±5%, 200 VDCW, 1/8 w.
R21	19B800607P273	Metal film: 27K ohms ±5%, 200 VDCW, 1/8 w.
R22	19B800607P103	Metal film: 10K ohms ±5%, 200 VDCW, 1/8 w.
R23	19A702585P85	Composition: 8.2K ohms ±5%, 150 VDCW, 1/8 w.
R24	19B800607P104	Metal film: 100K ohms ±5%, 200 VDCW, 1/8 w.
R25 and R26	19B800607P222	Metal film: 2.2K ohms ±5%, 200 VDCW, 1/8 w.
R27	19B800607P473	Metal film: 47K ohms ±5%, 200 VDCW, 1/8 w.
R28	19B800607P223	Metal film: 22K ohms ±5%, 200 VDCW, 1/8 w.
R29	19B800607P153	Metal film: 15K ohms ±5%, 200 VDCW, 1/8 w.
R30	19B800607P563	Metal film: 56K ohms ±5%, 200 VDCW, 1/8 w.
R31	19B800607P682	Metal film: 6.8K ohms ±5%, 200 VDCW, 1/8 w.
R32	19B800762P1	Variable, carbon film: 5K ohms ±20%, 150 VDCW, .1 w; sim to TOCOS RPR124.
R34	19B800607P563	Metal film: 56K ohms ±5%, 200 VDCW, 1/8 w.
R35	19B800607P823	Metal film: 82K ohms ±5%, 200 VDCW, 1/8 w.
R36	19B800607P152	Metal film: 1.5K ohms ±5%, 200 VDCW, 1/8 w.
R37	19B800607P821	Metal film: 820 ohms ±5%, 200 VDCW, 1/8 w.
R41	19B800607P471	Metal film: 470 ohms ±5%, 200 VDCW, 1/8 w.
R42	19B800251P471	Composition: 470 ohms ±5%, 150 VDCW, 1/8 w.
R43	19B800607P681	Metal film: 680 ohms ±5%, 200 VDCW, 1/8 w.
R44	19B800607P100	Metal film: 10 ohms ±5%, 200 VDCW, 1/8 w.
R45	19B800607P101	Metal film: 100 ohms ±5%, 200 VDCW, 1/8 w.
R47	19B800607P100	Metal film: 10 ohms ±5%, 200 VDCW, 1/8 w.
R48	19B800607P101	Metal film: 100 ohms ±5%, 200 VDCW, 1/8 w.
R51	19B800607P103	Metal film: 10K ohms ±5%, 200 VDCW, 1/8 w.
R52	19A702289P7	Metal film: 22 ohms ±5%, 1/4 w; sim to Corning FP55.
R53	19B800607P562	Metal film: 5.6K ohms ±5%, 200 VDCW, 1/8 w.
R54	19B800607P102	Metal film: 1K ohms ±5%, 200 VDCW, 1/8 w.
R55	19B800607P103	Metal film: 10K ohms ±5%, 200 VDCW, 1/8 w.
R56	19B800607P470	Metal film: 47 ohms ±5%, 200 VDCW, 1/8 w.
R57	19B800607P103	Metal film: 10K ohms ±5%, 200 VDCW, 1/8 w.
R58	19B800607P102	Metal film: 1K ohms ±5%, 200 VDCW, 1/8 w.
R59	19B800607P560	Metal film: 56 ohms ±5%, 200 VDCW, 1/8 w.
R60	19B800607P102	Metal film: 1K ohms ±5%, 200 VDCW, 1/8 w.
R61	19B800607P103	Metal film: 10K ohms ±5%, 200 VDCW, 1/8 w.
R62	19B800607P222	Metal film: 2.2K ohms ±5%, 200 VDCW, 1/8 w.
R63	19B800607P331	Metal film: 330 ohms ±5%, 200 VDCW, 1/8 w.
R64	19B800607P123	Metal film: 12K ohms ±5%, 200 VDCW, 1/8 w.
R65	19B800607P562	Metal film: 5.6K ohms ±5%, 200 VDCW, 1/8 w.
R66	19B800607P102	Metal film: 1K ohms ±5%, 200 VDCW, 1/8 w.
R67	19B800607P223	Metal film: 22K ohms ±5%, 200 VDCW, 1/8 w.
R68	19B800607P151	Metal film: 150 ohms ±5%, 200 VDCW, 1/8 w.
R69	19B800751P16	Variable, solid carbon: 100K ohms ±25%, 0.05 w; sim to ALSP H0651A.
R73	19B800751P16	Variable, solid carbon: 100K ohms ±25%, 0.05 w; sim to ALSP H0651A.
R74	19B801251P222	Composition: 2.2K ohms ±5%, 150 VDCW, 1/8 w.
R77	19B800607P223	Metal film: 22K ohms ±5%, 200 VDCW, 1/8 w.
R78	19B800607P683	Metal film: 68K ohms ±5%, 200 VDCW, 1/8 w.
R79	19B800607P473	Metal film: 47K ohms ±5%, 200 VDCW, 1/8 w.
R80	19B800607P823	Metal film: 82K ohms ±5%, 200 VDCW, 1/8 w.
R81	19B800607P123	Metal film: 12K ohms ±5%, 200 VDCW, 1/8 w.
R84	19B800607P103	Metal film: 10K ohms ±5%, 200 VDCW, 1/8 w.
R85 and R86	19A700016P3	Variable, cermet: 4.7K ohms ±10%, 1/2 w.
R87	19A700016P4	Variable, cermet: 10K ohms ±10%, 1/2 w; sim to Bourns 3329H-1-103.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U1	19A701780P1	Linear: IF AMPLIFIER AND DETECTOR.
U2	19A702536P2	Linear. POSITIVE VOLTAGE REGULATOR; sim to LM2931T.
		- - - - - - - - - - - CABLES - - - - - - - - - - -
W1	19A148762G1	RF Cable. (Includes J1).
		- - - - - - - - - - - SOCKETS - - - - - - - - - - -
XY1	19A115834P1	Contact, electrical: sim to AMP 2-330808-8.
XY3	19A700042P3	Contact, electrical: sim to AMP 2-332070-2.
XY4 and XY5	19A115834P1	Contact, electrical: sim to AMP 2-330808-8.
		- - - - - - - - - - - FILTERS - - - - - - - - - - -
Z1	19A702522G11	Crystal pair. (Includes Z2).
Z2		(Part of Z1).
Z3	19A702171P1	Bandpass filter: 455 ±1.5 kHz; sim to Murata CFU455D2.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19A702471P2	Crystal pad. (Used in Z1 & Z2).
	19A702945P1	Shield.
	19C336537G1	Cover.
	19B234710G1	Housing.
	19C850977P4	Nameplate.
	19C336504G1	Ribbon Cable Adapter Board. (Includes printed wire board 19C336503P1).
	19A148861G1	BNC Cable Adapter.
		ASSOCIATED PARTS
		- - - - - - - - - - - CRYSTALS - - - - - - - - - - -
		NOTE: when reordering specify GE part number and exact frequency needed.
		$Fx = \frac{Fo - 21.4}{9}$
Y1	19A702375G2	Quartz.
		$Fx = \frac{Fo}{8}$
Y3	19A702248G3	Quartz 20945.0 kHz.
	19A702248G4	(Alternate IF Crystal) 21855.0 kHz.
Y4	19A702375G1	Quartz.

PARTS LIST

HARDWARE KIT
19A148854G1 UHF
19A148854G2 HB

ISSUE 1

MBOL	GE PART NO.	DESCRIPTION
	19A702471P3	Crystal pad. (Used with Y3).
	19A702471P2	Crystal pad. (Used with Y1 and Y4).
	19B801314G1	Interconnect cable.
	19A148797P1	Clamp.
	19A148796P1	Heatsink. (Group 1 only) Outside Housing.
	19A148796P2	Heatsink. (Group 2 only) Inside Housing.
	19B234729G1	Heatsink. (Group 1 only) Inside Housing.
	N248P15B	Hex nut. (Group 1 only) Secures Q9 to heatsink.
	19A102829P1	Washer.
	19B201955P8	Standoff.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST

AUDIO BOARD
19D901123G5

ISSUE 1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A702052P26	Ceramic: 0.1 uF ±10%, 50 VDCW.
C5	19A702052P120	Ceramic: 0.033 uF ±5%, 50 VDCW.
C11	19B800755P1	Electrolytic: 1 uF ±20%, 20 VDCW.
C14	19A703324P1	Electrolytic: 22 uF ±20%, 16 VDCW.
C15	19A702052P107	Ceramic: 2200 pF ±5%, 50 VDCW.
C17	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C18	19A702052P5	Ceramic: 1000 pF ±10%, 50 VDCW.
C19	19B800755P4	Electrolytic: 10 uF ±20%, 16 VDCW.
C20	19A702052P122	Ceramic: 0.047 uF ±5%, 50 VDCW.
C21	19A702052P110	Ceramic: 4700 pF ±5%, 50 VDCW.
C22 and C23	19A702052P122	Ceramic: 0.047 uF ±5%, 50 VDCW.
C25	19A702052P106	Ceramic: 1500 pF ±5%, 50 VDCW.
C28	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C30 and C31	19B800755P2	Electrolytic: 2.2 uF ±20%, 50 VDCW.
C37	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
		- - - - - - - - - - DIODES - - - - - - - - - -
D1	19A700028P1	Silicon, fast recovery: fwd current 75 mA, 75 PIV; sim to Type 1N4148.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P2 and P3	19A700041P56	Printed wire: 7 contacts rated @ 2.5 amps; sim to Molex 22-02-2075.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A134739P2	Silicon, NPN.
Q2	19A700026P1	Silicon, PNP.
Q3 thru Q4	19A700076P2	Silicon, NPN.
Q6 and Q7	19A700076P2	Silicon, NPN.
Q8	19A700059P2	Silicon, PNP.
Q9	19A700076P2	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	19B800607P333	Metal film: 33K ohms ±5%, 200 VDCW, 1/8 w.
R2	19B800607P683	Metal film: 68K ohms ±5%, 200 VDCW, 1/8 w.
R3	19B800607P393	Metal film: 39K ohms ±5%, 200 VDCW, 1/8 w.
R7	19B800607P331	Metal film: 330 ohms ±5%, 200 VDCW, 1/8 w.
R9	19B800607P272	Metal film: 2.7K ohms ±5%, 200 VDCW, 1/8 w.
R16	19B800607P183	Metal film: 18K ohms ±5%, 200 VDCW, 1/8 w.
R17	19B800607P683	Metal film: 68K ohms ±5%, 200 VDCW, 1/8 w.
R18	19B800607P473	Metal film: 47K ohms ±5%, 200 VDCW, 1/8 w.
R19	19B800607P562	Metal film: 5.6K ohms ±5%, 200 VDCW, 1/8 w.
R20	19B800607P183	Metal film: 18K ohms ±5%, 200 VDCW, 1/8 w.
R21	19B800607P472	Metal film: 4.7K ohms ±5%, 200 VDCW, 1/8 w.
R22	19B800607P331	Metal film: 330 ohms ±5%, 200 VDCW, 1/8 w.
R23	19B800607P821	Metal film: 820 ohms ±5%, 200 VDCW, 1/8 w.
R24	19B800607P104	Metal film: 100K ohms ±5%, 200 VDCW, 1/8 w.
R25	19B800607P473	Metal film: 47K ohms ±5%, 200 VDCW, 1/8 w.
R26	19B800607P823	Metal film: 82K ohms ±5%, 200 VDCW, 1/8 w.
R28	19B800607P224	Metal film: 220K ohms ±5%, 200 VDCW, 1/8 w.
R29	19B800607P823	Metal film: 82K ohms ±5%, 200 VDCW, 1/8 w.
R31	19B800607P103	Metal film: 10K ohms ±5%, 200 VDCW, 1/8 w.
R32	19B800607P223	Metal film: 22K ohms ±5%, 200 VDCW. 1/8 w.
R33	19B800607P183	Metal film: 18K ohms ±5%, 200 VDCW, 1/8 w.
R34	19B800607P333	Metal film: 33K ohms ±5%, 200 VDCW, 1/8 w.
R35	19B800607P103	Metal film: 10K ohms ±5%, 200 VDCW, 1/8 w.
R36	19B800607P223	Metal film: 22K ohms ±5%, 200 VDCW, 1/8 w.
R37	19B800607P183	Metal film: 18K ohms ±5%, 200 VDCW, 1/8 w.
R38	19A701828P1	Thermistor: 3.3K ohms ±5%; sim to Philips 2322-642-63332.
R39	19B800607P124	Metal film: 120K ohms ±5%, 200 VDCW, 1/8 w.
R40	19B800607P273	Metal film: 27K ohms ±5%, 200 VDCW, 1/8 w.
R42	19B800607P473	Metal film: 47K ohms ±5%, 200 VDCW, 1/8 w.
R44	19B800607P102	Metal film: 1K ohms ±5%, 200 VDCW, 1/8 w.
R45	19B800607P471	Metal film: 470 ohms ±5%, 200 VDCW, 1/8 w.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	19A701622P1	Cotter pin.
	19B232682P11	Ensolite pad.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES