MOBILE RADIO

DL100™ DATA LINK
MAINTENANCE MANUAL
LBI-31498C

403-425 MHz
450-470 MHz
2/4 Watts

GENERAL ELECTRIC

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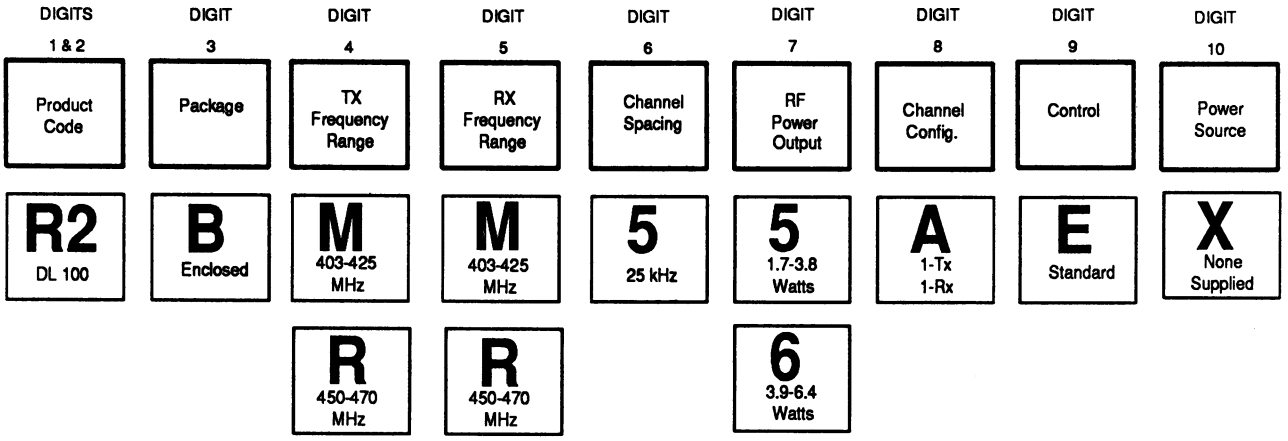
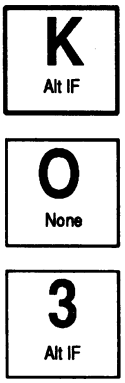
COMBINATION NOMENCLATURE



STRUCTURED OPTIONS



TYPICAL SPECIFICATIONS*

SYSTEM

FCC IDENTIFICATION NUMBER
2-WATT (450-470 MHz) AXA9MZTR131A
4-WATT (450-470 MHz) AXA9MZTR132A

FREQUENCY RANGE	450-470 MHz 403-425 MHz
BATTERY DRAIN*	
Receiver	
Standby	18 milliamperes
Receive Data	18 milliamperes (Std. Data link)
Rated Audio	155 milliamperes (with Data/Voice 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
DATA/AUDIO FREQUENCY CHARACTERISTICS	Frequency Response per EIA RS 316-B. Post-limiter filter per FCC and EIA.
DISTORTION	Less than 5% (300 to 3000 Hz)
DEVIATION SYMMETRY	1.0 kHz maximum
RF OUTPUT INPEDANCE	50 ohms

RECEIVER

DATA/AUDIO OUTPUT	DATA/LINK (STD)	DATA/VOICE (OPTION)
Level	100 mVrms	0.5 Watt
Impedance	600 ohms	8 ohms
Distortion	<5%	<5%
De-emphasis	No	Yes
SENSITIVITY		
12 DB SINAD	0.70 uV	0.35 uV
20 dB Quieting	0.90 uV	0.50 uV
FREQUENCY STABILITY	0.0005%	0.0005%
SELECTIVITY		
EIA Two Signal Method @ ± 25 kHz	-70 dB	-70 dB
SPURIOUS RESPONSE	-60 dB	-60 dB
INTERMODULATION	-58 DB	-65 DB
MODULATION ACCEPTANCE	±7 kHz	±7 kHz
SQUELCH SENSITIVITY	<0.25µV	<0.25µV
FREQUENCY RESPONSE (300-3000 Hz)	+0.1 to -3 dB (REF 1 kHz)	EIA RS-316B
RF INPUT IMPEDANCE	50 ohms	50 ohms

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

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 403-425 or 450-470 MHz range between remote data-collection sites and a control location. An optional audio board replaces the data link board 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 2-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 Data output lead for monitoring the audio. Also, audio can be applied to the Transmit Data input lead to transmit voice messages on the radio data link.

CIRCUIT ANALYSIS

The 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 Data
- C103 - Ground
- C104 - Receive Data
- C105 - PTT (closure to ground)
- C106 - CAS (0 VDC with receiver squelched or 10 VDC/7.5 VDC unsquelched). This function is not available with Data/Voice Option.

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 403-425 or 450-470 MHz band. The transmitter utilizes discrete components to provide a minimum RF power output of two watts (+7.5V) or four watts (+10V). The transmitter consists of the following assemblies.

- Data Link Board - with the transmitter data amplifier/limiter, post limiter filter and oscillator compensator circuits.
- Transmit/Receive (T/R) Board - oscillator, multiplier stages, amplifier, driver and PA stages, T/R 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
Continous 10 Volts (7.5V for 2 Watts)	Post-limiter filter, driver and PA circuits.
Switched TX 10 Volts (7.5V for 2 Watts)	Multiplier, 1st amplifier, buffer, and antenna switch
Switched TX 5.4 Volts	TX oscillator.
Regulated 5.4 Volts	Compensator, modulator, and data amplifier/limiter.

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.

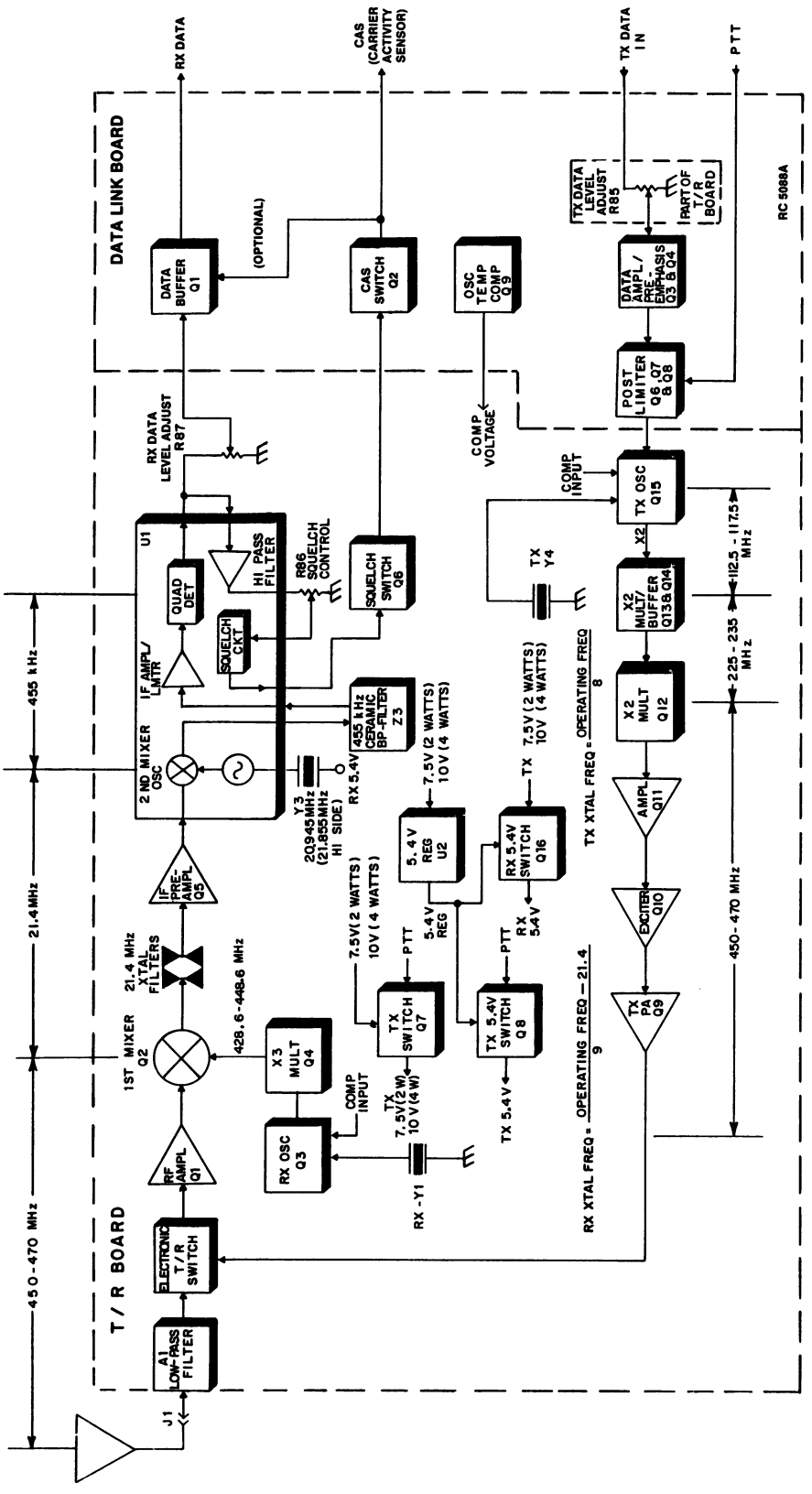


FIGURE 1 - DL 100 BLOCK DIAGRAM

DATA/AUDIO CIRCUITS

Data from a modem (or audio from a microphone for the voice option) is coupled through TX Data Level Adjust R85 to a 6 dB pre-emphasis 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 on the data link board) provides frequency compensation at low temperatures for the transmitter and receiver oscillators.

T/R BOARD

OSCILLATOR

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

Q15, Y4, and 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 (RX) AND Y4 (TX) 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 Q10. 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 driver 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 T/R 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 403-425 or 450-470 MHz frequency range. Regulated 5.4 volts is used for oscillator varactor bias and squelch detector bias. Receiver RF amplifier, mixer, and CAS operate from the external supply (10/7.5 VDC). Switched RX 5.4 volts controls IF, oscillator, tripler, and data buffer stages.

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

All of the receiver circuitry except the receive data buffer, CAS switch, and oscillator compensator is mounted on the transmitter/receiver (T/R) 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

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, L34 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.

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. Tunable capacitor C12 is used to match the mixer output 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 1st mixer can be metered at J5 (TP3). The meter reading is typically 9.9/7.4 volts.

1ST IF, 2ND IF, AND DETECTOR STAGES

The 21.4 MHz IF output of the crystal filters is applied to the base of 1st 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. R87 is used to set the data output level. R37 and C48 provide a low pass filter to remove 455 kHz from the data output.

DATA OUT & SQUELCH CIRCUIT

Data

Data from the arm of R87 is coupled through C1 to the base of buffer Q1. The de-emphasis filter has been removed to provide for a flat data response. The data output of Q1 is coupled through C11 to the output (C104) on access panel 19A148798G1. The lack of de-emphasis and a wider audio response (300-4500 Hz, typical) will degrade measured sensitivity and other specifications.

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 squelch switch Q6. When turned on, the collector voltage of Q6 goes low, turning on PNP Q2.

Transistor Q2 is the Carrier Activity Sensor (CAS) switch. 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 CAS output at C106-1 may be used to activate an external function. Any CAS external current load will increase the maximum current required by the DL100 unit. Maximum CAS current load should not exceed 20mA. The CAS line may also be used to switch the receiver data output line on and off by controlling the collector voltage to Q1. See Note 6 on page 23 for required modifications.

VOLTAGE REGULATOR AND T/R 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 lead turns on Q7 and Q8. When Q7 is turned on, 10/7.5 Volts from the external supply is applied to the transmitter multipliers and 1st amplifier stages. The switched supply voltage is also applied to the base of RX 5.4 volt switch Q16, turning the switch off in the transmit mode.

Turning on Q8 applies 5.4 volts to the transmitter oscillator stage.

RECEIVER SWITCH

Removing the low on the PTT line turns off the transmitter switches and turns on receiver switch Q16. This applies 5.4 volts to the receiver oscillator, IF amplifier, data and squelch stages.

DATA/VOICE OPTION (DV10)

When the Data/Voice Option is used, Data Link Board 19D901123G5 or G11 must be replaced with the 19D901123G1 or G7 audio board. The CAS output line is not available when this option board is used.

Audio (data or voice) from the arm of R87 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 C104 (RX Data) on access panel 19A148798G1 and the external speaker.

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. The output data will follow this roll-off over its frequency range and will not have a flat response.

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

SERVICE

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

RX DATA LEVEL & SQUELCH ADJUST

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

For receivers with data link board 19D901123-G5 or G11 set RX Data Level Adjust R84 for 100 millivolts RMS across 600-ohm load.

For receivers with audio board 19D901123G1 or G7 set Rx Data Level Adjust 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 circuit 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 Rx Data Output	Check data line board buffer 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 data link board: Emitter of Q1, base of Q1, and P2-5 (R87 level dependent). If the problem is not found on the data link board, check for recovered data 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 RX Data Output Level	Verify that at least 110 mV (310 mV 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 600 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 data 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 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.

SYMPTON	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 if 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.

SYMPTON	PROCEDURE
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.
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 indicate 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 TX mod adjust (R69) and TX Data Level Adjust (R85).

TRANSMITTER ALIGNMENT

EQUIPMENT REQUIRED

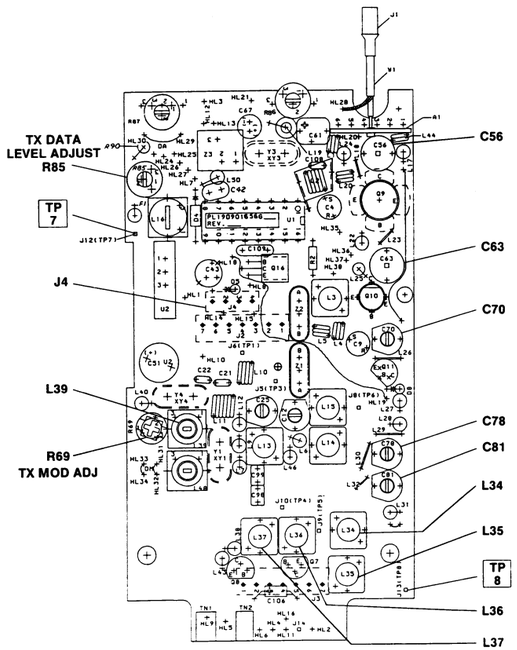
1. Power Supply (6-12 Volts, 3 Amperes).
2. Ammeter (3 Amperes).
3. 50-ohm Wattmeter with 50 ohm load.
4. Audio Oscillator
5. Deviation Monitor
6. Frequency Counter
7. Digital Voltmeter
8. Tune-up Kit Option 4120 (contains coil tuning tools, capacitor tuning tools, capacitor tuning tools, audio board 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 of board. (e. g. use a 4-40 screw and nut).
2. Unplug the data link board from the T/R 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 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.



RC 5091A

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	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 data link board onto the T/R board, and adjust L39 for the proper frequency.
MODULATION & TX LEVEL ADJUSTMENT			
7.		R85	Pre-set TX Data Level Adjust R85 to the fully clockwise position.
8.	Deviation Monitor	R69	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 Data Level Adjust R85 for 2.2 kHz deviation.

RECEIVER ALIGNMENT

EQUIPMENT REQUIRED

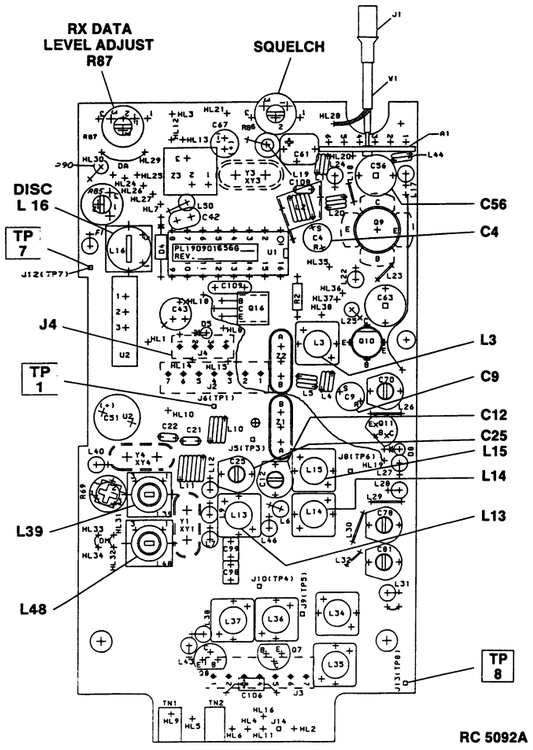
1. 10-Volt Power Supply. (0.5 amps)
2. Floating terminal (non-grounded) multimeter with at least 3 1/2 digits and a 200 millivolt DC lowest range.
3. RF generator.
4. Distortion analyzer.
5. Tune-up Option 4120 containing coil tuning tools, trimmer capacitor tuning tools, audio board jumper csbles and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

PRELIMINARY CHECKS AND AJUSTMENTS

1. The radio must be held tight against the case at the lower right corner and the top edge (e. g. use a 4-40 screw and nut).
2. Remove the front cover and unplug the data link board from the T/R board. Then connect the link board to the T/R 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 to rounded end of the capacitor.
5. Connect two 1.2k resistors in parallel across C104 and (Rx Data) C103 (GND) for the data load. Use 8-ohm load for units with Data/Voice option.

NOTE

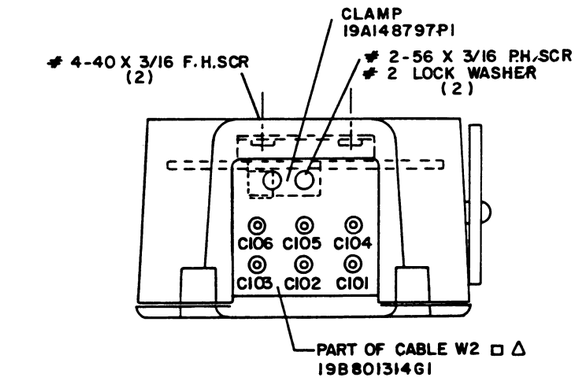
When measuring sensitivity using the 19D901123G5 or G11 data link board, 12 dB SINAD and 20 dB quieting will be degraded by approximately 7 dB due to the wider audio response of the audio board and no de-emphasis.

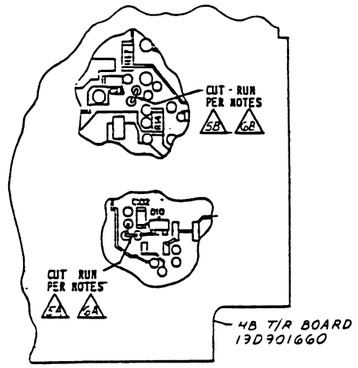


ALIGNMENT PROCEDURE

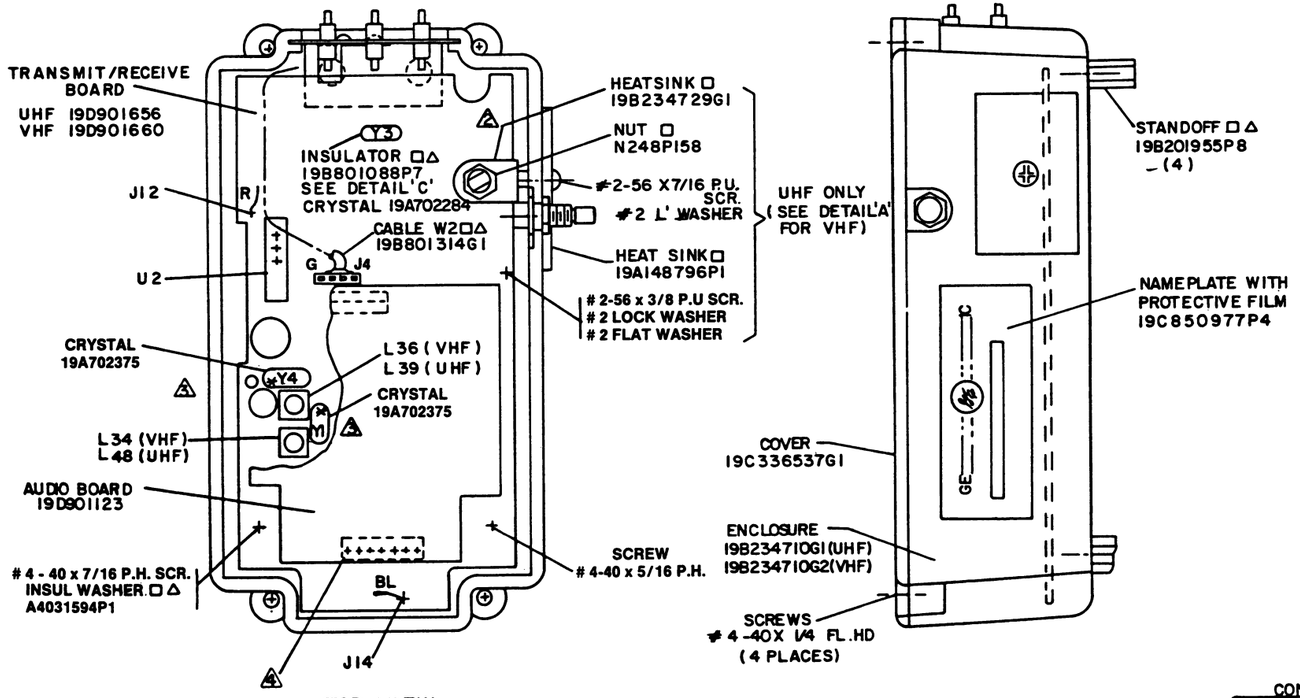
STEP	METERING POINT	TUNING CONTROL	PROCEDURE
1.	Across 600 ohm or 8 ohm	L16	Set Rx Data Level Adjsut R 84 for a data level of approximately 100 mV RMS (IV RMS with data/Voice option). Using the 50 ohm probe, apply a strong modulated 21.4 MHz signal (>-50 dBm) to U1A-16 on T/R board and adjust L16 for 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 milivolts).
3.	Across 600 ohm or 8 ohm	C25, C9 and L13	Apply a strong (0 dBm) signal to the antenna jack. Adjust C25, C9 and L13 in that order for or 8 ohm 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 600 ohm or 8 ohm	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 t 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.

MECHANICAL LAYOUT





DETAIL 'D'
SOLDER SIDE VIEW
(ENLARGED)



TOP VIEW
(COVER REMOVED)

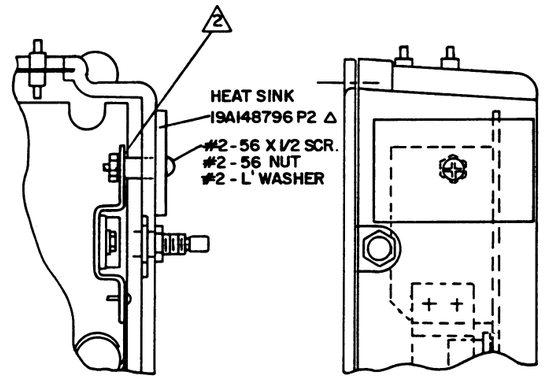
RC 5090A
(19D437990 REV. 4)

① UHF

② HB

SAME AS PART 1
EXCEPT AS NOTES IN TOP VIEW
AND DETAILS A & D

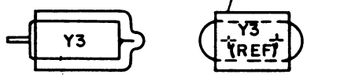
NOTES:
1. ITEMS MARKED □ ARE PART OF HARDWARE KIT PL 19A148854G1 (UHF)
   ITEMS MARKED △ ARE PART OF HARDWARE KIT PL 19A148854G2 (VHF)
2. APPLY SILICON GREASE(19A701337P1 PER 19A701431) BETWEEN MATING SURFACES OF HEAT SINK,NUT, TRANSISTOR AND EXTERNAL HEATSINK. SCREW MUST BE TIGHTENED BEFORE NUT. NUT 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 G11 OR G5 DATA LINK BOARD IS USED CUT THIS PIN OFF T/R BOARD.
   WHEN G7 OR G1 AUDIO BD (DATA/VOICE OPTION) IS USED DO NOT CUT.
5. A. CUT RUN ON SOLDER SIDE OF TX/RX BD. 19D901660G5 OR G11 WHEN LOWEST TX FREQ. SPECIFIED IS BELOW 162 MHZ AS SHOWN IN DETAIL 'D'.
   B. CUT RUN ON SOLDER SIDE OF TX/RX BD. 19D901660G5 OR G11 WHEN HIGHEST RX FREQ. SPECIFIED IS BELOW 162 MHZ AS SHOWN IN DETAIL 'D'.
6. A. WHEN NO TX CRYSTALS ARE SPECIFIED ON PRODUCTION TAG DO NOT CUT RUN SHOWN IN DETAIL 'D' PER NOTE 5 A.
   B. WHEN NO RX CRYSTALS ARE SPECIFIED ON PRODUCTION TAG DO NOT CUT RUN SHOWN IN DETAIL 'D' PER NOTE 5 B.



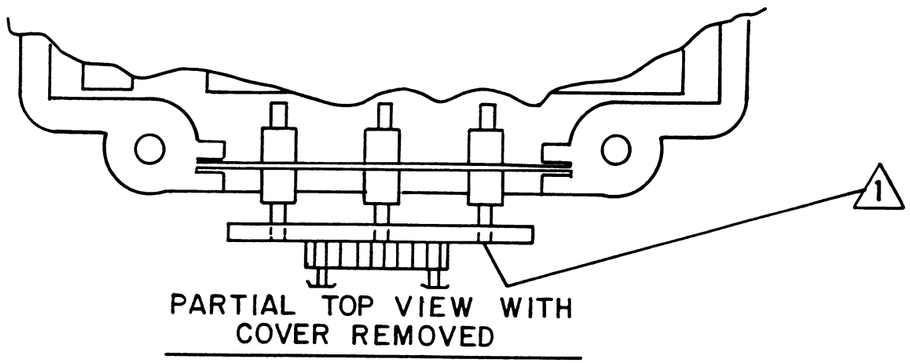
DETAIL A
TRANSISTOR TO HEATSINK ASM.
(VHF ONLY)

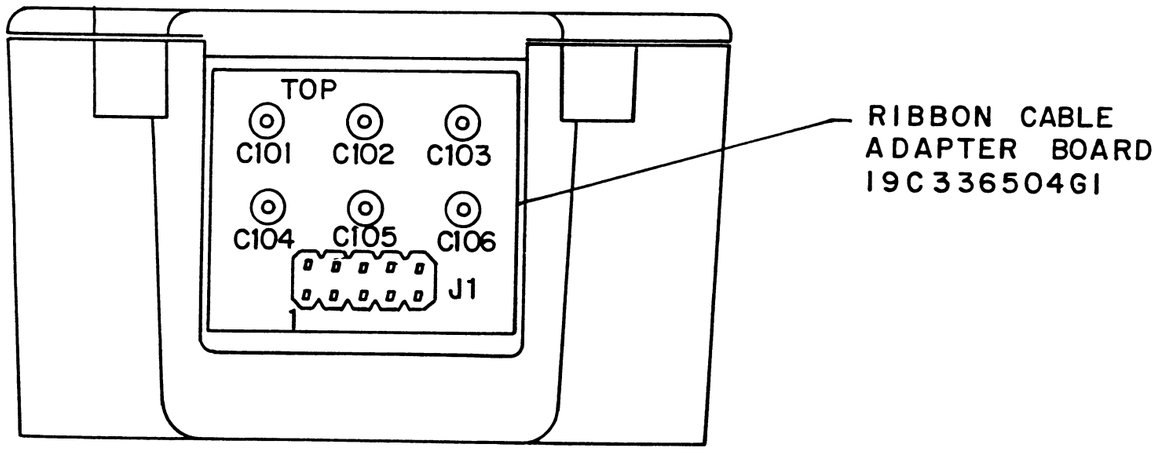
CONNECTION CHART

FROM CABLE W2	TO T/R BOARD	WIRE
P2	J14	BL
P3	J12	RED
P4	J 4	LACED



DETAIL C





RIBBON CABLE ADAPTER

NOTES:

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

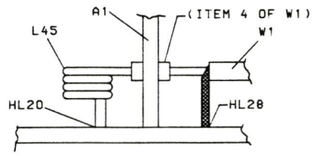
RIBBON CABLE ADAPTER BOARD CONNECTION CHART

FUNCTION	PIN CONN.
+7.5/+10 Vdc	J1 - 3 & 5
TX DATA	J1 - 8
GROUND	J1 - 4 & 9
RX DATA	J1 - 10
PTT	J1 - 6
CAS	J1 - 7
OPEN	J1 - 1 & 2

FEED-THRU CAPACITOR CONNECTIONS

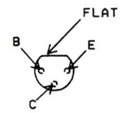
FUNCTION	CAPACITOR
+7.5/+10 Vdc	C101
TX DATA	C102
GROUND	C103
RX DATA	C104
PTT	C105
CAS	C106

RC-5086B
(19B234731, REV. 2)

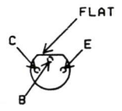


WIRE CHART			
FROM	TO	WIRE	COMMENTS
HL18	HL19	T-0.09-5	COMPONENT SIDE
HL22	HL23	T-0.09-5	COMPONENT SIDE
HL24	HL25	DM	COMPONENT SIDE
HL29	HL30	DA	COMPONENT SIDE
HL31	HL32	DM	COMPONENT SIDE
HL33	HL34	DM	COMPONENT SIDE
	A1 HOLE	CONDUCTOR	W1
	HL28	SHIELD	W1

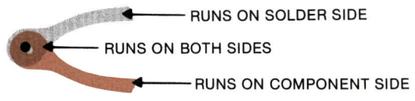
LEAD IDENTIFICATION FOR Q7,Q8 & Q16

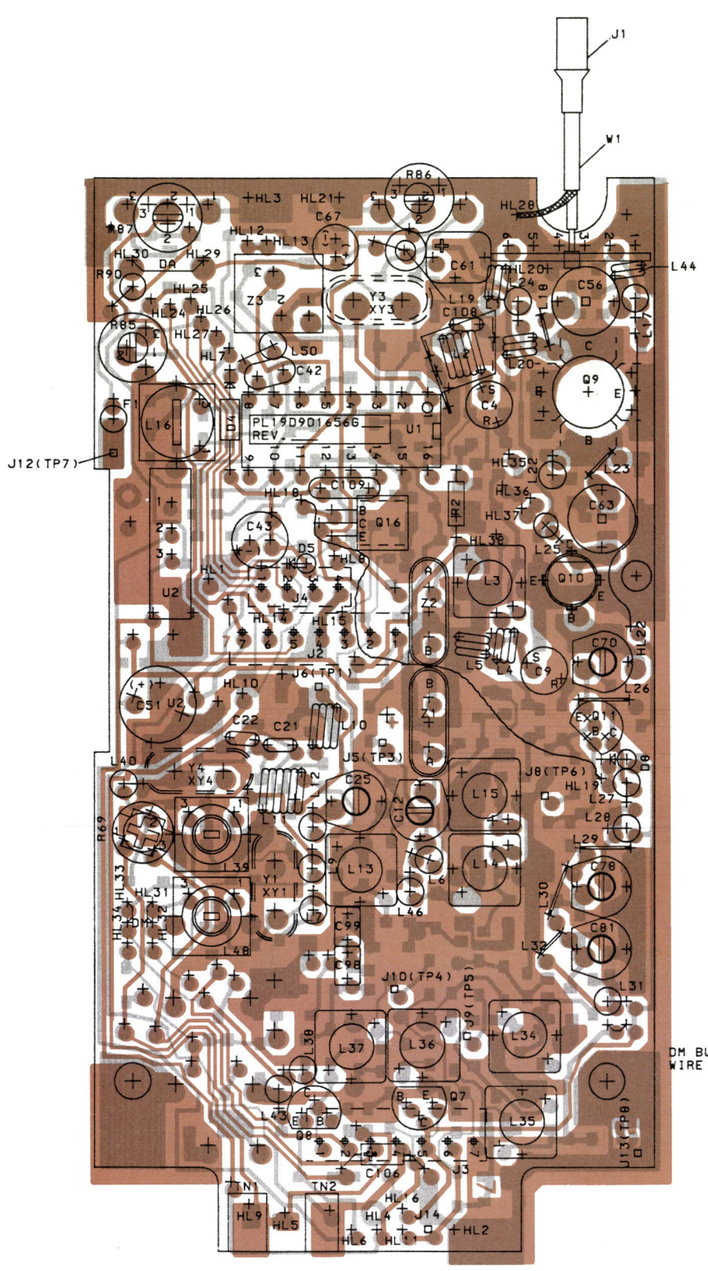


LEAD IDENTIFICATION FOR Q11



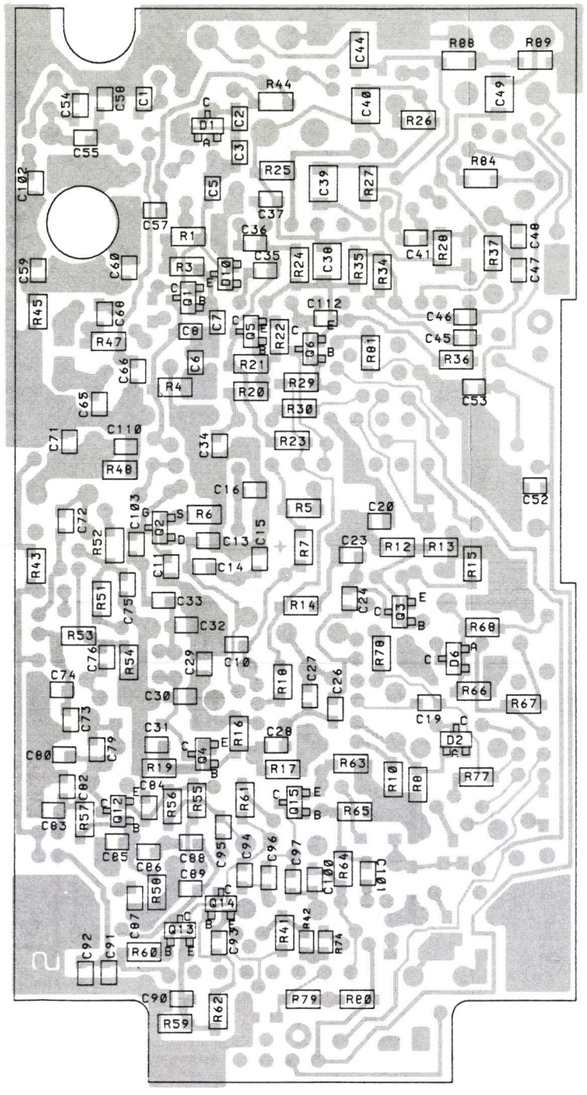
NOTE: CASE SHAPE IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.





FRONT VIEW

(19D901493. Sh. 1, Rev. 4)
(19A704667 Sh. 1, Rev. 2)
(19A704667, Sh. 2, Rev. 2)



REAR VIEW

(19D901656, Sh. 2, Rev. 5)
(19A704667, Sh. 2, Rev. 2)

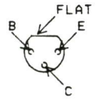
CAUTION

OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES

Q1 & Q2 on Main Board
Q10 on Audio Board

TRANSMITTER/RECEIVER BOARD

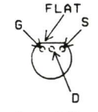
LEAD IDENTIFICATION
FOR Q2



IN-LINE
TOP VIEW

NOTE: CASE SHAPE IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

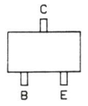
LEAD IDENTIFICATION
FOR Q10



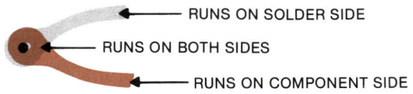
IN-LINE
TOP VIEW

NOTE: CASE SHAPE IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

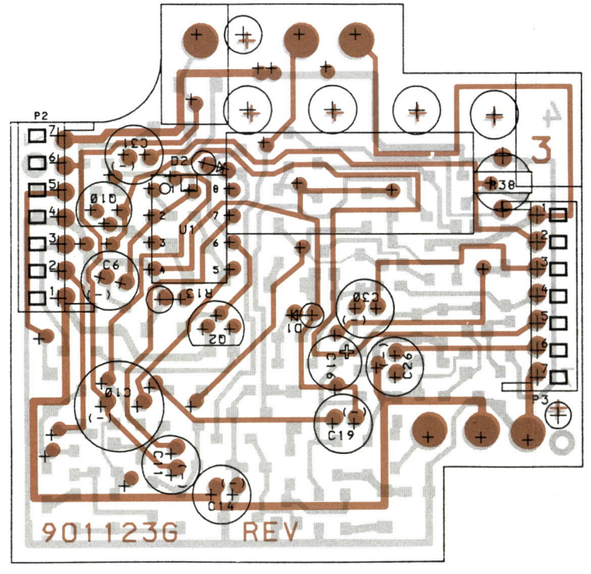
LEAD IDENTIFICATION
FOR Q1,Q3 THRU Q9



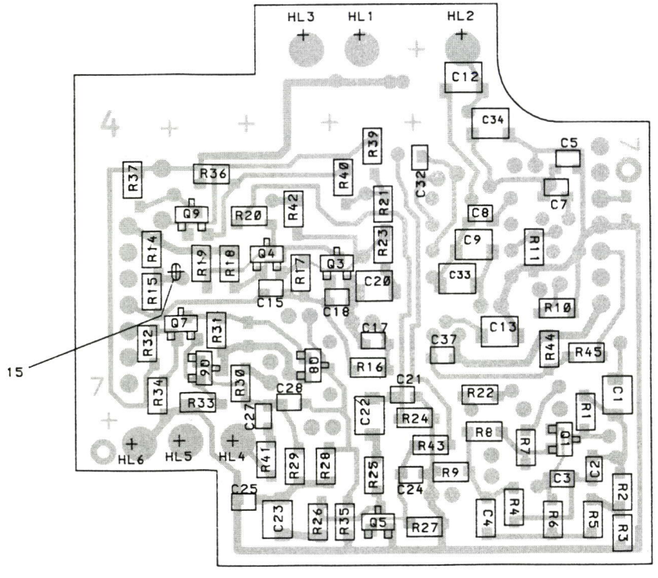
TOP VIEW



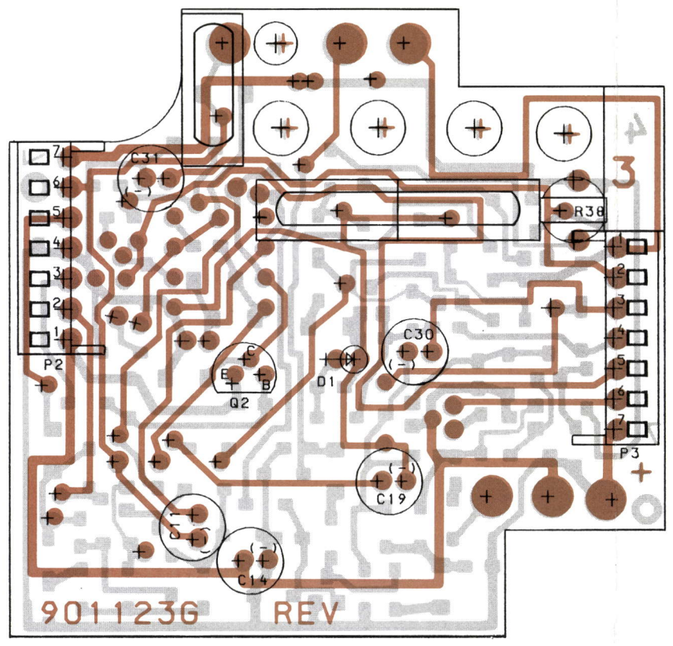
DATA LINK BOARD &
DATA/VOICE OPTION (DV10)



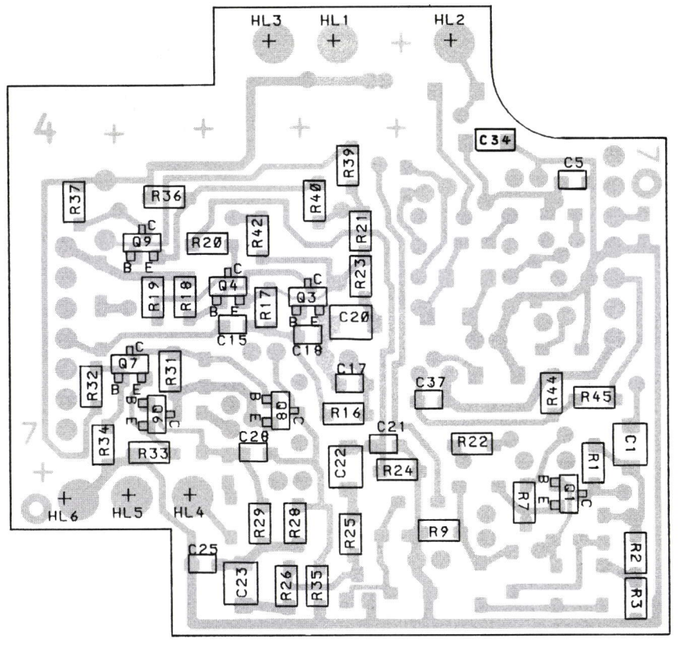
(RC-5130A)
(19A703568, Sh. 2, Rev. 4)



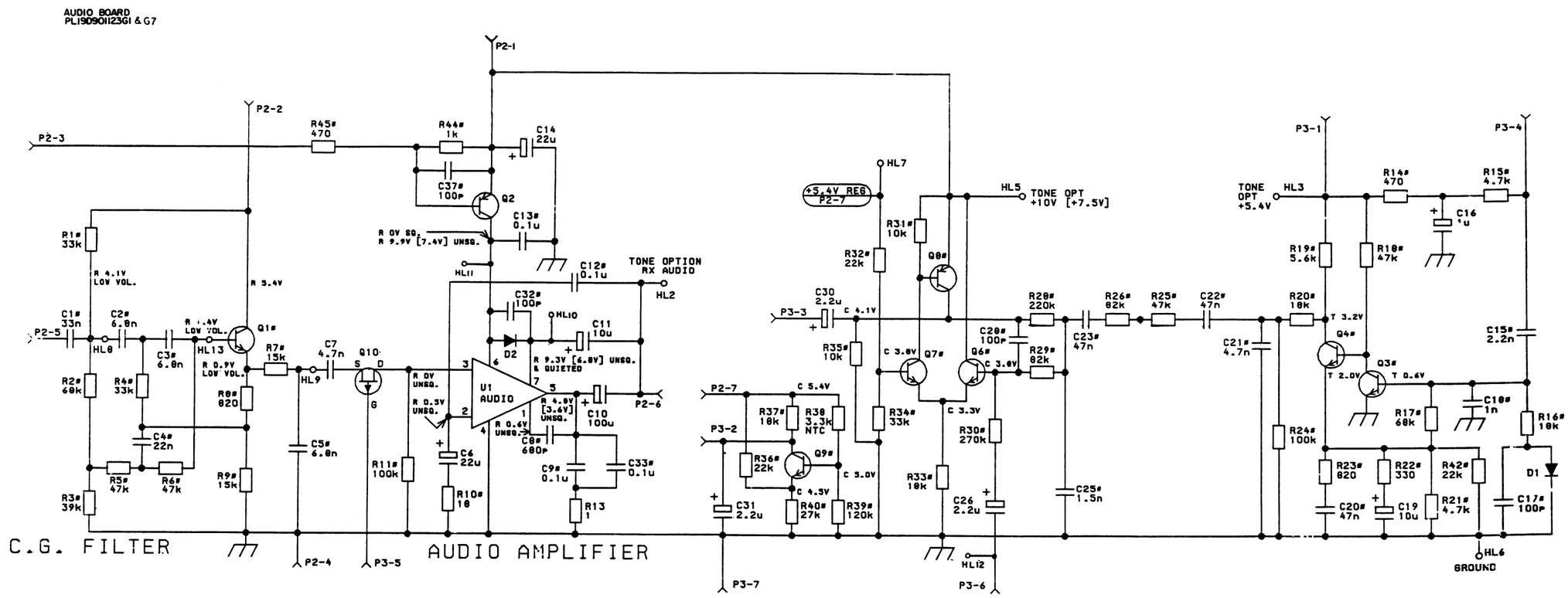
(19D901123, Sh. 1, Rev. 7)
(19A703568, Sh. 2, Rev. 4)



(RC-5130A)
(19A703568, Sh. 2, Rev. 4)



(RC-5130A)
(19A703568, Sh. 1, Rev. 3)
(19A703568, Sh. 2, Rev. 4)



NOTES:

1. 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.

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

VOLTAGE READINGS:

VOLTAGE READINGS ARE TYPICAL VALUES MEASURED WITH A HIGH IMPEDANCE (≥≥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 SHOWN ARE FOR 4W MPI UNITS UNLESS ENCLOSED IN BRACKETS WHICH INDICATE VOLTAGES MEASURED ON 2 WATT MPI UNITS (FOR EXAMPLE [+7.5V])

DESCRIPTION	MODEL NO.	REV LTR
AUDIO BOARD (STANDARD)	PL19D901123G1	E
AUDIO BOARD (STANDARD) (GOLD)	PL19D901123G7	A

(19D901618, Rev. 3)

DATA/VOICE OPTION (DV10)
19D901123G1, G7

PARTS LIST

AUDIO BOARD
19D901123G1 STANDARD
19D901123G7 STANDARD (GOLD CONTACTS)
ISSUE 6

SYMBOL	GE PART NO.	DESCRIPTION
		NOTE: WHEN CHANGING BOARDS, CARE SHOULD BE TAKEN TO ASSURE BOARDS WITH GOLD CONTACTS ARE NOT INTERMIXED WITH BOARDS HAVING TIN CONTACTS. REPLACE ONLY WITH THE SAME GROUP AS THE ORIGINAL.
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1	19A702052P120	Ceramic: 0.033 uF + or - 5%, 50 VDCW.
C2 and C3	19A702052P112	Ceramic: 6800 pF + or - 5%, 50 VDCW.
C4	19A702052P128	Ceramic: 0.022 uF + or - 5%, 50 VDCW.
C5	19A702052P12	Ceramic: 6800 pF + or - 10%, 50 VDCW.
C6	19A702844P1	Tantalum: 22 uF + or -20%, 6.3 VDCW.
C7	19A702052P10	Ceramic: 4700 pF + or - 10%, 50 VDCW.
C8	19A702052P4	Ceramic: 680 pF + or - 10%, 50 VDCW.
C9	19A702052P26	Ceramic: 0.1 uF + or - 10%, 50 VDCW.
C10	19B800755P7	Electrolytic: 100 uF + or - 20%, 10 VDCW.
C11	19B800755P4	Electrolytic: 10 uF + or - 20%, 16 VDCW.
C12 and C13	19A702052P26	Ceramic: 0.1 uF + or - 10%, 50 VDCW.
C14	19A703324P1	Electrolytic: 22 uF + or -20%, 16 VDCW.
C15	19A702052P107	Ceramic: 2200 pF + or - 5%, 50 VDCW.
C16	19A701534P4	Tantalum: 1 uF + or - 20%, 35 VDCW.
C17	19A702061P61	Ceramic: 100 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
C18	19A702052P5	Ceramic: 1000 pF + or -10%, 50 VDCW.
C19	19B800755P4	Electrolytic: 10 uF + or - 20%, 16 VDCW.
C20	19A702052P122	Ceramic: 0.047 uF + or - 5%, 50 VDCW.
C21	19A702052P110	Ceramic: 4700 pF + or - 5%, 50 VDCW.
C22 and C23	19A702052P122	Ceramic: 0.047 uF + or - 5%, 50 VDCW.
C25	19A702052P106	Ceramic: 1500 pF + or - 5%, 50 VDCW.
C26	19B800755P2	Electrolytic: 2.2 uF + or - 20%, 50 VDCW.
C28	19A702061P61	Ceramic: 100 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
C30 and C31	19B800755P2	Electrolytic: 2.2 uF + or - 20%, 50 VDCW.
C32	19A702061P61	Ceramic: 100 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
C33	19A702052P26	Ceramic: 0.1 uF + or - 10%, 50 VDCW.
C37	19A702061P61	Ceramic: 100 pF + or - 5%, 50 VDCW, temp coef 0 + or - 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. (Group 1 only).
P2 and P3	19A704779P56	Printed wire: 7 contacts rated @ 2.5 amps. (Group 7 only).

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A134739P2	Silicon, NPN.
Q2	19A700026P1	Silicon, PNP.
Q3 and Q4	19A700076P2	Silicon, NPN.
Q6 and 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 + or - 5%, 200 VDCW, 1/8 w.
R2	19B800607P683	Metal film: 68K ohms + or - 5%, 200 VDCW, 1/8 w.
R3	19B800607P393	Metal film: 39K ohms + or - 5%, 200 VDCW, 1/8 w.
R4	19B800607P333	Metal film: 33K ohms + or - 5%, 200 VDCW, 1/8 w.
R5 and R6	19B800607P473	Metal film: 47K ohms + or - 5%, 200 VDCW, 1/8 w.
R7	19B800607P153	Metal film: 15K ohms + or - 5%, 200 VDCW, 1/8 w.
R8	19B800607P821	Metal film: 820 ohms + or - 5%, 200 VDCW, 1/8 w.
R9	19B800607P153	Metal film: 15K ohms + or - 5%, 200 VDCW, 1/8 w.
R10	19B800607P180	Metal film: 18 ohms + or - 5%, 200 VDCW, 1/8 w.
R11	19B800607P104	Metal film: 100K ohms + or - 5%, 200 VDCW, 1/8 w.
R13	19A702289P1	Metal film: 1 ohms + or - 5%, 1/4 w; sim to Corning FL55.
R14	19B800607P471	Metal film: 470 ohms + or - 5%, 200 VDCW, 1/8 w.
R15	19B800607P472	Metal film: 4.7K ohms + or - 5%, 200 VDCW, 1/8 w.
R16	19B800607P183	Metal film: 18K ohms + or - 5%, 200 VDCW, 1/8 w.
R17	19B800607P683	Metal film: 68K ohms + or - 5%, 200 VDCW, 1/8 w.
R18	19B800607P473	Metal film: 47K ohms + or - 5%, 200 VDCW, 1/8 w.
R19	19B800607P562	Metal film: 5.6K ohms + or - 5%, 200 VDCW, 1/8 w.
R20	19B800607P183	Metal film: 18K ohms + or - 5%, 200 VDCW, 1/8 w.
R21	19B800607P472	Metal film: 4.7K ohms + or - 5%, 200 VDCW, 1/8 w.
R22	19B800607P331	Metal film: 330 ohms + or - 5%, 200 VDCW, 1/8 w.
R23	19B800607P821	Metal film: 820 ohms + or - 5%, 200 VDCW, 1/8 w.
R24	19B800607P104	Metal film: 100K ohms + or - 5%, 200 VDCW, 1/8 w.
R25	19B800607P473	Metal film: 47K ohms + or - 5%, 200 VDCW, 1/8 w.
R26	19B800607P823	Metal film: 82K ohms + or -5%, 200 VDCW, 1/8 w.
R28	19B800607P224	Metal film: 220K ohms + or - 5%, 200 VDCW, 1/8 w.
R29	19B800607P823	Metal film: 82K ohms + or -5%, 200 VDCW, 1/8 w.
R30	19B800607P274	Metal film: 270K ohms + or - 5%, 200 VDCW, 1/8 w.
R31	19B800607P103	Metal film: 10K ohms + or - 5%, 200 VDCW, 1/8 w.
R32	19B800607P223	Metal film: 22K ohms + or - 5%, 200 VDCW, 1/8 w.
R33	19B800607P183	Metal film: 18K ohms + or - 5%, 200 VDCW, 1/8 w.
R34	19B800607P333	Metal film: 33K ohms + or - 5%, 200 VDCW, 1/8 w.
R35	19B800607P103	Metal film: 10K ohms + or - 5%, 200 VDCW, 1/8 w.
R36	19B800607P223	Metal film: 22K ohms + or - 5%, 200 VDCW, 1/8 w.
R37	19B800607P183	Metal film: 18K ohms + or - 5%, 200 VDCW, 1/8 w.
R38	19A701828P1	Thermistor: 3.3K ohms + or -5%; sim to Philips 2322-642-63332/
R39	19B800607P124	Metal film: 120K ohms + or - 5%, 200 VDCW, 1/8 w.
R40	19B800607P273	Metal film: 27K ohms + or - 5%, 200 VDCW, 1/8 w.

SYMBOL	GE PART NO.	DESCRIPTION
R42	19B800607P223	Metal film: 22K ohms + or - 5%, 200 VDCW, 1/8 w.
R44	19B800607P102	Metal film: 1K ohms + or - 5%, 200 VDCW, 1/8 w.
R45	19B800607P471	Metal film: 470 ohms + or - 5%, 200 VDCW, 1/8 w.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - -
U1	19A702410P1	Linear: Audio Amplifier; sim to TBA-820M.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19A149342P2	Pad. (Quantity 2).
	19A149342P1	Pad. (Quantity 1).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

FREQUENCY SENSITIVE COMPONENTS

REF. NO.	G11 & G23 450-470 MHZ	G25 403-425 MHZ
C1#	5.6P	6.8P
C2#	6.8P	8.2P
C3#	2.7P	3.3P
C4	0.5-2.5P	1-5P
C5#	2.7P	3.3P
C8#	1.2P	2.2P
C19#	100P	68P
C22	68P	120P
C23#	22P	30P
C24#	3.3P	4.7P
C27#	15P	22P
C30#	2.7P	3.3P
C32#	3.3P	4.3P
C33#	0.5P	1P
C54#	10P	12P
C55#	3.9P	8.2P
C58#	15P	15P
C59#	39P	47P
C60#	39P	47P
C65#	15P	24P
C71#	10P	15P
C85#	39P	43P
C86#	22P	33P
C87#	39P	51P
C89#	10P	12P
C93#	39P	43P
C94#	18P	27P
C95#	47P	56P
C96#	2.7P	3.3P
C97#	30P	39P
C108	6.8P	6.8P
C110#	10P	
L1	2 1/2 TURNS 2.0mm ID	2 1/2 TURNS 2.2mm ID
L4 & L5	2 1/2 TURNS 2.0mm ID	2 1/2 TURNS 2.0mm ID
L7	1u	1.2u
L9	680n	1u
L11	5 1/2 TURNS 3.04mm ID	5 1/2 TURNS 3.04mm ID
L12	150n	150n
L38	270n	470n
L44	1 1/2 TURNS 2.0mm ID	1 1/2 TURNS 2.0mm ID
L45	3 3/4 TURNS 2.54mm ID	3 3/4 TURNS 2.54mm ID
R15#	560	390
R77#	22k	18k
R78#	68k	82k
R79#	47k	47k
R80#	82k	82k

VOLTAGE READINGS:

VOLTAGE READINGS ARE TYPICAL VALUES MEASURED WITH A HIGH IMPEDANCE (ee: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 DL100 UNITS UNLESS ENCLOSED IN BRACKETS WHICH INDICATES VOLTAGES MEASURED ON 2 WATT DL100 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 & G23 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 CAS SWITCH THE RX DATA OUTPUT ON/OFF PERFORM THE FOLLOWING:
a. ON THE 19D901656 UHF T/R BOARD, REMOVE PIN J2-2.
b. ON THE 19D901123 DATA LINK BOARD, ADD A DM WIRE FROM HL11 TO P2-2.

⚠7 CAS +7.5/+10V OUTPUT MAY BE USED TO ACTIVATE AN EXTERNAL FUNCTION. MAXIMUM CAS OUTPUT CURRENT MUST NOT EXCEED 20 mA. INCREASE MAXIMUM CURRENT (RECEIVE DATA) SPECIFICATION BY CAS OUTPUT CURRENT. CAS OUTPUT NOT AVAILABLE WITH DATA/VOICE OPTION.

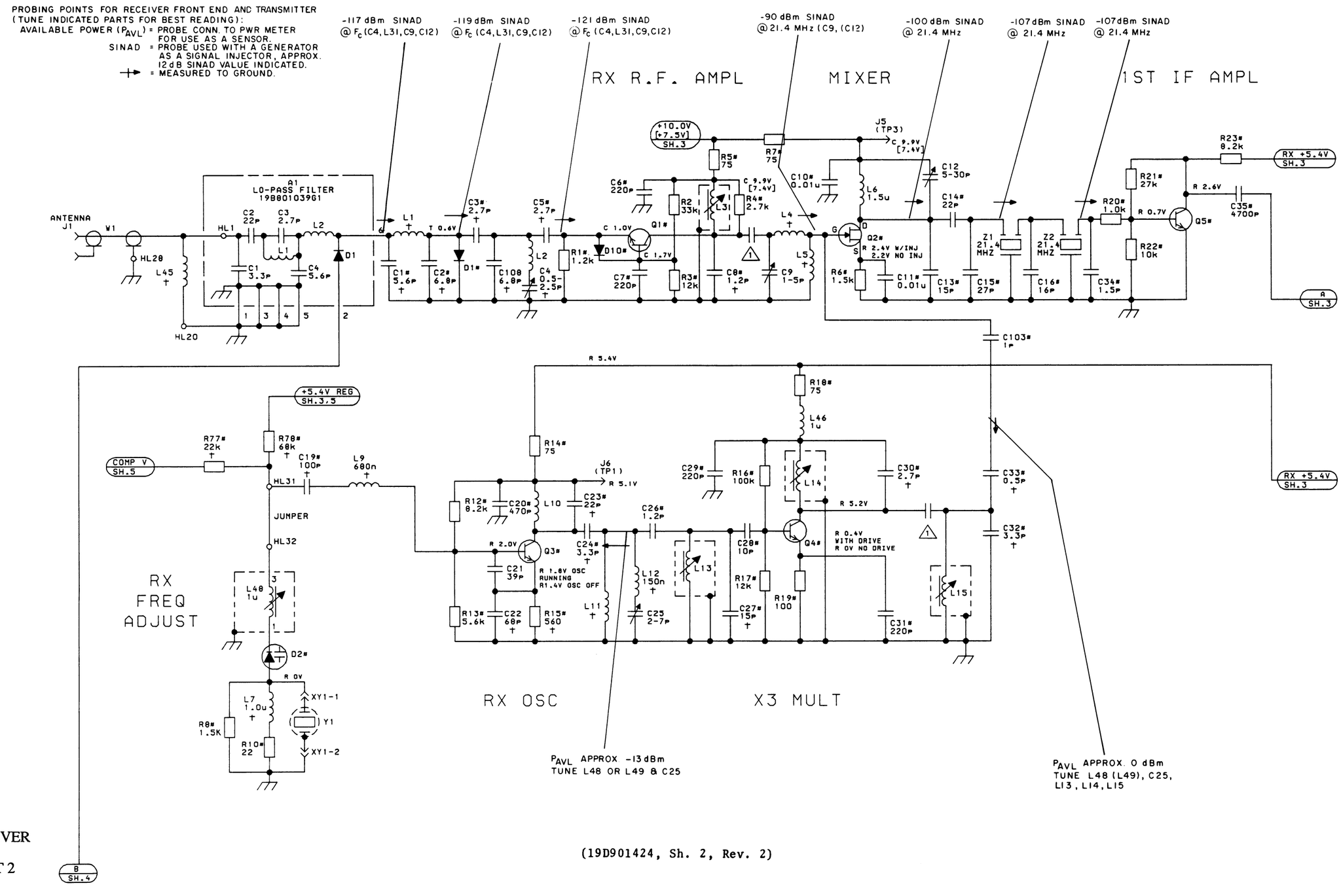
⚠8 PIN J3-1 IS REMOVED FOR STANDARD DATA LINK BUT MUST BE INSTALLED FOR DATA/VOICE OPTION.

DESCRIPTION		MODEL NO.	REV LTR
UHF 2W/4W T/R BD	450-470 MHZ	PL19D901656G11	D
UHF 2W/4W T/R BD	450-470 MHZ	PL19D901656G23	B
UHF 2W/4W T/R BD	403-425 MHZ	PL19D901656G25	B
DATA LINK BOARD		PL19D901123G5	
DATA LINK BOARD		PL19D901123G11	

(19D901424, Sh. 1, Rev. 6)

450-470 MHz T/R BOARD

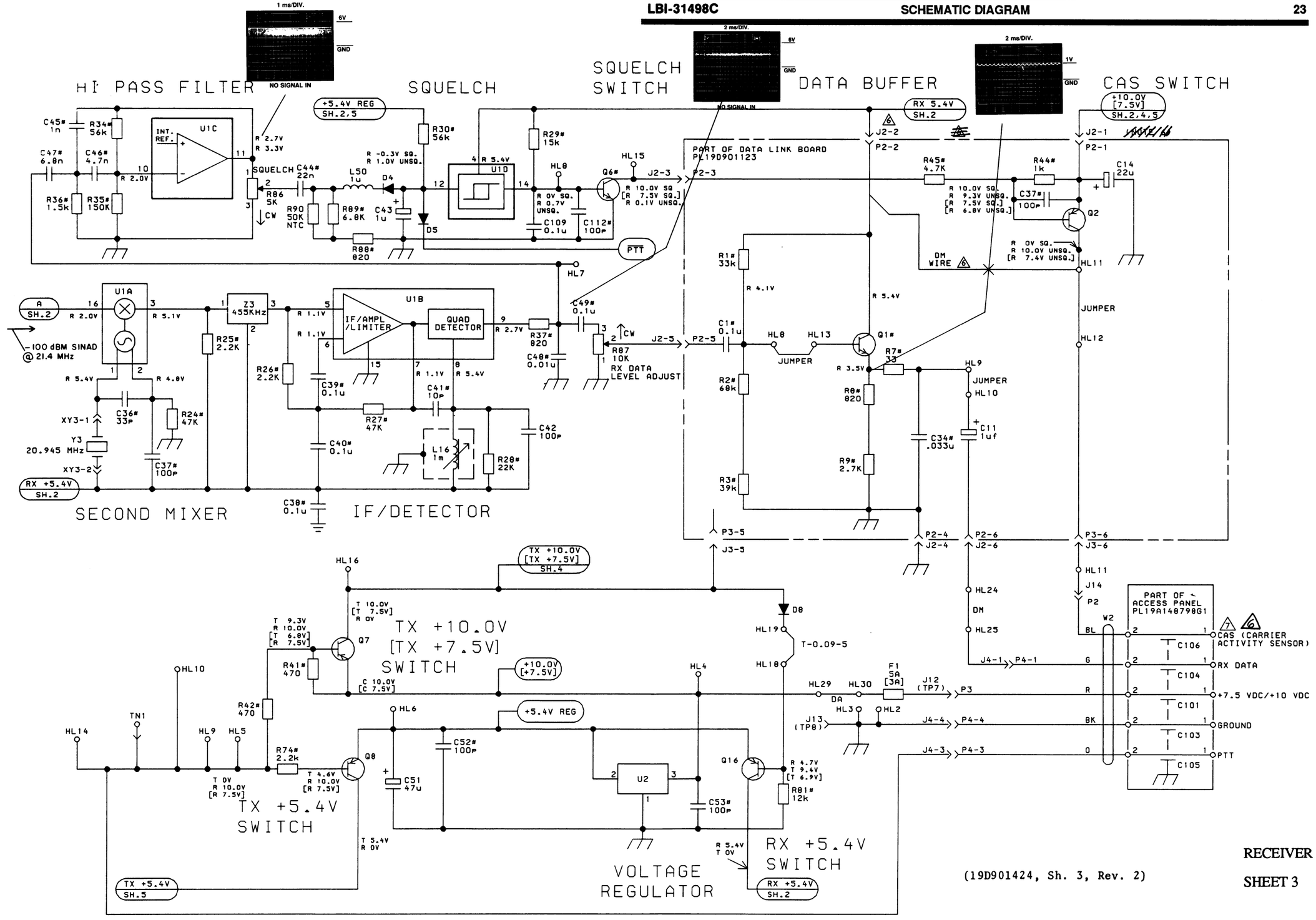
SHEET 1

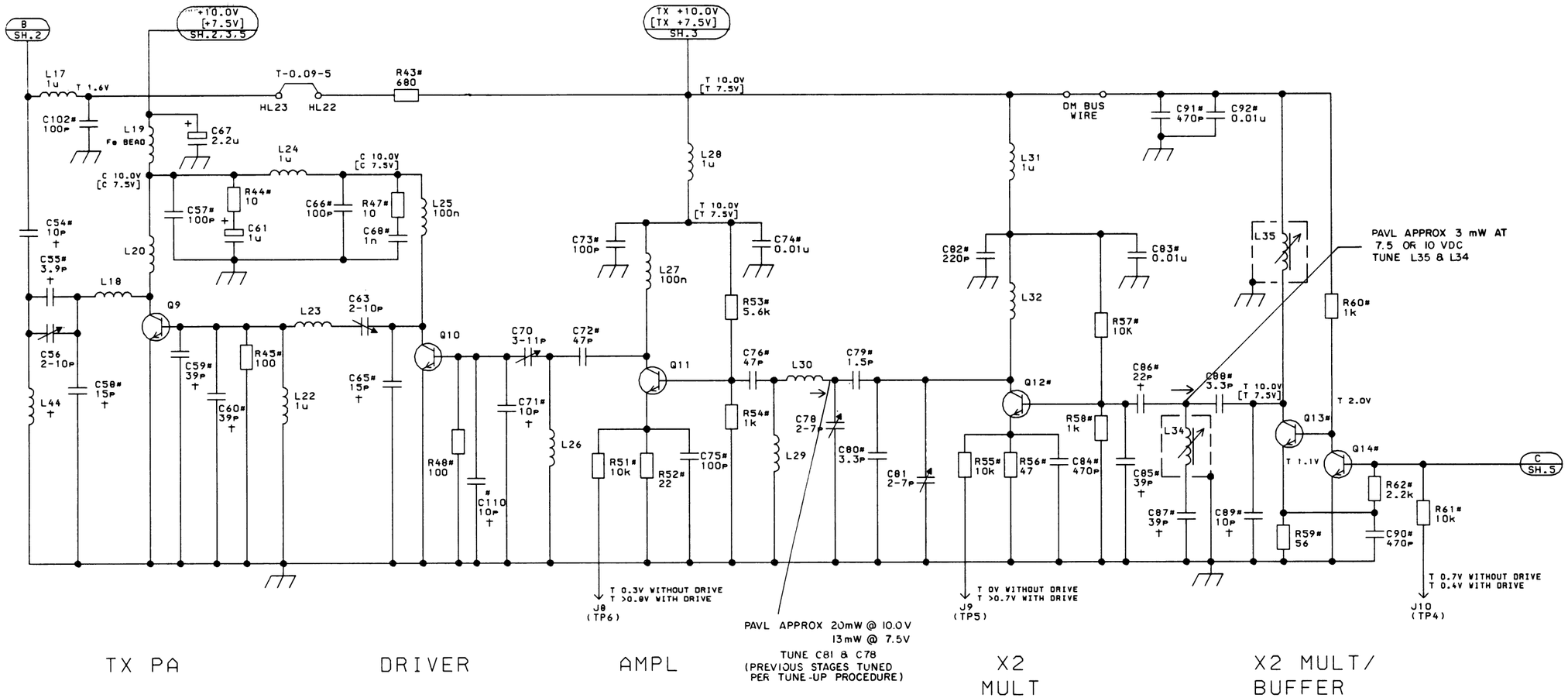


RECEIVER

SHEET 2

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

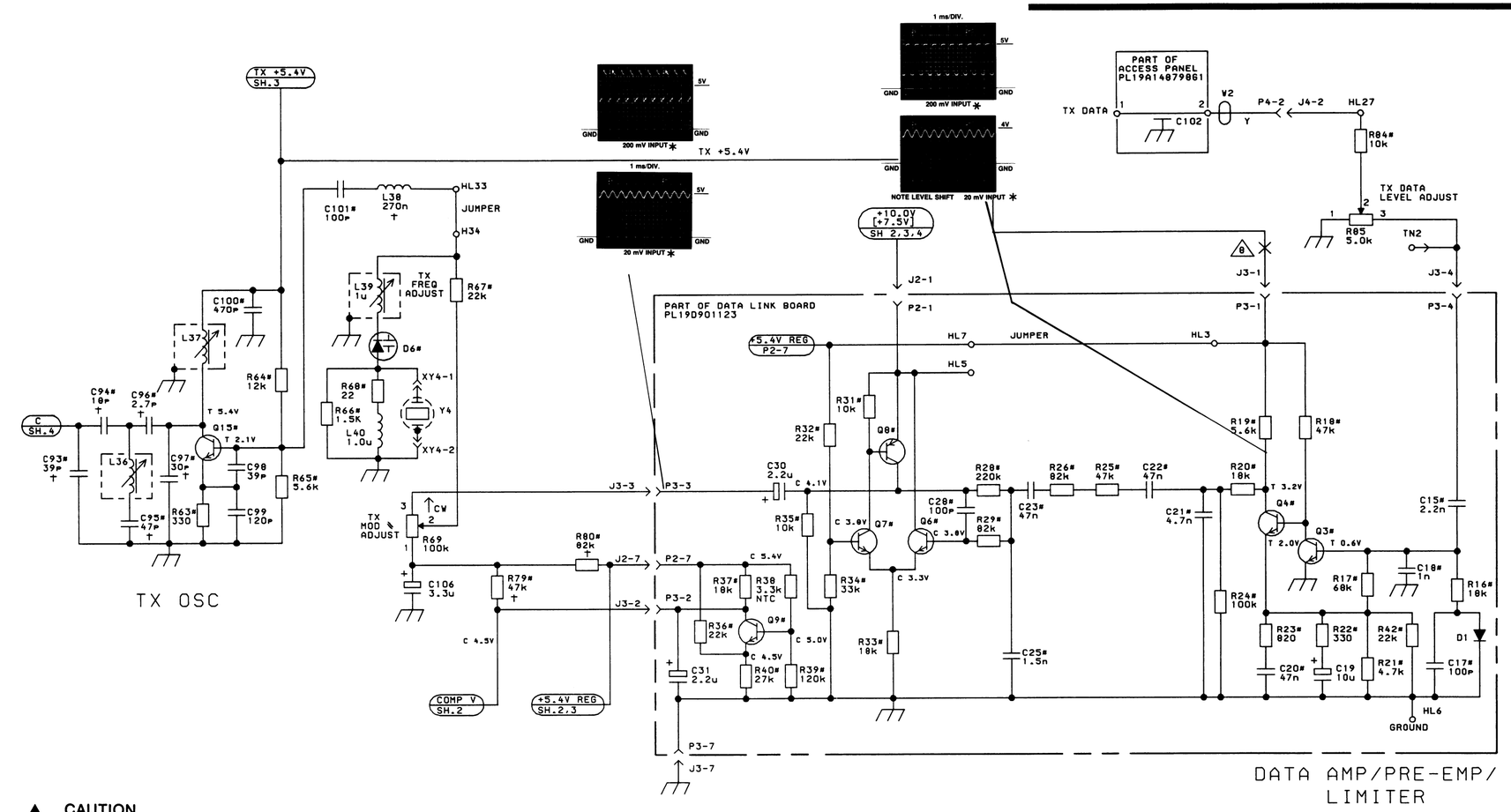

HI PASS FILTER
SQUELCH
SQUELCH SWITCH
DATA BUFFER
CAS SWITCH
SECOND MIXER
IF/DETECTOR
TX +10.0V [+7.5V] SWITCH
TX +5.4V SWITCH
VOLTAGE REGULATOR
RX +5.4V SWITCH
RECEIVER
SHEET 3
(19D901424, Sh. 3, Rev. 2)
PART OF DATA LINK BOARD PL19D901123
PART OF ACCESS PANEL PL19A148798G1
-100 dBM SINAD @ 21.4 MHz
RX DATA LEVEL ADJUST
CAS (CARRIER ACTIVITY SENSOR)
RX DATA
+7.5 VDC/+10 VDC
GROUND
PTT
JUMPER
DM WIRE
NO SIGNAL IN
1 ms/DIV.
2 ms/DIV.
+5.4V REG SH.2,5
RX 5.4V SH.2
+10.0V [7.5V] SH.2,4,5
TX +10.0V [TX +7.5V] SH.4
+10.0V [+7.5V]
TX +5.4V SH.3
RX +5.4V SH.2
A SH.2
U1A
U1B
U1C
U10
Z3 455KHz
IF/AMPL /LIMITER
QUAD DETECTOR
INT. REF.
Y3 20.945 MHz
XY3-1
XY3-2
SQUELCH
CW
PTT
Q1#
Q2
Q6#
Q7
Q8
Q16
U2
D4
D5
D8
F1 5A [3A]
W2
J2-1
J2-2
J2-3
J2-4
J2-5
J2-6
J3-5
J3-6
J4-1
J4-3
J4-4
J12 (TP7)
J13 (TP8)
J14
P2-1
P2-2
P2-3
P2-4
P2-5
P2-6
P3
P3-5
P3-6
P4-1
P4-3
P4-4
P2
HL1
HL2
HL3
HL4
HL5
HL6
HL7
HL8
HL9
HL10
HL11
HL12
HL13
HL14
HL15
HL16
HL18
HL19
HL23
HL24
HL25
HL29
HL30
TN1
R1# 33k
R2# 68k
R3# 39k
R4# 1k
R5# 4.7K
R7# 33
R8# 820
R9# 2.7K
R25# 2.2K
R26# 2.2K
R27# 47K
R28# 22K
R29# 15k
R30# 56k
R34# 56k
R35# 150K
R36# 1.5k
R37# 820
R41# 470
R42# 470
R74# 2.2k
R80# 12k
R86 5K
R87 10K
R88# 820
R90 50K NTC
R89# 6.8K
C1# 0.1u
C11 1uf
C14 22u
C34# .033u
C36# 33P
C37# 100P
C38# 0.1u
C39# 0.1u
C40# 0.1u
C41# 10P
C42 100P
C43 1u
C44# 22n
C45# 1n
C46# 4.7n
C47# 6.8n
C48# 0.01u
C49# 0.1u
C51 47u
C52# 100P
C53# 100P
C101
C103
C104
C105
C106
C109 0.1u
C112# 100P
L16 1m
L50 1u
R 2.7V
R 3.3V
R 2.0V
R 5.1V
R 4.8V
R 5.4V
R 1.1V
R 2.7V
R 4.1V
R 3.5V
R 4.7V
T 9.4V [T 6.9V]
R 10.0V SQ [R 7.5V SQ.] R 0.1V UNSQ.
R 0V SQ. R 0.7V UNSQ.
R 10.0V SQ [R 9.3V UNSQ. [R 7.5V SQ.] [R 6.8V UNSQ.]
R 0V SQ. R 10.0V UNSQ. [R 7.4V UNSQ.]
R -0.3V SQ. R 1.0V UNSQ.
T 10.0V [T 7.5V] R 0V
T 9.3V R 10.0V [T 6.8V] [R 7.5V]
C 10.0V [C 7.5V]
T 0V R 10.0V [R 7.5V]
T 4.4V R 10.0V [R 7.5V]
T 5.4V R 0V
R 5.4V T 0V



TRANSMITTER

SHEET 4

(19D901424, Sh. 4, Rev. 3)



CAUTION
OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES

MAIN BOARD: Q2
AUDIO BOARD: Q10

(19D90 1424, Sh. 5, Rev. 1)

TRANSMITTER
SHEET 5

PARTS LIST

TRANSMIT/RECEIVE BOARD
19D901656G11 450-470 MHz
19D901656G23 450-470 MHz (GOLD CONTACTS)
19D901656G25 403-425 MHz (GOLD CONTACTS)
ISSUE 4

SYMBOL	GE PART NO.	DESCRIPTION
		NOTE: WHEN CHANGING BOARDS, CARE SHOULD BE TAKEN TO ASSURE BOARDS HAVING GOLD CONTACTS ARE NOT INTERMIXED WITH BOARDS HAVING TIN CONTACTS. REPLACE ONLY WITH SAME GROUP NUMBER AS THE ORIGINAL.
A1		FILTER BOARD 19B801039G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A700219P14	Ceramic: 3.3 pF + or -5%, 100 VDCW, temp coef 0 + or - 30 PPM.
C2	19A700219P40	Ceramic: 22 pF + or -10%, 100 VDCW, temp coef 0 PPM.
C3	19A700219P12	Ceramic: 2.7 pF + or -5%, 100 VDCW, NPO.
C4	19A700219P20	Ceramic: 5.6 pF + or -5%, 100 VDCW, temp coef 0 PPM.
		- - - - - - - - - - DIODES - - - - - - - - - -
D1	19A702411P1	Silicon; sim to Hewlett Packard 5082-3188.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19A702472P3	Coil.
L2	19A702472P1	Coil.
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A702061P10	Ceramic: 5.6 pF + or - 0.5 pF, 50 VDCW, temp coef 0 + or - 60 PPM. (Used in G11 & G23).
C1	19A702061P11	Ceramic: 6.8 pF + or - 0.5 pF, 50 VDCW, temp coef 0 + or - 60 PPM. (Used in G25).
C2	19A702061P11	Ceramic: 6.8 pF + or - 0.5 pF, 50 VDCW, temp coef 0 + or - 60 PPM. (Used in G11 & G23).
C2	19A702061P12	Ceramic: 8.2 pF + or - 0.5 pF, 50 VDCW, temp coef 0 + or - 60 PPM. (Used in G25).
C3	19A702061P906	Ceramic: 2.7 pF + or -.25 pF, 50 VDCW, temp coef 0 + or -120 PPM. (Used in G11 & G23).
C3	19A702061P907	Ceramic: 3.3 pF + or -.25 pF, 50 VDCW, temp coef 0 + or -120 PPM. (Used in G25).
C4	19B800873P7	Variable, ceramic: 0.5 to 2.5 pF, 150 VDCW; sim to Johanson 9620. (Used in G11 & G23).
C4	19B800873P8	Variable, ceramic: 1 to 5 pF, 150 VDCW; sim to Johanson 9621. (Used in G25).
C5	19A702061P906	Ceramic: 2.7 pF + or -.25 pF, 50 VDCW, temp coef 0 + or -120 PPM. (Used in G11 & G23).
C5	19A702061P907	Ceramic: 3.3 pF + or -.25 pF, 50 VDCW, temp coef 0 + or -120 PPM. (Used in G25).
C6 and C7	19A702061P69	Ceramic: 220 pF + or -5%, 50 VDCW, temp coef 0 + or -30 PPM/°C.
C8	19A702061P902	Ceramic: 1.2 pF + or -0.25 pF, 50 VDCW, temp coef 0 + or -250 PPM. (Used in G11 & G23).
C8	19A702061P905	Ceramic: 2.2 pF + or -.25 pF, 50 VDCW, temp coef 0 + or -250 PPM. (Used in G25).
C9	19B800873P8	Variable, ceramic: 1 to 5 pF, 150 VDCW; sim to Johanson 9621.
C10 and C11	19A702052P14	Ceramic: 0.01 uF + or - 10%, 50 VDCW.
C12	19A702168P4	Variable, ceramic: 5.2 to 30 pF, 100 VDCW, temp coef NT50+300 PPM; sim to JFD DV2SB3D0.
C13	19A702061P21	Ceramic: 15 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
C14	19A702061P29	Ceramic: 22 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
C15	19A702061P33	Ceramic: 27 pF + or -5%, 50 VDCW, temp coef 0 + or -30 PPM/°C.
C16	19A702061P23	Ceramic: 16 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
C19	19A702061P61	Ceramic: 100 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM. (Used in G11 & G23).
C19	19A702061P53	Ceramic: 68 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM. (Used in G25).
C20	19A702061P77	Ceramic: 470 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
C21	19A700226P50	Ceramic: 39 pF + or -5%, 100 VDCW, temp coef -750 PPM. (Used in G11 & G23).
C21	19A700227P50	Ceramic: 39 pF + or -5%, 100 VDCW, temp coef -1500 PPM. (Used in G25).
C22	19A700228P59	Ceramic: 68 pF + or -5%, 100 VDCW, temp coef -2200 PPM. (Used in G11 & G23).
C22	19A700228P68	Ceramic: 120 pF + or -5%, 50 VDCW, temp coef -2200 PPM. (Used in G25).
C23	19A702061P29	Ceramic: 22 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM. (Used in G11 & G23).
C23	19A702061P35	Ceramic: 30 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM. (Used in G25).
C24	19A702061P907	Ceramic: 3.3 pF + or -.25 pF, 50 VDCW, temp coef 0 + or -120 PPM. (Used in G11 & G23).
C24	19A702061P909	Ceramic: 4.7 pF + or -.25 pF, 50 VDCW, temp coef 0 + or -60 PPM. (Used in G25).
C25	19A702168P1	Variable, ceramic: 2 to 7 pF, 100 VDCW; sim to JFD DV2SN7A.
C26	19A702061P902	Ceramic: 1.2 pF + or -0.25 pF, 50 VDCW, temp coef 0 + or -250 PPM.
C27	19A702061P21	Ceramic: 15 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM. (Used in G11 & G23).
C27	19A702061P29	Ceramic: 22 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM. (Used in G25).
C28	19A702061P13	Ceramic: 10 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
C29	19A702061P69	Ceramic: 220 pF + or -5%, 50 VDCW, temp coef 0 + or -30 PPM/°C.
C30	19A702061P906	Ceramic: 2.7 pF + or -.25 pF, 50 VDCW, temp coef 0 + or -120 PPM. (Used in G11 & G23).
C30	19A702061P907	Ceramic: 3.3 pF + or -.25 pF, 50 VDCW, temp coef 0 + or -120 PPM. (Used in G25).
C31	19A702061P69	Ceramic: 220 pF + or -5%, 50 VDCW, temp coef 0 + or -30 PPM/°C.
C32	19A702061P907	Ceramic: 3.3 pF + or -.25 pF, 50 VDCW, temp coef 0 + or -120 PPM. (Used in G11 & G23).
C32	19A702236P16	Ceramic: 4.3 pF + or -.25 pF, 50 VDCW, temp coef 0 + or -30 PPM. (Used in G25).
C33	19A702236P1	Ceramic: 0.5 pF + or -.1 pF, 50 VDCW, temp coef 0 + or -30 PPM. (Used in G11 & G23).
C33	19A702236P6	Ceramic: 1.0 pF + or -.25 pF, 50 VDCW, temp coef 0 + or -30 PPM/°C. (Used in G25).
C34	19A702061P903	Ceramic: 1.5 pF + or -.25 pF, 50 VDCW, temp coef 0 + or -250 PPM.
C35	19A702052P10	Ceramic: 4700 pF + or - 10%, 50 VDCW.
C36	19A702061P37	Ceramic: 33 pF + or -5%, 50 VDCW, temp coef 0 + or -30 PPM/°C.
C37	19A702061P61	Ceramic: 100 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
C38 thru C40	19A702052P26	Ceramic: 0.1 uF + or - 10%, 50 VDCW.
C41	19A702061P13	Ceramic: 10 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
C42	19A700225P65	Ceramic: 100 pF + or -5%, 100 VDCW, temp coef -470 PPM.
C43	19B800755P4	Electrolytic: 10 uF + or - 20%, 16 VDCW.
C43	19A701534P4	Tantalum: 1 uF + or - 20%, 35 VDCW.
C44	19A702052P28	Ceramic: 0.022 uF + or -10%, 50 VDCW.
C45	19A702052P105	Ceramic: 1000 pF + or - 5%, 50 VDCW.
C46	19A702052P110	Ceramic: 4700 pF + or - 5%, 50 VDCW.
C47	19A702052P112	Ceramic: 6800 pF + or - 5%, 50 VDCW.
C48	19A702052P14	Ceramic: 0.01 uF + or - 10%, 50 VDCW.
C49	19A702052P26	Ceramic: 0.1 uF + or - 10%, 50 VDCW.
C51	19A701534P9	Tantalum: 47 uF + or -20%, 6.3 VDCW.
C52 and C53	19A702061P61	Ceramic: 100 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
C54	19A702236P25	Ceramic: 10 pF + or -.5 pF, 50 VDCW, temp coef 0 + or -30 PPM/°C. (Used in G11 & G23).
C54	19A702236P28	Ceramic: 12 pF + or - 5%, 50 VDCs, temp coef 0 + or -30 PPM/°C. (Used in G25).
C55	19A702236P15	Ceramic: 3.9 pF + or -.25 pF, 50 VDCW, temp coef 0 + or -30 PPM/°C. (Used in G11 & G23).
C55	19A702236P23	Ceramic: 8.2 pF + or -.25 pF, 50 VDCW, temp coef 0 + or -30 PPM. (Used in G25).
C56	19B800873P3	Variable, ceramic: 2.5 to 10 pF, 150 VDCW; sim to Johanson 9611.
C57	19A702236P50	Ceramic: 100 pF + or - 5%, 50 VDCW, temp coef 0 + or -30 PPM/°C.
C58	19A702236P30	Ceramic: 15 pF + or -5%, 50 VDCW, temp coef 0 + or -30 PPM/°C.
C59	19A702236P40	Ceramic: 39 pF + or -5%, 50 VDCW, temp coef 0 + or -30 PPM. (Used in G11 & G23).
C59	19A702236P42	Ceramic: 47 pF + or -5%, 50 VDCW, temp coef 0 + or -30 PPM. (Used in G25).
C60	19A702236P40	Ceramic: 39 pF + or -5%, 50 VDCW, temp coef 0 + or -30 PPM. (Used in G11 & G23).
C60	19A702236P42	Ceramic: 47 pF + or -5%, 50 VDCW, temp coef 0 + or -30 PPM. (Used in G25).
C61	19A701534P4	Tantalum: 1 uF + or - 20%, 35 VDCW.
C63	19B800873P3	Variable, ceramic: 2.5 to 10 pF, 150 VDCW; sim to Johanson 9611.
C65	19A702236P30	Ceramic: 15 pF + or -5%, 50 VDCW, temp coef 0 + or -30 PPM/°C. (Used in G11 & G23).
C65	19A702236P35	Ceramic: 24 pF + or -5%, 50 VDCW, temp coef 0 + or -30 PPM. (Used in G25).
C66	19A702236P50	Ceramic: 100 pF + or -5%, 50 VDCW, temp coef 0 + or -30 PPM/°C.
C67	19A703324P2	Electrolytic: 2.2 uF + or -20%, 50 VDCW.
C68	19A702052P5	Ceramic: 1000 pF + or -10%, 50 VDCW.
C70	19A702168P2	Variable, ceramic: 3 to 11 pF 100 VDCW, temp coef N450+300 PPM; sim to JFD DV2SN11C.
C71	19A702236P25	Ceramic: 10 pF + or -.5 pF, 50 VDCW, temp coef 0 + or -30 PPM/°C. (Used in G11 & G23).
C71	19A702236P30	Ceramic: 15 pF + or -5%, 50 VDCW, temp coef 0 + or -30 PPM/°C. (Used in G25).
C72	19A702061P45	Ceramic: 47 pF + or -5%, 50 VDCW, temp coef 0 + or -30 PPM.
C73	19A702061P61	Ceramic: 100 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
C74	19A702052P14	Ceramic: 0.01 uF + or - 10%, 50 VDCW.
C75	19A702061P61	Ceramic: 100 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
C76	19A702061P45	Ceramic: 47 pF + or -5%, 50 VDCW, temp coef 0 + or -30 PPM.
C78	19A702168P1	Variable, ceramic: 2 to 7 pF, 100 VDCW; sim to JFD DV2SN7A.
C79	19A702061P3	Ceramic: 1.5 pF + or - 0.5 pF, 50 VDCW, temp coef 0 + or - 250 PPM.
C80	19A702061P7	Ceramic: 3.3 pF + or - 0.5 pF, 50 VDCW, temp coef 0 + or - 120 PPM.
C81	19A702168P1	Variable, ceramic: 2 to 7 pF, 100 VDCW; sim to JFD DV2SN7A.
C82	19A702061P69	Ceramic: 220 pF + or -5%, 50 VDCW, temp coef 0 + or -30 PPM/°C.
C83	19A702052P14	Ceramic: 0.01 uF + or - 10%, 50 VDCW.
C84	19A702061P77	Ceramic: 470 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
C85	19A702061P41	Ceramic: 39 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM. (Used in G11 & G23).
C85	19A702061P43	Ceramic: 43 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM. (Used in G25).
		- - - - - - - - - - FUSES - - - - - - - - - -
F1	19A702169P9	Enclosed link; rated 3 amps @ 125 vj sim to Littelfuse 255003.
		- - - - - - - - - - JACKS - - - - - - - - - -
J1		Part of W1.
J2	19A703248P4	Contact, electrical. (Group 11).
J2	19A703248P14	Contact, electrical. (Group 23 & 25).
J3	19A703248P4	Contact, electrical. (Group 11).
J3	19A703248P14	Contact, electrical. (Group 23 & 25).
J4	19A703248P1	Contact, electrical.
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. (Used in G11 & G23).
L1	19A702472P33	Coil. (Used in G25).
L2	19A702472P30	Coil.
L3	19C850826P211	Coil, RF: sim to Paul Smith SK-800-1.
L4 and L5	19A702472P3	Coil.
L6	19A700024P15	Coil, RF: 1.5 uH + or - 10%.
L7	19A700024P13	Coil, RF: 1.0 uH + or -10%. (Used in G11 & G23).
L7	19A700024P14	Coil, RF: 1.2 uH + or - 10%. (Used in G25).
L9	19A700024P11	Coil, RF: 680 nH + or -10%. (Used in G11 & G23).
L9	19A700024P13	Coil, RF: 1.0 uH + or -10%. (Used in G25).
L10	19A702472P24	Coil.
L11	19A702472P26	Coil.
L12	19A700024P3	Coil, RF: 1.0 uH + or -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 Variable: 1.0 mH + or -6%; sim to TORO 126AM-A5318HM.
L17	19A700024P13	Coil, RF: 1.0 uH + or -10%.
L18	19A702988P1	Coil.
L19	19A702473G1	Coil.
L20	19A702472P8	Coil.
L22	19A700024P13	Coil, RF: 1.0 uH + or -10%.
L23	19A702472P3	Coil.
L24	19A700024P13	Coil, RF: 1.0 uH + or -10%.
L25	19A700024P1	Coil, RF: 100 nH + or -10%, 0.08 ohms DC res max, 100 v.
L26	19A702474P4	Coil.
L27	19A700024P1	Coil, RF: 100 nH + or -10%, 0.08 ohms DC res max, 100 v.
L28	19A700024P13	Coil, RF: 1.0 uH + or -10%.
L29 and L30	19A702474P5	Coil.
L31	19A700024P13	Coil, RF: 1.0 uH + or -10%.
L32	19A702474P1	Coil.
C86	19A702061P29	Ceramic: 22 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM. (Used in G11 & G23).
C86	19A702061P37	Ceramic: 33 pF + or -5%, 50 VDCW, temp coef 0 + or -30 PPM/°C. (Used in G25).
C87	19A702061P41	Ceramic: 39 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM. (Used in G11 & G23).
C87	19A702061P47	Ceramic: 51 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM. (Used in G25).
C88	19A702061P7	Ceramic: 3.3 pF + or - 0.5 pF, 50 VDCW, temp coef 0 + or - 120 PPM.
C89	19A702061P13	Ceramic: 10 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM. (Used in G11 & G23).
C89	19A702061P17	Ceramic: 12 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM. (Used in G25).
C90 and C91	19A702061P77	Ceramic: 470 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
C92	19A702052P14	Ceramic: 0.01 uF + or - 10%, 50 VDCW.
C93	19A702061P41	Ceramic: 39 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM. (Used in G11 & G23).
C93	19A702061P43	Ceramic: 43 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM. (Used in G25).
C94	19A702061P25	Ceramic: 18 pF + or -5%, 50 VDCW, temp coef 0 + or -30 PPM/°C. (Used in G11 & G23).
C94	19A702061P33	Ceramic: 27 pF + or -5%, 50 VDCW, temp coef 0 + or -30 PPM/°C. (Used in G25).
C95	19A702061P45	Ceramic: 47 pF + or -5%, 50 VDCW, temp coef 0 + or -30 PPM. (Used in G11 & G23).
C95	19A702061P49	Ceramic: 56 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM. (Used in G25).
C96	19A702061P906	Ceramic: 2.7 pF + or -.25 pF, 50 VDCW, temp coef 0 + or -120 PPM. (Used in G11 & G23).
C96	19A702061P907	Ceramic: 3.3 pF + or -.25 pF, 50 VDCW, temp coef 0 + or -120 PPM. (Used in G25).
C97	19A702061P35	Ceramic: 30 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM. (Used in G11 & G23).
C97	19A702061P41	Ceramic: 39 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM. (Used in G25).
C98	19A700227P50	Ceramic: 39 pF + or -5%, 100 VDCW, temp coef -1500 PPM.
C99	19A700229P68	Ceramic: 120 pF + or -5%, 100 VDCW, temp coef -3300 PPM. (Used in G11 & G23).
C99	19A700228P68	Ceramic: 120 pF + or -5%, 50 VDCW, temp coef -2200 PPM. (Used in G25).
C100	19A702052P3	Ceramic: 470 pF + or - 10%, 50 VDCW.
C101 and C102	19A702061P61	Ceramic: 100 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
C103	19A702236P6	Ceramic: 1.0 pF + or -.25 pF °0 VDCW, temp coef 0 + or -30 PPM/°C.
C106	19B800650P15	Tantalum: 3.3 uF + or - 20%, 10 VDCW.
C108	19A700219P22	Ceramic: 6.8 pF + or -5%, 100 VDCW, temp coef 0 PPM.
C109	19A116192P14	Ceramic: 0.1 uF + or -20%, 50 VDCW; sim to Erie USCC CW10C104-M2.
C110	19A702236P25	Ceramic: 10 pF + or -.5 pF, 50 VDCW, temp coef 0 + or -30 PPM/°C.
C112	19A702061P61	Ceramic: 100 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
		- - - - - - - - - - DIODES - - - - - - - - - -
D1	19A700155P2	Silicon, fwd current: 100 mA, 35 VIP.
D2	19A700079P3	Silicon; sim to BBY 31.
D4 and D5	19A702015P1	Silicon; sim to 1N458A.
D6	19A700079P3	Silicon; sim to BBY 31.
D8	19A702015P1	Silicon; sim to 1N458A.
D10	19A700155P2	Silicon, fwd current: 100 mA, 35 VIP.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
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 + or - 10%.
L38	19A700024P9	Coil, RF: 470 nH + or - 10%.
L39	19B801465P1	Coil, RF.
L40	19A700024P13	Coil, RF: 1.0 uH + or -10%.
L44	19A702472P7	Coil.
L45	19A703161P2	Coil.
L46	19A700024P13	Coil, RF: 1.0 uH + or -10%.
L48	19B801465P1	Coil, RF.
L50	19A700024P13	Coil, RF: 1.0 uH + or -10%.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A702413P2	Silicon, NPN.
Q2	19A703795P1	N-Type, Field effect.
Q3	19A700092P2	Silicon, NPN.
Q4	19A700236P4	Silicon, NPN.
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.
Q10	19A701940P4	Silicon, NPN.
Q11	19A701808P3	Silicon, NPN.
Q12 and Q13	19A700236P4	Silicon, NPN.
Q14 and Q15	19A700092P2	Silicon, NPN.
Q16	19A700026P1	Silicon, PNP.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	19B800607P122	Metal film: 1.2K ohms + or -5%, 200 VDCW, 1/8 w.
R2	19A702585P99	Composition: 33K ohms + or -5%, 150 VDCW, 1/8 w.
R3	19B800607P123	Metal film: 12K ohms + or - 5%, 200 VDCW, 1/8 w.
R4	19B800607P272	Metal film: 2.7K ohms + or - 5%, 200 VDCW, 1/8 w.
R5	19B800607P750	Metal film: 75 ohms + or - 5%, 200 VDCW, 1/8 w.
R6	19B800607P152	Metal film: 1.5K ohms + or - 5%, 200 VDCW, 1/8 w.
R7	19B800607P750	Metal film: 75 ohms + or - 5%, 200 VDCW, 1/8 w.
R8	19B800607P152	Metal film: 1.5K ohms + or - 5%, 200 VDCW, 1/8 w.
R10	19B800607P220	Metal film: 22 ohms + or - 5%, 200 VDCW, 1/8 w.
R12	19B800607P822	Metal film: 8.2K ohms + or - 5%, 200 VDCW, 1/8 w.
R13	19B800607P562	Metal film: 5.6K ohms + or - 5%, 200 VDCW, 1/8 w.
R14	19B800607P750	Metal film: 75 ohms + or - 5%, 200 VDCW, 1/8 w.
R15	19B800607P561	Metal film: 560 ohms + or - 5%, 200 VDCW, 1/8 w. (Used in G11 & G23).
R15	19B800607P391	Metal film: 390 ohms + or -5%, 200 VDCW, 1/8 w. (Used in G25).
R16	19B800607P104	Metal film: 100K ohms + or - 5%, 200 VDCW, 1/8 w.
R17	19B800607P123	Metal film: 12K ohms + or - 5%, 200 VDCW, 1/8 w.
R18	19B800607P750	Metal film: 75 ohms + or - 5%, 200 VDCW, 1/8 w.
R19	19B800607P101	Metal film: 100 ohms + or - 5%, 200 VDCW, 1/8 w.
R20	19B800607P102	Metal film: 1K ohms + or - 5%, 200 VDCW, 1/8 w.
R21	19B800607P273	Metal film: 27K ohms + or - 5%, 200 VDCW, 1/8 w.
R22	19B800607P103	Metal film: 10K ohms + or - 5%, 200 VDCW, 1/8 w.
R23	19B800607P822	Metal film: 8.2K ohms + or - 5%, 200 VDCW, 1/8 w.
R24	19B800607P473	Metal film: 47K ohms + or - 5%, 200 VDCW, 1/8 w.
R25 and R26	19B800607P222	Metal film: 2.2K ohms + or - 5%, 200 VDCW, 1/8 w.
R27	19B800607P473	Metal film: 47K ohms + or - 5%, 200 VDCW, 1/8 w.
R28	19B800607P223	Metal film: 22K ohms + or - 5%, 200 VDCW, 1/8 w.
R29	19B800607P153	Metal film: 15K ohms + or - 5%, 200 VDCW, 1/8 w.
R30	19B800607P563	Metal film: 56K ohms + or - 5%, 200 VDCW, 1/8 w.
R34	19B800607P563	Metal film: 56K ohms + or - 5%, 200 VDCW, 1/8 w.
R35	19B800607P154	Metal film: 150K ohms + or -5%, 200 VDCW, 1/8 w.
R36	19B800607P152	Metal film: 1.5K ohms + or - 5%, 200 VDCW, 1/8 w.
R37	19B800607P821	Metal film: 820 ohms + or - 5%, 200 VDCW, 1/8 w.
R41	19B800607P471	Metal film: 470 ohms + or - 5%, 200 VDCW, 1/8 w.
R42	19B801251P471	Composition: 470 ohms + or -5%, 150 VDCW, 1/8 w.
R43	19B800607P681	Metal film: 680 ohms + or - 5%, 200 VDCW, 1/8 w.
R44	19B800607P100	Metal film: 10 ohms + or -5%, 200 VDCW, 1/8 w.
R45	19B800607P101	Metal film: 100 ohms + or - 5%, 200 VDCW, 1/8 w.
R47	19B800607P100	Metal film: 10 ohms + or -5%, 200 VDCW, 1/8 w.
R48	19B800607P390	Metal film: 39 ohms + or - 5%, 200 VDCW, 1/8 w.
R51	19B800607P103	Metal film: 10K ohms + or - 5%, 200 VDCW, 1/8 w.
R52	19B800607P220	Metal film: 22 ohms + or - 5%, 200 VDCW, 1/8 w.
R53	19B800607P562	Metal film: 5.6K ohms + or - 5%, 200 VDCW, 1/8 w.
R54	19B800607P102	Metal film: 1K ohms + or - 5%, 200 VDCW, 1/8 w.
R55	19B800607P103	Metal film: 10K ohms + or - 5%, 200 VDCW, 1/8 w.
R56	19B800607P470	Metal film: 47 ohms + or - 5%, 200 VDCW, 1/8 w.
R57	19B800607P103	Metal film: 10K ohms + or - 5%, 200 VDCW, 1/8 w.
R58	19B800607P102	Metal film: 1K ohms + or - 5%, 200 VDCW, 1/8 w.
R59	19B800607P560	Metal film: 56 ohms + or - 5%, 200 VDCW, 1/8 w.
R60	19B800607P102	Metal film: 1K ohms + or - 5%, 200 VDCW, 1/8 w.
R61	19B800607P103	Metal film: 10K ohms + or - 5%, 200 VDCW, 1/8 w.
R62	19B800607P222	Metal film: 2.2K ohms + or - 5%, 200 VDCW, 1/8 w.
R63	19B800607P331	Metal film: 330 ohms + or - 5%, 200 VDCW, 1/8 w.
R64	19B800607P123	Metal film: 12K ohms + or - 5%, 200 VDCW, 1/8 w.
R65	19B800607P562	Metal film: 5.6K ohms + or - 5%, 200 VDCW, 1/8 w.
R66	19B800607P152	Metal film: 1.5K ohms + or - 5%, 200 VDCW, 1/8 w.
R67	19B800607P223	Metal film: 22K ohms + or - 5%, 200 VDCW, 1/8 w.
R68	19B800607P220	Metal film: 22 ohms + or - 5%, 200 VDCW, 1/8 w.
R69	19B800751P16	Variable, solid carbon: 100K ohms + or -25%, 0.05 w; sim to ALSP H0651A.
R74	19B801251P222	Composition: 2.2K ohms + or -5%, 150 VDCW, 1/8 w.
R77	19B800607P223	Metal film: 22K ohms + or - 5%, 200 VDCW, 1/8 w. (Used in G11 & G23).
R77	19B800607P183	Metal film: 18K ohms + or - 5%, 200 VDCW, 1/8 w. (Used in G25).
R78	19B800607P683	Metal film: 68K ohms + or - 5%, 200 VDCW, 1/8 w. (Used in G11 & G23).
R78	19B800607P823	Metal film: 82K ohms + or -5%, 200 VDCW, 1/8 w. (Used in G25).
R79	19B800607P473	Metal film: 47K ohms + or - 5%, 200 VDCW, 1/8 w.
R80	19B800607P823	Metal film: 82K ohms + or -5%, 200 VDCW, 1/8 w.
R81	19B800607P123	Metal film: 12K ohms + or - 5%, 200 VDCW, 1/8 w.
R84	19B800607P103	Metal film: 10K ohms + or - 5%, 200 VDCW, 1/8 w.
R85 and R86	19A700016P3	Variable, cermet: 4.7K ohms + or -10%, 1/2 w.
R87	19A700016P4	Variable, cermet: 10K ohms + or -10%, 1/2 w; sim to Bourns 3329H-1-103.
R88	19B800607P821	Metal film: 820 ohms + or - 5%, 200 VDCW, 1/8 w.
R89	19B800607P682	Metal film: 6.8K ohms + or - 5%, 200 VDCW, 1/8 w.
R90	19A701864P2	Thermistor: 50K ohms + or -10%; sim to Midwest Components 1H-503.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U1	19A701780P1	Linear: IF AMPLIFIER AND DETECTOR.
U2	19D438002G1	5.4 Volt Voltage Regulator.
		- - - - - - - - - - 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 + or -1.5 kHz; sim to Murata CFU455D2.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19A149009P2	Pad.
	19A702945P1	Shield.
	19A703669P1	Insulator.
		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

SYMBOL	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

DATA LINK BOARD
19D901123G5
19D901123G11 (GOLD CONTACTS)
ISSUE 4

SYMBOL	GE PART NO.	DESCRIPTION
		NOTE: WHEN REPLACING BOARDS CARE SHOULD BE TAKEN TO ASSURE BOARDS WITH GOLD CONTACTS ARE NOT INTERMIXED WITH BOARDS HAVING TIN CONTACTS. REPLACE ONLY WITH SAME GROUP NUMBER AS THE ORIGINAL.
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A702052P26	Ceramic: 0.1 uF + or - 10%, 50 VDCW.
C11	19B800755P1	Electrolytic: 1 uF + or - 20%, 50 VDCW.
C14	19A703324P1	Electrolytic: 22 uF + or -20%, 16 VDCW.
C15	19A702052P107	Ceramic: 2200 pF + or - 5%, 50 VDCW.
C17	19A702061P61	Ceramic: 100 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
C18	19A702052P5	Ceramic: 1000 pF + or -10%, 50 VDCW.
C19	19B800755P4	Electrolytic: 10 uF + or - 20%, 16 VDCW.
C20	19A702052P122	Ceramic: 0.047 uF + or - 5%, 50 VDCW.
C21	19A702052P110	Ceramic: 4700 pF + or - 5%, 50 VDCW.
C22 and C23	19A702052P122	Ceramic: 0.047 uF + or - 5%, 50 VDCW.
C25	19A702052P106	Ceramic: 1500 pF + or - 5%, 50 VDCW.
C28	19A702061P61	Ceramic: 100 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
C30 and C31	19B800755P2	Electrolytic: 2.2 uF + or - 20%, 50 VDCW.
C34	19A702052P120	Ceramic: 0.033 uF + or - 5%, 50 VDCW.
C37	19A702061P61	Ceramic: 100 pF + or - 5%, 50 VDCW, temp coef 0 + or - 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. (Group 5).
P2 and P3	19A704779P56	Printed wire: 7 contacts rated @ 2.5 amps. (Group 11).
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A134739P2	Silicon, NPN.
Q2	19A700026P1	Silicon, PNP.
Q3 and 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 + or - 5%, 200 VDCW, 1/8 w.
R2	19B800607P683	Metal film: 68K ohms + or - 5%, 200 VDCW, 1/8 w.
R3	19B800607P393	Metal film: 39K ohms + or - 5%, 200 VDCW, 1/8 w.
R7	19B800607P330	Metal film: 33 ohms + or - 5%, 200 VDCW, 1/8 w.
R8	19B800607P821	Metal film: 820 ohms + or - 5%, 200 VDCW, 1/8 w.
R9	19B800607P272	Metal film: 2.7K ohms + or - 5%, 200 VDCW, 1/8 w.
R16	19B800607P183	Metal film: 18K ohms + or - 5%, 200 VDCW, 1/8 w.
R17	19B800607P683	Metal film: 68K ohms + or - 5%, 200 VDCW, 1/8 w.
R18	19B800607P473	Metal film: 47K ohms + or - 5%, 200 VDCW, 1/8 w.
R19	19B800607P562	Metal film: 5.6K ohms + or - 5%, 200 VDCW, 1/8 w.
R20	19B800607P183	Metal film: 18K ohms + or - 5%, 200 VDCW, 1/8 w.
R21	19B800607P472	Metal film: 4.7K ohms + or - 5%, 200 VDCW, 1/8 w.
R22	19B800607P331	Metal film: 330 ohms + or - 5%, 200 VDCW, 1/8 w.
R23	19B800607P821	Metal film: 820 ohms + or - 5%, 200 VDCW, 1/8 w.
R24	19B800607P104	Metal film: 100K ohms + or - 5%, 200 VDCW, 1/8 w.
R25	19B800607P473	Metal film: 47K ohms + or - 5%, 200 VDCW, 1/8 w.
R26	19B800607P823	Metal film: 82K ohms + or -5%, 200 VDCW, 1/8 w.
R28	19B800607P224	Metal film: 220K ohms + or - 5%, 200 VDCW, 1/8 w.
R29	19B800607P823	Metal film: 82K ohms + or -5%, 200 VDCW, 1/8 w.
R31	19B800607P103	Metal film: 10K ohms + or - 5%, 200 VDCW, 1/8 w.
R32	19B800607P223	Metal film: 22K ohms + or - 5%, 200 VDCW, 1/8 w.
R33	19B800607P183	Metal film: 18K ohms + or - 5%, 200 VDCW, 1/8 w.
R34	19B800607P333	Metal film: 33K ohms + or - 5%, 200 VDCW, 1/8 w.
R35	19B800607P103	Metal film: 10K ohms + or - 5%, 200 VDCW, 1/8 w.
R36	19B800607P223	Metal film: 22K ohms + or - 5%, 200 VDCW, 1/8 w.
R37	19B800607P183	Metal film: 18K ohms + or - 5%, 200 VDCW, 1/8 w.
R38	19A701828P1	Thermistor: 3.3K ohms + or -5%; sim to Philips 2322-642-63332/
R39	19B800607P124	Metal film: 120K ohms + or - 5%, 200 VDCW, 1/8 w.
R40	19B800607P273	Metal film: 27K ohms + or - 5%, 200 VDCW, 1/8 w.
R42	19B800607P223	Metal film: 22K ohms + or - 5%, 200 VDCW, 1/8 w.
R44	19B800607P102	Metal film: 1K ohms + or - 5%, 200 VDCW, 1/8 w.
R45	19B800607P472	Metal film: 4.7K ohms + or - 5%, 200 VDCW, 1/8 w.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	19A701622P1	Cotter pin. (Located between R15 and R19).
	19A149342P2	Crystal cushion. (Quantity 2)
	19A149342P1	Crystal cushion.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter" which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

REV. A - DATA LINK BOARD 19D901123G5, G11

To reduce receive data current changed R45.
R45 was: 19B800607P471 - Metal film, 470 ohms ±5%.
To improve operation added C34.

REV A - TRANSMIT/RECEIVE BOARD 19D901656G11
To improve operation, replaced L33 with a wire jumper.

L33 was: H343CLP10922 Coil, RF: 1.0 uH ±10%.

REV B - TRANSMIT/RECEIVE BOARD 19D901656G11
To prevent transmitter from becoming unstable at voltages below 7.5 VDC, changed R48.

R48 was: 19B800607P101 Metal film: 100 ohms ±5%.

REV C - TRANSMIT/RECEIVE BOARD 19D901656G11
REV A - TRANSMIT/RECEIVE BOARD 19D901656G23,25
To improve operation, changed R4.

R4 was: 19B800607P332 Metal film: 3.3K ohm ±5%.

REV D TRANSMITTER/RECEIVER BOARD 19D901656G11
REV B TRANSMITTER/RECEIVER BOARD 19D901656G23,25
To improve squelch operation, added C42,R84,R88,R89, and R90 and changed C43.

C43 was: 19B800755P1 Electrolytic: 1 uf ±20%.