Maintenance Manual

900 MHz
CONVENTIONAL STATION
RECEIVER

ComNet Ericsson
CRITICAL RADIO SYSTEMS

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NOTICE

Repairs to this equipment should be made only by an authorized service technician or facility designated by the supplier. Any repairs, alterations or substitution of recommended parts made by the user to this equipment not approved by the manufacturer could void the user's authority to operate the equipment in addition to the manufacturer's warranty.

SPECIFICATIONS*

Frequency Range	896.0125 - 900.9875
Audio Output Audio PA Vol/Squelch Hi	2 Watts at 8 Ohms 1 Vrms @ 1.5 kHz Deviation with 1 kHz modulation
Selectivity	75 dB adjacent channel
Intermodulation	-90 dB minimum
12 dB SINAD	-120 dBm typical
Distortion	2 watts
Frequency Stability	Less than 5%
AM Rejection	-26 dB minimum
Hum and Noise	-45 dB

* These specifications are intended primarily for use by service personnel. Refer to the appropriate Specification Sheet for complete specifications.

DESCRIPTION

900 MHz station receivers are double conversion, superheterodyne, single frequency FM receivers for operation in conventional repeater systems. The receiver utilizes monolithic crystal filters between the IF gain stages to provide the selectivity and intermodulation required to meet or exceed all EIA specifications for conventional 900 MHz receivers.

The receiver consists of the receiver board and audio board, with audio and control functions as well as supply voltages applied through the system board.

Receiver 1st local oscillator (LO) injection is generated on the exciter board.

CIRCUIT ANALYSIS

RECEIVER BOARD

The receiver board consists of the RF amplifier, mixer and 1st IF, 2nd IF and audio stages, and a synthesizer circuit. The receiver board uses a combination of crystal and ceramic bandpass filters for good intermodulation and desensitization characteristics. A Block Diagram of the receiver board is shown in Figure 1.

RF Front End

RF signal input from the antenna is applied to the receiver board through J1. The 896-901 MHz input is coupled through broadband ceramic filter FL1 to RF amplifier, U1. Amplifier U1 provides a gain of approximately 23 dB. The amplifier output is coupled through two broadband ceramic filters (FL2 and FL3) and applied to Mixer U2. The mixer is a high level passive switch with a loss of approximately 6.5 dB.

First Mixer And IF

The local oscillator (LO) injection for the mixer is generated by the receiver synthesizer located on the exciter. The 826-831 MHz LO signal from the exciter is applied to the receiver board at J4, where it is amplified to approximately 100 milliwatts by RF Amp U3, filtered by FL4, and applied to the 1st mixer.

The 70 MHz mixer output is amplified by Q6 and IF Amplifier U4. Two 70 MHz crystal filters, FL5 and FL6, provide the 1st IF filtering.

Synthesizer

A synthesizer circuit located on the receiver board provides the 2nd LO frequency of 70.450 MHZ. The synthesizer consists of counter U9, phase detector U10, DC amp U11, VCO FET Q3, RF buffer amplifiers Q1, Q2 and Q4.

The high stability 17.6125 MHz reference frequency from the master oscillator is applied to the receiver board at J2. This reference frequency is buffered by Q1, and applied to phase detector U10.

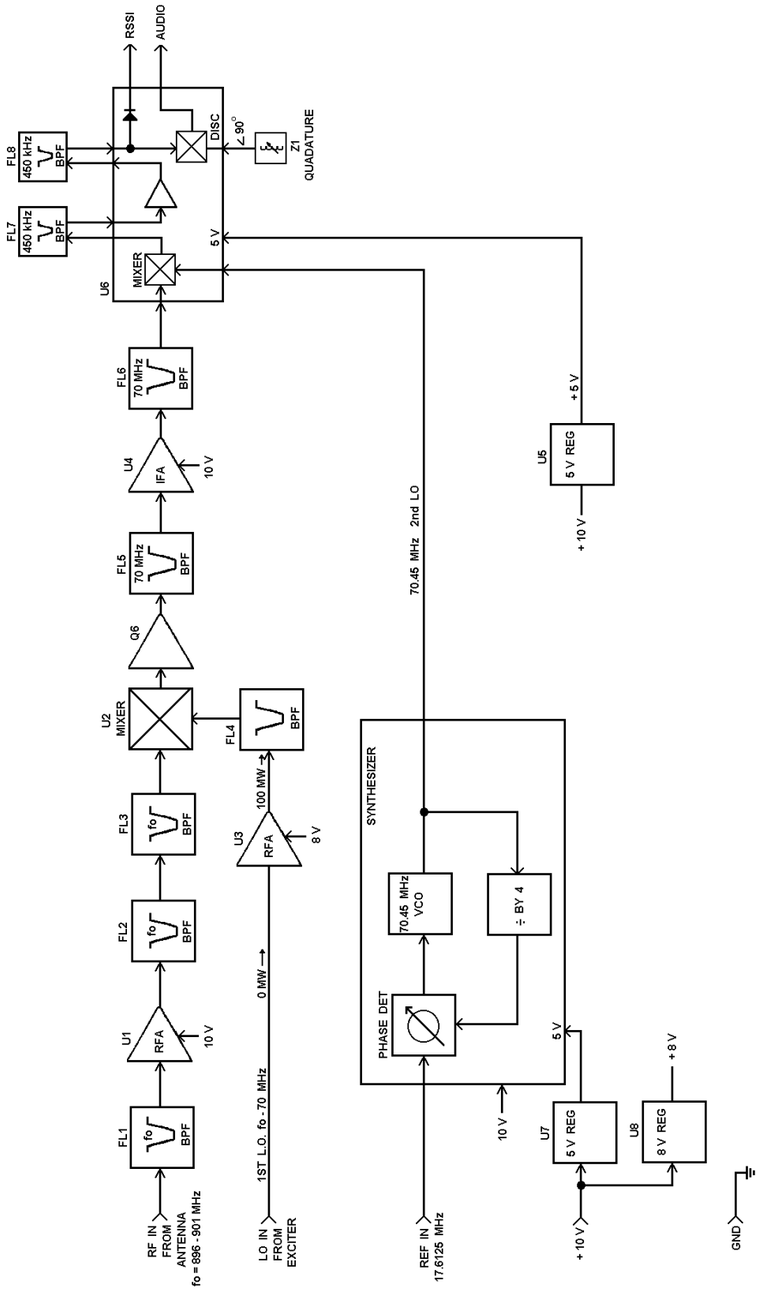


Figure 1 - Receiver Board Block Diagram

VCO Q3 operates at 70.450 MHz. The circuit is tuned by L11. The output of the VCO is coupled through buffer amp Q4 and RF amp Q2, and applied to the divide-by-four counter, U9. The counter output is applied to phase detector U10, whose output is applied to DC amplifier, U11. Feedback for the loop control voltage is developed across R7.

The 70.450 MHz output is coupled through C40 from the collector of Q4 to pin 4 of audio IC, U6, , where it is mixed with the 70 MHz 1st IF input to derive the 450 kHz 2nd IF.

Second Mixer, IF & Audio

Integrated circuit (IC) U6 contains the 2nd mixer, 2nd IF amplifier and mixer stages, the audio detector and audio amplifiers.

The 70 MHz 1st IF output of FL6 is applied to U6-1. The 70.450 MHz 2nd LO signal is applied to the 2nd mixer at U6-4 to derive the 450 kHz 2nd IF signal. The 450 kHz IF is filtered by ceramic filters FL7 and FL8. The audio component of the 2nd IF is demodulated by the quadrature detector circuit in U6. Network Z1 provides the required 90° phase shift of the 450 kHz signal. The de-modulated audio from U6-8 is coupled through buffer Q5 and applied to audio output jack J3-3.

RSSI Voltage

The Received Signal Sensitivity Indication (RSSI) is a DC level that is proportional to the receiver RF input signal level to the receiver. This voltage can be measured at J3-4.

Refer to the Schematic Diagram and Adjustment Procedure voltage readings.

Supply Voltage

The receiver is supplied by a regulated 10 volts from the system board. However, other circuits are supplied by voltage regulators U5, U7 and U8 for stability and isolation.

Regulated 10 volts from the system board is used to supply RF amplifier U1, IF amp U4, VCO transistor Q3, and RF buffer Q4. Regulator U5 provides the 5-volt supply for audio IC U6. 5-volt regulator U7 supplies counter U9, Phase detector U10, and RF amps Q1 and Q2. The 8-volt regulator (U8) provides power for RF amp U3 and audio buffer Q5.

AUDIO BOARD

The audio board consists of a preamplifier circuit, squelch detector, and audio PA circuit. The audio board is connected to the system board through P904. The discriminator output is applied through J602 on the audio board. Power is supplied from a regulated 10 volts from the system board at P904-14. The audio power amplifier is supplied by 13 Volts at P904-15. A block diagram of the audio board is shown in Figure 2.

Audio Preamplifier

Discriminator audio from J602-3 is coupled through Audio Level Adjust R608 to the preamplifier circuit. The preamp consists of Q601, Q602, Q603 and associated circuitry, and provides 26 dB of gain. The amplified output is connected to the squelch and audio PA IC through the arm of the VOL and SQ controls on the exciter-receiver door assembly.

Receiver Audio

The audio circuitry consists of a three-stage, quad integrated circuit (U602-A, U602-C and U602-D). The three stages provide a standard EIA Channel Guard tone reject filter, a receiver de-emphasis circuit, and the low level audio driver circuitry.

Audio from the pre-amplifier circuit is coupled through the VOLUME control to VOLUME arm (P904-13). The audio at P904-13 is applied to CG tone reject filter U602-C, U602-D and associated circuitry to remove any low frequency signal. The filter output is then applied to a 6-dB per octave de-emphasis/audio driver circuit (U602-A). The audio driver output is AC-coupled to the Class AB audio PA integrated circuit, U604-1.

The PA output is coupled through C633 to provide rated power to the 8-ohm speaker. Feedback from U604-3 is coupled through R652 and C630 to determine the gain of the audio power amplifier. Capacitor C634 is connected across the output to protect U604 from a "no load" or open circuit condition.

Receiver Squelch

Audio Switches

U606 is a dual section, audio switching IC that acts as two form "C" (N.O.- N.C.) contacts. The switch states are controlled by the inputs at U606A-10 and U606B-11. Both of the inputs are activated by the receiver SQ DISABLE function.

When the receiver is squelched, pin 11 of U606-A is near A-. This turns off the entire audio circuit to eliminate noise. Pin 1 of U606-B is connected to the system board through P904-7 (RX MUTE). This allows the receiver audio to be disabled by the Channel Guard option when used.

Pin 2 of U606-10 is connected to the system board through P904-6 (SQ DISABLE) so that the receiver audio stages can be activated for an alert tone output whenever the Carrier Controlled Timer or other options are used.

Squelch ICs

The receiver squelch circuit consists of noise amplifier U602B, active noise filter U601C and U601D, noise rectifier U601B, DC amp U601A, and level detector U603D. In addition, the squelch circuit contains the Receiver Unsquelched Sensor (RUS) switch U603B, Carrier Activity Sensor (CAS) switch U603A, and the RX MUTE switch U603C. The RX MUTE switch controls the audio path to audio IC U604 through U606.

Noise Amp, Filter & Level Detector

Noise from the limiter/detector at P904-10 is coupled to the noise amplifier U602B through the SQUELCH control, and then applied to the active noise filter (U601C and U601D). The active filter provides the gain and selectivity necessary to distinguish between noise and audio. The filter output at U601D-14 drives the level detector circuit to provide the squelch switching functions. Potentiometer R622 adjusts the noise level for the proper squelch operation.

SQUELCH SWITCHES

Level detector U603D controls two of the switched squelch outputs. The first output controls the RX MUTE switch (U603C), and the second output controls the CAS switch (U603A). The RUS switch (U603B) is also controlled by the RX MUTE signal.

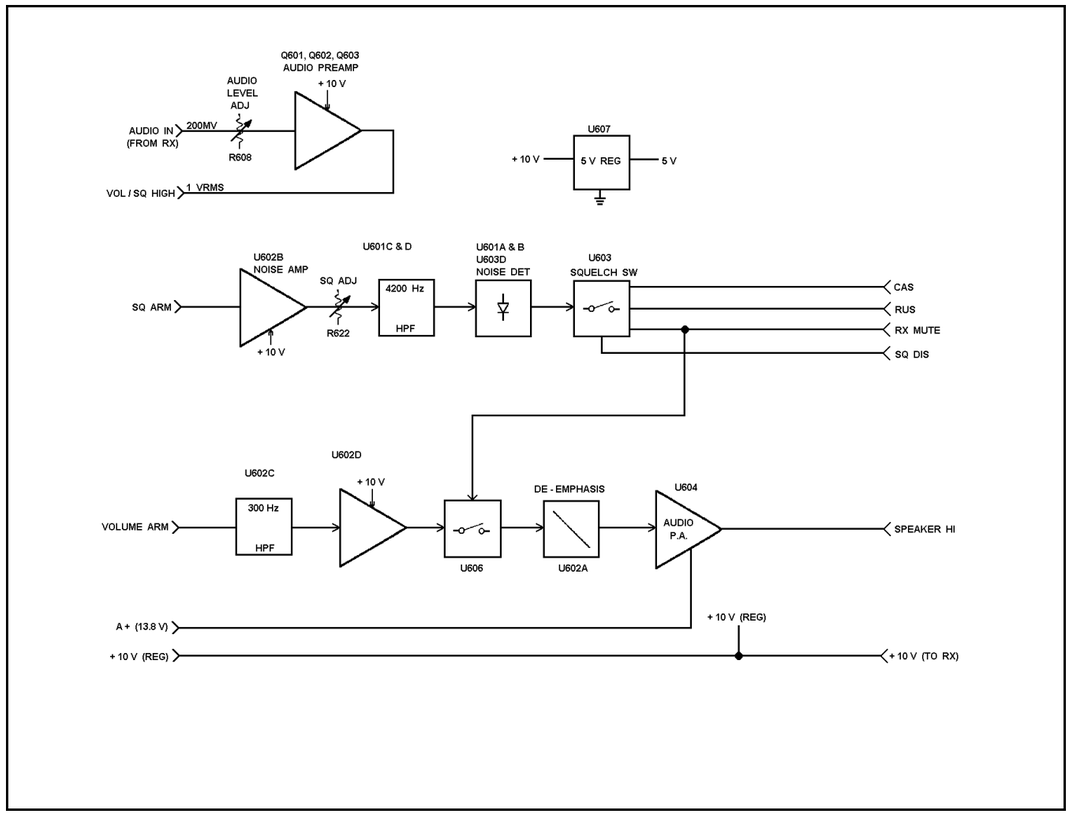


Figure 2 - Audio Board Block Diagram

The squelch input to the level detector is at U603D-10. U603D-11 is referenced to 4 Volts from voltage divider R640 and R641. When the receiver is squelched, the input at U603D-10 is near 3 Volts, and the output at pin 13 is approximately 10 Volts. This keeps the output of receiver audio stages turned off, muting the audio. The level detector output is connected to its input through R639, providing a hysteresis loop in the squelch circuit to prevent squelch closing on weak signals.

When the receiver is quieted by an on-frequency signal (receiver unsquelches), the voltage at U603D-10 rises to approximately 5 Volts DC, and the output at pin 14 drops to near 0 volts. This turns on the audio stages and sound is heard at the speaker.

RUS Switch (Receiver Unsquelched Sensor)

When the receiver is unsquelched, the output of the level detector (U603D-13) goes low. The low turns off U603C, causing U603B-1 to go high (approximately 10 Vdc), turning on RUS switch U603B. The RUS output at U603B-1 is also connected to the system board through P904-8 for use in special applications.

CAS Switch (Carrier Activity Sensor)

Level detector U603D also drives CAS switch U603A. When the receiver unsquelches, the voltage at U603A-2 rises to approximately 10 volts. This voltage is connected to the system board through P904-9 where it is used to activated such options as the Channel Busy light, Carrier Control Timer, and Carrier Operated Relay.

MAINTENANCE

SERVICING

To gain access to the receiver for servicing:

To service the receiver from the top:

1. Turn the two latching knobs shown in Figure 3 counter-clockwise to unlatch the exciter/receiver door.

2. Swing the exciter/receiver door housing down as shown in Figure 4 and remove the top cover (exciter/receiver door shown with cover removed).

To service the receiver from the bottom:

1. Turn the two latching knobs shown in Figure 3 counter-clockwise to unlatch the exciter/receiver door housing and swing the housing down as shown.

CAUTION

Disconnect the two RF cables connecting the receiver and exciter, and remove the cable retaining screw before raising the receiver housing as directed in Step 2.

2. Remove the top cover. Then, grasp the receiver handle shown in Figure 4 and swing the housing up for access to the bottom of the receiver.

ADJUSTMENTS

The 900 MHz conventional receiver has no adjustments for "peaking" up receiver performance. If some adjustment is required as a result of component replacement or other maintenance, refer to the Adjustment Procedure contained in this Maintenance Manual.

TROUBLESHOOTING

Both the Schematic and Outline diagrams contain troubleshooting information to assist in servicing the receiver. This service information includes voltage and gain readings, power levels and signal flow information. Refer to these diagrams when troubleshooting the receiver (see Table of Contents).

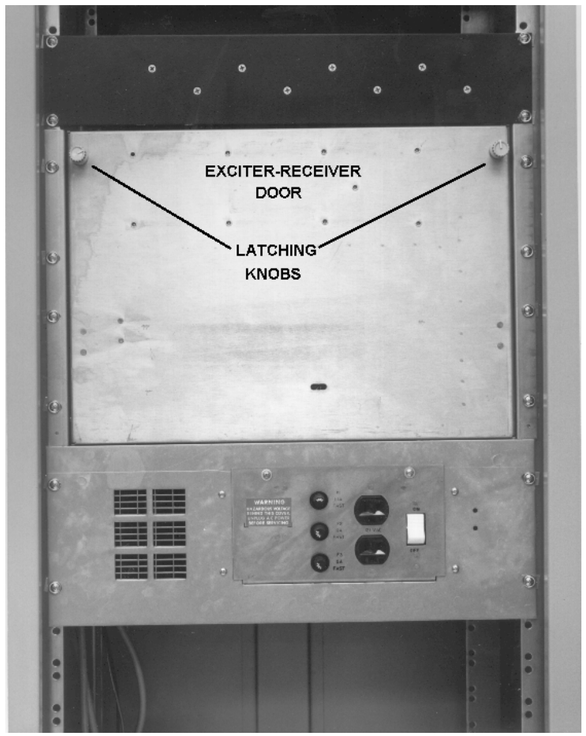


Figure 3 - Latching Knobs Securing Door

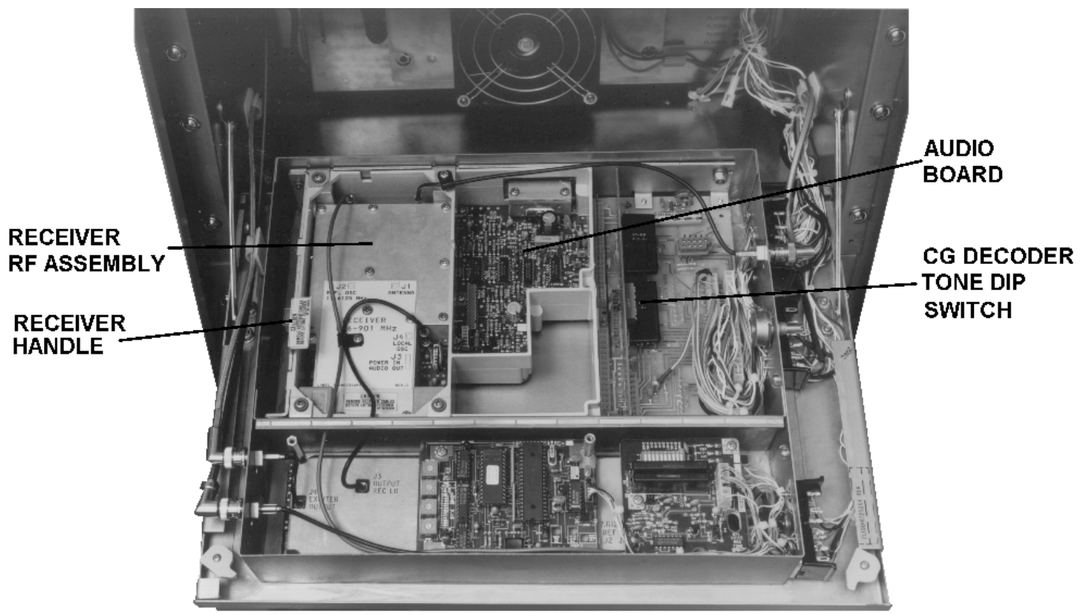
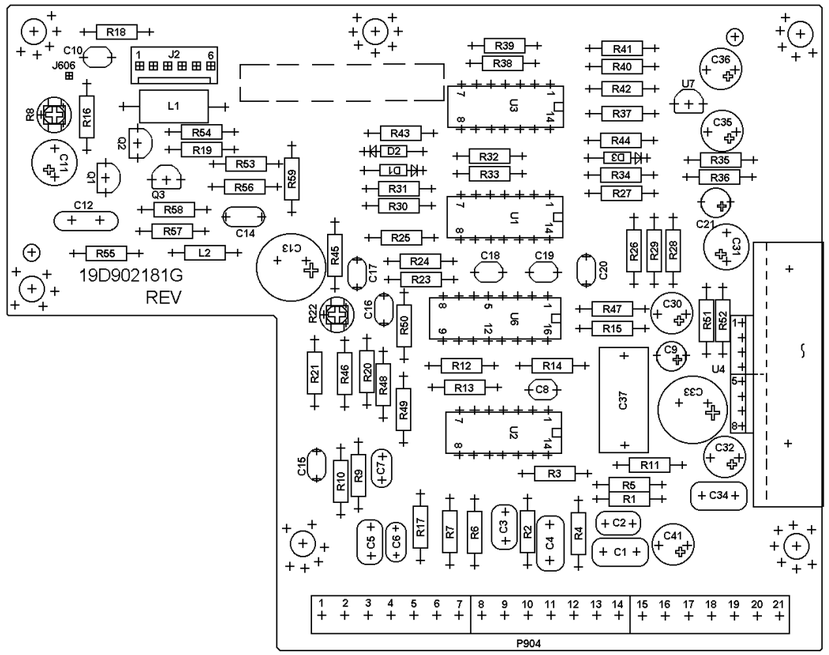


Figure 4 - Access To Receiver



(19D902181, Sh. 1, Rev. 0)

ADJUSTMENT PROCEDURE

The conventional receiver has no field adjustments for peaking up performance. However, should it become necessary to replace components at the customer location, the following adjustments may be required.

Calibration of the 70.45 MHz 2nd L.O. (L11):

1. Remove the top cover of the receiver, and then disconnect the 17.6125 MHz reference signal from J2.

2. Measure for 70.45 MHz ±50 kHz at J5. If necessary, carefully adjust L11 to obtain 70.45 MHz ±50 kHz (see CAUTION below).

CAUTION

The tuning slug in L11 is very fragile. Do NOT use a hard material tuning tool such as metal or ceramic to tune the coil. If it should become necessary to tune the L11, it is suggested that a tuning tool be constructed out of a round toothpick (or equivalent plastic tool) that has one end fashioned into a flat tuning edge.

RF INPUT	RSSI
-40 dBm	4.5 Vdc
-60 dBm	4.5 Vdc
-80 dBm	4.0 Vdc
-100 dBm	3.3 Vdc
-120 dBm	2.3 Vdc

Typical RF Levels vs. RSSI Voltages

Receiver Board

Calibration Of Quadrature Detector Z1:

1. Remove the receiver top cover. Then apply a modulated RF signal to antenna jack J1.

2. Adjust the RF generator for -50 dBm with 1 kHz tone at 1.5 kHz modulation.

3. Adjust Z1 for maximum audio at J3-3 (200 mV rms minimum).

4. Fine tune Z1 for symmetrical eye pattern at J3-3 with input signal modulated with 9600 b/s data at 1.8 kHz peak deviation.

AUDIO BOARD

System Audio Level Adjust (R608):

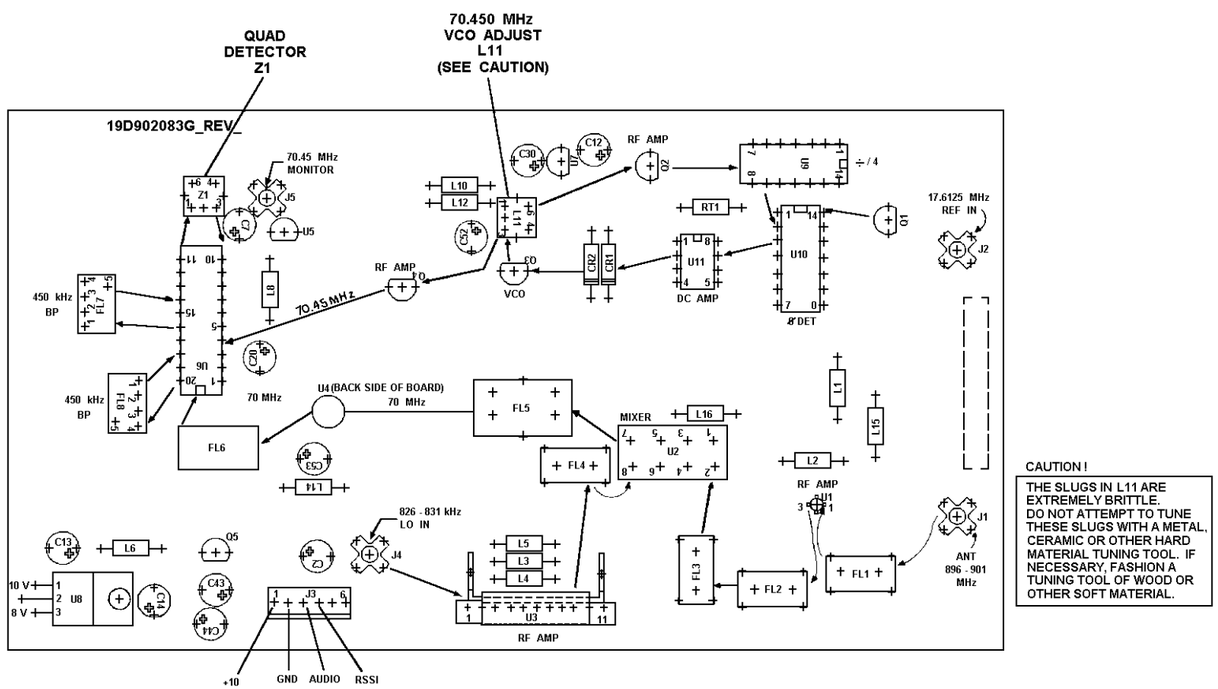
1. Apply a -50 dBm RF signal with 1 kHz tone at 1.5 kHz deviation at the receiver input.

2. Adjust R608 for a reading of 1 volt RMS at P904-11 (Volume-Squelch High).

Squelch (Noise) Calibration:

1. Turn the SQUELCH control on the exciter-receiver door fully clockwise. Then turn the control counterclockwise approximately one third of the way.

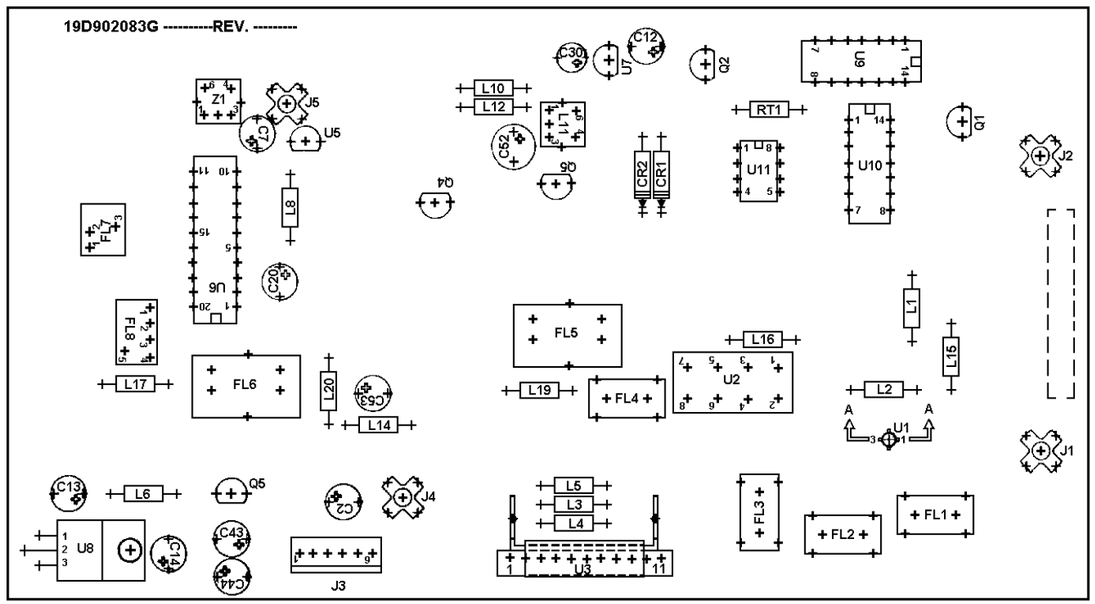
2. Adjust R622 until the voltage reading at P904-7 (RX MUTE) just drops to near zero volts. Then readjust the SQUELCH control for critical squelch.



CAUTION !

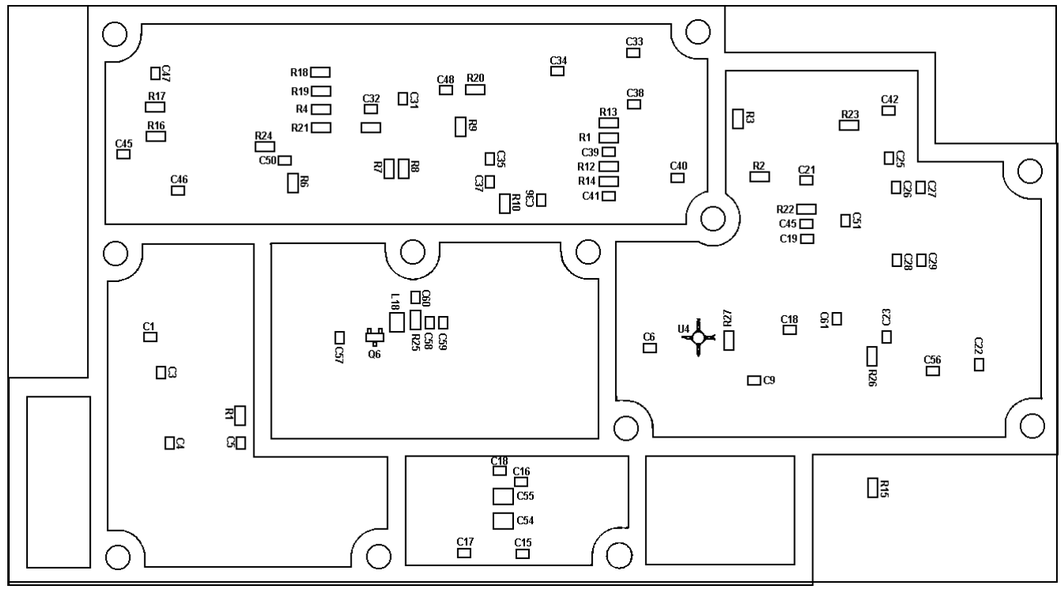
THE SLUGS IN L11 ARE EXTREMELY BRITTLE. DO NOT ATTEMPT TO TUNE THESE SLUGS WITH A METAL, CERAMIC OR OTHER HARD MATERIAL TUNING TOOL. IF NECESSARY, FASHION A TUNING TOOL OF WOOD OR OTHER SOFT MATERIAL.

TOP VIEW



(19D902083, Sh. 3, Rev. 2)

BOTTOM VIEW



(19D902083, Sh. 4, Rev. 2)

LEAD IDENTIFICATION FOR Q4 & Q5

IN - LINE

TOP VIEW

NOTE: CASE SHAPE IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

LEAD IDENTIFICATION FOR Q1 & Q2

IN - LINE

TOP VIEW

NOTE: CASE SHAPE IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

LEAD IDENTIFICATION FOR Q3

IN - LINE

TOP VIEW

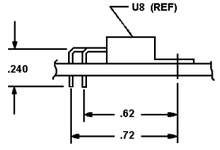
NOTE: CASE SHAPE IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

LEAD IDENTIFICATION FOR U5 & U7

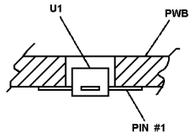
IN - LINE

TOP VIEW

NOTE: CASE SHAPE IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

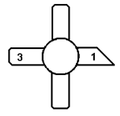


FORMING DIMENSIONS FOR U8 LEADS



SECTION A - A

LEAD IDENTIFICATION FOR U1



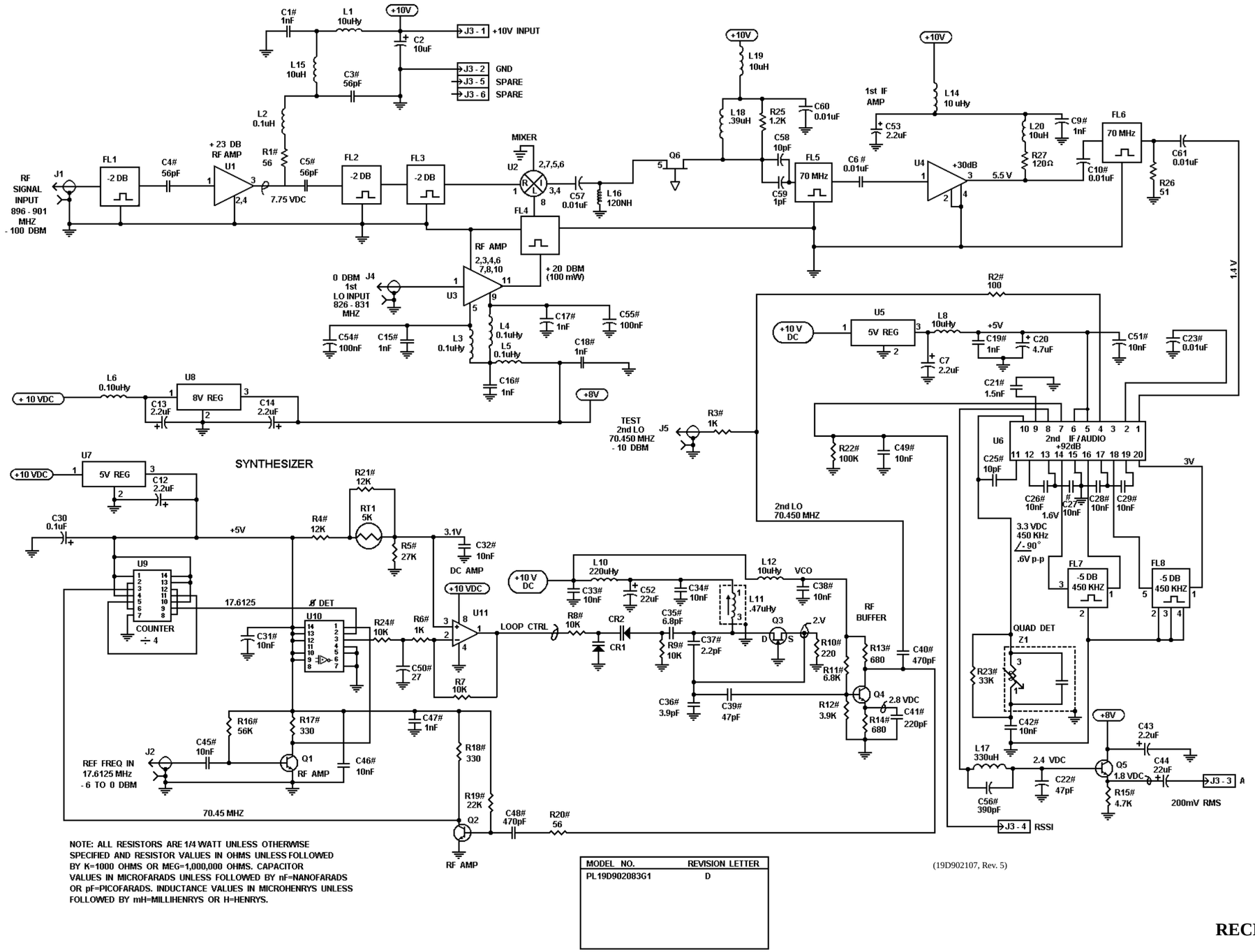
VIEW FROM SOLDER SIDE

CAUTION

OBSERVE PRECAUTIONS FOR HANDLING

ELECTROSTATIC SENSITIVE DEVICES

RECEIVER BOARD

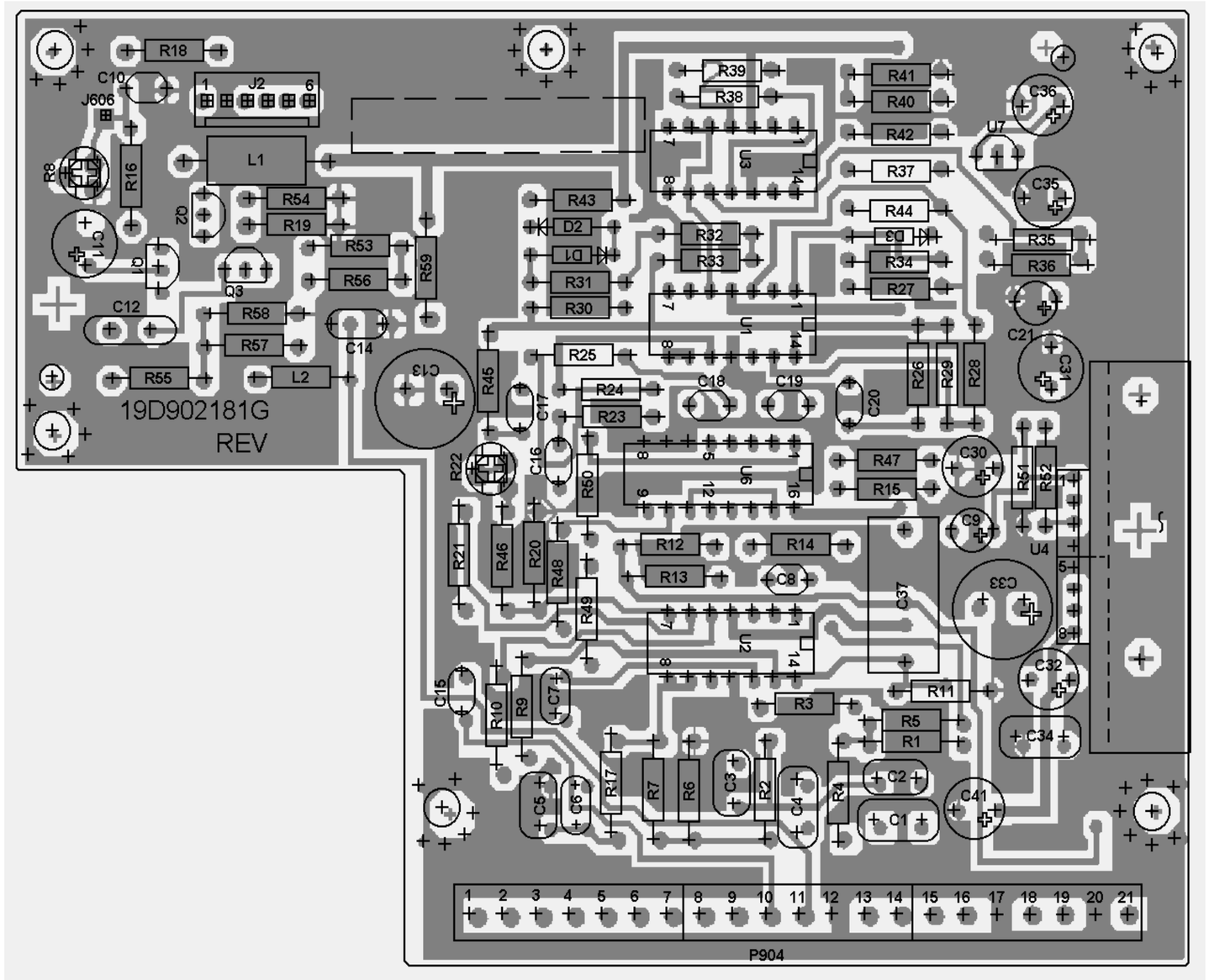


NOTE: ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN MICROFARADS UNLESS FOLLOWED BY nF=NANOFARADS OR pF=PICOFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY mH=MILLIHENRYS OR H=HENRYS.

MODEL NO.	REVISION LETTER
PL19D902083G1	D

(19D902107, Rev. 5)

RECEIVER BOARD
19D902083G1



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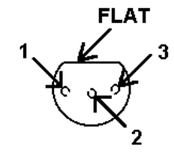
(19D902182, Sh. 1&2, Rev. 3)

LEAD IDENTIFICATION FOR U607

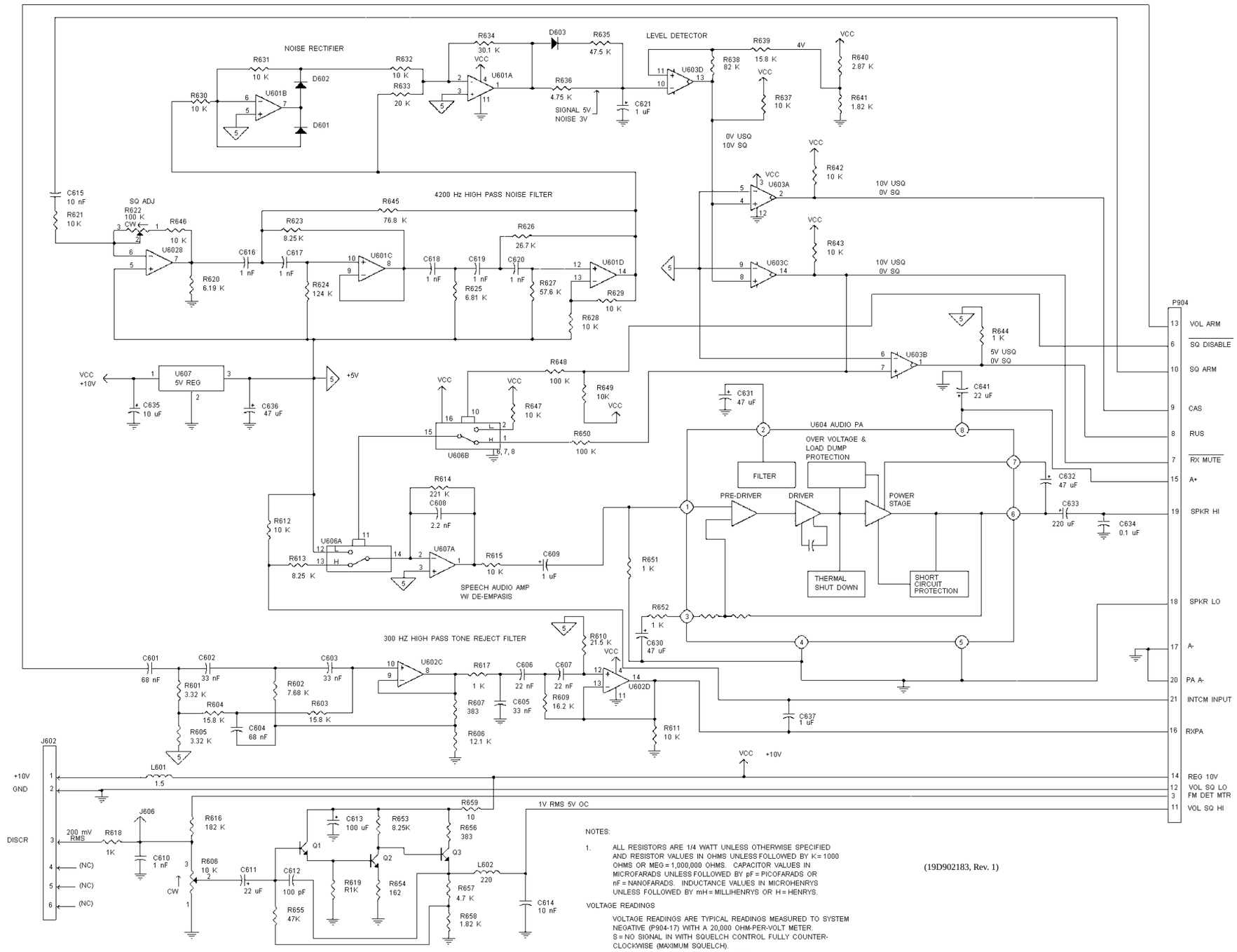


IN - LINE

TOP VIEW

NOTE: CASE SHAPE IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

AUDIO BOARD
19D902181G1



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VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO SYSTEM NEGATIVE (P904-17) WITH A 20,000 OHM-PER-VOLT METER.
S = NO SIGNAL IN WITH SQUELCH CONTROL FULLY COUNTER-CLOCKWISE (MAXIMUM SQUELCH).
US = SQUELCH CONTROL FULLY CLOCKWISE.

(19D902183, Rev. 1)

AUDIO BOARD
19D902181G1

PARTS LIST

900 MHz RECEIVER ASSEMBLY
19D902120G1
ISSUE 4

SYMBOL	PART NO.	DESCRIPTION
A1		RECEIVER BOARD 19D902083G1
		CAPACITORS
C1	19A702052P5	Ceramic: 1000 pF + or - 10%, 50 VDCW.
C2	19A701534P7	Tantalum: 10 uF + or - 20%, 16 VDCW.
*C3 and C5	19A702061P49	Ceramic: 56 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
C6	19A702052P14	Ceramic: 0.01 uF + or - 10%, 50 VDCW,
C7	19A701534P5	Tantalum: 2.2 uF, + or - 20%, 35 VDCW.
C9	19A702052P5	Ceramic: 1000 pF + or - 10%, 50 VDCW.
*C10	19A702052P14	Ceramic: 0.01 uF + or - 10%, 50 VDCW,
C12 thru C14	19A701534P5	Tantalum: 2.2 uF, + or - 20%, 35 VDCW.
C15 thru C19	19A702052P5	Ceramic: 1000 pF + or - 10%, 50 VDCW.
C20	19A701534P6	Tantalum: 4.7 uF + or - 20%, 35 VDCW.
C21	19A702052P6	Ceramic: 1500 pF + or - 10%, 50 VDCW.
C22	19A702061P45	Ceramic: 47 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
*C23	19A702052P14	Ceramic: 0.01 uF + or - 10%, 50 VDCW.
C25	19A702061P13	Ceramic: 10 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
C26 thru C29	19A702052P14	Ceramic: 0.01 uF + or - 10%, 50 VDCW.
C30	19A701534P1	Tantalum: 0.1 uF + or - 20%, 35 VDCW.
C31 thru C34	19A702052P14	Ceramic: 0.01 uF + or - 10%, 50 VDCW.
C35	19A702061P11	Ceramic: 6.8 pF + or - 0.5 pF, 50 VDCW, temp coef 0 + or - 60 PPM.
C36	19A702061P8	Ceramic: 3.9 pF + or - 0.5 pF, 50 VDCW, temp coef 0 + or - 120 PPM.
C37	19A702061P5	Ceramic: 2.2 pF + or - 0.5 pF, 50 VDCW, temp coef 0 + or - 120 PPM.
C38	19A702052P14	Ceramic: 0.01 uF + or - 10%, 50 VDCW.
C39	19A702061P45	Ceramic: 47 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
C40	19A702061P77	Ceramic: 470 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
C41	19A702061P69	Ceramic: 220 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM/°C.
C42	19A702052P14	Ceramic: 0.01 uF + or - 10%, 50 VDCW.
C43	19A701534P5	Tantalum: 2.2 uF, + or - 20%, 35 VDCW.
C44	19A701534P8	Tantalum: 22 uF + or - 20%, 16 VDCW.
C45 and C46	19A702052P14	Ceramic: 0.01 uF + or - 10%, 50 VDCW.
C47	19A702052P5	Ceramic: 1000 pF + or - 10%, 50 VDCW.
C48	191702061P77	Ceramic: 470 pF + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
C49	19A702052P14	Ceramic: 0.01 uF + or - 10%, 50 VDCW.
C50	19A702061P33	Ceramic: 27 pF + or - 5%, 50 VDCW, temp coef 0 - or - 30 PPM/°C.
C51	19A702052P14	Ceramic: 0.01 uF + or - 10%, 50 VDCW.
C52	19A701534P8	Tantalum: 22 uF + or - 20%, 16 VDCW.
C53	19A701534P5	Tantalum: 2.2 uF, + or -20%, 35 VDCW.
C54 and C55	19A702052P26	Ceramic: 0.1 uF + or - 10%, 50 VDCW.
C56	19A702061P75	Ceramic: 390 pF, + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
*C57	19A702052P14	Ceramic: 0.01 uF + or - 10%, 50 VDCW.
*C58	19A702061P13	Ceramic: 10 pF, + or - 5%, 50 VDCW, temp coef 0 + or - 30 PPM.
*C59	19A702061P1	Ceramic: 1 pF, + or - 5%, 50 VDCW, temp coef 0 + or - 250 PPM/°C.
*C60 and C61	19A702052P14	Ceramic: 0.01 uF + or - 10%, 50 VDCW.
		RECTIFIERS
CR1 and CR2	19A705547P2	Varactor, sim to Frequency Sources KV3201.
		FILTERS
FL1 thru FL3	19B801524P1	Filter, bandpass: 898.5 MHz
FL4	19B801524P2	Filter, bandpass: 828.5 MHz
*FL5 and *FL6	19A149974G11	Crystal filer, monolithic: 70 MHz
FL7	RTN202670 / 01	Ceramic, bandpass: 450 MHz
FL8	19A705580P1	Ceramic filter: 450 KHz
		JACKS
J1 and J2	19A705512P1	Connector, RF SMB Series: sim to AMP No. 221111-1.
J3	19A704852P32	Printed wire, two part: 6 contacts, sim to Molex 22-29-2061.
J4 and J5	19A705512P1	Connector, RF SMB Series: sim to AMP No. 221111-1.
		INDUCTORS
L1 and	19A700024P25	Coil, RF: 10.0 uH + or - 10%, 3.70 ohms DC res max.
*L2 thru L6	19A700024P1	Coil, RF: 100 nH + or - 10%, 0.08 ohms DC res max, 100 v.
L8	19A700024P25	Coil, RF: 10.0 uH + or - 10%, 3.70 ohms DC res max.
L10	19A700024P41	Coil, RF: 220 uH + or - 10%.
L11	19B801413P6	Coil.
L12	19A700024P25	Coil, RF: 10.0 uH + or - 10%, 3.70 ohms DC res max.
L14	19A700024P25	Coil, RF: 10.0 uH + or - 10%, 3.70 ohms DC res max.
*L15	19A700024P25	Coil, RF: 10uH + or - 10%, 3.90 ohms DC res max, 100 v.
L16	19A700024P2	Coil, RF: 120 nH + or - 10%.
L17	19A700024P43	Coil, RF: 330µH + or - 10%.
*L18	19A705470P20	Coil, RF: 0.39µH + or - 20%; sim to Toyo 380NB - R39M.
*L19 and *L20	19A700024P25	Coil, RF: 10µH + or - 10%.
		TRANSISTORS
Q1 and Q2	19A705531P1	High frequency, NPN.
Q3	19A700060P3	N-Type, field effect; sim to J310.
Q4	19A702503P2	Silicon, NPN.
Q5	344A3104P1	Silicon: NPN; Darlington
*Q6	19A702524P2	FET, N - type; sim to MMBFU310
		RESISTORS
R1	19B800607P560	Metal film: 56 ohms + or - 5%, 200 VDCW, 1/8 w.
R2	19B800607P101	Metal film: 100 ohms + or - 5%, 200 VDCW, 1/8 w.
R3	19B800607P102	Metal film: 1K ohms + or - 5%, 200 VDCW, 1/8 w.
R4	19B800607P123	Metal film: 12K ohms + or - 5%, 200 VDCW, 1/8 w.
R5	19B800607P273	Metal film: 27K ohms + or - 5%, 200 VDCW, 1/8 w.
R6	19B800607P102	Metal film: 1K ohms + or - 5%, 200 VDCW, 1/8 w.
R7 thru R9	19B800607P103	Metal film: 10K ohms + or - 5%, 200 VDCW, 1/8 w.
R10	19B800607P221	Metal film: 220 ohms + or - 5%, 200 VDCW, 1/8 w.
R11	19B800607P682	Metal film: 6.8K ohms + or - 5%, 200 VDCW, 1/8 w.
R12	19B800607P392	Metal film: 3.9K ohms + or - 5%, 200 VDCW, 1/8 w.
R13 and R14	19B800607P681	Metal film: 680 ohms + or - 5%, 200 VDCW, 1/8 w.
R15	19B800607P472	Metal film: 4.7K ohms + or - 5%, 200 VDCW, 1/8 w.
R16	19B800607P563	Metal film: 56K ohms + or - 5%, 200 VDCW, 1/8 w.
R17 and R18	19B800607P331	Metal film: 330 ohms + or - 5%, 200 VDCW, 1/8 w.
R19	19B800607P223	Metal film: 22K ohms + or - 5%, 200 VDCW, 1/8 w.
R20	19B800607P560	Metal film: 56 ohms + or - 5%, 200 VDCW, 1/8 w.
R21	19B800607P123	Metal film: 12K ohms + or - 5%, 200 VDCW, 1/8 w.
R22	19B800607P104	Metal film: 100K ohms + or - 5%, 200 VDCW, 1/8 w.
*R23	19B800607P333	Metal film: 33K ohms + or - 5%, 200 VDCW, 1/8 w.
R24	19B800607P103	Metal film: 10K ohms + or - 5%, 200 VDCW, 1/8 w.
*R25	19B800607P122	Metal film: 1.2K ohms + or - 5%, 200 VDCW, 1/8 w.
*R26	19B800607P510	Metal film: 51 ohms + or - 5%, 200 VDCW, 1/8 w.
*R27	19B800607P121	Metal film: 120 ohms + or - 5%, 200 VDCW, 1/8 w.
		THERMISTOR
RT1	19A703813P1	Thermal: 5k ohms + or - 2%; sim to Midwest Components P1H-502.
		INTEGRATED CIRCUITS
U1	19A705537P1	Integrated Circuit (MMIC), RF Power Amplifier: sim to Avantek MSA0885.
U2	19B801025P3	Mixer, balanced (double): sim to Mini-Circuits SRA-173H.
U3	19A704695P1	Hybrid RF Amplifier: sim to NEC Type MIC-5809L.
*U4	344A3740P1	Amplifier, MMIC.
U5	19J706031P1	Linear: POSITIVE VOLTAGE REGULATOR.
U6	19A705535P1	Integrated Circuit, IF System, FM: sim to Signetics SA605N.
U7	19J706031P1	Linear: POSITIVE VOLTAGE REGULATOR.
U8	19A134717P3	Linear: 8 Volt Regulator; sim to MC7808CT.
U9	19A705579P1	Dual D-Type flip flop.
U10	19A700037P341	Digital: Qual 2 Input Exclusive OR gate; sim to 74LS86.
U11	19A701789P2	Linear: Dual Op Amp; sim to LM358.
		FILTER
Z1	19B801415P3	Transformer: 455 KHz.
		MISCELLANEOUS
	19B801531P1	Cover, receiver.
	19B201074P304	Tap screw, Phillips POZIDRIV: No. 6-32 x 1/4.
	19B209382P308	Tap screw, Phillips POZIDRIV: No. 6-32 x 1/2.
	19A702364P408	Machine Screw: TORX Drive, M3.5 - 0.6 x 8.
	19A700034P5	Hex nut: No. M3.5 x 0.6.
	19A700033P6	Lockwasher, external tooth, M3.5

* COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST

AUDIO BOARD
19D902181G1
ISSUE 2

SYMBOL	PART NO.	DESCRIPTION
		— — — — — — — — CAPACITORS — — — — — — — —
C601	T644ACP368K	Polyester: .068 uF + or -10%, 50 VDCW.
C602 and C603	T644ACP333K	Polyester: .033 uF + or -10%, 50 VDCW.
C604	T644ACP368K	Polyester: .068 uF + or -10%, 50 VDCW.
C605	T644ACP333K	Polyester: .033 uF + or -10%, 50 VDCW.
C606 and C607	T644ACP322K	Polyester: .022 uF + or -10%, 50 VDCW.
C608	T644ACP222K	Polyester: .0022 uF + or -10%, 50 VDCW.
C609	19A701534P4	Tantalum: 1 uF + or -20%, 35 VDCW.
C610	T644ACP210K	Polyester: .0010 uF + or -10%, 50 VDCW.
C611	19A701534P8	Tantalum: .22 uF + or -20%, 16 VDCW.
C612	19A700235P25	Ceramic: 100 pF + or -5%, 50 VDCW.
C613	19A701225P7	Electrolytic: 100 uF - 10 + 50%, 60 VDCW.
C614 and C615	T644ACP310K	Polyester: .010 uF + or -10%, 50 VDCW.
C616 thru C620	T644ACP210K	Polyester: .0010 uF + or -10%, 50 VDCW.
C621	19A701534P4	Tantalum: 1 uF + or -20%, 35 VDCW.
C630 thru C632	19A701534P9	Tantalum: 47 uF + or -20%, 6.3 VDCW.
C633	19A701225P3	Electrolytic: 220 uF, -10 + 50%, 25 VDCW.
C634	T644ACP410K	Polyester: 0.1 uF + or -10%, 50 VDCW.
C635	19A701534P7	Tantalum: 10 uF + or -10%, 50 VDCW.
C636	19A701534P9	Tantalum: 47 uF + or -20%, 6.3 VDCW.
C637	19A700004P8	Metallized polyester: 1 uF + or -10%, 63 VDCW.
C641	19A701534P8	Tantalum: 22 uF + or -20%, 16 VDCW.
		— — — — — — — — DIODES — — — — — — — —
D601 thru D603	19A700025P1	Silicon, fast recovery: fwd current 75 mA, 75 PIV; sim to Type 1N4148.
		— — — — — — — — JACKS — — — — — — — —
J602	19A704852P32	Printed wire, two part: 6 contacts, sim to Molex 22 - 29 - 2061.
J606	19A701785P1	Contact, electrical: sim to Molex 08 - 50 - 0404.
		— — — — — — — — INDUCTORS — — — — — — — —
L601	19A700000P14	Coil, RF: 4.5 uH + or -10%, sim to Jeffers 4411 - 10K.
L602	19A700025P41	Coil, RF: 220 uH + or -10%.
		— — — — — — — — PLUGS — — — — — — — —
P904	19B219594P1	Contact, electrical: 7 pins.
		— — — — — — — — TRANSISTORS — — — — — — — —
Q601 thru Q603	19A700023P2	Silicon, NPN: sim to 2N3904.
		— — — — — — — — RESISTORS — — — — — — — —
R601	19A701250P251	Metal film: 3320 ohms + or -1%, 1/4 w.
R602	19A701250P286	Metal film: 7680 ohms + or -1%, 250 VDCW, 1/4 w.
R603 and R604	19A701250P320	Metal film: 15.8K ohms + or -1%, 250 VDCW.
R605	19A701250P251	Metal film: 3320 ohms + or -1%, 1/4 w.
R606	19A701250P309	Metal film: 12.1K ohms + or -1%, 250 VDCW, 1/4 w.
R607	19A701250P157	Metal film: 383 ohms + or -1%, 250 VDCW.
R608	19B800779P10	Variable: 10K ohms + or -25%, 100 VDCW, .3 watt.
R609	19A701250P321	Metal film: 16.2K ohms + or -1%, 250 VDCW, 1/4 w.
R610	19A701250P333	Metal film: 21.5K ohms + or -1%, 250 VDCW, 1/4 w.
R611 and R612	19A701250P301	Metal film: 10K ohms + or -1%, 1/4 w.
R613	19A701250P289	Metal film: 8.25K ohms + or -1%, 250 VDCW, 1/4 w.
R614	19A701250P434	Metal film: 221K ohms + or -1%, 250 VDCW, 1 w.
R615	19A701250P301	Metal film: 10K ohms + or -1%, 1/4 w.
R616	19A701250P426	Metal film: 182K ohms + or -1%, 1/4 w.
R617 thru R619	19A701250P201	Metal film: 1K ohms + or -1%, 250 VDCW, 1/4 w.
R620	19A701250P277	Metal film: 6.19K ohms + or -1%, 250 VDCW, 1/4 w.
R621	19A701250P301	Metal film: 10K ohms + or -1%, 250 VDCW, 1/4 w.
R622	19A800779P16	Variable, 100K ohms, + or -25%, 100 VDCW, 3 watt.
R623	19A701250P289	Metal film: 8.25K ohms + or -1%, 250 VDCW, 1/4 w.
R624	19A701250P410	Metal film: 124K ohms + or -1%, 250 VDCW, 1/4 w.
R625	19A701250P281	Metal film: 6.81K ohms + or -1%, 250 VDCW, 1/4 w.
R626	19A701250P342	Metal film: 26.7K ohms + or -1%, 250 VDCW, 1/4 w.
R627	19A701250P374	Metal film: 57.6K ohms + or -1%, 250 VDCW, 1/4 w.
R628 thru R632	19A701250P301	Metal film: 10K ohms + or -1%, 250 VDCW, 1/4 w.
R633	19A701250P330	Metal film: 20K ohms + or -1%, 250 VDCW, 1/4 w.
R634	19A701250P347	Metal film: 30.1K ohms + or -1%, 250 VDCW, 1/4 w.
R635	19A701250P366	Metal film: 47.5K ohms + or -1%, 250 VDCW, 1/4 w.
R636	19A701250P266	Metal film: 4.75K ohms + or -1%, 250 VDCW, 1/4 w.
R637	19A701250P301	Metal film: 10K ohms + or -1%, 250 VDCW, 1/4 w.
R638	19A701250P426	Metal film: 182K ohms + or -1%, 250 VDCW, 1/4 w.
R639	19A701250P320	Metal film: 15.8K ohms + or -1%, 250 VDCW.
R640	19A701250P245	Metal film: 2870 ohms + or -1%, 250 VDCW, 1/4 w.
R641	19A701250P226	Metal film: 1.82K ohms + or -1%, 1/4 w.
R642 and R643	19A701250P301	Metal film: 10K ohms + or -1%, 1/4 w.
R644	19A701250P201	Metal film: 1K ohms + or -1%, 250 VDCW, 1/4 w.
R645	19A701250P386	Metal film: 76.8K ohms + or -1%, 1/4 w.
R646 and R647	19A701250P301	Metal film: 10K ohms + or -1%, 1/4 w.
R648	19A701250P401	Metal film: 100K ohms + or -1%, 1/4 w.
R649	19A701250P301	Metal film: 10K ohms + or -1%, 1/4 w.
R650	19A701250P401	Metal film: 100K ohms + or -1%, 1/4 w.
R651 and R652	19A701250P201	Metal film: 1K ohms + or -1%, 250 VDCW, 1/4 w.
R653	19A701250P289	Metal film: 8.25K ohms + or -1%, 250 VDCW, 1/4 w.
R654	19A701250P121	Metal film: 162 ohms + or -1%, 1/4 w.
R655	19A701250P366	Metal film: 47.5K ohms + or -1%, 1/4 w.
R656	19A701250P157	Metal film: 383 ohms + or -1%, 250 VDCW.
R657	19A701250P266	Metal film: 4.75K ohms + or -1%, 1/4 w.
R658	19A701250P226	Metal film: 1.82K ohms + or -1%, 1/4 w.
R659	19A701250P1	Metal film: 10 ohms + or -1%, 1/4 w.
		— — — — — — — — INTEGRATED CIRCUITS — — — — — — — —
U601 and U602	19A704883P1	OP AMP, QUAD: sim to Motorola MC 3303P.
U603	19A134764P1	Linear: (VOLTAGE COMPARATOR).
U604		Part of 19B226657G2 Heat Sink Assembly.
U606	19A700029P38	Digital: Triple 2 - Channel Multiplexer.
U607	19J706031P1	Linear: POSITIVE VOLTAGE REGULATOR.
		HEAT SINK ASSEMBLY 19B226657G2
		— — — — — — — — INTEGRATED CIRCUITS — — — — — — — —
U604	19A705646P1	Integrated circuit.
		— — — — — — — — MISCELLANEOUS — — — — — — — —
	19B226646P1	Heat Sink.
	4029846P1	Nut, self - locking, steel: thd. size No. 4 - 40, (Used with Heat Sink).
	N187P006B6	Machine screw: #4 (.112) - 40 x 3/8. (Used with Heat Sink).

*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 - Receiver Board 19D902083G1
Incorporated into initial shipment.

REV. B - Receiver Board 19D902083G1
To improve Test reading at J5. Changed R3.

R3 was: 19D800607P101; Metal Film, 100 ohms ±5%, 1/8 w.

REV. C - Receiver Board 19D902083G1
To improve audio frequency response for high speed data applications, capacitor C22 was changed to 19A702061P45 (47 pF) and transistor Q5 was changed to NPN Darlington 344A3104P1. Capacitor C56 19A702061P75 (390 pF) and coil L17 19A700024P43 (330 µH) were added between pin U6-8 and Q5 base.

C22 was: 19A702061P77; 470 pF.
Q5 was: 19A700023P2; NPN; sim to 2N3904.

REV. D - Receiver Board 19D902083G1
To permit 9600 baud operation.
Printed wire board changed.
Deleted C8, C11, C24, L7 and L9
C6 was 220 pF (19A702061P69).
C10 was 10 pF (19A702061P13).
C23 was 1000 pF (19A702052P5).
R23 was 220K ohms (19B800607P224).
U4 was 19A705538P1.
C3 was 1000 pF (19A702052P5).
L2 was 10uH (19A700024P25).
L15 was 100 nH (19A700024P1).
FL5 was 19A705548G2.
FL6 was 19A705548G1.
FL7 was 19A705580P1.
Added C57 thru C61, L18 thru L20, and R25 thru R27.