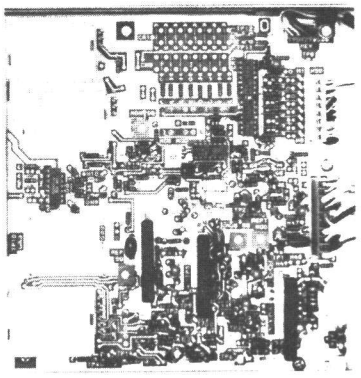
MOBILE RADIO

MASTR® *Executive II* MAINTENANCE MANUAL

SYSTEM BOARD OPTIONAL MOBILE DETECTOR MOTHER BOARD, CRYSTAL MODULES & SYSTEM CABLE ASSEMBLY

Maintenance Manual LBI30827A
DATAFILE FOLDER – DF4101



SYSTEM BOARD 19D429658G1

SPECIFICATIONS *

INPUT VOLTAGE	13.8 Volts DC
OUTPUT VOLTAGE (REGULATED)	10.0 Volts DC 8.5 Volts DC 5.4 Volts DC
MAXIMUM CURRENT DRAIN	
Standby/Receive	400 mA
Transmit	700 mA
Off	3 mA
CAS OUTPUT	0.4 Volts DC (Squelched) 8 Volts DC (Unsquelched)

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

GENERAL ELECTRIC

TABLE OF CONTENTS

ILLUSTRATIONS

WARNING

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

DESCRIPTION

The system board for the MASTR® Executive II Vehicular Repeater Radio Unit provides interconnections beween the control cable from the mobile radio control unit and the repeater transmitter and receiver boards that plug into it. It also provides the interconnections with the logic board, Mobile Detector mother board, the Type 90 encode/decode board and the Channel Guard decode boards for the repeater radio.

Mounted on the underside of the radio chassis, the system board is accessible by removing the radio chassis from the mounting frame. Molex pins on the board protrude through slots on the radio chassis to make connections with the exciter, IF-Detector (IF-DET), and monitor receiver mother board. Molex pins on top of the system board provide harness connections to system jack J1 and the amplifier/antenna switch. The logic board, Type 90 and Channel Guard boards plug onto molex pins on top of the board.

The system board contains the +10 Volt regulator, system control circuits, the audio and squelch circuits for the repeater, transmitter, receiver and monitor receiver connections.

The Mobile Detector is an 8-frequency PE receiver mounted on a shielded mother board that makes interface connections to the system board through plugs P905A and P905B. From plugs P905A and P905B all connections to the receiver (except antenna) are made through the harness connections of W2 and W3.

All power and control input connections are made through plug P1 and distributed to their respective board connections through the system cable assembly.

CIRCUIT ANALYSIS

A Block Diagram of the system board is shown in Figure 1. For the circuit analysis description, refer to the system board Schematic Diagram and the Block Diagram in Figure 1.

10 VOLT REGULATOR

The 10 Volt Regulator IC circuit is shown in Figure 2. The 10 Volt regulator includes regulator amplifiers Q1 and Q2 (in the IC) and regulator pass transistor Q18. Q18 is mounted on the edge of the system board and also to the main radio chassis which acts as a heat sink for the transistor. The regulator circuit provides a closely-controlled supply voltage for the repeater exciter, receiver, logic board and the amplifier/antenna switch assembly.

The output of the 10 Volt regulator is then coupled to zener diode VR2 which provides the regulated +8.5 VDC for the Mobile Detector, Type 90 tone board and the Channel Guard boards. Also this +10 VDC is coupled to zener diode VR3 which provides the regulated +5.4 VDC for the Mobile Detector and logic circuits of the system board.

Turning on the mobile radio unit applies voltage (A+) from the control unit to J901A-10, but the vehicular repeater unit will not be turned on until the POWER switch on the vehicular charger unit is turned on. This is due to the clamping action of Q17 on the output of regulator U1. When the POWER switch on the vehicular charger unit is in the "on" position, voltage (A+) is applied to J901A-9. Q17 is clamped off and the following action takes place in the regulator IC U1.

In U1 the voltage is applied to the base of Q1 causing it to conduct. This turns on regulator pass transistor Q18 and an output voltage appears at the collector. When the output voltage (at pin 3) reaches 10 volts, zener diode VR1 (in IC) breaks down and Q2 begins conducting.

If the output voltage starts to increase, the base current of Q2 also increases, causing it to conduct harder. This causes Q1 to conduct less decreasing the forward bias on Q18. The voltage drop across Q18 increases and the output remains constant.

When the input voltage starts to drop, the output voltage also tends to drop, causing Q2 to conduct less. This allows Q1 to conduct harder, increasing the forward bias on Q18 and causing it to conduct harder. This reduces the voltage drop across Q18 to keep the output constant.

Service Note: The 10 Volt regulator is protected against short circuits. When supply voltage is present but there is no 10 Volt output, the trouble is probably not in the regulator. Always check for a short (or high drain) on the 10 Volt line before replacing the regulator.

INTERFACE AND PROGRAMMING

The frequency selection input leads to the monitor receiver and the program selection of the simplex frequencies and Channel Guard tone is accomplished from the mobile radio control unit input at J901B-1 to J901B-8. Each of the eight frequency selection circuits are identical; therefore, only the selection of F5 will be described in detail.

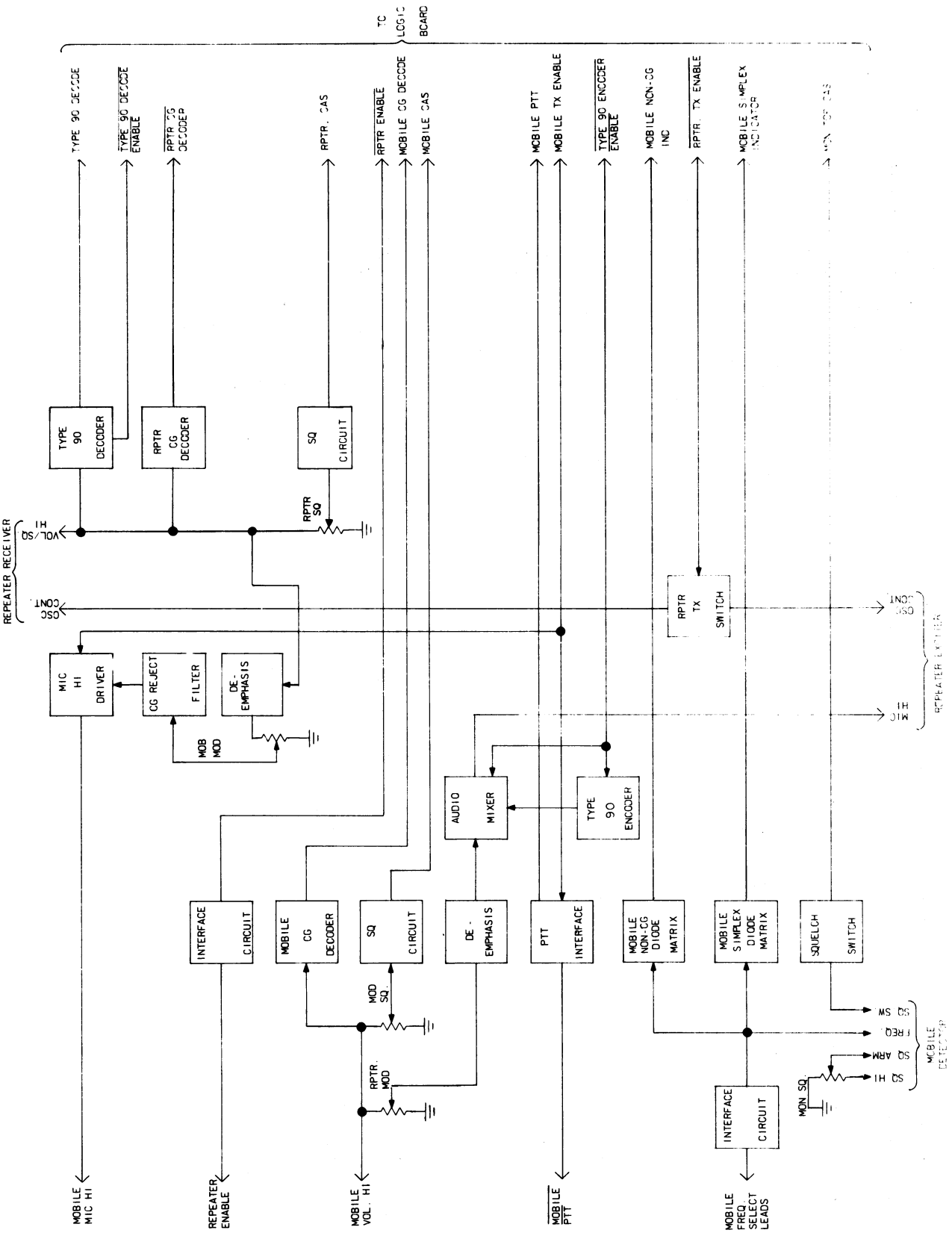


Figure 1 - System Board Block Diagram

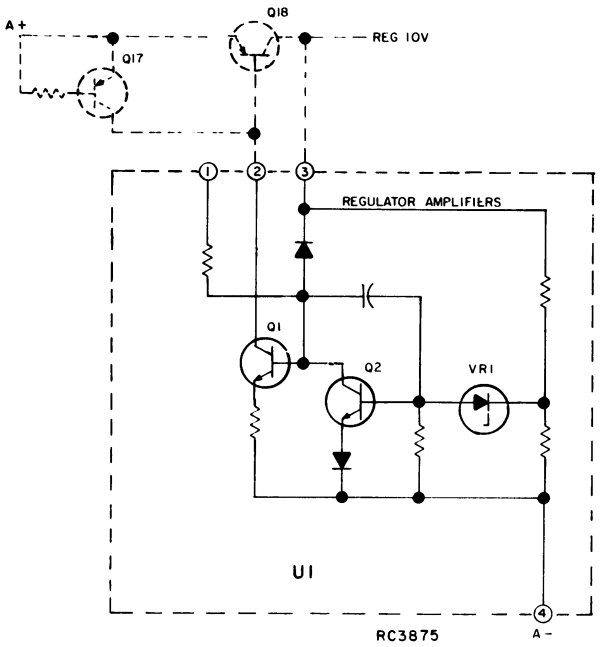


Figure 2 - Regulator IC

In order to select a frequency, a ground must be applied to the frequency select input. Grounding J901B-5 forward biases CR25 and this low causes inverter AR3A output pin 1 to switch from a normal low to a high of more than 7 volts. This high is then coupled through R93 which drops the voltage down to approximately +5.4 VDC. The Mobile Detector is a PE receiver and in order to select a frequency, a +5.4 VDC must be applied to turn on the local oscillator module. The high output of the inverter at pin 1 also forward biases diodes CR5 and CR15. Forward biasing diode CR5 applies a high output to the logic board indicating that the frequency selected is a simplex frequency (i.e., the mobile transmitter and receiver operate on the same RF frequency). When diode CR15 is forward biased, the high output is also coupled to the logic board indicating that a Channel Guard tone will not be present on this particular mobile frequency.

The diodes are used on the outputs of inverters AR2-A through AR3-C as follows:

1. If the diodes are present to the mobile simplex bus, the mobile radio is operating simplex.

2. If the diodes are not present to the mobile simplex bus, the mobile operates non-simplex, i.e., transmit and receive frequencies are different.

3. If the diodes are present to the mobile non-Channel Guard bus, the mobile radio operates in the non-Channel Guard mode and the vehicular repeater will repeat base-to-portable upon receiving any signal.

4. If the diodes are not present to the mobile non-Channel Guard bus, the mobile radio operates in the Channel Guard mode and CG is required for the vehicular repeater to repeat base-to-portable.

REPEATER RECEIVER AUDIO AND SQUELCH

Volume/squelch Hi from the repeater receiver is applied to J903-1 and branches off to the REPEATER SQUELCH ADJ R25, to the input of op-amp AR1-B, through R27 to the input of the Type 90 tone decoder and to the input of the repeater Channel Guard decoder.

Squelch

The hybrid squelch IC (U3) is a custom flip-chip monolithic integrated circuit. The squelch IC contains the noise amplifier, active noise filter, detector, fast squelch circuits as well as the receiver unsquelch sensor (RUS) switch and carrier activity sensor (CAS) switch.

Noise Amp, Filter & Active Detector

Noise input from the receiver is coupled through the REPEATER SQUELCH ADJ control R25 to pin 1 on the squelch IC. This signal is applied to the noise amplifier and then to the active filter circuit.

The noise amp and active filter provide the gain and selectivity to distinguish between noise and audio. The filter output drives the active detector circuit to provide the squelch switching functions. Thermistor RT2 keeps the input to the active detector constant over a wide variation in temperature.

Fast Squelch

A signal at or above 20 dB quieting level is sensed by the signal level detector and activates the fast squelch circuit, providing a fast (10 millisecond) squelch operation.

The squelch circuit has one output which controls the CAS switch.

CAS Switch

When the receiver unsquelches, the voltage at pin 6 rises to apprximately 10 volts. This voltage is connected to the logic board through J904-11 as Repeater CAS.

Audio

Audio is coupled from the repeater receiver through resistor R101 to the input pin 5 of operational amplifier AR1-B. The output level at pin 7 is adjusted by MOBILE MOD ADJ control R11 to set the repeater deviation of the transmitter. Audio is then coupled through the active Channel Guard Filter which consists of Q2 and associated components that filters out any undesired Channel Guard tone present. From the active filter the audio is then coupled to emitter follower Q3/Q4 to drive the low impedance microphone circuit in the mobile radio unit. Q3/Q4 are gated on from the logic board J904-8.

TYPE 90 TONE

When the audio from the repeater receiver contains a Type 90 tone burst, the tone is coupled through resistor R27 to the input of the Type 90 tone encoder/decoder at P1-7. If the Type 90 tone burst is the proper frequency, the decoder will decode, causing a high output at P1-2. This high output is then coupled to the logic board at J904-14.

MOBILE RECEIVER SQUELCH & AUDIO

Squelch

Audio from the volume/squelch high is coupled from the mobile receiver to J901A-8 to emitter follower Q1. The noise is then coupled through the Mobile Squelch Adjust control R6 to pin 1 of the squelch hybrid U2. The squelch theory of operation is the same as described earlier for the Repeater Squelch.

Audio

Mobile Receiver audio is also coupled through Repeater Modulation Adjust control R3 which adjusts the audio level applied to the Repeater Transmitter Exciter Microphone high input lead.

CHANNEL GUARD

The systems Board contains a Repeater Channel Guard Decoder Board (A2). If the decoder receives the proper CG tone, the output (CG DET) will switch to a high condition at P601-2. This high output is then coupled to the input of inverter U4-C causing the output of the inverter to switch low. The output of the inverter is diode gated through CR9 to J904-13 and then on to the logic board. For additional information on the REPT CG Decode output refer to the logic board maintenance manual.

An optional second Channel Guard Decoder (A3) plugs into the Vehicular Repeater systems board and is required only when the mobile radio itself is equipped with Channel Guard. When a tone coded message is received and a Channel Guard tone is detected, a Mobile CG Decode signal is applied to the Logic Board. This signal is used as one of the inputs in determining whether a repeat condition exists.

When a mobile Channel Guard Decoder is present in the Vehicular Repeater, certain diodes in the interface circuit are removed (refer to schematic diagram) to prevent the vehicular repeater transmitter from being enabled when a non-Channel Guard coded message is received.

When the mobile radio is not equipped with Channel Guard, the above mentioned diodes remain in the circuit. Under these conditions, when a message is received on any channel, a mobile non-CG signal is applied to the Logic Board to allow the vehicular repeater transmitter to be enabled.

MOBILE DETECTOR CAS

The Mobile Detector is a PE receiver that is used to monitor the carrier activity on any one of the selected RF frequencies. If no signal is detected, the voltage at J905B-5 (Squelch Switch) is greater than +8.2 VDC; therefore, Q14 is turned off and no output is applied to the logic board through J904-7 (Monitor CAS). When the Mobile Detector detects a signal, the squelch switch voltage drops to less than +7.5 VDC allowing Q14 to conduct. When Q14 conducts, a high output is applied to the logic board Monitor CAS at J904-7. For additional information on the Monitor CAS output, refer to the Logic Board Maintenance Manual.

REPEATER ON-OFF

The Repeater On-Off is controlled from the control unit of the MASTR II Mobile via the Repeater Enable lead at J901A-2. When this lead goes high, diode CR19 is forward biased causing the output at pin 14 of inverter AR1-D to switch low. This low is then coupled to the logic board through J904-9. For additional information on the REPT ENABLE output, refer to the Logic Board Maintenance Manual.

TYPE 90 DECODE ENABLE

The Type 90 Decode Enable input comes from the logic board at J904-16. If this input is high, transistor Q7 is not conducting; however, when the Type 90 Decode Enable lead goes low, transistor Q7 conducts

and applies approximately +8.5 VDC to P1-3. For further information on the operation of the Type 90 Encoder/Decoder, refer to the proper Maintenance Manual.

TYPE 90 ENCODE ENABLE

The Type 90 encoder enable operation is the same as described for the Type 90 Decode operation with the addition that when Q8 conducts, a positive voltage (+8.5 VDC) is applied to P1-6 of the Type 90 Encoder/ Decoder module A1 and is also used to gate on emitter follower Q5/Q6. Applying this positive voltage to P1-6 (Encoder Enable) turns on the encoder allowing a tone output at P1-8. The Tone Out is coupled through operational amplifier AR1-C and then on through emitter follower Q5/Q6 to drive the low impedance microphone circuit of the Repeater Transmitter at J902-4.

MOBILE PTT

Keying the mobile radio from the mobile microphone causes J901A-1 to switch to a low condition, forward biasing diode CR30 and causing the output on pin 1 of inverter AR1-A to switch high. This high output is then coupled to the logic board through J904-6.

When the mobile transmitter is enabled from the logic board, the MOBILE TX ENABLE lead at J904-8 couples a high through R100 to the base of transistor Q15. This causes Q15 to conduct which then causes Q16 to conduct, forward biasing diode CR29 and keying the mobile transmitter by placing a ground on J901A-1. When Q16 conducts, diode CR31 is also forward biased placing a ground on pin 3 of inverter AR1-A. Since pin 3 of inverter AR1-A is lower in potential than pin 2, the inverter will not switch and the Mobile PTT at J904-6 will stay high.

TRANSMIT/RECEIVE SWITCHING

In the stand-by condition, no input is applied from the logic board (REPT TX ENABLE) at J904-15; therefore, transistors Q11 and Q12 are not conducting. Transistor Q13 is turned on by the base current flowing through resistors R79, R80 and R81 and while Q13 is turned on, approximately +10.0 VDC is applied to the receiver oscillator circuit allowing the Repeater Receiver to receive incoming RF signals. When the REPT TX ENABLE receives a high input from the logic board, this high is coupled to the base of Q11 through R85 turning on Q11. This forward biases diode CR32, turning on transistor Q12. Turning on Q12 applies approximately +10.0 VDC to the Repeater Transmitter Osc Cont lead at J902-1, keying the transmitter. Also this +10.0 VDC is applied to the base of Q13 turning off Q13 which turns off the +10.0 VDC normally applied to the receiver oscillator. This action prevents the Repeater Receiver from receiving its own transmitted signal.

CRYSTAL MODULE

Crystal modules determine the operating frequency of the transmitter and receiver. The plug-in module contains a crystal, a trimmer capacitor, and varicap for temperature compensation.

The quartz crystals used in the crystal module exhibit the traditional "S" curve characteristics of output frequency versus operating temperature.

In the mid-temperature range (-10°C to +50°C), the raw crystal characteristic is maintained. The compensation voltage which drives the crystal module varicap is approximately constant over this temperature range. Consequently, the crystal almost solely determines the temperature characteristic. The crystals whose temperature characteristic lie toward the high limit of +4 PPM shown in Figure 3 are rotated slightly. All others have little or no rotation.

The cold end temperature characteristic is "lifted" by a temperature-dependent increasing voltage. The compensator which drives the crystal module varicap produces a voltage which increases linearly from -10°C to -30°C. This voltage decreases the varicap capacity, which in turn increases the module tuned circuit frequency to compensate for the decreasing frequency characteristic of the crystal.

The hot end crystal temperature characteristic in Figure 3 is shown to be increasing with temperature. The hot end

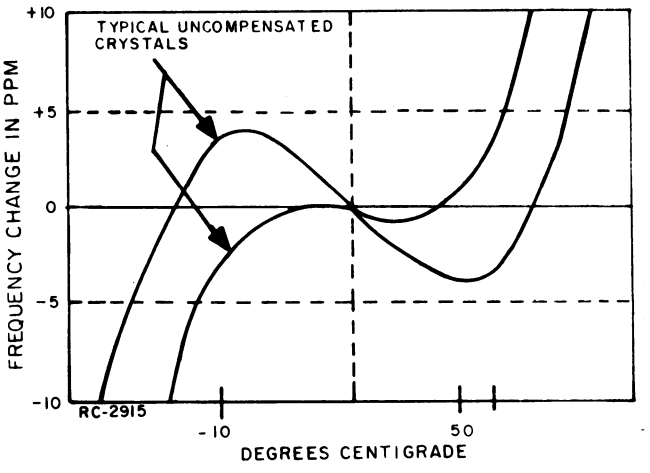


Figure 3 - Typical Crystal Characteristics

(above 50°C) crystal characteristic is compensated for by a decreasing voltage from the compensator. This results in added capacity from the varicap. In turn, a decreasing frequency response of the crystal.

Service Note: Proper crystal module operation is dependent on the closely-controlled input voltages from the 10 Volt regulator. Should all of the crystal modules shift off frequency, check the 10 Volt regulator.

Compensation voltage from the exciter is applied to pin 4 of the crystal modules to maintain frequency stability with ±5 PPM over a temperature range of -30°C to +60°C.

The compensation voltage varies non-linearly with temperature to complement the temperature/frequency characteristics of the crystal. The following chart lists typical minimum and maximum voltage readings to be expected at pin 4 of the crystal modules, as measured with a high impedance meter.

Trimmer capacitor C3 is used to adjust the radio for the exact operating frequency. Refer to the applicable Alignment Procedure for details.

MODIFICATIONS

Field modifications to the system board are provided for installing the optional mobile Channel Guard decoder, mobile detector, repeating mobile detector frequencies, and for disabling the vehicular repeater on mobile frequencies when the repeater is not required. Refer to the Systems Board Modification Instructions (see Table of Contents).

TEMPERATURE RANGE	OUTPUT VOLTAGE	
	MINIMUM	MAXIMUM
-30 C	4.9 Volts	6.0 Volts
-10 C to +50 C	3.7 Volts	4.3 Volts
-75 C	3.3 Volts	3.8 Volts

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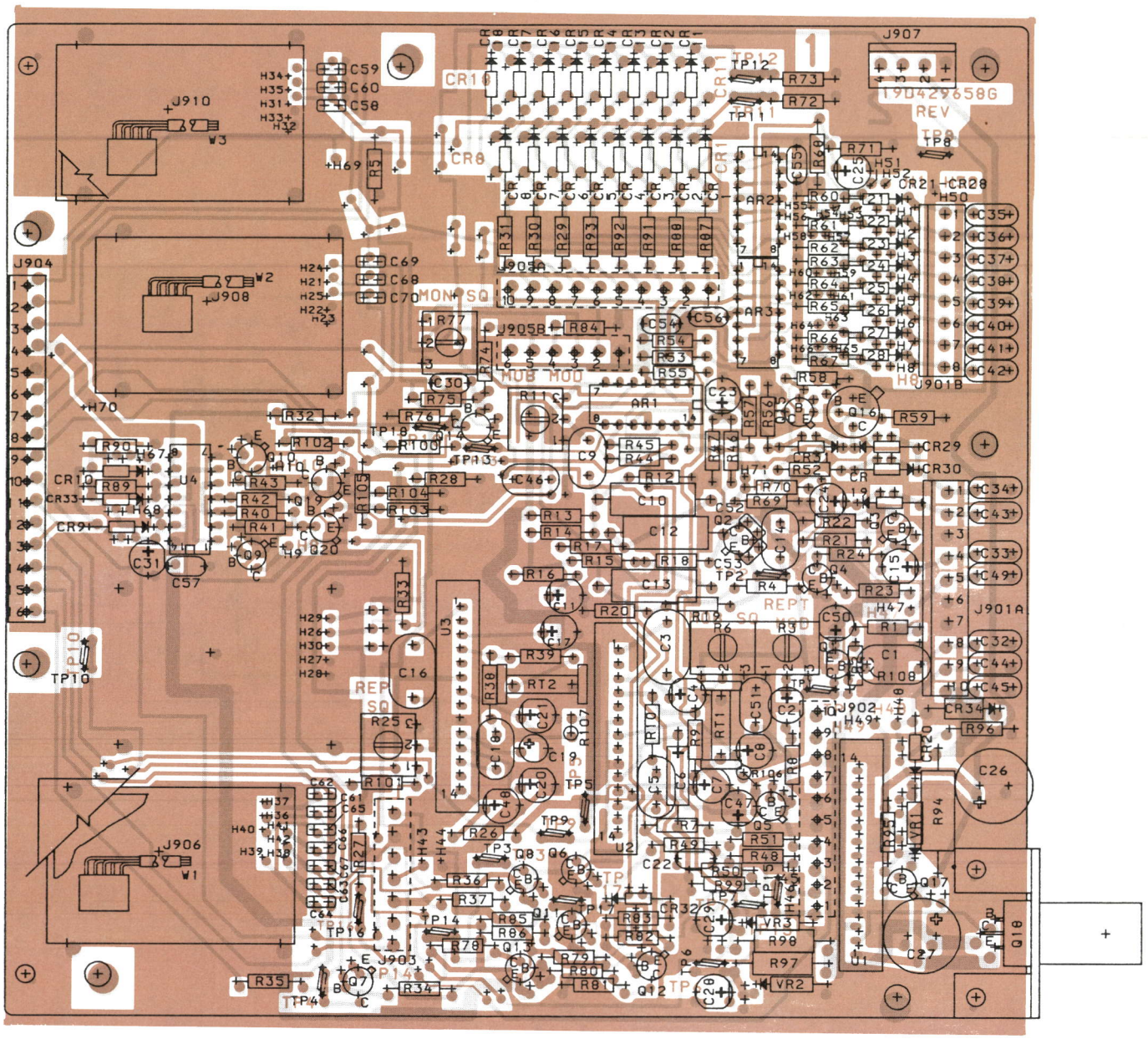
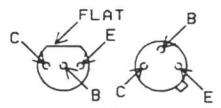


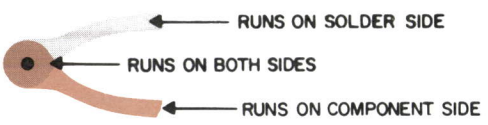
LEAD IDENTIFICATION
FOR Q1-Q17, Q19, &Q20



TOP VIEW

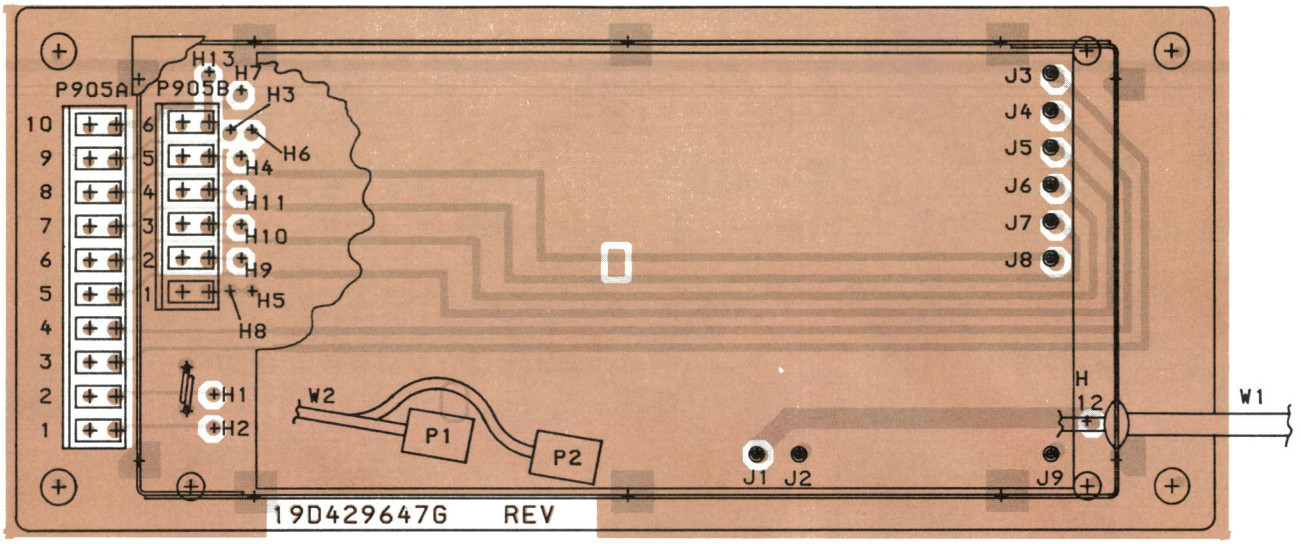
NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

(19D430311, Rev. 2)
(19A138382, Sh. 1, Rev. 1)
(19A138382, Sh. 2, Rev. 2)



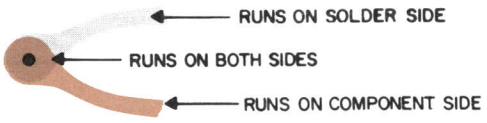
OUTLINE DIAGRAM

SYSTEM BOARD



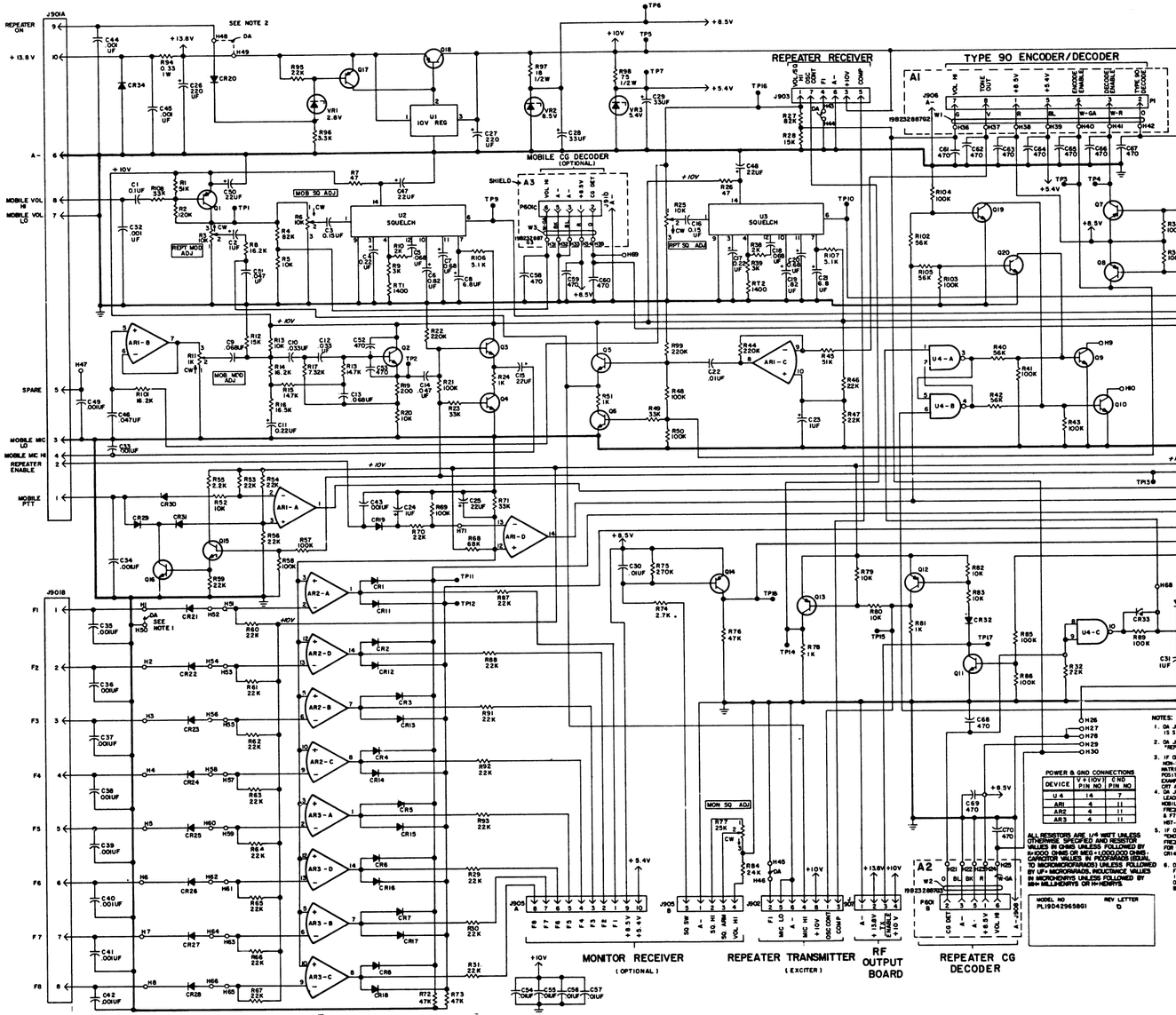
(19C330107, Rev. 0)
(19A138387, Sh. 1, Rev. 0)
(19A138387, Sh. 2, Rev. 0)

CONNECTION CHART	
FROM	TO
W2-WO	H1
W2-WV	H2
W2-WBL	H3
W2-V	H4
W2-BK	H5
W2-WR	H6
W2-BL	H7
W2-BK	H8
W2-WY	H9
W2-WG	H10
W2-G	H11
W1 CTR CNDCT	H12



OUTLINE DIAGRAM

MOBILE DETECTOR MOTHER BOARD



(19E501748, Rev. 6)

SCHEMATIC DIAGRAM

SYSTEM BOARD

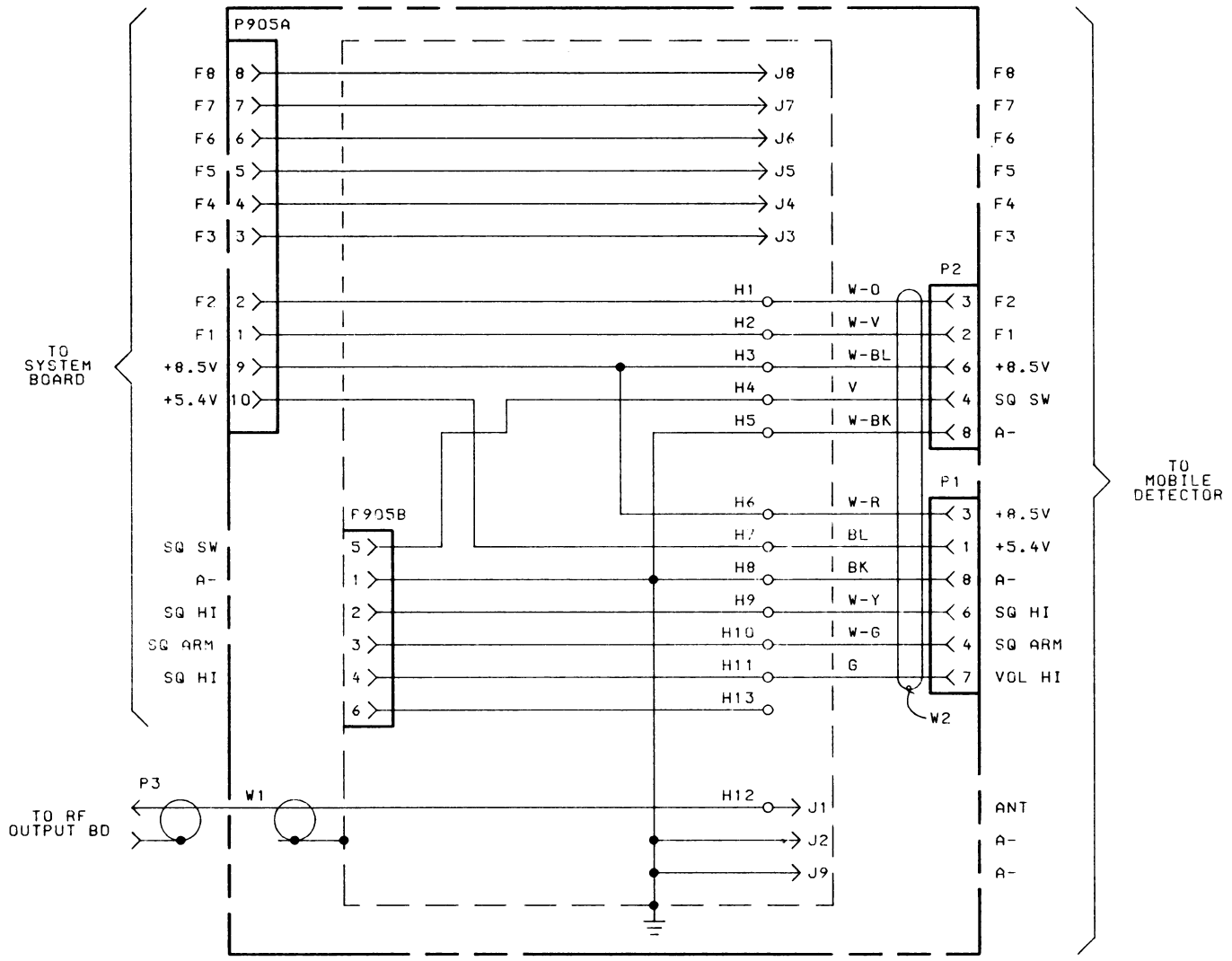
PARTS LIST

SYSTEM BOARD
19D429658G1

ISSUE 2

SYMBOL	GE PART NO.	DESCRIPTION
AR1 thru AR3	19A134511P1	Linear: QUAD OP AMP; sim to LM224J.
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A116080P107	Polyester: 0.1 uF ±10%, 50 VDCW.
C2	19A134202P14	Tantalum: 1 uF ±20%, 35 VDCW.
C3	19A116080P8	Polyester: 0.15 uF ±20%, 50 VDCW.
C4	19A134202P110	Tantalum: 0.22 uF ±10%, 35 VDCW.
C5	19A116080P106	Polyester: 0.068 uF ±10%, 50 VDCW.
C6	5496267P230	Tantalum: 0.82 uF ±10%, 35 VDCW, sim. to Sprague Type 150D.
C7	19A134202P13	Tantalum: 0.68 uF ±20%, 35 VDCW.
C8	19A134202P15	Tantalum: 6.8 uF ±20%, 35 VDCW.
C9	19A116080P6	Polyester: 0.068 uF ±20%, 50 VDCW.
C10	19C300075P33001G	Polyester: .033 uF ±2%, 100 VDCW; sim to GE Type 61F.
C11	19A134202P10	Tantalum: 0.22 uF ±20%, 35 VDCW.
C12	19C300075P33001G	Polyester: .033 uF ±2%, 100 VDCW; sim to GE Type 61F.
C13	19C300075P68001G	Polyester: .068 uF ±2%, 100 VDCW; sim to GE Type 61F.
C14	19A700005P11	Polyester: 0.047 uF ±10%, 50 VDCW.
C15	19A134202P6	Tantalum: 22 uF ±20%, 15 VDCW.
C16	19A116080P8	Polyester: 0.15 uF ±20%, 50 VDCW.
C17	19A134202P110	Tantalum: 0.22 uF ±10%, 35 VDCW.
C18	19A116080P106	Polyester: 0.068 uF ±10%, 50 VDCW.
C19	19A143486P119	Tantalum: 0.82 uF ±10%, 35 VDCW.
C20	19A134202P13	Tantalum: 0.68 uF ±20%, 35 VDCW.
C21	19A134202P15	Tantalum: 6.8 uF ±20%, 35 VDCW.
C22	19A700005P7	Polyester: 0.01 uF ±10%, 50 VDCW.
C23 and C24	19A134202P14	Tantalum: 1 uF ±20%, 35 VDCW.
C25	19A134202P6	Tantalum: 22 uF ±20%, 15 VDCW.
C26 and C27	19A134319P1	Electrolytic: 220 uF -10 +75%, 25 VDCW; sim to Sprague 502D182.
C28 and C29	19A134202P4	Tantalum: 33 uF ±20%, 10 VDCW.
C30	19A700005P7	Polyester: 0.01 uF ±10%, 50 VDCW.
C31	19A134202P14	Tantalum: 1 uF ±20%, 35 VDCW.
C32 thru C45	19A116655P19	Ceramic disc: 1000 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C46	19A700005P11	Polyester: 0.047 uF ±10%, 50 VDCW.
C47 and C48	19A134202P6	Tantalum: 22 uF ±20%, 15 VDCW.
C49	19A116655P19	Ceramic disc: 1000 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C50	19A134202P6	Tantalum: 22 uF ±20%, 15 VDCW.
C51	19A700005P11	Polyester: 0.047 uF ±10%, 50 VDCW.
C53	19A116192P2	Ceramic: 470 pF ±20%, 50 VDCW; sim to Erie 811-A050-W5R-471M.
C54 thru C57	19A700005P7	Polyester: 0.01 uF ±10%, 50 VDCW.
C58 thru C70	19A116192P2	Ceramic: 470 pF ±20%, 50 VDCW; sim to Erie 811-A050-W5R-471M.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
CR1 thru CR33	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR34	T324ADP1041	Rectifier, silicon; general purpose.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J901A	19A116659P109	Connector, printed wiring: 10 contacts rated at 5 amps; sim to Molex 09-60-1101.
J901B	19A116659P107	Connector, printed wiring: 8 contacts rated at 5 amps; sim to Molex 09-60-1081.
J902	19A116659P29	Printed wire: 20 contacts rated at 4 amps; sim to Molex 22-03-2201.
J903	19B219594P1	Contact, electrical: 7 pins.
J904	19A116659P40	Connector, printed wiring: 8 contacts rated at 5 amps; sim to Molex 09-64-1082.
J905A	19A116659P29	Printed wire: 20 contacts rated at 4 amps; sim to Molex 22-03-2201.
J905B	19A116659P28	Connector, printed wiring: 6 contacts rated at 5 amps; sim to Molex 09-64-1081.
J906	19A116366P6	Contact, electrical: sim to Concord 10-891-1.
J907	19A116659P10J	Connector, printed wiring: 4 contacts rated at 5 amps; sim to Molex 09-60-1041.
J908	19A116366P6	Contact, electrical: sim to Concord 10-891-1.
J910	19A116366P6	Contact, electrical: sim to Concord 10-891-1.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 and Q2	19A700022P1	Silicon, PNP; sim to Type 2N3906.
Q6	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q7 and Q8	19A700022P1	Silicon, PNP; sim to Type 2N3906.
Q9 thru Q11	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q12 thru Q14	19A700022P1	Silicon, PNP; sim to Type 2N3906.
Q15	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q16	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q17	19A700022P1	Silicon, PNP; sim to Type 2N3906.
Q18	19A116375P1	Silicon, PNP.
Q19 and Q20	19A700023P1	Silicon, NPN; sim to Type 2N3904.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152P513J	Composition: 51K ohms ±5%, 1/4 w.
R2	H212CRP312C	Deposited carbon: 12K ohms ±5%, 1/4 w.
R3	19A116659P106	Connector, printed wire: 7 contacts rated at 5 amps; sim to Molex 09-60-1071.
R4	19A700106P109	Composition: 82K ohms ±5%, 1/4 w.
R5	19A700106P87	Composition: 10K ohms ±5%, 1/4 w.
R6	19A116659P106	Connector, printed wire: 7 contacts rated at 5 amps; sim to Molex 09-60-1071.
R7	19A700106P31	Composition: 47 ohms ±5%, 1/4 w.
R8	19C314256P21622	Metal film: 16.2K ohms ±1%, 1/4 w.
R9	3R152P302J	Composition: 3K ohms ±5%, 1/4 w.
R10	3R152P202J	Composition: 2K ohms ±5%, 1/4 w.
R11	19A700109P1	Variable, cermet: 1K ohms ±20%, 1/4 w.
R12	19A700106P91	Composition: 15K ohms ±5%, 1/4 w.
R13	19A700106P87	Composition: 10K ohms ±5%, 1/4 w.
R14	19A701250P321	Metal film: 16.2K ohms ±1%, 250 VDCW, 1/4 w.
R15	19A701250P317	Metal film: 14.7K ohms ±1%, 250 VDCW, 1/4 w.
R16	19A701250P322	Metal film: 16.5K ohms ±1%, 250 VDCW, 1/4 w.
R17	19A701250P284	Metal film: 7.32K ohms ±1%, 250 VDCW, 1/4 w.
R18	19A701250P317	Metal film: 14.7K ohms ±1%, 250 VDCW, 1/4 w.
R19	19A701250P130	Metal film: 13.3 ohms ±5%, 1/4 w.
R20	19A701250P301	Metal film: 10K ohms ±1%, 1/4 w.
R21	19A700106P111	Composition: 100K ohms ±5%, 1/4 w.
R22	3R152P224J	Composition: 220K ohms ±5%, 1/4 w.
R23	19A700106P99	Composition: 33K ohms ±5%, 1/4 w.
R24	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.
R25	19A116659P106	Connector, printed wire: 7 contacts rated at 5 amps; sim to Molex 09-60-1071.
R26	19A700106P31	Composition: 47 ohms ±5%, 1/4 w.
R27	19A700106P109	Composition: 82K ohms ±5%, 1/4 w.
R28	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R29 thru R33	19A700106P95	Composition: 22K ohms ±5%, 1/4 w.
R34 thru R37	19A700106P111	Composition: 100K ohms ±5%, 1/4 w.
R38	3R152P202J	Composition: 2K ohms ±5%, 1/4 w.
R39	3R152P302J	Composition: 3K ohms ±5%, 1/4 w.
R40	19A700106P105	Composition: 56K ohms ±5%, 1/4 w.
R41	19A700106P111	Composition: 100K ohms ±5%, 1/4 w.
R42	19A700106P105	Composition: 56K ohms ±5%, 1/4 w.
R43	19A700106P111	Composition: 100K ohms ±5%, 1/4 w.
R44	3R152P224J	Composition: 220K ohms ±5%, 1/4 w.
R45	3R152P513J	Composition: 51K ohms ±5%, 1/4 w.
R46 and R47	19A700106P95	Composition: 22K ohms ±5%, 1/4 w.
R48	19A700106P111	Composition: 100K ohms ±5%, 1/4 w.
R49	19A700106P99	Composition: 33K ohms ±5%, 1/4 w.
R50	19A700106P111	Composition: 100K ohms ±5%, 1/4 w.
R51	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.
R52	19A700106P87	Composition: 10K ohms ±5%, 1/4 w.
R53 and R54	19A700106P95	Composition: 22K ohms ±5%, 1/4 w.
R55	19A700106P71	Composition: 2.2K ohms ±5%, 1/4 w.
R56	19A700106P95	Composition: 22K ohms ±5%, 1/4 w.
R57 and R58	19A700106P111	Composition: 100K ohms ±5%, 1/4 w.
R59 thru R67	19A700106P95	Composition: 22K ohms ±5%, 1/4 w.
R68	19A700106P107	Composition: 68K ohms ±5%, 1/4 w.
R69	19A700106P111	Composition: 100K ohms ±5%, 1/4 w.
R70	19A700106P95	Composition: 22K ohms ±5%, 1/4 w.
R71	19A700106P99	Composition: 33K ohms ±5%, 1/4 w.
R72 and R73	19A700106P103	Composition: 47K ohms ±5%, 1/4 w.
R74	19A700106P97	Composition: 27K ohms ±5%, 1/4 w.
R75	3R152P274J	Composition: 270K ohms ±5%, 1/4 w.
R76	19A700106P103	Composition: 47K ohms ±5%, 1/4 w.
R77	19A116659P107	Connector, printed wiring: 8 contacts rated at 5 amps; sim to Molex 09-60-1081.
R78	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.
R79 and R80	19A700106P87	Composition: 10K ohms ±5%, 1/4 w.
R81	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.
R82 and R83	19A700106P87	Composition: 10K ohms ±5%, 1/4 w.
R84	3R152P243J	Composition: 24K ohms ±5%, 1/4 w.
R85 and R86	19A700106P111	Composition: 100K ohms ±5%, 1/4 w.
R87 and R88	19A700106P95	Composition: 22K ohms ±5%, 1/4 w.
R89	19A700106P111	Composition: 100K ohms ±5%, 1/4 w.
R90 thru R93	19A700106P95	Composition: 22K ohms ±5%, 1/4 w.
R94	19A700050P7	Wirewound: 0.33 ohms ±10%, 2 w.
R95	19A700106P95	Composition: 22K ohms ±5%, 1/4 w.
R96	19A700106P75	Composition: 3.3K ohms ±5%, 1/4 w.
R97	19A700113P21	Composition: 18 ohms ±5%, 1/2 w.
R98	19A700113P36	Composition: 75 ohms ±5%, 1/2 w.
R99	3R152P224J	Composition: 220K ohms ±5%, 1/4 w.
R100	19A700106P87	Composition: 10K ohms ±5%, 1/4 w.
R101	19A701250P321	Metal film: 16.2K ohms ±1%, 250 VDCW, 1/4 w.
R102	19A700106P105	Composition: 56K ohms ±5%, 1/4 w.
R103 and R104	19A700106P111	Composition: 100K ohms ±5%, 1/4 w.
R105	19A700106P105	Composition: 56K ohms ±5%, 1/4 w.
R106 and R107	3R152P512J	Composition: 5.1K ohms ±5%, 1/4 w.
R108	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
		- - - - - - - - - - THERMISTORS - - - - - - - - - -
RT1 and RT2	5490828P38	Thermistor: 1400 ohms ±5%, color code green and white; sim to Carborundum Type 723H-2.
		- - - - - - - - - - TEST POINTS - - - - - - - - - -
TP1 thru TP18	19B211379P1	Spring (Test Point).
		- - - - - - - - - INTEGRATED CIRCUITS - - - - - - -
U1	19D416564G13	Regulator, 10 v.
U2 and U3	19D416560G3	Hybrid Squelch.
U4	19A700029P7	Digital: QUAD 2-INPUT NAND GATE.
		- - - - - - - - - VOLTAGE REGULATORS - - - - - - -
VR1	4036887P2	Zener: 500 mW, 2.8 v. nominal.
VR2	4036887P9	Zener: 500 mW, 8.5 v. nominal.
VR3	4036887P5	Zener: 500 mW, 5.4 v. nominal.
		- - - - - - - - - - - - CABLES - - - - - - - - - - -
W1	19B232887G2	Cable. Includes (P1).
W2 and W3	19B232887G3	Cable. Includes (P1).
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	4036555P1	Insulator, washer: Nylon. (Used with Q16).
	19A116023P3	Insulator, plate. (Used with Q18).
	19A134016P1	Insulator, bushing. (Used with Q18).
	19B232899P1	Heat sink. (Used with Q18).
	19B200525P155	Rivet. (Secures Q18 heat sink to board).
	19A137867G1	Cover. (Used with A1-A3).
	19B232778G1	Can.
	19A137865G1	Insulator. (Located under A1-A3 cans).
	19A137866P1	Insulator. (Located between J906 & cover).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



MODEL NO	REV LETTER
19D429647G1	

(19C328603, Rev. 1)

SCHEMATIC DIAGRAM

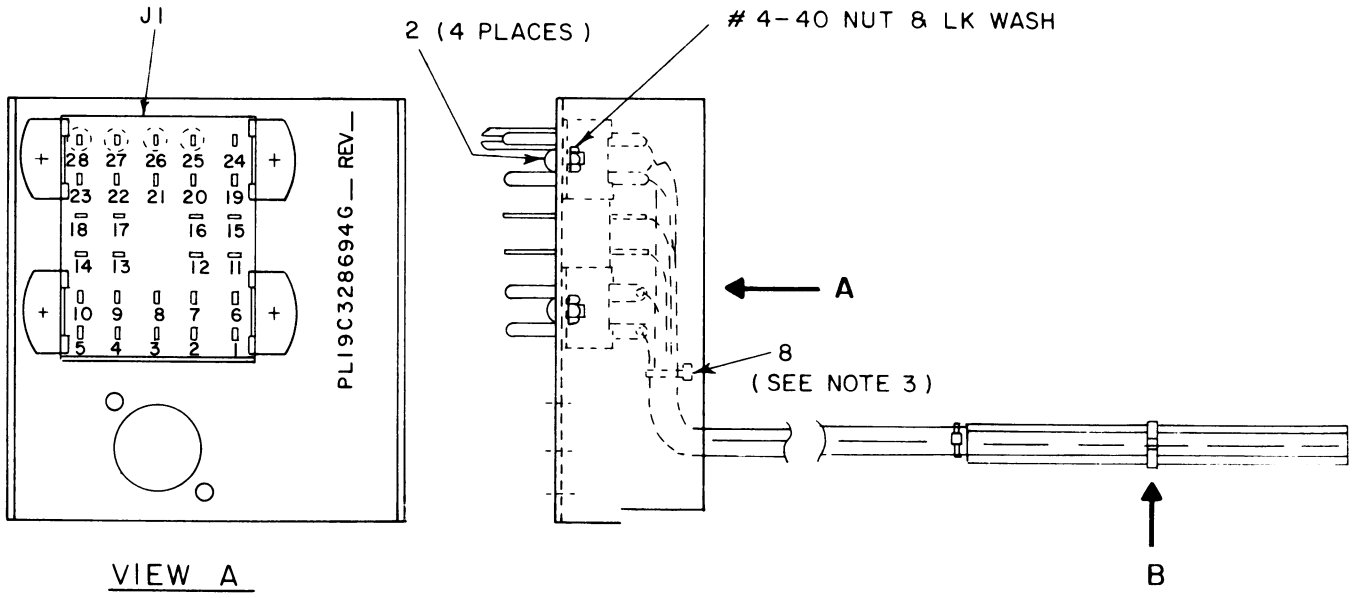
MOBILE DETECTOR MOTHER BOARD

PARTS LIST

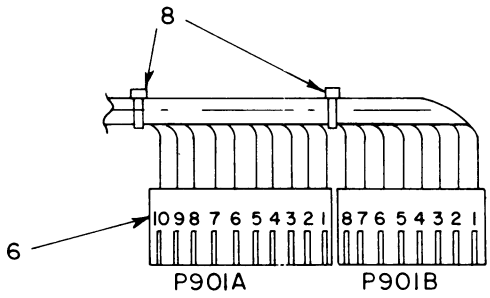
MOBILE DETECTOR MOTHER BOARD
19D429647G1
ISSUE 1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - - - PLUGS - - - - - - - - - - -
P905A	19A116659P2	Connector, printed wiring: 10 contacts; sim to Molex 09-52-3102.
P905B	19A116659P4	Connector, printed wiring: 6 contacts; sim to Molex 09-52-3062.
		- - - - - - - - - JACKS AND RECEPTACLES - - - - -
J1 thru J9	19A116366P6	Contact, electrical: sim to Concord 10-891-2.
		- - - - - - - - - - - - CABLES - - - - - - - - - - -
W1	5491689P132	Cable, RF: approx 23-1/2 inches long; 350 VRMS, 500 VDC operating voltage.
W2	19B232887G1	Cable. Includes (P1 & P2).
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19C328499G1	Can.
	19A137785G1	Cover.
	19B232883G1	Insulator.
	19B211379P1	Spring (Test Point). (Used with W2).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



VIEW A



VIEW B

(19C328694, Rev. 1)

OUTLINE DIAGRAM

SYSTEM CABLE

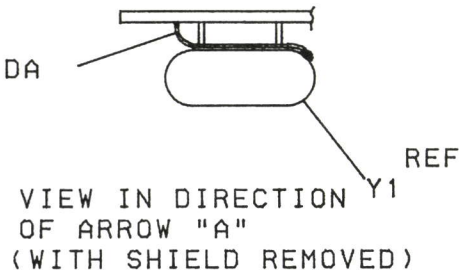
PARTS LIST

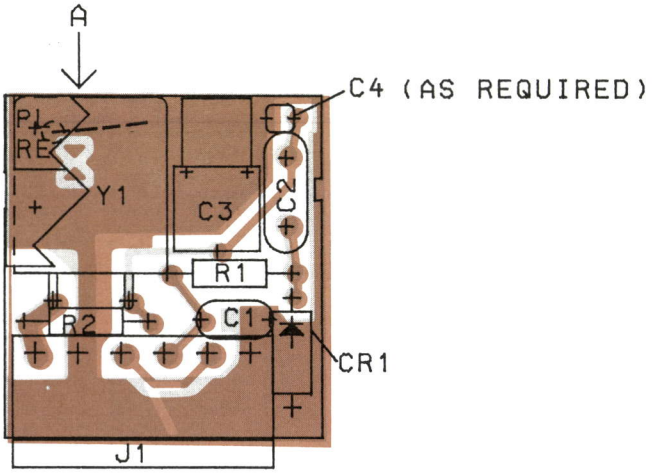
SYSTEM CABLE ASSEMBLY
19C328694G1
ISSUE 1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - JACKS AND RECEPTACLES - - - - - -
J1	19C303775P1	Connector, plug: 28 terminals.
		- - - - - - - - - - - - PLUGS - - - - - - - - - -
P901A		Connector. Includes:
	19A116659P81	Shell.
	19A116781P5	Contact, electrical: wire range No. 18-24 AWG; sim to Molex 08-50-0106. (P901A-3, 6, 7, 10).
	19A116781P6	Contact, electrical: wire range No. 22-26 AWG; sim to Molex 08-50-0108. (P901-1, 2, 4, 5, 8, 9).
P901B		Connector. Includes:
	19A116659P135	Shell.
	19A116781P6	Contact, electrical: wire range No. 22-26 AWG; sim to Molex 08-50-0108.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19B226892P1	Support. (J1).
	19B201074P606	Tap screw, Phillips POZIDRIV®: No. 4-40 x 3/8. (Secures J1 to support).
	19A115185P5	Retaining strap.

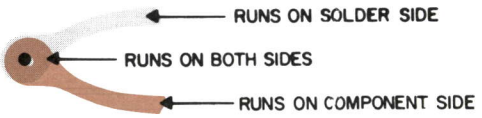
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

OUTLINE DIAGRAM

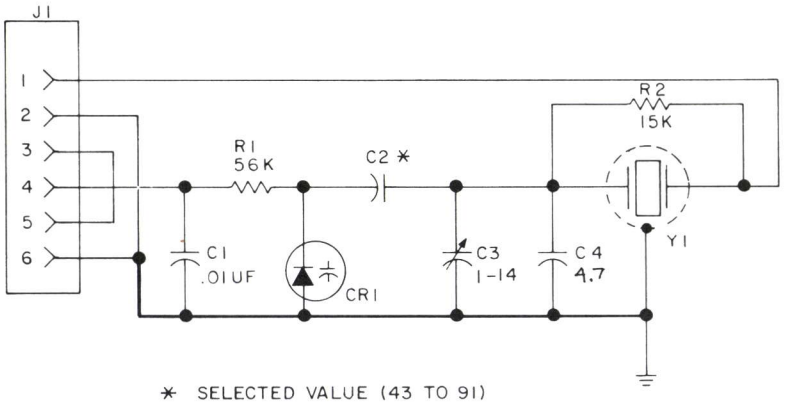




(19B227337, Rev. 8)
(19B226851, Sh. 1, Rev. 8)
(19B226851, Sh. 2, Rev. 7)



SCHEMATIC DIAGRAM



* SELECTED VALUE (43 TO 91)

MODEL NO	REV LETTER
PLI9B226962G1-27	

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

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 PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H= HENRYS.

(19B226951, Rev. 5)

SCHEMATIC & OUTLINE DIAGRAM

CRYSTAL MODULE

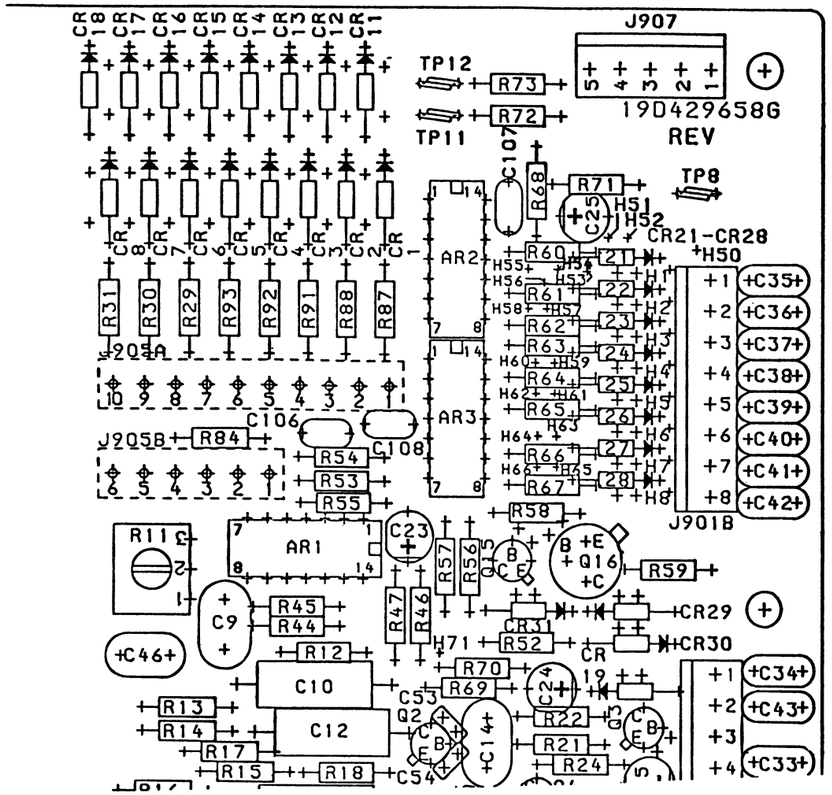
PARTS LIST

LBI30069E

CRYSTAL MODULE (5 PPM)
19B226962G1-G29, 31-34, 36

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - CRYSTAL MODULES - - - - - - - -
		NOTE: When reordering, give GE Part Number and specify exact transmitter or receiver frequency needed.
Y2601 thru Y2606		19B226962G1 Tx 29.7-36 MHz 19B226962G2 Tx 36-42 MHz 19B226962G3 Tx 42-50 MHz 19B226962G31 Tx 66-78 MHz 19B226962G32 Tx 77-88 MHz 19B226962G4 Tx 138-155 MHz 19B226962G5 Tx 150.8-174 MHz 19B226962G6 Tx 406-420 MHz 19B226962G28 Tx 420-450 MHz 19B226962G7 Tx 450-470 MHz 19B226962G8 Tx 470-494 MHz 19B226962G9 Tx 494-512 MHz 19B226962G10 Rx 29.7-36 MHz 19B226962G11 Rx 36-42 MHz 19B226962G12 Rx 42-50 MHz 19B226962G33 Rx 66-78 MHz 19B226962G34 Rx 77-88 MHz 19B226962G13 Rx 138-155 MHz 19B226962G14 Rx 150.8-174 MHz 19B226962G15 Rx 406-420 MHz 19B226962G29 Rx 420-450 MHz 19B226962G16 Rx 450-470 MHz 19B226962G17 Rx 470-494 MHz 19B226962G18 Rx 494-512 MHz 19B226962G19 Rx 138-155 MHz HIGH SIDE INJECT 19B226962G20 Rx 150.8-174 MHz HIGH SIDE INJECT 19B226962G21 Rx 406-420 MHz HIGH SIDE INJECT 19B226962G36 Rx 420-450 MHz HIGH SIDE INJECT 19B226962G22 Rx 450-470 MHz HIGH SIDE INJECT 19B226962G23 Rx 470-494 MHz HIGH SIDE INJECT 19B226962G24 Rx 494-512 MHz HIGH SIDE INJECT 19B226962G25 Rx 29.7-36 MHz ALTERNATE IF 19B226962G26 Rx 36-42 MHz ALTERNATE IF 19B226962G27 Rx 42-50 MHz ALTERNATE IF
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C2		Capacitor, compensating. (Factory selected to match crystal characteristics).
C3	19A134633P1	Variable, glass: 2 to 14 pf, 500 VDCW; sim to Sprague-Goodman GSG185A.
		- - - - - - - - - - CRYSTALS - - - - - - - - - -
Y1		Crystal. (Not Field replaceable).
		COMPONENT BOARD 19B226849G1
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C4		(Part of printed board 19B226850P1).
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1	5495769P19	Silicon, variable capacitance, 34 pf nominal.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J1	19A116659P6	Connector, printed wiring: 6 contacts; sim to Molex 09-52-3061.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R152P563J	Composition: 56K ohms ±5%, 1/4 w.
R2	3R152P153J	Composition: 15K ohms ±5%, 1/4 w.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19B227397P1	Shield. (Y1).
	19A121175P39	Insulator, plate. (Used with C4).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



SYSTEM BD 19D429658 (ENLARGED)

THESE INSTRUCTIONS COVER MODIFICATION TO SYSTEM BD 19D429658 TO DISABLE VEHICULAR REPEATER ON MOBILE FREQUENCY POSITION WHERE NOT REQUIRED.

(3)

1. IF VEHICULAR REPEATER IS NOT REQUIRED ON ALL MOBULE FREQUENCY POSITIONS, ADD JUMPERS TO H51 THRU H66 TO H71 ON FREQUENCY LEADS OF SYSTEM BD 19D429658 CORRESPONDING TO FREQUENCY POSITIONS NOT CALLING FOR VEHICULAR REPEATER. SEE TABLE BELOW FOR LIST OF HOLES CONNECTED TO FREQUENCY LEADS. EXAMPLE: F2, F4 & F7 ARE OPEN. ADD JUMPERS FROM H71 TO H64, H63 TO H58 AND H57 TO H54.

FREQ POSITION	HOLES
F1	H51, H52
F2	H53, H54
F3	H55, H56
F4	H57, H58
F5	H59, H60
F6	H61, H62
F7	H63, H64
F8	H65, H66

(19C328722, Rev. 2)

THESE INSTRUCTIONS COVER MODIFICATIONS REQUIRED TO SYSTEMS BD 19D429658 WHEN OPTIONAL CHANNEL GUARD MODULE (OPTION 2703) 19C321017 IS INSTALLED.

(1)

1. REMOVE DIODES FROM MATRIX CR11 THRU CR18 ON SYSTEMS BD 19D429658 CORRESPONDING TO MOBILE FREQUENCY POSITION REQUIRING THE CG MODULE. SEE TABLE BELOW FOR PROPER DIODE TO REMOVE. EXAMPLE: MOBILE CG DECODER IS REQUIRED ON F2 (RB), F4 (RD) & F7 (RG). REMOVE DIODES CR12, CR14, & CR17.

FREQ POSITION	DIODES
1 (RA)	CR11
2 (RB)	CR12
3 (RC)	CR13
4 (RD)	CR14
5 (RE	CR15
6 (RF)	CR16
7 (RG)	CR17
8 (RH)	CR18

THESE INSTRUCTIONS COVER MODIFICATIONS REQUIRED TO SYSTEM BD 19D429658 WHEN OPTIONAL MOBILE DETECTOR (OPTION 2704) IS INSTALLED.

(2)

1. REMOVE DIODES FROM MATRIX CR1 THRU CR8 ON SYSTEM BOARD 19D429658 CORRESPONDING TO MOBILE FREQUENCY POSITIONS REQUIRING THE MOBILE DETECTOR. SEE TABLE BELOW FOR PROPER DIODE TO REMOVE.

FREQ POSITION	DIODE
1	CR1
2	CR2
3	CR3
4	CR4
5	CR5
6	CR6
7	CR7
8	CR8

2. IF MOBILE DETECTOR FREQUENCIES ARE REPEATED, ADD JUMPERS TO H51 THRU H66 ON FREQUENCY LEADS OF SYSTEM BOARD 19D429658 TO STRAP SICOM TO MORE THAN ONE POSITION. SEE TABLE BELOW FOR LIST OF HOLES CONNECTED TO FREQUENCY LEADS. EXAMPLE: F2, F4 & F7 ARE TO BE STRAPPED, ADD DA JUMPERS FROM H54 TO H57 AND FROM H58 TO H63.

FREQ POSITION	HOLES
F1	H51, H52
F2	H53, H54
F3	H55, H56
F4	H57, H58
F5	H59, H60
F6	H61, H62
F7	H63, H64
F8	H65, H66

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 - System Board 19D429658G1

To assure proper keying of mobile transmit relay driver. Changed R55. Old part number was:

R55: 3R152P103J - Composition: 10K ohms ±5%, 1/4 w.

REV. B - To correct drive to Channel Guard versatones. Changed R28. Old part number was:

R28:. 3R152P103J - Composition: 10K ohms ±5%, 1/4 w.

REV. C - To improve operation of squelch circuit. Added R106 and R107 and changed C19. R106 and R107 are connected between U2-7 and the 10 volt supply and U3-7 and the 10 volt supply at a convenient location. Old part number was:

C19: 19A134202P110 - Tantalum: 22 uF ±10%, 35 VDCW.

REV. D - System Board 19D429658G1

To increase VOL/SQ HI level to modulate the Vehicular Repeater transmitter in Delta applications. Changed Q1 from an emitter-follower to a PNP gain stage, changed R2 and added R108 from C1 to base of Q1. Old part numbers were:

Q1: 19A115910P1 - Silicon, NPN; sim to Type 2N3904.

R2: 3R152P513J - Composition: 51K ohms ±5%, 1/4 w.