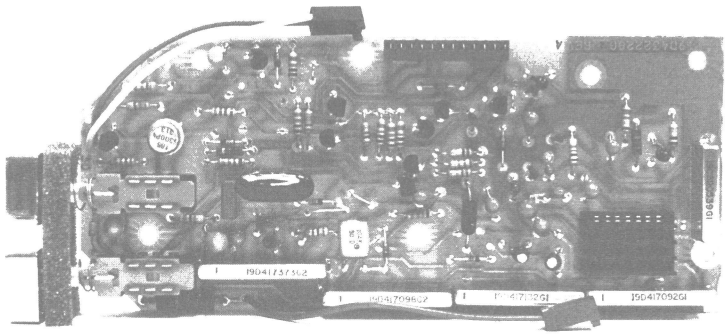
MOBILE RADIO

MAINTENANCE MANUAL

SOLID STATE TYPE 99 TONE DECODERS EXTERNAL ALARM RELAY KIT



SPECIFICATIONS *

Tone Frequencies	288.5 Hz to 1433.4 Hz
Frequency Stability	±0.4%
Alert Tone	1150 ±300 Hz Interrupted Tone (600 Millivolts P-P Minimum at Volume/Squelch Hi)
Current Drain	
Standby	60 Milliamperes Maximum
Decoded	70 Milliamperes Maximum
During Alert	80 Milliamperes Maximum
Temperature Range	-30°C to 70°C (-22°F to 158°F)
Voltage Requirements	13.8 ±20% VDC

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

GENERAL ELECTRIC

Maintenance Manual LBI30939D
DATAFILE FOLDER — DF5051

TYPE 99 TONE DECODERS
EXTERNAL ALARM RELAY KIT

TABLE OF CONTENTS

WARNING

No one should be permitted to handle any portion of the equipment that is supplied with high voltage; or to connect any external apparatus to the units while the units are supplied with power. KEEP AWAY FROM LIVE CIRCUITS!

High-level RF energy in the transmitter Power Amplifier assembly can cause RF burns. KEEP AWAY FROM THESE CIRCUITS WHEN THE TRANSMITTER IS ENERGIZED!

DESCRIPTION

The Type 99 Decoder is a solid state sequential tone decoder mounted on a single printed wiring board that plugs onto the interconnect board in the Phoenix-S, SX or Century II mobile radios. Two different systems can be provided; a two-tone system for individual call and a four-tone system for individual, group and super group call. A wire jumper is installed so that the four-tone system is strapped allowing only two-tone operation. The decoder capability responds to tone codes within the range of 288.5 to 1433.4 Hz and uses Versatone networks to determine the tone frequencies. The decoder will operate with encoders that provide two tone sequential signaling. These include the General Electric Type 99 16 and 64 call and Dial Paging Encoders (100, 400 and 900 call).

Type 99 Decoders may be provided as original equipment, factory installed or as an option kit to be installed in the field. The Type 99 decoder is provided in two groups. Decoder 19D432228G1 is used in Century II radios and decoder 19D432228G2 is used in Phoenix-S, SX radios.

The component board, in addition to the Versatone networks, is comprised of discrete components and five integrated circuits (IC's). The number of tone networks used is dictated by the option employed i.e., two-tone or four-tone. The IC's consist of the following:

U1701 - Limiter Detector

U1702 - Selective Amplifier

U1703 - Control

U1704 - 4-Tone Search

U1705 - Interface Control

F1701 thru F1704 - Versatone Networks

OPERATION

CALL RESET

The CALL RESET switch is a two position push-push switch which, by controlling the decode function, allows the user to select operation with Type 99 decode and Channel Guard or with Channel Guard alone. It also allows the user to reset the CALL indicator without removing the microphone from the microphone hookswitch.

For normal operation the CALL RESET switch is left in the "out" position. This allows only radio calls with the correct Type 99 tone code to be heard. When a call is received the CALL light will turn on and the decoder will provide an interrupted 1150 Hz Alert tone that is chopped at a 100 Hz per minute rate and controlled in level by the volume control. When the switch is "in" the Type 99 decode function is disabled and unless Channel Guard is present, all calls transmitted on the operating frequency are heard. The CALL indicator will remain out when the CALL RESET switch is "in".

NOTE

The CALL RESET switch operates independently of the Monitor Reset switch. Unlike the Monitor Reset switch which disables both Type 99 and Channel Guard decoders, the CALL RESET switch disables only the Type 99 decode function.

To reset the CALL indicator push the CALL RESET switch in -- push again to release.

EXTERNAL ALARM SWITCH (OPTIONAL)

The EXTERNAL ALARM switch allows the user to select the external alarm function. When the alarm function is selected (switch "in"), receipt of a properly tone coded call will actuate the external alarm -- horn on light. The alarm is turned off by removing the microphone from the microphone holder or by resetting the decoder.

MONITOR/RESET

The Monitor/Reset switch on the microphone holder controls receiver operation. For normal operation the Monitor/Reset switch is placed in the "down" position, allowing only radio signals coded with the specific Type 99 on Channel Guard tones (if used) to be heard. When in the monitor position (switch toward speaker symbol). All calls transmitted on the operating frequency are heard.

The hookswitch parallels the Monitor/Reset switch so that when the microphone is removed from the holder, the receiver reverts to normal noise squelch operation and the decoder circuits are automatically reset.

CIRCUIT ANALYSIS

FOUR-TONE OPERATION (Refer to Schematic Diagram)

The input audio is amplified and limited ahead of the selectivity. The frequency-switchable selective-amplifier (FSSA) will only pass a narrow band of frequencies predetermined by the selected Versatone Network. The output of the FSSA is amplified and fed to the Threshold Detector. Before a correct first tone is received, the FSSA continuously searches tone A1 and A2 at approximately 500 milliseconds per tone.

The Control IC controls the OR gates in the 4-Tone Search IC that select the Versatone networks. The active Versatone network determines the tone frequency that the Selective Amplifier responds to. A free running FF in the 4-Tone Search IC alternately enables two pairs of OR gates: 1,2 and 3,4 to complete the search of all four possible tone combinations. Tone combinations decoded are: A1-B1, A1-B2, A2-B1, A2-B2. With 4-tone operation, the DA jumper wire between H3 and H4 is omitted.

The 2nd tone switch in the Control IC provides +5.0 V to OR gates 2 and 4 in the 4-Tone Search IC via pin 14. Since +5 V on either input of the OR gates prevent selection of the associated Versatone network, the B tones are not selected.

At the same time the 1st tone switch in the Control IC provides A- to "A" tone OR gates 1 and 3 in the 4-Tone Search IC via pin 10. Thus, when the free running FF alternately applies A- to OR gate pairs 1,2 and 3,4 only the A tone gates are enabled. As each "A" tone gate is enabled A- is applied to the associated Versatone network. This allows the Selective Amplifier to respond to that tone frequency.

The input tone (taken from the Volume/ Squelch Hi) is applied to the Limiter/ Threshold Detector IC. The tone is then limited and applied to pin 12 of the Selective Amplifier. If the tone corresponds to the selected Versatone the Selective Amplifier applies the tone to the Threshold Detector. The Threshold Detector provides 4.7 V to pin 5 of the 4-Tone Search IC. This turns on the FF lock and stops the free running FF. This voltage is also applied to the 2nd tone search timer, the 1st tone clamp and the "B" input of the decode gate in the Control IC. The 4.7 V sets the 2nd tone search timer; however, the 1st tone clamp prevents it from starting its 1.5 second run until the "A" tone ends.

The decode gate requires A- on the "A" input and a positive voltage on the "B" input to provide a timed output. When the decode gate receives a positive input voltage on the "B" input as a result of the first tone, it is still disabled by 5.0 V on the "A" input received from the 2nd tone switch.

At the end of the "A" tone, the 2nd tone search timer initiates the 1.5 second run enabling the 2nd tone switch to supply A- to pin 14 of the 4-Tone Search IC, the 1st tone switch, and the "A" input of the decode gate in the Control IC. The input from the 2nd tone switch enables the 1st tone switch to supply 5.0 V to pin 10 of the 4-Tone Search IC and to the 2nd tone clamp. The 2nd tone clamp then disables the 1st tone clamp in the Control IC.

The FF lock unlatches and starts the free running FF again but now the free running FF alternately supplies A- to OR gates 2 and 4 which enable tone networks B1 and B2. Circuit operation is the same as that described above for "A" tone selection.

When a proper second tone is received, the Selective Amplifier supplies the tone to the Threshold Detector which then applies 4.7 V to pin 5 of the 4-Tone Search IC. This turns on the FF lock and stops the free running FF.

This voltage is also applied to the "B" input of the decode gate in the Control IC. If the "B" tone occurs within 1.5 seconds of the "A" tone, the "A" input of the decode gate remains at A- by the 2nd tone switch. A- is applied to the "A" input and the positive voltage at "B" opens the decode gate and provides a timed output to the relay driver and to the alert tone mute switch Q1406 and Q1407. It also starts the alert tone oscillator in the Control IC.

The decode gate in the Control IC turns on the decode latched gate and the alert tone mute gate to provide 5.2 V at pin 11 and 2.8 V at pin 12. Either of these outputs may be used to control the optional external relay. Latched or timed output is determined by a strapping arrangement between H9, H10, H11 and H12. Refer to Schematic Diagram for connection data. The output of the decode latched gate also is applied to the Interface IC via pin 12 and turns on the CALL indicator and turns off the receiver mute switches. A- is supplied by indicator switch in the Interface IC to the CALL light, turning it on. The receiver mute switch removes A- from pin 14 of the Interface IC to allow the receiver to return to noise squelch operation.

The timed output of the Control IC turns on the alert tone oscillator which in turn provides an 1150 Hz tone to the tone amplifier in the Interface IC via pins 15 and 2 respectively. A free running FF within the Interface IC controls the alert tone switch which turns the tone amplifier on and off at a 100 Hz per minute rate to provide the alert tone burst at pin 5 of the Interface IC. The alert tone is then buffered and applied to the audio circuits via Volume/ Squelch Hi out at P1706-1.

TWO-TONE OPERATION

Two-Tone operation uses two Versatone networks and limits the number of tone paths to one, A1-B1.

Except for presence of jumper H3-H4 which alters operation of the 4-Tone Search IC, operation of the 2-Tone Decoder is identical to the 4-Tone Decoder described above. In 2-tone operation a DA jumper wire connected between H3 and H4 locks the free running FF. With the free running FF locked, OR gates 1 and 2 are continuously enabled; thus the 1st tone switch in the Control IC selects only the A1 Versatone via OR gate 1 and 2nd tone switch selects only the B1 Versatone via OR gate 2.

PRE-DETERMINED SIGNALLING PATHS

The 4-Tone Decoder normally has four signalling paths: A1-B1, A1-B2, A2-B1, and A2-B2. The number of signalling paths can be limited to two, A1-B1, and A2-B2 by removing the jumper between H6 and H7, and adding a jumper between H5 and H6. This stops the free running FF after the first tone, preventing the 4-Tone Search IC from searching the "B" tone. Thus, if A1 is the first tone, B1 must be the second. Likewise, if A2 is the first tone, B2 must be the second.

CALL RESET SWITCH

The CALL RESET switch allows the user to reset the external alarm and call indicator and to select a mode of operation. If the switch is left depressed, it will disable the Type 99 decoder but does not disable Channel Guard (if present).

Pressing the CALL RESET switch in applies A- to the indicator and Rx mute switches in Interface Control IC U5 through diode D1710. This action resets CALL indicator. A- is also applied to U5-13 turning off the monitor and Rx mute switch and allowing the Rx mute line to go high, disabling the Type 99 decoder. Therefore, if the switch is left in the depressed position, the Type 99 decoder will not control radio reception. Channel Guard operation however, is not affected.

The CALL RESET switch is released for normal operation with the Type 99 decoder.

ALERT TONE MUTE/ALARM BUFFER

Alert tone muting transistors Q1706 and Q1707 function as a muting switch to control tone switch Q1708. When the proper sequential tones have been decoded 2.8 V from the alert tone mute in the control IC turns on the alert tone oscillator and Q1706. Q1706 turns mute switch Q1707 off which then removes A- from the base of alert tone switch Q1708 allowing the alert tone to appear at the Volume/Squelch Hi out P1706-1. It also interrupts the emitter return path for Alarm Buffer Switch Q1709, causing its emitter voltage to exceed the cutoff point. With Q1709 turned off all received audio from the FM detector is blocked from entering the audio circuits.

In the absence of the proper sequential tones, Q1706 is turned off and Q1707 is turned on. Q1707 applies A- to the base of Q1708, turning it off. Alarm Buffer switch Q1707 conducts to complete the audio path.

EXTERNAL ALARM/RELAY DRIVER

The external alarm circuitry consists of relay drivers Q3, Q4, timed alarm switch Q2 the external alarm switch and external relay. The alarm switch and external relay are both options. The external alarm operates in either a latched or timed mode as determined by strapping between holes H9-H12. Refer to the schematic diagram for strapping information.

Timed relay operation activates the external alarm circuit (for approximately 0.5 to 3 seconds) during receipt of the second sequential tone. The duration of the alarm is dependant upon whether the decoder is strapped for 2 tone or 4 tone operation and the duration of the second tone.

Latched operation activates the external alarm during receipt of the second sequential tone and holds it until the decoder is manually reset. The decoder is automatically reset when the microphone is removed from the microphone holder or by momentarily operating the CALL RESET switch.

OPERATION WITH CHANNEL GUARD

When Type 99 and Channel Guard decoders are both present in a system, two types of operation can be provided:

- Type 99 AND Channel Guard
- Type 99 OR Channel Guard

Operation in either mode is determined by strapping. Refer to the Type 99 Decoder and Interconnect Schematic Diagrams for proper connection data.

Type 99 Decode AND Channel Guard

When the microphone is on-hook, both Channel Guard and Type 99 tones must be present to unmute the receiver and allow it to revert to normal noise squelch operation. A call is indicated when the CALL light is on and the alert tone (1150 Hz tone bursts) sounds. Should a valid Type 99 tone be received simultaneously with an incorrect channel guard tone the CALL light will turn on but the alert tone will not sound. In this case, reset the Type 99 Decoder and CALL light using the MON/RESET switch on the microphone holder. The receiver mute switch at pin 14 of the Interface IC is connected directly to the receiver mute line by strap H15-H17 on the decoder component board and through the interconnect board to the Channel Guard board. Since A- on the receiver mute lead will mute the receiver, both the Channel Guard and the T99 tones must be present to allow the receiver to revert to noise squelch operation. If either tone is missing the receiver mute lead will be held low and the receiver will remain muted.

Type 99 Decode OR Channel Guard

In the OR configuration, receipt of either a valid channel guard tone or Type 99

sequential tones will unmute the receiver and allow it to revert to noise squelch operation.

When operating with Type 99 Decoders OR Channel Guard an inverter is used between the receiver mute output at pin 14 of the Interface IC and the Channel Guard disable input at J905-10.

When the proper Type 99 tones are received, the receiver mute switch in the Interface IC removes A- from the base of inverter Q1705. Q1705 conducts and supplies A- to P1706-6 to disable Channel Guard and allow the receiver to revert to noise squelch operation. When the proper Type 99 tones have not been received Q1705 is biased off by the receiver mute switch which effectively removes it from the circuit.

INSTALLATION

External Relay Kit (Option SU01)

The external relay kit 19B226025G4 consists of a relay, diode, and fused lead. Refer to the Installation Diagram for instructions.

MAINTENANCE

A Troubleshooting Diagram (Figure 1) and associated procedures contain typical voltage data taken at selected points on the Decoder board to expedite maintenance.

REMOVING INTEGRATED CIRCUITS

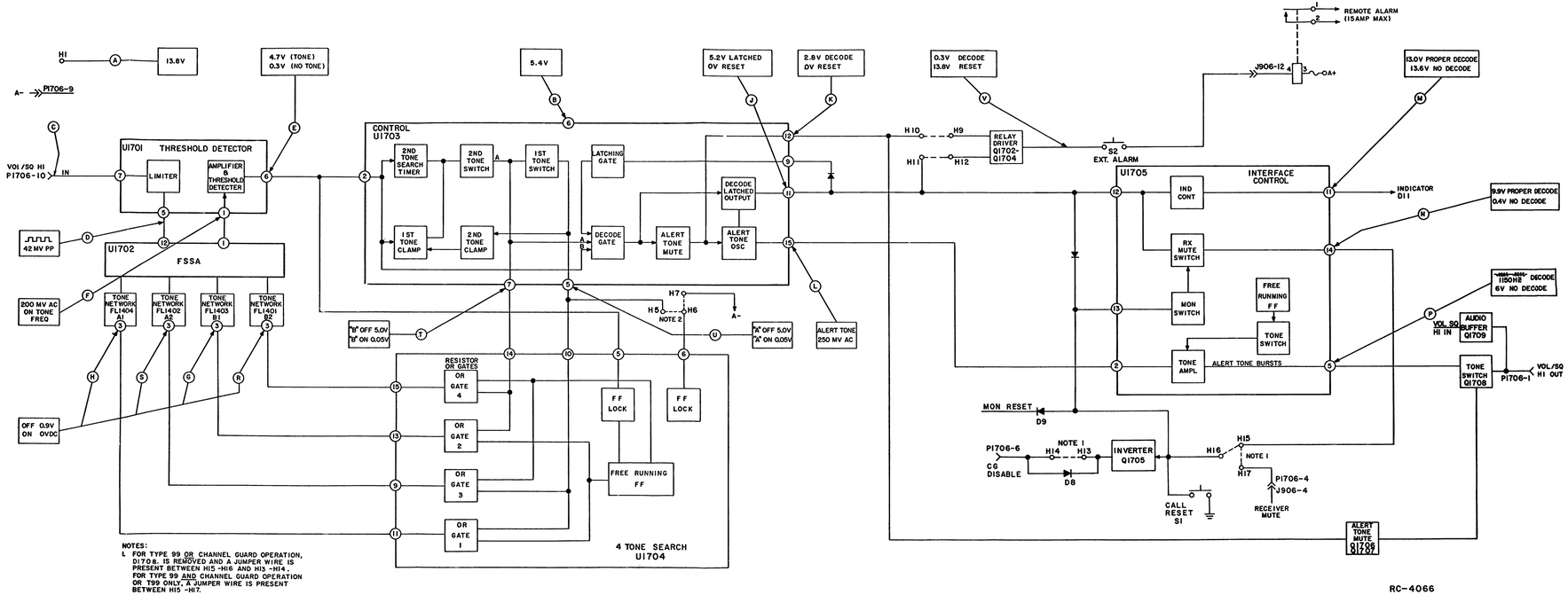
Removing IC's (and all other soldered in components) can be easily accomplished by using a de-soldering tool such as the SOLDA-PULLT® or equivalent. To remove an IC, heat each lead separately on the solder side with the de-soldering tool.

An alternate method is to use a special soldering tip that heats all pins simultaneously.

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

GENERAL ELECTRIC*
U.S.A.

SYMPTOM	STEP	TEST POINT	ACTION
Unit does not decode	1		Connect U1704-4 to ground. This stops the free running FF and allows the decoder to be checked as a two tone decoder. Tone networks may be checked by substitution.
	2	(A)	Check for +13.8 V (battery) between H1 (A) and P1706-9.
	3	(B)	Check for +5.4 V (B) .
	4	(D)	Apply correct Type 99 tone to P1706-10 (C) at a level sufficient to cause limiting at (D) . Approximately 100 mV.
	5	(E)	Check for 4.7 V.
	6	(F)	If (E) is incorrect check for 200 mV AC.
	7	(G)(H)	If Selective Amplifier appears to be defective, before replacing check: 1) XFL1701 for proper contact. 2) Versatone switching voltages at (G) and (H) . 3) Replace FL1701 (may be interchanged with FL1702).
	8	(E)	If the switching voltages at (F) and (G) are incorrect, connect pin 3 of FL1701 to ground. Remove FL1702. Repeat step 5.
	9	(H)(S)	Remove ground connection from U1704-4. With no tone applied, monitor switching voltages at (H) and (S) . If FF is not switching check: 1) Timing capacitors C1709 and C1720. 2) Replace U1704.
	10	(G)(H)	If 4.7 V is present at (E) , monitor the switching voltages at (G) and (H) with no tone and then a continuous "A" tone. Remove tone and verify that voltages at (G) and (H) reverse for approximately 1.5 seconds. If this sequence is correct proceed to step 11. If the switching voltages are incorrect, check: 1) XFL1702 and replace FL1702. 2) 4.7 V across C1717 during the "A" tone. If no voltage replace C1717. If still no voltage replace U1703. 3) Check for shorts on U1703. 4) Replace U1703.
	11	(F)	If the response at (E) is correct, a decode indication (0.05 V) should be present at (F) during the second tone. If decode does not occur replace U1707.
	12	(J)(K)(L)	Check performance at (J)(K)(L) . Replace U1702 if any test point fails to respond properly.
Receiver does not mute.	13	(M)(N)	Check performance at (M)(N) . Replace U1705 if test point indication is incorrect. If indicator does not light, replace D11. Verify proper strappping at H15, H16 and H17.
Alert tone not heard.	14	(P)	Check performance at (P) . If indication is incorrect, replace U1705. Check Q1708.
Alert tone does not reset.	15	(K)	Check for A- (0.6 V or less) at base of Q1708. If indication is incorrect recheck conditions at (K) . If (K) is normal check and replace Q1706 and/or Q1707 as necessary.
External relay circuit does not respond.	16	(K)(J)(V)	Check line fuse between battery and external relay. Verify proper strapping at H9 thru H12. Recheck indications at (J) and (K) . Verify indications at (V) . If battery voltage is present, replace relay drivers Q1702, Q1703 and Q1704 as required. If A- (0.5 or less) is present check EXTERNAL ALARM switch and relay K1.

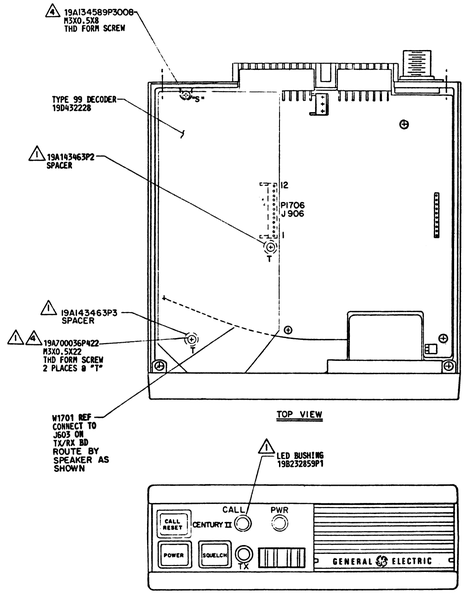


RC-4066

TROUBLESHOOTING PROCEDURE

TYPE 99 TONE DECODER

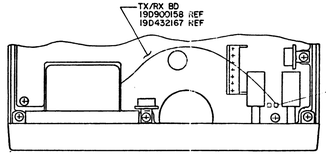
EXTERNAL ALARM SWITCH



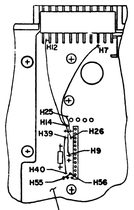
TOP VIEW

INTERCONNECT/MULTI-FREQ BD'S CONNECTION CHART

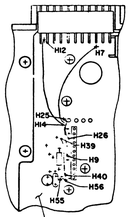
FROM	TO	ADD	DELETE	WIRE & INSTRUCTION
H7	H9	X		SW22-W ⚠1
H12	H14	X		SW22-W ⚠1
H39	H40	X		SW22-W ⚠1
H25	H26		X	
H55	H56		X	



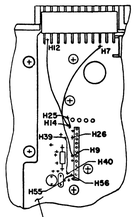
BOTTOM VIEW



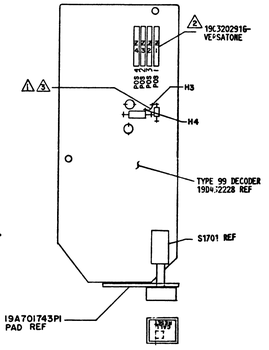
INTERCONNECT BD
19D900158 REF
SEE INTERCONNECT/MULTI-FREQ
BD'S CONNECTION CHART



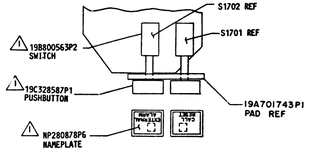
4 FREQ BD
19D903128 REF
SEE INTERCONNECT/MULTI-FREQ
BD'S CONNECTION CHART



6 FREQ BD
19D900126 REF
SEE INTERCONNECT/MULTI-
FREQ BD'S
CONNECTION CHART



COMPONENT VIEW



EXT ALARM SWITCH-T99 DEC

NOTES:

⚠1 PART OF SWITCH KIT 19A143490

TYPE 99 DECODER, 2 TONE

NOTES:

⚠1 PART OF HARDWARE KIT PL19AI43894

⚠2 PLUG THE VERSATONE ELEMENTS IN THE POSITIONS INDICATED ON THE "SELECTIVE CALLING SYSTEM REQUISITION WORK SHEET".

⚠3 ADD DA JUMPER ON TYPE 99 DECODER BOARD BETWEEN H3 AND H4 FOR 2 FREQ OPERATION

⚠4 RELOCATE ONE 19AI34589P3008 SCREW AT "T" TO "S" AND REPLACE WITH 19A700036P422 SCREW.

TYPE 99 DECODER, 4 TONE

SAME AS PART 19, EXCEPT NOTE 3 DOES NOT APPLY.

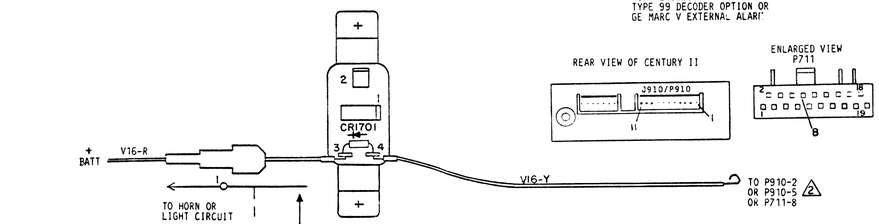
INSTALLATION DIAGRAMS

TYPE 99 DECODER/EXTERNAL ALARM SWITCH AND EXTERNAL RELAY

(19D432543, Sh. 5, Rev. 4)

EXTERNAL RELAY

THESE INSTRUCTIONS COVER THE FIELD INSTALLATION OF EXTERNAL RELAY KIT PL19B226025G4 FOR CENTURY II TYPE 99 DECODER OPTION OR GE MARC V EXTERNAL ALARM.



INSTRUCTIONS:

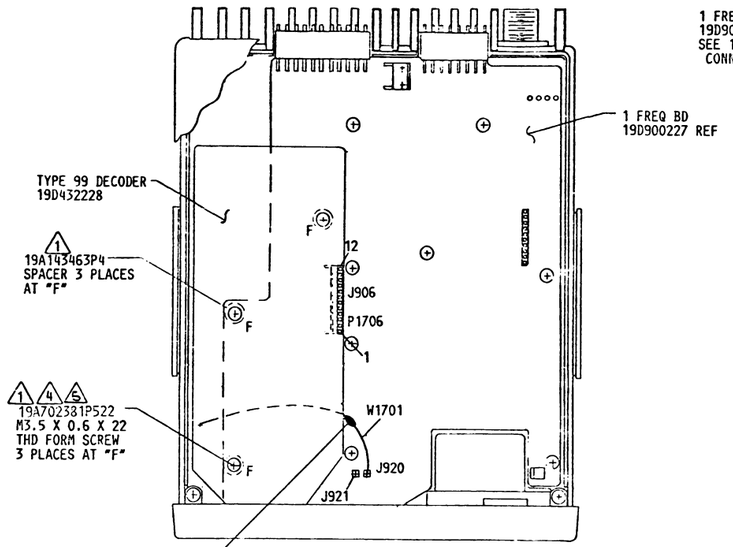
1. FASTEN RELAY IN DESIRED LOCATION USING SELF TAPPING SCREWS:

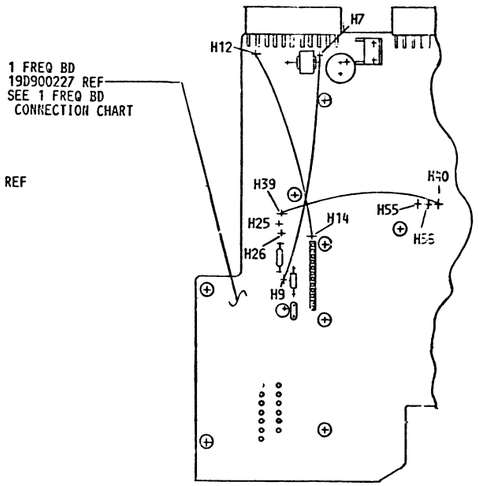
⚠1 RUN YELLOW LEAD ATTACHED TO LUG 4 OF RELAY, TO P910-2 (TYPE 99 DECODER) OR P910-5 (GE MARC V EXT ALARM) OF POWER CABLE ON THE REAR OF THE RADIO. INSERT THE CONTACT ON LEAD FLAT SIDE DOWN INTO APPROPRIATE HOLE IN P910 UNTIL IT LOCKS. FOR TRUNK MOUNT GE MARC V CENTURY II, CONNECT TO P711-8 IN CONTROL UNIT.

3. CUT RED FUSED LEAD SO FUSE ASSEMBLY IS CLOSE TO VOLTAGE SOURCE. ATTACH THE SOLDERLESS TERMINAL WITH THE 0.197 INCH HOLE TO THE END OF THE LEAD GOING TO THE RELAY. USING #8-32 X 5/16 LG HARDWARE ATTACH THE TERMINAL TO LUG 3 OF THE RELAY. ATTACH OTHER END OF FUSED LEAD TO VOLTAGE SOURCE WITH APPROPRIATE HARDWARE.

4. CONNECT HORN OR LIGHT CIRCUIT TO LUGS 1 AND 2 OF RELAY.

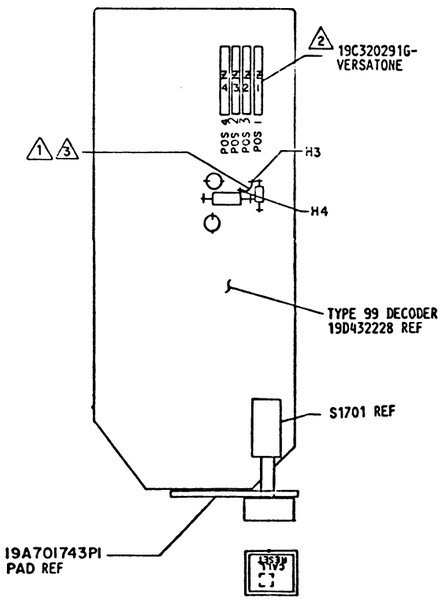
(19D233073, Rev. 3)





1 FREQ BD CONNECTION CHART

FROM	TO	ADD	DELETE	WIRE & INSTRUCTION
H7	H9	X		SN22-W 1
H12	H14	X		SN22-W 1
H39	H40	X		SN22-W 1
H25	H26		X	
H55	H56		X	
W1701	J920			CONNECT



COMPONENT VIEW

TYPE 99 DECODER, 2 TONE

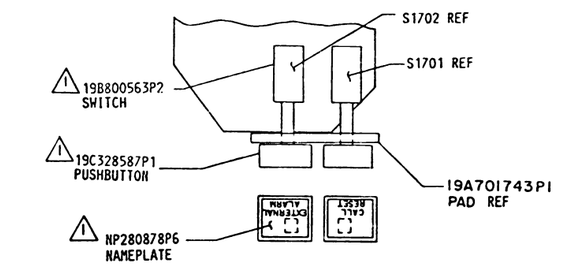
1. PART OF HARDWARE KIT 19A143894
2. PLUG THE VERSATONE ELEMENTS IN THE POSITIONS INDICATED ON THE "SELECTIVE CALLING SYSTEM REQUISITION WORK SHEET."
3. ADD DA JUMPER ON TYPE 99 DECODER BOARD BETWEEN H3 AND H4 FOR 2 FREQ OPERATION.
4. DISCARD THREE 19A702381P508 SCREWS AT "F" AND REPLACE WITH 19A702381P522 SCREWS.
5. DIP ENDS OF THD FORMING SCREWS INTO LUBRICANT 19A115204P1 BEFORE INSTALLING IN CASTING.

TYPE 99 DECODER, 4 TONE

SAME EXCEPT

NOTE 3 DOES NOT APPLY. DISCARD EXTRA JUMPER.

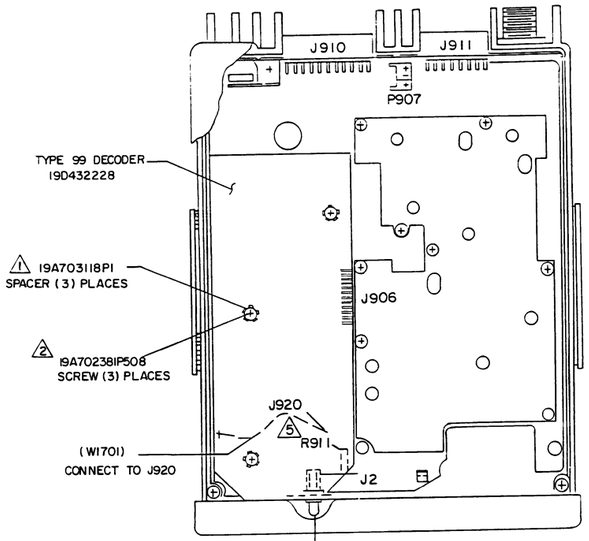
(19D900218, Sh. 3, Rev. 3)



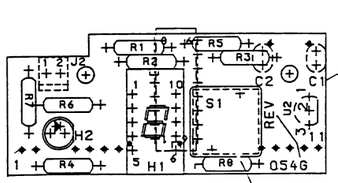
EXT ALARM SWITCH-T99 DEC

NOTES:

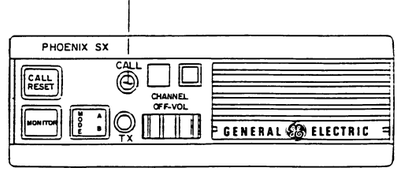
1. PART OF SWITCH KIT 19A143490



WHEN UNIT IS 19D900908P1)



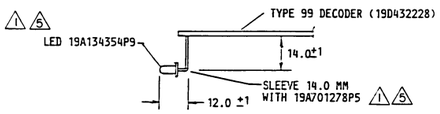
DISPLAY BOARD
VIEW AT "A"

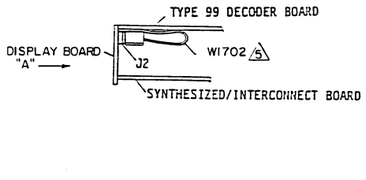


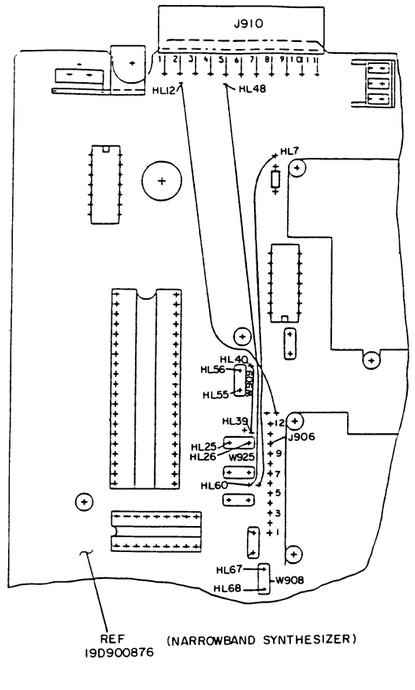
REF
19D901054

SYNTHESIZED / INTERCONNECT BD'S CONNECTION CHART

FROM	TO	ADD	DELETE	WIRE & INSTRUCTION
HL7	HL9	X		SN22-W 1
HL12	HL14	X		SN22-W 1
HL39	HL40	X		SN22-W 1
HL25	HL26		X	W905
HL55	HL56		X	W909
HL48	HL60	X		SN22-W 1
W1701	J920			CONNECT
W1702	J2			CONNECT
HL67	HL68		X	W908

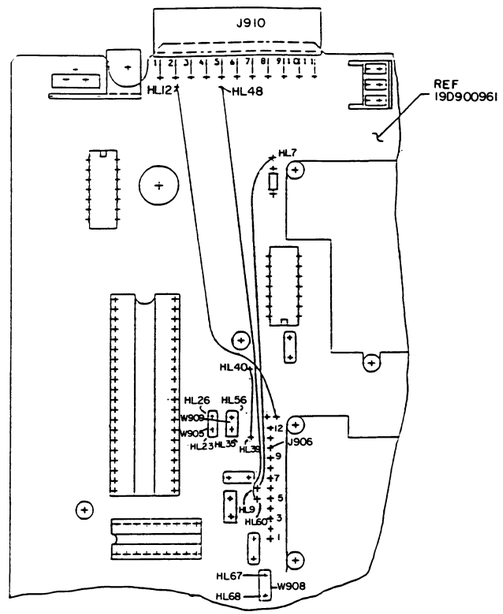


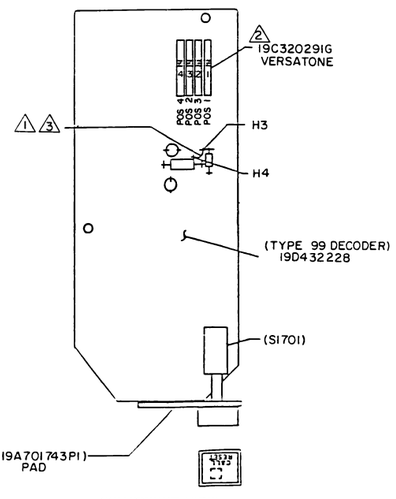




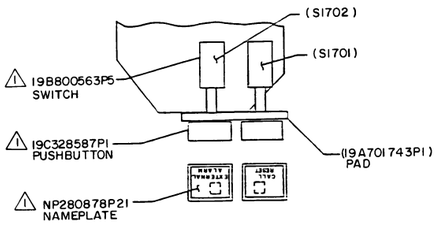
REF
19D900876

(NARROWBAND SYNTHESIZER)





COMPONENT VIEW



EXT ALARM SWITCH-T99 DEC

NOTES:

1 PART OF SWITCH KIT 19A143490

RC-4421

NOTES:

1 PART OF HARDWARE KIT PL19A143894.

2 PLUG THE VERSATONE ELEMENT IN THE POSITIONS INDICATED ON THE "SELECTIVE CALLING SYSTEM REQUISITION WORK SHEET".

3 ADD DA JUMPER ON TYPE 99 DECODER BOARD BETWEEN H3 AND H4 FOR 2 FREQ. OPERATION. (2 TONE ONLY).

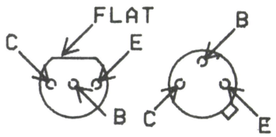
4 WHEN USED IN MULTI FREQ. RADIO REMOVE R911 FROM SYNTHESIZED/INTERCONNECT BOARD AND R8 FROM DISPLAY BOARD.

5 WHEN USED 1 OR 2 FREQUENCY RADIOS FROM SYN/INTC BD. AND REMOVE W1702 FROM TYPE 99 DECODER 19D432228 AND INSTALL LED 19A134354P9 AS SHOWN.

INSTALLATION DIAGRAM

TYPE 99 DECODER/EXTERNAL ALARM SWITCH (19D901052)

LEAD IDENTIFICATION
FOR Q1-Q10

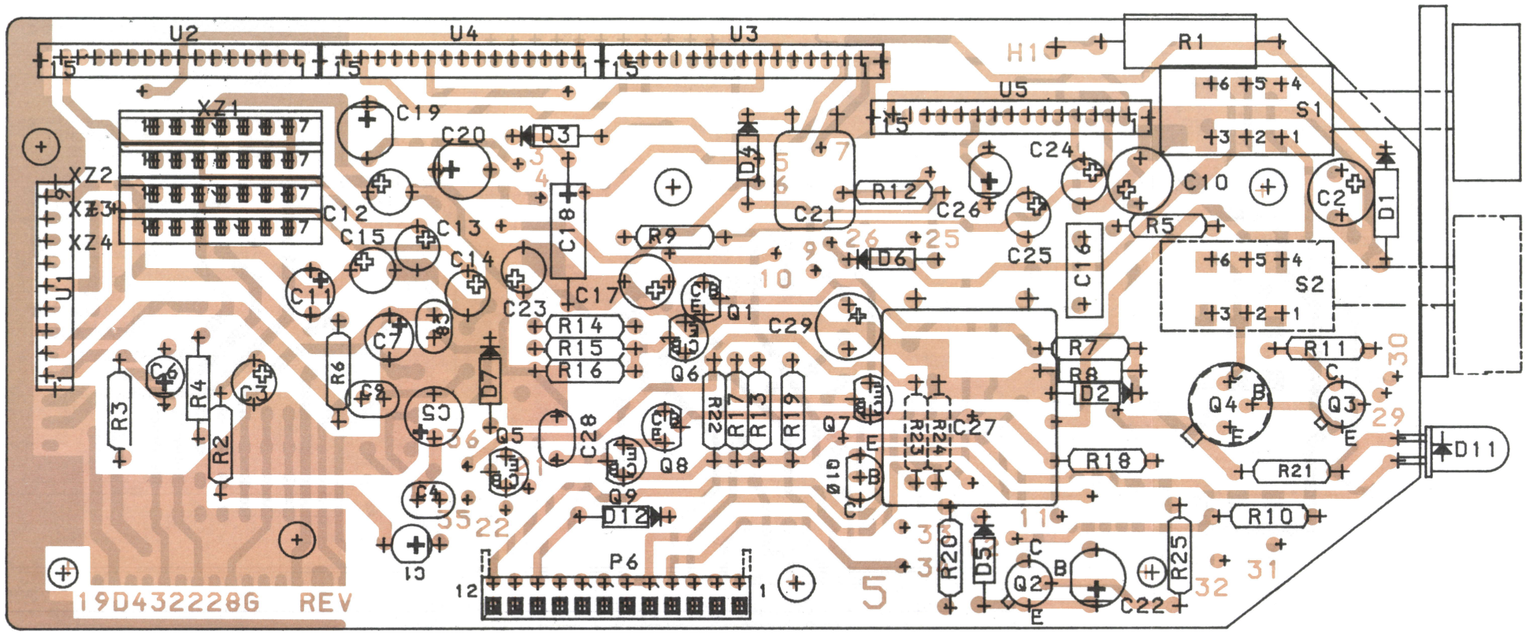


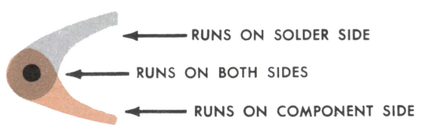
OR

IN-LINE TRIANGULAR

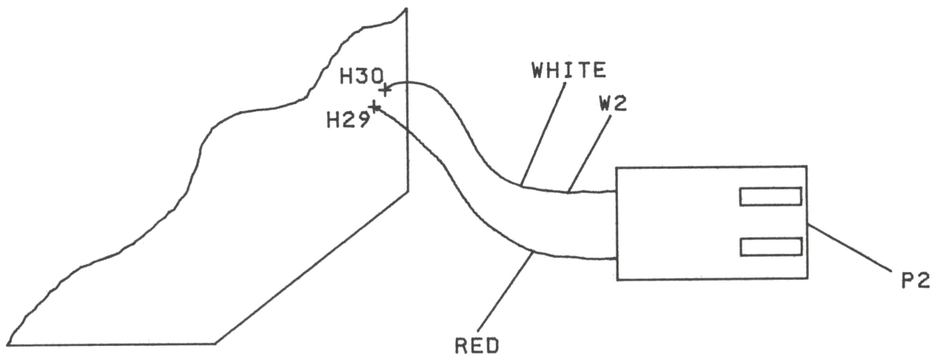
TOP VIEW

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





FOR GROUP 1



FOR GROUP 2 & 3

CALL RESET

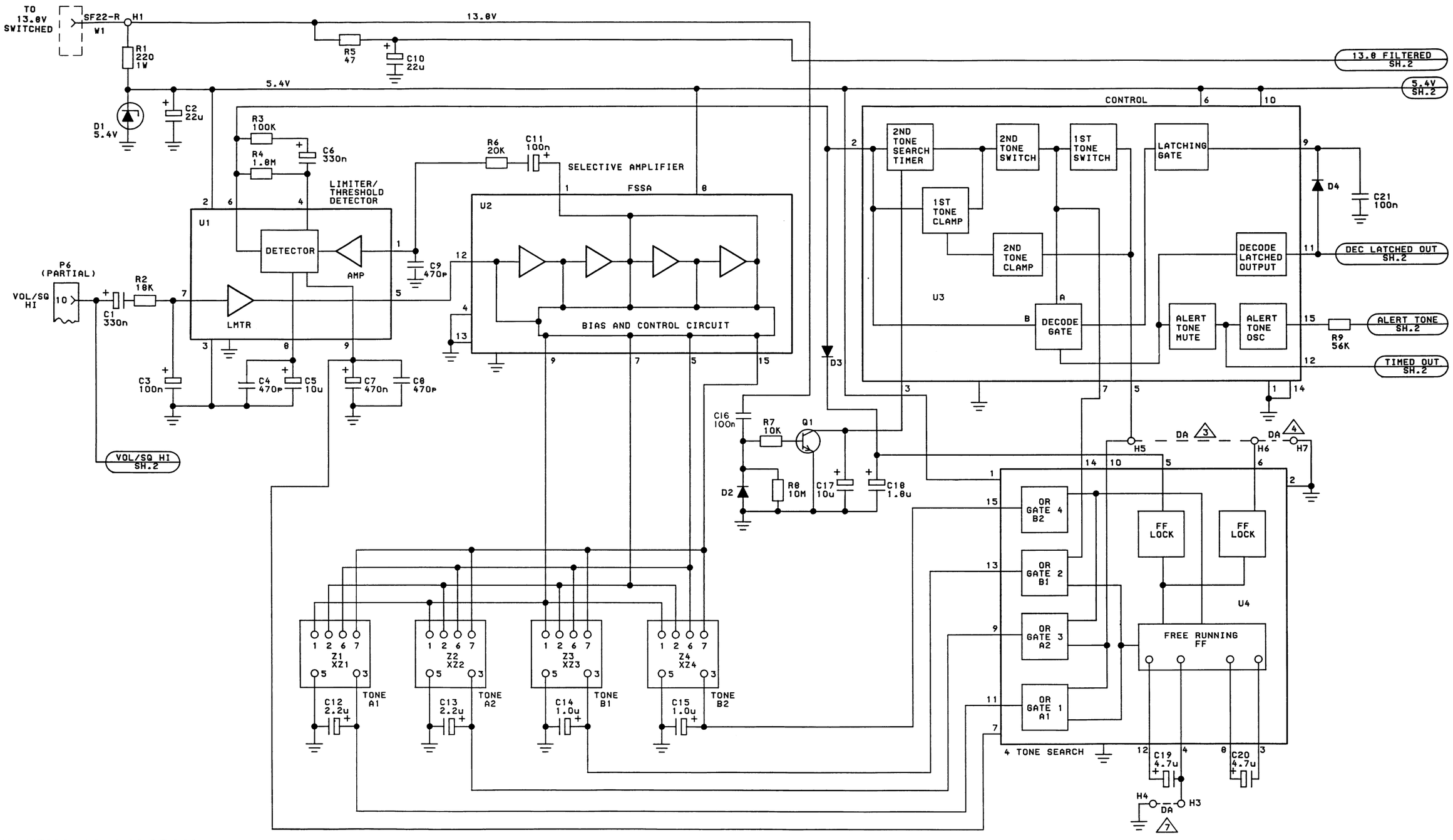
EXTERNAL ALARM

PARTIAL REF. DESIGNATIONS SHOWN.
ALL DESIGNATIONS ARE 1700 SERIES.
EXAMPLE: C1-C1701, R1-R1701, ETC.

(19D432227, Rev. 9)
(19A143327, Sh. 1, Rev. 5)
(19A143326, Sh. 2, Rev. 5)

OUTLINE DIAGRAM

TYPE 99 TONE DECODER

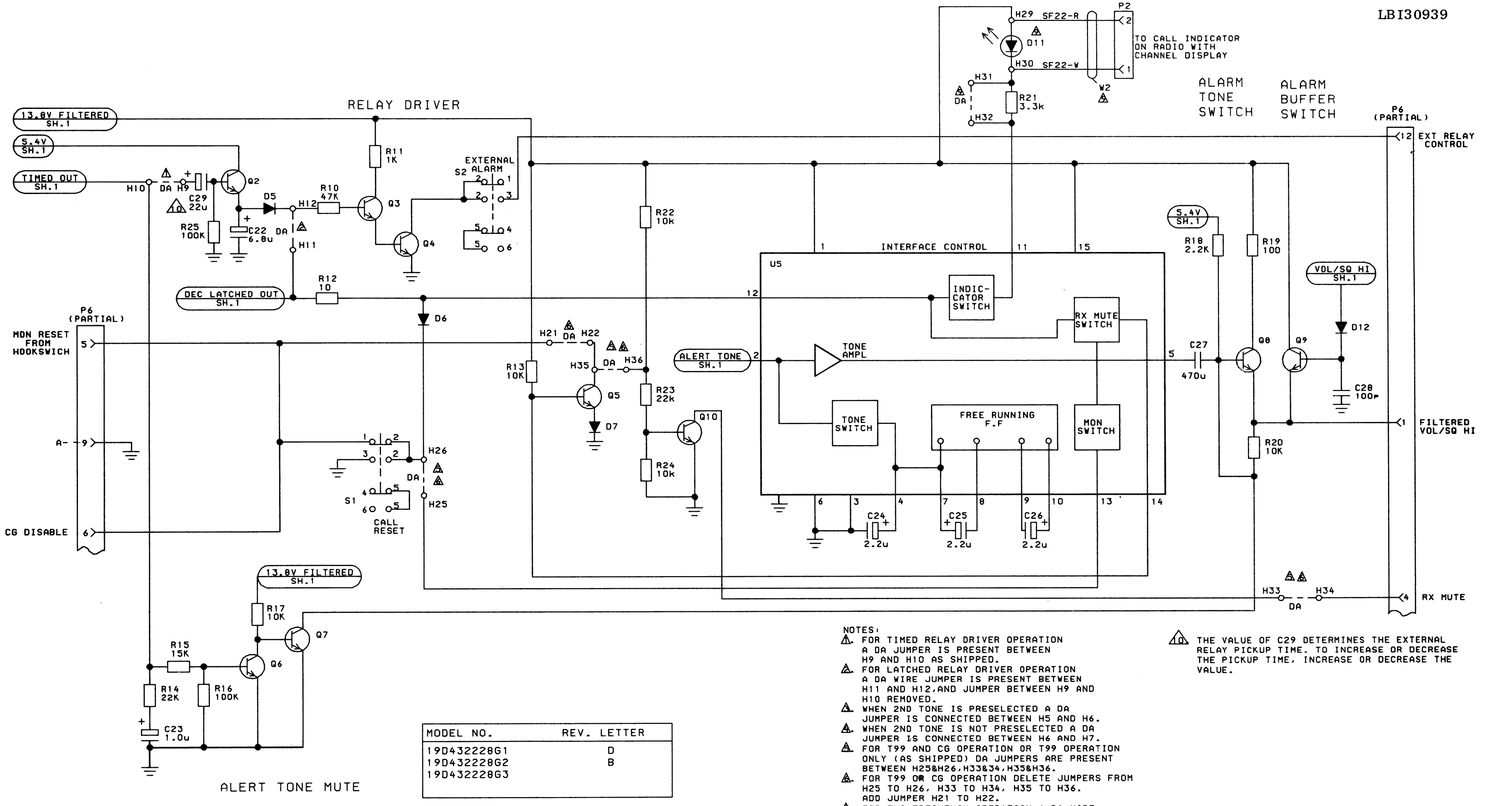


SCHEMATIC DIAGRAM

TYPE 99 TONE DECODER

(19D432224, Sh. 1, Rev. 3)

LBI30939



MODEL NO.	REV. LETTER
19D43222861	D
19D43222862	B
19D43222863	

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

(19D432224, Sh. 2, Rev. 8)

NOTES:

1. FOR TIMED RELAY DRIVER OPERATION A DA JUMPER IS PRESENT BETWEEN H9 AND H10 AS SHIPPED.
2. FOR LATCHED RELAY DRIVER OPERATION A DA WIRE JUMPER IS PRESENT BETWEEN H11 AND H12 AND JUMPER BETWEEN H9 AND H10 REMOVED.
3. WHEN 2ND TONE IS PRESELECTED A DA JUMPER IS CONNECTED BETWEEN H5 AND H6.
4. WHEN 2ND TONE IS NOT PRESELECTED A DA JUMPER IS CONNECTED BETWEEN H6 AND H7.
5. FOR T99 AND CG OPERATION OR T99 OPERATION ONLY (AS SHIPPED) DA JUMPERS ARE PRESENT BETWEEN H25&H26,H33&34,H35&H36.
6. FOR T99 OR CG OPERATION DELETE JUMPERS FROM H25 TO H26, H33 TO H34, H35 TO H36. ADD JUMPER H21 TO H22.
7. FOR TWO FREQUENCY OPERATION,A DA WIRE JUMPER IS PRESENT BETWEEN H3 AND H4.
8. ALL COMPONENTS ARE 1700 SERIES. EXAMPLE:C1701,R1701.
9. D11 (CALL INDICATOR) AND DA JUMPER BETWEEN H31 AND H32 PRESENT IN GP 1 ONLY. R21 AND W2 PRESENT IN GP 2 & GP 3 ONLY.

10. THE VALUE OF C29 DETERMINES THE EXTERNAL RELAY PICKUP TIME. TO INCREASE OR DECREASE THE PICKUP TIME, INCREASE OR DECREASE THE VALUE.

SCHEMATIC DIAGRAM

TYPE 99 TONE DECODER

PARTS LIST

TYPE 99 DECODER
19D432228G1
19D432228G2
ISSUE 5

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1701	19A134202P111	Tantalum: 0.33 uF ±10%, 35 VDCW.
C1702	3154047P226N	Tantalum: 22 uF ±20%, 16 VDCW.
C1703	3154047P104U	Tantalum: 0.1 uF ±20%, 35 VDCW.
C1704	19A700001P5	Ceramic: 470 pF ±20%, 50 VDCW.
C1705	315A6047P106N	Tantalum: 10 uF ±20%, 16 VDCW.
C1706	19A134202P111	Tantalum: 0.33 uF ±10%, 35 VDCW.
C1707	315A6047P474U	Tantalum: 0.47 uF ±20%, 35 VDCW.
C1708 and C1709	19A700001P5	Ceramic: 470 pF ±20%, 50 VDCW.
C1710	315A6047P226N	Tantalum: 22 uF ±20%, 16 VDCW.
C1711	315A6047P104U	Tantalum: 0.1 uF ±20%, 35 VDCW.
C1712 and C1713	315A6047P225U	Tantalum: 2.2 uF ±20%, 35 VDCW.
C1714 and C1715	315A6047P105U	Tantalum: 1 uF ±20%, 35 VDCW.
C1716	19A700004P2	Metallized polyester: 0.1 uF ±10%, 63 VDCW.
C1717	315A6047P106N	Tantalum: 10 uF ±20%, 16 VDCW.
C1718	19B200240P15	Tantalum: 1.8 uF ±5%, 20 VDCW.
C1719 and C1720	19A134202P116	Tantalum: 4.7 uF ±10%, 25 VDCW.
C1721	19A702250P113	Polyester: .1 uF ±10%, 50 VDCW.
C1722	19A134202P15	Tantalum: 6.8 uF ±20%, 35 VDCW.
C1723	315A6047P105U	Tantalum: 1 uF ±20%, 35 VDCW.
C1724 and C1725	315A6047P225U	Tantalum: 2.2 uF ±20%, 35 VDCW.
C1726	19A134202P107	Tantalum: 2.2 uF ±10%, 20 VDCW.
C1727	19A116080P11	Polyester: 0.47 uF ±20%, 50 VDCW.
C1728	19A700001P1	Ceramic: 100 pF ±20%, 50 VDCW.
C1729	315A6047P226N	Tantalum: 22 uF ±20%, 16 VDCW.
		- - - - - - - - - - DIODES - - - - - - - - - -
D1701	4036887P5	Zener: 500 mW, 5.4 v. nominal.
D1702 thru D1707	19A700028P1	Silicon, fast recovery: fwd current 75 mA, 75 PIV; sim to Type 1N4148.
D1708* thru D1710*	19A700028P1	Silicon, fast recovery: fwd current 75 mA, 75 PIV; sim to Type 1N4148. Deleted by REV B.
D1711	19A134354P2	Diode, optoelectronic: yellow; sim to Hew. Packard 5082-4555.
D1712	19A700028P1	Silicon, fast recovery: fwd current 75 mA, 75 PIV; sim to Type 1N4148.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P1702		(Part of W1702).
P1706	19A700041P61	Printed wire: 15 circuits; sim to Molex 22-01-2155.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1701	19A700023P1	Silicon, NPN: sim to Type 2N3904.
Q1702	19A702084P1	Silicon, NPN; sim to MPS 2369.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
Q1703	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q1704	19A115300P4	Silicon, NPN.
Q1705 thru Q1710	19A700023P1	Silicon, NPN; sim to Type 2N3904.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1701	19A700112P47	Composition: 220 ohms ±5%, 1 w.
R1702	R212CRP318C	Deposited carbon: 18K ohms ±5%, 1/4 w.
R1703	R212CRP410C	Deposited carbon: 0.1M ohms ±5%, 1/4 w.
R1704	3R152P185J	Composition: 1.8 megohms ±5%, 1/4 w.
R1705	R212CRP047C	Deposited carbon: 47 ohms ±5%, 1/4 w.
R1706	19A143400P52	Deposited carbon: 20K ohms ±5%, 1/4 w.
R1707	R212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R1708	3R152P106J	Composition: 10.0 megohms ±5%, 1/2 w.
R1709	R212CRP356C	Deposited carbon: 56K ohms ±5%, 1/4 w.
R1710	R212CRP347C	Deposited carbon: 47K ohms ±5%, 1/4 w.
R1711	R212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R1712	R212CRP010C	Deposited carbon: 10 ohms ±5%, 1/4 w.
R1713	R212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R1714	R212CRP322C	Deposited carbon: 22K ohms ±5%, 1/4 w.
R1715	R212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R1716	R212CRP410C	Deposited carbon: 0.1M ohms ±5%, 1/4 w.
R1717	R212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R1718	R212CRP222C	Deposited carbon: 2.2K ohms ±5%, 1/4 w.
R1719	R212CRP110C	Deposited carbon: 100 ohms ±5%, 1/4 w.
R1720	R212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R1721	R212CRP233C	Deposited carbon: 3.3K ohms ±5%, 1/4 w.
R1722	R212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R1723	R212CRP322C	Deposited carbon: 22K ohms ±5%, 1/4 w.
R1724	R212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R1725	R212CRP410C	Deposited carbon: 0.1M ohms ±5%, 1/4 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1701	19B800563P2	Switch, push: DPDT, 1 station, alternate action; sim to Schadow Co. Series "F". (Used in G1).
S1701	19B800563P5	Push, 1 station: contacts rated 100 mA @ 28 VDC; sim to Shadow F2UEE. (Used in G2).
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U1701	19C320539G1	Limiter Threshold Detector.
U1702	19D417092G1	Selective Amplifier. (FSSA).
U1703	19D417098G2	Control (Type 99), 1150 Hz.
U1704	19D417132G1	4 Tone Search.
U1705	19D417373G2	Interface Control Hybrid.
		- - - - - - - - - - CABLES - - - - - - - - - -
W1701	19A701340G5	Cable, stranded No. 24 AWG, includes 19A115871P34 terminal. (Used in G1).
W1701	19A701340G9	Cable. Includes: 19A127042P2 terminal. (Used in G2).
W1702	19A703125G1	Cable. Includes: 19A700041P28 Shell; and (2) 19A700041P26 Contacts.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XI1701 thru XI1704	19C320299G1	Connector. Includes:
	19D416714P1	Shell.
	19B219681P1	Contact, electrical. (Quantity 7).

SYMBOL	GE PART NO.	DESCRIPTION
		ASSOCIATED ASSEMBLIES
		- - - - - - - - - - NETWORKS - - - - - - - - - -
Z1701 thru Z1704	19C320291G1	Versatone Network: 71.9-203.5 Hz.
		EXTERNAL ALARM SWITCH KIT 19A143490G2 (CENTURY II)
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1702	19B800563P2	Switch, push: DPDT, 1 station, alternate action; sim to Schadow Co. Series "F".
		EXTERNAL ALARM SWITCH KIT 19A143490G14 (PHOENIX)
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1702	19B800563P5	Push, 1 station: contacts rated 100 mA @ 28 VDC; sim to Shadow F2UEE.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19C328587P1	Pushbutton. (Used with S1701 & S1702).
	NP280878P5	Nameplate. (S1701 - CALL RESET - CENTURY II).
	NP280878P6	Nameplate. (S1702 - EXT. ALARM - CENTURY II).
	NP280878P20	Nameplate. (S1701 - CALL - RESET - PHOENIX SX).
	NP280878P21	Nameplate. (S1702 - EXT. ALARM - PHOENIX SX).
	19A701332P4	Insulator, washer: nylon. (Used with Q1704).
	19A130013P1	Insulator. (Located under U1701).
	19A701743P1	Pad. (Located behind S1701 & S1702 pushbuttons).

PARTS LIST

EXTERNAL ALARM RELAY
19B226025G4
ISSUE 3

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1701	T324ADP1041	Rectifier, silicon; general purpose.
		- - - - - - - - - - RELAYS - - - - - - - - - -
K1701	7486515P2	Armature, enclosed: 12 VDC nominal, 85 to 90 ohms coil res, 1 form A contact rated at 15 amps.
		FUSED LEAD 19B226454G1
	1R16P3	Quick blowing: 1 amp at 250 v; sim to Littelfuse 312001 or Bussman AGC-1.
	19A115776P6	Fuseholder: sim to Bussmann 9835.
	19A115776P5	Knob assembly: sim to Bussmann 9953 1/2.
	19A115776P7	Spring: sim to Bussmann 1A1853.
	19A115776P3	Contact: sim to Littelfuse 904-88. (Crimped on wires inside holder).
		WIRE ASSEMBLY 19A129937G2
	19B209260P12	Terminal, solderless: wire range No. 22-16; sim to AMP41310.
	19A116781P5	Contact, electrical: wire range No. 18-24 AWG; sim to Molex 08-50-0106.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	N80P13005C6	Machine screw: No. 6-32 x 5/16. (Secures relay to support).
	N604P13C6	Lockwasher, internal tooth: No. 6. (Secures relay to support).
	N402P37C13	Flatwasher: No. 6. (Secures relay to support).
	N80P15005C6	Machine screw, phillips head: No. 8-32 x 5/16. (Secures wire to relay terminals).
	19A129833P1	Support. (K1701).
	N130P1608C6	Tap screw: No. 10-16 x 1/2. (Secures relay support).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST

S1702
EXTERNAL ALARM SWITCH
19A143490G2
ISSUE 1

SYMBOL	GE PART NO.	DESCRIPTION
	19B800563P2	Switch, push: DPDT, 1 station, alternate action; sim to Schadow Co. Series "F".
	NP280878P6	Nameplate (EXTERNAL SPEAKER).
	19C328587P1	Pushbutton.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

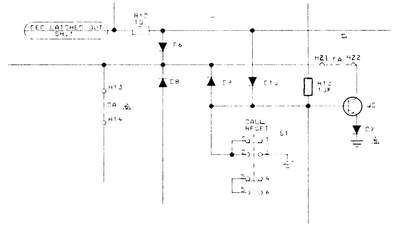
PRODUCTION CHANGES

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 - Decoder Board 19D432228G1
Incorporated in initial shipment.

REV. B - Improve operation of Rx mute circuit. Deleted D1708, D1709 and D1710. Added D1713. All diode Part Numbers are 19A700028P1.

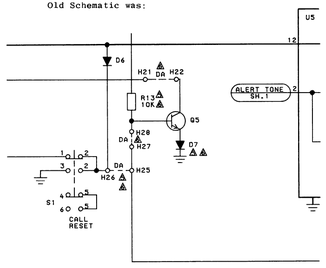
Old Schematic Was:



REV. C - Decoder Board 19D432228G1
REV. A - Decoder Board 19D432228G2

To improve operation of RX mute circuits. Added Q1710, R1722, R1723, changed R1721.
R1721 was:Composition: 3.3K ohms ±5%, 1/4w.

Old Schematic was:



REV. B - Decoder Board 19D432228G2

REV. D - Decoder Board 19D432228G1
To prevent car horn from locking up decoder. Added C29 and R25.

ADDENDUM NO 1 TO LBI-30939D
(PCN5)

This addendum contains information concerning a change to this publication.

Type 99 Decoder Board 19D432228G2 has been replaced with a Group 3 board. The only difference between the two boards is that the new board has gold plated contacts to enhance performance. The older Group 2 board had tin plated contacts.

Whenever replacing boards care should be taken to assure that boards with gold contacts are not intermixed with boards having tin contacts. Replace the board only with one having the same group number as the original.