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ILLUSTRATIONS

TABLES

SPECIFICATIONS*

INPUT VOLTAGE	10 Volts DC
CURRENT DRAIN	55 Milliamperes Maximum (PROM OFF) 165 Milliamperes Maximum (PROM ON)
FREQUENCY RANGE	67-210.7 Hz
MAXIMUM FREQUENCY ERROR	±0.2%
ENCODE OUTPUT LEVEL	
67-210 Hz	0.8 Volt RMS Minimum (Not de-emphasized)
67 Hz	0.8 Volt RMS Minimum (De-emphasized)
156.7 Hz	0.4 Volt RMS Minimum (De-emphasized)
210.7 Hz	0.2 Volt RMS Minimum (De-emphasized)
ENCODE TONE DISTORTION	1.5% Maximum
PROGRAMMING INCREMENTS	0.25 Hz
DECODE LEVEL	45 Millivolts RMS Minimum
DECODE RESPONSE TIME	250 Milliseconds Maximum
PTT DELAY	160-190 Milliseconds
STE PHASE SHIFT	135°
TEMPERATURE RANGE	-40°C (-40°F) to +70°C (158°F)

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

WARNING

Although the highest DC voltage in the unit is supplied by the vehicle battery, high current 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 ENERGIZED CIRCUITS!

DESCRIPTION

General Electric Channel Guard Modules 19D432689 are field programmable, synthesized multitone Channel Guard encoders/decoders for use with MASTR® II mobile radios.

The encode function provides continuous tone-coded modulation for the transmitter. The decode function is used with the receiver to eliminate all calls that are not tone coded with the proper Channel Guard (CG) frequency.

Five different Channel Guard boards are available:

- 19D432689G1 - multitone encode/decode
- 19D432689G2 - multitone encode only
- 19D432689G3 - multitone decode only
- 19D432689G4 - multitone encode/decode with de-emphasis
- 19D432689G5 - multitone encode with de-emphasis

OPERATION

In mobile Channel Guard applications, a microphone hookswitch is supplied with the radio. The CG hookswitch is equipped with a CG disable switch.

Placing the disable hookswitch in the "up" position (towards the small speaker symbol) disables the receive Channel Guard. With the switch in the "down" position, the receive Channel Guard is disabled when the microphone is removed from the hookswitch.

In station applications, a desk microphone is available for use with Channel Guard. Pressing the MONITOR bar on the base of the desk microphone disables the CG decode function. This permits the channel to be monitored before sending a message.

CIRCUIT ANALYSIS

Channel Guard is a continuous-tone controlled squelch system that provides communications control in accordance with EIA standard RS-220-A. The basic Channel Guard system utilizes standard tone frequencies from 67 to 210.7 hertz with both the encoder and decoder operating on the same frequency. The standard Channel Guard tone frequencies are shown in the following chart.

STANDARD TONE FREQUENCIES				
67.0	88.5	107.2	131.8	167.9
71.9	91.5	110.9	136.5	173.8
74.4	94.8	114.8	141.3	179.9
77.0	97.4	118.8	146.2	186.2
79.7	100.0	123.0	151.4	192.8
82.5	103.5	127.3	156.7	203.5
85.4			162.2	210.7

The Channel Guard circuitry consists of Programmable Read Only Memory (PROM) U1002, PROM controller U1003, frequency synthesizer U1004, Encoder/Decoder U1005/U1006, inverter AR1, and associated circuitry.

The tone frequency PROM is a standard 32 x 8 PROM that is programmed for the different tone frequencies. The PROM controller contains the output latches, address change detector, PROM voltage switches, and timing circuits.

Frequency synthesizer U1004 includes the synthesizer IC and a 32,768 Hz reference crystal that provides the clock inputs for encoder/decoder module U1005/U1006. The clock inputs are required to produce the tone frequency and the digitally generated time delays for the DELAYED PTT and squelch tail elimination (STE) circuits.

Encode/decode hybrid U1005/U1006 contains the encoder and decoder, a voice reject filter, STE circuit and the interface circuitry. The interface circuitry provides increased output drive for RX MUTE, DELAYED PTT and other functions. U1006 deletes the decoder for encode only operation.

TONE SELECTION

Encode/decode tone selection is accomplished by a binary converter (CR6-CR17) and quad comparator AR1-A through AR1-6, and converts the output of the frequency select switch to a three-bit binary code. For example: selecting F2 on the control unit applies a low to the cathode of CR6, forward biasing the diode and causing a high at AR1A-14. As AR1-B and AR1-C output remain in a low state, a binary "one" (001) is applied to the controller and PROM. Selecting F8 applies a binary "7" (111) to the controller and PROM.

Ten frequency programming inputs (bits) and two encode-decode bits are required to program frequency synthesizer U1005. The 10 bits are loaded into U1004 in two groups of five bits each (bytes).

When an address change occurs, the controller turns the PROM on and off twice to load the new output address bytes into the synthesizer IC. Loading the bytes serially reduces the number of inputs to the synthesizer. The PROM controller then stores the new address in the latch circuits and turns off the PROM to reduce power consumption.

The first data loaded into the synthesizer is the most significant byte (MSB). The data loaded second is the least significant byte (LSB). The PROM is turned on for approximately 2 milliseconds each time a new CG frequency is selected.

ENCODE MODE

Depressing the PTT switch applies a low (A-) to PTT lead J908-6. This causes the delayed PTT lead to go low, keying the transmitter. The encoder then generates the CG tone which is applied to a low pass filter to remove any tone or clock harmonics. The filter output is coupled through J908-7 to the transmitter exciter.

When the PTT button on the microphone is released (transmitter unkeyed), the delayed PTT circuit in U1005/U1006 keeps the transmitter keyed for an additional 160 milliseconds. During the 160 milliseconds delay time, the encoder shifts the phase of the CG tone output 135°. This combination of 160 milliseconds delay and the 135° phase shift causes the CG decoder in other receivers to squelch the audio before the loss of signal, eliminating the receiver noise burst (squelch tail elimination).

DECODE MODE

In the receive mode, receiver audio from VOLUME/SQUELCH HI lead J908-1 is applied to a voltage divider (R1020 and R1 and then to a voice reject filter in the decode circuit. The filter removes any voice information to prevent voice blocking or clipping.

The digital decoder compares the frequency of the incoming tone to a reference clock input produced by the synthesizer. If the correct tone is detected, the decoder circuit causes the REC MUTE lead at J908-5 to go high, unsquelching the receiver. The REC MUTE lead is normally held in a low voltage condition when the correct CG tone is not detected.

After the CG tone is decoded, the decoder then waits for a phase shift in the tone to occur. When the phase shift occurs, the STE delay circuit in the decoder pulls the REC MUTE lead to a low voltage state. This squelches the receiver for 200 milliseconds and keeps the receiver squelched until the RF carrier applied to the receiver is removed.

ENCODE DISABLE

The encoder circuit can be disabled to allow the serviceman to make transmitter distortion and modulation checks. The encoder is disabled by applying a ground to J908-2.

DECODE DISABLE

The decoder circuit can be disabled when servicing the receiver. Disable the decoder by applying a ground to J908-3.

MAINTENANCE

Troubleshooting the Channel Guard assembly is made easier by using the Channel Guard extender board (19C320966G1). The extender board contains three slide switches which disable the decode and encode circuitry, and also bridges the PTT input to the delayed PTT output when the CG board is removed. In addition, "test points" are provided for all pins on J908.

PTT Bridge - Allows the transmitter to be keyed when the Channel Guard board is removed. Note: If transmitter is keyed with Channel Guard installed and PTT bridge closed the Channel Guard PTT delay will lock up until PTT bridge is opened.

Encode Disable - Applies A- to pin 2 of J908 and pin 11 of Encode IC to prevent transmitting the Channel Guard tone.

Rx CG Disable - Applies A- to J908-3 and pin 2 of the decode IC to disable the decoder. Under this condition the receiver is not muted.

A Troubleshooting Chart provides a method of checking the Channel Guard functions.

INSTALLATION

IN MOBILE RADIOS

To install Channel Guard in radios not previously equipped with this feature, proceed as follows:

1. Gain access to system board and clip out the DA jumper wire between H71 and H72 on the system board (Refer to the MASTR II Maintenance Manual for the Front Panel and System Board).

2. Plug the Channel Guard unit into J908 and J909 on the system board.

3. Install the hookswitch to the control unit as directed in the Control Unit Maintenance Manual.

4. Adjust transmitter deviation in accordance with the Alignment Procedures in the Transmitter Maintenance Manual. No other adjustments are required.

IN STATIONS

Refer to the Station combination Maintenance Manual for installation instructions.

PROM ORDERING INFORMATION

The tone frequency PROM used in the multitone Channel Guard may be ordered by two different part numbers. Part number 19A134331P4 is a blank PROM which must be blown by the customer. Part number 19A701906G1 is a factory-blown PROM. When ordering the factory-blown PROM, specify the Channel Guard frequency in Hertz for each transmit (TX) and receive (RX) channel. Insert a "0" if a tone is not desired on a particular channel.

NOTE

A maximum of six transmit and six receive channels are available in the multitone Channel Guard option (see Figure 1).

CHANNEL	CG FREQUENCY	
	TX	RX
1		
2		
3		
4		
5		
6		

Figure 1 - Tone Ordering Format

PROM PROGRAMMING

The 32 x 8 PROM is used to store Channel Guard frequencies and data to control the function performed i.e., encode, decode, or encode/decode. Programmable Channel Guard frequencies range from 67.0 to 210.7 Hz.

NOTE

When ordering a PROM from the factory always include the radio channel vs Channel Guard tone allocation and the functions required of each channel (encode/decode). Also identify channels without Channel Guard as "open" channels.

To program the PROM the tone frequencies must be converted to binary and recorded in the data bit map shown in Figure 2. Data for the function(s) required are also entered and the resulting hexadecimal (hex) code for the MSB (most significant byte) and the LSB (least significant byte) is determined. The hex code is then used to blow the PROM. The following equipment may be used to program the PROM:

Blank PROM (GE) - 19J706247P2

Socket Adapter - PA16-2

Module - PM9059

Configuration - 32 x 8 (L)

The hex code for all standard Channel Guard frequencies with encode/decode functions enabled are given in Table 1. If non-standard frequencies are required on standard frequencies used but with the encode on decode function disabled, a bit map for that particular tone and function must be created and the new hex code determined. The example in Figure 3 illustrates how to derive the binary number for 156.7 Hz using the divide by 2 algorithm and to configure the bit map. The binary bits for the fraction part of the number is obtained from Table 2. Figure 4 is the bit map for 156.7 Hz with the encode and decode functions enabled. The hex code for the MSB and the LSB is determined by dividing the 8 bits forming the MSB and the LSB into two groups of four bits for each byte. Then refer to Table 3 for Binary to Hex Conversion.

BYTE	B7	B6^Δ	B5^Δ	B4	B3	B2	B1	B0
MSB	1*	Decode Enable	Encode Enable	5 Most Significant Bits				
LSB	1*	Decode Disable	Encode Disable	3 Least Significant Bits			Fractional Bits	

* B7 is always set to "1" Δ"1" Enables "0" Disables

Figure 2 - PROM Bit Map

FREQUENCY	MSB	LSB	FREQUENCY	MSB	LSB
67.0	E2	EC	131.8	E1	EF
71.9	F2	E0	136.5	F1	E2
74.4	F2	EA	141.3	F1	F5
77.0	F2	F4	146.2	E9	E9
79.7	F2	FF	151.4	E9	FE
82.5	EA	EA	156.7	F9	F3
85.4	EA	F6	162.2	E5	E9
88.5	FA	E2	617.9	F5	E0
91.5	FA	EE	173.8	F5	F7
94.8	FA	F8	179.9	ED	F0
100.0	E6	F0	186.2	FD	E9
103.5	E6	FE	192.8	E3	E3
107.2	F6	ED	203.5	F3	EE
110.9	F6	FC	210.7	EB	EB
114.8	EE	FB	OPEN*	C1	C1
118.8	EE	FB	(No transmit tone)		
123.0	FE	EC	OPEN*	A1	A1
127.3	FE	FD	(No receive tone)		

* Also reprogrammed for non-specified or unused channels

Table 1 - Standard Tone vs Hez Equivalent - Encode/Decode Function Enabled

Equation	Remainder	Bit	Byte
156 ÷ 2 = 78	0	B2	LSB
78 ÷ 2 = 39	0	B3	LSB
39 ÷ 2 = 19	1	B4	LSB
19 ÷ 2 = 9	1	B4	MSB
9 ÷ 2 = 4	1	B3	MSB
4 ÷ 2 = 2	0	B2	MSB
2 ÷ 2 = 1	0	B1	MSB
1 ÷ 2 = 0	1	B0	MSB

Figure 3 - Binary Conversion For 156 Hz

FROM	TO	B1	B0
0.00 to	0.12 Hz	0	0
0.13 to	0.37 Hz	0	1
0.38 to	0.62 Hz	1	0
0.63 to	0.87 Hz	1	1
0.88 to	0.99 Hz	0	0 *

* Round frequency to next highest integer

Table 2 - Data Bits for Fractional Numbers

	HEX DIGIT 1				HEX DIGIT 2				
BYTE	B7	B6	B5	B4	B3	B2	B1	B0	HEX
MSB	1	1	1	1	1	0	0	1	F9
LSB	1	1	1	1	0	0	1	1	F3

Figure 4 - Bit Map For 156.7 Hz Encode/Decode Enabled

Binary to Hex Conversion For Figure 4

	F	9
MSB	1111	1001
	F	3
LSB	1111	0011

BINARY	HEX	BINARY	HEX
000	0	1000	8
001	1	1001	9
010	2	1010	A
011	3	1011	B
100	4	1100	C
101	5	1101	D
110	6	1110	E
111	7	1111	F

Table 3 - Binary To Hex Conversion

CHANNEL ALLOCATION

Having determined the hex code for the desired tone frequency and functions, the next step is to determine the transmit and receive channel locations.

Each channel (1 through 8) has 4 locations in the PROM reserved for it; two on receive and two on transmit. See Figure 5 for these locations. The MSB location is programmed to the two digit hex MSB value. The LSB location is programmed to the LSB value. Transmit frequencies (including no tone) are programmed in transmit locations, and receive frequencies (including open channels) are programmed in received locations.

For example, to program a four channel radio for the following frequencies and functions, you must first create a bit map for each transmit and receive channel and then the resulting hex code equivalent. The hex codes are programmed according to the channel allocations of Figure 5. The example for a four frequency radio and resulting programming codes are given below and in Figure 6.

LABELING

After programming the PROM, a label should be affixed to the PROM identifying the hex code blown into each location.

PROM LOCATION Decimal	Hex	Contents	PROM LOCATION Decimal	Hex	Contents
0	00	Tx LSB CH1	16	10	Rx LSB CH1
1	01	Tx LSB CH2	17	11	Rx LSB CH2
2	02	Tx LSB CH3	18	12	Rx LSB CH3
3	03	Tx LSB CH4	19	13	Rx LSB CH4
4	04	Tx LSB CH5	20	14	Rx LSB CH5
5	05	Tx LSB CH6	21	15	Rx LSB CH6
6	06	Tx LSB CH7	22	16	Rx LSB CH7
7	07	Tx LSB CH8	23	17	Rx LSB CH8
8	08	Tx MSB CH1	24	18	Rx MSB CH1
9	09	Tx MSB CH2	25	19	Rx MSB CH2
10	0A	Tx MSB CH3	26	1A	Rx MSB CH3
11	0B	Tx MSB CH4	27	1B	Rx MSB CH4
12	0C	Tx MSB CH5	28	1C	Rx MSB CH5
13	0D	Tx MSB CH6	29	1D	Rx MSB CH6
14	0E	Tx MSB CH7	30	1E	Rx MSB CH7
15	0F	Tx MSB CH8	31	1F	Rx MSB CH8

Figure 5 - Channel Allocations

Channel	Tx	Rx
1	100	100
2	203.5	Open (No decode)
3	Open (No decode)	Open (No decode)
4	156.7	131.8

The following hex codes are determined for each channel:

	TRANSMIT		RECEIVE	
Channel	MSB	LSB	MSB	LSB
1	E6	F0	E6	F0
2	F3	EE	A1	A1
3	C1	C1	A1	A1
4	F9	F3	E1	EF

The locations for all other channels are programmed for no encode and no decode.

Placing the hex codes into the correct locations in the PROM results in the programming codes shown in Figure 6.

Location			Location		
Decimal	Hex	PROM Contents	Decimal	Hex	PROM Contents
0	00	F0	16	10	F0
1	01	EE	17	11	A1
2	02	C1	18	12	A1
3	03	F3	19	13	EF
4	04	C1	20	14	A1
5	05	C1	21	15	A1
6	06	C1	22	16	A1
7	07	C1	23	17	A1
8	08	E6	24	18	E6
9	09	F3	25	19	A1
10	0A	C1	26	1A	A1
11	0B	F9	27	1B	E1
12	0C	C1	28	1C	A1
13	0D	C1	29	1D	A1
14	0E	C1	30	1E	A1
15	0F	C1	31	1F	A1

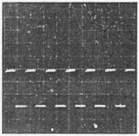
Figure 6 - Programming Codes

TROUBLESHOOTING PROCEDURE

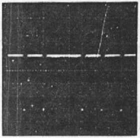
Before beginning the Troubleshooting Procedure, verify that +10V is present between J908-4 and J908-9.

SYMPTOM	PROCEDURE
No Encode Tone	• Check for $\overline{PTT}$ input at J906-8 (0.7V or less). If a "low" is not present, check the microphone and hookswitch circuits. If a low is present check $\overline{DPTT}$ for a "low" at J908-8. • Check DELAY CLK output at U1004-9 for 64 Hz and TONE CLK output at U1004-8 for 256 times the Channel Guard frequency. Example: If the CG frequency is 100 Hz, the TONE CLK output should be 25,600 Hz. If either clock output is missing, replace U1004. If both clock outputs are correct, check U1005-5/U1006-5 for tone output. If tone is missing replace U1005/U1006. • Check $\overline{TX\ CG\ DISABLE}$ at J908-2 and U1005/U1006 Pin 11 for a "low". If a low is present at J908-2 and not at U1005/U1006, replace CR1005.
No decode or Always Decodes	• Verify that correct CG tone is present at J908-1 (VOL SQ HI) and U1005/U1006. • Check $\overline{RX\ MUTE}$ at J908-5 for a low. If a low is present, trouble is not in Channel Guard. • Check decode disable lead at U1005/U1006 pin 2 for a low (0.7V), also CR1002. If $\overline{RX\ MUTE}$ is high (No decode), substitute U1004 with a known good prom. If CG is OK replace PROM. If CG is still inoperative, proceed to "Wrong Encode or/Decode Frequency".
Wrong Encode or Decode Frequency	• Substitute PROM U1004 with a known good PROM. Replace if bad. • Verify that PROM is properly seated in socket. Check for bent legs, bad connections, etc. • Check pin 16 (VCC) of PROM for two 2 millisecond power on blips when changing channels. If blips are missing verify correct inputs to J909 binary converter and outputs of AR1 quad comparator. If these are correct replace U1003. • Determine the difference between the desired frequency and the actual frequency. If the frequency difference is close to a power of 2, the appropriate bit on U1004 (Freq Synthesizer) may be shorted. Example: 100 Hz desired - 164 Hz actual. The different frequency is 64 or 2^6. Verify that the 64 Hz bit, B6 of U1004, is present. Check for a shorted or open connection.
$\overline{DPTT}$ Hangs UP	• Check DELAY CLK OUTPUT from U1004-9, Frequency Synthesizer.

SYMPTOM	PROCEDURE
SQUELCH TAIL Present (No STE)	• When the $\overline{\text{PTT}}$ input lead is low, J908-8 should also be low. When the $\overline{\text{PTT}}$ lead is high (PTT switch released), the DELAYED $\overline{\text{PTT}}$ output at J908-8 should remain low for an additional 160 milliseconds. If not replace U1005/U1006.



64 Hz Clock



256 X CG Tone (Tone = 100 Hz)

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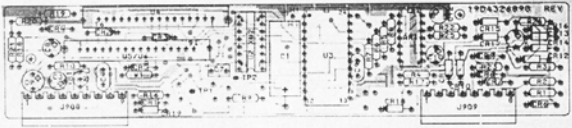
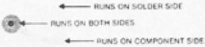
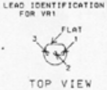
Ericsson GE Mobile Communications Inc.
Mountain View Road • Lynchburg, Virginia 24502

Printed in U.S.A.





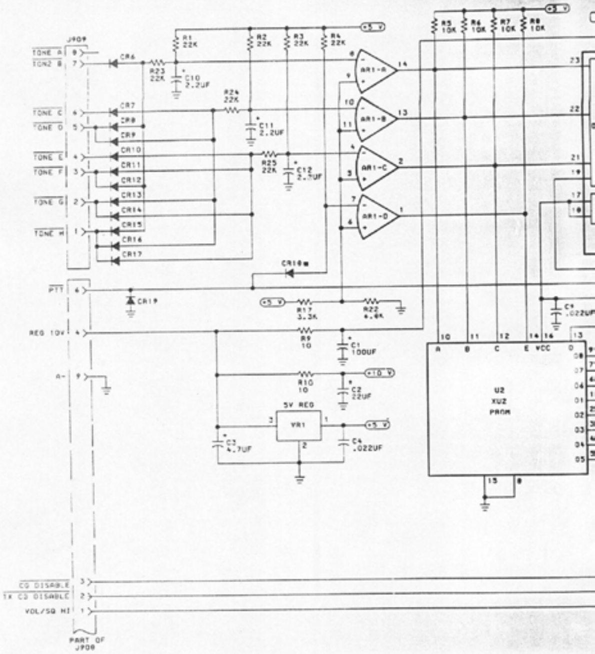


NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

(19D432689, Sh. 1, Rev. 2)
([illegible], Sh. 1, Rev. 1)
([illegible], Sh. 2, Rev. 1)

OUTLINE DIAGRAM

MULTITONE CHANNEL GUARD
19D432689G1-G5

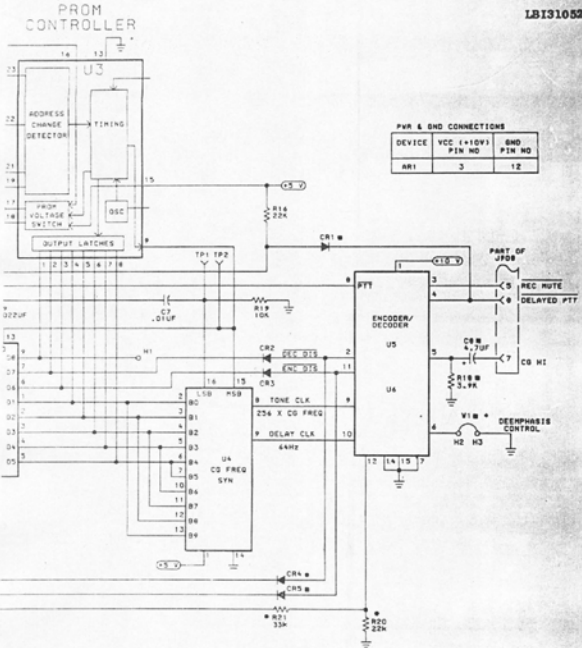


MODEL NO	REV LETTER	DESCRIPTION
19D432689G1	A	ENCODER/DECODER
19D432689G2		ENCODER ONLY
19D432689G3	A	DECODER ONLY
19D432689G4	A	ENC/DEC DE-EMPHASIZED
19D432689G5		ENC ONLY DE-EMPHASIZED

⚠1 NOTES:

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.

⚠2



PWR & GND CONNECTIONS

DEVICE	VCC (+10V) PIN NO	GND PIN NO
AR1	3	12

NOT PRESENT IN G4 AND G5
• NOT PRESENT IN G1 AND G2
■ NOT PRESENT IN G3
NOT PRESENT IN G2 AND G5

PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATIONS PREFIX WITH 1000 SERIES. R1-R1001 ETC. EXCEPT J809 AND J909

SCHEMATIC DIAGRAM

MULTITONE CHANNEL GUARD
19D432689G1-G5

(19D432706, Sh. 1, Rev. 4)

PARTS LIST

MASTR II
PROGRAMMABLE CHANNEL GUARD
19D437268G1 ENCODE/DECODE
19D437268G2 ENCODE ONLY
19D437268G3 DECODE ONLY
19D437268G4 ENCODE/DECODE DE-EMPHASIZED
19D437268G5 ENCODE ONLY DE-EMPHASIZED
ISSUE 2

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - INTEGRATED CIRCUITS - - - - - - -
AR1001	19A700021P1	Linear: QUAD COMPARATOR.
		- - - - - - - - - - - CAPACITORS - - - - - - - - -
C1001	[illegible]	Electrolytic: 100 uF +150-10%, 15 VDCW; sim to Mallory Type TTX.
C1002	19A701534P8	Tantalum: 22 uF + or -20%, 16 VDCW.
C1003	19A701534P6	Tantalum: 4.7 uF + or -20%, 35 VDCW.
C1004	T644ACP122K	Polyester: .022 uF + or -10%, 50 VDCW.
C1007	T644ACP110K	Polyester: .010 uF + or -10%, 50 VDCW.
C1008	19A701534P6	Tantalum: 4.7 uF + or -20%, 35 VDCW. (Used in G1, G2, G4 and G5).
C1009	T644ACP122K	Polyester: .022 uF + or -10%, 50 VDCW.
C1010 thru C1012	19A701534P5	Tantalum: 3.3 uF, + or -20%, 35 VDCW.
		- - - - - - - - - - - - DIODES - - - - - - - - - -
CR1001	19A700028P1	Silicon: 75 mA, 75 PIV; sim to 1N4148. (Used in G1, G2, G4 and G5).
CR1002 and CR1003	19A700028P1	Silicon: 75 mA, 75 PIV; sim to 1N4148.
CR1004	19A700028P1	Silicon: 75 mA, 75 PIV; sim to 1N4148. (Used in G1, G3 and G4).
CR1005	19A700028P1	Silicon: 75 mA, 75 PIV; sim to 1N4148. (Used in G1, G2, G4 and G5).
CR1006 thru CR1017	19A700028P1	Silicon: 75 mA, 75 PIV; sim to 1N4148.
CR1018	19A700028P1	Silicon: 75 mA, 75 PIV; sim to 1N4148. (Used in G1, G2, G4 and G5).
CR1019	19A700028P1	Silicon: 75 mA, 75 PIV; sim to 1N4148.
		- - - - - - - - - - - - JACKS - - - - - - - - - -
J908	19A116659P74	Connector, printed wiring: 9 contacts rated 5 amps; sim to Molex 09-52-3091.
J909	19A116659P77	Connector, printed wiring: 8 contacts rated at 5 amps; sim to Molex 09-52-3081.
		- - - - - - - - - - - RESISTORS - - - - - - - - -
R1001 thru R1004	H212CRP322C	Deposited carbon: 22K ohms + or -5%, 1/8 w.
R1005 thru R1008	H212CRP310C	Deposited carbon: 10K ohms + or - 5%, 1/8 w.
R1009 and R1010	H212CRP010C	Deposited carbon: 10 ohms + or -5%, 1/8 w.
R1016	H212CRP312C	Deposited carbon: 12K ohms + or -5%, 1/8 w.
R1017	H212CRP233C	Deposited carbon: 3.3K ohms + or -5%, 1/8 w.
R1018	H212CRP239C	Deposited carbon: 3.9K ohms + or -5%, 1/8 w. (Used in G1, G2, G4 and G5).
R1019	H212CRP310C	Deposited carbon: 10K ohms + or - 5%, 1/8 w.
R1020	H212CRP322C	Deposited carbon: 22K ohms + or -5%, 1/8 w. (Used in G1, G3 and G4).
R1021	H212CRP310C	Deposited carbon: 10K ohms + or -5%, 1/8 w. (Used in G1, G3 and G4).
R1022	H212CRP268C	Deposited carbon: 6.8K ohms + or -5%, 1/8 w.
R1023 thru R1025	H212CRP322C	Deposited carbon: 22K ohms + or -5%, 1/8 w.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - - TEST POINTS - - - - - - - - -
TP1001 and TP1002	19A701622P1	Cotter pin.
		- - - - - - - - - INTEGRATED CIRCUITS - - - - - - -
U1003	[illegible]	Prom. Controller.
U1004	[illegible]	Frequency Synthesizer.
U1005	[illegible]	Channel Guard, Encode/Decode Hybrid. (Used in G1, G3 and G4).
U1006	[illegible]	Channel Guard, Encode Hybrid. (Used in G2 and G5).
		- - - - - - - - - VOLTAGE REGULATORS - - - - - - -
VR1001	19A700031P1	Linear: POSITIVE VOLTAGE REGULATOR.
		- - - - - - - - - - - - CABLES - - - - - - - - - -
W1001	19A700014P1	Jumper. (Used in G4 and G5).
		- - - - - - - - - - - - SOCKETS - - - - - - - - - -
XU1002	19A700154P9	Integrated circuit: 16 contacts; sim to Burndy DILB16-P108.
		ASSOCIATED PARTS
		NOTE: WHEN ORDERING A PROM, ALWAYS SPECIFY THE CHANNEL GUARD FREQUENCY FOR EACH TRANSMIT AND RECEIVE CHANNEL. IDENTIFY ALL OPEN CHANNELS
U1002	[illegible]	PROM, Channel Guard Frequency.