

MAINTENANCE MANUAL

CHANNEL GUARD ENCODER/DECODER OPTION MHCG1E (349A9730P27) FOR MONOGRAM SERIES PORTABLE RADIO 30-50 MHZ

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SPECIFICATIONS

Tone Frequencies	37 (Standard EIA) 67 to 250.3 Hz
Modulation Limits	500 - 1000 Hz
Decode Sensitivity	8 dB SINAD
Receive Response Time	250 ms max.
Encode Response Time	75 ms max.
Transmit Tone Distortion	5% max.
Transmit Intermodulation Distortion	15% max.
Power	5 Vdc, 4.5 mA
Temperature Range	-30° to +60°C

DESCRIPTION

Channel Guard Option MHCG1E is use with the 30-50 MHz Monogram Portable radio. It is a continuous tone coded squelch system (CTCSS) capable of utilizing all 37 standard EIA tone frequencies to provide a degree of privacy in voice communications and allow you to hear only those calls intended for you. Additionally, a non-standard tone, 97.4 Hz and a disabled state called "No Tone" are available. All are programmed by channel and mode, transmit or receive. This allows radios with Channel Guard to be programmed so that each channel may have different encode/decode tones or may have no encode or decode at all. The subaudible tone assigned to your transmit frequency precedes the voice message. Its purpose is to activate the decoder and open the receiver to allow the message to be heard. Table 1 identifies the standard EIA CTCSS tones.

Operational control of the programmed Channel Guard frequencies is controlled by an eight bit digital code sent serially by the radio's microcomputer from the EEPROM to the Channel Guard when the radio is first turned on, when the channel is changed, and when the radio changes from receive to transmit and transmit to receive modes.

The Channel Guard board contains a single IC (integrated circuit) and associated discreet components mounted on a printed circuit board. The PCB is located underneath the Top

Panel PCB and is plugged into the option interface connector located on the main PCB. See Installation.

Table 1 Channel Guard Tone Frequencies

No.	Freq. Hz	No.	Freq. Hz.
01	67.0	20	131.8
02	71.9	21	136.5
03	74.4	22	141.3
04	77.0	23	146.2
05	79.7	24	151.4
06	82.5	25	156.7
07	85.4	26	162.2
08	88.5	27	167.9
09	91.5	28	173.8
10	94.8	29	179.9
11	97.4	30	186.2
12	100.0	31	192.8
13	103.5	32	203.5
14	107.2	33	210.7
15	110.9	34	218.1
16	114.8	35	225.7
17	118.8	36	233.6
18	123.0	37	241.8
19	127.3	38	250.3

PINOUT/FUNCTIONS

PIN	FUNCTION
1	PTT OUT - Connects to pin 2; allows PTT signal to pass through
2	PTT IN - Connects to pin 1; allows PTT signal to pass through
3	GND - ground
4	TX AF IN - Transmit audio input; allows CTCSS tones to be added
5	1 MHz - Frequency reference for U1.
6	+ 5 Vdc - input power, 4.5 mA
7	DECODE - CTCSS decode state output to the radio; +5 Vdc indicates tone is present, 0 Vdc indicates it is not.
8	Not used
9	DATA - Data received from EEPROM to set tone frequency and mode (encode/decode)
10	SQ POT (dual purpose) - Grounded - disables the CTCSS decode function. Ungrounded - allows R6 to control the radio's squelch threshold and enables the tone decode function
11	RX AF IN - Radio detector input from radio. Allows audio frequencies below 300 Hz to be filtered out and permits CTCSS tone detection..
12	CLOCK - Used to shift data out of EEPROM. R8 & C4 delays data out so that the rising edge seen by U1 comes after the data appears on pin 9.
13	STROBE/ENABLE - Input used to strobe data into its internal control register.
14	RF AF OUT - Receive audio, after U1 filters out the Channel Guard tones, to radio volume control.
15	TX AF OUT - Transmit audio, after Channel Guard tone has been added, to radio modulator.
16	PUSH TO MON - Not used by Channel Guard. Radio microprocessor monitors this signal and always unmutes the receiver.

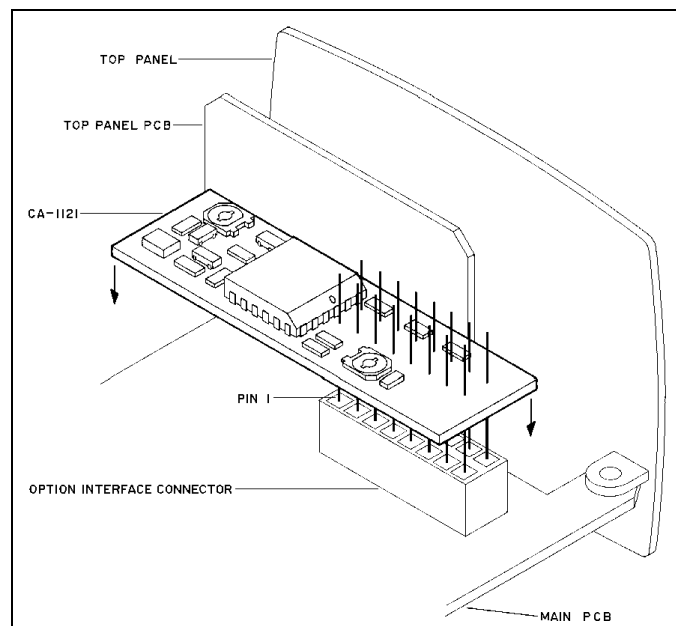
INSTALLATION

The Channel Guard Board plugs into the option interface connector on the main printed circuit board and is located below the top panel printed circuit board. Refer to Figure 1, Channel Guard Installation.

1. Release the locking bolt securing the battery cover (back) and remove cover.
2. Remove battery by pulling up on cloth tab attached to battery.
3. On each side of the radio near the top, remove the two posidrive screws securing bottom cover casting to the top panel casting. One screw passes through the top of the PTT bar.
4. Using a posidrive screw driver, remove the four machine screws from the bottom cover (battery compartment) and separate the bottom from the radio assembly to expose the option interface board.
5. Remove the option interface board from the main printed circuit board in the radio and plug in the Channel Guard board, as shown in Figure 1.
6. Reassemble radio in reverse order.
7. Refer to the ALIGNMENT section in this manual and complete the procedures given to set the noise squelch threshold and the tone deviation.

CAUTION

Improper installation or pin misalignment may result in damage to the radio and/or the tone board.



CA-1121 Sub-Audible Tone Encoder/Decoder

ALIGNMENT

NOISE SQUELCH THRESHOLD, 10 DB SINAD

1. Complete normal radio alignment given in the radio maintenance manual (LBI-38998) and then select a channel programmed for Channel Guard.
2. Set RF Test Set to the channel frequency and modulate it with a 1 kHz tone and 3 kHz deviation.
3. Adjust the output level for 10 dB SINAD.
4. Enable the tone decoder by rotating the radio squelch control counterclockwise until it clicks.
5. Monitor U7-13 on main printed circuit board with a DC voltmeter and adjust R6 until the voltage just goes high more than 2.5 Vdc).
6. Remove the RF signal and verify that pin 13 goes low (less than 2.5 Vdc).

TONE DEVIATION ADJUSTMENT

1. Set RF Generator to channel frequency and modulate with 1 kHz tone. Set deviation for 750 Hz. You should hear the 1 kHz tone only when the Channel Guard tone is present.
2. Set up the test equipment to check transmitter modulation as directed in the radio maintenance manual.
3. Push the PTT bar and adjust R9 for the desired tone deviation, normally 750 Hz.

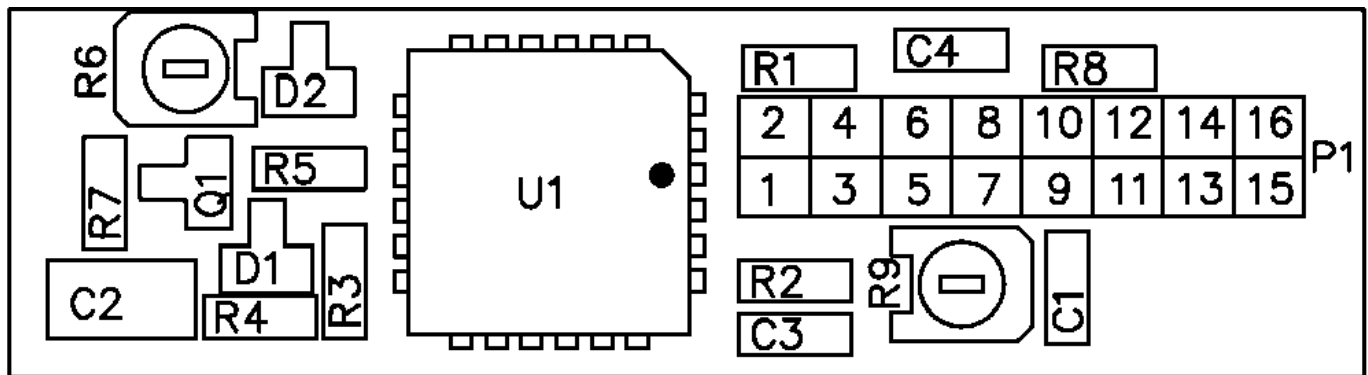
PARTS LIST

Channel Guard Board

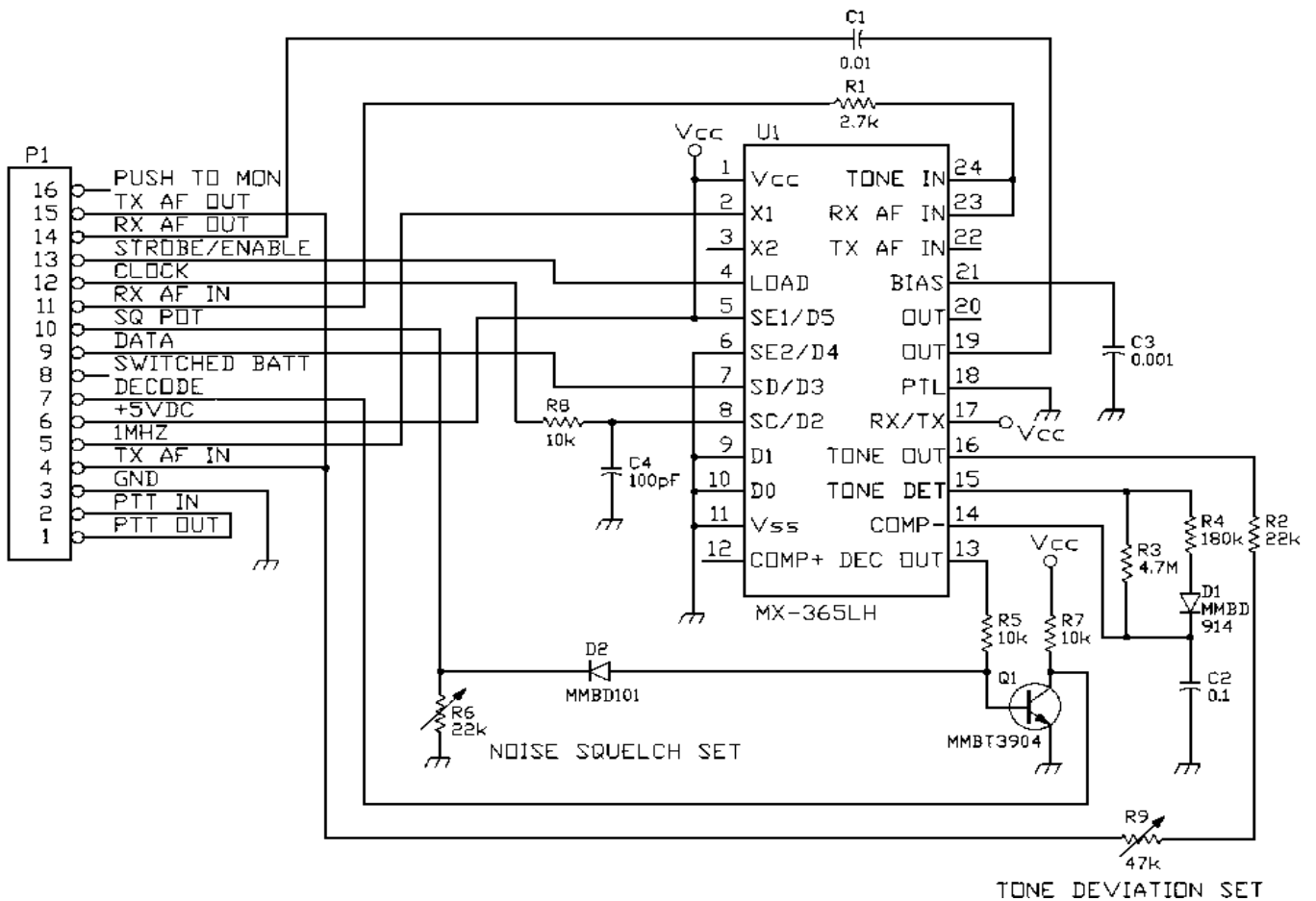
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SYMBOL	PART NO.	DESCRIPTION
C1	R29/130-185-5	Capacitor, ceramic chip. 0.1 μ F
C2	R29/130-153-5	Capacitor, ceramic chip. 0.1 μ F
C3	R29/130-158-0	Capacitor, ceramic chip. 0.001 μ F
C4	R29/131-027--0	Capacitor, ceramic chip. 100 pF
D1	R29/243-027-4	Diode, switching MMBD914 (5D)
D2	R29/249-005-4	Diode, Schottkey MMBD101 (4M)
P1	R29/422-217-0	Header, 16 pin male
Q1	R29/218-018-2	Transistor, switching MMBT3904(1A)
R1	R29/060-272-7	Resistor, Chip 2.7k ohm \pm 5%
R2	R29/060-223-3	Resistor, Chip 22k ohm \pm 5%
R3	R29/060-474-3	Resistor, Chip 470k ohm \pm 5%
R4	R29/060-105-0	Resistor, Chip 1M ohm \pm 5%
R5	R29/060-103-8	Resistor, Chip 10k ohm \pm 5%
R6	R29/074-223-7	Resistor, Trimmer 22k ohm
R7, R8	R29/060-103-8	Resistor, Chip 10k ohm \pm 5%
R9	R29/074-473-6	Resistor, Trimmer 47k ohm
U1	R29/229-288-7	IC MX-365LH

OUTLINE DIAGRAM



SCHEMATIC DIAGRAM



CHANNEL GUARD BOARD

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