Mobile Communications

MPI™

CHANNEL GUARD
DIGITAL CHANNEL GUARD
CARRIER CONTROL TIMER

Maintenance Manual

TABLE OF CONTENTS

CHANNEL GUARD (CG)

DESCRIPTION

The MPI Channel Guard is a continuous-tone encoder and decoder for operation on tone frequencies in the 71.9 to 210.7 Hz range. Both the encoder and decoder operate on the same frequency. The option consists of a Channel Guard module and an option board. The option board provides the proper interface with the transmitter-receiver board.

The Channel Guard module contains a tone frequency synthesizer, encoder, decoder and Squelch Tail Eliminator circuitry (see Figure 1). The synthesizer is programmable to produce Channel Guard tones from 67 to 210.7 Hz in 0.25 Hz increments.

The synthesizer uses a crystal controlled 32,768 Hz reference to produce the desired clock inputs to the encoder and decoder circuits and produce digitally generated time delays for the STE circuitry.

The Channel Guard circuit is controlled by an CG-OFF switch on the control unit. Placing the switch in the OFF position disables the decoder circuits to permit monitoring all calls on the channel. Placing the switch in the CG posi tion enables the Decoder.

CIRCUIT ANALYSIS

ENCODE

When the transmit circuit is keyed, the CPTT lead is pulled low and the Channel Guard module responds by pulling the DPTT lead low, holding the transmit circuit in a keyed condition. The encoder circuit generates a sine wave encoder tone which passes through a low pass filter to remove any clock and tone harmonics. This output tone is connected by the CG output lead to the transmitter audio circuit.

When the radio is unkeyed, the CPTT lead goes high but the PTT delay circuit holds the transmit circuit in a keyed condition for an additional 160 milliseconds by holding the DPTT lead low during this time. During this 160 millisecond time, the encode circuit sends the tone with a 135° phase shift. This combination of 135° phase shift and 160 millisecond delay causes the CG decoder in other receivers to squelch the receiver audio prior to loss of RF signal. This reduces or eliminates the receiver noise burst.

DECODE

In the decode mode, receiver audio from the quadrature detector is applied to the CG module where it passes through a 212 Hz low pass filter to remove voice information. This prevents voice falsing or clipping in the decoder circuit. The digital decoder compares the frequency of the incoming tone to a reference clock produced by the synthersizer. If the correct tone is detected, the module responds by releasing the RUS (Receiver UnSquelched) lead which is normally held in a low voltage condition when the correct tone is not detected.

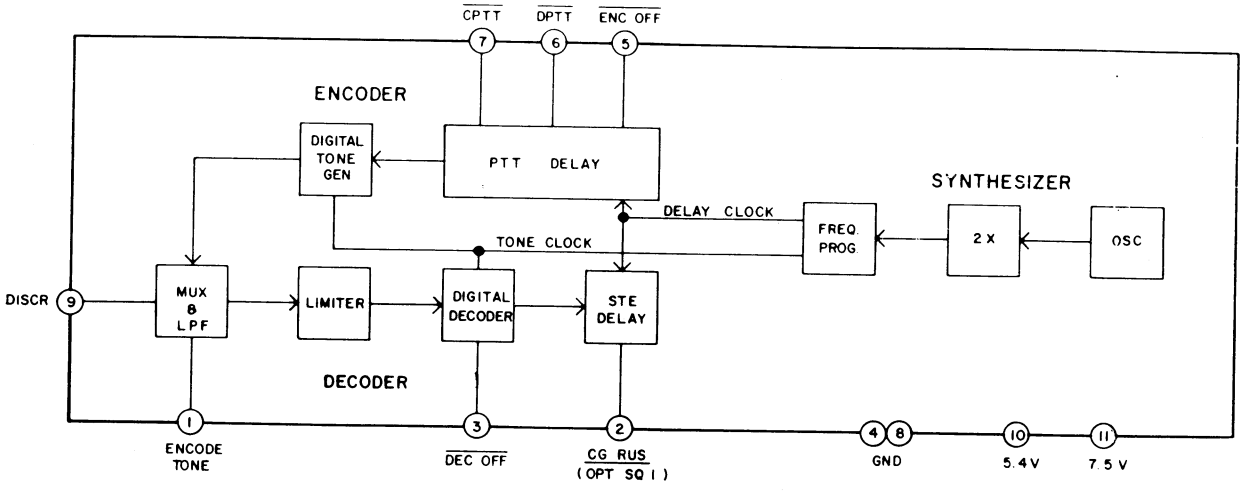

Figure 1 - Channel Guard Module

RC-3751

After decoding the tone, the decoder then looks for a phase shift to occur. If the phase shift occurs, the decoder responds by pulling CG RUS low for 200 milliseconds using the STE delay circuit. This forces the receive circuit to squelch for 200 ms during which time the received carrier should disappear.

DIGITAL CHANNEL GUARD (DCG)

DESCRIPTION

The DCG module contains three integrated circuits consisting of a system linear circuit, an encoder circuit and a decoder circuit (see Figure 2).

The system linear circuit contains the required analog circuits, including a crystal controlled slow clock oscillator circuit, a free running fast clock oscillator circuit, a limiter circuit, for received audio, active filter components and system interfacing.

CIRCUIT ANALYSIS

ENCODE

The encoder circuit is programmed to produce a repetitive, twenty-three bit binary word. This binary word can be one of 83 possible codes between 023 and 754 (see DCG Programming Procedure). The programming is accomplished by nine programming pins located on the top of the module.

When the transmit circuit is keyed, the CPTT lead is pulled low and the Digital Channel Guard module responds by pulling the DPTT lead low, holding the transmit circuit in a keyed condition. The encoder circuit generates a repetitive twenty-three code word, using the slow 32 kHz clock, which passes through a low pass filter (Digital Code Filter) to remove any high frequency components. The digital output is connected by the CG Encode lead to the transmit audio circuit.

When the radio is unkeyed, the CPTT lead goes high, but the PTT delay circuit holds the transmit circuit in a keyed condition for an additional 180 milliseconds by holding the DPTT lead low during this time. During this 180 milliseconds delay, the digital word generator generates a 135 Hz sine wave. This transmitted sine wave and the 180 millisecond delay causes the DCG decoder in other receivers to squelch the receiver circuit audio prior to loss of RF signal. This reduces or eliminates the receiver noise burst.

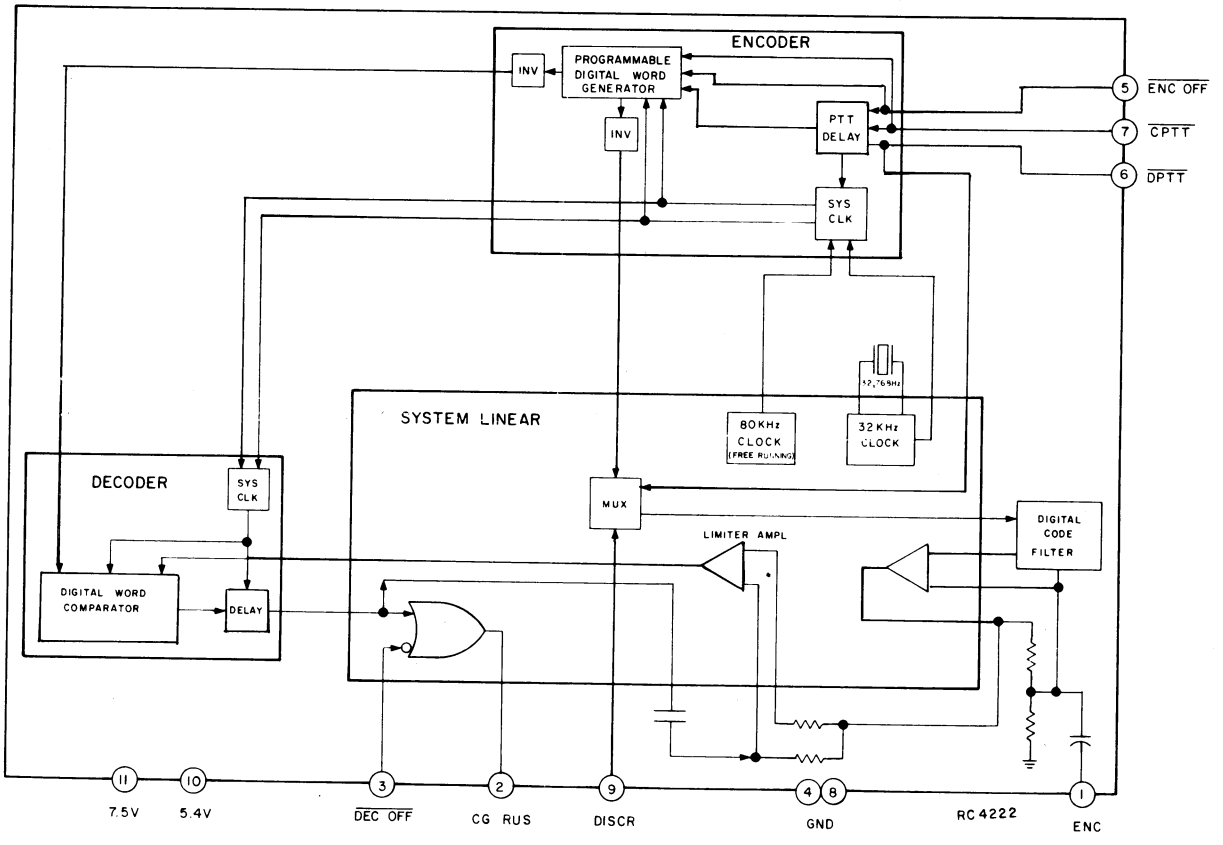

Figure 2 - Digital Channel Guard Module

DECODE

In the decode mode, receiver audio from the quadrature detector lead is fed to the DCG module where it passes through a 212 Hz low pass filter to remove voice information. This prevents interference in detecting the correct code word in the decoder circuit. The decoder circuit compares the digital code word received by the receive circuit to the digital code word generated by the digital word generator. All possible combinations of the code word are check to insure the correct code word is detected. Comparisons are made at the fast 80 kHz clock rate for a fast response time. The module responds by releasing the RUS lead normally held in a low voltage condition when the correct code word is not detected. Releasing the RUS lead unsquelches the receive circuit.

CARRIER CONTROL TIMER

DESCRIPTION

MPI Carrier Control Timer automatically interrupts the transmission of a transmitter by deactivating the system PTT after a 70 second ±10 seconds timing cycle. The timer also alerts the operator that the transmitter is off with a 950 Hertz alarm tone from the speaker as long as the push-to-talk switch is pressed. Transmission can be resumed by releasing the push-to-talk switch and re-keying the transmitter.

ERICSSON

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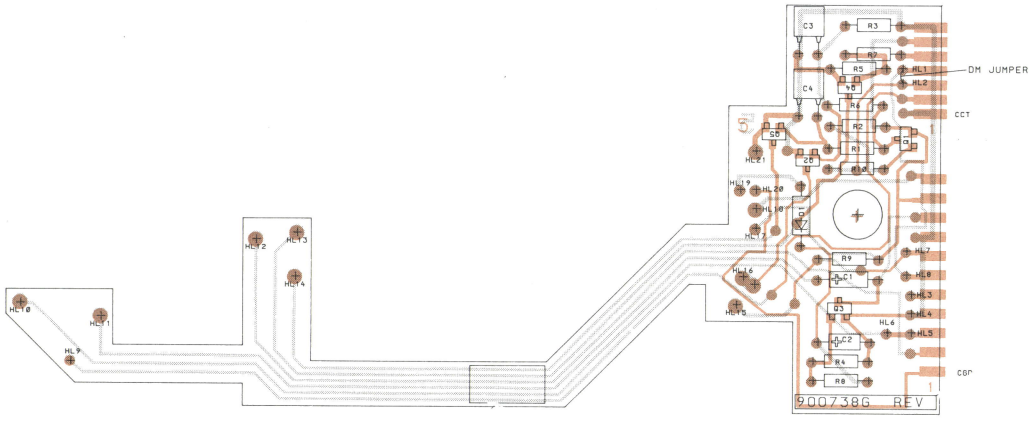
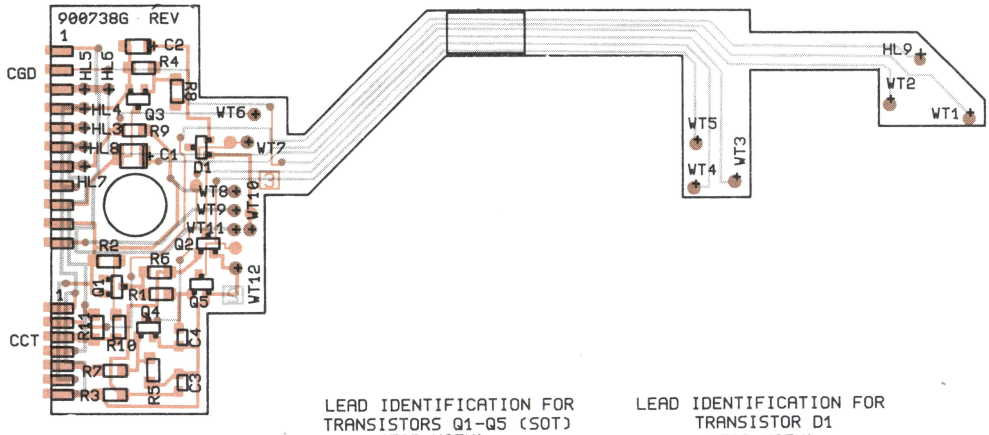


LEAD IDENTIFICATION
Q1-Q4

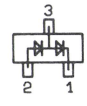
TOP VIEW

(19D900738, Sh. 3, Rev. 1)
(19A704103, Sh. 1, Rev. 5)
(19A704103, Sh. 2, Rev. 5)



LEAD IDENTIFICATION FOR
TRANSISTORS Q1-Q5 (SOT)
(TOP VIEW)

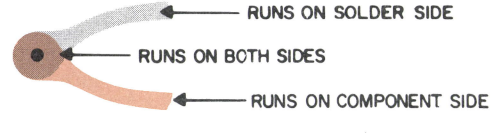
LEAD IDENTIFICATION FOR
TRANSISTOR D1
(TOP VIEW)

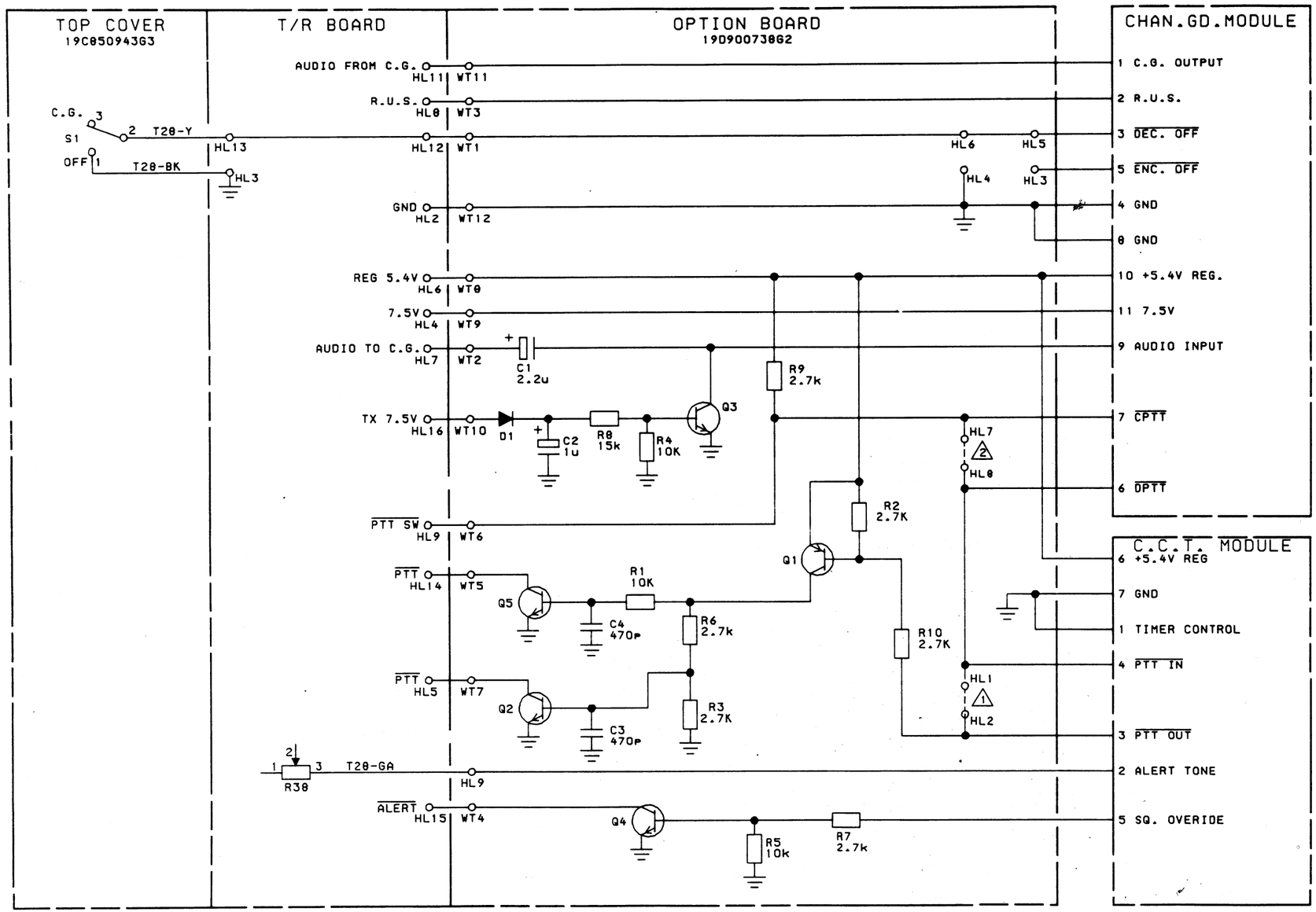


(19D900738, Sh. 4, Rev. 4)
(19D902154, Component Side, Rev. 3)
(19D902154, Solder Side, Rev. 2)

OUTLINE DIAGRAM

CHANNEL GUARD AND
CARRIER CONTROL TIMER
OPTION BOARDS
19D900738G2 - G4





(19D901356, Sh. 1, Rev. 3)

NOTES:

1. JUMPER FOR NON CCT UNITS.
2. JUMPER FOR CCT ONLY UNITS.

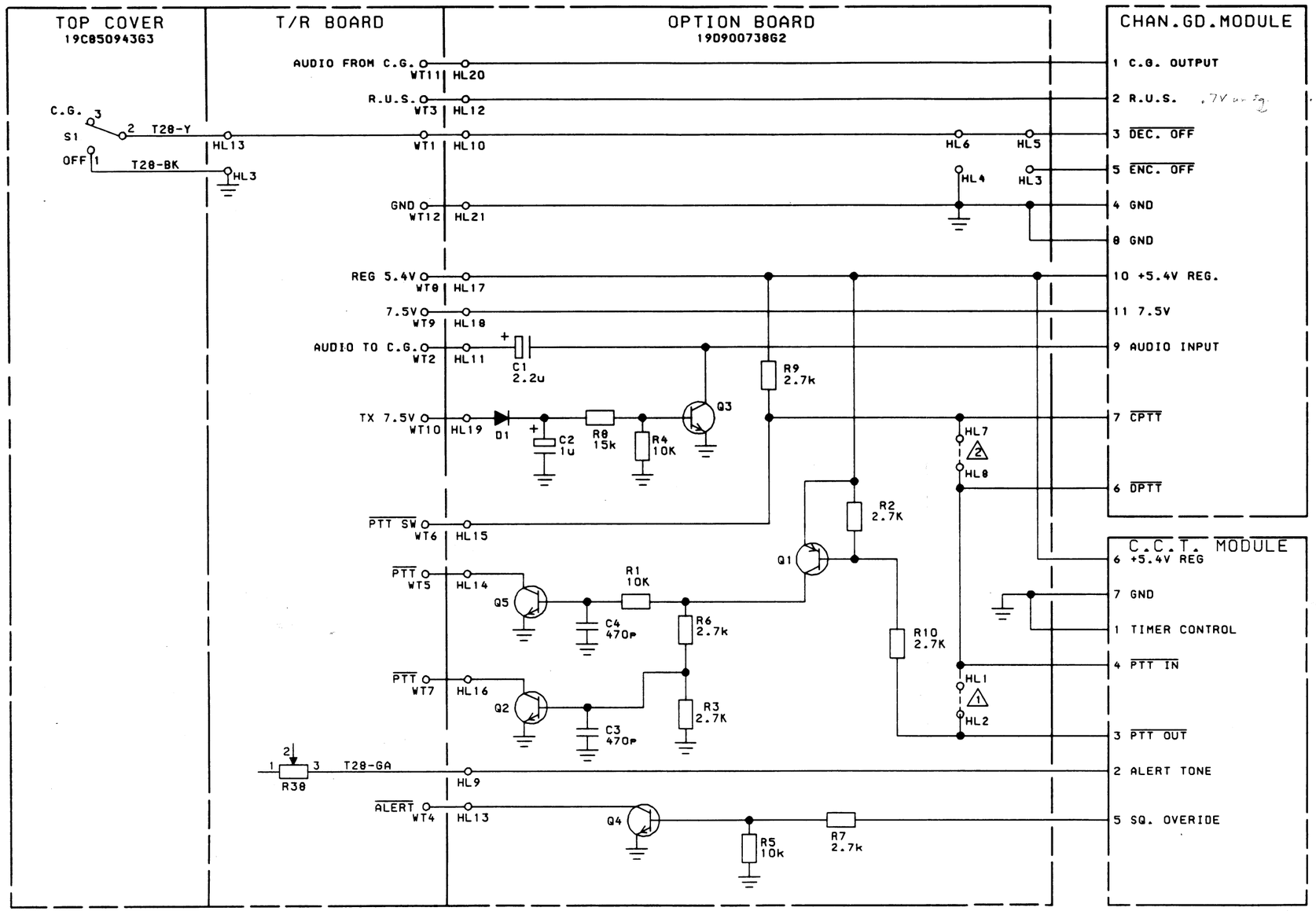
NOTE: NO JUMPERS ARE USED FOR COMBINATION CG AND CCT UNITS.

ALL RESISTORS ARE 1/8 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.

MODEL NO.	REV. LETTER
PL19D900738G2	B

SCHEMATIC DIAGRAM

CHANNEL GUARD AND
CARRIER CONTROL TIMER
OPTION BOARD
19D900738G2



NOTES:

1. JUMPER FOR NON CCT UNITS.
2. JUMPER FOR CCT ONLY UNITS.

NOTE: NO JUMPERS ARE USED FOR COMBINATION CG AND CCT UNITS.

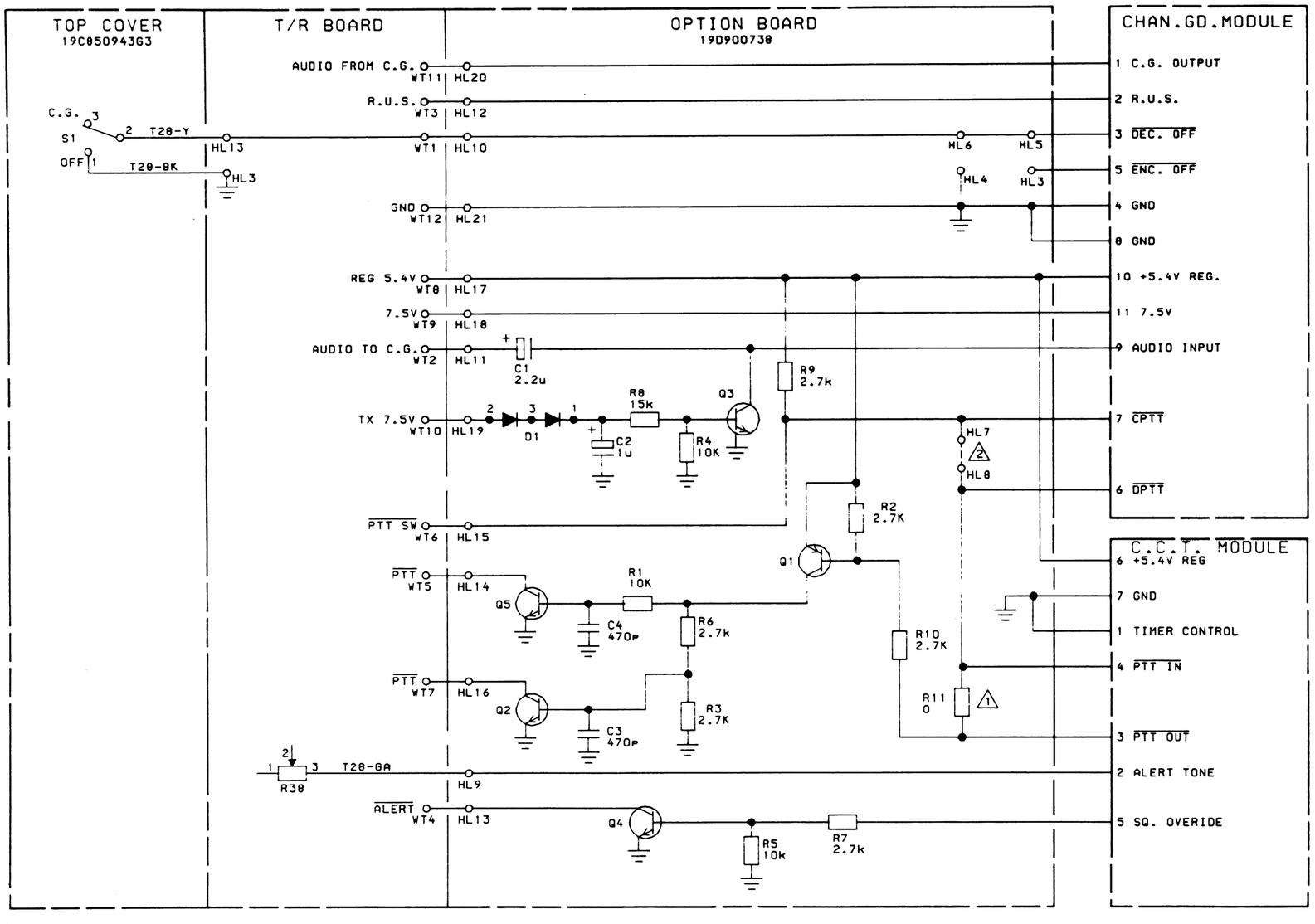
ALL RESISTORS ARE 1/8 WATT UNLESS OTHERWISE SPECIFIED.
RESISTOR VALUES IN Ω UNLESS FOLLOWED BY MULTIPLIER k OR M.
CAPACITOR VALUES IN F UNLESS FOLLOWED BY MULTIPLIER μ,n OR p
INDUCTANCE VALUES IN H UNLESS FOLLOWED BY MULTIPLIER m OR μ.

MODEL NO.	REV. LETTER
PL19D900738G3	

SCHEMATIC DIAGRAM

(19D901356, Sh. 2, Rev. 1)

CHANNEL GUARD AND
CARRIER CONTROL TIMER
OPTION BOARD
19D900738G3



(19D901356, Sh. 3, Rev. 2)

NOTES:

1. REMOVE R11 FOR CCT UNITS.
2. JUMPER FOR CCT ONLY UNITS.

NOTE: NO JUMPERS ARE USED FOR COMBINATION CG AND CCT UNITS.

ALL RESISTORS ARE 1/8 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.

MODEL NO.	REV. LETTER
PL19D900738G4	A

SCHEMATIC DIAGRAM

CHANNEL GUARD AND CARRIER CONTROL TIMER OPTION BOARD 19D900738G4

PARTS LIST

CARRIER CONTROLLED TIMER
AND
CHANNEL GUARD HARDWARE KIT
19A702765G1 CARRIER CONTROLLED TIMER
19A702765G2 CHANNEL GUARD ENCODER
19A702765G3 CHANNEL GUARD ENCODER/DECODER
19A702765G4 CHANNEL GUARD ENCODER/DECODER
ISSUE 5

SYMBOL	GE PART NO.	DESCRIPTION
	19D900738G4	MPI Option Board.
	19B219681P1	Contact, electrical. (Located on terminals 0-9 to program CG freq. or DCG Code).
	19D429521P1	Cover. (Located over Channel Guard select pins).
	19C850943G3	Top Cover.
	19D900667P1	Option Cover.
	19A702364P104	Machine screw, TORX Drive: M2-0.4 x 4.
	19A700032P1	Lockwasher, internal tooth: No. 2.
	19A702471P6	Xtal Pad.
		- - - - - - - - ASSOCIATED PARTS - - - - - - - -
	19B800865G3	Top Cover. Channel Guard.
	19D429618G5	1 Tone Channel Guard - Encode Module.
	19D429618G6	1 Tone Channel Guard - Encode/Decode Module.
	19C327619G1	Carrier Controlled Timer
	19D432621G10	1 Code Digital Channel Guard (Negative Phase) Module.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST

MPI CG/CCT OPTION BOARD
19D900738G2, G3

ISSUE 7

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19B800650P14	Tantalum: 2.2 uF +40-20%, 10 VDCW.
C2	19B800650P13	Tantalum: 1 uF +40-20%, 10 VDCW.
C3 and C4	19A700121P7	Ceramic: 470 pF ±20%, 50 VDCW.
		- - - - - - - - - - - DIODES - - - - - - - - - -
D1	19A702015P1	Silicon; sim to IN458A.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A700059P1	Silicon, PNP.
Q2	19A134739P1	Silicon, NPN.
Q3 and Q4	19A700076P1	Silicon, NPN: sim to MMBT3904.
Q5	19A134739P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	19A702585P87	Composition: 10K ohms ±5%, 1/8 w.
R2 and R3	19A702585P73	Composition: 2.7K ohms ±5%, 1/8 w.
R4 and R5	19A702585P87	Composition: 10K ohms ±5%, 1/8 w.
R6 and R7	19A702585P73	Composition: 2.7K ohms ±5%, 1/8 w.
R8	19A702585P91	Composition: 15K ohms ±5%, 1/8 w.
R9 and R10	19A702585P73	Composition: 2.7K ohms ±5%, 1/8 w.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19A702752P1	Contact. (Used in G2).
	19A702471P6	Foam pad.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST

MPI CG/CCT OPTION BOARD
19D900738G4

ISSUE 2

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A705205P3	Tantalum: 2.2 uF ±20%, 10 VDCW.
C2	19A705205P2	Tantalum: 1 uF, 16 WVDC; sim to Sprague 293D.
C3 and C4	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
		- - - - - - - - - - - DIODES - - - - - - - - - -
D1	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A700059P2	Silicon, PNP.
Q2	19A134739P2	Silicon, NPN.
Q3 and Q4	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
Q5	19A134739P2	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
R2 and R3	19B800607P272	Metal film: 2.7K ohms ±5%, 1/8 w.
R4 and R5	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
R6 and R7	19B800607P272	Metal film: 2.7K ohms ±5%, 1/8 w.
R8	19B800607P153	Metal film: 15K ohms ±5%, 1/8 w.
R9 and R10	19B800607P272	Metal film: 2.7K ohms ±5%, 1/8 w.
R11	19B800607P1	Metal Film: Jumper.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19A702471P6	Foam pad.

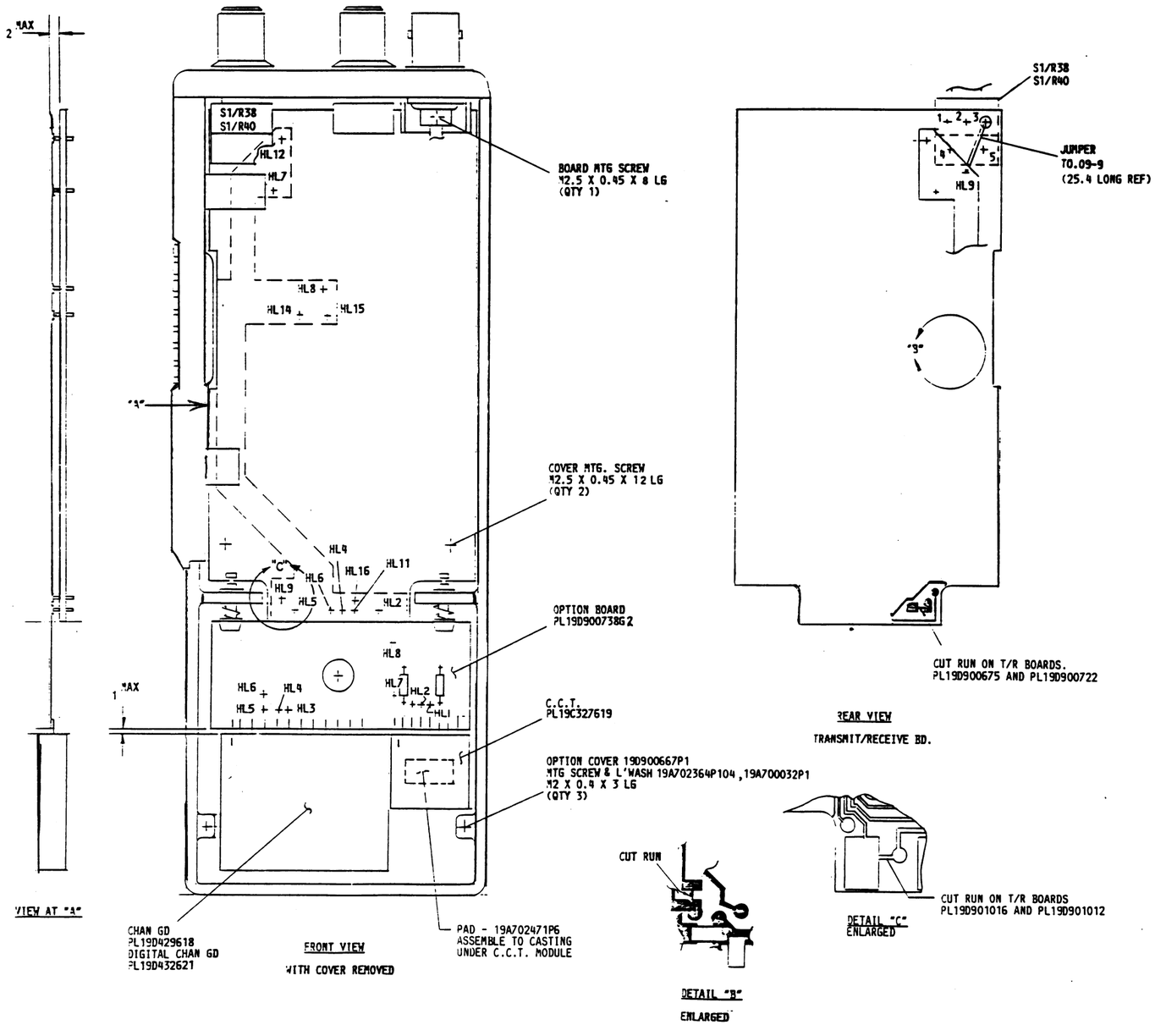
PRODUCTION CHANGES

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 the descriptions of parts affected by these revisions.

REV. A - CG/CCT OPTION BOARD 19D900738G2
Incorporated in initial shipment.

REV. B - CG/CCT OPTION BOARD 19D900738G2
To correct reverse squelch tail on radios with Carrier Control Timer. Added C4, Q5 and R10.

REV. A - CG/CCT OPTION BOARD 19D900738G4
To make flex board compatible with the new back casting, widened PWB hole for shoulder boss.



(19D900782, Sh. 1, Rev. 6)

(1) THESE INSTRUCTIONS COVER THE INSTALLATION OF CHAN. GD. KIT PL19A70276561 FOR APPLICATION OF CARRIER CONTROL TIMER TO MPI PERSONAL RADIO

* 1. REMOVE BATTERY PACK, FRONT COVER AND OPTION COVER. REMOVE SCREW FROM ANTENNA MOUNTING BRACKET AND REMOVE TOP COVER AND TRANSMIT/ RECEIVE BOARD AS AN ASSEMBLY.

2. ON TRANSMIT/RECEIVE BOARD CUT RUNS AS SHOWN. (2 PLACES).

3. SOLDER C.C.T. MODULE TO OPTION BOARD AS SHOWN.

4. SOLDER JUMPER FROM HL9 ON OPTION BOARD TO S1/R38-3 OR S1/R40-3 ON SOLDER SIDE OF TRANSMIT/RECEIVE BOARD.ROUTE JUMPER BETWEEN OPTION BOARD AND T/R BOARD. REMOVE DM JUMPER FROM HL1 TO HL2 ON OPTION BOARD. ADD DM JUMPER FROM HL7 TO HL8 ON OPTION BOARD.

5. ALIGN PINS ON OPTION BOARD WITH CORRESPONDING HOLES ON TRANSMIT/RECEIVE BOARD. SEAT FULLY AND SOLDER. MAX ASSEMBLED HEIGHT TO BE 2 BELOW TRANSMIT/RECEIVE BOARD

* 6. REASSEMBLE TRANSMIT/RECEIVE BOARD, TOP COVER, REAR COVER, OPTION COVER, FRONT COVER, AND BATTERY PACK.

(2) THESE INSTRUCTIONS COVER THE INSTALLATION OF CHAN. GD. KIT PL19A70276562 FOR APPLICATION OF CHANNEL GUARD/DIGITAL CHANNEL GUARD ENCODE ONLY TO MPI PERSONAL RADIO

* 1. REMOVE BATTERY PACK, FRONT COVER AND OPTION COVER. REMOVE SCREW FROM ANTENNA MOUNTING BRACKET AND REMOVE TOP COVER AND TRANSMIT/ RECEIVE BOARD AS AN ASSEMBLY.

2. ON TRANSMIT/RECEIVE BOARD CUT RUNS AS SHOWN. (2 PLACES).

3. SOLDER DESIRED CHANNEL GUARD MODULE TO OPTION BOARD AS SHOWN. SEE SHEETS 4 OR 5 FOR CODING INSTRUCTIONS.

4. ON DIGITAL CHANNEL GUARD ONLY-SOLDER DA JUMPER FROM HL4 TO HL5 ON OPTION BOARD.

5. ALIGN PINS ON OPTION BOARD WITH CORRESPONDING HOLES ON TRANSMIT/RECEIVE BOARD. SEAT FULLY AND SOLDER. MAX ASSEMBLED HEIGHT TO BE 2 BELOW TRANSMIT/RECEIVE BOARD

* 6. REASSEMBLE TRANSMIT/RECEIVE BOARD, TOP COVER, REAR COVER, OPTION COVER, FRONT COVER, AND BATTERY PACK.

(3) THESE INSTRUCTIONS COVER THE INSTALLATION OF CHAN. GD. KIT PL19A70276562 FOR APPLICATION OF CHANNEL GUARD/DIGITAL CHANNEL GUARD ENCODE ONLY AND CARRIER CONTROL TIMER TO M.P.I. PERSONAL RADIO

* 1. REMOVE BATTERY PACK, FRONT COVER AND OPTION COVER. REMOVE SCREW FROM ANTENNA MOUNTING BRACKET AND REMOVE TOP COVER AND TRANSMIT/ RECEIVE BOARD AS AN ASSEMBLY.

2. ON TRANSMIT/RECEIVE BOARD CUT RUNS AS SHOWN. (2 PLACES).

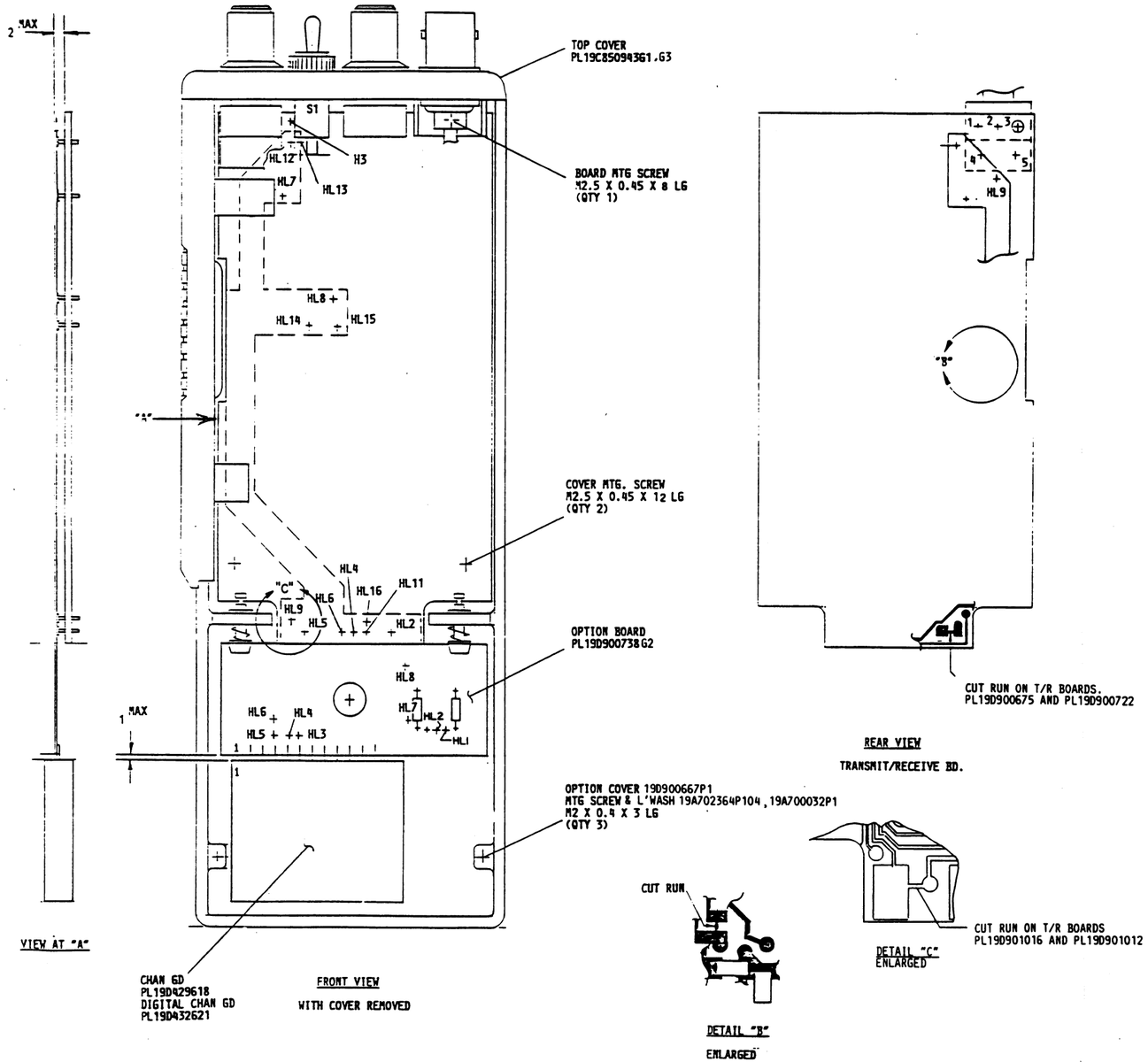
3. SOLDER DESIRED CHANNEL GUARD MODULE AND CARRIER CONTROL TIMER MODULE TO OPTION BOARD AS SHOWN. SEE SHEETS 4 OR 5 FOR CODING INSTRUCTIONS.

4. SOLDER JUMPER FROM HL9 ON OPTION BOARD TO S1/R38-3 OR S1/R40-3 ON SOLDER SIDE OF TRANSMIT/RECEIVE BOARD.ROUTE JUMPER BETWEEN OPTION BOARD AND T/R BOARD. REMOVE DM JUMPER FROM HL1 TO HL2 ON OPTION BOARD. ON DIGITAL CHANNEL GUARD ONLY-SOLDER DA JUMPER FROM HL4 TO HL5 ON OPTION BOARD.

5. ALIGN PINS ON OPTION BOARD WITH CORRESPONDING HOLES ON TRANSMIT/RECEIVE BOARD. SEAT FULLY AND SOLDER. MAX ASSEMBLED HEIGHT TO BE 2 BELOW TRANSMIT/RECEIVE BOARD

* 6. REASSEMBLE TRANSMIT/RECEIVE BOARD, TOP COVER, REAR COVER, OPTION COVER, FRONT COVER, AND BATTERY PACK.

* APPLIES ONLY IF OPTION IS INSTALLED IN AN ASSEMBLED RADIO.



(4) THESE INSTRUCTIONS COVER THE INSTALLATION OF CHAN. GD. KIT PL19A70276563,G4 FOR APPLICATION OF CHANNEL GUARD/DIGITAL CHANNEL GUARD ENCODE ONLY WITH OFF/ON SWITCH TO MPI PERSONAL RADIO

*1. REMOVE BATTERY PACK, FRONT COVER AND OPTION COVER. REMOVE SCREW FROM ANTENNA MOUNTING BRACKET AND REMOVE TOP COVER AND TRANSMIT/RECEIVE BOARD AS AN ASSEMBLY.

*2. REMOVE KNOBS & NUTS SECURING TOP COVER TO TRANSMIT/RECEIVE BOARD POTS. REMOVE EXISTING TOP COVER. BEFORE ASSEMBLING NEW TOP COVER PL19C850943G1,G3 MAKE THE FOLLOWING CONNECTIONS.

FROM	TO	WIRE
S1-1	HL3	BK
S1-2	HL13	Y

3. ON TRANSMIT/RECEIVE BOARD CUT RUNS AS SHOWN. (2 PLACES)

4. SOLDER DESIRED CHANNEL GUARD MODULE TO OPTION BOARD AS SHOWN. SEE SHEETS 4 OR 5 FOR CODING INSTRUCTIONS.

5. ON OPTION BOARD CUT RUN BETWEEN HL5 & HL6 AS SHOWN.

6. MAKE THE FOLLOWING CONNECTIONS ON THE OPTION BOARD

FROM	TO	WIRE	REMARKS
HL4	HL5	DA	DIGITAL CHANNEL GUARD ONLY
HL3	HL6	DA	

7. ALIGN PINS ON OPTION BOARD WITH CORRESPONDING HOLES ON TRANSMIT/RECEIVE BOARD. SEAT FULLY AND SOLDER. MAX ASSEMBLED HEIGHT TO BE 2 BELOW TRANSMIT/RECEIVE BOARD.

*8. REASSEMBLE TRANSMIT/RECEIVE BOARD, TOP COVER, REAR COVER, OPTION COVER, AND BATTERY PACK.

(6) THESE INSTRUCTIONS COVER THE INSTALLATION OF CHAN. GD. KIT PL19A70276563,G4 FOR APPLICATION OF CHANNEL GUARD/DIGITAL CHANNEL GUARD ENCODE/DECODE WITH MONITOR SWITCH TO MPI PERSONAL RADIO

*1. REMOVE BATTERY PACK, FRONT COVER AND OPTION COVER. REMOVE SCREW FROM ANTENNA MOUNTING BRACKET AND REMOVE TOP COVER AND TRANSMIT/RECEIVE BOARD AS AN ASSEMBLY.

*2. REMOVE KNOBS & NUTS SECURING TOP COVER TO TRANSMIT/RECEIVE BOARD POTS. REMOVE EXISTING TOP COVER. BEFORE ASSEMBLING NEW TOP COVER PL19C850943G1,G3 MAKE THE FOLLOWING CONNECTIONS.

FROM	TO	WIRE
S1-1	HL3	BK
S1-2	HL13	Y

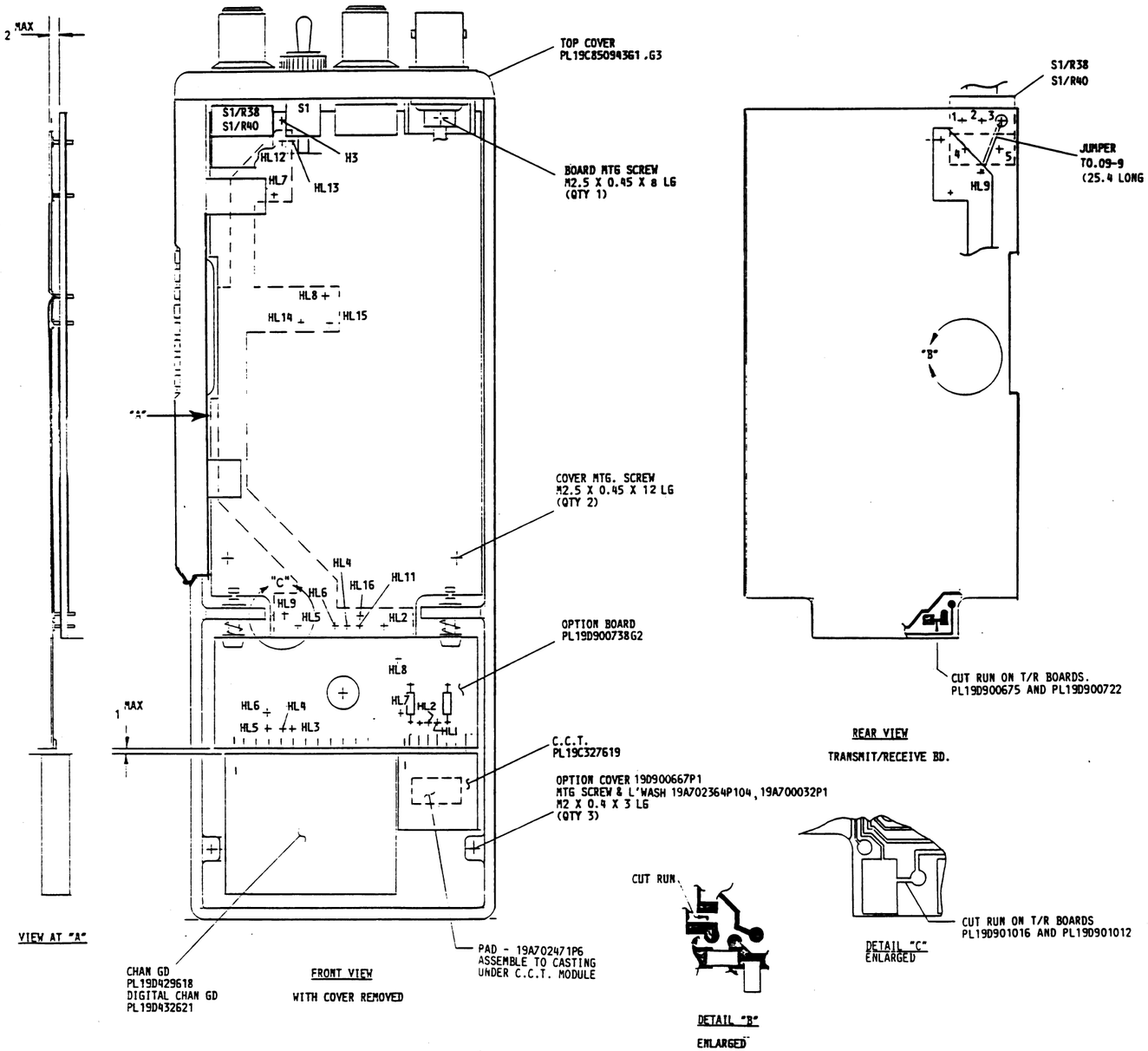
3. ON TRANSMIT/RECEIVE BOARD CUT RUNS AS SHOWN. (2 PLACES).

4. SOLDER DESIRED CHANNEL GUARD MODULE TO OPTION BOARD AS SHOWN. SEE SHEETS 4 OR 5 FOR CODING INSTRUCTIONS.

5. ALIGN PINS ON OPTION BOARD WITH CORRESPONDING HOLES ON TRANSMIT/RECEIVE BOARD. SEAT FULLY AND SOLDER. MAX ASSEMBLED HEIGHT TO BE 2 BELOW TRANSMIT/RECEIVE BOARD.

*6. REASSEMBLE TRANSMIT/RECEIVE BOARD, TOP COVER, REAR COVER, OPTION COVER, AND BATTERY PACK.

* APPLIES ONLY IF OPTION IS INSTALLED IN AN ASSEMBLED RADIO.



(19D900782, Sh. 3, Rev. 7)

(5) THESE INSTRUCTIONS COVER THE INSTALLATION OF CHAN. GD. KIT PL19A70276563 .G4 FOR APPLICATION OF CHANNEL GUARD/DIGITAL CHANNEL GUARD ENCODE ONLY WITH OFF/ON SWITCH AND CARRIER CONTROL TIMER TO MPI PERSONAL RADIO

*1. REMOVE BATTERY PACK, FRONT COVER AND OPTION COVER. REMOVE SCREW FROM ANTENNA MOUNTING BRACKET AND REMOVE TOP COVER AND TRANSMIT/RECEIVE BOARD AS AN ASSEMBLY.

*2. REMOVE KNOBS & NUTS SECURING TOP COVER TO TRANSMIT/RECEIVE BOARD POTS, REMOVE EXISTING TOP COVER. BEFORE ASSEMBLING NEW TOP COVER PL19C85094361 .G3 MAKE THE FOLLOWING CONNECTIONS.

FROM	TO	WIRE
S1-1	HL3	BK
S1-2	HL13	Y

3. ON TRANSMIT/RECEIVE BOARD CUT RUNS AS SHOWN, (2 PLACES).

4. SOLDER DESIRED CHANNEL GUARD MODULE AND CARRIER CONTROL TIMER MODULE TO OPTION BOARD AS SHOWN. SEE SHEETS 4 OR 5 FOR CODING INSTRUCTIONS.

5. ON OPTION BOARD CUT RUN BETWEEN HL5 & HL6 AS SHOWN.

6. MAKE THE FOLLOWING CONNECTIONS ON THE OPTION BOARD

FROM	TO	WIRE	REMARKS
HL4	HL5	DA	DIGITAL CHANNEL GUARD ONLY
HL3	HL6	DA	
HL1	HL2	DM	REMOVE

7. SOLDER JUMPER FROM HL9 ON OPTION BOARD TO S1/R38-3 OR S1/R40-3 ON SOLDER SIDE OF TRANSMIT/RECEIVE BOARD. ROUTE JUMPER BETWEEN OPTION BOARD AND T/R BOARD.

8. ALIGN PINS ON OPTION BOARD WITH CORRESPONDING HOLES ON TRANSMIT/RECEIVE BOARD. SEAT FULLY AND SOLDER. MAX ASSEMBLED HEIGHT TO BE 2 BELOW TRANSMIT/RECEIVE BOARD.

*9. REASSEMBLE TRANSMIT/RECEIVE BOARD, TOP COVER, REAR COVER, OPTION COVER, AND BATTERY PACK.

(7) THESE INSTRUCTIONS COVER THE INSTALLATION OF CHAN. GD. KIT PL19A70276563 .G4 FOR APPLICATION OF CHANNEL GUARD/DIGITAL CHANNEL GUARD ENCODE/DECODE WITH MONITOR SWITCH AND CARRIER CONTROL TIMER TO MPI PERSONAL RADIO

*1. REMOVE BATTERY PACK. FRONT COVER AND OPTION COVER. REMOVE SCREW FROM ANTENNA MOUNTING BRACKET AND REMOVE TOP COVER AND TRANSMIT/RECEIVE BOARD AS AN ASSEMBLY.

*2. REMOVE KNOBS & NUTS SECURING TOP COVER TO TRANSMIT/RECEIVE BOARD POTS. REMOVE EXISTING TOP COVER. BEFORE ASSEMBLING NEW TOP COVER PL19C85094361 .G3 MAKE THE FOLLOWING CONNECTIONS.

FROM	TO	WIRE
S1-1	HL3	BK
S1-2	HL13	Y

3. ON TRANSMIT/RECEIVE BOARD CUT RUNS AS SHOWN, (2 PLACES).

4. SOLDER DESIRED CHANNEL GUARD MODULE AND CARRIER CONTROL TIMER MODULE TO OPTION BOARD AS SHOWN. SEE SHEETS 4 OR 5 FOR CODING INSTRUCTIONS.

5. SOLDER JUMPER FROM HL9 ON OPTION BOARD TO S1/R38-3 OR S1/R40-3 ON SOLDER SIDE OF TRANSMIT/RECEIVE BOARD. ROUTE JUMPER BETWEEN OPTION BOARD AND T/R BOARD. REMOVE DM JUMPER FROM HL1 TO HL2 ON OPTION BOARD.

6. ALIGN PINS ON OPTION BOARD WITH CORRESPONDING HOLES ON TRANSMIT/RECEIVE BOARD. SEAT FULLY AND SOLDER. MAX ASSEMBLED HEIGHT TO BE 2 BELOW TRANSMIT/RECEIVE BOARD.

*7. REASSEMBLE TRANSMIT/RECEIVE BOARD, TOP COVER, REAR COVER, OPTION COVER, AND BATTERY PACK.

* APPLIES ONLY IF OPTION IS INSTALLED IN AN ASSEMBLED RADIO

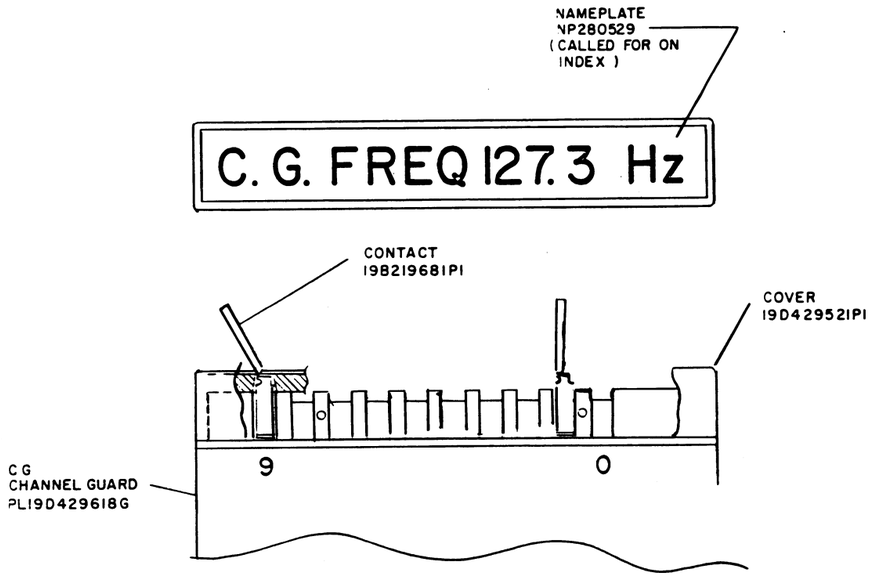


FIG. 1

THESE INSTRUCTIONS COVER THE FREQ CODING FOR C. G. MODULE 19D429618 USING THE STANDARD C. G. FREQ.

1. INSTALL CONTACT PINS (19821968I). PER FIG. 1, IN POSITIONS INDICATED BY "X" IN CHART 1, WHICH AGREES WITH DESIRED CG FREQ. (NOTE - EXAMPLE SHOWN FOR 127.3Hz).
2. ASSEMBLE SNAP ON COVER (19D429521PI).
3. BREAK OFF CONTACT TABS ABOVE COVER BY BENDING TOWARD EITHER END OF MODULE. (DO NOT BEND TAB TOWARD SIDE OF MODULE).
4. STAMP APPROPRIATE CG FREQ ON LABEL (NP280529) AND ASSEMBLE IN RECESS ON TOP OF COVER. (EXAMPLE 127.3)

CHART 1

FREQ CHART										
C.G.	CONTACT PIN POSITION									
FREQ	9	8	7	6	5	4	3	2	1	0
67	X		X	X	X	X			X	X
71.9	X		X	X		X	X	X	X	X
77	X		X	X			X		X	X
82.5	X		X		X	X		X		X
88.5	X		X			X	X	X		X
94.8	X		X					X		
100	X			X	X		X	X	X	X
103.5	X			X	X					X
107.2	X			X		X			X	
110.9	X			X					X	X
114.8	X				X	X		X		
118.8	X				X			X		
123	X					X			X	X
127.3	X								X	
131.8		X	X	X	X	X				
136.5		X	X	X		X	X	X		X
141.3		X	X	X			X		X	
146.2		X	X		X	X		X	X	
151.4		X	X		X					X
156.7		X	X				X	X		
162.2		X		X	X	X		X	X	
167.9		X		X		X	X	X	X	X
173.8		X		X			X			
179.9		X			X		X	X	X	X
186.2		X				X		X	X	
192.8			X	X	X	X	X	X		
203.5			X	X		X				X
210.7			X		X	X		X		

THESE INSTRUCTIONS COVER THE FREQ CODING FOR CG MODULE 19D429618 USING THE NON STANDARD CG FREQ.

1. USE CHART 2 TO CALCULATE THE CG FREQ DESIRED.
2. FIND THE FREQ DESIRED BY ADDING UP THE FREQ IN CHART 2. ABOVE EACH FREQ IS A CONTACT PIN POSITION NUMBER. IF THIS POSITION IS OPEN (THAT IS A PIN IS NOT INSTALLED), THE CG WILL PRODUCE THAT FREQ. IF MORE THAN ONE IS LEFT OPEN, THE OUTPUT FREQ WILL BE THE SUM OF THE OPEN POSITIONS.

   EXAMPLE: CG FREQ 128Hz THEREFORE CONTACT PIN POSITION ±9 WILL BE OPEN AND CONTACT PINS WILL BE INSTALLED IN POSITION 0, 1, 2, 3, 4, 5, 6 ,7 AND 8.

   EXAMPLE: CG FREQ 132.75Hz. THEREFORE CONTACT PIN POSITION ±9 WHICH IS 128, ±4 WHICH IS 4, ±1 WHICH IS .5, AND ±0 WHICH IS .25 WILL BE OPEN. ADD THE FREQ 128 + 4 + .5 + .25 = 132.75. CONTACT PINS WILL BE INSTALLED IN POSITION ±2, 3, 5, 6, 7 AND 8.
3. INSTALL CONTACT PINS, ASSEMBLE COVER AND STAMP LABEL PER INSTRUCTIONS FOR FREQ CODING THE STANDARD CG FREQ.

CHART 2

9	8	7	6	5	4	3	2	1	0	CONTACT PIN POSITION
128	64	32	16	8	4	2	1	.5	.25	FREQ IN Hz

(19D900782, Sh. 4, Rev. 0)

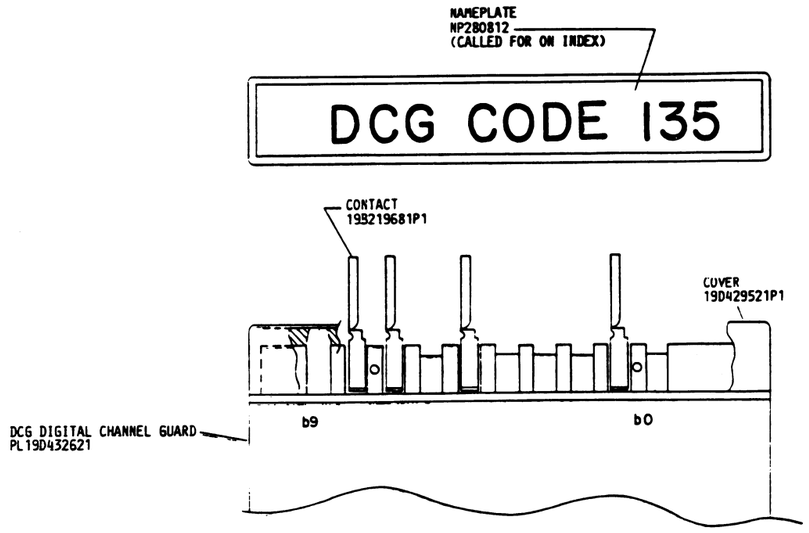


FIG 2

CHART 1
CODE CHART
CONTACT PIN POSITION

DCG CODE	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
023		X	X	X	X		X	X		
025		X	X	X	X		X		X	
026		X	X	X	X		X			X
031		X	X	X	X			X	X	
032		X	X	X	X			X		X
036		X	X	X	X					X
037		X	X	X	X					
043		X	X	X		X	X	X		
047		X	X	X		X	X			
051		X	X	X		X		X	X	
053		X	X	X		X		X		
054		X	X	X		X			X	X
056		X	X	X		X				X
057		X	X	X		X				
060		X	X	X			X	X	X	X
065		X	X	X			X		X	
066		X	X	X			X			X
067		X	X	X			X			
071		X	X	X				X	X	
072		X	X	X				X		X
073		X	X	X				X		
074		X	X	X					X	X
075		X	X	X					X	
076		X	X	X						X
104		X	X		X	X	X		X	X
107		X	X		X	X	X			
114		X	X		X	X			X	X
115		X	X		X	X			X	
117		X	X		X	X				
122		X	X		X		X	X		X
123		X	X		X		X	X		
125		X	X		X		X		X	
127		X	X		X		X			
130		X	X		X			X	X	X
131		X	X		X			X	X	
132		X	X		X			X		X
133		X	X		X			X		
134		X	X		X				X	X
135		X	X		X				X	
136		X	X		X					X
142		X	X			X	X	X		X
143		X	X			X	X	X		
144		X	X			X	X		X	X
145		X	X			X	X		X	
147		X	X			X	X			
150		X	X			X		X	X	X
152		X	X			X		X		X
153		X	X			X		X		
155		X	X			X			X	
156		X	X			X				X
157		X	X			X				
161		X	X				X	X	X	

CHART 1
CODE CHART(CONT.)
CONTACT PIN POSITION

DCG CODE	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
162		X	X				X	X		X
163		X	X				X	X		
164		X	X				X		X	X
165		X	X				X		X	
171		X	X					X	X	
176		X	X							X
212		X		X	X	X		X		X
213		X		X	X	X		X		
217		X		X	X	X				
222		X		X	X		X	X		X
223		X		X	X		X	X		
224		X		X	X		X		X	X
225		X		X	X		X		X	
227		X		X	X		X			
231		X		X	X			X	X	
234		X		X	X				X	X
235		X		X	X				X	
236		X		X	X					X
237		X		X	X					
243		X		X		X	X	X		
245		X		X		X	X		X	
246		X		X		X	X			X
252		X		X		X		X		X
254		X		X		X			X	X
255		X		X		X			X	
262		X		X			X	X		X
266		X		X			X			X
271		X		X				X	X	
274		X		X					X	X
276		X		X						X
307		X			X	X	X			
311		X			X	X		X	X	
312		X			X	X		X		X
315		X			X	X			X	
317		X			X	X				
324		X			X		X		X	X
325		X			X		X		X	
331		Y			X			X	X	
332		Y			Y			X		X
344		X				X	X		X	X
346		X				X	X			X
351		X				X		X	X	
356		Y				X				X
363		X					X	X		
446			X	X		X	X			X
447			X	Y		X	X			
452			X	X		X		X		X
454			X	Y		X			X	X
455			Y	X		X			X	
462			X	X			X	X		X
523			X		X		X	X		
526			X		X		X			X

THESE INSTRUCTIONS COVER THE CODING FOR DCG MODULE 19D432621 USING THE STANDARD DCG CODES.

1. IN HI BAND AND 450 MHz UNITS WITHOUT OPTION K3 POSITION B9 HAS CONTACT PIN INSTALLED. WITH OPTION K3 DO NOT INSTALL CONTACT PIN IN POSITION B9.

■ 2. INSTALL CONTACT PINS (19B219681). PER FIG. 2, IN POSITIONS INDICATED BY "X" IN CHART 1, WHICH AGREES WITH DESIRED DCG CODE. (NOTE - EXAMPLE SHOWN FOR 135 HI BAND).

3. ASSEMBLE SNAP ON COVER (19D429521P1).

4. BREAK OFF CONTACT TABS ABOVE COVER BY BENDING TOWARD EITHER END OF MODULE. (DO NOT BEND TAB TOWARD SIDE OF MODULE).

5. STAMP APPROPRIATE CG FREQ ON LABEL (NP280812) AND ASSEMBLE IN RECESS ON TOP OF COVER. (EXAMPLE 135).

■ FOR DCG CODES THAT ARE NOT LISTED IN CHART, BUT WILL HAVE THE SAME CONTACT PIN POSITION AS ONES THAT ARE LISTED ON THE CHART, SEE DRAWING 19A702208.

(19D900782, Sh. 5, Rev. 1)