INSTRUCTIONS
FOR
AUDIO BOARDS 19A129924G1-G3

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DESCRIPTION

The 19A129924G1 Audio Board is used in MASTR® II Repeater and Local/Repeater Base Stations. The 19A129924G2 Audio board is used in MASTR II Remote/ Repeater Base Stations. The 19A129924G3 Audio Board is used in MASTR II Remote Control Base Stations. The repeater circuits consist of a high-pass filter, audio amplifiers, a de-emphasis network, a repeater audio switch and receiver unsquelch sensor (RUS) switch. The remote circuits consist of a high-pass filter, audio amplifiers, a de-emphasis network, a line driver for feeding receive audio to the telephone line, a compressor amplifier for controlling the line audio level fed to the transmitter and audio and RUS switches for controlling the transmit and receive audio paths.

CIRCUIT ANALYSIS

Audio Board 19A129924G1

Audio from the station receiver is coupled to emitter follower Q1 through the high-pass filter consisting of C2-C3 and R1-R2. This filter attenuates 60 and 120 Hz to reduce the hum and noise. The output of the emitter follower is passed through a de-emphasis network C5 and R6. This network provides a 6dB/octave rolloff. The signal is then amplified by Q2 and fed to another emitter follower Q3. The Tx MOD control R14 is connected in the emitter circuit of Q3 and allows feeding the transmitter modulator input at a maximum level of 200 millivolts.

The receiver Unsquelched Sensor Operating Switch (RUSOS) lead is at a positive potential when the receiver is squelched. CR4 is forward biased, allowing Q5 to conduct. This grounds the collector of Q2 at audio frequencies, preventing the audio signal from passing to Q3. Q12 is normally conducting, grounding the gate of FET Q13 and blocking the audio from the transmitter. When the receiver is unsquelched, the RUS lead D12 goes high, turning on Q11. This grounds the RUSOS lead and turns off Q5 and Q12. The audio signal is now allowed to pass through Q3 and Q13 to the transmitter modulator.

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Audio Board 19A129924G2

The 19A129924G2 Audio Board is used in remote/ repeat station combinations. The receiver audio amplifiers, de-emphasis network and repeater audio switch operate in the same manner as described for the 19A129924G1 Board. A separate emitter follower (Q4) is connected to the emitter of Q3 for repeater applications. The REPEATER TX LEVEL control (R15) is connected in the emitter circuit of Q4. R14 in the emitter circuit of (Q3) now serves as the LINE OUT level control.

The audio from the station receiver is connected to the Remote Control/Repeat Audio board at VOL/SQ/HI lead B11. The audio signal is amplified by Q1-Q4; the level is adjusted by means of REPEATER TX LEVEL Control R15 and passed to the TX AUDIO HI lead B14.

The emitter-follower Q3 output is coupled by means of C10 to the RCVR NOTCH FILTER OUTPUT lead D14 and connected to the Transmitter Control Board where the 2175 Hz Secur-it tone components are notched out of the receiver audio. Resistor R16 and the jumper between H7 and H8 are removed in tone control systems.

When the audio is returned from the Transmitter Control Board, via RCVR NOTCH FILTER INPUT lead D13, the signal is connected to amplifiers Q6 and Q8. Q7 serves as an audio gate controlled by the RUS input circuit. As long as the RUS input is active Q7 passes the signal to the audio output transistor Q9 which, in turn, couples the signal to T1 and the audio path.

Line audio is coupled from the primary of T1 to LINE AUDIO lead A8. The signal is connected to the Secur-it Tone Board and the Transmitter Control Board. The TX NOTCH FILTER removes the 2175 Hz tone from the audio and the signal is returned to the COMP INPUT FROM TONE CONTROL lead A9. The compressor amplifier functions in the same manner as described for the Remote Audio Board.

Audio Board 19A129924G3

Audio from the station receiver discriminator is coupled to emitter follower Q1 through the high-pass filter consisting of C2-C3 and R1-R2. This filter attenuates 60 and 120 Hertz to reduce the hum and noise. The output of the emitter follower is passed through a de-emphasis network C5 and R6. This network provides a 6 dB/octave rolloff. The signal is then amplified by Q2 and fed to another emitter follower Q3.The LINE OUT Control R14 is connected in the emitter circuit of Q3 and allows feeding the audio to the line driver at the proper level.

The audio is coupled through C10 to the RX NOTCH FILTER OUTPUT lead D14. This lead is connected to the Transmitter Control Board where the 2175 Hz tone components are notched out of the receiver audio. Resistor R16 and the jumper between H7 and H8 are removed in tone control systems.

When the audio is returned from the Transmitter Control board via RCVR NOTCH FILTER INPUT lead D13, the signal is coupled to the line driver. Q6 and Q8 amplify the signal. Q7 serves as an audio switch controlled by the RUS circuit. As long as the RUS switch (Q11) is turned off (receiver squelched), CR5 is forward biased allowing Q7 to conduct. Conduction of Q7 grounds the audio path between Q6 and Q8, preventing the audio from being passed to the line. When the receiver unsquelches, the RUS lead goes high. This turns Q11 on, turning off CR5 and Q7. The audio is now allowed to pass to the output amplifier Q9 and to the line transformer T1. CR2, CR3 and VR1 are provided for line surge protection.

Audio from the telephone pair is coupled to the input of the transmitter compressor amplifier which consists of Q15-Q19. The proper audio level for the compressor amplifier is adjusted by LINE INPUT control R39. R41 and the AC impedance of transistor Q15 act as a voltage divider for the AC input signal. The output of Q15 is amplified by a four stage direct-coupled amplifier (Q16-Q19). Both AC and DC feedback in the amplifier circuit provides for stable operation.

One portion of the amplified output is fed through R50 (REM TX LEVEL) to the XMTR AUDIO HI lead to modulate the transmitter. The remaining portion of the signal is rectified by detector CR6-CR7, filtered by C29, and amplified by DC current amplifier Q20. This DC output is fed back to the base of gain control transistor Q15.

The amount of DC feedback to Q15 determines the AC impedance of this transistor. When the input level rises, the AC amplifier output starts to increase. The output is detected, amplified and fed back to the base of Q15. The increase in feedback reduces the AC impedance of Q15 which decreases the audio voltage to the AC amplifiers, keeping the output constant.

When the input decreases, the output of the AC amplifier starts to decrease, reducing the feedback to Q15. This raises the AC impedance of Q15 and increases the audio voltage to the AC amplifier, keeping the output constant.

The compressor amplifier resets when switching from the receive to transmit mode. Resetting the compressor amplifier prevents losing the first portion of a weak line signal due to the compressor release time. When the RUS lead returns to ground, Q11 is turned off. This allows the Receiver Unsquelch Sensor Operating Switch (RUSOS) lead to go high. Transistor Q14 is turned on, grounding the base of Q20. This shorts capacitor C29 for approximately 10 milliseconds. This resets the compressor amplifier.

Transmit audio is coupled from the REM TX LEVEL control R50 to the source terminal of FET Q21. Q22 is normally conducting, grounding the gate terminal of Q21 and preventing the audio from passing through the FET. Applying ground to the REMOTE PTT terminal D3 forward biases CR10, turning Q22 off. Q21 is now allowed to the TRANSMITTER AUDIO HI lead D14 and to the station transmitter modulator.

When the Intercom Kit is used in the station, audio from the local microphone is connected from the Intercom Board via D9 to the base of Q8 and, after amplification, the local audio is fed to the line transformer.

Line audio, after passing through the compressor amplifier is connected via B10 to the Intercom Board. Receiver audio overrides the intercom audio. Instructions for the Intercom Kit are provided in the maintenance manual for Option 9508.

When Secur-it Tone is detected, +10 VDC is applied to the AUDIO MUTE lead D2 from the Secur-it Tone Board. This turns Q10 on, grounding the base of Q11. Q7 is now allowed to conduct and prevent the receive audio from reaching the line and masking the function tone. The RX 1 MUTE lead turns the receiver off during transmit, causing the RUS lead to go low. This turns off the receiver audio to the line.

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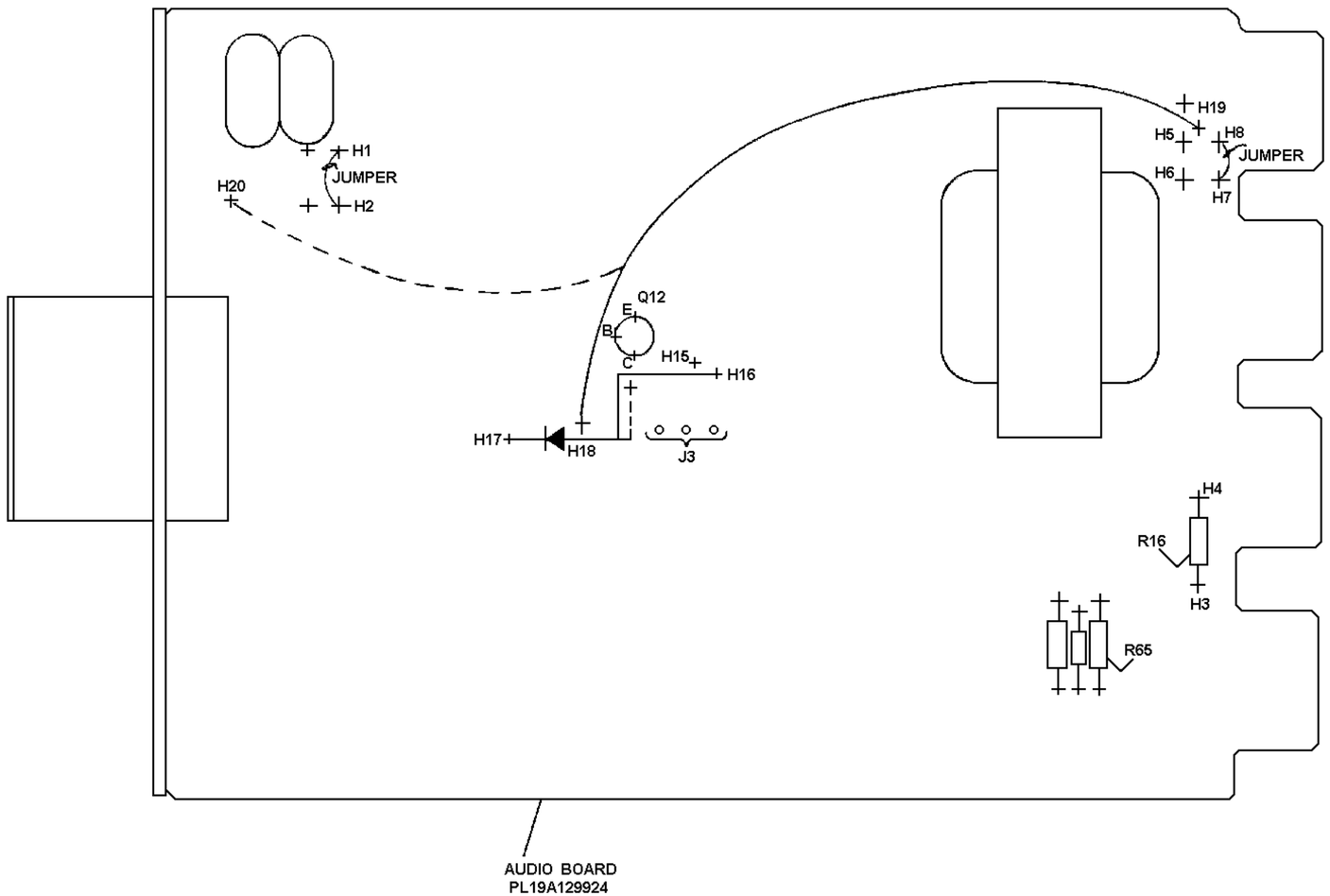


AUDIO BOARD

THESE INSTRUCTIONS COVER THE MODIFICATIONS TO THE AUDIO BOARD (19A129924) FOR OPERATION WITH CHANNEL GUARD SYSTEM AND FOR OPERATION IN TONE CONTROL OR WITH CHANNEL GUARD IN A TONE CONTROL SYSTEM.

(1) MODIFICATION FOR OPERATION AS CHANNEL GUARD SYSTEM.

1. REMOVE JUMPER BETWEEN HOLE 1 AND HOLE 2 AND DISCARD.

(2) MODIFICATIONS FOR OPERATION IN TONE CONTROL SYSTEM.

1. REMOVE R16 AND R65 AND DISCARD. DO NOT REMOVE R65 IF OPTION 9820, 9821, VT1B OR VT1C ARE PRESENT.
2. REMOVE JUMPER BETWEEN HOLE 7 AND HOLE 8 AND DISCARD.

(3) MODIFICATIONS FOR OPERATION IN TONE CONTROL SYSTEM WITH CHANNEL GUARD.

1. REMOVE JUMPER BETWEEN HOLE 1 AND HOLE 2 AND DISCARD.
2. REMOVE R16 AND R65 AND DISCARD. DO NOT REMOVE R65 IF OPTION 9820, 9821, VT1B OR VT1C ARE PRESENT.
3. REMOVE JUMPER BETWEEN HOLE 7 AND HOLE 8 AND DISCARD.

(4) MODIFICATION FOR GE - MARC V DUPLEX SYSTEM.

1. INSTALL DIODE (19A700047P2) BETWEEN H16 AND H17. USE INSULATING SLEEVE (A7143140P2) ON DIODE LEADS.

(5) MODIFICATIONS FOR GE - MARC - V DUPLEX SYSTEM.

1. INSTALL DIODE (19A700047P2) BETWEEN H16 AND H17 (AN ALTERNATIVE TO H16 IS THE FEEDTHRU HOLE CONNECTING TO COLLECTOR OF Q12). USE SLEEVE (A7143140P2) ON DIODE LEADS.
2. UNSOLDER ONE END OF JUMPER FROM HOLE 20 AND MOVE IT TO HOLE 18 FOR USE WITH 19C336562 FILTER BOARD.

(19C320824, Rev. 6)

PARTS LIST

REPEATER AUDIO BOARD
19A129924G1
ISSUE 2

SYMBOL	PART NO.	DESCRIPTION
A1		COMPONENT BOARD 19D417210G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	T644ACP347K	Polyester: .047 uF ±10%, 50 VDCW.
C2	T644ACP322K	Polyester: .022 uF ±10%, 50 VDCW.
C3	T644ACP315K	Polyester: .015 uF ±10%, 50 VDCW.
C4 and C5	19A116080P109	Polyester: 0.22 uF ±10%, 50 VDCW.
C6	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C7	5496267P14	Tantalum: 15 uF ±20%, 20 VDCW; sim to Sprague Type 150D.
C8	19A116080P109	Polyester: 0.22 uF ±10%, 50 VDCW.
C15	19A115680P7	Electrolytic: 100 uF +150-10%, 15 VDCW; sim to Mallory Type TTX.
C16 and C17	5496267P10	Tantalum: 22 uF ±20%, 15 VDCW; sim to Sprague Type 150D.
C32	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C38 *	19A700233P2	Ceramic, disc: 100 pF ±20%, 50 VDCW.
		- - - - - - - - - - RECTIFIERS - - - - - - - - - -
CR4	19A115250P1	Silicon, fast recovery: 225 mA, 50 PIV.
		- - - - - - - - - - JACKS - - - - - - - - - -
J3 and J4	19A701785P1	Contact, electrical; sim to Molex 08-50-0404. (Quantity of 3 each connector).
		- - - - - - - - - - PLUGS - - - - - - - - - -
P6		Connector. (Part of PWB 19D417083P1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 and Q2	19A116774P1	Silicon, NPN: sim to Type 2N5210.
Q3 *	19A700023P1	Silicon, NPN: sim to Type 2N3904.
Q5	19A129184P1	Silicon, NPN.
Q11 and Q12	19A700023P1	Silicon, NPN: sim to Type 2N3904.
Q13	19A134137P4	N Type, field effect: sim to Type 2N3458.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1 and R2	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R3	H212CRP410C	Deposited carbon: 100K ohms ±5%, 1/4 w.
R4	19A143400P64	Deposited carbon: 200K ohms ±5%, 1/4 w.
R5	19A143400P45	Deposited carbon: 5.1K ohms ±5%, 250 VDCW, 1/4 w.
R6	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R7	H212CRP339C	Deposited carbon: 39K ohms ±5%, 1/4 w.
R8	H212CRP415C	Deposited carbon: 150K ohms ±5%, 1/4 w.
R9	19A143400P45	Deposited carbon: 5.1K ohms ±5%, 250 VDCW, 1/4 w.
R10 *	H212CRP133C	Deposited carbon: 330 ohms ±5%, 1/4 w.
R11	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R12	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R13	19A143400P52	Deposited carbon: 20K ohms ±5%, 1/4 w.
R14 *	19B209358P116	Variable carbon film: approx 25 to 2.5K ohms ±10% 0.2 w; sim to Stackpole R11-44442.
R17	H212CRP110C	Deposited carbon: 100 ohms ±5%, 1/4 w.
R28	H212CRP012C	Deposited carbon: 12 ohms ±5%, 1/4 w.
R29	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R30	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R32	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R33	H212CRP433C	Deposited carbon: 330K ±5%, 1/4 w.
R34	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R35	H212CRP447C	Deposited carbon: 470K ohms ±5%, 1/4 w.
R36	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R60 *	H212CRP133C	Deposited carbon: 330 ohms ±5%, 1/4 w.
R63	H212CRP382C	Deposited carbon: 82K ohms ±5%, 1/4 w.
R69	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19B219698G1	Handle assembly.
	19D417384P4	Panel.

*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 the descriptions of parts affected by these revisions.

REV. A - REPEATER AUDIO BOARD 19A129924G1
To prevent amplifier oscillation of approximately 150 MHz, changed Q3. Q3 was: 19A115910P1 Silicon, NPN.

REV. B - REPEATER AUDIO BOARD 19A129924G1
REV. C - REPEATER AUDIO COMPONENT BOARD 19D417210G1
To improve operation by reducing distortion in audio path, changed R10 from 180 ohms to 330 ohms. Resistor R10 was: 19A700019P28 Deposited carbon: 180 ohms ±5%, 1/4 w.

REV. C - REPEATER AUDIO BOARD 19A129924G1
REV. D - REPEATER AUDIO COMPONENT BOARD 19D417210G1
To prevent amplifier oscillation, added C38 near Q3.

REV. D - REPEATER AUDIO BOARD 19A129924G1
REV. E - REPEATER AUDIO COMPONENT BOARD 19D417210G1
To increase audio attenuation during squelch, deleted C9 and R37. Also changed R60. Old part numbers were:
C9: 5496267P14 Tantalum: 15 uF ±20%, 20VDCW.
R37: H212CRP410C Deposited carbon: 110K ohms ±5%.
R60: H212CRP118C Deposited carbon: 180 ohms ±5%.

REV. A - REPEATER AUDIO COMPONENT BOARD 19D417210G1
To improve output level on the 600 ohms line, changed R14. R14 was: 19B209358P103 Variable carbon film: 50 to 1K ohms.

REV. B - REPEATER AUDIO COMPONENT BOARD 19D417210G1
Changed board layout and added H19, H20 for new GE-MARC V design.

PARTS LIST

REMOTE AUDIO BOARD
19A129924G2 REMOTE/REPEAT AUDIO BOARD
19A129924G3 REMOTE AUDIO BOARD
ISSUE 8

SYMBOL	PART NO.	DESCRIPTION
A2 A3		COMPONENT BOARDS 19D417210G2 REMOTE/REPEAT AUDIO (Used in G2). 19D417210G3 REMOTE AUDIO (Used in G3).
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	T644ACP347K	Polyester: .047 uF ±10%, 50 VDCW.
C2	T644ACP322K	Polyester: .022 uF ±10%, 50 VDCW.
C3	T644ACP315K	Polyester: .015 uF ±10%, 50 VDCW.
C4 and C5	19A116080P109	Polyester: 0.22 uF ±10%, 50 VDCW.
C6	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C7	5496267P14	Tantalum: 15 uF ±20%, 20 VDCW; sim to Sprague Type 150D.
C8	19A116080P109	Polyester: 0.22 uF ±10%, 50 VDCW.
C10 *	19A700004P11	Polyester: 1.0 uF ±10%, 60 VDCW.
C11	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C12	19A143477P26	Polyester: .1 uF ±20%, 50 VDCW.
C13	19A115680P7	Electrolytic: 100 uF +150-10%, 15 VDCW; sim to Mallory Type TTX.
C14	5496267P2	Tantalum: 47 uF ±20%, 6 VDCW; sim to Sprague Type 150D.
C15	19A115680P7	Electrolytic: 100 uF +150-10%, 15 VDCW; sim to Mallory Type TTX.
C16	5496267P10	Tantalum: 22 uF ±20%, 15 VDCW; sim to Sprague Type 150D. (Used in G2).
C17	5496267P10	Tantalum: 22 uF ±20%, 15 VDCW; sim to Sprague Type 150D.
C18	19A143477P26	Polyester: .1 uF ±20%, 50 VDCW.
C19	19A116080P111	Polyester: 0.47 uF ±10%, 50 VDCW.
C20	T644ACP333K	Polyester: .033 uF ±10%, 50 VDCW.
C21 and C22	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C23	7489162P111	Silver mica: 22 pF ±10%, 500 VDCW; sim to Sprague Type 118.
C24	19A116080P109	Polyester: 0.22 uF ±10%, 50 VDCW.
C25	4029003P104	Silver mica: 680 pF ±10%, 500 VDCW, sim to Electro Motive Type DM-20.
C26	19A115680P7	Electrolytic: 100 uF +150-10%, 15 VDCW; sim to Mallory Type TTX.
C27	5496267P10	Tantalum: 22 uF ±20%, 15 VDCW; sim to Sprague Type 150D.
C28	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C29	5496267P2	Tantalum: 47 uF ±20%, 6 VDCW; sim to Sprague Type 150D.
C30	5496267P17	Tantalum: 1.0 uF ±20%, 35 VDCW; sim to Sprague Type 150D.
C31	19A700233P5	Ceramic: 470 pF ±20%, 50 VDCW.
C32	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C33	19A116080P110	Polyester: 0.33 uF ±10%, 50 VDCW.
C34	19A700233P5	Ceramic: 470 pF ±20%, 50 VDCW.
C35	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C36 and C37	19A700233P5	Ceramic: 470 pF ±20%, 50 VDCW.
C38	19A700233P2	Ceramic, disc: 100 pF ±20%, 50 VDCW.
		- - - - - - - - - - RECTIFIERS - - - - - - - - - -
CR1	19A115250P1	Silicon, fast recovery: 225 mA, 50 PIV.
CR2 and CR3	T324ADP1061	Silicon: 800 PIV, 1000 mA max; sim to 1N4006
CR4 thru CR7	19A115250P1	Silicon, fast recovery: 225 mA, 50 PIV.
CR9 and CR10	19A115250P1	Silicon, fast recovery: 225 mA, 50 PIV.
		- - - - - - - - - - JACKS - - - - - - - - - -
J1 and J2	403353P4	Contact, electrical: sim to Bead Chain L93-3.
J3 and J4	19A701785P1	Contact, electrical; sim to Molex 08-50-0404. (Quantity of 3 each connector).
		- - - - - - - - - - PLUGS - - - - - - - - - -
P6		Connector. (Part of PWB 19D417083P1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 and Q2	19A116774P1	Silicon, NPN: sim to Type 2N5210.
Q3	19A700023P1	Silicon, NPN: sim to Type 2N3904.
Q4	19A700023P1	Silicon, NPN: sim to Type 2N3904. (Used in G2).
Q5	19A129184P1	Silicon, NPN.
Q6	19A116774P1	Silicon, NPN: sim to Type 2N5210.
Q7	19A129184P1	Silicon, NPN.
Q8	19A116774P1	Silicon, NPN: sim to Type 2N5210.
Q9	19A115300P4	Silicon, NPN.
Q10 and Q11	19A700023P1	Silicon, NPN: sim to Type 2N3904.
Q12	19A700023P1	Silicon, NPN: sim to Type 2N3904. (Used in G2).
Q13	19A134137P4	N Type, field effect: sim to Type 2N3458. (Used in G2).
Q14 thru Q19	19A700023P1	Silicon, NPN: sim to Type 2N3904.
Q20	19A116774P1	Silicon, NPN: sim to Type 2N5210.
Q21	19A134137P4	N Type, field effect: sim to Type 2N3458.
Q22	19A700023P1	Silicon, NPN: sim to Type 2N3904.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1 and R2	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R3	H212CRP410C	Deposited carbon: 100K ohms ±5%, 1/4 w.
R4	19A143400P64	Deposited carbon: 200K ohms ±5%, 1/4 w.
R5	19A143400P45	Deposited carbon: 5.1K ohms ±5%, 250 VDCW, 1/4 w.
R6	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R7	H212CRP339C	Deposited carbon: 39K ohms ±5%, 1/4 w.
R8	H212CRP415C	Deposited carbon: 150K ohms ±5%, 1/4 w.
R9	19A143400P45	Deposited carbon: 5.1K ohms ±5%, 250 VDCW, 1/4 w.
R10	H212CRP133C	Deposited carbon: 330 ohms ±5%, 1/4 w.
R11	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R12	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R13	19A143400P52	Deposited carbon: 20K ohms ±5%, 1/4 w.
R14	19B209358P116	Variable carbon film: approx 25 to 2.5K ohms ±10% 0.2 w; sim to Stackpole R11-44442.
R15	19B209358P103	Variable, carbon film: approx 50 to 1K ohms ±10% 0.2 w; sim to CTS Type X-201. (Used in G2).
R16	H212CRP233C	Deposited carbon: 3.3K ohms ±5%, 1/4 w.
R17	H212CRP110C	Deposited carbon: 100 ohms ±5%, 1/4 w.
R18	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R19	19A143400P62	Deposited carbon: 130K ohms ±5%, 1/4 w.
R20	H212CRP268C	Deposited carbon: 6.8K ohms ±5%, 1/4 w.
R21	19A143400P52	Deposited carbon: 20K ohms ±5%, 1/4 w.
R22	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R23	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	PART NO.	DESCRIPTION
R24	H212CRP382C	Deposited carbon: 82K ohms ±5%, 1/4 w.
R25	H212CRP327C	Deposited carbon: 27K ohms ±5%, 1/4 w.
R26	19A143400P41	Deposited carbon: 2.4K ohms ±5%, 1/4 w.
R27	19A143400P20	Deposited carbon: 43 ohms ±5%, 1/4 w.
R28	H212CRP012C	Deposited carbon: 12 ohms ±5%, 1/4 w.
R29	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R30	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R31	H212CRP168C	Deposited carbon: 680 ohms ±5%, 1/4 w.
R32	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R33	H212CRP433C	Deposited carbon: 330K ±5%, 1/4 w.
R34	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w. (Used in G2).
R35	H212CRP447C	Deposited carbon: 470K ±5%, 1/4 w. (Used in G2).
R36	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w. (Used in G2).
R38	H212CRP322C	Deposited carbon: 22K ohms ±5%, 1/4 w.
R39	19B209358P107	Variable, carbon film: approx 800 to 25K ohms ±10%, 1/4 w; sim to CTS Type X-201.
R40 and R41	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R42	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R43	19A143400P50	Deposited carbon: 13K ohms ±5%, 250 VDCW, 1/4 w.
R44	H212CRP410C	Deposited carbon: 100K ohms ±5%, 1/4 w.
R45	H212CRP133C	Deposited carbon: 330 ohms ±5%, 1/4 w.
R46	19A143400P58	Deposited carbon: 62K ohms ±5%, 1/4 w.
R47	19A143400P40	Deposited carbon: 2K ohms ±5%, 1/4 w.
R48	H212CRP215C	Deposited carbon: 1.5K ohms ±5%, 1/4 w.
R49	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R50	19B209358P103	Variable, carbon film: approx 50 to 1K ohms ±10% 0.2 w; sim to CTS Type X-201.
R51	H212CRP110C	Deposited carbon: 100 ohms ±5%, 1/4 w.
R52	H212CRP112C	Deposited carbon: 120 ohms ±5%, 1/4 w.
R53	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R54	H212CRP222C	Deposited carbon: 2.2K ohms ±5%, 1/4 w.
R55	H212CRP333C	Deposited carbon: 33K ohms ±5%, 1/4 w.
R56	H212CRP222C	Deposited carbon: 2.2K ohms ±5%, 1/4 w.
R57	H212CRP439C	Deposited carbon: 390K ±5%, 1/4 w. (Used in G2).
R58	H212CRP447C	Deposited carbon: 470K ±5%, 1/4 w.
R59	H212CRP247C	Deposited carbon: 4.7K ohms ±5%, 1/4 w.
R60	H212CRP133C	Deposited carbon: 330 ohms ±5%, 1/4 w.
R61 and R62	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R63	H212CRP382C	Deposited carbon: 82K ohms ±5%, 1/4 w.
R64	3R77P621J	Composition: 620 ohms ±5%, 1/2 w.
R65	19A143400P58	Deposited carbon: 62K ohms ±5%, 1/4 w.
R66	H212CRP110C	Deposited carbon: 100 ohms ±5%, 1/4 w.
R67	H212CRP322C	Deposited carbon: 22K ohms ±5%, 1/4 w.
R68	H212CRP010C	Deposited carbon: 10 ohms ±5%, 1/4 w.
R69	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R70	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1	19A116736P1	Audio freq: 300 to 6000 Hz: Pri: 300 ohms ±15% DC res: Sec: No. 1 & 2: 15 ohms ±15% DC res.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - - -
VR1	19A116325P4	Silicon zener: 5 w, 12 v; sim to Type 1N5349.
VR2	4036887P2	Silicon, zener: sim to 1N5223B.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19A701332P4	Insulator, washer: nylon.

SYMBOL	PART NO.	DESCRIPTION
	19B219690G1	Handle assembly.
	19D417384P3	Panel. (Used in G2).
	19D417384P2	Panel. (Used in G3).

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 - REMOTE AUDIO BOARD 19A129924G2, G3
Added H17 and H18 for use in 4 frequency remote stations.

REV. B - REMOTE AUDIO BOARD 19A129924G2, G3
To prevent amplifier oscillation of approximately 150 MHz, changed Q3. Q3 was: 19A115910P1 Silicon, NPN.

REV. C - REMOTE AUDIO BOARD 19A129924G2, G3
REV. C - REMOTE AUDIO COMPONENT BOARD 19D417210G2, G3
To reduce distortion added R70.

REV. D - REMOTE AUDIO BOARD 19A129924G2, G3
REV. D - REMOTE AUDIO COMPONENT BOARD 19D417210G2, G3
To improve operation by reducing distortion in audio path, changed R10 from 180 ohms to 330 ohms. Resistor R10 was: 19A700019P28 Deposited carbon: 180 ohms ±5%, 1/4 w.

REV. E - REMOTE AUDIO BOARD 19A129924G2, G3
REV. E - REMOTE AUDIO COMPONENT BOARD 19D417210G2, G3
To prevent amplifier oscillation, added C38 near Q3.

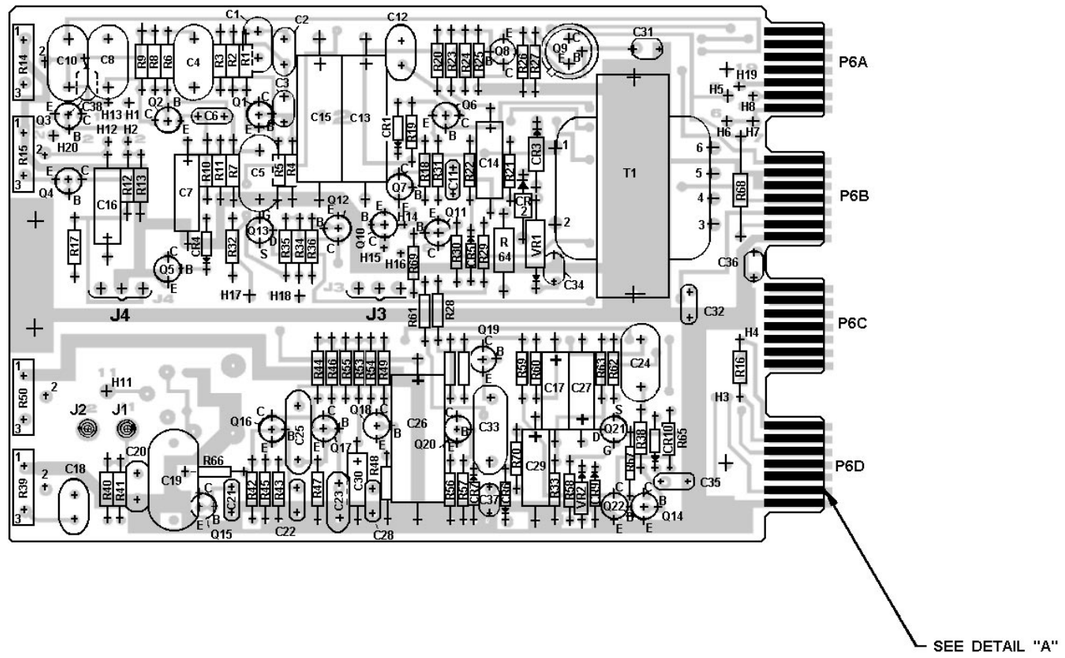
REV. F - REMOTE AUDIO BOARD 19A129924G2, G3
REV. F - REMOTE AUDIO COMPONENT BOARD 19D417210G2, G3
To increase audio attenuation during squelch, deleted C9 and R37. Also changed R60. Old part numbers were:
C9: 5496267P14 Tantalum: 15 uF ±20%, 20VDCW.
R37: H212CRP410C Deposited carbon: 110K ohms ±5%.
R60: H212CRP118C Deposited carbon: 180 ohms ±5%.

REV. A - REMOTE AUDIO COMPONENT BOARD 19D417210G2, G3
To improve output level on the 600 ohms line, changed R14, R14 was: 19A209358P103 Variable carbon film: 50 to 1K ohms.

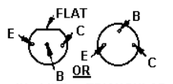
REV. B - REMOTE AUDIO COMPONENT BOARD 19D417210G2, G3
Changed board layout and added H19, H20 for new GE-MARC V design.

REV. G - REMOTE AUDIO COMPONENT BOARD 19D417210G2, G3
To improve audio response. C10 was .22uF (19A116080P109).

AUDIO COMPONENT BD (A1, A2, A3)



LEAD IDENTIFICATION
FOR Q1 - Q12, Q14 - Q20, Q22



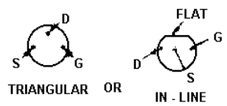
VIEW FROM LEAD END

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

8 9 10 11 12 13 14
7 6 5 4 3 2 1
SOLDER SIDE

DETAIL "A"
TYP. NUMBERING OF CONT. FINGERS.

LEAD IDENTIFICATION
FOR Q13 & Q21



VIEW FROM LEAD END

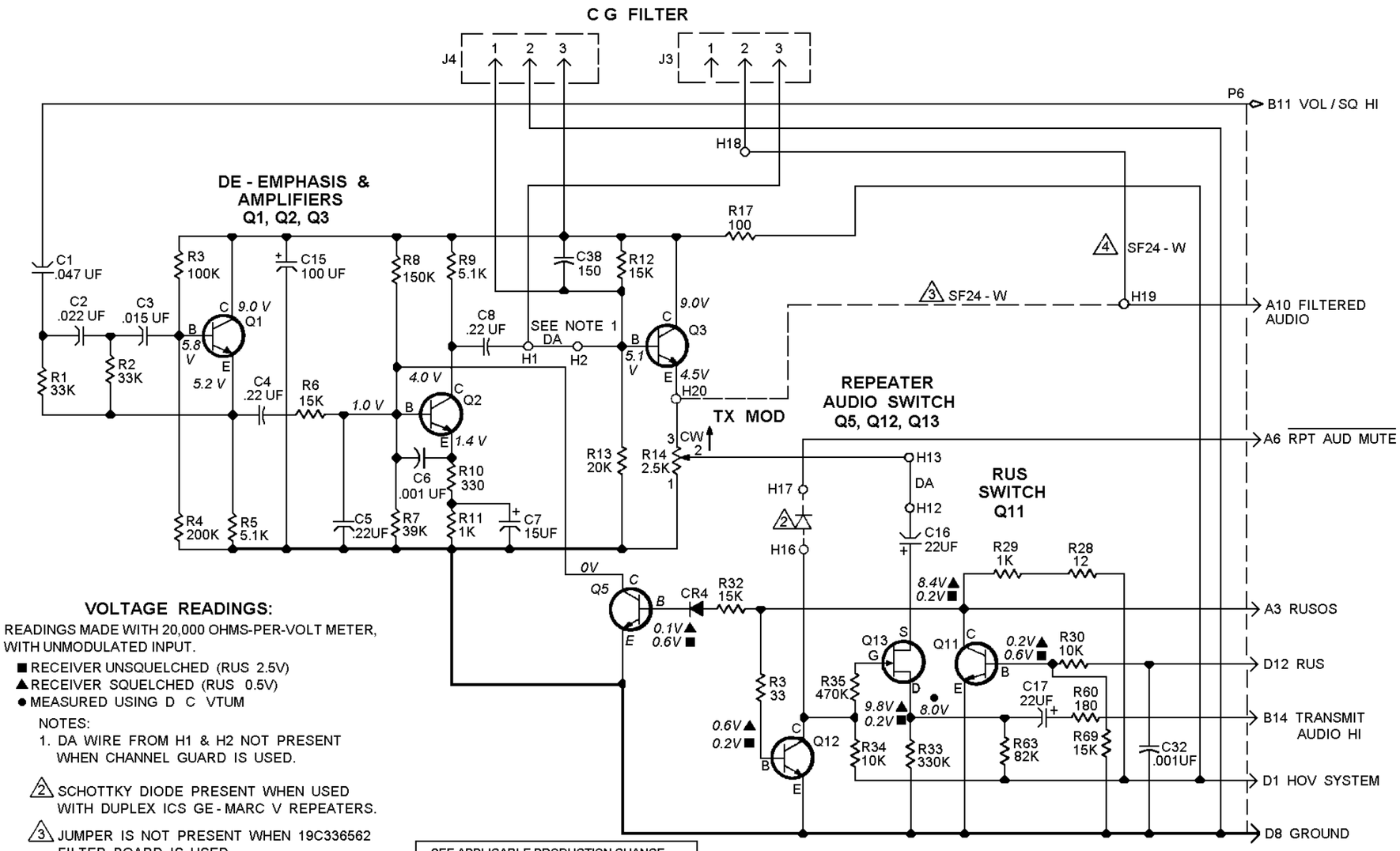
NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

NOTE:
THIS DIAGRAM IS INTENDED TO SHOW COMPONENT LOCATIONS FOR ALL GROUPS OF THE BOARD. REFER TO APPROPRIATE SCHEMATIC DIAGRAM OR PARTS LIST FOR COMPONENTS USED IN A SPECIFIC GROUP.

REFER TO WIRING DIAGRAM FOR THE FOLLOWING CONNECTION			
FROM	TO	WIRE	GROUP
H1	H2	DA	G1, G2, G3
H5	H6	DA	G2, G3
H7	H8	DA	G2, G3
H12	H13	DA	G1
H14	H15	DA	G2, G3
H17	H18	DA	G2, G3
H19	H20	SF24 - W	G1, G2, G3

(19D417210, Rev. 20)
(19D417083, Sh. 3, Rev. 12)

AUDIO BOARD
19A129924G1-G3



VOLTAGE READINGS:

READINGS MADE WITH 20,000 OHMS-PER-VOLT METER, WITH UNMODULATED INPUT.

- ■ RECEIVER UNSQUELCHED (RUS 2.5V)
- ▲ RECEIVER SQUELCHED (RUS 0.5V)
- ● MEASURED USING D C VTUM

NOTES:

1. DA WIRE FROM H1 & H2 NOT PRESENT WHEN CHANNEL GUARD IS USED.

2 SCHOTTKY DIODE PRESENT WHEN USED WITH DUPLEX ICS GE - MARC V REPEATERS.

3 JUMPER IS NOT PRESENT WHEN 19C336562 FILTER BOARD IS USED.

4 JUMPER IS PRESENT WHEN 19C36562 FILTER BOARD IS USED.

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.

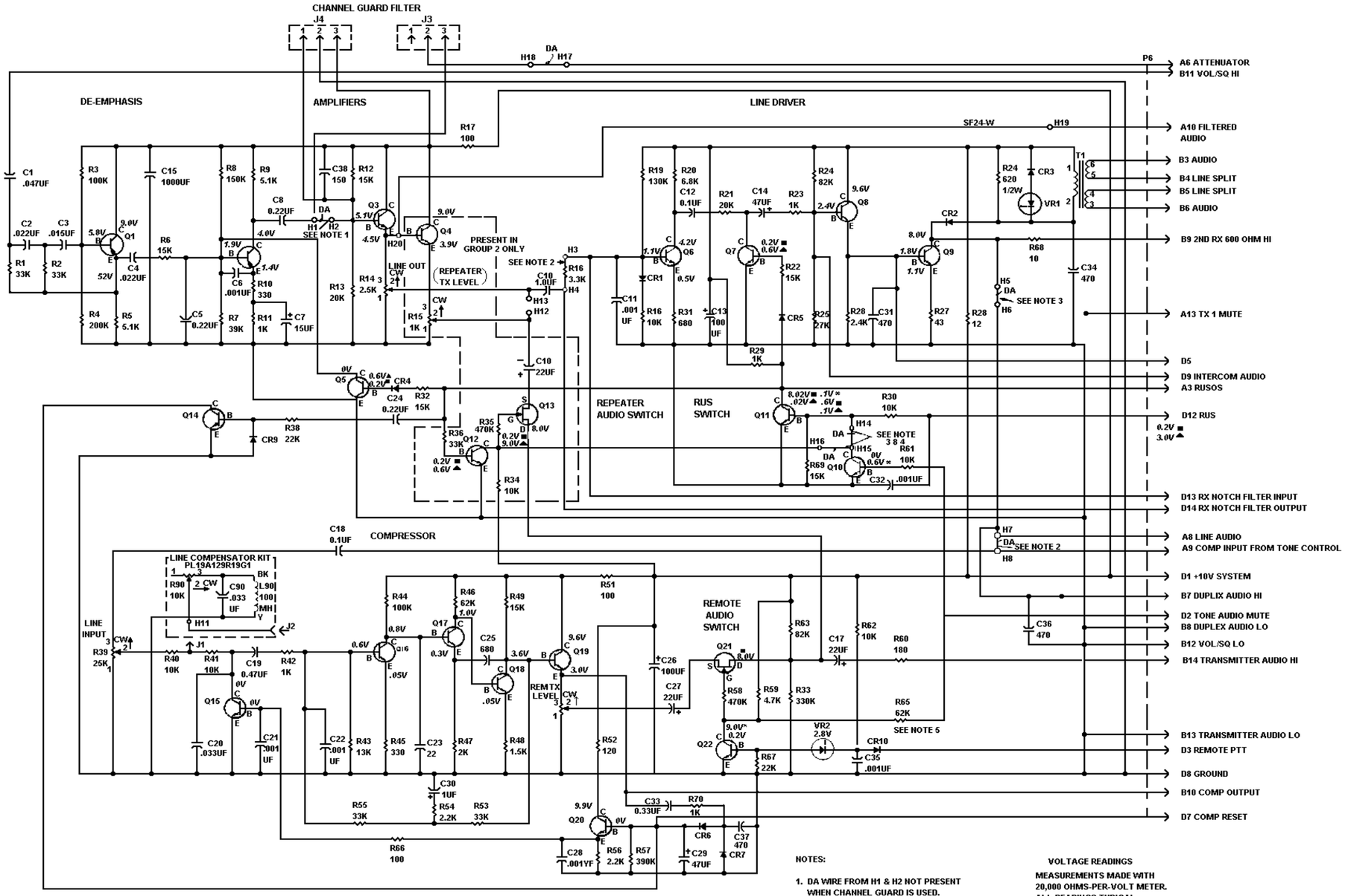
SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DES - CRIPTION OF CHANGES UNDER EACH REVISION LETTER.

THIS ELEM DIAG APPLIES TO

MODEL NO	REV LETTER
19A129924G1	D
19D417210G1	E

REPEATER AUDIO BOARD
19A129924G1

(19C320650, Rev. 18)



AUDIO BOARD
19A129924G2-G3

(19E501150, Rev. 18)

NOTES:

1. DA WIRE FROM H1 & H2 NOT PRESENT WHEN CHANNEL GUARD IS USED.
2. DA WIRE FROM H7 & H8 AND RESISTOR RIG NOT PRESENT IN TONE CONTROL.
3. DA WIRE FROM H5 & H6 AND H14 & H15 NOT PRESENT IN 4 WIRE AUDIO AND ALSO IN RCVR VOTING APPLICATION.
4. DA WIRE FROM H15 TO H16 IS PRESENT IN 4 WIRE AUDIO AND RCVR VOTING APPLICATION IN GR. 2 BD. ONLY.
5. R65 NOT PRESENT IN TONE CONTROL.

VOLTAGE READINGS

MEASUREMENTS MADE WITH 20,000 OHMS-PER-VOLT METER. ALL READINGS TYPICAL.
× RX UNSQUELCHED
■ RX SQUELCHED
▲ REMOTE TRANSMIT KEYED
● MEASURED USING DC VTVM

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

ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF=MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH=MILLIHENRYS OR H=HENRYS.

SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

THIS ELEM DIAG APPLIES TO

MODEL NO.	REV LETTER
PL19A129924G2	F
PL19A129924G3	F
PL19D417210G2	G
PL19D417210G3	G

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