MAINTENANCE MANUAL

10-VOLT REGULATOR/CONTROL BOARD 19D417401G1 & 2

TABLE OF CONTENTS

DESCRIPTION

The 19D417401G1 10-Volt Regulator/Control Board is used in the MASTR® II Base Station Control Shelf. The 19D417401G2 board is used in the GE-MARC V Repeater Control Shelf. The board consists of a 10-Volt 2 Ampere regulator; a keying switch and a 20 dB preamplifier for local microphone operation.

CIRCUIT ANALYSIS

The 13.8 Vdc from the station power supply low current filter is applied to terminal D5 of the regulator. This current is filtered by choke L1 and applied to the 10-Volt, 1/2 Amp hybrid regulator consisting of A1-Q1 and integrated circuit U1. This regulator feeds the receiver and transmitter oscillators, providing the close tolerance (1%) required by these modules.

The 13.8 Vdc input is also applied to the 10-Volt, 2 Amp regulator consisting of A3-Q1, Q3, Q4 and zener diode VR1. When the output of the regulator starts to increase, Q4 conducts harder, Q3 conducts less, causing A3-Q1 to conduct less. This increases the voltage drop across A3, Q1, keeping the output voltage constant. Potentiometer R4 is used to set the base voltage of Q4 for the desired 10-Volt output. This regulator supplies the station exciter, the receiver control circuits and the station accessories.

Diodes CR2-CR5 form a PTT OR gate. Applying a ground to any one of the PTT inputs forward biases the diode connected to that input, turning on Q5. Conduction of Q5 operates Q6, applying ground to the antenna relay lead A10. This ground is also applied to the cathode of the Light Emitting Diode (LED) CR15 (TX LIGHT), turning the light on. Pin 8 on the regulator hybrid U1 is also grounded. Capacitor C6 (not present in G2) starts to charge. In 15 milliseconds C6 is charged to a voltage high enough to allow the time delay switch in U1 to turn on.

Operation of the time delay switch causes the transmitter oscillator control switch in U1 to turn on. +10 volts is applied via pin 14 of U1 to the transmitter ICOM(s), keying the transmitter. The 15 millisecond delay in the transmitter oscillator keying circuit allows the antenna relay to energize before RF is applied to the relay. When the PTT is released, CR6 delays the antenna relay from deenergizing until the RF is removed from the contacts.

When one of the PTT input leads is grounded, CR8 is also forward biased, turning on Q11. Conduction of Q11 operates Q1 and Q12, applying ground to the RX1 MUTE and RX2 MUTE leads. If REPEATER PTT (D3) is grounded, CR9 is forward biased, preventing Q12 from conducting to allow the normal repeater system to function.

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

Printed in U.S.A.

When a local microphone is used with the station the microphone audio is connected via B1 to the input of the MIC PRE-AMP, consisting of Q2, Q7, Q8 and Q9. The audio is amplified by Q7 and the amplified audio level is adjusted by MIC GAIN control R14. The audio is further applied by Q2 and Q8 and applied to the source lead of FET Q9. The audio is further amplified by Q2 and Q8 and applied to the source lead of FET Q9. Q10 is normally conducting, keeping the gate of Q9 grounded and preventing the audio from passing. When the LOCAL PTT switch is operated, CR7 is forward biased, turning off Q10. FET Q9 is now allowed to conduct, passing the local audio to the transmitter modulator.

Service switches provided on the Regulator include the TX DISABLE/INTERCOM switch S1 which ground the TX DISABLE PATH to permit the serviceman to use the intercom without keying the transmitter; the REMOTE PTT switch S2 which allows the adjustment of remote line levels by keying the REMOTE PTT path in remote control systems.

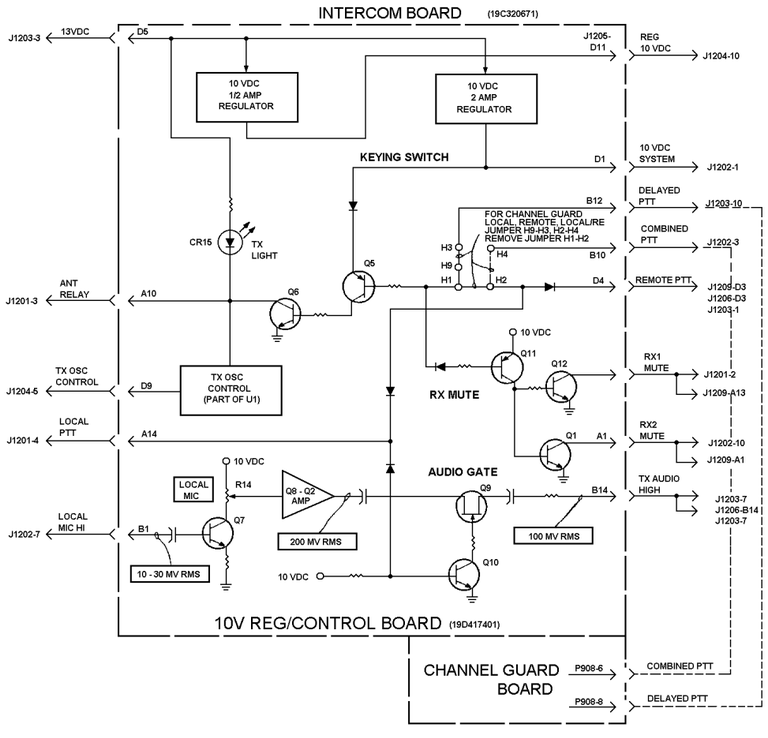


Figure 1 - Regulator/Control Board Block Diagram

PARTS LIST

LBI4802Q

10 - VOLT REGULATOR / CONTROL

19D417401G1

SYMBOL	PART NO.	DESCRIPTION
A1		PANEL 19C320809G1
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A116375P1	Silicon, PNP.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1 and S2	19B209261P11	Slide: DPST, normally open, sim. to Switchcraft 46204MR.
A2		REGULATOR BOARD 19D432774G1
C2 and C3	19A115680P10	Electrolytic: 200 uF + 150 –10%, 18 VDCW; sim to Mallory Type TTX.
C4	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C5	19A115680P10	Electrolytic: 200 uF + 150 –10%, 18 VDCW; sim to Mallory Type TTX.
C6	19A701534P3	Tantalum: 0.47 uF ±20%, 35 VDCW.
C7	19A143486P10	Tantalum: 15 uF ±20%, 20 VDCW.
C8	19A116080P109	Polyester: 0.22 uF + 10%, 50 VDCW.
C9	19A116080P110	Polyester: 0.33 uF + 10%, 50 VDCW.
C10	19B209233P1	Electrolytic, non-polarized: 25 uF + 20%, 25 VDCW; sim to Sprague 41D.
C11	19A701534P8	Tantalum: 22 uF ±20%, 16 VDCW.
C12 and C13	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C14	19A143486P10	Tantalum: 15 uF ±20%, 20 VDCW.
C15	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C16	19A700233P5	Ceramic: 470 pF ±20%, 50 VDCW.
C17 and C18	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C20 and C21	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C22	19A115680P3	Electrolytic: 20 uF + 150 –10%, 25 VDCW; sim to Mallory Type TTX.
C23	19A143486P107	Tantalum: 3.3 uF ±10%, 15 VDCW.
C24	19A700233P7	Ceramic: 1000 pF ±20%, 50 VDCW.
C25	T644ACP310K	Polyester: .010 uF ±10%, 50 VDCW.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1	19A115775P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR2 thru CR5	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR6	T324ADP1041	Rectifier, silicon; general purpose.
CR7 thru CR12	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR13	T324ADP1041	Rectifier, silicon; general purpose.
CR15	162B3011P0002	Diode, optoelectronic: red; sim to Hew. Packard 5082 - 4650.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19A115894P1	Audio freq: 1.0 mh inductance, 0.35 ohms DC res.

SYMBOL	PART NO.	DESCRIPTION
		- - - - - - - - - - - - PLUGS - - - - - - - - - - - -
P5		(Part of printed board 19D432788P1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 and Q2	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q3	19A116300P2	Silicon, NPN; sim to Type 2N3053.
Q4	19A700323P1	Silicon, NPN; sim to Type 2N3904.
Q5	19A700022P1	Silicon PNP; sim to Type 2N3906.
Q6	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q7 and Q8	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q9	19A134137P4	N Type, field effect; sim to Type 2N3458.
Q10	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q11	19A700022P1	Silicon PNP; sim to Type 2N3906.
Q12	19A700023P1	Silicon, NPN; sim to Type 2N3904.
		- - - - - - - - - - - - RESISTORS - - - - - - - - - - - -
R1	H212CRP222C	Deposited carbon: 2.2K ohms ±5%, 1/4 w.
R2	19A700112P45	Composition: 180 ohms ±5%, 1 w.
R3	3R77P240J	Composition: 24 ohms ±5%, 1/2 w.
R4	19B209358P101	Variable, carbon film: approx. 25 to 250 ohms ±10%, 0.2 w; sim to CTS Type X-201.
R5	19A700113P59	Composition: 680 ohms ±5%, 1/2 w.
R6	H212CRP147C	Deposited carbon: 470 ohms ±5%, 1/4 w.
R7	19A143400P40	Deposited carbon: 2K ohms ±5%, 1/2 w.
R8	19A700113P63	Composition: 1K ohms ±5%, 1/2 w.
R9	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R10	19A143400P34	Deposited carbon: 620 ohms ±5%, 250 VDCW, 1/4 w.
R11	H212CRP210C	Composition: 1K ohms ±5%, 1/2 w.
R12	H212CRP422C	Deposited carbon: 0.22M ohms ±5%.
R13	H212CRP322C	Deposited carbon: 22K ohms ±5%, 1/4 w.
R14	19B209358P106	Variable, carbon film: approx. 300 to 10K ohms ±10%, 1/4 w; sim to CTS Type X-201.
R15	19A143400P35	Deposited carbon: 750 ohms ±5%, 1/4 w.
R16	H212CRP415C	Deposited carbon: 0.15M ohms ±5%, 1/4 w.
R17	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R18	H212CRP268C	Deposited carbon: 6.8K ohms ±5%, 1/4 w.
R19	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R20	19A700113P63	Composition: 1K ohms ±5%, 1/2 w.
R21	19A143400P52	Deposited carbon: 20K ohms ±5%, 1/4 w.
R22	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R23	H212CRP447C	Deposited carbon: 0.47M ohms ±5%, 1/4 w.
R24	H212CRP382C	Deposited carbon: 82K ohms ±5%, 1/4 w.
R25	H212CRP433C	Deposited carbon: 0.33M ohms ±5%, 1/4 w.
R26	19A143400P57	Deposited carbon: 51K ohms ±5%, 1/4 w.
R27	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R28	19A143400P47	Deposited carbon: 7.5K ohms ±5%, 1/4 w.
R29	19A143400P54	Deposited carbon: 30K ohms ±5%, 1/4 w.
R30	19A143400P34	Deposited carbon: 620 ohms ±5%, 250 VDCW, 1/4 w.
R31	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R32	H212CRP212C	Deposited carbon: 1.2K ohms ±5%, 1/4 w.
R33	H212CRP068C	Deposited carbon: 68 ohms ±5%, 1/4 w.
R34	H212CRP312C	Deposited carbon: 12K ohms ±5%, 1/4 w.
R35	19A143400P28	Deposited carbon: 200 ohms ±5%, 1/4 w.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SYMBOL	PART NO.	DESCRIPTION
R36	H212CRP133C	Deposited carbon: 330 ohms ±5%, 1/4 w.
R37	H212CRP047C	Deposited carbon: 47 ohms ±5%, 1/4 w.
		- - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U1	19D416564G13	10 - Volt Regulator.
		- - - - - - -VOLTAGE REGULATORS- - - - - - - -
VR1	19A70025P9	Silicon, zener: 400 mW max; sim to BZX55 - C8V2.
VR2	4036887P4	Zener: 500 mW, 4.4 v. nominal.
VR3	4036887P6	Zener: 500 mW, 6.5 v. nominal.
		- - - - - - - - MISCELLANEOUS - - - - - - - - -
	19A701332P4	Insulator, washer: nylon.
	7118719P10	Clip, spring tension: sim to Prestole E - 50019 - 003.
	19B00608P153	Rivet, tubular.
	19A121175P11	Insulator.
A2		REGULATOR BOARD 19D417252G1 (EARLIER MODELS)
		- - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19B200240P10	Tantalum: 10 uF ±5%, 15 VDCW.
C2 and C3	19A115680P10	Electrolytic: 200 uF + 150 –10%, 18 VDCW; sim to Mallory Type TTX.
C4	5494481P111	Ceramic: 1000 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C5	19A115680P10	Electrolytic: 200 uF + 150 –10%, 18 VDCW; sim to Mallory Type TTX.
C6	5496267P28	Tantalum: 0.47 uF ±20%, 35 VDCW; sim to Sprague Type 150D.
C7	5496267P14	Tantalum: 15 uF ±20%, 20 VDCW; sim to Sprague Type 150D.
C8	19A116080P109	Polyester: 0.22 uF ±10%, 50 VDCW.
C9	19A116080P110	Polyester: 0.33 uF ±10%, 50 VDCW.
C10	19B209233P1	Electrolytic, non - polarized: 25 uF + 20%, 25 VDCW; sim to Sprague 41D.
C11	5496267P10	Tantalum: 22 uF ±20%, 15 VDCW; sim to Sprague Type 150D.
C12 and C13	5494481P111	Ceramic disk: 1000 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C14	5496267P14	Tantalum: 15 uF ±20%, 20 VDCW; sim to Sprague Type 150D.
C15	5494481P111	Ceramic disk: 1000 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C16	5495491P107	Ceramic disk: 470 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C17 and C18	5494481P111	Ceramic disk: 1000 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
CR19*	5494481P111	Ceramic disk: 1000 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap. Deleted by REV D.
C20 and C21	5494481P111	Ceramic disk: 1000 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C22	19A115680P3	Electrolytic: 20 uF + 150 –10%, 18 VDCW; sim to Mallory Type TTX.
C23	5496267P209	Tantalum: 3.3 uF + 10%, 15 VDCW; sim to Sprague Type 150D.
C24	5494481P111	Ceramic disk: 1000 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C25*	19A700005P7	Polyester: 0.01 uF + 10%, 50 VDCW. Added by REV H.
		- - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1*	19A115775P1	Silicon, fast recovery, 225 mA, 50 PIV.

SYMBOL	PART NO.	DESCRIPTION
		In REV H & earlier:
	4037822P1	Silicon, 1000 mA, 400 PIV.
CR2 thru CR5	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR6	T324ADP1041	Rectifier, silicon; general purpose.
CR7 thru CR12	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR13	T324ADP1041	Rectifier, silicon; general purpose.
CR15	162B3011P0002	Diode, optoelectronic: red; sim to Hew. Packard 5082 - 4650.
		- - - - - - - - - - INDUCTORS - - - - - - - - - - -
L1	19A115894P1	Audio freq: 1.0 mh inductance, 0.35 ohms DC res.
		- - - - - - - - - - PLUGS - - - - - - - - - - -
P5		(Part of printed board 19D432788P1).
		- - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 and Q2	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q3	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q4	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q5	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q6	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q7 and Q8	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q9	19A134137P4	N Type, field effect; sim to Type 2N3458.
Q10	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q11	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q12	19A700023P1	Silicon, NPN; sim to Type 2N3904.
		- - - - - - - - - - RESISTORS - - - - - - - - - - -
R1	H212CRP222C	Deposited carbon: 2.2K ohms ±5%, 1/4 w.
R2	19A700112P45	Composition: 180 ohms ±5%, 1 w.
R3	3R77P240J	Composition: 24 ohms ±5% 1/2 w.
R4	19B209358P101	Variable, carbon film: approx. 25 to 250 ohms ±10%, 0.2 w; sim to CTS Type X - 201.
R5	19A700113P59	Composition: 680 ohms ±5%, 1/2 w.
R6	H212CRP147C	Deposited carbon: 470 ohms ±5%, 1/4 w.
R7	19A143400P40	Depsoited carbon: 2K ohms ±5%, 1/4 w.
R8	19A700113P63	Composition: 1K ohms ±5%, 1/2 w.
R9	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R10	19A143400P34	Deposited carbon: 620 ohms ±5%, 1/4 w.
R11	H212CRP210C	Depsoited carbon: 1K ohms ±5%, 1/4 w.
R12	H212CRP422C	Deposited carbon: 0.22M ohms ±5%, 1/4 w.
R13	H212CRP322C	Deposited carbon: 22K ohms ±5%, 1/4 w.
R14	19B209358P106	Variable, carbon film: approx. 300 to 10K ohms ±10%, 1/4 w; sim to CTS Type X - 201.
R15	19A143400P35	Deposited carbon: 750 ohms ±5%, 1/4 w.
R16	H212CRP415C	Deposited carbon: 0.15M ohms ±5%, 1/4 w.
R17	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R18	H212CRP268C	Deposited carbon: 6.8K ohms ±5%, 1/4 w.
R19	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R20	19A700113P63	Composition: 1K ohms ±5%, 1/2 w.
R21	19A143400P52	Deposited carbon: 20K ohms ±5%, 1/4 w.
R22	H212CRP315C	Deposited carbon: 15K ohms ±5%, 1/4 w.
R23	H212CRP447C	Deposited carbon: 0.47M ohms ±5%, 1/4 w.

SYMBOL	PART NO.	DESCRIPTION
R24	H212CRP382C	Deposited carbon: 82K ohms ±5%, 1/4 w.
R25	H212CRP433C	Deposited carbon: 0.33M ohms ±5%, 1/4 w.
R26	19A143400P57	Deposited carbon: 51K ohms ±5%, 1/4 w.
R27	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R28	19A143400P47	Deposited carbon: 7.5K ohms ±5%, 1/4 w.
R29	19A143400P54	Deposited carbon: 30K ohms ±5%, 1/4 w.
R30	19A143400P34	Deposited carbon: 620 ohms ±5%, 250 VDCW / 1/4 w.
R31	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R32	H212CRP212C	Deposited carbon: 1.2K ohms ±5%, 1/4 w.
R33	H212CRP068C	Deposited carbon: 68 ohms ±5%, 1/4 w.
R34	H212CRP312C	Deposited carbon: 12K ohms ±5%, 1/4 w.
R35	19A143400P28	Deposited carbon: 200 ohms ±5%, 1/4 w.
R36	H212CRP133C	Deposited carbon: 330 ohms ±5%, 1/4 w.
R37	H212CRP047C	Deposited carbon: 47 ohms ±5%, 1/4 w.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U1	19D416564G13	10 - Volt Regulator.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - -
VR1	19A700025P9	Silicon, zener: 400 mW max; sim to BZX55 - C8V2.
VR2	4036887P4	Zener: 500 mW, 4.4 v. nominal.
VR3	4036887P6	Zener: 500 mW, 6.5 v. nominal.
A3		HEAT SINK ASSEMBLY 19B226114G2
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A116758P2	Silicon, PNP; sim to Type 2N4399.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19B219690G1	Handle assembly.
	19A700115P4	Insulator, plate. (Used with Q1 and A1).
	19A700068P1	Insulator, bushing. (Used with Q1 on A1).
	19A701332P4	Insulator, washer: nylon. (Used with Q3 & Q6 on A2).
	7118719P10	Clip, spring tension: sim to Prestole E - 50019 - 003. (Used with L1 on A2).
	4029974P1	Insulator, plate: alluminum. (Used with Q1 on A3).
	19A121882P1	Washer. shield. (Used with Q1 and A3).
	4036994P1	Terminal, solderless. (Used with Q1 and A3).
	19B226013G1	Heat sink. (Used with Q1 on A3).
	19A121175P111	Insulator. (Used with C10 on A2).
	5491541P307	Spacer, threaded: No. 6 - 32. (Support A3).
	N405P5C6	Lockwasher, spring type: No. 4 (Secures S1 & S2 on A1).
	N80P9004B6	Machine screw: No. 4 - 40 x 1/4. (Secures S1 & S2 on A1).
	N80P9006B6	Machine screw: No. 4 - 40 x 3/8. (Secures Q1 on A1).

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.

REGULATOR BOARD 19D417252G1

REV. A - To correct noisy Regulator. Changed R3 and added R36.

REV. B - to optimize the regulator bias. Changed R2.

REV. C - To prevent local Mic audio from going to the wrong transmitter in back - to - back repeaters. Added H13, H14, H15 and D7.

REV. D - To eliminate 150 MHz oscillation in Regulator. Deleted C19.

REV. E - To prevent Regulator from sending transmit pulse during switch - off delay period. Changed V1.

REV. F - For receiver muting. Added H16 and H17.

REV. G - To correct repeater muting problem. Added H18, H19, H20 with jumper between H18 and H19.

REV. H. - To stop oscillation on the 10 Volt Line. Added C25.

REV. J - To assure start - up of 10 Volt Regulator. Changed CR1 and added R37.

REV. K - Deleted C1.
C1 was 19B200240P10 - Tantalum: 10 uF ±5%, 15 VDCW.

10 VOLT REGULATOR / CONTROL 19D417401G1

REV. A - To add a higher gain transistor. Changed Q1.

PARTS LIST

10 - VOLT REGULATOR / CONTROL
19D417401G2
ISSUE 5

SYMBOL	PART NO.	DESCRIPTION
A1		PANEL 19C320809G1
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A116375P1	Silicon, PNP.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1 and S2	19B209261P11	Slide: DPST, normally open, sim. to Switchcraft 46204MR.
A3		HEAT SINK ASSEMBLY 19B226114G2
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A116758P2	Silicon, PNP; sim to Type 2N4399.
A4		REGULATOR BOARD 19D432774G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2 and C3	19A115680P10	Electrolytic: 200 uF + 150 –10%, 18 VDCW; sim to Mallory Type TTX.
C4	19A700233P7	Ceramic: 1000 pF ± 20%, 50 VDCW.
C5	19A115680P10	Electrolytic: 200 uF + 150 –10%, 18 VDCW; sim to Mallory Type TTX.
C7	19A143486P10	Tantalum: 15 uF ± 20%, 20 VDCW.
C8	19A116080P109	Polyester: 0.22 uF ± 10%, 50 VDCW.
C9	19A116080P110	Polyester: 0.33 uF ± 10%, 50 VDCW.
C10	19B209233P1	Electrolytic, non - polarized: 25 uF ± 20%, 25 VDCW; sim to Sprague 41D.
C11	19A701534P8	Tantalum: 22 uF ± 20%, 16 VDCW.
C12 and C13	19A700233P7	Ceramic: 1000 pF ± 20%, 50 VDCW.
C14	19A143486P10	Tantalum: 15 uF ± 20%, 20 VDCW.
C15	19A700233P7	Ceramic: 1000 pF ± 20%, 50 VDCW.
C16	19A700233P5	Ceramic: 470 pF ± 20%, 50 VDCW.
C17 and C18	19A700233P7	Ceramic: 1000 pF ± 20%, 50 VDCW.
C20 and C21	19A700233P7	Ceramic: 1000 pF ± 20%, 50 VDCW.
C22	19A115680P3	Electrolytic: 20 uF + 150 –10%, 25 VDCW; sim to Mallory Type TTX.
C23	19A143486P107	Tantalum: 3.3 uF ± 10%, 50 VDCW.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
CR1	19A115775P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR3 and CR4	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR6	T324ADP1041	Rectifier, silicon; general purpose.
CR7	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR10 thru CR12	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.

* COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

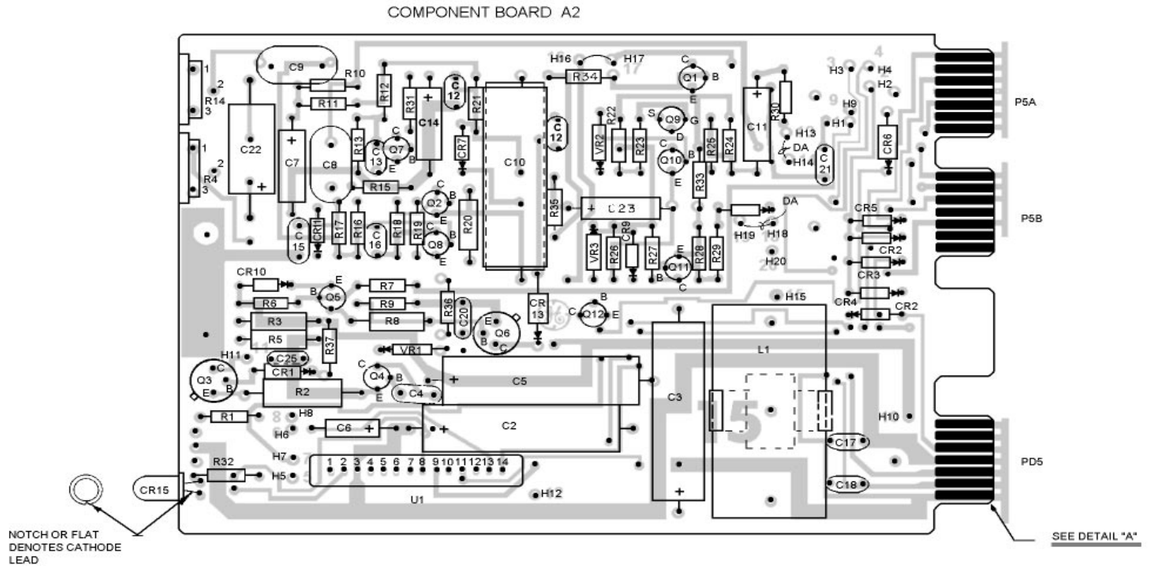
SYMBOL	PART NO.	DESCRIPTION
CR13	T324ADP1041	Rectifier, silicon; general purpose.
CR15	162B3011P0002	Diode, optoelectronic: red; sim to Hew. Packard 5082 - 4650.
		- - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19A115894P1	Audio freq: 1.0 mh inductance, 0.35 ohms DC res.
		- - - - - - - - TRANSISTORS - - - - - - - - -
Q2	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q3	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q4	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q5	19A700022P1	Silicon, PNP; sim to Type 2N3906.
Q6	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q7 and Q8	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q9	19A134137P4	N Type, field effect; sim to Type 2N3458.
Q10	19A700023P1	Silicon, NPN; sim to Type 2N3904.
		- - - - - - - - - - PLUGS - - - - - - - - - - -
P5		(Part of printed board 19D432788P1).
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	H212CRP222C	Deposited carbon: 2.2K ohms ±5%, 1/4 w.
R2	19A700112P45	Composition: 180 ohms ±5%, 1 w.
R3	3R77P240J	Composition: 24 ohms ± 5%, 1/2 w.
R4	19B209358P101	Variable, carbon film: approx. 25 to 250 ohms ± 10%, 0.2 w; sim to CTS Type X - 201.
R5	19A700113P59	Composition: 680 ohms ± 5%, 1/2 w.
R6	H212CRP147C	Deposited carbon: 470 ohms ±5%, 1/4 w.
R7	19A143400P40	Deposited carbon: 2K ohms ±5%, 1/4 w.
R8	19A700113P63	Composition: 1K ohms ± 5%, 1/2 w.
R9	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R10	19A143400P34	Deposited carbon: 620 ohms ±5%, 1/4 w.
R11	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R12	H212CRP422C	Deposited carbon: 0.22M ohms ±5%, 1/4 w.
R13	H212CRP322C	Deposited carbon: 22K ohms ±5%, 1/4 w.
R14	19B209358P106	Variable, carbon film: approx. 300 to 10K ohms + 10%, 1/4 w; sim to CTS Type X - 201.
R15	19A143400P35	Deposited carbon: 750 ohms ±5%, 1/4 w.
R16	H212CRP415C	Deposited carbon: 0.15M ohms ±5%, 1/4 w.
R17	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R18	H212CRP268C	Deposited carbon: 6.8K ohms ±5%, 1/4 w.
R19	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R20	19A700113P63	Composition: 1K 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	H212CRP447C	Deposited carbon: 0.47M ±5%, 1/4 w.
R24	H212CRP382C	Deposited carbon: 82K ohms ±5%, 1/4 w.
R25	H212CRP433C	Deposited carbon: 0.33M ±5%, 1/4 w.
R30	19A143400P34	Deposited carbon: 620 ohms ±5%, 1/4 w.
R31	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R32	H212CRP212C	Deposited carbon: 1.2K ohms ±5%, 1/4 w.
R33	H212CRP068C	Deposited carbon: 68 ohms ±5%, 1/4 w.
R36	H212CRP133C	Depsoited carbon: 330 ohms ±5%, 1/4 w.
R37	H212CRP047C	Deposited carbon: 47 ohms ±5%, 1/4 w.
		- - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U1	19D416564G13	10 - Volt regulator.

SYMBOL	PART NO.	DESCRIPTION
		- - - - - - - - VOLTAGE REGULATORS - - - - - - - -
VR1	19A700025P9	Silicon, zener: 400 mW max; sim to BZX55 - C8V2.
VR2	4036887P4	Zener: 500 mW, 4.4 v. nominal.
A4		REGULATOR BOARD 19D417262G2 (EARLIER MODELS)
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2 and C3	19A115680P10	Electrolytic: 200 uF +150 –10%, 18 VDCW; sim to Mallory Type TTX.
C4	5494481P111	Ceramic disc: 1000 pF ± 20%, 1000 VDCW; sim to RMC Type JF Discap.
C5	19A115680P10	Electrolytic: 200 uF +150 –10%, 18 VDCW; sim to Mallory Type TTX.
C7	5496267P14	Tantalum: 15 uF ± 20%, 20 VDCW; sim to Sprague Type 150D.
C8	19A116080P109	Polyester: 0.22 uF ± 10%, 50 VDCW.
C9	19A116080P110	Polyester: 0.33 uF ± 10%, 50 VDCW.
C10	19B209233P1	Electrolytic, non-polarized: 25 uF + 20%, 25 VDCW; sim to Sprague 41D.
C11	5496267P10	Tantalum: 22 uF ± 20%, 15 VDCW; sim to Sprague Type 150D.
C12 and C13	5494481P111	Ceramic disc: 1000 pF ± 20%, 1000 VDCW; sim to RMC Type JF Discap.
C14	5496267P14	Tantalum: 15 uF ± 20%, 15 VDCW; sim to Sprague Type 150D.
C15	5494481P111	Ceramic disc: 1000 pF ± 20%, 1000 VDCW; sim to RMC Type JF Discap.
C16	5494481P107	Ceramic disc: 470 pF ± 20%, 1000 VDCW; sim to RMC Type JF Discap.
C17 and C18	5494481P111	Ceramic disc: 1000 pF ± 20%, 1000 VDCW; sim to RMC Type JF Discap.
C20 and C21	5494481P111	Ceramic disc: 1000 pF ± 20%, 1000 VDCW; sim to RMC Type JF Discap.
C22	19A115680P3	Electrolytic: 20 uF +150 –10%, 18 VDCW; sim to Mallory Type TTX.
C25	19A700005P7	Polyester: 0.01 uF ± 10%, 50 VDCW.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1	19A115775P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR3 and CR4	19A15250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR6	T324ADP1041	Rectifier, silicon; general purpose.
CR7	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR10 thru CR12	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR13	T324ADP1041	Rectifier, silicon; general purpose.
CR15	162B3011P0002	Diode, optoelectronic: red; sim to Hew. Packard 5082 - 4650.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19A115894P1	Audio freq: 1.0 mh inductance, 0.35 ohms DC res.
		- - - - - - - - - - PLUGS - - - - - - - - - - -
P5		(Part of printed board 19D417241P1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q2	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q3	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q4	19A700023P1	Silicon, NPN; sim to Type 2N3904.

SYMBOL	PART NO.	DESCRIPTION
Q5	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q6	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q7 and Q8	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q9	19A134137P4	N Type, field effect; sim to Type 2N3458.
Q10	19A700023P1	Silicon, NPN; sim to Type 2N3904.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	H212CRP222C	Deposited carbon: 2.2K ohms ± 5%, 1/4 w.
R2	19A700112P45	Composition: 180 ohms ± 5 %, 1 w.
R3	3R77P240J	Composition: 24 ohms ± 5 %, 1/2 w.
R4	19B209358P101	Variable, carbon film: approx. 25 to 250 ohms ± 10%, 0.2 w; sim to CTS Type X - 201.
R5	19A700113P59	Composition: 680 ohms ± 5 %, 1/2 w.
R6	H212CRP147C	Deposited carbon: 470 ohms ± 5%, 1/4 w.
R7	19A143400P40	Deposited carbon: 2K ohms ± 5%, 1/4 w.
R8	19A700113P63	Composition: 1K ohms ± 5 %, 1/2 w.
R9	H212CRP310C	Deposited carbon: 10K ohms ± 5%, 1/4 w.
R10	19A143400P34	Deposited carbon: 620 ohms ± 5%, 1/4 w.
R11	H212CRP210C	Deposited carbon: 1K ohms ± 5%, 1/4 w.
R12	H212CRP422C	Deposited carbon: 0.22M ohms ± 5%, 1/4 w.
R13	H212CRP322C	Deposited carbon: 22K ohms ± 5%, 1/4 w.
R14	19B209358P106	Variable, carbon film: approx. 300 to 10K ohms ± 10%, 1/4 w; sim to CTS Type X - 201.
R15	19A143400P35	Deposited carbon: 750 ohms ± 5%, 1/4 w.
R16	H212CRP415C	Deposited carbon: 0.15M ohms ± 5%, 1/4 w.
R17	H212CRP310C	Deposited carbon: 10K ohms ± 5%, 1/4 w.
R18	H212CRP268C	Deposited carbon: 6.8K ohms ± 5%, 1/4 w.
R19	H212CRP210C	Deposited carbon: 1K ohms ± 5%, 1/4 w.
R20	19A700113P63	Composition: 1K ohms ± 5 %, 1/2 w.
R21	19A143400P52	Deposited carbon: 20K ohms ± 5%, 1/4 w.
R22	H212CRP315C	Deposited carbon: 15K ohms ± 5%, 1/4 w.
R23	H212CRP447C	Deposited carbon: 0.47M ohms ± 5%, 1/4 w.
R24	H212CRP382C	Deposited carbon: 82K ohms ± 5%, 1/4 w.
R25	H212CRP433C	Deposited carbon: 0.33M ± 5%, 1/4 w.
R30	19A143400P34	Deposited carbon: 620 ohms ± 5%, 250 VDCW / 1/4 w.
R31	H212CRP210C	Deposited carbon: 1K ohms ± 5%, 1/4 w.
R32	H212CRP212C	Deposited carbon: 1.2K ohms ± 5%, 1/4 w.
R33	H212CRP068C	Deposited carbon: 68 ohms ± 5%, 1/4 w.
R36	H212CRP133C	Deposited carbon: 330 ohms ± 5%, 1/4 w.
R37	H212CRP047C	Deposited carbon: 47 ohms ± 5%, 1/4 w.
		- - - - - - - INTEGRATED CIRCUITS - - - - - - -
U1	19D416564G13	10 - Volt regulator.
		- - - - - - -VOLTAGE REGULATORS - - - - - - -
VR1	4036887P40	Zener: 500 mW, 8.2 v. nominal.
VR2	4036887P4	Zener: 500 mW, 4.4 v. nominal.
		- - - - - - - - MISCELLANEOUS - - - - - - - -
	19B219690G1	Handle assembly.
	19A116023P1	Insulator, Plate. (Used with Q1 on A1).
	19A700068P1	Insulator, bushing. (Used with Q1 on A1).
	19A701332P4	Insulator, washer: nylon. (Used with Q3 & Q5 on A4).
	7118719P10	Clip, spring tension: sim to Prestole E - 500196 - 003. (Used with L1 on A4).

SYMBOL	PART NO.	DESCRIPTION
	4029974P1	Insulator, plate: aluminum. (Used with Q1 on A3).
	19A121882P1	Washer, shield. (Used with Q1 on A3).
	4036994P1	Terminal, solderless. (Used with Q1 on A3).
	19B226013G1	Heat sink. (Used with Q1 on A3).
	19A121175P11	Insulator. (Used with C10 on A4).
	5491541P307	Spacer, threaded: No. 6 - 32. (Supports A3).
	N405P5C	Lockwasher: No. 4. (Secures S1 & S2 on A1).
	N80P9004C6	Machine screw: No. 4 - 40 x 1/4. (Secures S1 & S2 on A1).
	N80P9006C6	Machine screw: No. 4 - 40 x 3/8. (Secures Q1 on A1).

COMPONENT BOARD A2



(19D423132, Rev. 14)
(19D417241, Sh. 2, Rev. 15)

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 partts affected by these revisions.

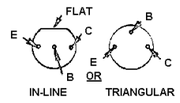
REV. A - REGULATOR BOARD 19D417262G2
Deleted C1. Old part number was:

19B200240P10, Tantalum: 10 uF ±5%, 15 VDCW.

REFER TO WIRING DIAGRAM FOR THE FOLLOWING CONNECTIONS	
FROM	TO
A3-Q1-B	A2 - H11
A3-Q1-C	A2 - H10
A3-Q1-E	A2 - H12
A1-S1-3	A2 - H5
A1-S1-2	A2 - H6
A1-S2-3	A2 - H7
A1-S2-2	A2 - H8

REFER TO WIRING DIAGRAM FOR THE FOLLOWING CONNECTIONS	
FROM	TO
H2	H1
H3	H9

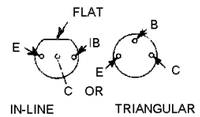
LEAD IDENTIFICATION
FOR Q1-Q2, Q4, Q10, Q12



VIEW FROM LEAD END

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

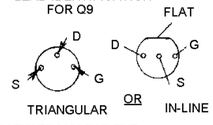
LEAD IDENTIFICATION
FOR Q3, 15-Q8, Q11



VIEW FROM LEAD END

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

LEAD IDENTIFICATION
FOR Q9



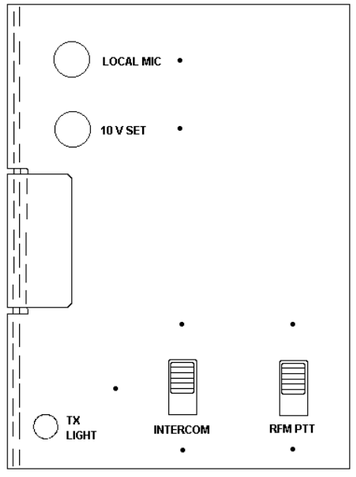
VIEW FROM LEAD END

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

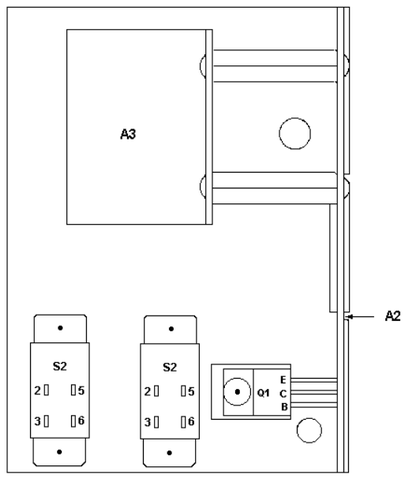
8 9 1011121314
7 6 5 4 3 2 1
SOLDER SIDE
DETAIL "A"

TYP. NUMBERING OF CONT. FINGERS

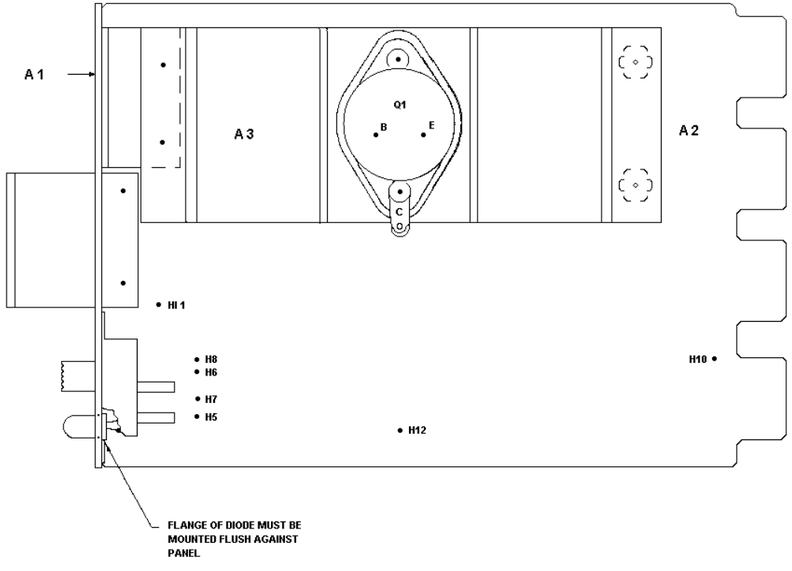
COMPONENT BOARD A2
19D417252G1
(USED IN EARLIER MODELS)



FRONT PANEL (A1)

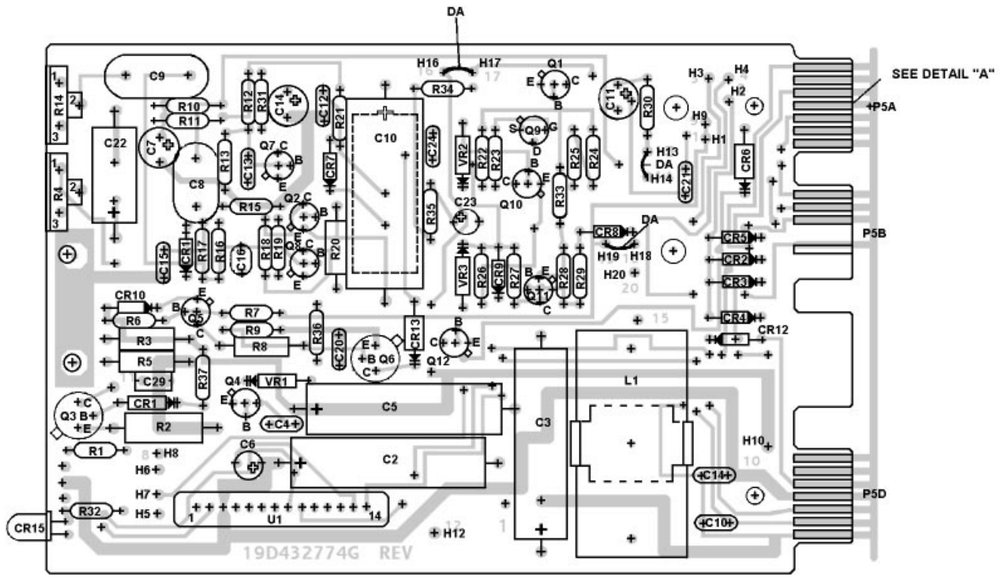


FRONT PANEL (A1)
REAR VIEW



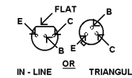
COMPONENT BOARD A2
19D432774G1

(19D423128, Rev. 0)



(19D432789, Rev. 1)
(19A143796, Sh. 1, Rev. 1)

LEAD IDENTIFICATION
FOR Q1 - Q2, Q4, Q5, Q7, Q8, Q10, Q11, Q12

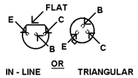


IN - LINE OR TRIANGULAR

VIEW FROM LEAD END

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

LEAD IDENTIFICATION
FOR Q3 AND Q6



IN - LINE OR TRIANGULAR

VIEW FROM LEAD END

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

SOLDER SIDE
TYP. NUMBERING OF CONTACT FINGERS.
DETAIL "A"

LEAD IDENTIFICATION
FOR Q9

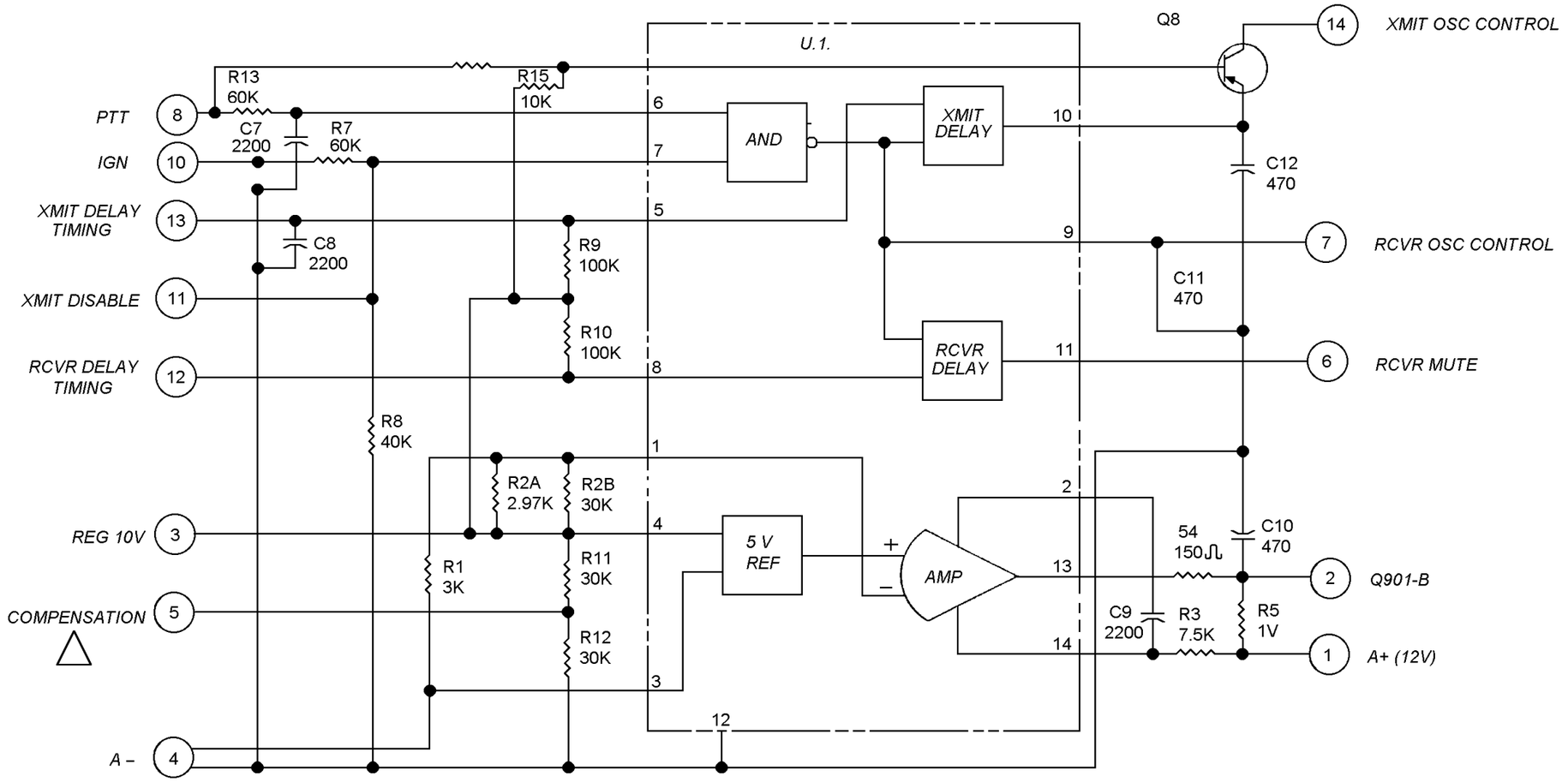
TRIANGULAR

VIEW FROM LEAD END

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

REFER TO WIRING DIAGRAM FOR THE FOLLOWING CONNECTIONS.	
FROM	TO
H2	H1
H3	H9
H16	H17
H18	H19
H13	H14

10 VOLT REGULATOR/CONTROL BOARD
19D417401G1

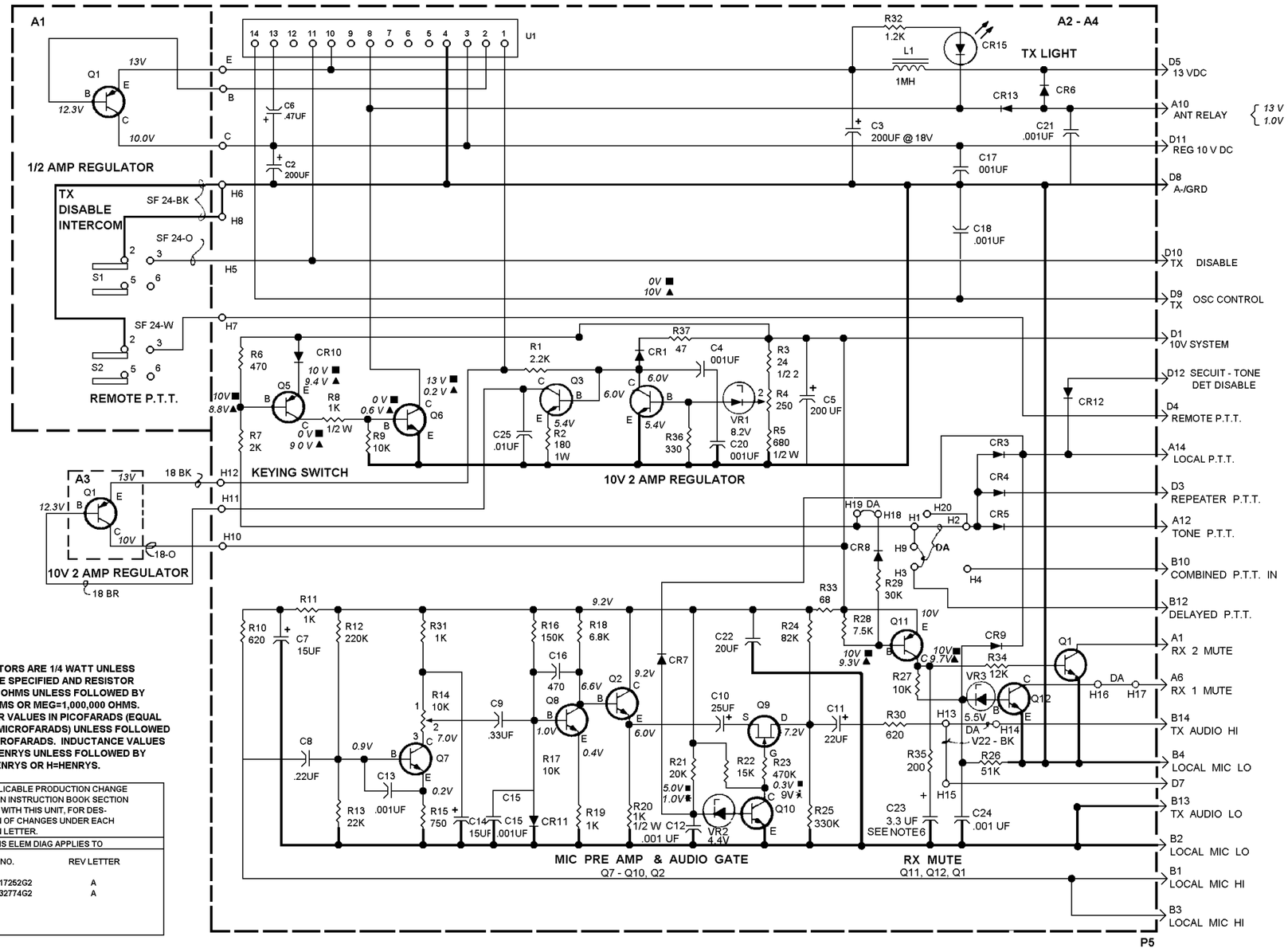


NOTES:

△ COMPENSATION FUNCTION (AT PIN 5) IS NOT USED IN GROUP 14.

10-VOLT REGULATOR U1
19D416564G13

(19C328057, Rev. 1)



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=MILIHENRYS 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
PL19D417252G2	A
PL19D432774G2	A

10 V REG / CONTROL BD

NOTES:

1. FOR CARRIER SQUELCH (NON-CHANNEL GUARD) STATIONS, JUMPER H1-H2 & H3-H9 ARE PRESENT.
2. FOR CHANNEL GUARD LOCAL, REMOTE OR LOCAL/REMOTE STATIONS JUMPER H9-H3 & H2-H4 ARE PRESENT.
3. FOR CHANNEL GUARD REPEATERS USING DECODE ONLY (NO ENCODE), JUMPER H1-H2 IS PRESENT.
   FOR CHANNEL GUARD REPEATERS USING BOTH ENCODE AND DECODE, JUMPER H2-H4 AND H3-H9 ARE PRESENT.
5. WHEN SECOND RECEIVER MUTE ON TRANSMIT IS NOT DESIRED, CUT OUT Q1.
6. IN REPEAT, REMOTE/REPEAT AND LOCAL/REPEAT STATIONS, C23 IS NOT PRESENT.
7. WHEN OPTIONS 9555, 9556, AND 9589 (BACK TO BACK REPEATERS) ARE APPLIED, JUMPER FROM H13 TO H14 IS REMOVED AND A JUMPER FROM H13 TO H15 IS ADDED.
8. IN DUPLEX, DUPLEX WITH CHANNEL GUARD AND REPEATERS WITH CHANNEL GUARD, THE JUMPER FROM H16 TO H17 IS REMOVED.
9. FOR VOICE GUARD STATION OPTIONS 9783 THRU 9788, JUMPER H2-H4 IS PRESENT AND JUMPERS H1-H2 AND H16-H17 ARE REMOVED.
10. SIMULCAST REMOVE CR4, CR5.

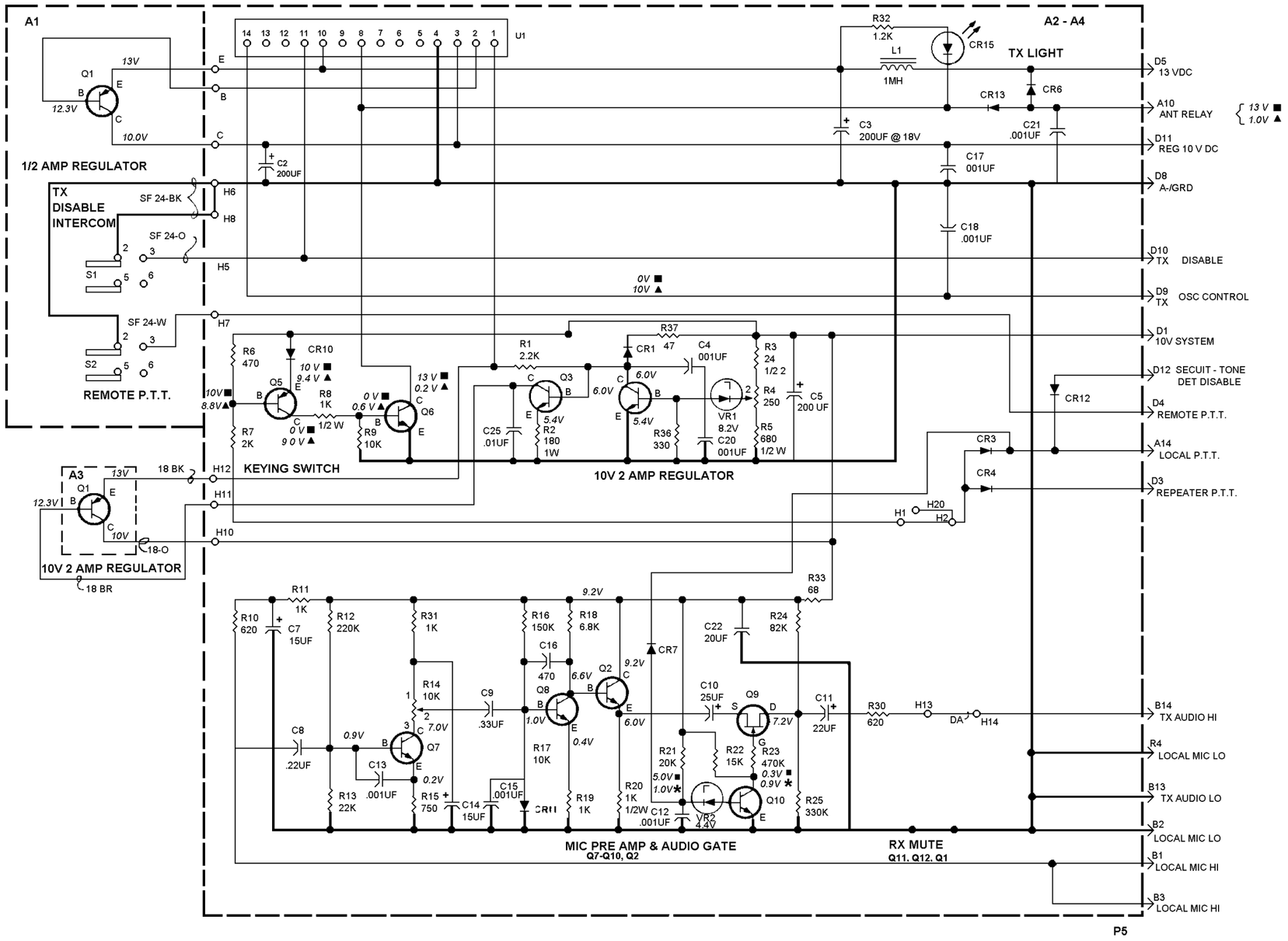
VOLTAGE READINGS

ALL READINGS MADE WITH 20,000 OHMS-PER-VOLT METER. ALL READINGS TYPICAL.

- ▲ TRANSMITTER KEYED
- ■ TRANSMITTER UNKEYED
- ✱ LPTT KEYED

10-VOLT REGULATOR/CONTROL BOARD 19D417401G1

(19D417270, Rev. 19)



NOTES:

1. FOR G.E. MARC V REPEATERS, JUMPERS H1-H2 AND H13-H14 ARE PRESENT.

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=MILIHENRYS 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
PL19D417252G2	A
PL19D432774G2	A

VOLTAGE READINGS

ALL READINGS MADE WITH 20,000 OHMS-PER-VOLT METER. ALL READINGS TYPICAL.

- ▲ TRANSMITTER KEYED
- ■ TRANSMITTER UNKEYED
- ✱ LPTT KEYED

10-VOLT REGULATOR/CONTROL BOARD 19D417401G2

(19D430958, Rev. 4)

This page intentionally left blank