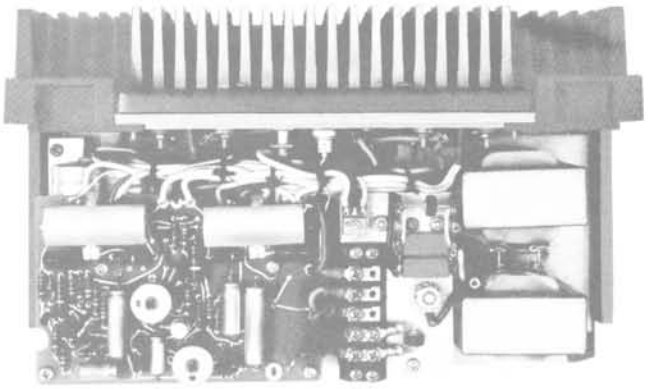
MOBILE RADIO

MASTR® II MAINTENANCE MANUAL

DC CONVERTER 19D417134G1



SPECIFICATIONS *

Used With	MASTR II "E" Series Mobile Combinations
Operable Input Voltage	16 Volts DC Minimum to 60 Volts DC Maximum (Nominal 24 Volts, 36 Volts and 48 Volts)
Output Voltage	12.5 Volts DC (+1 Volt, -0 Volts)
Maximum Current Output	15 Amperes (12.5 Volts across 0.83 Ohms)

	INPUT VDC	TX MODE INPUT AMPS	RX MODE SQUELCHED INPUT AMPS	RX MODE UNSQUELCHED INPUT AMPS	TX MODE OUTPUT AMPS	RX MODE SQUELCHED OUTPUT AMPS	RX MODE UNSQUELCHED OUTPUT AMPS
50 Watt Low Band (25-50 MHz)	24	8.0	0.50	2.0	11.0	0.25	2.4
	36	5.8	0.35	1.5			
	48	4.5	0.30	1.2			
35 Watt High Band (138-174 MHz)	24	6.7	0.50	2.0	9.0	0.25	2.4
	36	5.0	0.35	1.5			
	48	3.8	0.30	1.2			
65 Watt High Band (138-174 MHz)	24	10.6	0.50	2.0	15.0	0.25	2.4
	36	7.6	0.35	1.5			
	48	6.2	0.30	1.2			
40 Watt UHF (406-420 MHz) (450-512 MHz)	24	7.7	0.50	2.0	10.5	0.25	2.4
	36	5.5	0.35	1.5			
	48	4.2	0.30	1.2			

Temperature Range	-40°C to +70°C (-40°F to +158°F)
Duty Cycle	20% EIA

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

DC CONVERTER 19D417134G1

GENERAL ELECTRIC

TABLE OF CONTENTS

ILLUSTRATIONS

WARNING

Although the highest DC voltage in MASTR II Mobile Equipment is supplied by the vehicle battery, high currents may be drawn under short circuit conditions. These currents can possibly heat metal objects such as tools, rings, watchbands, etc., enough to cause burns. Be careful when working near energized circuits.

High-level RF energy in the transmitter Power Amplifier assembly can cause RF burns upon contact. Keep away from these circuits when the transmitter is energized!

DESCRIPTION

DC Converter 19D417134G1 is a compact, solid state converter for use with MASTR II "E" Series Mobile Radios. The converter is designed for use with mobile combinations in the following power and frequency ranges:

- 50-Watt Low Band
- 35/40 and 65-Watt High Band
- 40-Watt UHF

The converter is a switching regulator capable of operating on battery voltages of 16 to 60 Volts DC, and provides an output of 12.5 Volts DC. The output is both current and voltage controlled for improved operation and protection of the radio.

Protective circuits are provided to prevent damage to the radio if transients or high voltages pass through the regulator to the output. Filtering for input voltage transients is also provided.

The converter mounts in the space below the transmitter PA assembly, with the power switching transistors mounted on a rear heat sink. The unit is electrically isolated from the radio chassis to permit operation in either positive or negative ground vehicles without any changes to the radio.

CIRCUIT ANALYSIS

Two voltage inputs are required for operating the DC converter. Supply voltage from the battery is applied to the converter at all times. CR803 is a polarity-protection diode, and will cause a fuse to blow if the polarity to the converter is reversed.

A control voltage from the control unit is used to turn the converter on and off. The control unit POWER-ON switch is modified so that placing the switch in the ON position applies the control voltage (battery plus) directly to the converter. Turning the switch off removes the control voltage.

One output from the converter is applied directly to the feed-through capacitors on the transmitter power amplifier. A second output is applied to the system board for operating the 10-Volt regulator, control unit indicators and options, and the receiver audio PA stages. A simplified power distribution diagram is shown in Figure 1.

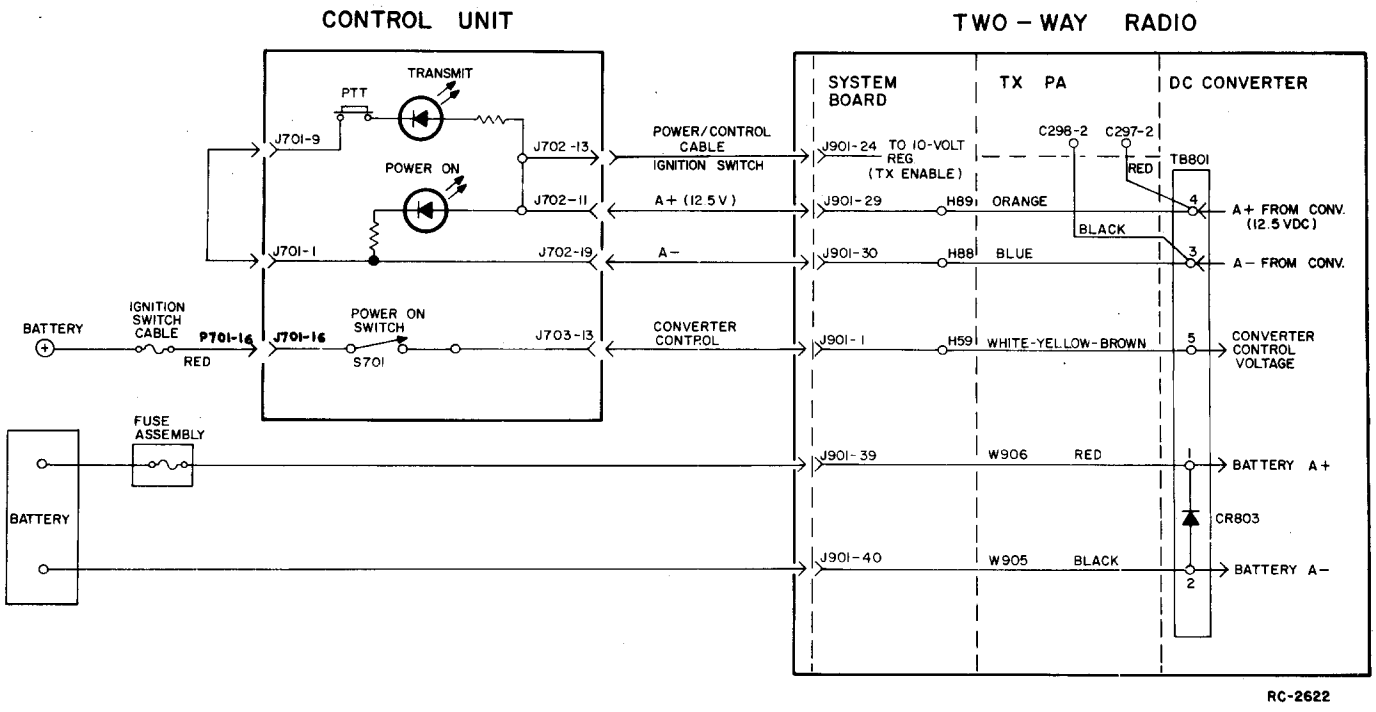


Figure 1 - Simplified Converter Power Distribution Diagram

SWITCHING CIRCUITS

Turning the POWER-ON switch to the ON position applies the control voltage to the converter. The voltage developed across voltage divider R22 and R23 turns Q1 off. This allows Q803 and Q802 to conduct when the proper voltage is applied to the base of Q803. At the same time, voltage is applied to the Schmitt trigger (Q2 and Q4) and control circuits through CR1 and R2.

At the instant the power switch is turned on, Q4 and Q5 are off. With Q4 off, its collector voltage is sufficiently negative to turn Q2 on. The positive voltage at the collector of Q2 turns on Q803 and Q802. Turning on Q802 causes its collector to go negative, turning on the paralleled pass transistors Q801 and Q804 and driving them into saturation.

With Q801 and Q804 turned on, voltage is applied to the base of Q5 through voltage divider network R12, R13 and R14. When C6 charges up to the proper level, Q5 turns on. This turns on Q4 which turns Q2 off. Turning off Q2 removes the drive to Q802 and Q803 and turns off the pass transistors (Q801 and Q804).

A network consisting of CR801, R802, R806, C2 and C11 is provided to minimize dissipation in pass transistors. The network passes high current during the turn-off time of Q801 and Q804, preventing simultaneous high current and high voltage in the transistors.

During the switching cycle (turning Q801 and Q804 on and off), energy is stored in L802, L803, L804, C802, C804, and C805. When Q801 and Q804 turn off, current from the inductors and capacitors is applied to the load on the output. The inductors deliver current through CR802.

With Q801 and Q804 off, the voltage applied to divider network R12, R13 and R14 is near zero. This causes capacitor C6 to start discharging through R12, R13 and R14. When C6 is discharged sufficiently, Q5 turns off and the switching cycle starts again. Instructions for setting Voltage Control potentiometer R13 are given in the Adjustment Procedure (see Table of Contents).

The total time for Q801 and Q804 to switch on and switch off is dependent on the value of C6 and the effective shunt resistance of R12, R13 and R14. It is also dependent on the voltage rating of VR1, the ratio of input to output voltage, and the differential voltage of the collector of Q5 referenced to the emitter supply (control voltage) of the Schmitt trigger (Q2 and Q4).

The ratio of "on" time to "off" time of Q801 and Q804 varies inversely with the ratio of input to output voltage, and varies directly with the load current.

PROTECTIVE CIRCUITS

Switching Circuit Control

To avoid switching high current, the converter is turned off by switching off the Schmitt trigger supply voltage (control voltage). Under certain temperature conditions, current leakage could cause Q802 and Q803 to turn on, driving Q801 and Q804 into saturation. Q1 and voltage divider R22-R23 prevent this from occurring. Turning off the POWER-ON switch forward biases Q1, turning it on. This effectively clamps the base of Q803 to A-, keeping the transistor off.

In addition, when the switch is turned off, the charge on filter capacitor C8 is sufficient to keep Q2 and Q803 turned on for a few milliseconds, which would keep Q801 and Q804 turned on. If this should occur, a transient would appear at the converter output that would be approximately equal to the input voltage. Diode CR1 isolates Q1 from the charge on C8 so that Q1 turns on the instant the control voltage is turned off. This effectively clamps the base of Q803 to A-, keeping the transistor off.

Current Control

The circuit consisting of Q3, C7, C16, VR2, R15 through R19 and R803 provides output limiting to protect the converter from overloads.

Zener diode VR1 (in the emitter circuit of Q5) provides the reference for the output voltage. Lowering the reference voltage lowers the output voltage, and lowering the output voltage without an increase in the output current lowers the output power.

Base bias for Q3 is determined by the setting of Current Control Potentiometer R19 and resistance wire R803. The base bias is adjusted by R19 to just below the conduction point when the maximum allowable load current is flowing through R803. Instructions for setting R19 are contained in the Adjustment Procedure (see Table of Contents).

Any increase in the allowable load current through R803 causes Q3 to conduct, which lowers the reference voltage at the emitter of Q5. This increases the conduction of Q5, decreasing the "on" time of pass transistors Q801 and Q804. As the output voltage is proportional to the "on" time of Q801 and Q804, the voltage starts to decrease. If the load current tries to increase further, the output voltage will continue to decrease until it drops to approximately 3 Volts.

When the output voltage reaches the 3-Volt level, the load is practically a short circuit and the converter automatically turns off. The automatic turn-off circuit consists of diode CR2 and voltage dividers R15 and R16.

The average voltage at the base of Q5 is dependent upon the "on" time of pass transistors Q801 and Q804. When the "on" time of Q801 and Q804 becomes too short, the base voltage is too low to keep Q5 operating properly. Before this state is reached, CR2 starts to conduct and sets a minimum voltage at the base of Q5. This voltage locks Q5 in an "on" condition and Q801-Q804 in an "off" condition. The circuit will remain in this state until the overload condition is corrected and the POWER-ON switch turned off and then turned back on. Zener diode VR2 prevents the automatic turn-off circuit from locking Q5 "on" under normal operating conditions. When the converter is turned on, the charger time of C7 keeps CR2 from conducting until a normal operating voltage is established at the base of Q5.

Over-Voltage Protection

An over-voltage protective circuit consisting of zener diode VR4, silicon controlled rectifier SCR801, voltage dividers R20 and R21, and capacitor C806 protect the radio against a short in one of the pass transistors (Q801 or Q804) and against transients.

If one of the pass transistos should short out, the high input voltage could be applied directly to the radio. If this should occur, VR4 breaks down, turning on SCR801. The resulting high current flow will cause the input fuse to blow. Voltage dividers R20 and R21 set the turn-on level of SCR801 for an output voltage of approximately 18 volts. Capacitor C806 prevents the SCR from turning on as a result of small transients.

When the converter is operating normally and a transient causes the output voltage to exceed 18 volts, SCR801 will turn on and short the output. This is the same as a low resistance short circuit, and the converter will turn off without blowing the input fuse. Turning the POWER-ON switch off resets the SCR circuit so that turning the switch back ON will start the converter operating normally again.

A network consisting of C15, VR5 and R25 minimizes transients resulting from fast load changes.

MAINTENANCE

DISASSEMBLY

To gain access to the converter for servicing:

1. Pull the locking handle down and pull the radio out of the mounting frame.
2. Turn the radio over and remove the two bottom cover retaining screws. Then lift off the bottom cover.

To remove the converter from the radio:

1. Remove all power to the converter.
2. Remove the bottom cover and disconnect the leads from the radio at TB801 if desired.
3. Remove the two screws (A) securing the transistor cover.
4. Remove the four screws (B) (two as shown and two below in heatsink.)
5. Remove the five screws (C) and lift the converter assembly up and out of the radio.

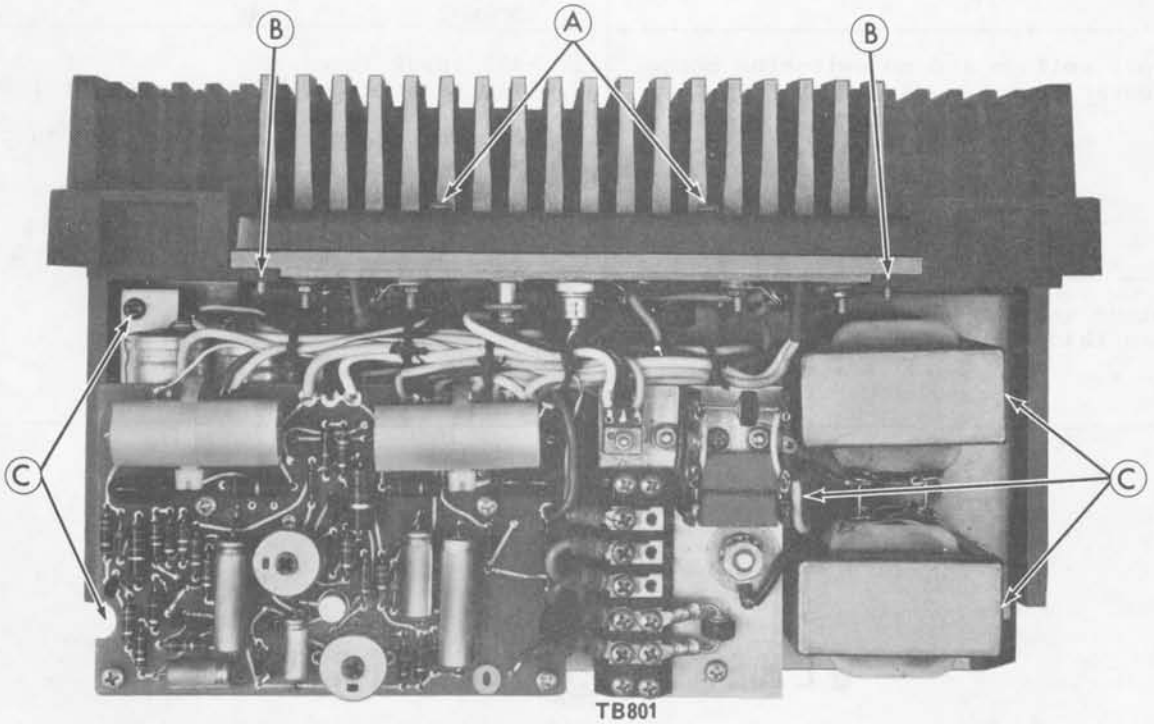


Figure 2 - Disassembly Procedure

ADJUSTMENT PROCEDURE

The converter is adjusted at the factory and will normally require no adjustment unless components are replaced in the current or voltage control circuits. If adjustment is required, make sure that the transmitter is tuned for maximum rated output.

Preliminary Check

Connect a Voltmeter between TB801-3 (A-) and TB801-4 (A+). Key the transmitter and check for a meter reading of 12.5 to 13 volts. If the meter reading is not in this range, leave the Voltmeter connected and make the following adjustment:

Adjustment

1. Set Current Control R19 fully clockwise.
2. Set Voltage Control R13 to approximately mid-range.
3. Key the transmitter and set Voltage Control R13 fully counterclockwise, or until a meter reading of 14.5 volts is reached.
4. Key the transmitter and adjust Current Control R19 for a meter reading of 13 Volts DC.
5. Key the transmitter and adjust Voltage Control R13 for a meter reading of 12.5 Volts DC.

TROUBLESHOOTING PROCEDURE

Troubleshooting Chart For DC V Converter

Input Voltage: 24-48 VDC
Load Resistance: 6 ohms

SYMPTOM	CHECK:
Anything abnormal, such as output voltage too high or too low, but with switching noise coming from converter.	Voltages — Typical Value Q5 Base — 9.7 VDC Cathode of VR3 — 3.8 VDC Cathode of VR2 — 6.5 VDC Q801, Q804 bases — 0.7 Volt less than input voltage
If above voltages are off by more than ±20%.	1. Short on output (less than 0.8 ohms) 2. Components involved 3. SCR801
No output voltage and no switching noise from converter.	1. All input fuses 2. For voltages at TB801-1 and -2, TB801-5 and -2 3. Switch control voltage off and on to check starting 4. VR2 5. For short on output 6. Q1 for open or short 7. Q801, Q804, Q802, Q803 for short or open
Low output voltage - less than 12.5 V but more than 3 V.	1. VR1 2. For short on output 3. Q3 for short 4. VR3 for short 5. Setting of R13 and R19

GENERAL ELECTRIC COMPANY • MOBILE COMMUNICATIONS DIVISION
WORLD HEADQUARTERS • LYNCHBURG, VIRGINIA 24502 U.S.A.

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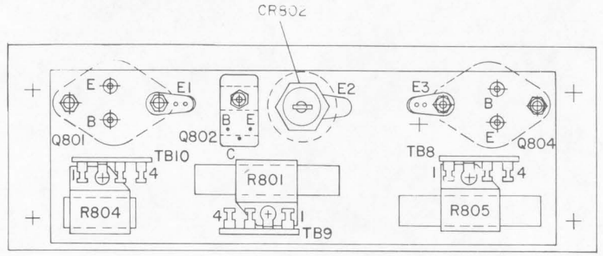
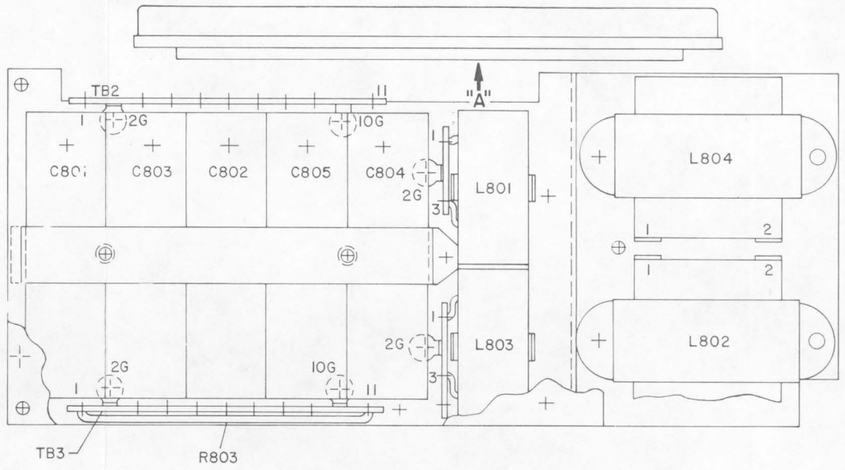
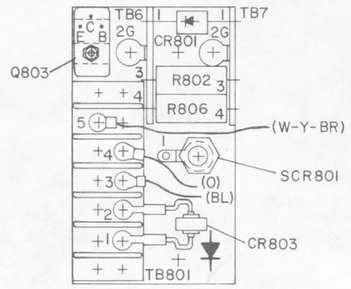
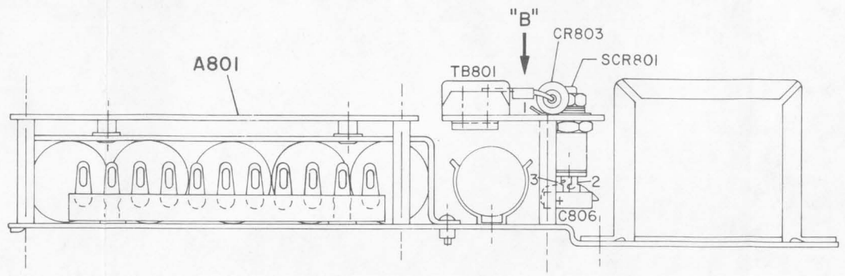


VIEW "A"



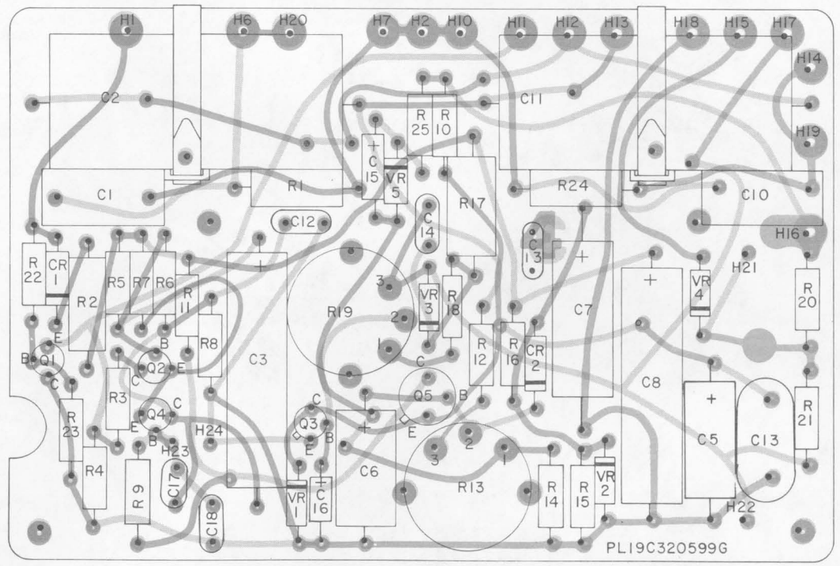


VIEW "B"



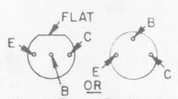
(19D423044, Rev. 2)

A801

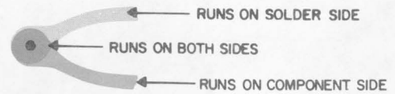


(19D417129, Sh. 2, Rev. 3)
(19D417129, Sh. 3, Rev. 4)

LEAD IDENTIFICATION
FOR Q1-Q5



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



OUTLINE DIAGRAM

DC CONVERTER 19D417134G1

▲A42984OP5 TERMINAL-CRIMP & SOLDER TO Q801 & Q804

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
PLI9C320599G1	B
PLI9D417134G1	

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 1/2 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.

NOTE
1. 4 INCHES OF RESISTANCE WIRE SLEEVE WITH A4035893P18.
2. ATTACH TERMINAL 19B209268P101 TO TERMINALS ON TB801 SHOWN "●".
3. DB=#18 AWG WIRE SIZE.

INSTALLATION DIAGRAM
SEE INSTRUCTION 19D417235

SYSTEM BD J901
A+ 39 — V10-R
A- 40 — V10-BK
H88 A- — V18-BL
H89 A+ — V18-O
H59 CONTROL VOLTAGE 16-60V — SF24-W-Y-BR

TRANSMITTER POWER AMPLIFIER
(RED) A+ — V16-R
(BLACK) A- — V16-BK

TB801
1 +16-60VDC
2 A-
3 A-(TO TB3-7)
4 A+(TO TB5-1)
5 16-60V
SEE NOTE 2

CR803

A801 (PL19C320599G1)

TO TB801-4 (A+)
TO TB801-3 (A-)

L804 3.0MH
L802 3.0MH
L803 50

Q802 Q803 Q804 Q801 Q1 Q2 Q3 Q4 Q5

CR801 CR802 CR1 CR2

SCR601 CR606

VOLTAGE CONTROL
CURRENT CONTROL

R1 10 1W
R2 220 W
R3 5.6K
R4 10K
R5 120K
R6 150K
R7 1K
R8 82K
R9 10K
R10 4.7K
R11 10K
R12 2K
R13 1K
R14 5.1K
R15 22K
R16 3.3K
R17 1K 2W
R18 680
R19 250
R20 180
R21 220
R22 6.8K
R23 680
R24 10 1W
R25 200
R801 40 10W
R804 40 5W
R805 40 10W
R806 10 5W
R807 10 5W
R803 SEE NOTE 1

C1 .47UF
C2 20UF
C3 100UF
C4 .47UF
C5 20UF
C6 20UF
C7 300UF
C8 50UF
C9 .47UF
C10 .47UF
C11 2UF
C12 .001
C13 47 UF
C14 .01 UF
C15 3.3UF
C16 22UF
C17 150
C18 .001UF
C801 600 UF
C802 3600UF
C803 600 UF
C804 3600UF
C805 3600UF

VR1 9.0V
VR2 6.5V
VR3 5.8V
VR4 9V
VR5 5.4V

TB1-1 TB1-4 TB2-1 TB2-2 TB2-3 TB2-6 TB2-7 TB2-8 TB2-9 TB2-11 TB3-1 TB3-3 TB3-4 TB3-5 TB3-7 TB3-8 TB3-9 TB3-11 TB4-1 TB4-3 TB4-4 TB5-1 TB5-3 TB6-1 TB6-3 TB6-4 TB7-1 TB7-3 TB7-4 TB8-4 TB9-4

(198621904, Rev. 6)

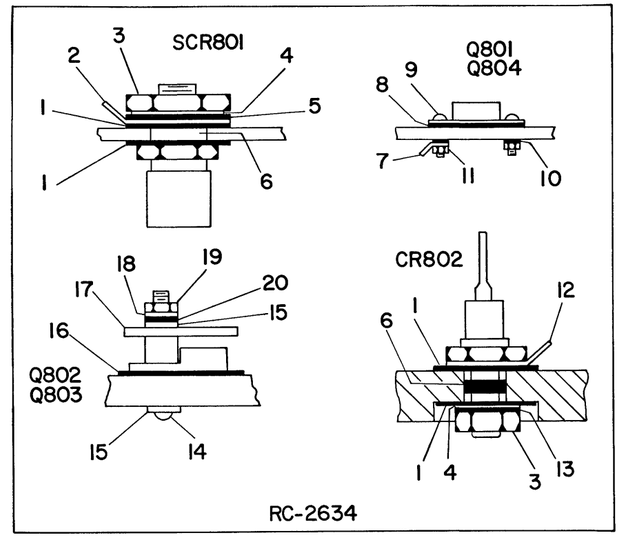
SCHEMATIC DIAGRAM
DC CONVERTER 19D417134G1

PARTS LIST

LBI4725C

DC CONVERTER
19D417134G1

SYMBOL	GE PART NO.	DESCRIPTION
A801		COMPONENT BOARD 19C320599G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A116080P111	Polyester: 0.47 µf ±10%, 50 VDCW.
C2	7491930P14	Polyester: 2.0 µf ±20%, 100 VDCW; sim to GE Type 61F.
C3	19A115680P5	Electrolytic: 100 µf +150% -10%, 25 VDCW; sim to Mallory Type TTX.
C5 and C6	19A115680P3	Electrolytic: 20 µf +150% -10%, 25 VDCW; sim to Mallory Type TTX.
C7	19A115680P14	Electrolytic: 300 µf +150% -10%, 7 VDCW; sim to Mallory Type TTX.
C8	19A115680P6	Electrolytic: 50 µf +150% -10%, 50 VDCW; sim to Mallory Type TTX.
C10	19A116080P111	Polyester: 0.47 µf ±10%, 50 VDCW.
C11	7491930P14	Polyester: 2.0 µf ±20%, 100 VDCW; sim to GE Type 61F.
C12	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C13*	19A116080P111	Polyester: 0.47 µf ±10%, 50 VDCW.
		In REV A and earlier:
	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C14	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C15	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C16*	5491674P35	Tantalum: 22 µf ±20%, 4 VDCW; sim to Sprague Type 162D. Added by REV A.
C17*	5494481P1	Ceramic disc: 150 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap. Added by REV B.
C18*	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap. Added by REV B.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1 and CR2	4037822P1	Silicon, 1000 mA, 400 PIV.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1 and Q2	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q3	19A115889P1	Silicon, NPN.
Q4	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q5	19A115300P2	Silicon, NPN; sim to Type 2N3053.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R78P100K	Composition: 10 ohms ±10%, 1 w.
R2	3R78P221K	Composition: 220 ohms ±10%, 1 w.
R3	3R77P562K	Composition: 5.6K ohms ±10%, 1/2 w.
R4	3R77P103K	Composition: 10K ohms ±10%, 1/2 w.
R5	3R77P124J	Composition: 0.12 megohm ±5%, 1/2 w.
R6	3R77P154K	Composition: 0.15 megohm ±10%, 1/2 w.
R7	3R77P102K	Composition: 1K ohms ±10%, 1/2 w.
R8	3R77P823K	Composition: 82K ohms ±10%, 1/2 w.
R9	3R77P103K	Composition: 10K ohms ±10%, 1/2 w.
R10	3R77P472K	Composition: 4.7K ohms ±10%, 1/2 w.
R11	3R77P103K	Composition: 10K ohms ±10%, 1/2 w.
R12	3R77P202K	Composition: 2K ohms ±10%, 1/2 w.
R13	19A115681P1	Variable, wirewound: 1K ohms ±20%, 2.25 w; sim to CTS Series 115.
R14	3R77P512J	Composition: 5.1K ohms ±5%, 1/2 w.
R15	3R77P223K	Composition: 22K ohms ±10%, 1/2 w.
R16	3R77P332K	Composition: 3.3K ohms ±10%, 1/2 w.
R17	3R79P102K	Composition: 1K ohms ±10%, 2 w.
R18	3R77P681K	Composition: 680 ohms ±10%, 1/2 w.
R19	19A115681P3	Variable, wirewound: 250 ohms ±20%, 2.25 w; sim to CTS Series 115.
R20	3R77P181K	Composition: 180 ohms ±10%, 1/2 w.
R21	3R77P221K	Composition: 220 ohms ±10%, 1/2 w.
R22	3R77P682K	Composition: 6.8K ohms ±10%, 1/2 w.
R23	3R77P681K	Composition: 680 ohms ±10%, 1/2 w.
R24	3R78P100K	Composition: 10 ohms ±10%, 1 w.
R25	3R77P201K	Composition: 200 ohms ±10%, 1/2 w.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - - -
VR1	4036887P7	Zener: 500 mW, 9.0 v. nominal.
VR2	4036887P6	Zener: 500 mW, 6.5 v. nominal.
VR3	4036887P3	Zener: 500 mW, 3.8 v. nominal.
VR4	4036887P7	Zener: 500 mW, 9.0 v. nominal.
VR5	4036887P5	Zener: 500 mW, 5.4 v. nominal.
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C801	19A126770P112	Electrolytic: 600 µf +50% -10%, 75 VDCW; sim to Sprague Type 34D.
C802	5493132P11	Electrolytic: 3600 µf +75% -10%, 30 VDCW.
C803	19A126770P112	Electrolytic: 600 µf +50% -10%, 75 VDCW; sim to Sprague Type 34D.
C804 and C805	5493132P11	Electrolytic: 3600 µf +75% -10%, 30 VDCW.
C806	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - -
CR801	19A116783P2	Silicon.
CR802	19A116524P2	Silicon: sim to Type 1N2158R.
CR803	19B226282G1	Rectifier, silicon.
		- - - - - - - - - - TERMINALS - - - - - - - - - -
E1	4036994P1	Terminal, solder: sim to Zierick Mfg Corp 505.
E2	4033714P9	Terminal: sim to Stewart Stampinc 928.
E3	4036994P1	Terminal, solder: sim to Zierick Mfg Corp 505.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L801	19A115391P1	Coil, RF: 50 µh ±10%, .02 ohm DC res max.
L802	19A116848P1	Reactor: 3.0 mh at 8.0 amps DC, 0.110 ohms DC res max.
L803	19A115391P1	Coil, RF: 50 µh ±10%, .02 ohm DC res max.
L804	19A116848P1	Reactor: 3.0 mh at 8.0 amps DC, 0.110 ohms DC res max.
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q801	19A116758P1	Silicon, PNP; sim to Type 2N4399.
Q802 and Q803	19A116118P1	Silicon, NPN.
Q804	19A116758P1	Silicon, PNP; sim to Type 2N4399.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R801	5493035P25	Wirewound: 40 ohms ±5%, 10 w; sim to Hamilton Hall Type HR.
R802	5493035P27	Wirewound: 10 ohms ±5%, 5 w; sim to Hamilton Hall Type HR.
R803	19A129886P1	Strap.
R804	5493035P11	Wirewound: 40 ohms ±5%, 5 w; sim to Hamilton Hall Type HR.
R805	5493035P25	Wirewound: 40 ohms ±5%, 10 w; sim to Hamilton Hall Type HR.
R806	5493035P27	Wirewound: 10 ohms ±5%, 5 w; sim to Hamilton Hall Type HR.
		- - - - - - - - DIODES AND RECTIFIERS - - - - -
SCR801	19A115814P1	Silicon Controlled Rectifier: sim to GE C30A.
		- - - - - - - - TERMINAL BOARDS - - - - - - - -
TB2 and TB3	7775500P27	Phen: 11 terminals.
TB4	7775500P7	Phen: 3 terminals.
TB5 thru TB7	7775500P8	Phen: 4 terminals.
TB8 thru TB10	7487424P24	Miniature, phen: 3 terminals.
TB801	19C301087P15	Phen: 5 terminals; sim to GE CR151D.
		MISCELLANEOUS
	19A129742G1	Strap. (Secures C801-C805).
	5491541P308	Spacer, threaded: No. 6-32 x 1-1/4.
	7160508P2	Nut, sheet spring: sim to Tinnerman C1356-632-24. (Secures TB801).
	4038930P1	Clip: approx 13/16 x 13/16 inches. (Secures R801, R804, R805).
	19B201074P304	Tap screw, Phillips POZIDRIV®: No. 6-32 x 1/4. (Secures TB8-TB10).
	19B201074P310	Tap screw, Phillips POZIDRIV®: No. 6-32 x 5/8. (Secures cover over Q801, Q802, Q804 & CR802).
	19A129751G1	Cover. (Located over Q801, Q802, Q804 & CR802).
	4036555P1	Insulator, washer: nylon. (Used with Q5 on A801).
	19A115185P8	Strap, retainer: sim to Dennison BAR-LOK08470. (Used with C2, C11 on A801).
		MECHANICAL PARTS (SEE RC2634)
1	19A115276P2	Insulator.
2	4033714P2	Terminal, solderless: sim to Zierick 110.
3	N210P20C6	Hex nut: No. 1/4-28.
4	N403P25C6	Lockwasher, external tooth: 1/4 inch.
5	N401P11C6	Flatwasher: 1/4 inch.
6	19A115275P2	Insulator, disc.
7	4036994P1	Terminal, solder: sim to Zierick Mfg Corp 505. (E1 and E3).
8	4029974P1	Insulator, plate.
9	N80P13012C6	Screw, phillips panhead: No. 6-32 x 3/4.
10	19A121882P1	Washer, shield.
11	7141225P3	Hex nut: No. 6-32.
12	4033714P9	Terminal: sim to Stewart Stampinc 928. (E2).
13	N402P11C6	Flatwasher: 1/4 inch.
14	N80P9016C6	Screw, phillips panhead. No. 4-40 x 1.
15	19A116022P1	Insulator, bushing.
16	19A116023P1	Insulator, plate.
17	19A127515G1	Terminal board.
18	N404P11C6	Lockwasher, internal tooth: No. 4.
19	7141225P2	Hex nut: No. 4-40.
20	N402P5C6	Flatwasher: No. 4.



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 descriptions of parts affected by these revisions.

REV. A - To improve operation. Added C16.

REV. B - To improve operation. Changed C13 and added C17 & C18.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.