Red-D-Arc Welderentals®

TM-2208E July 2000
Eff. w/Serial Number KG049063

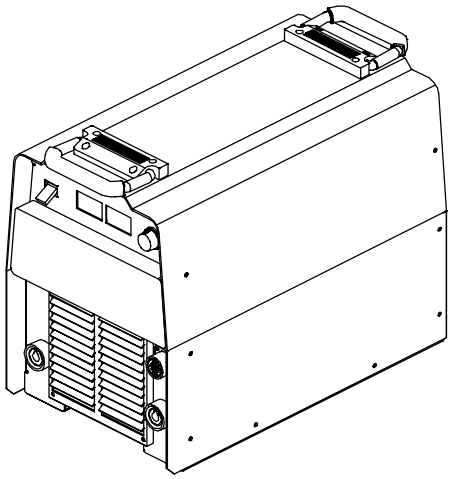
Processes

Multiprocess Welding

Description

Arc Welding Power Source

EX300 (230/460 and 460/575 Volt Models)



CC/CV and CC Models

TECHNICAL MANUAL

TABLE OF CONTENTS

⚠ WARNING

This product, when used for welding or cutting, produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code Section 25249.5 et seq.)

SECTION 1 – SAFETY PRECAUTIONS FOR SERVICING

safety_stm1 4/95

1-1. Symbol Usage

Means Warning! Watch Out! There are possible hazards with this procedure! The possible hazards are shown in the adjoining symbols.

▲ **Marks a special safety message.**

☞ *Means NOTE; not safety related.*

This group of symbols means Warning! Watch Out! possible ELECTRIC SHOCK, MOVING PARTS, and HOT PARTS hazards. Consult symbols and related instructions below for necessary actions to avoid the hazards.

1-2. Servicing Hazards

⚠ WARNING

The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard.

Only qualified persons should service, test, maintain, and repair this unit.

During servicing, keep everybody, especially children, away.

ELECTRIC SHOCK can kill.

1. Do not touch live electrical parts.
2. Stop engine or turn OFF welding power source and wire feeder, and disconnect and lockout input power using line disconnect switch, circuit breakers, or by removing plug from receptacle before servicing unless the procedure specifically requires an energized unit.
3. Insulate yourself from ground by standing or working on dry insulating mats big enough to prevent contact with the ground.
4. Do not leave live unit unattended.
5. When testing a live unit, use the one-hand method. Do not put both hands inside unit. Keep one hand free.
6. Disconnect input power conductors from deenergized supply line BEFORE moving a welding power source.

SIGNIFICANT DC VOLTAGE exists after removal of input power on inverters.

7. Turn Off inverter, disconnect input power, and discharge input capacitors according to instructions in Maintenance Section before touching any parts.

HOT PARTS can cause severe burns.

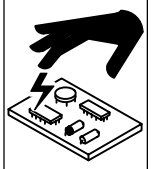
1. Do not touch hot parts bare handed.
2. Allow cooling period before servicing welding gun or torch.

EXPLODING PARTS can cause injury.

1. Failed parts can explode or cause other parts to explode when power is applied to inverters.
2. Always wear a face shield and long sleeves when servicing inverters.

ELECTRIC SHOCK HAZARD from incorrect use of test equipment.

1. Turn Off welding power source and wire feeder or stop engine before making or changing meter lead connections.
2. At least one meter lead should be a self-retaining spring clip such as an alligator clamp.
3. Read instructions for test equipment.

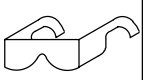


STATIC ELECTRICITY can damage parts on circuit boards.

1. Put on grounded wrist strap BEFORE handling boards or parts.
2. Use proper static-proof bags to store, move, or ship PC boards.

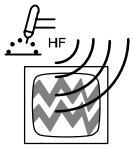
FIRE OR EXPLOSION can result from placing unit on, over, or near combustible surfaces.

1. Do not place unit on, over, or near combustible surfaces.
2. Do not service unit near flammables.



FLYING PIECES OF METAL or DIRT can injure eyes.

1. Wear safety glasses with side shields or face shield during servicing.
2. Be careful not to short metal tools, parts, or wires together during testing and servicing.



HIGH-FREQUENCY RADIATION can interfere with radio navigation, safety services, computers, and communications equipment.

1. Have only qualified persons familiar with electronic equipment perform this installation.
2. The user is responsible for having a qualified electrician promptly correct any interference problem resulting from the installation.
3. If notified by the FCC about interference, stop using the equipment at once.
4. Have the installation regularly checked and maintained.
5. Keep high-frequency source doors and panels tightly shut, keep spark gaps at correct setting, and use grounding and shielding to minimize the possibility of interference.

FALLING EQUIPMENT can cause serious personal injury and equipment damage.

1. Use lifting eye to lift unit only, NOT running gear, gas cylinders, or any other accessories.
2. Use equipment of adequate capacity to lift unit.

MAGNETIC FIELDS FROM HIGH CURRENTS can affect pacemaker operation.

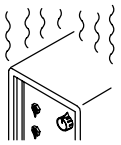
1. Pacemaker wearers keep away from servicing areas until consulting your doctor.

MOVING PARTS can cause injury.

1. Keep away from moving parts such as fans.
2. Keep all doors, panels, covers, and guards closed and securely in place.

MOVING PARTS can cause injury.

1. Keep away from moving parts.
2. Keep away from pinch points such as drive rolls.



OVERUSE can cause OVERHEATED EQUIPMENT.

1. Allow cooling period.
2. Reduce current or reduce duty cycle before starting to weld again.
3. Follow rated duty cycle.

READ INSTRUCTIONS.

1. Use MILLER Testing Booklet (Part No. 150 853) when servicing this unit.
2. Consult the Owner's Manual for welding safety precautions.
3. Use only genuine MILLER replacement parts.

1-3. EMF Information

Considerations About Welding And The Effects Of Low Frequency Electric And Magnetic Fields

The following is a quotation from the General Conclusions Section of the U.S. Congress, Office of Technology Assessment, *Biological Effects of Power Frequency Electric & Magnetic Fields – Background Paper*, OTA-BP-E-53 (Washington, DC: U.S. Government Printing Office, May 1989): ". . . there is now a very large volume of scientific findings based on experiments at the cellular level and from studies with animals and people which clearly establish that low frequency magnetic fields can interact with, and produce changes in, biological systems. While most of this work is of very high quality, the results are complex. Current scientific understanding does not yet allow us to interpret the evidence in a single coherent framework. Even more frustrating, it does not yet allow us to draw definite conclusions about questions of possible risk or to offer clear science-based advice on strategies to minimize or avoid potential risks."

To reduce magnetic fields in the workplace, use the following procedures:

1. Keep cables close together by twisting or taping them.
2. Arrange cables to one side and away from the operator.
3. Do not coil or drape cables around the body.
4. Keep welding power source and cables as far away as practical.
5. Connect work clamp to workpiece as close to the weld as possible.

About Pacemakers:

The above procedures are also recommended for pacemaker wearers. Consult your doctor for complete information.

SECTION 2 – INTRODUCTION

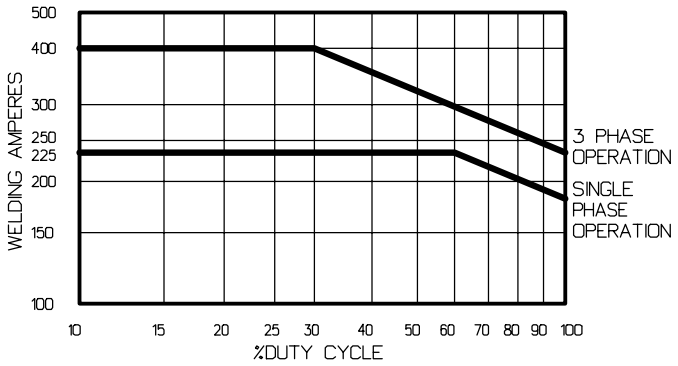
2-1. Specifications

Rated Output at 60% Duty Cycle	Voltage Range in CV Mode	Amperage Range in CC Mode	Max. Open-Circuit Voltage	RMS Amps Input at Rated Load Output, 60 Hz 3-Phase at NEMA Load Voltages and Class I Rating			KVA	KW
				230 V	460 V	575 V		
300 A at 32 VDC, 3-Phase	10–35 V	5–400 A	90 VDC	30.5 (0.21*)	18.9 (0.10*)	15.2 (0.08*)	12.2 (0.09*)	11.6 (0.04*)
225 A at 29 VDC, 1-Phase				47.4 (0.34*)	24.5 (0.14*)	– –	11.3 (0.09*)	7.6 (0.04*)

*While idling

**See Section 3-5 for additional information.

2-2. Duty Cycle And Overheating

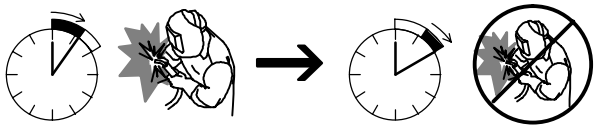


Duty Cycle is percentage of 10 minutes that unit can weld at rated load without overheating.

If unit overheats, output stops, a Help message is displayed (see Section 7-3), and cooling fan runs. Wait fifteen minutes for unit to cool. Reduce amperage or voltage, or duty cycle before welding.

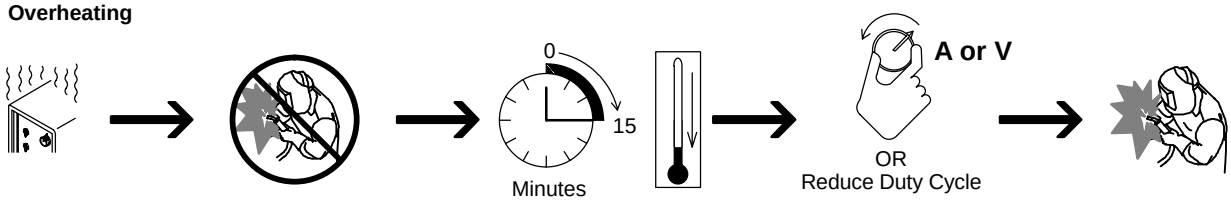
▲ **Exceeding duty cycle can damage unit and void warranty.**

60% Duty Cycle



6 Minutes Welding — 4 Minutes Resting

Overheating

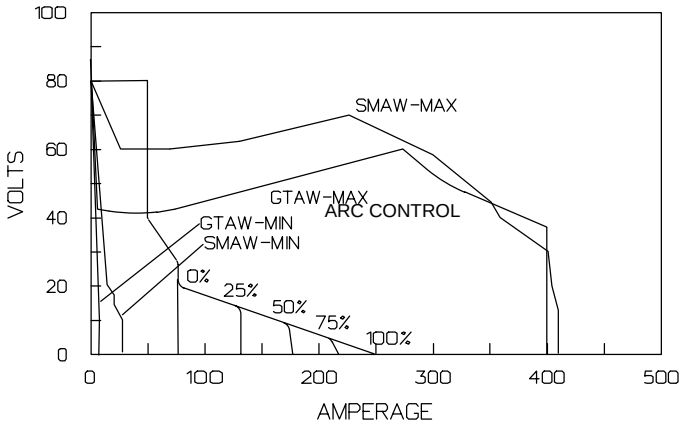


sduty1 5/95 / SA-178 651

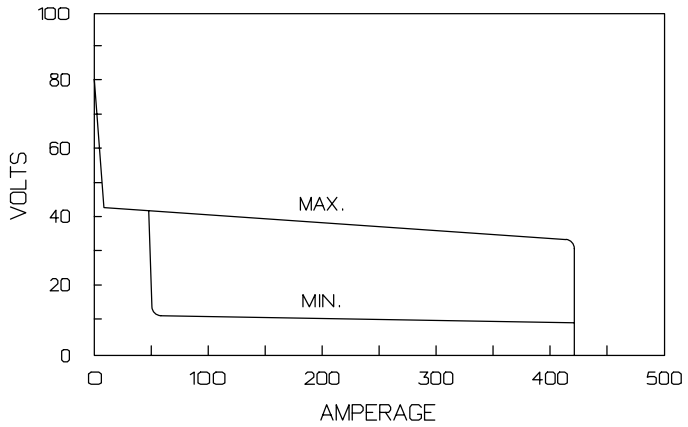
2-3. Volt-Ampere Curves

Volt-ampere curves show minimum and maximum voltage and amperage output capabilities of unit. Curves of other settings fall between curves shown.

A. CC Mode



B. CV Mode



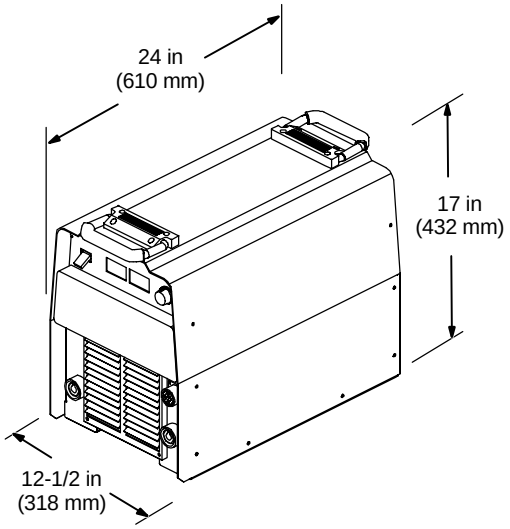
va_curve1 4/95 – SA-178 652 / SA-178 653

SECTION 3 – INSTALLATION

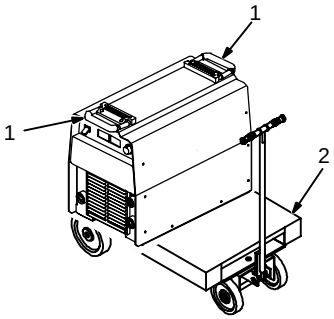
3-1. Selecting a Location

Dimensions And Weight

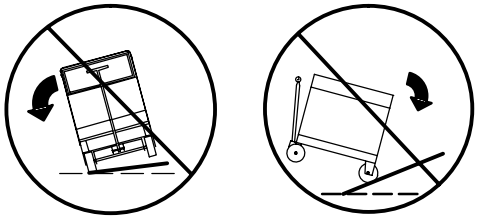
76 lb (34.6 kg)



Movement



▲ **Do not move or operate unit where it could tip.**



1 Lifting Handles

Use handles to lift unit.

2 Hand Cart

Use cart or similar device to move unit.

3 Rating Label

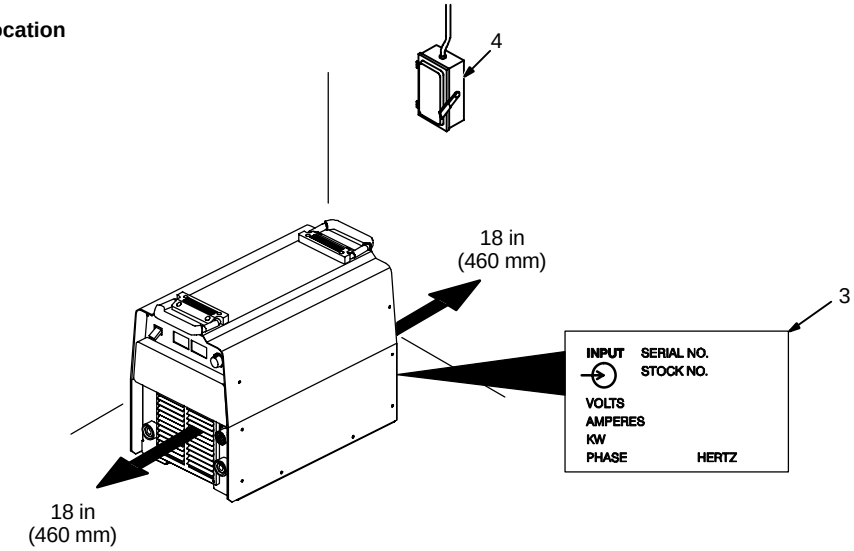
Use rating label to determine input power needs.

4 Line Disconnect Device

Locate unit near correct input power supply.

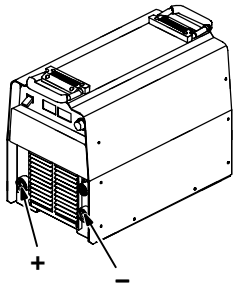
▲ **Special installation may be required where gasoline or volatile liquids are present – see NEC Article 511 or CEC Section 20.**

Location



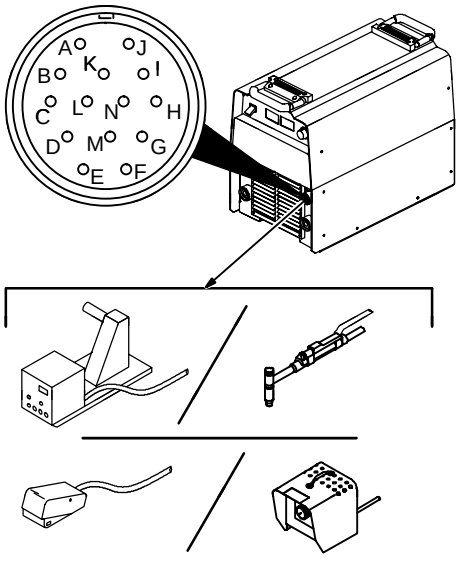
loc_2 3/96 - Ref. ST-151 556 / ST-801 192

3-2. Weld Output Receptacles And Selecting Cable Sizes

Weld Output Terminals	Welding Amperes	Total Cable (Copper) Length In Weld Circuit Not Exceeding							
		100 ft (30 m) Or Less		150 ft (45 m)	200 ft (60 m)	250 ft (70 m)	300 ft (90 m)	350 ft (105 m)	400 ft (120 m)
		10 – 60% Duty Cycle	60 – 100% Duty Cycle	10 – 100% Duty Cycle					
 Output Receptacles	100	4	4	4	3	2	1	1/0	1/0
	150	3	3	2	1	1/0	2/0	3/0	3/0
	200	3	2	1	1/0	2/0	3/0	4/0	4/0
	250	2	1	1/0	2/0	3/0	4/0	2-2/0	2-2/0
	300	1	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-3/0
	350	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-3/0	2-4/0
	400	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-4/0	2-4/0
	500	2/0	3/0	4/0	2-2/0	2-3/0	2-4/0	3-3/0	3-3/0
	600	3/0	4/0	2-2/0	2-3/0	2-4/0	3-3/0	3-4/0	3-4/0

Weld cable size (AWG) is based on either a 4 volts or less drop or a current density of at least 300 circular mils per ampere. S-0007-D

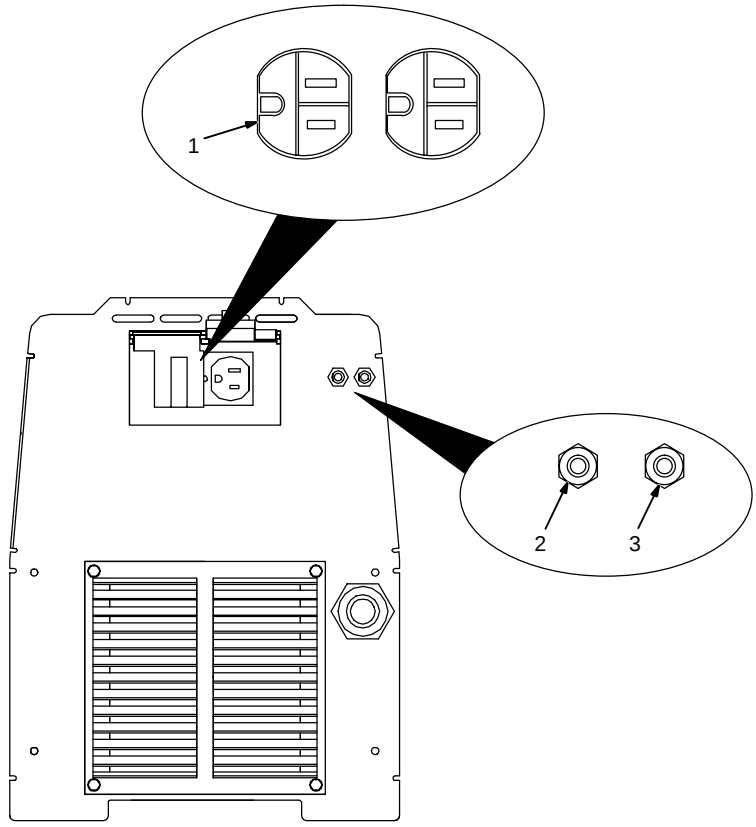
3-3. Remote 14 Receptacle Information



REMOTE 14	Socket*	Socket Information
24 VOLTS AC OUTPUT (CONTACTOR)	A	24 volts ac. Protected by circuit breaker CB2.
	B	Contact closure to A completes 24 volts ac contactor control circuit.
115 VOLTS AC OUTPUT (CONTACTOR)	I	115 volts ac. Protected by circuit breaker CB1.
	J	Contact closure to I completes 115 volts ac contactor control circuit.
REMOTE OUTPUT CONTROL	C	Output to remote control; 0 to +10 volts dc, +10 volts dc in MIG mode.
	D	Remote control circuit common.
	E	0 to +10 volts dc input command signal from remote control.
	M	CC/CV select (CC/CV models).
A/V **AMPERAGE VOLTAGE**	F	Current feedback; +1 volt dc per 100 amperes.
	H	Voltage feedback; +1 volt dc per 10 output receptacle volts.
GND	G	Circuit common for 24 and 115 volts ac circuits.
	K	Chassis common.

*The remaining sockets are not used.

3-4. Optional 115 Volts AC Duplex Receptacle And Circuit Breakers



1 115 V 10 A AC Receptacle

Power is shared between duplex receptacle and Remote 14 receptacle (see Section 3-3).

2 Circuit Breaker CB1

3 Circuit Breaker CB2

CB1 protects duplex receptacle and 115 volts ac portion of Remote 14 receptacle from overload.

CB2 protects 24 volts ac portion of Remote 14 receptacle from overload.

Press button to reset breaker.

ST-801 245-A

3-5. Electrical Service Guide

▲ **CAUTION: INCORRECT INPUT POWER can damage this welding power source. This welding power source requires a CONTINUOUS supply of 60 Hz (±10%) power at ±10% of rated input voltage. Do not use a generator with automatic idle device (that idles engine when no load is sensed) to supply input power to this welding power source.**

NOTE ☞ *Actual input voltage should not exceed ± 10% of indicated required input voltage. If actual input voltage is outside of this range, output may not be available.*

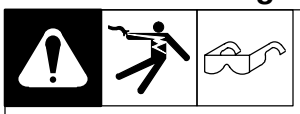
	Single Phase		Three Phase	
Input Voltage	230	460	230	460
Input Amperes At Rated Output	47.4	24.5	33	18.9
Max Recommended Standard Fuse Rating In Amperes [1]				
Normal Operating [2]	70	35	45	20
Min Input Conductor Size In AWG/Kcmil	8	12	10	14
Max Recommended Input Conductor Length In Feet (Meters)	123 (37)	201 (61)	112 (34)	175 (53)
Min Grounding Conductor Size In AWG/Kcmil	8	12	10	14

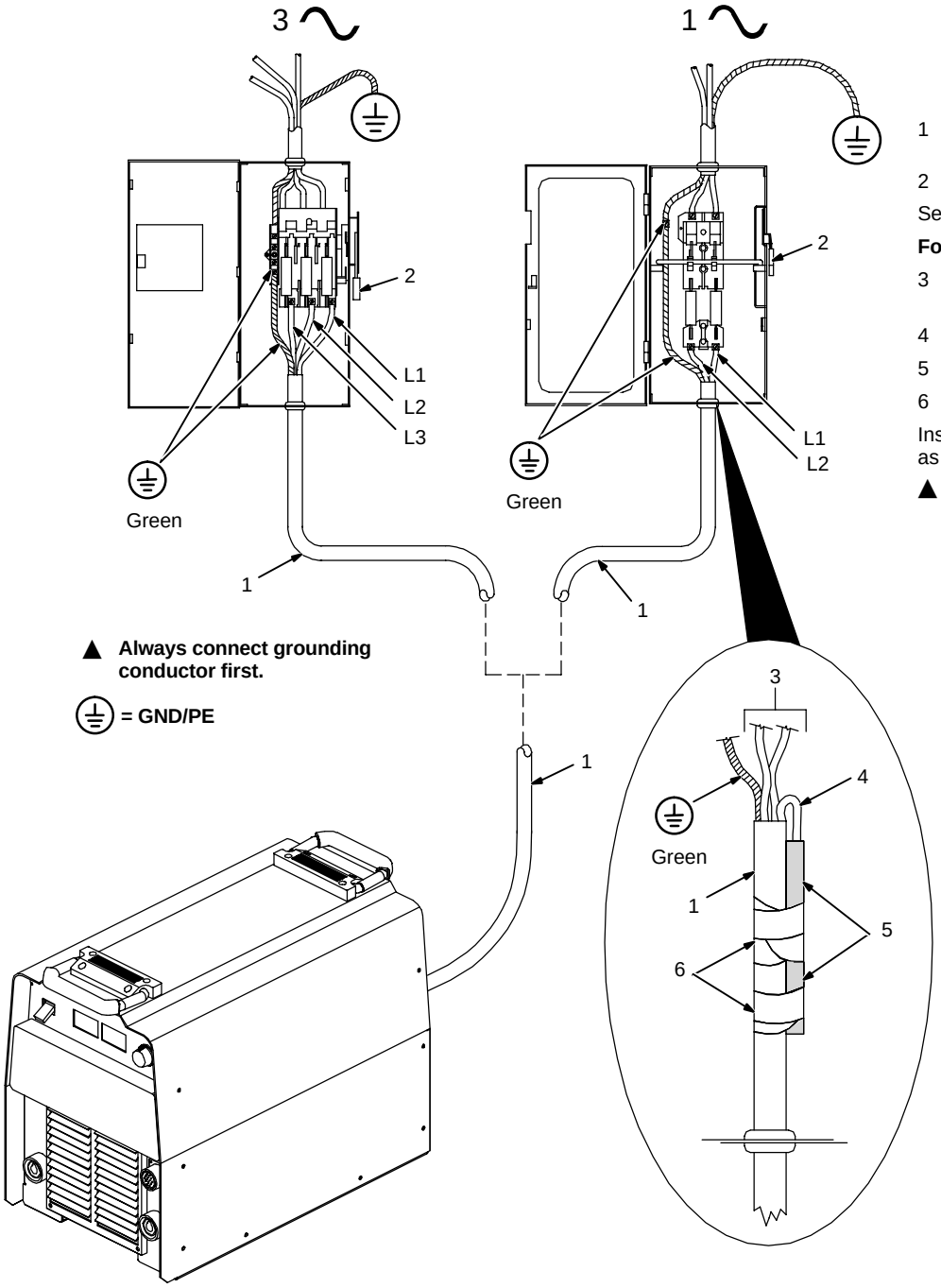
Reference: 1999 National Electrical Code (NEC)

1 Consult factory for circuit breaker applications.

2 “Normal Operating” (general purpose – no intentional delay) fuses are UL class “K5” (up to and including 60 amp), and UL class “H” (65 amp and above).

3-6. Connecting Input Power





Check input voltage available at site.

☞ *The Auto-Link circuitry in this unit automatically links the power source to the primary voltage being applied. A 230/460 unit can be connected to either 230 or 460 VAC input power. A 460/575 model can be connected to either 460 or 575 VAC input power.*

1 Input And Grounding Conductors

2 Line Disconnect Device

See Section 3-5.

For single-phase operation:

3 Black And White Input Conductor

4 Red Input Conductor

5 Insulation Sleeving

6 Electrical Tape

Insulate and isolate red conductor as shown.

▲ **Always connect green wire to supply grounding terminal, never to a line terminal. Connect black, white, and red wires (L1, L2, L3) to line terminals.**

Tools Needed:

3/8 in

3/8 in

input_9_99 - Ref. ST-144 221 / Ref. ST-070 399-C / ST-801 192

Notes

4-1. Front Panel Controls For CC/CV Model

1 Power Switch

☞ *The fan motor is thermostatically controlled and only runs when cooling is needed.*

2 Voltmeter (see Section 4-2)

3 Ammeter (see Section 4-2)

4 V/A (Voltage/Amperage) Adjustment Control

5 Mode Switch

The Mode switch setting determines both the process and output On/Off control (see Section 4-3). Source of control (panel or remote) for the amount of output is selected on the V/A Control switch.

For Air Carbon Arc (CAC-A) cutting and gouging, place switch in Stick position. For best results, place Inductance/Dig control in the maximum position.

6 V/A (Voltage/Amperage) Control Switch

For front panel control, place switch in Panel position and use the V/A Adjust control.

For remote control, make connections to Remote 14 receptacle, and place switch in Remote position. In most modes, remote control is a percent of V/A Adjust control setting (value selected on V/A Adjust is maximum available on remote). In the MIG mode, remote control provides full range of unit output regardless of V/A Adjust control setting

7 Inductance/Dig Control

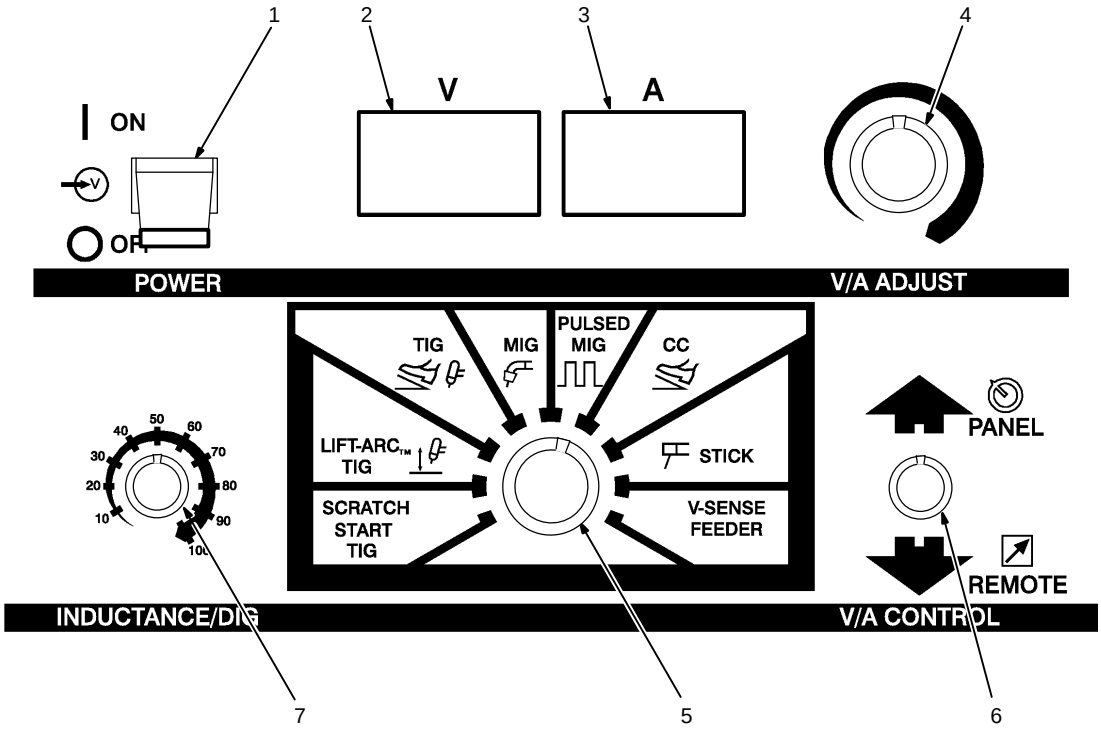
Control adjusts Dig when Stick or CC mode is selected on mode switch. When set towards minimum, short-circuit amperage at low arc voltage is the same as normal welding amperage.

When set towards maximum, short-circuit amperage is increased at low arc voltage to assist with arc starts as well as reduce sticking while welding (see volt-ampere curves in Section 2-3).

Select setting best suited for application.

Control adjusts inductance when MIG or V-Sense Feeder position is selected on the mode switch. Inductance determines the "wetness" of the weld puddle. When set towards maximum, "wetness" (puddle fluidity) increases.

When Pulsed MIG or one of the TIG modes is selected, this control is not functional.



Ref. ST-175 086

4-2. Meter Functions For CC/CV Model

NOTE ☞ *The meters display the actual weld output values for approximately three seconds after the arc is broken.*

Mode	Meter Reading At Idle		Meter Reading While Welding	
Scratch Start TIG	V **80.0** Actual Volts (OCV)	A **85** Preset Amps	V **10.3** Actual Volts	A **85** Actual Amps
Lift-Arc TIG	V **7.0** Actual Volts	A **85** Preset Amps	V **10.3** Actual Volts	A **85** Actual Amps
TIG	V Blank	A **85** Preset Amps	V **10.3** Actual Volts	A **85** Actual Amps
MIG	V **24.5** Preset Volts	A Blank	V **24.5** Actual Volts	A **250** Actual Amps
Pulsed MIG	V **PPP** Pulse Display	A **PPP** Pulse Display	V **24.5** Actual Volts	A **250** Actual Amps
CC	V Blank	A **85** Preset Amps	V **24.5** Actual Volts	A **85** Actual Amps
Stick	V **80.0** Actual Volts (OCV)	A **85** Preset Amps	V **24.5** Actual Volts	A **85** Actual Amps
V-Sense Feeder	V **80.0** Flashes OCV And Preset	A Blank	V **24.5** Actual Volts	A **250** Actual Amps

4-3. Mode Switch Settings For CC/CV Model

NOTE ☞ *The Stick and CC modes provide the* Adaptive Hot Start™ *feature, which automatically increases the output amperage at the start of a weld should the start require it. This eliminates electrode sticking at arc start.*

Mode Switch Setting	Process	Output On/Off Control
Scratch Start TIG	GTAW	Electrode Hot
Lift-Arc TIG	GTAW – See Section NO TAG	Electrode Hot
TIG	GTAW With HF Unit, Pulsing Device, Or Remote Control	At Remote 14
MIG	GMAW	At Remote 14
Pulsed MIG	GMAW-P (Requires an external pulsing device.)	At Remote 14
CC	Stick (SMAW) With Remote On/Off	At Remote 14
Stick	SMAW	Electrode Hot
V-Sense Feeder	MIG (GMAW) With Voltage Sensing Wire Feeder	Electrode Hot

4-4. Front Panel Controls For CC Model

1 Power Switch

☞ *The fan motor is thermostatically controlled and only runs when cooling is needed.*

2 Voltmeter (see Section 4-5)

3 Ammeter (see Section 4-5)

4 V/A (Voltage/Amperage) Adjustment Control

5 Mode Switch

The Mode switch setting determines both the process and output On/Off control (see Section 4-6). Source of control (panel or remote) for the amount of output is selected on the V/A Control switch.

For Air Carbon Arc (CAC-A) cutting and gouging, place switch in one of the Stick positions. For best results, place Dig control in the maximum position.

6 V/A (Voltage/Amperage) Control Switch

For front panel control, place switch in Panel position and use the V/A Adjust control.

For remote control, make connections to Remote 14 receptacle, and place switch in Remote position. Remote control is a percent of V/A Adjust control setting. Value selected on V/A Adjust is maximum available on remote.

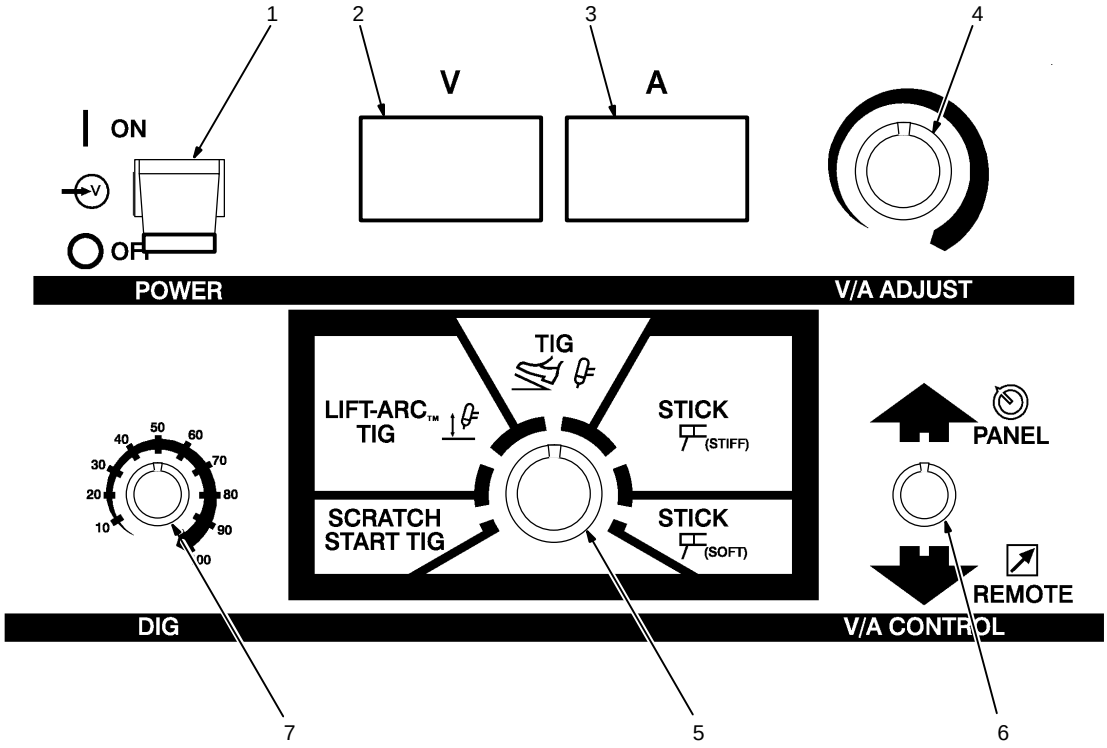
7 Dig Control

When set towards minimum, short-circuit amperage at low arc voltage is the same as normal welding amperage.

When set towards maximum, short-circuit amperage is increased at low arc voltage to assist with arc starts as well as reduce sticking while welding (see volt-ampere curves in Section 2-3).

Select setting best suited for application.

When a TIG process is selected on the mode switch, this control is not functional.



Ref. ST-175 500

4-5. Meter Functions For CC Model

NOTE ☞ *The meters display the actual weld output values for approximately three seconds after the arc is broken.*

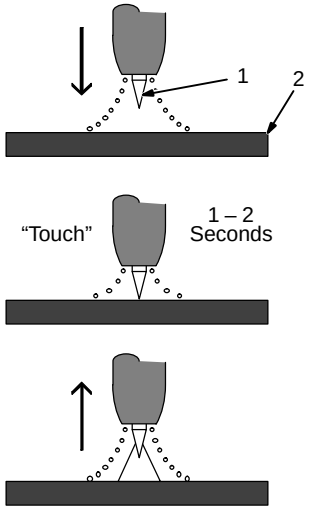
Mode	Meter Reading At Idle		Meter Reading While Welding	
Scratch Start TIG	V **80.0** Actual Volts (OCV)	A **85** Preset Amps	V **10.3** Actual Volts	A **85** Actual Amps
Lift-Arc TIG	V **7.0** Actual Volts	A **85** Preset Amps	V **10.3** Actual Volts	A **85** Actual Amps
TIG	V Blank	A **85** Preset Amps	V **10.3** Actual Volts	A **85** Actual Amps
Stick (Stiff Or Soft)	V **80.0** Actual Volts (OCV)	A **85** Preset Amps	V **24.5** Actual Volts	A **85** Actual Amps

4-6. Mode Switch Settings For CC Model

NOTE ☞ *The Stick modes provide the* Adaptive Hot Start™ *feature, which automatically increases the output amperage at the start of a weld should the start require it. This eliminates electrode sticking at arc start.*

Mode Switch Setting	Process	Output On/Off Control
Scratch Start TIG	GTAW	Electrode Hot
Lift-Arc TIG	GTAW With Lift-Arc Start – See Section NO TAG	Electrode Hot
TIG	GTAW With HF Unit, Pulsing Device, Or Remote Control	At Remote 14
Stick (Stiff)	SMAW When A Stiff Arc Characteristic Is Desired	Electrode Hot
Stick (Soft)	SMAW When A Soft Arc Characteristic Is Desired	Electrode Hot

4-7. Lift-Arc TIG Procedure



Do NOT Strike Like A Match!

Ref. S-156 279

With Process Switch in the Lift-Arc TIG position, start an arc as follows:

1 TIG Electrode

2 Workpiece

Touch tungsten electrode to workpiece at weld start point, **hold electrode to workpiece for 1-2 seconds**, and slowly lift electrode. An arc will form when electrode is lifted.

Normal open-circuit voltage is not present before tungsten electrode touches workpiece; only a low sensing voltage is present between electrode and workpiece. The solid-state output contactor does not energize until after electrode is touching workpiece. This allows electrode to touch workpiece without overheating, sticking, or getting contaminated.

SECTION 5 – THEORY OF OPERATION

☞ *Theory of Operation is shown for the 230/460 volt models. Theory for other models is similar.*

1 Power Switch S1

Provides on/off control of welding power source.

2 Input Rectifier SR1

Changes the ac line input power to full-wave rectified dc.

3 Control Transformer T2

Supplies power to control board PC1, interconnecting board PC2, and Remote 14 receptacle RC1.

4 Circuit Breaker CB1

Provides overload protection for 115 volts ac portion of Remote 14 receptacle RC1 and optional 115 volt ac receptacle.

5 Circuit Breaker CB2

Provides overload protection for 24 volts ac portion of Remote 14 receptacle RC1.

6 115 Volt AC Receptacle

Connects auxiliary equipment to welding power source.

7 Remote 14 Receptacle RC1

Connects remote amperage or voltage, and contactor controls.

8 Control Board PC1

Controls weld output by changing gate pulses (frequency of pulses) to IGBT power modules PM1 and PM2 after comparing current or voltage feedback to reference level set by R2 on PC3.

9 460 V Input Contactor W1

Connects the 220 volts ac secondary voltage from T2 to interconnecting board PC2 to balance voltage on input capacitors C3 and C4.

10 230 V Auto-Link Contactor W2

Provides automatic linking for different input voltages. W2 sets power circuit for correct input voltage. W2A sets T2 primary.

11 Fan Motor FM

Provides cooling of internal components.

12 Display Board PC3

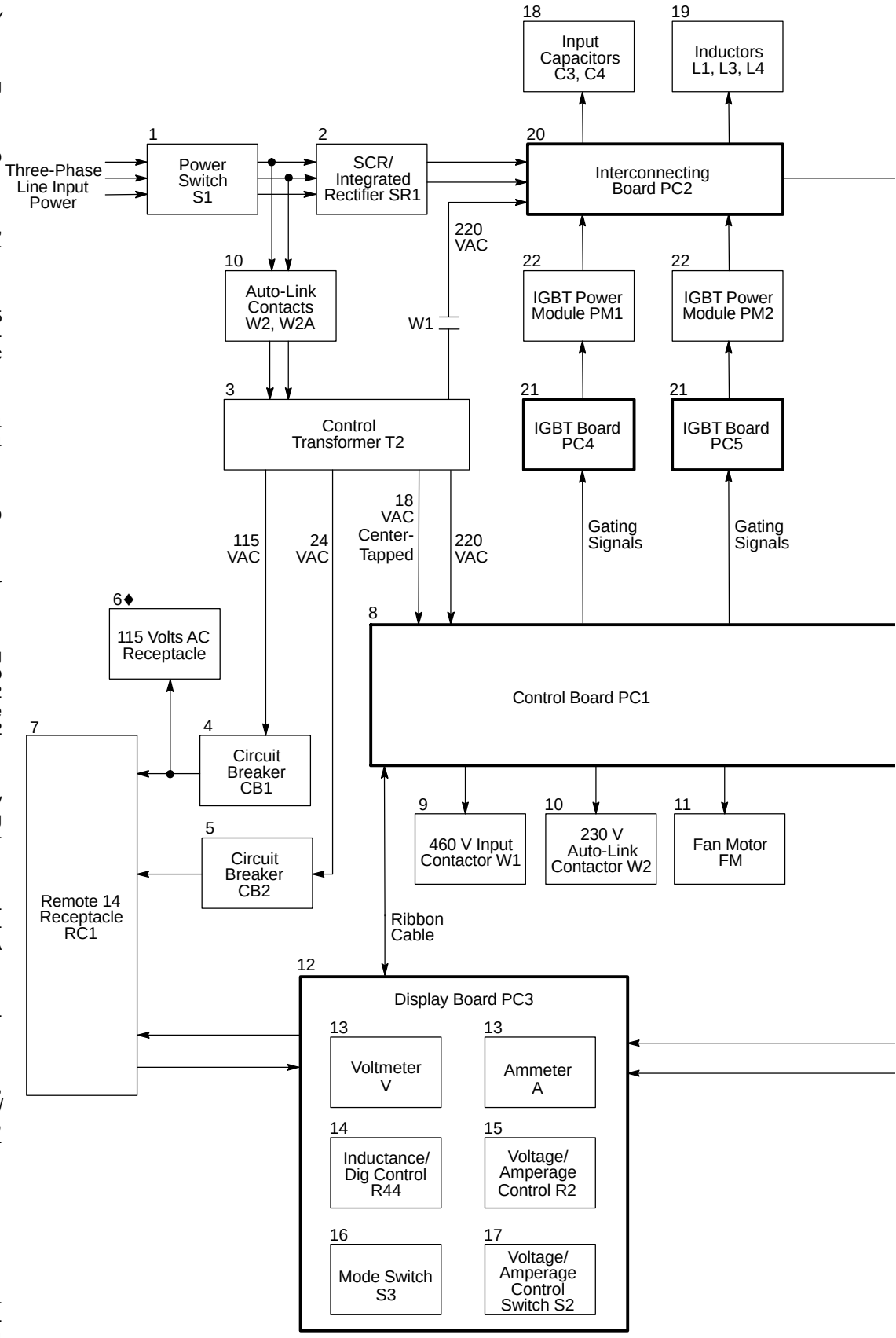
Consists of voltmeter V, ammeter A, Inductance/Dig control R44, Voltage/Amperage Adjustment control R2, Mode switch S3, and Voltage/Amperage Control switch S2.

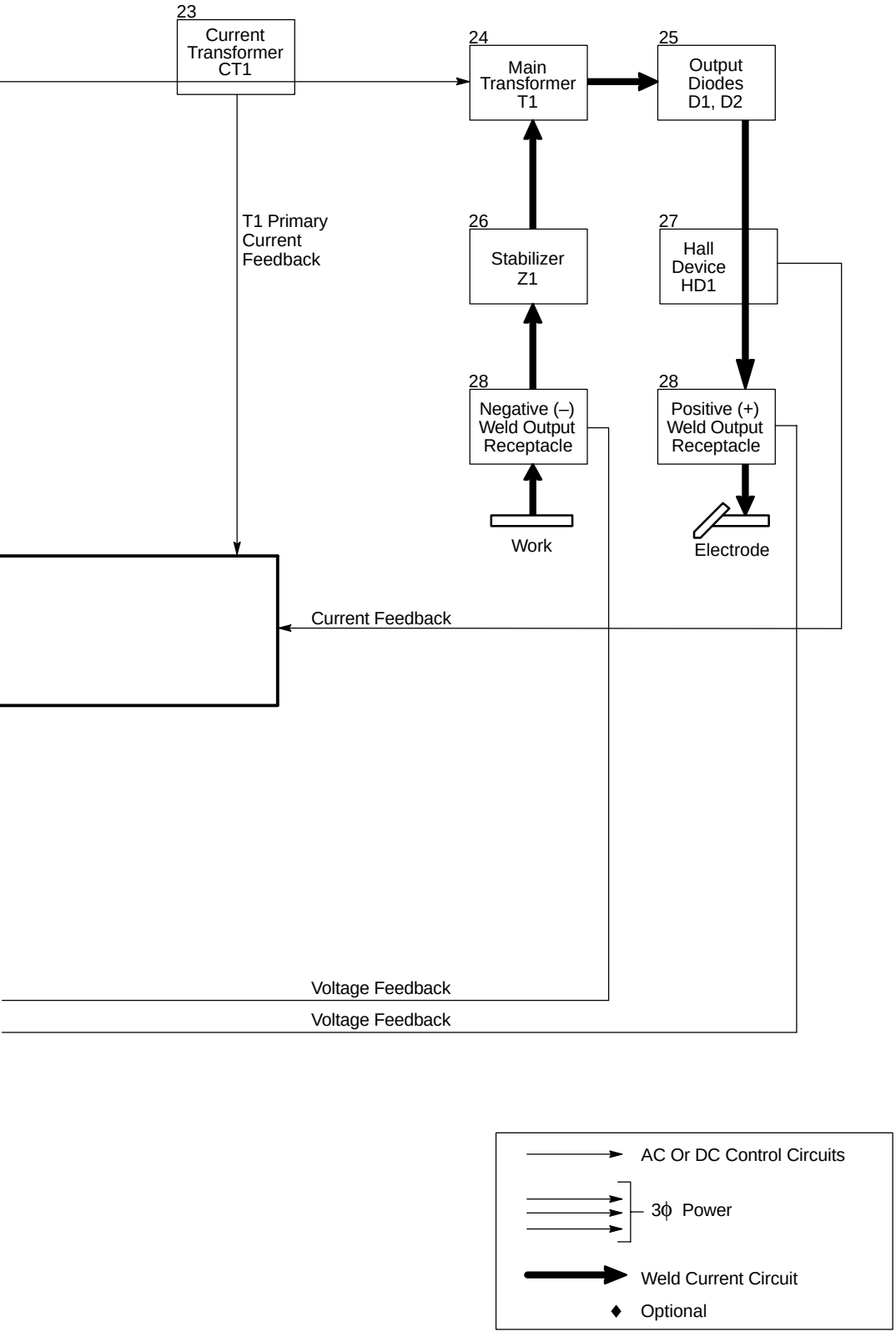
13 Voltmeter V, Ammeter A

See Sections 4-2 and 4-5.

14 Inductance/Dig Control R44 (CC/CV Models) Or Dig Control R44 (CC Models)

In CV mode, R44 functions as an inductance control modifying the response of the arc. In CC mode, R44 functions as a dig control.





15 Voltage/Amperage Adjustment Control R2 (CC/CV Models) Or Amperage Adjustment Control R2 (CC Models)

Selects weld output voltage or amperage level. Setting defines maximum output when remote voltage and/or amperage control is used, and Mode switch S3 is in a CC position.

16 Mode Switch S3

Selects type of weld output, meter function, and remote contactor or front panel for welding process.

17 Voltage/Amperage Control Switch S2 (CC/CV Models) Or Amperage Control Switch S2 (CC Models)

Selects front panel or remote voltage or amperage control.

18 Input Capacitors C3, C4

Filter the dc output voltage of SR1.

19 Inductors L1, L3, L4

L1 limits peak current in SR1, C3, and C4. L3 and L4 limit voltage and current in IGBT's during turn-on and turn-off.

20 Interconnecting Board PC2

Provides electrical connections for SR1, T1, C3, C4, L1, L3, L4, and IGBT's. Precharge and bleeder resistors are mounted on PC2.

21 IGBT Boards PC4, PC5

Provide interconnection of gate pulses from PC1 to PM1 and PM2.

22 IGBT Power Modules PM1, PM2

Use very fast on/off switching action to effectively turn the dc into ac.

23 Current Transformer CT1

Provides current feedback to PC1 from the primary of T1 for control circuit timing and to limit primary current.

24 Main Transformer T1

Energized by on/off switching action of PM1 and PM2, and supplies power to weld output circuit.

25 Output Diodes D1, D2

Rectify output of T1.

26 Stabilizer Z1

Smooths out welding current.

27 Hall Device HD1

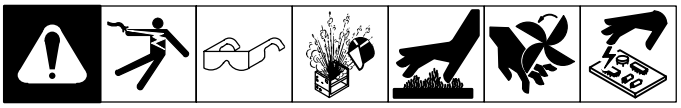
Provides weld or secondary current feedback signal to PC1.

28 Positive (+) And Negative (–) Weld Output Receptacles

Provide weld output and allow changing of output polarity.

SECTION 6 – PRE-POWER CHECKLIST

6-1. Checking Unit Before Applying Power



☞ *See Section 7-4 for test points and values and Section 10 for parts location.*

▲ **Discharge input capacitors according to Section 8-3 and be sure voltage is near zero before touching any parts.**

▲ **Before troubleshooting or applying power to unit, complete following checks to avoid causing further damage.**

▲ **Although control board PC1 and hall device HD1 are briefly checked in this procedure, more complete tests may be needed later for these parts. This check is simply to get a basic okay to power up unit.**

NOTE ☞

The pre-power checklist should be followed if any of the following conditions exist:

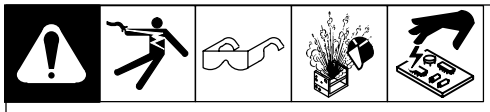
the unit is completely inoperative;

the symptoms are unknown;

visual damage is found on any of the following components: capacitors C3 and C4, control board PC1, IGBT power modules PM1 and PM2, interconnecting board PC2, or input rectifier SR1;

there is no output or limited output.

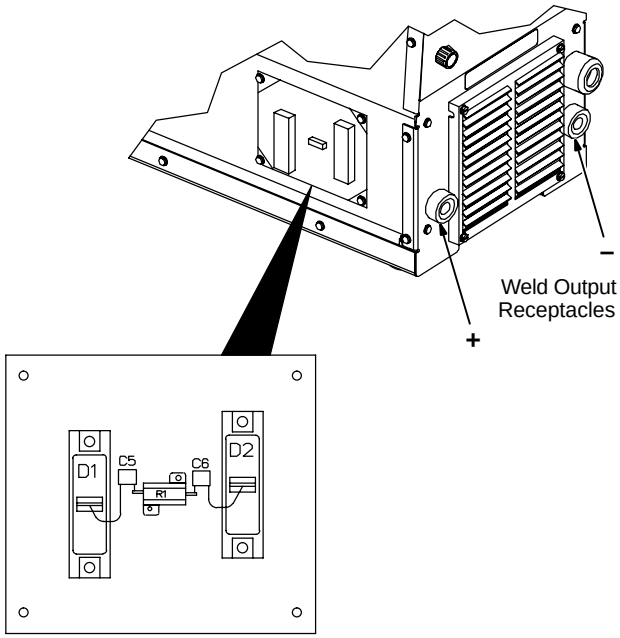
6-2. Output Diodes D1, D2



▲ **Read and follow safety information in Section 6-1 before proceeding.**

1 First, check resistance across weld output receptacles (ohms position). Resistance should be greater than 100 ohms.

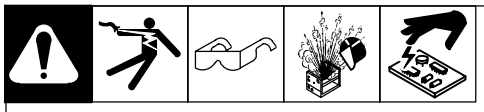
2 If resistance is less than 100 ohms, isolate diodes D1 and D2 and retest individually (diode test).

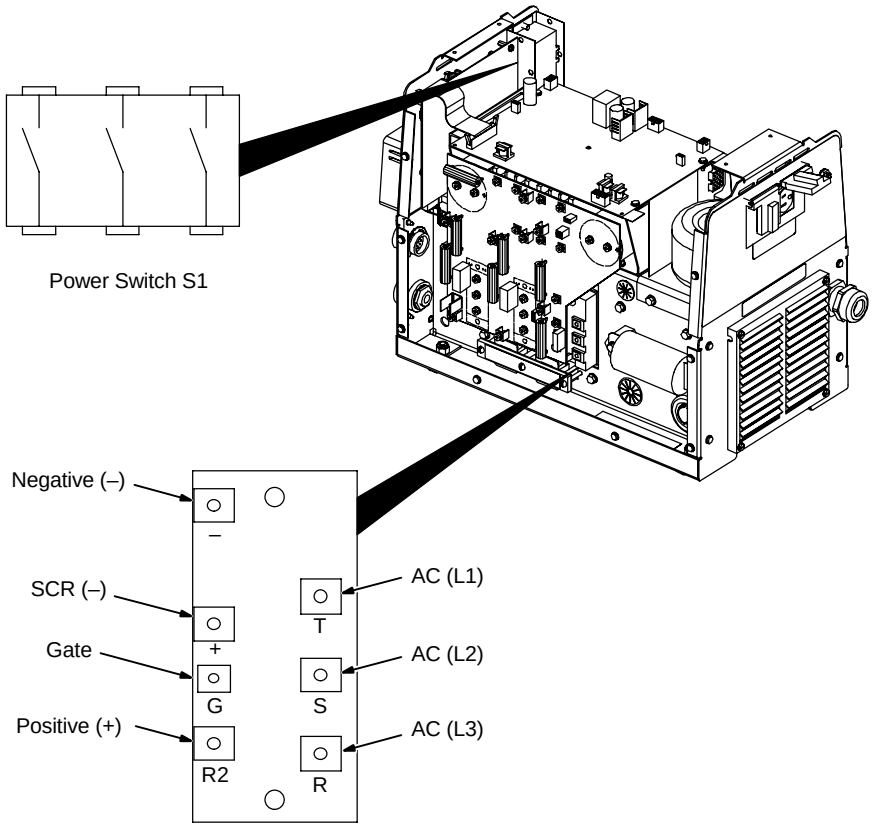


Diodes D1, D2

Ref. SD-183 484 / ST-801 705

6-3. Input Rectifier SR1





Input Rectifier SR1

▲ **Read and follow safety information in Section 6-1 before proceeding.**

☞ *Resistance values are based on in-circuit measurements.*

1 Visually inspect SR1 for damage.

2 Check 6 diodes (diode test). Check from each ac terminal to the positive (+) terminal and from each ac terminal to the negative (–) terminal.

3 Check precharge SCR (ohms position). Connect negative lead to SCR (–) terminal and positive lead to positive (+) terminal. Resistance should be 200 ohms ±10%. If meter reads infinite resistance (OL), check resistor R7 on interconnecting board PC2. Connect a jumper between positive (+) and gate terminals. Resistance should be approximately 35 ohms.

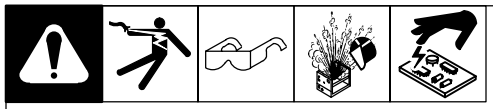
4 If results are in doubt, use an IGBT tester (MILLER Part No. 043 553) to test the SCR portion of SR1 as follows:

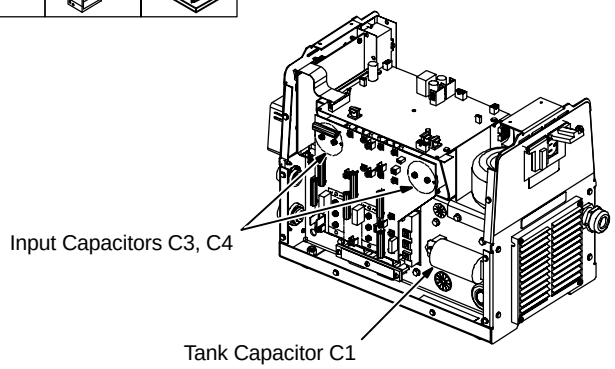
- A. Disconnect plug PLG13 from receptacle RC1 on interconnecting board PC2.
- B. Connect red clip to positive (+) terminal.
- C. Connect black clip to SCR (–) terminal.
- D. Connect yellow clip to gate terminal.

5 If SR1 is defective, check the three poles of power switch S1 (switch off = OL, switch on = 0 ohms).

ST-801 550 / Ref. SD-183 484

6-4. Tank Capacitor C1 and Input Capacitors C3, C4





▲ **Read and follow safety information in Section 6-1 before proceeding.**

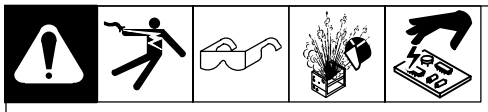
☞ *This is not a conclusive test. For best results use a capacitor tester to check capacitance.*

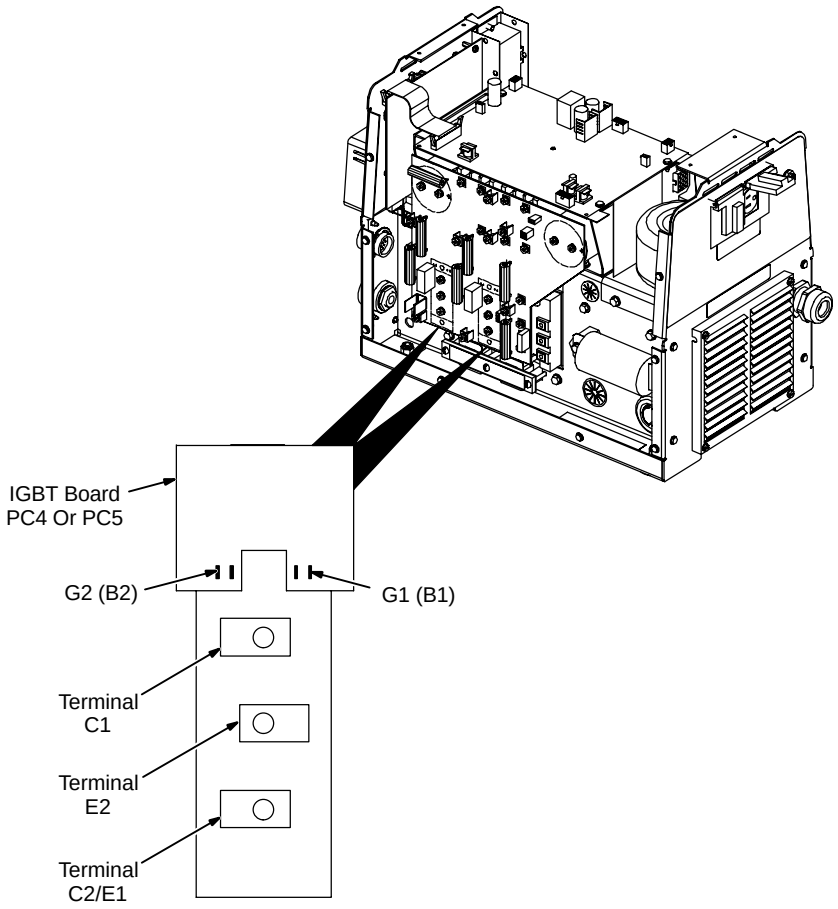
☞ *If either C3 or C4 is shorted, remove interconnecting board PC2 and check IGBT's PM1 and PM2.*

1 Check C1, C3, and C4 for a short (ohms position).

ST-801 550

6-5. IGBT Modules PM1, PM2





IGBT Module PM1 Or PM2

▲ **Read and follow safety information in Section 6-1 before proceeding.**

☞ *It is not necessary to remove interconnecting board PC2 to test the IGBT's unless input capacitor C3 or C4 is shorted.*

1 Visually inspect PM1 and PM2 for damage.

2 Disconnect gate lead plug PLG5 from receptacle RC5 on control board PC1.

3 Check C1 to E1 and C2 to E2 on PM1 and PM2 for resistance greater than 100 ohms (ohms position). Zero ohms indicates a short.

4 Check E1 to PLG5-10 and E2 to PLG5-7 for 100 k ohms ±10% (ohms position) on PM1. Then check E1 to PLG5-6 and E2 to PLG5-9 for 100 k ohms ±10% (ohms position) on PM2.

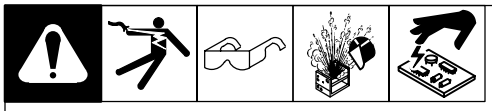
5 If results are in doubt, use an IGBT tester (MILLER Part No. 043 553) as follows:

- A. Check two IGBT's per module.
- B. Connect red clip to C.
- C. Connect black clip to E.
- D. Connect yellow clip to G (white leads at plug PLG5).

6 If IGBT's are defective, check D1, D2, D3, and D4 on PC2 (see Section 6-6). Also check W1 and W2 in 230/460 volt models (see Section 6-7).

ST-801 550 / Ref. SD-183 484

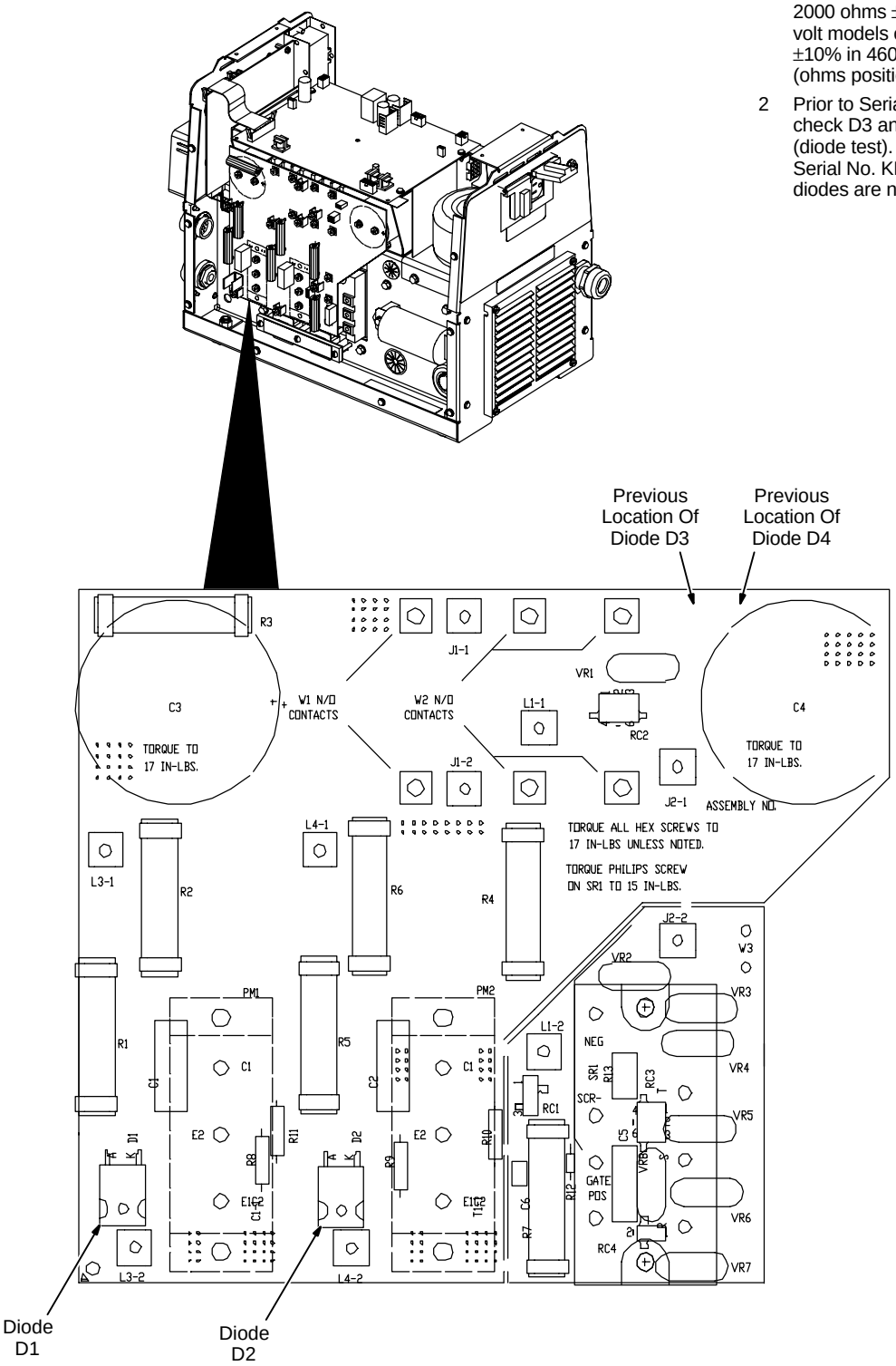
6-6. Diodes D1, D2, D3, D4



▲ **Read and follow safety information in Section 6-1 before proceeding.**

1 Check D1 and D2 on PC2 for 2000 ohms ±10% in 230/460 volt models or 400 ohms ±10% in 460/575 volt models (ohms position).

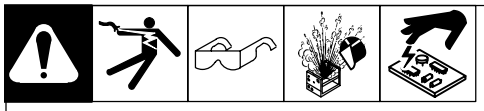
2 Prior to Serial No. KK266150, check D3 and D4 on PC2 (diode test). Effective with Serial No. KK266150, these diodes are no longer present.



Interconnecting Board PC2

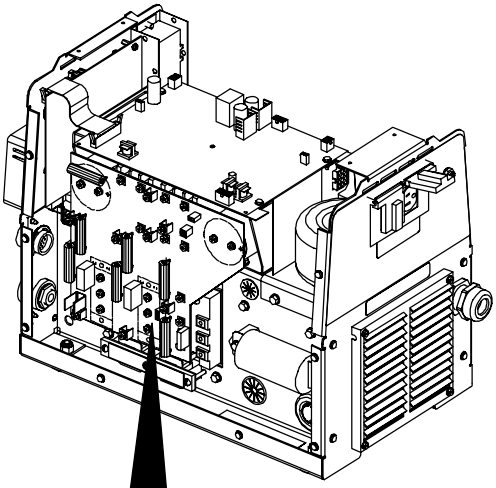
ST-801 550 / 195 587

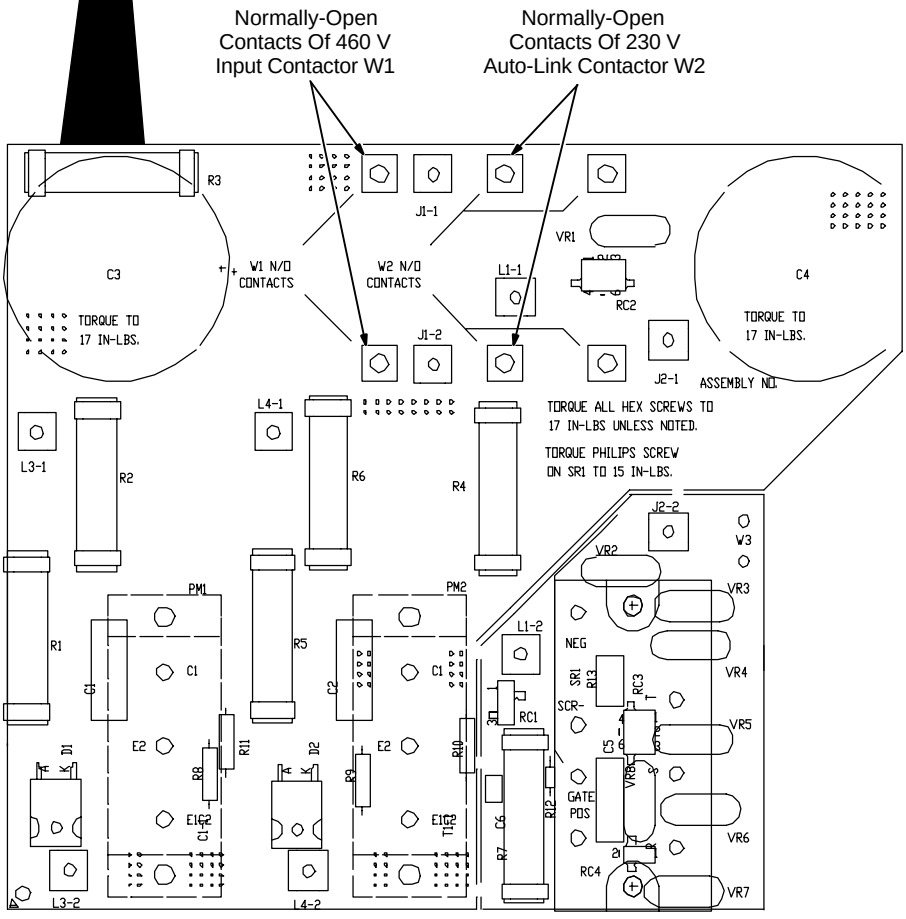
6-7. Contactors W1, W2 (230/460 V Models Only)



▲ **Read and follow safety information in Section 6-1 before proceeding.**

1 Check normally-open contacts of W1 and W2 to be sure contacts are not stuck shut (ohms position).



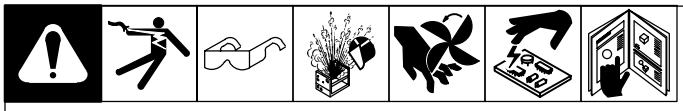


Interconnecting Board PC2

ST-801 550 / 195 587

SECTION 7 – TROUBLESHOOTING

7-1. Troubleshooting Table



☞ *See Section 7-4 and Section 7-6 for test points and values and Section 10 for parts location.*

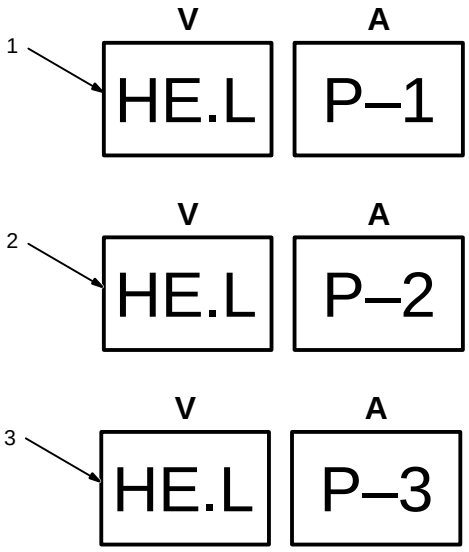
☞ *Use MILLER Testing Booklet (Part No. 150 853) when servicing this unit.*

Trouble	Remedy
No weld output; unit completely inoperative.	Follow pre-power checklist (see Section 6).
	Place line disconnect switch in On position (see Section 3-6).
	Check and replace line fuse(s), if necessary, or reset circuit breaker (see Section 3-6).
	Check for proper input power connections (see Section 3-6).
	Check continuity of Power switch S1, and replace if necessary.
	Check control transformer T2 for signs of winding failure. Check continuity across windings, and check for proper connections. Check secondary voltages. Replace T2 if necessary.
No weld output; meter display On.	Follow pre-power checklist (see Section 6).
	If using remote control, be sure Voltage/Amperage Control switch S2 (CC/CV models) or Amperage Control switch S2 (CC models) is in the Remote 14 position.
	Prior to Serial No. KG177169 (KG177342 w/auxiliary power), input voltage outside acceptable range of variation (see Section 3-5). Effective with Serial No. KG177169 (KG177342 w/auxiliary power), see Sections 7-2 and 7-3 for Help screens.
	Unit overheated and Help 3 or Help 5 screen is displayed. Allow unit to cool with fan On (see Sections 7-2 and 7-3).
	Check, repair, or replace remote control.
	For 230/460 volt models, check coil voltage and connections of contactors W1 and W2. Check continuity of coils and condition of contacts. Replace W1 and W2 if necessary.
	For 460/575 volt models, check coil voltage and connections of contactor CR1. Check continuity of coil and condition of contacts. Replace CR1 if necessary.
	Check resistance and connections of hall device HD1. Check input and output voltages. Replace HD1 if necessary.
	Check output diodes D1 and D2, and replace if necessary.
	Check input integrated rectifier SR1, and replace if necessary.
	Check IGBT modules PM1 or PM2, and replace if necessary.
	Check control board PC1 and connections, and replace if necessary (see Section 7-9).
Low weld output with no control.	Check position of Voltage/Amperage Control switch S2 (see Section 4-1) or Amperage Control switch S2 (see Section 4-4).
	Check resistance and connections of hall device HD1. Check input and output voltages. Replace HD1 if necessary.
	Check control board PC1 and connections, and replace if necessary (see Section 7-9).
	Check display board PC3 and connections, and replace if necessary (see Section 7-11).
Maximum weld output with no control.	Check resistance and connections of hall device HD1. Check input and output voltages. Replace HD1 if necessary.
	Check control board PC1 and connections, and replace if necessary (see Section 7-9).
	Check display board PC3 and connections, and replace if necessary (see Section 7-11).

Trouble	Remedy
Limited output and low open-circuit voltage.	Follow pre-power checklist (see Section 6).
	Check incoming power for correct voltage (see Section 3-5). Replace line fuse(s), if necessary, or reset circuit breaker (see Section 3-6).
	Check for proper input and output connections.
	If using remote amperage/voltage control, check position of Amperage/Voltage control R2.
	Check hall device HD1. Disconnect HD1 from circuit; if proper open circuit voltage appears, replace HD1.
	Check control board PC1 and connections, and replace if necessary (see Section 7-9).
	Check display board PC3 and connections, and replace if necessary (see Section 7-11).
Erratic or improper weld output.	Use proper size and type of weld cable (see Section 3-2).
	Clean and tighten all weld connections.
	Check for proper input and output connections.
	Replace electrode.
	Check resistance and connections of remote amperage control potentiometer, and replace if necessary.
	Check resistance and connections of hall device HD1. Check input and output voltages. Replace HD1 if necessary.
	Check control board PC1 and connections, and replace if necessary (see Section 7-9).
No 24 volts ac output at Remote 14 receptacle RC1.	Reset circuit breaker CB2 if necessary (see Section 3-4).
	Check receptacle wiring and connections.
No 115 volts ac output at Remote 14 receptacle RC1 or optional duplex receptacle.	Reset circuit breaker CB1 if necessary (see Section 3-4).
	Check receptacle(s) wiring and connections.
Fan motor does not run after approximately four minutes of operation at rated load.	Check and clear blocked fan blade
	Check thermistors RT1 and RT2 on display board PC3 (see Section 7-11).
	Check fan motor FM, and replace if necessary.
Wandering arc; poor control of arc direction.	Use proper size tungsten.
	Use properly prepared tungsten.
	Reduce gas flow rate.
Tungsten electrode oxidizing and not remaining bright after conclusion of weld.	Shield weld zone from drafts.
	Increase postflow time.
	Check and tighten all gas fittings.
	Water in torch. Refer to torch manual.

7-2. Voltmeter/Ammeter Help Displays Prior to KG177169*

☞ *Prior to KG177342 w/Auxiliary Power



1 Help 1 Display

Indicates a malfunction in the primary power circuit. If this display is shown, check tank capacitor C1 (see Section 6-4) and control board PC1 (see Section 7-9).

2 Help 2 Display

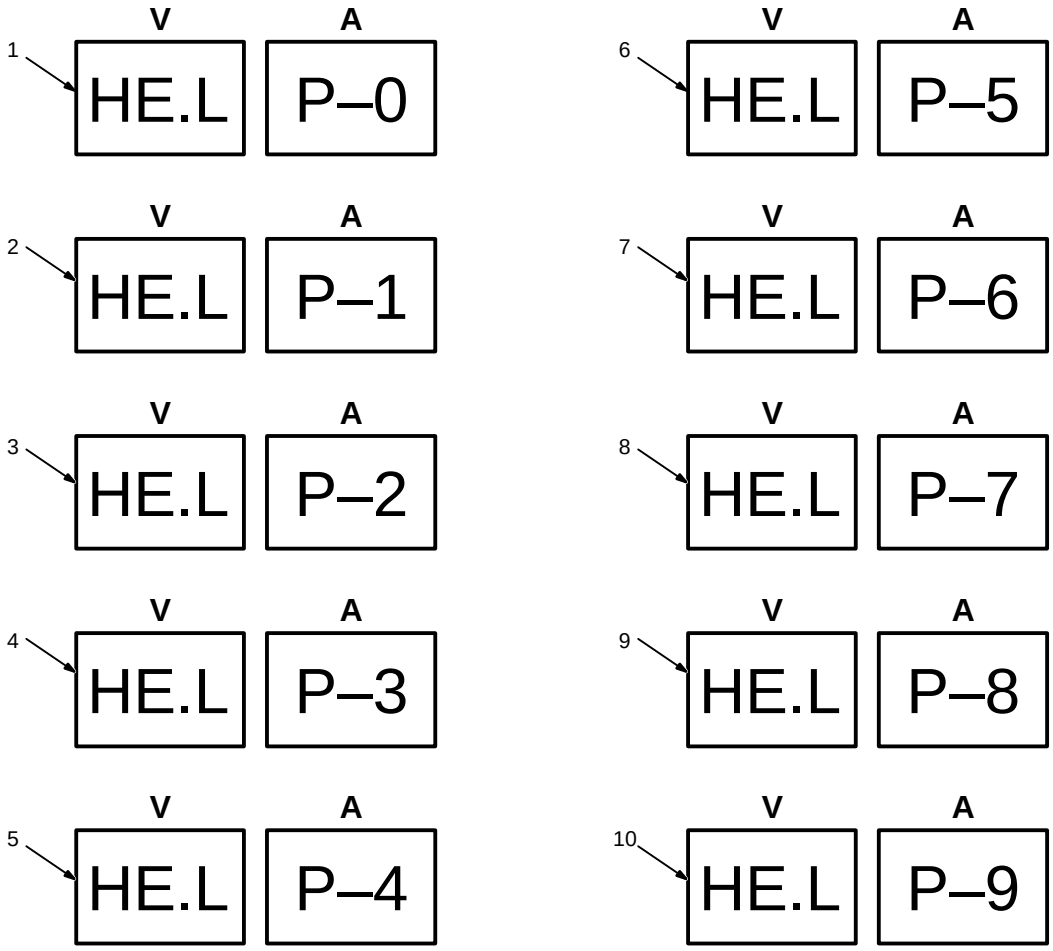
Indicates a malfunction in the thermal protection circuitry of the unit. If this display is shown, check thermistors RT1 and RT2 and display board PC3 (see Section 7-11).

3 Help 3 Display

Indicates the unit has overheated and has automatically shut down to allow the fan to cool it (see Section 2-2). Operation will continue when the unit has cooled down.

7-3. Voltmeter/Ammeter Help Displays Effective with KG177169*

☞ *Effective w/KG177342 w/Auxiliary Power



☞ *All directions are in reference to the front of the unit. All circuitry referred to is located inside the unit.*

1 Help 0 Display

Indicates a shorted thermistor RT2 on the left side of the unit. If this display is shown, check thermistor RT2.

2 Help 1 Display

Indicates a malfunction in the primary power circuit. If this display is shown, check tank capacitor C1 (see Section 6-4) and control board PC1 (see Section 7-9).

3 Help 2 Display

Indicates a malfunction in the thermal protection circuitry located on the left side of the unit. If this display is shown, check thermistor RT2 and display board PC3 (see Section 7-11).

4 Help 3 Display

Indicates the left side of the unit has overheated. The unit has shut down to allow the fan to cool it (see Section 2-2). Operation will continue when the unit has cooled.

5 Help 4 Display

Indicates a malfunction in the thermal protection circuitry located on the right side of the unit. If this display is shown, check thermistor RT1 and display board PC3 (see Section 7-11).

6 Help 5 Display

Indicates the right side of the unit has overheated. The unit has shut down to allow the fan to cool it (see Section 2-2). Operation will continue when the unit has cooled.

7 Help 6 Display

Indicates that the input voltage is too low and the unit has automatically shut down. Operation will continue when the voltage is within the acceptable lower range limit (15% below the applicable input voltage). If this display is shown, have an electrician check the input voltage.

8 Help 7 Display

Indicates that the input voltage is too high and the unit has automatically shut down. Operation will continue when the voltage is within the acceptable upper range limit (15% above the applicable input voltage). If this display is shown, have an electrician check the input voltage. Effective with KK104771, Help 7 can also indicate a bus voltage imbalance.

9 Help 8 Display

Indicates a malfunction in the secondary power circuit of the unit. If this display is shown, check control board PC1 (see Section 7-9). When this occurs, have an electrician check the primary and secondary connections.

10 Help 9 Display

Indicates a shorted thermistor RT1 on the right side of the unit. If this display is shown, check thermistor RT1.

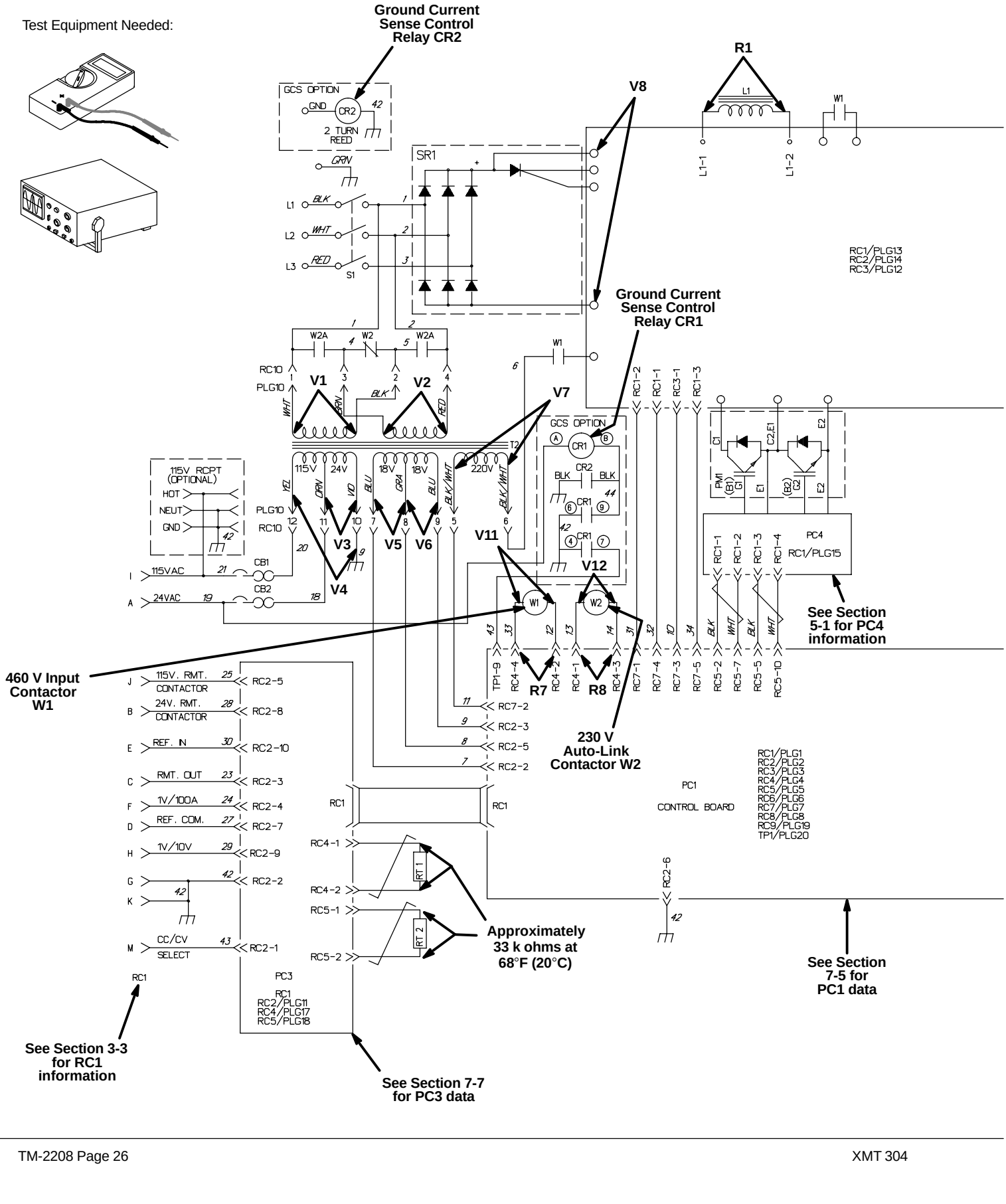
Notes

7-4. Troubleshooting Circuit Diagram For 230/460 Volt Models Prior To Serial No. KK104771

▲ **Discharge input capacitors according to Section 8-3, and be sure voltage is near zero before touching any parts.**

☞ *No calibration available for voltmeter V or ammeter A.*

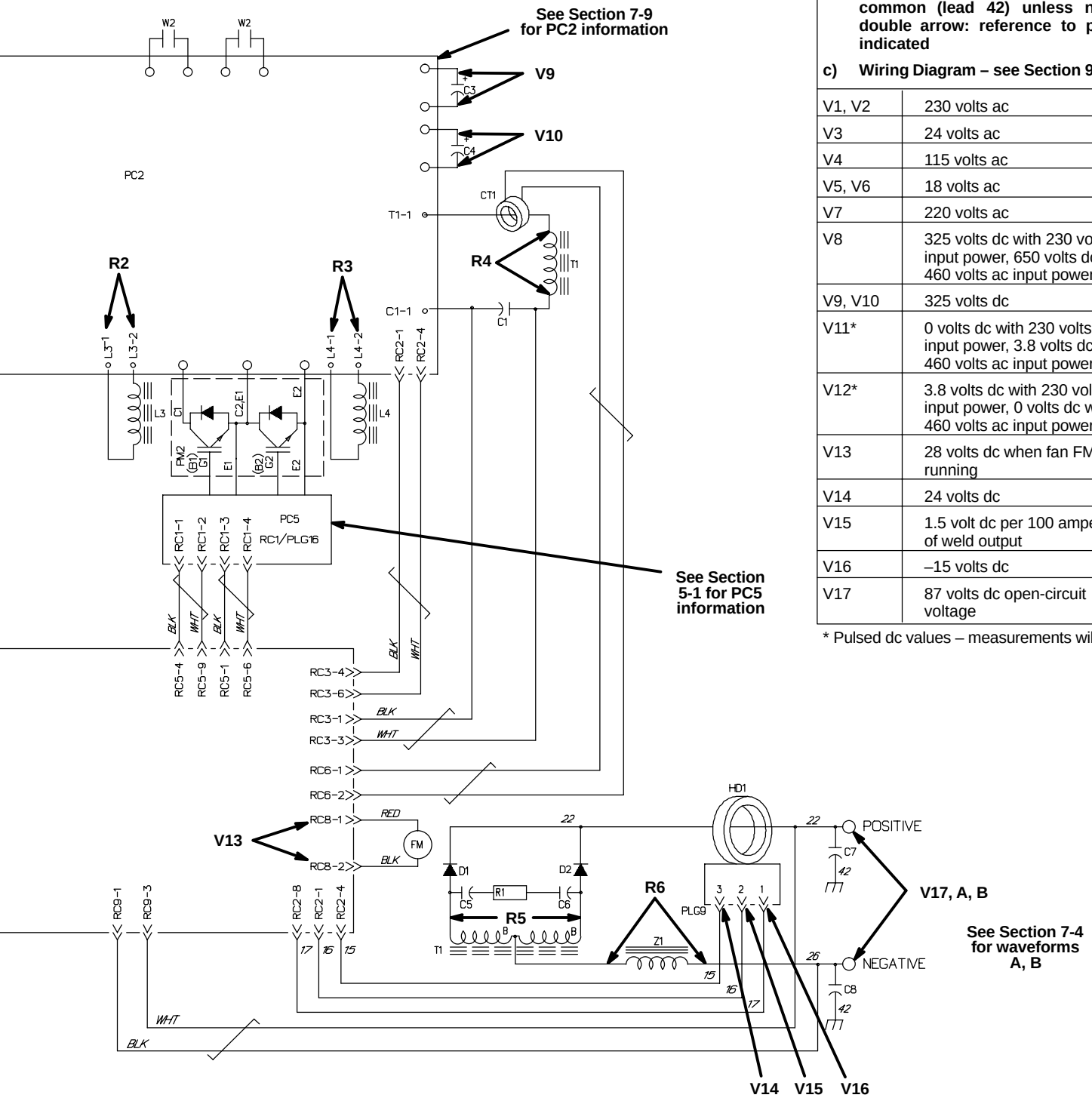
Test Equipment Needed:



Resistance Values	
a) Tolerance – ±10% unless specified	
b) Turn Off unit and disconnect input power before checking resistance	
R1 thru R6	Less than 1 ohm
R7, R8	7.5 ohms

Voltage Readings	
a) Tolerance – ±10% unless specified	
b) Reference – single arrow: to circuit common (lead 42) unless noted; double arrow: reference to points indicated	
c) Wiring Diagram – see Section 9	
V1, V2	230 volts ac
V3	24 volts ac
V4	115 volts ac
V5, V6	18 volts ac
V7	220 volts ac
V8	325 volts dc with 230 volts ac input power, 650 volts dc with 460 volts ac input power
V9, V10	325 volts dc
V11*	0 volts dc with 230 volts ac input power, 3.8 volts dc with 460 volts ac input power
V12*	3.8 volts dc with 230 volts ac input power, 0 volts dc with 460 volts ac input power
V13	28 volts dc when fan FM is running
V14	24 volts dc
V15	1.5 volt dc per 100 amperes of weld output
V16	–15 volts dc
V17	87 volts dc open-circuit voltage

* Pulsed dc values – measurements will vary.



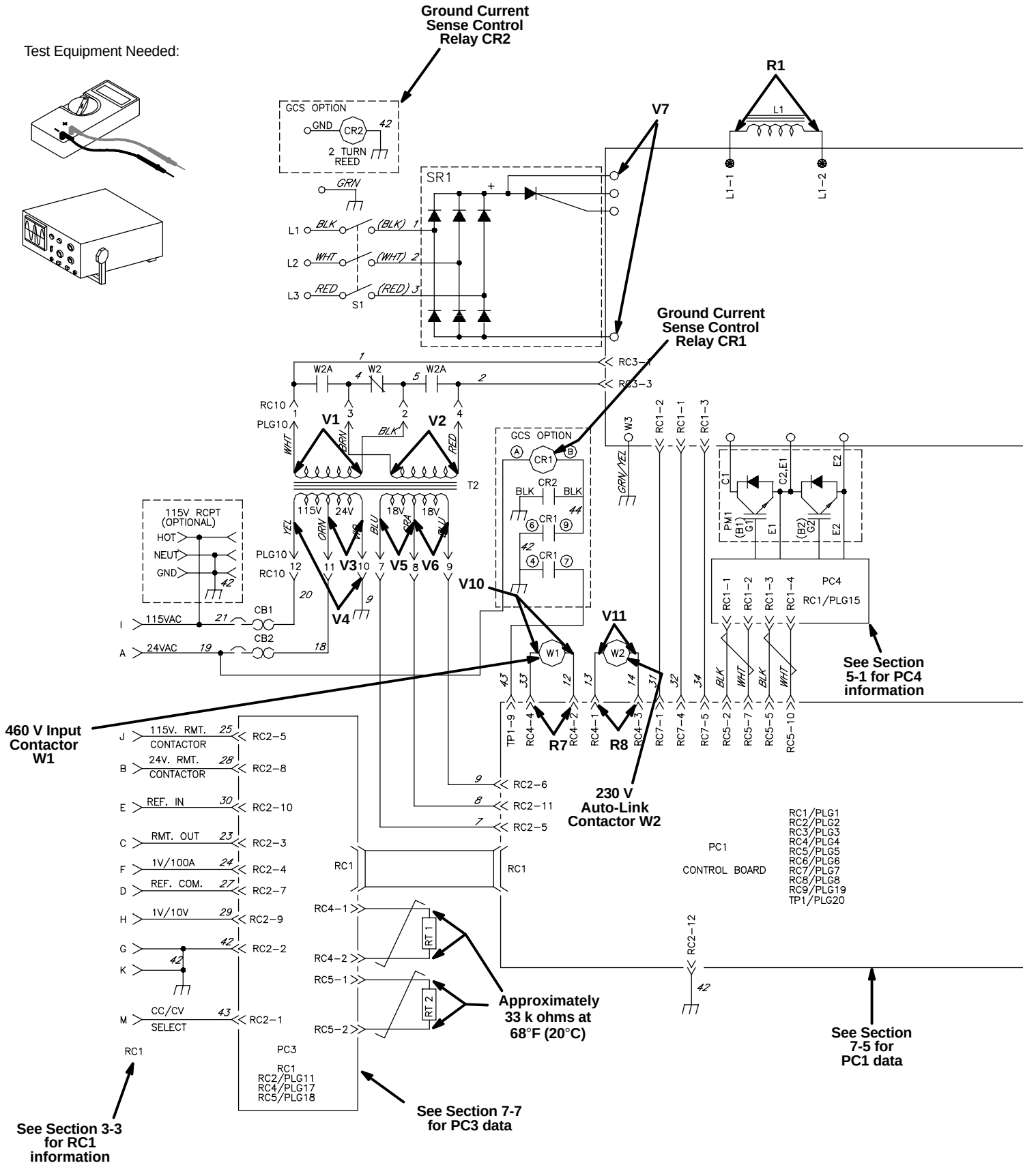
SC-181 837-B

7-5. Troubleshooting Circuit Diagram For 230/460 Volt Models With Serial Nos. Following KK104771

▲ **Discharge input capacitors according to Section 8-3, and be sure voltage is near zero before touching any parts.**

☞ *No calibration available for voltmeter V or ammeter A.*

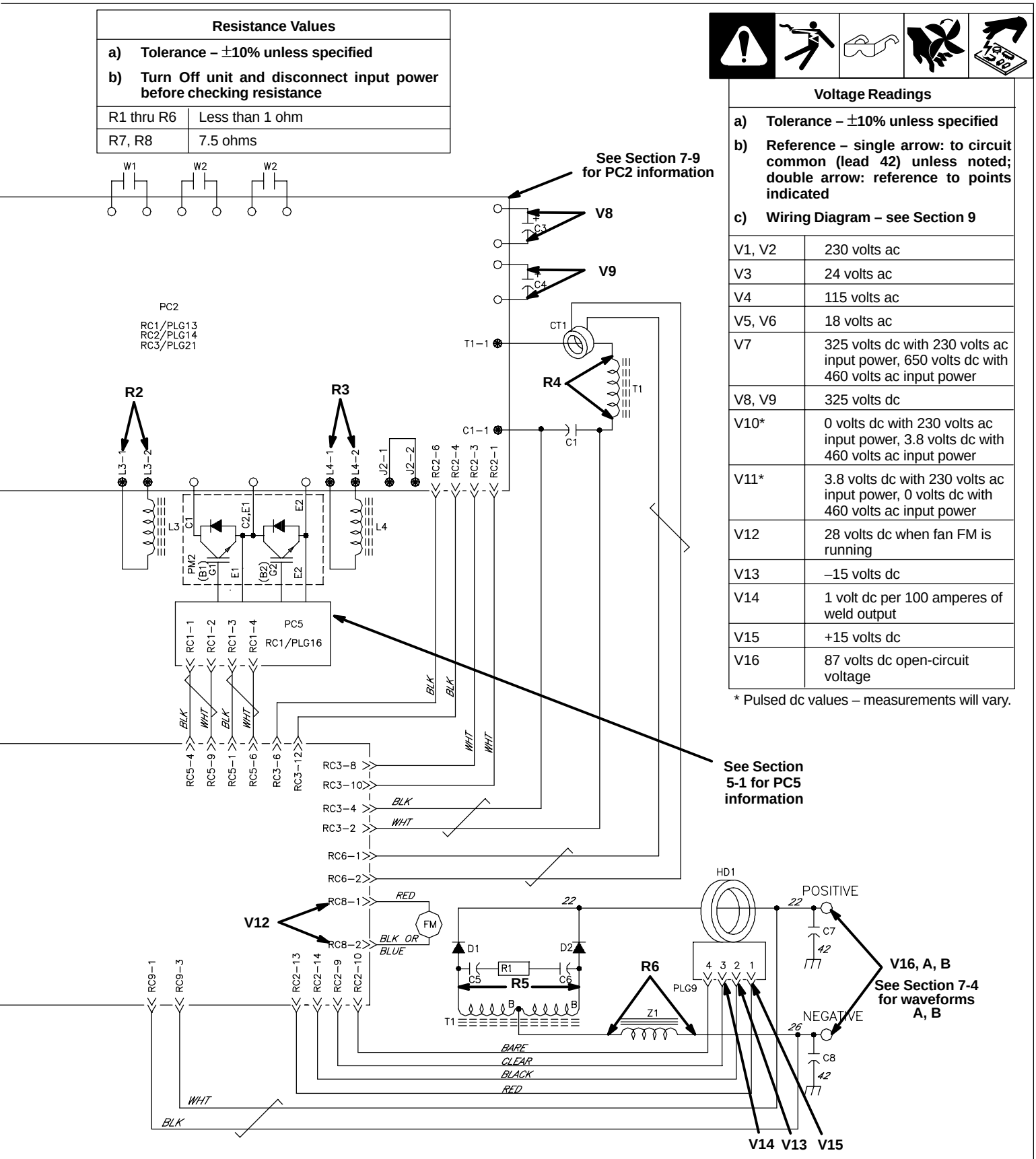
Test Equipment Needed:



Resistance Values	
a) Tolerance – ±10% unless specified	
b) Turn Off unit and disconnect input power before checking resistance	
R1 thru R6	Less than 1 ohm
R7, R8	7.5 ohms

Voltage Readings	
a) Tolerance – ±10% unless specified	
b) Reference – single arrow: to circuit common (lead 42) unless noted; double arrow: reference to points indicated	
c) Wiring Diagram – see Section 9	
V1, V2	230 volts ac
V3	24 volts ac
V4	115 volts ac
V5, V6	18 volts ac
V7	325 volts dc with 230 volts ac input power, 650 volts dc with 460 volts ac input power
V8, V9	325 volts dc
V10*	0 volts dc with 230 volts ac input power, 3.8 volts dc with 460 volts ac input power
V11*	3.8 volts dc with 230 volts ac input power, 0 volts dc with 460 volts ac input power
V12	28 volts dc when fan FM is running
V13	–15 volts dc
V14	1 volt dc per 100 amperes of weld output
V15	+15 volts dc
V16	87 volts dc open-circuit voltage

* Pulsed dc values – measurements will vary.



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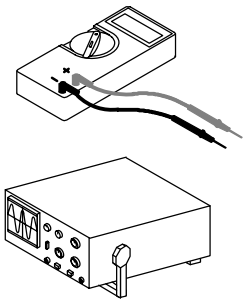
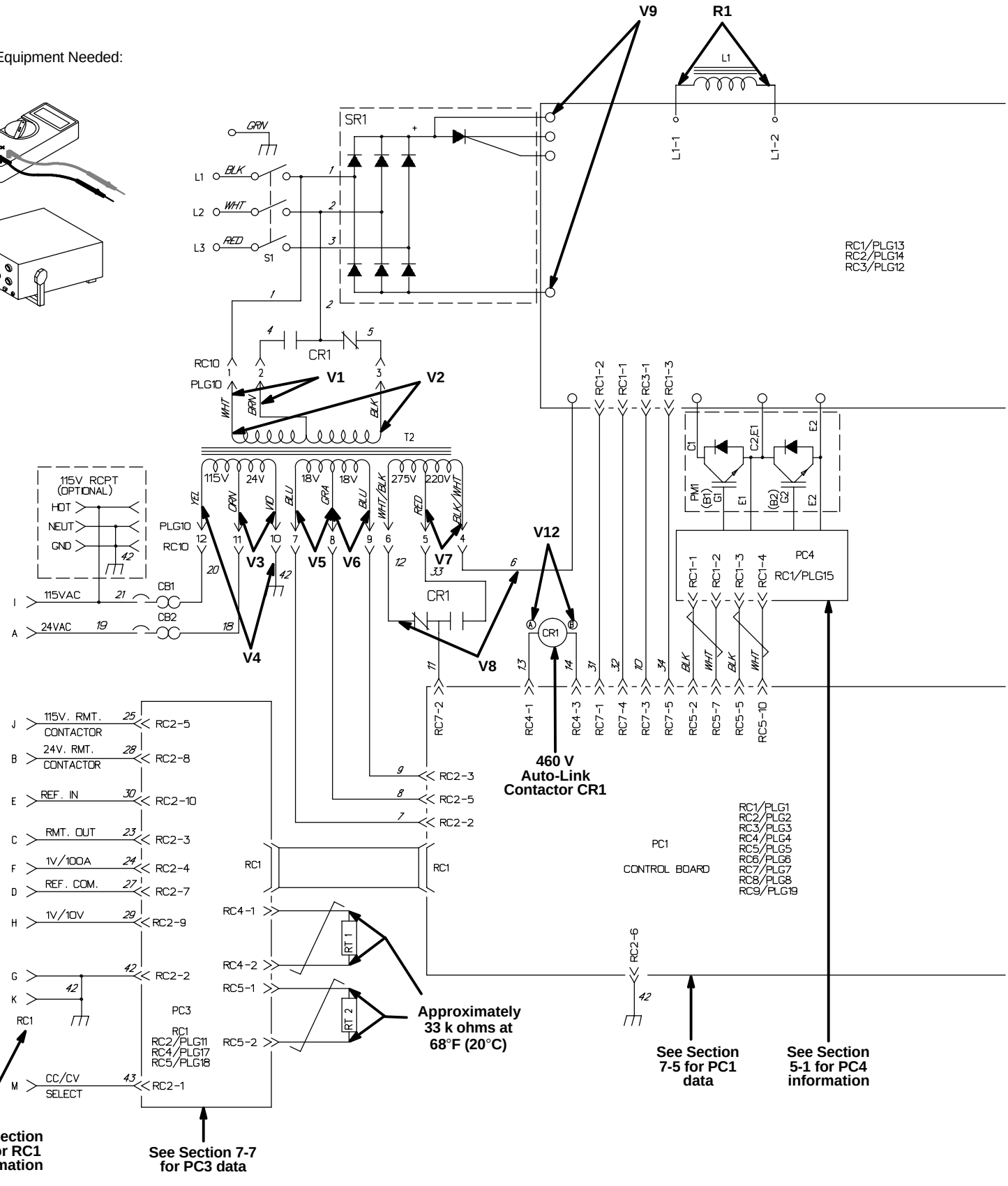
7-6. Troubleshooting Circuit Diagram for 460/575 Volt Models Prior To Serial No. KK104771

▲ **Discharge input capacitors according to Section 8-3, and be sure voltage is near zero before touching any parts.**

☞ *No calibration available for voltmeter V or ammeter A.*

Test Equipment Needed:

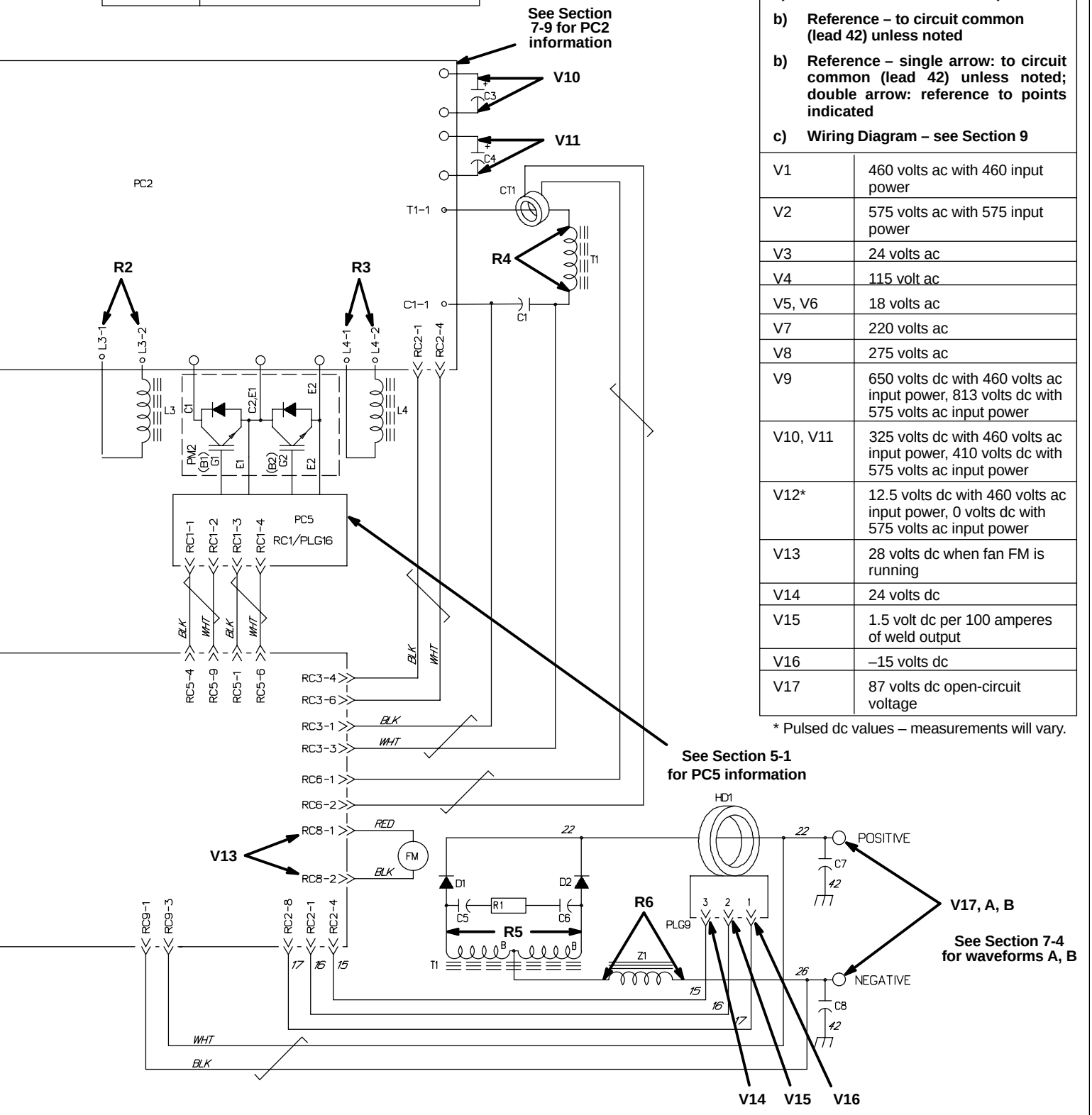




Resistance Values	
a) Tolerance – ±10% unless specified	
b) Turn Off unit and disconnect input power before checking resistance	
R1 thru R6	Less than 1 ohm

Voltage Readings	
a) Tolerance – ±10% unless specified	
b) Reference – to circuit common (lead 42) unless noted	
b) Reference – single arrow: to circuit common (lead 42) unless noted; double arrow: reference to points indicated	
c) Wiring Diagram – see Section 9	
V1	460 volts ac with 460 input power
V2	575 volts ac with 575 input power
V3	24 volts ac
V4	115 volt ac
V5, V6	18 volts ac
V7	220 volts ac
V8	275 volts ac
V9	650 volts dc with 460 volts ac input power, 813 volts dc with 575 volts ac input power
V10, V11	325 volts dc with 460 volts ac input power, 410 volts dc with 575 volts ac input power
V12*	12.5 volts dc with 460 volts ac input power, 0 volts dc with 575 volts ac input power
V13	28 volts dc when fan FM is running
V14	24 volts dc
V15	1.5 volt dc per 100 amperes of weld output
V16	–15 volts dc
V17	87 volts dc open-circuit voltage

* Pulsed dc values – measurements will vary.



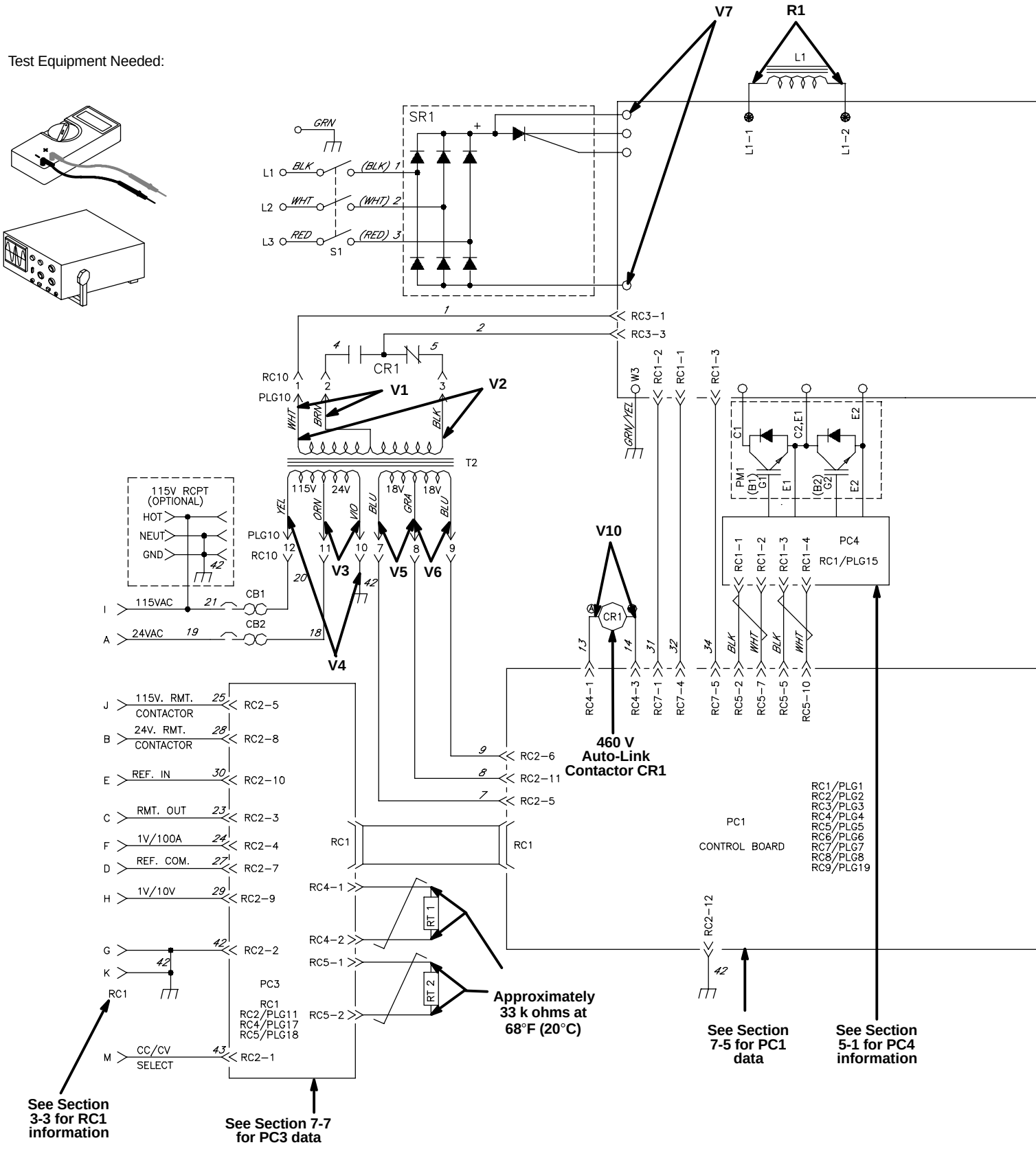
SC-180 958-C

7-7. Troubleshooting Circuit Diagram for 460/575 Volt Models With Serial Nos. Following KK104771

▲ **Discharge input capacitors according to Section 8-3, and be sure voltage is near zero before touching any parts.**

☞ *No calibration available for voltmeter V or ammeter A.*

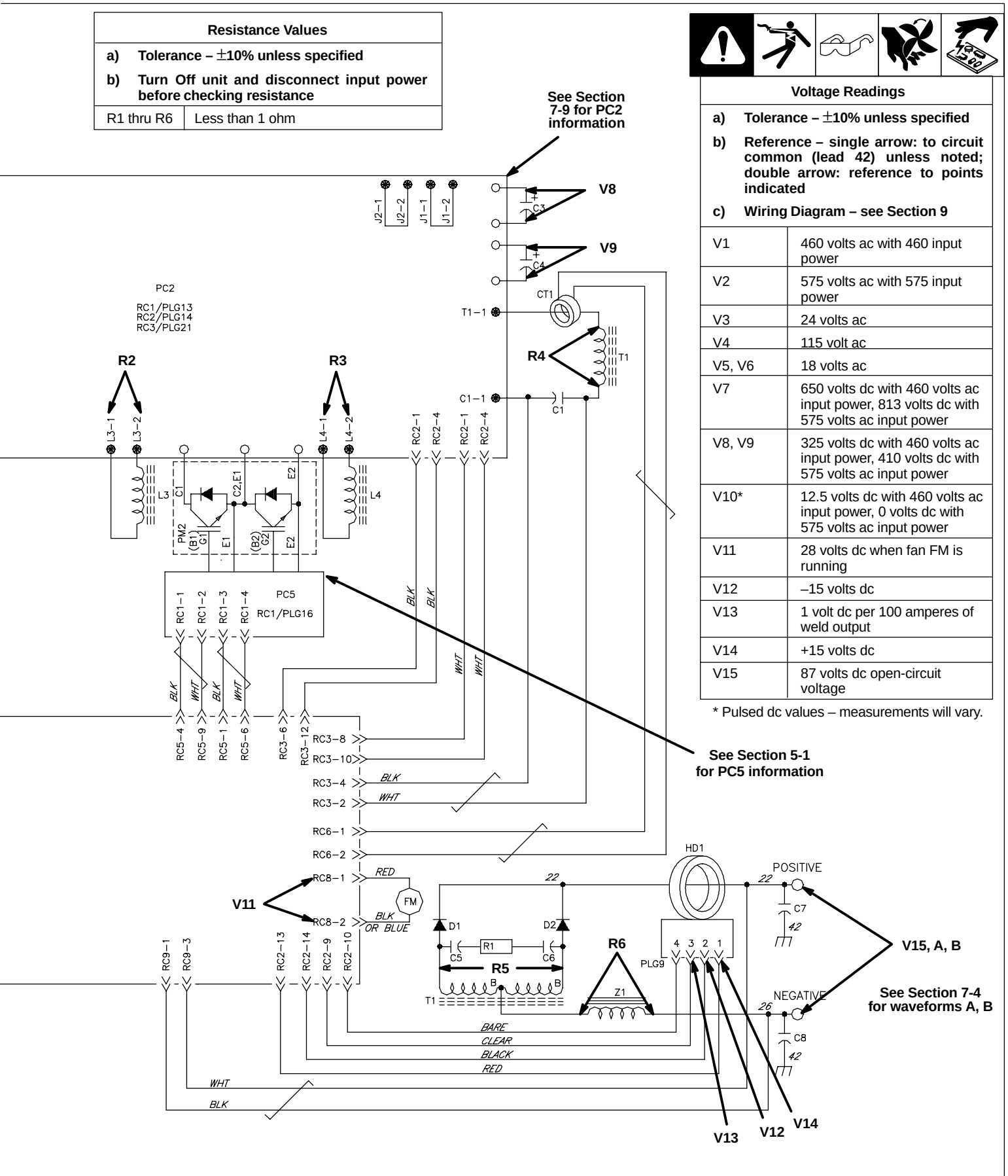
Test Equipment Needed:



Resistance Values	
a) Tolerance – ±10% unless specified	
b) Turn Off unit and disconnect input power before checking resistance	
R1 thru R6	Less than 1 ohm

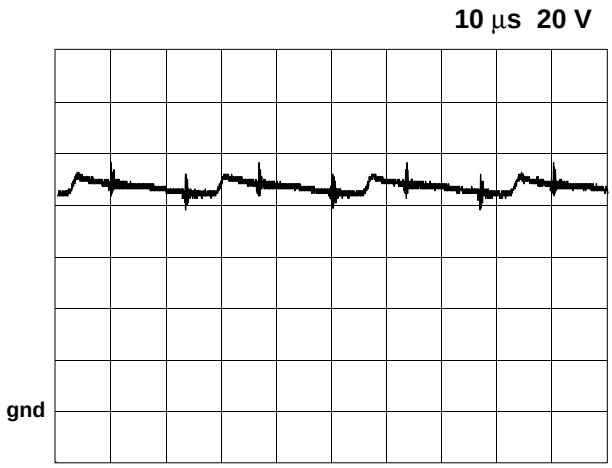
Voltage Readings	
a) Tolerance – ±10% unless specified	
b) Reference – single arrow: to circuit common (lead 42) unless noted; double arrow: reference to points indicated	
c) Wiring Diagram – see Section 9	
V1	460 volts ac with 460 input power
V2	575 volts ac with 575 input power
V3	24 volts ac
V4	115 volt ac
V5, V6	18 volts ac
V7	650 volts dc with 460 volts ac input power, 813 volts dc with 575 volts ac input power
V8, V9	325 volts dc with 460 volts ac input power, 410 volts dc with 575 volts ac input power
V10*	12.5 volts dc with 460 volts ac input power, 0 volts dc with 575 volts ac input power
V11	28 volts dc when fan FM is running
V12	–15 volts dc
V13	1 volt dc per 100 amperes of weld output
V14	+15 volts dc
V15	87 volts dc open-circuit voltage

* Pulsed dc values – measurements will vary.

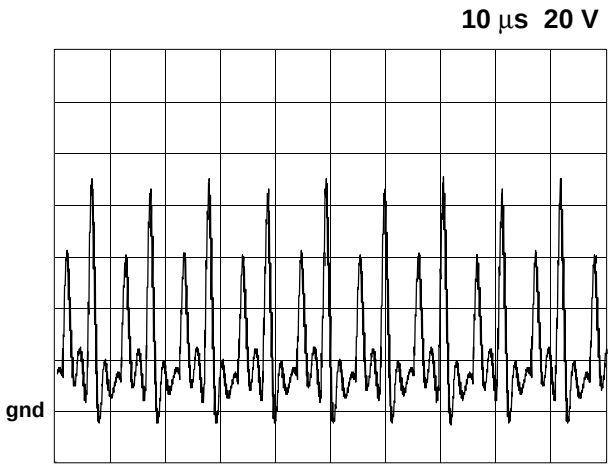


197 553

7-8. Waveforms For Sections 7-4 Thru 7-7

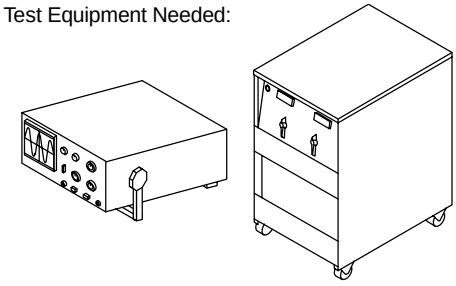


A. CC Or CV Mode, DC Open-Circuit Voltage

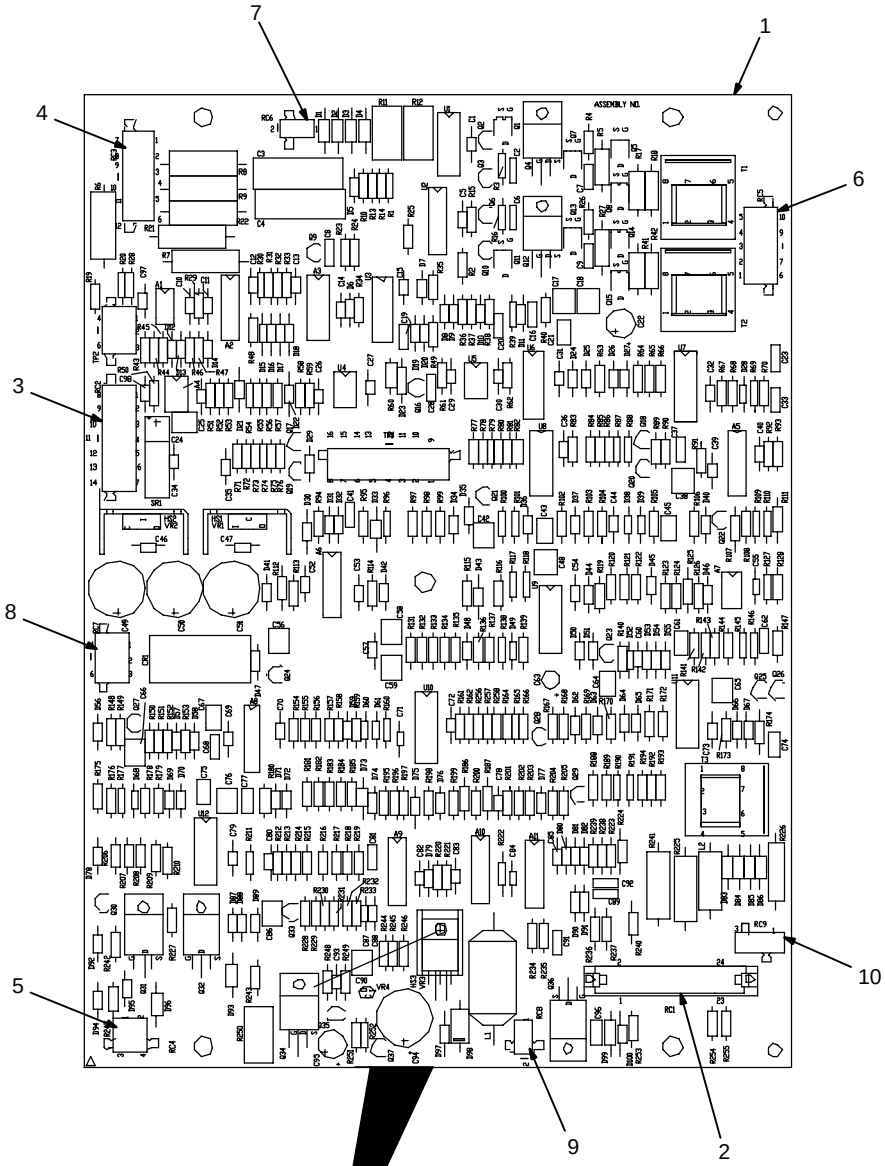


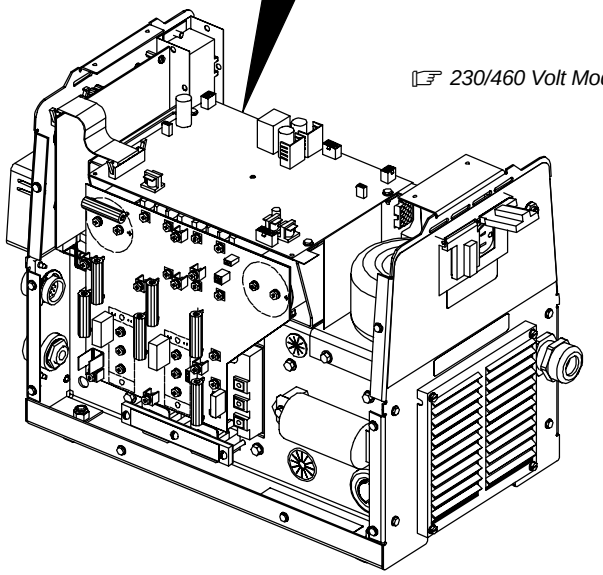
B. CC Or CV Mode, 25 Volts DC, 200 Amperes (Resistive Load)

Test Equipment Needed:



7-9. Control Board PC1 Testing Information (All Models – Use with Section 7-10)





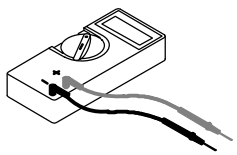
☞ *230/460 Volt Model Shown*

▲ **Discharge input capacitors according to Section 8-3, and be sure voltage is near zero before touching any parts.**

Be sure plugs are secure before testing. See Section 7-10 for specific values during testing.

1 Control Board PC1
2 Receptacle RC1
3 Receptacle RC2
4 Receptacle RC3
5 Receptacle RC4
6 Receptacle RC5
7 Receptacle RC6
8 Receptacle RC7
9 Receptacle RC8
10 Receptacle RC9

Test Equipment Needed:



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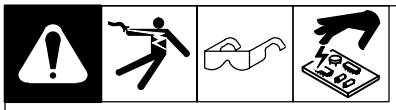
7-10. Control Board PC1 Test Point Values (All Models)



PC1 Voltage Readings

a) Tolerance – ±10% unless specified

b) Reference – to circuit common (lead 42) unless noted

Receptacle	Pin	Value
RC1	1	+24 volts dc output
	2	Not used
	3	+24 volts dc output
	4	+1 volt dc output per 10 volts dc of weld output
	5	–24 volts dc output
	6	+15 volts dc output when HELP 1 screen is displayed, 0 volts dc with normal conditions
	7	–24 volts dc output
	8	0 to +10 volts dc input from min to max of Inductance/Dig control
	9	Circuit common
	10	Circuit common
	11	–24 volts dc input with fan motor FM off, –10 volts dc with fan motor FM on
	12	0 volts dc output during normal operation, +15 volts dc output when HELP 8 screen is displayed
	13	Not used
	14	+15 volts dc output during normal operation, 0 volts dc output when HELP 6 screen is displayed
	15	+15 volts dc input in Stick (SMAW) mode, 0 volts dc input in GMAW mode
	16	+15 volts dc output during normal operation, 0 volts dc output when HELP 7 screen is displayed
	17	+15 volts dc input with weld output on, 0 volts dc input with weld output off
	18	+15 volts dc input in Stick Mode, 0 volts dc input in GMAW mode
	19	+1.0 to +3.5 volts dc input, CV preset
	20	+1 volt dc output per 100 amperes of weld output
	21	+15 volts dc input with Mode switch S3 in CV position, 0 volts dc input with S3 in CC position
	22	0 to +10 volts dc input from min to max of Voltage/Amperage Adjustment in MIG and Stick modes, +13 volts dc in Pulse mode and output Off
	23	Not used
	24	Not used
RC2	1	+1.5 volts dc input per 100 amperes of weld output (Prior to KK104771) Not used (Effective w/KK104771)
	2	18 volts ac input with respect to pin RC2-5 (Prior to KK104771) Not used (Effective w/KK104771)
	3	18 volts ac input with respect to pin RC2-5 (Prior to KK104771) Not used (Effective w/KK104771)
	4	+24 volts dc output (Prior to KK104771) Not used (Effective w/KK104771)
	5	Circuit common (Prior to KK104771) 18 volts ac input with respect to pin RC2-11 (Effective w/KK104771)
	6	Circuit common (Prior to KK104771) 18 volts ac input with respect to pin RC2-11 (Effective w/KK104771)
	7	+15 volts dc output (Prior to KK104771) Not used (Effective w/KK104771)

Receptacle	Pin	Value
RC2	8	–15 volts dc output (Prior to KK104771) Not used (Effective w/KK104771)
	9	+1 volts dc input per 100 amperes of weld output (Effective w/KK104771)
	10	Circuit common (Effective w/KK104771)
	11	Circuit common (Effective w/KK104771)
	12	Circuit common (Effective w/KK104771)
	13	+15 volts dc output (Effective w/KK104771)
	14	–15 volts dc output (Effective w/KK104771)
RC3	1	**Do not measure – high voltage present**
	2	**Do not measure – high voltage present**
	3	**Do not measure – high voltage present**
	4	**Do not measure – high voltage present**
	5	Not used
	6	Negative (–) of C4 325 volts dc with respect to pin RC3-8 (Effective w/KK104771)
	7	Not used
	8	Positive (+) of C4 325 volts dc with respect to pin RC3-6 (Effective w/KK104771)
	9	Not used
	10	Positive (+) of C3 325 volts dc with respect to pin RC3-12 (Effective w/KK104771)
	11	Not used
	12	Negative (–) of C3 325 volts dc with respect to pin RC3-10 (Effective w/KK104771)
RC4	1	In 230/460 volt models: with 230 volts ac input power, +3.8 volts dc with respect to pin 3; with 460 volts ac input power, 0 volts dc with respect to pin 3 In 460/575 volt models: with 460 volts ac input power, +12.5 volts dc with respect to pin 3; with 575 volts ac input power, 0 volts dc with respect to pin 3
	2	In 230/460 volt models: with 230 volts ac input power, 0 volts dc with respect to pin 3; with 460 volts ac input power, +3.8 volts dc with respect to pin 3 Not used in 460/575 volt models
	3	In 230/460 volt models: with 230 volts ac input power, +3.8 volts dc with respect to pin 1; with 460 volts ac input power, 0 volts dc with respect to pin 1 In 460/575 volt models: with 460 volts ac input power, +12.5 volts dc with respect to pin 1; with 575 volts ac input power, 0 volts dc with respect to pin 1
	4	In 230/460 volt models: with 230 volts ac input power, 0 volts dc with respect to pin 3; with 460 volts ac input power, +3.8 volts dc with respect to pin 3 Not used in 460/575 volt models
RC5		**Make no connections – damage to test equipment or components can occur.**
RC6		**Do not measure – high voltage present.**
RC7	1	Reference for pins RC7-4 and RC7-5
	2	220 volts ac input with respect to black/white lead of control transformer T2 (Prior to KK104771) Not used (Effective w/KK104771)
	3	220 volts ac input with respect to pin RC7-2 after precharge (Prior to KK104771) Not used (Effective w/KK104771)
	4	0 volts dc during precharge, +0.27 volts dc after precharge with respect to pin RC7-1
	5	0 volts dc after precharge, +0.6 volts dc at power-up with respect to pin RC7-1
	6	Not used

Receptacle	Pin	Value
RC8	1	+28 volts dc output with respect to pin RC8-2 when fan is turned On
	2	–28 volts dc output with respect to pin RC8-1 when fan is turned On
RC9	1	Negative (–) voltage feedback input with respect to pin RC9-3
	2	Not used
	3	Positive (+) voltage feedback input with respect to pin RC9-1

7-11. Display Board PC3 Testing Information (All Models – Use with Section 7-12)

▲ **Discharge input capacitors according to Section 8-3, and be sure voltage is near zero before touching any parts.**

Be sure plugs are secure before testing. See Section 7-12 for specific values during testing.

1 Display Board PC3
2 Receptacle RC1
3 Receptacle RC2
4 Receptacle RC4

Connection point for thermistor RT1.

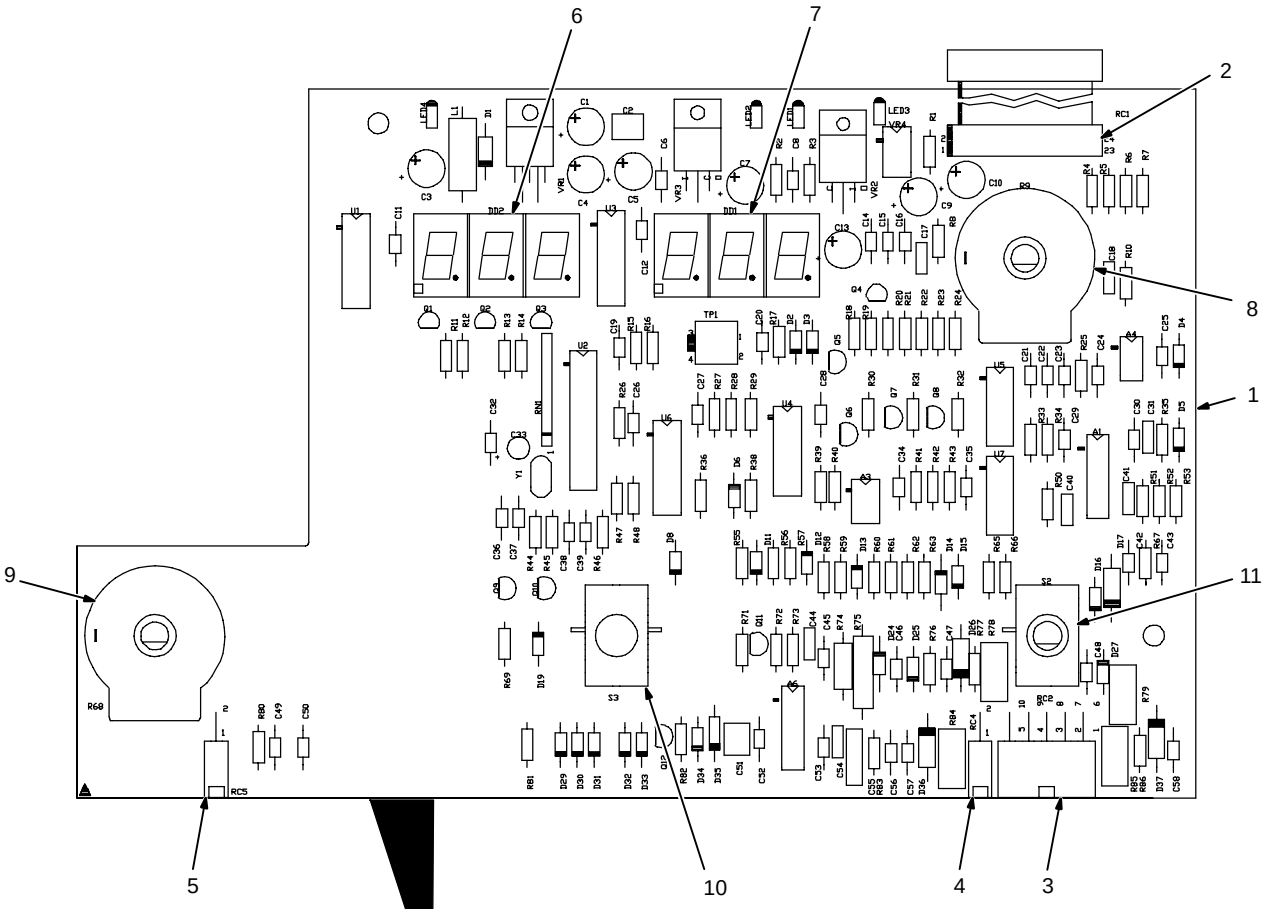
5 Receptacle RC5

Connection point for thermistor RT2.

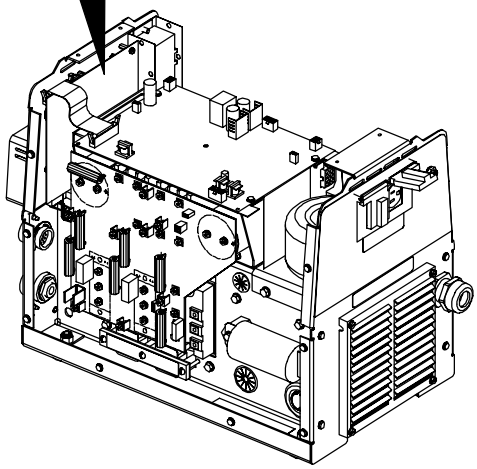
6 Voltmeter V
7 Ammeter A

☞ *No calibration available for voltmeter V or ammeter A.*

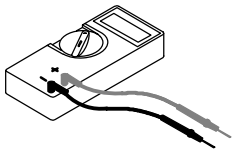
8 Voltage/Amperage Adjustment Control R2 (CC/CV Model) Or Amperage Adjustment Control R2 (CC Model)
9 Inductance/Dig Control R44 (CC/CV Model) Or Dig Control R44 (CC Model)
10 Mode Switch S3
11 Voltage/Amperage Control Switch S2 (CC/CV Model) Or Amperage Control Switch S2 (CC Model)



☞ *CC/CV Model Shown*



Test Equipment Needed:



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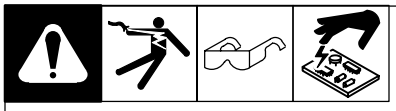
7-12. Display Board PC3 Test Point Values (All Models)



PC3 Voltage Readings

a) Tolerance – ±10% unless specified

b) Reference – to circuit common (lead 42) unless noted

Receptacle	Pin	Value
RC1	1	+24 volts dc input
	2	Not used
	3	+24 volts dc input
	4	+1 volt dc input per 10 volts dc of weld output
	5	–24 volts dc input
	6	+15 volts dc input when Help 1 screen is displayed, 0 volts dc during normal conditions
	7	–24 volts dc input
	8	0 to +10 volts dc output from min to max of Inductance/Dig control R44 (CC/CV models) or Dig control R44 (CC models)
	9	Circuit common
	10	Circuit common
	11	–24 volts dc output with fan motor FM off, –10 volts dc output with fan motor FM on
	12	Prior to Serial No. KG177169 (KG177342 w/auxiliary power), circuit common; effective with Serial No. KG177169 (KG177342 w/auxiliary power), 0 volts dc input during normal operation, +15 volts dc input when Help 8 screen is displayed
	13	+15 volts dc output in Lift Arc mode
	14	Prior to Serial No. KG177169 (KG177342 w/auxiliary power), circuit common; effective with Serial No. KG177169 (KG177342 w/auxiliary power), +15 volts dc input during normal operation, 0 volts dc input when Help 6 screen is displayed
	15	+15 volts dc output with Mode switch S3 in Dig (SMAW) position, 0 volts dc output with S3 in GMAW or GTAW position
	16	Prior to Serial No. KG177169 (KG177342 w/auxiliary power), circuit common; effective with Serial No. KG177169 (KG177342 w/auxiliary power), +15 volts dc input during normal operation, 0 volts dc input when Help 7 screen is displayed
	17	+15 volts dc output with output on, 0 volts dc output with output off
	18	+15 volts dc output with Mode switch S3 in droop (SMAW) position, 0 volts dc output with S3 in remaining positions
	19	For CC/CV models only, +1 to +3.5 volts dc output, CV preset
	20	+1 volt dc input per 100 amperes of weld output
	21	+15 volts dc output with Mode switch S3 in CV position, 0 volts dc output with S3 in CC position (always 0 volts dc for CC models)
	22	0 to +10 volts dc output from min to max of Voltage/Amperage Adjustment control R2 (CC/CV models) or Amperage Adjustment control R2 (CC models)
	23	Prior to Serial No. KG177169 (KG177342 w/auxiliary power), negative (–) voltage feedback output with respect to pin RC1-24; effective with Serial No. KG177169 (KG177342 w/auxiliary power), not used
	24	Prior to Serial No. KG177169 (KG177342 w/auxiliary power), positive (+) voltage feedback output with respect to pin RC1-23; effective with Serial No. KG177169 (KG177342 w/auxiliary power), not used

Receptacle	Pin	Value
RC2	1	Prior to Serial No. KG177169, voltage feedback input with respect to pin RC2-6, same as positive (+) weld output receptacle. Effective with Serial No. KG177169, CC/CV select (+10 to +35 volts dc with remote input indicates CV mode; 0 volts dc input indicates CC mode).
	2	Circuit common
	3	For CC/CV models, in MIG mode: +10 volts dc output; in other modes: 0 to +10 volts dc output from min to max of Voltage/Amperage Adjustment control R2. In CC models, 0 to +10 volts dc output from min to max of Amperage Adjustment control R2.
	4	+1 volt dc output per 100 amperes of actual output
	5	115 volts ac input for weld output (On/Off)
	6	Prior to Serial No. KG177169, voltage feedback input with respect to pin RC2-1, same as negative (–) weld output receptacle. Effective with Serial No. KG177169, not used.
	7	Reference common
	8	24 volts ac input, for weld output (On/Off)
	9	+1 volt dc output per 10 volts dc of weld output
	10	0 to +10 volts dc input command signal from min to max of remote control
RC4	1, 2	RT1 input connection
RC5	1, 2	RT2 input connection

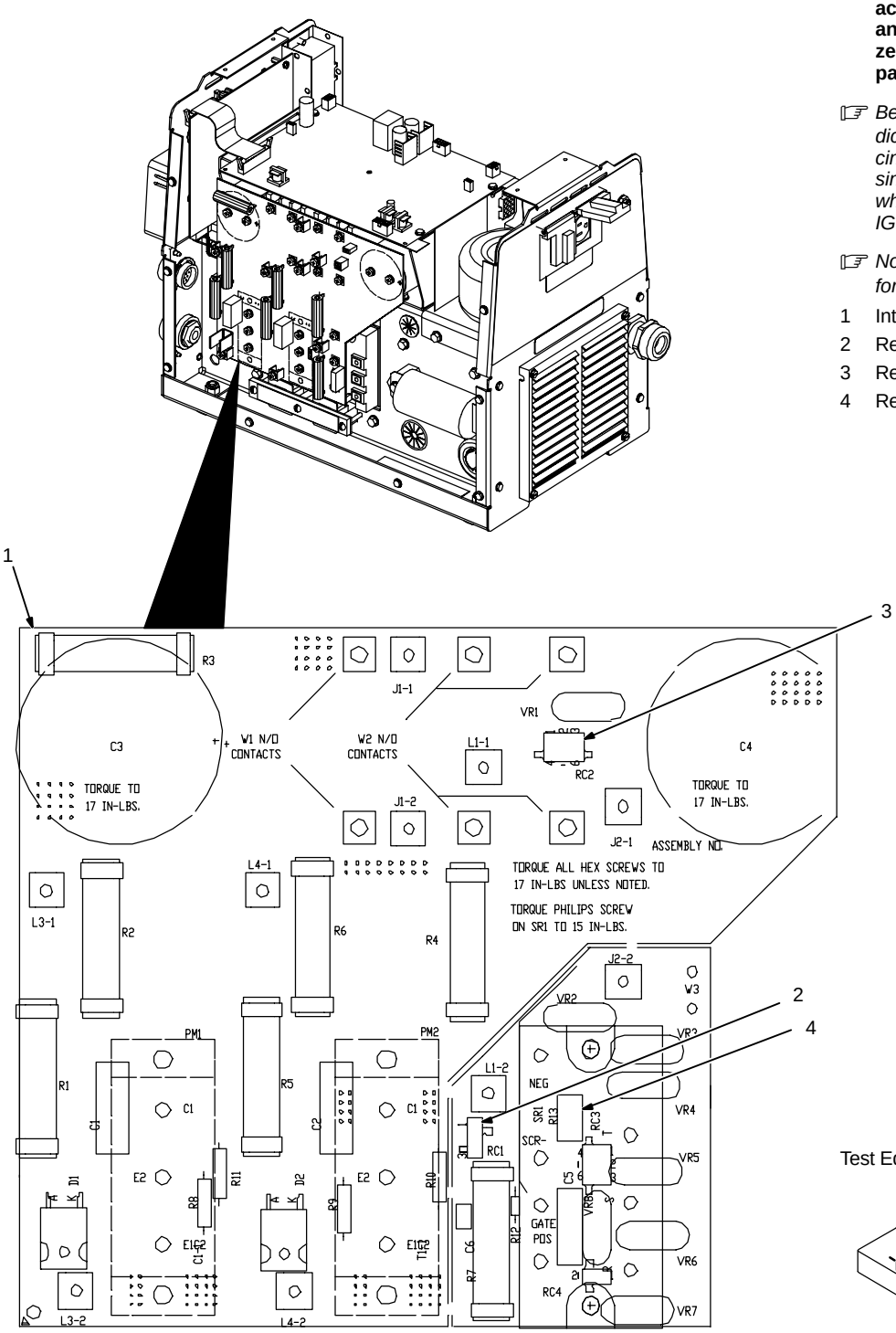
7-13. Interconnecting Board PC2 Testing Information (All Models)

▲ **Discharge input capacitors according to Section 8-3, and be sure voltage is near zero before touching any parts.**

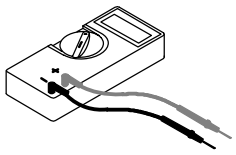
☞ *Be sure to use torque values indicated on PC2 when servicing. Use component-to-heat sink torque value of 26 in-lb when servicing SR1 and IGBT's PM1 and PM2.*

☞ *No test point values provided for this PC board.*

1 Interconnecting Board PC2
2 Receptacle RC1
3 Receptacle RC2
4 Receptacle RC3



Test Equipment Needed:



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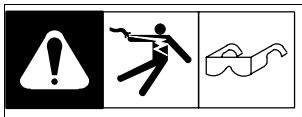
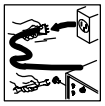
SECTION 8 – MAINTENANCE

8-1. Routine Maintenance



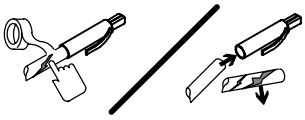


▲ **Disconnect power before maintaining.**

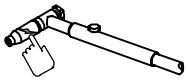
☞ *Maintain more often during severe conditions.*

3 Months

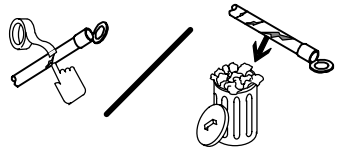
Replace Damaged Or Unreadable Labels

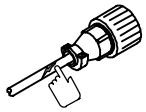


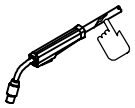
Repair Or Replace Cracked Cables



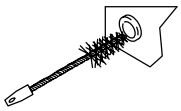
Replace Cracked Torch Body

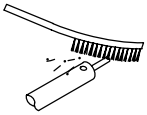


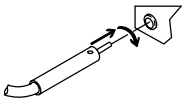




Repair Or Replace Cracked Cables And Cords

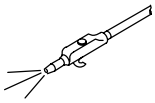






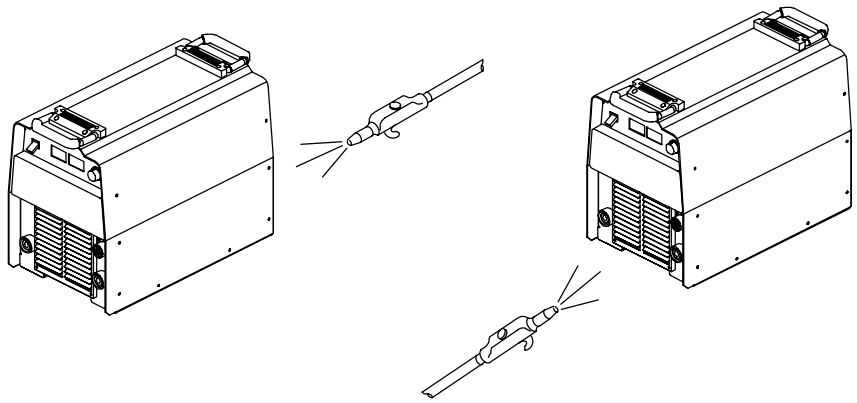
Clean And Tighten Weld Connections

6 Months



Blow Out Inside

8-2. Blowing Out Inside Of Unit

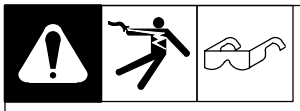


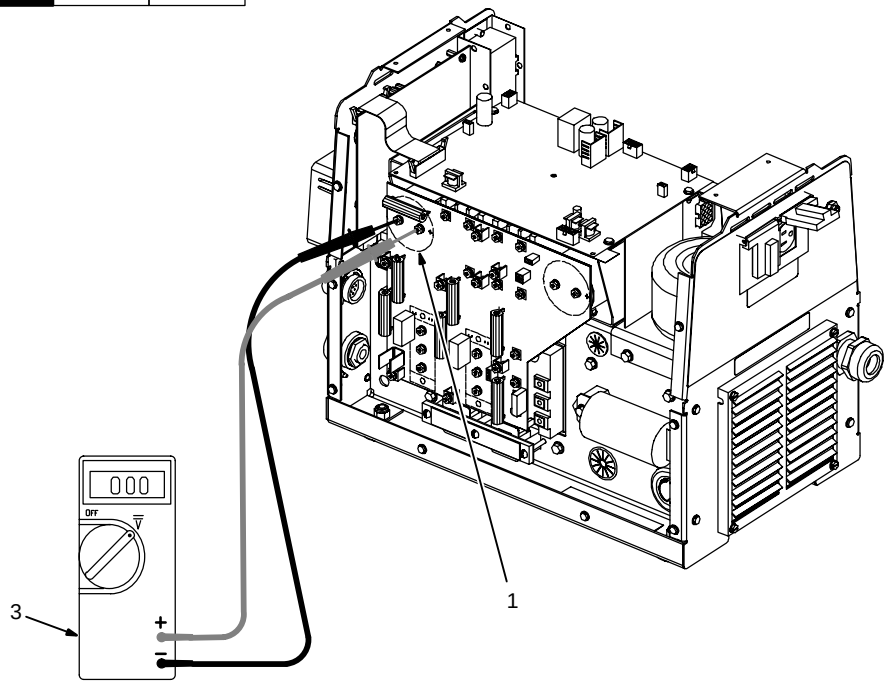
▲ **Do not remove case when blowing out inside of unit.**

To blow out unit, direct airflow through front and back louvers as shown.

ST-801 192

8-3. Measuring Input Capacitor Voltage





▲ **Significant DC voltage can remain on capacitors after unit is Off. Always check capacitors as shown to be sure they have discharged before working on unit.**

Turn Off welding power source and disconnect input power.

Remove case.

1 Input Capacitor C3 Terminals

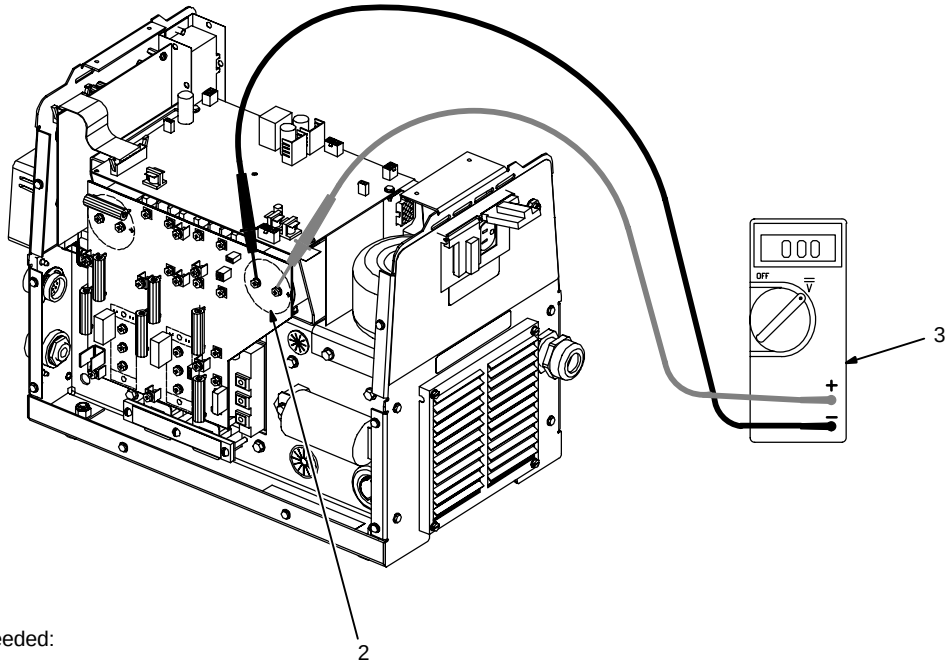
2 Input Capacitor C4 Terminals

3 Voltmeter

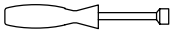
Check input capacitors as shown.

Measure the dc voltage across the positive (+) and negative (–) terminals until voltage drops to near 0 (zero) volts.

Proceed with job inside unit. Reinstall case when finished.



Tools Needed:

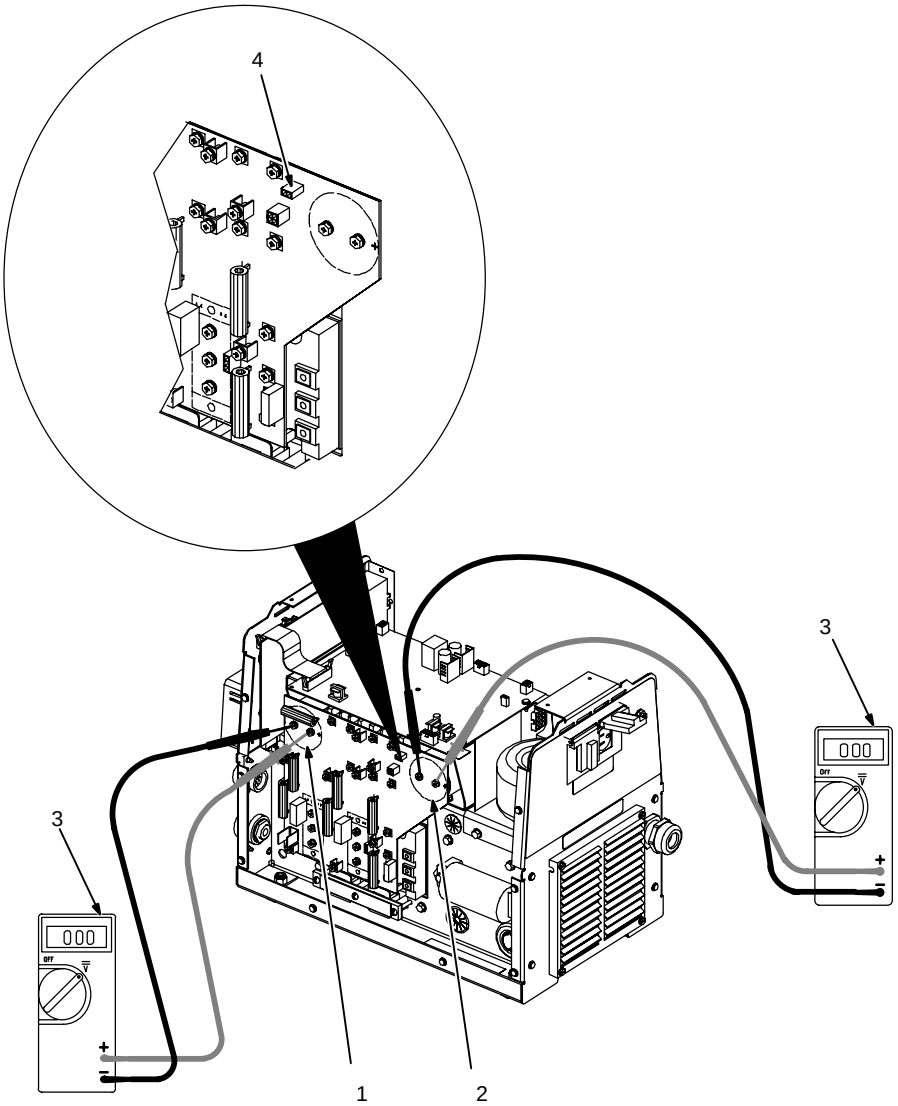


5/16 in

ST-801 550

8-4. Checking Bus Voltage Imbalance

NOTE ☞	*Check for a bus voltage imbalance whenever any of the following components are replaced: capacitors C3 or C4; control board PC1; interconnecting board PC2; IGBT power modules PM1 or PM2; or input rectifier SR1.*



▲ This procedure requires an energized unit. Have only personnel familiar with and following standard safety practices do the job.

Turn off welding power source.

Remove case.

1 Input Capacitor C3 Terminals

2 Input Capacitor C4 Terminals

3 Voltmeter

4 Receptacle 3/Plug 12

Measure the dc voltage across the positive (+) and negative (–) terminals on C3 and C4 as shown in Section 8-3 until voltage drops to near 0 (zero) volts.

Prior to Serial No. KK266150, disconnect plug 12 from receptacle 3.

Connect two voltmeters across capacitors C3 and C4 as shown.

Place Process Selector switch in Remote TIG position.

Use 460 volt primary input power if possible. Turn on input power and monitor the voltage levels across the capacitor terminals. The bus voltages should remain equal to each other ±15% (±48 vdc maximum difference). If the voltage difference exceeds the ±15%, **immediately** turn off the unit and repeat the entire Pre-Power Checklist. If the voltage remains balanced for 10 seconds, place the Process Selector Switch in the SMAW position. If the voltage difference now exceeds the ±15%, **Immediately** turn off the unit and repeat the entire Pre–Power Checklist.

Turn off unit and wait for voltage to drop to near 0 (zero) volts according to Section 8-3. Prior to Serial No. KK266150, reconnect plug 12 to receptacle 3.

Reinstall case.

Tools Needed:

5/16 in

ST-801 523-A / ST-801 536

SECTION 9 – ELECTRICAL DIAGRAMS

☞ *The circuits in this manual can be used for troubleshooting, but there might be minor circuit differences from your machine. Use circuit inside machine case or contact factory for actual circuit, if needed.*

The following is a list of all diagrams for models covered by this manual. To order a copy, proceed as follows:

1 Know unit Model and Serial or Style Number.

2 Use this list to find diagram number.

3 Include your FAX number or mailing address with your request.

4 FAX Technical Publications Department at 920-735-4011 or call 920-735-4356.

Model	Serial Or Style Number	Circuit Diagram	Wiring Diagram
XMT 304 (All 230/460 Volt Models)	KG049063 thru KG177168 (thru KG177341 w/aux. power)	175 014-A	178 564♦♦
	KG177169 thru KK104770 (eff. w/KG177342 w/aux. power)	181 837-B	183 484-A♦♦
	KK104771 thru KK266149	194 588	195 876
	KK266150 and following	197 550	195 876
XMT 304 (All 460/575 Volt Models)	KG145520 thru KK104770	180 958-C	180 959-A♦♦
	KK104771 thru KK266149	194 589	195 877
	KK266150 and following	197 553	195 876
Circuit Board PC1 (All CC, 230/460 Volt Models)	KG049063 thru KG191114 (thru KG139275 w/aux. power)	173 587♦♦	
	KG191115 thru KH526180 (eff. w/KG139276 w/aux. power)	181 472♦♦	
Circuit Board PC1 (All CC/CV, 230/460 Volt Models)	KG049063 thru KG177168 (thru KG177341 w/aux. power)	173 587♦♦	
	KG177169 thru KH523148 (eff. w/KG177342 w/aux. power)	181 472♦♦	
Circuit Board PC1 (All 230/460 Volt Models)	CC/CV models: KH523149 thru KK104770 CC models: KH526181 thru KK104770	185 507-A	
	KK104771 and following	193 755	
Circuit Board PC1 (All 460/575 Volt Models)	KG145520 thru KH499630	181 475♦♦	
	KH499631 thru KK104770	188 657-A	
	KK104771 and following	193 761	
Circuit Board PC2 (All Models)	KG049063 thru KH321500	173 591♦♦	
	KH321501 thru KJ176290	183 623♦♦	
	KJ176291 thru KK266149	190 430♦♦	
	KK266150 and following	195 589	
Circuit Board PC3 (All CC, 230/460 Volt Models)	KG049063 thru KG191114 (thru KG139275 w/aux. power)	178 846♦♦	
	KG191115 thru KH353058 (eff. w/KG139276 w/aux. power)	181 488-A♦♦	
Circuit Board PC3 (All CC, 460/575 Volt Models)	KG145520 thru KH353058	181 488-A♦♦	

Model	Serial Or Style Number	Circuit Diagram	Wiring Diagram
Circuit Board PC3 (All CC Models)	KH353059 thru KH526179	183 324-A♦♦	
	KH526180 thru KJ188991	187 103♦♦	
	KJ188992 and following	190 706	
Circuit Board PC3 (All CC/CV, 230/460 Volt Models)	KG049063 thru KG177168 (thru KG177341 w/aux. power)	178 843♦♦	
	KG177169 thru KH353058 (eff. w/KG177342 w/aux. power)	181 485-A♦♦	
Circuit Board PC3 (All CC/CV, 460/575 Volt Models)	KG145520 thru KH353058	181 485-A ♦♦	
Circuit Board PC3 (All CC/CV Models)	KH353059 thru KH523188	183 321-A♦♦	
	KH523189 thru KJ188991	187 100♦♦	
	KJ188992 and following	190 703	
Circuit Boards PC4, PC5 (All Models)	KG049063 thru KH450175	173 599♦♦	
	KH450176 and following	188 015	

♦♦ Not included in this manual

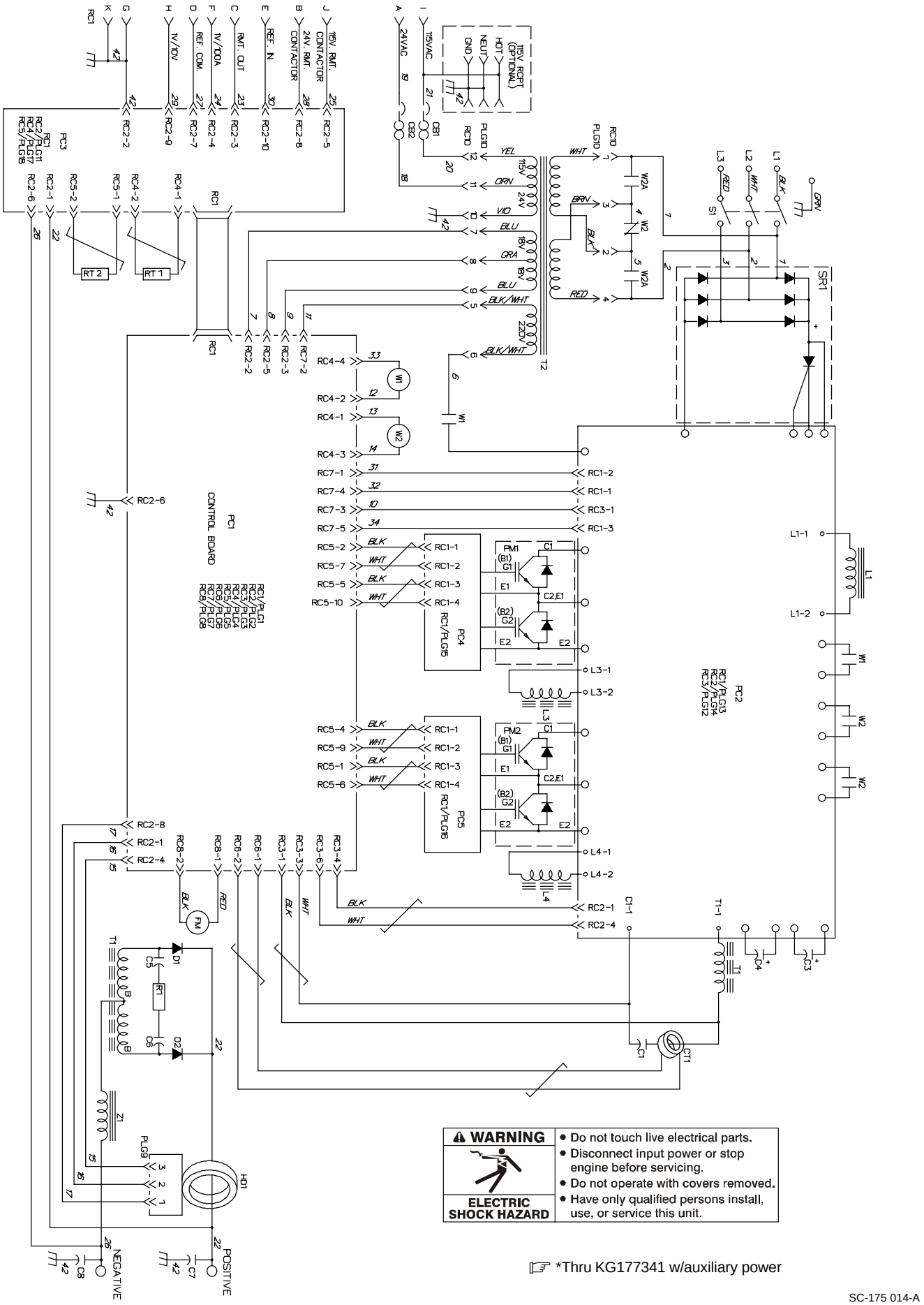
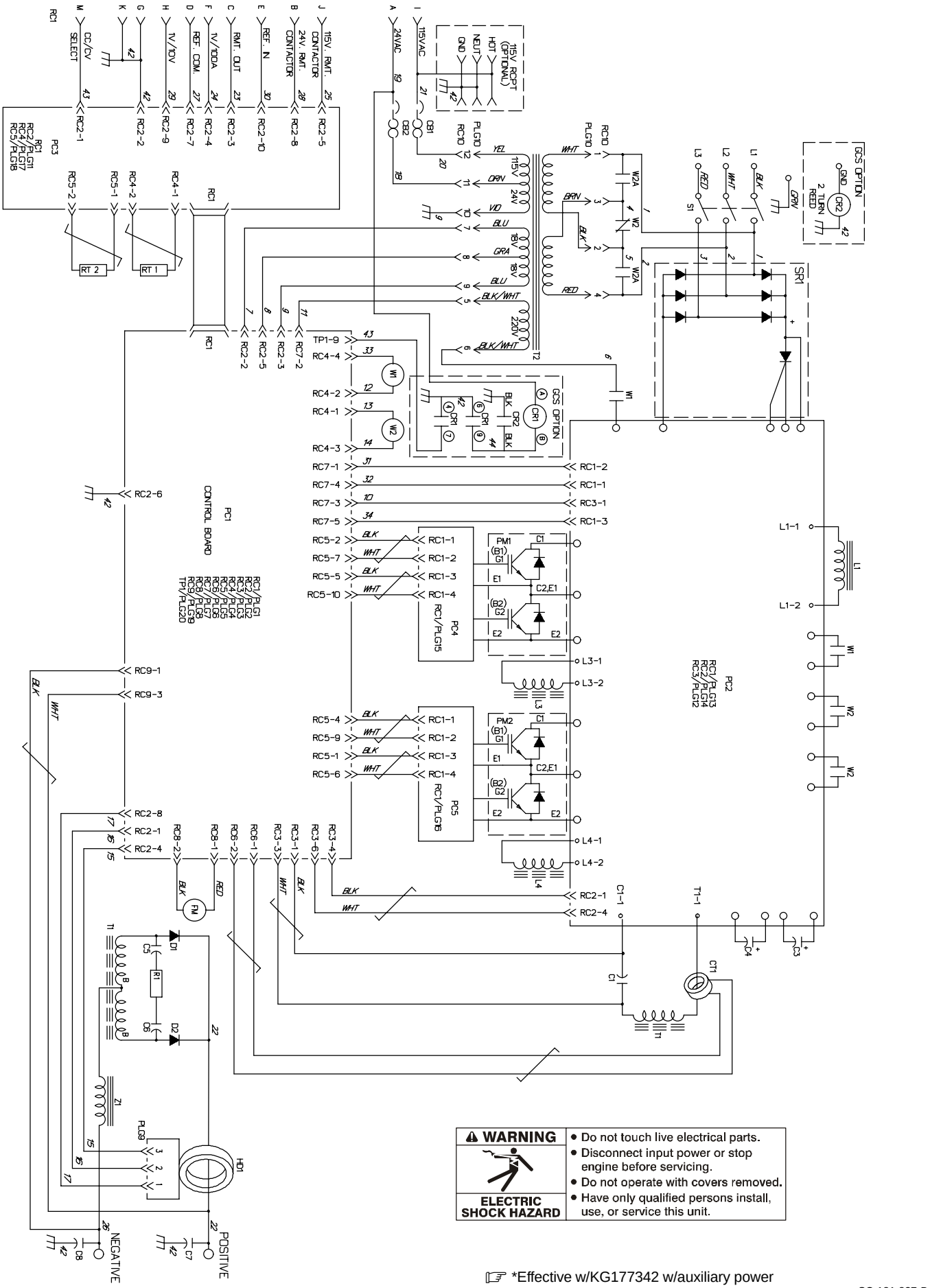


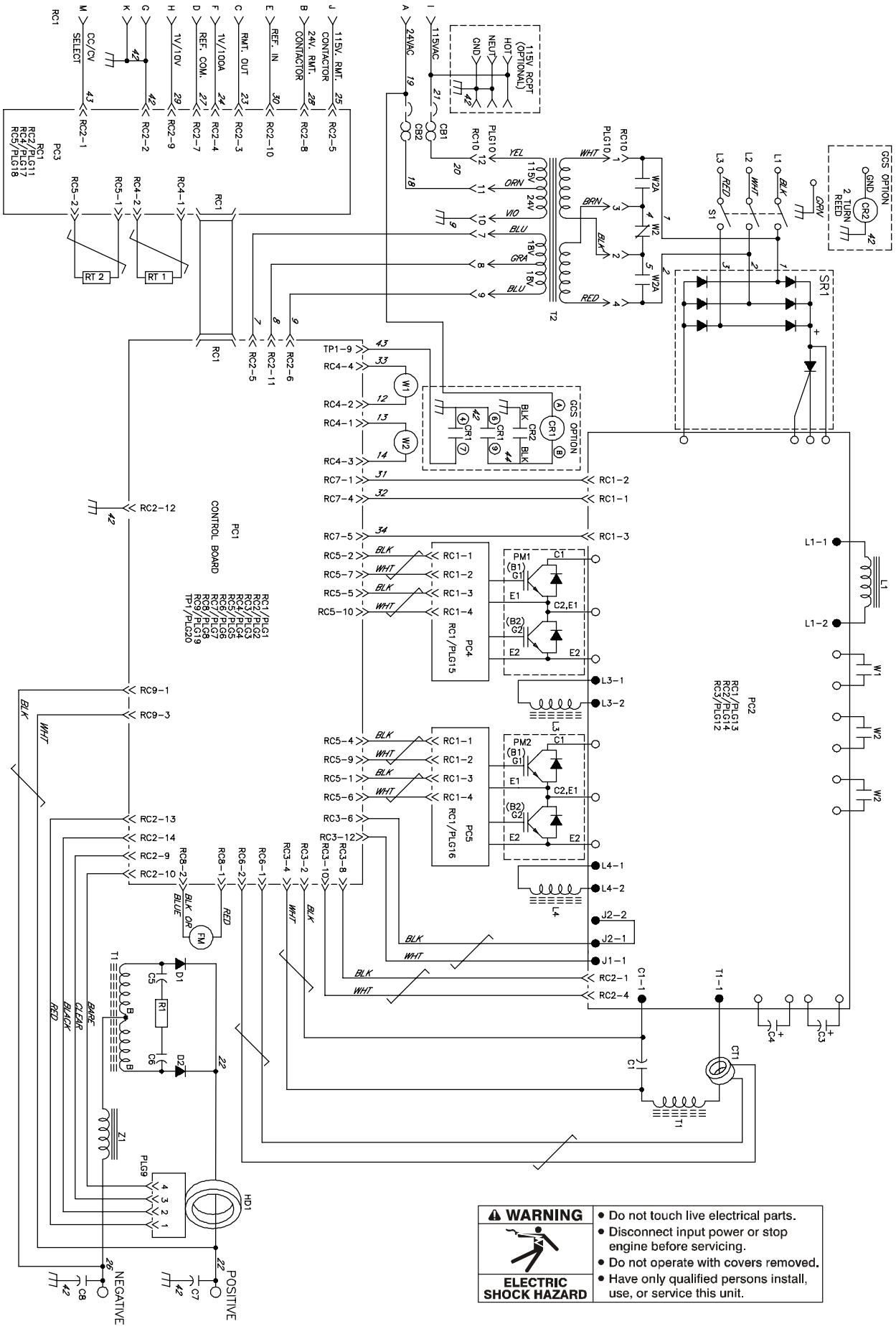
Figure 9-1. Circuit for XMT 304 (230/460 V) Eff. w/KG049063 – KG177168*



☞ *Effective w/KG177342 w/auxiliary power

SC-181 837-B

Figure 9-2. Circuit for XMT 304 (230/460 V) Eff. w/KG177169* Thru KK104770



194 588

Figure 9-3. Circuit for XMT 304 (230/460 V) Eff. w/KK104771 Thru KK266149

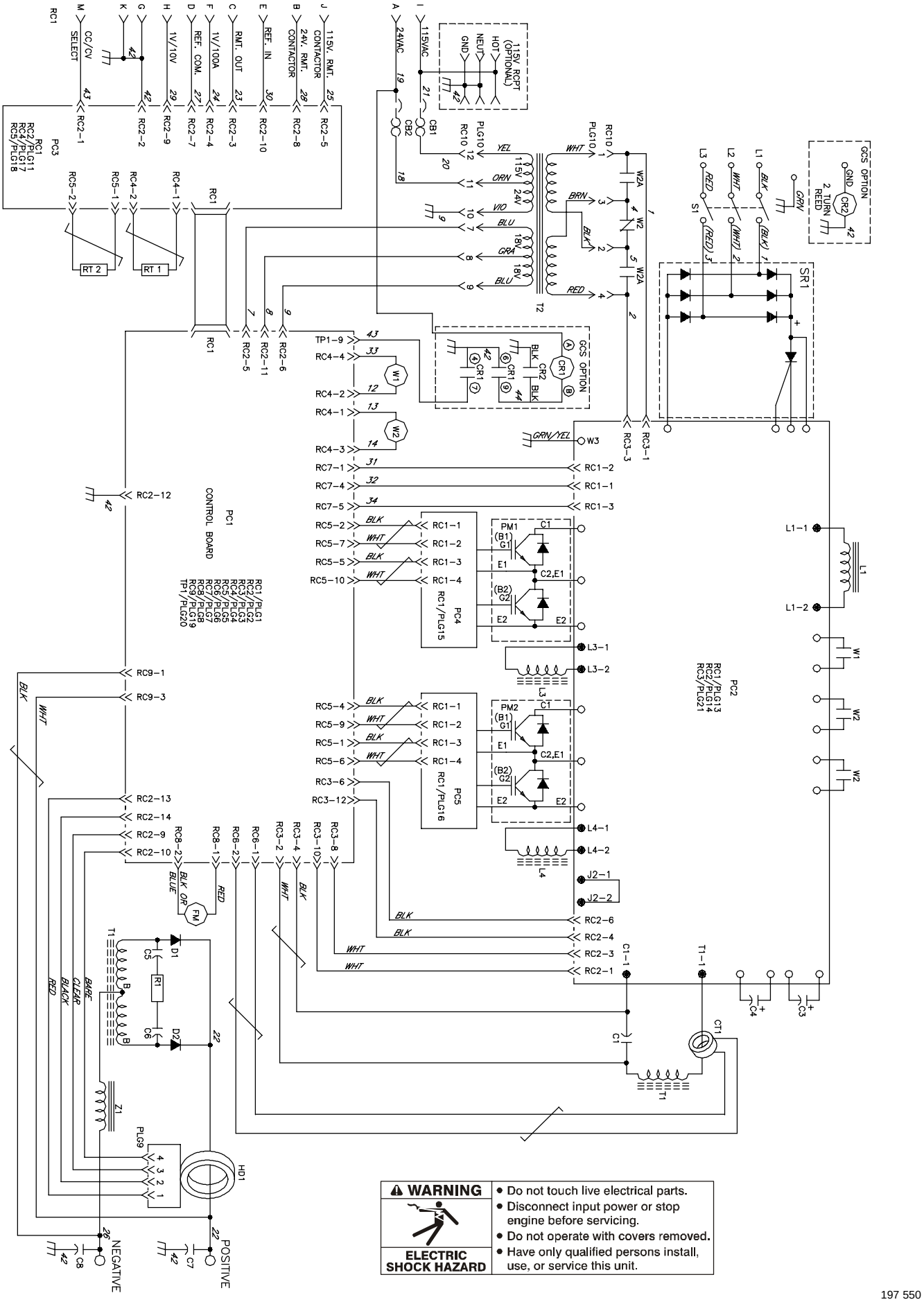
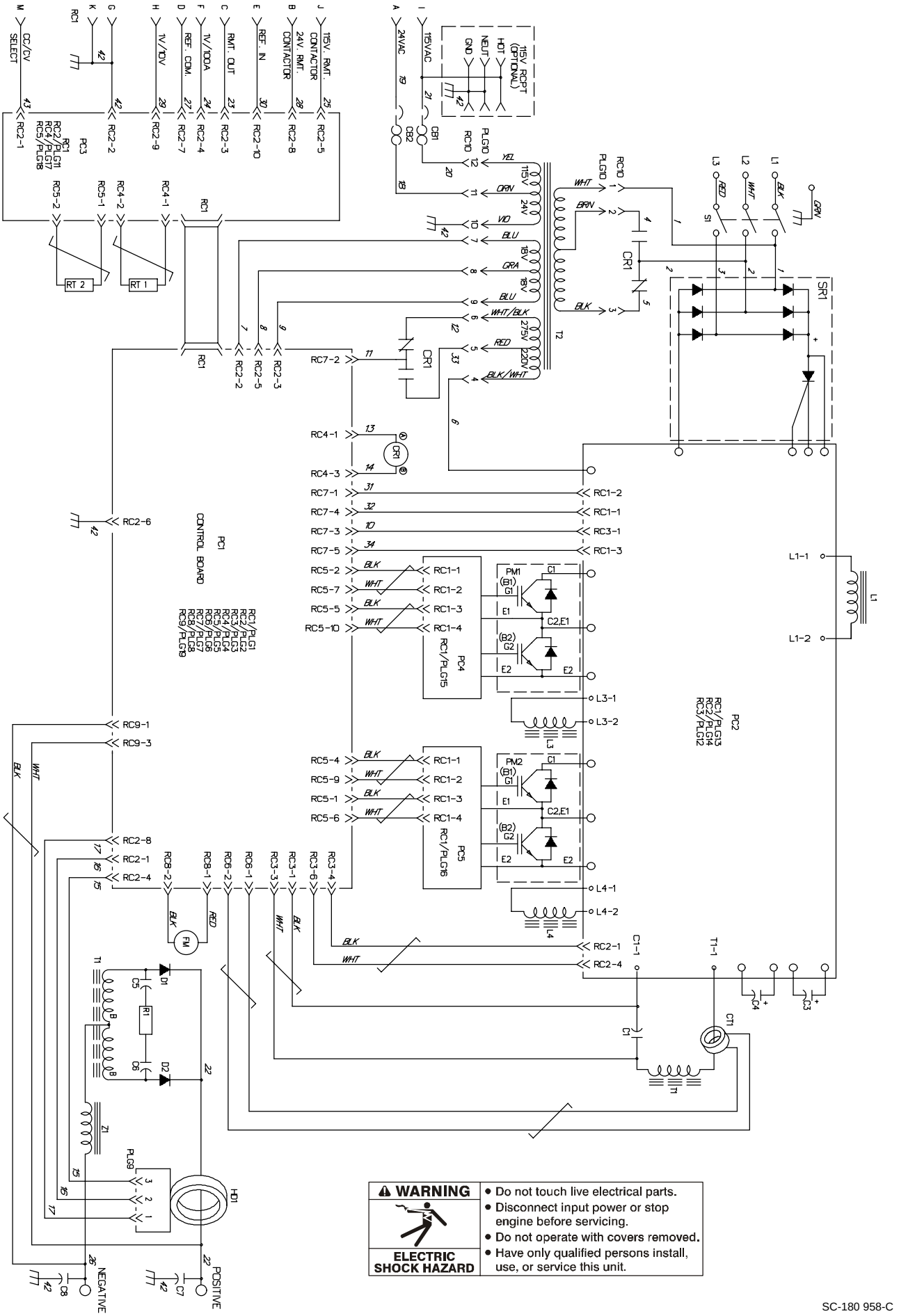


Figure 9-4. Circuit for XMT 304 (230/460 V) Eff. w/KK266150

Notes



SC-180 958-C

Figure 9-5. Circuit for XMT 304 (460/575 V) Eff. w/KG145520 Thru KK104770

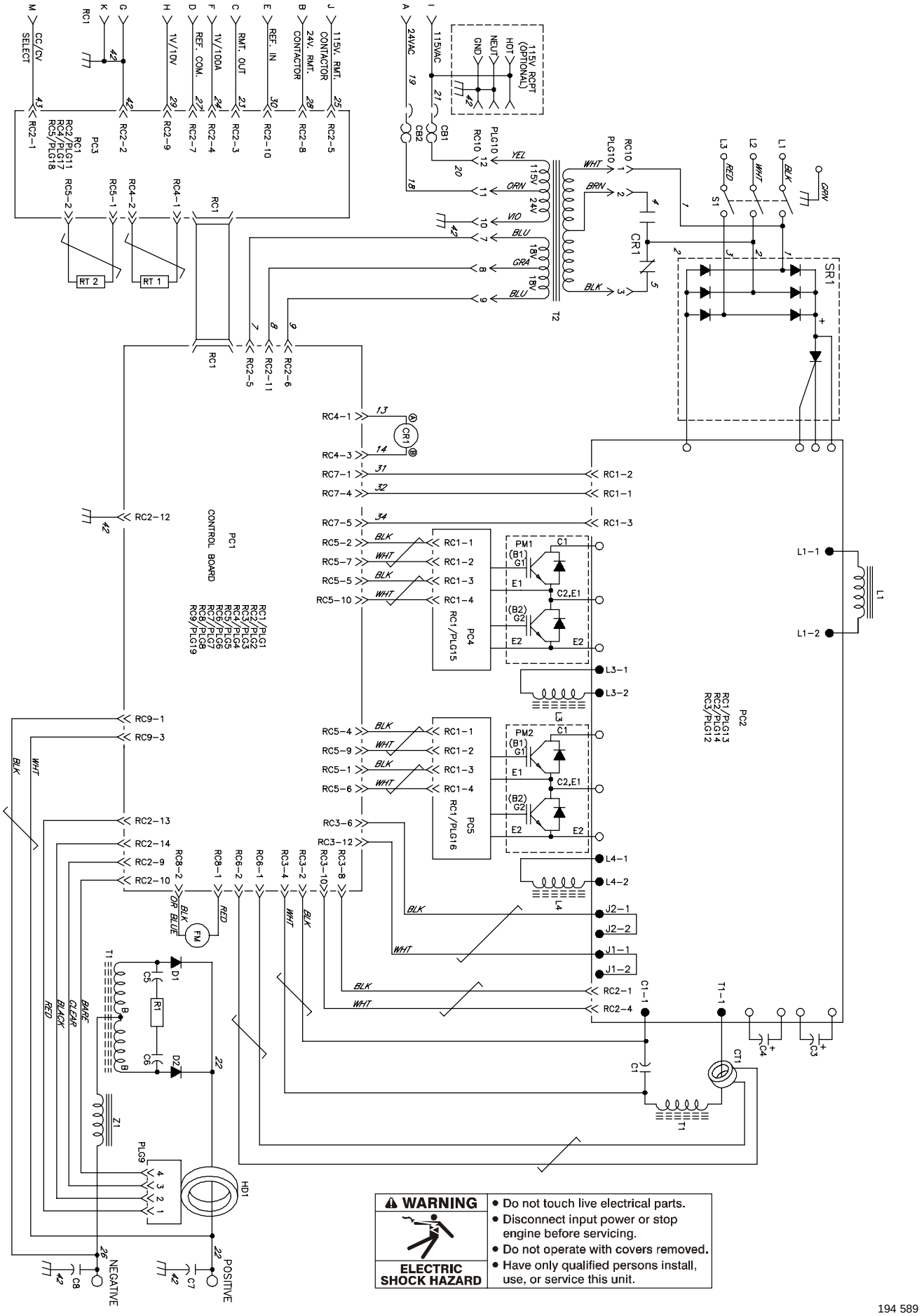


Figure 9-6. Circuit for XMT 304 (460/575 V) Eff. w/KK104771 Thru KK266149

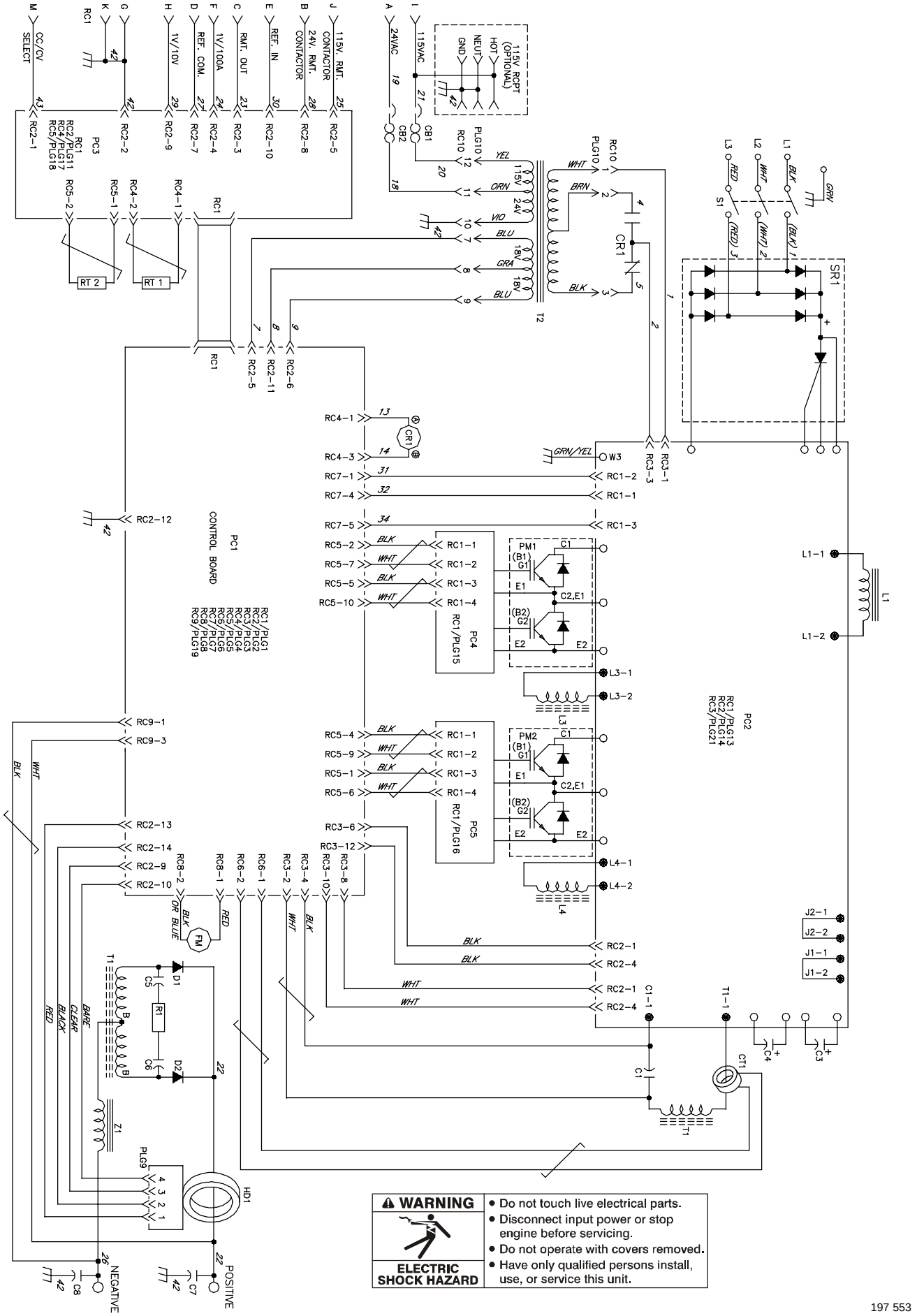


Figure 9-7. Circuit for XMT 304 (460/575 V) Eff. w/KK266150

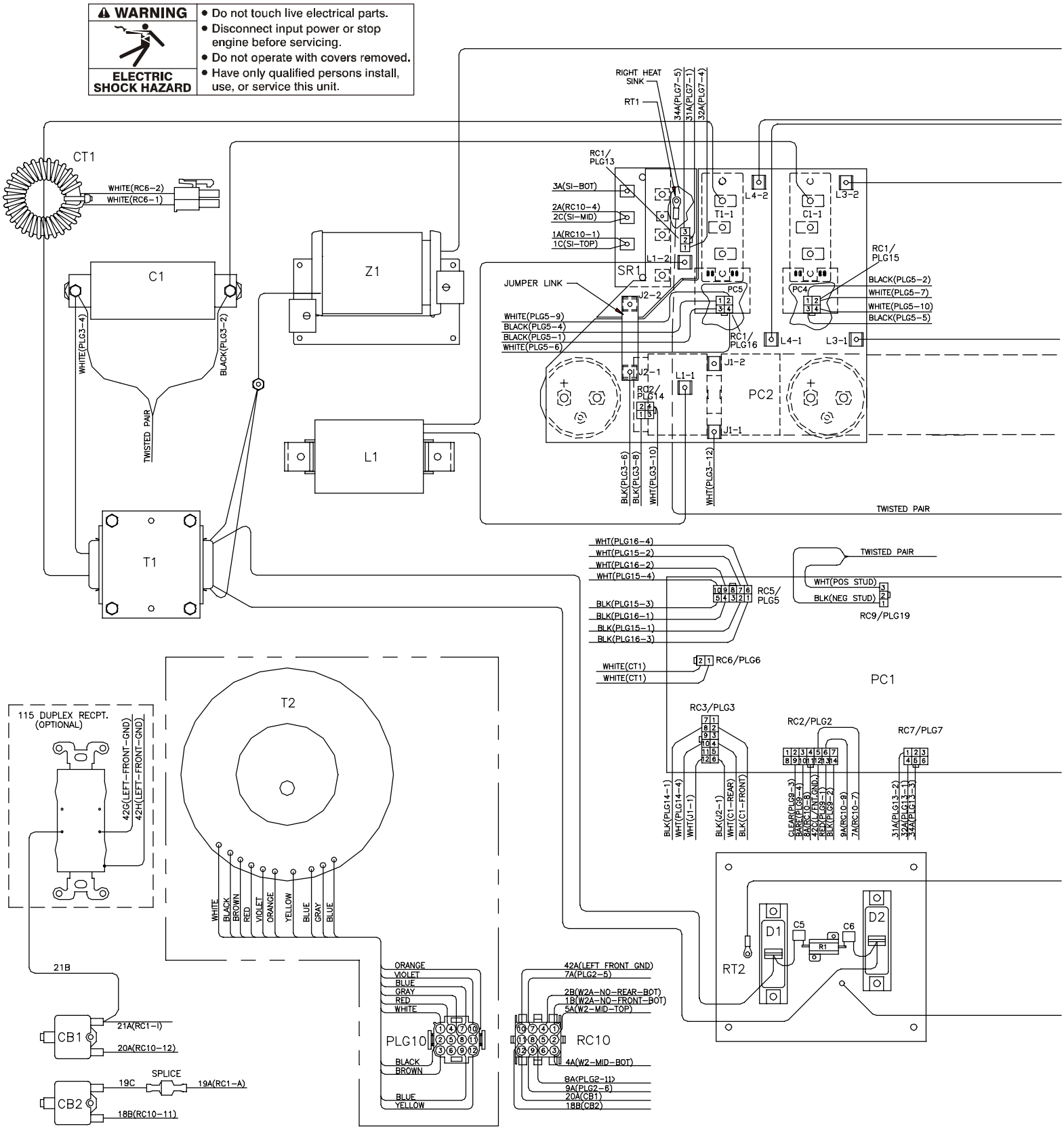
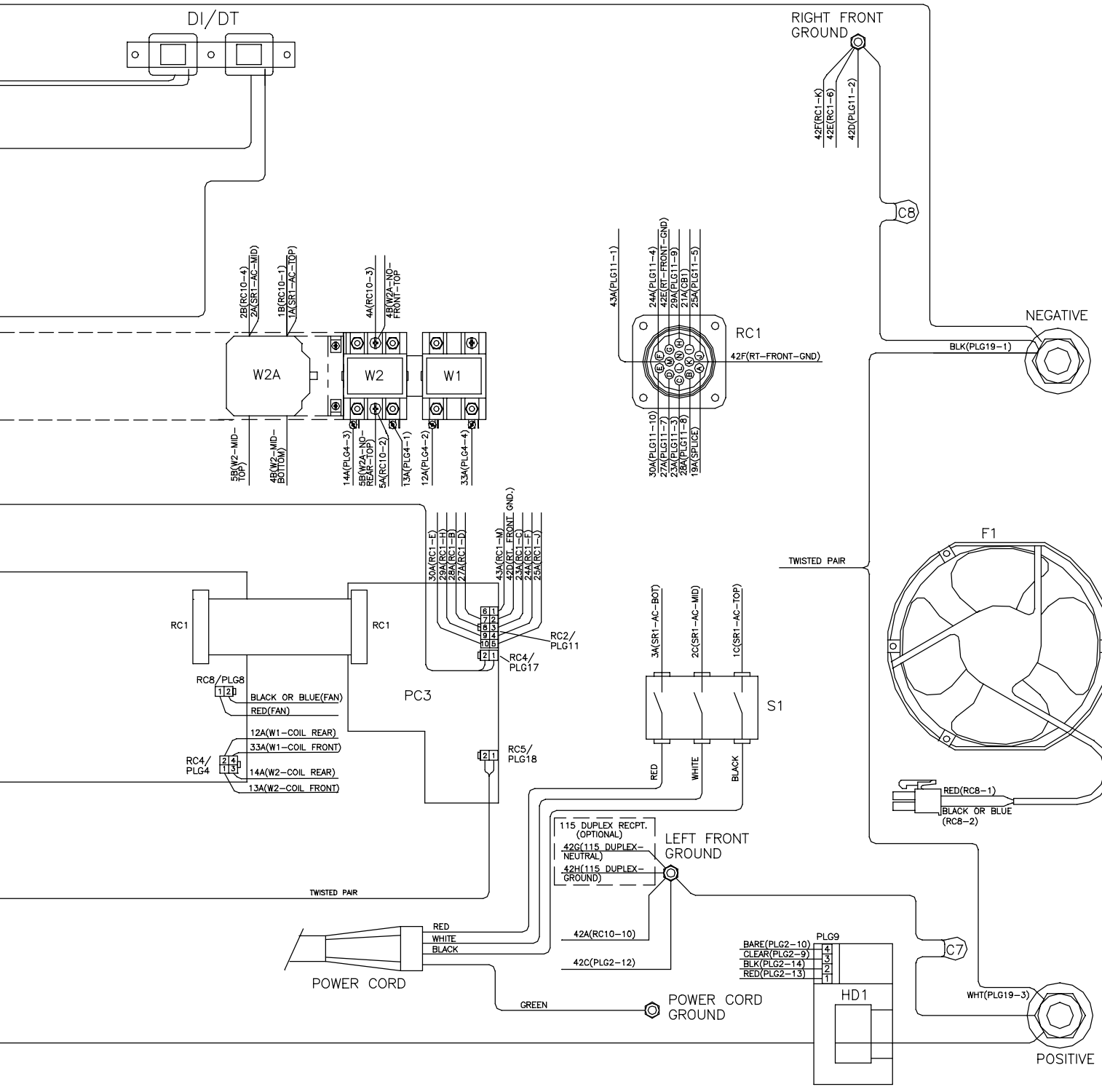


Figure 9-8. Diagram for XMT 304 (230/460 V) Eff. w/KK104771


DI/DT
RIGHT FRONT GROUND
42F(RC1-K)
42E(RC1-6)
42D(PLG11-2)
C8
NEGATIVE
BLK(PLG19-1)
2B(RC10-4)
2A(SR1-AC-MID)
1B(RC10-1)
1A(SR1-AC-TOP)
4A(RC10-3)
4B(W2A-NO-FRONT-TOP
W2A
W2
W1
43A(PLG11-1)
24A(PLG11-4)
42E(RT-FRONT-GND)
29A(PLG11-9)
21A(CB1)
25A(PLG11-5)
RC1
42F(RT-FRONT-GND)
30A(PLG11-10)
27A(PLG11-7)
23A(PLG11-3)
28A(PLG11-8)
19A(SPLICE)
5B(W2-MID-TOP)
4B(W2-MID-BOTTOM)
14A(PLG4-3)
5B(W2A-NO-REAR-TOP)
5A(RC10-2)
13A(PLG4-1)
12A(PLG4-2)
33A(PLG4-4)
30A(RC1-E)
29A(RC1-H)
28A(RC1-B)
27A(RC1-D)
43A(RC1-M)
42E(RT-FRONT GND.)
23A(RC1-F)
24A(RC1-J)
25A(RC1-J)
RC1
RC1
RC2/PLG11
RC4/PLG17
RC8/PLG8
BLACK OR BLUE(FAN)
RED(FAN)
PC3
12A(W1-COIL REAR)
33A(W1-COIL FRONT)
RC4/PLG4
14A(W2-COIL REAR)
13A(W2-COIL FRONT)
RC5/PLG18
3A(SR1-AC-BOT)
2C(SR1-AC-MID)
1C(SR1-AC-TOP)
S1
RED
WHITE
BLACK
TWISTED PAIR
F1
RED(RC8-1)
BLACK OR BLUE (RC8-2)
115 DUPLEX RECPT. (OPTIONAL)
42G(115 DUPLEX-NEUTRAL)
42H(115 DUPLEX-GROUND)
LEFT FRONT GROUND
TWISTED PAIR
RED
WHITE
BLACK
POWER CORD
42A(RC10-10)
42C(PLG2-12)
PLG9
BARE(PLG2-10)
CLEAR(PLG2-9)
BLK(PLG2-14)
RED(PLG2-13)
C7
HD1
GREEN
POWER CORD GROUND
WHT(PLG19-3)
POSITIVE

195 876

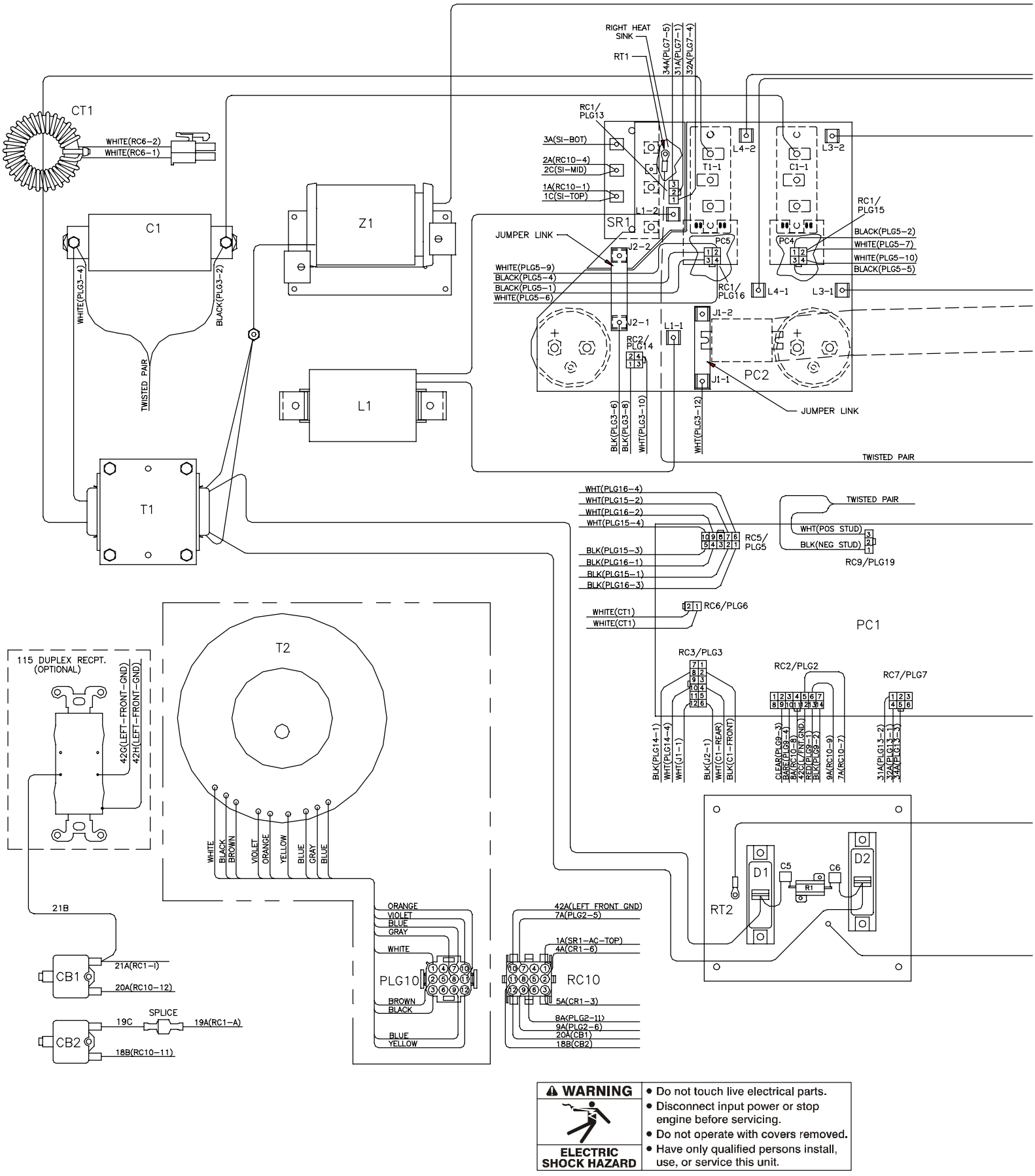
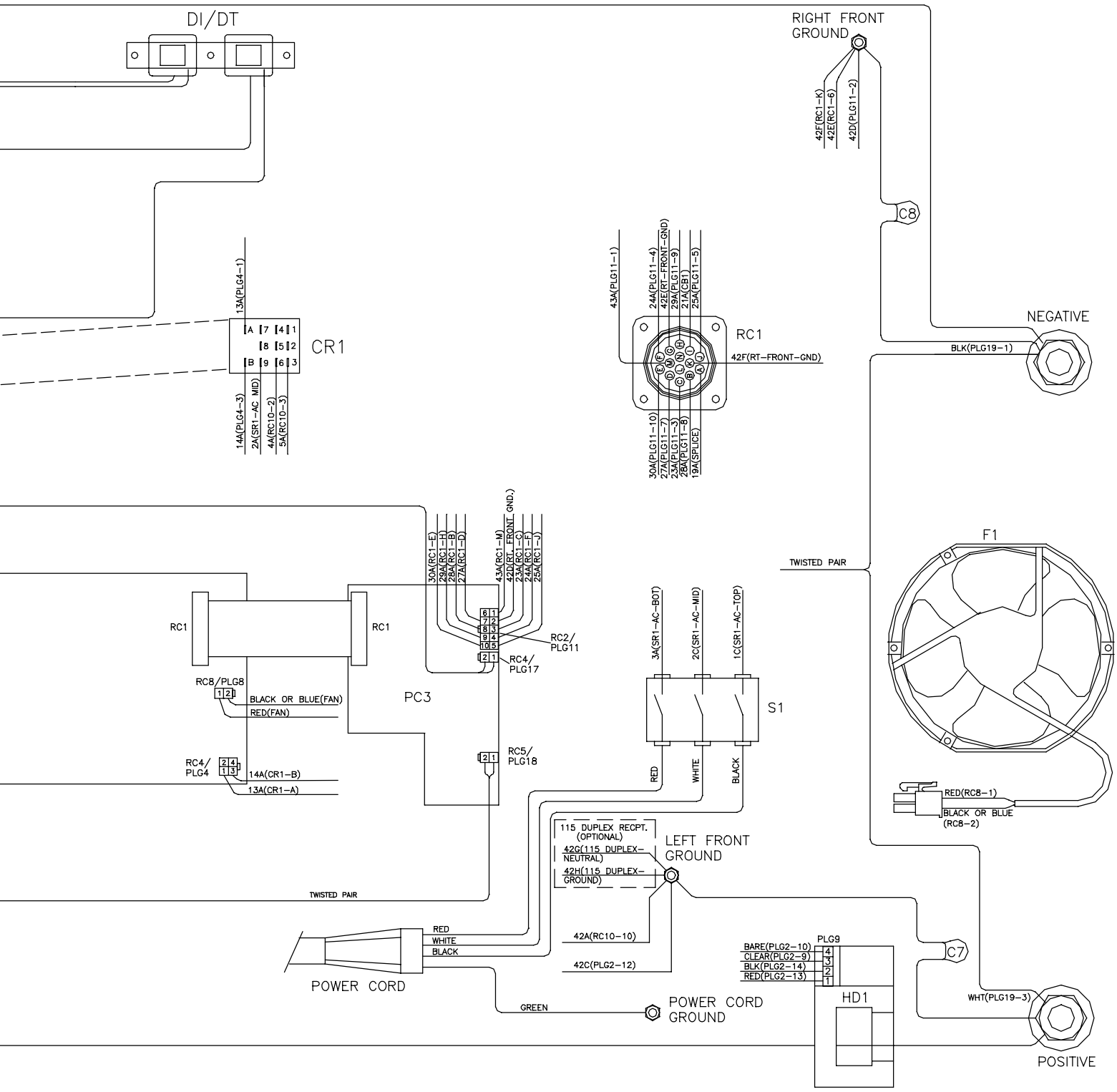
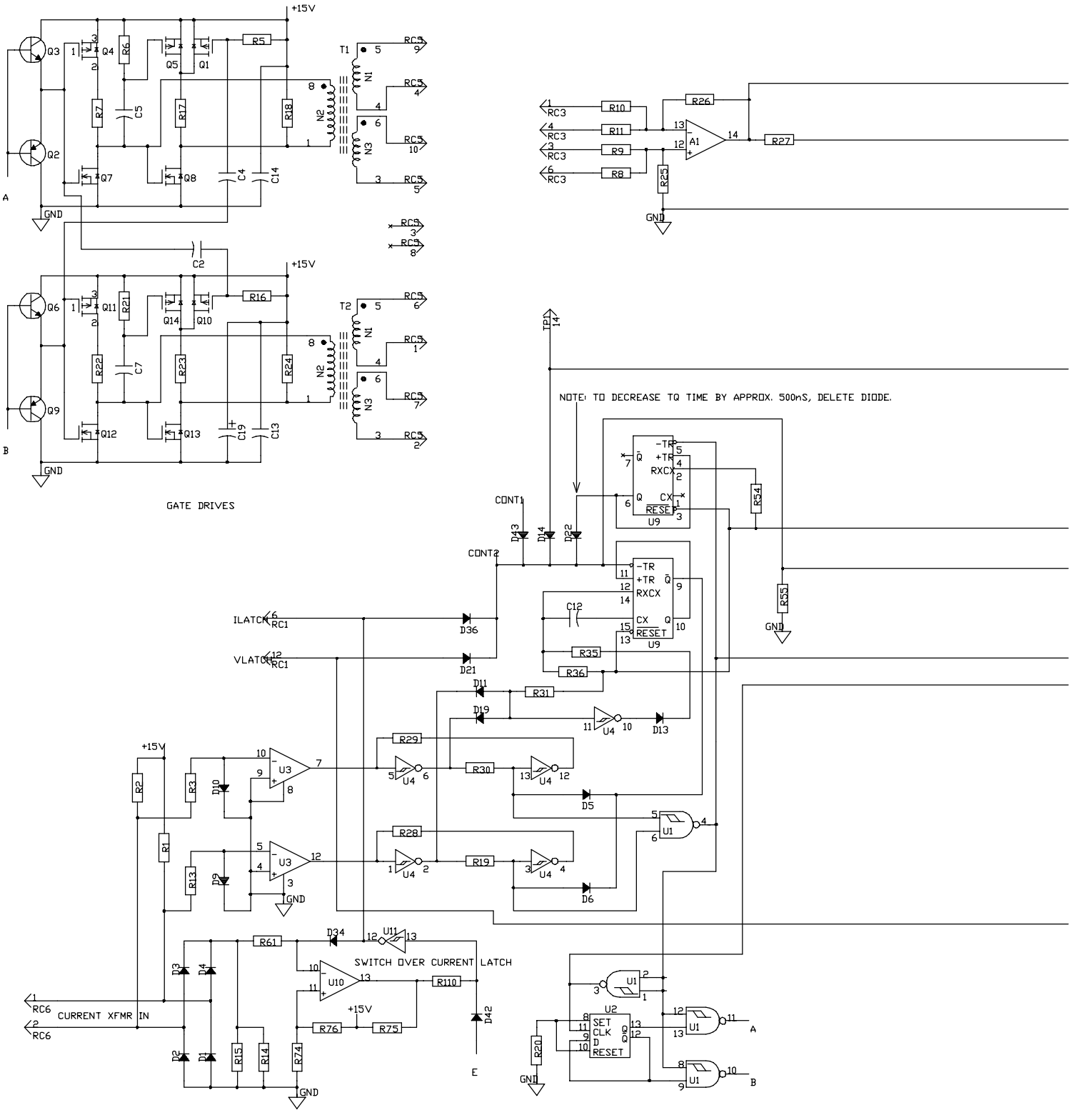


Figure 9-9. Diagram for XMT 304 (460/575 V) Eff. w/KK104770

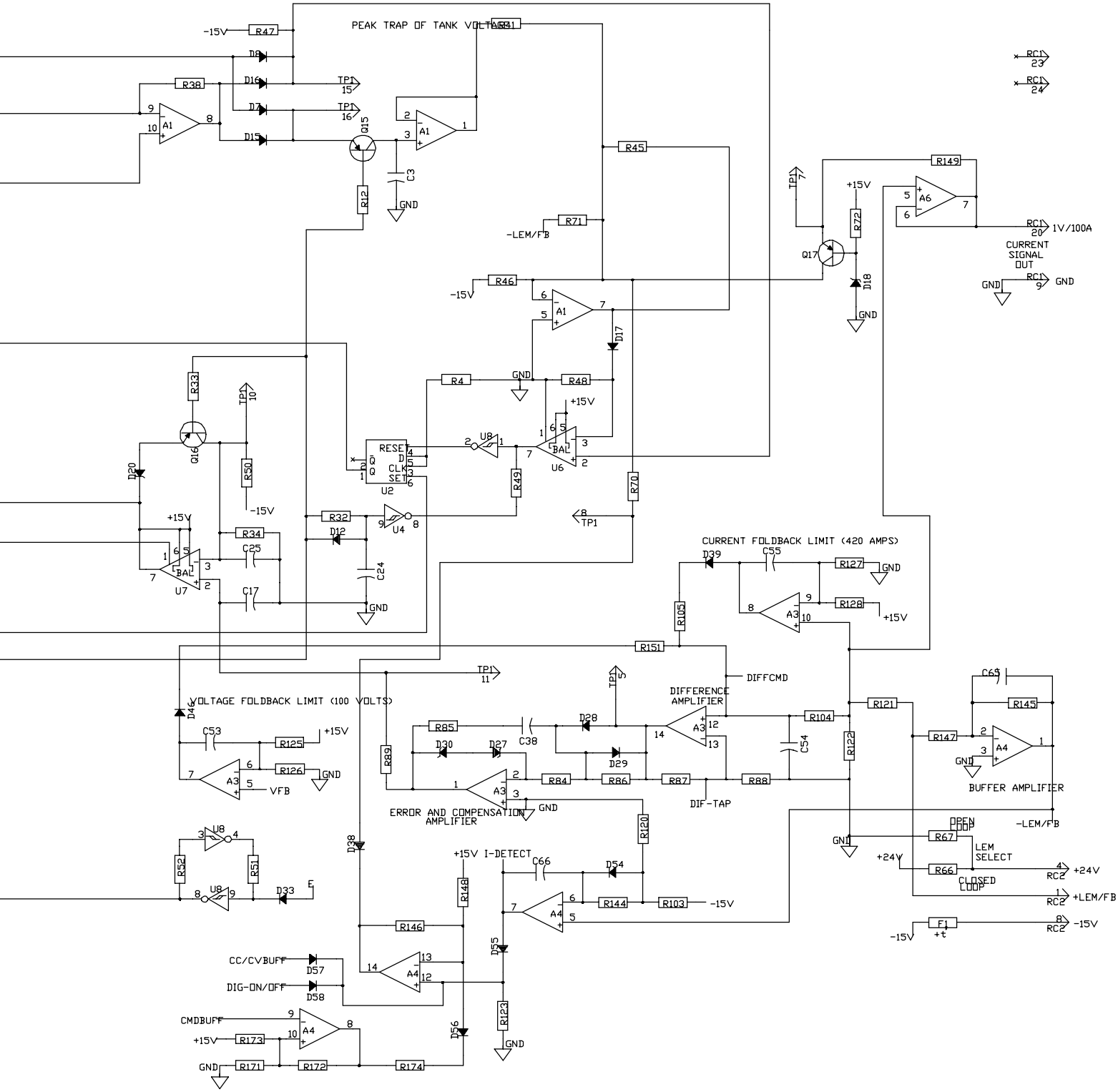

DI/DT
RIGHT FRONT GROUND
42F(RC1-K)
42E(RC1-6)
42D(PLG11-2)
C8
NEGATIVE
BLK(PLG19-1)
13A(PLG4-1)
CR1
14A(PLG4-3)
2A(SR1-AC MID)
4A(RC10-2)
5A(RC10-3)
43A(PLG11-1)
24A(PLG11-4)
42E(RT-FRONT-GND)
29A(PLG11-9)
21A(CB1)
25A(PLG11-5)
RC1
42F(RT-FRONT-GND)
30A(PLG11-10)
27A(PLG11-7)
23A(PLG11-3)
26A(PLG11-8)
19A(SPLICE)
30A(RC1-E)
29A(RC1-H)
28A(RC1-B)
27A(RC1-D)
43A(RC1-M)
42D(RT. FRONT GND.)
23A(RC1-C)
24A(RC1-F)
25A(RC1-J)
RC1
RC1
RC2/ PLG11
RC4/ PLG17
RC8/PLG8
BLACK OR BLUE(FAN)
RED(FAN)
PC3
RC4/ PLG4
14A(CR1-B)
13A(CR1-A)
RC5/ PLG18
3A(SR1-AC-BOT)
2C(SR1-AC-MID)
1C(SR1-AC-TOP)
S1
RED
WHITE
BLACK
F1
TWISTED PAIR
RED(RC8-1)
BLACK OR BLUE (RC8-2)
115 DUPLEX RECPT. (OPTIONAL)
42G(115 DUPLEX-NEUTRAL)
42H(115 DUPLEX-GROUND)
LEFT FRONT GROUND
TWISTED PAIR
RED
WHITE
BLACK
POWER CORD
42A(RC10-10)
42C(PLG2-12)
PLG9
BARE(PLG2-10)
CLEAR(PLG2-9)
BLK(PLG2-14)
RED(PLG2-13)
C7
HD1
WHT(PLG19-3)
GREEN
POWER CORD GROUND
POSITIVE

195 877

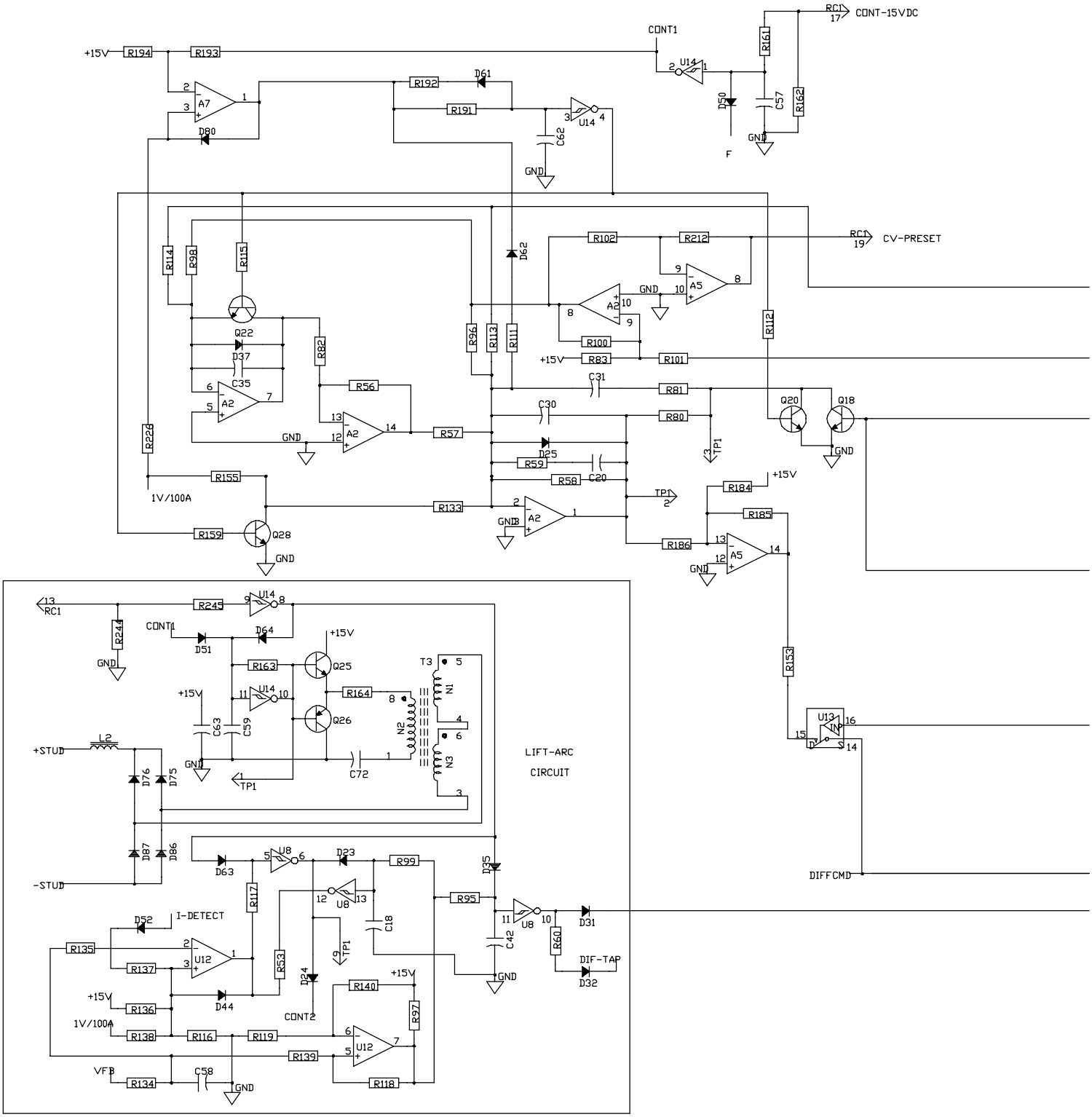


⚠ WARNING	• Do not touch live electrical parts. • Disconnect input power or stop engine before servicing. • Do not operate with covers removed. • Have only qualified persons install, use, or service this unit.
ELECTRIC SHOCK HAZARD	

Figure 9-10. Circuit for PC1 (230/460 V) Eff. w/KH526181 (CC) or KH523149 (CC/CV) Thru KK104770 (Part 1 of 3)

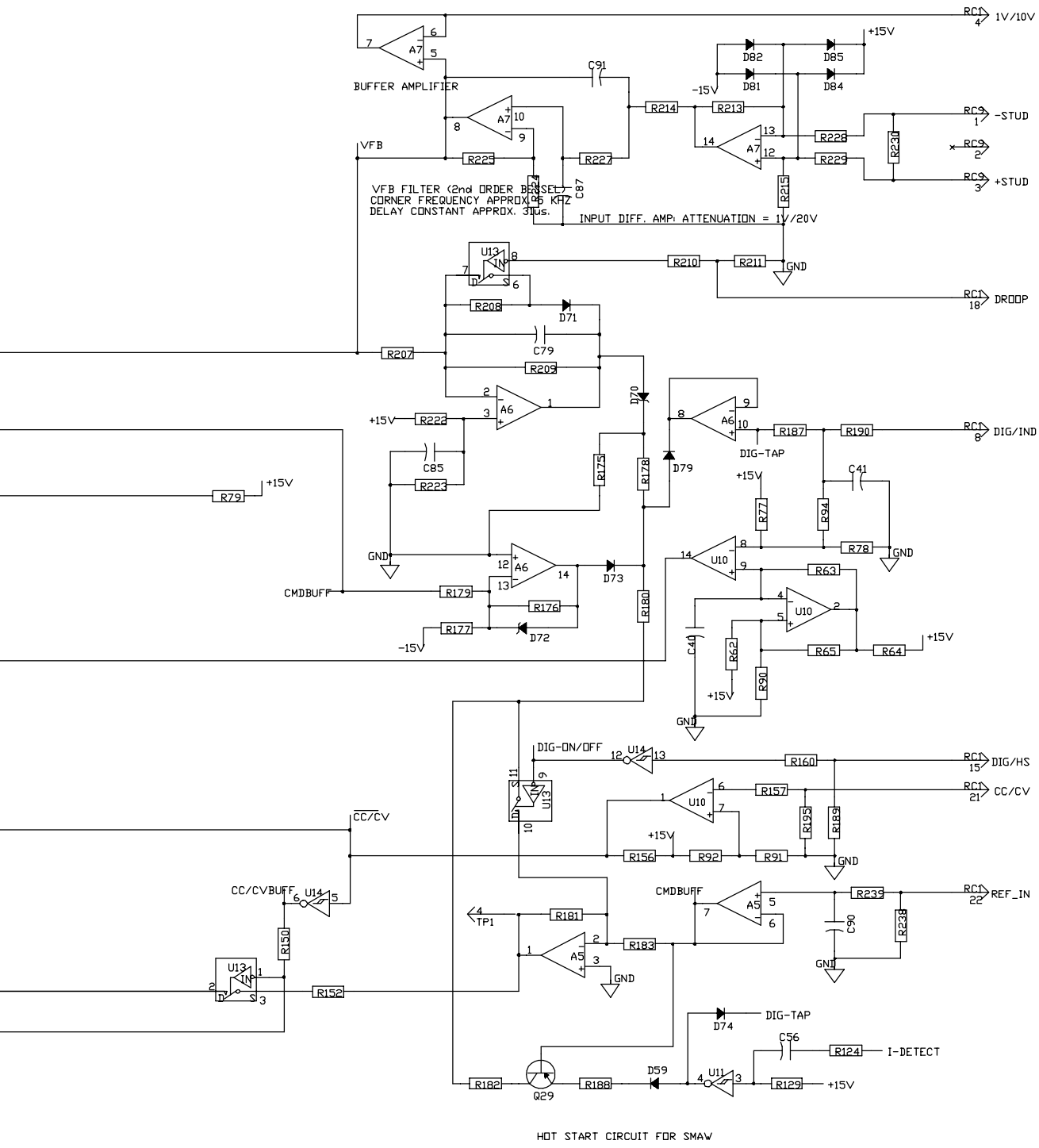


185 507-A (1 of 3)



⚠ WARNING	• Do not touch live electrical parts. • Disconnect input power or stop engine before servicing. • Do not operate with covers removed. • Have only qualified persons install, use, or service this unit.
ELECTRIC SHOCK HAZARD	

Figure 9-11. Circuit for PC1 (230/460 V) Eff. w/KH526181 (CC) or KH523149 (CC/CV) Thru KK104770 (Part 2 of 3)



185 507-A (2 of 3)

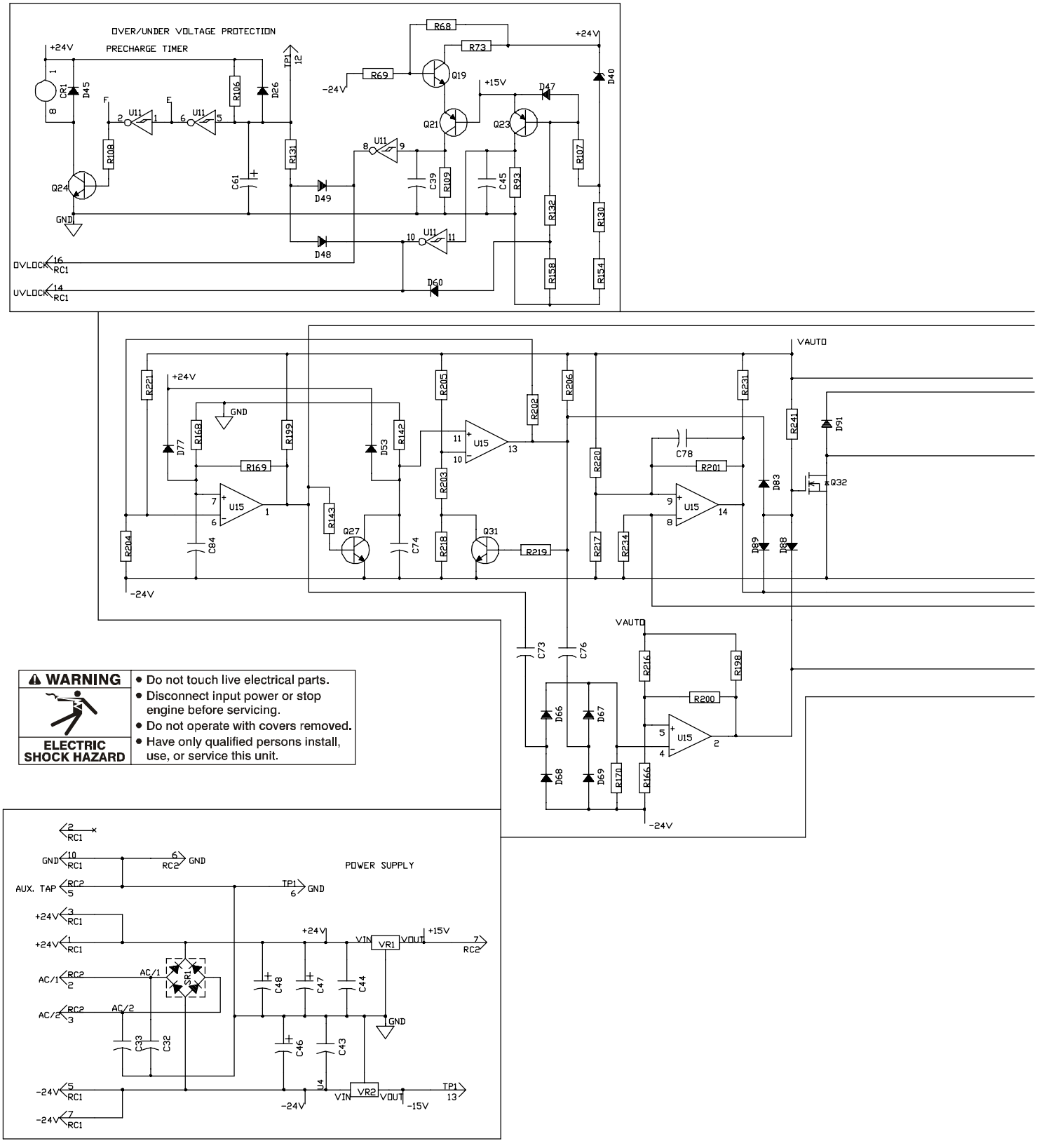
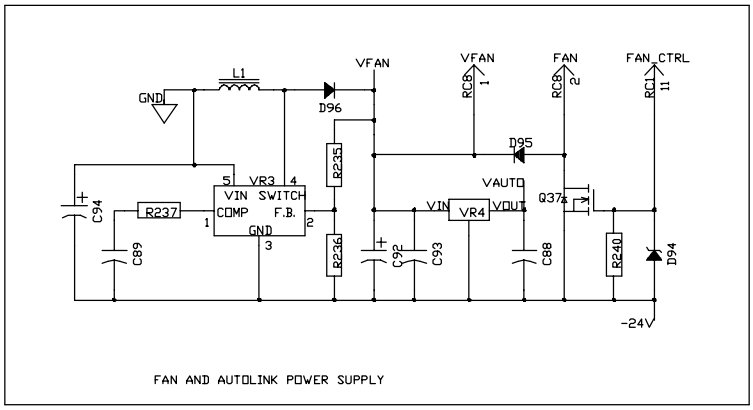
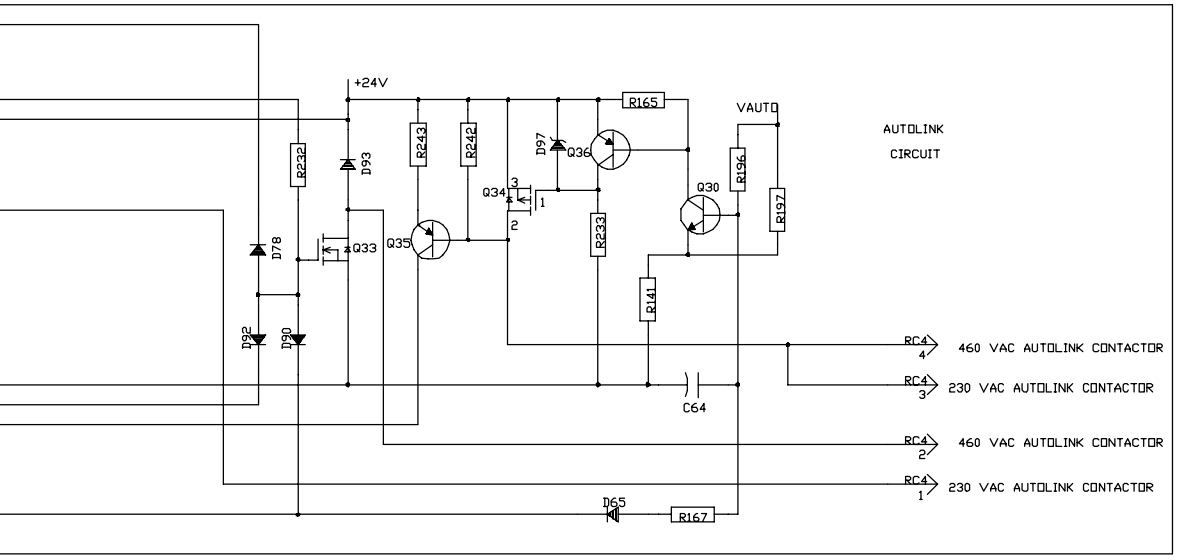


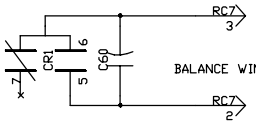
Figure 9-12. Circuit for PC1 (230/460 V) Eff. w/KH526181 (CC) or KH523149 (CC/CV) Thru KK104770 (Part 3 of 3)

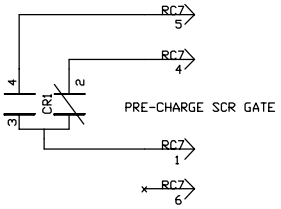


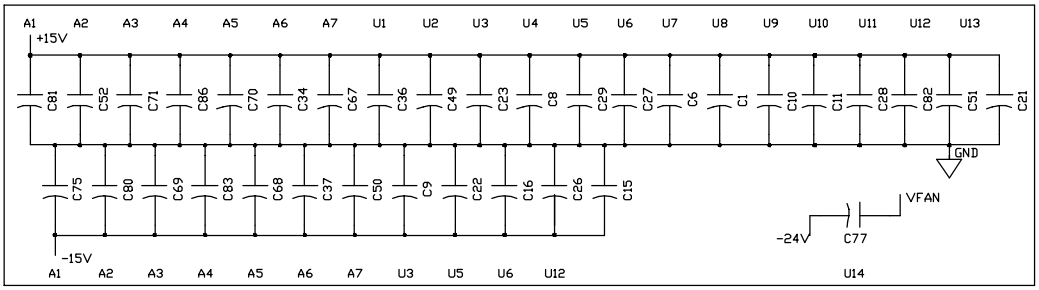
FAN AND AUTOLINK POWER SUPPLY

POWER/GROUND NETS FOR CHIPS	
U1	7=GND,14=+15V
U2	7=GND,14=+15V
U3	6=-15V,11=+15V
U4	7=GND,14=+15V
U5	4=-15V,5=GND,12=+15V,13=+15V
U6	4=-15V,8=+15V
U7	4=-15V,8=+15V
U8	7=GND,14=+15V
U9	8=GND,16=+15V
U10	12=GND,3=+15V
U11	7=GND,14=+15V
U12	4=GND,8=+15V
U13	4=-15V,5=GND,12=+15V,13=+15V
U14	7=GND,14=+15V
U15	12=-24V,3=VFAN
A1	4=+15V,11=-15V
A2	4=+15V,11=-15V
A3	4=+15V,11=-15V
A4	4=+15V,11=-15V
A5	4=+15V,11=-15V
A6	4=+15V,11=-15V
A7	4=+15V,11=-15V









BYPASS CAPS

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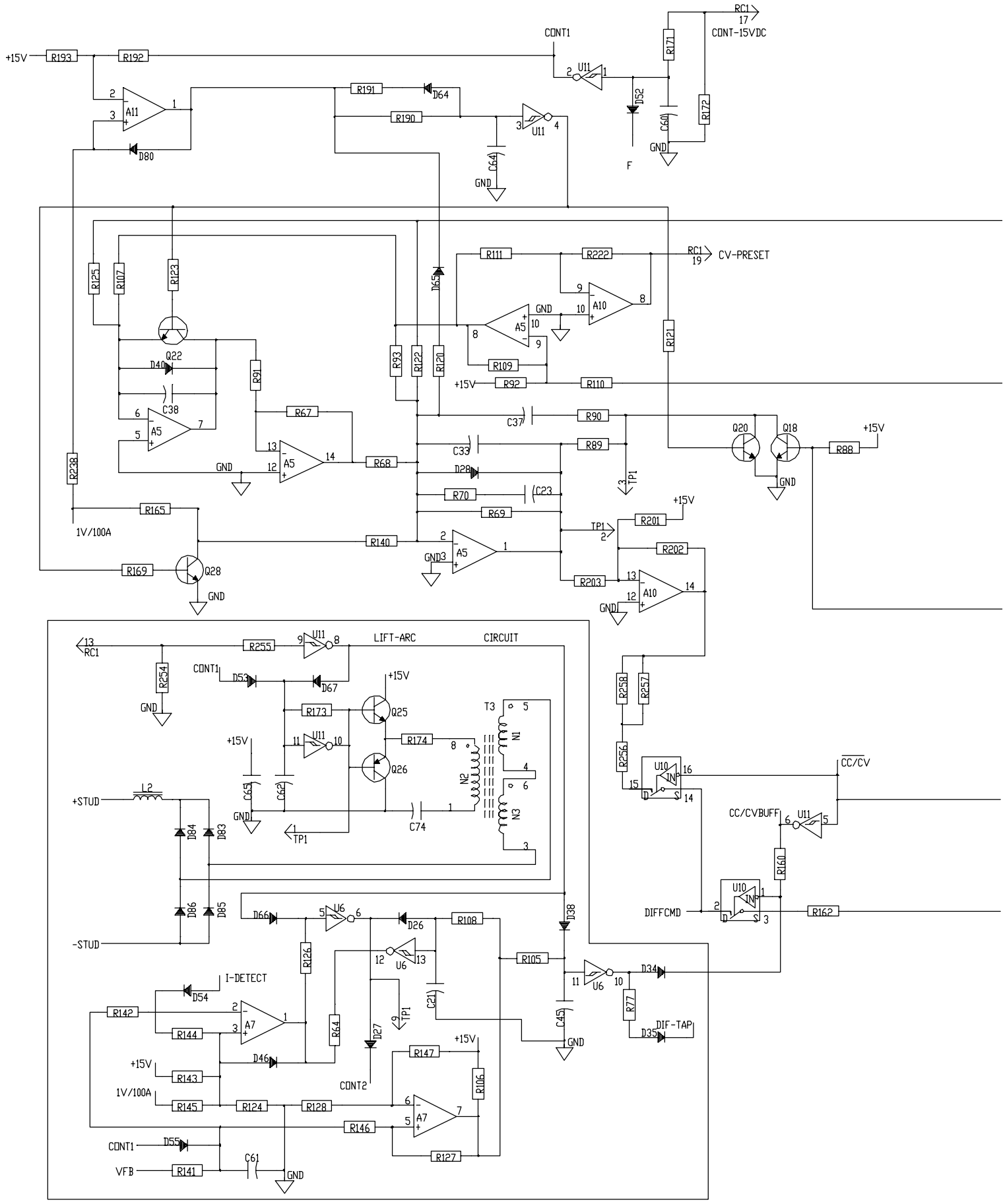
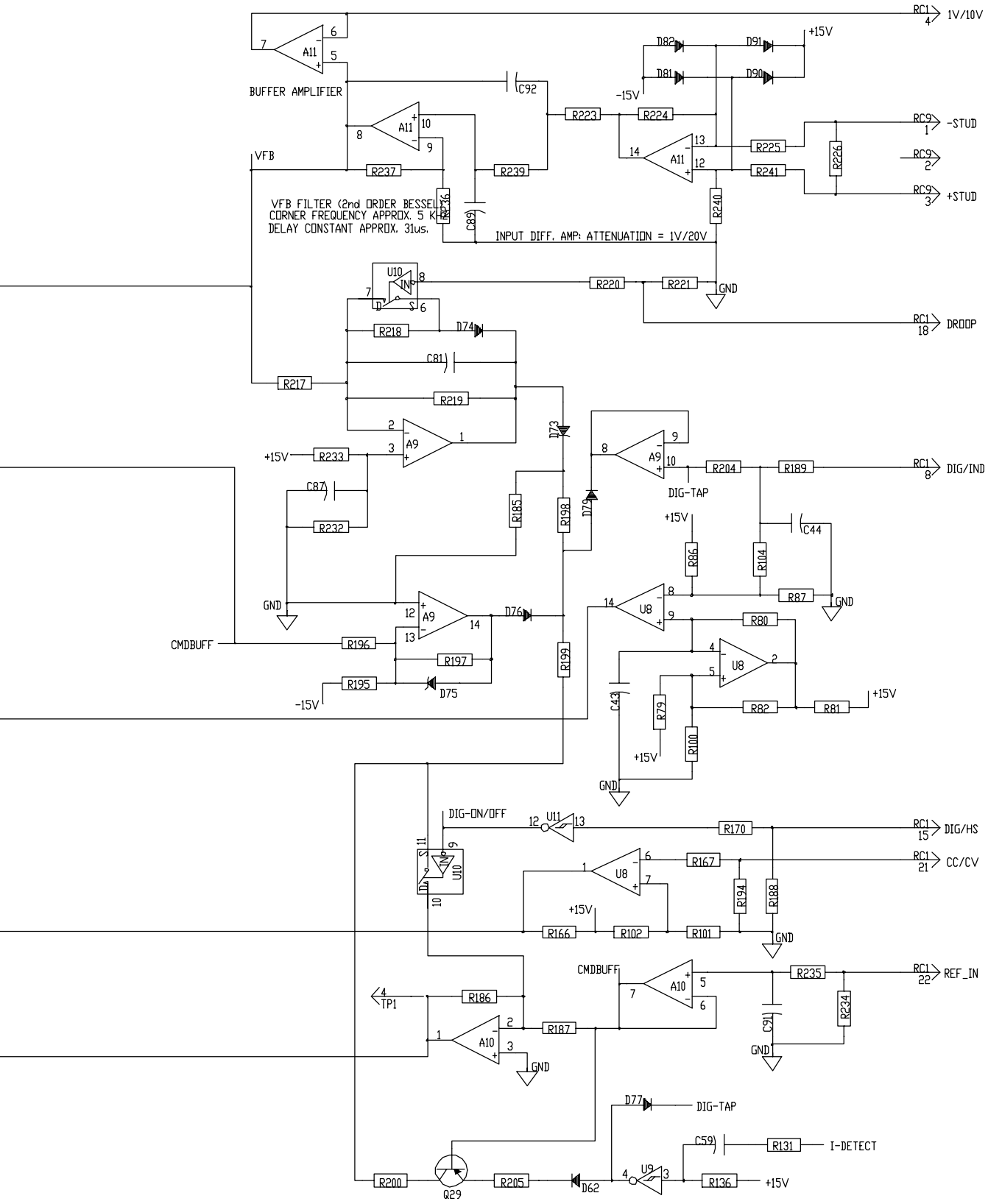


Figure 9-13. Circuit for PC1 (230/460 V) Eff. w/KK104771 (Part 1 of 3)



⚠ WARNING	• Do not touch live electrical parts. • Disconnect input power or stop engine before servicing. • Do not operate with covers removed. • Have only qualified persons install, use, or service this unit.
ELECTRIC SHOCK HAZARD	

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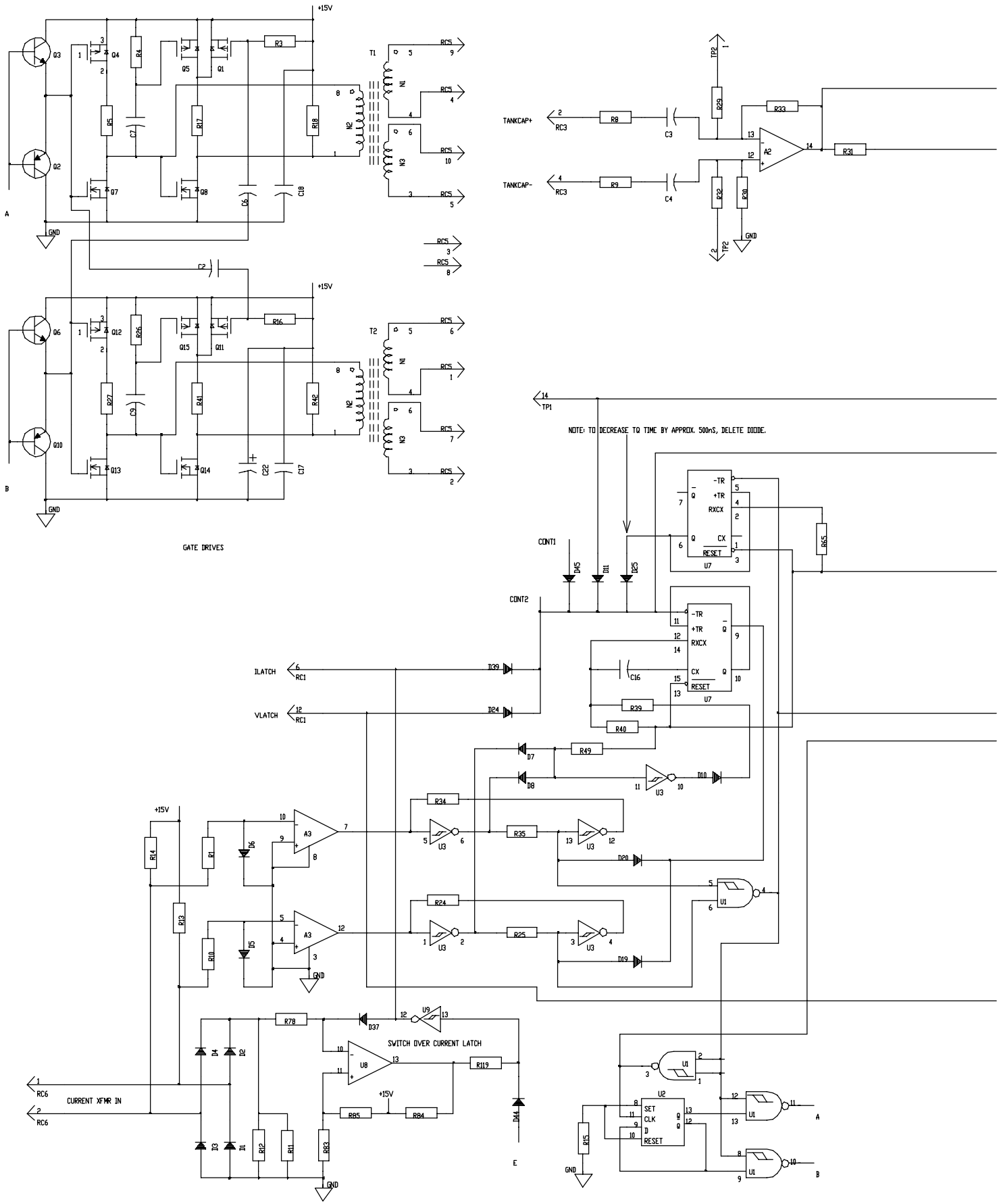
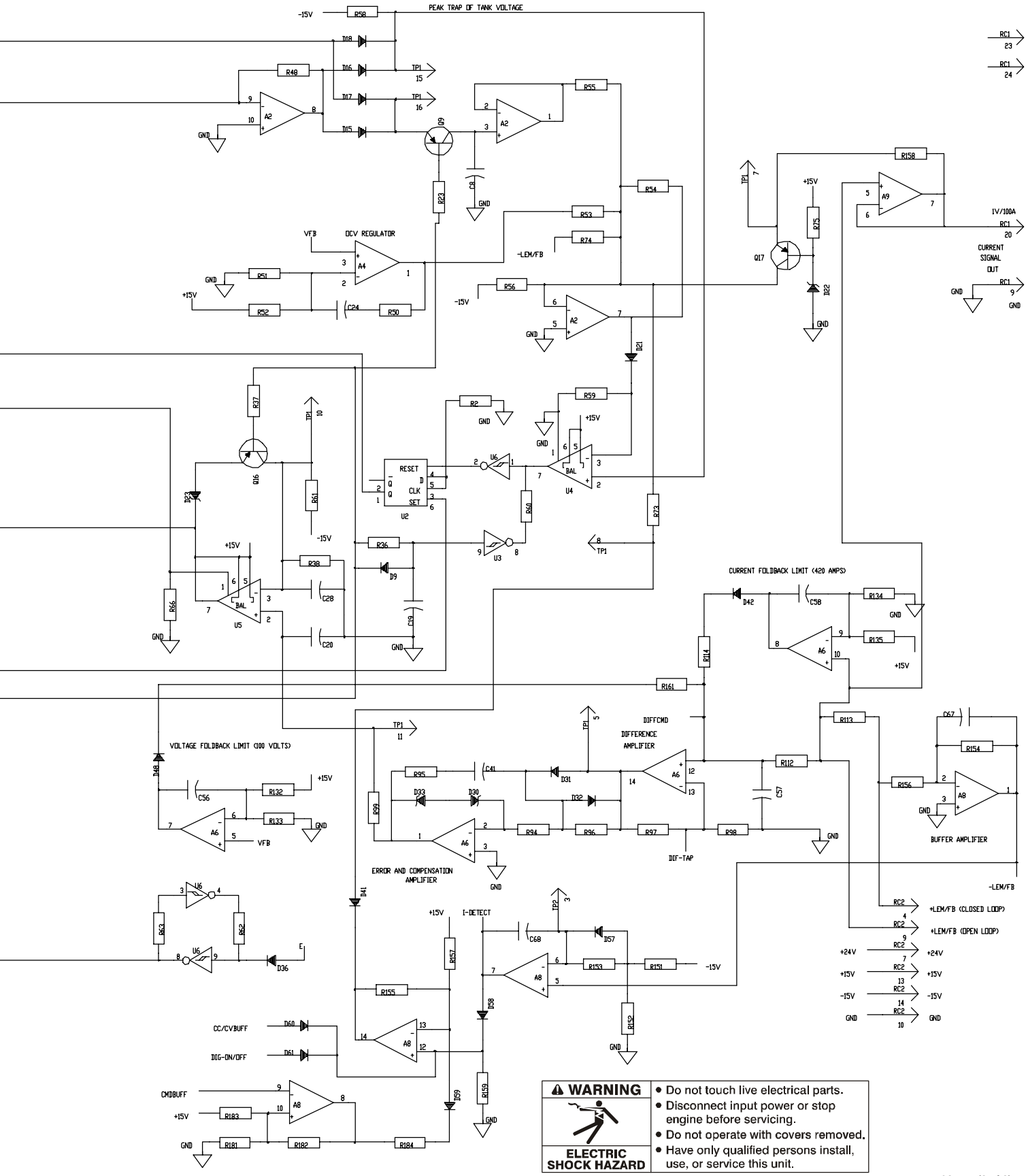


Figure 9-14. Circuit for PC1 (230/460 V) Eff. w/KK104771 (Part 2 of 3)


PEAK TRAP OF TANK VOLTAGE
OCV REGULATOR
VFB
-LEM/FB
CURRENT FOLDBACK LIMIT (420 AMPS)
VOLTAGE FOLDBACK LIMIT (100 VOLTS)
DIFFERENCE AMPLIFIER
DIFFCMD
DIF-TAP
ERROR AND COMPENSATION AMPLIFIER
BUFFER AMPLIFIER
I-DETECT
CC/CVBUFF
DIG-ON/OFF
CMDBUFF
1V/100A
CURRENT SIGNAL OUT
+LEM/FB (CLOSED LOOP)
+LEM/FB (OPEN LOOP)
+24V
+15V
-15V
GND
RESET
CLK
SET
BAL
WARNING
ELECTRIC SHOCK HAZARD
• Do not touch live electrical parts.
• Disconnect input power or stop engine before servicing.
• Do not operate with covers removed.
• Have only qualified persons install, use, or service this unit.

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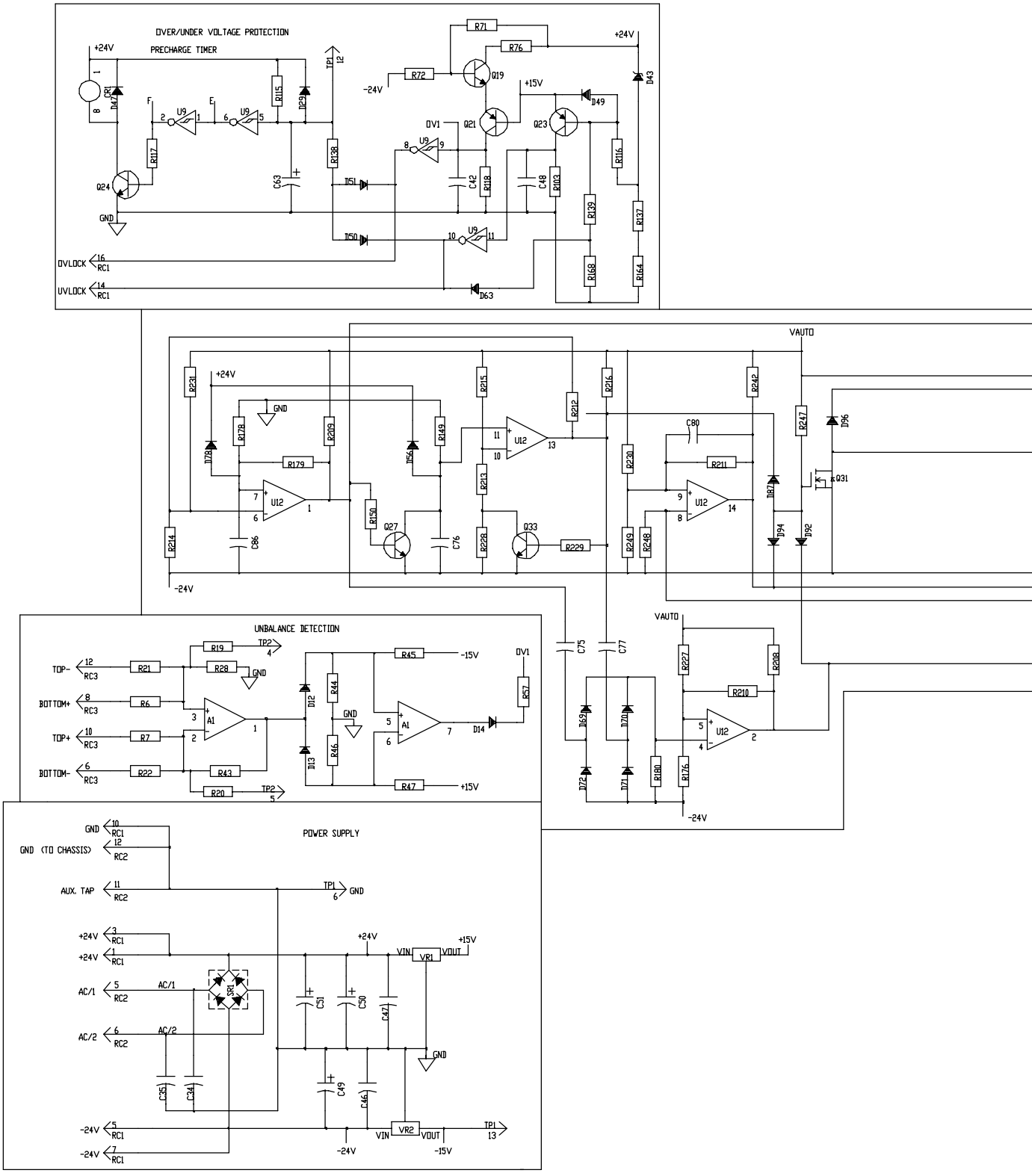


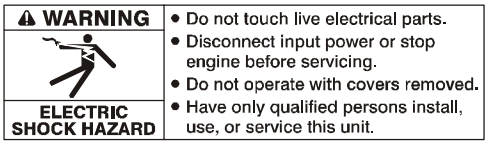
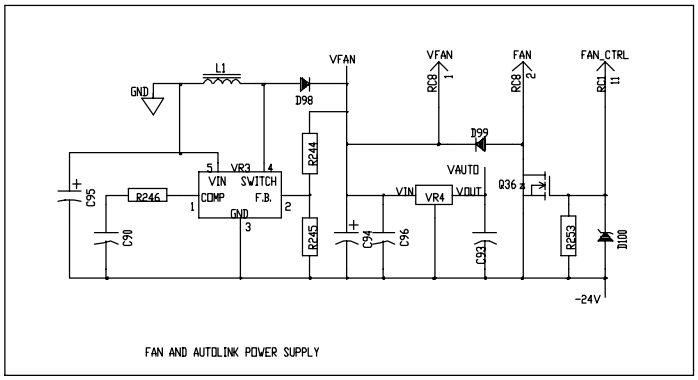
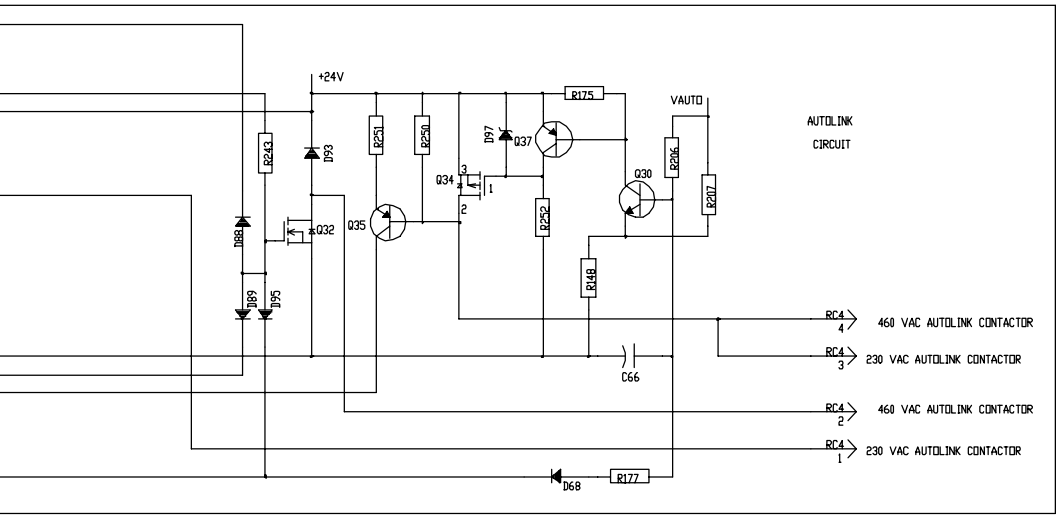


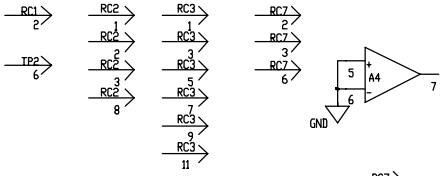
Figure 9-15. Circuit for PC1 (230/460 V) Eff. w/KK104771 (Part 3 of 3)

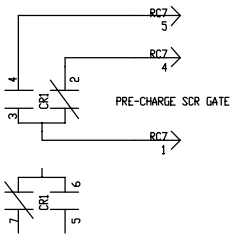


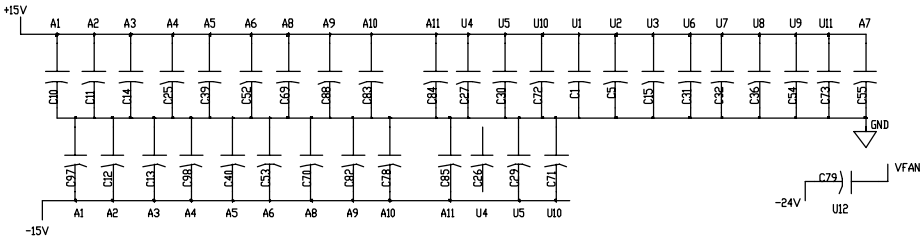
FAN AND AUTOLINK POWER SUPPLY

POWER/GROUND NETS FOR CHIPS	
U1	7=GND,14=+15V
U2	7=GND,14=+15V
U3	7=GND,14=+15V
U4	4=-15V,8=+15V
U5	4=-15V,8=+15V
U6	7=GND,14=+15V
U7	8=GND,16=+15V
U8	12=GND,3=+15V
U9	7=GND,14=+15V
U10	4=-15V,5=GND,12=+15V,13=+15V
U11	7=GND,14=+15V
U12	12=-24V,3=VFAN
U13	7=GND,14=+15V
A1	4=-15V,8=+15V
A2	4=+15V,11=-15V
A3	6=-15V,11=+15V
A4	4=-15V,8=+15V
A5	4=+15V,11=-15V
A6	4=+15V,11=-15V
A7	4=GND,8=+15V
A8	4=+15V,11=-15V
A9	4=+15V,11=-15V
A10	4=+15V,11=-15V
A11	4=+15V,11=-15V
A12	









BYPASS CAPS

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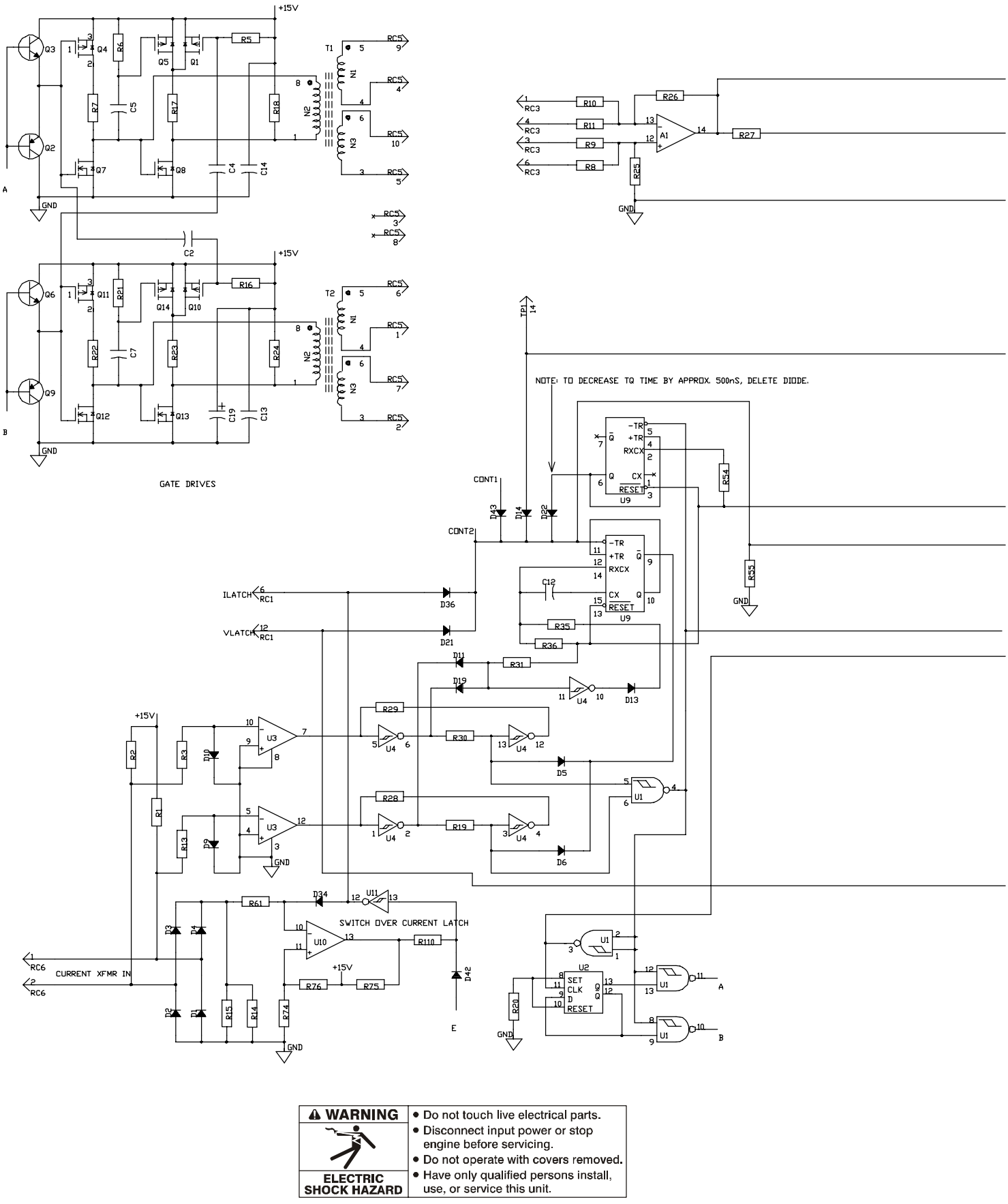
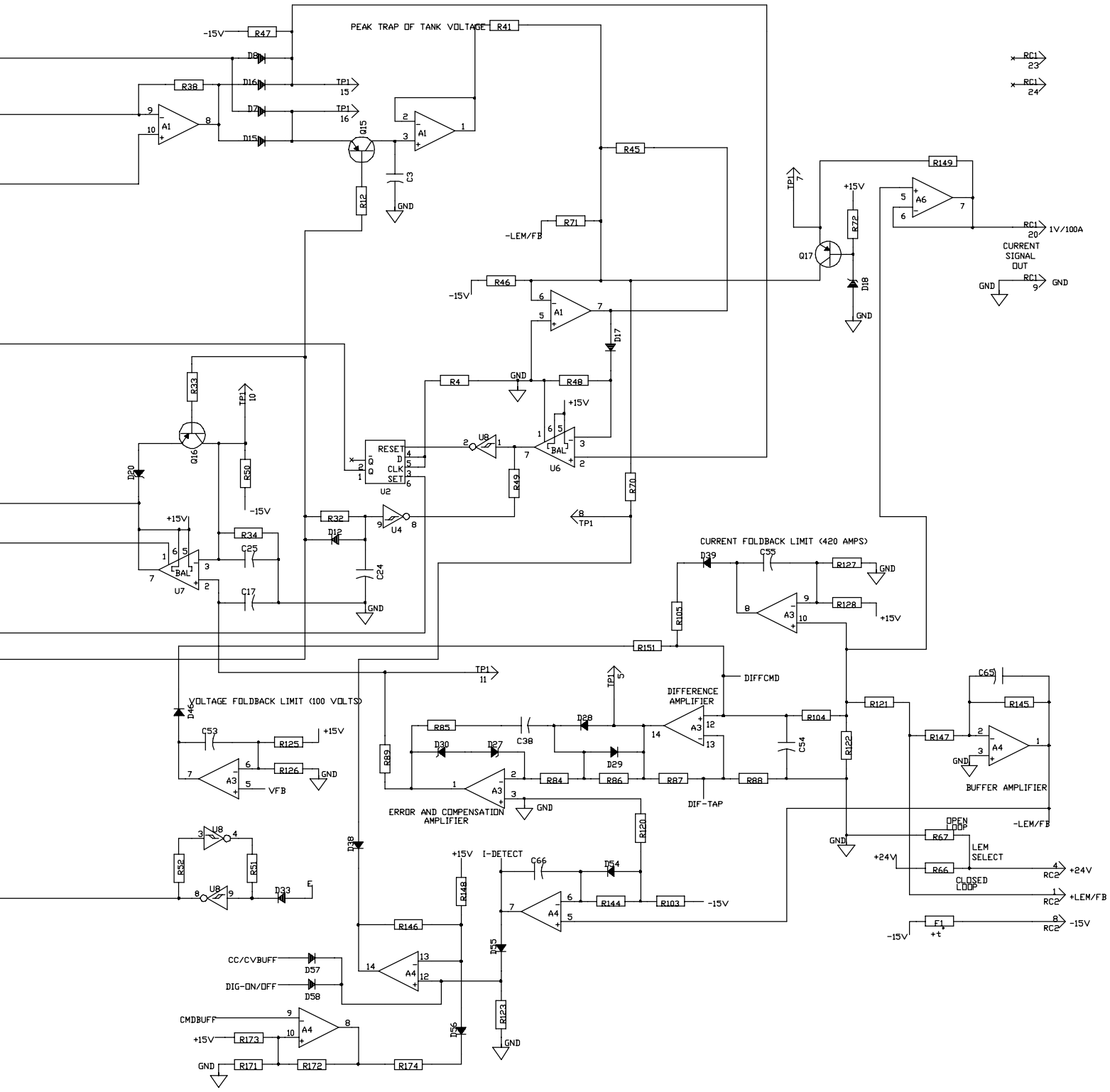


Figure 9-16. Circuit for PC1 (460/575 V) Eff. w/KH499631 Thru KK104770 (Part 1 of 3)



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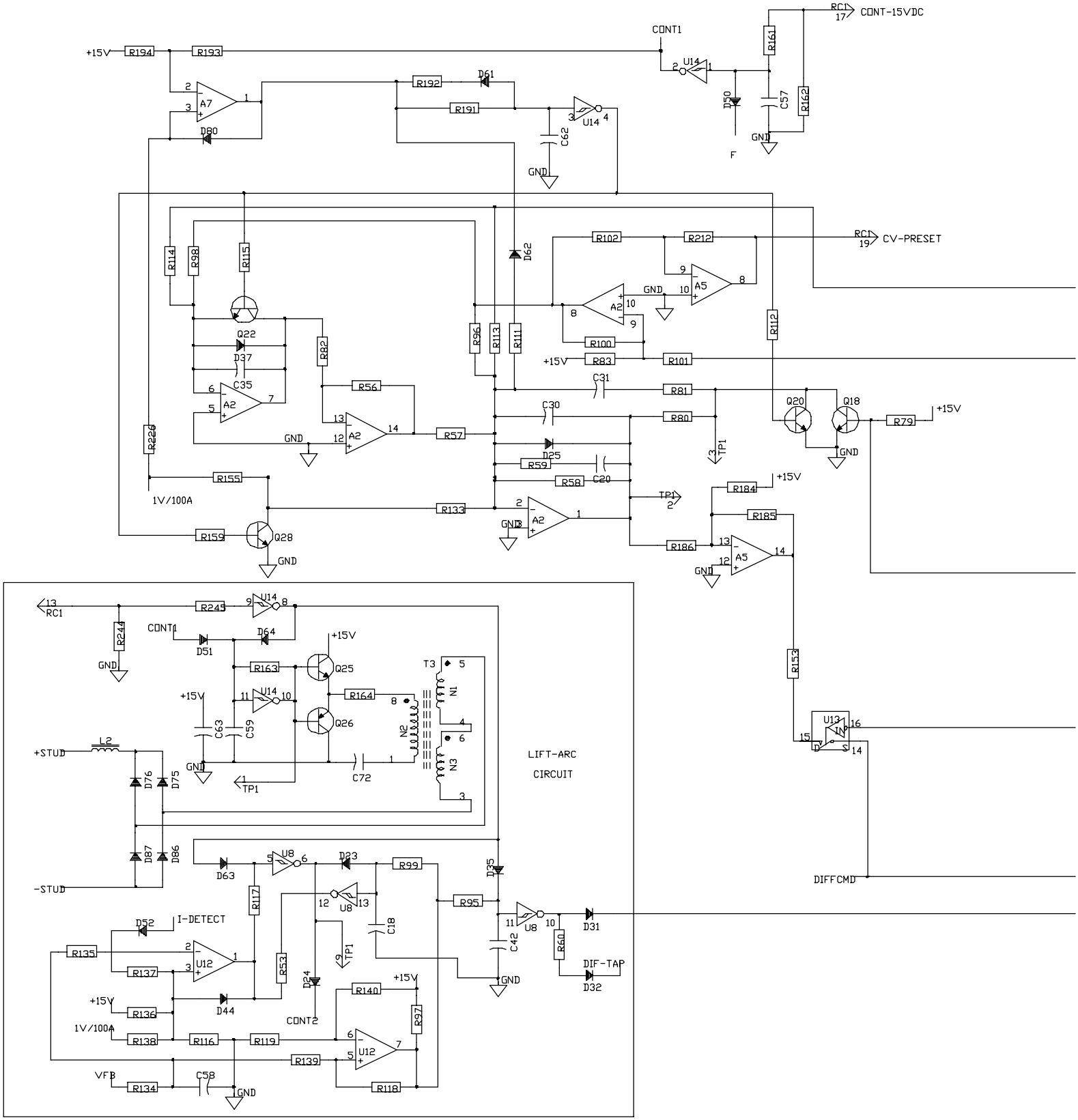
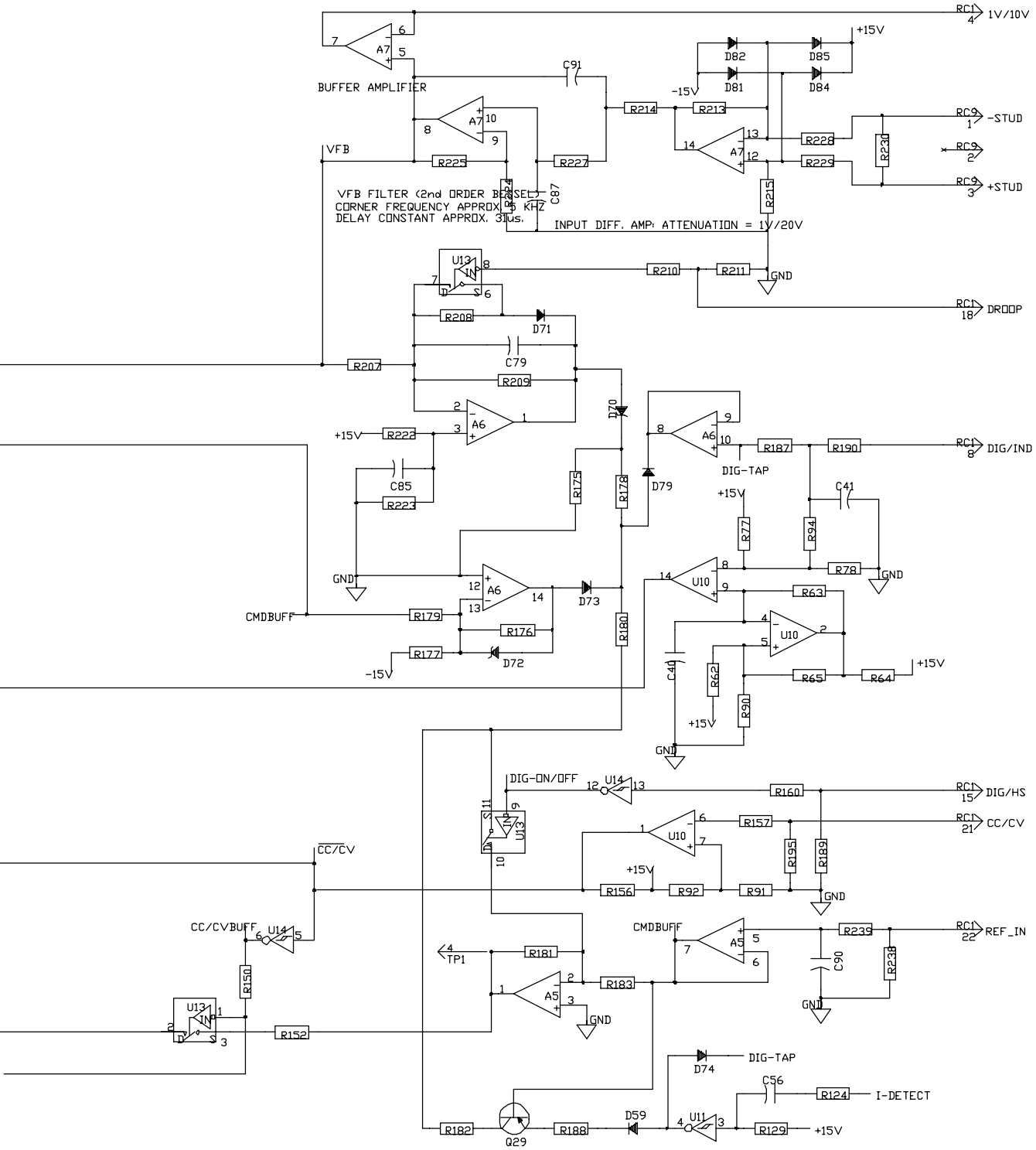


Figure 9-17. Circuit for PC1 (460/575 V) Eff. w/KH499631 Thru KK104770 (Part 2 of 3)



HOT START CIRCUIT FOR SMAW

⚠ WARNING	• Do not touch live electrical parts. • Disconnect input power or stop engine before servicing. • Do not operate with covers removed. • Have only qualified persons install, use, or service this unit.
ELECTRIC SHOCK HAZARD	

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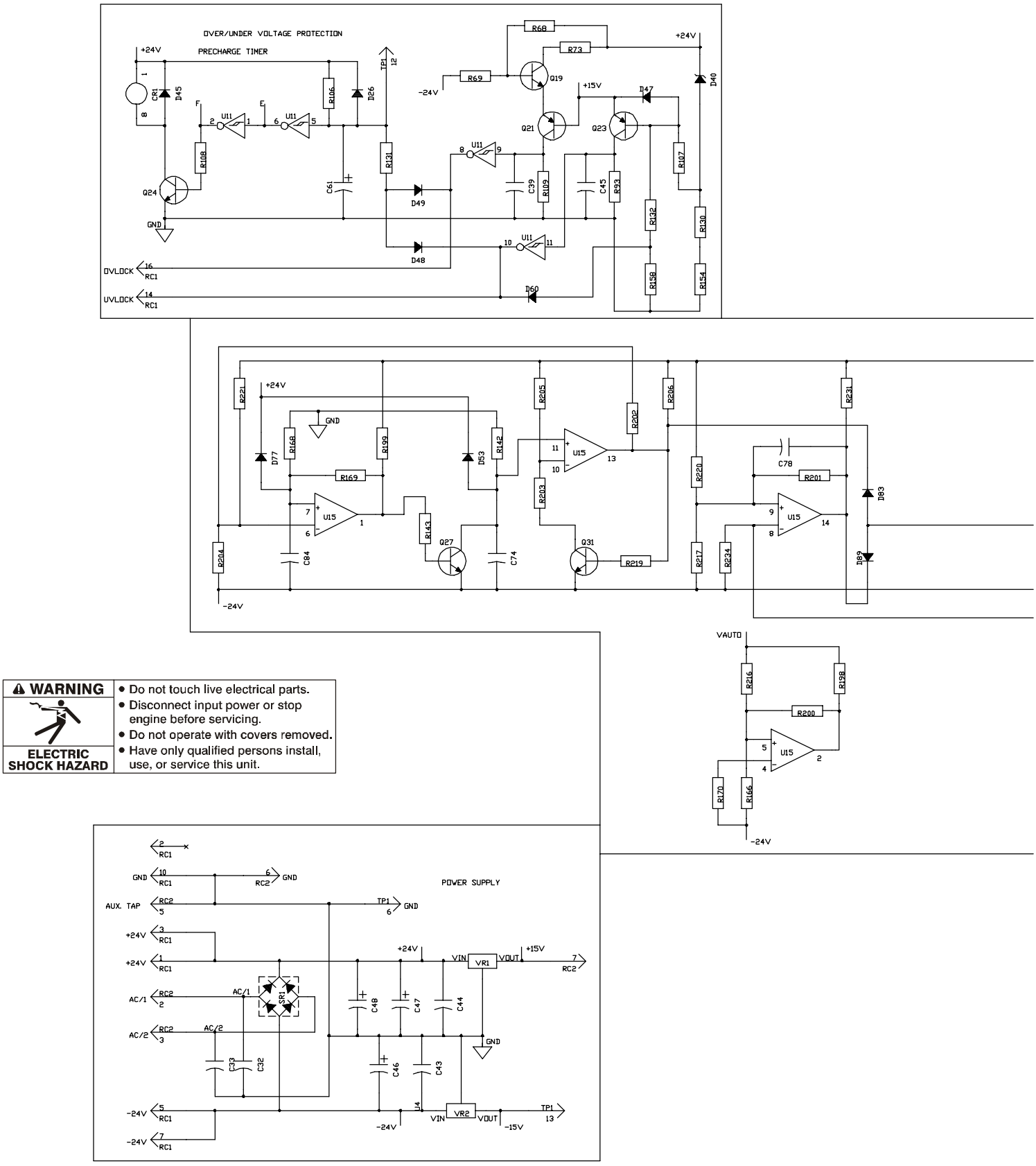
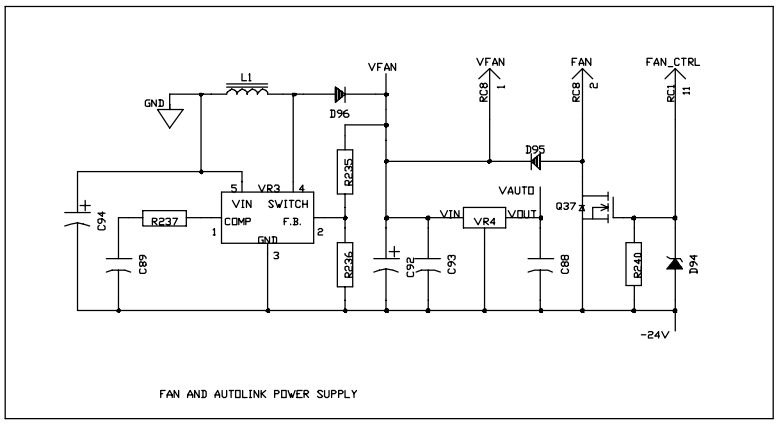
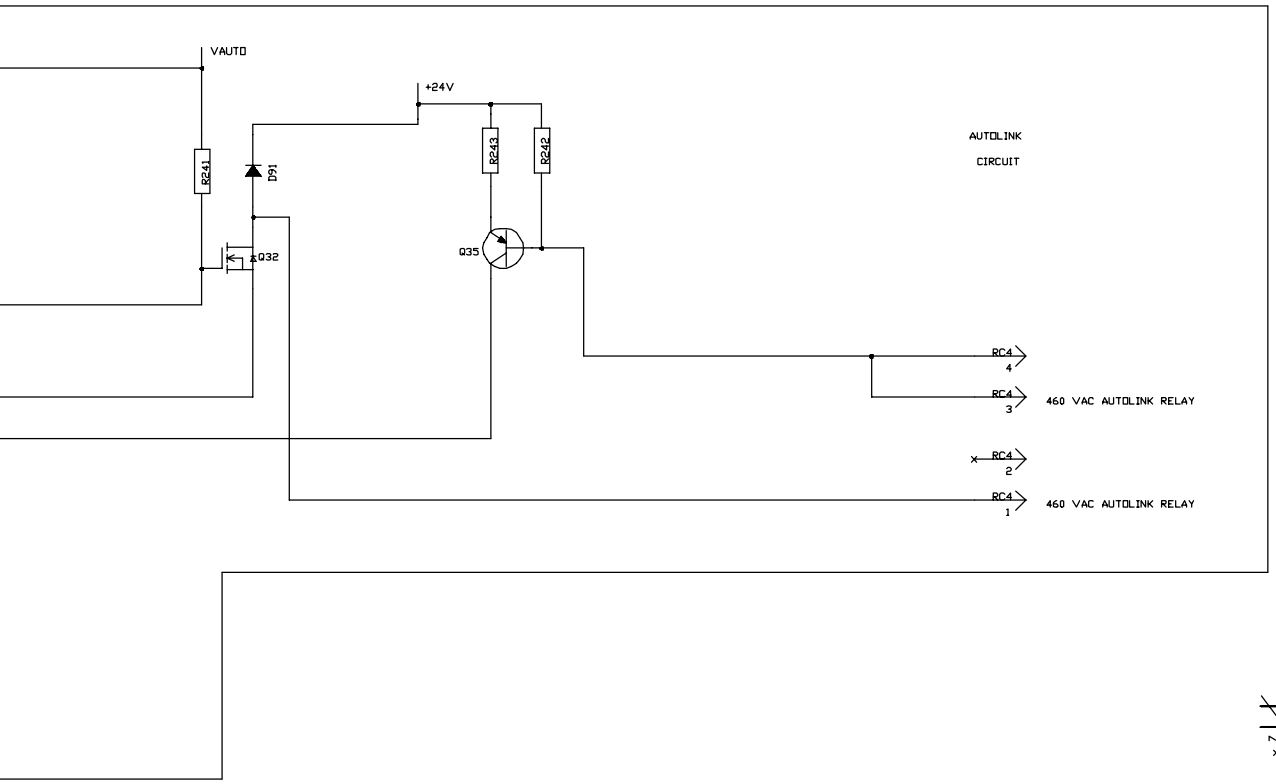
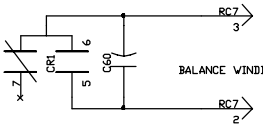


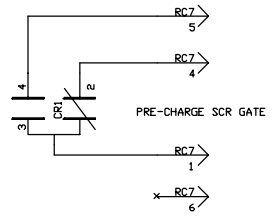
Figure 9-18. Circuit for PC1 (460/575 V) Eff. w/KH499631 Thru KK104770 (Part 3 of 3)

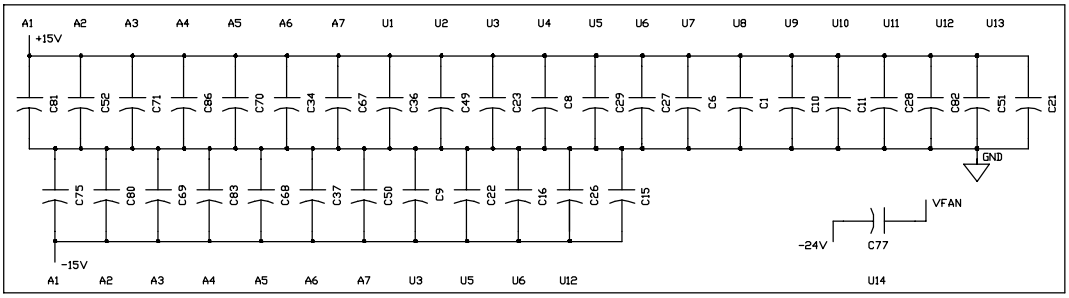
POWER/GROUND NETS FOR CHIPS	
U1	7=GND,14=+15V
U2	7=GND,14=+15V
U3	6=-15V,11=+15V
U4	7=GND,14=+15V
U5	4=-15V,5=GND,12=+15V,13=+15V
U6	4=-15V,8=+15V
U7	4=-15V,8=+15V
U8	7=GND,14=+15V
U9	8=GND,16=+15V
U10	12=GND,3=+15V
U11	7=GND,14=+15V
U12	4=GND,8=+15V
U13	4=-15V,5=GND,12=+15V,13=+15V
U14	7=GND,14=+15V
U15	12=-24V,3=VFAN
A1	4=+15V,11=-15V
A2	4=+15V,11=-15V
A3	4=+15V,11=-15V
A4	4=+15V,11=-15V
A5	4=+15V,11=-15V
A6	4=+15V,11=-15V
A7	4=+15V,11=-15V











BYPASS CAPS

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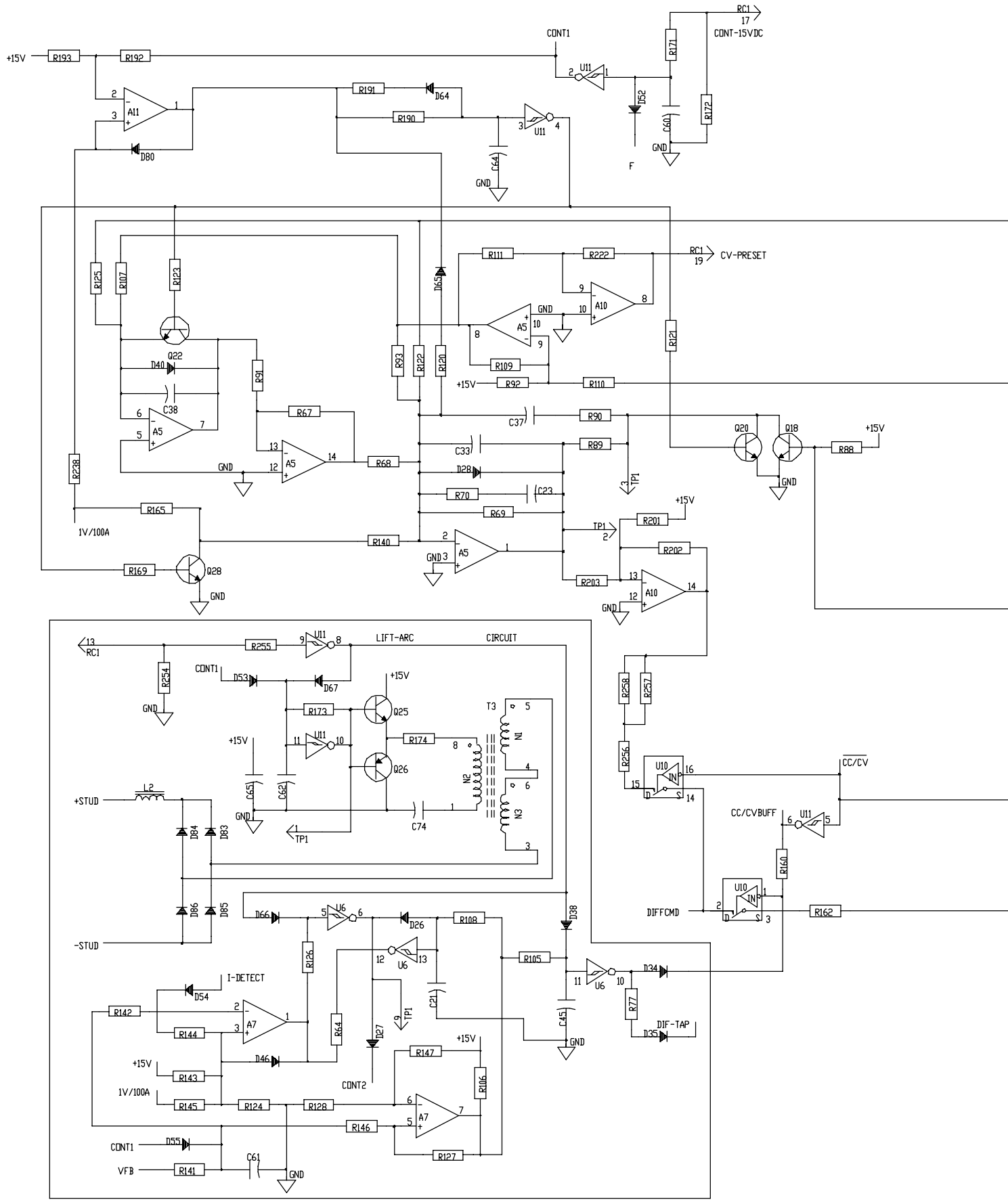
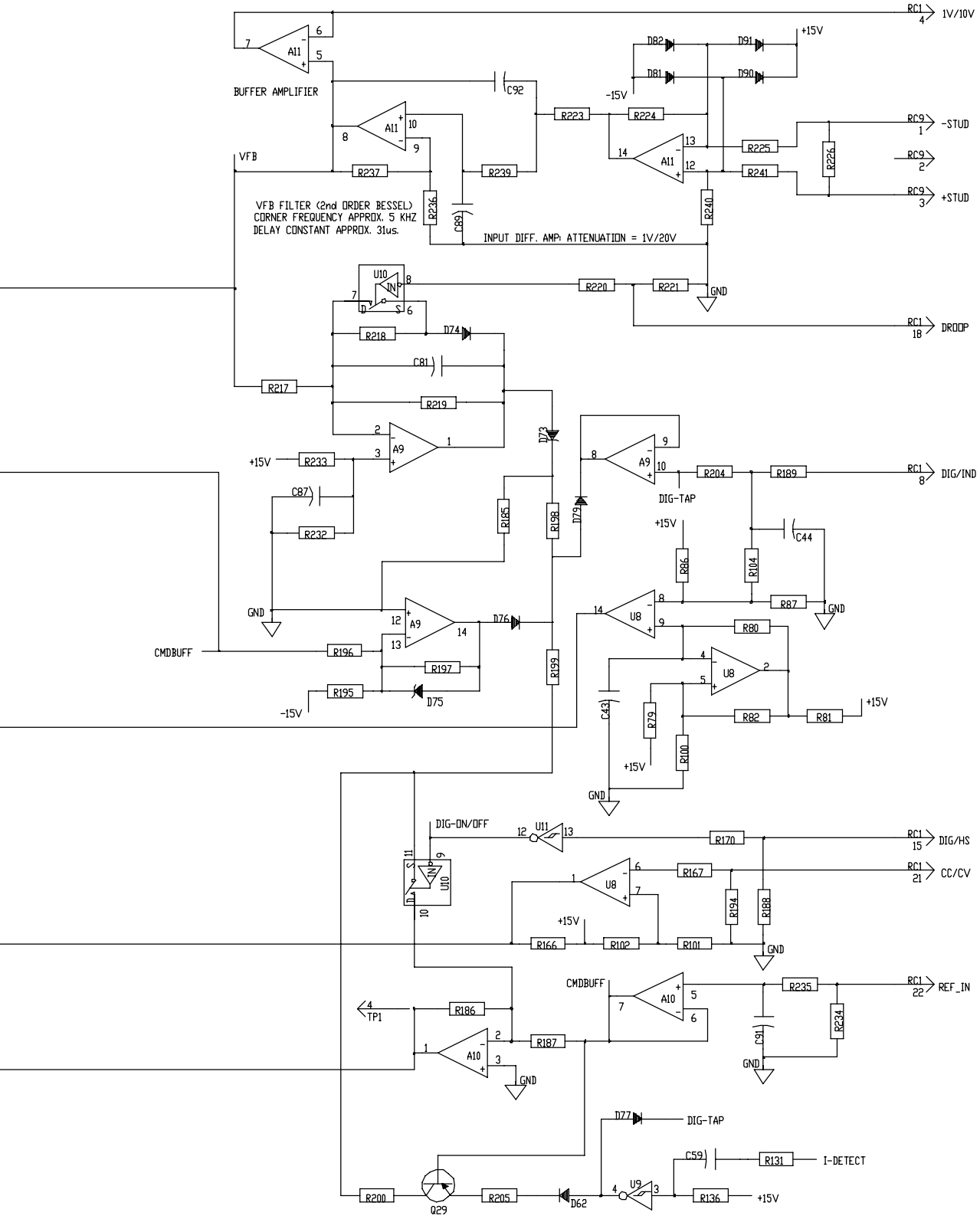


Figure 9-19. Circuit for PC1 (460/575 V) Eff. w/KK104771 (Part 1 of 3)



⚠ WARNING	• Do not touch live electrical parts. • Disconnect input power or stop engine before servicing. • Do not operate with covers removed. • Have only qualified persons install, use, or service this unit.
ELECTRIC SHOCK HAZARD	

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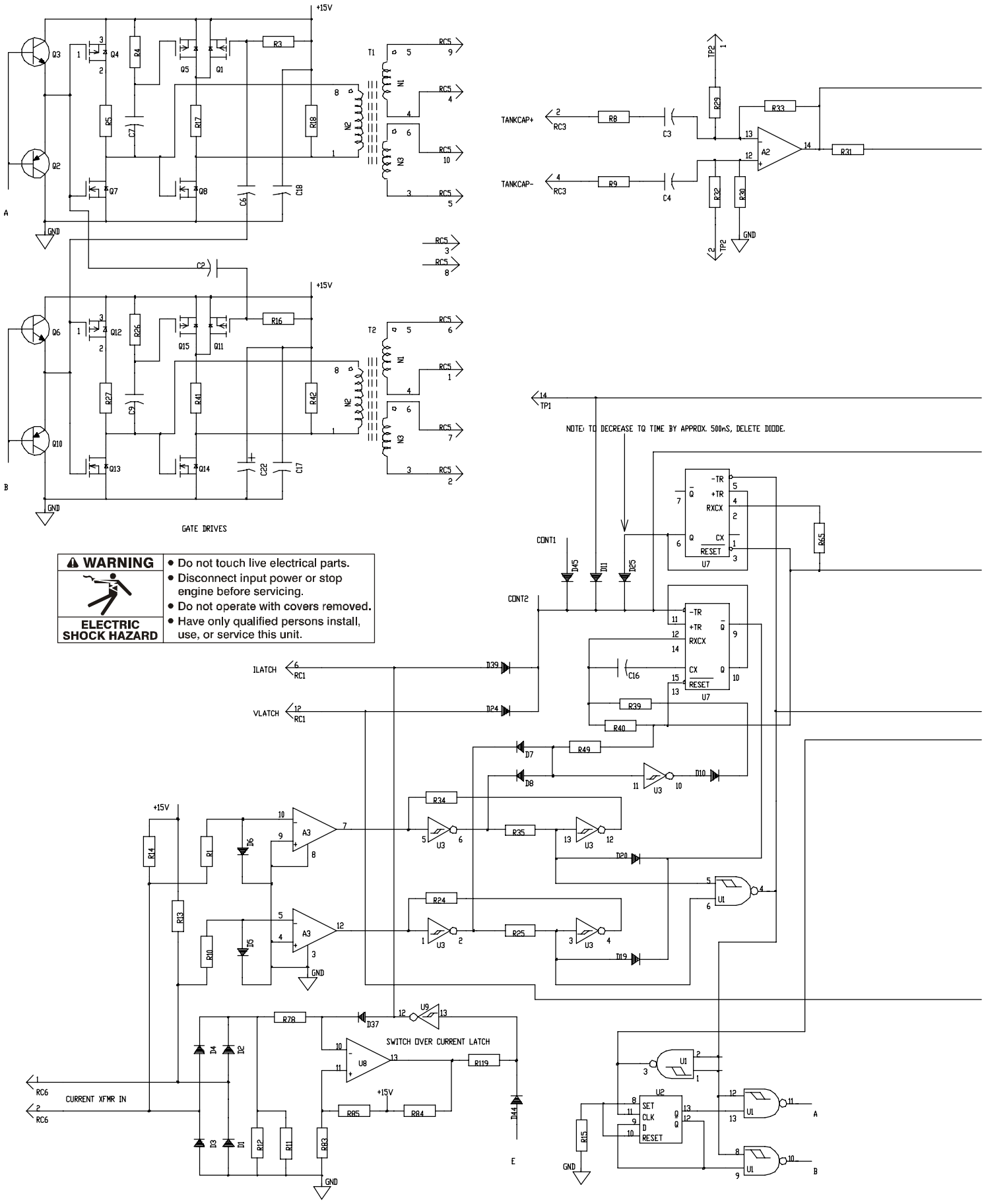
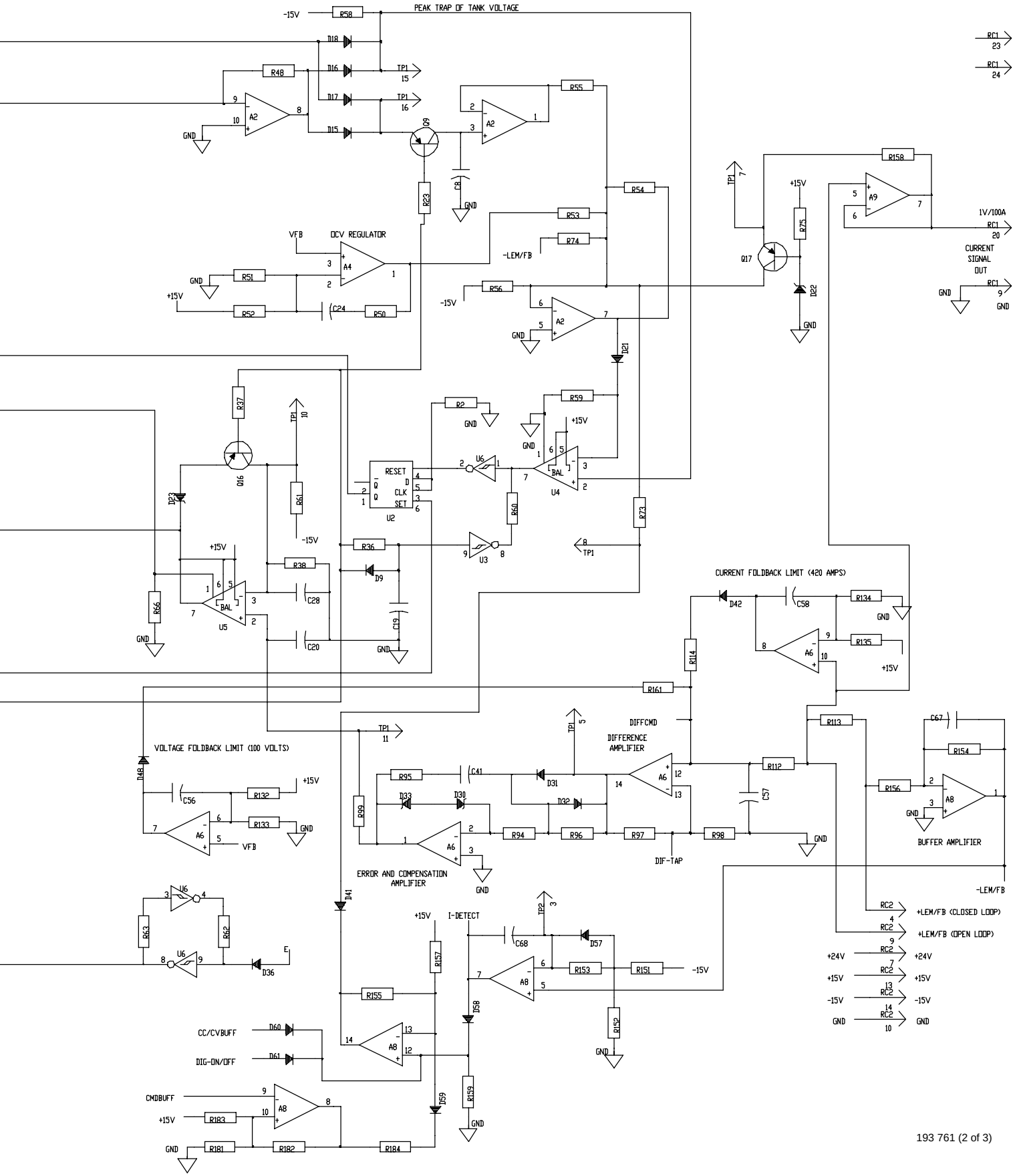


Figure 9-20. Circuit for PC1 (460/575 V) Eff. w/KK104771 (Part 2 of 3)


PEAK TRAP OF TANK VOLTAGE
VFB
OCV REGULATOR
-LEM/FB
CURRENT FOLDBACK LIMIT (420 AMPS)
VOLTAGE FOLDBACK LIMIT (100 VOLTS)
DIFFCMD
DIFFERENCE AMPLIFIER
ERROR AND COMPENSATION AMPLIFIER
BUFFER AMPLIFIER
DIF-TAP
I-DETECT
CC/CVBUFF
DIG-ON/OFF
CMDBUFF
1V/100A
CURRENT SIGNAL OUT
+LEM/FB (CLOSED LOOP)
+LEM/FB (OPEN LOOP)
-LEM/FB
RESET
CLK
SET
BAL
GND
+15V
-15V
+24V

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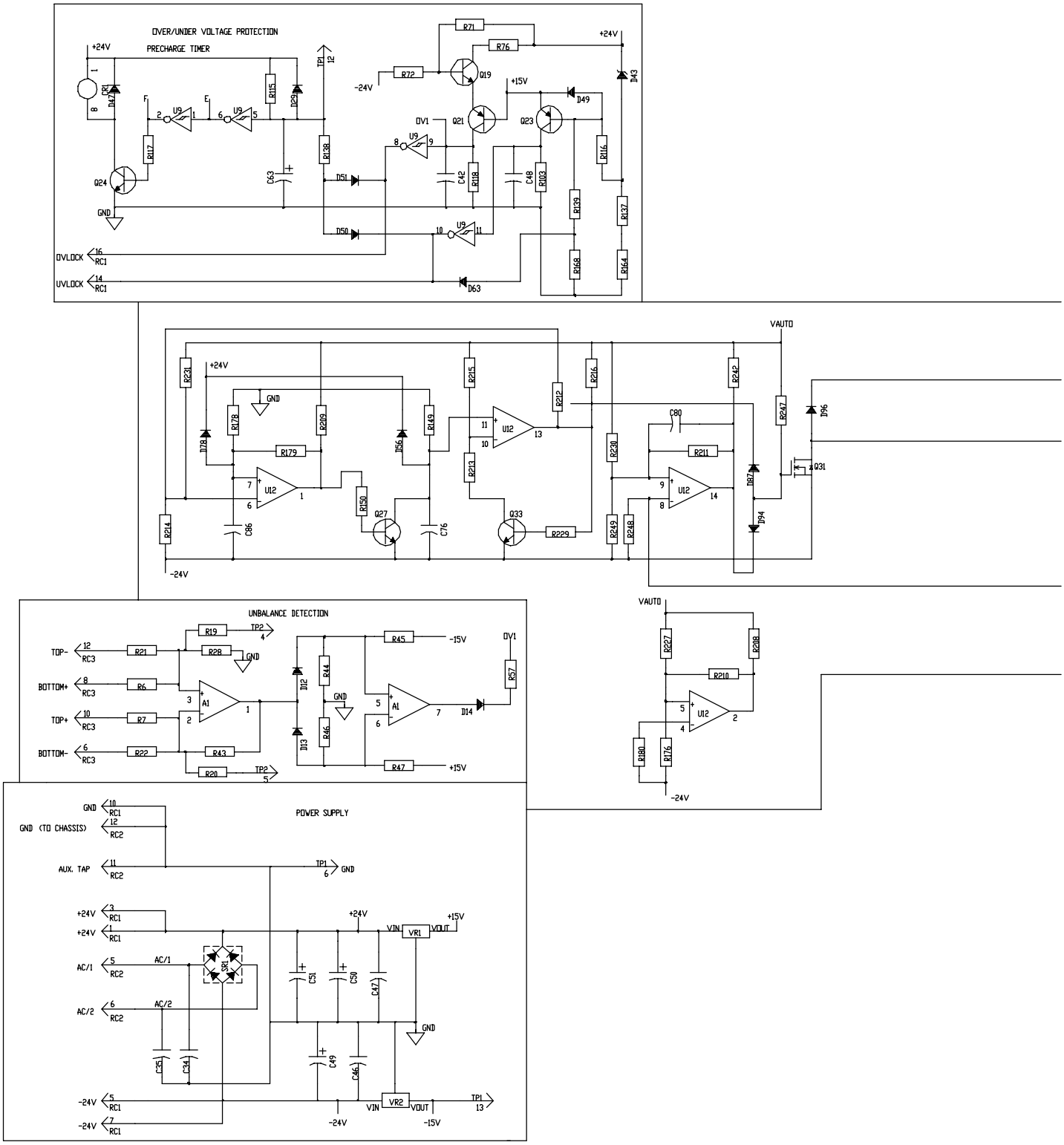
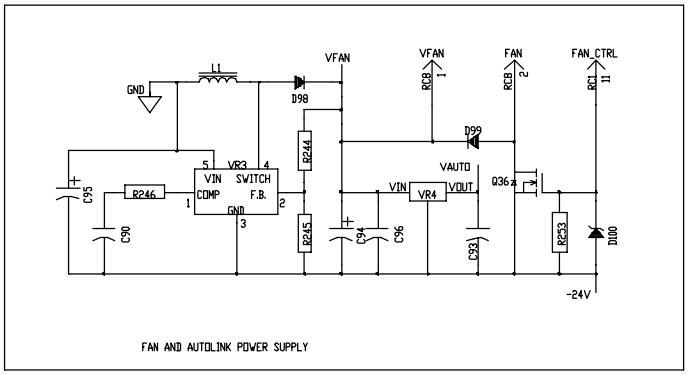


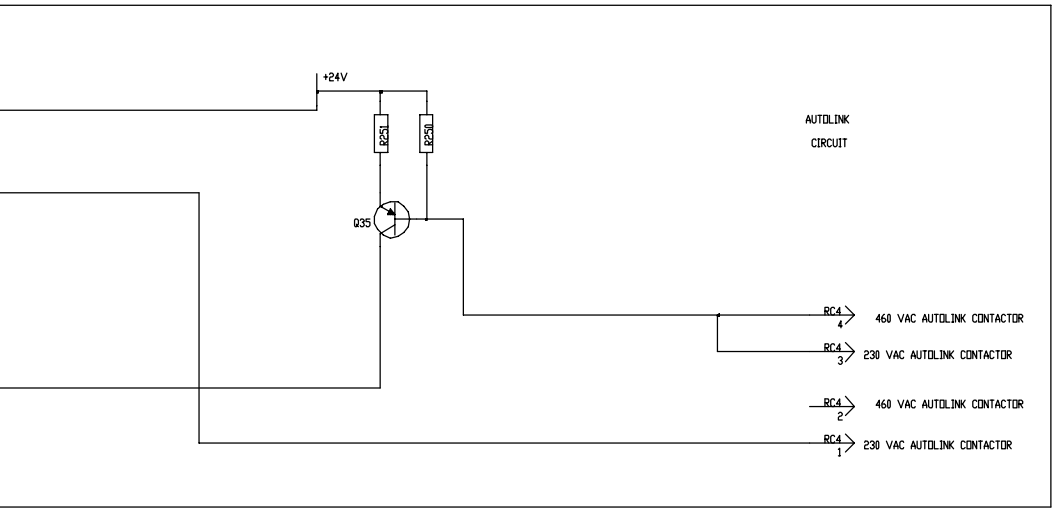
⚠ WARNING	• Do not touch live electrical parts. • Disconnect input power or stop engine before servicing. • Do not operate with covers removed. • Have only qualified persons install, use, or service this unit.
ELECTRIC SHOCK HAZARD	

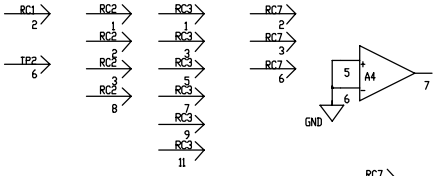
Figure 9-21. Circuit for PC1 (460/575 V) Eff. w/KK104771 (Part 3 of 3)

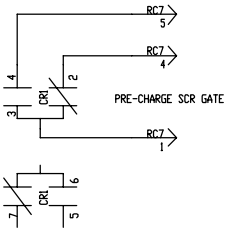


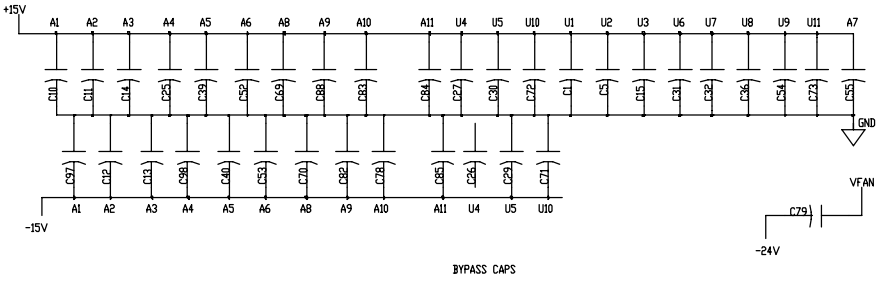
FAN AND AUTOLINK POWER SUPPLY

POWER/GROUND NETS FOR CHIPS	
U1	7=GND,14=+15V
U2	7=GND,14=+15V
U3	7=GND,14=+15V
U4	4=-15V,8=+15V
U5	4=-15V,8=+15V
U6	7=GND,14=+15V
U7	8=GND,16=+15V
U8	12=GND,3=+15V
U9	7=GND,14=+15V
U10	4=-15V,5=GND,12=+15V,13=+15V
U11	7=GND,14=+15V
U12	12=-24V,3=VFAN
U13	7=GND,14=+15V
A1	4=-15V,8=+15V
A2	4=+15V,11=-15V
A3	6=-15V,11=+15V
A4	4=-15V,8=+15V
A5	4=+15V,11=-15V
A6	4=+15V,11=-15V
A7	4=GND,8=+15V
A8	4=+15V,11=-15V
A9	4=+15V,11=-15V
A10	4=+15V,11=-15V
A11	4=+15V,11=-15V
A12	

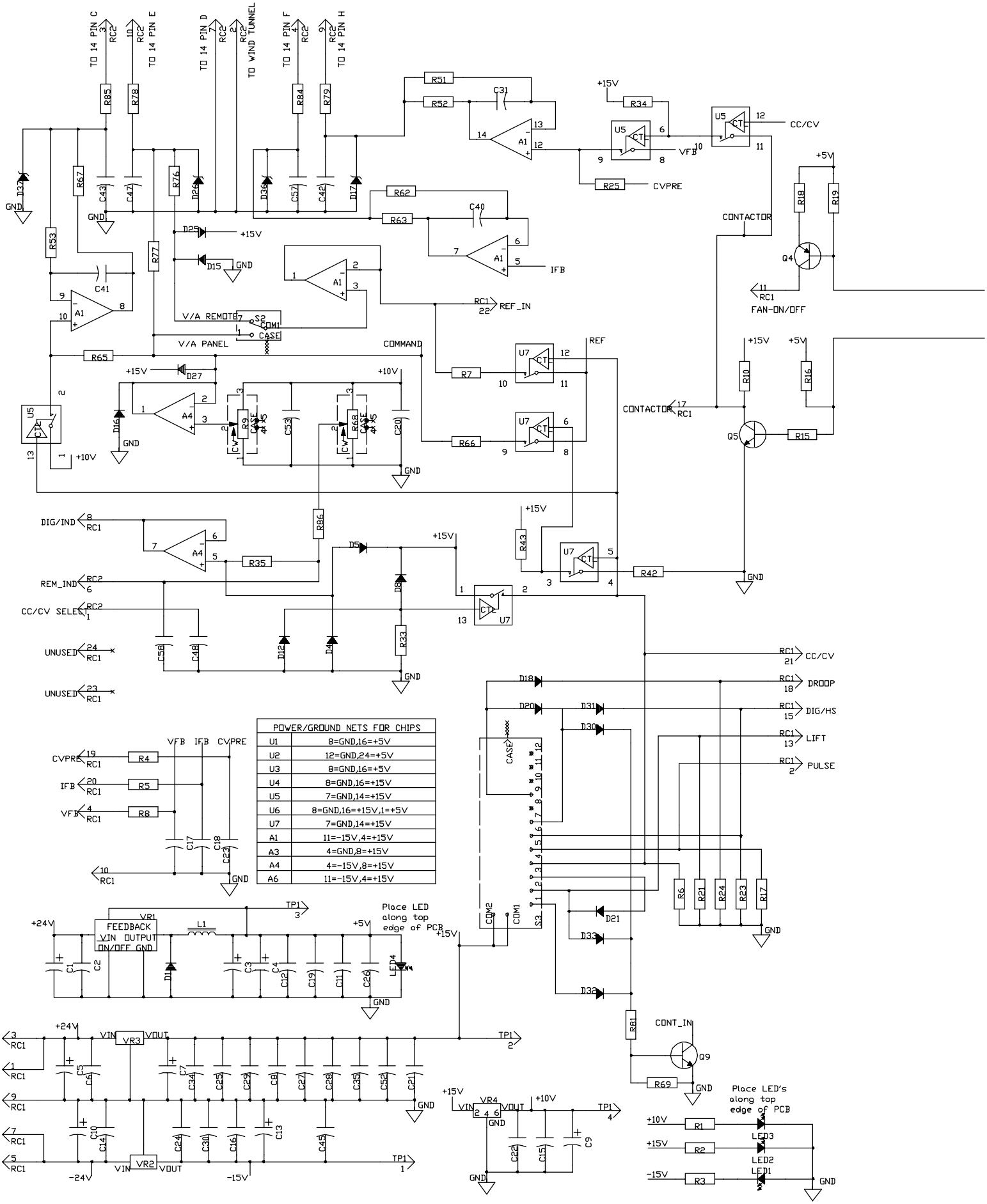






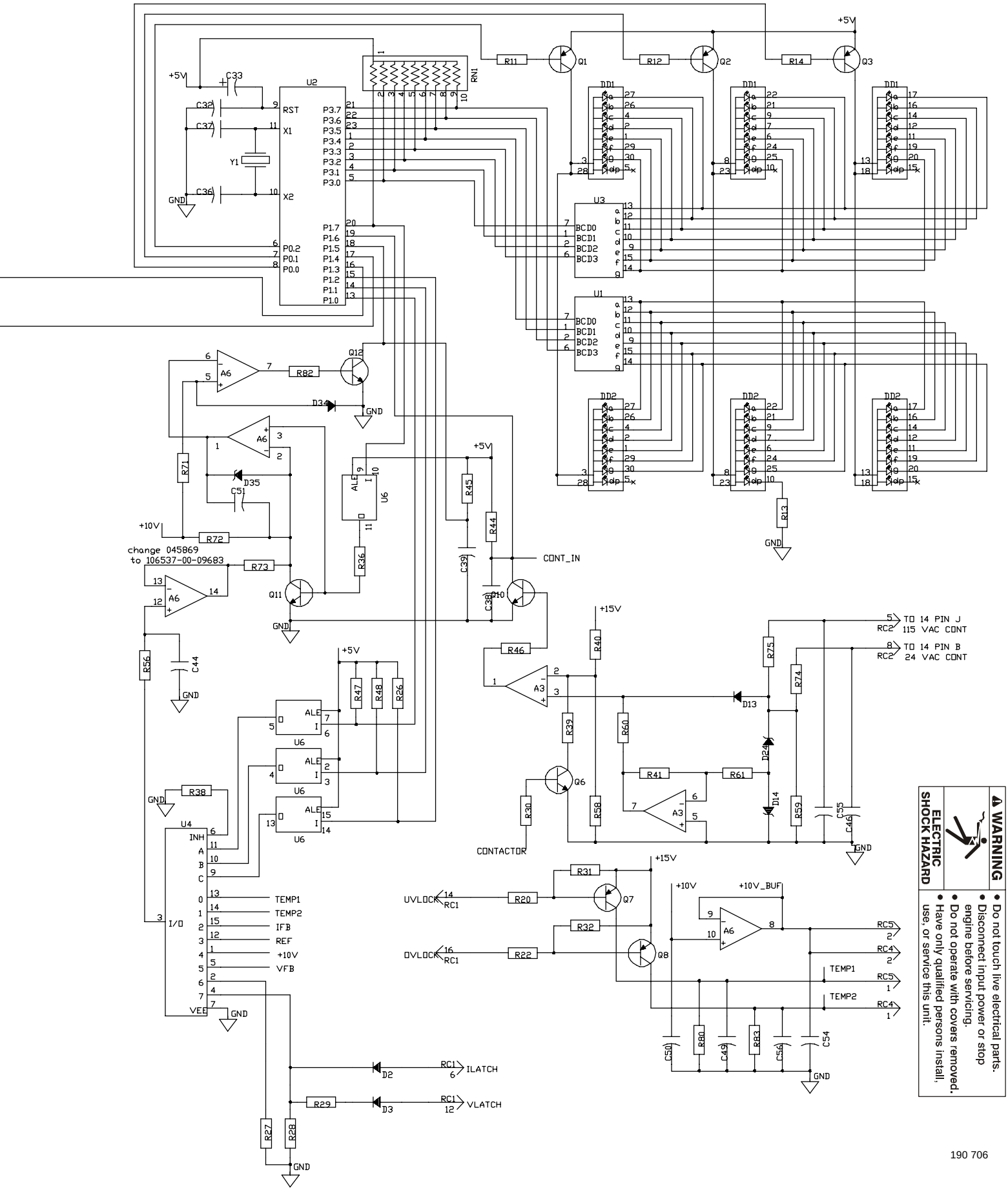


BYPASS CAPS



POWER/GROUND NETS FOR CHIPS	
U1	8=GND,16=+5V
U2	12=GND,24=+5V
U3	8=GND,16=+5V
U4	8=GND,16=+15V
U5	7=GND,14=+15V
U6	8=GND,16=+15V,1=+5V
U7	7=GND,14=+15V
A1	11=-15V,4=+15V
A3	4=GND,8=+15V
A4	4=-15V,8=+15V
A6	11=-15V,4=+15V

Figure 9-22. Circuit for PC3 (CC) Eff. w/KJ188992


+5V
C33
U2
C32
C37
C36
Y1
GND
RST
X1
X2
P3.7
P3.6
P3.5
P3.4
P3.3
P3.2
P3.1
P3.0
P1.7
P1.6
P1.5
P1.4
P1.3
P1.2
P1.1
P1.0
P0.2
P0.1
P0.0
RN1
R11
R12
R14
Q1
Q2
Q3
DD1
DD2
U3
U1
BCD0
BCD1
BCD2
BCD3
R13
A6
Q12
R82
D34
R71
D35
C51
R72
change 045869
to 106537-00-09683
R73
Q11
R36
U6
ALE
R45
R44
C39
C38
Q10
CONT_IN
R56
C44
R47
R48
R26
R46
R40
A3
D13
R39
R60
R75
R74
D24
R41
R61
Q6
D14
R30
R58
R59
C55
C46
CONTACTOR
R38
U4
INH
A
B
C
I/O
VEE
TEMP1
TEMP2
IFB
REF
+10V
VFB
R31
Q7
R20
UVLOCK
OVLOCK
R32
Q8
R22
+10V_BUF
RC5
RC4
C50
R80
C49
R83
C56
C54
D2
ILATCH
R29
D3
VLATCH
R27
R28
TO 14 PIN J
115 VAC CONT
TO 14 PIN B
24 VAC CONT
WARNING
ELECTRIC SHOCK HAZARD
• Do not touch live electrical parts.
• Disconnect input power or stop engine before servicing.
• Do not operate with covers removed.
• Have only qualified persons install, use, or service this unit.

190 706

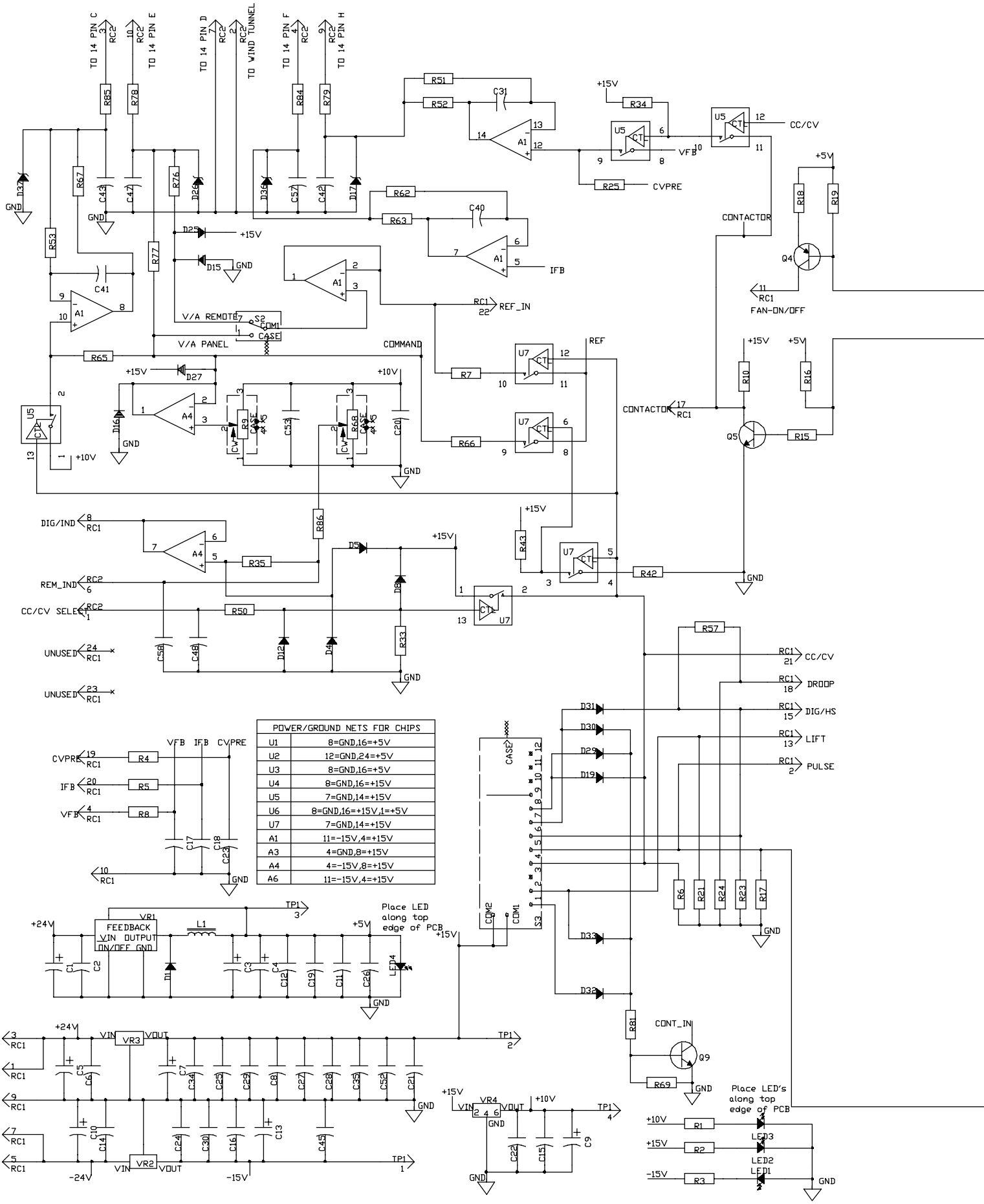
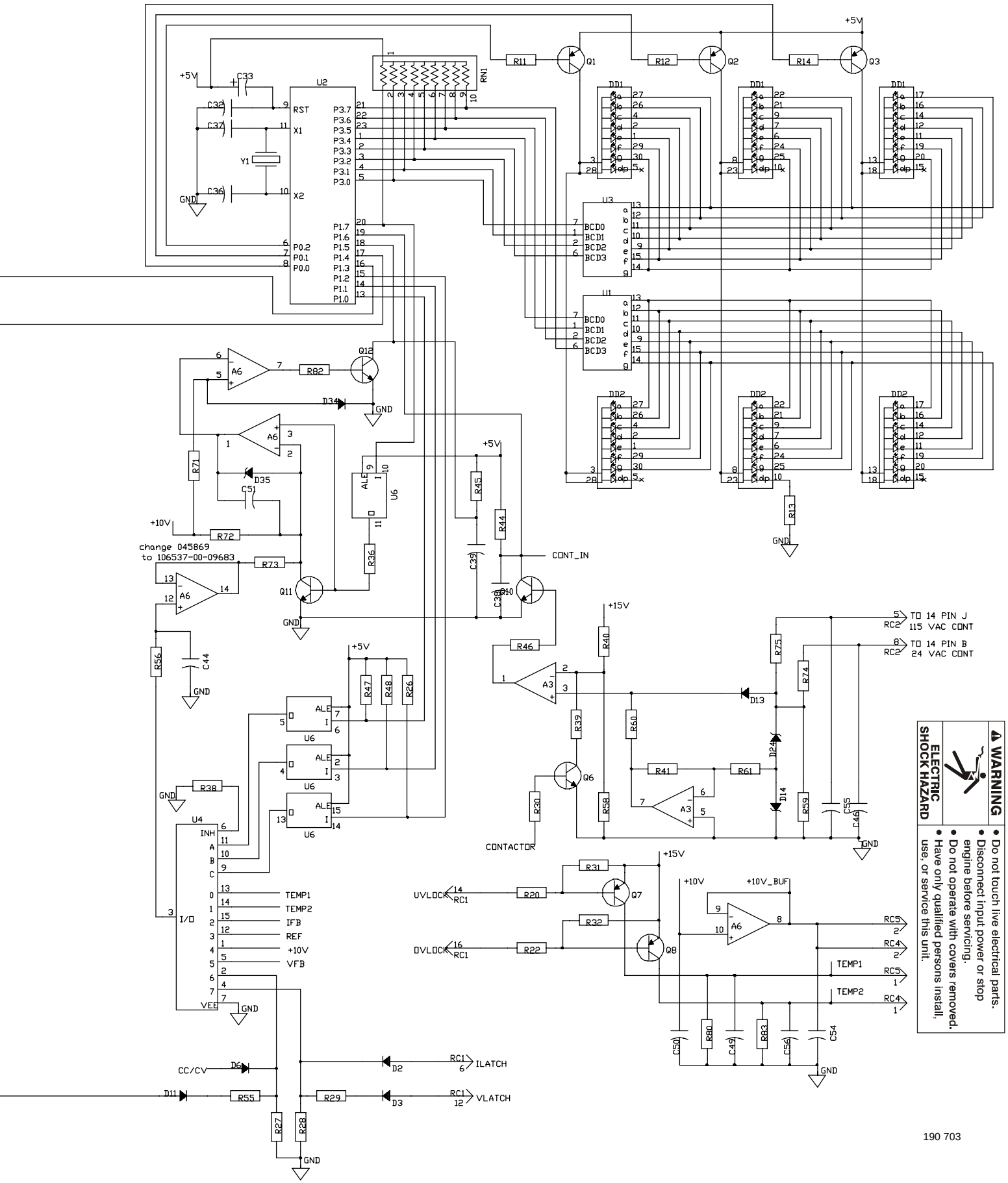
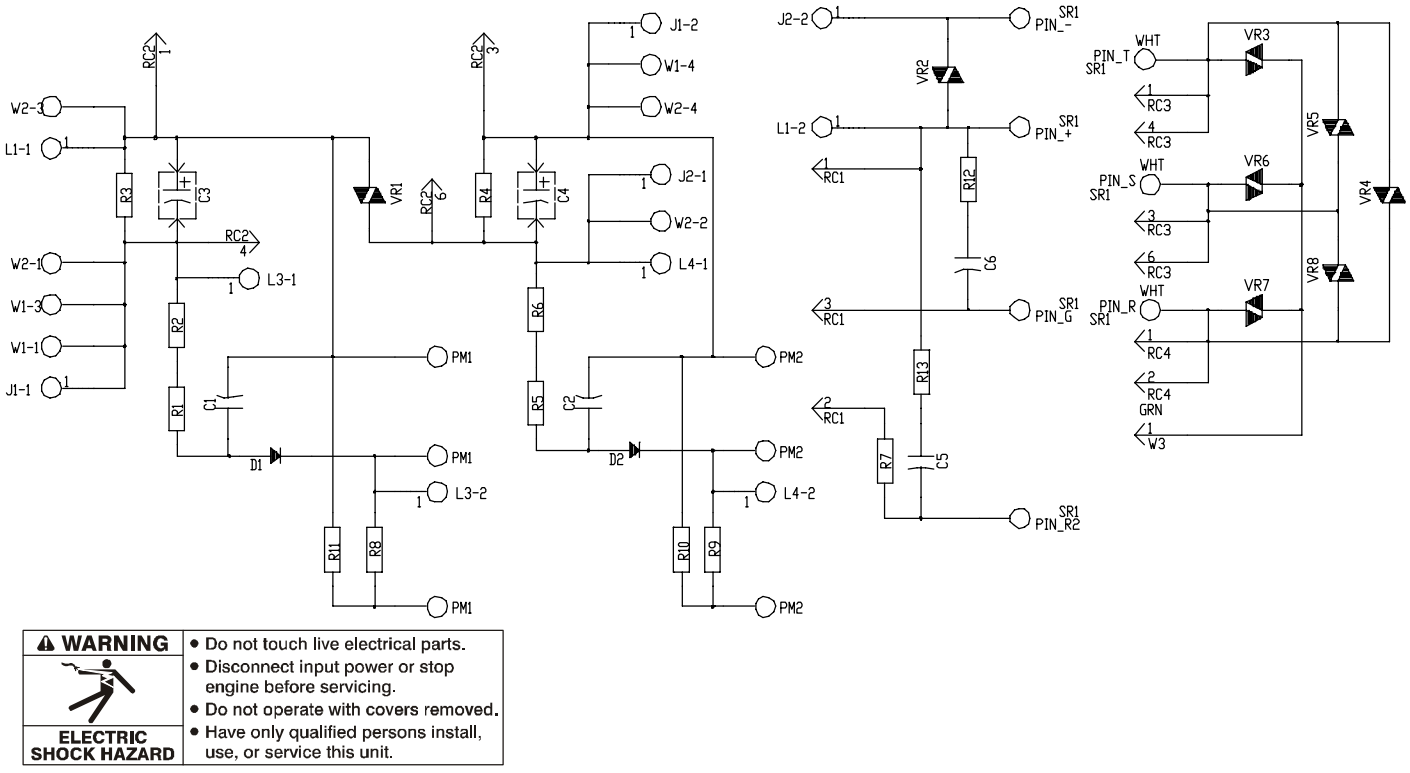


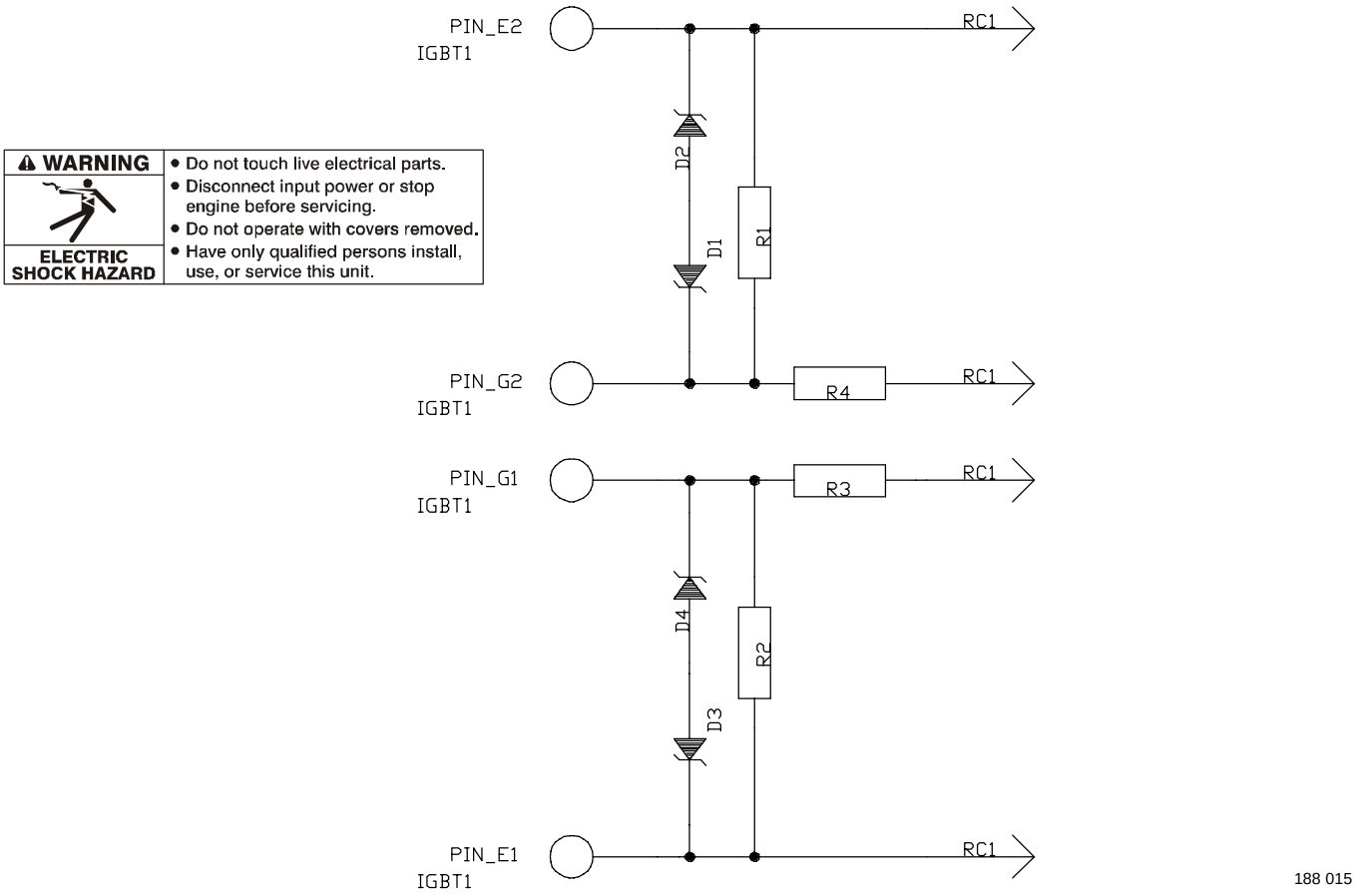
Figure 9-23. Circuit for PC3 (CC/CV) Eff. w/KJ188992


+5V
C33
U2
RST
X1
X2
Y1
C32
C37
C36
GND
P3.7
P3.6
P3.5
P3.4
P3.3
P3.2
P3.1
P3.0
P1.7
P1.6
P1.5
P1.4
P1.3
P1.2
P1.1
P1.0
P0.2
P0.1
P0.0
RN1
R11
R12
R14
Q1
Q2
Q3
DD1
DD2
U3
U1
BCD0
BCD1
BCD2
BCD3
R13
Q12
R82
D34
A6
R71
D35
C51
+10V
R72
change 045869
to 106537-00-09683
R73
Q11
R36
U6
ALE
R45
R44
C32
C38
Q10
CONT_IN
R56
C44
R47
R48
R26
R46
R40
+15V
A3
D13
R39
R60
R75
R74
D24
R41
R61
Q6
R30
R58
D14
R59
C55
C46
CONTACTOR
TO 14 PIN J
115 VAC CONT
TO 14 PIN B
24 VAC CONT
R38
U4
INH
A
B
C
I/O
VEE
TEMP1
TEMP2
IFB
REF
+10V
VFB
R31
R32
Q7
Q8
UVLOCK
OVLOCK
R20
R22
RC1
+10V_BUF
RC5
RC4
C50
R80
C49
R83
C56
C54
CC/CV
D6
D11
R55
R29
D2
D3
ILATCH
VLATCH
R27
R28
WARNING
ELECTRIC SHOCK HAZARD
• Do not touch live electrical parts.
• Disconnect input power or stop engine before servicing.
• Do not operate with covers removed.
• Have only qualified persons install, use, or service this unit.
190 703



195 589

Figure 9-24. Circuit for PC2 Eff. w/KK266150



188 015

Figure 9-25. Circuit for PC4, PC5 Eff. w/KH450176

TM-2208E July 2000
Eff. w/Serial Number KG049063

Processes

Multiprocess Welding

Description

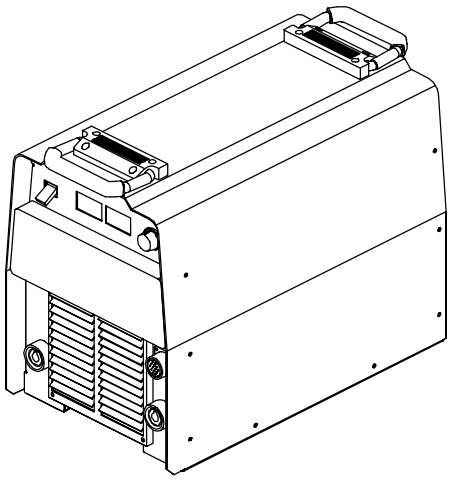
Arc Welding Power Source

XMT® 304 (230/460 And 460/575 Volt Models)

PARTS LIST

Eff w/KG049063 Thru KK104770

For OM-2208 (175 493) Revisions * Thru J



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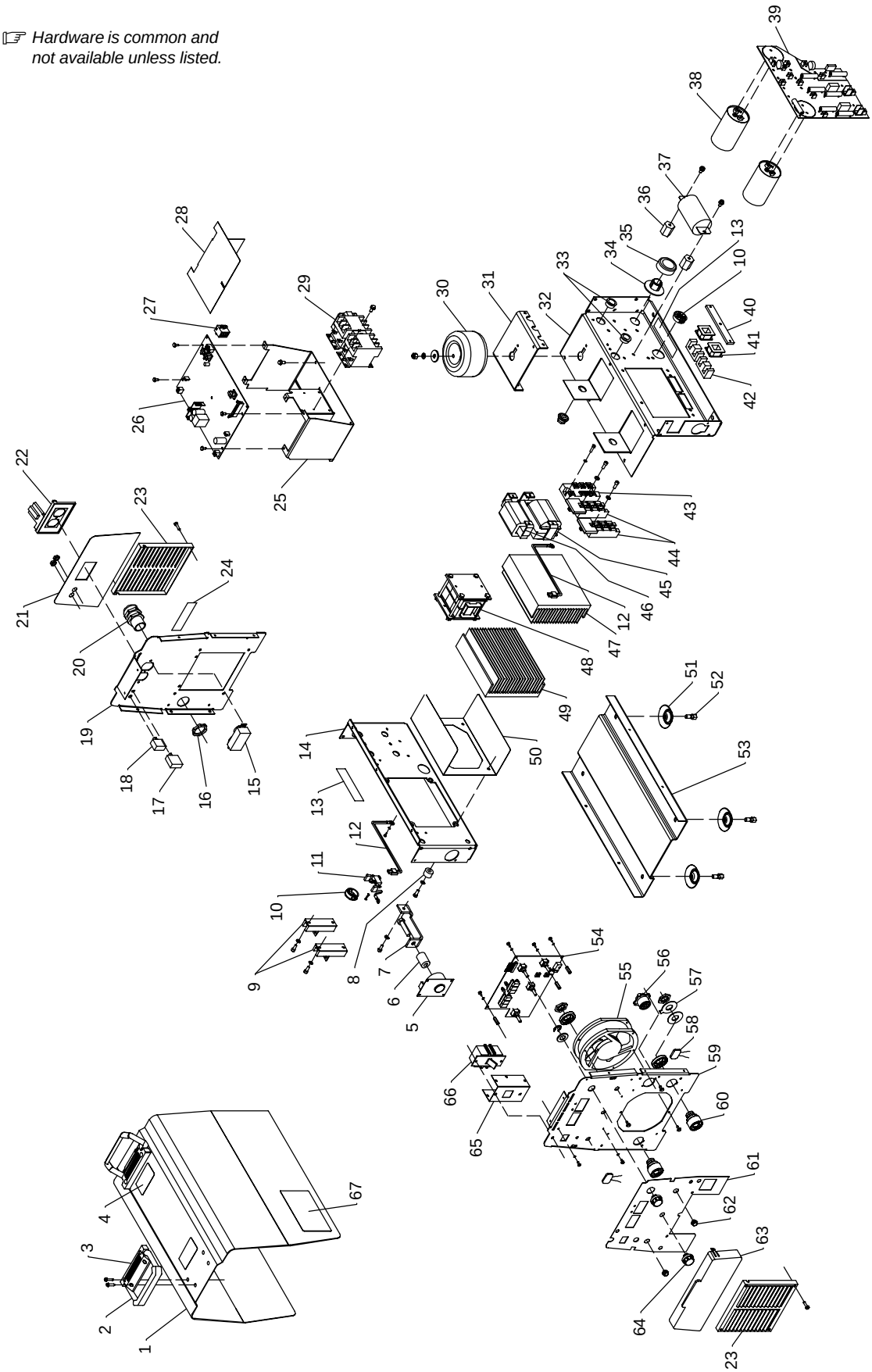
☞ *Hardware is common and not available unless listed.*



ST-801 428-B

Figure 10-1. Parts Assembly

Item No.	Dia. Mkgs.	Part No.	Description	Quantity

Figure 10-1. Parts Assembly

1		+175 148	WRAPPER	1
		178 551	INSULATOR, side LH	1
		175 256	INSULATOR, side RH	1
2		126 416	HANDLE	2
3		126 415	CLAMP, saddle	2
4		138 442	LABEL, caution falling equipment	2
5	HD1	156 313	TRANSDUCER, current 300A	1
	PLG9	130 204	CONNECTOR & PINS	1
6		175 142	BUS BAR, lem	1
7		175 139	BUS BAR, output rectifier	1
8		181 853	INSULATOR, screw	1
9	D1,2	179 630	KIT DIODE, ultra fast recovery	2
10		179 276	BUSHING, snap-in nyl 1.000 ID x 1.375mtg hole	2
11	C5,6 R1	175 194	RESISTOR/CAPACITOR	1
12	RT1,2	173 632	THERMISTOR, NTC 30K ohm	2
13		185 835	LABEL, warning exploding parts	2
14		+183 551	WINDTUNNEL, LH	1
15		♦604 176	RECEPTACLE, str dx grd 2P3W 15A 125V	1
16		182 445	NUT, 1.000NPT	1
17	CB1	089 807	CIRCUIT BREAKER, man reset 1P 2.5A 250VAC	1
17	CB1	♦083 432	CIRCUIT BREAKER, man reset 1P 10A 250VAC	1
18	CB2	083 432	CIRCUIT BREAKER, man reset 1P 10A 250VAC	1
19		175 147	PANEL, rear	1
20		186 441	BUSHING, strain relief .710-.980 ID x 1.375	1
		186 469	CABLE, power	1
		184 382	CABLE, pwr 12ft (included w/optional Ground Sensor) (deleted w/KJ297193)	1
21			PLATE, ident rear (order by model and serial number)	1
22		♦175 282	COVER, receptacle	1
23		175 138	BOX, louver	2
24		148 329	LABEL, caution incorrect voltage (230/460)	1
24		182 227	LABEL, caution incorrect voltage (460/575)	1
25			BRACKET, mtg contactor/capacitor/PC Board (230/460)	
		193 285	(Prior to KJ297193, capacitor elctlt update kit includes bracket and capacitors C3, C4 part no. 192 935)	1
		193 288	(Service Bracket)	1
		192 853	(Eff w/KJ297193)	1
25			BRACKET, mtg contactor/capacitor/PC Board (460/575)	
		194 448	(Prior to KK011325, capacitor elctlt update kit includes bracket and capacitors C3, C4 part no. 193 738)	1
		192 853	(Eff w/KK011325)	1
26	PC1		CIRCUIT CARD, control 230/460 (CC model)	1
		182 425	(Prior to KG191115 std) (Prior to KG139276 w/aux power)	1
		188 205	(Eff w/KG191115 thru KH523148 std) (Eff w/KG139276 thru KH523148 w/aux power)	1
		185 504	(Eff w/KH523149 std and w/aux power)	1
26	PC1		CIRCUIT CARD, control 230/460 (CC/CV model)	1
		182 425	(Prior to KG177169 std) (Prior to KG177342 w/aux power)	1
		188 205	(Eff w/ KG177169 thru KH523148 std) (Eff w/ KG177342 thru KH523148 w/aux power)	1
		185 504	(Eff w/KH523149 std and w/aux power)	1
26	PC1	188 068	CIRCUIT CARD, control 460/575 (CC/CV & CC models)	1
	PLG2	115 092	CONNECTOR & SOCKETS (RC2)	1
	PLG3,7	115 093	CONNECTOR & SOCKETS (RC3) (RC7)	1
	PLG4	115 094	CONNECTOR & SOCKETS (RC4)	1
	PLG5	115 091	CONNECTOR & SOCKETS (RC5)	1
27	RC10	166 679	CONNECTOR & SOCKETS	1
28		180 520	INSULATOR, PC card	1
29	W1,2	175 082	CONTACTOR, def prp 40A 24VAC coil (230/460 only)	1
		173 763	STAND-OFF, No. 10-32 x 1.418 (230/460 only)	7

Item No.	Dia. Mkgs.	Part No.	Description	Quantity

Figure 10-1. Parts Assembly (Continued)

30	T2	174 982	TRANSFORMER, control 230/460 (Prior to KH523149)	1
30	T2	184 151	TRANSFORMER, control 230/460 (Eff w/KH523149)	1
30	T2	♦174 981	TRANSFORMER, control 230/460 (Prior to KH523149)	1
30	T2	♦187 757	TRANSFORMER, control 230/460 (Eff w/KH523149)	1
30	T2	180 963	TRANSFORMER, control 460/575	1
30	T2	♦180 962	TRANSFORMER, control 460/575	1
31		♦183 549	BRACKET, mtg aux transformer	1
32		183 550	WINDTUNNEL, RH (Prior to KH353059)	1
32		185 731	WINDTUNNEL, RH (Eff w/KH353059 thru KJ272682)	1
32		193 016	WINDTUNNEL, RH (Eff w/KJ272683 thru KJ297192)	1
32		192 855	WINDTUNNEL, RH (Eff w/KJ297193)	1
33		153 403	BUSHING, snap-in nyl .750 ID x 1.000mtg	2
34		177 547	BUSHING, snap-in nyl 1.125mtg	1
35	CT1	175 199	TRANSFORMER, current	1
36		025 248	STAND-OFF, insul	2
37	C1	186 015	CAPACITOR, polyp film .34uf 1000VAC (230/460)	1
37	C1	186 549	CAPACITOR, polyp film .27uf 1000VAC (460/575)	1
38	C3,4		CAPACITOR, elctlt 2700uf 450VDC (230/460)	
		193 285	(Prior to KJ297193, capacitor elctlt update kit includes capacitors C3, C4 and mounting bracket part no. 193 288)	1
		192 935	(Eff w/KJ297193)	2
38	C3,4		CAPACITOR, elctlt 1800uf 500VDC (460/575)	
		194 448	(Prior to KK011325, capacitor elctlt update kit includes capacitors C3, C4 and mounting bracket part no. 193 288)	1
		193 738	(Eff w/KK011325)	2
39	PC2	+185 090	CIRCUIT CARD, interconnect (230/460) (when ordering PC2, also order MOV protection board 198 095)	1
39	PC2	+185 092	CIRCUIT CARD, interconnect (460/575) (when ordering PC2, also order MOV protection board 198 095)	1
	PLG12	131 054	CONNECTOR & SOCKETS (RC12)	1
	PLG13	131 204	CONNECTOR & SOCKETS (RC13)	1
	PLG14	115 094	CONNECTOR & SOCKETS (RC14)	1
		126 026	LABEL, warning electric shock	1
40		175 140	BRACKET, DI/DT	1
41		175 482	COIL, DI/DT	2
42		109 056	CORE	2
43	SR1	179 629	KIT DIODE, power module	1
44	PM1,2	180 110	KIT, transistor IGBT module	1
45	Z1	173 570	STABILIZER	1
46	L1	173 563	INDUCTOR, input	1
47		173 631	HEAT SINK, power module	1
48	T1	173 811	TRANSFORMER, HF (230/460)	1
48	T1	180 952	TRANSFORMER, HF (460/575)	1
49		175 192	HEAT SINK, rect	1
50		175 255	INSULATOR, rectifier	1
		110 386	RELAY, 24VAC (460/575 only)	1
51		173 693	FOOT, mtg unit	4
52		176 736	SCREW, mtg foot	4
53		175 132	BASE	1
54	PC3		CIRCUIT CARD, front panel display 230/460 (CC model)	
		178 845	(Prior to KG191115 std) (Prior to KG139276 w/aux power)	1
		190 704	(Eff w/KG191115 std) (Eff w/KG139276 w/aux power)	1
		190 380	ASSY, socket/7 segment display	1
54	PC3		CIRCUIT CARD, front panel display 230/460 (CC/CV model)	
		178 842	(Prior to KG177169 std) (Prior to KG177342 w/aux power)	1
		190 700	(Eff w/KG177169 std) (Eff w/ KG177342 w/aux power)	1
		190 380	ASSY, socket/7 segment display	1
54	PC3	190 704	CIRCUIT CARD, front panel display 460/575 (CC model)	1
		190 380	ASSY, socket/7 segment display	1

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
54	PC3	190 700	CIRCUIT CARD, front panel display 460/575 (CC/CV model)	1
		190 380	ASSY, socket/7 segment display	1
	PLG11	115 091	CONNECTOR & SOCKETS (RC2)	1
55	FM	175 084	MOTOR, fan 24VDC 3000RPM	1
56	RC1	175 217	RECEPTACLE, w/leads & plug (Prior to KH353059)	1
		175 249	RING, rtng ext 1.188 shaft grv x .054thk (Prior to KH353059)	1
56	RC1	185 730	RECEPTACLE, w/leads & plug (Eff w/KH353059)	1
57		178 548	TERMINAL, connector friction	2
58	C7,8	186 543	CAPACITOR	2
59		175 134	PANEL, front (Prior to KH353059)	1
59		185 732	PANEL, front (Eff w/KH353059)	1
60		129 525	RECEPTACLE, twlk insul fem	2
61			NAMEPLATE, (order by model and serial number)	1
62		174 992	KNOB, pointer .840	2
63		175 855	DOOR, front	1
64		174 991	KNOB, pointer 1.250	2
65		176 226	INSULATOR, switch power	1
66	S1	128 756	SWITCH, tgl 3PST 40A 600VAC	1
67		134 327	LABEL, warning general precautionary	2
		♦043 588	WELD CURRENT GROUND SENSOR, (consisting of)	
			(deleted w/KJ297193)	1
		184 376	BRACKET, mtg relay	1
	CR1	110 386	RELAY, encl 24VAC DPDT	1
	PLG20	131 056	CONNECTOR & SOCKETS	1
	CR2	184 380	SWITCH, reed	1

Figure 10-1. Parts Assembly (Continued)

+When ordering a component originally displaying a precautionary label, the label should also be ordered.

♦Part of 043 302 115V Aux Power Option (230/460) or 043 303 115V Aux Power Option (460/575).

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

Notes

TM-2208E July 2000

Eff. w/Serial Number KG049063

Processes

Multiprocess Welding

Description

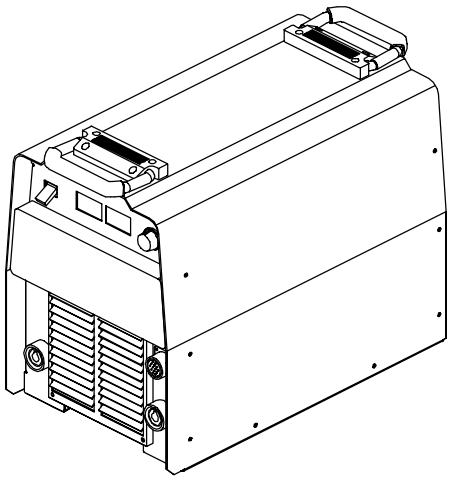
Arc Welding Power Source

XMT® 304 (230/460 And 460/575 Volt Models)

PARTS LIST

Eff w/KK104771 And Following

For OM-2208 (175 493) Revision K And Following



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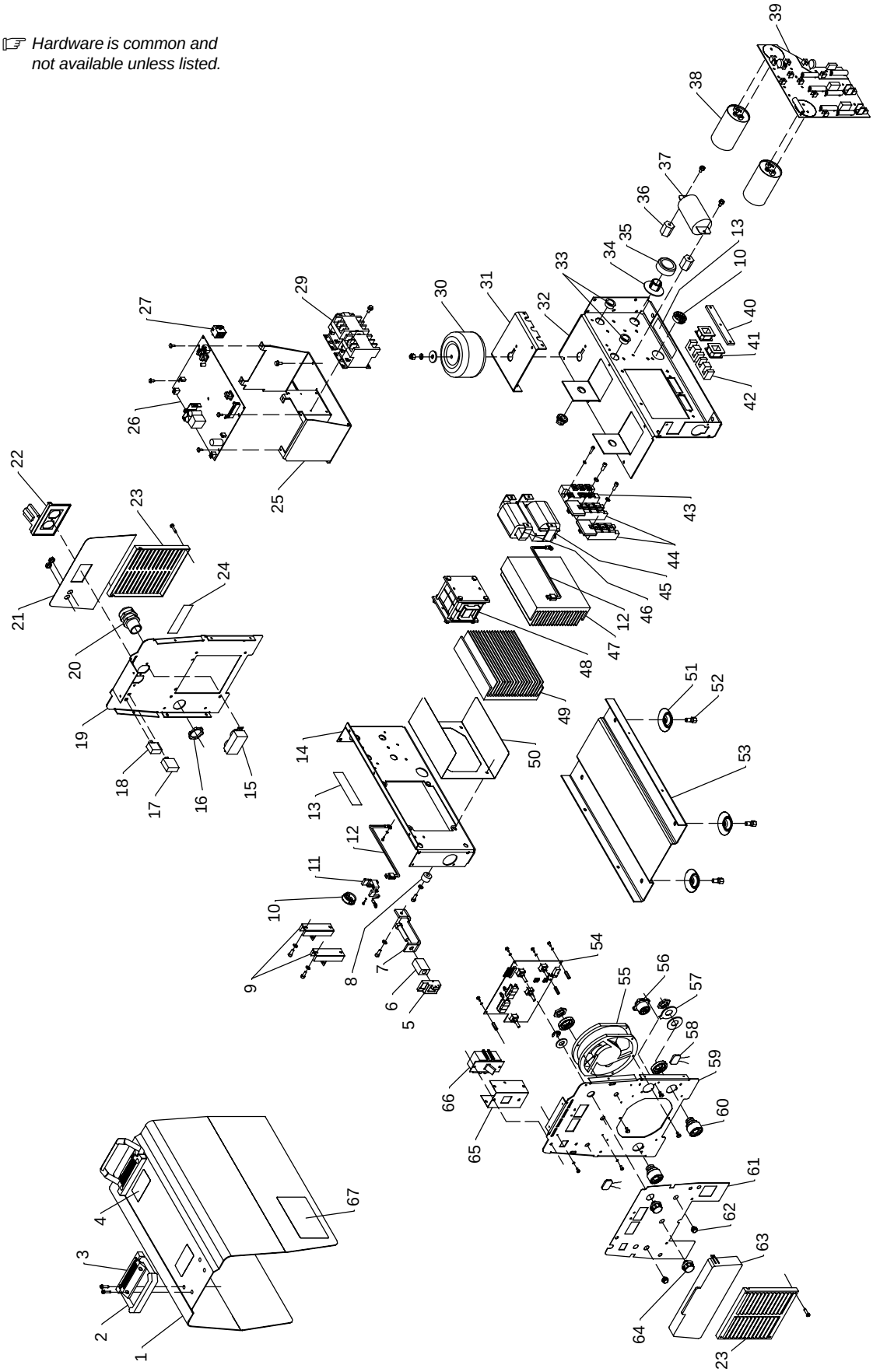

Figure 11-1. Parts Assembly

Eff w/KK104771 And Following

Item No.	Dia. Mkgs.	Part No.	Description	Quantity

Figure 11-1 . Parts Assembly

1		+175 148	WRAPPER	1
		178 551	INSULATOR, side LH	1
		175 256	INSULATOR, side RH	1
2		126 416	HANDLE (Eff w/KK266150, includes saddle clamp)	2
3		126 415	CLAMP, saddle (deleted w/KK266150)	2
4		138 442	LABEL, caution falling equipment	2
5	HD1	189 567	TRANSDUCER, current 300A	1
	PLG9	130 204	CONNECTOR & PINS	1
6		194 546	BUS BAR, lem	1
7		175 139	BUS BAR, output rectifier	1
8		181 853	INSULATOR, screw	1
9	D1,2	179 630	KIT DIODE, ultra fast recovery	2
10		179 276	BUSHING, snap-in nyl 1.000 ID x 1.375mtg hole	2
11	C5,6 R1	175 194	RESISTOR/CAPACITOR	1
12	RT1,2	173 632	THERMISTOR, NTC 30K ohm	2
13		185 835	LABEL, warning exploding parts	2
14		+183 551	WINDTUNNEL, LH	1
15		♦604 176	RECEPTACLE, str dx grd 2P3W 15A 125V	1
16		182 445	NUT, 1.000NPT	1
17	CB1	089 807	CIRCUIT BREAKER, man reset 1P 2.5A 250VAC	1
17	CB1	♦083 432	CIRCUIT BREAKER, man reset 1P 10A 250VAC	1
18	CB2	083 432	CIRCUIT BREAKER, man reset 1P 10A 250VAC	1
19		175 147	PANEL, rear	1
20		186 441	BUSHING, strain relief .710-.980 ID x 1.375	1
		186 469	CABLE, power	1
21			PLATE, ident rear (order by model and serial number)	1
22		♦175 282	COVER, receptacle	1
23		175 138	BOX, louver	2
24		148 329	LABEL, caution incorrect voltage (230/460)	1
24		182 227	LABEL, caution incorrect voltage (460/575)	1
25		192 853	BRACKET, mtg contactor/capacitor/PC Board	1
26	PC1	193 752	CIRCUIT CARD, control (230/460)	1
26	PC1	193 759	CIRCUIT CARD, control (460/575)	1
	PLG2	131 056	CONNECTOR & SOCKETS (RC2)	1
	PLG3	130 203	CONNECTOR & SOCKETS (RC3)	1
	PLG4	115 094	CONNECTOR & SOCKETS (RC4)	1
	PLG5	115 091	CONNECTOR & SOCKETS (RC5)	1
	PLG7	115 093	CONNECTOR & SOCKETS (RC7)	1
27	RC10	166 679	CONNECTOR & SOCKETS	1
28			deleted	
29	W1,2	175 082	CONTACTOR, def prp 40A 24VAC coil (230/460 only)	1
		173 763	STAND-OFF, No. 10-32 x 1.418 (230/460 only)	7
30	T2	184 151	TRANSFORMER, control (230/460)	1
30	T2	♦193 774	TRANSFORMER, control (230/460)	1
30	T2	180 963	TRANSFORMER, control (460/575)	1
30	T2	♦180 962	TRANSFORMER, control (460/575)	1
31		♦183 549	BRACKET, mtg aux transformer	1
32		192 855	WINDTUNNEL, RH	1
33		153 403	BUSHING, snap-in nyl .750 ID x 1.000mtg	2
34		177 547	BUSHING, snap-in nyl 1.125mtg	1
35	CT1	175 199	TRANSFORMER, current	1
36		025 248	STAND-OFF, insul	2
37	C1	186 015	CAPACITOR, polyp film .34uf 1000VAC (230/460)	1
37	C1	186 549	CAPACITOR, polyp film .27uf 1000VAC (460/575)	1
38	C3,4	192 935	CAPACITOR, elctlt 2700uf 450VDC (230/460)	2
38	C3,4	193 738	CAPACITOR, elctlt 1800uf 500VDV (460/575)	2

Eff w/KK104771 And Following

Item No.	Dia. Mkgs.	Part No.	Description	Quantity

Figure 11-1. Parts Assembly (Continued)

39	PC2		CIRCUIT CARD, interconnect (230/460)	
		+185 090	(Prior to KK266150; also order MOV protection board 198 095)	1
		+197 585	(Eff w/KK266150)	1
39	PC2		CIRCUIT CARD, interconnect (460/575)	
		+185 092	(Prior to KK266150; also order MOV protection board 198 095)	1
		+197 586	(Eff w/KK266150)	1
	PLG12	131 054	CONNECTOR & SOCKETS (RC12) (deleted eff w/KK266150)	1
	PLG13	131 204	CONNECTOR & SOCKETS (RC13)	1
	PLG14	115 094	CONNECTOR & SOCKETS (RC14) (Prior to KK266150)	1
	PLG14,21	115 093	CONNECTOR & SOCKETS (RC14,21) (Eff w/KK266150)	2
		126 026	LABEL, warning electric shock	1
40		175 140	BRACKET, DI/DT	1
41		175 482	COIL, DI/DT	2
42		109 056	CORE	2
43	SR1	179 629	KIT DIODE, power module	1
44	PM1,2	180 110	KIT, transistor IGBT module	1
45	Z1	173 570	STABILIZER	1
46	L1	173 563	INDUCTOR, input	1
47		173 631	HEAT SINK, power module	1
48	T1	173 811	TRANSFORMER, HF (230/460)	1
48	T1	180 952	TRANSFORMER, HF (460/575)	1
49		175 192	HEAT SINK, rect	1
50		175 255	INSULATOR, rectifier	1
		110 386	RELAY, 24VAC (460/575 only)	1
51		173 693	FOOT, mtg unit	4
52		176 736	SCREW, mtg foot	4
53		175 132	BASE	1
54	PC3	190 704	CIRCUIT CARD, front panel display (CC model)	1
		190 380	. . . ASSY, socket/7 segment display	1
54	PC3	190 700	CIRCUIT CARD, front panel display (CC/CV model)	1
		190 380	. . . ASSY, socket/7 segment display	1
	PLG11	115 091	CONNECTOR & SOCKETS (RC2)	1
55	FM	175 084	MOTOR, fan 24VDC 3000RPM	1
56	RC1	185 730	RECEPTACLE, w/leads & plug	1
57		178 548	TERMINAL, connector friction	2
58	C7,8	186 543	CAPACITOR	2
59		185 732	PANEL, front	1
60		129 525	RECEPTACLE, twlk insul fem	2
61			NAMEPLATE, (order by model and serial number)	1
62		174 992	KNOB, pointer .840	2
63		175 855	DOOR, front	1
64		174 991	KNOB, pointer 1.250	2
65		176 226	INSULATOR, switch power	1
66	S1	128 756	SWITCH, tgl 3PST 40A 600VAC	1
67		134 327	LABEL, warning general precautionary	2

+When ordering a component originally displaying a precautionary label, the label should also be ordered.

♦Part of 043 302 115V Aux Power Option (230/460) or 043 303 115V Aux Power Option (460/575).

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

Notes

Notes

Call
1-800-4-A-
MILLER
for your local
Miller distribu-
tor.

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