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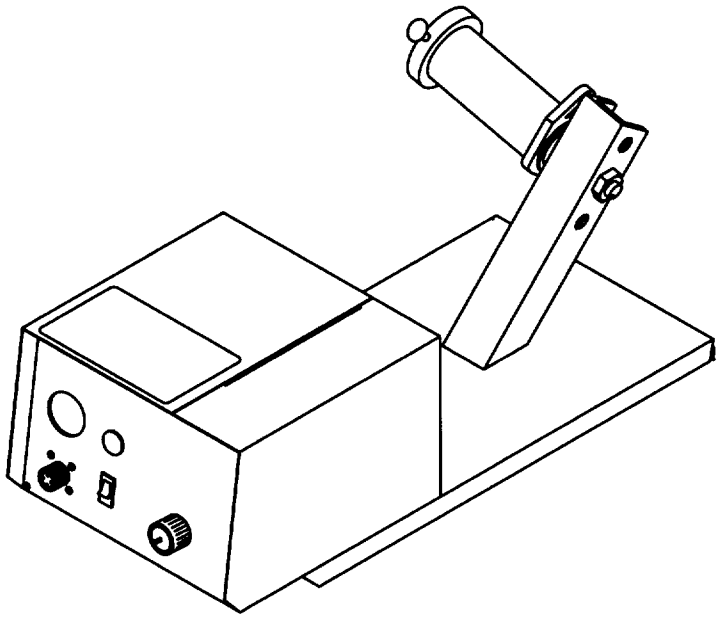
TECHNICAL MANUAL

Service And Parts



S-21E

Wire Feed Equipment

⚠ WARNING

SERVICING can be hazardous.

- Have all service procedures performed only by qualified persons following standard safety practices.

- Use MILLER Testing Booklet (Part No. 150 853) when servicing this unit.
- Use only genuine MILLER replacement parts.

■ For help, call Factory Service Department: 414-735-4505

■ Or FAX: 414-735-4136

■ Or write to: MILLER Electric Mfg. Co. P.O. Box 1079 Appleton, WI 54912 USA

PRINTED IN USA

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SECTION 1 – SAFETY PRECAUTIONS AND SIGNAL WORDS

1-1. GENERAL INFORMATION AND SAFETY

This manual provides theory of operation along with specific operating, testing, and troubleshooting procedures. It also includes precautionary information relevant to these procedures. This manual can be an effective tool in the hands of a trained serviceperson. However, it does not and cannot take the place of previous training nor safety-conscious service work. If any doubt arises about the specific application of procedures presented, or if problems arise which are not covered in this manual, contact the factory Service Department before proceeding further.

1-2. SAFETY ALERT SYMBOL AND SIGNAL WORDS

The following safety alert symbol and signal words are used throughout this manual to call attention to and identify different levels of hazard and special instructions.

This safety alert symbol is used with the signal words WARNING and CAUTION to call attention to the safety statements.

WARNING statements identify procedures or practices which must be followed to avoid serious personal injury or loss of life.

CAUTION statements identify procedures or practices which must be followed to avoid minor personal injury or damage to this equipment.

IMPORTANT *statements identify special instructions necessary for the most efficient operation of this equipment.*

1-3. SAFETY PRECAUTIONS

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Protect yourself with dry insulating gloves and clothing.*
- *Insulate yourself from ground by using rubber gloves and insulating floor mats when power is applied to the unit.*
- *Shut down unit and disconnect input power when servicing unless the procedure specifically requires an energized unit.*
- *Do not leave live unit unattended.*

ARC RAYS, SPARKS, AND HOT SURFACES can burn eyes and skin; NOISE can damage hearing.

- *Wear correct eye, ear, and body protection.*

FUMES AND GASES can seriously harm your health.

- *Keep your head out of the fumes.*
- *Ventilate to keep from breathing fumes and gases.*
- *If ventilation is inadequate, use approved breathing device.*
- *Read Material Safety Data Sheets (MSDSs) and manufacturer's instructions for any materials used.*

WELDING WIRE can cause puncture wounds.

- *Do not point gun toward any part of the body, any conductive surface, or other personnel.*

HOT METAL, SPATTER, AND SLAG can cause fire and burns.

- *Watch for fire.*
- *Have a fire extinguisher nearby, and know how to use it.*
- *Do not use near flammable material.*
- *Allow work and equipment to cool before handling.*

MOVING PARTS can cause serious injury.

- *Keep away from moving parts.*

HOT SURFACES can cause severe burns.

- *Allow cooling period before servicing.*

MAGNETIC FIELDS FROM HIGH CURRENTS can affect pacemaker operation.

- *Wearers should consult their doctor before going near the servicing of arc welding equipment or any arc welding operations.*

SECTION 2 – SHIPPING AND STORAGE

2-1. PREPARATION FOR RESHIPMENT

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Shut down wire feeder and welding power source, and disconnect input power employing lockout/tagging procedures before preparing unit for shipping.*

Lockout/tagging procedures for wire feeder consist of disconnecting interconnecting cord, and for welding power source consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device. Stop engine, and disconnect negative (–) battery cable from battery on welding generators.

1. Disconnect interconnecting cord from rear of wire feeder.
2. Disconnect weld cable from drive assembly.
3. Disconnect and remove any remote controls or devices.
4. Disconnect shielding gas (and water if applicable) hoses from wire feeder.
5. Disconnect gun from wire feeder.
6. Secure welding wire to spool/reel, and remove wire spool or reel from wire feeder.
7. Tape plastic around top and sides of unit.
8. Securely tie and/or tape cardboard over top and around sides of unit. Use original shipping carton if available.

IMPORTANT: *Do not ship without a cardboard carton. Not only do costs increase dramatically, but the unit is more subject to loss or damage without a carton.*

9. If sending unit to factory, ship unit as directed by factory Service Department or Transportation Department.

2-2. STORAGE

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Shut down wire feeder and welding power source, and disconnect input power employing lockout/tagging procedures before storing unit.*

Lockout/tagging procedures for wire feeder consist of disconnecting interconnecting cord, and for welding power source consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device. Stop engine, and disconnect negative (–) battery cable from battery on welding generators.

1. Disconnect interconnecting cord from rear of wire feeder.
2. Disconnect weld cable from drive assembly.
3. Disconnect and remove any remote controls or devices.
4. Disconnect shielding gas (and water if applicable) hoses from wire feeder.
5. Disconnect gun from wire feeder.
6. Secure welding wire to spool/reel, and remove wire spool or reel from wire feeder.
7. Clean outside of unit.
8. Remove wrapper.
9. Using dry compressed air, clean inside of unit.
10. Reinstall wrapper.
11. Select a storage location that least subjects the unit to wide temperature variation, dust, dirt, and corrosive vapors.
12. Carry unit to storage location.
13. Cover unit with plastic or suitable tarp.

SECTION 3 – SPECIFICATIONS

Table 3-1. Specifications

Input Power Requirements	Electrode Wire Diameter Capacity	Wire Spool Capacity	Electrode Wire Feed Speed	Weight	
				Net	Ship
24 VAC 3.5 Amps 50/60 Hz	.023 thru .045 in. (0.6 thru 1.1 mm)	10 to 20 lb. (4.5 to 9 kg) 8 in. (203 mm) spools up to 60 lb. (27.2 kg) coils	75-600 ipm (1.9-15.2 mpm) at 24 VAC	30 lbs. (13.6 kg)	33 lbs. (15 kg)

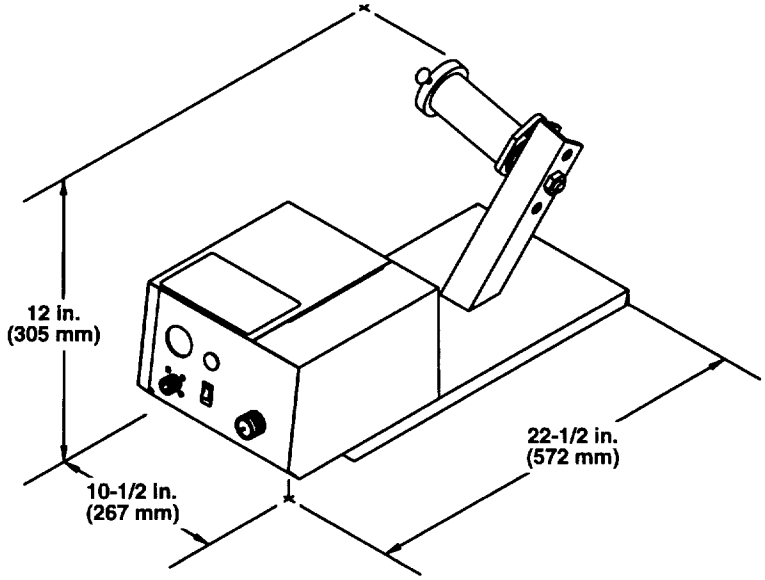


Figure 3-1. Overall Dimensions

3-1. DESCRIPTION

This unit is a semiautomatic constant speed wire feeder which operates on 24 volts ac. The feeder is designed for connection to a constant voltage (CV) type power source through a 14-pin connector. If 115 volts ac is the only power available for use with the feeder, the optional power supply adapter Model PSA-2 115/24 should be used to convert the power to 24 volts ac.

The case can be tightly latched to help keep out dust and dirt.

SECTION 4 – INSTALLATION OR RELOCATION

4-1. LOCATION (Figure 3-1)

The service life and efficiency of this unit and associated components are reduced when they are subjected to high levels of dust, dirt, moisture, corrosive vapors, and extreme heat.

A proper installation site should be selected for the wire feeder if the unit is to provide dependable service. Lead lengths must be considered when installing the unit. A slot is provided in the base of the unit to fit over the lifting eye on welding power sources so equipped. Suitable space should be maintained around the unit for making necessary connections and for maintenance functions.

4-2. DRIVE ROLL INSTALLATION (Figure 4-1)

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Shut down wire feeder and welding power source, and disconnect input power employing lockout/tagging procedures before inspecting or installing.*

Lockout/tagging procedures for wire feeder consist of disconnecting interconnecting cord, and for welding power source consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device. Stop engine, and disconnect negative (–) battery cable from battery on welding generators.

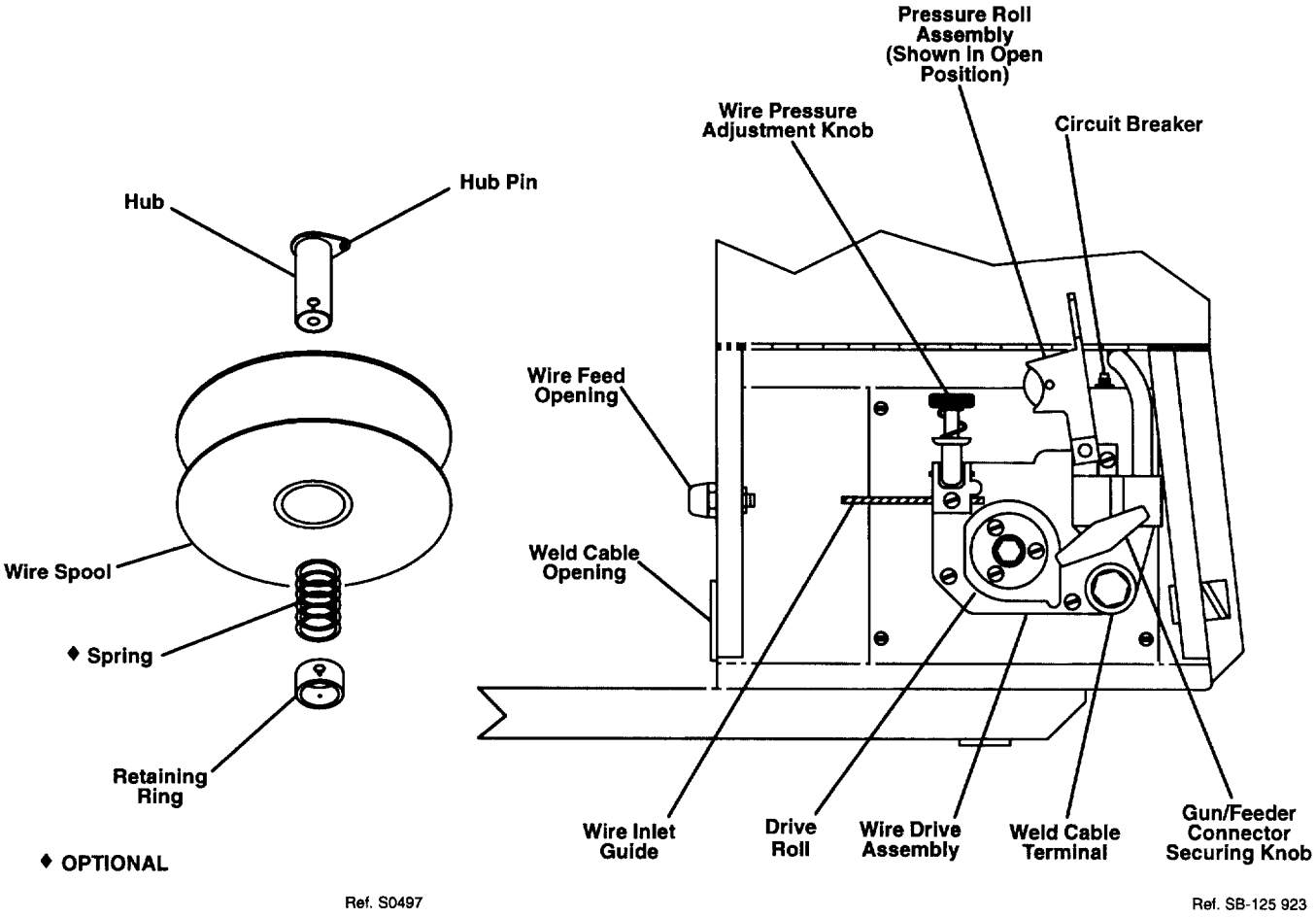


Figure 4-1. Wire Feeder Components

It is necessary to install the required drive rolls when setting up this unit and also when changing wire sizes.

IMPORTANT: *Base drive roll selection on the following recommendations:*

The dual-grooved drive roll provided with the feeder accommodates .023 through .045 in. (0.6 through 1.1 mm) wire. This drive roll has both a "V" groove and a "V" knurled groove. Use the "V" groove for feeding .023 and .030 in. (0.6 and 0.76 mm) wire. Use the "V" knurled groove for feeding .035 and .045 in. (0.89 and 1.1 mm) wire. The wire size for each groove is stamped on the side of the drive roll. When the drive roll is installed in the feeder, the wire size stamp for the unused groove will be visible.

The 50 Series wire feeder style drive rolls may be used with this feeder, but, due to the flat idler pressure roll used, a knurled drive roll is recommended when feeding .035 and .045 (.089 and 1.1 mm) wire.

WARNING: ELECTRIC SHOCK can kill.

- *Do not store metallic objects in this compartment. The motor drive assembly is electrically hot whenever the welding circuit is energized.*

  Loose metal objects in this compartment may create an electrical path between the weld output circuit and any metal surfaces or components resulting in electric shock.

IMPORTANT: *Both types of 50 Series style drive rolls can be reversed for reuse when they become worn. Reverse rolls to position unused groove(s) to feed wire. The dual-grooved drive roll provided with this feeder can be reversed, but only to feed a different size wire.*

1. Unlatch and open left case access door.
2. Loosen pressure adjustment knob, and pivot knob free of pressure arm.
3. Pivot pressure arm away to expose drive roll carrier.
4. For dual-grooved roll supplied with feeder:
   a. Choose the proper groove.
   b. Slide drive roll onto drive roll mounting hub with chosen groove toward inside of machine. The wire size for the unused groove will be visible after installation.
   c. Align the drive roll with holes.
   d. Insert securing screws, and tighten.

5. For 50 Series style one-piece drive rolls:
   a. Slide drive roll onto drive roll mounting hub.
   b. Align drive roll with holes.
   c. Insert securing screws, and tighten.
6. For 50 Series style split drive rolls:
   a. Align holes on pair of split drive rolls.
   b. Insert securing screw.
   c. Slide drive rolls onto drive roll mounting hub.
   d. Align drive rolls with holes.
   e. Insert securing screws, and tighten.

IMPORTANT: *Horizontal alignment of the drive roll on the drive roll mounting hub with the wire guide is factory set and should not require readjustment. If readjustment becomes necessary, see Section 10-2.*

7. Close and secure left case access door.

4-3. WELDING GUN CONNECTIONS (Figures 4-1 And 5-1)

WARNING: ELECTRIC SHOCK can kill.
- *Do not touch live electrical parts.*
- *Shut down wire feeder and welding power source, and disconnect input power employing lockout/tagging procedures before working on feeder.*

Lockout/tagging procedures for wire feeder consist of disconnecting interconnecting cord, and for welding power source consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device. Stop engine, and disconnect negative (–) battery cable from battery on welding generators.

IMPORTANT: *A hole is provided in the nameplate for installation of a gun requiring an opening for an external gas line. Remove snap-in blank before installation.*

A. Gun Connector To Drive Assembly (Figure 4-1)

1. Unlatch and open left case access door.
2. Loosen gun/feeder connector securing knob on the wire drive housing.
3. Insert gun/feeder connector through the access hole in the front panel.
4. Insert gun/feeder connector into drive housing with the outlet wire guide as close to the drive rolls as possible without touching, and tighten the securing knob.
5. Close and secure left case access door.

B. Gun Trigger (Figure 5-1)

TRIGGER RECEPTACLE

Connect gun trigger plug to trigger receptacle on the front panel as follows: align keyways, insert gun plug into trigger receptacle, and rotate threaded collar fully clockwise.

4-4. SHIELDING GAS INSTALLATION (Figures 4-2 And 4-3)

WARNING: PRESSURIZED CYLINDERS can rupture causing serious personal injury and loss of life; FALLING CYLINDERS can cause serious injury and equipment damage.
- *Keep cylinders away from welding or other electrical circuits.*
- *Never allow a welding electrode to touch any cylinder.*
- *Always fasten cylinder securely to running gear bracket, a wall, or other stationary support.*

A. Gas Cylinder (Customer Supplied)

Chain the cylinder to a wall or other stationary support to prevent the cylinder from falling over and breaking off the valve. If optional power source running gear is used, secure gas cylinder to running gear with supplied chain.

B. Regulator/Flowmeter (Customer Supplied)

1. With the cylinder securely installed, remove the cylinder cap, stand to one side of cylinder valve, and open valve slightly. When gas flows from cylinder, close valve. This procedure blows out dust or dirt that may have accumulated around the valve seat.

IMPORTANT: *A gasket should be installed to prevent leaks. Do not use lubricants or sealing agents.*

2. The regulator/flowmeter must be properly equipped with a stem, nut connectors, and gasket for use with either CO_2 cylinders or inert gas type cylinders.
3. Install gas regulator/flowmeter onto gas cylinder valve; keep the face of the regulator/flowmeter gauge in vertical position, and tighten stem nut securely to gas cylinder valve.
4. A shielding gas fitting is provided on the rear of the wire feeder. Obtain a suitable hose with 5/8-18 right- hand fitting. Attach one end of the gas hose to this fitting. Attach the other end of the gas hose to the regulator/flowmeter.

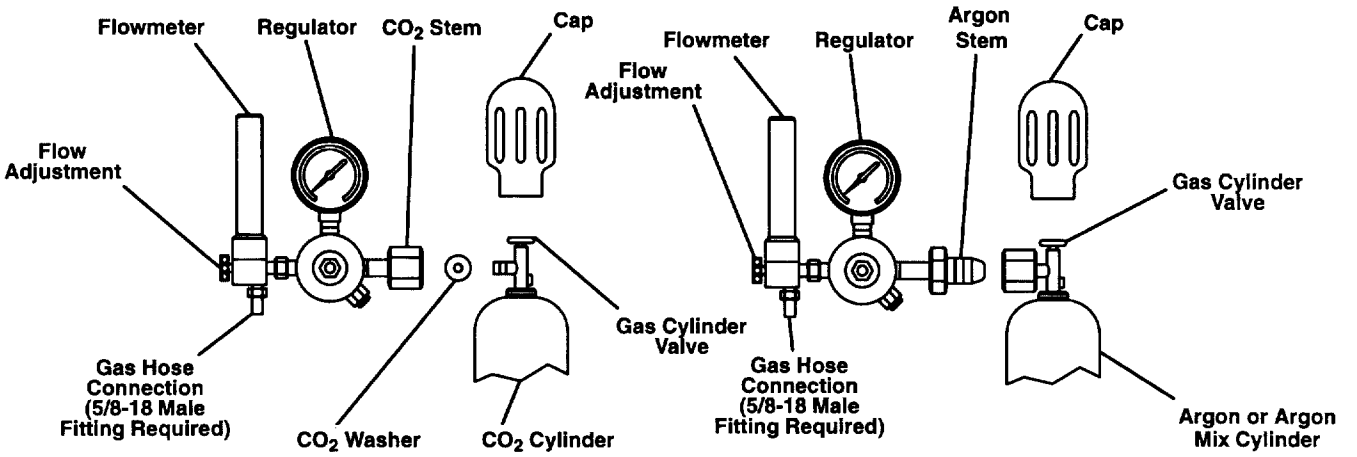


Figure 4-2. Typical Regulator/Flowmeter Installation

4-5. 14-PIN PLUG CONNECTION (Figures 4-3 And 4-4)

The 14-pin plug PLG100, on the end of the interconnecting cord, provides a junction point for connecting the wire feeder to a welding power source. This connection provides 24 volt ac power, and contactor control when used with a constant voltage (CV) power source with a 14-pin receptacle. To make connections, align keyway, insert plug, and rotate threaded collar fully clockwise.

The pins on plug PLG100 are defined in relation to both the power source and wire feeder. The welding power source provides six functions to the wire feeder. The pins are designated as follows:

Pin A: Up to 10 amperes of 24 volts ac, 60 Hz, with respect to socket G (circuit common); protected by fuse in welding power source.

Pin B: 24 volts ac input power to energize the weld contactor. The feeder sends back 24 volts ac by means of a contact closure from pin A to pin B.

Pin G: 24 volts ac circuit common; also connected to welding power source chassis.

IMPORTANT: *The remaining pins in the receptacle are not used by the feeder.*

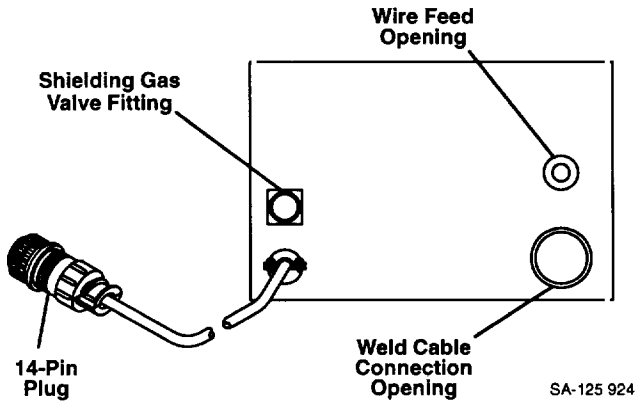


Figure 4-3. Rear Panel View

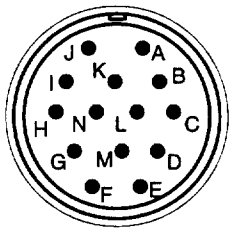


Figure 4-4. Front View Of 14-Pin Plug With Pin Locations

4-6. WELDING WIRE INSTALLATION (Figure 4-5)

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Shut down wire feeder and welding power source, and disconnect input power employing lockout/tagging procedures before working on feeder.*

Lockout/tagging procedures for wire feeder consist of disconnecting interconnecting cord, and for welding power source consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device. Stop engine, and disconnect negative (–) battery cable from battery on welding generators.

CAUTION: LOOSE WELDING WIRE can cause injury.

- *Keep a firm hold on the wire during installation, removal, and threading operations.*

Spooled wire has a tendency to unravel rapidly when loosened from the spool.

IMPORTANT: *If it should become necessary to replace any part of the hub assembly, see hub assembly reinstallation instruction in Section 10-3.*

A. Installation Of Spool-Type Wire (Figure 4-1)

1. Remove retaining ring from hub.
2. Slide wire spool on hub so that wire feeds off the bottom of the spool.
3. Rotate wire spool until hole in spool slides over pin in hub and seats against back flange of the hub.
4. Insert optional compression spring if required.
5. Reinstall retaining ring to secure wire spool on hub.

B. Installation Of Optional Wire Reel And Reel-Type Wire (Figure 4-5)

1. Remove retaining ring and, if applicable, wire reel assembly from hub.
2. Lay wire reel assembly flat on a table or floor.
3. Remove spanner nut from wire reel assembly.
4. Remove wire retainer, and install wire onto wire reel. Be sure that wire feeds off bottom of reel.
5. Reinstall wire retainer and spanner nut onto wire reel.
6. Slide wire reel assembly onto hub, and rotate assembly until hub guide pin is seated in reel.
7. Reinstall retaining ring onto hub.

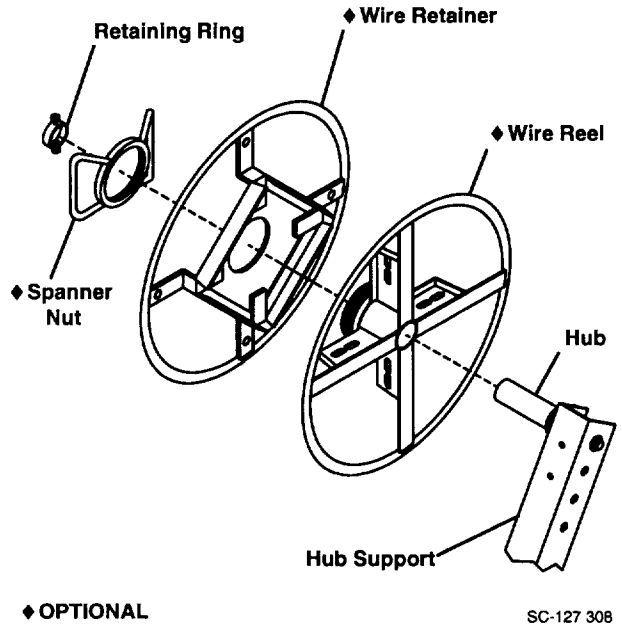


Figure 4-5. Optional Wire Reel And Reel-Type Wire Installation

4-7. WELDING WIRE THREADING

WARNING: ELECTRIC SHOCK can kill; MOVING PARTS can cause injury.

- *Do not touch live electrical parts.*
- *Keep clear of pinch points.*
- *Do not energize welding power source or wire feeder until instructed to do so.*

The welding wire and all metal parts in contact with it are energized while welding.

WELDING WIRE can cause puncture wounds; HOT SURFACES can burn skin.

- *Do not depress gun trigger until instructed to do so.*
- *Do not point gun toward any part of the body, any conductive surface, or other personnel when threading welding wire.*
- *Allow gun to cool before touching.*

FLYING DIRT AND METAL PARTICLES can injure personnel and damage equipment.

- *Point gun liner only in a safe direction away from personnel and equipment when cleaning with compressed air.*

Blow out the gun wire guide liner with compressed air when changing wire. This will remove any metal chips and dirt that may have accumulated.

CAUTION: LOOSE WELDING WIRE can cause injury.

- *Keep a firm hold on the wire during installation, removal, and threading operations.*

Spooled wire has a tendency to unravel rapidly when loosened from the spool.

1. Install the wire as instructed in Section 4-6.
2. Cut off any portion of the free end of the wire which is not straight. Be sure that the cut end is free from rough surfaces to permit proper feeding.
3. Adjust hub tension according to Section 4-8 if necessary.
4. Loosen the pressure adjustment knob on the wire drive housing, and pivot the pressure arm open.
5. Feed the wire through the inlet wire guide, past the drive rolls, and on into the gun. Feed approximately 4 inches (102 mm) of wire into the gun.
6. Close the pressure lever, and secure with pressure adjustment knob making sure the welding wire is in the drive roll groove and properly aligned with the inlet and outlet guides (outlet guide is part of gun).
7. Tighten the pressure adjustment knob to obtain the proper clamping pressure on the welding wire. Do not overtighten. Further adjustment can

be made when the wire feeder is put into operation.

4-8. ADJUST THE HUB TENSION (Figure 4-1)

CAUTION: LOOSE WELDING WIRE can cause injury.

- *Keep a firm hold on the wire during installation, removal, and threading operations.*

Spooled wire has a tendency to unravel rapidly when loosened from the spool.

Check the hub tension by slowly pulling the wire toward the drive roll. The wire should unwind freely, but have sufficient tension to keep the wire taut and prevent backlash when wire feeding stops. If adjustment is necessary, loosen or tighten the hex nut on the end of the hub support shaft accordingly.

4-9. WELDING CABLE CONNECTION

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Shut down wire feeder and welding power source, and disconnect input power employing lockout/tagging procedures before making weld cable connections.*

Lockout/tagging procedures for wire feeder consist of disconnecting interconnecting cord, and for welding power source consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device. Stop engine, and disconnect negative (–) battery cable from battery on welding generators.

1. Unlatch and open left case access door.
2. Route weld cable through weld cable connection opening on rear of unit (see Figures 4-1 and 4-3).
3. Connect end of cable to terminal on bottom of drive assembly. Be sure that terminal is clean and bolt is secure.
4. Close and secure left case access door.

4-10. FEEDING WELDING WIRE

WARNING: ELECTRIC SHOCK can kill; MOVING PARTS can cause injury.

- *Do not touch live electrical parts.*
- *Keep away from pinch points.*
- *Do not energize welding power source or wire feeder until instructed to do so.*

The welding wire and all metal parts in contact with it are energized while welding.

WELDING WIRE can cause puncture wounds; HOT SURFACES can burn skin.

- *Do not depress gun trigger until instructed to do so.*
- *Do not point gun toward any part of the body, any conductive surface, or other personnel when threading welding wire.*
- *Allow gun to cool before touching.*

1. Be sure wire is installed as instructed in Section 4-7.
2. Be sure gun is installed according to Section 4-3 of this manual and the gun Owner's Manual.
3. Cut off any portion of the free end of the wire which is not straight. If necessary, straighten wire to remove cast. Be sure that the cut end is free from rough surfaces to permit proper feeding.
4. Lay gun cable assembly out flat and straight (no coils in the cable/conduit).
5. Energize the welding power source.
6. Place the wire feeder POWER switch in the ON position.

WARNING: ELECTRIC SHOCK can kill; TANGLED WELDING WIRE can touch case causing welding power source open-circuit voltage to be present on case if gun trigger is pressed.

- *Do not touch wire feeder case if gun trigger is pressed, and wire does not feed.*
- *If wire stops feeding, turn off welding power source, and determine the cause.*
- *Correct any hub tension, jammed wire, or gun liner damage problems before trying to continue welding.*

7. Press the gun trigger (see WARNING block at beginning of the Section). Wire feeds if drive roll pressure is properly adjusted to prevent slippage. If wire slippage is noticed, adjust hub tension according to Section 4-8. If excessive pressure is required, check gun contact tube and gun liner for correct size or obstructions. Release the trigger when welding wire extends approximately one inch (25 mm) out of gun tip.
8. Shut down wire feeder and welding power source.

SECTION 5 – OPERATOR CONTROLS

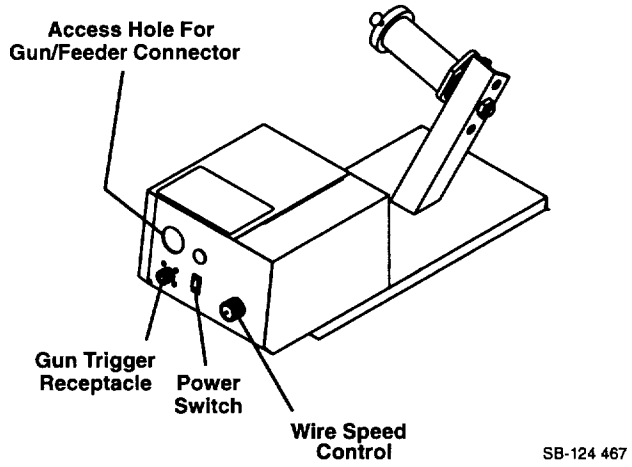


Figure 5-1. Control Panel View

5-1. POWER SWITCH (Figure 5-1)

POWER

The POWER switch functions as the ON/OFF switch for the wire feeder.

5-2. WIRE SPEED CONTROL (Figure 5-1)

WIRE SPEED

The WIRE SPEED control adjusts the wire feed speed in inches per minute within the wire speed range. Rotating the WIRE SPEED control clockwise increases wire feed speed. The scale is calibrated in inches per minute.

SECTION 6 – SEQUENCE OF OPERATION

6-1. GAS METAL ARC (GMAW) AND FLUX CORED ARC (FCAW) WELDING

WARNING: ELECTRIC SHOCK can kill; MOVING PARTS can cause serious injury; EXPOSURE TO ENVIRONMENT can damage internal parts.

- *Do not touch live electrical parts.*
- *Keep case closed while operating.*

Warranty is void if the wire feeder is operated with any portion of the outer enclosure open or removed.

ARC RAYS can burn eyes and skin; NOISE can damage hearing.

- *Wear correct eye, ear, and body protection.*

FUMES AND GASES can seriously harm your health.

- *Ventilate to keep from breathing fumes and gases.*
- *If ventilation is inadequate, use approved breathing device.*

HOT METAL, SPATTER, AND SLAG can cause fire and burns.

- *Watch for fire.*
- *Keep a fire extinguisher nearby, and know how to use it.*
- *Allow work and equipment to cool before handling.*

MAGNETIC FIELDS FROM HIGH CURRENTS can affect pacemaker operation.

- *Wearers should consult their doctor before going near arc welding gouging, or spot welding operations.*

WELDING WIRE can cause puncture wounds.

- *Do not point gun toward any part of the body, any conductive surface, or other personnel.*

1. Install and connect unit according to Section 4.
2. Wear dry insulating gloves and clothing.
3. Connect work clamp to clean, bare metal at workpiece.
4. Rotate WIRE SPEED control to desired position (see Section 5-2).

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Do not touch welding wire or any metal part in contact with it while welding.*

The welding wire and all metal parts in contact with it carry weld output when the welding power source contactor is energized.

5. Energize the welding power source or generator.
6. Place the POWER switch in the ON position
7. Turn on shielding gas at the source, if applicable.
8. Wear welding helmet with proper filter lens according to ANSI Z49.1.
9. Hold tip of gun approximately 1/2 in. (13 mm) from workpiece, and depress gun trigger. Current flows, gas flows, and wire feeds. If wire slippage is noticed, adjust drive roll pressure according to Section 4-7.

WARNING: ELECTRIC SHOCK can kill; TANGLED WELDING WIRE can touch case causing welding power source open-circuit voltage to be present on case if gun trigger is pressed.

- *Do not touch wire feeder case if gun trigger is pressed and wire does not feed.*
- *If wire stops feeding, turn off welding power source, and determine the cause.*
- *Correct any hub tension, jammed wire, or gun liner damage problems before trying to continue welding.*

6-2. SHUTTING DOWN

1. Stop welding.
2. Place POWER switch in the OFF position.
3. Shut down welding power source or generator.
4. Turn off shielding gas at source, if applicable.

WARNING: HIGH CONCENTRATION OF SHIELDING GAS can harm health or kill.

- *Shut off gas supply when not in use.*

SECTION 7 – THEORY OF OPERATION

7-1. THEORY OF OPERATION

IMPORTANT: *The following Theory Of Operation is written in steps which match the circled numbers on Diagrams 7-1 and 7-2.*

A. Wire Feeder Without Options (Diagram 7-1)

1. The 14-pin plug PLG100 on the end of the interconnecting cord provides 24 volts ac input power from the welding power source and provides contactor control to the welding power source.
2. POWER switch S1 provides on/off control of 24 volts ac input power to the wire feeder.
3. Circuit breaker CB1 provides overload protection for the wire feeder.
4. Motor Board PC1 regulates the speed of wire drive motor M1 as set by WIRE SPEED control R32. PC1 also controls gas valve GS1 and welding power source contactor via control relay CR1.
5. Gas valve GS1 provides shielding gas during the weld cycle.
6. Integrated rectifier SR1 converts the 24 volts ac input power to a rectified 35 volts dc.
7. Capacitor C1 provides filtering for the 35 volts dc.
8. Voltage regulator VR1 reduces the 35 volts dc input voltage to 24 volts dc for control circuitry on PC1 and trigger receptacle RC101.
9. Trigger receptacle RC101 provides the trigger input signal to the motor stop/start circuitry.
10. Motor stop/start circuitry provides input to the brake turn on ramp, phase modulation, and control relay circuitries.
11. Control relay CR1 controls gas valve GS1 and the welding power source contactor through 14-pin plug PLG100.
12. Brake circuitry transistor Q7 provides an electrical path for motor current during braking.
13. Turn on ramp provides power to WIRE SPEED control R32.
14. WIRE SPEED control R32 provides a signal to the comparator circuitry to control the wire speed.
15. Feedback circuitry provides comparator circuitry with a feedback signal of actual motor voltage.
16. Comparator circuitry compares feedback signal to R32 control signal and adjusts phase modulation circuitry accordingly.
17. Phase reset transistors Q5 and Q6 reset the timing of phase modulation.
18. Unijuction transistor Q1 creates the phase modulation from the charging of capacitor C10.
19. Pulse transformer T1 transfers the phase modulated signal to the gates of SCR1 and SCR2.
20. Drive SCR's SCR1 and SCR2 turn on from the phase modulation signal and supply power to wire drive motor M1.
21. Wire drive motor M1 feeds the welding wire.

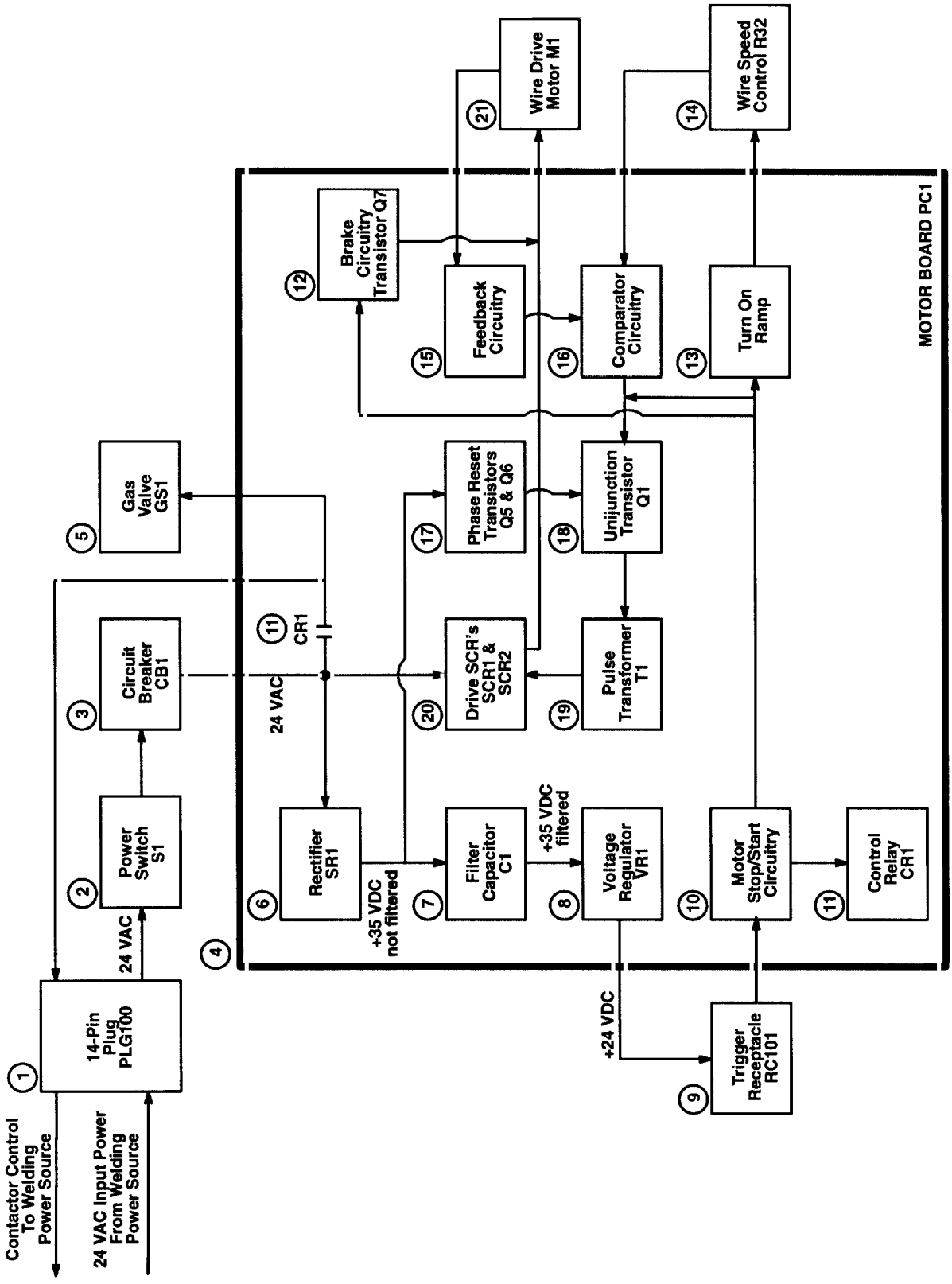


Diagram 7-1. Block Diagram For Wire Feeder (Without Options)

IMPORTANT: *The circled numbers match the steps in the Theory Of Operation (Section 7-1A).*

B. Spot/Burnback Time Control Option (Diagram 7-2)

1. Optional Spot/Burnback Board PC2 provides control of spot weld time and adjustment of burnback time.

2. Burnback potentiometer R26 allows adjustment of the burnback time between 0.02 and 0.25 seconds.

3. Spot time potentiometer R25 allows adjustment of spot time from 0.12 to 2.5 seconds or 0.25 to 5 seconds depending on the setting of Spot Time DIP Switch S1.

4. Spot/Continuous switch S51 allows either a normal untimed weld cycle or a timed spot weld cycle.

5. Spot time DIP switch S1 provides a selection of short range (0.12 to 2.5 seconds) or long range (0.25 to 5 seconds) spot time.

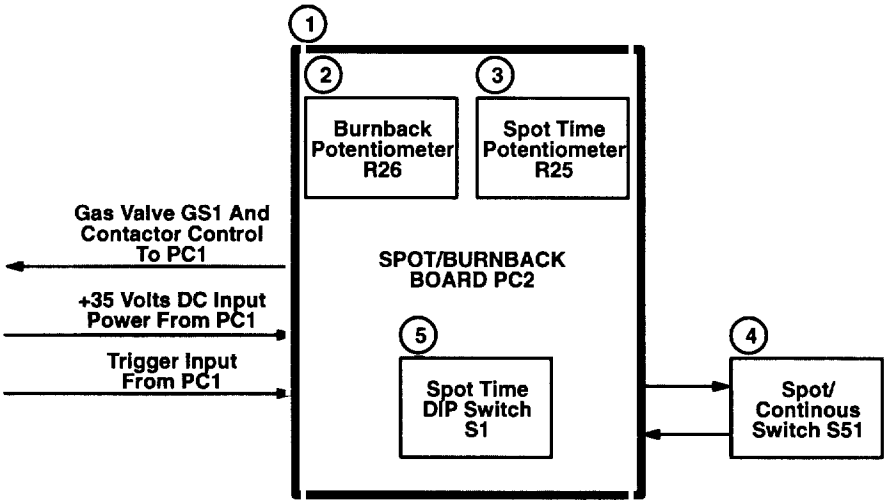


Diagram 7-2. Block Diagram For Spot/Burnback Time Control Option

Notes

SECTION 8 – TROUBLESHOOTING

8-1. TESTING INSTRUMENTS AND INFORMATION

The service procedures in this manual require proper testing instruments. Use a good quality digital volt-ohmmeter (DVM) with one megohm input impedance or greater and diode check capability (use an analog VOM for variable resistor testing). If an oscilloscope is specified, use a good quality unit with one megohm input impedance or greater. If a circuit board has a protective coating, it will be necessary to remove coating or use needle probes in the test area to obtain proper contact. Recoat areas if necessary to retain corrosion protection. Digital volt-ohmmeters (DVM's) do not require lead polarity attention when making connections. However, the meter may indicate a – (negative) voltage when the test procedure specified a + (positive) voltage. If the incorrect polarity appears on the display, reverse meter lead connections to test points.

8-2. CIRCUIT BOARD HANDLING PRECAUTIONS

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Shut down wire feeder and welding power source, and disconnect input power employing lockout/tagging procedures before inspecting, maintaining, or servicing.*

Lockout/tagging procedures for wire feeder consist of disconnecting interconnecting cord, and for welding power source consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device. Stop engine, and disconnect negative (–) battery cable from battery on welding generators.

MOVING PARTS can cause serious injury.

- *Keep away from moving parts.*

HOT SURFACES can cause severe burns.

- *Allow cooling period before servicing.*

CAUTION: ELECTROSTATIC DISCHARGE (ESD) can damage circuit boards.

- *Put on properly grounded wrist strap BEFORE handling circuit boards.*
- *Transport circuit boards in proper static-shielding carriers or packages.*
- *Perform work only at a static-safe work area.*

INCORRECT INSTALLATION or misaligned plugs can damage circuit board.

- *Be sure that plugs are properly installed and aligned.*

EXCESSIVE PRESSURE can break circuit board.

- *Use only minimal pressure and gentle movement when disconnecting or connecting board plugs and removing or installing board.*

8-3. TROUBLESHOOTING (Table 8-1 And Diagram 8-1)

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Shut down wire feeder and welding power source, and disconnect input power employing lockout/tagging procedures before inspecting, maintaining, or servicing.*

Lockout/tagging procedures for wire feeder consist of disconnecting interconnecting cord, and for welding power source consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device. Stop engine, and disconnect negative (–) battery cable from battery on welding generators.

MOVING PARTS can cause serious injury.

- *Keep away from moving parts.*

HOT SURFACES can cause severe burns.

- *Allow cooling period before servicing.*

Troubleshooting to be performed only by qualified persons.

The troubleshooting table is designed to diagnose some of the troubles that can develop in this wire feeder. Any circuit normally tied to ground must be at ground potential.

Use the table in conjunction with the diagrams in this manual and the exploded views and component values in the Service Parts Manual while performing troubleshooting procedures.

When replacing components, use only genuine MILLER replacement parts. MILLER parts are required for warranty repair by authorized warranty service agency.

Resistance and continuity measurements must be made with the unit shut down. Isolate components before making resistance and continuity measurements.

IMPORTANT: *Before beginning troubleshooting procedures, visually examine internal components for signs of overheating and failure. Many major problems, such as winding(s) failure are usually apparent by discoloration, smoke, and smell. Fortunately, most electrical problems are relatively simple: blown fuses, tripped circuit breakers, incorrect switch positions, loose connections, corrosion, and the like. A complete, careful inspection often saves considerable time, money, and frustration.*

IMPORTANT: *Be sure that all connections are correct and secure according to Section 4 and that all controls and switches are in proper positions before proceeding with troubleshooting.*

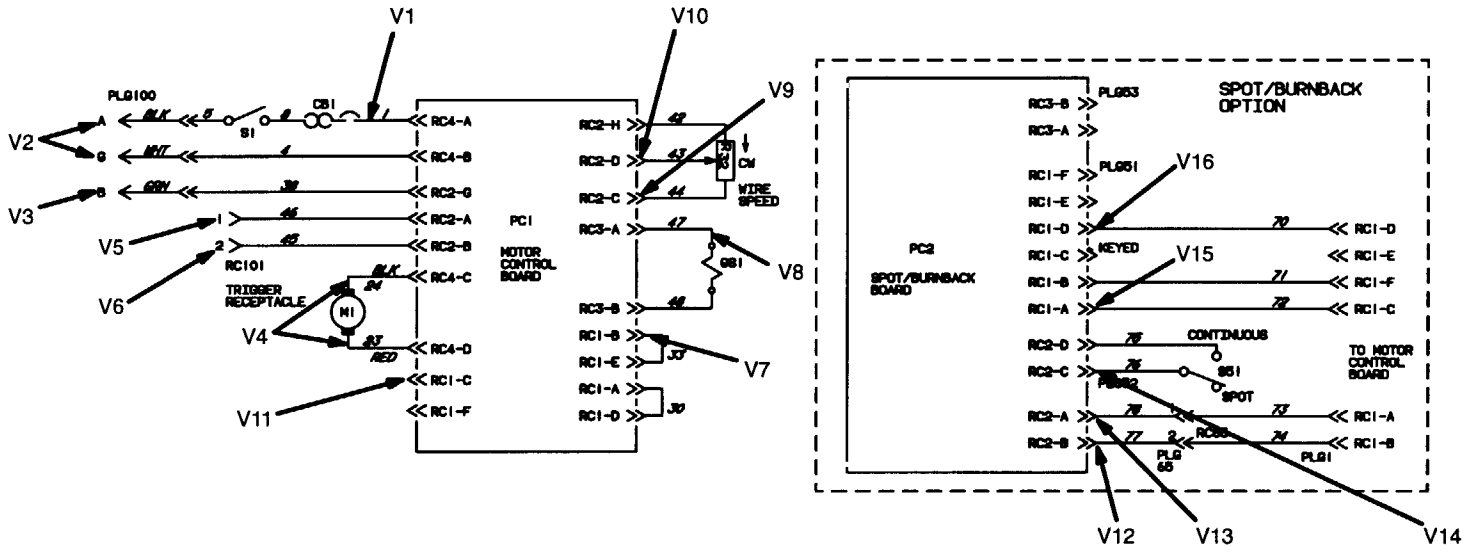
Table 8-1. Troubleshooting

TROUBLE	CAUSE	REMEDY
Wire does not feed.	Circuit breaker CB1.	Check gun liner, hub tension, and drive roll pressure (see Section 4). Reset CB1 (see Section 10-5).
	Loose or improperly made gun trigger connection.	Check gun trigger connection (see Section 4-3).
	Gun trigger.	See gun Owner's Manual.
	Welding gun shorted.	Repair or replace welding gun.
	Motor M1.	Check connections for continuity to M1. Check motor brushes (see Section 10-4). Replace M1 if necessary.
	Motor Control Board PC1 or poor connections to PC1.	Check connections for continuity to PC1. Check PC1 according to Diagram 8-2 and Section 8-4. Replace PC1 if necessary.
Wire feeds erratically.	Pressure on drive roll is insufficient.	Rotate pressure adjustment knob counterclockwise in 1/4 turn increments until the wire stops slipping (see Section 4-2).
	Drive roll wrong size for wire size used.	Change to correct size drive roll (see Section 4-2).
	Drive rolls worn.	Replace drive rolls (see Section 4-2).
	Dirt in drive rolls.	Clean drive rolls (see Section 10-1C).
	Motor Control Board PC1 or poor connections to PC1.	Check connections for continuity to PC1. Check PC1 according to Diagram 8-2 and Section 8-4. Replace PC1 if necessary.
Wire feeds but there is no gas flow.	Gas valve GS1.	Check GS1 for proper coil voltage and connections (see Diagram 8-1). Check continuity of coil. Replace GS1 if necessary.
	Motor Control Board PC1 or poor connections to PC1.	Check connections for continuity to PC1. Check PC1 according to Diagram 8-2 and Section 8-4. Replace PC1 if necessary.
Wire does not feed until trigger is pulled but continues to feed after trigger is released.	Welding gun is shorted between one of the trigger leads and weld cable.	Repair or replace welding gun.
Gun nozzle opening restricted.	Weld spatter or foreign matter accumulation.	Carefully remove any weld spatter or foreign matter which may accumulate around the nozzle opening. Use a hardwood stick, never a metal tool.
The gas valve in the feeder is rattling loudly along with possible erratic or slow wire feed speed.	Welding gun is shorted between one of the trigger leads and weld cable.	Repair or replace welding gun.
Motor runs but wire is not energized with Spot/Burnback Option installed.	Spot/Burnback Board PC2 or poor connections to PC2.	Check connections for continuity to PC2. Check PC2 according to Diagram 8-3 and Section 8-5. Replace PC2 if necessary.

WARNING: ELECTRIC SHOCK can kill; MOVING PARTS can cause serious injury.

- *Do not touch live electrical parts.*
- *Shut down wire feeder and welding power source or stop engine before making or changing meter lead connections and before disconnecting or connecting any leads*
- *Have only qualified persons familiar with and following standard safety practices perform troubleshooting procedures.*
- *Follow standard ESD precautions to prevent damaging static-sensitive parts during testing.*
- *See Table 8-1 if values are not present.*

IMPORTANT: *For DC, the values are based on a good quality digital volt-ohmmeter or equivalent reading average (not RMS) values. For AC, the values are RMS readings. The DC voltages shown are with respect to DC circuit common lead 24 (pin C of plug PLG4) and the AC voltages are with respect to lead 4 (pin B of plug PLG4) unless otherwise indicated. Use Wiring Diagram (see Section 11) and Figure 9-1 to help locate leads and parts.*



Voltage Readings ±10% Unless Specified	
V1	24 volts ac with POWER switch S1 ON
V2	24 volts ac
V3	24 volts ac contactor control with gun trigger pressed
V4	+3 to +24 volts dc from min. to max. of WIRE-SPEED control R32
V5	+24 volts dc
V6	+24 volts dc
V7	+19 volts dc with gun trigger pressed
V8	+24 volts dc when gun trigger pressed
V9	+6.5 volts dc
V10	0 to +6.5 volts dc from min. to max. of WIRE-SPEED control R32 with gun trigger pressed
V11	+35 volts dc
V12	+24 volts dc for contactor control with gun trigger pressed
V13	+24 volts dc for motor stop/start circuity with gun trigger pressed.
V14	0 volts dc during spottime 0.7 volts dc after spottime with S51 in Spot
	0 volts dc with S51 in Continuous
V15	+35 volts dc
V16	+19 volts dc with gun trigger pressed

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Diagram 8-1. Troubleshooting Circuit Diagram For Wire Feeder

8-4. MOTOR BOARD PC1 TESTING INFORMATION (Figure 8-1 And Diagram 8-2)

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Shut down wire feeder and welding power source or stop engine before making or changing meter lead connections and before disconnecting or connecting any leads.*

MOVING PARTS can cause serious injury.

- *Keep away from moving parts.*

HOT SURFACES can cause severe burns.

- *Allow cooling period before servicing.*

This procedure requires the unit to be energized. Only qualified persons familiar with and following standard safety practices are to perform this testing procedure.

CAUTION: ELECTROSTATIC DISCHARGE (ESD) can damage circuit boards.

- *Put on properly grounded wrist strap BEFORE handling circuit boards.*
- *Transport circuit boards in proper static-shielding carriers or packages.*
- *Perform work only at a static-safe work area.*

INCORRECT INSTALLATION or misaligned plugs can damage circuit board.

- *Be sure that plugs are properly installed and aligned.*

EXCESSIVE PRESSURE can break circuit board.

- *Use only minimal pressure and gentle movement when disconnecting or connecting board plugs and removing or installing board.*

IMPORTANT: *For all checks, be sure to test and verify the continuity of leads between the board and the area where check is performed. All checks should go through the connections and be actual terminal-to-terminal tests so that bad connections or leads and corrosion are not the problem.*

A. Preliminary Checks

1. Check that jumper plug PLG1 is secure in receptacle RC1 on Motor Control Board PC1.
2. Check that plug PLG2 is secure in receptacle RC2 on Motor Control Board PC1.
3. Check that plug PLG3 is secure in receptacle RC3 on Motor Control Board PC1.
4. Check that plug PLG4 is secure in receptacle RC3 on Motor Control Board PC1.

B. Power Supply Circuit

Input power of 24 volts ac should be present between pins A and B of receptacle RC4. If 24 volts ac are not present, check POWER switch S1 and circuit breaker CB1 for proper operation with an ohmmeter.

An output voltage of +24 volts dc should be present at pin A of receptacle RC2 with respect to circuit common. If +24 volts dc are not present at pin A, replace Motor Control Board PC1.

An output voltage of +6.5 volts dc should be present at pin C of receptacle RC2 with respect to circuit common with gun trigger pressed. If +6.5 volts dc are not present at pin C, replace Motor Control Board PC1.

C. Trigger Circuit

When the gun trigger is pressed, +19 volts dc should be present at pin B of receptacle RC2 with respect to circuit common otherwise the voltage at pin B should be 0 volts dc when the gun trigger is not pressed. The trigger signal is then supplied to pin A of receptacle RC1 as a motor start/stop control signal and also supplied to pin B of receptacle RC1 to control gas valve GS1 and contactor control relay CR1 on PC1.

D. Wire Feed Speed Circuit

The 0 to +6.5 volts dc wire feed speed command input signal should be present at pin D of receptacle RC2. The wire feed speed command signal is compared to the current and voltage feedback from Motor M1 thereby providing the proper voltage output of 0 to +24 volts dc to wire drive motor M1 through pins D (positive) and C (negative) of receptacle RC4. If 0 to +24 volts dc is not present between pins C and D of RC4, replace Motor Control Board PC1.

WARNING: ELECTRIC SHOCK can kill; MOVING PARTS can cause serious injury.

- *Do not touch live electrical parts.*
- *Shut down wire feeder and welding power source or stop engine before making or changing meter lead connections and before disconnecting or connecting any leads.*
- *Have only qualified persons familiar with and following standard safety practices perform troubleshooting procedures.*
- *Follow standard ESD precautions to prevent damaging static-sensitive parts during testing.*

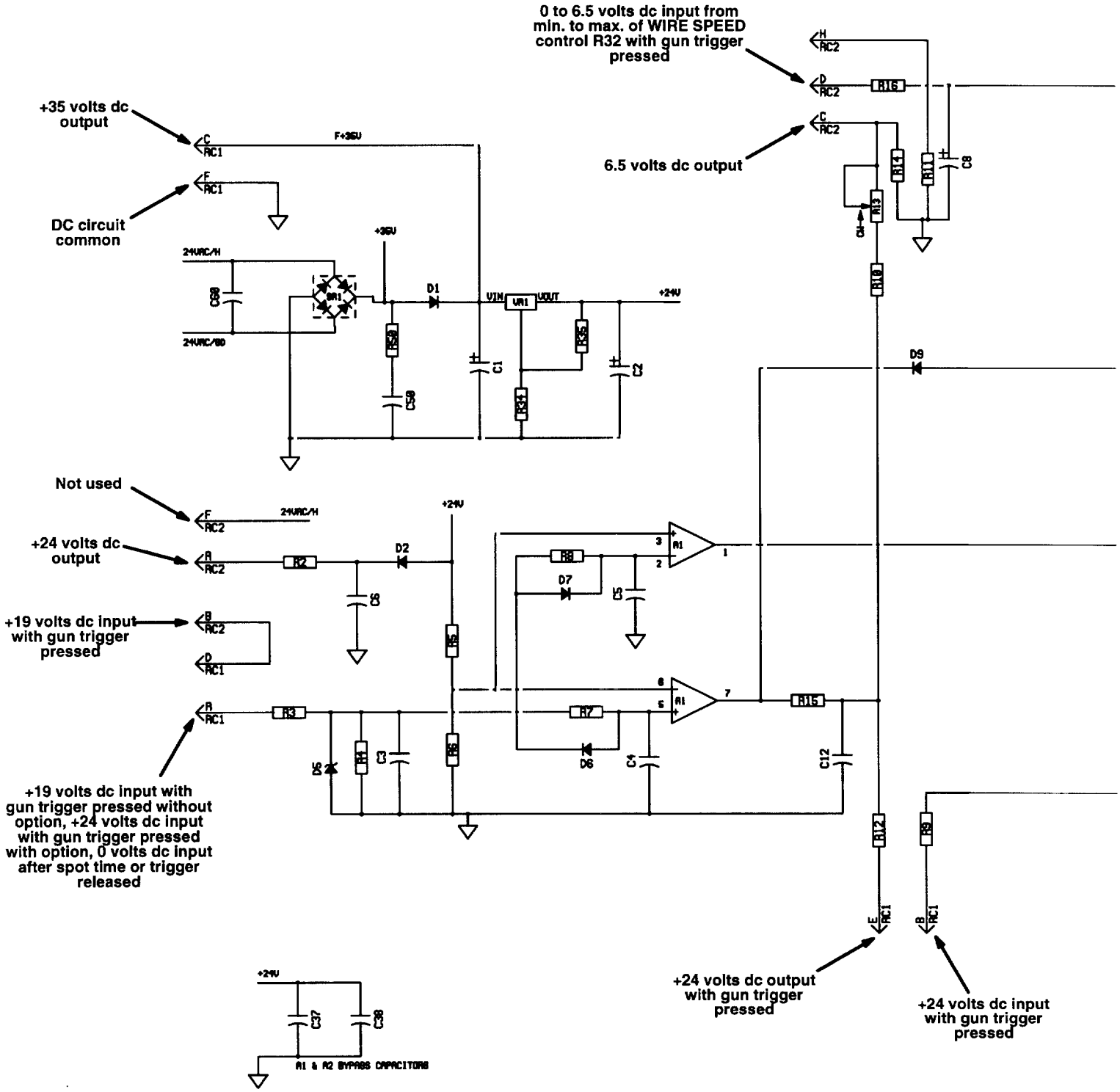
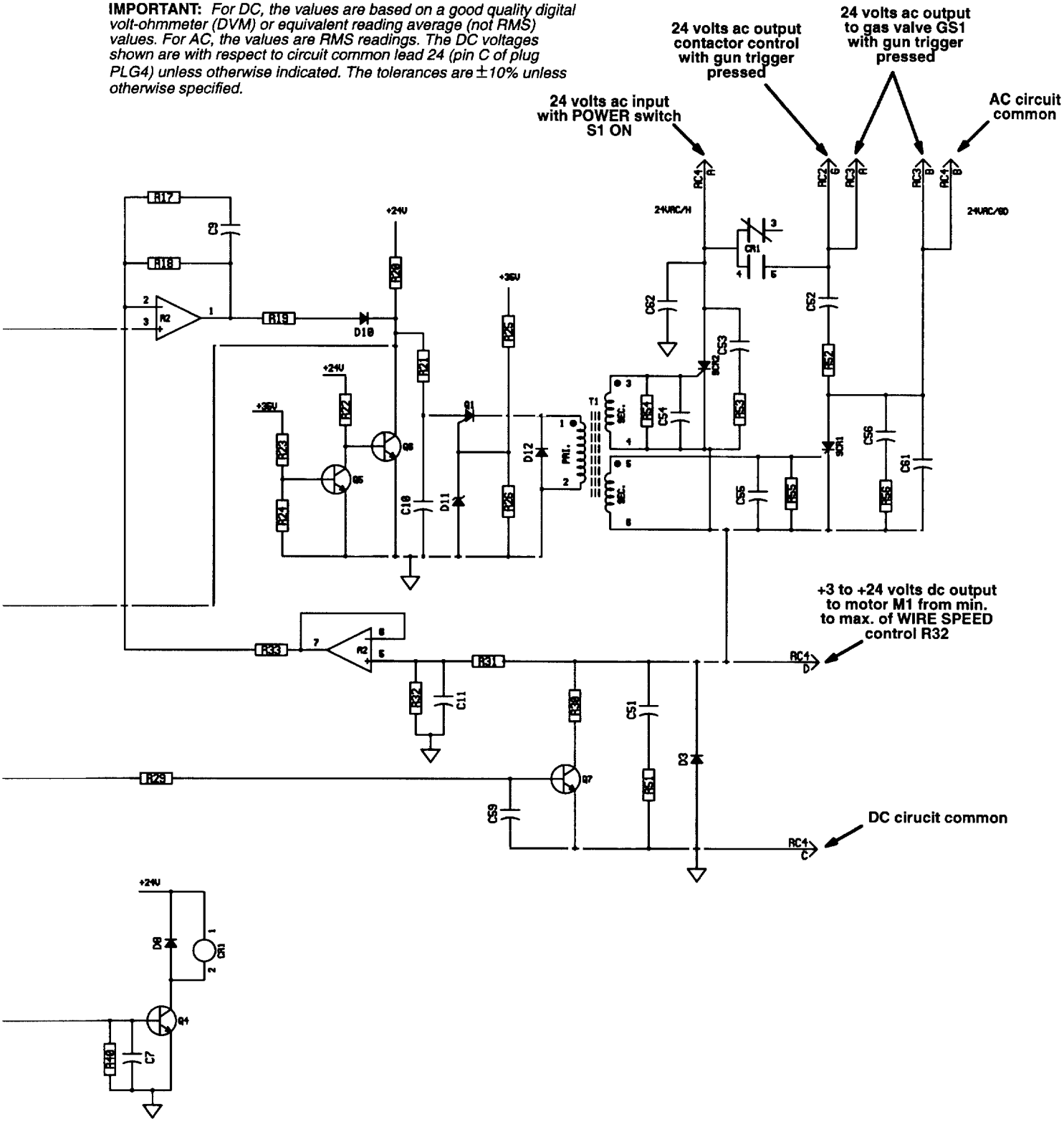


Diagram 8-2. Troubleshooting Circuit Diagram For Motor Control Board PC1

IMPORTANT: *For DC, the values are based on a good quality digital volt-ohmmeter (DVM) or equivalent reading average (not RMS) values. For AC, the values are RMS readings. The DC voltages shown are with respect to circuit common lead 24 (pin C of plug PLG4) unless otherwise indicated. The tolerances are ±10% unless otherwise specified.*



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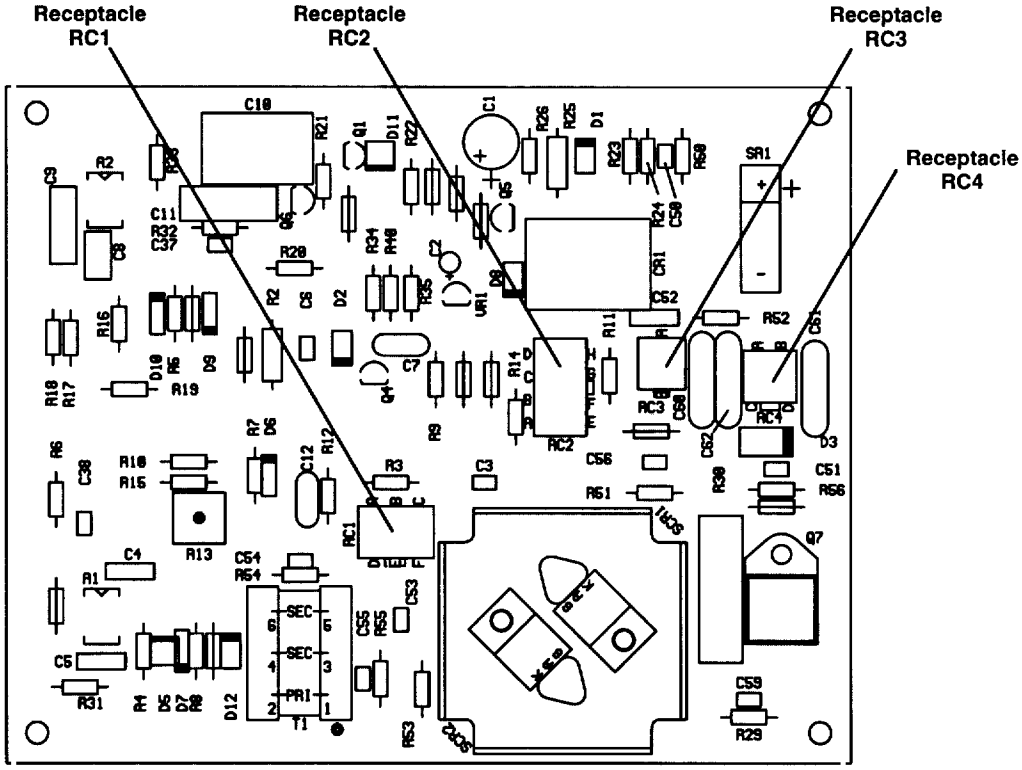


Figure 8-1. Motor Control Board PC1 Component Locations And Information

8-5. OPTIONAL SPOT/BURNBACK BOARD PC2 TESTING INFORMATION (Diagram 8-3 And Figure 8-2)

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Shut down wire feeder and welding power source or stop engine before making or changing meter lead connections and before disconnecting or connecting any leads.*

MOVING PARTS can cause serious injury.

- *Keep away from moving parts.*

HOT SURFACES can cause severe burns.

- *Allow cooling period before servicing.*

This procedure requires the unit to be energized. Only qualified persons familiar with and following standard safety practices are to perform this testing procedure.

CAUTION: ELECTROSTATIC DISCHARGE (ESD) can damage circuit boards.

- *Put on properly grounded wrist strap BEFORE handling circuit boards.*
- *Transport circuit boards in proper static-shielding carriers or packages.*
- *Perform work only at a static-safe work area.*

INCORRECT INSTALLATION or misaligned plugs can damage circuit board.

- *Be sure that plugs are properly installed and aligned.*

EXCESSIVE PRESSURE can break circuit board.

- *Use only minimal pressure and gentle movement when disconnecting or connecting board plugs and removing or installing board.*

IMPORTANT: *For all checks, be sure to test and verify the continuity of leads between the board and the area where check is performed. All checks should go through the connections and be actual terminal-to-terminal tests so that bad connections or leads and corrosion are not the problem.*

A. Power Supply Circuit

Input power of +35 volts dc should be present between pins A and B (DC circuit common) of receptacle RC1. If +35 volts dc are not present, check that plug PLG51 is secure in receptacle RC1 on Burnback Board PC2 and plug PLG1 is secure in receptacle RC1 on Motor Control Board PC1. If +35 volts dc are still not present, check Motor Control Board PC1 according to Section 8-4.

B. Trigger Circuit

A trigger input voltage of +19 volts dc should be present at pin D of receptacle RC1 with respect to circuit common when the gun trigger is pressed, and 0 volts dc should be present when the gun trigger is released. If +19 volts dc are not present when the gun trigger is pressed, check Motor Board PC1 according to Section 8-4.

C. Motor Start/Stop Circuit

When the gun trigger is pressed, a motor control output voltage of +24 volts dc should be present at pin A of re-

ceptacle RC2 with respect to circuit common to start the motor and 0 volts dc should be present when the gun trigger is released to stop the motor. If +24 volts dc are not present at pin A when the gun trigger is pressed, replace Spot/Burnback Board PC2.

D. Contactor Control Circuit

When the gun trigger is pressed and +19 volts dc are present at pin D of receptacle RC1 with respect to DC circuit common, a contactor control output voltage of +24 volts dc should be present at pin B of receptacle RC2 with respect to circuit common. When the gun trigger is released, 0 volts dc should be present at pin B after a delay of 0 to 0.25 seconds depending on the time set on Burnback Potentiometer R26. If +24 volts dc are not present at pin B when the gun trigger is pressed or 0 volts dc are not present when the gun trigger is released, replace Spot/Burnback Board PC2.

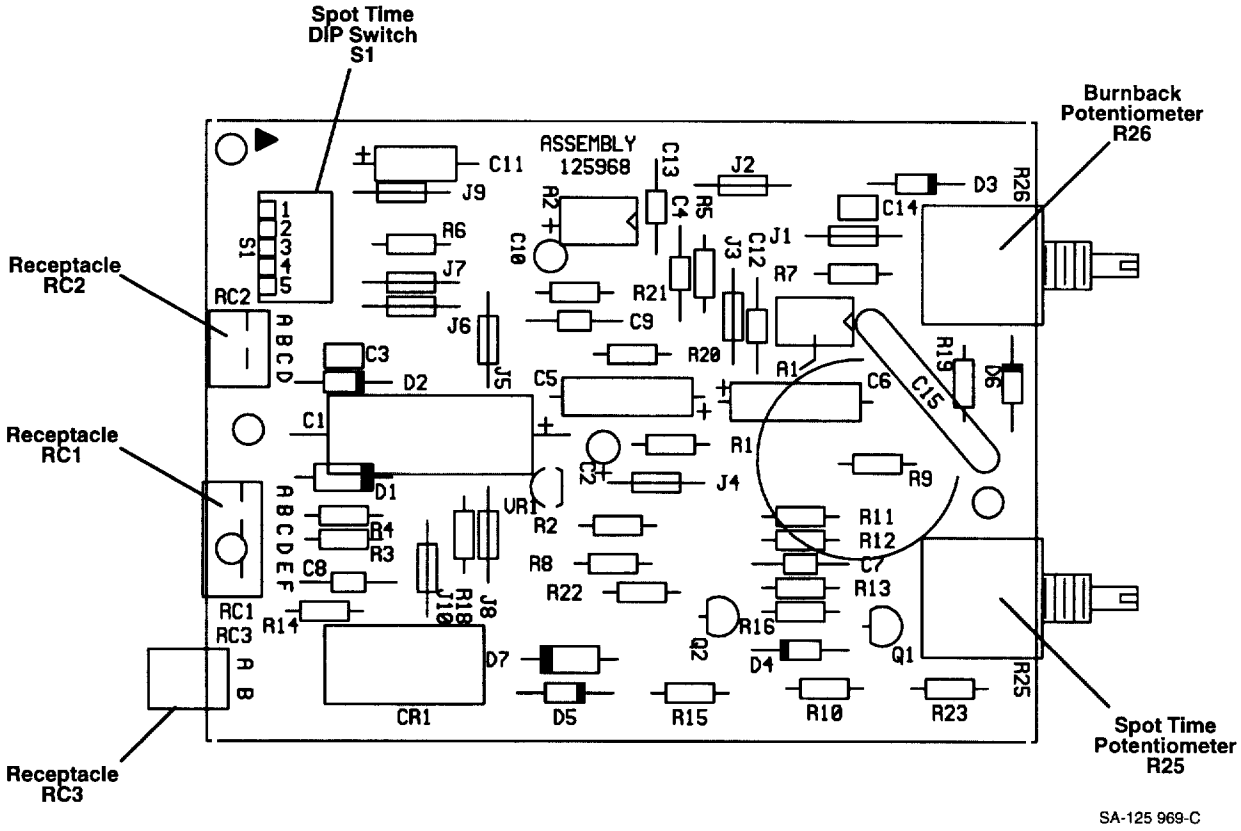


Figure 8-2. Optional Spot/Burnback Board PC2 Component Locations And Information

WARNING: ELECTRIC SHOCK can kill; MOVING PARTS can cause serious injury.

- *Do not touch live electrical parts.*
- *Shut down wire feeder and welding power source or stop engine before making or changing meter lead connections and before disconnecting or connecting any leads.*
- *Have only qualified persons familiar with and following standard safety practices perform troubleshooting procedures.*
- *Follow standard ESD precautions to prevent damaging static-sensitive parts during testing.*

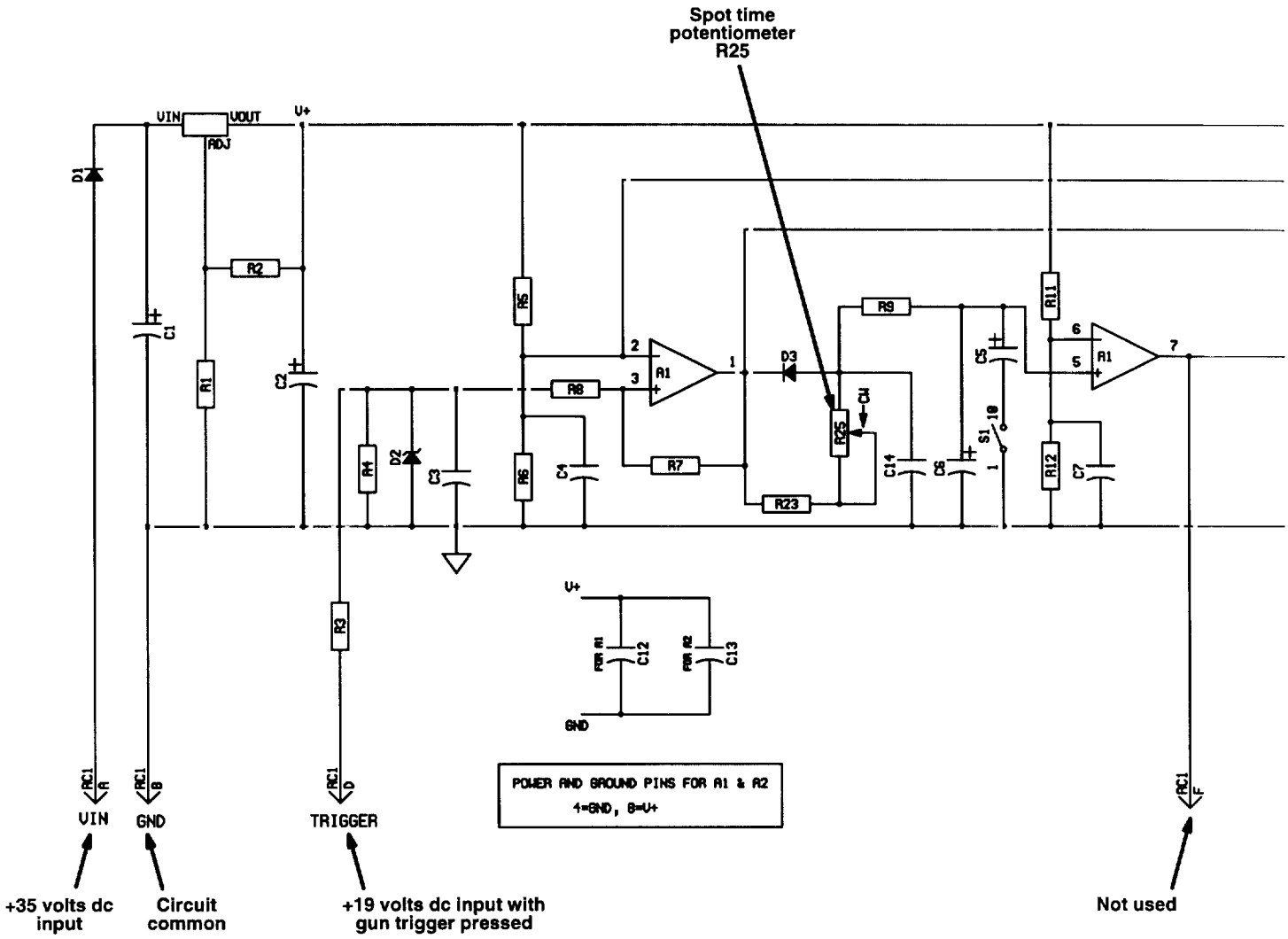
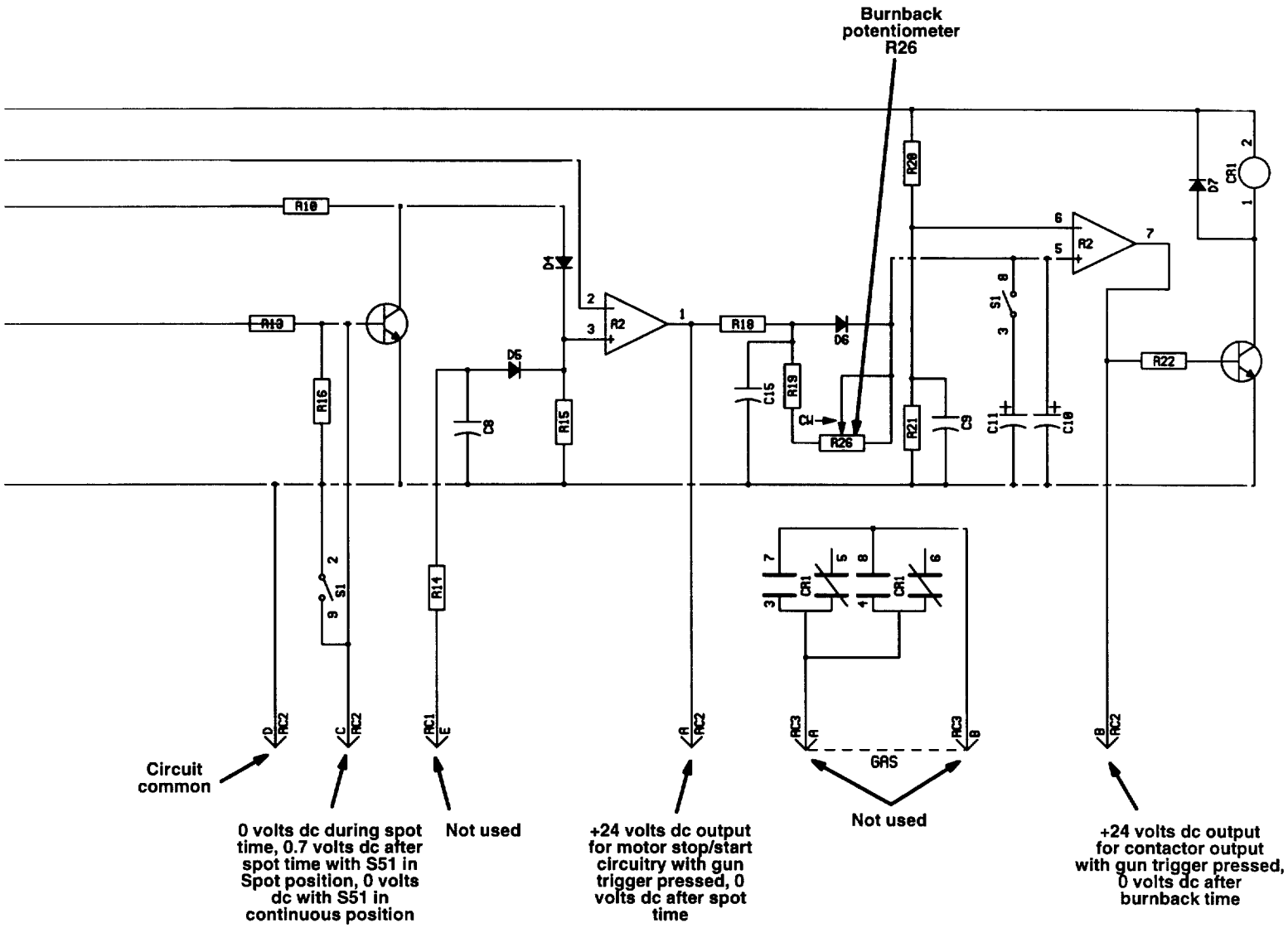


Diagram 8-3. Troubleshooting Circuit Diagram For Optional Spot/Burnback Board PC2

IMPORTANT: *For DC, the values are based on a good quality digital volt-ohmmeter (DVM) or equivalent reading average (not RMS) values. For AC, the values are RMS readings. The DC voltages shown are with respect to DC circuit common lead 71 (pin B of plug PLG51) unless otherwise indicated. The tolerances are ±10% unless otherwise specified.*



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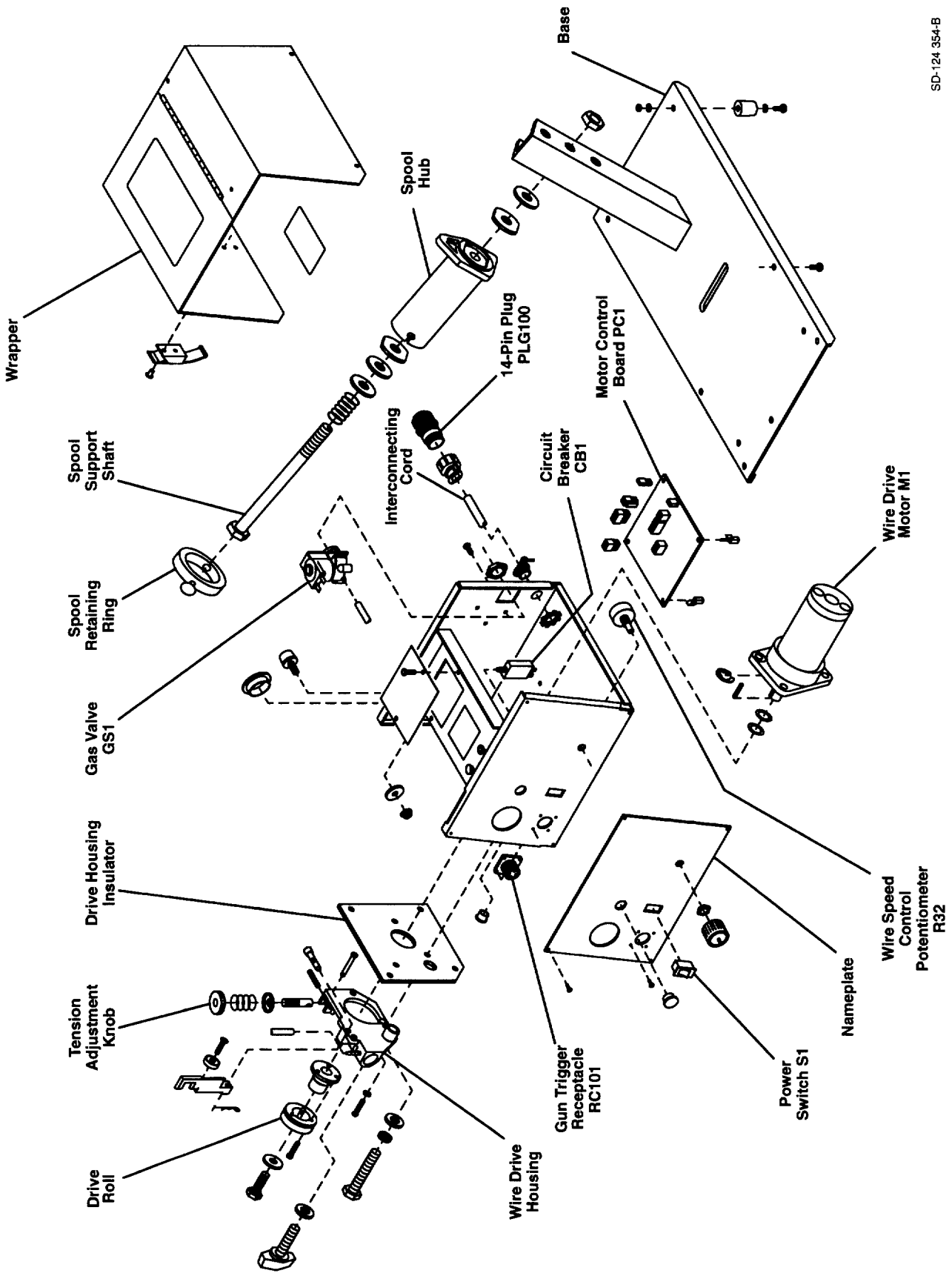


Figure 9-1. Component Identification and Location

10-1. ROUTINE MAINTENANCE (Table 10-1)

IMPORTANT: *Every six months inspect the labels on this unit for legibility. All precautionary labels must be maintained in a clearly readable state and replaced when necessary. See Service Parts Manual for part number of precautionary labels.*

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Shut down wire feeder and welding power source, and disconnect input power employing lockout/tagging procedures before inspecting, maintaining, or servicing.*

Lockout/tagging procedures for wire feeder consist of disconnecting interconnecting cord, and for welding power source consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device. Stop engine, and disconnect negative (–) battery cable from battery on welding generators.

- *Allow gun and unit to cool before touching.*
- *Do not depress gun trigger while performing maintenance on gun.*

Troubleshooting to be performed only by qualified persons.

Table 10-1. Maintenance Schedule

Frequency*	Maintenance
Every Month	Units in heavy service environments: Check labels, weld cables, clean internal parts and drive rolls.
Every 6 Months	Check all labels (see IMPORTANT block, Section 10-1). Inspect gun and cables (Section 10-1B). Clean drive rolls (Section 10-1C).

*Frequency of service is based on units operated 40 hours per week. Increase frequency of maintenance if usage exceeds 40 hours per week.

A. Internal Cleaning

WARNING: Read and follow safety information at beginning of entire Section 10-1 before proceeding.

Every month, blow our or vacuum dust and dirt from the inside of the wire feeder. Remove the outer enclosure, and use a clean, dry airstream or vacuum suction for the cleaning operation. If dusty or dirty conditions are present, clean the unit monthly.

B. Inspection and Upkeep

WARNING: Read and follow safety information at beginning of entire Section 10-1 before proceeding.

Every six months, inspect the gun, hoses, and cables. If dusty or dirty conditions are present, inspect the unit monthly. Inspection should consist of the following:

1. Unlatch and open left case access door.
2. Inspect gun for broken areas, cracks, and loose parts; tighten, repair, and replace as required.
3. Repair or replace, as required, all hose and cable; give particular attention to frayed and cracked insulation and areas where hose and cables enter equipment.
4. Remove grease and grime from components, moisture from electrical parts and cable.

CAUTION: FLYING DIRT AND METAL PARTICLES can injure personnel and damage equipment.

- *Point gun liner only in a safe direction away from personnel and equipment when cleaning with compressed air.*

5. Blow out the gun wire guide liner with compressed air when changing wire. This will remove any metal chips and dirt that may have accumulated.
6. Close and secure left case access door.

C. Cleaning Of Drive Rolls

WARNING: Read and follow safety information at beginning of entire Section 10-1 before proceeding.

MOVING PARTS can cause serious injury.

- *Keep away from moving parts.*

HIGH ROTATIONAL SPEED may cause damage to drive rolls and injure personnel.

- *Do not allow drive rolls to rotate at high speed if compressed air is used for cleaning the drive roll assembly.*

It is necessary to remove the drive rolls for proper cleaning of the wire grooves (see Section 4-2 for removal and installation instructions). Use a wire brush to clean rolls.

IMPORTANT: *Failure to properly maintain the drive rolls can result in a buildup of wire particles which decreases the efficiency of the wire feeding operation.*

1. Remove the three drive roll securing screws from each drive roll, and remove drive rolls.
2. Using wire brush, remove the buildup of wire particles in the wire grooves.
3. Reinstall drive rolls according to Section 4-2.
4. Resume operation.

10-2. ALIGNING DRIVE ROLL AND WIRE GUIDE (Figure 10-1)

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Shut down wire feeder and welding power source, and disconnect input power employing lockout/tagging procedures before working on feeder.*

Lockout/tagging procedures for wire feeder consist of disconnecting interconnecting cord, and for welding power source consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device. Stop engine, and disconnect negative (–) battery cable from battery on welding generators.

MOVING PARTS can cause serious injury.

- *Keep away from moving parts.*

HOT SURFACES can cause severe burns.

- *Allow cooling period before servicing.*

Maintenance to be performed only by qualified persons.

The drive roll and wire guide must be aligned for wire to feed properly. Alignment is factory set and should not require readjustment. To check alignment, compare drive roll and wire guide positions with Figure 10-1. If alignment is necessary, proceed as follows:

Behind the drive roll mounting hub is a spring washer. To obtain proper alignment of the drive roll with the wire guide, rotate drive roll mounting hub securing bolt, and move drive roll in or out until groove in drive roll lines up with wire guide (see Figure 10-1).

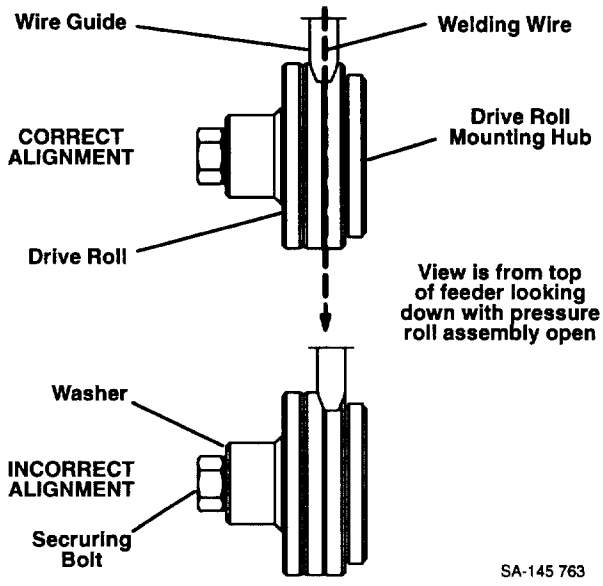


Figure 10-1. Reinstallation Of Hub Assembly

10-3. REINSTALLATION OF HUB ASSEMBLY (Figure 10-2)

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Shut down wire feeder and welding power source, and disconnect input power employing lockout/tagging procedures before working on feeder.*

Lockout/tagging procedures for wire feeder consist of disconnecting interconnecting cord, and for welding power source consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device. Stop engine, and disconnect negative (–) battery cable from battery on welding generators.

If it should become necessary to replace any part of the assembly, obtain part and proceed as follows to reinstall the assembly.

1. Slide the following items onto the spool support shaft in order given:
   a. Fiber Washer
   b. Brake Washer
   c. Hub
   d. Brake Washer
   e. Fiber Washer
   f. Keyed Washer
   g. Spring
   h. Wire Reel
   i. Wire Retainer
   j. Spanner Nut
   k. Retaining Ring
2. Rotate bolt into support shaft. Bolt should be rotated only until a slight drag is felt while turning hub.
3. Install retaining ring on hub.

10-4. BRUSH INSPECTION AND REPLACEMENT

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Shut down wire feeder and welding power source, and disconnect input power employing lockout/tagging procedures before working on feeder.*

Lockout/tagging procedures for wire feeder consist of disconnecting interconnecting cord, and for welding power source consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device. Stop engine, and disconnect negative (–) battery cable from battery on welding generators.

1. Remove two brush caps located on end of the drive motor.

2. Remove brushes.
3. Examine brushes. Replace brushes if they are chipped or broken or if less than 1/4 in. (6.4 mm) of brush material remains.
4. Install brushes, and secure with caps.

10-5. OVERLOAD PROTECTION

Circuit breaker CB1 provides protection to the feeder circuits. CB1 is located towards the front of the unit, behind the left case access door. If the motor should overload or the circuit fail, the breaker would trip and shut down the wire feeder. If CB1 opens, correct the problem and manually reset the breaker.

To reset CB1, proceed as follows:

1. Unlatch and open left case access door.
2. Locate CB1, and reset (see Figure 4-1).
3. Close and secure left case access door.

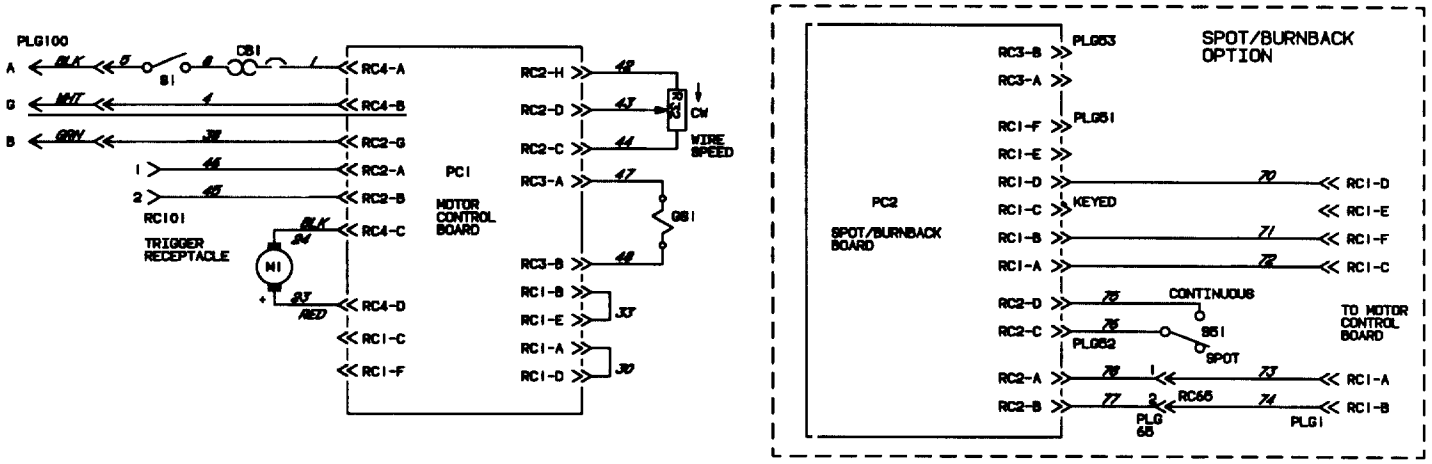
Table 11-1. List Of Circuit Diagrams And Wiring Diagrams

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

1. Know unit Model and Serial or Style Number.
2. Use List to find diagram number.
3. Call the Technical Publications Department at 414-735-4356.

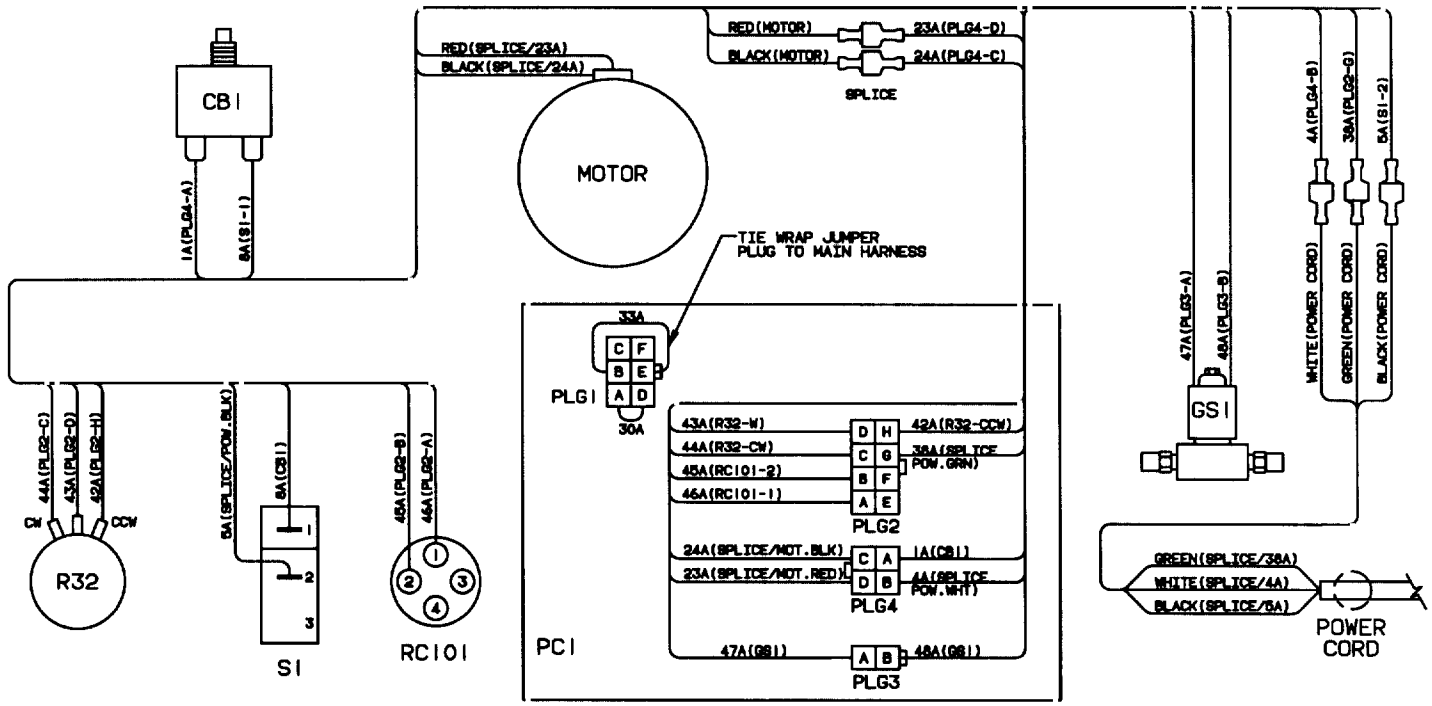
Model	Serial Or Style Number	Circuit Diagram	Wiring Diagram
S-21E	JJ507797 and following	SB-124 895-B	SB-124816-B
Circuit Board PC1	JJ507797 and following	SD-124 896-A	
Circuit Board PC2♦	JJ507797 thru JK742028	SC-122 194	
	JK742029 and following	SC-125 971	

♦Optional



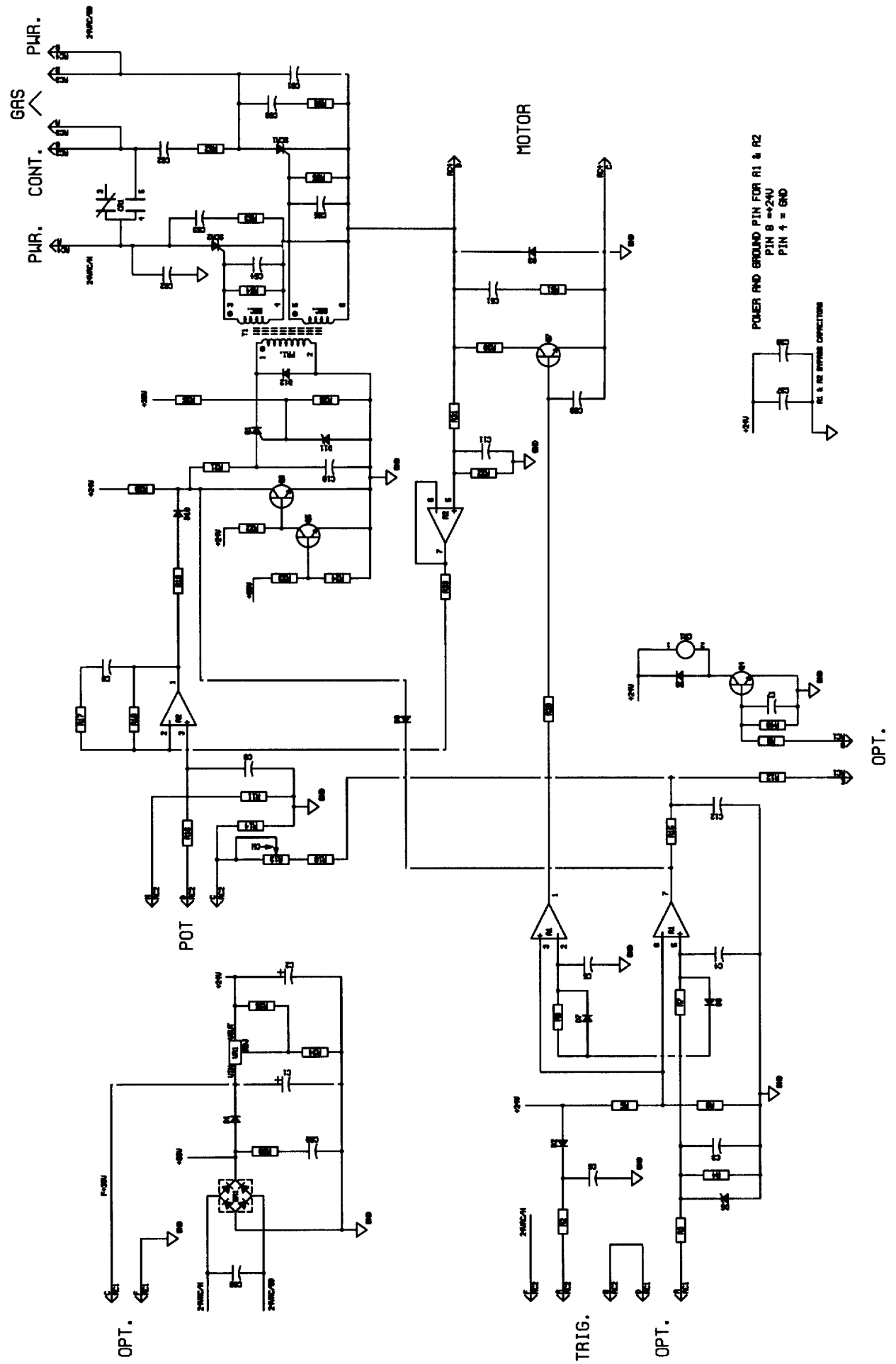
Circuit Diagram No. SB-124 895-B

Diagram 11-1. Circuit Diagram For S-21E Effective With Serial No. JJ507797 And Following



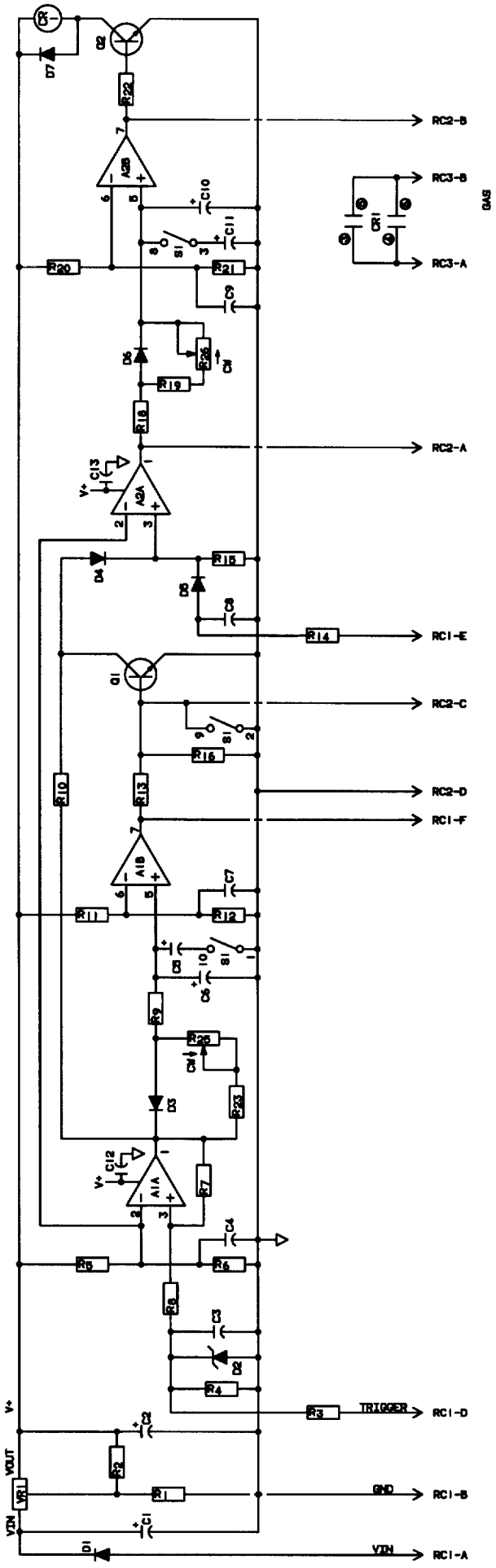
Wiring Diagram No. SB-124 816-B

Diagram 11-2. Wiring Diagram For S-21E Effective With Serial No. JJ507797 And Following



Circuit Diagram No. SD-124 896-A

Diagram 11-3. Circuit Diagram For Motor Control Board PC1 Effective With Serial No. JJ507797 And Following



Circuit Diagram No. SC-122 194

Diagram 11-4. Circuit Diagram For Optional Spot/Burnback Board PC2 Effective With Serial No. JJ507797 Thru JK742028

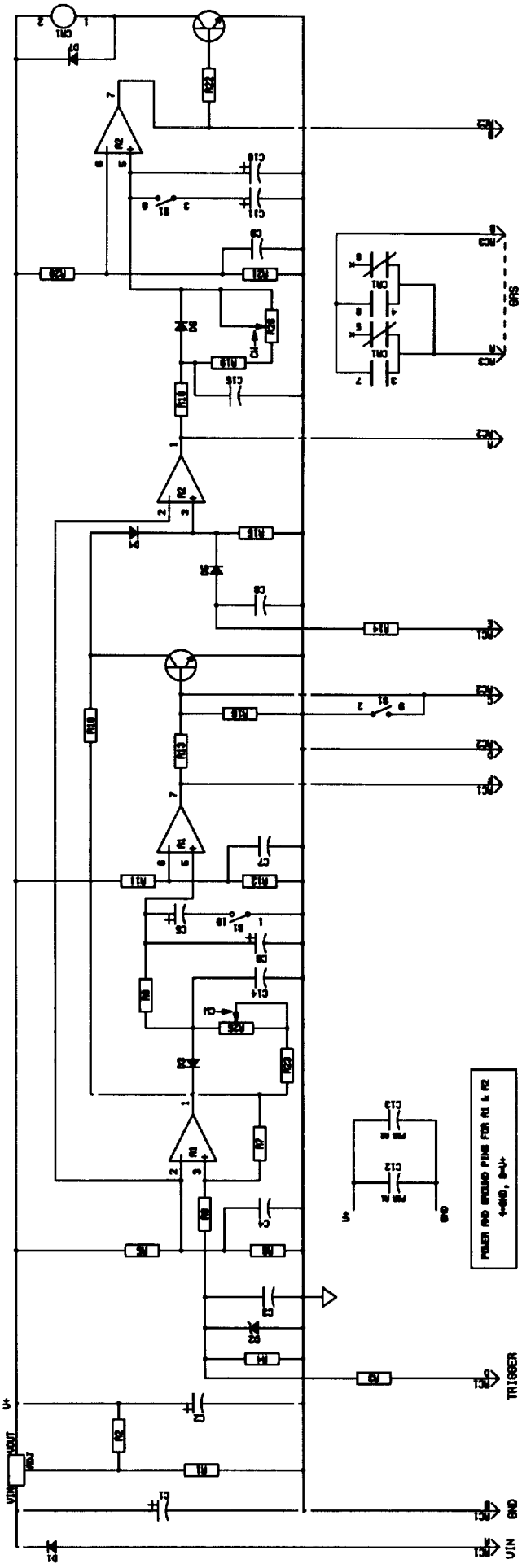
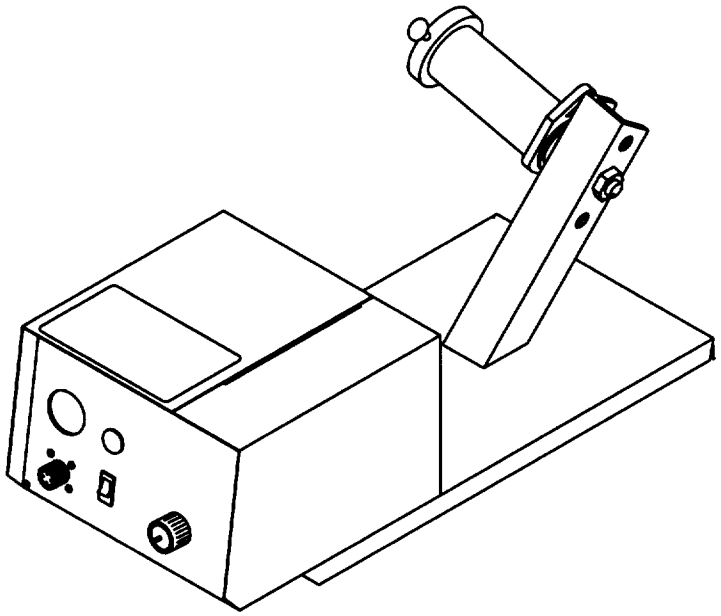


Diagram 11-5. Circuit Diagram For Optional Spot/Burnback Board PC2 Effective With Serial No. JK742029 And Following

Circuit Diagram No. SD-125 971

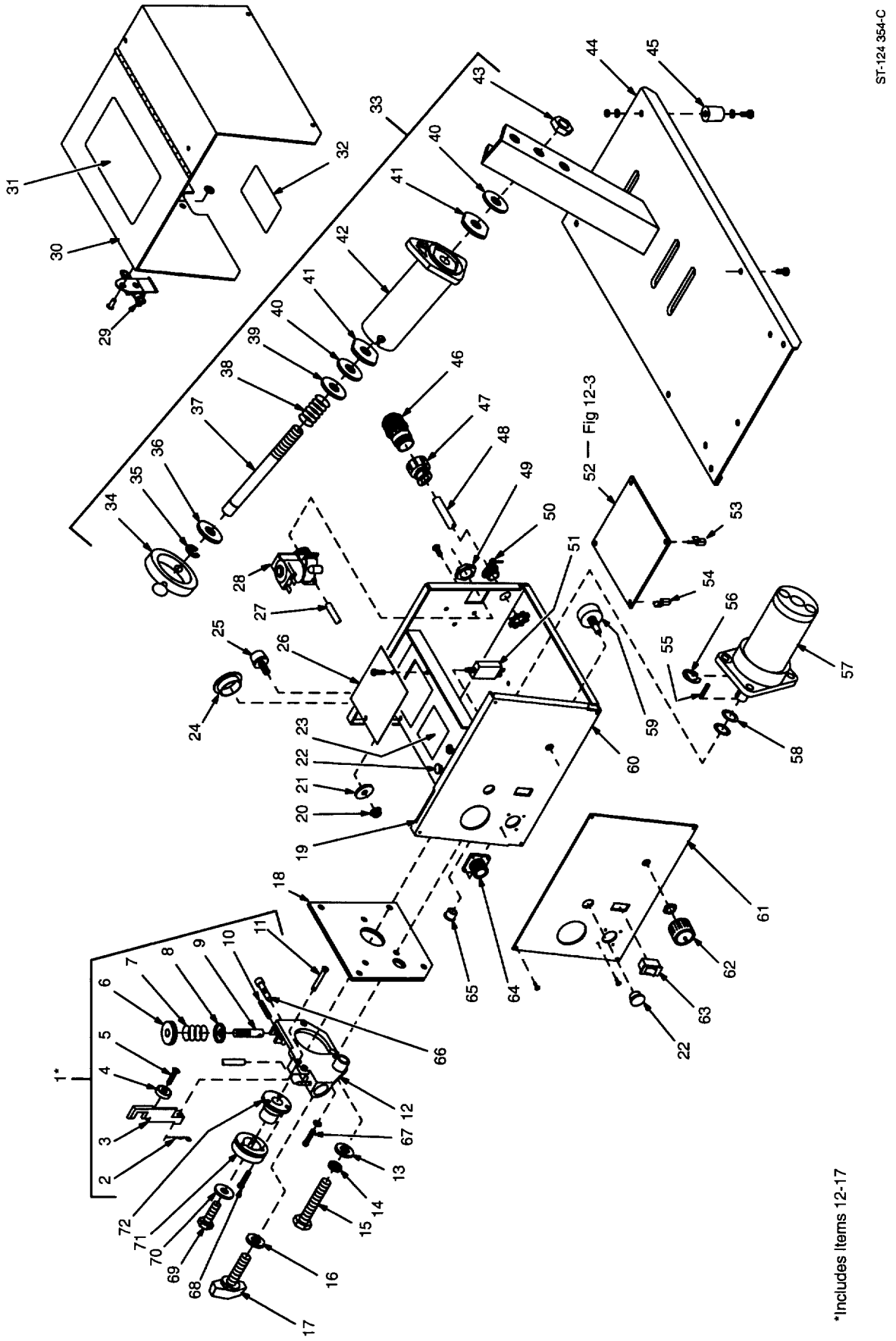
November 1996 Form: TM-1571
Effective With Serial No. JJ507797

SECTION 12 – PARTS LIST



S-21E

Wire Feed Equipment



*Includes Items 12-17

Figure 12-1. Main Assembly

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
			Figure 12-1. Main Assembly	
1		127 232	DRIVE ASSEMBLY, wire (consisting of)	1
2		151 828	PIN, cotter-hair .042 x .750	1
3		112 031	LEVER, pressure-roll	1
4		111 523	BEARING, ball .315 x .866 x .275	1
5		114 415	SCREW, phillips-flat hd 10-24 x .625	1
6		092 237	KNOB, adjustment-tension	1
7		089 477	SPRING, cprsn .770 OD x 1.000 wire x .715pld	1
8		085 244	WASHER, cupped stl .328 ID x .812 OD x .125 lip	1
9		089 562	FASTENER, pinned	1
10		010 224	PIN, spring cs .187 x 1.000	1
11		090 416	PIN, hinge	1
12		124 817	HOUSING, wire drive	1
13		602 243	WASHER, flat stl std .378	1
14		602 213	WASHER, lock stl split .375	1
15		601 966	SCREW, cap stl hex hd .375-16 x 1.250	1
16		604 538	WASHER, flat stl SAE .312	1
17		124 778	KNOB	1
18		124 819	INSULATOR, housing drive (Prior to KA759476)	1
18		130 365	INSULATOR, housing-drive (Eff w/KA759476)	1
19		090 440	INSULATOR, cover housing	1
20		604 668	NUT, stl slflkg hex med fnsh .500-20 (Prior to JK702158)	1
20		601 880	NUT, stl hex jam .500-13 (Eff w/JK702158)	1
21		010 291	WASHER, flat-nylafil .625 ID x 1.250 OD x .125thk	1
22		107 983	BLANK, snap-in nyl .500mtg hole	2
23		071 602	LABEL, caution high frequency will damage etc	1
24		010 494	BUSHING, snap-in nyl 1.375 ID x 1.750mtg hole	1
25		092 200	WIRE GUIDE & NUT, inlet (Prior to JK702158)	1
25		131 181	WIRE GUIDE & NUT, (Eff w/JK702158)	1
26			PLATE, identification control panel (order by model and serial number)	1
27		134 834	HOSE, SAE .187 ID x .410 OD (order by ft)	2 ft
28	GS1	109 930	VALVE, 24VAC 2 way 1/4 IPS x 1/8 orf (Prior to JK617847)	1
		010 296	FITTING, hose brs elb m 1/4NPT x .625-18RH (Prior to JK617847)	1
		010 869	FITTING, pipe brs bushing 1/4 x 1/8NPT (Prior to JK617847)	1
		112 090	FITTING, pipe brs elb 1/8NPT x 3/16 hose (Prior to JK617847)	1
28	GS1	125 785	VALVE, 24VAC 2 way 1/8 orf (Eff w/JK617847)	1
29		089 572	CATCH, link-lock (Prior to KA848999)	1
		089 573	PLATE, keeper link-lock (Prior to KA848999)	1
29		137 304	LATCH, door (Eff w/KA848999 thru KC261809)	1
29		089 572	CATCH, link-lock (Eff w/KC261810 and on)	1
		089 573	PLATE, keeper link-lock (Eff w/KC261810)	1
30		+122 313	WRAPPER (Prior to KC261810)	1
30		152 725	WRAPPER (Eff w/KC261810)	1
31		134 464	LABEL, warning general precautionary	1
32		090 439	LABEL, warning electric shock can kill	1
		126 873	BUMPER, polyurethane polymer .500	1
33		072 094	HUB & SPINDLE ASSEMBLY, (consisting of)	1
34		058 427	RING, retaining-spool	1
35		141 700	RING, retaining ext .625 shaft x .050thk (Eff w/KC237900)	1
36		605 941	WASHER, flat stl .640 ID x 1.000 OD (Eff w/KC237900)	1
37		072 292	SHAFT, spool support (Prior to KC237900)	1
37		154 098	SHAFT, spool support (Eff w/KC237900)	1
38		010 233	SPRING, compression .970 OD x .120 wire x 1.250 pld	1
39		057 971	WASHER, flat stl keyed 1.500dia x .125thk	1
40		010 191	WASHER, fbr .656 ID x 1.500 OD x .125thk	2
41		058 628	WASHER, brake	2
42		058 428	HUB, spool	1
43		135 205	NUT, stl slflkg hex reg .625-11	1
44		122 430	BASE, (Prior to KA848999)	1
44		137 461	BASE, (Eff w/KA848999)	1
45		122 339	FOOT, rubber 1.250dia x 1.125 high (Prior to KA848999)	4

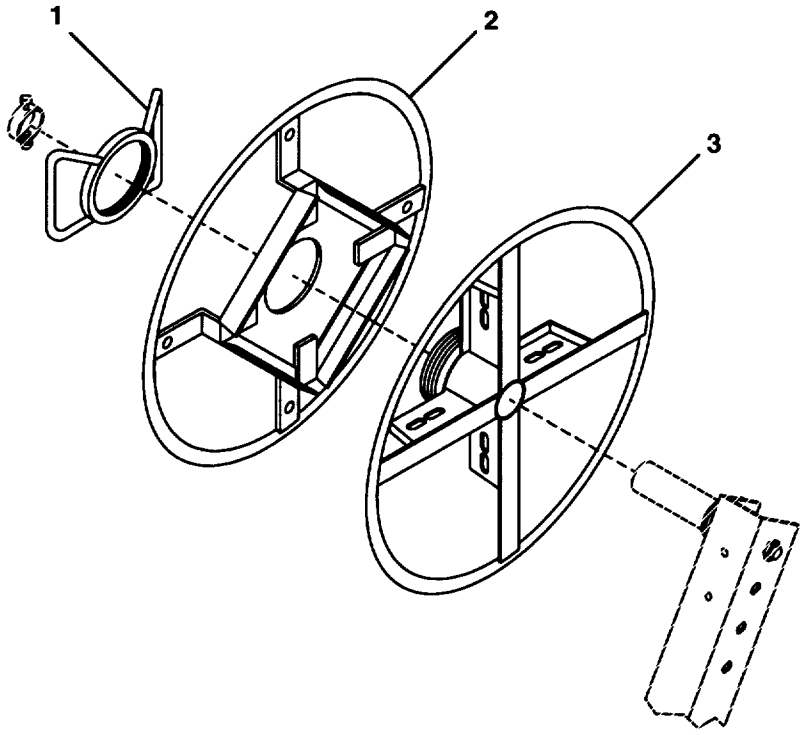
Item No.	Dia. Mkgs.	Part No.	Description	Quantity

Figure 12-1. Main Assembly (Continued)

45		134 306	FOOT, rubber 1.250dia x 1.375 high	4
46	PLG100	144 310	CONNECTOR & PINS, (Prior to KB041147) (consisting of)	1
		134 732	. CONNECTOR, circ pin push-in 20-24ga Amp 213605-1	14
47		079 739	. CONNECTOR, circ clamp str rlf 17-20 Amp 206322-2	1
46	PLG100	141 162	CONNECTOR & PINS, (Eff w/KB041147) (consisting of)	1
		134 731	. CONNECTOR, circ pin push-in 14-18ga Amp 213603-1	14
47		143 922	. CONNECTOR, circ clamp str rlf size 17-20 Amp 206070-3	1
48		007 826	CABLE, No. 18/3c (order by ft)	11ft
49		605 227	NUT, nyl hex jam .750, (Eff w/JK617847)	1
		120 304	BLANK, snap-in nyl .250mtg	3
50		115 104	CONNECTOR, clamp-cable .500	1
51	CB1	123 745	CIRCUIT BREAKER, manual reset 1P 4A 250VAC	1
52	PC1	123 148	CIRCUIT CARD, motor control (Fig 12-3)	1
	PLG1	115 093	CONNECTOR & SOCKETS, (consisting of)	1
		113 746	. CONNECTOR, rect skt 24-18ga Molex 39-00-0038	6
	PLG2	115 092	CONNECTOR & SOCKETS, (consisting of)	1
		113 746	. CONNECTOR, rect skt 24-18ga Molex 39-00-0038	8
	PLG3	131 054	CONNECTOR & SOCKETS, (consisting of)	1
		113 746	. CONNECTOR, rect skt 24-18ga Molex 39-00-0038	2
	PLG4	115 094	CONNECTOR & SOCKETS, (consisting of)	1
		113 746	. CONNECTOR, rect skt 24-18ga Molex 39-00-0038	4
53		110 375	STAND-OFF, support	2
54		123 810	STAND-OFF, support	2
55		092 865	KEY, .122 x .123 x .750	1
56		605 308	RING, retaining	1
57	M1	122 741	MOTOR, gear 24VDC 122RPM (consisting of)	1
		*136 745	. BRUSH & SPRING ASSEMBLY	2
58		079 625	WASHER, spring stl .500	2
59	R32	073 562	POTENTIOMETER, C 1/T 2W 10K ohm	1
60		124 720	CASE ASSEMBLY, (Prior to KA848999)	1
60		137 814	CASE ASSEMBLY, (Eff w/KA848999 thru KC261809)	1
60		153 612	CASE ASSEMBLY, (Eff w/KC261810 and on)	1
61			NAMEPLATE, (order by model and serial number)	1
62		097 922	KNOB, pointer	1
63	S1	111 997	SWITCH, rocker SPST 10A 250VAC	1
64	RC101	048 282	CONNECTOR & SOCKETS, (consisting of)	1
		079 534	. CONNECTOR, circ skt push-in 14-18ga Amp 66358-6	4
65		057 084	BUSHING, snap-in nyl .250 OD x .375mtg hole	1
66		058 549	GUIDE, wire-inlet 1/16	1
67		605 758	SCREW, mach stl rdh 10-32 x 1.000	3
68		079 626	SCREW, mach stl filh 10-32 x .875	3
69		000 418	SCREW, cap stl hex hd slflkg .250-20 x .500	1
70		602 241	WASHER, flat stl SAE .250	1
71		124 818	ROLL, drive-combination large	1
71		♦087 130	ROLL, drive - V-grooved .023 wire	1
71		♦053 695	ROLL, drive - V-grooved .030 wire	1
71		♦079 726	ROLL, drive - V-knurled .035 wire	2
71		♦079 728	ROLL, drive - V-knurled .045 wire	2
72		124 820	HUB, mtg-roll drive	1
		♦108 008	REEL, wire (Fig 12-2)	1

+When ordering a component originally displaying a precautionary label, the label should also be ordered.
*Recommended Spare Parts.
♦OPTIONAL
BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

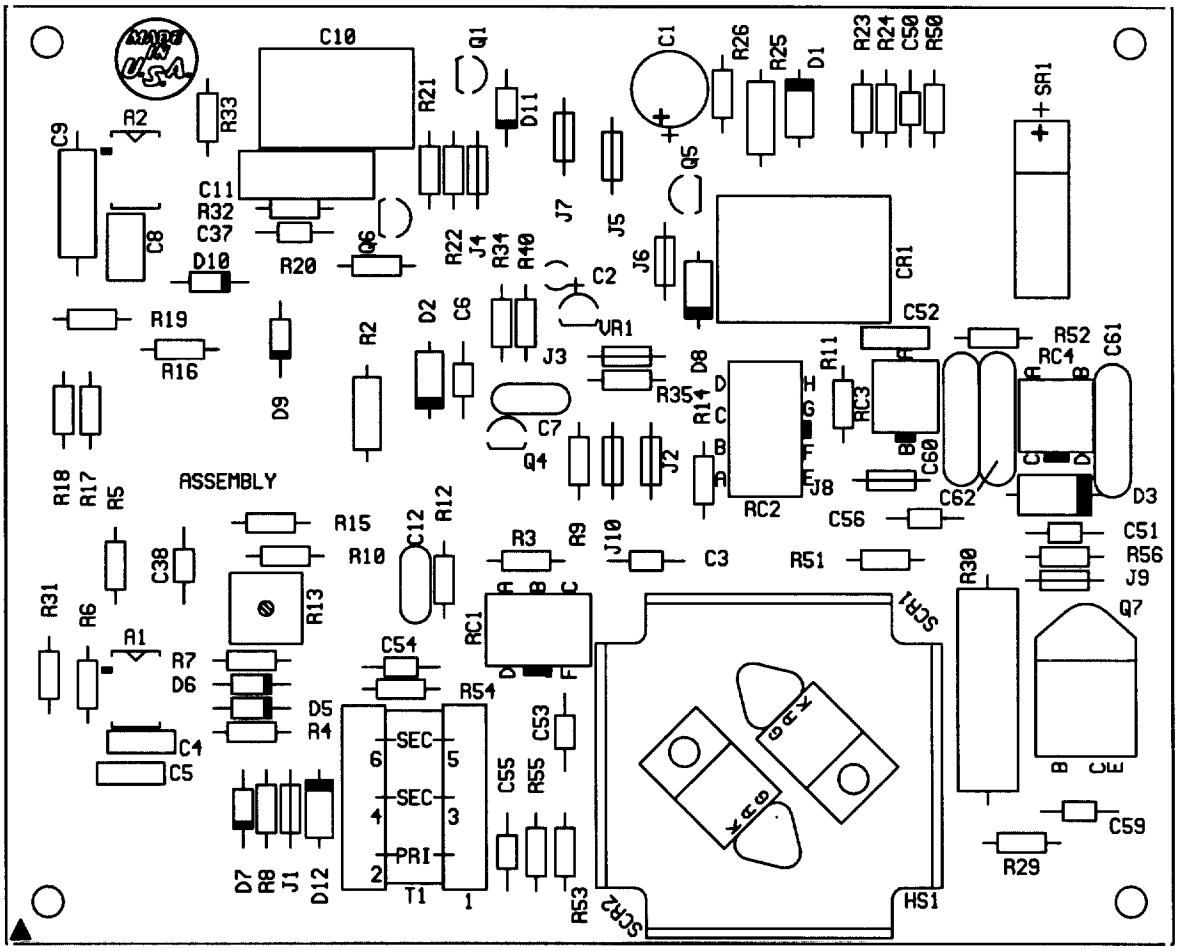
Item No.	Part No.	Description	Quantity
	108 008	**Figure 12-2. Reel, Wire (Optional)**	
1	124 904	NUT, spanner - spool support	1
2	124 905	RETAINER, spool - support	1
3	124 900	SUPPORT, reel - spool	1



Ref. SC-127 308

Figure 12-2. Reel, Wire

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.



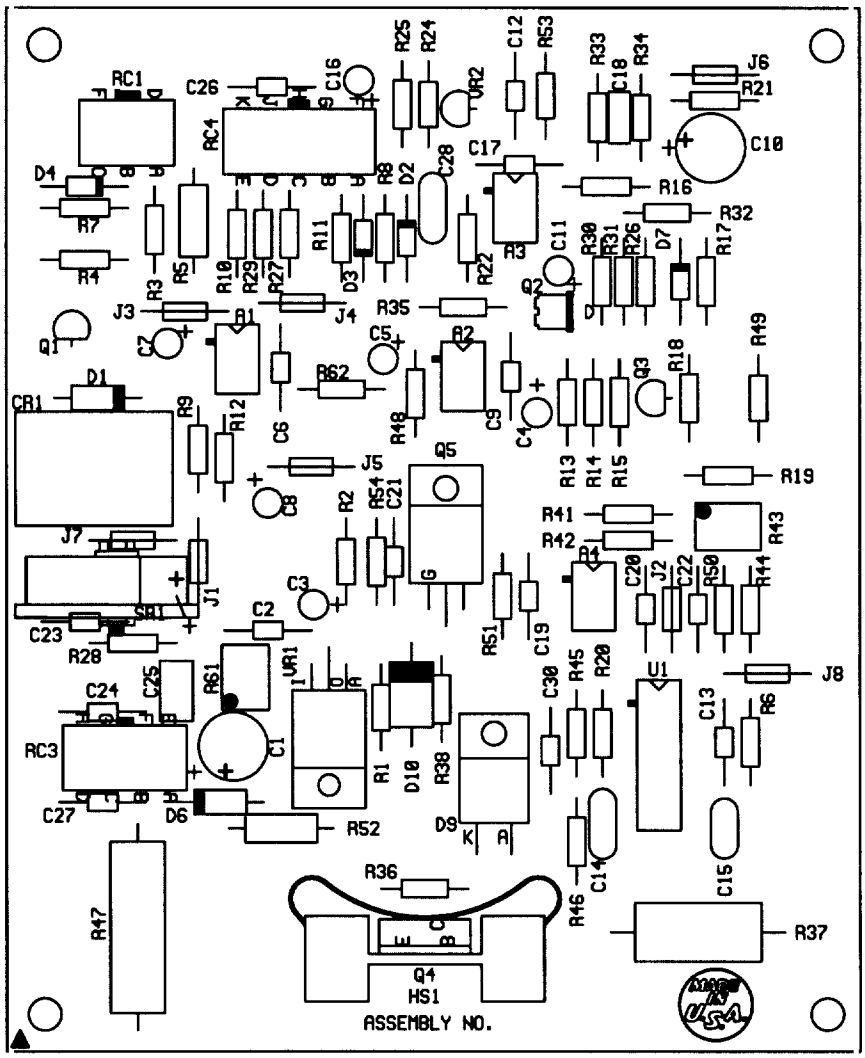
SA-123 147-F

Figure 12-3. Motor Control Circuit Card PC1

Dia. Mkgs.	Part No.	Description	Quantity
PC1	**123 148**	**Figure 12-3. Circuit Card, Motor Control (Fig 12-1 Item 52)**	
.... A1,2	009 159 ...	IC, linear 358	2
..... C1	039 482 ...	CAPACITOR, elctlt 100uf 35VDC	1
..... C2	039 481 ...	CAPACITOR, elctlt 3.3uf 50VDC	1
C3,6,37,38,50 51,53-56,59	122 723 ...	CAPACITOR, cer mono .1uf 50VDC	11
... C4,5,8	119 198 ...	CAPACITOR, polye met film .33uf 100V	3
... C7,12	000 340 ...	CAPACITOR, cer disc .01uf 50VDC	2
..... C9	077 206 ...	CAPACITOR, polye met film .0047uf 100V	1
.... C10	031 693 ...	CAPACITOR, polye film .33uf 100VDC	1
.... C11	035 522 ...	CAPACITOR, polye film .047uf 100V	1
.... C52	119 197 ...	CAPACITOR, polye met film .1uf 100V	1
... C60-62	053 991 ...	CAPACITOR, cer disc .05uf 500VDC	3
.... CR1	099 018 ...	RELAY, encl 24VDC SPDT 5A 120VAC	1
.. D1,2,8,12	026 202 ...	DIODE, rect 1A 400V SP	4
..... D3	087 294 ...	DIODE, fast recovery 3A 400V	1
..... D5	037 250 ...	DIODE, zener 24V 1W	1
.. D6,7,9,10	028 351 ...	DIODE, signal .020A 75V SP	4
.... D11	032 210 ...	DIODE, zener 10V 1W	1
.....	092 648 ...	RESISTOR, WW fxd zero ohm (Prior to KC301174)	12
... J1-10	092 648 ...	RESISTOR, WW fxd zero ohm (Eff w/KC301174)	10
..... Q1	039 355 ...	TRANSISTOR, UJT 15MA 40V	1
... Q4,5,6	037 200 ...	TRANSISTOR, NPN 200MA 40V	3
..... Q7	121 129 ...	TRANSISTOR, NPN 10A 100V	1
..... R2	028 284 ...	RESISTOR, C .5W 27K ohm	1
.. R3,5,7,8	093 037 ...	RESISTOR, MF .25W 47.5K ohm	4
... R4,31	044 789 ...	RESISTOR, MF .25W 100K ohm	2
... R6,22	072 559 ...	RESISTOR, MF .25W 22.1K ohm	2
.. R9,17,33	000 885 ...	RESISTOR, MF .25W 10K ohm	3
.... R10	035 829 ...	RESISTOR, MF .25W 1.5K ohm	1
.... R11	035 888 ...	RESISTOR, CF .25W 2.2K ohm	1
R12,14,24,26,40 .	072 560 ...	RESISTOR, MF .25W 1K ohm	5
.... R13	006 424 ...	POTENTIOMETER, cermet trmr 1/T .5W 2K ohm	1
... R15,35	035 828 ...	RESISTOR, MF .25W 243 ohm	2
.... R16	052 143 ...	RESISTOR, MF .25W 162K ohm	1
.... R18	093 041 ...	RESISTOR, MF .25W 150K ohm, ...	1
.... R19	093 030 ...	RESISTOR, MF .25W 15K ohm	1
.... R20	052 139 ...	RESISTOR, MF .25W 39.2K ohm	1
.... R21	039 106 ...	RESISTOR, CF .25W 470 ohm	1
.... R23	108 437 ...	RESISTOR, MF .25W 4.75K ohm	1
.... R25	030 105 ...	RESISTOR, C .5W 680 ohm	1
.... R29	084 205 ...	RESISTOR, MF .25W 3.32K ohm	1
.... R30	030 098 ...	RESISTOR, WW fxd 5W 1 ohm	1
.... R32	072 677 ...	RESISTOR, MF .25W 33.2K ohm	1
.... R34	108 436 ...	RESISTOR, MF .25W 4.32K ohm	1
. R50,53,56	605 919 ...	RESISTOR, C .25W 47 ohm	3
R51,52,54,55 ...	605 918 ...	RESISTOR, C .25W 100 ohm	4
.... RC1	114 654 ...	CONNECTOR, rect 6 pin 2 row rcpt Molex 39-28-1063	1
.... RC2	113 749 ...	CONNECTOR, rect 8 pin 2 row rcpt Molex 39-28-1083	1
.... RC3	117 038 ...	CONNECTOR, rect 2 pin 2 row rcpt Molex 39-28-1023	1
.... RC4	113 748 ...	CONNECTOR, rect 4 pin 2 row rcpt Molex 39-28-1043	1
.. SCR1,2	080 508 ...	THYRISTOR, SCR 8.5A 200V	2
.... SR1	121 131 ...	RECTIFIER, integ 8A 100V	1
..... T1	111 910 ...	TRANSFORMER, pulse	1
.... VR1	091 256 ...	IC, linear 317L	1

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

Dia. Mkgs.	Part No.	Description	Quantity
	121 562	**Kit, Spot Control (Field Option)**	
.....	093 551	... KNOB, pointer	2
.....	110 375	... STAND-OFF SUPPORT, PC Card No 6 screw w/post	1
.....	098 691	... STAND-OFF, No 6-32 x .500 lg	1
.....	073 756	... STAND-OFF, No 6-32 x .625 lg	1
.....	122 426	... BRACKET, mtg options	1
..... PC2	125 968	... CIRCUIT CARD, timer (consisting of)	1
..... A1,2	009 159	.... IC, linear 358	2
..... C1	031 708	.... CAPACITOR, elctlt 220uf 50VDC	1
..... C2	000 348	.... CAPACITOR, tantlm .47uf 35V	1
..... C3	083 182	.... CAPACITOR, cer mono .1uf 50VDC	1
. C4,7-9,12,13 ...	122 723	.... CAPACITOR, cer mono .1uf 50VDC	6
..... C5,6	032 820	.... CAPACITOR, tantlm 2.2uf 35VDC	2
..... C10	000 347	.... CAPACITOR, tantlm .33uf 35V	1
..... C11	031 677	.... CAPACITOR, tantlm 5.6uf 35VDC	1
..... C14	084 128	.... CAPACITOR, cer mono .01uf 50VDC (Eff w/JK742029)	1
..... C15	044 176	.... CAPACITOR, cer disc .01uf 1000VDC (Eff w/JK742029)	1
..... CR1	093 192	.... RELAY, encl 24VDC DPDT	1
..... D1,7	026 202	.... DIODE, rect 1A 400V SP	2
..... D2	037 386	.... DIODE, zener 11V 1W SP	1



SB-149 456

Circuit Card Layout, Timer PC2

Dia. Mkgs.	Part No.	Description	Quantity
	121 562	**Kit, Spot Control (Field Option) (Continued)**	
.... D3-6	028 351	DIODE, sig 200mA 75V SP	4
.... J1-10	092 648	RESISTOR, WW fxd zero ohm	10
.... Q1,2	037 200	TRANSISTOR, NPN 200mA 40V	2
..... R1	108 436	RESISTOR, MF .25W 4.32K ohm	1
..... R2	035 828	RESISTOR, MF .25W 243 ohm	1
.... R3,23	039 335	RESISTOR, CF .25W 47K ohm	2
..... R4,8	044 789	RESISTOR, MF .25W 100K ohm	2
..... R5	035 830	RESISTOR, MF .25W 6.81K ohm	1
..... R6	108 434	RESISTOR, MF .25W 3.01K ohm	1
..... R7	003 272	RESISTOR, CF .25W 1 meg ohm	1
... R9,12,18	108 437	RESISTOR, MF .25W 4.75K ohm	3
... R10,14	000 885	RESISTOR, MF .25W 10K ohm	2
..... R11	039 329	RESISTOR, CF .25W 2.7K ohm	1
... R13,22	035 827	RESISTOR, CF .25W 10K ohm	2
..... R15	117 134	RESISTOR, MF .25W 24.3K ohm	1
..... R16	035 886	RESISTOR, CF .25W 22K ohm	1
..... R19	093 037	RESISTOR, MF .25W 47.5K ohm	1
..... R20	108 441	RESISTOR, MF .25W 18.2K ohm	1
..... R21	108 440	RESISTOR, MF .25W 13K ohm	1
... R25,26	121 214	POTENTIOMETER, C sltd sft 1/T 1W 1 meg ohm	2
..... RC1	123 031	CONNECTOR, rect 6 pin rcpt Amp 640457-6	1
..... RC2	089 242	CONNECTOR, rect 4 pin rcpt Amp 640457-4	1
..... RC3	121 084	CONNECTOR, rect 2 pin rcpt Amp 640389-2	1
..... S1	117 114	SWITCH, DIP SPST 5posn	1
..... VR1	091 256	IC, linear 317L	1
.... PLG1	115 093 ...	CONNECTOR & SOCKETS, (consisting of)	1
.....	113 746	CONNECTOR, rect skt 24-18ga Molex 39-00-0038	6
.... PLG51	105 673 ...	CONNECTOR, rect 6skt plug Amp 640440-6	1
.... PLG52	089 241 ...	CONNECTOR, rect 4skt plug Amp 640440-4	1
.... PLG65	131 054 ...	CONNECTOR & SOCKETS, (consisting of)	1
.....	113 746	CONNECTOR, rect skt 24-18ga Molex 39-00-0038	2
.....	123 032 ...	CONNECTOR, rect plug keying Amp 641994-1	1
.... RC65	135 635 ...	CONNECTOR & PINS, (consisting of)	1
.....	114 656	CONNECTOR, rect pin 24-18ga Molex 39-00-0040	2
..... S51	121 893 ...	SWITCH, tgl SPDT 6A 125VAC	1

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

Notes

Notes