LINCOLN WELDERS

OPERATING MANUAL

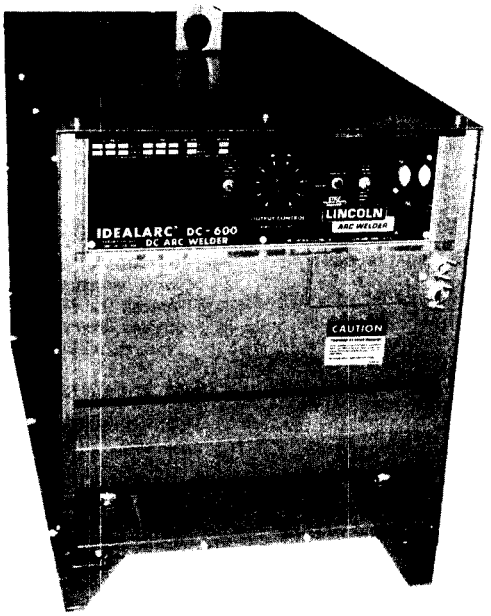
IM-291

IM291
Idealarc DC-600
May, 1980
7972; 7995; 8006; 8011; 8018; 8025; 8033; 8047; 8048; 8049; 8050; 8051; 8077; 8082; 8100; 8129; 8130; 8164

IDEALARC® DC-600

(Codes Above 8000)

Constant and Variable Voltage DC Arc Welding Power Source, 3 Phase Rectifier Type



This manual covers equipment which is obsolete and no longer in production by The Lincoln Electric Co. Specifications and availability of optional features may have changed.

Codes 8000 to 8200.
(For Codes 8201 thru 8279 see IM-306.)
(For Codes above 8280 see IM-306-A.)

DAMAGE CLAIMS

When this equipment is shipped, title passes to the purchaser upon receipt by the carrier. Consequently, claims for material damaged in shipment must be made by the purchaser against the transportation company at the time the shipment is received.

SAFETY DEPENDS ON YOU

Lincoln arc welding equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation ... and thoughtful operation on your part.

DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS OPERATING MANUAL AND THE ARC WELDING SAFETY PRECAUTIONS ON THE INSIDE FRONT COVER. And, most importantly, think before you act and be careful.

PRODUCT PURPOSE

The Idealarc DC-600 is a transformer-rectifier type DC power source designed for submerged arc and open arc semiautomatic and automatic welding. The output is controlled by SCR's instead of mechanical contactors, providing extra long life for highly repetitive welding applications.

LINCOLN ELECTRIC
THE LINCOLN ELECTRIC COMPANY
World's Largest Manufacturer of Arc Welding Products • Manufacturer of Industrial Motors
Cleveland, Ohio 44117 U.S.A.

ARC WELDING SAFETY PRECAUTIONS

PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. READ AND UNDERSTAND BOTH THE SPECIFIC INFORMATION GIVEN IN THE OPERATING MANUAL FOR THE WELDER AND/OR OTHER EQUIPMENT TO BE USED AS WELL AS THE FOLLOWING GENERAL INFORMATION.

1. Have all installation, maintenance and repair work performed only by qualified people.

2. ELECTRIC SHOCK can kill.

Protect yourself from possible dangerous electrical shock:

a. The electrode and work (or ground) circuits are electrically "hot" when the welder is on. Never permit contact between "hot" parts of the circuits and bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.
b. Always insulate yourself from the work and ground using dry insulation when welding in damp locations, on metal floors, gratings or scaffolds, and particularly when in positions (such as sitting or lying) where large areas of your body can be in contact with a conductive surface.
c. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition.
d. Never dip the electrode holder in water for cooling.
e. Never simultaneously touch electrically "hot" parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.
f. If using the welder as a power source for mechanized welding, the above precautions also apply for the automatic electrode, electrode reel, welding head, nozzle or semiautomatic welding gun.
g. When working above floor level, protect yourself from a fall should you get a shock. Never wrap the electrode cable around any part of your body.
h. Also see Item 7.

3. FUMES AND GASES can be dangerous to your health.

a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. When welding on galvanized, lead or cadmium plated steel and other metals which produce toxic fumes, even greater care must be taken.
b. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.
c. Also see Item 8b.

4. ARC RAYS can injure eyes and burn skin.

Arcburn may be more severe than sunburn. Therefore:

a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Filter lens should conform to ANSI Z87.1 standards.
b. Use suitable clothing to protect your skin and that of your helpers from the arc rays.
c. Protect other nearby personnel with suitable non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.

5. FIRE OR EXPLOSION can cause death or property damage.

a. Remove fire hazards well away from the area. If this is not possible cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
b. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.
c. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been "cleaned." For information purchase "Safe Practices for Welding and Cutting Containers That Have Held Combustibles", A6.0-65 from the American Welding Society, Miami, Florida 33125.
d. Vent hollow castings or containers before heating, cutting or welding. They may explode.
e. Also see Items 6c and 8c.

Additional Safety Precautions

6. For Welding in General.

a. Droplets of molten slag and metal are thrown or fall from the welding arc. Protect yourself with oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses when in a welding area. Use glasses with side shields when near slag chipping operations.
b. Keep all equipment safety guards, covers and devices in position and good repair. Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.
c. Be sure the work cable is connected to the work as close to the welding area as practical. Work cables connected to the building framework or other locations some distance from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.

7. For Electrically Powered Equipment.

The high voltage and rotating parts associated with such units requires observance of these additional precautions:

a. Disconnect and lock out all power sources before doing any work on the equipment.
b. Make the electrical installation in accordance with the National Electrical Code and all local codes.
c. Properly ground the equipment in accordance with the National Electrical Code and the manufacturer's recommendations. The work or metal to be welded must also be connected to a good electrical ground.

8. For Engine Powered Equipment.

The required fuel and rotating parts associated with such units requires observance of these additional precautions:

a. Whenever possible, turn the engine off before troubleshooting and maintenance work.
b. Operate internal combustion engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.
c. Do not add the fuel near an open flame or when the engine is running. Stop the engine and, if possible, allow it to cool to prevent spilled fuel from igniting on contact with hot engine parts or electrical sparks. Do not spill fuel when filling tank.
d. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.
e. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.

For more detailed information it is strongly recommended that you purchase a copy of "Safety in Welding & Cutting — ANSI Standard Z49.1" from the American Welding Society, Miami, Florida 33125.

INSTALLATION

Location

Install the welder in a dry location where there is free circulation of air in through the louvers in the front and out through the louvers in the back of the case. A location which minimizes the amount of smoke and dirt drawn into the machine reduces the chance of dirt accumulation that can block air passages and cause overheating.

Input Wiring

Be sure the voltage, phase and frequency of the input power is as specified on the welder nameplate.

- Multiple voltage (e.g. 230/460 or 220/380/440) models are shipped connected for the highest voltage. To change the connection, see the connection diagram pasted to the inside of the access panel in the case back.

Have a qualified electrician remove the rear case panel and connect 3 phase AC power to terminals L_1, L_2 and L_3 of the input contactor in accordance with the National Electrical Code, all local codes and the wiring diagram located inside the machine.

The welder frame must be grounded. A stud marked with the symbol ⏚ located inside the machine near the input contactor is provided for this purpose. See the National Electrical Code for details on proper grounding methods.

Recommended Input Wire, Ground Wire and Fuse Sizes Based on National Electrical Code For 60 Hertz, 3 Phase Welders at 100% Duty Cycle

Input Volts	Amps Input	Copper Wire Size Type 75° C in Conduit		Super Lag Fuse Size in Amps
		3 Input Wires	1 Ground Wire	
230	99	3	6	150
460	49.5	6	8	80

Output Connections

A. Output Studs

With welder off connect the output leads to the output terminals marked (+) and (–). They are located at the lower right and lower left corners of the front panel. A strain relief loop for the electrode and work cables is provided directly below the output terminals and are retractable. Pull the loop out and pass the cables up through the loop before the connections to the output terminals are made. Tighten the output stud nuts with a wrench.

Cable Sizes for Combined Lengths of Electrode and Work Cable (Copper) at 100% Duty Cycle

Machine Size	Lengths up to 150 ft.	150 to 200 ft.	200 to 250 ft.
600	(2) #1/0	(2) #2/0	(2) #3/0

B. Auxiliary Power

This machine supplies the 1,000 volt-amperes of 115 volt, AC power needed for wire feeding equipment. The power is available from terminals #31 and #32 on the terminal strip. An 8 amp fuse on the machine control panel protects the auxiliary power from excessive overloads.

C. Control Cable Connections

The control cable from the automatic wire feeding equipment is connected to the terminal strip behind the hinged door on the front of the power source. Strain relief box connectors are provided for access into the terminal strip section. A chassis ground screw is also provided below the terminal strip marked with the symbol ⏚ for connecting the automatic equipment grounding wire.

To connect the DC-600 to wire feeders not covered in available connection diagrams, write to the factory for instructions giving complete nameplate information for the DC-600 and wire feeder.

D. Control P.C. Board Jumper Lead Connections

For access to the Control P.C. board:

1. Turn off all power to the DC-600.
2. Remove the screws securing the nameplate and control cover.
3. Open the cover and locate the control board which is the P.C. board on the right side of the control compartment (facing the machine).

Codes Between 8000 and 8045

As shipped these codes had the control P.C. board jumper leads connected for optimum welding on all processes except solid wire and gas. If solid wire and gas is to be used change the jumpers per the following instructions.

All Processes *Except* Solid Wire and Gas	White Jumper Lead to Pin "I" Blue Jumper Lead to Pin "S"
Solid Wire and Gas.	White Jumper Lead to Pin "M" Blue Jumper Lead to Pin "W"

(Can also be used with other processes except that with some Innershield electrodes such as NR-203 and NR-302 erratic arc action may be experienced.)

If a Dual Process Kit (K-317) or Dual Process Contactor Kit (K-318) is used with these codes, position the jumpers for the processes to be used according to the information above. The only combination *not* presently recommended with the dual process equipment is solid wire and gas, and either NR-203 or NR-302 Innershield.

Codes 8045 to 8200

As shipped these codes have the control P.C. board jumper connected for optimum welding on all processes* *except* NR-203. When using the NR-203, it is necessary to change the jumper on the control board (for optimum arc stability) per the following instructions.

All Processes Except NR-203	White jumper on "M"
NR-203	White jumper on "I"

*Not recommended for short circuiting transfer.

If a Dual Process Kit (K-317) or Dual Process Contactor Kit (K-318) is used with codes above 8045, place the jumper for the processes to be used according to the information above. If NR-203 is *one* of the processes to be used, the white jumper should be placed on "I". This will be satisfactory for all uses except rapid repeat starting.

4. Close the cover and replace the screws.

E. Connecting for Miscellaneous Applications

To use the DC-600 for air carbon arc cutting, resistance heating or other applications, disconnect all wire feeder leads and connect a jumper between #2 and #4 on the terminal strip on the front of the DC-600. With the jumper connected the output studs are energized whenever the machine is on. **WARNING:** If the welding lead to the wire feeder is left connected, the wire feeder nozzle or gun and electrode will be electrically "hot".

F. Stick Welding Option

The DC-600 is available with a factory installed option to provide stick welding (also available as a kit for field installation). To energize the welder output place the mode switch in "stick". DC-600's with codes below 8045 should not be used on E-XX10 electrodes because of a tendency for pop-outs. For DC-600's with codes above 8045, E-XX10 electrodes 5/32 and larger can be used, 3/32 and 1/8 electrodes are not recommended because of a tendency for pop-outs.

OPERATING INSTRUCTIONS

Duty Cycle

The DC-600 is rated for 100% duty cycle at 600 amps and 44 volts for either 60 or 50 Hertz.

To Set Polarity

Connect the electrode cable to the 'Positive' or 'Negative' studs depending upon the electrode polarity desired. Connect the work cable to the other stud.

Set the 'Electrode Negative – Electrode Positive' switch to correspond to the polarity of the electrode cable connection. This switch setting is necessary for proper operation of some Lincoln wire feeders.

To Start the Welder

The push button power 'start' switch at the extreme right side of the control panel energizes and closes the three phase input contactor which energizes the main power transformer.

The red light below the stop-start button indicates when the input contactor is energized. To turn the power source off press the stop push button.

Output Control

The output control in the center of the control panel is a continuous control of the machine output. The control may be rotated from min. to max. while under load to adjust the machine output.

The machine is equipped with line voltage compensation as a standard feature. This will hold the output essentially constant except at maximum outputs of the machine, through a fluctuation of ±10% input line voltage.

Output Control at DC-600 or Output Control Remote

The toggle switch on the control panel labeled "Output Control at DC-600" – "Output Control Remote" gives the operator the option of controlling the output at the machine control panel or at a remote station. For remote control, the toggle switch is set in the "Output Control Remote" position and controlled at the wire feed unit control or by installing a K-775 control to terminals 75, 76 and 77 on the terminal strip on the front of the machine. For control on the machine control panel, the toggle switch is set in the "Output Control at DC-600". (Exception: When used with an LN-9 wire feeder, the toggle switch must be in the "Output Control Remote" position or automatic shut down of the LN-9 may occur.)

Mode Switch — For Constant or Variable Voltage Output

The toggle switch labeled CV Innershield, CV submerged arc, VV submerged arc, is used to select the proper welder characteristics for the process being used.

The CV Innershield mode permits the DC-600 to produce essentially a flat output characteristic that can be varied from approximately 12 to 47 volts. In this position the dynamic characteristic of the machine under welding conditions provides optimum welding characteristics for Innershield welding. Other open arc welding is also done using the CV Innershield mode.

The CV Submerged Arc mode produces an essentially flat output characteristic that can be varied from approximately 12 to 47 volts. In addition, the dynamic characteristics of the CV Submerged Arc mode are such that excellent submerged arc welding can be obtained for most procedures that previously required a variable voltage type power source.

The VV Submerged Arc mode permits the DC-600 to produce a variable voltage output characteristic through the range of 120A-15V to 600A-44V with maximum open circuit voltage of 67 volts. Even though almost all submerged arc welding can now be done in the CV mode, the VV mode is available for those procedures where VV may still be desirable.

Set-up for Various Processes

Selection of Mode Switch Position – There are several general rules to follow in the selection of the mode switch position.

1. Use the CV Innershield mode for all Innershield welding, other open arc welding and air carbon arc cutting using up to 3/8" diameter carbon rods at currents under 750 amps. On larger carbons, and currents over 750 amps, air carbon arc cutting can produce extremely high short circuiting pulses, resulting in more frequent tripping of the welder protection circuit.
2. Use the CV Submerged Arc mode for most submerged arc welding. However, some high speed welding procedures may

perform better on the CV Innershield mode. Merely change the switch between the CV Innershield and CV Submerged Arc position and select the best welding.

3. The VV mode is available for high current, large puddle, submerged arc procedures that cannot be done as well with the constant voltage mode.

NA-3 — The NA-3 should be set for the mode being used on the power source. If using either of the CV modes, the NA-3 VV board switch should be set for CV. If the power source is used in the VV mode, then the NA-3 VV board mode switch should be placed in the VV position.

All NA-3S's when used with the DC-600 are capable of cold starting with the variable voltage board mode switch in VV. Cold starting permits the wire to be inched down to the work, automatically stop, and automatically energize the flux hopper valve. All NA-3's made after September, 1976, are capable of cold starting on either CV or VV settings of the variable voltage board toggle switch.

Arc striking with DC-600 mode switch on CV Sub-Arc or CV Innershield — There are a number of basic techniques for good arc striking that apply to all processes and power sources. It may not be necessary in every application to follow these guidelines, but when striking problems do occur, following the suggestions below should provide trouble-free starting. These procedures apply to single solid wires and Innershield wires.

1. Cut electrode to a sharp point.
2. For cold starts with automatic equipment, make certain work piece is clean and electrode makes positive contact with plate.
3. For hot starts, travel should be started before wire contacts the work, ("on the fly" starting).
4. On the NA-3, set the open circuit voltage control to the same dial setting as the arc voltage control. If the procedure has not yet been established a good starting point is to set the OCV to 6.
5. Run a test weld, setting the proper current, voltage, and travel speed.
6. Once the proper welding procedure is established and if the start is poor — wire blast-off, stub, etc., adjust the NA-3 OCV and inch speed controls for optimum starting. In general, a low inch speed and an OCV dial setting identical to the voltage dial setting will provide the best starting.

   Adjust the OCV by making repeated starts and observing the NA-3 voltmeter action.

   With proper adjustment of the OCV control, the voltmeter needle will swing smoothly up to the desired arc voltage and thus provide repeatable starts.

   If the voltmeter swings *above* then back to the desired welding voltage, the OCV is *too high*. This usually results in a bad start where the wire tends to "blast-off".

   If the voltmeter needle hesitates *before* coming up to the desired voltage, the OCV is set *too low*. This will cause the electrode to stub.

Single Innershield Wire — Procedures and techniques are the same as above. For electrical stickouts above 1-3/4", an NA-3 start board may be required.

Use of the NA-3 start board — For those procedures where an NA-3 start board is used to improve arc striking, the following method should be used to set up the procedure.

1. Set start time at 0 and start current and voltage at mid-range. Set the proper current and voltage for the welding procedure.
2. Turn the start board timer to maximum.
3. Set start board current one to one-and-a-half dial numbers below NA-3 front control settings.
4. Place start board's voltage control approximately equal to NA-3 voltage control setting.

   When set per steps 3 and 4, the starting only procedure will provide a current setting lower than the NA-3 current setting, and a voltage setting nearly equal to the desired welding procedure.
5. With the start board time delay set at maximum, establish the correct arc striking procedure as described previously by changing OCV and inch speed.
6. Increase the start board current and voltage to bring the start current and voltage closer to the welding procedure. The start board current and voltage should be as close to the welding procedure as possible while still getting satisfactory starts.
7. Decrease the start time as low as possible for optimum starts.

Arc striking with the DC-600 mode switch in VV

1. NA-3 — The NA-3 variable voltage board mode switch should be set to the VV position.
2. The OCV control should be at minimum.
3. Other techniques recommended in the previous sections for good arc striking apply here also.

LN-8 — Set the LN-8 mode switch (located on the VV board) to the CV position. Set the DC-600 mode switch on CV Innershield or CV Sub-Arc according to the process being used.

LN-7, LN-9 and other constant wire feed units — Set the DC-600 mode switch on CV Innershield or CV Sub-Arc according to the process being used. If using an LN-9, refer to the LN-9 instruction manual for further instructions on using the LN-9 with the DC-600. If using an LN-7, it will be necessary to use either a K-775 remote control or operate the DC-600 with the toggle switch in the "Output Control at DC-600" position.

Semiautomatic or automatic welding in VV mode: DC-600's with stick option

1. Codes between 8000 and 8045 — Turn the input power off. Open the control box cover behind the nameplate for easy access to the upper terminals of the terminal strip. Remove the double ("piggyback") terminal from #32. Separate the red lead and the black lead and tape up the red lead. Reconnect the black lead to #32. Check to be sure there is still 115V AC between terminals #31 and #32 when the DC-600 is turned on.
2. Codes 8045 to 8200 — Turn the input power off. Open the terminal strip access door. Remove and tape up the DC-600 red lead #32 on the upper screw of the terminal strip.

NL Option Kit — Type K-783 (for field installation), includes a K-775 remote control. For use with the NA-2, LAF-3 or LT-3.

MAINTENANCE

WARNING: Have a qualified electrician do all installation, maintenance and trouble shooting work. Turn the input power off at the fuse box before working inside the machine.

General Maintenance

1. The fan motor has sealed bearings which require no service.
2. In extremely dusty locations, dirt may clog the air channels causing the welder to run hot. Blow out the welder with low pressure air at regular intervals to eliminate excessive dirt and dust build-up on internal parts.

Overload Protection

The DC-600 has built-in protective thermostats. If the interphase reactor or power transformer reaches the maximum safe operating temperature because of frequent overload or high room temperature plus overload, the contactor drops out stopping the welder. This protects the rectifiers as well as the interphase reactor and the power transformer. The thermostats automatically reset when the temperature reaches a safe operating level. Press the 'Start' button to start the welder.

The power rectifiers are also protected by a special solid state circuit. With the occurrence of a short circuit or excessively high overloads, the input contactor opens. When the overload is removed, press the 'Start' button to start the welder.

An 8 amp fuse located on the front of the machine protects the 115 volt auxiliary AC circuit (#31 and #32) from overload. If replacing, use an 8 amp slow blow fuse.

TROUBLE SHOOTING GUIDE

WARNING: Have a qualified electrician do the maintenance and trouble shooting work. Turn the input power off using the disconnect switch at the fuse box before working inside the machine.

Trouble	Cause	What To Do
Input contactor (CR1 chatters).	1. Faulty input contactor (1CR). 2. Low line voltage. 3. Faulty pilot relay (2CR).	1. Repair or replace. 2. Check with power company. 3. Replace relay.
Machine input contactor does not operate.	1. Supply line fuse blown. 2. Contactor power circuit dead. 3. Broken power lead. 4. Wrong input voltage. 5. Primary or interphase thermostats open. 6. Open input contactor coil. 7. Faulty on-off push button. 8. Faulty pilot relay (2CR).	1. Replace if blown — look for reason first. 2. Check pilot transformer T3 and associated leads. 3. Check input voltage at contactor. 4. Check voltage against nameplate and input connection. 5. Check for overheating; make sure fan is operating and there is no obstruction to free air flow. Replace faulty thermostats. 6. Replace coil. 7. Replace push button. 8. Replace relay.
Machine input contactor operates but no output when trying to weld.	1. Electrode or work lead loose or broken. 2. Open main transformer T1 primary or secondary circuit. 3. Output pilot relay (6CR) not operating or faulty. 4. Firing circuit P.C. board not connected or is faulty.	1. Repair connection. 2. Repair. 3. Check relay by connecting a jumper across terminals 2 and 4 on DC-600 terminal strip. Replace if faulty. 4. All nine light emitting diodes (LED1 thru LED9) must be lit. See P.C. board Trouble Shooting Guide.
Machine has maximum output but no control.	1. Output control switch (SW4) in wrong position. 2. Output control switch faulty. 3. Open in feedback circuitry. 4. Faulty control or firing circuit P.C. boards. 5. Output control potentiometer circuit open (Lead 75).	1. Check position of switch. 2. Check switch and replace if faulty. 3. Check wiring and control and firing circuit P.C. board wiring harness plugs. 4. All light emitting diodes must be lit, except LED4 on the control/fault board. See P.C. board Trouble Shooting Guide. 5. Check and replace potentiometer if faulty. Check wiring for Lead #75.
Machine does not have maximum output.	1. One input fuse blown. 2. One phase of main transformer open. 3. Faulty control or firing circuit P.C. board. 4. Output control potentiometer defective. 5. Output control potentiometer leads open 226, 237, 236, 238, 76, 77.	1. Check and replace if blown after checking for reason for blown fuse. 2. Check for open and repair. 3. All light emitting diodes must be lit on both P.C. boards, except LED4 on control/fault board. See P.C. Board Trouble Shooting Guide. 4. Check and replace if faulty. 5. Check and repair broken lead.

TROUBLE SHOOTING GUIDE (Continued)

Trouble	Cause	What To Do
Machine has output but trips off immediately.	1. Machine has either an internal or external short circuit on the output. 2. Faulty control P.C. board.	1. Check internally and externally for any shorts and remove or repair. 2. If no short circuits, LED4 must be lit. See P.C. Board Trouble Shooting Guide.
Variable or sluggish welding arc.	1. Poor work or electrode connection. 2. Welding leads too small. 3. Welding current or voltage too low.	1. Check and clean all connections. 2. Check table in instruction manual. 3. Check procedures for recommended settings.
Machine will not shut off.	1. Input contactor contacts frozen. 2. Fault protection/pilot relay (2CR) contacts stuck closed.	1. Check and replace if necessary. 2. Check and replace if necessary.
Output control not functioning on the machine.	1. Output control switch in wrong position. 2. Faulty output control switch. 3. Faulty output control potentiometer. 4. Leads or connections open in control circuit. 5. Faulty firing circuit or control circuit P.C. board.	1. Place switch in "Output Control at DC-600". 2. Check and replace if found faulty. 3. Check and replace if found faulty. 4. Check lead continuity and connections for an open and repair if necessary. 5. All light emitting diodes must be lit on both P.C. boards, except LED4 on control/fault board. See P.C. Board Trouble Shooting Guide.
Output control not functioning on remote control.	1. Output control switch in wrong position. 2. Faulty output control switch. 3. Faulty remote control potentiometer. 4. Leads or connections open in control circuit. 5. Faulty firing or control circuit P.C. board.	1. Place switch in "Output Control Remote". 2. Check and replace if found faulty. 3. Check and replace if found faulty. 4. Check all leads and connections, internal or remote, for continuity; repair if necessary. 5. All light emitting diodes must be lit on both P.C. boards, except LED4 on control/fault board. See P.C. Board Trouble Shooting Guide.
Poor starting on CV Sub-arc.	1. Improper procedures or setting of controls. 2. 3CR reed switch inoperative. 5CR relay coil open. 5CR time delay circuit defective. 3. Faulty control board. 4. Jumper improperly installed on TS4 (behind terminal strip access door).	1. See instruction manual and procedures. 2. Replace defective component. 3. Replace. 4. See connection diagram.
Poor bead shape on CV Sub-arc.	1. Improper procedures. 2. Defective 5CR relay. 3. Shorted 3CR reed switch. 4. Faulty control board.	1. See instruction manual and review procedures. 2. Replace. 3. Replace. 4. Replace.
Poor starting on CV Innershield and CV Sub-arc.	1. Defective 4CR reed switch 2. Faulty control board. 3. Jumper improperly installed on TS4 (behind terminal strip access door).	1. Replace. 2. Replace. 3. See connection diagram.
DC-600's Codes 8000 to 8045 — poor starting and welding with solid wire and gas.	1. Control P.C. board jumpers improperly connected.	1. Connect white jumper to pin M; Connect blue jumper to pin W.
DC-600's Codes 8000 to 8045 — arc seems to surge or hunt with NR-203 and NR-302 electrodes.	1. Jumpers on control P.C. board improperly connected.	1. Connect white jumper to pin I; Connect blue jumper to pin S.
DC-600's Codes Above 8045 — NR-203 arc unstable at low arc voltages.	1. White jumper lead on control board connected to pin M.	1. Connect white jumper lead to Pin I.

STICK WELDING OPTION MACHINES ONLY

Pop-outs on stick welding.	1. Defective 7CR relay or wiring. 2. Using machine on electrodes or currents for which machine is not designed.	1. Repair or replace. 2. See instruction manual operating instructions.
Poor starting at low currents. No output.	3. Defective 7CR relay or wiring. 4. Defective 7CR relay or wiring.	3. Repair or replace. 4. Repair or replace.

P.C. BOARD TROUBLE SHOOTING GUIDE

WARNING: Have a qualified electrician do the trouble shooting work. When the sides are off and the power on, take special care to avoid contact with electrically "hot" terminals while using the following guide.

Machine settings for P.C. board trouble shooting	Disconnect all other leads to the wire feeder and jumper terminals #2 and #4 on DC-600. Output Control at DC-600. Variable Voltage operation.

Control Fault Protection P.C. Board

1. LED1 indicates AC input voltage is present at leads 255-256. If not lit, check the voltage across the secondary winding of the control transformer T3. The voltage should be approximately 115 volts. If not, the problem is in the power supply and not the P.C. board.
2. LED2 indicates welder output voltage is being supplied to the control circuit. If not lit, check to make certain lead 222 from the control circuit P.C. board Molex connector is connected to the power source negative output lead, and is not broken. See wiring diagram for P.C. connector pin number.
3. LED3 indicates power is being applied to fault protection pilot relay 2CR.
4. LED4 indicates when fault protection circuit is being activated.
5. LED5 indicates a control signal is being supplied to the firing circuit. As the output control is varied, with terminals 2 and 4 open, LED5 should change brilliancy from very dim to bright. The LED will be very dim (or out) at max. OCV and bright at min. OCV.

Firing Circuit P.C. Board

All nine light emitting diodes must be lit when the power source is turned on and the wire feed arc start button is pressed or a jumper is connected between 2 and 4.

1. *Light 7* indicates AC power being supplied to P.C. board from T1 auxiliary winding. If not lit, check voltage across terminals 203 and 204 on the terminal strip TS1 located on the right side of the control box. Voltage should be approximately 75 volts. If no voltage indicates a supply problem, check wiring. If voltage is present, turn the machine off, remove the 12-pin Molex harness plug from the P.C. board, turn the machine back on and check the voltage across pins 2 and 3 on the Molex. This should be approximately 75 volts. If no voltage and there is voltage at terminals 203 and 204 on terminal strip TS1, this indicates a broken lead or loose terminal on either lead 203 or 204. If voltage is present and light 7 is not lit, replace P.C. board.
2. *Light 8* indicates AC power being supplied to P.C. board from T1 auxiliary winding 205-206. If not, follow the same procedure as above in (1) for terminals 205 and 206 on terminal strip TS1 and pins 5 and 6 on the Molex connector.
3. *Light 9* indicates AC power being supplied to P.C. board from T1 auxiliary winding 207-208. If not, follow the same procedure as above in (1) for terminals 207 and 208 on terminal strip TS1 and pins 9 and 12 on the Molex connector.
4. *Lights 1 through 6* indicate gate signals are being supplied to the main power SCR's 1 through 6 respectively. If light 5 on the control circuit and lights 7 through 9 on the firing circuit are lit and lights 1 through 6 are not lit, check 6CR and leads 215 and 216 from 6CR to firing circuit. Terminals 2 and 4 on T.S.2 must be connected to energize lights 1 through 6. Also check lead 231 between the firing circuit and the control circuit that it is not broken and is connected to each Molex connector. If the lead show continuity and lights 1 through 6 are not lit, replace the firing circuit P.C. board. If any one of the lights 1 through 6 is not lit and lights 7 through 9 are lit, replace the firing circuit P.C. board.

If trouble shooting guide indicates a possible P.C. board problem, the following guide can be used to locate the problem.

NO WELDER OUTPUT (INPUT CONTACTOR "ON", 2 AND 4 CLOSED AND OUTPUT CONTROL AT MIN.)

CHECK CONTROL BOARD LED 5

IF OFF

CHECK LED 1

IF OFF

CHECK AC INPUT TO CONTROL BOARD POSSIBLE DEFECTIVE T3 TRANSFORMER

IF ON

REPLACE CONTROL BOARD

IF ON

CHECK FIRING BOARD LED'S

ALL NINE LIGHTS SHOULD BE ON

IF YES

CHECK GATE LEAD CONNECTIONS TO SCR'S

IF NO

CHECK LIGHTS 7,8,9

IF ONE OR MORE ARE OUT

CHECK AC INPUT TO BOARD, 203-204, 205-206, 207-208 POSSIBLE DEFECTIVE AUXILIARY WINDINGS ON MAIN TRANSFORMER

CHECK FOR OPENS IN LEADS 203, 204 205, 206, 207, 208

IF ON AND OTHER LIGHTS ARE OUT

CHECK LEAD TO 6CR IF LEADS AND 6CR OK REPLACE FIRING BOARD

MACHINE HAS OUTPUT BUT TRIPS OFF IMMEDIATELY

CHECK FOR SHORT BETWEEN ELECTRODE AND WORK LEADS. REMOVE EXTERNAL LEADS FROM THE OUTPUT TERMINALS

IF TROUBLE STILL PERSISTS, CHECK LED 3 ON CONTROL BOARD

IF LIGHT GOES ON, THEN QUICKLY OUT WHEN START BUTTON IS PRESSED, CONTROL BOARD IS DEFECTIVE AND SHOULD BE REPLACED

ERRATIC WELDING

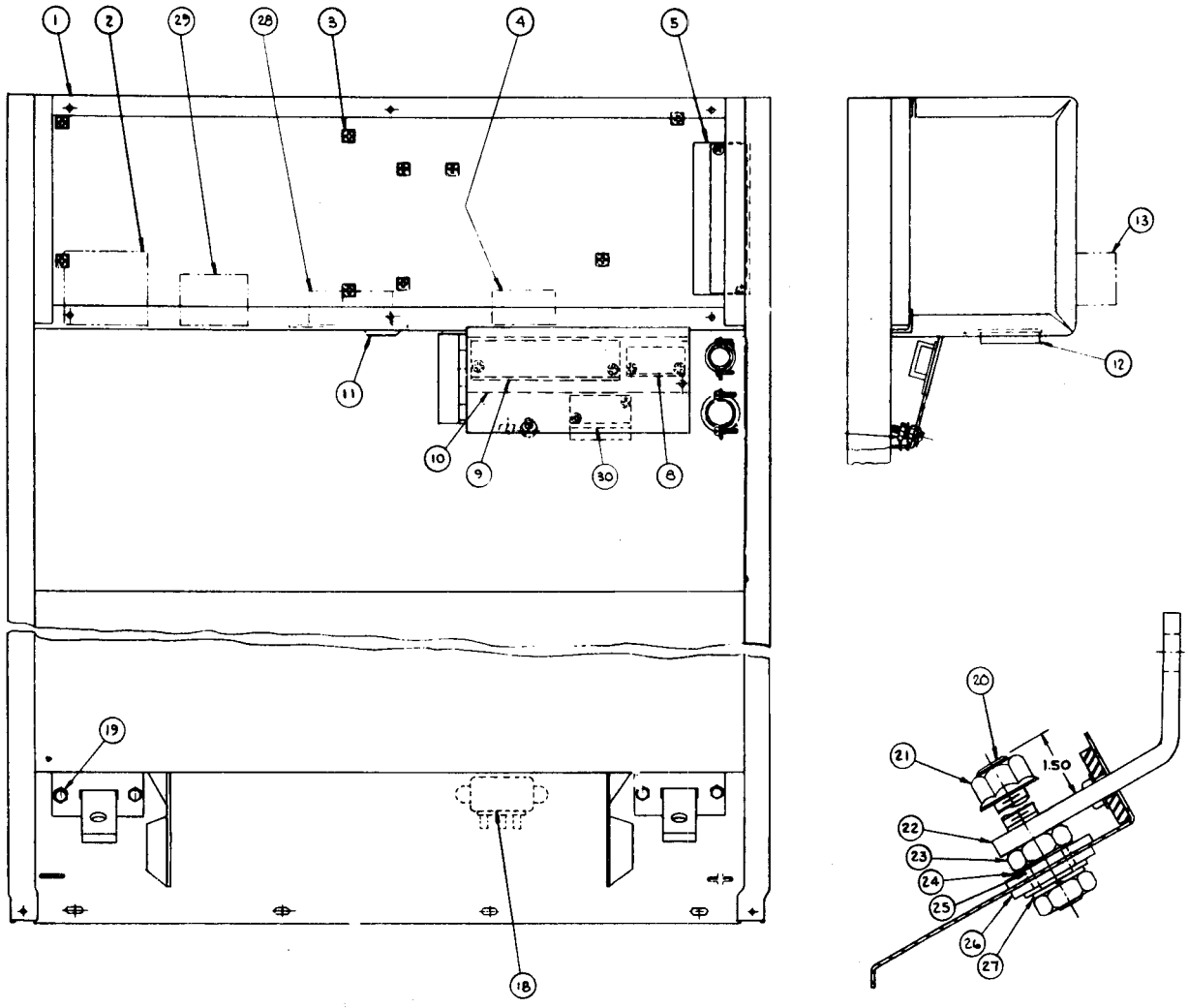
CHECK PROCEDURE

CHECK MODE SWITCH FOR PROPER POSITION FOR PROCESS BEING USED

CHECK LED'S 1 THROUGH 6 FOR EQUAL BRILLIANCY

IF LIGHTS ARE NOT ALL APPROXIMATELY EQUALLY BRIGHT, REPLACE FIRING P.C. BOARD

FRONT PANEL ASSEMBLY

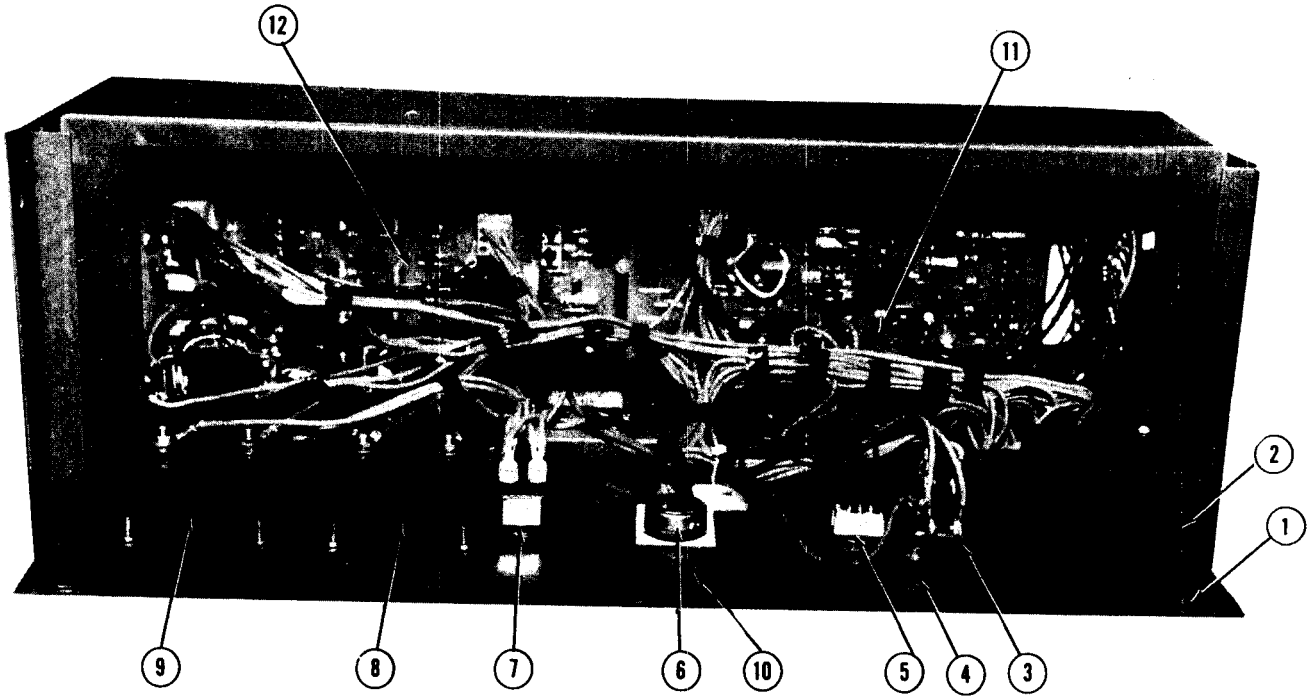


Parts List P-126-C

ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Front Panel	1
2	Relay	1
	Identification Sticker (6CR)	1
3	Plastic Expansion Nut	11
	Self Tapping Screw	11
4	Pilot Relay	1
	Identification Sticker (2CR)	1
5	Terminal Strip	1
	Number Plate	1
8	Terminal Strip	1
9	Terminal Strip	1
10	Number Plate	1
11	Bushing	1
12	Bushing	1
13	Diode Assembly, Includes:	1
	Diode	1
18	Capacitor	1

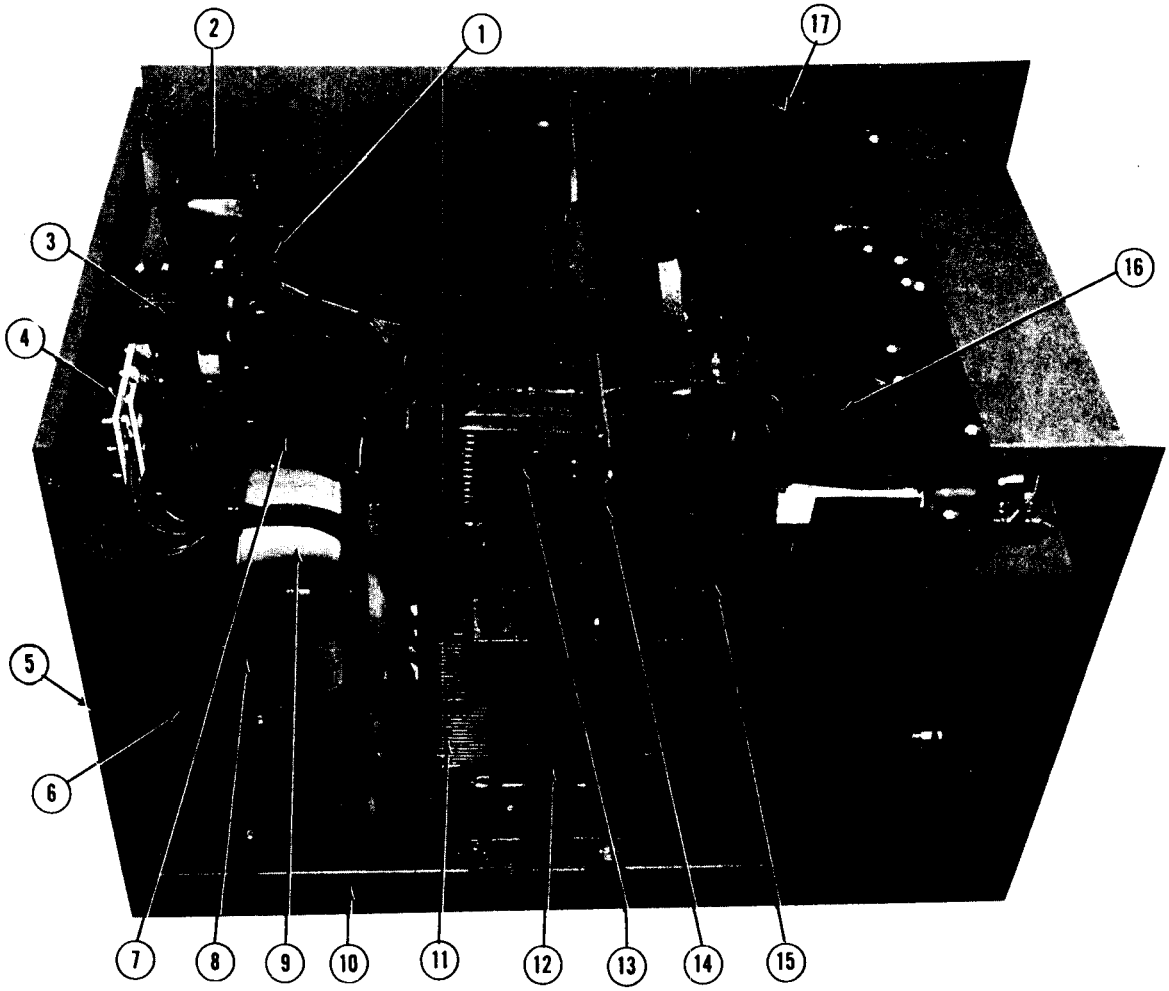
ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
20	Stud	2
21	Flanged Nut	2
22	Connection Strap	2
23	Hex Jam Nut	4
24	Plain Washer	4
25	Insulating Tube	2
26	Insulating Washer	4
27	Lock Washer	2
28	Time Delay Assembly	1
29	Relay	1
	Identification Sticker (5CR)	1
30	Terminal Strip)Above Code 7975)	1
	Number Plate (Above Code 7975)	1

CONTROL BOX



Parts List P-126-D		
ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Control Box Cover	1
2	Pushbutton	1
3	Output Control Switch	1
4	Fuse Holder	1
	Fuse	
5	Welding Mode Switch (Stick Welding Option Only)	1
5	Welding Mode Switch	1
6	Output Control Potentiometer	1
	Potentiometer Insulation	1
	Knob	1
7	Control Circuit Polarity Switch	1
8	DC Ammeter (Optional)	1
9	DC Voltmeter (Optional)	1
10	Instruction Decal	1
11	Control Circuit Printed Circuit Board (Code 7972 Only)	1
12	Firing Circuit Printed Circuit Board	1
	Parts Not Illustrated	
	Nameplate	1
	Nameplate (With Meters)	1
	Nameplate (With Stick Welding Option)	1
	Nameplate (With Meters and Stick Welding Option)	1
	Pilot Light	1

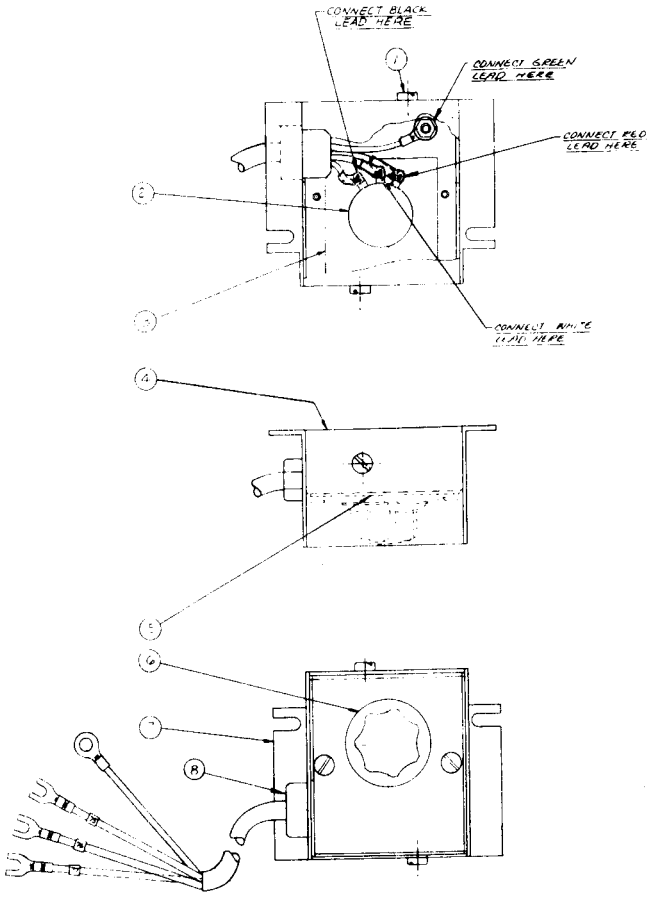
CASE AND INTERNAL COMPONENTS



Parts List P-126-E

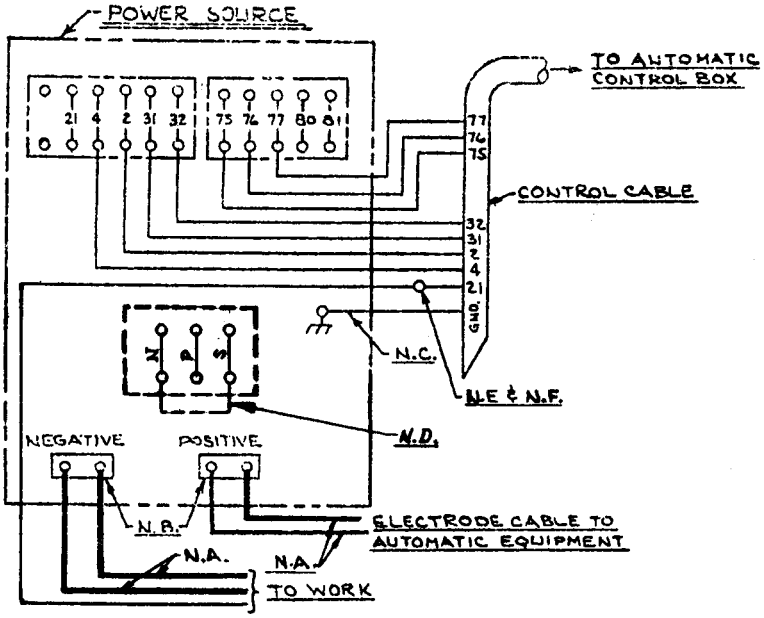
ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
1	Input Box	1
	Bushing (Input Box Rear)	1
	Bushing (Input Box Bottom)	1
2	Control Transformer	1
3	Contactor (1 CR)	1
4	Reconnect Panel (Dual Voltage Only)	1
	Terminal Board	1
	Self Tapping Screw	2
	Carriage Bolt	3
5	Rear Panel	1
	Input Access Door	1
6	Fan Baffle Assembly	1
7	Fan Motor Bracket Stiffener	1
8	Fan	1
9	Fan Motor	1
10	Base	1
11	Transformer Assembly Includes:	1
	Primary Coils	6
	Secondary Coils	2
	Studs	4
	Lower Lamination Assembly	1
	Upper Lamination Assembly	1
	Insulation (Between Top & Bottom Primary Coils)	6
	Insulation (Between Primary Coils & Lamination)	12
12	Lift Bale Assembly	1
	Cover Seal	1
13	Interphase Coil & Lamination Assembly, Includes:	
	Interphase Coil	2
	Interphase Thermostat	1
14	Interphase Baffle	2
15	Snubber P.C. Board Assembly	1
16	Three Phase Bridge Rectifier Assembly, Includes:	1
	SCR Heat Sink Assembly	6
17	Side Panel	2
	Parts Not Illustrated:	
	Roof	1
	Reed Switch (4 CR)	1
	Reed Switch (3 CR)	1
	Meter Shunt Assembly	1
	Choke and Lamination Assembly (Stick Welding Option Only), Includes:	1
	Choke Coil	1
	Relay Assembly, Includes:	1
	Relay (7 CR)	1
	Relay Enclosure	1
	Resistor	1
	Resistor Mounting Stud	1
	Resistor Plain Washer	1
	Resistor Lock Washer	1
	Resistor Insulating Washer	2
	Resistor Hex Nut	2
	Ground Decal	1
	Caution Decal (Case Front)	1

REMOTE CONTROL



Parts List P-84-J		
ITEM	PART NAME AND DESCRIPTION	NO. REQ'D.
	Remote Control Box Assembly, Includes:	1
1	Thread Cutting Screw	4
2	Potentiometer	1
3	Insulation	1
4	Wraparound	1
5	Nameplate	1
6	Knob	1
7	Case	1
8	Lead Grommet	1

Connection of NA-3, LT-5 or LT-7 to DC-600



ABOVE DIAGRAM SHOWS ELECTRODE CONNECTED POSITIVE. TO CHANGE POLARITY, TURN POWER OFF, REVERSE THE ELECTRODE AND WORK LEADS AT THE POWER SOURCE AND POSITION THE SWITCH ON POWER SOURCE TO PROPER POLARITY. ALSO REVERSE THE LEADS ON THE BACK OF THE AMMETER AND VOLTMETER IN THE AUTOMATIC CONTROL BOX.

NOTES

NA. WELDING CABLE MUST BE OF PROPER CAPACITY FOR THE CURRENT AND DUTY CYCLE OF IMMEDIATE AND FUTURE APPLICATIONS.

N.B. DC-600 HAS ONE OUTPUT STUD TERMINAL.

N.C. CONNECT THE CONTROL CABLE GROUND LEAD TO THE FRAME TERMINAL MARKED ⏚ NEAR THE POWER SOURCE TERMINAL STRIP. THE POWER SOURCE MUST BE PROPERLY GROUNDED.

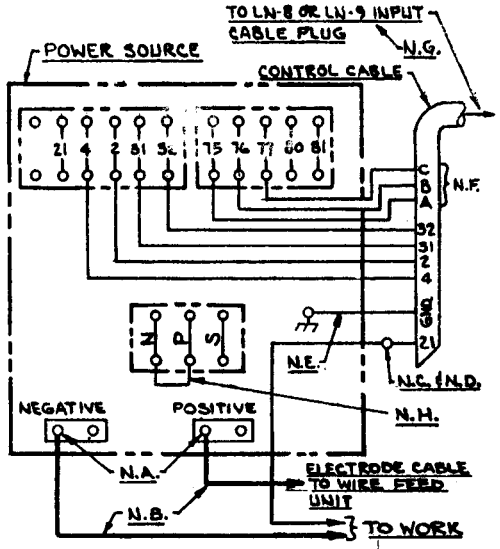
N.D. FOR DC-600 CODES BELOW 8200, CONNECT A JUMPER FROM "N" TO "S". THERE IS NO NPS TERMINAL STRIP ON CODES ABOVE 8200.

N.E. EXTEND LEAD 21 USING #14 OR LARGER INSULATED WIRE PHYSICALLY SUITABLE FOR THE INSTALLATION. AN S-16586-[ ] REMOTE VOLTAGE SENSING WORK LEAD IS AVAILABLE FOR THIS PURPOSE. CONNECT IT DIRECTLY TO THE WORK PIECE KEEPING IT ELECTRICALLY SEPARATE FROM THE WELDING WORK LEAD CIRCUIT AND CONNECTION. FOR CONVENIENCE, THIS EXTENDED #21 LEAD SHOULD BE TAPED TO THE WELDING WORK LEAD.

N.F. TAPE UP BOLTED CONNECTION

S-16366
12-20-79G

Connection of LN-8 or LN-9 to DC-600



ABOVE DIAGRAM SHOWS ELECTRODE CONNECTED POSITIVE TO CHANGE POLARITY, TURN POWER OFF, REVERSE THE ELECTRODE AND WORK LEADS AT THE POWER SOURCE AND POSITION THE SWITCH ON POWER SOURCE TO PROPER POLARITY.

N.A. DC-600 HAS ONE OUTPUT STUD TERMINAL, DC-1000 HAS TWO OUTPUT STUD TERMINALS.

N.B. WELDING CABLES MUST BE OF PROPER CAPACITY FOR THE CURRENT AND DUTY CYCLE OF IMMEDIATE AND FUTURE APPLICATIONS.

N.C. EXTEND LEAD 21 USING #14 OR LARGER INSULATED WIRE PHYSICALLY SUITABLE FOR THE INSTALLATION. AN S-16586-[ ] REMOTE VOLTAGE SENSING WORK LEAD IS AVAILABLE FOR THIS PURPOSE. CONNECT IT DIRECTLY TO THE WORK PIECE KEEPING IT ELECTRICALLY SEPARATE FROM THE WELDING WORK LEAD CIRCUIT AND CONNECTION. FOR CONVENIENCE, THIS EXTENDED #21 LEAD SHOULD BE TAPED TO THE WELDING WORK LEAD. (THIS EXTENDED #21 LEAD CONNECTION REPLACES THE NEED TO EMPLOY THE REMOTE WORK LEAD ACCESSORY ON LN-9'S WHICH HAVE A DIRECT WORK LEAD JACK.)

N.D. TAPE UP BOLTED CONNECTION.

N.E. CONNECT THE LN-8 OR LN-9 CONTROL CABLE GROUND LEAD TO THE FRAME TERMINAL MARKED ⏚ NEAR THE POWER SOURCE TERMINAL STRIP. THE POWER SOURCE MUST BE PROPERLY GROUNDED.

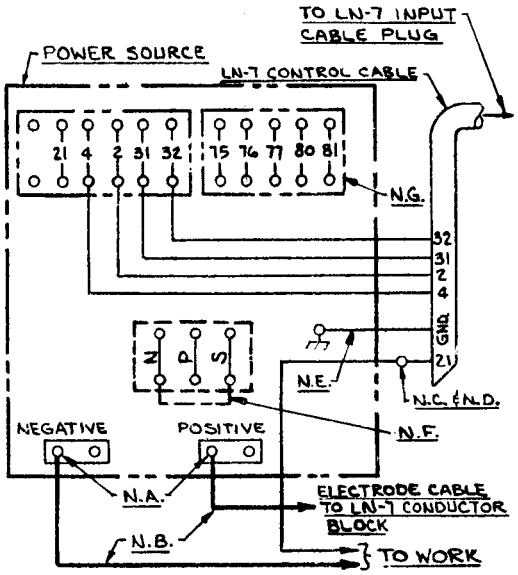
N.F. IF USING AN OLDER LN-8 CONTROL CABLE: CONNECT LEAD #75 TO #75 ON TERMINAL STRIP, CONNECT LEAD #76 TO #76 ON TERMINAL STRIP, CONNECT LEAD #77 TO #77 ON TERMINAL STRIP.

N.G. THE JUMPERS ON THE LN-9 VOLTAGE BOARD AND START BOARD (USED ON LATER MODELS) MUST BE CONNECTED AS FOLLOWS
VOLTAGE BOARD - CONNECT WHITE JUMPER TO PIN '3' (BLUE JUMPER ON EARLIER UNITS)
ON LN-9 MODELS WITH START BOARDS - CONNECT BLUE JUMPER TO PIN 'B'
REFER TO OPERATING MANUAL

N.H. FOR DC-600 CODES BELOW 8200
CONNECT A JUMPER FROM 'N' TO 'P' ON LN-9 ONLY.
CONNECT A JUMPER FROM 'N' TO 'S' ON LN-8 ONLY
THERE IS NO NPS TERMINAL STRIP ON CODES ABOVE 8200

S-16367
6-15-79A

Connection of LN-7 to DC-600



ABOVE DIAGRAM SHOWS ELECTRODE CONNECTED POSITIVE TO CHANGE POLARITY, TURN POWER OFF, REVERSE THE ELECTRODE AND WORK LEADS AT THE POWER SOURCE AND POSITION THE SWITCH ON POWER SOURCE TO PROPER POLARITY.

N.A. DC-600 HAS ONE OUTPUT STUD TERMINAL, DC-1000 HAS TWO OUTPUT STUD TERMINALS.

N.B. WELDING CABLES MUST BE OF PROPER CAPACITY FOR THE CURRENT AND DUTY CYCLE OF IMMEDIATE AND FUTURE APPLICATIONS.

N.C. EXTEND LEAD 21 USING #14 OR LARGER INSULATED WIRE PHYSICALLY SUITABLE FOR THE INSTALLATION. AN S-16586-[ ] REMOTE VOLTAGE SENSING WORK LEAD IS AVAILABLE FOR THIS PURPOSE. CONNECT IT DIRECTLY TO THE WORK PIECE KEEPING IT ELECTRICALLY SEPARATE FROM THE WELDING WORK LEAD CIRCUIT AND CONNECTION FOR CONVENIENCE, THIS EXTENDED #21 LEAD SHOULD BE TAPED TO THE WELDING WORK LEAD. (THIS EXTENDED #21 LEAD CONNECTION REPLACES THE NEED TO EMPLOY THE REMOTE WORK LEAD ACCESSORY ON LN-7 METER KITS WHICH HAVE A DIRECT WORK LEAD JACK. AN LN-7 NOT EQUIPPED WITH A METER KIT DOES NOT REQUIRE LEAD 21 TO BE EXTENDED.)

N.D. TAPE UP BOLTED CONNECTION.

N.E. CONNECT THE CONTROL CABLE GROUND LEAD TO THE FRAME TERMINAL MARKED ⏚ NEAR THE POWER SOURCE TERMINAL STRIP. THE POWER SOURCE MUST BE PROPERLY GROUNDED.

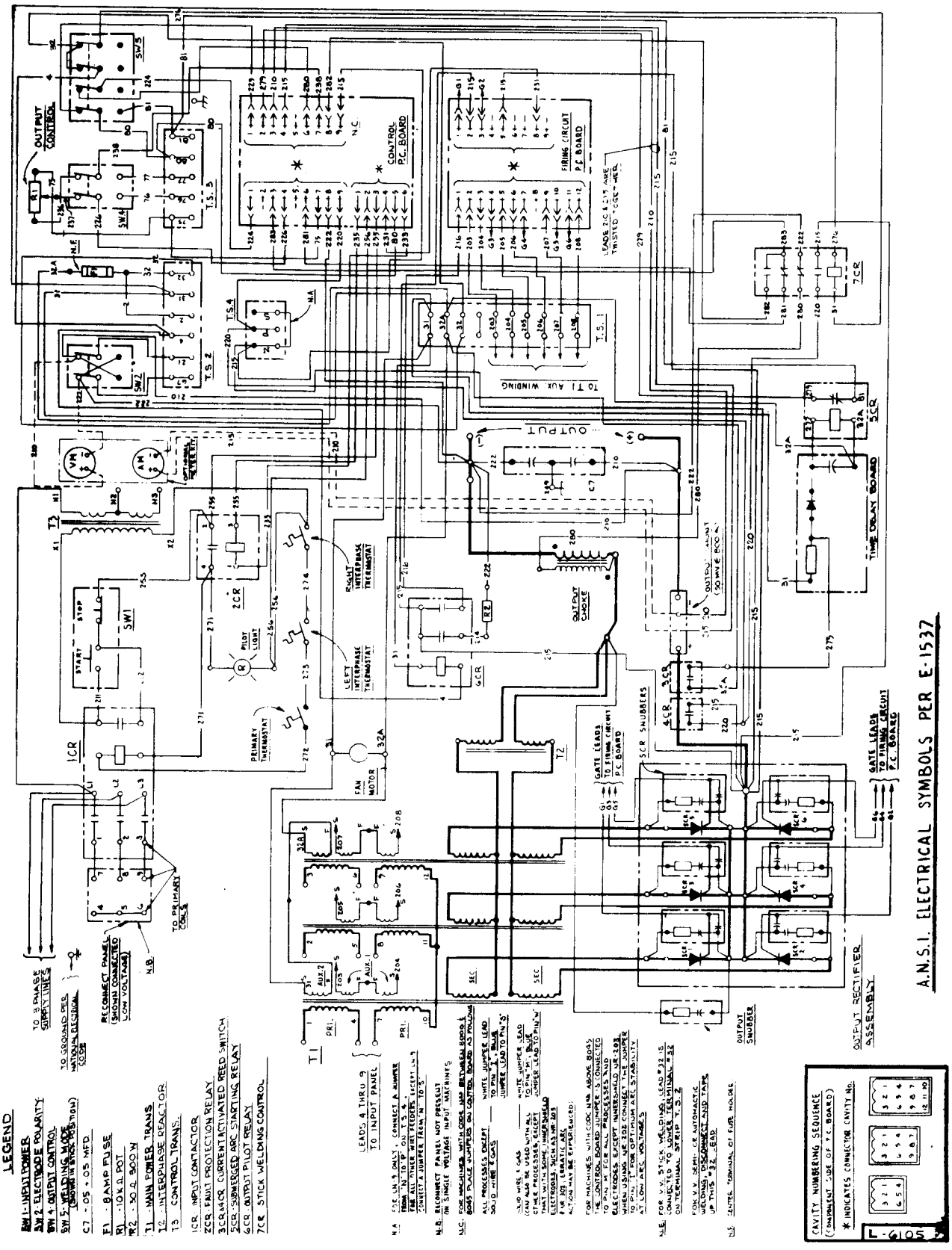
N.F. FOR DC-600 CODES BELOW 8200, CONNECT A JUMPER FROM "N" TO "S". THERE IS NO NPS TERMINAL STRIP ON CODES ABOVE 8200.

N.G. TERMINAL STRIP FOR REMOTE VOLTAGE CONTROL POD WHEN USED.

S-16368
6-15-79A

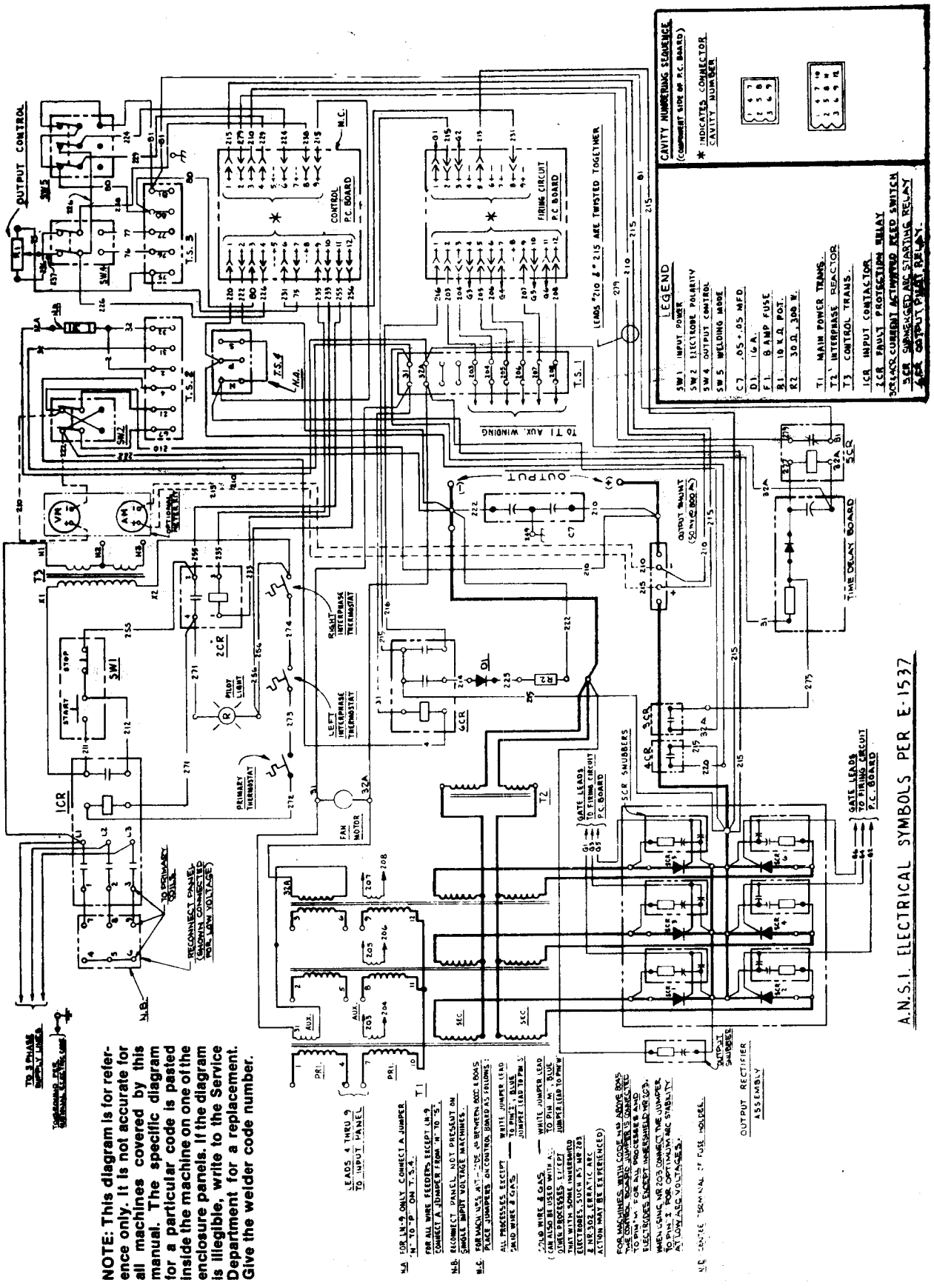
L-6105
Wiring Diagram

DC-600 WITH STICK WELDING OPTION



NOTE: This diagram is for reference only. It is not accurate for all machines covered by this manual. The specific diagram for a particular code is pasted inside the machine on one of the enclosure panels. If the diagram is illegible, write to the Service Department for a replacement. Give the welder code number.

DC-600 WITHOUT STICK WELDING OPTION



NOTE: This diagram is for reference only. It is not accurate for all machines covered by this manual. The specific diagram for a particular code is pasted inside the machine on one of the enclosure panels. If the diagram is illegible, write to the Service Department for a replacement. Give the welder code number.

HOW TO ORDER REPLACEMENT PARTS

Order parts only from Lincoln offices or from the Authorized Field Service Shops listed in the "Service Directory". Give the following information:

(a) From the nameplate — machine model, code and serial numbers.
(b) From this manual — part name, item number, quantity required and the number of the list used to get this information.

Any items indented in the "Parts Name" column are included in the assembly under which they are listed. The indented items may be ordered separately. If the entire assembly is needed, do *not* order the indented parts.

GUARANTEE

The Lincoln Electric Company, the Seller, warrants all new equipment except engines and accessories thereof against defects in workmanship and material for a period of one year from date of shipment, provided the equipment has been properly cared for, and operated under normal conditions. Engines and engine accessories are warranted free from defects for a period of ninety days from the date of shipment.

If the Buyer gives the Seller written notice of any defects in equipment or electrode or flux within any period of warranty and the Seller's inspection confirms the existence of such defects, then the Seller shall correct the defective equipment or defects at its option, either by repair or replacement F.O.B. its own factory or other place as designated by the Seller. The remedy provided Buyer herein for breach of Seller's warranty shall be exclusive.

No expense, liability or responsibility whatsoever assumed by the Seller for repairs made outside of the Seller's factory without written authority from the Seller.

The Seller shall not be liable for any consequential damages in case of any failure to meet the conditions of any warranty. The liability of the Seller arising out of the supplying of said equipment or electrode or its use by the Buyer, whether on warranties or otherwise, shall not in any case exceed the cost of correcting defects in the equipment or replacing defective electrode in accordance with the above guarantee. Upon the expiration of any period of warranty, all such liability shall terminate.

The foregoing guarantees and remedies are exclusive and except as above set forth. There are no guarantees or warranties with respect to engines, accessories, equipment, electrodes, or flux, either express or arising by operation of law or trade usage or otherwise implied, including without limitation the warranty of merchantability, all such warranties being waived by the Buyer.

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