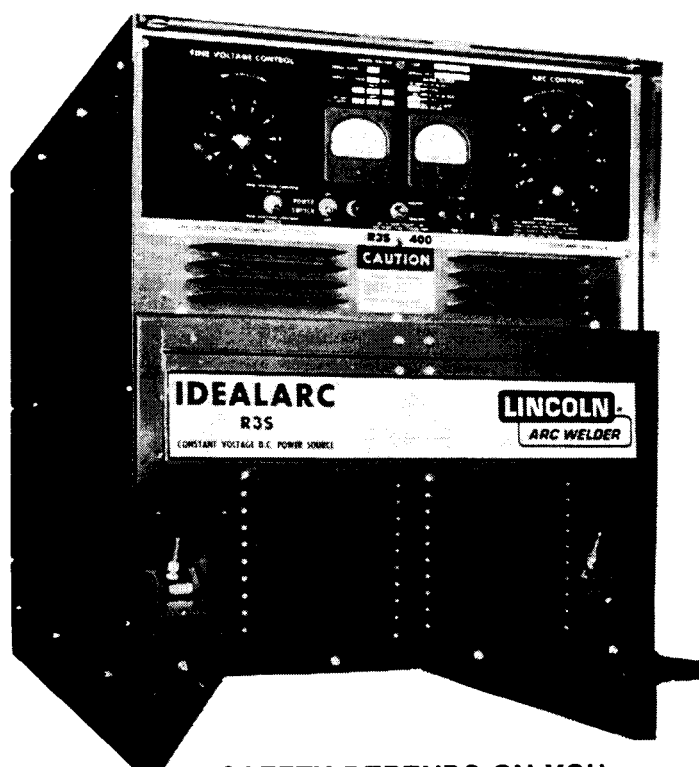


# OPERATING MANUAL

IM269  
Idealarc Idealarc R3S-400 R3S-600  
R3S-800  
October, 1966  
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8831, 8965, 8966, 9051

## IDEALARC<sup>®</sup> R3S-400, R3S-600 and R3S-800 DC ARC WELDING POWER SOURCES Constant Voltage, 3 Phase, Rectifier Type



This manual covers equipment which is obsolete and no longer in production by The Lincoln Electric Co. Specifications and the availability of optional features may have changed.

### 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 welders are 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.

# 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, OPERATION, 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 by using dry insulation. When welding in damp locations, on metal floors, gratings or scaffolds, and when in positions such as sitting or lying, make certain the insulation is large enough to cover your full area of physical contact with work and ground.
- c. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.
- d. Ground the work or metal to be welded to a good electrical ground.
- e. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition.
- f. Never dip the electrode in water for cooling.
- g. 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.
- h. 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.
- i. When working above floor level, protect yourself from a fall should you get a shock.
- j. Also see Items 6c and 8.

## 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. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.

- d. Read and understand the manufacturer's instructions for this equipment and the consumables to be used, including the material safety data sheet (MSDS) and follow your employer's safety practices.

- e. Also see item 9b.

## 4. ARC RAYS can injure eyes and burn skin.

- 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. Headshield and filter lens should conform to ANSI Z87.1 standards.

- b. Use suitable clothing made from durable, flame-resistant material 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. Have a fire extinguisher readily available.

- b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to "Safety in Welding and Cutting" (ANSI Standard Z49.1) and the operating information for the equipment being used.

- c. 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.

- d. 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 "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances.", AWS F4.1-80 from the American Welding Society (see address below).
  - e. Vent hollow castings or containers before heating, cutting or welding. They may explode.
  - f. Also see items 6c and 9c.
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 in 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 Gas-Shielded Arc Welding.
- a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.
  - b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.
  - c. Cylinders should be located:
    - Away from areas where they may be struck or subjected to physical damage.
    - A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.
  - d. Never allow the electrode, electrode holder, or any other electrically "hot" parts to touch a cylinder.
  - e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.
  - f. Valve protection caps should always be in place and handtight except when the cylinder is in use or connected for use.
  - g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-1 "Precautions for Safe Handling of Compressed Gases in Cylinders" available from the Compressed Gas Association, 1235 Jefferson Davis Highway, Arlington, VA 22202.
8. For Electrically Powered Equipment.
- a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.
  - b. Make the electrical installation in accordance with the National Electrical Code, all local codes and the manufacturer's recommendations.
  - c. Properly ground the equipment in accordance with the National Electrical Code and the manufacturer's recommendations.
9. For Engine Powered Equipment.
- a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.
  - b. Operate the 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, welding arc or when the engine is running. Stop the engine and, if possible, allow it to cool when refueling to prevent spilled fuel from vaporizing on contact with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.
  - d. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.
  - e. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.
  - f. 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.
  - g. 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, P.O. Box 351040 Miami, Florida 33135.

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## PRODUCT DESCRIPTION

The R3S-400, 600, and now obsolete 800 are three phase transformer rectifier DC constant voltage power sources for automatic or semiautomatic welding. The R3S-800 and the standard R3S-600 (without Arc Control) are not recommended for open arc processes other than cored wire. The R3S-600, when equipped with Arc Control, is suitable for other open arc processes. Operation on low current and low voltage Innershield procedures is also improved with the addition of the Arc Control.

## INSTALLATION

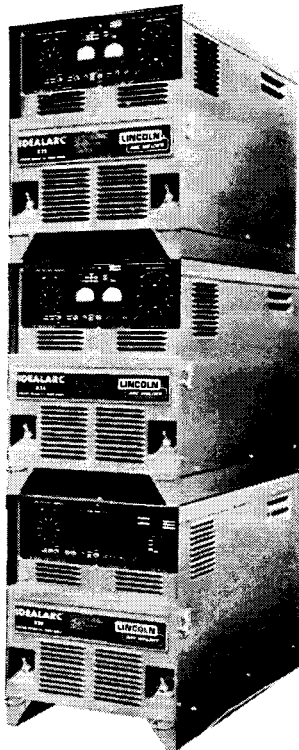
**WARNING:** Have qualified personnel do all installation work. Turn the input power off at the fuse box before working inside the machine.

### Location and Stacking

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

These welders can be stacked three high when the following precautions are observed:

1. Be sure the bottom machine is on a firm level surface suitable for the total weight (up to 2300 pounds) of the stacked machines.
2. Stack the machines with the fronts flush. Be certain the pins on the top front corners of the lower machines fit through the holes in the base rails of the upper machines.
3. The length (or depth) of different amperage R3S welders vary. Do not stack a longer case on top of a shorter case.



### Input Wiring

230/460 volt models are shipped connected for 460 volts. To change the connection, see the wiring or connection diagram pasted to the inside of the access panel in the case back.

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

Before applying power have a qualified electrician remove the access panel in the case back and connect three phase AC power to terminals L<sub>1</sub>, L<sub>2</sub>, L<sub>3</sub> of the input connection panel in accordance with the National Electrical Code, all local codes, and the wiring diagram located inside the machine.

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

Welder	Input Volts	Input Amps	Copper Wire Size — Type 75°C in Conduit				Super Lag Fuse Size (Amps)
			3-Input Wires		1-Ground Wire		
			Wire	T&B Terminal	Wire	T&B Terminal	
400	230	68	4	31007	6	31005	110
	460	34	8	31005	10	31003	60
600	230	100	3	31007	6	31005	150
	460	50	8	31005	8	31005	80
800	230	142	0	—	4	31007	225
	460	71	4	31007	6	31005	110

The welder frame must be grounded. A stud marked with the symbol  $\equiv$  located on the input connection panel is provided for this purpose. See the National Electrical Code for details on proper grounding methods.

Thomas & Betts wire terminals (or equal) recommended above are required to comply with applicable UL standards for safety. Tooling required to assemble terminals are a screwdriver for the 31003 and 31005 and a #30 hex (Allen) key wrench for others.

### Output Connections (Turn power source off.)

#### a. Output Studs

Studs for electrode and work cable connections are located at the bottom corners of the front panel. The cable should be run up through the strain relief loops below the studs to prevent loosening the cable connection or damaging the studs if the cables are pulled excessively.

Cables in accessory kits recommended below are terminated as required to comply with applicable UL standards for safety.

Welder	Combined Copper Cable Lengths up to 100 ft.	Lincoln Accessory Kit Numbers
400	3/0	K-797 (electrode & work cables) <sup>(1)</sup>
600	2 — 1/0	K-795 (electrode & work cables) <sup>(1)</sup>

<sup>(1)</sup> Specify length of each.

#### b. Terminal Strip

The terminal strips for connection of the wire feeder control leads are located behind the "Voltage Selector Panel" door. Turn the "Power" switch off and lift the "Voltage Selector Panel" door. Run the control leads from the wire feeder input cable through the upper of two cable clamps near the front edge of the right side of the machine. Connect the leads to the appropriate terminals per the following instructions for the appropriate wire feeder. Tighten the cable clamp. Close the door.

#### c. Auxiliary Power

This machine supplies the power needed for current Lincoln wire feeder controls and drive circuits. The power available is 600 volt-amperes of 115 volt, AC power at #31 and #32 on the terminal strips.

#### d. Optional Line Voltage Compensator (K-781 and K-782)

When using the R3S-400 or R3S-600 in locations where line voltage variations cause welding problems, order this compensator. Complete installation and operating instructions are shipped with the compensator.

The Line Voltage Compensator is designed for use with a single R3S and cannot be used with parallel connected machines. Arc voltage is controlled only by the LVC rheostat. Wire feeder voltage controls will be inoperative. Not required with the LN-9 or NA-5.

#### e. Connection of LN-7, LN-8, LN-9, LN-22, NA-3, NA-5, LT-7 or LT-56 Wire Feeders

Connect the control leads and the electrode and ground cables **exactly** as specified on the connection diagram in the wire feeder operating manual. Connection diagrams are also included at the rear of this instruction manual. Be sure multiprocess wire feeder are set for constant voltage welding as specified in the wire feeder instruction manual.

#### f. Connection to Discontinued LN-4, LN-5, LN-6, MN-1, NA-1 and NA-2 Wire Feeders

These wire feeders require the 115 volt AC plus 115 volt DC input power. The DC auxiliary power is available from #1 and #2 on the R3S terminal strip only on older welders built to codes below 7594. Write to the factory for specific connection information.

#### g. Other Wire Feeders

These machines can be used with most wire feeders manufactured by other companies. The connection must be determined by the user for the specific equipment being used.

Auxiliary power used for wire feeder operation is described in paragraph c above. To connect to the auxiliary power, turn the "Power" switch off and lift the "Voltage Selector Panel" door. Run the control leads from the wire feeder input cable through the upper of two cable clamps near the front edge of the right side of the machine and connect the leads to the larger of two terminal strips as appropriate. For remote operation of the contactor, a wire feeder control circuit must complete the #2 — #4 circuit on the terminal strip. If the wire feeder is not equipped with a contactor circuit, put a jumper between #2 and #4 to close the R3S contactor.

**WARNING: With this connection, the electrode is electrically "hot" whenever the power source is on, so appropriate care must be taken.**

Tighten the cable clamp. Close the panel door.

#### h. Connection of Optional Remote Control

To install the optional Remote Control, turn the "Power" switch off and lift the "Voltage Selector Panel" door. Run the cord from the Remote Control through the lower of the two cable clamps near the front edge of the right side of the machine. Connect the numbered leads to the appropriate terminals — 75 to 75, 76 to 76, 77 to 77 — on the smaller terminal strip. If the Remote Control has a fourth (green) lead, connect this green lead to the frame terminal marked with the symbol located near the access hole. (If an older R3S does not have the grounding terminal, connect the green lead to one of the unpainted screws which mount the compartment to the welder case.) Tighten the cable clamp. Close the door. The Remote Control cord can be lengthened to any length by splicing four conductor lead wires to the standard 25' cord before connecting to the R3S.

#### i. Connection for High Frequency Starting

When using these welders with a high frequency unit for improved automatic welding starting characteristics, an R.F. by-pass condenser must be installed to protect the R3S control circuits. Order Kit T-12246. Instructions are included in the kit.

## OPTIONAL FEATURES

All listed Optional Features are available at extra cost.

1. **Undercarriage** (K-817 or K-817R) — Three wheeled running gear for shop floor movement only. Includes spring loaded handle which rests in the Up position. Assembly and Installation instructions are included with the undercarriage.
2. **Meters** — Available factory installed only. A separate ammeter and voltmeter are mounted on the front panel of the machine. The voltmeter has a 0-60 scale. The ammeter has a 0-6 ( $\times 100$ ) scale on the R3S-400, a 0-8 ( $\times 100$ ) scale on the R3S-600, and a 0-10 ( $\times 100$ ) scale on the R3S-800.
3. **Remote Voltage Control** (K-775) — Portable fine voltage control provides continuous adjustment of welding voltage over approximately seven volt

range. Includes a control box and 28 feet of four conductor cable. The Fine Voltage Control switch must be set in the Remote Control position. For installation, see Section h of Installation, Output Connections.

4. **Arc Control** — Factory installed only. Standard on the R3S-400 and optional on the R3S-600. Provides for changing the pinch effect of the arc when welding in a short circuiting type transfer. See Operating Instructions, Section 2.c for operation.
5. **Line Voltage Compensator** (K-781 for R3S-400 and K-782 for R3S-600) — Not available for R3S-800. See Installation, Output Connections, Section d for additional details.

## OPERATING INSTRUCTIONS

### 1. To Set Polarity

With the power source off, connect the electrode cable to the "Positive" or "Negative" stud, depending upon the electrode polarity desired. Connect the work cable to the other stud.

Set the "Control Circuit Switch" on the front panel to "Positive" or "Negative" to correspond to the electrode cable connection. This switch setting is needed for proper operation of most Lincoln wire feeding equipment. The switch has no function when operating with other wire feeders.

### 2. To Set the Welding Output

- a. Turn the "Power Switch" to "Off". Lift the "Voltage Selector Panel" door. Remove the three nuts on the connection triangle and move the triangle so the approximate welding voltage desired shows through the hole in the triangle. Replace the three nuts and tighten with a wrench. Close the door.
- b. The precise desired voltage above or below the voltage set on the "Voltage Selector Panel" can be adjusted while welding either at the R3S control panel or at a remote location as follows:

To set the output from the R3S, set the "Fine Voltage Control" switch to "AT R3S" and adjust the "Fine Voltage Control" located on the R3S control panel.

To set the output from a remote location, set the "Fine Voltage Control" switch to "Remote". Adjust the voltage using either the optional Remote Control, the voltage control on the wire feeder or the "Fine Voltage Control" on the optional "Line Voltage Compensator" as appropriate.

- c. On lower current and voltage applications, adjusting the "Arc Control" (not on R3S-800 and optional on the R3S-600) helps to select the desired arc characteristics. Turning the control counter-clockwise tends to produce a more fluid puddle, reduce penetration and minimize fine spatter. Turning the control clockwise tends to produce a smaller puddle and deeper penetration. The control can be adjusted while welding.

### 3. To Start the Welder

Move the "Power Switch" to "On". This lights the red pilot light next to the switch and starts the cooling fan. Operate the gun trigger (or the wire feeder contactor circuit) to start the weld.

### 4. To Read the Meters

Welding current and voltage can be read on the optional voltmeter and ammeter only when welding.

With the "Power Switch" on and the wire feeder gun trigger pulled, the voltmeter reads higher than the voltage indicated on the "Voltage Selector Panel". This reading is not affected by changing the "Fine Voltage Control". The voltage drops to actual welding voltage as soon as the arc is struck.

### 5. Maximum Recommended Arc Gouging Carbon Sizes

R3S-400	1/4" Carbon
R3S-600	3/8" Carbon
R3S-800	3/8" Carbon

#### Duty Cycle & Rating

Model	Hertz	Amps	Volts	Duty Cycle
R3S-400	60	400	40	100% <sup>(1)</sup>
R3S-600	60	600	44	100% <sup>(1)</sup>
R3S-800	60	800	44	100% <sup>(1)</sup>

<sup>(1)</sup> 50 hertz machines are rated 80% duty cycle.



## MAINTENANCE AND TROUBLESHOOTING

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

### Overload Protection

A fuse protecting the auxiliary transformer from overload is located on the front of the machine. It is a ten amp fuse in the auxiliary AC (#31 and #32) circuit. Machines built to codes below 7594 also have a four amp fuse in the DC (#1 and #2) circuit. If replacing, use the same type and size fuse.

All Idealarc R3S machines have built-in protective thermostats operated by both temperature and current. These devices open the contactor if the rectifier or transformer exceeds the maximum safe operating temperature because of frequent overload, high room temperature plus overload or abnormally high input voltage. The thermostats automatically reset when the temperature reaches a safe operating level.

### 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 at regular intervals.

### Contactors Maintenance — R3S-400 and R3S-600

Where the output contactor is operated frequently for tacking or short welds, inspect it every three months:

1. Be sure the mating surfaces of the contacts are not worn and all make contact at approximately the same time.
2. Make sure the springs and holders are not broken or out of adjustment. Approximate spring compression after making contact is  $\frac{1}{8}$ ". Less than  $\frac{1}{16}$ " compression indicates worn contacts that should be replaced.
3. Make sure the moving contact or other moving parts are not binding.

### NAMEPLATES

Whenever routine maintenance is performed on this machine — or at least yearly — inspect all nameplates and labels for legibility. Replace those which are no longer clear. Refer to the parts list for the replacement item number.

### RECTIFIER TROUBLESHOOTING

If the welder trips off the line under no load or the DC welding output is lower than normal, test for a possible failed rectifier as follows:

1. Turn the input power off.
2. Disconnect all input and output leads from the rectifier bridge.
3. Connect an ohmmeter between the DC positive (red) terminal and one of the AC (yellow) terminals. Note the ohmmeter reading using the 10 to 100 scale.
4. Reverse the ohmmeter leads. Note the reading.
5. The readings taken in steps 3 and 4 should be different. If the readings are the same and near zero, the rectifier has shorted. If the readings are the same and near full scale, the rectifier has failed open.
6. Repeat steps 3, 4 and 5 between the DC positive (red) terminal and each of the AC (yellow) terminals.
7. Repeat steps 3, 4 and 5 between the DC negative (black) terminal and each of the AC (yellow) terminals.

**NOTE:** Since it is unlikely that all rectifiers of a full wave bridge would fail simultaneously, check the test method and the ohmmeter if the checking indicates that all the rectifiers have failed.

## TROUBLESHOOTING

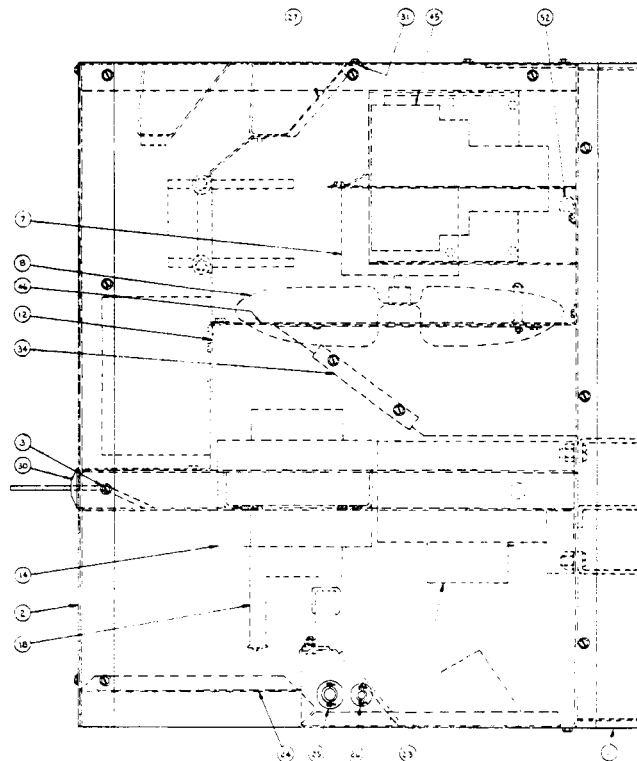
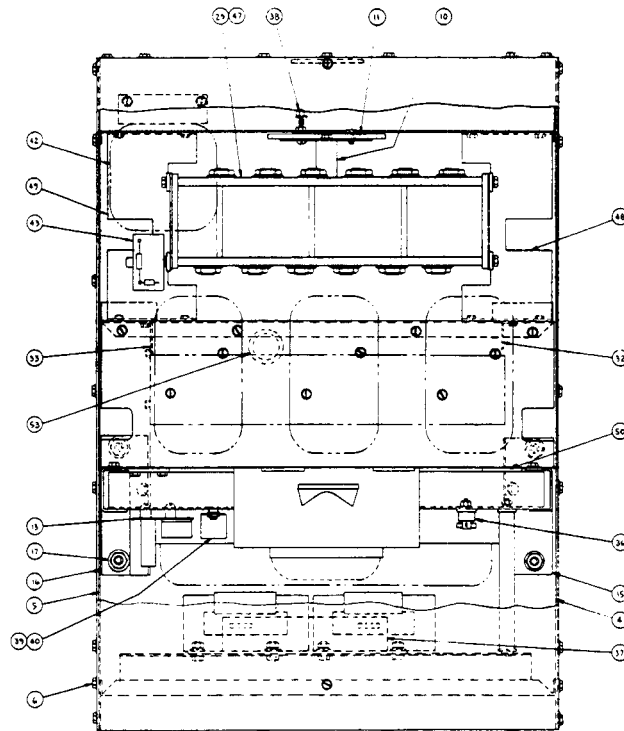
**WARNING:** Have a qualified electrician do the maintenance and troubleshooting work. Turn the input power off using the disconnect switch at the fuse box before working inside the machine.

Trouble	Cause	What To Do
1. Contactor Chatters	a. Check for low line volts b. Faulty contactor	a. Check with Power Company b. Repair or replace
2. Machine will not start (Contactor not operating)	a. Supply line fuse blown b. Power circuit dead c. Broken power lead d. Wrong voltage e. Thermostat tripped (Welder Overheated)  f. Fuse in 115 volt AC blown g. Contactor coil open h. Wire feeder control circuit not completing circuit 2 to 4 j. Pilot relay contacts not closing.	a. Replace (look for reason for blown fuse first) b. Check voltage c. Repair d. Check voltage against nameplate e. Make sure that fan is operating and that there are no obstructions to free flow of air. Operate at normal current and duty cycle. f. Replace (look for reason) g. Replace h. Repair  j. Check pilot relay, replace if defective.
3. Machine will not weld (Contactor operating)	a. Electrode or work lead loose or broken b. Open transformer circuit c. Connection triangle not on "Voltage Range Panel"	a. Tighten and repair connections b. Have coils replaced c. Install triangle
4. Welder welds but soon stops welding (Thermostat tripped)	a. Proper ventilation hindered  b. Unit loaded beyond rating c. Fan inoperative  d. Shorted rectifier	a. Make sure all case openings are free for proper circulation of air b. Operate at normal current and duty cycle c. Check leads and motor bearings. Fan can be tested on 115 volt AC line; with welder on, voltage across fan should be 115 volts AC d. Check rectifier for shorted diode
5. Variable or sluggish welding arc	a. Poor work or electrode lead connection b. Current too low c. Open rectifier d. Low line voltage  e. Welding cables too small or too long f. Connection triangle on "Voltage Range Panel" not tight	a. Check and clean all connections b. Check recommended currents for wire type and size c. Check each diode assembly d. Check with Power Company e. Use at least 3/0 with R3S-400, two 1/0 with R3S-600 and two 3/0 with R3S-800. f. Tighten nuts with a wrench.
6. Arc control not functioning (R3S-400 and 600 only)	a. Variable resistor open b. Diode open or shorted on choke diode assembly	a. Replace b. Check diodes and replace if found faulty

## TROUBLESHOOTING CONTINUED

Trouble	Cause	What To Do
7. "Fine Voltage Control" (or Optional Remote Control) on machine not functioning	a. "Fine Voltage Control" switch in the wrong position b. P.C. Board plug disconnected c. Voltage control potentiometer open d. Leads to voltage control broken or disconnected e. P.C. Board components failed f. Leads 75, 76 and 77 of Remote Control not connected to correct numbers on terminal strip g. "Fine Voltage Control" switch failed h. Open control or bias winding on one of the mag-amps.	a. Place switch in "R3S" or "Remote" position as appropriate b. Plug in properly c. Replace d. Repair broken leads or connection e. Replace P.C. Board f. Correct connection g. Replace switch h. Check for open and repair or replace
8. Contactor will not open when gun trigger is released	a. Pilot relay contacts stuck closed b. Contactor contacts frozen	a. Replace pilot relay b. Repair or replace contactor
9. Contactor will not open when "Power Switch" is turned off	a. Contactor contacts frozen	a. Repair or replace contactor
10. Machine comes on (contactor closes) but open circuit voltage is low.	a. Low line voltage b. Supply line to reconnect panel "L <sub>3</sub> " open c. One open lead between reconnect panel and 1CR (output contactor) d. One contact on 1CR broken and open	a. Check with power company b. Check for open line and repair c. Check "L <sub>1</sub> " on reconnect panel to "L <sub>1</sub> " on 1CR. "L <sub>2</sub> " on reconnect panel to "L <sub>2</sub> " on 1CR, and "L <sub>3</sub> " on reconnect panel to "L <sub>3</sub> " in 1CR. Repair open lead. d. Repair
11. Do not get full range of control on fine voltage control when machine is under load.	a. Supply line to reconnect panel terminal "L <sub>3</sub> " open. b. One open lead between reconnect panel and 1CR. c. One-mag-amp not functioning	a. Check for open line and repair b. Check "L <sub>1</sub> " on reconnect panel to "L <sub>1</sub> " on 1CR, "L <sub>2</sub> " on reconnect panel to "L <sub>2</sub> " on 1CR, and "L <sub>3</sub> " on reconnect panel to "L <sub>3</sub> " on 1CR. Repair open lead c. Check for shorted mag-amp load coil, bias coil, or control coil. Replace if shorted.

# TRANSFORMER, RECTIFIERS AND INTERNAL PARTS



A-456  
5-16-86B

**WHEN ORDERING GIVE:** Item No., Part Name,  
Parts List No., and Welder Code.

### Parts List P-96-F

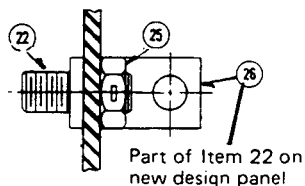
ITEM	PART NAME & DESCRIPTION	NO. REQ'D	ITEM	PART NAME & DESCRIPTION	NO. REQ'D
1	Base	1		Primary Coils	6
2	Roof	1		Primary Coil Thermostat	1
3	Thread Cutting Screw	8		Secondary Coils	3
4	Case Side (Right)	1		Self Tapping Screw, Transformer Mounting	2
5	Case Side (Left)	1		Self Tapping Screw, Transformer Mounting	4
6	Self Tapping Screw	As Req'd	24	Case Front Assembly	1
7	Fan Motor	1	25	Connector	1
8	Fan	1	26	Connector	1
9	Fan Baffle	1	27	Case Back	1
	Self Tapping Screw Baffle Mounting	2		Self Tapping Screw, Back Mounting	2
10	Upper Mounting Bracket (R3S-400 and R3S-600		28	Rectifier Thermostat Assembly — Includes	
	Only)	1		Transformer	1
10	Reconnect Panel Support	1		Round Head Screw	4
	Thread Cutting Screw, Bracket Mounting	2		Lock Washer	4
	Self Tapping Screw, Bracket Mounting	1		Flat Washer	4
11	Reconnect Panel — R3S-400 and R3S-600	1		Hex Nut	4
11	Input Panel — R3S-800	1	30	Cover Seal	1
12	Mag Amp Assembly	1	31	Case Back Door	1
	Self Tapping Screw, Mag Amp Mounting	8		Self Tapping Screw	7
13	Auxiliary Transformer	1	32	Transformer Side Baffle	1
	Thread Forming Screw, Transformer Mounting	4		Self Tapping Screw	2
14	Choke Coil and Lamination Assembly	1	33	Transformer Side Baffle	1
15	Transformer Mounting Bracket	1		Self Tapping Screw	2
16	Transformer Mounting Bracket	1	34	Transformer Top Baffle	1
17	Lock Washer Bracket Mounting	4		Self Tapping Screw	4
	Hex Nut, Bracket Mounting	4	35	Lead Insulator	As Req'd
18	Resistor (Used with Arc Control Only)	1		Self Tapping Screw	As Req'd
	Insulating Washer, Resistor Mounting	2	40	Component Mounting Panel	1
	Flat Washer, Resistor Mounting	1		Capacitor (At Top of Panel) Not Illustrated	1
	Lock Washer, Resistor Mounting	1		Silicon	
	Round Head Screw, Resistor Mounting	1	B	Bridge Assembly	1
	Hex Nut, Resistor Mounting	1			
19	Three Phase Rectifier, Includes:	1	C	Resistor	1
	Negative Base Heat Sink & Diode Assembly	1	E	Resistor	1
	(Black)	1	D	Capacitor	1
	Positive Base Heat Sink & Diode Assembly	1	F	Pilot Relay	1
	(Red)	1		The Following Parts Not Illustrated:	
20	Rectifier Mounting Baffle	1		Printed Circuit Board	1
	Self Tapping Screw, Baffle Mounting	4		Diode Assembly	1
21	Rectifier Mounting Baffle	1		Bridge Rectifier	1
21	Rectifier Mounting Bracket	1		Suppressor Capacitor	1
	Self Tapping Screw, Baffle Mounting	4		Suppressor Assembly	1
22	Contact	1			
23	Transformer Assembly, Includes:				

7-12-84

**WHEN ORDERING GIVE:** Item No., Part Name,  
Parts List No., and Welder Code.

## VOLTAGE SELECTOR STUD ASSEMBLY

**WHEN ORDERING GIVE:** Item No., Part Name,  
Parts List No., and Welder Code.

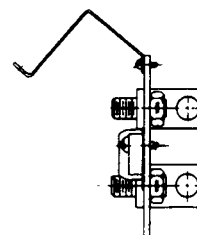
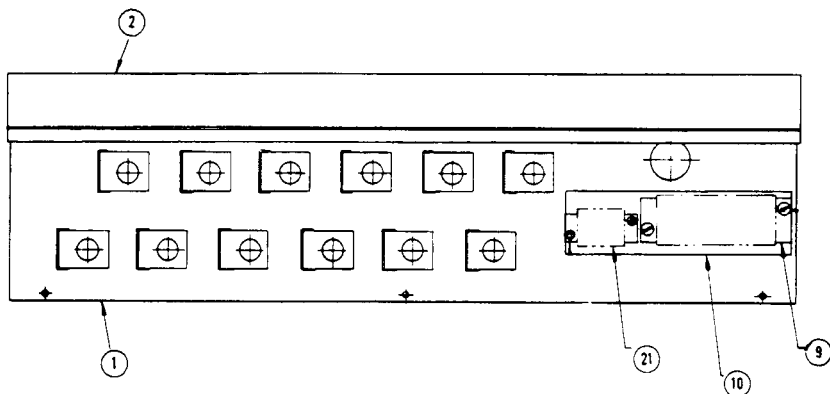


M-13779  
6-23-78M

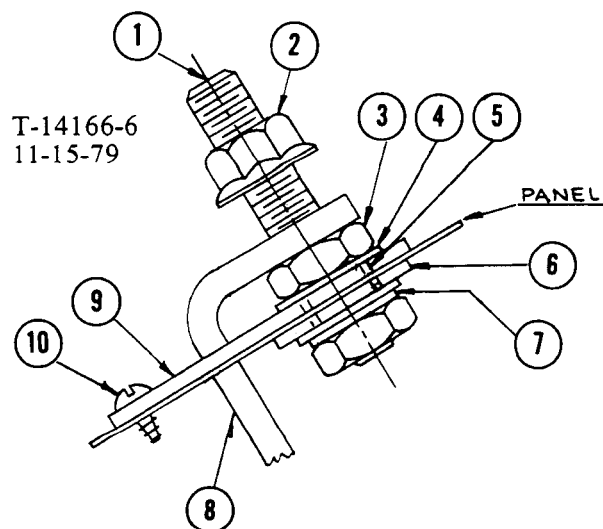
**Parts List P-96-G**

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
1	Selector Panel Assembly, Includes: Selector Panel	1 1
2	Selector Panel Mounting Bracket	1
9	Terminal Strip	1
10	Number Plate	1
18	Lead Clamp — Not Illustrated	1
19	Capacitor — Not Illustrated	1
20	Number Plate — Not Illustrated	1
21	Terminal Strip	1
22	Stud & Connection Strap Assembly	12
23	Lock Washer — Not Illustrated	12
24	Flat Washer — Not Illustrated	24
25	Hex Jam Nut	24
25	Hex Jam Lock Nut	12
26	Connection Strap	12
	Connection Triangle	1
	Flanged Weld Nut; Triangle Connection	3
	Output Voltage Number Plate R3S-400	1
	Output Voltage Number Plate R3S-600	1
	Output Voltage Number Plate R3S-800	1

3-2-82



## OUTPUT STUD ASSEMBLY

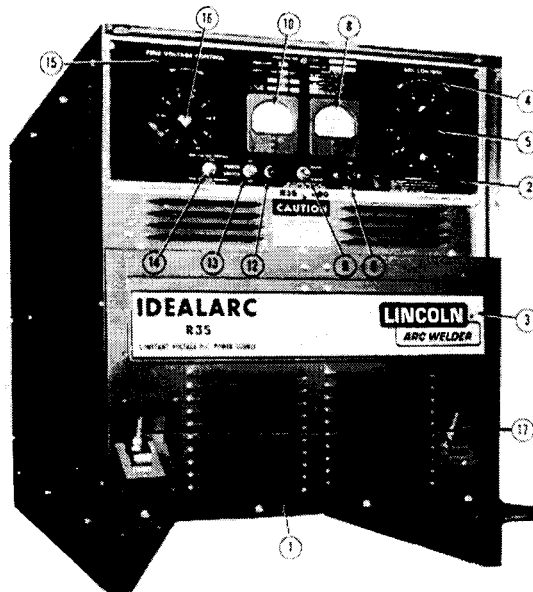


**Parts List P-95-D**

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
1	Output Stud Assembly, Includes Items 1 thru 10 Stud	2 1
2	Flanged Weld Nut	1
3	Hex Jam Nut	2
4	Plain Washer	2
5	Insulating Bushing	1
6	Insulating Washer	1
7	Lockwasher	1
8	Connection Strap without Shunt	1
8	Connection Strap with Shunt	1
9	Stud Insulation	1
10	Self Tapping Screw	1

November 1979

## CASE FRONT AND CONTROLS



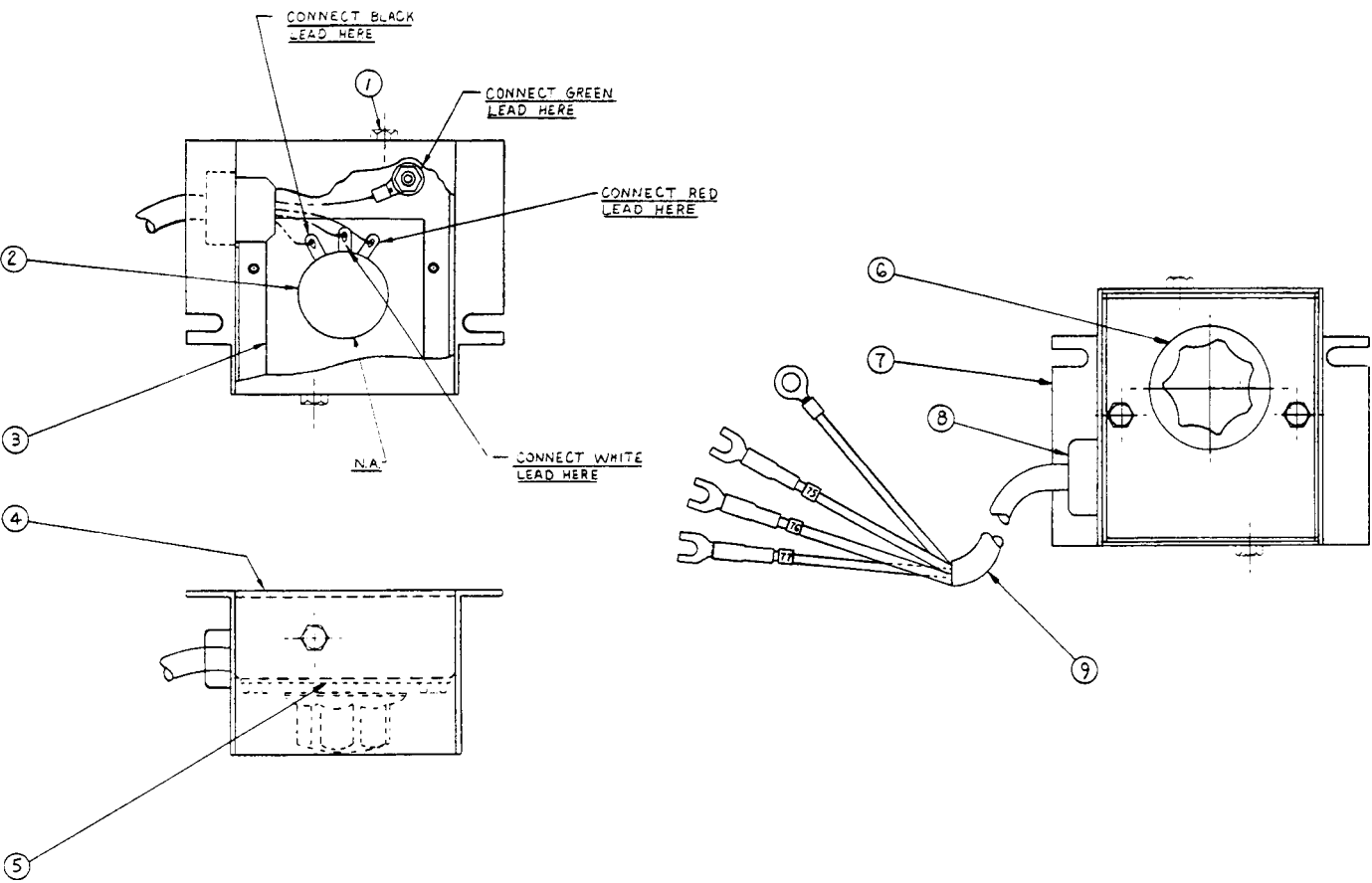
**WHEN ORDERING GIVE:** Item No., Part Name,  
Parts List No., and Welder Code.

**Parts List P-96-C**

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
1	Case Front Panel	1
2	Nameplate	1
3	Selector Panel Nameplate	1
4	Arc Control Rheostat	1
5	Handle	1
6	Fuse Holder	1
	Fuse	1
8	Ammeter	1
9	Control Circuit Switch	1
10	Voltmeter	1
12	Pilot Light	1
13	Power Switch	1
14	Fine Voltage Control Switch	1
15	Fine Voltage Rheostat	1
16	Insulation Knob	1
	Decal (Negative)	1
	Decal (Positive)	1
	Lead Bushing — Mounts in Selector Panel	1
	Selector Panel Door Latch — Not Illustrated	
17	Molded Output Stud	
	Flanged Weld Nut	
	Thread Cutting Screw — Stud Mounting	
	Hex Nut — Stud Mounting	

10-1-82

# REMOTE CONTROL



L-4829  
12-4-81V

**WHEN ORDERING GIVE:** Item No., Part Name,  
Parts List No., and Welder Code.

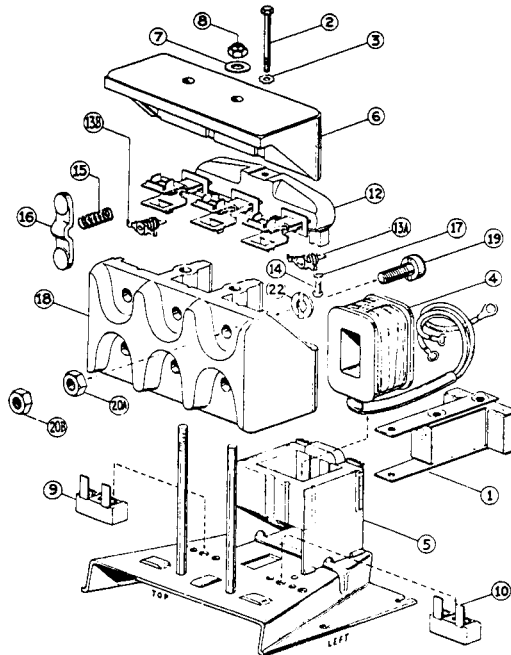
Parts List P-84-J

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
1	Remote Control Box Assembly, Includes: Thread Cutting Screw	1 4
2	Potentiometer	1
3	Insulation	1
4	Wraparound	1
5	Nameplate	1
6	Knob	1
7	Case	1
8	Lead Grommet	1
9	Lead Cable	1

December 1980



## S-67 CONTACTOR (R3S-400 & R3S-600)



**WHEN ORDERING GIVE:** Item No., Part Name,  
Parts List No., and Welder Code.

**Parts List P-28-H**

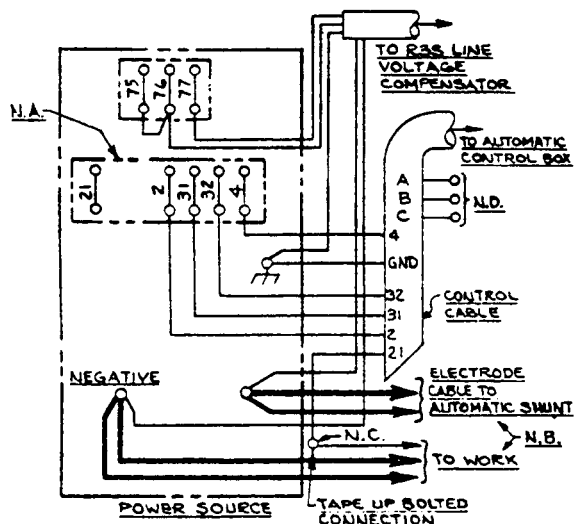
ITEM	PART NAME & DESCRIPTION	NO. REQ'D
	S-67 Starter Assembly, Includes: (Less NVR Coil)	1
1	Moving Lamination Assembly	1
2	Screw — Lamination Mounting	1
3	Lock Washer	1
4	NVR Coil (Not included in L-4300 Assembly)	1
5	Lamination and Panel Assembly (Specify Input Cycles)	1
	Plastic Insert	1
6	Contact Block Cover	1
7	Plain Washer	2
8	Hugnut	2
9	Stationary Interlock Contact Assembly	1
10	Stationary Interlock Contact Assembly	1
	Moving Contactor Assembly, Includes:	1
12	Moving Contactor Block	1
13A	Moving Interlock Contact Assembly	1
13B	Moving Interlock Contact Assembly	1
14	Round Head Screw	As Req'd
15	Spring — Main Contact	As Req'd
16	Moving Contact	As Req'd
17	Lock Washer	As Req'd
	Main Contact Block Assembly, Includes:	As Req'd
18	Main Contact Block	1
19	Main Stationary Contact	As Req'd
20A	Hex Jam Nut — Brass	As Req'd
20B	Hex Jam Nut — Brass	As Req'd
22	Spacer Washer	As Req'd

4-30-82

February 1981

## CONNECTION DIAGRAM

### R3S-400, -600, -800 With Line Voltage Compensation to NA-3, LT-5, or LT-7



Above diagram shows electrode connected positive. To change polarity, turn power off, reverse the electrode and work leads at the power source and reverse the "control switch" at the power source.

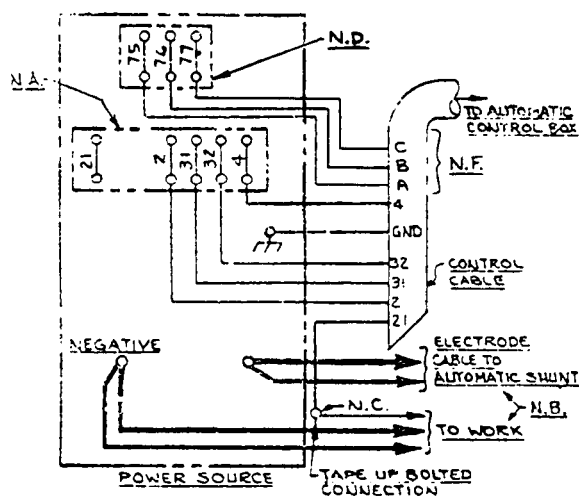
Connect the control cable ground lead to the frame terminal marked 77 near the power source terminal strip or to an unpainted frame screw. The power source must be grounded properly.

- N.A. On earlier R3S-400, -600 & -800 machines, #67 & #1 terminals were also on the terminal strip.
- 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.
- N.D. NA-3 or LT-7 leads A, B and C (#75, #76 and #77 on older K-215 control cable) are taped up when R3S line voltage compensator is connected. Arc voltage is controlled by the line voltage compensator rheostat. There will be no adjustment of voltage by automatic control box controls.
- N.E. If a variable voltage board is present in the automatic controls the jumper lead on the V.V. board must be connected to pin "L".

S-15990  
1-25-80

## CONNECTION DIAGRAM

### R3S-400, -600, -800 Without Line Voltage Compensation to NA-3, LT-5, or LT-7



Above diagram shows electrode connected positive. To change polarity, turn power off, reverse the electrode and work leads at the power source and reverse the "control switch" at the power source.

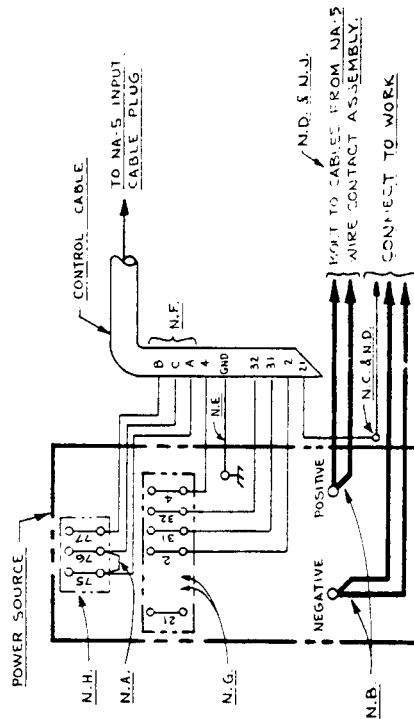
Connect the control cable ground lead to the frame terminal marked 77 near the power source terminal strip or to an unpainted frame screw. The power source must be grounded properly.

- N.A. On earlier R3S-400, -600 & -800 machines, #67 & #1 terminals, were also on the terminal strip.
- 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.
- N.D. Upper terminal strip does not appear on older R3S machines. Leads A, B and C should then be taped up. There will be no adjustment of voltage by the automatic control box voltage controls.
- N.E. If a variable voltage board is present in the automatic controls the jumper lead on the V.V. board must be connected to pin "L".
- N.F. If using an older 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.

S-15991  
1-25-80

# CONNECTION DIAGRAM R3S-400, -600 or -800 Without Line Voltage Compensation to NA-5 or NA-5R

CONNECTIONS MUST BE MADE EXACTLY AS SHOWN BELOW.  
FOR ANY OTHER USE OF POWER SOURCE, DISCONNECT ALL NA-5 LEADS AND CABLES.




NOTE: Above diagram shows electrode connected positive. To change polarity, turn power off, reverse the electrode and work cables at the power source and position the switch on power source to proper polarity. Refer to NA-5 operating manual for required NA-5 control box polarity connections.

N.A. Add jumper from #75 to #76, using insulated copper wire.

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-C remote voltage-sensing work lead is available for this purpose. Connect it directly to the work piece, keeping it separate from the welding work cable connection to the work piece. For convenience, this extended #21 lead should be taped along the welding work cable.

N.D. Tape up bolted connection.

N.E. Connect the NA-5 control cable grounding lead to the frame terminal marked , near the power source terminal strip. The power source must be properly grounded.

R3S POWER SOURCE SETTINGS	NA-5 SETTINGS
<p>TURN POWER SOURCE OFF.</p> <p>For all processes:</p> <ol style="list-style-type: none"> <li>1. Connect electrode cable to terminal of desired polarity.</li> <li>2. Set the Polarity Switch to the same polarity as the electrode cable connection.</li> <li>3. Set toggle switch to Remote.</li> <li>4. Install voltage triangle in a position as close as possible to the desired arc voltage.</li> </ol>	<p>For Sub Arc:</p> <ol style="list-style-type: none"> <li>1. Red lead on Voltage P.C. Board is connected to Pin "S".</li> <li>2. White lead on Voltage P.C. Board is connected to Pin "A".</li> </ol> <p>For all Open Arc Processes:</p> <ol style="list-style-type: none"> <li>1. Red lead on Voltage P.C. Board is connected to Pin "P".</li> <li>2. White lead on Voltage P.C. Board is connected to Pin "A".</li> </ol>

FOR ADDITIONAL INSTALLATION INSTRUCTIONS, SEE NA-5 OPERATING MANUAL

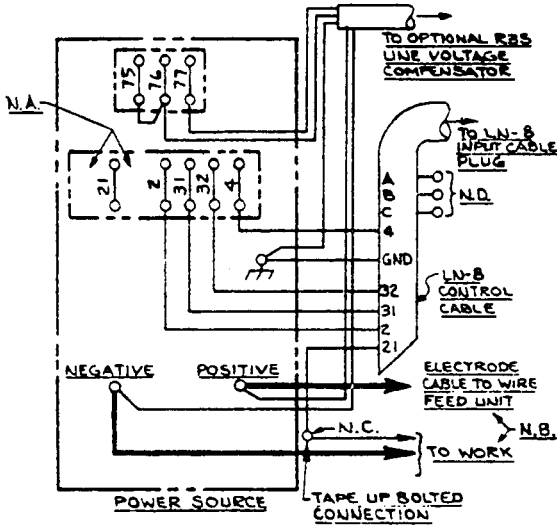
N.F. If using an older K-215 control cable: Connect lead #75 to #75 on terminal strip, connect lead #76 to #77 on terminal strip, connect lead #77 to #76 on terminal strip, and add jumper per N.A.

N.G. On earlier R3S machines, #67 and #1 terminals were also on the terminal strip.

The upper terminal strip (#75, #76, #77) was not present on early R3S machines. Those machines are not compatible with the NA-5, since there can be no adjustment of voltage by the NA-5.

N.J. For proper NA-5 operation, the electrode cables must be snugged under the clamp bar on the left side of the NA-5 Control Box.

### R3S-400, -600, -800 With Line Voltage Compensation to LN-8



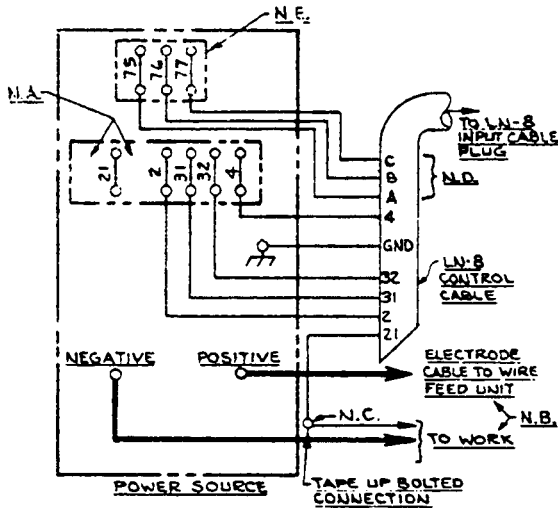
- N.A. On earlier R3S-400, -600 & -800 machines, #67 & #1 terminals were also on the terminal strip.
- N.B. Welding cables must be of proper capacity for the current and duty cycle of immediate and future applications.
- N.C. Extend lead 21 using #14 or larger insulated wire physically suitable for the 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-8 meter kits which have a direct work lead jack.)
- N.D. LN-8 leads A, B & C are taped up when R3S line voltage compensator is connected. Arc voltage is controlled by the line voltage compensator rheostat. There will be no adjustment of voltage by the LN-8 voltage control. Older LN-8 control cables are tagged #75, #76 and #77 instead of A, B and C.

Above diagram shows electrode connected positive. To change polarity, turn power off, reverse the electrode and work leads at the power source and reverse the "control switch" at the power source.

Connect the LN-8 control cable ground lead to the frame terminal marked **7** near the power source terminal strip or an unpainted frame screw. The power source must be grounded properly.

S-16026  
4-20-79

### R3S-400, -600, -800 Without Line Voltage Compensation to LN-8



- N.A. On earlier R3S-400, -600 & -800 machines, #67 & #1 terminals were also on the terminal strip.
- 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-8 meter kits which have a direct work lead jack.)
- N.D. 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.E. Upper terminal strip (#75, #76 & #77) may not appear on older R3S machines, leads A, B, & C should be taped up. There will be no adjustment of voltage by the LN-8 voltage control.

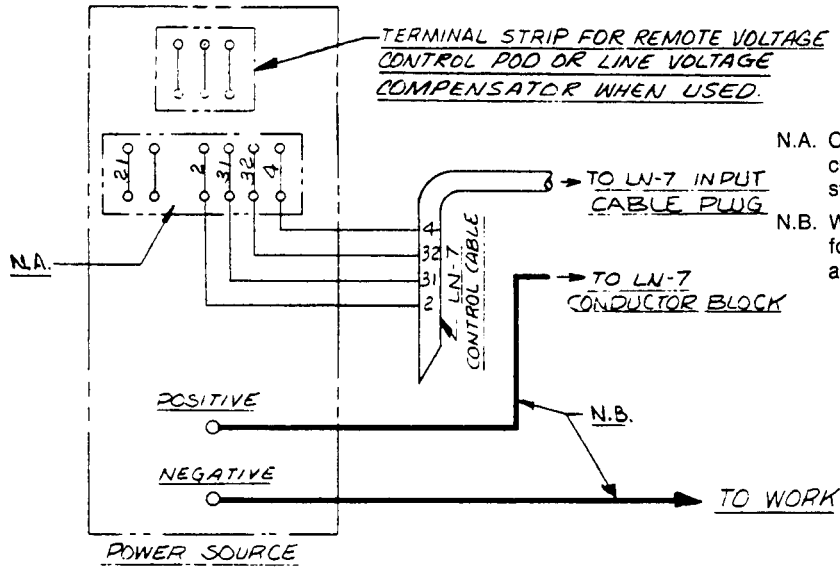
Above diagram shows electrode connected positive. To change polarity, turn power off, reverse the electrode and work leads at the power source and reverse the "control switch" at the power source.

Connect the LN-8 control cable ground lead to the frame terminal marked **—** near the power source terminal strip or to an unpainted frame screw. The power source must be grounded properly.

S-16027  
4-20-79

## CONNECTION DIAGRAM

### R3S-400, 600, or 800 to LN-7



#### NOTES

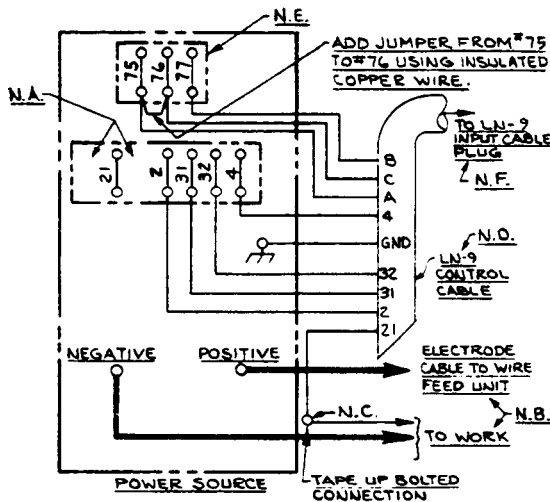
- N.A. On earlier R3S-400, -600, and -800 machines, #1 terminal was also on the terminal strip.
- N.B. Welding cables must be of proper capacity for the current and duty cycle of immediate and future applications.

Above diagram shows electrode connected positive. To change polarity, reverse the electrode and work leads at the power source.

S-14179  
S-28-76B

## CONNECTION DIAGRAM

### R3S-400, -600, or -800 to LN-9



Above diagram shows electrode connected positive. To change polarity, turn power off, reverse the electrode and work leads at the power source and reverse the "control switch" at the power source, and the "polarity switch" on the LN-9.

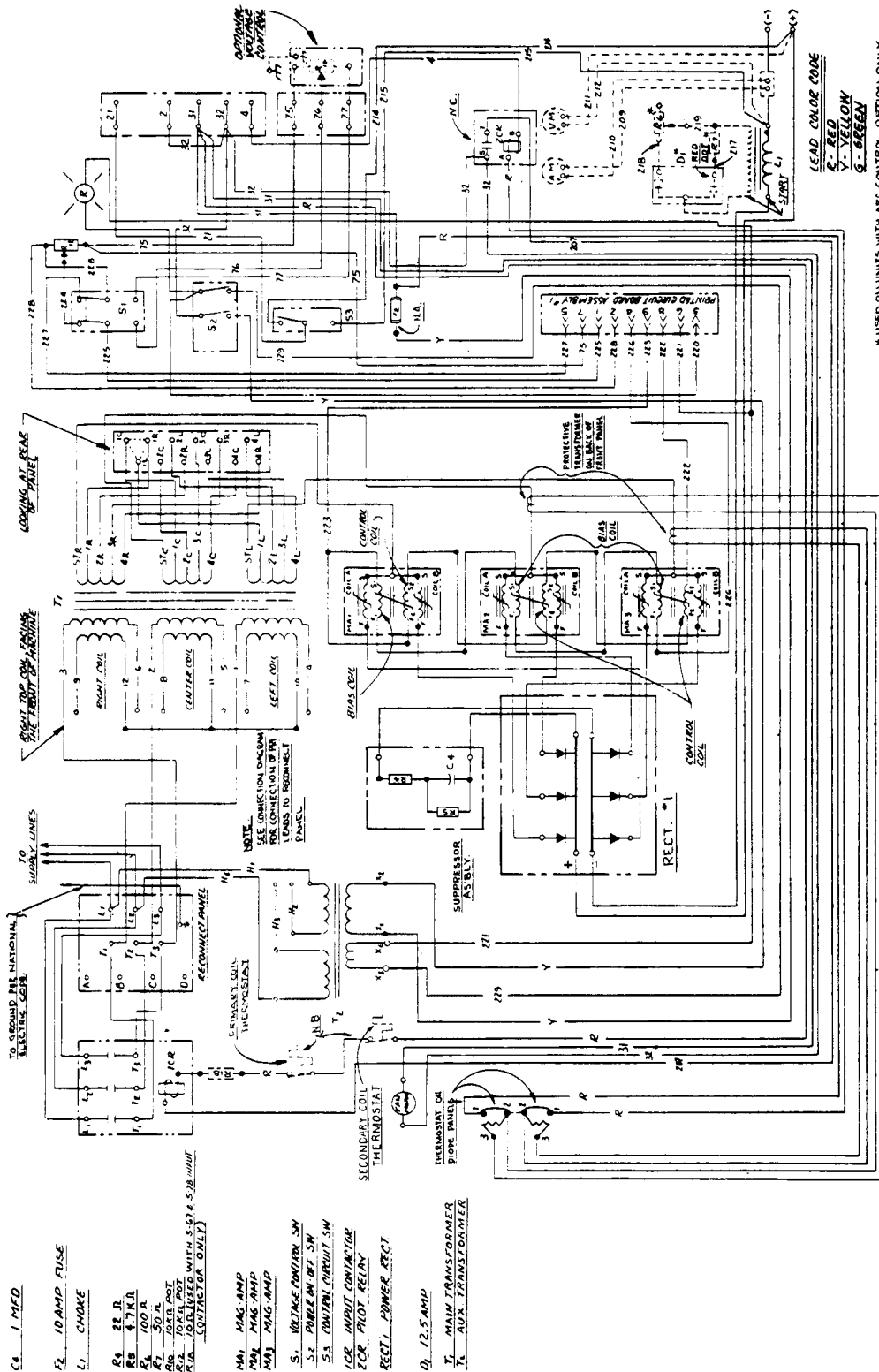
Connect the control cable ground lead to the frame terminal marked near the power source terminal strip or to an unpainted frame screw. The power source must be grounded properly.

- N.A. On earlier R3S-400, -600 & -800 machines, #67 & #1 terminals were also on the terminal strip.
- 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. 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 #76 on terminal strip. Then jumper terminal strip #75 to #76 per diagram.
- N.E. Upper terminal strip (#75, #76 & #77) may not appear on older R3S machines, and therefore is not compatible for use since there will be no adjustment of voltage by the LN-9.
- N.F. The LN-9 voltage control jumpers must be connected as follows. (Refer to LN-9 operating manual):  
**White jumper on voltage board:** To pin "F" for open arc process or to pin "S" for submerged arc process.  
**Blue jumper on voltage board,** (later units only), or on start board (earlier units), to pin "A".

S-16285  
6-28-85N

# WIRING DIAGRAM R3S-400 & 600

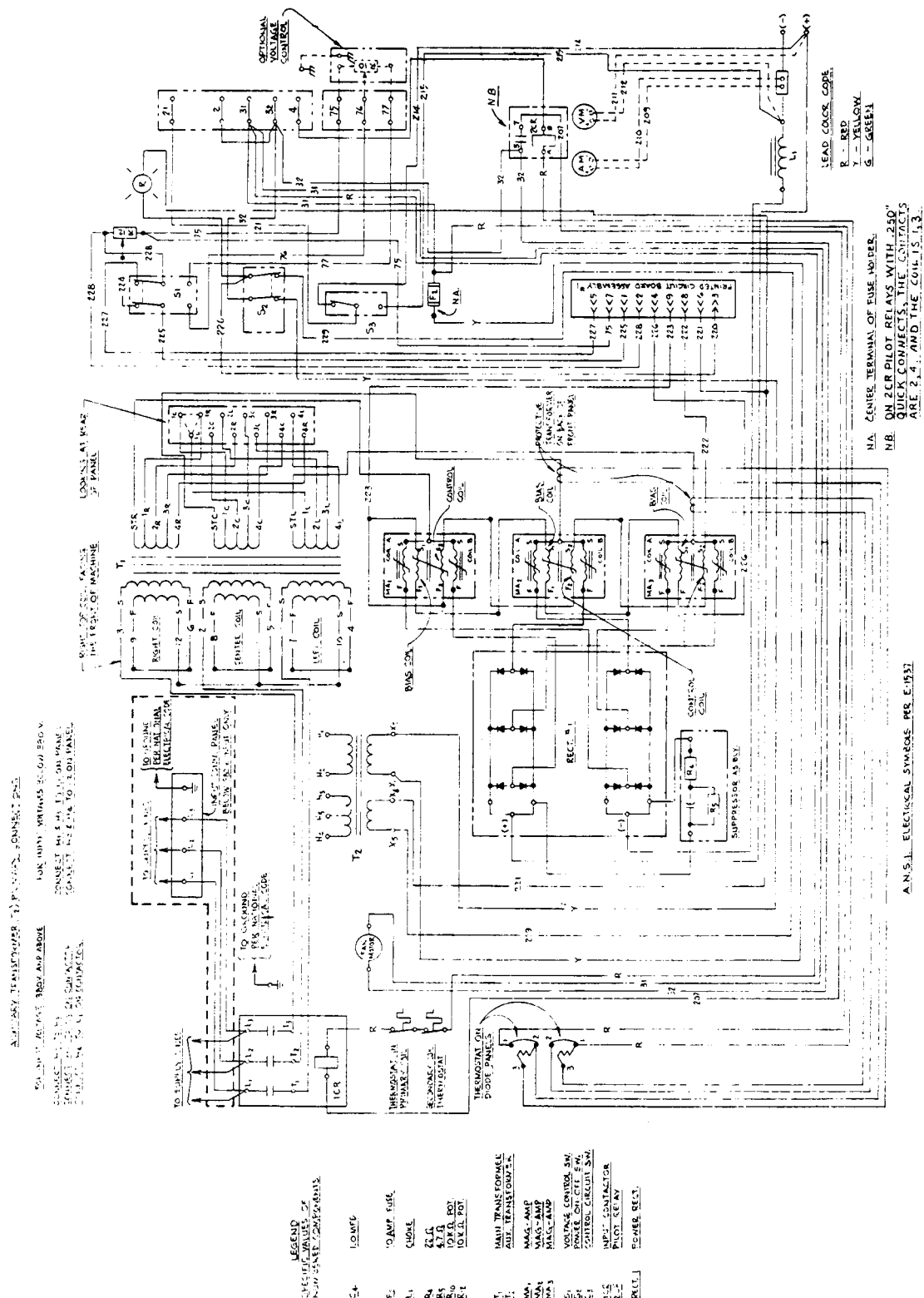
NOTE: This diagram is for reference only. It is not accurate for all R3S-400 & R3S-600 machines covered by this manual. The specific diagram for each machine is pasted to the inside of the right side panel. If the diagram is illegible, write to the Service Department for a replacement. Give the welder code number.



L-6414  
9-12-80P

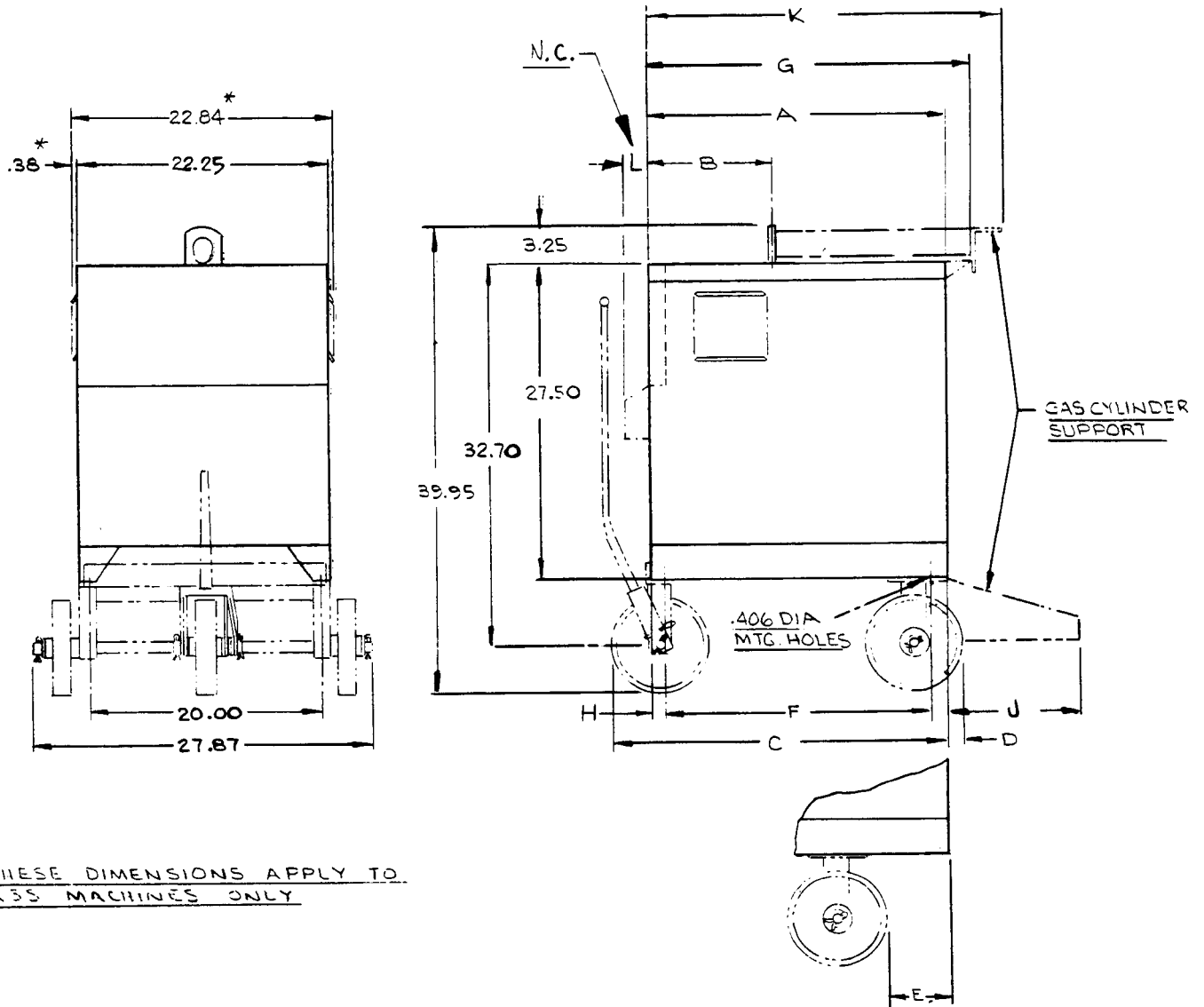
## WIRING DIAGRAM R3S-800

NOTE: This diagram is for reference only. It is not accurate for all R3S-800 machines covered by this manual. The specific diagram for each machine is pasted to the inside of the right side panel. If this diagram is illegible, write to the Service Department for a replacement. Give the welder code number.



# DIMENSION DIAGRAM

R3S-400 and 600



\* THESE DIMENSIONS APPLY TO R3S MACHINES ONLY

N.A - OPTIONAL UNDERCARRIAGE AVAILABLE

N.B. OPTIONAL UNDERCARRIAGE AVAILABLE EITHER WITH OR WITHOUT SUPPORT FOR TWO GAS CYLINDERS

N.C. DIMENSION "L" APPLIES TO ANALOG METER OPTION ONLY.

M-12244  
3-21-86A



### **Need Welding Training?**

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## 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 — complete part name and description, 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 defect 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 will be 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, 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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5-84

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