LINCOLN® WELDERS

IM-369A

IM369
Idealarc CV-400
February, 1993
9303; 9304; 9305; 9306; 9307; 9308; 9309; 9310; 9311; 9312; 9351; 9405; 9406; 9420; 9472; 9477; 9858; 9859

OPERATING MANUAL

IDEALARC® CV-400

This manual covers equipment which is obsolete and no longer in production by The Lincoln Electric Co. Specifications and availability of optional features may have changed.

SHIPPING 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 PAGES 2, 3 AND 4. And, most importantly, think before you act and be careful.

LINCOLN® ELECTRIC

THE LINCOLN ELECTRIC COMPANY
World's Leader in Welding and Cutting Products • Premier Manufacturer of Industrial Motors
Sales and Service through Subsidiaries and Distributors Worldwide
Cleveland, Ohio 44117-1199 U.S.A.

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⚠ WARNING

ARC WELDING can be hazardous.

PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS SHOULD CONSULT WITH THEIR DOCTOR BEFORE OPERATING.

Read and understand the following safety highlights. For additional safety 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 or CSA Standard W117.2-1974. A **Free** copy of "Arc Welding Safety" booklet E205 is available from the Lincoln Electric Company, 22801 St. Clair Avenue, Cleveland, Ohio 44117-1199.

BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE, AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.

ELECTRIC SHOCK can kill.

1.a. The electrode and work (or ground) circuits are electrically "hot" when the welder is on. Do not touch these "hot" parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.

1.b. Insulate yourself from work and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.

In addition to the normal safety precautions, if welding must be performed under electrically hazardous conditions (in damp locations or while wearing wet clothing; on metal structures such as floors, gratings or scaffolds; when in cramped positions such as sitting, kneeling or lying, if there is a high risk of unavoidable or accidental contact with the workpiece or ground) use the following equipment:

- **Semiautomatic DC Constant Voltage (Wire) Welder.**
- **DC Manual (Stick) Welder.**
- **AC Welder with Reduced Voltage Control.**

1.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically"hot".

1.d. 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.

1.e. Ground the work or metal to be welded to a good electrical (earth) ground.

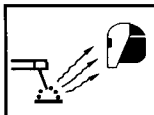
1.f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.

1.g. Never dip the electrode in water for cooling.

1.h. 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.

1.i. When working above floor level, use a safety belt to protect yourself from a fall should you get a shock.

1.j. Also see Items 4.c. and 6.

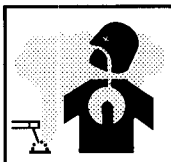


ARC RAYS can burn.

2.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. I standards.

2.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.

2.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.



FUMES AND GASES can be dangerous.

3.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 with electrodes which require special ventilation such as stainless or hard facing (see instructions on container or MSDS) or on galvanized, lead or cadmium plated steel and other metals which produce toxic fumes, keep exposure as low as possible and below Threshold Limit Values (TLV) using local exhaust or mechanical ventilation. In confined spaces or in some circumstances, outdoors, a respirator may be required.**

3.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.

3.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.

3.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. MSDS forms are available from your welding distributor or from the manufacturer.

3.e. Also see item 7b.

WELDING SPARKS can cause fire or explosion.

4.a..Remove fire hazards from the welding 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. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.

4.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.

4.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.

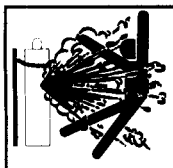
4.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been "cleaned." For information purchase "Recommended Safe 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 above).

4.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.

4.f. Sparks and spatter are thrown from the welding arc. Wear 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 with side shields when in a welding area.

4.g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away 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.

4.h. Also see item 7c.



CYLINDER may explode if damaged.

5.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.

5.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.

5.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.

5.d. Never allow the electrode, electrode holder or any other electrically "hot" parts to touch a cylinder.

5.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.

5.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.

5.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-l, "Precautions for Safe Handling of Compressed Gases in Cylinders,"available from the Compressed Gas Association 1235 Jefferson Davis Highway, Arlington, VA 22202.

FOR ELECTRICALLY powered equipment.

6.a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.

6.b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer's recommendations.

6.c. Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer's recommendations.

FOR ENGINE powered equipment.

7.a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.

7.b. Operate engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.

7.c. Do not add the fuel near an open flame welding arc or when the engine is running. Stop the engine and allow it to cool before 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.

7.d. 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.

7.e. 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.

7.f. 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.

7.g. 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.

7.h. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.

ELECTRIC AND MAGNETIC FIELDS may be dangerous

8.a. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding current creates EMF fields around welding cables and welding machines.

8.b. EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before welding.

8.c. Exposure to EMF fields in welding may have other health effects which are now not known.

8d. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

8.d.1. Route the electrode and work cables together - Secure them with tape when possible.

8.d.2. Never coil the electrode lead around your body.

8.d.3. Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.

8.d.4. Connect the work cable to the workpiece as close as possible to the area being welded.

8.d.5. Do not work next to welding power source.

PRÉCAUTIONS DE SÛRETÉ

Pour votre propre protection lire et observer toutes les instructions et les précautions de sûreté specifiques qui parraissent dans ce manuel aussi bien que les précautions de sûreté générales suivantes:

Sûreté Pour Soudage A L'Arc

1. Protegez-vous contre la secousse électrique:
   a. Les circuits à l'électrode et à la piéce sont sous tension quand la machine à souder est en marche. Eviter toujours tout contact entre les parties sous tension et la peau nue ou les vétements mouillés. Porter des gants secs et sans trous pour isoler les mains.
   b. Faire trés attention de bien s'isoler de la masse quand on soude dans des endroits humides, ou sur un plancher metallique ou des grilles metalliques, principalement dans les positions assis ou couché pour lesquelles une grande partie du corps peut être en contact avec la masse.
   c. Maintenir le porte-électrode, la pince de masse, le câble de soudage et la machine à souder en bon et sûr état defonctionnement.
   d. Ne jamais plonger le porte-électrode dans l'eau pour le refroidir.
   e. Ne jamais toucher simultanément les parties sous tension des porte-électrodes connectés à deux machines à souder parce que la tension entre les deux pinces peut être le total de la tension à vide des deux machines.
   f. Si on utilise la machine à souder comme une source de courant pour soudage semi-automatique, ces precautions pour le porte-électrode s'applicuent aussi au pistolet de soudage.

2. Dans le cas de travail au dessus du niveau du sol, se protéger contre les chutes dans le cas ou on recoit un choc. Ne jamais enrouler le câble-électrode autour de n'importe quelle partie du corps.

3. Un coup d'arc peut être plus sévère qu'un coup de soliel, donc:
   a. Utiliser un bon masque avec un verre filtrant approprié ainsi qu'un verre blanc afin de se protéger les yeux du rayonnement de l'arc et des projections quand on soude ou quand on regarde l'arc.
   b. Porter des vêtements convenables afin de protéger la peau de soudeur et des aides contre le rayonnement de l'arc.
   c. Protéger l'autre personnel travaillant à proximité au soudage à l'aide d'écrans appropriés et non-inflammables.

4. Des gouttes de laitier en fusion sont émises de l'arc de soudage. Se protéger avec des vêtements de protection libres de l'huile, tels que les gants en cuir, chemise épaisse, pantalons sans revers, et chaussures montantes.

5. Toujours porter des lunettes de sécurité dans la zone de soudage. Utiliser des lunettes avec écrans lateraux dans les zones où l'on pique le laitier.

6. Eloigner les matériaux inflammables ou les recouvrir afin de prévenir tout risque d'incendie dû aux étincelles.

7. Quand on ne soude pas, poser la pince à une endroit isolé de la masse. Un court-circuit accidental peut provoquer un échauffement et un risque d'incendie.

8. S'assurer que la masse est connectée le plus prés possible de la zone de travail qu'il est pratique de le faire. Si on place la masse sur la charpente de la construction ou d'autres endroits éloignés de la zone de travail, on augmente le risque de voir passer le courant de soudage par les chaines de levage, câbles de grue, ou autres circuits. Cela peut provoquer des risques d'incendie ou d'echauffement des chaines et des câbles jusqu'à ce qu'ils se rompent.

9. Assurer une ventilation suffisante dans la zone de soudage. Ceci est particuliérement important pour le soudage de tôles galvanisées plombées, ou cadmiées ou tout autre métal qui produit des fumeés toxiques.

10. Ne pas souder en présence de vapeurs de chlore provenant d'opérations de dégraissage, nettoyage ou pistolage. La chaleur ou les rayons de l'arc peuvent réagir avec les vapeurs du solvant pour produire du phosgéne (gas fortement toxique) ou autres produits irritants.

11. Pour obtenir de plus amples renseignements sur la sûreté, voir le code "Code for safety in welding and cutting" CSA Standard W 117.2-1974.

PRÉCAUTIONS DE SÛRETÉ POUR LES MACHINES À SOUDER À TRANSFORMATEUR ET À REDRESSEUR

1. Relier à la terre le chassis du poste conformement au code de l'électricité et aux recommendations du fabricant. Le dispositif de montage ou la piece à souder doit être branché à une bonne mise à la terre.

2. Autant que possible, l'installation et l'entretien du poste seront effectués par un électricien qualifié.

3. Avant de faires des travaux à l'interieur de poste, la debrancher à l'interrupteur à la boite de fusibles.

4. Garder tous les couvercles et dispositifs de sûreté à leur place.

SPECIFICATIONS

Model	CV-400
Type	K1346
Frequency	60 Hertz
Output Rating	DC
Amperes	400¦500
Volts	36*¦35
Duty Cycle	100%¦60%

*No added capacity over NEMA rated 36V at 400 amps.

Current Range	60A 12V 500A 35V
Max. O.C.V.	42
Input Power	
Standard Voltages	230-460
Single Voltages Available	Yes
Input Current (230V/60 Hz)	56A @ 400A (230V)
Input KVA	22.3 @ 400A 26.7 @ 500A
Power Factor	.84 @ 400A .91 @ 500A
Efficiency	76% @ 400A 75% @ 500A
Idle Current	6.1A (230V)
Idle Power	.9kw
Optional Features	
115V Starter Circuit	Standard
Meters	Yes
Diode Option	Yes
Suitable Undercarriages	K817/K817R/K841
Remote Control	K775
Other Features	Stackable Case
Net Weight	357 lbs. (162kg)

PRODUCT PURPOSE

The CV-400 is an SCR controlled three-phase DC power source. It is designed with a single range potentiometer control.

The CV-400 is supplied as a constant voltage power source only. It is designed for all open arc processes including Innershield, Outershield, and all solid wire and gas procedures within the capacity of the machine. The output characteristics have been optimized for these CV processes without use of a variable arc control.

It can be used with the LN-7, LN-8, LN-9, LN-22, LN-23P, or LN-25 semiautomatic wire feeders, the NA-3, NA-5, and NA-5R automatics within the capacity of the machine. The factory installed Diode Option is required to utilize the cold start and cold electrode sensing features of the NA-3, NA-5 and NA-5R.

The CV-400 is also available with factory installed voltmeter and ammeter and can be used with any of the following field installed optional accessories:

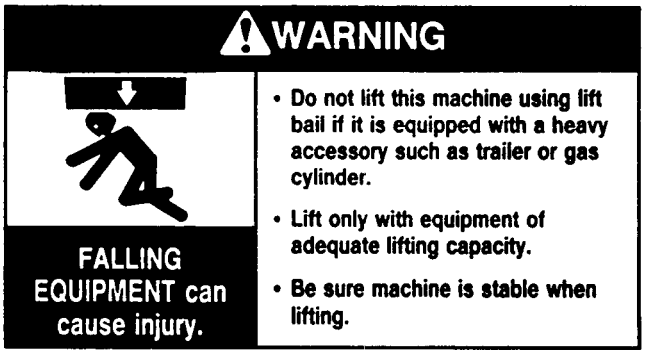
K775 Remote Output Control
K817 or K841 Undercarriage

There are no provisions on the CV-400 for paralleling, and outdoor operation without rain sheltering is not recommended.

INSTALLATION AND OPERATION

Installation

The machine should be located in a clean, dry place where there is free circulation of clean air such that air movement in through the front and out through the back will not be restricted. Dirt and dust that can be drawn into the machine should be kept to a minimum. Failure to observe these precautions can result in excessive operating temperatures and nuisance shutdown of the machine.



The units may be stacked three high by observing the following safety precautions.

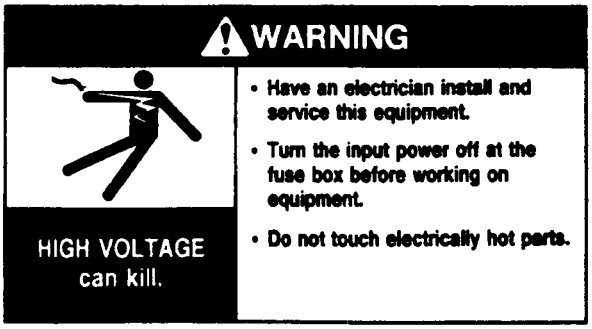
Safety Precautions

A. Make sure the first or bottom unit is setting on a level, well supported surface.

B. The units must be stacked with their fronts flush, making sure the two holes in the base rails of the unit being stacked on top are over the two holes located on the top front corners of the unit it is being stacked on. Fasten the units together with 5/16 bolts, nuts, and lockwashers through these holes.

C. Remove fastening bolts before lifting unit off stacks.

Input Power Connections



By removing the rear access panel, the three phase input power can be connected to the three line terminals on the input contactor, and the earth grounding lead to the grounding terminal on the input box floor marked with the ⏚ symbol. Install the reconnect panel jumper links for the proper input voltage per the diagram pasted inside the access panel cover.

Recommended Input Wire, Grounding and Fuse Sizes
Based on National Electrical Code
For 60 Hertz, 3 Phase Welders at 100% Duty Cycle
Ambient Temperature 30°C or Less

Input Volts	Amps Input	Copper Wire Size Type 75°C in Conduit		Super Lag Fuse Size in Amps
		3 Input Wires	1 Grounding Wire	
230	56	6	8	90
460	28	10	10	45

Output Connections

The output leads are connected to the output terminals marked "+" and "-". They are located at the lower right and lower left corners of the front panel. The CV-400 provides 1/2" studs for weld cable connection.

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

Output Amps	Lengths up to 150 ft.	150 to 200 ft.	200 to 250 ft.
200	2	1	1/0
325	2/0	2/0	3/0
400	3/0	3/0	4/0

Control Cable Connections (excluding the LN-22)

The control cable from the automatic wire feeding equipment is connected to the terminal strips behind the hinged control panel on the front of the power source. A strain relief box connected is provided for cable access to terminal strips. A chassis ground screw is also provided near the terminal strip marked with symbol ⏚ for connecting the automatic equipment grounding wire. See the appropriate connection diagram for the exact instructions for the wire feeder being used.

Connection of CV-400 to LN-22

a) Turn off all power.

b) Connect a jumper from "2 to 4" on the terminal strip.

c) Connect the electrode cable to the output terminal of polarity required by electrode. Connect the work lead to the other terminal.

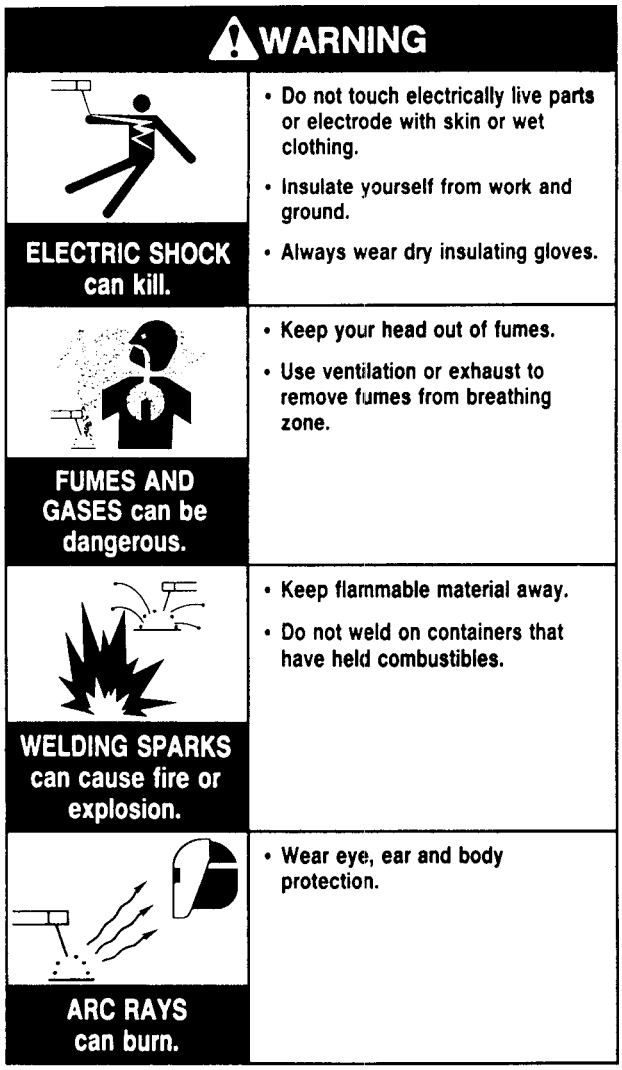
d) Place the Output Control Switch "at machine" position unless a K775 Remote Control is connected to 75, 76, 77 on the CV-400 terminal strip.

NOTE: The output terminals are energized at all times.

SAFETY PRECAUTIONS

WARNING: Do not connect any extra external loads (solenoid valves, etc.) across #4-#31 on the CV-400 terminal strip. Any load less than 4K ohms across these may cause the power source output to be activated.

WARNING: Do not use the K828 Capacitor Discharge Kit option with CV-400 model codes above 9400. To do so will cause the power source output to be activated.



All PC boards are protected by a moisture resistant coating. When the welder is operated, this coating will "bake off" of certain power resistors that normally operate at high temperatures emitting some smoke and odor for a short time. These resistors and the PC board beneath them may become blackened. This is a normal occurrence and does not damage the component or affect the machine performance.

WARNING:

When using a CV-400 power source with wire feeders, there will be a small spark if the electrode contacts the work or ground within a few seconds after releasing the trigger.

When used with some wire feeders with the electrical trigger interlock in the ON position, the arc can restart if the electrode touches the work or ground during these few seconds.

Starting the Machine

The toggle switch at the extreme right side of the control panel energizes and closes the three phase input contactor from a 115 volt auxiliary transformer. This in turn energizes the main power transformer.

The red light next to the power on-off toggle switch indicates when the input contactor is energized.

Output Voltage Control

The output voltage control in the center of the control panel is a continuous control of the machine output. The control may be rotated between min. and max. to adjust the machine output, even while welding.

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

Output Control at Machine or Output Control Remote - Switch

The toggle switch on the control panel labeled for "At CV-400" or "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 "Remote" position and controlled at the wire feed unit control or by connecting a K775 control to terminals 75, 76, and 77 on the terminal strip inside the control box of the machine. For control at the machine control panel, the toggle switch is set in the "At CV-400" position.

(Exception: When used with an LN-9 or NA-5 wire feeder, the toggle switch must be in the "Remote" position or automatic shutdown of the LN-9 or NA-5 may occur.)

Polarity Selection

Polarity selection is made by appropriately connecting the electrode and work welding cables to either the "positive" output terminal or to the "negative" output terminal. Work polarity terminals (+21 and -21) are provided for appropriate connection of the #21 work sensing lead of automatic or semiautomatic equipment.

10 Amp Circuit Breaker and Auxiliary Power Connections

The 10 amp circuit breaker on the control panel protects both the AC auxiliary power circuits from excessive overloads or short circuits. The nominal 110-115 VAC auxiliary power is availale at terminals 31 and 32. The nominal 40-42 VAC auxiliary power is available at terminals 41 and 42. The terminal strips are behind the output control panel.

OPTIONAL EQUIPMENT

Optional - Remote Output Control

An optional "remote output control" is available. This is the same remote control that is used on the Lincoln R3S, R3R, DC-600, and DC-400 power sources (K775). The K775 consists of a control box with 28 feet (8.5m) of four conductor cable. This connects to terminals 75, 76, 77 on the terminal strip and the case grounding screw so marked with the symbol on the machine. These terminals are made available by opening the hinged control panel on the front of the power source. This control will give the same control as the output control on the machine.

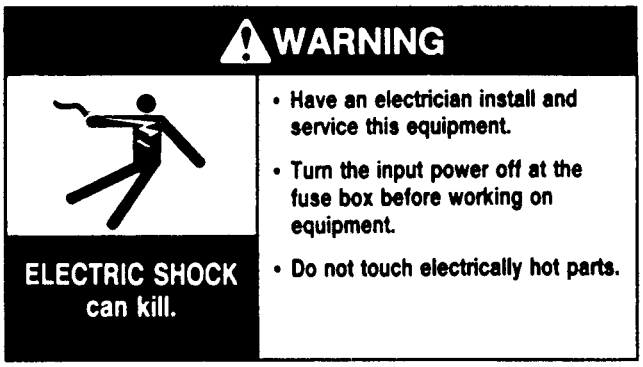
Optional - Undercarriages (K817, K817R or K841)

For easy moving of the machine, optional undercarriages are available with either steel (K817) or rubber tired (K817R) wheels. The K841 is provided with gas tank mountings.

Optional - Ammeter and Voltmeter (factory installed only)

Optional - Diode Option - (factory installed only)

This factory installed option allows the use of the cold start and cold electrode sensing features of the NA-3, NA-5 or NA-5R.



Routine 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 machine at regular intervals.

3. In extremely dusty locations, dirt may accumulate on the remote control terminal strip. Wipe or blow this terminal strip off at regular intervals. This is particularly important in damp locations.

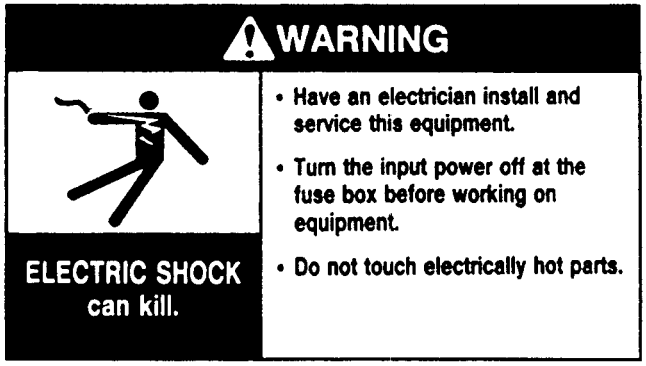
Machine and Circuit Protection

The power source is thermostatically protected with proximity thermostats against overload or insufficient cooling. One thermostat is located on the nose of the center bottom primary coil and a second thermostat is attached to the lead connecting the secondaries together. The primary thermostat is connected in series with the output circuit 2-4. If the machine is overloaded, the thermostat will open and the output will be zero. The fan will continue to run. The secondary thermostat is in series with the input contactor and will open either with an excessive overload or insufficient cooling, opening the input contactor. The input contactor will close. The fan motor will not run while the secondary thermostat is open.

The power source is also protected against overloads on the SCR bridge assembly through the solid state fault protection circuit. This circuit senses an overload on the power source and limits the output to approximately 550 amps by phasing back the SCR's.

Protection is provided to protect the circuitry from accidental grounds. If the customer accidentally "grounds" 75, 76, or 77 to the positive output lead, the CV-400 output will be reduced to a low value, thus preventing any damage to the machine. If the ground occurs between 75, 76, 77 and the negative output lead, one of the PC board electronic "self-restoring" fuses will blow, preventing any machine damage. After the ground is cleared, the fuses automatically reset within a few seconds.

TROUBLESHOOTING CHART



Trouble	Cause	What To Do
Input contactor (CR1 chatters)	1. Faulty input contactor (CR1). 2. Low line voltage.	1. Repair or replace. 2. Check input power.
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 secondary thermostats open. 6. Open input contactor coil. 7. Power "on/off" switch (S1) not closing.	1. Replace if blown - look for reason first. 2. Check control transformer T2 and associated leads. 3. Check input voltage at contactor. 4. Check voltage connection instructions. 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 switch.
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. Terminals 2 & 4 not connected together 4. Defective Control PC Board	1. Repair connection. 2. Repair. 3. Jumper 2 to 4 on terminal strip. If still no output, check for voltage at leads 207 & 4 of J1. If voltage present, replace P. C. Board: If not, check primary thermostat and associated wiring. 4. Replace. See Procedure for Replacing P.C. Boards
Machine has minimum output and no control	1. Terminals 75, 76, or 77 grounded to positive output. [Positive output may be common with ground (⏚) if welding in negative polarity.]	1. Check 75, 76, or 77 for ground to positive output circuit. Nearly zero ohms to ground indicates a grounded circuit. A value greater than a few thousand ohms is normal. Self-restoring fuses on PC board automatically reset within a few seconds after ground is cleared.

Trouble	Cause	What To Do
Machine has high output and no control	1. Terminals 75, 76, or 77 grounded to negative output. [Negative output may be common with ground (⏚) if welding in positive polarity.]	1. Check 75, 76, or 77 for ground to negative output circuit. Nearly zero ohms to ground indicates a grounded circuit. A value greater than a few thousand ohms is normal. Self-restoring fuses on PC board automatically reset within a few seconds after ground is cleared.
Machine has low output and no control	1. Output control Machine/ Remote switch (S2) in wrong position. 2. Output control switch faulty. 3. Open in feedback circuitry. 4. Faulty Control PC Board. 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 PC board wiring harness plugs. 4. Replace. See Procedure for Replacing PC Boards. 5. Check and replace potentiometer if faulty. Check wiring of lead #75.
Machine does not have maximum output	1. One input fuse blown. 2. One phase of main transformer open. 3. Faulty Control PC Board. 4. Output control potentiometer defective. 5. Output control potentiometer leads 210, 211, or 75 open.	1. Check and replace if blown after checking for reason for blown fuse. 2. Check for open and repair. 3. Replace. See Procedure for Replacing PC Boards. 4. Check and replace if faulty. 5. Check and repair broken leads.
Machine will not shut off	1. Input contactor contacts frozen. 2. Defective On/Off switch, S1.	1. Check and replace if necessary. 2. Replace.
Variable or sluggish welding arc	1. Poor work or electrode connection. 2. Welding leads too small. 3. Welding current or voltage too low. 4. Defective main SCR bridge.	1. Check and clean all connections. 2. Check table in instruction manual. 3. Check procedures for recommended settings. 4. Check and replace if defective.
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 Control PC Board.	1. Place switch in "Panel". 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. Replace. See Procedure for Replacing PC Boards.

Trouble	Cause	What To Do
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 Control PC Board.	1. Place switch in "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. Replace. See Procedure for Replacing PC Boards.
Poor arc striking with semiautomatic or automatic wire feeders. (CV 400 in machine control)	1. Poor work connection. 2. Improper procedures. 3. Defective Control PC Board.	1. Work connection must be adequate for application. 2. Adjust procedures for improved starting. 3. Replace. See Procedure for Replacing PC Boards.
Poor arc characteristics	1. Defective Control PC Board. 2. Capacitor(s) in output circuit failed. A failure is indicated if the small vent plug on top of a capacitor is raised or blown out.	1. Replace. See Procedure for Replacing PC Boards. 2. Replace entire bank of capacitors. Do not replace individual capacitors. WARNING: The liquid electrolyte in these capacitors is toxic. Avoid contact with any portion of your body. Clean up vented electrolyte using rubber gloves and a water dampened cloth. Any electrolyte which gets on skin, clean with soap and water.

TROUBLESHOOTING PROCEDURES

Procedure for Replacing PC Boards

When a PC board is suspected to be defective, the following procedure must be followed:

1. Visually inspect the PC board. If the board has fuses, check to see if any are blown. Are any of the components damaged? Is a conductor on the back side of the board damaged? If electrical damage is visible on the PC board, inspect the machine wiring for grounds or shorts to avoid damaging a new PC board. Install a new PC board only after a visual inspection of the PC board and machine wiring is satisfactory.

2. If the problem is remedied by a new PC board, install the old PC board and see if the problem still exists. If the problem does not return with the old board:

   a. Check the PC board harness plug and PC board plug for contamination, corrosion or oversize.

   b. Check leads in the harness for loose connections.

Connecting the Remote Control to the Machine

Extreme caution must be observed when installing or extending the wiring of a remote control. Improper connection of this unit can lead to failure of the output control rheostat or the control circuit. Only the green lead can and should be grounded to the machine case. When extending the standard remote control, make sure the leads are the same and the splice is waterproof. Be very careful not to ground the cable when in use and don't let the lugs touch against the case.

Output Voltage

The open circuit voltage of the machine should be adjustable from 10 to 42 volts. If any other condition exists, refer to the Troubleshooting Guide.

Fault Protection Operation

The overload protection circuit, in the Control Board, will limit the welding current (heat) to approximately 550 amps if a short or overload is applied to the machine.

Checking Snubber PC Board

In case of an SCR malfunction or failure, the Snubber PC Board should be checked. Turn the machine off and remove the sides of the machine. Board is mounted on back of the case front.

1. Visually inspect the Board for overheated components or damaged components.

Checking Output Voltage Control Rheostat on Machine

Turn machine off.

Remove the screws from the hinged control panel and open the panel.

Turn the output control switch to remote.

Disconnect the harness plug from the Control Board.

With an ohmmeter on X1K, connect it to lead 210 and 75 on R4.

Exercise caution to avoid damaging rheostat tabs.

Rotate the output control rheostat. The resistance reading should be from around zero to 10K ohms. Check the resistance reading between 77 and 75 on the terminal strip. The reading must be 10K ohms. No reading will indicate an open rheostat and a low reading will indicate a shorted or partially shorted rheostat; in either case, replace.

Input Contactor Toggle Switch Check

1. Turn off the machine input power. S1 has 115 volts across it when the input power is connected.

2. Isolate the switch to be tested by removing all connecting leads.

3. Check to make sure the switch is making open and closed connections with a V.O.M. meter. Put ohmmeter on X1 scale. The meter should read zero resistance with switch "ON" and infinite with switch "OFF".

4. Put the ohmmeter on X1K scale and measure the resistance between the terminal and the case of the machine (touch a self-tapping screw). Reading should be infinite.

5. If either step (3) or step (4) fails, replace the switch.

Remote Control Check

Disconnect the remote output control and connect an ohmmeter across 75 and 76 and rotate the rheostat in the remote control. The resistance reading should go from zero to 10K ohms. Repeat with Triplett across 77 and 76 with same results. Connect ohmmeter across 75 and 77. The reading should be 10K ohms. A lower reading will indicate a shorted or partially shorted rheostat. A very high reading will indicate an open rheostat. In either of the last two cases, replace rheostat. Check cable for any physical damage.

Power Rectifier Bridge Assembly Checking Procedure

CAUTION: The rectifier bridge tests outlined below will identify the most common defects found in power diodes or power silicon controlled rectifiers. If a bridge problem still exists after test, please call a Lincoln Field Service Shop. Further evaluation of diodes or silicon controlled rectifiers may require laboratory equipment.

Bridge and Device Isolation (See the instruction manual parts list for the exact location.)

1.) Disconnect the following;

   a. Unplug P3 (G1, G2, G3, and 204) from the Control PC Board.

   b. Unplug P5 from the Snubber PC Board.

   c. Secondary leads X1, X2, and X3 from the anodes of the SCR's and cathodes of the diodes.

   d. Disconnect positive bridge lead from shunt and positive capacitor bank lead and from lug with dual 204 leads.

e. Perform following steps 2 and 3. If diodes and SCR's are not shorted, bridge test is completed. If any device appears shorted, disconnect the cathode lead of each diode (4 total) and repeat steps 2 and 3.

2.) Power Diode Test

a. Establish the polarity of the ohmmeter leads and set to X10 scale.

b. Connect the ohmmeter positive lead to anode and negative lead to the cathode.

c. Reverse the leads of the ohmmeter from Step b.

d. A shorted diode will indicate zero or an equally low resistance in both directions. An open diode will have an infinite or high resistance in both directions and a good diode will have a low resistance in Step b. and a much higher resistance in Step c.

3.) Power Silicon Controlled Rectifier Test

The SCR must be mounted in the heat sink when making this test.

a. Connect the ohmmeter (set to the X10 scale) leads to the anode and cathode.

b. Reverse the leads of the ohmmeter from Step a.

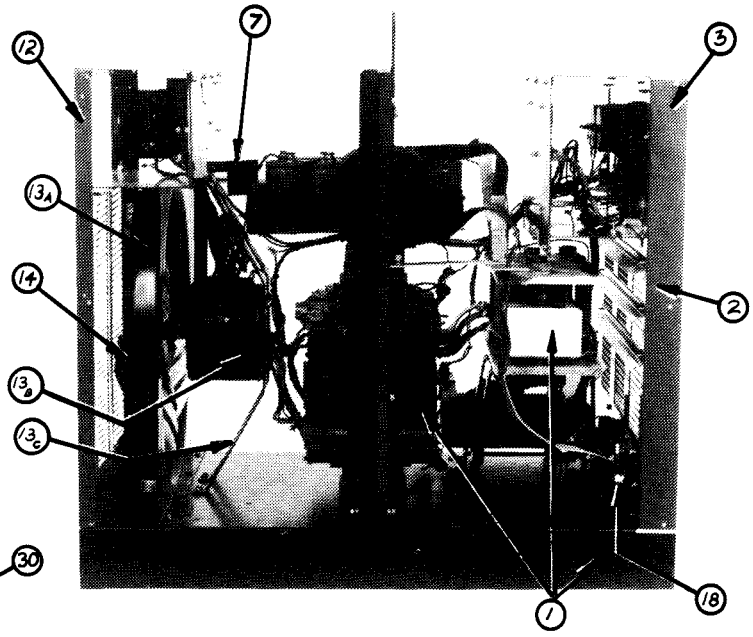
c. A shorted SCR will indicate zero or an equally low resistance in one or both directions.

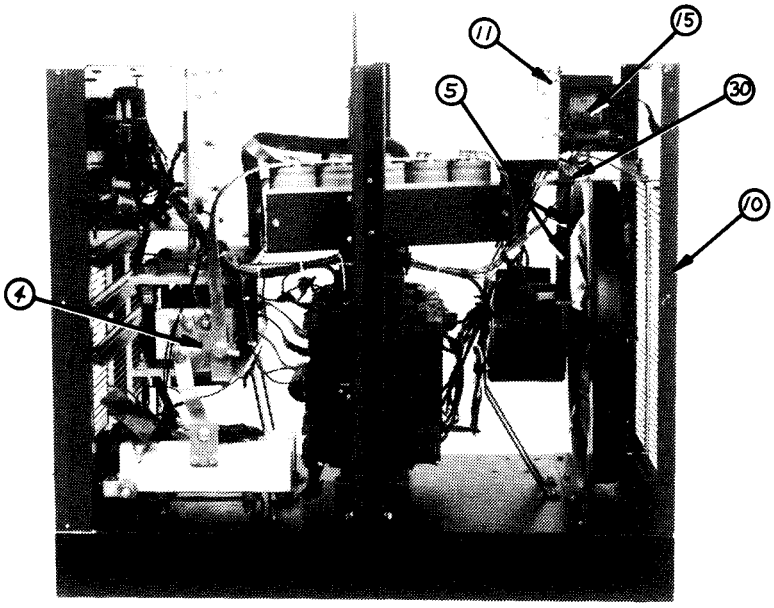
d. Establish the polarity of the ohmmeter. Connect the positive lead to the gate and the negative lead to the cathode.

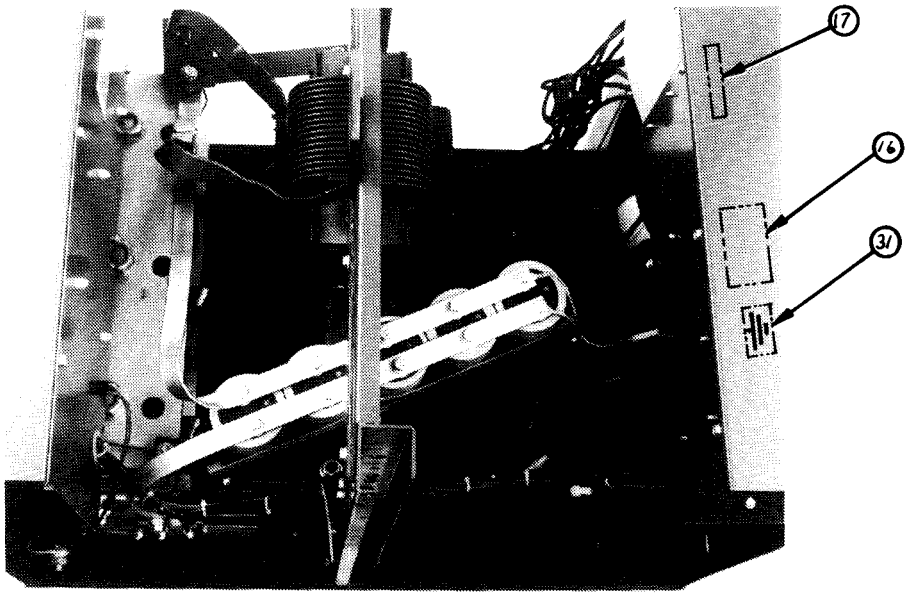
e. An open gate circuit will have an infinite or high resistance. A good gate circuit will read a low resistance, but not zero ohms. If gate circuit reads zero ohms, check gate harness for shorts between gate leads and 204 before replacing SCR.

The Lincoln Electric Company
Cleveland, Ohio 44117-1199

GENERAL ASSEMBLY





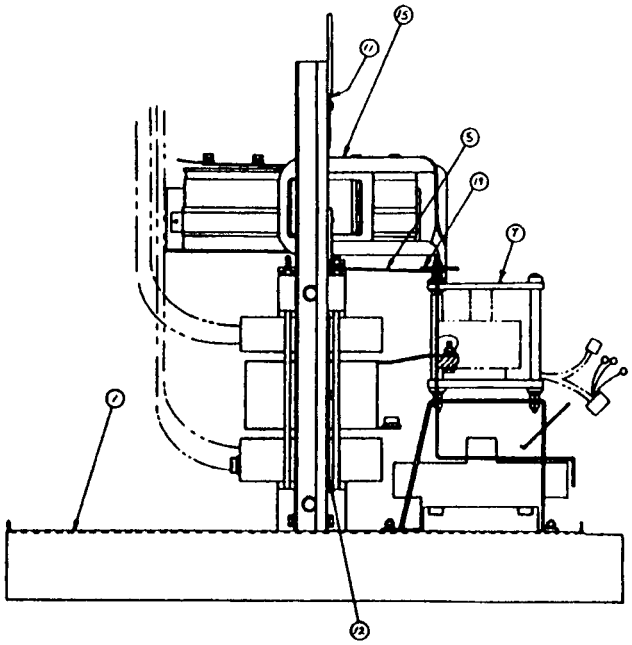


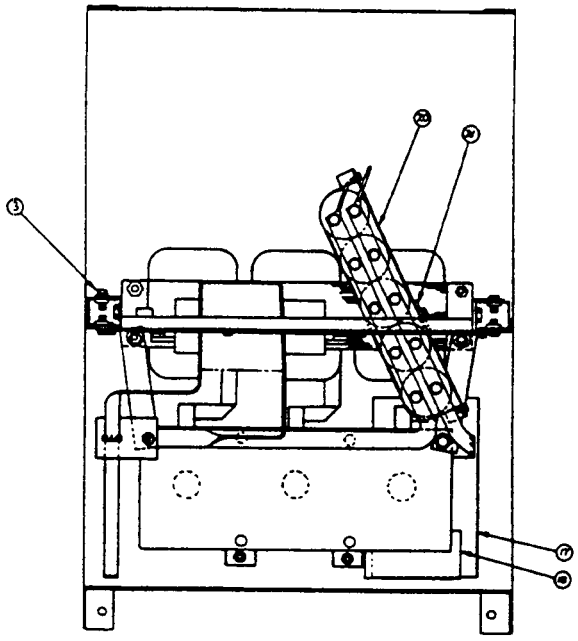
G1935
3-15-91B

Item	Part Name & Description	Part No.	No. Req'd
1	Base, Transformer, Bridge & Capacitor Assbly	See Page 24	1
2	Case Front Assembly	See Page 25	1
3	Control Box Cover Assbly	See Page 26	1
4	Shunt (Below Code 9315)	S17078-2	1
4	Shunt (Above Code 9315)	S6602-25	1
5	Resistor (R2 & R3)	S10404-94	2
*	Round Head Screw	#10-24 x 7.50	2
*	Insulating Washer	T4479-A	4
*	Lock Washer	E106A-1	2
*	Plain Washer	S9262-27	2
*	Hext Nut	#10-24	2
7	Capacitor Brace	S17356	1
10	Rear Panel	S16816-3	1
11	Input Box	S17978	1
12	Input Access Door	M13998-1	1
13A	Fan Baffle	L6247	1
13B	Fan Motor	M9983-4	1
13C	Fan Mounting Bracket	M15627	2
14	Fan Blade	M6819-9	1
15	Control Transformer	See Page 27	1
16	Contactor	M12161-21	1
17	Reconnect Panel	See Pg. 27	1
18	Hex Head Screw	1/2-13 x .75	2
*	Plain Washer	S9262-1	2
*	Lock Washer	E106A-15	2
19	Lead (Shunt to Pos. Terminal) (Without Diode Option Only)	M15641	1
20	Lead (Pos. Output Term. to Diode Option Only)	S18508-2	1
			1
30	Brushing	T12380-2	1
31	Ground Decal	T13260-4	
	Items Not Illustrated		
	Smoking Tag	T11590-90	1
	Roof	M12352-11	1
	Side Panel	M14065-6	2
	Cover Seal	S12934	1
	Warning Decal (Input Box)	T13259	1
	Identification Sticker (1CR)	T14798-1	1
	Caution Decal (Back of Control Box)	S13504	1
	Field Installed Options		
	Remote Control	Order K775	
	Welding Cable Plug (1/0-2/0 or 50-76mm)	Order K852-70	
	Welding Cable Plug (2/0-3/0 or 70-95mm)	Order K852-95	

NOTE: Items with * Not Illustrated 2-22-91

BASE ASSEMBLY

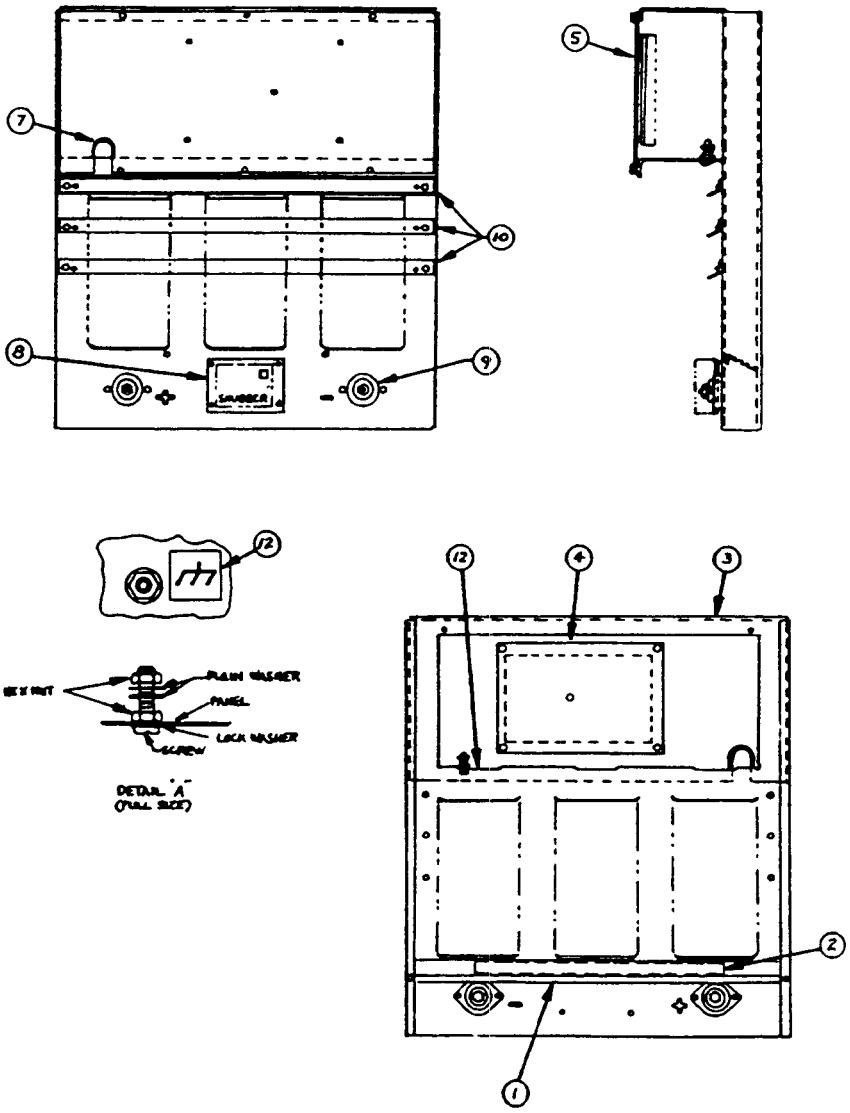




Item	Part Name & Description	Part No.	No. Req'd
1	Base Assembly	L7587	1
5	Brace	T8477-40	2
7	3 Phase Bridge Assbly Includes:	L7520	1
*	SCR Replacement Kit	M15392-A	3
*	Standard Diodes	M9661-31	4
11	Air Baffle	M15463	1
12	Insulation (Baffle)	T11472-24	2
15	Transformer, Choke & Lift Bail Assbly (Below Codes 9400) Includes:	L7597	1
15	Transformer, Choke & Lift Bail Assbly (Above Codes 9400) Includes:	L7796	1
*	Lift Bail	L6485	1
*	Transformer	See Pg. 27	2
*	Choke	M15584	1
*	Choke Mounting Bracket	S18784	1
17	Diode Heat Sink Assbly (Optional) Includes:	M15485	1
*	Heat Sink	S17053	1
*	Rectifier Diode (Sold in sets of 3)	M9661-36	3
*	Snubber Assembly	T14869	1
18	Air Delfector (Part of Diode Option)	M15491	1
19	Lead Insulating Panel	S18666	1
20	Capacitor Bank, Includes:	M14495-2	1
*	Capacitor	S13490-84	5
21	Capacitor Mounting Bracket	S17355	1

NOTE: Items with * Not Illustrated 10-19-91

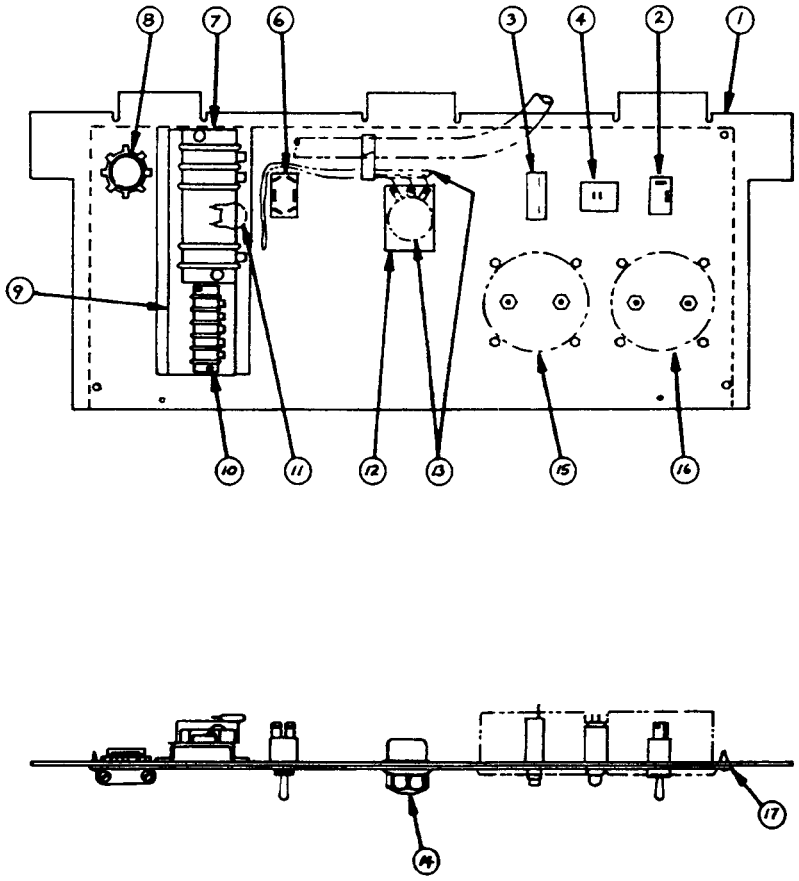
CASE FRONT ASSEMBLY



Item	Part Name & Description	Part No.	No. Req'd
1	Guard	M15475	1
1	Guard	M15475-1	1
2	Warning Plate	M14500	1
2	Warning Plate	M15734	1
*	Fastener Button	T14659	6
3	Front Panel	G1854	1
4	Control Printed Circuit Board	G1835-2	1
*	Expansion Nut	S14020-3	5
*	Self Tapping Screw	S8025-71	5
5	Control Box Back Panel	M15473	1
7	Grommet Strip	T12823-10	1
8	Snubber Printed Circuit Board	M15370-3	1
*	Self Tapping Screw	S8025-71	4
9	Output Terminal Assbly	M13900	2
10	Air Deifector	S17353	3
12	Chassis Ground Decal	T13260-3	1
13	Warranty Decal	T15163	1

NOTE: Items with * Not Illustrated 2-25-92

CONTROL BOX COVER ASSEMBLY



Item	Part Name & Description	Part No.	No. Req'd
1	Door	M15696	1
1	Door	M15477	1
2	Power Switch (S1)	T10800-4	1
3	Fuse Holder (F1)	S10433-1	1
3	Circuit Breaker	T12287-20	1
4	Pilot Light	T13486	1
6	Output Control Switch (2)	S10800-24	1
7	Terminal Strip (TS2)	S8542-7	1
8	Box Connector	T9639-1	1
9	Number Plate	S18378	1
9	Number Plate	S18832	1
10	Terminal Strip (TS1)	S14530-12	1
10	Terminal Strip (TS1)	S14530-11	1
11	Capacitor Assembly (C6)	S14824	1
12	Insulation	T12792-1	1
13	Potentiometer	T10812-40	1
14	Knob	T10491	1
15	D.C. Ammeter (Optional)	M15539-2	1
16	D.C. Voltmeter (Optional)	M15538-1	1
17	Nameplate w/o Meters	L7570	1
17	Nameplate w/Meters	L7570-1	1
17	Nameplate w/o Meters	L7794	1
17	Nameplate w/Meters	L7794-1	1
*	Fastener Buttons	T14659-1	3
22	Fuse (F1)	T10728-16	1

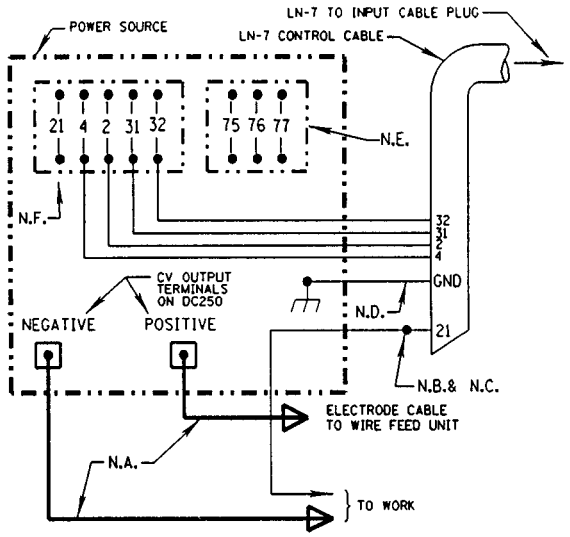
NOTE: Items with * Not Illustrated 2-22-91

Code No.	Volts/Phase/ Hertz	Transformer Assembly	Primary Top	Coil Bottom	Auxiliary Coil (Fan)	Secondary Coil	Auxiliary Coil (Firing Circuit)	Control Trasformer
9303	230/460/3/60	G1850/8588	L6371-4/8588	L6371-3/8588	M15465	M15464	M15466	M12390-31
9304	220/380/440/3/50	G1937/9304	L6371-17/9304	L6371-17/9304	M15695	M15464	M15466	M13471-2
9305	415/3/60	G1937/8592	L6371-18/8592	L6371-17/8592	M15695	M15464	M15466	M12390-33
9306	575/3/60	G1850/8637	L6371-4/8588	L6371-3/8588	M15465	M15464	M15466	M12390-51
9307	208/415/3/60	G1850/9307	L6371-18/9307	L6371-17/9307	M15465	M15464	M15466	M12390-33
9308	380/500/3/60	G1937/9308	L6371-18/9308	L6371-17/9308	M15695	M15464	M15466	M12390-34
9309	440/3/60	G1850/9309	L6371-18/9309	L6371-17/9309	M15465	M15464	M15466	M12390-31
9310	460/575/3/60	G1850/9310	L6371-21/9310	L6371-17/9310	M15465	M15464	M15466	M12390-32
9311	460/3/60	G1850/9311	L6371-18/9311	L6371-17/9311	M15465	M15464	M15466	M12390-31
9312	550/3/50	G1850/9312	L6371-4/9312	L6371-3/9312	M15465	M15464	M15466	M12390-51
9351	220/440/3/50	G1937/8588	L6371-4/8588	L6371-3/8588	M15695	M15464	M15466	M12390-31
9405	230/460/3/60	G1937/8588	L6371-4/8588	L6371-3/8588	M15695	M15464	M15466	M12390-31
9406	575/3/60	G1937/8637	L6371-4/8637	L6371-3/8637	M15695	M15464	M15466	M12390-51
9420	230/460/575/3/60	G1937/9420	L6371-21/9420	L6371-25/9420	M15695	M15464	M15466	M12390-67
9472	208/3/60	G1937/9307	L6371-18/9307	L6371-17/9307	M15695	M15464	M15466	M12390-33
9477	460/3/60	G1937/9311	L6371-18/9311	L6371-17/9311	M15695	M15464	M15466	M12390-31
9502	380/3/50	G1937/9309	L6371-17/9304	L6371-17/9304	M15695	M15464	M15466	M13471-2
9533	200/400/3/50/60	G1937/9355	L6371-18/9533	L6371-17/9533	M15695	M15464	M15466	M12390-33
9614	220/380/440/3/50/60	G1937/9304	L6371-17/9304	L6371-17/9304	M15695	M15464	M15466	M13471-2
9615	415/3/50/60	G1937/8592	L6371-4/8592	L6371-3/8592	M15695	M15464	M15466	M12390-33

Code No.	Reconnect Panel	Wiring Diagram	Connection Diagram	Choke	Thermostat	Primary Thermostat	42V. Auxiliary Coil (Fan)
9303	L7219-2	L7584	M15009	M15582	T13359-2	T14542-1	—
9304	L7219-1	L7795	M15010	M15582	T13359-2	T14542-1	M15694
9305	L7219-4	L7795	S17894	M15582	T13359-2	T14542-1	M15694
9306	L7219-4	L7584	S17894	M15582	T13359-2	T14542-1	—
9307	L7219-2	L7584	M15009	M15582	T13359-2	T14542-1	—
9308	L7219-5	L7795	M15530	M15582	T13359-2	T14542-1	M15694
9309	L7219-4	L7584	S17894	M15582	T13359-2	T14542-1	—
9310	L7219-5	L7584	M15009	M15582	T13359-2	T14542-1	—
9311	L7219-4	L7584	S17894	M15582	T13359-2	T14542-1	—
9312	L7219-4	L7584	S17894	M15582	T13359-2	T14542-1	—
9351	L7219-2	L7795	M15009	M15582	T13359-2	T14542-1	M15694
9405	L7219-2	L7795	M15009	M15582	T13359-2	T14542-1	M15694
9406	L7219-4	L7795	S17894	M15582	T13359-2	T14542-1	M15694
9420	L7219-6	L7883	M15666	M15582	T13359-2	T14542-1	M15694
9472	L7219-2	L7795	M15009	M15582	T13359-2	T14542-1	M15694
9477	L7219-4	L7795	S17894	M15582	T13359-2	T14542-1	M15694
9502	L7219-4	L7795	M15010	M15582	T13359-2	T14542-1	M15694
9533	L7219-2	L7795	M15009	M15582	T13359-2	T14542-1	M15694
9614	L7219-1	L7795	M15010	M15582	T13359-2	T14542-1	M15694
9615	L7219-4	L7795	S17894	M15582	T13359-2	T14542-1	M15694

CONNECTION OF LN-7 TO CV-400

S17372



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 and wire feeder (if equipped) to proper polarity. Also refer to note N.F.

SEE NOTE:

WARNING

- Do not operate with covers removed.
- Disconnect power source before servicing.
- Do not touch electrically live parts.
- Only qualified persons should install, use or service this machine.

ELECTRIC SHOCK CAN KILL

N.A. Welding cables must be of proper capacity for the current and duty cycle of immediate and future applications. See LN-7 Operating Manual for proper sizes.

N.B. If LN-7 is equipped with a meter kit, extend LN-7 control cable lead #21 using 14 AWG or larger insulated wire physically suitable for the installation. An S16586-[LENGTH] remote voltage sensing work lead may be ordered for this purpose. Connect it directly to the work piece independent of the welding work cable connection. For convenience, this extended #21 lead should be taped to the welding work lead. (If the length of welding work cable is short, less than 25 feet, and connections can be expected to be reliable, then control cable lead #21 does not need to be extended and can be directly connected to terminal #21 on the terminal strip. Note that this is not the preferred connection because it adds error to the LN-7 voltmeter reading.)

N.C. Tape up bolted connection if lead #21 is extended.

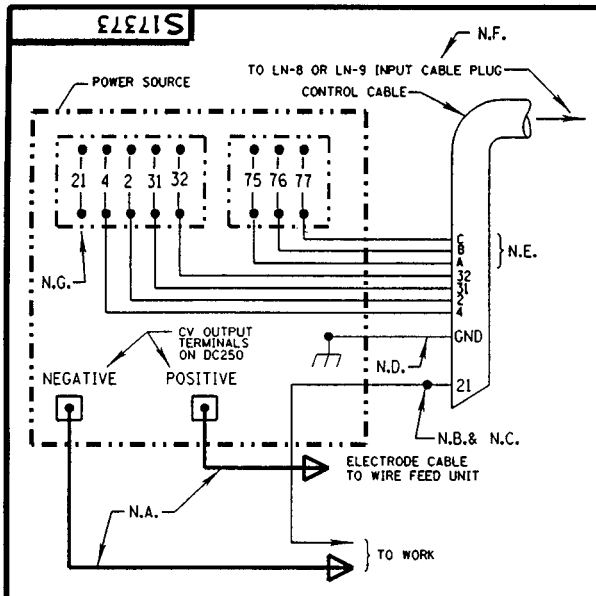
N.D. Connect the control cable ground lead to the frame terminal marked ⏚ near the power source terminal strip. The power source grounding terminal (marked ⏚ and located near the power source input power connections) must be properly connected to electrical ground per the power source operating manual.

N.E. If an optional remote voltage control is used, connect it to this terminal strip.

N.F.* If lead #21 is to be connected to the terminal strip, connect to the #21 terminal that matches work polarity. This connection must be changed whenever the electrode polarity is changed.

CONNECTION OF LN-8 OR LN-9 TO CV-400

S17373



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 and wire feeder (if equipped) to proper polarity. Also refer to note N.G.

SEE NOTE:

WARNING

- Do not operate with covers removed.
- Disconnect power source before servicing.
- Do not touch electrically live parts.
- Only qualified persons should install, use or service this machine.

ELECTRIC SHOCK CAN KILL

N.A. Welding cables must be of proper capacity for the current and duty cycle of immediate and future applications.

N.B. Extend lead #21 using #14 AWG or larger insulated wire physically suitable for the installation. An S16586-[LENGTH] 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. (If the length of work lead circuit is short, and connections can be expected to be reliable, then control cable lead #21 does not need to be extended and can be directly connected to terminal #21 on the terminal strip. Note that this is not the preferred connection because it adds error to the wire feeder voltmeter reading.)

N.C. Tape up bolted connection if lead #21 is extended.

N.D. Connect the control cable ground lead to the frame terminal marked ⏚ near the power source terminal strip. The power source grounding terminal (marked ⏚ and located near the power source input power connections) must be properly connected to electrical ground per the power source operating manual.

N.E. 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 the terminal strip.

N.F. The LN-9 voltage control jumpers must be connected as follows (refer to LN-9 Operating Manual):

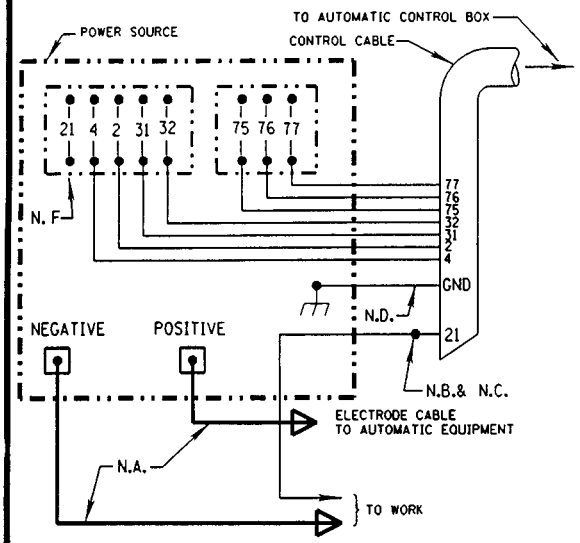
White jumper on voltage board to pin 'S'.
Blue jumper on voltage board (later units only), or on start board (earlier units), to pin 'B'.

N.G.* If lead #21 is to be connected to the terminal strip, connect to the #21 terminal that matches work polarity. This connection must be changed whenever the electrode polarity is changed.

NOTE : For positive polarity, connect lead #21 to the "21-" terminal; For negative polarity welding, connect to the "21+" terminal.

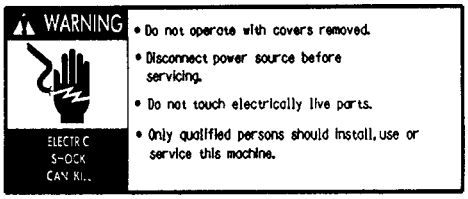
CONNECTION OF NA-3 TO CV-400

S17374



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 (if equipped) to proper polarity. Reverse the leads on the back of the ammeter and voltmeter in the automatic control box. Also refer to note N.F.

SEE NOTE:



N. A. Welding cables must be of proper capacity for the current and duty cycle of immediate and future applications.

N. B. Extend lead #21 using #14 AWG or larger insulated wire physically suitable for the installation. An S16586-[LENGTH] remote voltage sensing work lead is available for this purpose. Connect it directly to the work piece keeping it electrically separate form the welding work lead circuit and connection. For convenience, this extended #21 lead should be taped to the welding work lead. (If the length of work lead circuit is short, and connections can be expected to be reliable, then control cable lead #21 does not need to be extended and can be directly connected to terminal #21 on the terminal strip. Note that this is not the preferred connection because it adds error to the wire feeder voltmeter reading.)

N. C. Tape up bolted connection.

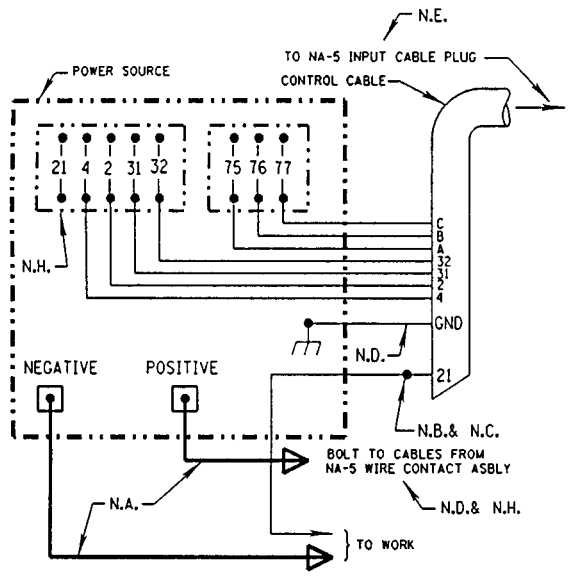
N. D. Connect the control cable ground lead to the frame terminal marked ⏚ near the power source terminal strip. The power source grounding terminal (marked ⏚ and located near the power source input power connections) must be properly connected to electrical ground per the power source operating manual.

N. E. If a variable voltage board is present in the automatic controls and the DC-400 diode kit or CV-400 or CVI-500 diode option is not used, the jumper lead on the VV board must be connected to pin 'L' to permit the inch down button to operate. This jumper, however, will disable the cold starting/autostop feature of the automatic controls, permitting only hot starting techniques to be used.

N. F.* If lead #21 is to be connected to the terminal strip, connect to the #21 terminal that matches work polarity. This connection must be changed whenever the electrode polarity is changed.

CONNECTION OF NA-5 OR NA-5R TO CV-400

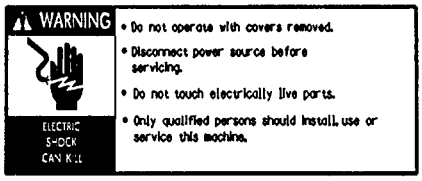
S17375



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 (if equipped), to proper polarity. Refer to NA-5 Operating Manual for required NA-5 control box polarity connections. Also refer to note N.H.

FOR ADDITIONAL INSTALLATION INSTRUCTIONS, SEE NA-5 OPERATING MANUAL.

SEE NOTE:



N. A. Welding cables must be of proper capacity for the current and duty cycle of immediate and future applications.

N. B. Extend lead #21 using #14 AWG or larger insulated wire physically suitable for the installation. An S16586-[LENGTH] 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. (If the length of work lead circuit is short, and connections can be expected to be reliable, then control cable lead #21 does not need to be extended and can be directly connected to terminal #21 on the terminal strip. Note that this is not the preferred connection because it adds error to the NA-5 voltmeter reading.)

N. C. Tape up bolted connection.

N. D. Connect the control cable ground lead to the frame terminal marked ⏚ near the power source terminal strip. The power source grounding terminal (marked ⏚ and located near the power source input power connections) must be properly connected to electrical ground per the power source operating manual.

N. E. The jumpers on the NA-5 voltage board must be connected as follows: Connect red jumper to pin 'S'.
Connect white jumper to pin 'B'.

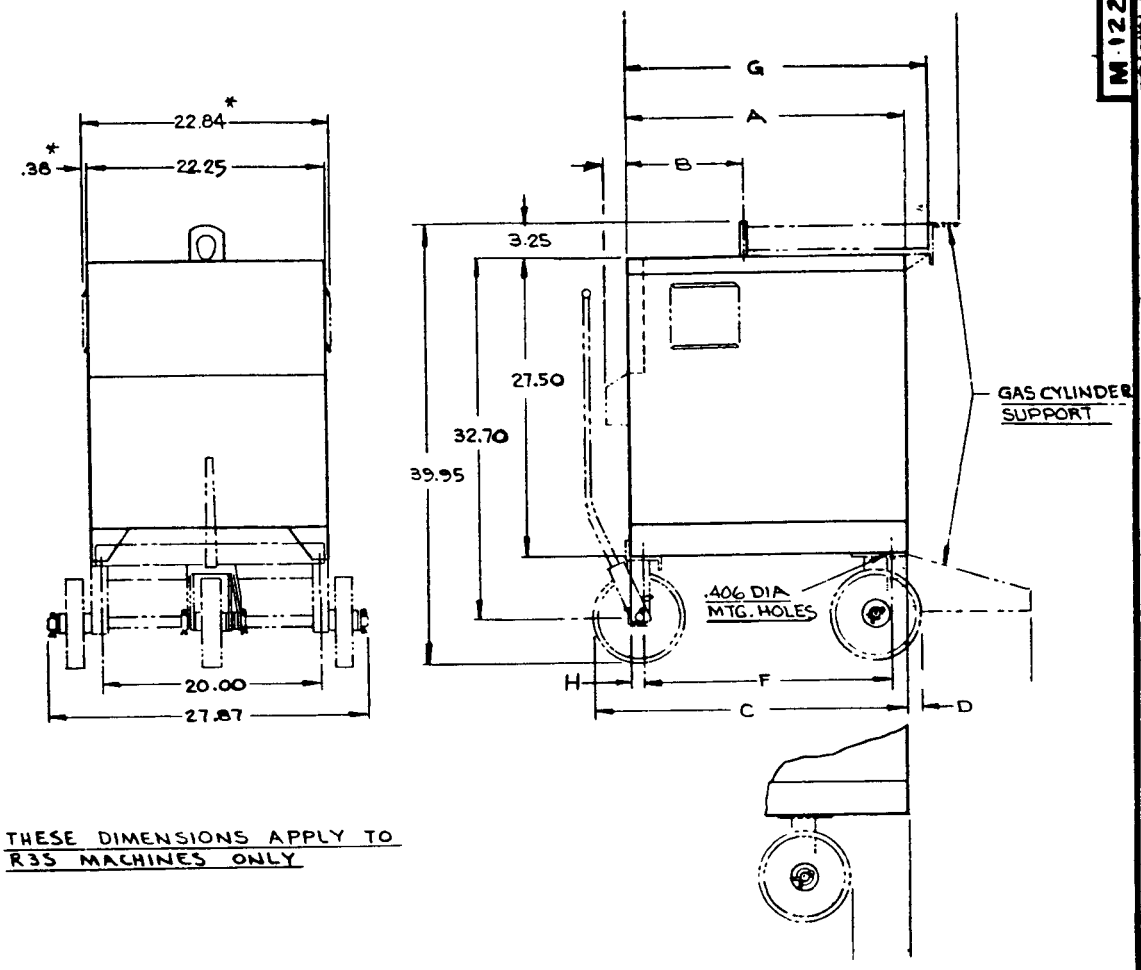
When using NA-5 controls above Code 8300 without the optional DC-400 diode kit or CV-400, CVI-500 diode option:
The NA-5 Inch Down button will not operate unless a jumper is connected between the two tab terminals, labeled 'AUTO', located above the transformer on the NA-5 Voltage P.C. board. This jumper, however, will disable the Cold Starting/Auto-Stop feature of the NA-5, permitting only Hot Starting techniques to be used.

N. G. 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.

N. H.* If lead #21 is to be connected to the terminal strip, connect to the #21 terminal that matches work polarity. This connection must be changed whenever the electrode polarity is changed.

NOTE: For positive polarity, connect lead #21 to the "21-" terminal; For negative polarity welding, connect to the "21+" terminal.

M-12244



* THESE DIMENSIONS APPLY TO R35 MACHINES ONLY

N.A.-OPTIONAL UNDERCARRIAGE AVAILABLE

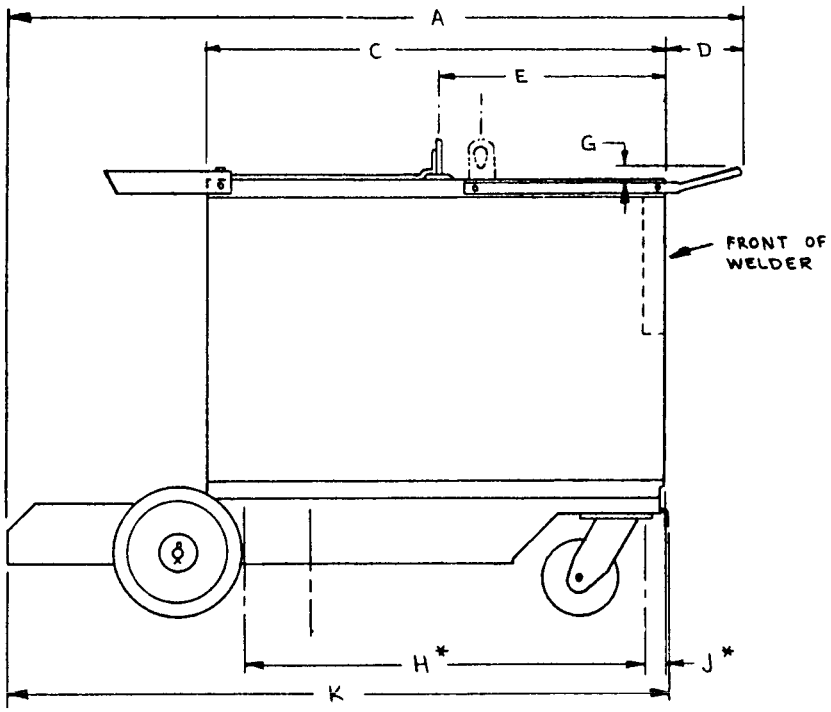
N.B. OPTIONAL UNDERCARRIAGE AVAILABLE EITHER WITH OR WITHOUT SUPPORT FOR TWO GAS CYLINDERS.

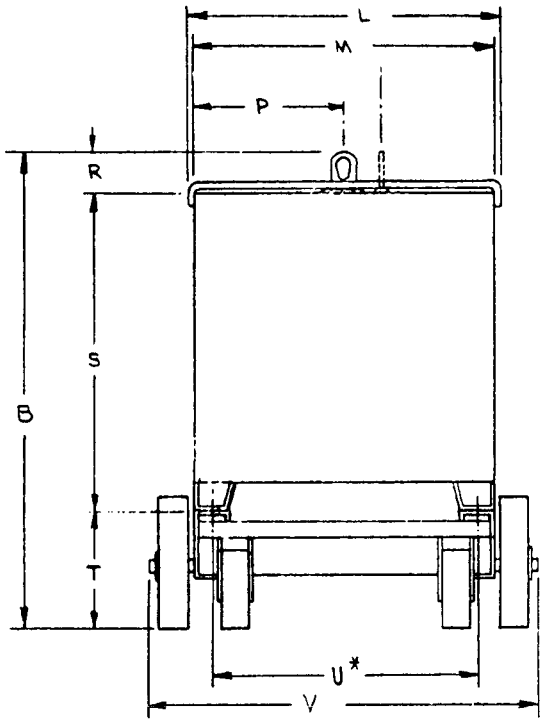
THE LINCOLN ELECTRIC CO. CLEVELAND, OHIO U. S. A.
TITLE IDEALARC & K-817 UNDERCARRIAGE
PROJECT DIMENSION PRINT
DWN. LJP DATE 7-7-78
DWG. NO. M-12244

PART Nº	TYPE	A	B	C	D	E	F	G	H	J	K	L	NOTE
M 12244-1	CV-400	32.00	15.39	30.92	1.44	X	±.11 30.02	±.06 39.07	.94	X	X	X	N.A.

PRINTER

M15200





* LOCATION OF .406 DIA. MOUNTING HOLES

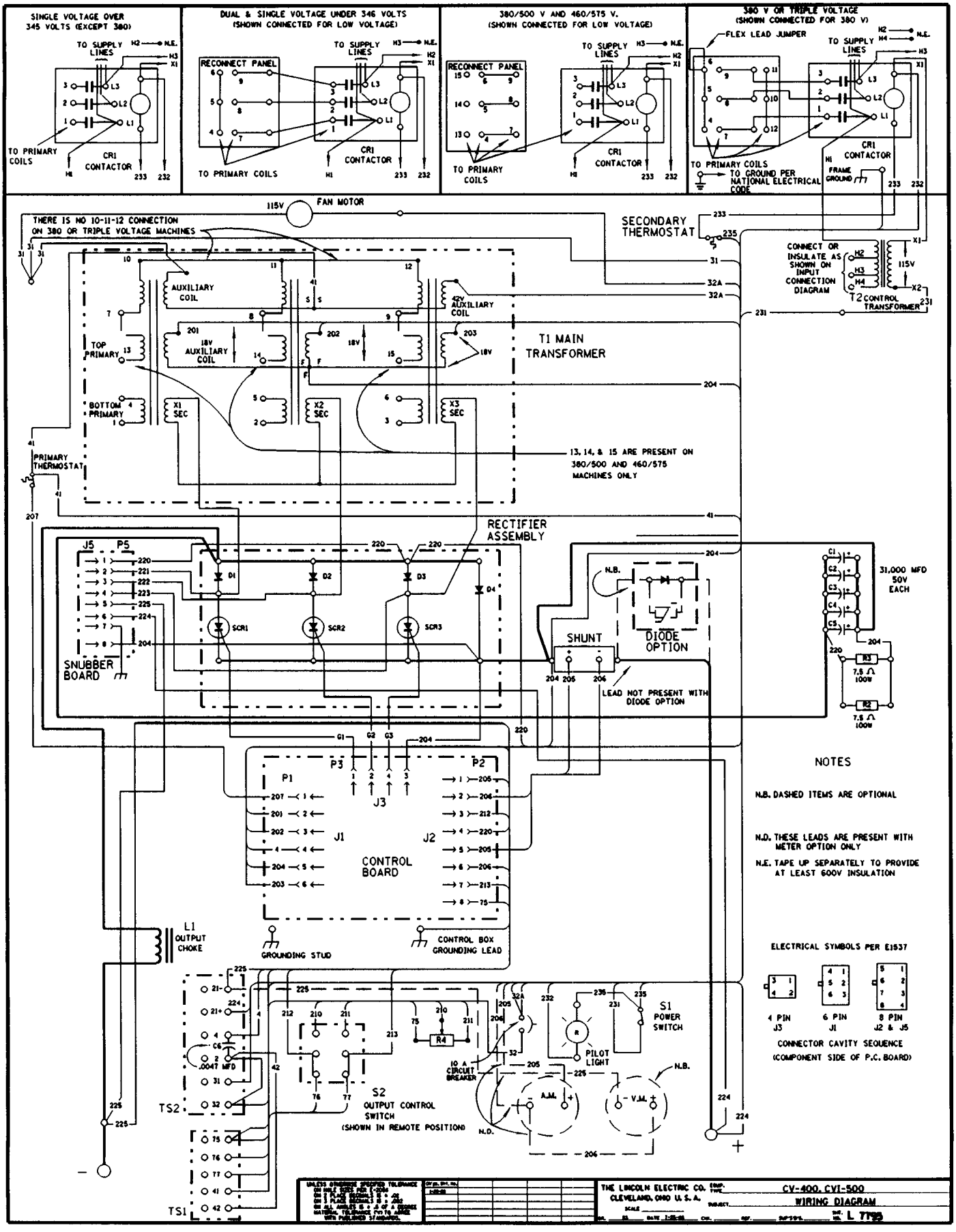
M15200-1	R3R-300-400-500 DC-400, CV-400, CV-500	K841	48.83	37.86	32.00	5.09	15.39		.74	30.11	.94	43.91	23.28	22.25		11.12	3.25	27.50	7.11	20.00	27.65	
PART No	WELDER	OPTIONAL UNDERCARRIAGE	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W

UNLESS OTHERWISE SPECIFIED TOLERANCE ON HOLE SIZES PER E-2056
ON 2 PLACE DECIMALS IS ± .02
ON 3 PLACE DECIMALS IS ± .002
ON ALL ANGLES IS ± .5 OF A DEGREE
MATERIAL TOLERANCE ("Y") TO AGREE WITH PUBLISHED STANDARDS.

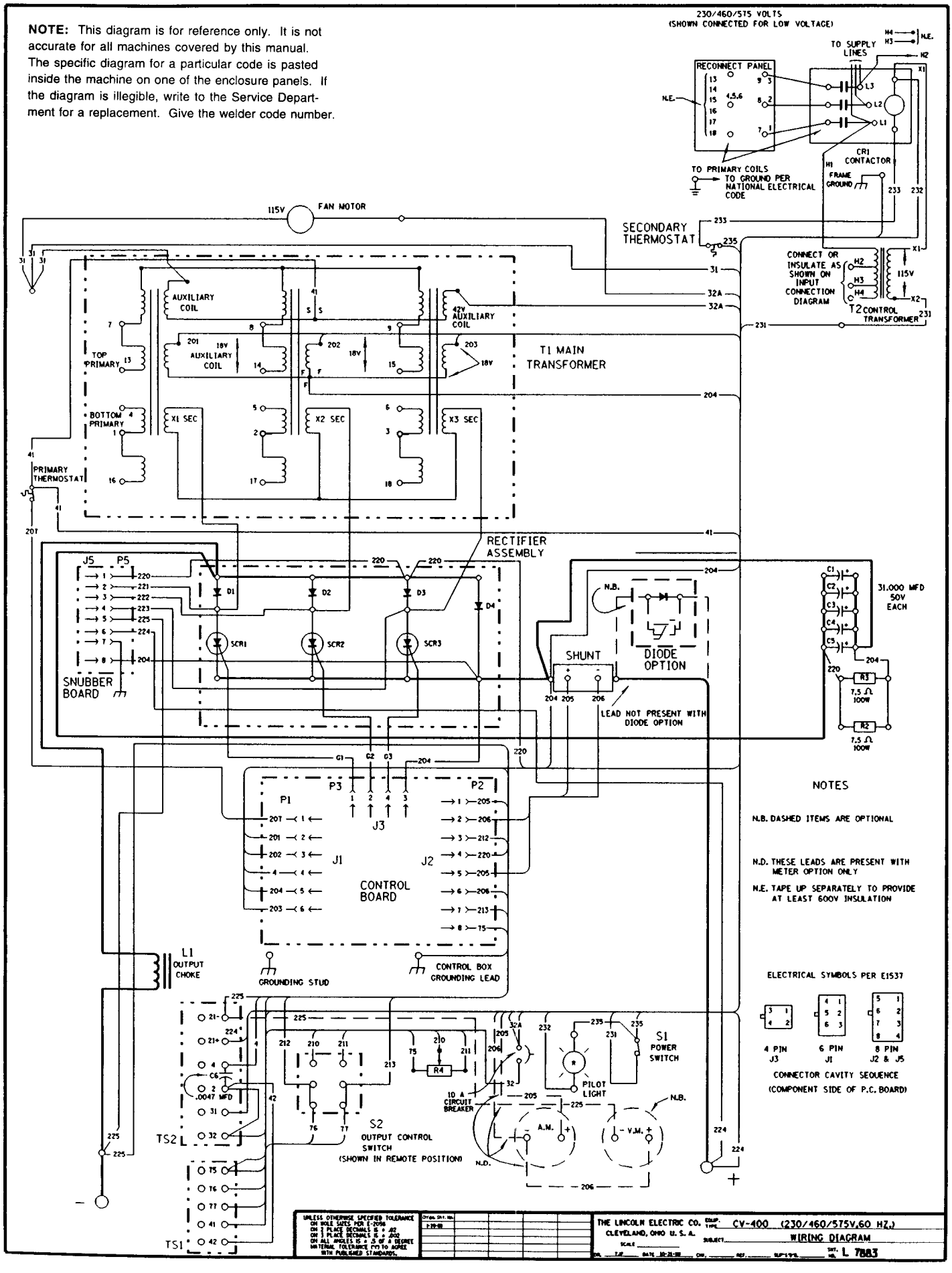
Ch'ge. Sht. No.
7-11-86
7-20-876
9-4-87
9-26-890
1-20-898

THE LINCOLN ELECTRIC CO. CLEVELAND, OHIO U. S. A.
EQUIP. TYPE TRANSFORMER WELDERS WITH UNDERCARRIAGE
SUBJECT DIMENSION PRINT
SCALE none
DR. [illegible] DATE 4-23-86 CHK. [illegible] SUP'S'D'G. SHT. NO. M 15200

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.



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.



NOTES

N.B. DASHED ITEMS ARE OPTIONAL

N.D. THESE LEADS ARE PRESENT WITH METER OPTION ONLY

N.E. TAPE UP SEPARATELY TO PROVIDE AT LEAST 600V INSULATION

ELECTRICAL SYMBOLS PER E1537

4 PIN J3 | 6 PIN J1 | 8 PIN J2 & J5

CONNECTOR CAVITY SEQUENCE
(COMPONENT SIDE OF P.C. BOARD)

UNLESS OTHERWISE SPECIFIED TOLERANCE ON WHOLE SIZES PER E-2056 ON 2 PLACE DECIMALS IS ± .02 ON 3 PLACE DECIMALS IS ± .002 ON ALL ANGLES IS ± .5 OF A DEGREE MATERIAL TOLERANCE (T) TO AGREE WITH PUBLISHED STANDARDS.

THE LINCOLN ELECTRIC CO. CLEVELAND, OHIO U. S. A.

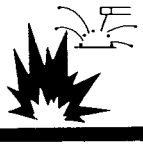
EQUIP. TYPE CV-400 (230/460/575V,60 HZ.)

SUBJECT WIRING DIAGRAM

SCALE

DR. TJF DATE 10-24-88 CHK. REF. SUPERSEDES

SHT. NO. L 7883

			
WARNING	• Do not touch electrically live parts or electrode with skin or wet clothing. • Insulate yourself from work and ground.	• Keep flammable materials away.	• Wear eye, ear and body protection.
Spanish **AVISO DE PRECAUCION**	• No toque las partes o los electrodos bajo carga con la piel o ropa mojada. • Aislese del trabajo y de la tierra.	• Mantenga el material combustible fuera del área de trabajo.	• Protéjase los ojos, los oídos y el cuerpo.
French **ATTENTION**	• Ne laissez ni la peau ni des vêtements mouillés entrer en contact avec des pièces sous tension. • Isolez-vous du travail et de la terre.	• Gardez à l'écart de tout matériel inflammable.	• Protégez vos yeux, vos oreilles et votre corps.
German **WARNUNG**	• Berühren Sie keine stromführenden Teile oder Elektroden mit Ihrem Körper oder feuchter Kleidung! • Isolieren Sie sich von den Elektroden und dem Erdboden!	• Entfernen Sie brennbarres Material!	• Tragen Sie Augen-, Ohren- und Körperschutz!
Portuguese **ATENÇÃO**	• Não toque partes elétricas e electrodos com a pele ou roupa molhada. • Isole-se da peça e terra.	• Mantenha inflamáveis bem guardados.	• Use proteção para a vista, ouvido e corpo.
Japanese **注意事項**	• 通電中の電気部品、又は溶材にヒフやぬれた布で触れないこと。 • 施工物やアースから身体が絶縁されている様にして下さい。	• 燃えやすいものの側での溶接作業は絶対にしてはなりません。	• 目、耳及び身体に保護具をして下さい。
Chinese **警 告**	• 皮肤或濕衣物切勿接觸帶電部件及銲條。 • 使你自己與地面和工件絕緣。	• 把一切易燃物品移離工作場所。	• 佩戴眼、耳及身體勞動保護用具。
Korean **위 험**	• 전도체나 용접봉을 젖은 헝겁 또는 피부로 절대 접촉치 마십시요. • 모재와 접지를 접촉치 마십시요.	• 인화성 물질을 접근 시키지 마시요.	• 눈, 귀와 몸에 보호장구를 착용하십시요.
Arabic **تحذير**	• لا تلمس الاجزاء التي يسري فيها التيار الكهربائي أو الالكترود بجلد الجسم أو بالملابس المبللة بالماء. • ضع عازلا على جسمك خلال العمل.	• ضع المواد القابلة للاشتعال في مكان بعيد.	• ضع أدوات وملابس واقية على عينيك وأذنيك وجسمك.

READ AND UNDERSTAND THE MANUFACTURER'S INSTRUCT ION FOR THIS EQUIPMENT AND THE CONSUMABLES TO BE USED AND FOLLOW YOUR EMPLOYER'S SAFETY PRACTICES.

SE RECOMIENDA LEER Y ENTENDER LAS INSTRUCCIONES DEL FABRICANTE PARA EL USO DE ESTE EQUIPO Y LOS CONSUMIBLES QUE VA A UTILIZAR, SIGA LAS MEDIDAS DE SEGURIDAD DE SU SUPERVISOR.

LISEZ ET COMPRENEZ LES INSTRUCTIONS DU FABRICANT EN CE QUI REGARDE CET EQUIPMENT ET LES PRODUITS A ETRE EMPLOYES ET SUIVEZ LES PROCEDURES DE SECURITE DE VOTRE EMPLOYEUR.

LESEN SIE UND BEFOLGEN SIE DIE BETRIEBSANLEITUNG DER ANLAGE UND DEN ELEKTRODENEINSATZ DES HERSTELLERS. DIE UNFALLVERHÜTUNGSVORSCHRIFTEN DES ARBEITGEBERS SIND EBENFALLS ZU BEACHTEN.

			⚠
● Keep your head out of fumes. ● Use ventilation or exhaust to remove fumes from breathing zone.	● Turn power off before servicing.	● Do not operate with panel open or guards off.	**WARNING**
● Los humos fuera de la zona de respiración. ● Mantenga la cabeza fuera de los humos. Utilice ventilación o aspiración. para gases.	● Desconectar el cable de alimentación de poder de la máquina antes de iniciar cualquier servicio.	● No operar con panel abierto o guardas quitadas.	Spanish **AVISO DE PRECAUCION**
● Gardez la tête à l'écart des fumées. ● Utilisez un ventilateur ou un aspirateur pour ôter les fumées des zones de travail.	● Débranchez le courant avant l'entretien.	● N'opérez pas avec les panneaux ouverts ou avec les dispositifs de protection enlevés.	French **ATTENTION**
● Vermeiden Sie das Einatmen von Schweißrauch! ● Sorgen Sie für gute Be- und Entlüftung des Arbeitsplatzes!	● Strom vor Wartungsarbeiten abschalten! (Netzstrom völlig öffnen; Maschine anhalten!)	● Anlage nie ohne Schutzgehäuse oder Innenschutzverkleidung in Betrieb setzen!	German **WARNUNG**
● Mantenha seu rosto da fumaça. ● Use ventilação e exhaustão para remover fumo da zona respiratória.	● Não opere com as tampas removidas. ● Desligue a corrente antes de fazer serviço. ● Não toque as partes elétricas nuas.	● Mantenha-se afastado das partes moventes. ● Não opere com os painels abertos ou guardas removidas.	Portuguese **ATENÇÃO**
● ヒュームから頭を離すようにして下さい。 ● 換気や排煙に十分留意して下さい。	● メンテナンス・サービスに取りかかる際には、まず電源スイッチを必ず切って下さい。	● パネルやカバーを取り外したままで機械操作をしないで下さい。	Japanese **注意事項**
● 頭部遠離煙霧。 ● 在呼吸區使用通風或排風器除煙。	● 維修前切斷電源。	● 儀表板打開或沒有安全罩時不準作業。	Chinese **警 告**
● 얼굴로부터 용접가스를 멀리하십시요. ● 호흡지역으로부터 용접가스를 제거하기 위해 가스제거기나 통풍기를 사용하십시요.	● 보수전에 전원을 차단하십시요.	● 판넬이 열린 상태로 작동치 마십시요.	Korean **위 험**
● ابعد رأسك بعيداً عن الدخان. ● استعمل التهوية أو جهاز ضغط الدخان للخارج لكي تبعد الدخان عن المنطقة التي تتنفس فيها.	● اقطع التيار الكهربائي قبل القيام بأية صيانة.	● لا تشغل هذا الجهاز اذا كانت الاغطية الحديدية الواقية ليست عليه.	Arabic **تحذير**

LEIA E COMPREENDA AS INSTRUÇÕES DO FABRICANTE PARA ESTE EQUIPAMENTO E AS PARTES DE USO, E SIGA AS PRÁTICAS DE SEGURANÇA DO EMPREGADOR.

使う機械や溶材のメーカーの指示書をよく読み、まず理解して下さい。そして貴社の安全規定に従って下さい。

請詳細閱讀並理解製造廠提供的說明以及應該使用的銀焊材料，並請遵守貴方的有関勞動保護規定。

이 제품에 동봉된 작업지침서를 숙지하시고 귀사의 작업자 안전수칙을 준수하시기 바랍니다.

اقرأ بتمعن وافهم تعليمات المصنع المنتج لهذه المعدات والمواد قبل استعمالها واتبع تعليمات الوقاية لصاحب العمل.

LIMITED WARRANTY

STATEMENT OF WARRANTY:

The Lincoln Electric Company (Lincoln) warrants to the original purchaser (end-user) of new equipment that it will be free of defects in workmanship and material.

This warranty is void if Lincoln finds that the equipment has been subjected to improper care or abnormal operation.

WARRANTY PERIOD:

All warranty periods date from the date of shipment to the original purchaser and are as follows:

Three Years:
Transformer Welders
Motor-generator Welders
Semiautomatic Wire Feeders
Plasma-cutting Power Source
Engine Driven Welders (except engine and engine accessories) with operating speed under 2,000 RPM

Two Years:
Engine Driven Welders (except engine and engine accessories) with operating speed over 2,000 RPM

All engine and engine accessories are warranted by the engine or engine accessory manufacturer and are not covered by this warranty.

Equipment not listed above such as guns and cable assemblies, automatic wire feeders and field-installed optional equipment are warranted for one year.

TO OBTAIN WARRANTY COVERAGE:

You are required to notify Lincoln Electric, your Lincoln Distributor, Lincoln Service Center or Field Service Shop of any defect within the warranty period. Written notification is recommended.

WARRANTY REPAIR:

If Lincoln's inspection of the equipment confirms the existence of a defect covered by this warranty, the defect will be corrected by repair or replacement at Lincoln's option.

WARRANTY COSTS:

You must bear the cost of shipping the equipment to a Lincoln Service Center or Field Service Shop as well as return shipment to you from that location.

IMPORTANT WARRANTY LIMITATIONS:

- Lincoln will not accept responsibility for repairs made without its authorization.
- Lincoln shall not be liable for consequential damages (such as loss of business, etc.) caused by the defect or reasonable delay in correcting the defect.
- Lincoln's liability under this warranty shall not exceed the cost of correcting the defect.
- This written warranty is the **only** express warranty provided by Lincoln with respect to its products. Warranties implied by law such as the Warranty of Merchantability are limited to the duration of this limited warranty for the equipment involved.

WARRANTY SUPERSEDED
SEE IMWS-1

LINCOLN® ELECTRIC

THE LINCOLN ELECTRIC COMPANY

World's Leader in Welding and Cutting Products • Premier Manufacturer of Industrial Motors
Sales and Service through Subsidiaries and Distributors Worldwide
Cleveland, Ohio 44117-1199 U.S.A.

EFF. 2/93

Litho in U.S.A.