IM224-C

March, 1996

Idealarc® TM

300, 400, 500 and 650 Amp AC and AC/DC Power Sources

Safety Depends on You

Lincoln arc welding and cutting 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 MANUAL AND THE SAFETY PRECAUTIONS CONTAINED THROUGHOUT.** And, most importantly, think before you act and be careful.

This manual covers equipment which is obsolete and no longer in production by The Lincoln Electric Co. Specifications and availability of optional features may have changed.

IM224
TM Idealarc
March, 1996

4301; 4302; 4303; 4304; 4305; 4307; 4320; 4331; 4335; 4336; 4337; 4338; 4340; 4341; 4342; 4343; 4344; 4346; 4348; 4351; 4363; 4364; 4367; 4375; 4376; 4378; 4379; 4381; 4382; 4383; 4393; 4396; 4397; 4401; 4402; 4403; 4404; 4405; 4406; 4407; 4408; 4409; 4410; 4411; 4412; 4413; 4414; 4415; 4417; 4418; 4419; 4420; 4421; 4422; 4424; 4430; 4431; 4433; 4434; 4436; 4437; 4438; 4439; 4448; 4449; 4450; 4452; 4454; 4455; 4501; 4502; 4503; 4504; 4505; 4506; 4507; 4508; 4509; 4510; 4511; 4512; 4513; 4514; 4515; 4516; 4518; 4519; 4520; 4521; 4522; 4523; 4527; 4530; 4532; 4533; 4534; 4535; 4536; 4537; 4539; 4540; 4542; 4543; 4544; 4545; 4546; 4547; 4549; 4550; 4551; 4552; 4553; 4575; 4576; 4577; 4578; 4579; 4580; 4581; 4582; 4583; 4586; 4591; 4593; 4594; 4595; 4596; 4598; 4599; 4600; 5186; 5187; 5192; 5193; 5194; 5250; 5263; 5286; 5342; 5346; 5382; 5437; 5610; 5771; 5790; 5792; 5805; 5811; 5834; 5976; 5977; 5978; 5979; 5980; 5981; 5982; 5983; 6005; 6006; 6040; 6041; 6084; 6099; 6106; 6147; 6148; 6149; 6150; 6151; 6156; 6177; 6180; 6197; 6204; 6209; 6210; 6211; 6212; 6213; 6214; 6217; 6218; 6267; 6283; 6289; 6292; 6293; 6337; 6384; 6413; 6492; 6493; 6496; 6515; 6532; 6549; 6557; 6574; 6575; 6576; 6577; 6578; 6579; 6580; 6581; 6582; 6583; 6584; 6585; 6586; 6587; 6588; 6604; 6610; 6613; 6615; 6625; 6626; 6652; 6658; 6660; 6664; 6667; 6678; 6693; 6694; 6695; 6696; 6697; 6698; 6707; 6742; 6749; 6750; 6751; 6752; 6753; 6754; 6757; 6758; 6759; 6760; 6761; 6762; 6763; 6764; 6765; 6786; 6788; 6803; 6804; 6806; 6819; 6833; 6843; 6864; 6874; 7020; 7029; 7036; 7045; 7081; 7112; 7127; 7134; 7205; 7206; 7207; 7208; 7226; 7231; 7268; 7273; 7274; 7282; 7649; 7650; 7655; 7656; 7657; 7658; 7670; 7673; 7674; 7675; 7688; 7711; 7712; 7713; 7714; 7715; 7737; 7752; 7774; 7776; 7777; 7788; 7804; 7806; 7812; 7823; 7879; 7880; 7906; 7945; 7946; 7967; 7975; 7976; 7977; 7987; 8012; 8030; 8041; 8063; 8190; 8191; 8192; 8193; 8199; 8212; 8214; 8230; 8495; 8544; 8550; 8553; 8559; 8561; 8562; 8599; 8829; 8919; 8932; 9003; 9117; 9162; 9172; 9189; 9227; 9228; 9229; 9230; 9231; 9232; 9233; 9234; 9235; 9236; 9237; 9238; 9239; 9240; 9241; 9242; 9243; 9244; 9245; 9246; 9247; 9248; 9249; 9250; 9251; 9252; 9253; 9254; 9255; 9256; 9257; 9258; 9259; 9260; 9261; 9262; 9341; 9376; 9401; 9412; 9417; 9419

OPERATOR'S MANUAL

World's Leader in Welding and Cutting Products

LINCOLN® ELECTRIC

Premier Manufacturer of Industrial Motors

Sales and Service through Subsidiaries and Distributors Worldwide

22801 St. Clair Ave. Cleveland, Ohio 44117-1199 U.S.A. Tel. (216) 481-8100

⚠ WARNING

⚠ CALIFORNIA PROPOSITION 65 WARNINGS ⚠

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

The Above For Diesel Engines

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

The Above For Gasoline Engines

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.

FOR ENGINE powered equipment.

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

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

1.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.

1.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.

1.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.

1.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.

1.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.

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

ELECTRIC AND MAGNETIC FIELDS may be dangerous

2.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

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

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

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

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

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

2.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.

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

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

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ELECTRIC SHOCK can kill.

3.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.

3.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.**

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

3.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.

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

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

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

3.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.

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

3.j. Also see Items 6.c. and 8.

ARC RAYS can burn.

4.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.

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

4.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.

5.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 lead or cadmium plated steel and other metals or coatings which produce highly 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. Additional precautions are also required when welding on galvanized steel.**

5.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.

5.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.

5.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.

5.e. Also see item 1.b.

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WELDING SPARKS can cause fire or explosion.

6.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.

6.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.

6.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.

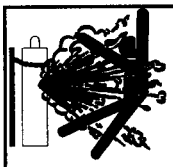
6.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been "cleaned". For information, purchase "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", AWS F4.1 from the American Welding Society (see address above).

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

6.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.

6.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.

6.h. Also see item 1.c.



CYLINDER may explode if damaged.

7.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.

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

7.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.

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

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

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

7.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.

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

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

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

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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

Mar. '93

Thank You ——— for selecting a **QUALITY** product by Lincoln Electric. We want you to take pride in operating this Lincoln Electric Company product ••• as much pride as we have in bringing this product to you!

Please Examine Carton and Equipment For Damage Immediately

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.

Please record your equipment identification information below for future reference. This information can be found on your machine nameplate.

Model Name & Number _____

Code & Serial Number _____

Date of Purchase _____

Whenever you request replacement parts for or information on this equipment always supply the information you have recorded above.

Read this Operators Manual completely before attempting to use this equipment. Save this manual and keep it handy for quick reference. Pay particular attention to the safety instructions we have provided for your protection. The level of seriousness to be applied to each is explained below:

⚠ WARNING

This statement appears where the information **must** be followed **exactly** to avoid **serious personal injury** or **loss of life.**

⚠ CAUTION

This statement appears where the information **must** be followed to avoid **minor personal injury** or **damage to this equipment.**

INSTALLATION

LOCATION

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 machine reduces the chance of dirt accumulation which can block air passages and cause overheating.

INPUT WIRING

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

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

Have a qualified electrician remove the right side panel and connect single phase (or one phase of a two or three phase line) AC power to the welder in accordance with the National Electrical Code, all local codes, and the wiring diagram pasted to the inside of the side panel.

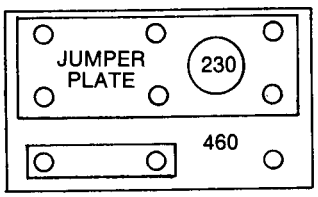
The welder frame must be grounded. A stud marked with the symbol ⏚ located inside the welder on the base is provided for this purpose. See the National Electrical Code for details on proper grounding methods. (If an old machine does not have a grounding stud, connect the grounding wire to an unpainted frame screw or bolt.)

Models designed for two or three input voltages (e.g. 230/460, 220/380/440, etc.) are shipped connected for the highest voltage. (AC models without accessory L — line contactor — are shipped unconnected.) Reconnection instructions are on the diagram inside the welder and, for machines with a reconnect panel, are given below.

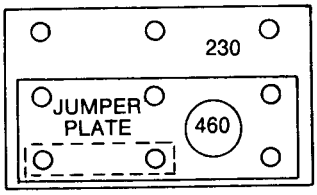
DUAL INPUT VOLTAGE RECONNECT PANEL

Machines equipped with a dual voltage reconnect panel are shipped connected for the higher input voltage. To change this connection:

1. Be sure the input power to the welder is off.
2. Remove the insulated jumper plate by removing the nuts.
3. The jumper plate has two positions — an upper and a lower. Each position is for a different voltage.
4. Place the jumper plate in position with the appropriate input voltage appearing in the opening in this plate. Tighten the nuts.



If your input voltage is 230 volts, the contact panel should look like this.



If your input voltage is 460 volts, the contact panel should look like this.

NOTE: Jumper plate configuration will vary with models.

RECOMMENDED CABLE SIZES

With the input power off, connect the output cables to the proper studs on the output panel. The cables should be led through the strain relief loop below the studs to prevent damage to the studs if the cables are pulled excessively. Cable size may be selected according to the table on page 5.

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

Cable Sizes for Combined Length of Electrode and Work Cable (Copper) at 60% Duty Cycle

Welder	Combined Copper Cable Lengths up to 100′	Lincoln Accessory Kit Numbers
300	1/0	K-703 (35′ electrode, 30′ work cable, headshield with lens & cover glass, electrode holder & work clamp)
400	2/0	K-704 (same as above)
500	2/0	K-796 (electrode & work cables)[1]
650	3/0	K-797 (electrode & work cables)[1]

[1] Specify length of each.

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 keeps 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.

Recommended Input Wire, Ground Wire and Fuse Sizes Based on National Electrical Code
For 60 Hertz, 1 Phase Welders at 60% Duty Cycle

Welder	Input Volts	Input Amps				Copper Wire Size-Type 75°C In Conduit								Super Lag Fuse Amps	
		With Capacitors		No Capacitors		2-Input Wires				1-Ground Wire					
		DC	AC	DC	AC	With Capacitors	T & B Term.	No Capacitors	T & B Term.	With Capacitors	T & B Term.	No Capacitors	T & B Term.	With Capacitors	No Capacitors
300	230	78	68	109	107	6	31005	4	31005	6	31005	6	31005	110	150
	460	39	34	54.5	53.5	8	31005	8	31005	10	31005	8	31005	60	80
400	230	112	102	146	142	3	31007	2	31007	6	31005	6	31005	150	200
	460	56	51	73	71	8	31005	6	31005	8	31005	6	31005	80	110
500	230	146	138	182	177	2	31007	0	31009	6	31005	4	31005	200	275
	460	73	69	91	88.5	6	31005	4	31005	6	31005	6	31005	110	125
650	230	206	190	232	226	00	31010	000	31011	4	31005	3	31007	300	350
	460	103	95	116	113	4	31005	3	31007	6	31005	6	31005	150	175

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

OPERATION

CONTINUOUS CURRENT CONTROL

Start the welder. A pilot light on the front panel indicates when the output studs are energized. Rotate the continuous current control hand wheel to raise and lower the output current. Adjust for the exact current desired. Turning the control handle also drives the output dial pointer indicating the welding current at all settings. Do not attempt to turn this pointer directly.

POLARITY SWITCH

Turn the arc polarity switch located in the upper right corner to AC, DC negative, or DC positive as required for the particular application. DO NOT CHANGE THE POLARITY SWITCH WHILE WELDING! Doing this can damage the switch.

DUTY CYCLE

This welder is rated for 60% duty cycle. Duty cycle is based on a ten minute period. Therefore, the welder can be operated at nameplate rated output for 6 minutes out of every 10 minute period.

AUXILIARY POWER

115 volts AC can be obtained from the transformer coil terminals used to energize the fan motor. Extra current available is about 10 amps. To obtain this power, turn off the input power and connect leads to transformer coil terminals X_1 and X_5.

SOLID STATE CONTROLLED REDUCED VOLTAGE SWITCH

The reduced voltage switch limits the voltage at the welder output terminals to 27 volts DC until the arc is struck. (Welders having this option cannot be used with the Hi-Freq™ option.)

REMOTE CURRENT CONTROL

The remote current control permits the operator to adjust the current required for different electrode sizes without returning to the welder. It consists of a motor-gear box unit coupled to the control shaft by a chain drive. Push the remote control toggle switch in the proper direction to raise or lower the welding current.

LINE CONTACTOR

The 115 volt operating coil line contact is standard on all combination AC/DC models. It is a factory installed Option L on AC models. The overload protective thermostat and start-stop push button is included with the line contactor assembly.

TIG WELDING

When using these welders with a Hi-Freq for TIG welding, install R.F. by-pass condenser Kit T-12246 shipped with each Hi-Freq for circuit protection. Instructions are in the kit. (The Hi-Freq option cannot be used with welders equipped with a Reduced Voltage Switch.)

MAINTENANCE

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

OVERLOAD PROTECTION

All AC/DC Idealarcs and all straight AC's equipped with a line contactor have a built-in protective thermostat operated by both temperature and current. This device stops the machine if the transformer or rectifier reach the maximum safe operating temperature because of frequent overload or high room temperature plus overload. The thermostat automatically resets when the temperature reaches a safe operating level.

A thermostat is mounted on the reactor coil. In AC/DC Idealarcs another thermostat is mounted on the rectifier.

The delay relay panel of the arc booster (discontinued March, 1978) assembly is adjusted at the factory. It should not be touched unless faulty operation of the arc booster can be traced directly to the panel. With the input power off, clean the delay relay contacts by passing a cloth soaked in naptha between them.

Do not force the contact arms or use abrasives to clean the contacts. The pilot relay is enclosed and should require no attention.

When the power factor correction capacitors fail, it is not always apparent from the appearance of the capacitors. Operate the welder at rated input voltage drawing rated output current. The input current should correspond to the nameplate amperes. If the input current is 10% or 20% higher, at least one capacitor has failed.

1. Periodically check the helical gears of the current control mechanism. If needed, lubricate with moly-disulfide grease. Any substitute lubricant must have a melting point no lower than 200°F.
2. Current machines have rubber boots to keep dirt off the control screw (Item 129 of Parts List P-61-D). Additional lubricant is not needed except during disassembly for major repairs. On machines built before April 1969, periodically check the control screw for an accumulation of dirt. If needed, lubricate with molydisulfide grease. A dust shield, L-4839, can be purchased to protect these control screws.
3. The fan motor has sealed bearings which required no service.
4. All exposed bearings are made of nylon or graphite impregnated bronze. No lubrication is normally required.
5. In extremely dusty locations dirt may clog the air channels causing the welder to run hot. Blow out the welder at regular intervals.

NAMEPLATES AND LABELS

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.

TROUBLESHOOTING

WARNING: Have a qualified electrician do the troubleshooting work. Turn the input power off using the disconnect switch at the fuse box before working inside the machine. In some cases, it may be necessary to remove the 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.

SILICON 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 each diode pigtail. 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 diode has shorted. If the readings are the same and near full scale, the diode has failed open.
6. Repeat steps 3, 4 and 5 between the DC negative (black) terminal and each diode pigtail.

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

TROUBLE	POSSIBLE CAUSE	WHAT TO DO
Starter chatters.	1. Check-Low Line Volts. 2. Faulty Starter.	1. Check with Power Company. 2. Repair or replace.
Welder will not start (starter not operating).	1. Supply line fuse blown. 2. Power Circuit dead. 3. Broken power lead. 4. Wrong voltage. 5. Thermostat tripped. (Welder Overheated.) 6. Starter switch jammed. 7. NVR coil open.	1. Replace (Look for reason for blown fuse first.) 2. Check voltage. 3. Repair. 4. Check voltage against instructions. 5. Make sure that fan is operating and that there are no obstructions to free flow of air. Operate at normal current and duty cycle. 6. Remove obstruction. 7. Replace.
Welder will not weld (starter operating).	1. Electrode or work lead loose or broken. 2. Open transformer circuit. 3. Switches not centered on arrows. (AC-DC only.)	1. Tighten and repair connections. 2. Send to repair shop to have coils replaced. 3. Center switch.
Welder welds but soon stops welding (thermostat tripped).	1. Proper ventilation hindered. 2. Either AC or DC unit loaded beyond rating. 3. Fan inoperative.	1. Make sure all case openings are free for proper circulation of air. 2. Operate at normal current and duty cycle consistent with both AC and DC rating. 3. Check leads and motor bearings. Fan can be tested on 115 volt line; with welder on, voltage across fan should be 115 volts.
Variable or sluggish welding arc.	1. Poor work or electrode connection. 2. Current too low. 3. Low line voltage. 4. Welding leads too small.	1. Check and clean all connections. 2. Check recommended currents for rod type and size. 3. Check with Power Company. 4. See Table on Page 5.
Welder won't shut off.	1. Starter contacts frozen.	1. Check for approximately 1/8" over travel of the contacts. Disconnect from line etc.
Polarity switch won't turn.	1. Arced by turning under load.	1. Replace switch.
Binding in current control cranking handle.	1. Dry spots on gears. 2. Gear misalignment front-to-back.	1. Lubricate. 2. Check for dislocated snap rings on control shaft and replace.
Objectionable noise.	1. Loosened cap and locking ring on moving core tubes.	1. Tighten end cap using channel lock pliers and secure locking rings.
No surge "Booster" current.	1. Surge switch broken. 2. One surge coil lead broken. 3. Surge control fuses blown.	1. Replace. 2. Repair broken leads or connections. 3. On AC-DC units, check operation of transformer switch located on polarity switch. Replace if defective. Replace fuse and check for cause of blowing.
Surge "Booster" current maintains too long.	1. Delay relay contacts sticking.	1. Smooth contacts carefully with 00 sandpaper (never use emery paper or cloth). Check for 1/16" over travel.

REDUCED VOLTAGE SWITCH TROUBLESHOOTING (Before Solid State Units)

The following instructions apply to the Reduced Voltage Switch used after January 1962 and before April 1980. Except when specified the parts referred to below are part of this optional feature. The wiring diagram is pasted inside the welder right side panel.

NOTE: The O.C.V. should be 35 to 40V, with the contactor open. When checking the O.C.V., use a high resistance voltmeter. An ohmmeter type instrument on an AC scale gives a false reading.

TROUBLE	POSSIBLE CAUSE	WHAT TO DO
Contactor chatters once or twice when dropping out.	1. Malfunction of R1 relay.	1. Replace R1 relay.[1] Do not attempt to repair.
Contactor closes about once a second after welding is stopped.	1. Malfunction of R1 relay.	1. Replace R1 relay.[1] Do not attempt to repair.
Contactor does not drop out after welding.	1. Malfunction of R1 relay. 2. N.C. interlock actuactor spring broken on contactor.	1. Replace R1 relay.[1] Do not attempt to repair. 2. Replace actuator spring.[1]
Contactor closes about once a second as soon as welder is turned on.	1. Too sensitive.	1. Reduce sensitivity by decreasing resistance of adjustable 400 ohm resistor. Check for high resistance ground in welding cables (up to 3,000 ohms). Might be due to cables with damaged rubber covering laying in water.
Contactor does not close when electrode touches work.	1. Electrode tip covered with slag or circuit not sensitive enough. 2. With welder on but electrode not touching work — no voltage across work and electrode.	1. Remove slag on electrode tip or increase sensitivity by increasing resistance of 400 ohm resistor. It may have been reset to too low a value. 2a. Check voltage across 1500 MFD capacitor. Should be approximately 36 volts DC. If okay, check contactor interlocks and look for any broken or open leads in the circuit. 2b. If no voltage across capacitor, check if approximately 117 VAC across primary of 117/24 V transformer. If okay, check both capacitors, rectifier, both transformer secondaries and look for any lead breaks in this circuit. 2c. If not voltage across primary of 117/24 V transformer and fan motor is running, look for broken leads between X_1 and X_5 connections and 117/24 V transformer primary.
Contactor does not hold in during welding.	1. Broken leads.	1. With welder output studs short circuited or while welding, check AC voltage across the secondary of the 12/12 V transformer. This should be between 5 and 20 volts AC. Check for broken leads or open transformer.

[1] Generally when the R1 relay starts to malfunction or actuator springs break, the RVS unit has operated one million or more times. It is then advisable to replace the whole RVS package.

SOLID-STATE CONTROLLED REDUCED VOLTAGE SWITCH

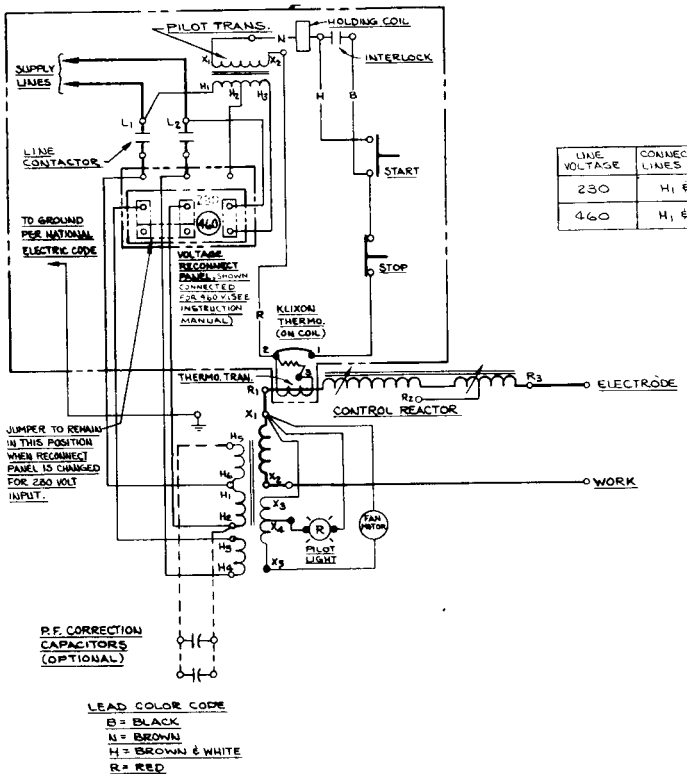
The following instructions apply to the Reduced Voltage Switch used after April 1980. Except when specified the parts referred to below are part of this feature. The wiring diagram is pasted inside the welder right side panel.

NOTE: The O.C.V. should be 25-30 VDC with the contactor open. When checking the O.C.V., use a high resistance voltmeter. An ohmmeter type instrument on an AC scale gives a false reading.

TROUBLE	POSSIBLE CAUSE	WHAT TO DO
Green light is on when welding.	1. Shorted N.C. interlock. 2. Shorted leads.	1. Replace defective interlock and inspect wiring. 2. Repair.

TROUBLE	POSSIBLE CAUSE	WHAT TO DO
Green light stays on when electrode touches work.	1. Electrode tip slag-covered or work piece heavy oxide coated. 2. Circuit not sensitive enough. 3. P.C. board failure. 4. RVS contactor failure.	1. Remove slag on electrode tip and/or clean work piece. 2. Increase sensitivity of circuit by adjusting "sensitivity control trimmer". 3. Replace P.C. board. 4. Measure voltage between terminals #6 and #7 on terminal strip — should be 115 VAC. Inspect leads and connections to RVS contactor coil for breaks or loose connections. Replace contactor coil if all else is okay.
Green light is out when not welding.	1. RVS contactor failure. 2. Green light failure. 3. Welder output shorted. 4. P.C. board failure. 5. If out for only 3 seconds after welder is turned on.	1. (Contactor should be open but is closed.) Measure voltage across contactor coil; if no voltage present, replace contactor. If voltage is 115 VAC, then contactor is operational and problem is elsewhere. 2a. Measure voltage across light. If above 9 volts AC, replace light. 2b. If no voltage, inspect leads, connections and N.C. interlocks of RVS contactor. Repair or replace as required. 3. Measure voltage work to electrode; should be 25-30 VDC. Determine location of short and remove same. 4. Remove blue lead from terminal #1 on terminal strip and measure voltage across terminals #1 and #8; this should be 25-30 VDC. If not, measure voltage across terminals #5 and #6; if no AC voltage is present, replace P.C. board. 5. Normal operation if welder has been off for approximately 20 minutes or more.
Contactor cycles about once per second.	1. No reactor voltage. 2. High resistance short work to electrode due to moisture, etc.	1. With electrode shorted to work, measure voltage across terminals #5 and #6 on terminal strip; this voltage should exceed 30 VAC. If it does not, inspect for broken leads or open connections between terminal strip and connections to X1 and R3. 2. Decrease sensitivity of circuit by adjusting "sensitivity control trimmer" counterclockwise.

WIRING DIAGRAM — AC ONLY MODELS

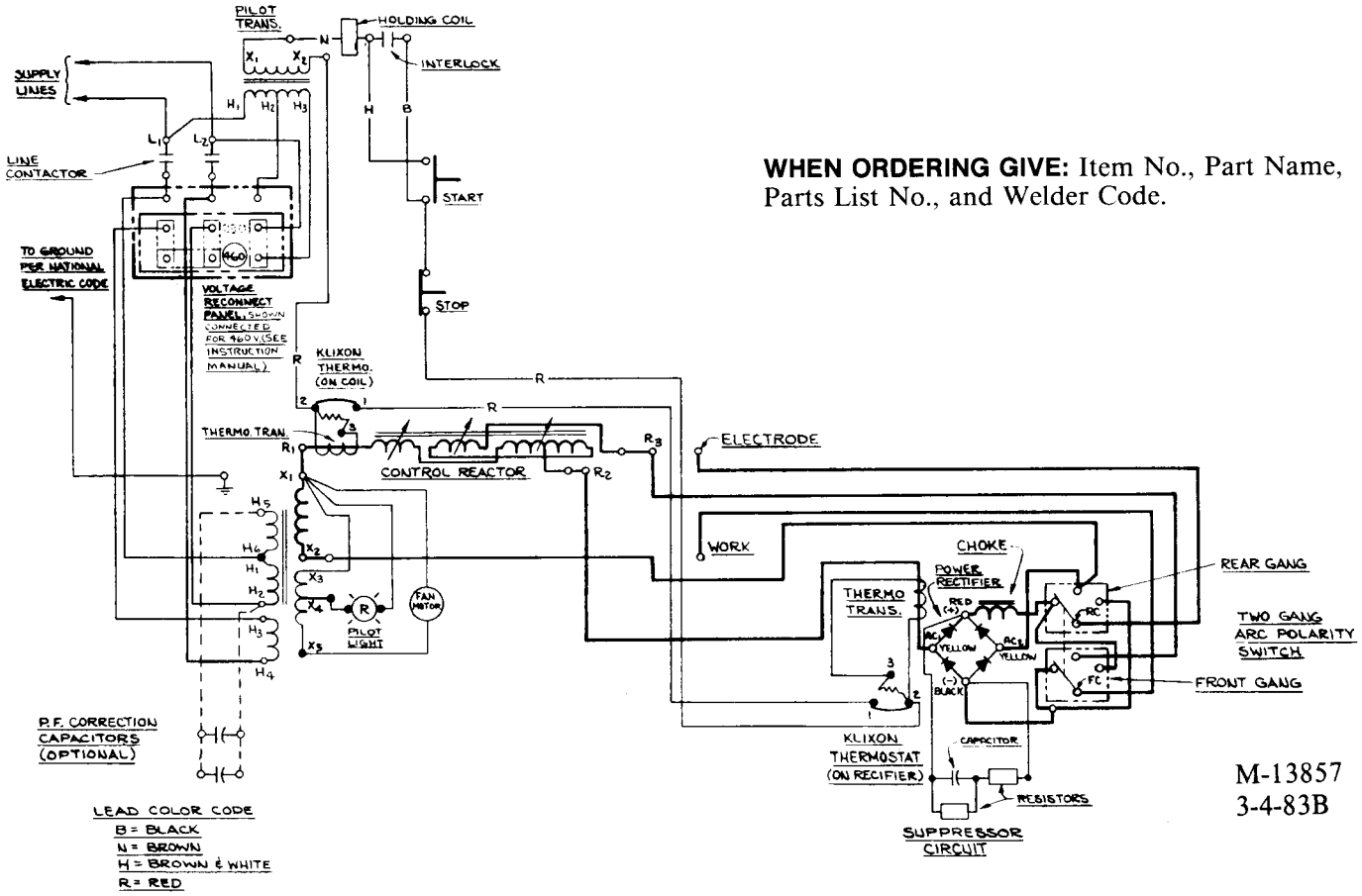


LINE VOLTAGE	CONNECT SUPPLY LINES TO LEADS	CONNECT & INSULATE TRANSFORMER LEADS
230	H_1 & H_4	H_1 TO H_3 H_2 TO H_4
460	H_1 & H_4	H_2 TO H_3

M-13854
3-4-83B

WIRING DIAGRAM — AC/DC MODELS

300, 400 and 500 Amp — Silicon Rectifier



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

M-13857
3-4-83B

INDEX OF PARTS LISTS

ACCESSORIES

Several accessories are (or were) available for addition to the basic Idealarc TM welder. Each accessory is designated by a single letter as listed below. To see which accessories are included in your welder, check the code number stamped in the nameplate. Each letter after the basic four digit code number indicates one of the following accessories. Always give the full welder code number when ordering parts.

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:

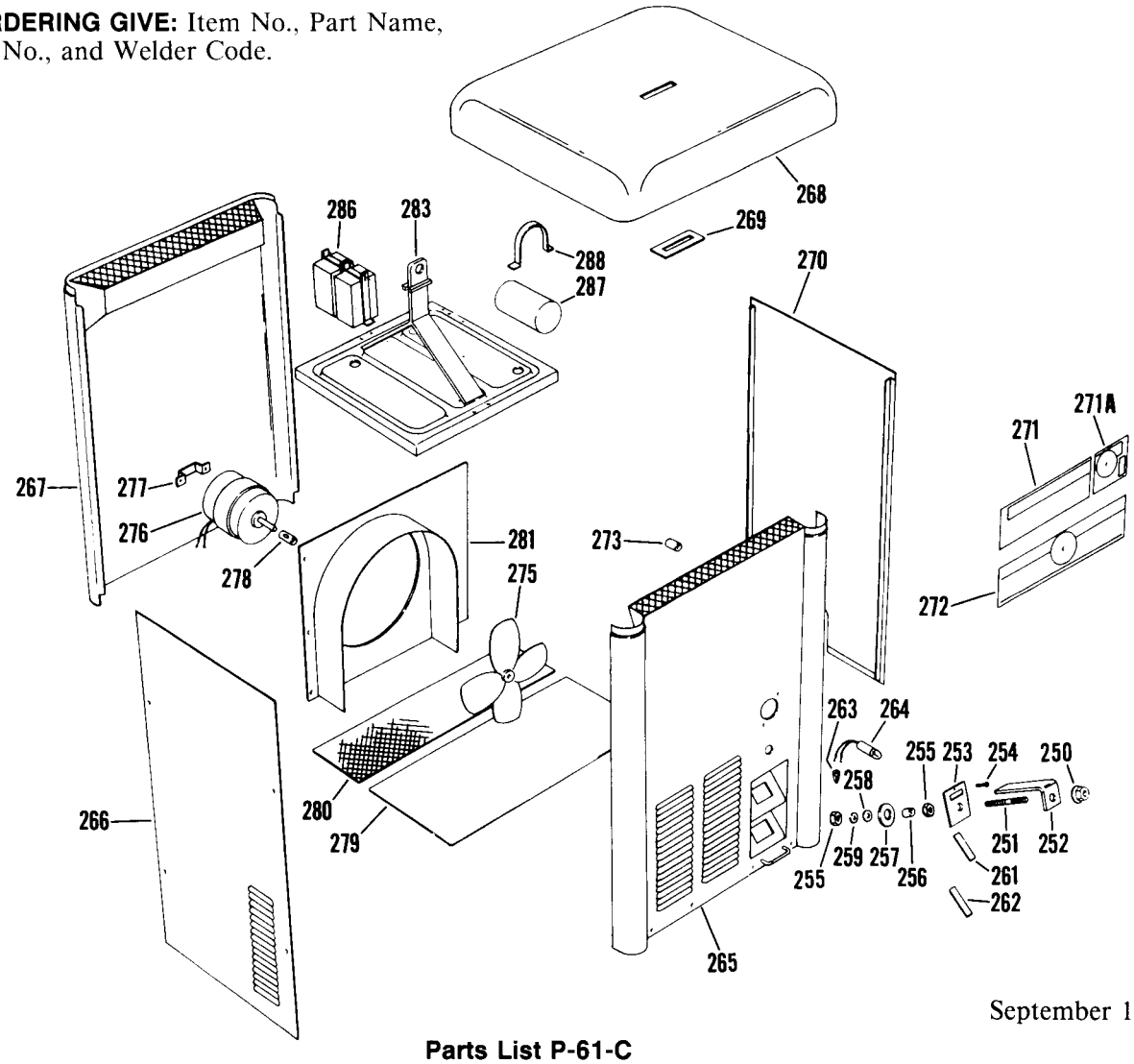
(a) From the nameplate — machine model, code and serial numbers.

(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.

CASE, BAFFLES, FAN, STUDS, ETC. — AC MODELS

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



September 1963

Parts List P-61-C

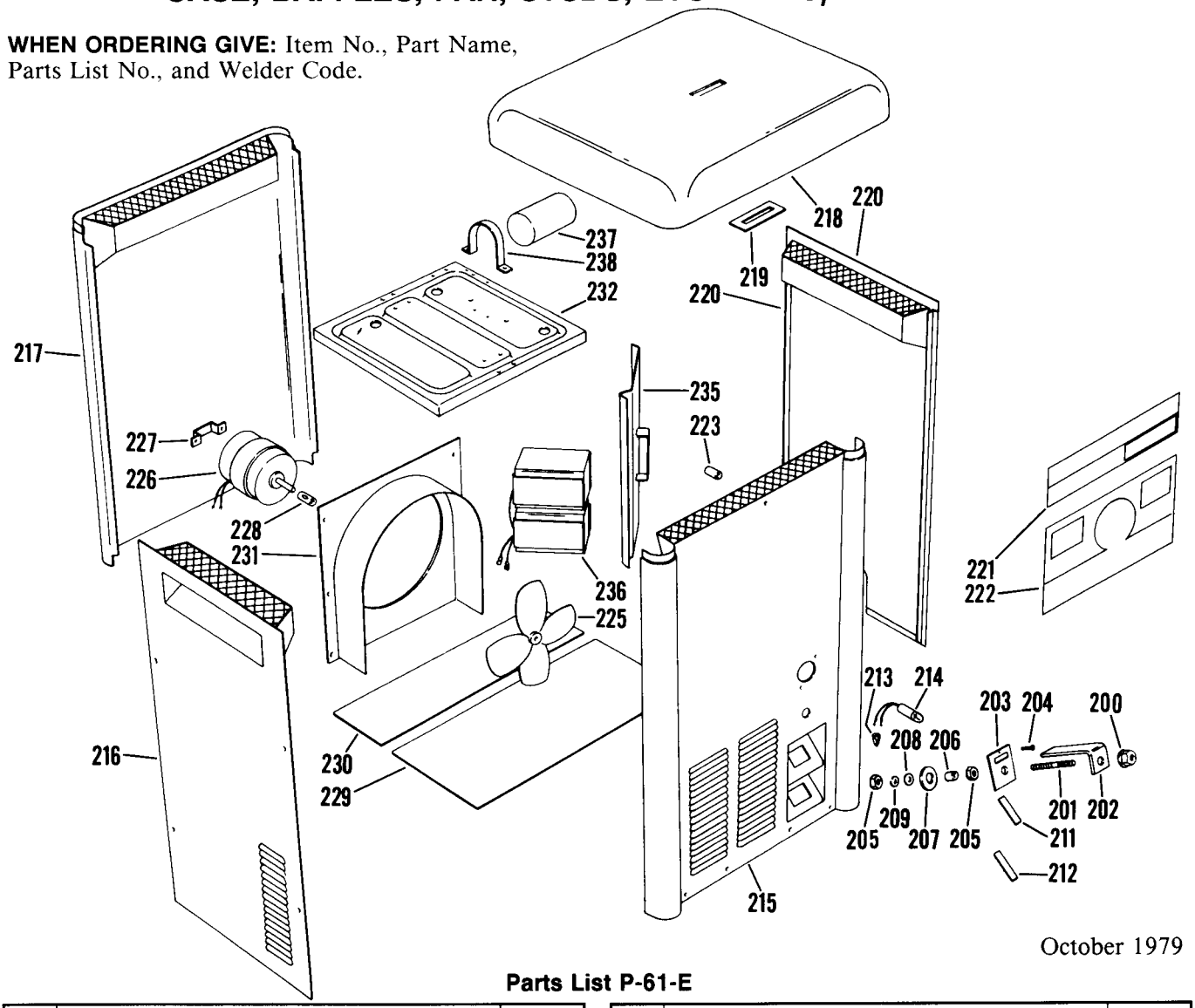
ITEM	PART NAME & DESCRIPTION	NO. REQ'D
	Output Stud Assembly Includes:	
250	Hex Flanged Weld Nut	2
251	Stud	2
252	Connection Strap	2
253	Stud Insulation	2
254	Self Tapping Screw	2
255	Hex Jam Nut	4
256	Insulating Tube	2
257	Insulating Washer	2
258	Flat Washer	4
259	Lock Washer	2
261	Decal (Electrode)	1
262	Decal (To Work)	1
263	Wire Nut	1
264	Pilot Light	1
265	Front Panel	1
266	Left Side Panel	1
267	Back Panel	1
268	Top	1
269	Cover Seal	1

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
270	Right Side Panel	1
271	Nameplate — Early Codes Only	1
271A	Dial Plate — Early Codes Only	1
272	Nameplate	
273	Spacer	1
275	Fan	1
276	Fan Motor	1
277	Fan Bracket Support	1
278	Fan Bushing, 300 Amp (25 Hertz Only)	1
279	Large Base Baffle	1
280	Small Base Baffle	1
281	Vertical Baffle	1
283	Horizontal Baffle and Lift Bail Assembly	1
286	Capacitors, Accessory C	1
287	Stabilizing Capacitor, Accessory Z	1
288	Capacitor Strap	1

10-10-85

CASE, BAFFLES, FAN, STUDS, ETC. — AC/DC MODELS

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



October 1979

Parts List P-61-E

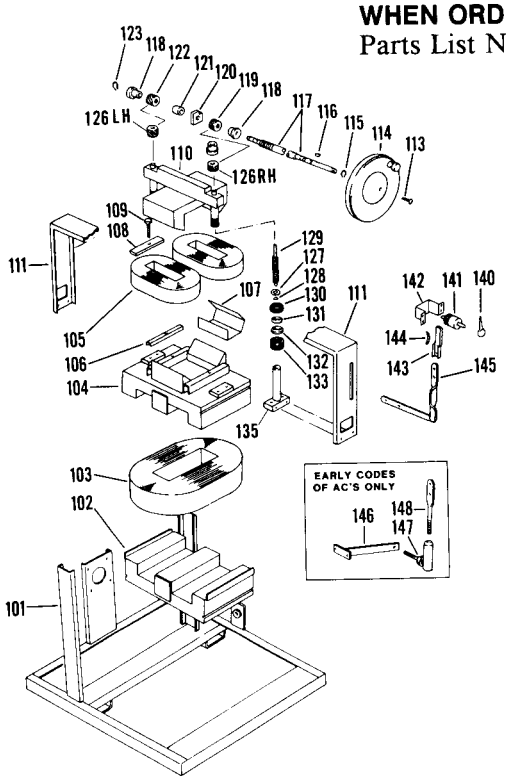
ITEM	PART NAME & DESCRIPTION	NO. REQ'D
	Output Stud Assembly, Includes:	
200	Hex Flanged Weld Nut	2
201	Stud	2
202	Connection Strap	2
203	Stud Insulation	2
204	Self Tapping Screw	2
205	Hex Jam Nut	4
206	Insulating Tube	2
207	Insulating Washer	2
208	Flat Washer	4
209	Lock Washer	2
211	Decal (Electrode)	1
212	Decal (To Work)	1
213	Wire Nut	2
214	Pilot Light	1
215	Front Panel	1
216	Left Side Panel	1
217	Back Panel	1
218	Top	1
219	Cover Seal	1

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
220	Right Side Panel	1
221	Nameplate — Early Codes Only	1
222	Nameplate	1
223	Spacer	1
225	Fan	1
226	Fan Motor	1
227	Fan Bracket Support	1
228	Fan Bushing, 300 Amp 25 Cycle Only	1
229	Large Base Baffle	1
230	Small Base Baffle	1
231	Vertical Baffle	1
232	Horizontal Baffle	1
235	Capacitor Panel	1
236	Capacitor, Accessory C	1
237	Capacitor, Accessory Z	1
238	Capacitor Strap	2

2-16-82

TRANSFORMER AND CURRENT CONTROLS
AC & AC/DC MODELS

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



June 1986

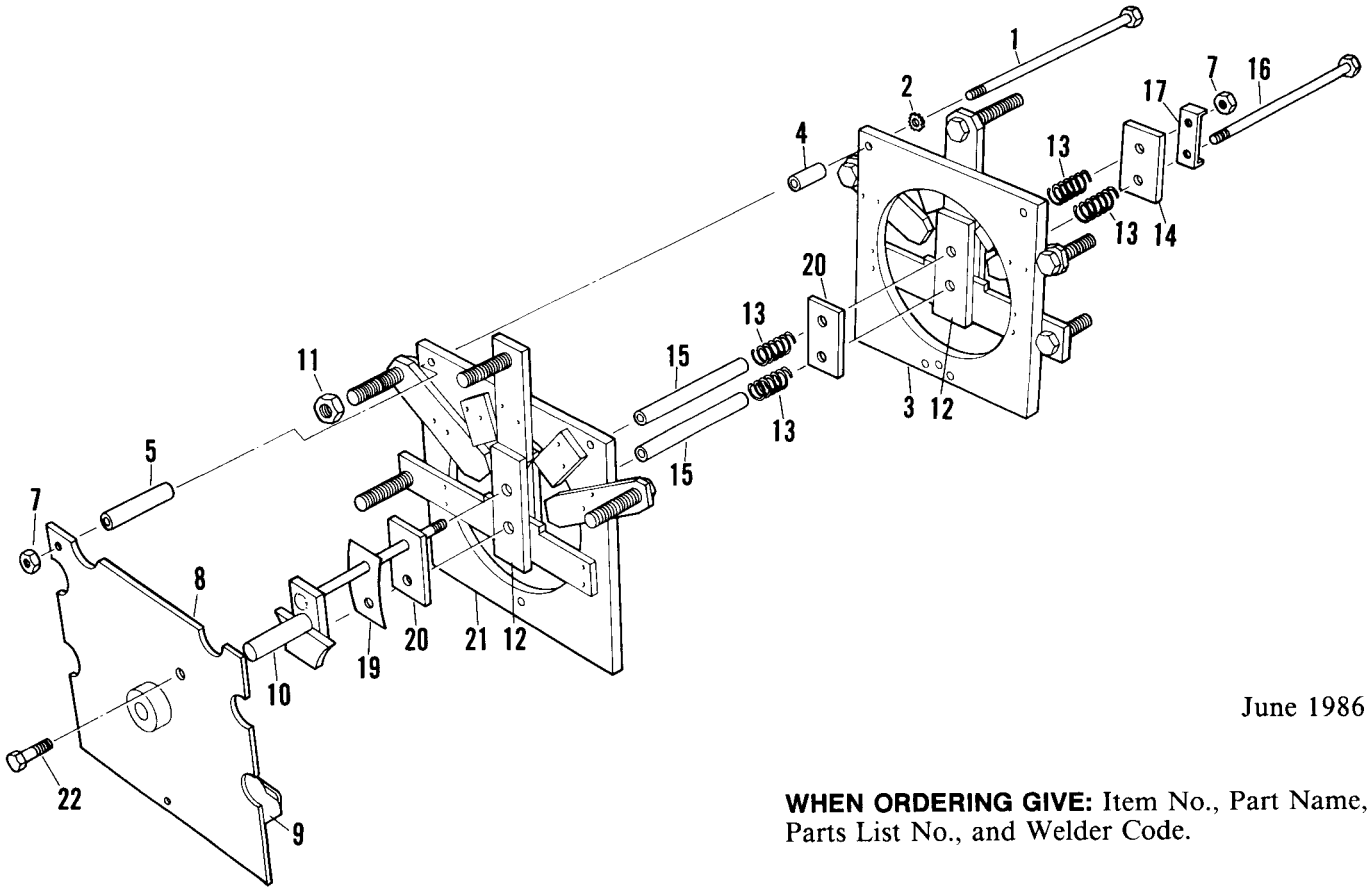
Parts List P-61-D

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
101	Base	1
102	Transformer Lower Lamination	1
103	Transformer Coil	1
104	Reactor Lower & Transformer Upper Lam.	1
	Hex Head Screw (Clamp Item 102 to 104)	6
105	Reactor Coil	1
106	Coil Clamp Insulation	2
107	Coil Insulation	2
108	Coil Clamp	2
109	Hex Head Bolt	2
	Lock Washer	2
110	Reactor Upper Lamination, Includes:	1
	Control Post (Left Hand)*	
	Control Post (Right Hand)*	
111	Shaft Support	1
113	Oval Head Screw	1
114	Control Handle	1
115	Snap Ring	5
116	Woodruff Key	4
117	Control Shaft	1
118	Shaft Bearing	1
119	Helical Gear (Right Hand)*	1
120	Crank Stop Tube & Nut	1
120	Crank Stop Nut Assembly	1
121	Stop Nut	1
122	Helical Gear (Left Hand)*	1
123	Snap Ring	1
125	Sleeve Bearing	2
126	Helical Gear (Right Hand)*	1

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
126	Helical Gear (Left Hand)*	1
127	"O" Ring	2
128	Wafer Bearing	2
129	Control Screw (Right Hand)*	1
129	Control Screw (Left Hand)*	1
129A	Control Screw Boots (Not Illustrated)	2
130	Retaining Lock Ring	2
131	Nylon Insert	2
132	Control Sleeve	2
133	Retaining Cap	2
135	Reactor Control Pin	2
140	Dial Pointer	1
141	Pointer Drive Gear	1
142	Pointer Mounting Bracket	1
143	Pointer Rack	1
144	Rack Spring	1
145	Support Arm Assembly	1
146	Drive Arm Assembly, Early Codes — AC Models	1
147	Ball Joint Connector, Early Codes — AC Models	1
148	Support Arm Assembly, Early Codes — AC Models	1
*	Right Hand Threaded Gears are to the Front of the Welder and Left Hand to the Rear	

2-16-82

ARC POLARITY SWITCH — AC/DC MODELS



June 1986

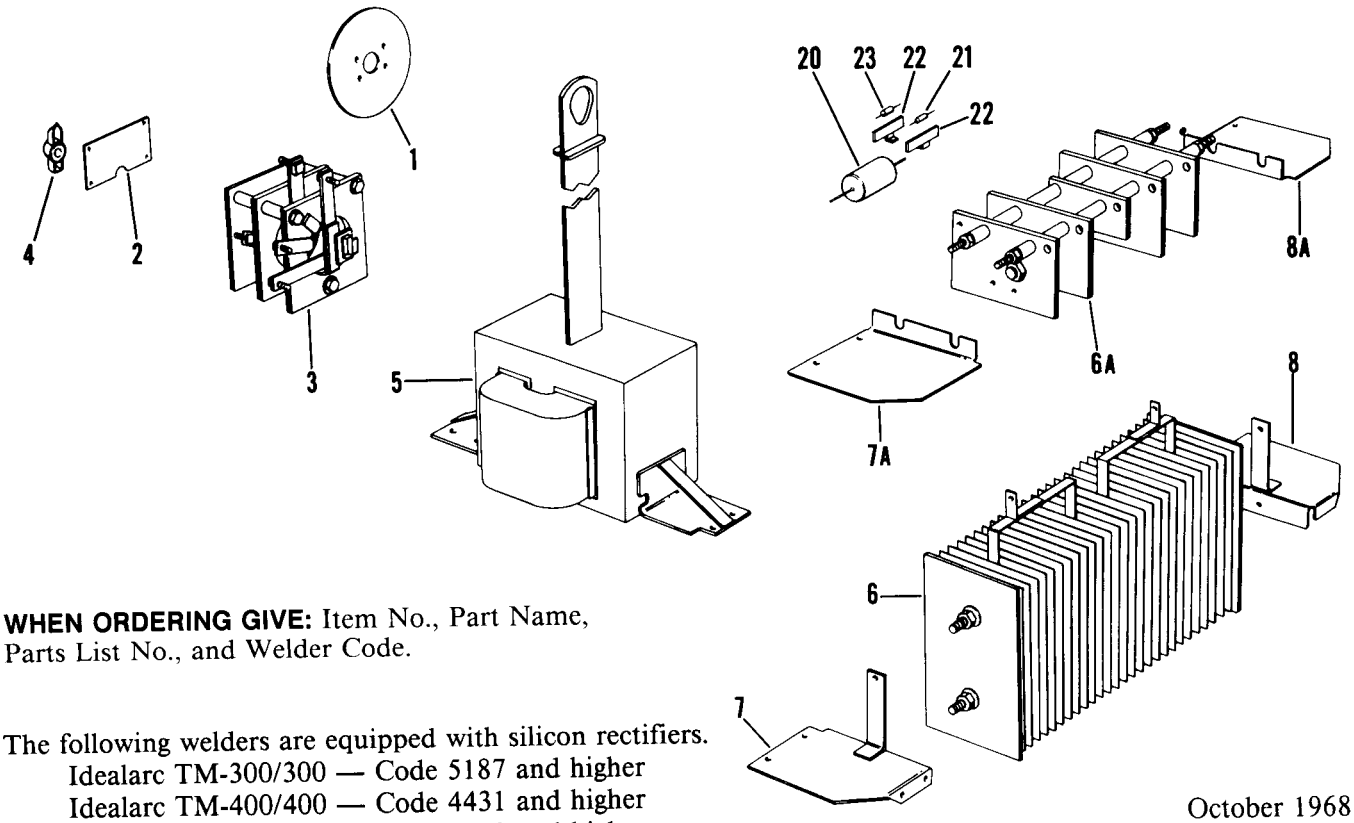
WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.

Parts List P-61-H

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
	Arc Polarity Switch Assembly, Includes:	1
1	Hex Head Bolt	3
2	Lock Washer	3
3	Contact Panel Assembly	2
4	Spacer	3
5	Spacer	3
6	Plain Washer	3
7	Hex Nut	4
8	Mounting Bracket Assembly	1
9	Spring	1
10	Shaft Assembly	1
11	Hex Nut	8
12	Moving Contact	4
13	Spring	4
14	Insulating Washer	1
15	Insulating Tube	2
16	Hex Head Bolt	1
17	Locking Clip	1
18	Insulating Washer	1
19	Spring	1
20	Rotor Insulation	2
21	Contact Panel Assembly	1
22	Self Tapping Screw	1

11-9-83

DC UNIT ASSEMBLY — AC/DC MODELS



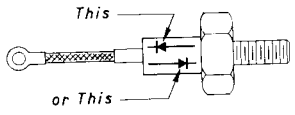
WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.

October 1968

The following welders are equipped with silicon rectifiers.
Idealarc TM-300/300 — Code 5187 and higher
Idealarc TM-400/400 — Code 4431 and higher
Idealarc TM-500/500 — Code 4530 and higher
Idealarc TM-650/650 — Code 5346 and higher

* When ordering replacement rectifiers always give:

1. Welder model, code and serial number.
2. The part number printed on the rectifier (example: M-9661-3, or S-12837-2, etc.)
3. Whether the pigtail is connected to the + (red) or − (black) terminals.
4. The rectifier polarity symbol.

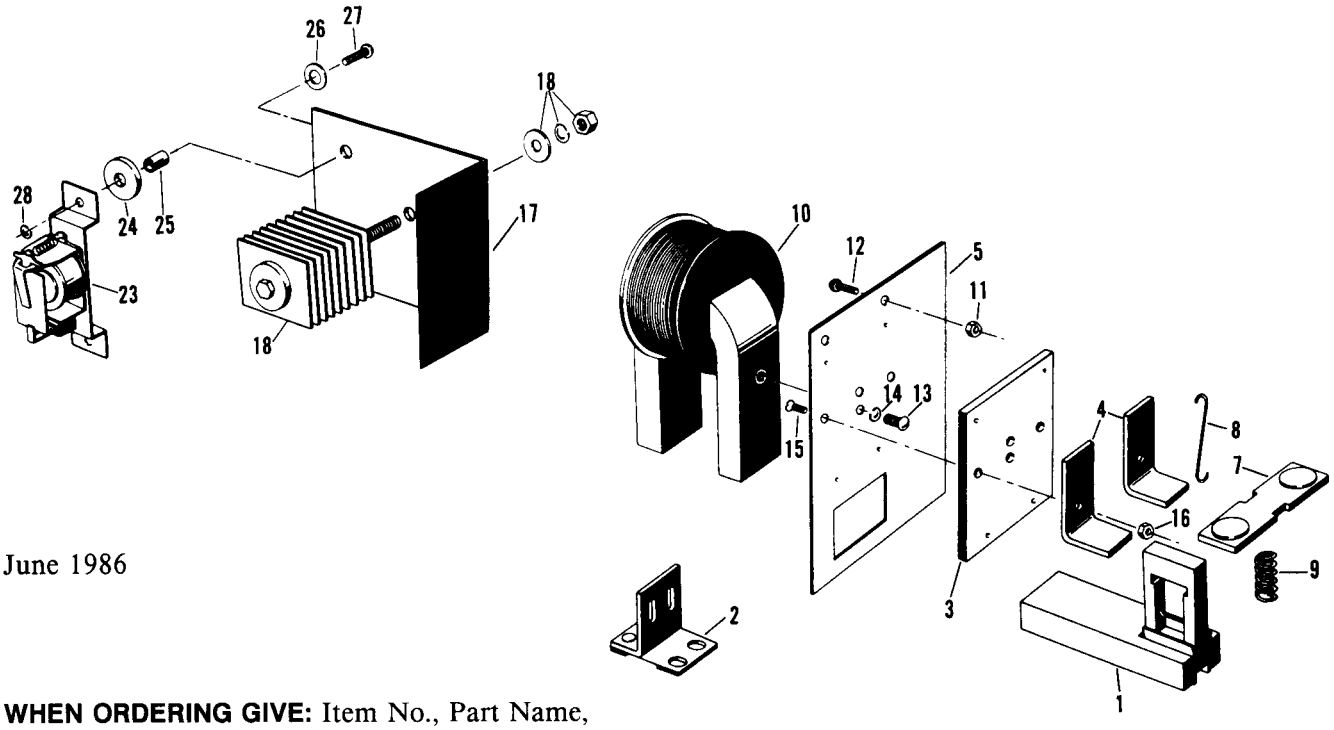


Parts List P-61-G

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
1	AC/DC Dial Plate (Early Codes Only)	1
2	Polarity Switch Nameplate (Early Codes Only)	1
3	Polarity Switch	1
3	Polarity Switch (With Accessory A Only)	
	Polarity Switch Parts See P-61-H	
4	Handle	1
5	Choke Coil and Lamination Assembly, Includes:	1
	Choke Coil	1
	Thermostat Assembly	1
6	Rectifier	1
7	Rectifier Bracket Support, Right	1
8	Recitifier Bracket Support, Left	1
6A	Silicon Rectifier, Includes:	1
	Diodes*	4 or 12
7A	Rectifier Bracket Support, Right (Incl. Items 20, 21, 22 & 23)	1
8A	Rectifier Bracket Support, Left	1
	Suppressor Assy. (Incl. Items 20, 21 & 23)	
20	Capacitor	1
21	Resistor	1
23	Resistor	1
25	DC Thermostat (Not Shown)	

2-16-82

A — ARC BOOSTER
(Not Used on Codes Above 8150)



June 1986

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

Parts List P-61-J

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
	Delay Relay Panel Assembly, Includes:	1
	Delay Relay Assembly, Includes:	1
1	Armature Assembly	1
2	Hinge Assembly	1
3	Contact Block	1
4	Stationary Contact	2
5	Contact Block Insulation	1
7	Moving Contact	1
8	Fuse Wire	3
9	Spring	1
10	Frame and Coil Assembly	1
11	Hex Nut	3
12	Sems Round Head Screw	3
13	Round Head Screw	2
14	Lock Washer	2
15	Flat Head Screw	2
16	Hex Nut	2
17	Panel	1
	Pilot Relay and Rectifier Assembly, Includes:	1
18	Rectifier	1
23	Pilot Relay	1
	Rectifier	1
	Capacitor	1
	Resistor	1
24	Pilot Relay Gasket	1
25	Insulating Tube	2
26	Flat Washer	2
27	Round Head Screw	2
28	Lock Washer	2
	Pilot Relay Box Assembly	1
	Surge Reactor Coil and Lamination Assembly	1
	Polarity Switch and Arc Booster Transfer Switch Assembly, Includes:	1
	Polarity Switch	1
	Polarity Switch Parts See P-61-H	
	Transfer Switch	1
	Actuator Guide	1
	Spacer	2

September 1980

K — REMOTE CURRENT CONTROL

Parts List P-61-K

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
	Drive Unit	1
	Drive Unit Shim	As Req'd
	Control Shaft	1
	Sprocket	1
	Sprocket	1
	Woodruff Key #404	1
	Woodruff Key #606	1
	Chain	1
	Connecting Link	1
	Half Link	1
	Bracket and Housing Assembly	1
	Drive Unit Adapter Assembly	1
	Resistor	1
	Fuse	1
	Bracket and Housing Assembly	1
	Cover and Relay Mounting Panel Assembly Includes:	1
	Cover and Relay Mounting Panel	1
	Relay	2
	Transformer	1
	Transformer Bracket	1
	Self Tapping Screw, Panel to Case	1
	Remote Switch and Cable Assembly	1
	Limit Switch Mounting Plate	1
	Self Tapping Screw, Limit Switch to Plate	1
	Limit Switch	2
	Actuator, Includes Mounting Parts	2
	Limit Switch Stop Bracket	1
	Carriage Bolt, Lower Limit Switch Stop	1
	Hex Nut, Lower Limit Switch Stop	1
	Self Tapping Screw, Mounts Limit	
	Switch Stop Bracket	2
	Receptacle and Lead Assembly	1

October 1979

L — LINE CONTACTOR

Parts List P-61-L

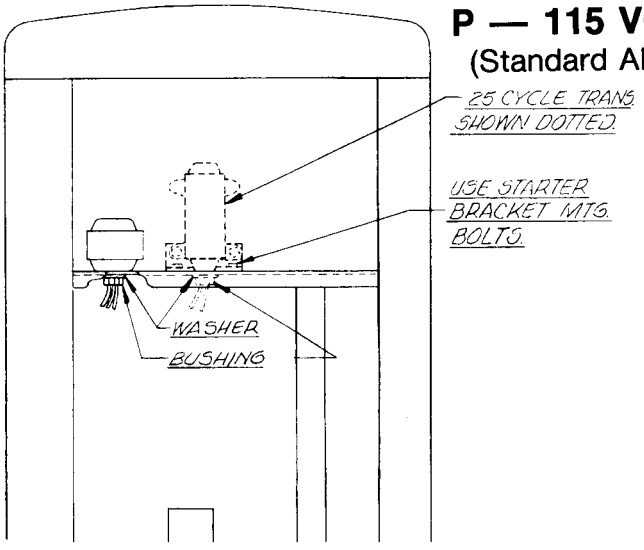
WHEN ORDERING GIVE: Item No., Part Name, Parts List No., and Welder Code.

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
	GXL Starter, Less NVR Coil, 300 Amp	1
	GXL Starter Parts See P-28-F	
	S-45, S-67 or S-78 Starter, Less NVR Coil, 400, 500 and 650 Amp	1
	S-45 Starter Parts See P-28-E	
	S-67 Starter Parts See P-28-H	
	S-78 Starter Parts See P-28-J	
	Two Volt Input Panel, Stationary, Specify Voltages	1
	Two Volt Input Panel, Movable	1
	Starter Mounting Panel	1
	Thread Cutting Screw, S-45 Mounting	2
	AC Thermostat Assembly, Includes:	1
	Push Button	1
	Klixon Thermostat	1

September 1980

P — 115 VOLT CONTROL

(Standard Above Code 8150)



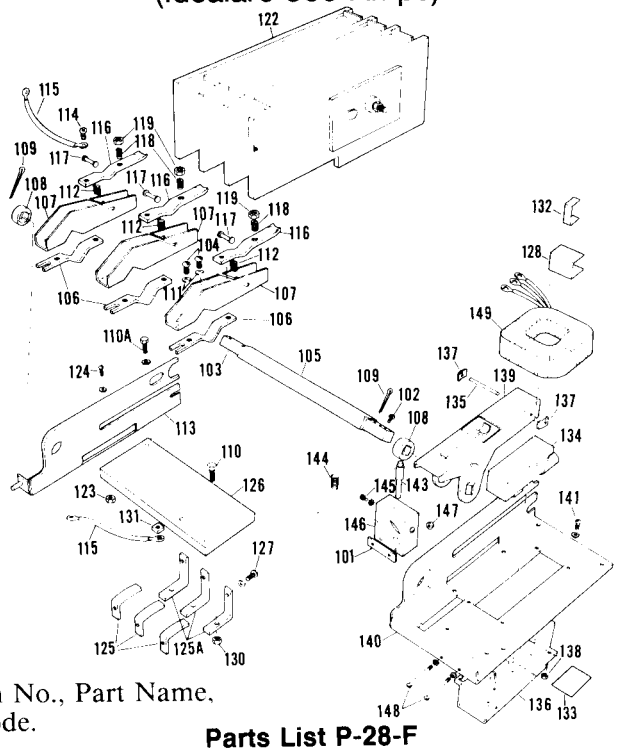
Parts List P-61-M

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
	Transformer	1
	Transformer Mounting Bracket	1
	Sems Screw, Bracket Mounting	2
	NVR Coil	1
	Conduit Bushing	1
	Washer	1
	Round Head Screw	2
	Hex Nut	2
	Sems Screw	

September 1980

GXL STARTER

(Idealarc 300 Amps)



June 1986

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

Parts List P-28-F

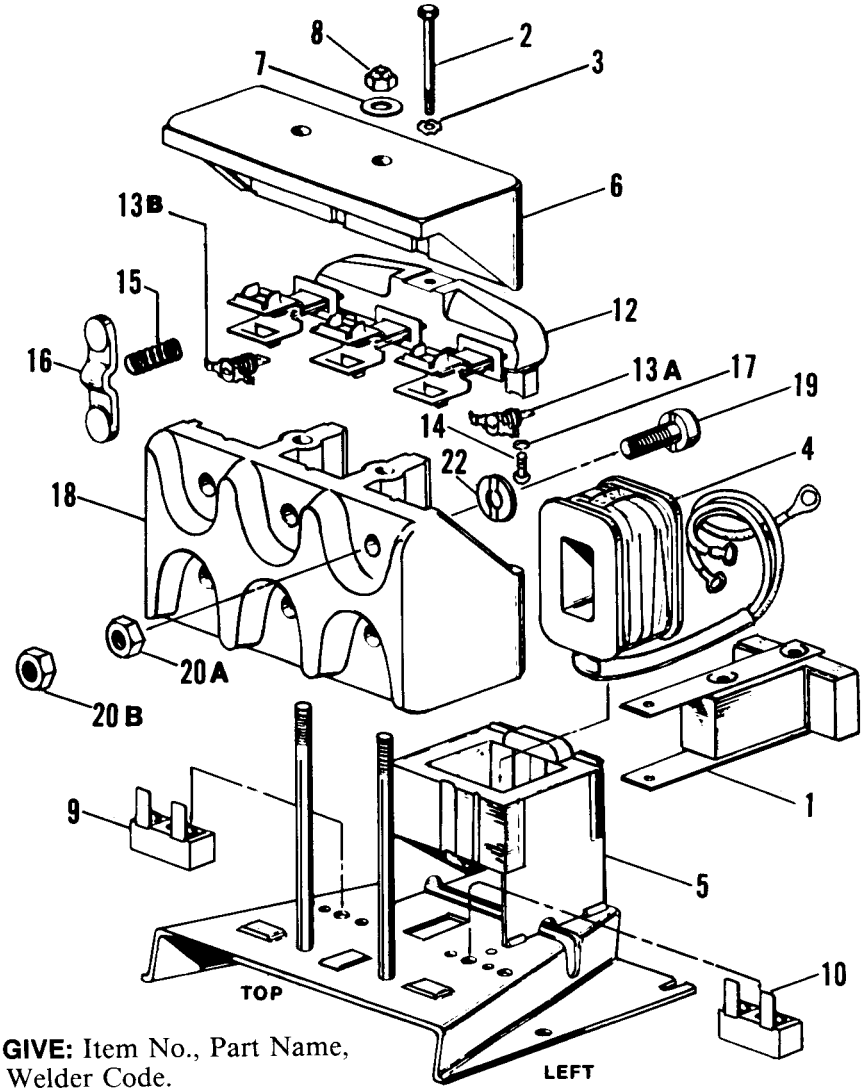
ITEM	PART NAME & DESCRIPTION	NO. REQ'D
	GXL Starter, Includes: (Less NVR Coil)	1
101	Interlock Insulation	1
	Interlock Support Plate	1
102	Sems Round Head Screw	2
103	Square Shaft	1
104	Sems Round Head Screw	6
105	Shaft Insulation	1
106	Contact Arm Clamp	2(1)
107	Contact Arm	2(1)
108	Bearing, Nylon	2
109	Cotter Pin	2
110	Hex Head Cap Screw — Contact Mounting (Lower)	3
110	Hex Head Cap Screw — Contact Mounting (Upper)	3
111	Shakeproof Washer	6
112	Contact Spring	2(1)
113	Side Panel, Left Side	1
114	Sems Round Head Screw	3
115	Lead With Lugs	2(1)
116	Moving Contact	2(1)
117	Rivet, Contact Assembly	2(1)
118	Headless Slotted Set Screw	2(1)
119	Hex Nut	2(1)
122	Barrier	1
123	Hex Nut, Contact Block Mounting	4
124	Sems Round Head Cap Screw — Contact Block Mounting	2
	Shakeproof Washer	4
	Contact Block Assembly, Includes	1
125	Stationary Contact	2(1)
126	Contact Block	1
	Stationary Contact (Not Illus.)	
	Moving Contact (Not Illus.)	
127	Sems Round Head Screw — Lead Connection	2(1)
128	NVR Coil Clamp Insulation	1
129	Jumper	
130	Hex Nut	
131	Square Nut	3
132	Clamp, NVR Coil	1
133	Fiber Retainer, NVR Coil	1
134	Moving Lamination Note 1	1
135	NVR Arm Pin	1
136	Station Lamination	1
137	Tinnerman Nut	2
138	Hex Nut	4
	Shakeproof Washer	4
139	Movable NVR Crossing Arm	1
140	Side Panel — Right Hand	1
141	Sems Round Head Screw, Lamination Mounting	4
	Interlock Assembly, Includes:	1
143	Plunger	1
144	Coil Spring	1
145	Sems Phillips Head Screw	2
146	Interlock Block	1
147	Hex Nut	2
148	Sems Round Head Screw — Interlock Mounting	2
	Lug	3
	Round Head Screw — Lug Mounting	3
149	NVR Coil (Specify Input Voltage)	1
	NOTE 1: To obtain proper moving lamination (Item 134) specify input line cycles.	

(1) 2 or 3 for 1 or 3 phase.

5-16-84

S-45, S-67 OR S-78 STARTER

(Idealarc 400, 500 and 650 Amps)



June 1986

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

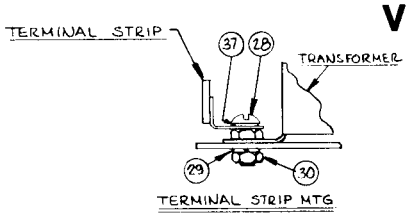
Parts List P-28-E, P-28-H or P-28-J
for Idealarc 400, 500 & 650

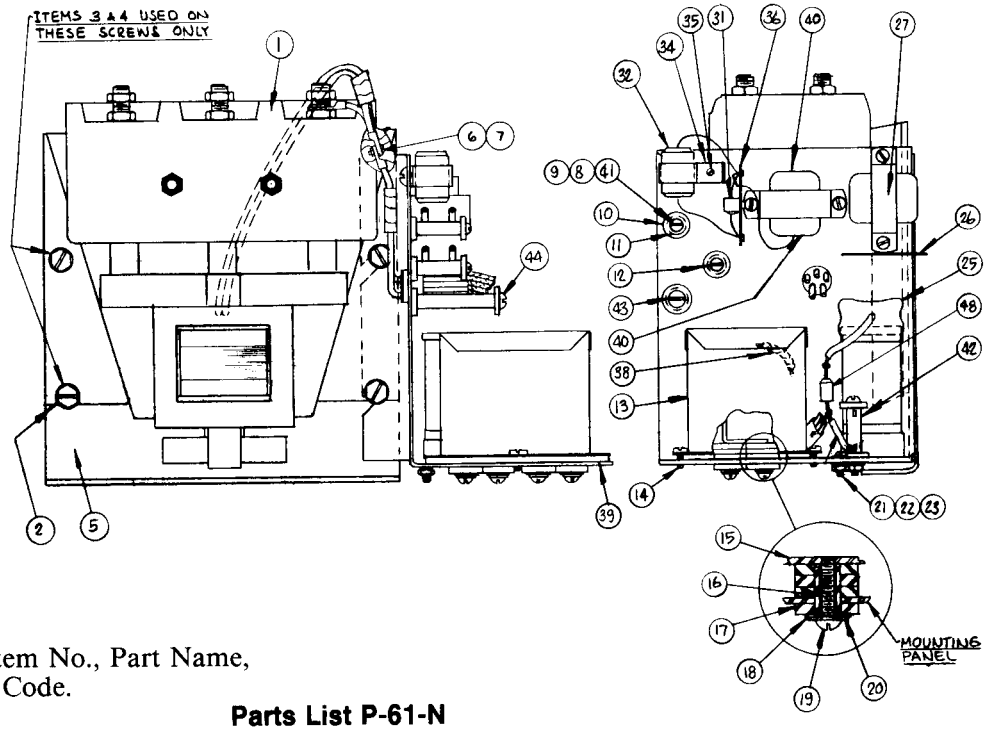
ITEM	PART NAME & DESCRIPTION	NO. REQ'D
	S-45, S-67 or S-78 Starter Assembly, Includes:	
	(Less NVR Coil)	1
1	Moving Lamination Assembly	1
2	Screw — Lamination Mounting	1
3	Lock Washer	1
4	NVR Coil (Not Included in Assembly)	1
5	Lamination & Mounting Panel Assembly	
	(Specify Input Cycles)	1
	Plastic Insert	1
6	Contact Block Cover	1
7	Plain Washer	2
8	Hugnut	2
9	Stationary Interlock Contact Assembly	1

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
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:	1
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

1-25-84

V — LOW VOLTAGE CONTACTOR
(Below Code 8300)





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

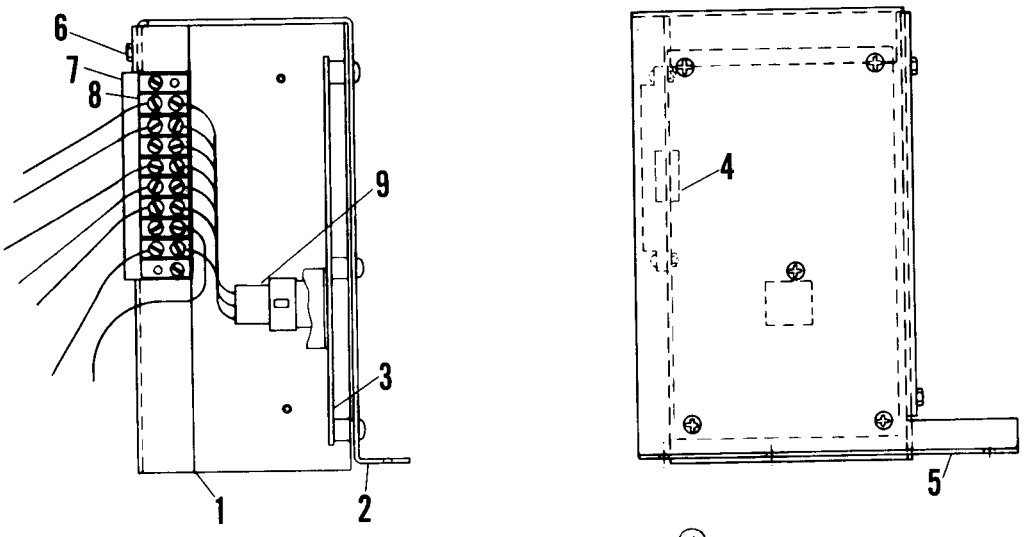
Parts List P-61-N

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
	Reduced Voltage Switch Assembly, Includes:	1
1	S-45 or S-67 Contactor S-45 Contactor Parts See P-28-E S-67 Contactor Parts See P-28-H	1
2	Thread Cutting Screw	4
3	Lock Washer	4
4	Hex Nut	2
5	Mounting Panel	1
6	Round Head Screw	2
7	Hex Nut	2
8	Lock Washer	2
9	Hex Nut	2
10	Insulating Washer	4
11	Resistor	1
12	Resistor	1
13	Pilot Relay Box	1
14	Self Tapping Screw	2
15	DC Relay (Note 1)	2
16	Insulating Bushing	4
17	Insulating Washer	16
18	Flat Washer	4
19	Round Head Screw	4
20	Lock Washer	4
21	Hex Nut	2
22	Lock Washer	2
23	Round Head Screw	2
25	Capacitor Assembly	1
26	Terminal Strip	2

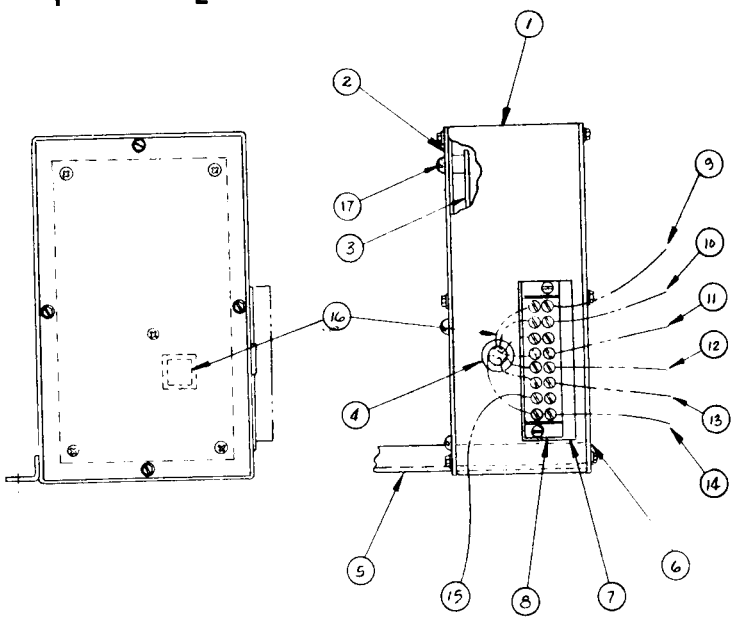
ITEM	PART NAME & DESCRIPTION	NO. REQ'D
27	Transformer	1
28	Round Head Screw	4
29	Lock Washer	4
30	Hex Nut	6
31	Rectifier	1
32	Capacitor	1
34	Clamp	1
35	Self Tapping Screw	1
36	Rectifier Support Assembly	2
37	Lock Washer	2
38	Sleeving	3
39	Cover Gasket	1
40	Transformer	1
41	Round Head Screw	3
42	Resistor (100 OHM)	1
43	Adjustable Resistor (400 OHM)	1
44	Round Head Screw	1
48	Diode (Serial A-291347 & Above)	1
	Parts Not Illustrated:	
	Terminal Strip	1
	Number Plate	1
	Note 1: Original models of the Low Voltage Contactor had only 1 DC relay. They did not include items 42 and 43.	

V — LOW VOLTAGE CONTACTOR

(Above Code 8300)



S-16810
9-19-80L



M-14237
7-15-83N

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

Parts List P-61-P

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
1	Control Box	1
2	Back Cover	1
3	P.C. Board	1
4	Grommet	1
5	Mounting Bracket	1
6	Front Cover	1
7	Number Plate	1
8	Terminal Strip	1
9	Receptacle & Lead Assembly	1
10	S-78 Contactor (Less NVR Coil)	1
	S-78 Contactor Parts	1
	Contactor NVR Coil	1
11	Mounting Panel	1
12	Nameplate (Not Illustrated)	1

5-19-82

NOTES

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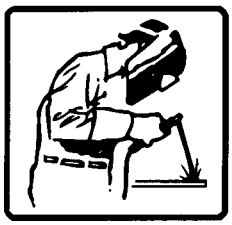

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WARNING	● Do not touch electrically live parts or electrode with skin or wet clothing. ● Insulate yourself from work and ground.	● Keep flammable materials away.	● Wear eye, ear and body protection.
Spanish **AVISO DE PRECAUCION**	● No toque las partes 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 INSTRUCTION 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 Schweibrauch! ● 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 paineis 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。	●當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説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.

PERFORMANCE PLUS PROTECTION

3 YEAR WARRANTY PARTS & LABOR

LINCOLN® ELECTRIC

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
- Inverter Welders
- Automatic Wire Feeders
- 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, engine accessories and Power-Arc 4000 generator/welders) 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.

One Year:
Equipment not listed above such as gun and cable assemblies, water coolers, FAS TRAK or MIG-TRAK equipment, Power-Arc 4000 generator/welders, Wire Feed Module (Factory Installed) and field-installed optional equipment.

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.

WARRANT 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

March, '96