PipeWorx 400
Welding System
(380-400 Volt Model)
CE

For product information, Owner’s Manual translations, and more, visit www.MillerWelds.com
From Miller to You

Thank you and congratulations on choosing Miller. Now you can get the job done and get it done right. We know you don’t have time to do it any other way.

That’s why when Niels Miller first started building arc welders in 1929, he made sure his products offered long-lasting value and superior quality. Like you, his customers couldn’t afford anything less. Miller products had to be more than the best they could be. They had to be the best you could buy.

Today, the people that build and sell Miller products continue the tradition. They’re just as committed to providing equipment and service that meets the high standards of quality and value established in 1929.

This Owner’s Manual is designed to help you get the most out of your Miller products. Please take time to read the Safety Precautions. They will help you protect yourself against potential hazards on the worksite. We’ve made installation and operation quick and easy. With Miller, you can count on years of reliable service with proper maintenance. And if for some reason the unit needs repair, there’s a Troubleshooting section that will help you figure out what the problem is, and our extensive service network is there to help fix the problem. Warranty and maintenance information for your particular model are also provided.

Miller Electric manufactures a full line of welders and welding-related equipment. For information on other quality Miller products, contact your local Miller distributor to receive the latest full line catalog or individual specification sheets. To locate your nearest distributor or service agency call 1-800-4-A-Miller, or visit us at www.MillerWelds.com on the web.
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WARRANTY
DECLARATION OF CONFORMITY

for European Community (CE marked) products.

MILLER Electric Mfg. Co., 1635 Spencer Street, Appleton, WI  54914 U.S.A. declares that the product(s) identified in this declaration conform to the essential requirements and provisions of the stated Council Directive(s) and Standard(s).

Product/Apparatus Identification:

<table>
<thead>
<tr>
<th>Product</th>
<th>Stock Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIPEWORX 400 POWER SOURCE, 380 –400</td>
<td>907534</td>
</tr>
<tr>
<td>PIPEWORX SINGLE BENCH FEEDER, CE</td>
<td>300949</td>
</tr>
<tr>
<td>PIPEWORX DUAL BENCH FEEDER</td>
<td>300950</td>
</tr>
<tr>
<td>PIPEWORX COOLER</td>
<td>300370</td>
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Council Directives:
- 2014/35/EU Low voltage
- 2014/30/EU Electromagnetic compatibility
- 2011/65/EU Restriction of the use of certain hazardous substances in electrical and electronic equipment

Standards:
- IEC 60974–1:2012 Arc welding equipment – Part 1: Welding power sources
- IEC 60974–2:2013 Arc welding equipment – Part 2: Liquid cooling systems
- IEC 60974–5:2013 Arc welding equipment – Part 5: Wire feeders

Signatory:

David A. Werba
MANAGER, PRODUCT DESIGN COMPLIANCE

Date of Declaration

October 30, 2017

255729E
Product/Apparatus Identification

<table>
<thead>
<tr>
<th>Product</th>
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<tbody>
<tr>
<td>PIPEWORX 400 POWER SOURCE, 380-400V (CE)</td>
<td>907534</td>
</tr>
</tbody>
</table>

Compliance Information Summary

Applicable regulation Directive 2014/35/EU

Intended use ☒ for occupational use ☐ for use by laymen
Non-thermal effects need to be considered for workplace assessment ☒ YES ☐ NO
Thermal effects need to be considered for workplace assessment ☐ YES ☒ NO
☒ Data is based on maximum power source capability (valid unless firmware/hardware is changed)
☐ Data is based on worst case setting/program (only valid until setting options/welding programs are changed)
☐ Data is based on multiple settings/programs (only valid until setting options/welding programs are changed)

Occupational exposure is below the Exposure Limit Values (ELVs) for health effects at the standardized configurations ☒ YES ☐ NO (if NO, specific required minimum distances apply)
Occupational exposure is below the Exposure Limit Values (ELVs) for sensory effects at the standardized configurations ☐ n.a ☒ YES ☐ NO (if applicable and NO, specific measures are needed)
Occupational exposure is below the Action Levels (ALs) at the standardized configurations ☐ n.a ☐ YES ☒ NO (if applicable and NO, specific signage is needed)

EMF Data for Non-thermal Effects

Exposure Indices (EIs) and distances to welding circuit (for each operation mode, as applicable)

<table>
<thead>
<tr>
<th>Head</th>
<th>Sensory Effects</th>
<th>Health Effects</th>
<th>Trunk</th>
<th>Limb (hand)</th>
<th>Limb (thigh)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 cm</td>
<td>3 cm</td>
<td>3 cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 cm</td>
<td>3 cm</td>
<td>3 cm</td>
</tr>
<tr>
<td></td>
<td>0.37</td>
<td>0.33</td>
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<td>0.30</td>
<td>0.69</td>
</tr>
<tr>
<td></td>
<td>2 cm</td>
<td>2 cm</td>
<td>4 cm</td>
<td>1 cm</td>
<td>2 cm</td>
</tr>
</tbody>
</table>

Distance where all occupational ELV Exposure Indices fall below 0.20 (20%) 38 cm
Distance where all general public ELV Exposure Indices fall below 1.00 (100%) 425 cm

Tested by: Tony Samimi  Date tested: 2016-02-01

275552-A
Protect yourself and others from injury — read, follow, and save these important safety precautions and operating instructions.

1-1. Symbol Usage

- **DANGER!** - Indicates a hazardous situation which, if not avoided, will result in death or serious injury. The possible hazards are shown in the adjoining symbols or explained in the text.
- **WARNING!** - Indicates a hazardous situation which, if not avoided, could result in death or serious injury. The possible hazards are shown in the adjoining symbols or explained in the text.

**NOTICE** – Indicates statements not related to personal injury.

1-2. Arc Welding Hazards

The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard. The safety information given below is only a summary of the more complete safety information found in the Safety Standards listed in Section 1-6. Read and follow all Safety Standards.

Only qualified persons should install, operate, maintain, and repair this equipment. A qualified person is defined as one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, has successfully demonstrated ability to solve or resolve problems relating to the subject matter, the work, or the project and has received safety training to recognize and avoid the hazards involved.

During operation, keep everybody, especially children, away.

**ELECTRIC SHOCK can kill.**

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also live when power is on. In semiautomatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

- Do not touch live electrical parts.
- Wear dry, hole-free insulating gloves and body protection.
- Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground.
- Do not use AC weld output in damp, wet, or confined spaces, or if there is a danger of failing.
- Use AC output ONLY if required for the welding process.
- If AC output is required, use remote output control if present on unit.
- Additional safety precautions are required when any of the following electrically hazardous conditions are present: 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; or when there is a high risk of unavoidable or accidental contact with the workpiece or ground. For these conditions, use the following equipment in order presented: 1) a semiautomatic DC constant voltage (wire) welder, 2) a DC manual (stick) welder, or 3) an AC welder with reduced open-circuit voltage. In most situations, use of a DC, constant voltage wire welder is recommended. And, do not work alone!

- Disconnect input power or stop engine before installing or servicing this equipment. Lockout/tagout input power according to OSHA 29 CFR 1910.147 (see Safety Standards).
- Properly install, ground, and operate this equipment according to its Owner’s Manual and national, state, and local codes.
- Always verify the supply ground – check and be sure that input power cord ground wire is properly connected to ground terminal in disconnect box or that cord plug is connected to a properly grounded receptacle outlet.
- When making input connections, attach proper grounding conductor first – double-check connections.
- Keep cords dry, free of oil and grease, and protected from hot metal and sparks.
- Frequently inspect input power cord and ground conductor for damage or bare wiring – replace immediately if damaged – bare wiring can kill.
- Turn off all equipment when not in use.
- Do not use worn, damaged, undersized, or repaired cables.
- Do not drape cables over your body.
- Do not touch electrode if you are in contact with the work, ground, or another electrode from a different machine.
- Do not connect more than one electrode or work cable to any machine at the same time since double open-circuit voltage will be present.
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
- Wear a safety harness if working above floor level.
- Keep all panels and covers securely in place.
- Clamp work cable with good metal-to-metal contact to workpiece or worktable as near the weld as practical.
- Insulate work clamp when not connected to workpiece to prevent contact with any metal object.
- Do not connect more than one electrode or work cable to any single weld output terminal. Disconnect cable for process not in use.
- Use GFCI protection when operating auxiliary equipment in damp or wet locations.

**SIGNIFICANT DC VOLTAGE exists in inverter welding power sources AFTER removal of input power.**

- Turn off unit, disconnect input power, and discharge input capacitors according to instructions in Manual before touching any parts.

**HOT PARTS can burn.**

- Do not touch hot parts bare handed.
- Allow cooling period before working on equipment.
- To handle hot parts, use proper tools and/or wear heavy, insulated welding gloves and clothing to prevent burns.

This group of symbols means Warning! Watch Out! ELECTRIC SHOCK, MOVING PARTS, and HOT PARTS hazards. Consult symbols and related instructions below for necessary actions to avoid the hazards.
FUMES AND GASES can be hazardous.

Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.

- Keep your head out of the fumes. Do not breathe the fumes.
- Ventilate the work area and/or use local forced ventilation at the arc to remove welding fumes and gases. The recommended way to determine adequate ventilation is to sample for the composition and quantity of fumes and gases to which personnel are exposed.
- If ventilation is poor, wear an approved air-supplied respirator.
- Read and understand the Safety Data Sheets (SDSs) and the manufacturer’s instructions for adhesives, coatings, cleaners, consumables, coolants, degreasers, fluxes, and metals.
- Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Always have a trained watchperson nearby. Welding fumes and gases can displace air and lower the oxygen level causing injury or death. Be sure the breathing air is safe.
- Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
- Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.

ARC RAYS can burn eyes and skin.

Arc rays from the welding process produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin. Sparks fly off from the weld.

- Wear an approved welding helmet fitted with a proper shade of filter lenses to protect your face and eyes from arc rays and sparks when welding or watching (see ANSI Z49.1 and Z87.1 listed in Safety Standards).
- Wear approved safety glasses with side shields under your helmet.
- Use protective screens or barriers to protect others from flash, glare and sparks; warn others not to watch the arc.
- Wear body protection made from durable, flame-resistant material (leather, heavy cotton, wool). Body protection includes oil-free clothing such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.

WELDING can cause fire or explosion.

Welding on closed containers, such as tanks, drums, or pipes, can cause them to blow up. Sparks can fly off from the welding arc. The flying sparks, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode to metal objects can cause sparks, explosion, overheating, or fire. Check and be sure the area is safe before doing any welding.

- Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
- Do not weld where flying sparks can strike flammable material.
- Protect yourself and others from flying sparks and hot metal.
- Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
- Watch for fire, and keep a fire extinguisher nearby.
- Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.

- Do not cut or weld on tire rims or wheels. Tires can explode if heat-ed. Repaired rims and wheels can fail. See OSHA 29 CFR 1910.177 listed in Safety Standards.
- Do not weld on containers that have held combustibles, or on closed containers such as tanks, drums, or pipes unless they are properly prepared according to AWS F4.1 and AWS A6.0 (see Safety Standards).
- Do not weld where the atmosphere can contain flammable dust, gas, or liquid vapors (such as gasoline).
- Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock, sparks, and fire hazards.
- Do not use welder to thaw frozen pipes.
- Remove stick electrode from holder or cut off welding wire at contact tip when not in use.
- Wear body protection made from durable, flame-resistant material (leather, heavy cotton, wool). Body protection includes oil-free clothing such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.
- Remove any combustibles, such as a butane lighter or matches, from your person before doing any welding.
- After completion of work, inspect area to ensure it is free of sparks, glowing embers, and flames.
- Use only correct fuses or circuit breakers. Do not oversize or by-pass them.
- Follow requirements in OSHA 29.10.252 (a) (2) (iv) and NFPA 51B hot work and have a fire watcher and extinguisher nearby.
- Read and understand the Safety Data Sheets (SDSs) and the manufacturer’s instructions for adhesives, coatings, cleaners, consumables, coolants, degreasers, fluxes, and metals.

FLYING METAL or DIRT can injure eyes.

- Welding, chipping, wire brushing, and grinding cause sparks and flying metal. As welds cool, they can throw off slag.
- Wear approved safety glasses with side shields even under your welding helmet.

BUILDUP OF GAS can injure or kill.

- Shut off compressed gas supply when not in use.
- Always ventilate confined spaces or use approved air-supplied respirator.

ELECTRIC AND MAGNETIC FIELDS (EMF) can affect Implanted Medical Devices.

- Wearers of Pacemakers and other Implanted Medical Devices should keep away.
- Implanted Medical Device wearers should consult their doctor and the device manufacturer before going near arc welding, spot welding, gouging, plasma arc cutting, or induction heating operations.

NOISE can damage hearing.

- Noise from some processes or equipment can damage hearing.
- Wear approved ear protection if noise level is high.
Compressed gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Since gas cylinders are normally part of the welding process, be sure to treat them carefully.

- Protect compressed gas cylinders from excessive heat, mechanical shocks, physical damage, slag, open flames, sparks, and arcs.
- Install cylinders in an upright position by securing to a stationary support or cylinder rack to prevent falling or tipping.
- Keep cylinders away from any welding or other electrical circuits.
- Never drape a welding torch over a gas cylinder.
- Never allow a welding electrode to touch any cylinder.
- Never weld on a pressurized cylinder – explosion will result.
- Use only correct compressed gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts in good condition.
- Turn face away from valve outlet when opening cylinder valve. Do not stand in front of or behind the regulator when opening the valve.
- Keep protective cap in place over valve except when cylinder is in use or connected for use.
- Use the proper equipment, correct procedures, and sufficient number of persons to lift, move, and transport cylinders.
- Read and follow instructions on compressed gas cylinders, associated equipment, and Compressed Gas Association (CGA) publication P-1 listed in Safety Standards.

1-3. Additional Symbols For Installation, Operation, And Maintenance

FIRE OR EXPLOSION can injure.
- Do not install or place unit on, over, or near combustible surfaces.
- Do not install unit near flammables.
- Do not overload building wiring – be sure power supply system is properly sized, rated, and protected to handle this unit.

FALLING EQUIPMENT can injure.
- Use lifting eye to lift unit only, NOT running gear, gas cylinders, or any other accessories.
- Use correct procedures and equipment of adequate capacity to lift and support unit.
- If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.
- Keep equipment (cables and cords) away from moving vehicles when working from an aerial location.
- Follow the guidelines in the Applications Manual for the Revised NIOSH Lifting Equation (Publication No. 94−110) when manually lifting heavy parts or equipment.

OVERUSE can cause OVERHEATING
- Allow cooling period; follow rated duty cycle.
- Reduce current or reduce duty cycle before starting to weld again.
- Do not block or filter airflow to unit.

FLYING SPARKS can injure.
- Wear a face shield to protect eyes and face.
- Shape tungsten electrode only on grinder with proper guards in a safe location wearing proper face, hand, and body protection.
- Sparks can cause fires — keep flammables away.

 STATIC (ESD) can damage PC boards.
- Put on grounded wrist strap BEFORE handling boards or parts.
- Use proper static-proof bags and boxes to store, move, or ship PC boards.
H.F. RADIATION can cause interference.

- High-frequency (H.F.) can interfere with radio navigation, safety services, computers, and communications equipment.
- Have only qualified persons familiar with electronic equipment perform this installation.
- The user is responsible for having a qualified electrician promptly correct any interference problem resulting from the installation.
- If notified by the FCC about interference, stop using the equipment at once.
- Have the installation regularly checked and maintained.
- Keep high-frequency source doors and panels tightly shut, keep spark gaps at correct setting, and use grounding and shielding to minimize the possibility of interference.

ARC WELDING can cause interference.

- Electromagnetic energy can interfere with sensitive electronic equipment such as computers and computer-driven equipment such as robots.
- Be sure all equipment in the welding area is electromagnetically compatible.
- To reduce possible interference, keep weld cables as short as possible, close together, and down low, such as on the floor.
- Locate welding operation 100 meters from any sensitive electronic equipment.
- Be sure this welding machine is installed and grounded according to this manual.
- If interference still occurs, the user must take extra measures such as moving the welding machine, using shielded cables, using line filters, or shielding the work area.

1-4. California Proposition 65 Warnings

⚠️ WARNING: This product can expose you to chemicals including lead, which are known to the state of California to cause cancer and birth defects or other reproductive harm.

For more information, go to www.P65Warnings.ca.gov.

1-5. Principal Safety Standards


1-6. EMF Information

Electric current flowing through any conductor causes localized electric and magnetic fields (EMF). The current from arc welding (and allied processes including spot welding, gouging, plasma arc cutting, and induction heating operations) creates an EMF field around the welding circuit. EMF fields can interfere with some medical implants, e.g. pacemakers. Protective measures for persons wearing medical implants have to be taken. For example, restrict access for passers-by or conduct individual risk assessment for welders. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

1. Keep cables close together by twisting or taping them, or using a cable cover.
2. Do not place your body between welding cables. Arrange cables to one side and away from the operator.
3. Do not coil or drape cables around your body.
4. Keep head and trunk as far away from the equipment in the welding circuit as possible.
5. Connect work clamp to workpiece as close to the weld as possible.
6. Do not work next to, sit or lean on the welding power source.
7. Do not weld whilst carrying the welding power source or wire feeder.

About Implanted Medical Devices:
Implanted Medical Device wearers should consult their doctor and the device manufacturer before performing or going near arc welding, spot welding, gouging, plasma arc cutting, or induction heating operations. IIf cleared by your doctor, then following the above procedures is recommended.
SECTION 2 – SAFETY PRECAUTIONS - READ BEFORE USING

Protect yourself and others from injury — read, follow, and save these important safety precautions and operating instructions.

2-1. Symbol Usage

DANGER! – Indicates a hazardous situation which, if not avoided, will result in death or serious injury. The possible hazards are shown in the adjoining symbols or explained in the text.

Indicates a hazardous situation which, if not avoided, could result in death or serious injury. The possible hazards are shown in the adjoining symbols or explained in the text.

NOTICE – Indicates statements not related to personal injury.

2-2. Cooling Equipment Hazards

The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard. The safety information given below is only a summary of the more complete safety information found in the Safety Standards listed in Section 1-5. Read and follow all Safety Standards.

Only qualified persons should install, operate, maintain, and repair this equipment. A qualified person is defined as one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, has successfully demonstrated ability to solve or resolve problems relating to the subject matter, the work, or the project and has received safety training to recognize and avoid the hazards involved.

During operation, keep everybody, especially children, away.

HOT PARTS can burn.

- Do not touch hot parts bare handed.
- Allow cooling period before working on equipment.
- To handle hot parts, use proper tools and/or wear heavy, insulated welding gloves and clothing to prevent burns.

FLYING METAL or DIRT can injure eyes.

- Wear approved safety glasses with side shields even under your welding helmet.

ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. The input power circuit and machine internal circuits are also live when power is on. Incorrectly installed or improperly grounded equipment is a hazard.

- Do not touch live electrical parts.
- Disconnect input power or stop engine before installing or servicing this equipment. Lockout/tagout input power according to OSHA 29 CFR 1910.147 (see Safety Standards).
- Properly install, ground, and operate this equipment according to its Owner's Manual and national, state, and local codes.
- Always verify the supply ground – check and be sure that input power cord ground wire is properly connected to ground terminal in disconnect box or that cord plug is connected to a properly grounded receptacle outlet.
- Keep cords dry, free of oil and grease, and protected from hot metal and sparks.
- Frequently inspect input power cord and ground conductor for damage or bare wiring – replace immediately if damaged – bare wiring can kill.
- Turn off all equipment when not in use.
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
- Keep all panels and covers securely in place.

2-3. Additional Symbols For Installation, Operation, And Maintenance

FALLING EQUIPMENT can injure.

- Use correct procedures and equipment of adequate capacity to lift and support unit.
- If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.
- Keep equipment (cables and cords) away from moving vehicles when working from an aerial location.
- Follow the guidelines in the Applications Manual for the Revised NIOSH Lifting Equation (Publication No. 94–110) when manually lifting heavy parts or equipment.

OVERUSE can cause OVERHEATING

- Allow cooling period; follow rated duty cycle.
- Do not block or filter airflow to unit.
READ INSTRUCTIONS.

- Read and follow all labels and the Owner’s Manual carefully before installing, operating, or servicing unit. Read the safety information at the beginning of the manual and in each section.
- Use only genuine replacement parts from the manufacturer.
- Perform installation, maintenance, and service according to the Owner’s Manuals, industry standards, and national, state, and local codes.
- Read and understand the Safety Data Sheets (SDSs) and the manufacturer’s instructions for adhesives, coatings, cleaners, consumables, coolants, degreasers, fluxes, and metals.

STEAM AND HOT COOLANT can burn.

- Hose may rupture if coolant overheats.
- Visually inspect condition of hoses before each use. Do not use damaged hoses.
- Allow cooling period before working on equipment.

HIGH PRESSURE FLUIDS can injure or kill.

- Coolant can be under high pressure.
- Release pressure before working on cooler.
- If ANY fluid is injected into the skin or body seek medical help immediately.

MOVING PARTS can injure.

- Keep away from moving parts such as fans.
- Keep all doors, panels, covers, and guards closed and securely in place.
- Have only qualified persons remove doors, panels, covers, or guards for maintenance and troubleshooting as necessary.
- Reinstall doors, panels, covers, or guards when maintenance is finished and before reconnecting input power.

2-4. California Proposition 65 Warnings

⚠️ WARNING: This product can expose you to chemicals including lead, which are known to the state of California to cause cancer and birth defects or other reproductive harm.

For more information, go to www.P65Warnings.ca.gov.

2-5. Principal Safety Standards


SECTION 3 – CONSIGNES DE SÉCURITÉ – LIRE AVANT UTILISATION

**Pour écarter les risques de blessure pour vous-même et pour autrui — lire, appliquer et ranger en lieu sûr ces consignes relatives aux précautions de sécurité et au mode opératoire.**

### 3-1. Symboles utilisés

**DANGER!** - Indique une situation dangereuse qui si on l’évit ne peut pas donner la mort ou des blessures graves. Les dangers possibles sont montrés par les symboles joints ou sont expliqués dans le texte.

**AVIS – Indique des déclarations pas en relation avec des blessures personnelles.**

**Indique des instructions spécifiques.**

Ce groupe de symboles veut dire Avertissement! Attention! DANGER DE CHOC ÉLECTRIQUE, PIÈCES EN MOUVEMENT, et PIÈCES CHAUDES. Consulter les symboles et les instructions ci-dessous y afférent pour les actions nécessaires afin d’éviter le danger.

### 3-2. Dangers relatifs au soudage à l’arc

Les symboles représentés ci-dessous sont utilisés dans ce manuel pour attirer l’attention et identifier les dangers possibles. En présence de l’un de ces symboles, prendre garde et suivre les instructions afférentes pour éviter tout risque. Les instructions en matière de sécurité indiquées ci-dessous ne constituent qu’un sommaire des instructions de sécurité plus complètes fournies dans les normes de sécurité énumérées dans la Section 3-5. Lire et observer toutes les normes de sécurité.

L’installation, l’utilisation, l’entretien et les réparations ne doivent être confiés qu’à des personnes qualifiées. Une personne qualifiée est définie comme celle qui, par la possession d’un diplôme reconnu, d’un certificat ou d’un statut professionnel, ou qui, par une connaissance, une formation et une expérience approfondies, a démontré avec succès sa capacité à résoudre les problèmes liés à la tâche, le travail ou le projet et a reçu une formation en sécurité afin de reconnaître et d’éviter les risques inhérents.

Pendant le fonctionnement, maintenir à distance toutes les personnes, notamment les enfants de l’appareil.

**UNE DÉCHARGE ÉLECTRIQUE peut entraîner la mort.**

- Le contact d’organes électriques sous tension peut provoquer des accidents mortels ou des brûlures graves. Le circuit de l’électrode et de la pièce est sous tension lorsque le courant est délivré à la sortie. Le circuit d’alimentation et les circuits internes de la machine sont également sous tension lorsque l’alimentation est sur Marche. Dans le mode de soudage avec droit, le fil, le dérouleur, le bloc de commande du rouleau et toutes les parties métalliques en contact avec le fil sont sous tension électrique. Un équipement installé ou mis à la terre de manière incorrecte ou impropre constitue un danger.

- Ne pas toucher aux pièces électriques sous tension.
- Porter des gants isolants et des vêtements de protection secs et sans trous.
- S’isoler de la pièce à couper et du sol en utilisant des housses ou des tapis assez grands afin d’éviter tout contact physique avec la pièce à couper ou le sol.
- Ne pas utiliser de sortie de soudage CA dans des zones humides ou confinées ou s’il y a un risque de chute.
- Ne servir d’une source électrique à courant électrique UNIQUE- MENT si le procédé de soudage le demande.
- Si l’utilisation d’une source électrique à courant électrique s’avère nécessaire, se servir de la fonction de télécommande si l’appareil en est équipé.
- D’autres consignes de sécurité sont nécessaires dans les conditions suivantes : risques électriques dans un environnement humide ou où l’on porte des vêtements mouillés ; sur des structures métalliques telles que sols, grilles ou échafaudages ; en position coincée comme assise, à genoux ou couchée ; ou s’il y a un risque élevé de contact involontaire ou accidentel avec la pièce à souder ou le sol. Dans ces conditions, utiliser les équipements suivants, dans l’ordre indiqué : 1) un poste à souder DC à tension constante (à fil), 2) un poste à souder DC manuel (électrode) ou 3) un poste à souder AC à tension variable. Dans la plupart des situations, l’utilisation d’un poste à souder AC à fil à tension constante est recommandée. En outre, ne pas travailler seul !
- Installer, mettre à la terre et utiliser correctement cet équipement conformément à son Manuel d’Utilisation et aux réglementations nationales, gouvernementales et locales.
- Toujours vérifier la terre du cordon d’alimentation. Vérifier et s’assurer que le fil de terre du cordon d’alimentation est bien raccordé à la borne de terre du sectionneur ou que la fiche du cordon est raccordée à une prise correctement mise à la terre.
- En effectuant les raccordements d’entrée, fixer d’abord le conducteur de mise à la terre approprié et contre-vérifier les connexions.
- Les câbles doivent être exempts d’humidité, d’huile et de graisse ; protégez-les contre les étincelles et les pièces métalliques chaudes.
- Vérifier fréquemment le cordon d’alimentation et le conducteur de mise à la terre afin de s’assurer qu’il n’est pas altéré ou dénudé –, le remplacer immédiatement s’il l’est –. Un fil dénudé peut entraîner la mort.
- L’équipement doit être hors tension lorsqu’il n’est pas utilisé.
- Ne pas utiliser des câbles usés, endommagés, de grosseur insuffisante ou mal épissés.
- Ne pas enrouler les câbles autour du corps.
- Si la pièce soudée doit être mise à la terre, le faire directement avec un câble distinct.
- Ne pas toucher l’électrode quand on est en contact avec la pièce, la terre ou une électrode provenant d’une autre machine.
- Ne pas passer des portes électrodes connectées à deux machines en même temps à cause de la présence d’une tension à vide doublée.
- N’utiliser qu’un matériel en bon état. Réparer ou remplacer sur-le-champ les pièces endommagées. Entretenir l’appareil conformément à ce manuel.
- Porter un harnais de sécurité si l’on doit travailler au-dessus du sol.
- S’assurer que tous les panneaux et couvercles sont correctement en place.
- Fixer le câble de retour de façon à obtenir un bon contact métal-métal avec la pièce à souder ou la table de travail, le plus près possible de la soudure.
- Isoler la pince de masse quand pas mis à la pièce pour éviter le contact avec tout objet métallique.
- Ne pas raccorder plus d’une électrode ou plus d’un câble de masse à une même borne de sortie de soudage. Débrancher le câble pour le procédé non utilisé.
- Utiliser une protection différentielle lors de l’utilisation d’un équipement auxiliaire dans des endroits humides ou mouillés.

Il reste une TENSION DC NON NÉGLIGEABLE dans les sources de soudage onduleur UNE FOIS l’alimentation coupée.

- Éteignez l’unité, débranchez le courant électrique, et déchargez les condensateurs d’alimentation selon les instructions indiquées dans le manuel avant de toucher les pièces.
Les pièces chaudes peuvent provoquer des brûlures.
- Ne pas toucher à mains nues les parties chaudes.
- Prévoir une période de refroidissement avant de travailler à l'équipement.
- Ne pas toucher aux pièces chaudes, utiliser les outils recommandés et porter des gants de soudage et des vêtements épais pour éviter les brûlures.

Les fumées et les gaz peuvent être dangereux.
- Le soudage génère des fumées et des gaz. Leur inhalation peut être dangereuse pour votre santé.
- Eloigner votre tête des fumées. Ne pas respirer les fumées.
- À l'intérieur, ventiler la zone et/ou utiliser une ventilation forcée au niveau de l'arc pour l'évacuation des fumées et des gaz de soudage. Pour déterminer la bonne ventilation, il est recommandé de procéder à un prélevement pour la composition et la quantité de fumées et de gaz auxquelles est exposé le personnel.
- Si la ventilation est médicocre, porter un respirateur anti-vapeurs approuvé.
- Lire et comprendre les fiches de données de sécurité et les instructions du fabricant concernant les adhésifs, les revêtements, les nettoyants, les consommables, les produits de refroidissement, les dégraissants, les flux et les métaux.
- Travailler dans un espace fermé seulement s'il est bien ventilé en portant un respirateur à alimentation d'air. Demander toujours à un surveillant d'être présent pour le soudage et porter des gants de soudage et des vêtements épais pour éviter les brûlures. Des étincelles et des gaz de soudage peuvent déplacer l'air et abaisser le niveau d'oxygène provoquant des blessures ou des accidents mortels. S'assurer que l'air de respiration ne présente aucun danger.
- Ne pas souder dans des endroits situés à proximité d'opérations de dégraissage, de nettoyage ou de pulvérisation. La chaleur et le rayonnement de l'arc peuvent agir sur des vapeurs et forger des gaz hautement toxiques et irritants.
- Ne pas souder des métaux munis d'un revêtement, tels que l'acier galvanisé, placé en plomb ou au cadmium à moins que la réaction ne soit bien ventilé et en portant un respirateur à alimentation d'air. Les dangers de souder des métaux renfermant ces éléments peuvent dégager des fumées toxiques en cas de soudage.
- Porter un casque de soudage approuvé muni de verres filtrants appropriés pour protéger visage et yeux et porter une protection pour les yeux pendant le soudage et pour regarder (voir ANSI Z49.1 et Z87.1 énumérés dans les normes de sécurité).
- Porter des lunettes de sécurité avec écrans latéraux même sous votre casque.
- Avoir recours à des écrans protecteurs ou à des rideaux pour protéger les autres contre les rayonnements éblouissants et les étincelles ; prévenir toute personne sur les lieux de ne pas regarder l'arc.
- Porter un équipement de protection pour le corps fait d'un matériau résistant et ignifuge (cuir, coton robuste, laine). La protection du corps comporte des vêtements sans huile comme par ex. des gants de cuir, une chemise solide, des pantalons sans revers, des chaussures hautes et une casquette.
- Porter des gants de soudage et des vêtements épais pour éviter les brûlures. Le contact accidentel de l'électrode avec des objets métalliques peut provoquer des étincelles, une explosion, un surchauffement ou un incendie. Avant de commencer le soudage, vérifier et s'assurer que l'endroit ne présente pas de danger.
- Déplacer toutes les substances inflammables à une distance de 10,7 m de l'arc de soudage. En cas d'impossibilité le recouvrir soigneusement avec des protections homologuées.
- Ne pas souder dans un endroit là où des étincelles peuvent tomber sur des substances inflammables.
- Se protéger et d'autres personnes de la projection d'étincelles et de métal chaud.
- Des étincelles et des matériaux chauds du soudage peuvent facilement passer dans d'autres zones en traversant de petites fissures et des ouvertures.
- Surveiller tout déclenchement d'incendie et tenir un extincteur à proximité.
- Le soudage effectué sur un plafond, plancher, paroi ou séparation peut déclencher un incendie de l'autre côté.
- Ne pas effectuer le soudage sur des conteneurs fermés tels que des réservoirs, tambours, ou conduites, à moins qu'ils n'aient été préparés correctement conformément à AWS F.4.1 et AWS A6.0 (voir les Normes de Sécurité).
- Ne pas souder là où l'air ambiant pourrait contenir des poussières, gaz ou émanations inflammables (vapeur d'essence, par exemple).
- Brancher le câble de masse sur la pièce le plus près possible de la zone de soudage pour éviter le transport du courant sur une longue distance par des chemins inconnus éventuels en provoquant des risques d'électrocution, d'étincelles et d'incendie.
- Ne pas utiliser le poste de soudage pour dégeler des conduites générées.
- En cas de non utilisation, enlever la baguette d'électrode du poste de soudage ou couper le fil à la ligne de pointe. Porter un équipement de protection pour le corps fait d'un matériau résistant et ignifuge (coton, coton robuste, laine). La protection du corps comporte des vêtements sans huile comme par ex. des gants de cuir, une chemise solide, des pantalons sans revers, des chaussures hautes et une casquette.
- Avant de souder, retirer toute substance combustible de vos poches telles qu'un allumeur au butane ou des allumettes.
- Une fois le travail achevé, assurez-vous qu'il ne reste aucune trace d'étincelles incandescentes ni de flammes.
- Utiliser exclusivement des fusibles ou coupe-circuits appropriés. Ne pas augmenter leur puissance, ne pas les porter.
- Suivre les recommandations dans OSHA 1910.252(a)(2)(iv) et NFPA 51B pour les travaux à chaud et avoir de la surveillance et un extincteur à proximité.
- Lire et comprendre les fiches de données de sécurité et les instructions du fabricant concernant les adhésifs, les revêtements, les nettoyants, les consommables, les produits de refroidissement, les dégraissants, les flux et les métaux.

Des pièces de métal ou des saletés peuvent provoquer des blessures dans les yeux.
- Le soudage, l’écaillage, le passage de la pièce à la braise en fil de fer, et le meulage génèrent des étincelles et des particules métalliques volantes. Pendant la période de refroidissement des soudures, elles risquent de projeter du laitier.
- Porter des lunettes de sécurité avec écrans latéraux ou un écran facial.

Les accumulations de gaz risquent de provoquer des blessures ou même la mort.
- Fermer l'alimentation du gaz comprimé en cas de non utilisation.
- Veiller toujours à bien aérer les espaces confinés ou se servir d'un respirateur d'adduction d'air homologué.
Les CHAMPS ÉLECTROMÉNÉTIQUES (CEM) peuvent affecter les implants médicaux.

- Les porteurs de stimulateurs cardiaques et autres implants médicaux doivent rester à distance.
- Les porteurs d’implants médicaux doivent consulter leur médecin et le fabricant du dispositif avant de s’approcher de la zone où se déroule du soudage à l’arc, du soudage par points, du gougeage, de la découpe plasma ou une opération de chauffage par induction.

**LE BOUTEILLES peuvent exploder si elles sont endommagées.**

Les bouteilles de gaz comprimé contiennent du gaz sous haute pression. Si une bouteille est endommagée, elle peut exploser. Du fait que les bouteilles de gaz font normalement partie du procédé de soudage, les manipuler avec précaution.

**LE BRUIT peut endommager l’ouïe.**

- Le bruit des processus et des équipements peut affecter l’ouïe.
- Porter des protections approuvées pour les oreilles si le niveau sonore est trop élevé.

3-3. Dangers supplémentaires en relation avec l’installation, le fonctionnement et la maintenance

**Risque d’INCENDIE OU d’EXPLOSION.**

- Ne pas placer l’appareil sur, au-dessus ou à proximité de surfaces inflammables.
- Ne pas installer l’appareil à proximité de produits inflammables.
- Ne pas surcharger l’installation électrique – s’assurer que l’alimentation est correctement dimensionnée et protégée avant de mettre l’appareil en service.

**LA CHUTE DE L’ÉQUIPEMENT peut provoquer des blessures.**

- Utiliser l’anneau de levage uniquement pour soulever l’appareil, NON PAS les chariots, les bouteilles de gaz ou tout autre accessoire.
- Utilisez les procédures correctes et des équipements d’une capacité appropriée pour soulever et supporter l’appareil.
- En utilisant des fourches de levage pour déplacer l’outil, s’assurer que les fourches sont suffisamment longues pour dépasser du côté opposé de l’appareil.
- Tenir l’équipement ( câbles et cordons) à distance des véhicules mobiles lors de toute opération en hauteur.
- Suivre les consignes du Manuel des applications pour l’équation de levage NIOSH révisé (Publication Nº94–110) lors du levage manuel de pièces ou équipements lourds.

**L’EMPLOI EXCESSIF peut SURCHAUFFER L’ÉQUIPEMENT.**

- Prévoir une période de refroidissement ; respecter le cycle opératoire nominal.
- Réduire le courant ou le facteur de marche avant de poursuivre le soudage.
- Ne pas obstruer les passages d’air du poste.

**LES ÉTINCELLES PROJETÉES peuvent provoquer des blessures.**

- Porter un écran facial pour protéger le visage et les yeux.
- Affûter l’électrode au tungstène uniquement à distance.

**L’EXPLOSION DE LA BATTERIE peut provoquer des blessures.**

- Ne pas utiliser l’appareil de soudage pour charger des batteries ou faire démarrer des véhicules à l’aide de câbles de démarrage, sauf si l’appareil dispose d’une fonctionnalité de charge de batterie destinée à cet usage.

**LES CHARGES ÉLECTROSTATIQUES peuvent endommager les circuits imprimés.**

- Établir la connexion avec la barrette de terre avant de manipuler des cartes ou des pièces.
- Utiliser des pochettes et des boîtes antistatiques pour stocker, déplacer ou expédition des cartes de circuits imprimés.

**Les PIÈCES MOBILES peuvent causer des blessures.**

- Ne pas s’approcher des organes mobiles.
- Ne pas s’approcher des points de coincement tels que des rouleaux de commande.

**LES FILS DE SOUDAGE peuvent provoquer des blessures.**

- Ne pas appuyer sur la gâchette avant d’en avoir reçu l’instruction.
- Ne pas diriger le pistolet vers soi, d’autres personnes ou toute pièce mécanique en engageant le fil de soudage.

**LES PIÈCES MOBILES peuvent causer des blessures.**

- S’abstenir de toucher des organes mobiles tels que des ventilateurs.
- Maintenir fermés et verrouillés les portes, panneaux, recouvrements et dispositifs de protection.
- Lorsque cela est nécessaire pour des travaux d’entretien et de dépannage, faire retirer les portes, panneaux, recouvrements ou dispositifs de protection uniquement par du personnel qualifié.
- Remettre les portes, panneaux, recouvrements ou dispositifs de protection quand l’entretien est terminé et avant de rebrancher l’alimentation électrique.
LIRE LES INSTRUCTIONS.

- N’utiliser que les pièces de rechange recommandées par le constructeur.
- Effectuer l’installation, l’entretien et toute intervention selon les manuels d’utilisateurs, les normes nationales, provinciales et de l’industrie, ainsi que les codes municipaux.

LE RAYONNEMENT HAUTE FRÉQUENCE (H.F.) risque de provoquer des interférences.

- Le rayonnement haute fréquence (H.F.) peut provoquer des interférences avec les équipements de radio-navigation et de communication, les services de sécurité et les ordinateurs.
- Demander seulement à des personnes qualifiées familiarisées avec des équipements électroniques de faire fonctionner l’installation.
- L’utilisateur est tenu de faire corriger rapidement par un électricien qualifié les interférences résultant de l’installation.
- Si le FCC signale des interférences, arrêter immédiatement l’appareil.

3-4. Proposition californienne 65 Avertissements

AVERTISSEMENT : ce produit peut vous exposer à des produits chimiques tels que le plomb, reconnus par l’État de Californie comme cancérigènes et sources de malformations ou d’autres troubles de la reproduction.

Pour plus d’informations, consulter www.P65Warnings.ca.gov.

3-5. Principales normes de sécurité


3-6. Informations relatives aux CEM

Le courant électrique qui traverse tout conducteur génère des champs électromagnétiques (CEM) à certains endroits. Le courant issu d’un soudage à l’arc (et de procédés connexes, y compris le soudage par points, le gougeage, le découpage plasma et les opérations de chauffage par induction) crée un champ électromagnétique (CEM) autour du circuit de soudage. Les champs électromagnétiques produits peuvent causer interférence à certains implants médicaux, p. ex. les stimulateurs cardiaques. Des mesures de protection pour les porteurs d’implants médicaux doivent être prises: Limiter par exemple tout accès aux câbles d’un côté et à distance de l’opérateur.

- Ne pas courber et ne pas entourer les câbles autour de votre corps.
- Maintenir la tête et le torse aussi loin que possible du matériel du circuit de soudage.
- Connecter la pince sur la pièce aussi près que possible de la soudure.
- Ne pas travailler à proximité d’une source de soudage, ni s’asseoir ou se pencher dessus.
- Ne pas souder tout en portant la source de soudage ou le dévidoir.

En ce qui concerne les implants médicaux : Les porteurs d’implants doivent d’abord consulter leur médecin avant de s’approcher des opérations de soudage à l’arc de soudage par points, de gougeage, du coupage plasma ou de chauffage par induction. Si le médecin approuve, il est recommandé de suivre les procédures précédentes.
SECTION 4 – CONSIGNES DE SÉCURITÉ – LIRE AVANT UTILISATION

Pour écarter les risques de blessure pour vous-même et pour autrui — lire, appliquer et ranger en lieu sûr ces consignes relatives aux précautions de sécurité et au mode opératoire.

4-1. Symboles utilisés

DANGER! – Indique une situation dangereuse qui si on l’évite pas peut donner la mort ou des blessures graves. Les dangers possibles sont montrés par les symboles joints ou sont expliqués dans le texte.

AVIS – Indique des déclarations pas en relation avec des blessures personnelles.

4-2. Dangers liés aux équipements de refroidissement

Les symboles représentés ci-dessous sont utilisés dans ce manuel pour attirer l’attention et identifier les dangers possibles. En présence de l’un de ces symboles, prendre garde et suivre les instructions afférentes pour éviter tout risque. Les instructions en matière de sécurité indiquées ci-dessous ne constituent qu’un sommaire des instructions de sécurité plus complètes fournies dans les normes de sécurité énumérées dans la Section 3-5. Lire et observer toutes les normes de sécurité.

L’installation, l’utilisation, l’entretien et les réparations ne doivent être confiés qu’à des personnes qualifiées. Une personne qualifiée est définie comme celle qui, par la possession d’un diplôme reconnu, d’un certificat ou d’un statut professionnel, ou qui, par une connaissance, une formation et une expérience approfondies, a démontré avec succès sa capacité à résoudre les problèmes liés à la tâche, le travail ou le projet et a reçu une formation en sécurité afin de reconnaître et d’éviter les risques inhérents.

Pendant le fonctionnement, maintenir à distance toutes les personnes, notamment les enfants de l’appareil.

LES PIÈCES CHAUDES peuvent provoquer des brûlures.

- Ne pas toucher à mains nues les parties chaudes.
- Prévoir une période de refroidissement avant de travailler à l’équipement.
- Ne pas toucher aux pièces chaudes, utiliser les outils recommandés et porter des gants de soudage et des vêtements épais pour éviter les brûlures.

DES PIÈCES DE METAL ou DES SALETES peuvent provoquer des blessures dans les yeux.

- Porter des lunettes de sécurité avec écrans latéraux ou un écran facial.

UNE DÉCHARGE ÉLECTRIQUE peut entraîner la mort.

Le contact d’organes électriques sous tension peut provoquer des accidents mortels ou des brûlures graves. Le circuit d’alimentation et les circuits internes de la machine sont également sous tension lorsque l’installation est sur Marche. Un équipement installé ou mis à la terre de manière incorrecte ou impropre constitue un danger.

- Ne pas toucher aux pièces électriques sous tension.
- Installez, mettez à la terre et utilisez correctement cet équipement conformément à son Manuel d’Utilisation et aux réglementations nationales, gouvernementales et locales.
- Toujours vérifier la terre du cordon d’alimentation. Vérifier et s’assurer que le fil de terre du cordon d’alimentation est bien raccordé à la borne de terre du sectionneur ou que la fiche du cordon est raccordée à une prise correctement mise à la terre.
- Les câbles doivent être exempts d’humidité, d’huile et de graisse; protégez-les contre les étincelles et les pièces métalliques chaudes.
- Vérifier fréquemment le cordon d’alimentation afin de s’assurer qu’il n’est pas altéré ou à nu, le remplacer immédiatement s’il l’est. Un fil à nu peut entraîner la mort.
- L’équipement doit être hors tension lorsqu’il n’est pas utilisé.
- N’utiliser qu’un matériel en bon état. Réparer ou remplacer sur-le-champ les pièces endommagées. Entretenir l’appareil conformément à ce manuel.
- S’assurer que tous les panneaux et couvercles sont correctement en place.
4-3. Dangers supplémentaires en relation avec l’installation, le fonctionnement et la maintenance

**LA CHUTE DE L’ÉQUIPEMENT peut provoquer des blessures.**
- Utilisez les procédures correctes et des équipements d’une capacité appropriée pour soulever et supporter l’appareil.
- En utilisant des fourches de levage pour déplacer l’unité, s’assurer que les fourches sont suffisamment longues pour dépasser du côté opposé de l’appareil.
- Tenir l’équipement (câbles et cordons) à distance des véhicules mobiles lors de toute opération en hauteur.
- Suivre les consignes du Manuel des applications pour l’équation de levage NIOSH révisée (Publication N°94–110) lors du levage manuelle de pièces ou équipements lourds.

**L’EMPLOI EXCESSIF peut SURCHAUFFER L’ÉQUIPEMENT.**
- Prévoir une période de refroidissement : respecter le cycle opératoire nominal.
- Ne pas obstruer les passages d’air du poste.

**LIRE LES INSTRUCTIONS.**
- N’utiliser que les pièces de rechange recommandées par le constructeur.
- Effectuer l’installation, l’entretien et toute intervention selon les manuels d’utilisateurs, les normes nationales, provinciales et de l’industrie, ainsi que les codes municipaux.
- Lire et comprendre les fiches de données de sécurité et les instructions du fabricant concernant les adhésifs, les revêtements, les nettoyants, les consommateurs, les produits de refroidissement, les dégraissants, les flux et les métaux.

**Les PIÈCES MOBILES peuvent causer des blessures.**
- S’abstenir de toucher des organes mobiles tels que des ventilateurs.
- Maintenir fermés et verrouillés les portes, panneaux, recouvrements et dispositifs de protection.
- Lorsque cela est nécessaire pour des travaux d’entretien et de dépannage, faire retirer les portes, panneaux, recouvrements ou dispositifs de protection uniquement par du personnel qualifié.
- Remettre les portes, panneaux, recouvrements ou dispositifs de protection quand l’entretien est terminé et avant de rebrancher l’alimentation électrique.

**LA VAPEUR ET LE LIQUIDE DE REFROIDISSEMENT CHAUD peuvent provoquer des brûlures.**
- Un tuyau peut se rompre lorsque le liquide de refroidissement surchauffe.
- Vérifiez visuellement l’état des tuyaux avant chaque utilisation. N’utilisez pas de tuyaux endommagés.
- Laissez refroidir avant d’intervenir sur l’équipement.

**LES LIQUIDES SOUS HAUTE PRESSION peuvent provoquer des blessures ou la mort.**
- Liquide de refroidissement sous haute pression.
- Libérez la pression avant d’intervenir sur le refroidisseur.
- En cas d’injection d’un liquide QUELCONQUE dans la peau ou le corps, consultez immédiatement un médecin.

4-4. Proposition californienne 65 Avertissements

⚠️ AVERTISSEMENT : ce produit peut vous exposer à des produits chimiques tels que le plomb, reconnus par l’État de Californie comme cancérigènes et sources de malformations ou d’autres troubles de la reproduction.

Pour plus d’informations, consulter www.P65Warnings.ca.gov.

4-5. Principales normes de sécurité


### 5-1. Additional Safety Symbols And Definitions

Some symbols are found only on CE products.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="" alt="Warning Symbol" /></td>
<td>Warning! Watch Out! There are possible hazards as shown by the symbols. Safe 1 2012–05</td>
</tr>
<tr>
<td><img src="" alt="Gloves Symbol" /></td>
<td>Wear dry insulating gloves. Do not touch electrode with bare hand. Do not wear wet or damaged gloves. Safe 2 2017–04</td>
</tr>
<tr>
<td><img src="" alt="Shock Symbol" /></td>
<td>Protect yourself from electric shock by insulating yourself from work and ground. Safe 3 2017–04</td>
</tr>
<tr>
<td><img src="" alt="Fumes Symbol" /></td>
<td>Keep your head out of the fumes. Safe 6 2017–04</td>
</tr>
<tr>
<td><img src="" alt="Ventilation Symbol" /></td>
<td>Use forced ventilation or local exhaust to remove the fumes. Safe 8 2012–05</td>
</tr>
<tr>
<td><img src="" alt="Fan Symbol" /></td>
<td>Use ventilating fan to remove fumes. Safe 10 2012–05</td>
</tr>
<tr>
<td><img src="" alt="Flammables Symbol" /></td>
<td>Keep flammables away from welding. Do not weld near flammables. Safe 12 2012–05</td>
</tr>
<tr>
<td><img src="" alt="Sparks Symbol" /></td>
<td>Welding sparks can cause fires. Have a fire extinguisher nearby, and have a watchperson ready to use it. Safe 14 2012–05</td>
</tr>
<tr>
<td><img src="" alt="Drums Symbol" /></td>
<td>Do not weld on drums or any closed containers. Safe 16 2017–04</td>
</tr>
<tr>
<td>Instruction</td>
<td>Reference</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Do not remove or paint over (cover) the label.</td>
<td>Safe20 2017–04</td>
</tr>
<tr>
<td>Disconnect input plug or power before working on machine.</td>
<td>Safe36 2017–04</td>
</tr>
<tr>
<td>When power is applied failed parts can explode or cause other parts to explode.</td>
<td>Safe26 2017–04</td>
</tr>
<tr>
<td>Flying pieces of parts can cause injury. Always wear a face shield when servicing unit.</td>
<td>Safe27 2017–04</td>
</tr>
<tr>
<td>Always wear long sleeves and button your collar when servicing unit.</td>
<td>Safe28 2017–04</td>
</tr>
<tr>
<td>After taking proper precautions as shown, connect power to unit.</td>
<td>Safe29 2017–04</td>
</tr>
<tr>
<td>Do not discard product (where applicable) with general waste. Reuse or recycle Waste Electrical and Electronic Equipment (WEEE) by disposing at a designated collection facility. Contact your local recycling office or your local distributor for further information.</td>
<td>Safe30 2017–04</td>
</tr>
<tr>
<td>Beware of electric shock from wiring.</td>
<td>Safe31 2017–04</td>
</tr>
<tr>
<td>Disconnect input plug or power before working on machine.</td>
<td>Safe32 2017–04</td>
</tr>
<tr>
<td>Connect Green Or Green/Yellow grounding conductor to ground terminal first. Connect input conductors (L1, L2, L3) to line terminals.</td>
<td>Safe33 2017–04</td>
</tr>
<tr>
<td>Become trained and read the instructions and labels before working on machine.</td>
<td>Safe34 2017–04</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Illustration</td>
<td>Text</td>
</tr>
<tr>
<td>-------------</td>
<td>---------------------------------------------------------------------</td>
</tr>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td>Wear dry insulating gloves. Do not touch electrode (wire) with bare hand. Do not wear wet or damaged gloves.</td>
</tr>
<tr>
<td><img src="image2.png" alt="Image" /></td>
<td>Consult rating label for input power requirements.</td>
</tr>
<tr>
<td><img src="image3.png" alt="Image" /></td>
<td>Drive rolls can injure fingers.</td>
</tr>
<tr>
<td><img src="image4.png" alt="Image" /></td>
<td>Welding wire and drive parts are at welding voltage during operation – keep hands and metal objects away.</td>
</tr>
<tr>
<td><img src="image5.png" alt="Image" /></td>
<td>Environmental Protection Use Period (China)</td>
</tr>
<tr>
<td><img src="image6.png" alt="Image" /></td>
<td>Plugged filter or hoses can cause overheating to the power source and torch.</td>
</tr>
<tr>
<td><img src="image7.png" alt="Image" /></td>
<td>Every 100 hours, check and clean filter and check condition of hoses.</td>
</tr>
<tr>
<td><img src="image8.png" alt="Image" /></td>
<td>Become trained and read the instructions before working on the machine or welding.</td>
</tr>
<tr>
<td><img src="image9.png" alt="Image" /></td>
<td>Wear hat and safety glasses. Use ear protection and button shirt collar. Use welding helmet with correct shade of filter. Wear complete body protection.</td>
</tr>
<tr>
<td><img src="image10.png" alt="Image" /></td>
<td>Hazardous voltage remains on input capacitors after power is turned off. Do not touch fully charged capacitors. Always wait 5 minutes after power is turned off before working on unit, OR check input capacitor voltage, and be sure it is near 0 before touching any parts.</td>
</tr>
</tbody>
</table>
### 5-2. Miscellaneous Symbols And Definitions

Some symbols are found only on CE products.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Amperage</td>
</tr>
<tr>
<td>I</td>
<td>Gas Input</td>
</tr>
<tr>
<td>Off</td>
<td>Gas Tungsten Arc Welding (GTAW) / Tungsten Inert Gas (TIG) Welding</td>
</tr>
<tr>
<td>Hz</td>
<td>Increase</td>
</tr>
<tr>
<td>U₀</td>
<td>Rated No Load Voltage (OCV)</td>
</tr>
<tr>
<td>Hertz</td>
<td>Pulsed</td>
</tr>
<tr>
<td>M</td>
<td>Trigger Select</td>
</tr>
<tr>
<td>SD Logo</td>
<td>SD Logo Is A Trademark Of The SD−3C, LLC</td>
</tr>
<tr>
<td>t₁</td>
<td>Wire Type</td>
</tr>
<tr>
<td>t₂</td>
<td>Gas Preflow</td>
</tr>
<tr>
<td>Gas Postflow</td>
<td></td>
</tr>
<tr>
<td>Initial Sequence</td>
<td></td>
</tr>
<tr>
<td>Press</td>
<td></td>
</tr>
<tr>
<td>VS</td>
<td>Volt Sense Input</td>
</tr>
<tr>
<td>Purge By Gas</td>
<td></td>
</tr>
<tr>
<td>Arc Control</td>
<td></td>
</tr>
<tr>
<td>DC</td>
<td>Direct Current (DC)</td>
</tr>
<tr>
<td>Circuit Breaker</td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td></td>
</tr>
<tr>
<td>I₂</td>
<td>Rated Welding Current</td>
</tr>
<tr>
<td>1</td>
<td>Single Phase</td>
</tr>
<tr>
<td>M</td>
<td>Recall From Memory</td>
</tr>
<tr>
<td>SD Logo</td>
<td>Flux Cored Arc Welding (FCAW)</td>
</tr>
<tr>
<td>Hz</td>
<td>Two-Step Trigger Operation (GTAW)</td>
</tr>
<tr>
<td>M</td>
<td>Touch Start (GTAW)</td>
</tr>
<tr>
<td>M</td>
<td>Welding (General)</td>
</tr>
<tr>
<td>I₁</td>
<td>Rated Supply Current</td>
</tr>
<tr>
<td>1</td>
<td>Trigger Hold Off</td>
</tr>
<tr>
<td>1</td>
<td>Right Side Select</td>
</tr>
<tr>
<td>V</td>
<td>Voltage</td>
</tr>
<tr>
<td>1</td>
<td>On</td>
</tr>
<tr>
<td>SD Logo</td>
<td>Shielded Metal Arc Welding (SMAW)</td>
</tr>
<tr>
<td>1</td>
<td>Protective Earth (Ground)</td>
</tr>
<tr>
<td>1</td>
<td>Three Phase Static Frequency Converter-Transformer-Rectifier</td>
</tr>
<tr>
<td>X</td>
<td>Duty Cycle</td>
</tr>
<tr>
<td>%</td>
<td>Percent</td>
</tr>
<tr>
<td>1</td>
<td>Gas Type</td>
</tr>
<tr>
<td>1</td>
<td>Busy</td>
</tr>
<tr>
<td>Pulse Transfer</td>
<td>Four-Step Trigger Operation (GTAW)</td>
</tr>
<tr>
<td>----------------</td>
<td>-----------------------------------</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>S</th>
<th>Seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\text{At})</td>
<td>Final Sequence</td>
</tr>
<tr>
<td>IP</td>
<td>Internal Protection Rating</td>
</tr>
<tr>
<td>Trigger Hold On</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RMD Process</th>
<th>(I_{1\text{max}})</th>
<th>Rated Maximum Supply Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Effective Supply Current</td>
<td>(I_{1\text{eff}})</td>
<td></td>
</tr>
</tbody>
</table>

**Notes**
## SECTION 6 – SPECIFICATIONS

### 6-1. Serial Number And Rating Label Location

The serial number and rating information for this product is located on the front. Use rating label to determine input power requirements and/or rated output. For future reference, write serial number in space provided on back cover of this manual.

### 6-2. Software Licensing Agreement

The End User License Agreement and any third-party notices and terms and conditions pertaining to third-party software can be found at https://www.millerwelds.com/eula and are incorporated by reference herein.

### 6-3. General Specifications

* Do not use information in welding power source specifications table to determine electrical service requirements. See Sections 7-9 and 7-10 for information on connecting input power.

* This equipment will deliver rated output at an ambient temperature up to 104°F (40°C).

#### A. Welding Power Source Specifications

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Three Phase</td>
<td>Stick</td>
<td>400 A @ 36 Volts DC, 100% Duty Cycle</td>
<td>40 – 400</td>
<td>— —</td>
<td>90</td>
<td>26.3</td>
<td>19.0</td>
</tr>
<tr>
<td></td>
<td>TIG</td>
<td>350 A @ 24 Volts DC, 100% Duty Cycle</td>
<td>10 – 350</td>
<td>— —</td>
<td>—</td>
<td>19.0</td>
<td>12.4</td>
</tr>
<tr>
<td></td>
<td>MIG</td>
<td>400 A @ 34 Volts DC, 100% Duty Cycle</td>
<td>— —</td>
<td>10-44</td>
<td>—</td>
<td>27.1</td>
<td>15.5</td>
</tr>
<tr>
<td></td>
<td>Flux Cored</td>
<td>400 A @ 34 Volts DC, 100% Duty Cycle</td>
<td>— —</td>
<td>10-44</td>
<td>—</td>
<td>27.1</td>
<td>15.5</td>
</tr>
</tbody>
</table>

To appropriately size circuit protection see Section 7-9.

#### B. Dimensions And Weight

<table>
<thead>
<tr>
<th>Hole Layout Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 495 mm (19.5 in.)</td>
</tr>
<tr>
<td>B 424 mm (16.875 in.)</td>
</tr>
<tr>
<td>C 806 mm (31.75 in.)</td>
</tr>
<tr>
<td>D 406.4 mm (16 in.)</td>
</tr>
<tr>
<td>E 5/16-18 in. UNC thread</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>102 kg (225 lb)</td>
</tr>
</tbody>
</table>

Lifting Eye Weight Rating:
525 lb (238 kg) Maximum
C. Wire Feeder Specifications

<table>
<thead>
<tr>
<th>Input Power Source Type</th>
<th>Welding Power</th>
<th>Wire Feed Speed</th>
<th>Wire Diameter</th>
<th>Welding Circuit Rating</th>
<th>Overall Dimensions</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 Volts AC 11 Amperes</td>
<td>PipeWorx 400</td>
<td>1.3 To 19.8 mpm (50 To 780 ipm)</td>
<td>0.9 To 1.6 mm (0.035 To 0.062 in.)</td>
<td>100 Volts, 600 Amperes, 100% Duty Cycle</td>
<td>Length: 737 mm (29 in.) Width: 483 mm (19 in.) Height: 356 mm (14 in.)</td>
<td>Single: 30 kg (65 lb) Dual: 41 kg (90 lb)</td>
</tr>
</tbody>
</table>

D. Cooler Specifications

<table>
<thead>
<tr>
<th>Input Power</th>
<th>Overall Dimensions</th>
<th>Cooling Power</th>
<th>Coolant Capacity</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump</td>
<td>Blower</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>115 Volts AC</td>
<td>115 Volts AC</td>
<td>Length: 29 in. (737 mm) Width: 19.375 in. (492 mm) Height: 12 in. (305 mm)</td>
<td>.9kw @ 60 Hz .8kw @ 50 Hz</td>
<td>3 gal (11.4 L)</td>
</tr>
</tbody>
</table>

E. Coolant Specifications

⚠️ Do not use conductive coolant.

<table>
<thead>
<tr>
<th>Application</th>
<th>Coolant</th>
</tr>
</thead>
<tbody>
<tr>
<td>GTAW Or Where High Frequency Current Is Used</td>
<td>Low Conductivity Coolant 043810* Distilled Or Deionized Water Okay Above 32°F (0°C)</td>
</tr>
<tr>
<td>GMAW Or Where High Frequency Current Is Not Used</td>
<td>Low Conductivity Coolant 043810* Aluminum Protecting Coolant 043809* Distilled Or Deionized Water Okay Above 32°F (0°C)</td>
</tr>
<tr>
<td>Where Coolant Contacts Aluminum Parts</td>
<td>Aluminum Protecting Coolant 043809*</td>
</tr>
</tbody>
</table>

*Coolants 043810 and 043809 protect to -37°F (-38°C) and resist algae growth.

NOTICE – Use of any coolant other than those listed in the table voids the warranty on any parts that come in contact with the coolant (pump, radiator, etc.).

6-4. Environmental Specifications

A. Wire Feeder IP Rating

<table>
<thead>
<tr>
<th>IP Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP21</td>
</tr>
</tbody>
</table>

This equipment is designed for indoor use and is not intended to be used or stored outside.

B. Water Cooler IP Rating

<table>
<thead>
<tr>
<th>IP Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP23</td>
</tr>
</tbody>
</table>

This equipment is designed for outdoor use. It may be stored, but is not intended to be used outside during precipitation unless sheltered.

C. Information On Electromagnetic Compatibility (EMC)

⚠️ This Class A equipment is not intended for use in residential locations where the electrical power is provided by the public low-voltage supply system. There can be potential difficulties in ensuring electromagnetic compatibility in those locations, due to conducted as well as radiated disturbances.

This equipment complies with IEC61000-3-11 and IEC 61000–3–12 and can be connected to public low-voltage systems provided that the public low-voltage system impedance Z_{max} at the point of common coupling is less than 17.70 m\(\Omega\) (or the short-circuit power S_{sc} is greater than 9,041,859 VA). It is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the system impedance complies with the impedance restrictions.

ce-emc 1 2014-07
### D. China EEP Hazardous Substance Information

<table>
<thead>
<tr>
<th>Component Name (if applicable)</th>
<th>Hazardous Substance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brass and Copper Parts</td>
<td>Pb</td>
</tr>
<tr>
<td>Coupling Devices</td>
<td>Hg</td>
</tr>
<tr>
<td>Switching Devices</td>
<td>Cd</td>
</tr>
<tr>
<td>Cable and Cable Accessories</td>
<td>Cr6</td>
</tr>
<tr>
<td>Batteries</td>
<td>PBB</td>
</tr>
<tr>
<td></td>
<td>PBDE</td>
</tr>
</tbody>
</table>

This table is prepared in accordance with China SJ/T 11364.

- **X**: Indicates that the concentration of the Hazardous Substance in all homogeneous materials of the part is below the relevant threshold of China GB/T 26572.
- **O**: Indicates that the concentration of the Hazardous Substance in at least one homogeneous material of the part is above the relevant threshold of China GB/T 26572.

- Output is derated at temperatures above 104°F (40°C).

### E. Temperature Specifications

<table>
<thead>
<tr>
<th>Operating Temperature Range</th>
<th>Storage/Transportation Temperature Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 to 104 °F (−10 to 40°C)</td>
<td>−4 to 131 °F (−20 to 55°C)</td>
</tr>
</tbody>
</table>

*Output is derated at temperatures above 104°F (40°C).*
### 6-5. MIG Duty Cycle and Overheating

Duty Cycle is percentage of 10 minutes that unit can weld at rated load without overheating.

If unit overheats, thermostat(s) opens, output stops, and cooling fan runs. Wait fifteen minutes for unit to cool. Reduce amperage or duty cycle before welding.

**NOTICE** – Exceeding duty cycle can damage unit and void warranty.

**Overheating**

<table>
<thead>
<tr>
<th>Duty Cycle</th>
<th>Welding Time</th>
<th>Resting Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>6 Minutes</td>
<td>4 Minutes</td>
</tr>
<tr>
<td>60%</td>
<td>4 Minutes</td>
<td>6 Minutes</td>
</tr>
</tbody>
</table>

### 6-6. TIG Duty Cycle and Overheating

Duty Cycle is percentage of 10 minutes that unit can weld at rated load without overheating.

If unit overheats, thermostat(s) opens, output stops, and cooling fan runs. Wait fifteen minutes for unit to cool. Reduce amperage, voltage, wire feed speed, or duty cycle before welding.

**NOTICE** – Exceeding duty cycle can damage unit and void warranty.

**Overheating**

<table>
<thead>
<tr>
<th>Duty Cycle</th>
<th>Welding Time</th>
<th>Resting Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>4 Minutes</td>
<td>6 Minutes</td>
</tr>
<tr>
<td>60%</td>
<td>6 Minutes</td>
<td>4 Minutes</td>
</tr>
</tbody>
</table>
6-7. Stick Duty Cycle and Overheating

Duty Cycle is percentage of 10 minutes that unit can weld at rated load without overheating. If unit overheats, thermostat(s) opens, output stops, and cooling fan runs. Wait fifteen minutes for unit to cool. Reduce amperage, voltage, wire feed speed, or duty cycle before welding.

**NOTICE** – Exceeding duty cycle can damage unit and void warranty.
7-1. Selecting a Location

**Movement**

1. Lifting Eye
2. Lifting Forks

Use lifting eye or lifting forks to move unit. If using lifting forks, extend forks beyond opposite side of unit.

**Location**

3. Line Disconnect Device

Locate unit near correct input power supply.

**Special installation may be required where gasoline or volatile liquids are present – see NEC Article 511 or CEC Section 20.**

- Do not move or operate unit where it could tip.

- Special installation may be required where gasoline or volatile liquids are present – see NEC Article 511 or CEC Section 20.
7-2. Remote 14 Accessory Receptacle Information

If a remote control is connected to the Remote 14 receptacle, the unit will automatically adjust output control to a primary/secondary configuration. In this configuration, the Amperage Adjust knob on the unit becomes the primary and sets the maximum amperage output of the unit. The remote control becomes the secondary and provides an amperage range of 0 to 100% based on the Amperage Adjust knob setting.

The Remote 14 receptacle is factory set to be active in TIG mode only. As an option, this receptacle may also be enabled in Stick mode (see Section 7-3).

<table>
<thead>
<tr>
<th>Socket*</th>
<th>Socket Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>15 volts DC.</td>
</tr>
<tr>
<td>B</td>
<td>Contact closure to A completes 15 volts DC contactor control circuit.</td>
</tr>
<tr>
<td>C</td>
<td>Output to remote control; +10 volts DC.</td>
</tr>
<tr>
<td>D</td>
<td>Remote control circuit common.</td>
</tr>
<tr>
<td>E</td>
<td>0 to +10 volts DC input command signal from remote control.</td>
</tr>
<tr>
<td>K</td>
<td>Chassis common.</td>
</tr>
</tbody>
</table>

*The remaining sockets are not used.

Notes
7-3. Turning On Remote 14 Receptacle Control For Stick

**Tools Needed:**

- 5/16 in. Screwdriver

---

**Warning:**

- Turn Off welding power source, disconnect input power, and check voltage on input capacitors according to Section 9-6 before proceeding.

When this control is active and a current/contactor control is connected to the Remote 14 receptacle on the power source front panel, the contactor and primary/secondary amperage control will function in both TIG and Stick modes.

1. **User Interface Board**
2. **Dip Switch**

Remove feeder and side mount cable hangers from top of unit, if applicable.

Remove top cover from power source.

Move number 2 switch to the up position (on stick side). Use a small screwdriver to move switch, if necessary.

Reinstall cover.

Replace side mount cable hangers and feeder to top of unit, if applicable.
7-4. Changing Wire Feed Speed From Inches Per Minute (IPM) To Meters Per Minute (MPM)

Turn Off welding power source, disconnect input power, and check voltage on input capacitors according to Section 9-6 before proceeding.

1 PipeWorx Feeder
2 Operator Interface Board
3 Dip Switch

Remove feeder wrapper.
Move number 1 switch (top switch) to the ON position. Use a small screwdriver to move switch, if necessary.
Reinstall wrapper.

Tools Needed:
- 5/16 in.
### 7-5. Remote 14 Wire Feeder Control Receptacle Information

<table>
<thead>
<tr>
<th>Remote 14 Feeder Control</th>
<th>Socket*</th>
<th>Socket Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>24 VOLTS AC</strong></td>
<td>8, 12</td>
<td>24 volts AC. Protected by supplementary protector CB2.</td>
</tr>
<tr>
<td></td>
<td>1, 4</td>
<td>24 volts AC return. Connected to chassis common. Completes 24 volts AC power supply circuit to feeder.</td>
</tr>
<tr>
<td><strong>SERIAL COMMUNICATION</strong></td>
<td>6</td>
<td>Isolated RS-485 (+) serial communication signal.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Isolated RS-485 (−) serial communication signal.</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Isolated serial communication common.</td>
</tr>
<tr>
<td><strong>POSITIVE VOLT SENSE</strong></td>
<td>14</td>
<td>Positive weld output voltage sense signal.</td>
</tr>
<tr>
<td><strong>NEGATIVE VOLT SENSE</strong></td>
<td>11</td>
<td>Negative weld output voltage sense signal.</td>
</tr>
<tr>
<td><strong>GND</strong></td>
<td>2, 10</td>
<td>Chassis common.</td>
</tr>
</tbody>
</table>

*The remaining sockets are not used.

**Notes**
Supplementary Protector CB2

CB2 protects the 24 volts ac power supply to the wire feeder (see Section 7-5).

Press button to reset supplementary protector.
1 115 V 10 A AC Receptacle RC2
(Cooler Power Supply Only
When Power Source Is On)

RC2 is a designated use
receptacle intended only for
supplying AC power to a
PipeWorx cooler.
Power is available at receptacle
RC2 only when the power source
is on.

2 Supplementary Protector CB1
CB1 protects single 115 volt AC
receptacle.
Press button to reset supplementary
protector.
7-8. Lifting Eye On Power Source

⚠️ Turn Off welding power source, disconnect input power.

1. Lifting Eye
The wire feeder allows access to the lifting eye on the power source.
The entire welding system as shown with cable hangers, cooler with coolant, dual feeder, and running gear can be lifted with the lifting eye.
The control cable must be disconnected from the feeder. Use of a lifting strap may be necessary.
Total weight is approximately 525 lb (238 kg) excluding welding guns and cables.

Be sure that wire spools, cables and gas bottles are removed before lifting the welding system.
NOTICE – INCORRECT INPUT POWER can damage this welding power source. This welding power source requires a CONTINUOUS supply of input power at rated frequency (±10%) and voltage (±10%). Phase to ground voltage shall not exceed +10% of rated input voltage. Do not use a generator with automatic idle device (that idles engine when no load is sensed) to supply input power to this welding power source.

NOTICE – Actual input voltage should not be 10% less than minimum and/or 10% more than maximum input voltages listed in table. If actual input voltage is outside this range, output may not be be available.

⚠️ This equipment shall only be used on a supply network that is a three-phase, four-wire system with an earthed neutral.

⚠️ Failure to follow these electrical service guide recommendations could create an electric shock or fire hazard. These recommendations are for a dedicated circuit sized for the rated output and duty cycle of the welding power source. In dedicated circuit installations, the National Electrical Code (NEC) allows the receptacle or conductor rating to be less than the rating of the circuit protection device. All components of the circuit must be physically compatible. See NEC articles 210.21, 630.11, and 630.12.

<table>
<thead>
<tr>
<th></th>
<th>50/60 Hz Three-Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage (V)</td>
<td>380 400</td>
</tr>
<tr>
<td>Input Amperes (A) At Rated Output</td>
<td>26.3 25.5</td>
</tr>
<tr>
<td>Max Recommended Standard Fuse Rating In Amperes</td>
<td>30 30</td>
</tr>
<tr>
<td>Time-Delay Fuses 2</td>
<td>40 40</td>
</tr>
<tr>
<td>Normal Operating Fuses 3</td>
<td></td>
</tr>
<tr>
<td>Min Input Conductor Size In AWG (mm²)</td>
<td>10 (5.26) 10 (5.26)</td>
</tr>
<tr>
<td>Max Recommended Input Conductor Length In Feet (Meters)</td>
<td>215 (66) 237 (72)</td>
</tr>
<tr>
<td>Min Grounding Conductor Size In AWG (mm²)</td>
<td>10 (5.26) 10 (5.26)</td>
</tr>
</tbody>
</table>

Reference: 2014 National Electrical Code (NEC) (including article 630)
1 If a circuit breaker is used in place of a fuse, choose a circuit breaker with time-current curves comparable to the recommended fuse.
2 “Time-Delay” fuses are UL class “RK5”. See UL 248.
3 “Normal Operating” (general purpose - no intentional delay) fuses are UL class “KS” (up to and including 60 amps), and UL class “H” (65 amps and above).
4 Conductor data in this section specifies conductor size (excluding flexible cord or cable) between the panelboard and the equipment per NEC Table 310.15(B)(16). If a flexible cord or cable is used, minimum conductor size may increase. See NEC Table 400.5(A) for flexible cord and cable requirements.
7-10. Connecting 3-Phase Input Power

Tools Needed:
- 5/16 in.

= GND/PE Earth Ground
Installation must meet all National and Local Codes – have only qualified persons make this installation.

Disconnect and lockout/tagout input power before connecting input conductors from unit. Follow established procedures regarding the installation and removal of lockout/tagout devices.

Make input power connections to the welding power source first.

Always connect green or green/yellow conductor to supply grounding terminal first, and never to a line terminal.

Select size and length of conductors using Section 7-9. Conductors must comply with national, state, and local electrical codes. If applicable, use lugs of proper amperage capacity and correct hole size.

Welding Power Source Input Power Connections
2. Strain Relief
Route conductors (cord) through strain relief. Tighten strain relief.
3. Welding Power Source Grounding Terminal
4. Green Or Green/Yellow Grounding Conductor
Connect green or green/yellow grounding conductor to welding power source grounding terminal first.
5. Welding Power Source Line Terminals
6. Input Conductors L1 (U), L2 (V) And L3 (W)
Connect input conductors L1 (U), L2 (V) and L3 (W) to welding power source line terminals.

Reinstall left side panel on welding power source.

Disconnect Device Input Power Connections
7. Disconnect Device (switch shown in OFF position)
8. Disconnect Device Grounding Terminal
9. Disconnect Device Line Terminals
Connect green or green/yellow grounding conductor to disconnect device grounding terminal first.

Connect input conductors L1 (U), L2 (V) And L3 (W) to disconnect device line terminals.

10. Over-Current Protection
Select type and size of over-current protection using Section 7-9 (fused disconnect switch shown).
Close and secure door on line disconnect device. Follow established lockout/tagout procedures to put unit in service.

Notes

Work like a Pro!
Pros weld and cut safely. Read the safety rules at the beginning of this manual.
7-11. Installing Optional Handles, Running Gear And Cooler

**Tools Needed:**
- 1/2 in.
- 5/16 in.

**Turn Off welding power source, disconnect input power.**
1. Running Gear 234359
2. Cooler
3. Wheel 163463 (2)
4. Flat Washer 602250 (4)
5. Retaining Ring 121614 (2)

Install wheels on cylinder tray as shown.
Set cooler on running gear.

**If not installing a cooler, set power source on running gear.**
6. Flat Washer 602240 (4)
7. Lock Washer 602211 (4)
8. Screw 601944 (4)

Remove hardware bag and hose from inside cooler.
Secure cooler to running gear using supplied flat washers, lock washers and screws.
9. Power Source

**Do not pinch cooler power cord between cooler and welding power source.**
Set power source on cooler.
Secure power source to cooler using same hardware that was used to secure cooler to running gear.

10. Cylinder Support Bracket
11. Bushing 170647 (2)
12. Bushing 004214 (1)
13. Screw 128237 (4)
14. Chain 188441 (2)

Install cylinder support bracket to rear of power source and secure with supplied screws. Install bushings and chains.

15. Handle Bracket
16. Gun Holder Assembly (2)
17. Screw 195666 (4)
18. Handle (2)
19. Tube Cap (4)

Install tube caps into ends of handles.
Remove 5 screws above louvered panel on front of power source.
Attach handle bracket to front of power source using the 5 screws previously removed. Use 4 supplied screws to attach gun holder assemblies to handle bracket.
Remove 2 screws on the side of the cover on front of power source.

20. Screw 234483 (2)

Start supplied upper handle mounting screws into handles by hand on each side of power source.

21. Screw 604535 (2)
22. Lock Washer 602211 (2)
23. Flat Washer 602240 (2)

Start supplied screws, lock washers and flat washers into handle bracket by hand on each side of power source.

24. Screw 604535 (4)
25. Lock Washer 602211 (4)
26. Flat Washer 602240 (4)

Start supplied lower handle mounting screws, lock washers and flat washers into handles by hand on each side of power source.
Tighten all handle hardware.
7-12. Assembling And Installing Cable Hanger

1 Bracket
2 Tube Cap (4)
3 Cable Holder Tube (2)

Install caps in tubes.
Assemble cable holder tubes to bracket using supplied hardware.
Place cable holder assembly on top of power source or cart and set wire feeder on cable hanger.

Tools Needed:

7/16 in.

3/8 in.
### 7-13. Proper Ring Terminal Connection To Volt Sense Lead

If volt sense lead is cut or broken at end with ring terminal, be sure that new ring terminal is connected as shown.

1. Jacket
2. Insulated Tape Or Heat-Shrink Tubing
3. Center Conductor 10 ga
4. Ring Terminal 1/2 in. Opening

Tools Needed:

![Wrench and pliers icon]

Ref. 239 780-B

### 7-14. Connecting Volt Sense Lead And Work Cable To Clamp

Be sure that volt sense lead ring terminal is on top of work cable ring terminal when connecting to clamp.

Connect volt sense lead and work cable to clamp.

1. Volt Sense Lead
2. Work Cable
3. Clamp

Tools Needed:

![Wrench and pliers icon]

1/2 in.
### 7-15. Weld Output Terminals And Selecting Cable Sizes* Recommended For PipeWorx 400

**NOTICE** – The Total Cable Length in Weld Circuit (see table below) is the combined length of both weld cables. For example, if the power source is 100 ft (30 m) from the workpiece, the total cable length in the weld circuit is 200 ft (2 cables x 100 ft). Use the 200 ft (60 m) column to determine cable size.

<table>
<thead>
<tr>
<th>Welding Amperes</th>
<th>100 ft (30 m) or Less</th>
<th>150 ft (45 m)</th>
<th>200 ft (60 m)</th>
<th>250 ft (70 m)</th>
<th>300 ft (90 m)</th>
<th>350 ft (105 m)</th>
<th>400 ft (120 m)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>10 – 60% Duty Cycle AWG (mm²)</strong></td>
<td>10 – 100% Duty Cycle AWG (mm²)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>4 (20)</td>
<td>4 (20)</td>
<td>3 (30)</td>
<td>2 (35)</td>
<td>1 (50)</td>
<td>1/0 (60)</td>
<td>1/0 (60)</td>
</tr>
<tr>
<td>150</td>
<td>3 (30)</td>
<td>3 (30)</td>
<td>2 (35)</td>
<td>1 (50)</td>
<td>1/0 (60)</td>
<td>2/0 (70)</td>
<td>3/0 (95)</td>
</tr>
<tr>
<td>200</td>
<td>3 (30)</td>
<td>2 (35)</td>
<td>1 (50)</td>
<td>1/0 (60)</td>
<td>2/0 (70)</td>
<td>3/0 (95)</td>
<td>4/0 (120)</td>
</tr>
<tr>
<td>250</td>
<td>2 (35)</td>
<td>1 (50)</td>
<td>1/0 (60)</td>
<td>2/0 (70)</td>
<td>3/0 (95)</td>
<td>4/0 (120)</td>
<td>2x2/0 (2x70)</td>
</tr>
<tr>
<td>300</td>
<td>1 (50)</td>
<td>1/0 (60)</td>
<td>2/0 (70)</td>
<td>3/0 (95)</td>
<td>4/0 (120)</td>
<td>2x2/0 (2x70)</td>
<td>2x3/0 (2x95)</td>
</tr>
<tr>
<td>350</td>
<td>1/0 (60)</td>
<td>2/0 (70)</td>
<td>3/0 (95)</td>
<td>4/0 (120)</td>
<td>2x2/0 (2x70)</td>
<td>2x3/0 (2x95)</td>
<td>2x4/0 (2x120)</td>
</tr>
<tr>
<td>400</td>
<td>1/0 (60)</td>
<td>2/0 (70)</td>
<td>3/0 (95)</td>
<td>4/0 (120)</td>
<td>2x2/0 (2x70)</td>
<td>2x3/0 (2x95)</td>
<td>2x4/0 (2x120)</td>
</tr>
<tr>
<td>500</td>
<td>2/0 (70)</td>
<td>3/0 (95)</td>
<td>4/0 (120)</td>
<td>2x2/0 (2x70)</td>
<td>2x3/0 (2x95)</td>
<td>2x4/0 (2x120)</td>
<td>3x3/0 (3x95)</td>
</tr>
<tr>
<td>600</td>
<td>3/0 (95)</td>
<td>4/0 (120)</td>
<td>2x2/0 (2x70)</td>
<td>2x3/0 (2x95)</td>
<td>2x4/0 (2x120)</td>
<td>3x3/0 (3x95)</td>
<td>3x4/0 (3x120)</td>
</tr>
</tbody>
</table>

* This chart is a general guideline and may not suit all applications. If cable overheats, use next size larger cable.

**Weld cable size (AWG) is based on either a 4 volts or less drop or a current density of at least 300 circular mils per ampere.

( ) = mm² for metric use.

***For distances longer than those shown in this guide, see AWS Fact Sheet No. 39, Welding Cables, available from the American Welding Society at http://www.aws.org.

Ref. S-0007-M 2017-08

### 7-16. Weld Output Terminals

- **Turn off power before connecting to weld output terminals.**
- **Do not use worn, damaged, undersized, or repaired cables.**

1. Stick/Positive (+) Weld Output Terminal
2. Work Output Terminal
3. TIG/Negative (−) Weld Output Terminal

For welding output terminal connections see Sections 7-17 thru 7-29 for typical connection processes.
7-17. Connecting Weld Output Cables

! Turn off power before connecting to weld output terminals.

! Failure to properly connect weld cables may cause excessive heat and start a fire, or damage your machine.

Tools Needed:

- 1 Weld Output Terminal
- 2 Supplied Weld Output Terminal Nut
- 3 Weld Cable Terminal
- 4 Copper Bar

Remove supplied nut from weld output terminal. Slide weld cable terminal onto weld output terminal and secure with nut so that weld cable terminal is tight against copper bar. Do not place anything between weld cable terminal and copper bar. Make sure that the surfaces of the weld cable terminal and copper bar are clean.

Incorrect Installation

Notes
7-18. Typical Connection Diagram For MIG (GMAW) Equipment With Feeder On Power Source

- Do not put feeder where welding wire hits cylinder.
- Do not move or operate equipment when it could tip.

1. Welding Power Source
2. Wire Feeder
3. MIG Connection
4. Positive (+) Weld Cable
5. Feeder Control Cable Connection
6. Gas Hose
7. Gas Cylinder
8. Work (−) Weld Cable
9. Volt Sense Cable
10. Workpiece
11. Welding Gun

Connect 14-pin plug to rear of power source, and connect 14-socket plug to rear of wire feeder. Connect one end of weld cable to weld terminal on rear of power source. Connect remaining end of weld cable to wire feeder drive housing. Connect one end of gas hose to regulator/flowmeter on gas cylinder and connect remaining end of gas hose to gas solenoid connector on rear of feeder or Y-hose for dual wire feeder.

Attach volt sense lead to work clamp and attach work clamp as close to arc as possible.

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7-19. Typical Connection Diagram For MIG (GMAW) Equipment With Feeder On Cart

![Diagram of MIG equipment with feeder on cart]

**Do not put feeder where welding wire hits cylinder.**

**Do not move or operate equipment when it could tip.**

1. Welding Power Source
2. Wire Feeder
3. Feeder Cart
4. Composite Cable
5. MIG Connection
6. Positive (+) Weld Cable
7. Gas Hose
8. Gas Cylinder
   Locate end of composite cable where gas hose extends out of sleeve approximately 50 inches (1270 mm). This end of the composite cable connects to the power source. Connect 14-pin plug to rear of power source, and connect 14-socket plug to rear of wire feeder. Connect one end of weld cable to weld terminal on rear of power source and secure cable in clamp block on rear panel. Connect remaining end of weld cable to wire feeder drive housing and secure cable in clamp block on feeder base. Connect one end of gas hose to regulator/flowmeter on gas cylinder and connect remaining end of gas hose to gas solenoid connector on rear of feeder or Y-hose for dual wire feeder.
9. Work (−) Weld Cable (2/0 minimum)
   ! Attach volt sense lead to work clamp and attach work clamp as close to arc as possible.
10. Volt Sense Cable
11. Workpiece
12. Welding Gun
13. Strain Relief Clamp
7-20. Wire Feeder Rear Panel Connections And Rotating Drive Assembly

Turn off power before connecting to weld terminal or receptacle.

Failure to properly connect weld cables may cause excessive heat and start a fire, or damage your machine.

1 14-Pin Control Cable
2 Shielding Gas Valve Fittings
3 Weld Cable Terminal
4 Jumper Weld Cable From Right Side Drive Assembly (Dual Model Only)
5 Weld Cable
6 Drive Assembly
7 Drive Assembly Rotation Knob

To rotate the drive assembly, loosen drive assembly rotation knob, rotate drive assembly, and tighten knob.
8 Rating Label Location
9 Volt Sense Terminal

Tools Needed:
- 9/16, 5/8 in.
- 3/16 in.
7-21. Gun Trigger Receptacle

1 Left Gun Trigger Receptacle
   RC2

2 Right Gun Trigger Receptacle
   RC3 (Dual Model Only)

Connect gun trigger plug to appropriate receptacle on feeder.

Notes
Installing gun with Accu-Mate connection

Loosen power clamp knob to allow power pin of gun to clear the gun locking tab.

Push power pin into power clamp as far as possible to align the groove in the power pin of the gun with the gun locking tab.

Secure gun by tightening power clamp knob.

Installing gun without Accu-Mate connection

When using a gun without the groove in the power pin, loosen power clamp knob and rotate gun locking tab 180 degrees. This prevents the locking tab from extending into the power pin gun connection.

Push power pin into power clamp as far as possible.

Secure gun by tightening power clamp knob.
For best wire feeding performance, be sure that the outlet cable has the proper size liner for the welding wire size being used. Also, when the gun is installed, the liner extending from the back of the gun should be as close to the drive rolls as possible, without touching.

Install gun. Lay gun cable out straight. Cut off end of wire. Push wire through guides up to drive rolls; continue to hold wire. Press Jog button to feed wire out gun.

For soft wire or small diameter stainless steel wire, reduce drive roll pressure on the rear roll to half that of the front rolls.

To adjust drive roll pressure, hold nozzle about 2 in (51 mm) from nonconductive surface and press gun trigger to feed wire against surface. Tighten knob so wire does not slip. Do not overtighten. If contact tip is completely blocked, wire should slip at the feeder (see pressure adjustment above). Cut wire off. Close cover.
A. Ideal Setup

1. Welding Power Source
2. Composite Cable
3. Work Cable
4. Volt Sense Lead

The volt sense lead must be used to provide an accurate voltage feedback signal to the welding system. Use of this lead is critical for stable welding performance.

5. Wire Feeder
6. Workpiece

This arrangement is an ideal setup for supporting separate voltage feedback to the welding power sources. The most accurate voltage sensing may not be achieved due to voltage drops in the workpiece. This may require compensation in the welding parameters.
B. Bad Setup

This arrangement is a bad setup due to sensing leads being directly in the current flow path of the welding arc. Interaction between welding circuits will affect voltage drop in the workpiece. The voltage drop across the workpiece will not be measured correctly for the voltage feedback signal. Voltage feedback to the welding power sources will not be correct at either sense lead and result in poor arc starts and arc quality.

1. Welding Power Source
2. Composite Cable
3. Work Cable
4. Voltage Sensing Lead
5. Wire Feeder
6. Workpiece
7-25. Arranging Welding Cables To Reduce Welding Circuit Inductance

**Ideal**

- Use shortest cables possible for the job
- Use proper sized work clamp and weld cables to accommodate peak amperages
- Separate volt sense lead and feeder control cable from weld cables
- Place weld cables together if possible
- Connect work clamp as close to welding arc as possible

**Bad**

- DO NOT coil cables
- DO NOT share work clamps (no more than 1 machine per clamp)
- DO NOT tangle cables from different machines
- DO NOT splice weld cables

The method used to arrange cables has a significant affect on welding performance. As an example, Pro-Pulse and RMD welding processes can produce high welding circuit inductance depending on cable length and arrangement. This can result in limited current rise during droplet transfer into the welding puddle.

The electrode sense and volt sense leads are contained in the feeder control cable and are enabled for all processes. The volt sense lead automatically compensates for work cable voltage drop when connected to the welding power source.

**Do not coil excess cables.** Use cables that are the appropriate length for the application. Avoid coupling the volt sense lead with the weld cables.
Attach volt sense lead to work clamp and attach work clamp as close to arc as possible.
7-27. Typical Connection Diagram For Two Piece Air-Cooled TIG (GTAW) Torch (Using Gas Solenoid Inside Power Source)

1 Welding Power Source
2 Gas Hose
3 TIG (−) Weld Cable
4 Work (+) Weld Cable
5 Workpiece
6 TIG Torch
7 Volt Sense Lead
8 Remote Foot Control (Optional)

Attach volt sense lead to work clamp and attach work clamp as close to arc as possible.
7-28. Typical Connection Diagram For One Piece Air-Cooled TIG (GTAW) Torch
(Using Gas Solenoid Inside Power Source)

1  Welding Power Source
2  Gas Hose 237415 (Short Black Hose Supplied With Power Source)
3  TIG Block (Customer Supplied)
4  TIG (-) Weld Cable
5  Work (+) Weld Cable
6  Workpiece
7  TIG Torch
8  Volt Sense Lead
9  Remote Foot Control (Optional)

Attach volt sense lead to work clamp and attach work clamp as close to arc as possible.
7-29. Typical Connection Diagram For Liquid-Cooled TIG (GTAW) Torch
(Using Gas Solenoid Inside Power Source)

1 Welding Power Source
2 Gas Hose
3 TIG Block (Customer Supplied)
4 Coolant Out Hose 237416
   (Short Red Hose Supplied With Cooler)
5 TIG (-) Weld Cable
6 Coolant Return Hose
7 Work (+) Weld Cable
8 Workpiece
9 TIG Torch
10 Volt Sense Lead
11 Remote Foot Control (Optional)

Attach volt sense lead to work clamp and attach work clamp as close to arc as possible.
SECTION 8 – OPERATION

8-1. Operational Terms

The following is a list of terms and their definitions as they apply to this interface unit:

**General Terms:**

98/2 Ox
Gas mixture of 98% Argon and 2% O₂.

Amps
Indicates average amperage while welding and holds the value for 10 seconds at end of weld.

Arc Control
The adjustment of arc cone width and arc characteristics in the RMD and Pulse processes. Increasing Arc Control value increases the arc cone width and subsequently effects the arc length (end of electrode to workpiece). See Section 8-9 items 1 and 4 for adjusting Arc Control value.

Arc Length
Distance from end of wire electrode to workpiece. This term is also used to represent arc length adjustments in RMD and Pulse processes. Increasing Arc Length increases the actual arc length; likewise, decreasing Arc Length shortens actual arc length. See Section 8-9 items 2 and 3 for adjusting arc length value.

C2
Gas mixture of 98% Argon and 2% CO₂.

C20
Gas mixture of mainly Argon and 20% CO₂.

C20-C25
Gas mixture of mainly Argon and 25% CO₂.

C8-C15
Gas mixture of mainly Argon and 8-15% CO₂.

Dig
Adjustable setting for stick welding. Increasing the value provides additional amperage during low voltage (short arc length) conditions while welding. Helps avoid “sticking” the electrodes or snubbing out the arc when a short arc length is used.

Dual Schedule
A two position switch which attaches to (or incorporated in) the gun handle that can be used to change weld parameters during the MIG welding processes. The gun trigger operates as a standard trigger. Dual Schedule is always activated. See Section 8-2 item F 8 for setup procedure.

EXX10
Stick welding electrode type. EXXX1 or EXXX2 are typically used on this setting (cellulosic electrode).

EXX18
Stick welding electrode type. EXXX3 through EXXX8, or stainless are typically used on this setting (low hydrogen type electrode).

FCAW (Flux Cored Arc Welding)
Flux cored arc welding is a continuous electrode that is fed into the arc and depends on shielding gas from either an external source or is generated from the decomposition of gas forming ingredients contained in the electrode’s core. Only dual shielded wire is recommended for the PipeWorx 400. A gas mixture or wire diameter selection is not required. See wire manufacturer for the recommended gas mixture. The 0.9 to 1.6 mm wire sizes can be used in the process.

Gas Type
Selection of shielding gas being used in an application: C8-C15 (Argon/8-15% CO₂), C20 (Argon/20% CO₂), C25 (Argon/25% CO₂), 100% CO₂, C2 (Argon/2% CO₂), 98/2 Ox (Argon/2% O₂), CO₂ (100% CO₂).

HF
TIG starting method. High frequency turns on to help start the arc when output is enabled. High frequency turns off when arc is started and turns on whenever the arc is broken to help restart the arc. HF start is used for GTAW process when a non-contact arc start method is required.

Hot Start
Adjustable setting for stick welding. Allows for adjustment of the output amperage at the start of a stick weld, should the start require it. This helps eliminate sticking of the electrode at are start. Increasing the value increases the start amperage. Decreasing the value, decreases the start amperage.

Inductance Control
Allows setting inductance in MIG and FCAW. In short circuit GMAW welding, an increase in inductance will decrease the number of short circuit transfers per second (provided no other changes are made) and increase the arc-on time. The increased arc-on time makes the welding puddle more fluid. See Section 8-9 items 1 and 4 for adjusting Inductance Control value.

Jog
Method for feeding wire without contactor or gas valve being energized (see Section 8-9, item 9).

Lift-Arc
TIG starting method. Touch tungsten electrode to workpiece at weld start point and enable output and shielding gas with torch trigger, foot control, or hand control (if a control is desired). Hold electrode to workpiece for one to two seconds, and slowly lift electrode to form the arc. Lift-Arc is used for the GTAW process when HF Start method is not permitted.

MIG (GMAW)
Also referred to as solid wire welding. An arc welding process which joins metals by heating them with an arc. The arc is between a continuously fed filler metal (consumable) electrode and the workpiece. Externally supplied gas or gas mixtures provide shielding.

Postflow
The time that the shielding gas continues to flow after the arc has been terminated.

Preflow
The time that the shielding gas flows prior to arc initiation.

Process
A selection made for MIG, Pulse, RMD, Stick, Flux Core (FCAW), or TIG (Lift-Arc or HF starts).

Memory Location Buttons 1-4
By selecting a process such as STICK, TIG, MIG LEFT side of feeder, or MIG right side of feeder there will be four Memory Locations available for selection providing a total of 16 Memory Locations for a dual feeder. There will only be 12 Memory Locations available for a single feeder.
8-1. Operational Terms (Continued)

**Pulse** (Pro-Pulse™)

An advanced pulse spray transfer process suited for the fill and cap passes on pipe. The Pulse process utilizes constant current ramps with constant voltage control of peaks and backgrounds. Adaptive response is controlled by peak and minimum current levels. Benefits are shorter arc lengths, better puddle control, more tolerance of tip-to-work variation, less audible noise, no arc wandering, allows weld to fill in at toes increasing travel speed and deposition, and more tolerant to poor fit up and gaps. Settings for Pulse include Arc Length, Wire Speed and Arc Control.

**Purge**

Method for energizing the gas valve(s) to purge gas lines before welding and to preset gas pressure at the regulator (see Section 8-9, 11).

**RMD**

RMD stands for Regulated Metal Deposition, a precisely controlled short-circuit transfer process. Benefits of RMD are well suited to root pass welding on pipe, improves gap filing and spatter reduction. Provides less heat input into the workpiece, minimizes distortion and allows use of larger diameter wire on thin gauge materials. Settings for RMD include Arc Length, Wire Speed and Arc Control.

**Stick (SMAW)**

Stick (SMAW) welding uses a flux covered consumable electrode that produces a shielding gas and slag to shield the arc and molten weld puddle.

**Synergic**

Synergic refers to the unit's ability to use preprogrammed parameters to determine the actual pulse settings of Peak Amperage, Background Amperage, Pulse Frequency, and Pulse Width at any specific wire feed speed setting. This is a characteristic used in RMD and Pulse processes.

**TIG (GTAW)**

TIG (GTAW) welding uses a non-consumable tungsten electrode and shielding gas to produce a strong, clean, high quality weld.

**Trigger Hold**

This feature reduces welder fatigue by allowing continuous welding without holding the trigger. See Section 8-9 item 10 to set up the Trigger Hold feature.

**Trigger Select**

This feature allows the operator to select MIG processes in Memory Locations 1-4 by pressing the gun trigger. See Section 8-2 item F 6 to set up the Trigger Select feature.

**Trim**

See Arc Length description.

**Volts**

Preset voltage in MIG mode at idle, actual voltage while welding, and 10 seconds hold value at end of weld.

**Wire Diameter**

Selection of wire diameter for MIG RMD and Pulse processes. The 0.9, 1.0 or 1.2 wire size must be selected for MIG RMD and Pulse processes. The 0.9 to 1.6 wire sizes can be used with FCAW, but a wire selection is not required.

**Wire Type**

Selection of wire type (carbon, metal core or stainless).

**WFS**

Term used to represent wire feed speed. In MIG mode, wire feed setting is independent of voltage setting. In Pulse and RMD, adjusting wire feed speed also increases power level on wire electrode (one knob control).

Notes
8-2. Welding Power Source Controls

A. Front Panel Controls

1. Memory Card Busy Indicator
2. Memory Card Save Button
3. Memory Card Load Button
4. Memory Card Indicator
5. Memory Location Buttons 1-4
6. Stick Process Select Button
7. Stick Electrode Type Select Button
8. Ammeter Display
9. Amperage Adjust Knob
10. TIG Process Select Button
11. TIG Starting Method Select Button
12. MIG Process Type Select Button
13. Wire Type Select Button
14. Wire Diameter Select Button
15. Gas Type Select Button
16. Gas Selection Table
17. Trigger Select Button
18. Side Select Button
19. TIG Sequence Controls

*Only illuminated controls can be changed or adjusted.*
8-3. Memory Card Slot

This is the memory card slot. The memory card slot uses an SD memory card. A memory card can be inserted into the slot and used for storing and retrieving operator settings, providing custom MIG type weld process data, and loading firmware updates to the unit. If the power source has multiple users, each user may use a card to store and load their own personal settings. Push in and release the card edge to eject it from the slot.

A. Memory Function Controls

1. Memory Card Busy Indicator

The memory card busy LED illuminates during the following conditions: storage/retrieval of operator settings, usage of custom MIG type weld process, and firmware upgrades.

2. Memory Card Save Button

Press and release this button to save all stored operator settings in memory locations 1-4 as a setup configuration file to memory card. The Busy LED will illuminate to indicate the save operation is in progress. In addition, whenever the Save button is pressed a file named PIPEWORX.TXT is updated on the Memory Card. This file has a PipeWorx Status Summary, Firmware Revisions, and Fault History. The file can be read using a computer equipped with a memory card reader. This information can be used for maintenance schedules or troubleshooting.

3. Memory Card Load Button

Press and release this button to load a previously saved configuration file from the memory card in the card slot. This operation allows restoring previously saved operator settings on the card to memory locations 1-4. The busy LED will illuminate to indicate the load operation is in progress.

4. Memory CARD Indicator

The memory CARD text will illuminate when custom MIG or TIG type weld process data is currently being used from the memory card.
B. Using Optional Memory Card

1. Memory Card Insertion
   a. Lift and hold memory card access cover open.
   b. Insert memory card into slot (push card all the way into slot and then release).
   c. Close memory card access cover.

2. Memory Card Removal
   a. Lift and hold memory card access cover open.
   b. Push in and release memory card to eject card.
   c. Grasp memory card and remove from slot.
   d. Close memory card access cover.

3. Optional Program Card Operation
   a. Insert optional program card into slot.
   b. Select wire feeder as follows:
      Press either the LEFT or RIGHT (dual feeder only) button on the feeder.
      or
      Press the SIDE SELECT button on the power source until the desired wire feeder side is illuminated.
   c. Select weld process by pressing the MIG TYPE button on the power source front panel until the desired process is illuminated.
      CARD will illuminate on the power source front panel as well as on the feeder front panel to indicate that the optional program is being used from the memory card.
   d. Select the wire diameter, if applicable, as follows:
      Press the WIRE DIA button on the power source front panel until the desired wire diameter is illuminated.

   — Some optional program cards only support a single wire diameter, in this case, only that diameter will illuminate.
   e. Remove memory card to revert to standard operation.

4. Optional Feature Card Operation
   a. Insert optional feature card.
   b. Specific feature will be displayed on Volt meter of feeder.
   c. Turn WFS knob to enable/disable feature.
   d. Remove card.

   — One card can enable/disable multiple machines.

5. Software Update Card (System Software Update)
   a. Insert software update card into slot.
   b. Perform software update by pressing and holding the LOAD button on the power source front panel until UPd appears on the 7-segment LED display.
   c. Wait for the software update to complete (approximately two minutes).

   — During the software update, the displays on both the power source and feeder front panels may display H99 or H98 as well as the UPd or go blank for a period of time. This is normal during a software update. Do not remove the memory card until the software update has completed. Do not turn off the power source until the software update has completed.
   d. Remove memory card.

C. Memory Locations

1. Memory Location Buttons 1-4

   These are locations for storing weld process settings for easy access. Press and release these buttons to recall stored unit configuration settings. Only one memory location can be active during unit operation. The number next to the button illuminates to indicate the active memory location. Unit configuration settings are automatically saved to the active memory location one second after any change is made to any of the front panel controls. This feature allows the unit to remember an operator’s preferred settings. These settings can be recalled at any time by selecting the appropriate memory location and process/feeder side. By selecting a process such as STICK, TIG, MIG LEFT side of feeder, or MIG RIGHT side of feeder there will be four Memory Locations available for each, providing a total of 16 Memory Locations for a dual feeder. There will only be 12 Memory Locations available for a single feeder.

2. Memory Location Reset

   Pressing and holding a memory location button for more than two seconds will restore factory default settings for the current weld process to that particular memory location. The memory location number light will go out and back on when the reset is complete.
D. Stick And TIG Welding Process Controls

1. Stick Process Select Button

Press and release this button to activate the stick welding process controls. The STICK text below the button illuminates as well as the active stick electrode type text and the swoosh above the amperage adjust knob. The operator must select the desired stick electrode type and adjust the amperage knob to the appropriate setting within a range from 40 to 400 amps.

2. Stick Electrode Type Select Button

Press and release this button to select the desired stick electrode type (EXX10 or EXX18). The text above or below the button will illuminate for the active electrode type. This button is only active with the stick welding process selection and only then will text for the electrode type selection illuminate.

3. Adjustable DIG And Hot Start

Adjustable DIG and Hot Start features are provided when in the STICK process. Settings for both DIG and Hot Start on EXX10 and EXX18 electrodes are independent (each has its own settings). To access the adjustable DIG and adjustable Hot Start functions, proceed as follows:

   a. When in the STICK mode, press and hold the STICK button for two seconds. The Amperage display will show the DIG setting with the right most decimal point illuminated. The default value for DIG is 40.

   b. Rotate the Amperage knob to adjust the DIG setting. Adjustable range is 0 to 99.

   c. When in the adjustable DIG function, press the STICK button To access the adjustable Hot Start function. The Amperage display will show the Hot Start setting with the middle decimal point illuminated. The default setting is 1.3.

   d. Rotate the Amperage knob to adjust the Hot Start setting. Adjustable range is 0.0 to 2.0.

   e. Press the STICK button or any other button on the interface to exit the adjustable DIG and Hot Start function.

4. Ammeter Display

The display illuminates and shows amperage setting when either a stick or TIG welding process is selected. Dashes are displayed when any MIG welding process is selected indicating the display is inactive; however, actual amperage is displayed while welding regardless of the selected welding process. Measured amperage just prior to the end of a welding operation will appear on the display for 10 seconds after the welding operation.

5. Amperage Adjust Knob

Use this knob to set a desired amperage setting for either a stick or TIG welding process. Rotating the knob clockwise increases amperage and counterclockwise decreases amperage. Amperage adjustment is active when the swoosh above the knob is illuminated. If a remote control is connected to the Remote 14 receptacle, the unit will automatically adjust output control to a primary/secondary configuration. In this configuration, the Amperage Adjust knob on the unit becomes the primary and sets the maximum amperage output of the unit. The remote control becomes the secondary and provides an amperage range of 0 to 100% based on the Amperage Adjust knob setting.

(C) The Remote 14 receptacle is factory set to be active in TIG mode only. As an option, this receptacle may also be enabled in Stick mode (see Section 7-3).

6. TIG Process Select Button

Press and release this button to activate the TIG welding process controls. The TIG text below the button illuminates as well as the active starting method text and the swoosh above the amperage adjust knob. The operator must select the desired starting method and adjust the amperage knob to the appropriate setting within a range from 10 to 350 amps. If the TIG process has been selected and a remote current/contactor control is connected, holding the TIG process select button for more than two seconds will display the effective amperage command (based on the amperage setting and the remote current/contactor control setting).

7. TIG Starting Method Select Button

Press and release this button to select the desired TIG starting method either HF or Lift Arc. The text above or below the button will illuminate for the active starting method. This button is only active with the TIG welding process selection and only then will text for the starting method selection illuminate.

E. TIG Sequence Controls

The TIG Sequence Controls provides flexibility in the TIG process operation. It provides “Std” (no sequencing), 2T and 4T trigger operation. The TIG Sequence Controls are active for both Lift Arc and HF start mode. To activate TIG Sequencing, proceed ad follows:

a. Press the TIG Set-up button.

   When pressed, the Amperage display will show “Std”, “2T” or “4T”. Rotate the Amperage knob to select the desired operation mode. When “2T” or “4T” is selected, the appropriate icon on the interface panel will illuminate.

b. Sequential pressing of the TIG Set-up button will cycle through the set-up options. An LED will illuminate at each option indicating the active option being programmed.

   - Preflow – 0.0 to 10.0 seconds (HF start only)
   - Initial amperage – 10 to 350 amps
   - Initial time – 0.0 to 10.0 seconds (2T only)
   - Ramp up time – 0.0 to 10.0 seconds
- Ramp down time – 0.0 to 10.0 seconds
- Final amperage – 10 to 350 amps
- Final time – 0.0 to 10.0 seconds (2T only)
- Postflow time – 0 to 60 seconds

2T Trigger Operation

When in the 2T trigger mode the following weld sequence will occur:
- Press and hold the TIG torch trigger to start the sequence.
- Preflow is conducted for the programmed time.
- After preflow, the weld sequence starts in accordance to the programmed parameters (initial amperage and time, ram-up time).
- After reaching the weld current, the weld will continue as long as the TIG torch trigger is depressed.
- Release the trigger to initiate the stop sequence. The stop sequence will proceed in accordance with the programmed parameters (ramp down time, final amperage and time, postflow).

4T Trigger Operation

When in the 4T trigger mode the following weld sequence will occur:
- Press and hold the TIG torch trigger to start the sequence.
- Preflow is conducted for the programmed time.
- After preflow, initial amperage is started if programmed. The initial amperage will be maintained as long as the TIG torch trigger is depressed.
- Releasing the TIG torch trigger initiates the ramp-up time until the welding amperage is reached.
- Welding will continue at the welding amperage setting.
- Press and hold the TIG torch trigger to initiate the ramp down time and final amperage. The final amperage will be maintained as long as the TIG torch trigger is depressed.
- Release the TIG torch trigger to stop the welding process. When released, postflow is initiated in accordance with the programmed value.

F. MIG Welding Process Controls

The reference to left side feeder controls or left side gun trigger applies to either a single feeder or dual feeder. The reference to right side feeder controls or right side gun trigger only applies to a dual feeder.

The controls in the MIG setup panel are only active when in the MIG process. Press and release the SIDE SELECT button to activate the MIG process and the desired feeder side. The LEFT or RIGHT text will illuminate to indicate the active feeder side (only LEFT will illuminate when using a single feeder). The MIG welding process controls can also be activated at the feeder front panel by pressing LEFT or RIGHT, or by pressing the left or right side gun trigger (see Section 8-9A). The MIG setup panel controls on the welding power source should be selected in order from left to right starting with MIG type and ending with trigger select.

1. MIG TYPE Process Select Button

Press and release the MIG TYPE button to select the desired process (FCAW, MIG, RMD, or PULSE). The text illuminates to the right of this button to indicate the active process selection:

FCAW – gas shielded flux cored welding process
MIG (GMAW) – standard short circuit or spray welding process
RMD ™ (Regulated Metal Deposition) – modified short circuit welding process
PULSE (GMAW-P) – Pro-Pulse ™ pulse welding process.

2. WIRE TYPE Select Button

Press and release WIRE TYPE button to select the desired wire type (CARBON, CARBON METAL CORE or STAINLESS steel). The text illuminates above or below the button to indicate the active wire type selection. This selection is required for all MIG process types except FCAW.

3. WIRE DIAMETER Select Button

Press and release the WIRE DIA button to select the desired wire diameter (0.9, 1.0 or 1.2). The text illuminates above or below the button to indicate the active wire diameter selection. This selection is required for all MIG process types except FCAW.

4. GAS TYPE Select Button

Press and release GAS TYPE button to select the desired shielding gas. This button will cycle through and illuminate only the available gas selections in one particular column of the gas table based on the selected MIG process and WIRE TYPE type. The text illuminates when any MIG process is selected except FCAW.
5. Gas Selection Table

The gas selection table provides the available shielding gas selections. For any MIG process except FCAW, gas selections are structured into columns based first on WIRE TYPE type and then on MIG process selections. The gas type text illuminates to indicate the active gas selection. Shielding gas selections are as follows:

- C8-C15 (92% Argon/8% CO2 to 85% Argon/15% CO2)
- C20 (80% Argon/20% CO2)
- C25 (75% Argon/25% CO2)
- CO2 (100% CO2)
- C2 (98% Argon/2% CO2)
- 98/2 Ox (98% Argon/2% O2)

6. TRIGGER SELECT Button

Press and release TRIGGER SELECT button to enable/disable the trigger select feature for memory locations 1-4. The indicator above or below the button, either On or Off respectively, illuminates to indicate the current trigger select status. This feature must have at least two memory locations enabled to perform its function, but as many as four memory locations can be enabled for TRIGGER SELECT. The desired MIG process type(s) and parameter settings should first be loaded to each memory location prior to welding. These parameter settings (voltage/arc length and wire feed speed) are made at the wire feeder front panel (see Section 8-9). Once parameters are set, quickly press and release gun trigger, in less than 0.2 seconds while not welding, to select the next enabled memory location. If the gun trigger is pressed and held for 0.2 seconds or longer, the memory location will not advance and parameter settings will remain at the current settings.

7. SIDE SELECT Button

Press and release SIDE SELECT button to select the MIG process and the desired side of a dual feeder (only LEFT will illuminate when using a single feeder).

8. Dual Schedule

To use Dual Schedule, plug in the switch, and select the MIG TYPE Process with the necessary selections and parameters with the switch in one position. Then move the switch position and select the MIG TYPE Process with the necessary selections and parameters again. Essentially, there are two programs saved to the selected memory location.

Notes
8-4. TIG Sequence Control

1 2T Trigger Icon
2 4T Trigger Icon
3 Preflow Indicator
4 Initial Amperage Indicator
5 Ramp-Up Indicator
6 Ramp-Down Indicator
7 Final Amperage Indicator
8 Postflow Indicator
9 TIG Sequence Control Set-Up Button
8-5. Stick Process Selection Setup Example

Only illuminated controls can be changed or adjusted.

1. Stick Process Active
2. EXX10 Electrode Type Selected
3. Amperage Setting 350A
4. Memory Location 1 Active
8-6. TIG Process Selection Setup Example

Only illuminated controls can be changed or adjusted.

1. TIG Process Active
2. HF Start Method Selected
3. Amperage Setting 350A
4. Memory Location 2 Active

Ref. 252 613-B
8-7. MIG Process Selection Setup Example 1

Only illuminated controls can be changed or adjusted.

1. MIG Process Active
2. Carbon Steel Wire Type Selected
3. 0.9 Wire Diameter Selected
4. C8-C15 Gas Type Selected
5. Trigger Select On
6. Side Select Left
7. Memory Location 3 Active
### MIG Process Selection Setup Example 2

- **Pro-Pulse MIG Process Active**
- **Stainless Steel Wire Type Selected**
- **0.9 Wire Diameter Selected**
- **98/2 Ox Gas Type Selected**
- **Trigger Select On**
- **Side Select Left**
- **Memory Location 4 Active**

#### Only illuminated controls can be changed or adjusted:

<table>
<thead>
<tr>
<th>MIG Type</th>
<th>Wire Type</th>
<th>Wire Diameter</th>
<th>Gas Type</th>
<th>Trigger Select</th>
<th>Side Select</th>
</tr>
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<tr>
<td>Carbon</td>
<td>Carbon</td>
<td>0.9</td>
<td>C8 - C15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RMD</td>
<td>Carbon</td>
<td>1.0</td>
<td>C20</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stainless</td>
<td>1.2</td>
<td>C25</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Metal Core</td>
<td></td>
<td>98/2 Ox</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>100% CO2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8-9. Wire Feeder Controls

A. Front Panel Controls

Only illuminated controls can be changed or adjusted.

1. Left Side Controls Select Button
2. Volts/Arc Length Display
3. Volts/Arc Length Adjust Knob
4. Right Side Controls Select Button*
5. Wire Feed Speed Display
6. Wire Feed Speed Adjust Knob
7. Memory Card Indicator
8. MIG Process Type Indicator
9. Jog Button
10. Trigger Hold Select Button
11. Purge Button
12. Memory Select Button And Location Indicator
13. Wire Feed Speed Units Indicators
14. Accu-Power Indicator

*Dual Feeder Only
1. **Left Side Controls Select Button**

Press and release this button to activate the wire feeder left side controls. The LEFT text below the button will illuminate and the swooshes above the volts/arc length adjustment knob and wire feed speed adjustment knob will illuminate. See Section 8-2 for the procedure to select the appropriate MIG process type parameters. Pressing the left side welding gun trigger will also activate the left side controls.

When in Pulse or RMD, holding the Left Side Select button for more than two seconds will activate Arc Control. “ARC” will be shown on the lower display and the Arc Control value on the upper display. The setable range is −25 to +25 with 0 as nominal. Increasing Arc Control value increases the arc cone width and subsequently effects the arc length (end of electrode to workpiece distance). Decreasing Arc Control value decreases the arc cone width and subsequently effects the arc length (electrode to workpiece distance).

When in MIG or FCAW, holding the Left Side Select button for more than two seconds will activate Inductance Control. “IND” will be shown on the lower display and the Inductance Control value on the upper display. The setable range is 0 to 99 with nominal setting being program specific. An increase in inductance will decrease the number of short circuit transfers per second (provided no other changes are made) and increase the arc-on time. The increased arc-on time makes the welding puddle more fluid. A decrease in inductance will increase the number of short circuit transfers per second (provided no other changes are made) and decrease the arc-on time. The decreased arc-on time makes the welding puddle less fluid.

2. **Volts/Arc Length Display**

This display shows the voltage setting for MIG and FCAW processes (10.0 to 44.0 volts), and it shows the arc length for RMD and Pro-Pulse processes (−3.0 to +3.0 in 0.1 increments with 0 as nominal). The actual arc voltage is displayed while welding and continues to appear for 10 seconds after the welding arc is extinguished. Dashes appear on the display when other welding processes are selected.

3. **Volts/Arc Length Adjust Knob**

Use this knob to adjust the desired voltage setting (10.0 to 44.0 volts) or arc length setting (−3.0 to +3.0 in 0.1 increments with 0 as nominal) depending on the type of MIG process selection. Rotating the knob clockwise increases volts/arc length and counter-clockwise decreases volts/arc length. Volts/arc length adjustment is active when the swoosh above the knob is illuminated. The setting can be different for left and right sides, and the unit will hold these settings for both sides.

4. **Right Side Controls Select Button (Dual Feeder Only)**

Press and release this button to activate the wire feeder right side controls. The RIGHT text below the button will illuminate and the swooshes above the volts/arc length adjustment knob and wire feed speed adjustment knob will illuminate. See Section 8-2 for the procedure to select the appropriate MIG process type parameters. Pressing the right side welding gun trigger will also activate the right side controls.

When in Pulse or RMD, holding the Right Side Select button for more than two seconds will activate Arc Control. “ARC” will be shown on the lower display and the Arc Control value on the upper display. The setable range is −25 to +25 with 0 as nominal. Increasing Arc Control value increases the arc cone width and subsequently effects the arc length (end of electrode to workpiece distance). Decreasing Arc Control value decreases the arc cone width and subsequently effects the arc length (end of electrode to workpiece distance).

When in MIG or FCAW, holding the Right Side Select button for more than two seconds will activate Inductance Control. “IND” will be shown on the lower display and the Inductance Control value on the upper display. The setable range is 0 to 99 with nominal setting being program specific. An increase in inductance will decrease the number of short circuit transfers per second (provided no other changes are made) and increase the arc-on time. The increased arc-on time makes the welding puddle more fluid. A decrease in inductance will increase the number of short circuit transfers per second (provided no other changes are made) and decrease the arc-on time. The decreased arc-on time makes the welding puddle less fluid.

5. **Wire Feed Speed Display**

This display shows the wire feed speed setting when any of the MIG process types are selected and the display is blank when other processes are selected. The wire feed speed range that can be displayed is from 1.3 to 19.8 mpm (50 to 780 ipm). Also, when the jog button is pressed the current jog speed appears on the display.
6. Wire Feed Speed Adjust Knob

Use this knob to adjust the desired wire feed speed setting [1.3 to 19.8 mpm (50 to 780 ipm)]. Rotating the knob clockwise increases wire feed speed and counter-clockwise decreases wire feed speed. Wire feed speed adjustment is active when the swoosh above the knob is illuminated. The setting can be different for left and right sides and MIG process type, and the unit will hold these settings for both sides.

7. Memory Card Indicator

The CARD text will illuminate to indicate that custom MIG type weld process data is currently being used from the memory card.

8. MIG Process Type Indicator

The FCAW, MIG, RMD, or PULSE text illuminates to indicate which type of MIG process is selected at the welding power source (see Section 8-2). No text illuminates when other welding processes are selected.

9. Jog Button

Press and hold this button to jog wire on either the left or right side depending on the active side selection. Rotate the wire feed speed adjustment knob to change jog speed. Rotating the knob clockwise increases jog speed and counter-clockwise decreases jog speed. Release the button to stop the jog operation and the display will return to the initial wire feed speed setting.

Wire jog is also initiated by pressing and holding the MIG gun trigger without establishing an arc. If the gun trigger is depressed and an arc is not established, the feeder will automatically go into jog after 2 seconds.

   Auto Jog

• Pressing and releasing the jog and trigger hold buttons simultaneously will activate the auto jog function. Depending on the active side selection, the left or right (dual feeder only) side will automatically jog a preset amount of wire. The volts/arc length display will count down in 0.01 m or 0.1 ft decrements starting at the preset wire length. A default preset wire length is set at 4.7 m (15.3 ft), but the length can be changed within a range of 1.5 to 9.1 m (5.0 to 30.0 ft) using the volts/arc length adjust knob. Rotating the knob clockwise increases wire length and counter-clockwise decreases wire length. The volts/arc length display will show the set wire length for a short time after making any desired adjustment. If no further changes are made to the wire length after one second the unit will resume the count down display. Jog speed can also be adjusted within a range of 1.3 to 19.8 m (50 to 780 ipm) using the wire feed speed adjust knob and the wire feed speed display will show the current jog speed setting.

10. Trigger Hold Select Button

Press and release this button to enable/disable the trigger hold feature. The text above or below the button, either ON or OFF respectively, illuminates to indicate the current trigger hold selection. When trigger hold is active, the gun trigger must be pressed and held for a minimum of one half second, but not more than six seconds. Then releasing the gun trigger activates the trigger hold function. To stop welding, press and release the gun trigger.

11. Purge Button

Press and hold this button to purge shielding gas lines prior to welding and to preset gas pressure at the regulator for either the left or right (dual feeder only) side. This button will also purge the TIG gas solenoid located at the welding power source if the TIG welding process is selected. Release the button to stop the purge operation.

   Timed Purge

• Pressing and releasing the purge and trigger hold buttons simultaneously will activate the timed purge function. The volts/arc length display will count down in 1 second decrements starting at the preset amount of time. A default preset time period is set at 30 seconds, but the time can be changed within a range of 5 to 60 seconds using the volts/arc length adjust knob. Rotating the knob clockwise increases time and counter-clockwise decreases time. The volts/arc length display will show the set time after making any desired adjustment. If no further changes are made to the time period after one second the unit will resume the count down display.

12. Memory Select Button And Location Indicator

Press and release this button to scroll through stored unit configuration in locations 1-4. This button can only recall configurations and cannot be used to restore factory default settings to a memory location (see Section 8-2). The numeral next to the button illuminates to indicate the active memory location.

13. Wire Feed Speed Units Indicators

Indicators display the settings for Wire Feed Speed; inches per minute (IPM) or meters per minute (mpm).

14. Accu-Power Indicator

Indicator illuminates when Accu-Power is enabled on the welding system. Accu-Power displays instantaneous power during welding to meet the new ASME requirement for calculating heat input on complex waveform processes (“RMD” and Pro-Pulse”). Requires version 1.07 software minimum. See product literature sheet.
8-10. Preflow And Postflow Adjustment

Postflow will not function without an arc initiation.

Preflow and Postflow times can be configured for each of the TIG, Wire Feeder Left and Wire Feeder Right outputs. These times are global settings (i.e. all memory slots share the same three preflow and postflow settings; it is not possible to set different postflow times between memory slots).

The unit is shipped in the standard configuration ("Std" appears on the display). In the standard configuration preflow and postflow times are automatically calculated as follows:

Preflow

Preflow is only active when in the HF start mode. For TIG, the preflow time is set to 0.1 seconds when in the standard configuration.

For wire processes, the preflow times are fixed at 0.25 seconds which is the default setting in the weld programs.

Postflow

For TIG, the postflow time is a function of output current where the minimum time is 8 seconds from 0 to 175 amps and increases linearly from 8 seconds at 175 amps to 16 seconds at 350 amps.

For wire processes, the postflow time is a function of wire feed speed where the minimum time is 8 seconds from 0 to 9.9 mpm and increases linearly for 8 seconds at 9.9 mpm to 16 seconds at 19.8 mpm.

To adjust preflow and postflow times, proceed as follows:

1. Select desired output: TIG, LEFT or RIGHT.
2. Press and hold the Purge button, gas solenoid will open.
3. Rotate the Voltage or Wire Feed Speed knob, gas solenoid will close.
   Unit will display PrE on the Voltage display and preflow setting on the Wire Feed Speed display (Std appears if this is the first time).
4. Release the Purge button.
5. Adjust preflow time to desired value by rotate the Wire Feed Speed knob.
   Available selections include Std and numeric values from 0.9 to 10.0 seconds.
   If Trigger Select is enabled, there is a minimum preflow time of 0.25 seconds even if programmed for 0.0 seconds.
6. Rotate the Voltage knob to change from preflow to postflow.
Unit will display PS on the Voltage display.

7. Adjust postflow time to desired value by rotate the Wire Feed Speed knob. Available selections include Std and numeric values from 0 to 60 seconds.

8. Press any button to return to the normal display.

8-11. Wire Feeder Left Side Active Setup Example

- Only illuminated controls can be changed or adjusted.

1. Left Side Controls Active
2. MIG Process Selected
3. Trigger Hold Off
4. Memory Location 1 Active
Only illuminated controls can be changed or adjusted.

1. Right Side Controls Active
2. Pulse Process Selected
3. Trigger Hold On
4. Memory Location 2 Active
8-13. Wire Feeder Non-MIG Setup Example

Only illuminated controls can be changed or adjusted.

1 Non-MIG Process Selected

2 Memory Location 3 Active
### 8-14. Wire Feeder Timed Purge Example

Only illuminated controls can be changed or adjusted.

- **1.** Purge And Trigger Hold Buttons
- **2.** Purge Time Setting Adjustment Knob
- **3.** Purge Time Remaining Display

<table>
<thead>
<tr>
<th>MIG TYPE</th>
<th>JOG</th>
<th>TRIGGER HOLD</th>
<th>PURGE</th>
<th>MEMORY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>
8-15. Wire Feeder Auto Jog Example

1 Jog And Trigger Hold Buttons Pressed
2 Jog Feet Adjustment Knob
3 Jog Feet Remaining Display
4 Jog Wire Feed Speed Adjustment Knob
5 Jog Wire Feed Speed Display

Only illuminated controls can be changed or adjusted.

Simultaneously
1 Jog And Trigger Hold Buttons Pressed
2 Jog Feet Adjustment Knob
3 Jog Feet Remaining Display
4 Jog Wire Feed Speed Adjustment Knob
5 Jog Wire Feed Speed Display
<table>
<thead>
<tr>
<th>Process</th>
<th>Wire Size mm</th>
<th>Wire Feed Speed mpm</th>
<th>Arc Length</th>
<th>Shielding Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Steel</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.9</td>
<td>2.5-8.9 w/5.1 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C8-C15</td>
<td></td>
</tr>
<tr>
<td>0.9</td>
<td>2.5-8.9 w/5.1 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C20</td>
<td></td>
</tr>
<tr>
<td>0.9</td>
<td>2.5-8.9 w/5.1 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C25</td>
<td></td>
</tr>
<tr>
<td>0.9</td>
<td>3.8-8.9 w/5.1 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>100% CO₂</td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>2.5-6.4 w/4.4 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C8-C15</td>
<td></td>
</tr>
<tr>
<td><strong>RMD Carbon</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>2.5-7.6 w/4.4 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C20</td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>2.5-7.6 w/4.4 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C25</td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>3.8-6.4 w/4.4 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>100% CO₂</td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td>1.9-6.4 w/3.8 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C8-C15</td>
<td></td>
</tr>
<tr>
<td><strong>RMD Carbon Metalcore</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td>1.9-5.7 w/3.8 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C20</td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td>1.9-5.7 w/3.8 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C25</td>
<td></td>
</tr>
<tr>
<td>Process</td>
<td>Wire Size mm</td>
<td>Wire Feed Speed mpm</td>
<td>Arc Length</td>
<td>Shielding Gas</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------------</td>
<td>--------------------------------------</td>
<td>---------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td><strong>ProPulse Carbon Using A Positioner (Rolling The Pipe)</strong></td>
<td>0.9</td>
<td>2.5-19.8 w/5.1 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C8-C15</td>
</tr>
<tr>
<td></td>
<td>0.9</td>
<td>2.5-19.8 w/5.1 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C20</td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td>2.5-19.8 w/4.4 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C8-C15</td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td>2.5-19.8 w/4.4 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C20</td>
</tr>
<tr>
<td></td>
<td>1.2</td>
<td>1.9-12.7 w/3.8 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C8-C15</td>
</tr>
<tr>
<td></td>
<td>1.2</td>
<td>1.9-12.7 w/3.2 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C20</td>
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<tr>
<td><strong>ProPulse Carbon Welding In Position</strong></td>
<td>0.9</td>
<td>2.5-19.8 w/5.7 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C8-C15</td>
</tr>
<tr>
<td></td>
<td>0.9</td>
<td>2.5-19.8 w/5.7 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C20</td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td>2.5-19.8 w/5.1 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C8-C15</td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td>2.5-19.8 w/5.1 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C20</td>
</tr>
<tr>
<td></td>
<td>1.2</td>
<td>2.5-12.7 w/3.8 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C8-C15</td>
</tr>
<tr>
<td></td>
<td>1.2</td>
<td>1.9-12.7 w/3.2 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C20</td>
</tr>
<tr>
<td>Process</td>
<td>Wire Size mm</td>
<td>Wire Feed Speed mpm</td>
<td>Arc Length</td>
<td>Shielding Gas</td>
</tr>
<tr>
<td>---------</td>
<td>--------------</td>
<td>---------------------</td>
<td>------------</td>
<td>---------------</td>
</tr>
<tr>
<td>RMD Stainless Steel</td>
<td>0.9</td>
<td>2.5-8.9 W/5.1 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C2</td>
</tr>
<tr>
<td></td>
<td>0.9</td>
<td>2.5-8.9 W/5.1 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>98/2 Ox</td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td>2.5-7.6 w/4.4 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C2</td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td>2.5-7.6 w/4.4 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>98/2 Ox</td>
</tr>
<tr>
<td></td>
<td>1.2</td>
<td>1.9-6.4 w/3.8 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C2</td>
</tr>
<tr>
<td></td>
<td>1.2</td>
<td>1.9-6.4 w/3.8 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>98/2 Ox</td>
</tr>
<tr>
<td>ProPulse Stainless Steel Using A Positioner (Rolling The Pipe)</td>
<td>0.9</td>
<td>1.9-19.8 w/5.1 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C2</td>
</tr>
<tr>
<td></td>
<td>0.9</td>
<td>1.9-19.8 w/5.1 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>98/2 Ox</td>
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<tr>
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<td>1.0</td>
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<td>C2</td>
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<tr>
<td></td>
<td>1.0</td>
<td>1.9-19.8 w/4.4 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>98/2 Ox</td>
</tr>
<tr>
<td></td>
<td>1.2</td>
<td>1.9-19.8 w/3.2 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C2</td>
</tr>
<tr>
<td></td>
<td>1.2</td>
<td>1.9-19.8 w/3.2 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>98/2 Ox</td>
</tr>
<tr>
<td>ProPulse Stainless Steel Welding In Position</td>
<td>0.9</td>
<td>2.5-19.8 w/5.1 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C2</td>
</tr>
<tr>
<td></td>
<td>0.9</td>
<td>2.5-19.8 w/5.1 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>98/2 Ox</td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td>2.5-19.8 w/4.4 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C2</td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td>2.5-19.8 w/4.4 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>98/2 Ox</td>
</tr>
<tr>
<td></td>
<td>1.2</td>
<td>1.9-19.8 w/3.2 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>C2</td>
</tr>
<tr>
<td></td>
<td>1.2</td>
<td>1.9-19.8 w/3.2 Nominal</td>
<td>+3.0 to −3.0 w/zero Nominal</td>
<td>98/2 Ox</td>
</tr>
</tbody>
</table>
Flux Core

<table>
<thead>
<tr>
<th>Process</th>
<th>Wire Size mm</th>
<th>Rolling Pipe/In Position Wire Feed Speed mpm</th>
<th>Voltage</th>
<th>Shielding Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flux Core/GMAW</td>
<td>Not Dependent</td>
<td>1.3-19.8 w/6.4 Nominal*</td>
<td>24.5-32 w/25.0 Nominal</td>
<td>Not Dependent</td>
</tr>
</tbody>
</table>

Note: Arc Length – Length of arc from end of wire to weld puddle. Wire feed speed and voltage are synergic for the RMD and ProPulse processes. This means when adjusting wire feed speed, the voltage is automatically adjusted so it is not necessary to adjust the Arc Length.

*See wire manufacturer for recommended wire feed speed and gas mixture.

8-17. Lift-Arc™ And HF TIG Start Procedures

Lift-Arc Start

When Lift-Arc™ button light is On, start arc as follows:

1. TIG Electrode
2. Workpiece

Touch tungsten electrode to workpiece at weld start point, enable output and shielding gas with torch trigger, foot control, or hand control (if a remote control is connected). **Hold electrode to workpiece for 1-2 seconds**, and slowly lift electrode. Arc is formed when electrode is lifted.

Normal open-circuit voltage is not present before tungsten electrode touches workpiece; only a low sensing voltage is present between electrode and workpiece. The solid-state output contactor does not energize until after electrode is touching workpiece. This allows electrode to touch workpiece without overheating, sticking, or getting contaminated.

**Application:**

Lift-Arc is used for the DCEN or process when HF Start method is not permitted, or to replace the scratch method.

HF Start

When HF Start button light is On, start arc as follows:

High frequency turns on to help start arc when output is enabled. High frequency turns off when arc is started, and turns on whenever arc is broken to help restart arc.

**Application:**

HF start is used for the DCEN GTAW process when a non-contact arc starting method is required.
9-1. Routine Maintenance

---

Disconnect power before maintaining.

- **Check** = Check
- **Clean** = Clean
- **Replace** = Replace

**Every 3 Months**

- ★ Unreadable Labels
- Clean Weld Terminals
- ☆ Weld Cable
- ☆ Cracked Parts

- 14-Pin Cord
- Gas Hose and Fittings
- Gun Cable

- ★ Cracked Electrode Holder Parts
- ★ Cracked Torch Body

**Every 6 Months**

- Inside Unit
- Drive Rolls

---

9-2. Blowing Out Inside of Unit

- Do not remove case when blowing out inside of unit.

To blow out unit, direct airflow through front and back louvers as shown.

---

Ref. 805142-B
9-3. Restoring Factory Defaults

Full System

A full factory reset can be accomplished by pressing memory location buttons 1 and 4 on the power source simultaneously for more than four seconds. The display will show rSt and then go to dashes when the reset is complete.

Memory Location

See Section 8-2 C2 the reset procedure.

9-4. Viewing Software Revision

Pressing the MIG TYPE and SIDE SELECT buttons behind the door on the power source simultaneously will display the Software Revision.

9-5. Power Source Calibration Procedure

⚠️ Only qualified persons should install, operate, maintain, and repair this unit.

A. Required Equipment

1. Calibrated DC voltmeter and clamp-on DC ammeter (e.g. Fluke 337)
2. Calibration Card
3. Shorting cable (2/0)

B. Calibration Procedure

1. Disconnect cables from all output studs.
2. Turn on power to the welding system.
3. Insert Calibration card.
   a. Lift and hold memory card access cover open.
   b. Insert memory card into slot (push card all the way into slot and then release).
   c. Close memory card access cover.
   d. Power source will display CAL.
4. Calibrate MIG voltage as follows:
   a. Connect voltmeter from MIG stud (on rear of unit) to Work stud (front center).
   b. Press memory 1 button on the power source front panel. Open circuit voltage should now be present from MIG output stud to the Work stud.
   c. Using the knob on the power source front panel, set the display voltage to the measured value on the voltmeter.
   d. Press memory 1 button on the power source front panel to end the MIG voltage calibration.
   e. Power source will display CAL.
5. Calibrate TIG voltage as follows:
   a. Connect voltmeter from Work stud (front center) to TIG stud (front right).
   b. Press memory 2 button on the power source front panel. Open circuit voltage should now be present from TIG output stud to the Work stud.
   c. Using the knob on the power source front panel, set the display voltage to the measured value on the voltmeter.
   d. Press memory 2 button on the power source front panel to end the TIG voltage calibration.
   e. Power source will display CAL.
6. Calibrate STICK voltage as follows:
   a. Connect voltmeter from STICK stud (front left) to Work stud (front center).
   b. Press memory 3 button on the power source front panel. Open circuit voltage should now be present from STICK output stud to the Work stud.
   c. Using the knob on the power source front panel, set the display voltage to the measured value on the voltmeter.
   d. Press memory 3 button on the power source front panel to end the STICK voltage calibration.
   e. Power source will display CAL.

7. Calibrate amperage as follows:
   a. Connect shorting cable from STICK stud (front left) to Work stud (front center).
   b. Attach clamp-on ammeter around shorting cable.
   c. Press memory 4 button on the power source front panel. Amperage should now be flowing in the shorting cable.
   d. Using the knob on the power source front panel, set the display amperage to the measured value on the ammeter.
   e. Press memory 4 button on the power source front panel to end the amperage calibration.
   f. Power source will display CAL.
   g. Disconnect shorting cable.

8. Remove Calibration card as follows:
   a. Lift and hold memory card access cover open.
   b. Push in and release memory card to eject card.
   c. Grasp memory card and remove from slot.
   d. Close memory card access cover.

9. Turn off power to the welding system.
9-6. Measuring And Discharging Input Capacitor Voltage

Turn Off welding power source, and disconnect input power.

Significant DC voltage can remain on capacitors after unit is Off. Always check the voltage as shown to be sure the input capacitors have discharged before working on unit.

Turn Off welding power source, and disconnect input power.

1 Right Side Panel
To remove panel, remove screws securing panel to unit.

2 Relinking Board PC10

3 Voltmeter
Measure the dc voltage across the screw terminals on PC10 as shown until voltage drops to near 0 (zero) volts.

If the capacitor voltage does not drop to near zero after several minutes, use a bleeder resistor of between 25 and 1000 ohms, at least 5 watts. #16 AWG 1000 volts DC insulating rating wire to discharge the capacitor(s).

4 Typical Bleeder Resistor
An example of a typical bleeder resistor is shown on this page.
Proceed with job inside unit. Reinstall right side panel when finished.

Tools Needed:

- 5/16 in.
## 9-7. Cooler Routine Maintenance

Disconnect cooler plug from welding power source receptacle before maintaining.

<table>
<thead>
<tr>
<th>Every 3 Months</th>
<th>Clean coolant strainer. Severe conditions may require more frequent cleaning (continuous use, high/low temperatures, dirty environment, etc.). Failure to properly clean coolant strainer voids pump warranty.</th>
</tr>
</thead>
</table>
| Every 6 Months  | Blow out heat exchanger fins.  
|                 | Check coolant level.  
|                 | Hoses  
|                 | Labels |
| Every 12 Months | Change coolant (if using Miller coolant). |

* To be done by Factory Authorized Service Agent
9-8. Coolant Maintenance

Disconnect cooler plug from welding power source receptacle before maintaining.

Dispose of used coolant according to national, state, and local codes. Do not pour down drain.

1. Cooler Housing
2. Cooler Drawer

Remove 4 screws from front of cooler housing and slide cooler drawer out.

3. Coolant Filter

Unscrew housing to clean filter and housing.

Changing Coolant

Drain coolant by tipping unit forward. Fill with clean water and run for 10 minutes. Drain and refill.

NOTICE – If replacing hoses, use hoses compatible with ethylene glycol, such as Buna-n, Neoprene, or Hypalon. Oxy-acetylene hoses are not compatible with any product containing ethylene glycol.

Reinstall cooler drawer into housing.
### Display Example

<table>
<thead>
<tr>
<th>Display Code</th>
<th>Fault</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H01</td>
<td>Primary Power Circuit Over Current</td>
<td>Indicates a malfunction in the primary power circuit. If this code appears on the display, contact the nearest Factory Authorized Service Agent.</td>
</tr>
<tr>
<td>H02</td>
<td>Temperature Sensor Malfunction</td>
<td>Indicates thermal protection circuitry is malfunctioning. If this code appears on the display, contact the nearest Factory Authorized Service Agent.</td>
</tr>
<tr>
<td>H03</td>
<td>Secondary Circuit Over Temperature</td>
<td>Indicates left side of unit has overheated. Unit has shutdown to allow fans to lower left side temperature. Operation will continue after unit is within normal temperature range.</td>
</tr>
<tr>
<td>H04</td>
<td>Secondary Circuit Over Temperature</td>
<td>Indicates bottom of unit has overheated. Unit has shutdown to allow fans to lower bottom temperature. Operation will continue after unit is within normal temperature range.</td>
</tr>
<tr>
<td>H05</td>
<td>Primary Circuit Over Temperature</td>
<td>Indicates right side of unit has overheated. Unit has shutdown to allow fans to lower right side temperature. Operation will continue after unit is within normal temperature range.</td>
</tr>
<tr>
<td>H08</td>
<td>Output Over Voltage Malfunction</td>
<td>Indicates secondary power circuit is malfunctioning. If this code appears on the display, contact the nearest Factory Authorized Service Agent.</td>
</tr>
<tr>
<td>H09</td>
<td>Primary Power Circuit Current Detect Malfunction</td>
<td>Indicates primary power circuit is malfunctioning. If this code appears on the display, contact the nearest Factory Authorized Service Agent.</td>
</tr>
<tr>
<td>H10</td>
<td>Primary Power Circuit Control Malfunction</td>
<td>Indicates primary power circuit is malfunctioning. If this code appears on the display, contact the nearest Factory Authorized Service Agent.</td>
</tr>
<tr>
<td>H11</td>
<td>Primary Bus Capacitor Voltage Imbalance</td>
<td>Indicates primary power circuit is malfunctioning. If this code appears on the display, contact the nearest Factory Authorized Service Agent.</td>
</tr>
<tr>
<td>H12</td>
<td>Primary Input Line Voltage Malfunction</td>
<td>Indicates input primary line voltage is too low. Increase primary line voltage to at least 90% of specified nominal voltage.</td>
</tr>
<tr>
<td>H25</td>
<td>Duty Cycle</td>
<td>Indicates duty cycle limit exceeded. Output stops and the cooling fan will run. Wait 15 minutes for unit to cool. Reduce amperage, voltage, wire feed speed, or duty cycle before welding.</td>
</tr>
<tr>
<td>H26</td>
<td>Button Stuck Power Source</td>
<td>Indicates button is stuck on the power source upon start up. Fault will clear when button is released.</td>
</tr>
<tr>
<td>H30</td>
<td>Stuck Contactor TIG</td>
<td>Indicates stuck remote contactor in TIG mode. Fault will clear when foot pedal or control device contactor is released.</td>
</tr>
<tr>
<td>H31</td>
<td>Stuck Contactor Stick</td>
<td>Indicates stuck remote contactor in Stick mode. Fault will clear when foot pedal or control device contactor is released.</td>
</tr>
<tr>
<td>H40</td>
<td>Tach Left</td>
<td>Indicates tach error on left motor. Check left feeder drive housing and wire spool for obstructions. If this code continues to appear on the display, contact the nearest Factory Authorized Service Agent.</td>
</tr>
<tr>
<td>H41</td>
<td>Tach Right</td>
<td>Indicates tach error on right motor. Check right feeder drive housing and wire spool for obstructions. If this code continues to appear on the display, contact the nearest Factory Authorized Service Agent.</td>
</tr>
<tr>
<td>H42</td>
<td>Motor Left</td>
<td>Indicates motor error on left motor. Check left feeder drive housing and wire spool for obstructions. If this code continues to appear on the display, contact the nearest Factory Authorized Service Agent.</td>
</tr>
<tr>
<td>H43</td>
<td>Motor Right</td>
<td>Indicates motor error on right motor. Check right feeder drive housing and wire spool for obstructions. If this code continues to appear on the display, contact the nearest Factory Authorized Service Agent.</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
<td>Error Message</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>--------------</td>
</tr>
<tr>
<td>H44</td>
<td>Motor Low Bus</td>
<td>Indicates input primary line voltage is too low. Increase primary line voltage to at least 90% of specified nominal voltage. If this code continues to appear on the display, contact the nearest Factory Authorized Service Agent.</td>
</tr>
<tr>
<td>H45</td>
<td>Button Stuck Feeder</td>
<td>Indicates button is stuck on the feeder upon feeder power up. Fault will clear when button is released.</td>
</tr>
<tr>
<td>H46</td>
<td>Trigger Stuck Left</td>
<td>Indicates left trigger stuck fault. Fault will clear when left trigger is released.</td>
</tr>
<tr>
<td>H47</td>
<td>Trigger Stuck Right</td>
<td>Indicates right trigger stuck fault. Fault will clear when right trigger is released.</td>
</tr>
<tr>
<td>H48</td>
<td>Trigger Fault Left</td>
<td>Indicates left trigger was held too long in trigger jog (the lesser of 60 seconds or 30 ft (9.1 m) of wire.</td>
</tr>
<tr>
<td>H49</td>
<td>Trigger Fault Right</td>
<td>Indicates right trigger was held too long in trigger jog (the lesser of 60 seconds or 30 ft (9.1 m) of wire.</td>
</tr>
<tr>
<td>H60</td>
<td>Memory Card Fault</td>
<td>Indicates unable to read memory card. Faulty memory card or wrong format.</td>
</tr>
<tr>
<td>H61</td>
<td>File Read Error</td>
<td>Indicates faulty file on memory card.</td>
</tr>
<tr>
<td>H62</td>
<td>File Write Error</td>
<td>Indicates full or faulty memory card.</td>
</tr>
<tr>
<td>H63</td>
<td>Invalid File</td>
<td>Indicates an invalid file on memory card. The system was able to read the file; however, the contents of the file were invalid. Remove card or press any button to clear error.</td>
</tr>
<tr>
<td>H64</td>
<td>Memory Card Locked</td>
<td>Indicates a save was attempted to a locked card. This refers to the physical switch on the memory card. Unlock the memory card and try again. Try a different memory card. Remove card or press any button to clear error. If this code continues to appear on the display, contact the nearest Factory Authorized Service Agent.</td>
</tr>
<tr>
<td>H65</td>
<td>Read Only File</td>
<td>Indicates a save was attempted to a file that has been marked read-only. Check with the appropriate person to see if the attributes are read only for a reason (the attributes can be altered using a PC). Use a different card. Remove card or press any button to clear error.</td>
</tr>
<tr>
<td>H66</td>
<td>No Memory Card Detected</td>
<td>Indicates no memory card detected when a memory card operation was attempted. Insert a card or press any button to clear error. Try a different memory card. If this code continues to appear on the display, contact the nearest Factory Authorized Service Agent.</td>
</tr>
<tr>
<td>H70</td>
<td>Weld Library</td>
<td>Indicates missing/incomplete weld library in power source. Weld library must be loaded from memory card.</td>
</tr>
<tr>
<td>H71</td>
<td>Invalid Model</td>
<td>Indicate if the unit is a standard, IEC, or CE machine.</td>
</tr>
<tr>
<td>H98</td>
<td>Serial Communication Loss</td>
<td>Indicates serial communication was initially made and is now malfunctioning. Check wire feeder/power source control cable connection and tighten if necessary. May appear normally during firmware updates. If this code continues to appear on the display, contact the nearest Factory Authorized Service Agent.</td>
</tr>
<tr>
<td>H99</td>
<td>Serial Communication Malfunction</td>
<td>Indicates serial communication is malfunctioning. Check wire feeder/power source control cable connection and tighten if necessary. May appear normally during firmware updates. If this code continues to appear on the display, contact the nearest Factory Authorized Service Agent.</td>
</tr>
</tbody>
</table>
9-10. Troubleshooting Welding Power Source/Wire Feeder Issues

If the welding power source and wire feeder are NOT responding after everything is connected, follow the items listed below before contacting the nearest factory-authorized service agent:

**Welding power source is plugged in and there is no power after turning on unit.**
- If unit is directly connected to a line disconnect box or plugged into a receptacle from a line disconnect box, be sure that the line disconnect switch or main breaker is in the ON position.

**Wire does not feed from wire feeder to end of gun.**
- Check to see if wire diameter matches the groove size of the drive rolls.
- Check if tension on drive rolls is too loose or too tight.
- Check if gun liner is the correct size for the wire size.
- Check if contact tip is correct size for the wire size, and that end of contact tip is not plugged.
- Check if gun end is fully inserted into wire drive housing at feeder, and knob is tightened down to secure gun end.

**Weld is not consistent from one welding application to another.**
- Be sure that work clamp is connected to a clean, paint-free area of pipe; otherwise, grind an area if necessary to make a good work connection.
- Keep work clamp as close as possible to joint being welded.
- Check if volt sensing lead is connected to the welding power source and that work connection is secure. Check for any frayed wires at work end of volt sensing lead that may prevent a good connection.
- Be sure that volt sense lead is separated from weld cables.
- Be sure gun angle during welding is straight in to 15 degrees back at joint.
- Follow recommended settings in Operation section of manual to select a starting point for welding.
- Recommended joint preparation and fit-up is 1/32-1/16 in (0.8-1.6 mm) land and a 1/8 in (3.2 mm) root opening.
- Refer to Pipe Welding Techniques DVD.

**Porosity in weld bead.**
- Check shielding gas supply that there is enough gas and supply is turned on.
- Check shielding gas flow rate at regulator.
- Check that gas pressure to the wire feeder does not exceed 90 psi (621 kPa).
- Check all shielding gas fitting and tighten if necessary.
- Remove gun end from wire drive housing and check condition of O-rings. Replace any worn or missing O-rings.
- Check power pin end of gun and tighten with a wrench.
- Be sure that gun end is fully inserted into wire drive housing and knob is tightened down to secure gun end.
- Check and clean shielding gas nozzle on gun.
- Shield joint from wind.

**Trouble feeding wire when welding.** Check drive rolls and wire guides to make sure they match the wire style and size.
- Check drive roll tension and readjust if necessary.
- Be sure that gun end is fully inserted into wire drive housing and knob is tightened down to secure gun end.
- Check if hub tension at wire spool is too tight or too loose and readjust if necessary.
- Be sure that welding gun cable is as straight as possible from wire feeder to workpiece.
- Check if contact tip is correct size for the wire size, and that end of contact tip is not plugged.
- Check if gun liner is the correct size for the wire size and liner is not dirty or damaged. Clean or replace gun liner if necessary.
## troubleshoot the welding power source

<table>
<thead>
<tr>
<th>Trouble</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>No weld output; unit completely inoperative.</td>
<td>Place line disconnect switch in On position (see Section 7-10). Check and replace line fuse(s), if necessary, or reset circuit breaker (see Section 7-10). Check for proper input power connections (see Section 7-10).</td>
</tr>
<tr>
<td>No weld output; meter display On.</td>
<td>Check, repair, or replace remote control. Unit overheated. Allow unit to cool with fan On (see Section 6-5). Check voltmeter/ ammeter Help displays.</td>
</tr>
<tr>
<td>Erratic or improper weld output.</td>
<td>Use proper size and type of weld cable (see Section 7-15). Clean and tighten all weld connections. Check volt sense lead. Straighten any coiled cables.</td>
</tr>
<tr>
<td>No 115 volts AC output at single receptacle.</td>
<td>Reset supplementary protector CB1 (see Section 7-7).</td>
</tr>
<tr>
<td>No 24 volts AC output at Remote 14 Feeder receptacle.</td>
<td>Reset supplementary protector CB2 (see Section 7-6).</td>
</tr>
<tr>
<td>When remote control is connected to unit output is always on.</td>
<td>Check remote control switch and potentiometer resistances.</td>
</tr>
</tbody>
</table>

## notes

- Disconnect power before troubleshooting.
### 9-12. Wire Feeder Troubleshooting

<table>
<thead>
<tr>
<th>Trouble</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wire feeds, shielding gas flows, but electrode wire is not energized.</td>
<td>Check cable connections. Check cables for continuity, and repair or replace cables if necessary.</td>
</tr>
<tr>
<td>Wire feeder is on, display does not light up, motor does not run, gas valve and welding power source contactor do not pull in.</td>
<td>Check and reset circuit breaker at welding power source.</td>
</tr>
<tr>
<td>Electrode wire feeding stops, or feeds erratically during welding.</td>
<td>Check gun trigger connection. See gun Owner's Manual.</td>
</tr>
<tr>
<td></td>
<td>Check gun trigger. See gun Owner's Manual.</td>
</tr>
<tr>
<td></td>
<td>Readjust hub tension and drive roll pressure (see Section 7-23).</td>
</tr>
<tr>
<td></td>
<td>Change to correct size drive roll (see Table 12-1).</td>
</tr>
<tr>
<td></td>
<td>Clean or replace dirty or worn drive roll.</td>
</tr>
<tr>
<td></td>
<td>Incorrect size or worn wire guides.</td>
</tr>
<tr>
<td></td>
<td>Replace contact tip or liner. See gun Owner's Manual.</td>
</tr>
<tr>
<td></td>
<td>Remove weld spatter or foreign matter from around nozzle opening.</td>
</tr>
<tr>
<td></td>
<td>Have Factory Authorized Service Agency check drive motor or motor control board PC1.</td>
</tr>
<tr>
<td>Motor runs slowly.</td>
<td>Check for correct input voltage.</td>
</tr>
<tr>
<td>Wire feeder displays light up, feeder jogs, purges, but unit is inoperative.</td>
<td>Check welding gun trigger leads for continuity, and repair leads or replace gun.</td>
</tr>
<tr>
<td>When triggered, wire feeds but no gas, no contactor.</td>
<td>If the welding arc does not establish in 2 seconds after the gun trigger is activated the unit will feed wire, but turns off contactor and gas valve. If the gun trigger is still activated after 60 seconds or 30 ft (9.1 m) of wire was fed from the gun, the wire will stop feeding.</td>
</tr>
</tbody>
</table>

### 9-13. Cooler Troubleshooting

<table>
<thead>
<tr>
<th>Trouble</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coolant system does not work.</td>
<td>Be sure input power cord is plugged into energized receptacle.</td>
</tr>
<tr>
<td></td>
<td>Check supplementary protector CB1 at welding power source, and reset if necessary.</td>
</tr>
<tr>
<td>Motor overheated. Unit starts running when motor has cooled.</td>
<td>Have Factory Authorized Service Agent check motor.</td>
</tr>
<tr>
<td>Decreased or no coolant flow.</td>
<td>Add coolant.</td>
</tr>
<tr>
<td></td>
<td>Check for clogged hoses or coolant filter.</td>
</tr>
<tr>
<td></td>
<td>Disconnect pump, and check for sheared coupling. Replace coupling if necessary.</td>
</tr>
</tbody>
</table>
Figure 10-1. Circuit Diagram For Welding Power Source
Figure 10-2. Circuit Diagram For Single Or Dual Wire Feeder
Figure 10-3. Circuit Diagram For Cooler
Figure 10-4. Flow Diagram For Cooler
SECTION 11 – HIGH FREQUENCY

11-1. Welding Processes Requiring High Frequency

1 High-Frequency Voltage

TIG – helps arc jump air gap between torch and workpiece and/or stabilize the arc.

11-2. Installation Showing Possible Sources Of HF Interference

Sources of Direct High-Frequency Radiation
1 High-Frequency Source (welding power source with built-in HF or separate HF unit)
2 Weld Cables
3 Torch
4 Work Clamp
5 Workpiece
6 Work Table

Sources of Conduction of High Frequency
7 Input Power Cable
8 Line Disconnect Device
9 Input Supply Wiring

Sources of Reradiation of High Frequency
10 Ungrounded Metal Objects
11 Lighting
12 Wiring
13 Water Pipes and Fixtures
14 External Phone and Power Lines

Best Practices Not Followed
11-3. Recommended Installation To Reduce HF Interference

1 High-Frequency Source (welding power source with built-in HF or separate HF unit)
Ground metal machine case (clean paint from around hole in case, and use case screw), work output terminal, line disconnect device, input supply, and worktable.

2 Center Point of Welding Zone
Midpoint between high-frequency source and welding torch.

3 Welding Zone
A circle 50 ft (15 m) from center point in all directions.

4 Weld Output Cables
Keep cables short and close together.

5 Conduit Joint Bonding and Grounding
Electrically join (bond) all conduit sections using copper straps or braided wire. Ground conduit every 50 ft (15 m).

6 Water Pipes and Fixtures
Ground water pipes every 50 ft (15 m).

7 External Power or Telephone Lines
Locate high-frequency source at least 50 ft (15 m) away from power and phone lines.

8 Grounding Rod
Consult the National Electrical Code for specifications.

9 Metal Building Panel Bonding Methods
Bolt or weld building panels together, install copper straps or braided wire across seams, and ground frame.

10 Windows and Doorways
Cover all windows and doorways with grounded copper screen of not more than 1/4 in (6.4 mm) mesh.

11 Overhead Door Track
Ground the track.
Hardware is common and not available unless listed.
<table>
<thead>
<tr>
<th>Item No.</th>
<th>Dia.</th>
<th>Part No.</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>250832</td>
<td>Panel, Rear</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>093995</td>
<td>Supplementary Pro, Man Reset 1P 15A 250VAC Frict</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>244471</td>
<td>Circuit Card Assy, PS/Feeder Interface</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>228036</td>
<td>Valve, 24VAC 1way .750–14 Thd 2.0mm Orf 100 PSI</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>236638</td>
<td>Hose, Nprn Brd No 1 x .187 ID x 40.000</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>220805</td>
<td>Nut, 750–14 NPS 1.48Hex .41h Nyl</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>185526</td>
<td>Label, Warning Electric Shock And Incorrect Input</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>237163</td>
<td>Label, MIG Output</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>237157</td>
<td>Label, CB2</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>238560</td>
<td>Label, TIG Gas In</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>254053</td>
<td>Label, To Wirefeeder</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>270608</td>
<td>Capacitor, Elctt 2700 uf 450 VDC Can 2.52 Dia</td>
<td>4</td>
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<tr>
<td>13</td>
<td></td>
<td>218004</td>
<td>Label, Warning Electric Shock/Exploding Parts</td>
<td>3</td>
</tr>
<tr>
<td>14</td>
<td></td>
<td>217040</td>
<td>Nut, Nylon M12 Thread Capacitor Mounting</td>
<td>4</td>
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<tr>
<td>15</td>
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<td>231599</td>
<td>Circuit Card Assy, Interconnecting</td>
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<tr>
<td>16</td>
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<td>185214</td>
<td>Bus Bar, Interconnecting</td>
<td>1</td>
</tr>
<tr>
<td>17</td>
<td></td>
<td>240841</td>
<td>Panel, Side RH</td>
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</tr>
<tr>
<td>18</td>
<td></td>
<td>237155</td>
<td>Label, Important Input Power/Relink Connections</td>
<td>1</td>
</tr>
<tr>
<td>19</td>
<td></td>
<td>234271</td>
<td>Sheet, Insulator Side Panel</td>
<td>1</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td>224694</td>
<td>Fan, Muffin 24VDC 4000 RPM 302 CFM</td>
<td>2</td>
</tr>
<tr>
<td>21</td>
<td></td>
<td>233501</td>
<td>Bracket, Fan</td>
<td>1</td>
</tr>
<tr>
<td>22</td>
<td></td>
<td>180026</td>
<td>Inductor, Input</td>
<td>1</td>
</tr>
<tr>
<td>23</td>
<td></td>
<td>270460</td>
<td>Windtunnel, RH w/Cmpnts (Includes)</td>
<td>1</td>
</tr>
<tr>
<td>24</td>
<td></td>
<td>030170</td>
<td>Bushing, Snap–In Nyl .750 ID x 1.000 Mtg Hole</td>
<td>2</td>
</tr>
<tr>
<td>25</td>
<td></td>
<td>025248</td>
<td>Stand–Off, Insul .250–20 x 1.250 Lg x .437 Thd</td>
<td>4</td>
</tr>
<tr>
<td>26</td>
<td></td>
<td>180270</td>
<td>Contactor, Def Prp 40A 3P 24VAC Coil w/Boxlug</td>
<td>1</td>
</tr>
<tr>
<td>27</td>
<td></td>
<td>233620</td>
<td>Xfrmr, Current 500 Turn Polarized</td>
<td>1</td>
</tr>
<tr>
<td>28</td>
<td></td>
<td>177547</td>
<td>Bushing, Snap–In Nyl Ct–Mount 1.125 Mtg Hole</td>
<td>1</td>
</tr>
<tr>
<td>29</td>
<td></td>
<td>010493</td>
<td>Bushing, Snap–In Nyl .625 ID x .875 Mtg Hole</td>
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<td>233462</td>
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<td>Kit, Transistor IGBT Module</td>
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<td>33</td>
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<td>173632</td>
<td>Thermistor, Ntc 30k ohm @ 25 Deg C 12.00 in Lead</td>
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</tr>
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<td>184260</td>
<td>Kit, Rectifier Integ Bridge</td>
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<td>238323</td>
<td>Capacitor, Polyf Film .5 uf 1700 VRMS +/-10%</td>
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<td>20 x 1.250 Lg x .437 Thd</td>
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<td>20 x 1.250 Lg x .437 Thd</td>
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<td>20 x 1.250 Lg x .437 Thd</td>
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<td>20 x 1.250 Lg x .437 Thd</td>
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<td>20 x 1.250 Lg x .437 Thd</td>
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<td>20 x 1.250 Lg x .437 Thd</td>
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**Figure 12-1. Main Assembly**
<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>47</td>
<td>Cover, Output Stud w/Labels (Includes)</td>
<td>1</td>
</tr>
<tr>
<td>48</td>
<td>Kit, Circuit Card Assy UI w/Program</td>
<td>1</td>
</tr>
<tr>
<td>49</td>
<td>Overlay, Power Source</td>
<td>1</td>
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<tr>
<td>50</td>
<td>Knob, Pointer 1.250 Dia x .250 ID w/Spring Clip−.21</td>
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</tr>
<tr>
<td>51</td>
<td>Door, Bezel, Mtg Setup</td>
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</tr>
<tr>
<td>52</td>
<td>Bezel, Power Source</td>
<td>1</td>
</tr>
<tr>
<td>53</td>
<td>Door, SD Reader</td>
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<tr>
<td>54</td>
<td>Bracket, SD Card Reader</td>
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<td>55</td>
<td>Circuit Card Assy, SD Card</td>
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</tr>
<tr>
<td>56</td>
<td>Plate, Mtg Front</td>
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<tr>
<td>57</td>
<td>Panel, Front</td>
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<tr>
<td>58</td>
<td>Heat Sink, Power Module</td>
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<tr>
<td>59</td>
<td>Kit, Diode, Ultra−Fast Recovery</td>
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<tr>
<td>60</td>
<td>Bus Bar, Diode</td>
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<tr>
<td>61</td>
<td>Windtunnel, LH</td>
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<tr>
<td>62</td>
<td>Bushing, Snap−In Y1.000 ID x 1.375 Mtg Hole</td>
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<tr>
<td>63</td>
<td>Thermistor, NTC 30k ohm @ 25 Deg C 24.00 in Lead</td>
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<td>64</td>
<td>Resistor/Capacitor Assy</td>
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<tr>
<td>65</td>
<td>Windtunnel Bottom, w/ Pem Nuts</td>
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<tr>
<td>66</td>
<td>Xfmr, HF 380−400 Unit PipeWorx (CE)</td>
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<tr>
<td>67</td>
<td>Kit, Thyristor, SCR Module</td>
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<tr>
<td>68</td>
<td>Bus Bar, SCR</td>
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<tr>
<td>69</td>
<td>Coil, HF Coupling</td>
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<td>Boot, Positive Output Stud</td>
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<td>Washer, Output Stud</td>
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<td>Windtunnel, Top Assy (Includes)</td>
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<td>73</td>
<td>Baffle, Windtunnel</td>
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<td>Windtunnel, Top</td>
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<td>Bracket, Capacitor Support</td>
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<td>Bushing, Snap−In Y1.500 ID x .625 Mtg Hole</td>
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<td>77</td>
<td>Strap, Grounding 4.50 in Long</td>
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<tr>
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<td>Label, Warning General Precautionary Static</td>
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<td>Cover, Top</td>
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<tr>
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<td>Frame, Lifting</td>
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<td>Gasket, Lifting Eye Cover</td>
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<tr>
<td>83</td>
<td>Circuit Card Assy, Secondary Gate Driver</td>
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<tr>
<td>84</td>
<td>Circuit Card Assy, Process Control w/Program</td>
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<tr>
<td>85</td>
<td>Circuit Card Assy, Inverter Control w/Program</td>
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<tr>
<td>86</td>
<td>Stand−Off Support, PC Card .250 w/Post&amp;Lock</td>
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<td>Bracket, Mtg Xfmr Assy (Includes)</td>
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<td>88</td>
<td>Bracket, Mtg Xfmr</td>
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<td>89</td>
<td>Stand−Off Support, PC Card .250 w/Post&amp;Lock</td>
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<td>90</td>
<td>Circuit Card Assy, HF Arc Starter</td>
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<td>Xfmr, Control 400 VAC Pri 1160 VA 50 Hz</td>
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<td>Bushing, Snap−In Y1.000 ID x 1.375 Mtg Hole</td>
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<tr>
<td>93</td>
<td>Capacitor Assy</td>
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<td>Dia. Mks.</td>
<td>Part No.</td>
</tr>
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<td>-----------</td>
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<tr>
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<td>FM3</td>
<td>183918</td>
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<td>96</td>
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+When ordering a component originally displaying a precautionary label, the label should also be ordered.

To maintain the factory original performance of your equipment, use only Manufacturer’s Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.
Hardware is common and not available unless listed.

Figure 12-2. Cooler

<table>
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<tr>
<th>Item No.</th>
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<td>Motor, 1/4hp 115VAC 50/60Hz 1425/1725 RPM Dual</td>
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<td>263703</td>
<td></td>
<td>Pump, Coolant (Includes)</td>
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<tr>
<td>3</td>
<td>005523</td>
<td></td>
<td>Fitting</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>134795</td>
<td></td>
<td>Coupler, Drive Pump</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>094263</td>
<td></td>
<td>Clamp, 1−Ear Type Nom Dim .718 x .276 Wide</td>
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<tr>
<td>6</td>
<td>236814</td>
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<td>Assy, Fan/Radiator (Includes)</td>
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<td>7</td>
<td>232424</td>
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<td>Radiator, Heat Exchanger</td>
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<tr>
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<td>231341</td>
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<td>Plenum, Air</td>
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<tr>
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<td>213072</td>
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<td>Fan, Muffin 115V 60Hz 3400 RPM 6.378 Mtg Holes</td>
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<tr>
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<td>236813</td>
<td></td>
<td>Base, w/Pem Studs</td>
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<tr>
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<td>236845</td>
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<td>Side, Cooler Base</td>
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<td>12</td>
<td>236846</td>
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<td>Shell, Cooler Base w/Pem Nuts</td>
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<td>Label, Warning General Precautionary (En/Fr/Sp)</td>
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<td>15</td>
<td>229325</td>
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<td>Foot, Mtg Unit</td>
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<td>173955</td>
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<td>Tank, Water</td>
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<td>166608</td>
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<td>Cap, Tank Screw−On w/Vent</td>
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<td>Item No.</td>
<td>Dia. Mkgs.</td>
<td>Part No.</td>
<td>Description</td>
<td>Quantity</td>
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<td>-------------</td>
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<tr>
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<td>233159</td>
<td>Ftg, Coolant</td>
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<td>236810</td>
<td>219178</td>
<td>Panel, Front w/Pem Studs</td>
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<td>Spacer, Nylon .312 OD x .194 ID x .500 Lg</td>
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<td>215279</td>
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<td>236815</td>
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<td>204603</td>
<td>236816</td>
<td>Bracket, Tank Top</td>
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<td>Label, Coolant In</td>
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<td>24</td>
<td>166564</td>
<td>236815</td>
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<td>236816</td>
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<td>26</td>
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<td>239494</td>
<td>Screen, Filter Lp Cyl 100 x 100 x 0.0045 SST</td>
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<tr>
<td></td>
<td>237152</td>
<td>237152</td>
<td>Hose, Rubber Braided .375 ID x .650 OD x 19.500</td>
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<tr>
<td></td>
<td>237416</td>
<td>237416</td>
<td>Hose, Coolant Braided 10 in.</td>
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</tr>
</tbody>
</table>

+When ordering a component originally displaying a precautionary label, the label should also be ordered.

To maintain the factory original performance of your equipment, use only Manufacturer’s Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.
Hardware is common and not available unless listed.

Figure 12-3. Single Wire Feeder
### Figure 12-3. Single Wire Feeder

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Dia. Mkgs.</th>
<th>Part No.</th>
<th>Description</th>
<th>Quantity</th>
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</thead>
<tbody>
<tr>
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<td>+234243</td>
<td>000527</td>
<td>Blank, Snap</td>
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</tr>
<tr>
<td>2</td>
<td>179310</td>
<td>071730</td>
<td>Tubing, Stl</td>
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<tr>
<td>3</td>
<td>236556</td>
<td>135205</td>
<td>Nut, 625-11 .94hex .77h</td>
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<td>4</td>
<td>244483</td>
<td>200556</td>
<td>Support, Spool</td>
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<tr>
<td>5</td>
<td>034504</td>
<td>213134</td>
<td>Bezel, Encoder</td>
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<tr>
<td>6</td>
<td>143160</td>
<td>200493</td>
<td>Panel, Front w/Cmpnts Single Bench Feeder (Includes)</td>
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<td>010191</td>
<td>Washer, Flat .656 OD x .125t Fbr</td>
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<tr>
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<td>010233</td>
<td>Spring, CPRSN .970 OD x .120 Wire x 1.250 Pld</td>
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<td>Hub, Spool</td>
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<td>Washer, Brake Stl</td>
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<td>058422</td>
<td>010191</td>
<td>Washer, Brake Stl</td>
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<td>14</td>
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<td>18</td>
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<td>19</td>
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<td>071730</td>
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**Notes:**
- When ordering a component originally displaying a precautionary label, the label should also be ordered.
- To maintain the factory original performance of your equipment, use only Manufacturer’s Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

---

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<th>Item No.</th>
<th>Description</th>
<th>Quantity</th>
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</thead>
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<td>Hub+Spindle Assy</td>
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<td>Nut, 625–11 .94hex .77h Stl Pld Elastic Stop Nut</td>
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<tr>
<td>5</td>
<td>Washer, Flat .632 ID x 1.500 OD x.125 Stl Pld .175key</td>
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<td>Washer, Flat .656 ID x1.500 OD x.125 Fbr</td>
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<td>Ring, Retaining Spool</td>
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<td>12</td>
<td>Support, Spool</td>
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<td>Base, Feeder w/Pem Nuts</td>
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<td>Foot, Rubber 1.250 Dia x 1.375 High No 10 Screw</td>
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<td>Kit, Circuit Card Assy UI w/Program</td>
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<tr>
<td>21</td>
<td>Overlay, Feeder</td>
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<tr>
<td>22</td>
<td>Bezel, Feeder</td>
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<tr>
<td>23</td>
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<td>24</td>
<td>Panel, Front</td>
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<td>25</td>
<td>Plug Assy, Trigger LH (Includes)</td>
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<td>Plug Assy, Trigger RH (Includes)</td>
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<td>27</td>
<td>Core, Toroidal 19.00mm ID x 29.01mm OD x 7.62mm Th</td>
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<td>28</td>
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<td>29</td>
<td>Insulator, Screw Machine</td>
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<td>30</td>
<td>Hose, SAE .187 ID x .410 OD x 27.000</td>
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<tr>
<td>32</td>
<td>Pad, Neoprene .250 x 3.000 x 4.000 DU70A</td>
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<tr>
<td>33</td>
<td>Clamp, Motor Top</td>
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<tr>
<td>34</td>
<td>Clamp, Motor Base</td>
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<td>Knob, w/Extension (RH) Clamp</td>
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<td>36</td>
<td>Rear Panel Assy, Dual Feeder (Includes)</td>
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<td>37</td>
<td>Circuit Card Assy, PS/Feeder Interface</td>
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<tr>
<td>38</td>
<td>Enclosure, Rear Dual Feeder</td>
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<td>43</td>
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**Figure 12-4. Dual Wire Feeder**
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<th>Part No.</th>
<th>Description</th>
<th>Quantity</th>
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<td>236556</td>
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<td>Panel Assy, PCB Support (Includes)</td>
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<td>010494</td>
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<td>Label, Warning Falling Equipment Can Injure--Wordless</td>
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+When ordering a component originally displaying a precautionary label, the label should also be ordered.

To maintain the factory original performance of your equipment, use only Manufacturer’s Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.
Hardware is common and not available unless listed.

Table 12-1 For Drive Roll & Wire Guide Kits

<table>
<thead>
<tr>
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<th>Dia. Mkgs.</th>
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<td>3</td>
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<td>Spacer, Carrier Drive Roll</td>
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<td>149486</td>
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<td>Pin, Rotation Arm Rocker</td>
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<td>Pin, Cotter Hair</td>
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<td>182156</td>
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<td>Spring, CPRSN</td>
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<td>182155</td>
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<td>Spring</td>
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**Figure 12-5. Drive Assembly, Wire (Continued)**

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<td>.375 x .625 ID x .125 OD x .062Thk</td>
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<td>179277</td>
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<td>Screw, .006-32 x .37 Soc Hd Hex Stl Pln</td>
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</tr>
</tbody>
</table>

*Recommended Spare Parts.

To maintain the factory original performance of your equipment, use only Manufacturer’s Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

**Table 12-1. Drive Roll And Wire Guide Kits**

<table>
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<tr>
<th>Wire Size</th>
<th>Inlet Guide</th>
<th>Intermediate Guide</th>
<th>V-GROOVE 4 Roll Kit</th>
<th>Drive Roll</th>
<th>VK-GROOVE 4 Roll Kit</th>
<th>Drive Roll</th>
</tr>
</thead>
<tbody>
<tr>
<td>.035 in.</td>
<td>0.9 mm</td>
<td>150993</td>
<td>149518</td>
<td>151026</td>
<td>053700</td>
<td>151052</td>
</tr>
<tr>
<td>.040 in.</td>
<td>1.0 mm</td>
<td>150993</td>
<td>149518</td>
<td>161189</td>
<td>053696</td>
<td>151053</td>
</tr>
<tr>
<td>.045 in.</td>
<td>1.1/1.2 mm</td>
<td>150994</td>
<td>149519</td>
<td>151027</td>
<td>053697</td>
<td>151054</td>
</tr>
<tr>
<td>.052 in.</td>
<td>1.3/1.4 mm</td>
<td>150994</td>
<td>149519</td>
<td>151028</td>
<td>053698</td>
<td>151055</td>
</tr>
<tr>
<td>1/16 in.</td>
<td>(.062 in.)</td>
<td>1.6 mm</td>
<td>150995</td>
<td>149520</td>
<td>053699</td>
<td>151056</td>
</tr>
<tr>
<td>.068-.072 in.</td>
<td>1.8 mm</td>
<td>150995</td>
<td>149520</td>
<td>151056</td>
<td>151057</td>
<td>132960</td>
</tr>
<tr>
<td>5/64 in.</td>
<td>(.079 in.)</td>
<td>2.0 mm</td>
<td>150995</td>
<td>149520</td>
<td>151058</td>
<td>132961</td>
</tr>
<tr>
<td>3/32 in.</td>
<td>(.094 in.)</td>
<td>2.4 mm</td>
<td>150996</td>
<td>149521</td>
<td>151058</td>
<td>132961</td>
</tr>
</tbody>
</table>

Hardware is common and not available unless listed.

Figure 12-6. Running Gear
**Figure 12-6. Running Gear**

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Dia. Mkgs.</th>
<th>Part No.</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>236827</td>
<td>Handle, Power Source</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>238611</td>
<td>Cap, Tube .865 OD</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>273522</td>
<td>Bracket, PipeWorx 400 Gun Holder</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>Gun Holder Assembly (Includes)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>273518</td>
<td>Bracket, Gun Holder</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>273519</td>
<td>Cap, Gun Holder</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>271830</td>
<td>Tube, Gun Holder</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>273520</td>
<td>Grommet, Rbr 1.375 Id x 1.625 Mtg Hole .125 Groove</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>+233666</td>
<td></td>
<td>Bracket, Support Cylinder Dual</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>200285</td>
<td>Label, Warning Cylinder May Explode If Damaged</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>170647</td>
<td>Bushing, Snap−In Nyl 1.312 ID x 1.500 Mtg Hole</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>004214</td>
<td>Bushing, Snap−In Nyl 1.625 ID x 2.000 Mtg hole</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>188441</td>
<td>Chain, Weldless 2/0 x 31. Bright Zinc Pld</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>234359</td>
<td>Rack Wheel Assy, Running Gear</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>602250</td>
<td>Washer, Flat .812 ID x 1.469 OD x.134T Stl Pld ANSI .750</td>
<td>4</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>121614</td>
<td>Ring, Rtg Ext .750 Shaft x .085 Thk E Style Pld</td>
<td>2</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>163463</td>
<td>Wheel, Rbr Tire 10.000 OD x 2.000 Wide x .750 Bore</td>
<td>2</td>
</tr>
<tr>
<td>13</td>
<td></td>
<td>209479</td>
<td>Caster, Swvl 5.00 in. Urethane w/Brake 2.000 in. Wide</td>
<td>2</td>
</tr>
</tbody>
</table>

+When ordering a component originally displaying a precautionary label, the label should also be ordered.

**To maintain the factory original performance of your equipment, use only Manufacturer’s Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.**
Hardware is common and not available unless listed.

Figure 12-7. Composite Cables

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Dia. Mkgs.</th>
<th>Part No.</th>
<th>Description</th>
<th>Quantity</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>300508</td>
<td></td>
<td>Cable, Interconnecting 5 ft</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>300465</td>
<td></td>
<td>Cable, Interconnecting 31 ft</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>300466</td>
<td></td>
<td>Cable, Interconnecting 56 ft</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>238108</td>
<td></td>
<td>Hose Assy, Gas 33 ft</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>238109</td>
<td></td>
<td>Hose Assy, Gas 58 ft</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>238110</td>
<td></td>
<td>Cable, Weld 4.5 ft 2/0 w/Terms</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>238111</td>
<td></td>
<td>Cable, Weld 31 ft 2/0 w/Terms</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>238112</td>
<td></td>
<td>Cable, Weld 56 ft 2/0 w/Terms</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>238432</td>
<td></td>
<td>Clamp, Strain Relief</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>238263</td>
<td></td>
<td>Cover, Cable 28 ft (Black)</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>238264</td>
<td></td>
<td>Cover, Cable 53 ft (Black)</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>210253</td>
<td></td>
<td>Cable Tie, 0–1.750 Bundle Dia</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>047636</td>
<td></td>
<td>Housing Plug + Pins, (Service Kit)</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>143922</td>
<td></td>
<td>Conn, Circ Cpc Clamp Str Rlf</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>300461</td>
<td></td>
<td>Cable, Volt Sense</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>300462</td>
<td></td>
<td>Cable, Volt Sense</td>
<td>1</td>
</tr>
</tbody>
</table>

When ordering a component originally displaying a precautionary label, the label should also be ordered.

To maintain the factory original performance of your equipment, use only Manufacturer’s Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.
Hardware is common and not available unless listed.

805 148-B

Figure 12-8. Cable Hanger Assembly

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Dia. Mkgs.</th>
<th>Part No.</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>285304</td>
<td>Bracket, Cable Holder w/Edge Trim</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>238611</td>
<td>Cap, Tube .865 OD</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>236826</td>
<td>Tube, Cable Holder</td>
<td>2</td>
</tr>
</tbody>
</table>

To maintain the factory original performance of your equipment, use only Manufacturer’s Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.
Hardware is common and not available unless listed.

Figure 12-9. Feeder Cart
### Figure 12-9. Feeder Cart

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Dia. Mkgs.</th>
<th>Part No.</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>. . . .</td>
<td>. . . . .</td>
<td>217255</td>
<td>Slide, Drawer</td>
<td>2</td>
</tr>
<tr>
<td>. . . .</td>
<td>. . . . .</td>
<td>234505</td>
<td>Handle Assy, Feeder Cart</td>
<td>1</td>
</tr>
<tr>
<td>. . . .</td>
<td>. . . . .</td>
<td>234546</td>
<td>Tab, Lift Slot</td>
<td>1</td>
</tr>
<tr>
<td>. . . .</td>
<td>. . . . .</td>
<td>234554</td>
<td>Shelf, Upper, Feeder Cart</td>
<td>1</td>
</tr>
<tr>
<td>. . . .</td>
<td>. . . . .</td>
<td>235121</td>
<td>Holder, Cable Gun</td>
<td>1</td>
</tr>
<tr>
<td>. . . .</td>
<td>. . . . .</td>
<td>234556</td>
<td>Leg, Rear Rh Cart</td>
<td>2</td>
</tr>
<tr>
<td>. . . .</td>
<td>. . . . .</td>
<td>234553</td>
<td>Axle, Cart</td>
<td>1</td>
</tr>
<tr>
<td>. . . .</td>
<td>. . . . .</td>
<td>163463</td>
<td>Wheel, Rbr Tire 10.000 OD x 2.000 Wide x .750 Bore</td>
<td>2</td>
</tr>
<tr>
<td>. . . .</td>
<td>. . . . .</td>
<td>602250</td>
<td>Washer, Flat .812 ID x 1.469 OD x .134t Stl Pld</td>
<td>4</td>
</tr>
<tr>
<td>. . . .</td>
<td>. . . . .</td>
<td>121614</td>
<td>Ring, Rtn Ext .750 Shaft x .085 Thk E Style Pld</td>
<td>2</td>
</tr>
<tr>
<td>. . . .</td>
<td>. . . . .</td>
<td>234545</td>
<td>Shelf, Lower, Feeder Cart</td>
<td>1</td>
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<tr>
<td>. . . .</td>
<td>. . . . .</td>
<td>123557</td>
<td>Caster, Swvl 5.00 in Polyolefin x 1.375 x .437–14</td>
<td>2</td>
</tr>
<tr>
<td>. . . .</td>
<td>. . . . .</td>
<td>234555</td>
<td>Leg, Rear LH Cart</td>
<td>2</td>
</tr>
<tr>
<td>. . . .</td>
<td>. . . . .</td>
<td>237215</td>
<td>Bracket, Drawer LH</td>
<td>1</td>
</tr>
<tr>
<td>. . . .</td>
<td>. . . . .</td>
<td>232470</td>
<td>Drawer, Assy</td>
<td>1</td>
</tr>
</tbody>
</table>

To maintain the factory original performance of your equipment, use only Manufacturer’s Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.
Warranty Questions?

Call 1-800-4-A-MILLER for your local Miller distributor.

Your distributor also gives you ... Service

You always get the fast, reliable response you need. Most replacement parts can be in your hands in 24 hours.

Support

Need fast answers to the tough welding questions? Contact your distributor. The expertise of the distributor and Miller is there to help you, every step of the way.

LIMITED WARRANTY – Subject to the terms and conditions below, Miller Electric Mfg. LLC, Appleton, Wisconsin, warrants to authorized distributors that new Miller equipment sold after the effective date of this limited warranty is free of defects in material and workmanship at the time it is shipped by Miller. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS.

Within the warranty periods listed below, Miller will repair or replace any warranted parts or components that fail due to such defects in material or workmanship. Miller must be notified in writing within thirty (30) days of such defect or failure, at which time Miller will provide instructions on the warranty claim procedures to be followed. Notifications submitted as online warranty claims must provide detailed descriptions of the fault and troubleshooting steps taken to diagnose failed parts. Warranty claims that lack the required information as defined in the Miller Service Operation Guide (SOG) may be denied by Miller.

Miller shall honor warranty claims on warranted equipment listed below in the event of a defect within the warranty coverage time periods listed below. Warranty time periods start on the delivery date of the equipment to the end-user purchaser, or 12 months after the equipment is shipped to a North American distributor, or 18 months after the equipment is shipped to an international distributor, whichever occurs first.

1. 5 Years Parts — 3 Years Labor
   - Original Main Power Rectifiers Only to Include SCRs, Diodes, and Discrete Rectifier Modules
2. 3 Years — Parts and Labor Unless Specified
   - Auto-Darkening Helmet Lenses (No Labor) (See Classic Series Exception Below)
   - Engine Driven Welder/Generators
   - (NOTE: Engines are Warranted Separately by the Engine Manufacturer.)
   - Inspect Welding Intelligence Products
   - Inverter Power Sources
   - Plasma Arc Cutting Power Sources
   - Process Controllers
   - Semi-Automatic and Automatic Wire Feeders
   - Transformer/Rectifier Power Sources
3. 2 Years — Parts and Labor
   - Auto-Darkening Helmet Lenses – Classic Series Only (No Labor)
   - Auto-Darkening Weld Masks (No Labor)
   - Furnace Extruders – Capture 5, Filtrar 400 and Industrial Collector Series
4. 1 Year — Parts and Labor Unless Specified
   - AugmentedArc and LiveArc Welding Systems
   - Automatic Motion Devices
   - Bernard BTB Air-Cooled MIG Guns (No Labor)
   - CoolBelt and CoolBand Blower Unit (No Labor)
   - Desiccant Air Dryer System
   - Field Options
   - (NOTE: Field options are covered for the remaining warranty period of the product they are installed in, or for a minimum of one year — whichever is greater.)
   - RFCS Foot Controls (Except RFCS-RJ45)
   - Spoolmate Spoolguns
   - Spoolmate Spoolguns
   - Fume Extruders – Filtrar 130, MXW and SWX Series
   - HF Units
   - ICE/XT Plasma Cutting Torches (No Labor)
   - Induction Heating Power Sources, Coolers
   - (NOTE: Digital Recorders are Warranted Separately by the Manufacturer.)
   - Load Banks
   - Motor-Driven Guns (except Spoolmate Spoolguns)
   - PAPR Blower Unit (No Labor)
   - Positioners and Controllers
   - Racks (For Housing Multiple Power Sources)
   - Running Gear/Trailers
   - Spot Welders
   - Subarc Wire Drive Assemblies
   - TIG Torches (No Labor)
   - Tregaskiss Guns (No Labor)
   - Water Cooling Systems
   - Wireless Remote Foot/Hand Controls and Receivers
   - Work Stations/Weld Tables (No Labor)

5. 6 Months — Parts
   - Batteries
6. 90 Days — Parts
   - Accessories (Kits)
   - Canvas Covers
   - Induction Heating Coils and Blankets, Cables, and Non-Electronic Controls
   - M-Guns
   - MIG Guns, Subarc (SAW) Torches, and External Cladding Heads
   - Remote Controls and RFCS-RJ45
   - Replacement Parts (No labor)
   - Spoollmate Spoolguns

Miller’s True Blue® Limited Warranty shall not apply to:

1. Consumable components; such as contact tips, cutting nozzles, contactors, brushes, relays, work station table tops and welding curtains, or parts that fail due to normal wear. (Exception: brushes and relays are covered on all engine-driven products.)
2. Items furnished by Miller, but manufactured by others, such as engines or trade accessories. These items are covered by the manufacturer’s warranty, if any.
3. Equipment that has been modified by any party other than Miller, or equipment that has been improperly installed, improperly operated or misused based upon industry standards, or equipment which has not had reasonable and necessary maintenance, or equipment which has been used for operation outside of the specifications for the equipment.
4. Defects caused by accident, unauthorized repair, or improper testing.

MILLER PRODUCTS ARE INTENDED FOR COMMERCIAL AND INDUSTRIAL USERS TRAINED AND EXPERIENCED IN THE USE AND MAINTENANCE OF WELDING EQUIPMENT. The exclusive remedies for warranty claims are, at Miller’s option, either: (1) repair; or (2) replacement; or, if approved in writing by Miller, (3) the pre-approved cost of repair or replacement at an authorized Miller service station; or (4) payment of or credit for the purchase price (less reasonable depreciation based upon use). Products may not be returned without Miller’s written approval. Return shipment shall be at customer’s risk and expense.

The above remedies are F.O.B. Appleton, WI, or Miller’s authorized service facility. Transportation and freight are the customer’s responsibility. TO THE EXTENT PERMITTED BY LAW, THE REMEDIES HEREIN ARE THE SOLE AND EXCLUSIVE REMEDIES REGARDLESS OF THE LEGAL THEORY. ANY WARRANTY NOT PROVIDED HEREIN AND ANY IMPLIED WARRANTY, GUARANTY, OR REPRESENTATION, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE, ARE EXCLUDED AND DISCLAIMED BY MILLER.

Some US states do not allow limiting the duration of an implied warranty or the exclusion of certain damages, so the above limitations may not apply to you. This warranty provides specific legal rights, and other rights may be available depending on your state. In Canada, some provinces provide additional warranties or remedies, and to the extent the law prohibits their waiver, the limitations set out above may not apply. This Limited Warranty provides specific legal rights, and other rights may be available, but may vary by province.
# Owner’s Record

Please complete and retain with your personal records.

<table>
<thead>
<tr>
<th>Model Name</th>
<th>Serial/Style Number</th>
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<th>(Date which equipment was delivered to original customer)</th>
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</table>

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# For Service

Contact a DISTRIBUTOR or SERVICE AGENCY near you.

Always provide Model Name and Serial/Style Number.

Contact your Distributor for:
- Welding Supplies and Consumables
- Options and Accessories
- Personal Safety Equipment
- Service and Repair
- Replacement Parts
- Training (Schools, Videos, Books)
- Technical Manuals (Servicing Information and Parts)
- Circuit Diagrams
- Welding Process Handbooks

To locate a Distributor or Service Agency visit www.millerwelds.com or call 1-800-4-A-Miller

Contact the Delivering Carrier to:
- File a claim for loss or damage during shipment.

For assistance in filing or settling claims, contact your distributor and/or equipment manufacturer’s Transportation Department.