OM-271146U 2024-01

Processes

Induction Heating

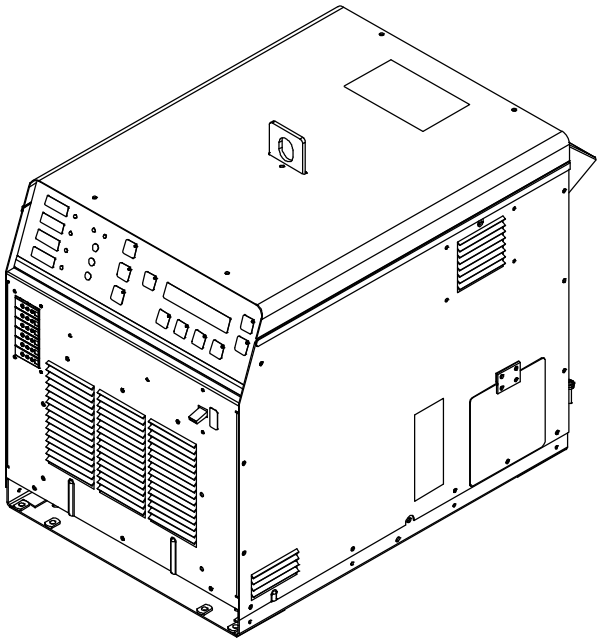
Description

Induction Heating Power Source

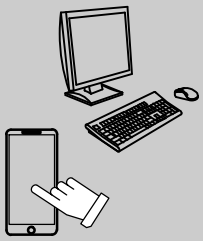
ProHeat™ 35

CE And Non CE Models

(For Stock Nos. 907689, and 907690)



OWNER'S MANUAL



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.

Certified System™

ISO 9001 Quality

Miller is the first welding equipment manufacturer in the U.S.A. to be registered to the ISO 9001 Quality System Standard.

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.**

TRUE BLUE® WARRANTY

Working as hard as you do – every power source from Miller is backed by the most hassle-free warranty in the business.

Miller®

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DECLARATION OF CONFORMITY

for European Community (CE marked) products.

MILLER Electric Mfg. LLC, 1635 West Spencer Street, Appleton, WI 54914 U.S.A. declares that the product(s) identified in this declaration, when used exclusively with MILLER induction heating cables and inductors, conform to the essential requirements and provisions of the stated Council Directive(s), Commission Regulation(s) and Standard(s).

Product/Apparatus Identification:

Product	Stock Number
ProHeat 35, 400-460V	907690
Cooler/ProHeat Heavy Duty Induction	301298

Council Directives and Commission Regulations:

- 2014/35/EU Low voltage
- 2014/30/EU Electromagnetic compatibility
- 2009/125/EC and regulation 2019/1784 Ecodesign requirements for energy-related products
- 2011/65/EU and amendment 2015/863 Restriction of the use of certain hazardous substances in electrical and electronic equipment

Standards:

- EN IEC 60974-1:2018/AI:2019 Arc welding equipment – Part 1: Welding power sources
- EN IEC 60974-2:2019 Arc welding equipment – Part 2: Liquid cooling systems
- EN 60974-10:2014/A1:2015 Arc welding equipment – Part 10: Electromagnetic compatibility requirements
- EN IEC 63000:2018 – Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Signatory:

November 5, 2021

David A. Werba
MANAGER, PRODUCT DESIGN COMPLIANCE

Date of Declaration

272703D

DECLARATION OF CONFORMITY

For United Kingdom (UKCA marked) products.

MILLER Electric Mfg. LLC, 1635 West Spencer Street, Appleton, WI 54914 U.S.A. declares that the product(s) identified in this declaration, when used exclusively with MILLER induction heating cables and inductors, conform to the essential requirements and provisions of the stated Regulation(s) and Standard(s).

Product/Apparatus Identification:

Product	Stock Number
ProHeat 35, 400-460V	907690
Cooler/ProHeat Heavy Duty Induction	301298

Regulations:

- S.I. 2016/1101 Electrical Equipment (Safety) Regulations 2016
- S.I. 2016/1091 Electromagnetic Compatibility Regulations 2016
- S.I. 2012/3032 Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

Standards:

- EN IEC 60974-1:2018/A1:2019 Arc welding equipment – Part 1 Welding power sources
- EN IEC 60974-2:2019 Arc welding equipment – Part 2: Liquid cooling systems
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Signatory:

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David A. Werba
MANAGER, PRODUCT DESIGN COMPLIANCE

Date of Declaration

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EMF DATA SHEET FOR INDUCTION HEATING POWER SOURCE

MILLER Electric Mfg. Co., 1635 Spencer Street, Appleton, WI 54914 U.S.A. is voluntarily providing the following information to assist European employers in carrying out their assessments to show compliance with Directive 2013/35/EU on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields).

Product/Apparatus Identification

Product	Stock Number
PROHEAT 35, 400-460V (CE)	907690

Compliance Information Summary

Applicable regulation: Directive 2014/35/EU

Reference limits: Directive 2013/35/EU, Recommendation 1999/519/EC

Applicable standards: None

Intended use: ☒ for occupational use ☐ for use by laymen

Sensory effects need to be considered for workplace assessment ☐ YES ☒ NO

Non-thermal health effects need to be considered for workplace assessment ☒ YES ☐ NO

Thermal health 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)

EMF Data for Non-thermal Health Effects

Minimum approach distances to pipe/coil where EMF exposure limit values are not exceeded (ELV Exposure Index ≤ 1)

Output Power	Body Part			
	Head	Trunk	Hand	Thigh
35 kW	12 cm	14 cm	6 cm	12 cm
25 kW	11 cm	13 cm	4 cm	11 cm
15 kW	9 cm	11 cm	2 cm	9 cm
5 kW	4 cm	6 cm	0 cm	4 cm

Distance where all occupational ELV Exposure Indices fall below 0.20 (20%) 30 cm

Distance where all general public ELV Exposure Indices fall below 1.00 (100%) 56 cm

Assessment performed by: Mike Madsen Date performed: 2016-03-18

276511A

SECTION 1 – SAFETY PRECAUTIONS – READ BEFORE USING

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

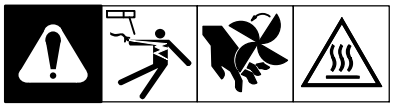
1-1. Symbol Usage

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.

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.*

☞ *Indicates special instructions.*



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 these hazards.

1-2. Induction Heating 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 Principal Safety Standards. 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 the 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 power circuit and output bus bars or connections are electrically live whenever the output is on. 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.
- Enclose any connecting bus bars and coolant fittings to prevent unintentional contact.
- 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.
- 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, see ANSI Z49.1 listed in Safety Standards. And, do not work alone!
- Disconnect input power before installing or servicing this equipment. Lockout/tagout input power according to OSHA 29 CFR 1910.147 (see Safety Standards).
- Use only nonconductive coolant hoses with a minimum length of 18 inches (457 mm) to provide isolation.
- 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 power circuit if you are in contact with the work, ground, or another power circuit from a different machine.
- 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.
- Use GFCI protection when operating auxiliary equipment in damp or wet locations.

FUMES AND GASES can be hazardous.

Induction Heating of certain materials, adhesives, and fluxes can produce 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. Fumes and gases from heating can displace air and lower the oxygen level causing injury or death. Be sure the breathing air is safe.
- Do not heat in locations near degreasing, cleaning, or spraying operations. The heat can react with vapors to form highly toxic and irritating gases.
- Do not overheat coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the heated 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 overheated. See coating SDS for temperature information.

FIRE OR EXPLOSION hazard.

- Do not overheat parts.
- Watch for fire; keep extinguisher nearby.
- Keep flammables away from work area.
- Do not locate unit on, over, or near combustible surfaces.
- Do not use unit to thaw frozen pipes.
- Do not install unit near flammables.
- Do not cover an air−cooled blanket with any material that will cause the blanket to overheat.
- Do not operate where the atmosphere can contain flammable dust, gas, or liquid vapors (such as gasoline).
- 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 bypass them.
- Read and understand the Safety Data Sheets (SDSs) and the manufacturer's instructions for adhesives, coatings, cleaners, consumables, coolants, degreasers, fluxes, and metals.
- Wear body protection made from leather or flame-resistant clothing (FRC). Body protection includes oil-free clothing such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.

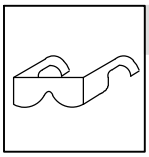
INDUCTION HEATING can burn.

- Do not touch hot parts bare-handed.
- Allow cooling period before handling parts or equipment.
- Do not touch or handle induction head/coil during operation unless the equipment is designed and intended to be used in this manner as specified in the owner's manual.
- Keep metal jewelry and other metal personal items away from head/coil during operation.
- To handle hot parts, use proper tools and/or wear heavy, insulated welding gloves and clothing to prevent burns.

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

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.



FLYING METAL OR DIRT can injure eyes.

- Wear approved safety glasses with side shields or wear face shield.

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.

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.

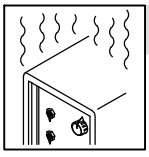
STEAM AND HOT COOLANT can burn.

Hose may rupture if coolant overheats.

- Never disconnect both ends of hose when installed on hot workpiece.
- If coolant flow stops, leave one end of hose connected to allow coolant to return to cooler and relieve pressure.
- Remove hose from hot workpiece to prevent damage.
- Visually inspect condition of hoses, cords, and cables before each use. Do not use damaged hoses, cords, or cables.
- 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.



OVERUSE can cause OVERHEATING

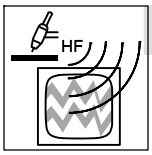
- Allow cooling period.
- Reduce output or reduce duty cycle before starting to heat again.
- Follow rated duty cycle.

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.

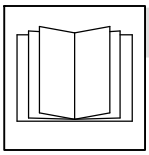
BATTERY EXPLOSION can injure.

- Do not use induction equipment to charge batteries or jump start vehicles unless it has a battery charging feature designed for this purpose.



H.F. RADIATION can cause interference.

- High-frequency (H.F.) can interfere with radio navigation, safety services, computers, and communications equipment.
- Have only qualified person 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.



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.

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

Safety in Welding, Cutting, and Allied Processes, American Welding Society standard ANSI Standard Z49.1. Website: www.aws.org.

Safety in Welding, Cutting, and Allied Processes, CSA Standard W117.2 from Canadian Standards Association. Website: www.csagroup.org.

OSHA *Occupational Safety and Health Standards for General Industry*, Title 29, Code of Federal Regulations (CFR), Part 1910.177 Subpart N, Part 1910 Subpart Q, and Part 1926, Subpart J. Website: www.osha.gov.

OSHA *Important Note Regarding the ACGIH TLV, Policy Statement on the Uses of TLVs and BEIs.* Website: www.osha.gov.

National Electrical Code, NFPA Standard 70 from National Fire Protection Association. Website: www.nfpa.org.

Canadian Electrical Code Part 1, CSA Standard C22.1 from Canadian Standards Association. Website: www.csagroup.org.

Safe Practice For Occupational And Educational Eye And Face Protection, ANSI Standard Z87.1 from American National Standards Institute. Website: www.ansi.org.

Applications Manual for the Revised NIOSH Lifting Equation from the National Institute for Occupational Safety and Health (NIOSH). Website: www.cdc.gov/NIOSH.

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.

For additional information on induction heating and EMF exposure, see the bulletin at this location:
https://www.millerwelds.com/–/media/miller–electric/files/pdf/safety/bulletins/bulletin–on–induction–heating–and–emf–exposure.pdf

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. If cleared by your doctor, then following the above procedures is recommended.

SECTION 2 – 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.

2-1. Signification des symboles

⚠ **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.**

⚠ **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.*

☞ *Indique des instructions spécifiques.*

Ce groupe de symboles veut dire Avertissement! Attention! DANGER DE CHOC ELECTRIQUE, PIECES EN MOUVEMENT, et PIECES CHAUDES. Reportez–vous aux symboles et aux directives ci–dessous afin de connaître les mesures à prendre pour éviter tout danger.

2-2. Dangers relatifs au chauffage par induction

⚠ **Les symboles présentés ci-après sont utilisés tout au long du présent manuel pour attirer votre attention et identifier les risques de danger. Lorsque vous voyez un symbole, soyez vigilant et suivez les directives mentionnées afin d'éviter tout danger. Les consignes de sécurité présentées ci–après ne font que résumer les informations contenues dans les principales normes de sécurité . Veuillez lire et respecter toutes ces 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.**

⚠ **Au cours de l'utilisation, tenir toute personne à l'écart et plus particulièrement les enfants.**

UNE DÉCHARGE ÉLECTRIQUE peut entraîner la mort.

Le contact de composants électriques peut provoquer des accidents mortels ou des brûlures graves. Le circuit électrique et les barres collectrices ou les connexions de sortie sont sous tension lorsque l'appareil fonctionne. Le circuit d'alimentation et les circuits internes de la machine sont également sous tension lorsque l'alimentation est sur marche. Des équipements installés ou reliés à la borne de terre de manière incorrecte sont dangereux.

- Ne pas toucher aux pièces électriques sous tension.
- Protéger toutes les barres collectrices et les raccords de refroidissement pour éviter de les toucher par inadvertance.
- 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.
- D'autres consignes de sécurité sont nécessaires dans les conditions suivantes : risques électriques dans un environnement humide ou si 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 inévitable ou accidentel avec la pièce à souder ou le sol. Dans ces conditions, voir ANSI Z49.1 énuméré dans les normes de sécurité. En outre, ne pas travailler seul !
- Couper l'alimentation d'entrée avant d'installer l'appareil ou d'effectuer l'entretien. Verrouiller ou étiqueter la sortie d'alimentation selon la norme OSHA 29 CFR 1910.147(se reporter aux Principales normes de sécurité).
- N'utiliser que des tuyaux de refroidissement non conducteurs ayant une longueur minimale de 457 mm pour garantir l'isolation.
- Installer le poste correctement et le mettre à la terre convenablement selon les consignes du manuel de l'opérateur et les normes nationales, provinciales 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 revérifier 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.
- Ne pas toucher le circuit électrique si l'on est en contact avec la pièce, la terre ou le circuit électrique d'une autre machine.
- 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.
- Utiliser une protection différentielle lors de l'utilisation d'un équipement auxiliaire dans des endroits humides ou mouillés.

LES FUMÉES ET LES GAZ peuvent être dangereux.

Le chauffage à induction de certains matériaux, adhésifs et flux génère des fumées et des gaz. Leur inhalation peut être dangereuse pour votre santé.

- Ne pas mettre sa tête au-dessus des vapeurs. Ne pas respirer ces vapeurs.
- 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 prélèvement pour la composition et la quantité de fumées et de gaz auxquelles est exposé le personnel.
- Si la ventilation est médiocre, 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 dégraisseurs, les flux et les métaux.
- Travailler dans un espace fermé seulement s'il est bien ventilé ou en portant un respirateur. Demander toujours à un surveillant dûment formé de se tenir à proximité. Des fumées et des gaz provenant du

chauffage peuvent déplacer l'air, abaisser le niveau d'oxygène et provoquer des lésions ou des accidents mortels. S'assurer que l'air ambiant ne présente aucun danger.

- Ne pas chauffer dans des endroits se trouvant à proximité d'opérations de dégraissage, de nettoyage ou de pulvérisation. La chaleur peut réagir en présence de vapeurs et former des gaz hautement toxiques et irritants.
- Ne pas surchauffer des métaux munis d'un revêtement tels que l'acier galvanisé, plaqué au plomb ou au cadmium, à moins que le revêtement ne soit enlevé de la zone chauffée, que la zone soit bien ventilée et, si nécessaire, en portant un respirateur. Les revêtements et tous les métaux contenant ces éléments peuvent dégager des fumées toxiques s'ils sont surchauffés. Voir les informations concernant la température dans les spécifications de revêtement SDS.

Risque D'INCENDIE OU D'EXPLOSION.

- Ne pas surchauffer les composants .
- Attention aux risques d'incendie: tenir un extincteur à proximité.

- Stocker des produits inflammables hors de la zone de travail.
- Ne pas placer l'appareil sur, au-dessus ou à proximité de surfaces inflammables.
- Ne pas utiliser l'appareil pour dégeler des tuyaux.
- Ne pas installer l'appareil à proximité de produits inflammables.
- Ne pas couvrir les protections isolantes refroidies par air avec un matériau pouvant entraîner leur surchauffe.
- Ne pas souder là où l'air ambiant pourrait contenir des poussières, gaz ou émanations inflammables (vapeur d'essence, par exemple).
- 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 ponter.
- 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 dégraisseurs, les flux et les métaux.
- Porter une protection corporelle en cuir ou des vêtements ignifuges (FRC). 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.

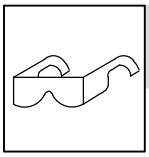
LE CHAUFFAGE PAR INDUCTION peut provoquer des brûlures.

- Ne pas toucher des parties chaudes à mains nues.
- Laisser refroidir les composants ou équipements avant de les manipuler.
- Ne pas toucher ou manipuler les câbles/enroulements d'induction durant l'opération à moins que l'équipement soit conçu à cet effet comme indiqué dans le manuel d'utilisateur.
- Tenir les bijoux et autres objets personnels en métal éloignés de la tête/de l'enroulement pendant le fonctionnement.
- Ne pas toucher aux pièces chaudes, utiliser les outils recommandés et porter des gants de soudage et des vêtements épais pour éviter les brûlures.

2-3. Symboles de dangers supplémentaires en relation avec l'installation, le fonctionnement et la maintenance

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'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 Nº94–110) lors du levage manuelle de pièces ou équipements lourds.



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

- Porter des lunettes de sécurité à coques latérales ou un écran facial.

DES ORGANES MOBILES peuvent provoquer 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.

Les CHAMPS ÉLECTROMAGNÉTIQUES (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.

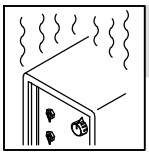
LE LIQUIDE DE REFROIDISSEMENT CHAUD ET LA VAPEUR peuvent causer des brûlures.

Si le liquide de refroidissement est en surchauffe, un boyau pourrait se sectionner.

- Ne jamais débrancher les deux extrémités du tuyau lorsque l'appareil est installé sur une pièce de travail chaude.
- Si le liquide de refroidissement cesse de s'écouler, laisser une extrémité du tuyau branchée pour permettre au liquide de refroidissement chaud de revenir au refroidisseur et dépressuriser.
- Pour éviter tout risque de dommage, retirer le tuyau de la pièce de travail chaude.
- Effectuer une inspection visuelle des boyaux, cordons et câbles avant chaque utilisation. Ne pas utiliser des boyaux, cordons ou câbles 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.



L'EMPLOI EXCESSIF peut SURCHAUFFER L'ÉQUIPEMENT.

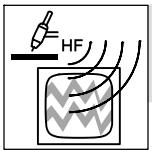
- Prévoir une période de refroidissement
- Réduire le courant de sortie ou le facteur de marche avant de recommencer le chauffage.
- Respecter le cycle opératoire nominal.

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 expédier des cartes PC.

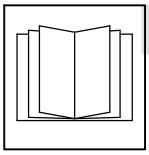
L'EXPLOSION DE LA BATTERIE peut provoquer des blessures.

- Ne pas utiliser l'appareil de induction 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.



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

- Le rayonnement haute fréquence (HF) 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.
- Effectuer régulièrement le contrôle et l'entretien de l'installation.
- Maintenir soigneusement fermés les portes et les panneaux des sources de haute fréquence.



LIRE LES INSTRUCTIONS.

- Lire et appliquer les instructions sur les étiquettes et le Mode d'emploi avant l'installation, l'utilisation ou l'entretien de l'appareil. Lire les informations de sécurité au début du manuel et dans chaque section.
- 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.

2-4. 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.

2-5. Principales normes de sécurité

Safety in Welding, Cutting, and Allied Processes, American Welding Society standard ANSI Standard Z49.1. Website: www.aws.org.

Safety in Welding, Cutting, and Allied Processes, CSA Standard W117.2 from Canadian Standards Association. Website: www.csagroup.org.

OSHA *Occupational Safety and Health Standards for General Industry*, Title 29, Code of Federal Regulations (CFR), Part 1910.177 Subpart N, Part 1910 Subpart Q, and Part 1926, Subpart J. Website: www.osha.gov.

OSHA *Important Note Regarding the ACGIH TLV, Policy Statement on the Uses of TLVs and BEIs.* Website: www.osha.gov.

National Electrical Code, NFPA Standard 70 from National Fire Protection Association. Website: www.nfpa.org

Canadian Electrical Code Part 1, CSA Standard C22.1 from Canadian Standards Association. Website: www.csagroup.org.

Safe Practice For Occupational And Educational Eye And Face Protection, ANSI Standard Z87.1 from American National Standards Institute. Website: www.ansi.org.

Applications Manual for the Revised NIOSH Lifting Equation from the National Institute for Occupational Safety and Health (NIOSH). Website: www.cdc.gov/NIOSH.

2-6. 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 passants ou procéder à une évaluation des risques individuels pour les soudeurs. Tous les soudeurs doivent appliquer les procédures suivantes pour minimiser l'exposition aux CEM provenant du circuit de soudage:

1. Rassembler les câbles en les torsadant ou en les attachant avec du ruban adhésif ou avec une housse.
2. Ne pas se tenir au milieu des câbles de soudage. Disposer les câbles d'un côté et à distance de l'opérateur.
3. Ne pas courber et ne pas entourer les câbles autour de votre corps.
4. Maintenir la tête et le torse aussi loin que possible du matériel du circuit de soudage.
5. Connecter la pince sur la pièce aussi près que possible de la soudure.
6. Ne pas travailler à proximité d'une source de soudage, ni s'asseoir ou se pencher dessus.
7. Ne pas souder tout en portant la source de soudage ou le dévidoir.

Pour des informations supplémentaires relatives au chauffage par induction et à l'exposition aux champs électriques et magnétiques (CEM), se reporter au communiqué suivant:

https://www.millerwelds.com/–/media/miller–electric/files/pdf/safety/bulletins/bulletin–on–induction_heating–and–emf–exposure–fr.pdf

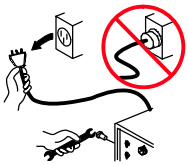
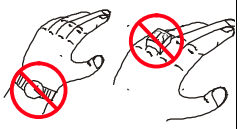
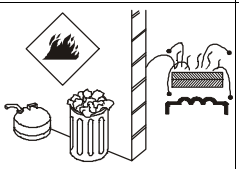
En ce qui concerne les implants médicaux :

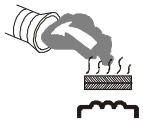
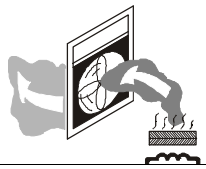
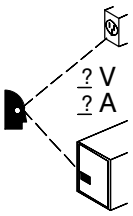
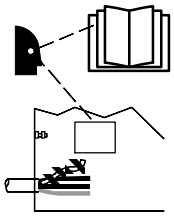
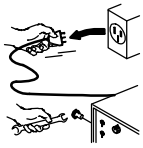
Les porteurs d'implants doivent d'abord consulter leur médecin avant de s'approcher des opérations de soudage à l'arc, de soudage par points, de gougeage, du coupage plasma ou de chauffage par induction. Si le médecin approuve, il est recommandé de suivre les procédures précédentes.

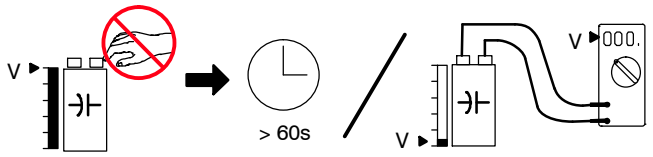
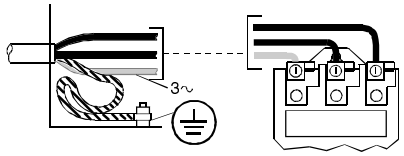
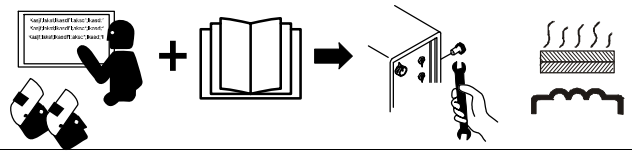
SECTION 3 – DEFINITIONS

3-1. Additional Safety Symbols And Definitions

☞ *Some symbols are found only on CE products.*

	Warning! Watch Out! There are possible hazards as shown by the symbols. Safe1 2012–05
	Wear dry insulating gloves. Do not wear wet or damaged gloves. Safe56 2017–04
	Disconnect input plug or power before working on machine. Safe5 2017–04
	Induction heating can cause injury or burns from hot items such as rings, watches, or parts. Safe74 2012–07
	Do not wear metal jewelry and other metal personal items such as rings and watches during operation. Safe75 2017–04
	Induction heating sparks can cause fire. Do not overheat parts and adhesives. Safe76 2012–07
	Keep flammables away from heating operation. Do not heat near flammables. Safe77 2012–07
	Heating sparks can cause fires. Have a fire extinguisher nearby and have a watchperson ready to use it. Safe78 2012–07
	Breathing heating fumes can be hazardous to your health. Read Material Safety Data Sheets (MSDSs) and manufacturer's instructions for material used. Safe79 2012–07

	Keep your head out of the fumes. Safe80 2017-04
	Use forced ventilation or local exhaust to remove the fumes. Safe81 2012-07
	Use ventilating fan to remove fumes. Safe82 2012-07
	Always wear safety glasses or goggles during and around heating operations to prevent possible injury. Safe83 2012-07
	Wear either safety glasses or full goggles depending on type of operation and nearby processes. Safe84 2012-07
	Do not remove or paint over (cover) the label. Safe20 2017-04
	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. Safe37 2017-04
	Consult rating label for input power requirements. Safe34 2012-05
	Become trained and read the instructions and labels before working on machine. Safe35 2012-05
	Disconnect input plug or power before working on machine. Safe30 2012-05

	Hazardous voltage remains on input capacitors after power is turned off. Do not touch fully charged capacitors. Always wait 60 seconds after power is turned off before working on unit, AND check input capacitor voltage, and be sure it is near 0 before touching any parts. Safe42 2017-04
	Connect green or green/yellow grounding conductor to ground terminal. Connect input conductors (L1, L2 And L3) to line terminals. Safe86 2012-06
	Become trained and read the instructions before working on the machine or heating. Safe85 2012-06

3-2. Miscellaneous Symbols And Definitions

☞ *Some symbols are found only on CE products.*

A	Amperage
V	Volts
~	Alternating Current
X	Duty Cycle
IP	Degree Of Protection
Hz	Hertz
	Circuit Protection
	Output
	Increase

	Line Connection
I_1	Primary Current
I_2	Rated Current
U_1	Primary Voltage
U_2	Load Voltage
	Read Operator's Manual
	Three Phase Static Frequency Converter-Transformer-Frequency Converter
I_{1max}	Rated Maximum Supply Current
P_{1max}	Maximum Power Consumption

3~	Three Phase
%	Percent
	Remote
	Panel/Local
	High Temperature
V	Voltage Input
	Off
	On
	Induction Heating

SECTION 4 – SPECIFICATIONS

4-1. Serial Number and Rating Label Location

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

4-2. 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.

4-3. Information About Default Weld Parameters And Settings

NOTICE *– Each welding application is unique. Although certain Miller Electric products are designed to determine and default to certain typical welding parameters and settings based upon specific and relatively limited application variables input by the end user, such default settings are for reference purposes only; and final weld results can be affected by other variables and application-specific circumstances. The appropriateness of all parameters and settings should be evaluated and modified by the end user as necessary based upon application-specific requirements. The end user is solely responsible for selection and coordination of appropriate equipment, adoption or adjustment of default weld parameters and settings, and ultimate quality and durability of all resultant welds. Miller Electric expressly disclaims any and all implied warranties including any implied warranty of fitness for a particular purpose.*

4-4. Specifications

☞ *Do not use information in unit specifications table to determine electrical service requirements. See Sections 5-3, 5-4 and 5-5 for information on connecting input power.*

☞ *This equipment will deliver rated output at an ambient air temperature up to 104 ℉ (40 ℃).*

Output Frequency	Rated Output		Required Reflective Inductance	Amperes Input at Rated Load Output 50 or 60 Hz, Three-Phase			kVA	kW	Overall Dimensions	Weight
	Single Output	Dual Output		400 V	460 V	575 V				
5 To 30 kHz	35 kW At 100% Duty Cycle 350 A (RMS), 700 V (RMS)	35 kW At 100% Duty Cycle 700 A (RMS), 700 V (RMS)	2.5 To 50 µh	60 A	50 A	40 A	39	37	Length: 36.75 in. (933 mm) Width: 21.75 in. (553 mm) Height: 27.5 in. (699 mm)	227 lb (103 kg)

4-5. Environmental Specifications

A. IP Rating

IP Rating
IP23C
This equipment is designed for outdoor use.
IP23 2017–02

B. 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 may 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 33.37mΩ (or the short–circuit power S_{sc} is greater than 112,138,497.99). 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

C. EU Ecodesign Information

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.

Critical raw materials possibly present in indicative amounts higher than 1 gram at component level

Component	Critical Raw Material
Printed circuit boards	Baryte, Bismuth, Cobalt, Gallium, Germanium, Hafnium, Indium, Heavy Rare Earth, Light Rare Earth, Niobium, Platinum Group Metals, Scandium, Silicon Metal, Tantalum, Vanadium
Plastic components	Antimony, Baryte
Electrical and electronic components	Antimony, Beryllium, Magnesium
Metal components	Beryllium, Cobalt, Magnesium, Tungsten, Vanadium
Cables and cable assemblies	Borate, Antimony, Baryte, Beryllium, Magnesium
Display panels	Gallium, Indium, Heavy Rare Earth, Light Rare Earth,Niobium, Platinum Group Metals, Scandium
Batteries	Fluorspar, Heavy Rare Earth, Light Rare Earth, Magnesium

EU Eco 2020-08

D. Temperature Specifications For Miller ProHeat 35 Rolling Inductor Cold Climate Operation

		ProHeat		Cooler		Rolling Inductor		Heating Cables	
°C	°F	Storage	Operation	Storage	Operation	Storage	Operation	Storage	Operation
60	140		Reduced efficiencies above 40°C		Reduced efficiencies above 40°C				
55	131								
50	122								
45	113								
40	104								
35	95								
30	86								
25	77								
20	68								
15	59								
10	50								
5	41								
0	32								
–5	23								
–10	14								
–15	5				Energize system frequently to maintain coolant temperature above 14°F (–10°C).		Energize system frequently to maintain coolant temperature above 14°F (–10°C).		Energize system frequently to maintain coolant temperature above 14°F (–10°C).
–20	-4								
–25	-13			Store dry		Store dry		Store dry	
–30	-22								
–35	-31								
–40	-40								

277088-A

	Not Recommended
	With Qualifications
	Normal Operation With Coolant

NOTICE – The Miller ProHeat 35 Rolling Inductor *is rated for operation between* 14° F and 140° F (–10° C to 60° C). For operation at -40° F to 14° F (–40° C to -10° C), take the following precautions to prevent equipment damage:

• Connect coolant lines to Rolling Inductor when dry, or when ambient temperature is above –4° F (–20° C).

• Operate ProHeat 35 Heavy Duty Induction Cooler only in temperatures between 14° F and 104° F (–10° C to 40° C) while operating Rolling Inductor/ Liquid Cooled Cables.

• Always use Miller Coolant (Miller Part Number 043810).

• Coolant must flow continuously through the Rolling Inductor/liquid cooled cables, and power must be applied to the Rolling Inductor /liquid cooled cables at regular intervals to maintain a coolant temperature of at least 14° F (–10° C).

• Store Rolling Inductor/liquid cooled cables dry. Dry unit by using compressed air at 40 psi (2.75 bar) max to blow coolant out of the Rolling Inductor and power cable.

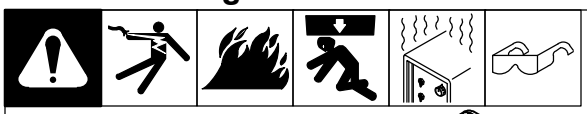
• Store ProHeat 35 Heavy Duty Induction Cooler at a temperature between–4° F and 131° F(–20° C to 55° C).

☞ *Coolant will not begin to flow until it is 14*° F (–10° C).

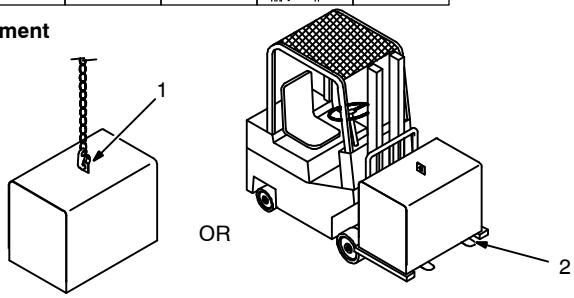
NOTICE – For colder storage, the cooler must be stored dry. Dry unit by using compressed air at 40 psi (2.75 bar) max to blow coolant out of coolant lines, filter bowls, pump, flow indicator, and heat exchanger.

SECTION 5 – INSTALLATION

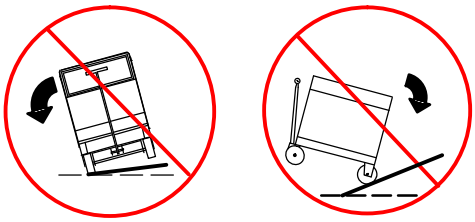
5-1. Selecting A Location



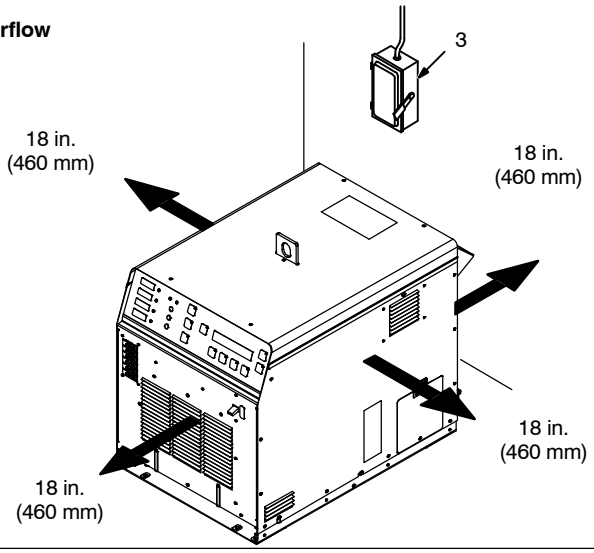
Movement



Do not move or operate unit where it could tip.



Location And Airflow



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

1 Lifting Eye

2 Lifting Forks

Use lifting eye or lifting forks to move unit.

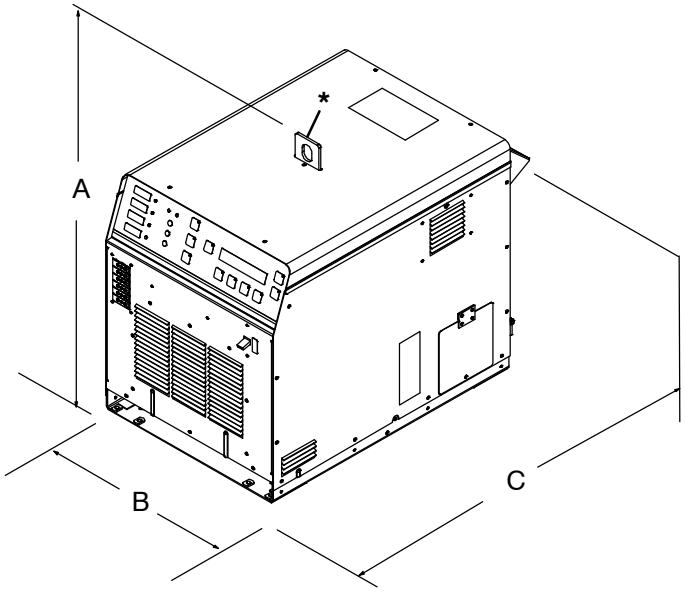
If using lifting forks, extend forks beyond opposite side of unit.

3 Line Disconnect Device

Locate unit near correct input power supply.

loc_large 2018-08 / 803992-B

5-2. Dimensions And Weights



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Dimensions	
A	27.5 in. (699 mm)
B	21.75 in. (553 mm)
C	36.75 in. (933 mm)
Weight	
227 lb (103 Kg)	
*** Lifting Eye Weight Rating** 600 lb (272 kg) Maximum	

5-3. Electrical Service Guide

Elec Serv 2020-02

CE-marked 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.

	50 Hz 3-Phase	60 Hz 3-Phase	
Rated Supply Voltage (V)	400	460	575
Rated Maximum Supply Current I_{1max} (A)	60	50	40
Maximum Effective Supply Current I_{1eff} (A)	60	50	40
Maximum Recommended Standard Fuse Rating In Amperes [1]			
Time-Delay Fuses [2]	70	60	50
Normal Operating Fuses [3]	90	70	60
Maximum Recommended Supply Conductor Length In Feet (Meters) [4]	214(74)	213(65)	333(101)
Raceway Installation			
Minimum Supply Conductor Size In AWG (mm^2) [5]	6	8	8
Minimum Grounding Conductor Size In AWG (mm^2) [5]	8	8	10
Flexible Cord Installation			
Minimum Supply Conductor Size In AWG (mm^2) [6]	4	4	6
Recommended Strain Relief [7]	Customer Supplied	Customer Supplied	Customer Supplied

Reference: 2020 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 “K5” (up to and including 60 amps), and UL class “H” (65 amps and above).

4 Maximum total length of copper input conductors in entire installation, raceway and/or flexible cord.

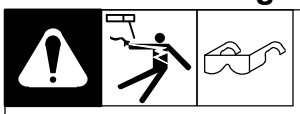
5 Raceway conductor data in this section specifies conductor size (excluding flexible cord or cable) between the panelboard and the equipment per NEC Table 310.15(B)(16) and is based on allowable ampacities of insulated copper conductors having a temperature rating of 75°C (167°F) with not more than three single current–carrying conductors in a raceway.

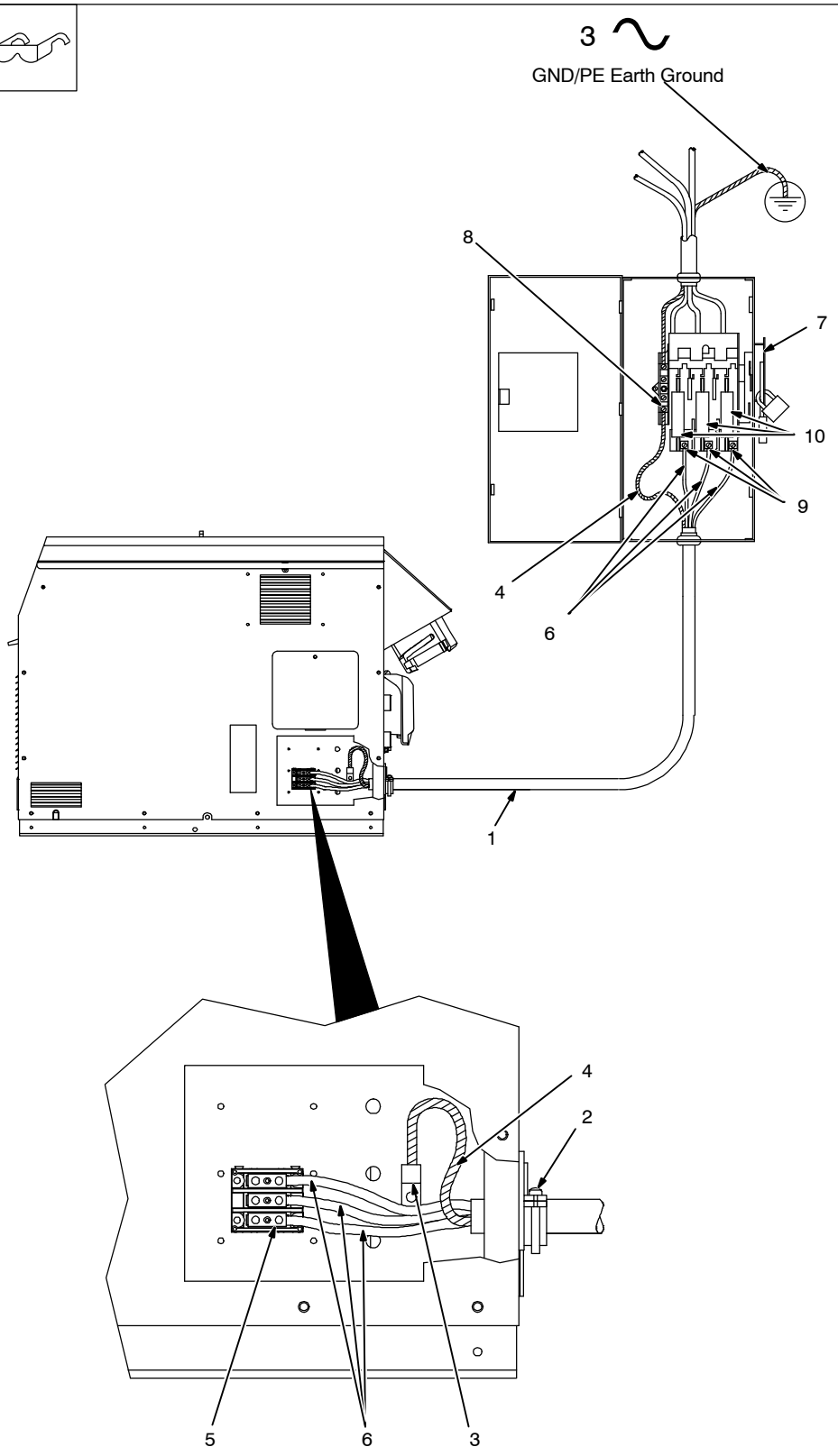
6 Flexible cord conductor size is based on NEC Table 400.5(A)(1) for SOOW 600V 90°C (194°F) jacketed cable in a 30°C (86°F) ambient temperature. See NEC Table 310.15(B)(2)(a) for ambient temperature correction factors. Flexible cord used for connection to the power supply system shall comply with the requirements of CSA C22.2 No. 49.

7 If necessary, have a qualified person enlarge access hole in machine panel to accommodate strain relief.

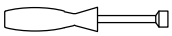
Notes

5-4. Connecting 3-Phase Input Power For 460/575 Volt Models

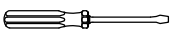




Tools Needed:



3/8 in.



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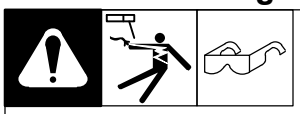
5-4. Connecting 3-Phase Input Power For 460/575 Volt Models (continued)



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.

☞ *The circuitry in this unit automatically adapts the power source to the primary voltage being applied. Check input voltage available at site. This unit can be connected to either 460 or 575 VAC input power.*

See rating label on unit and check input voltage available at site.

1 Input Power Conductors (Customer Supplied Cord)

Select size and length of conductors using Section 5-3. Conductors must comply with national, state, and local electrical codes. If applicable, use lugs of proper amperage capacity and correct hole size.

Power Source Input Power Connections

2 Strain Relief (Customer Supplied)

Install strain relief of proper size for unit and conductors. Route conductors (cord) through strain relief. Tighten strain relief.

3 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 Power Source Line Terminals

6 Input Conductors L1, L2 And L3

Connect input conductors L1, L2 and L3 to welding power source line terminals.

Close and secure access door on welding power source.

Disconnect Device Input Power Connections

7 Disconnect Device (switch shown in OFF position)

8 Disconnect Device (Supply) Grounding Terminal

9 Disconnect Device Line Terminals

Connect green or green/yellow grounding conductor to disconnect device grounding terminal first.

Connect input conductors L1, L2, And L3 to disconnect device line terminals.

10 Over-Current Protection

Select type and size of over-current protection using Section 5-3 (fused disconnect switch shown).

Close and secure door on line disconnect device. Follow established lockout/tagout procedures to put unit in service.

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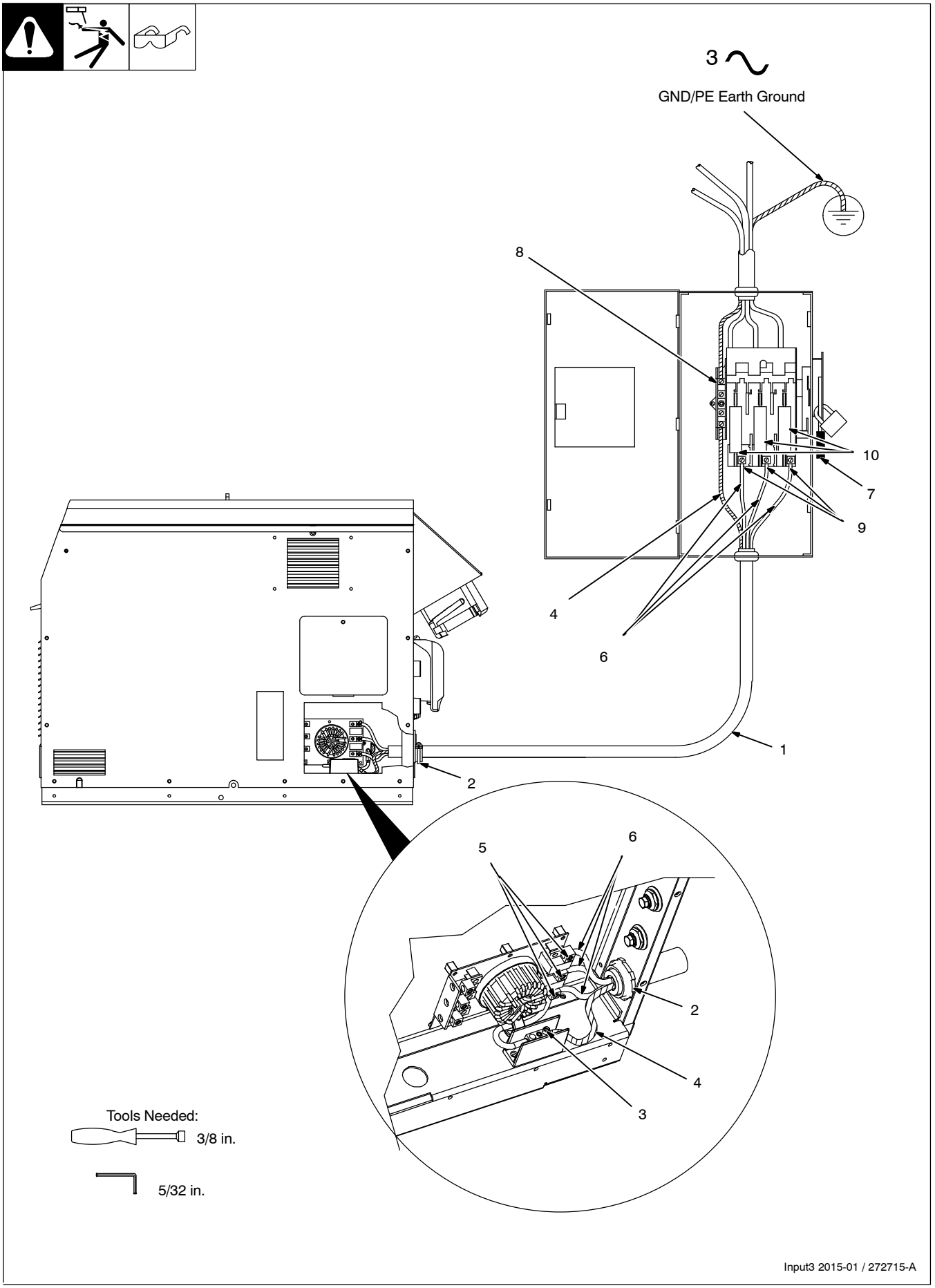
Notes

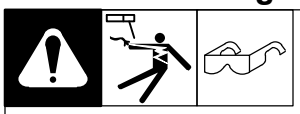
Work like a Pro!

Pros weld and cut safely. Read the safety rules at the beginning of this manual.

5-5. Connecting 3-Phase Input Power For 400/460 Volt IEC And CE Models



5-5. Connecting 3-Phase Input Power For 400/460 Volt IEC And CE Models (continued)



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.

☞ *The circuitry in this unit automatically adapts the power source to the primary voltage being applied. Check input voltage available at site. This unit can be connected to either 400 or 460 VAC input power.*

See rating label on unit and check input voltage available at site.

1 Input Power Conductors (Customer Supplied Cord)

Select size and length of conductors using Section 5-3. Conductors must comply with national, state, and local electrical codes. If applicable, use lugs of proper amperage capacity and correct hole size.

Power Source Input Power Connections

2 Strain Relief (Customer Supplied)

Install strain relief of proper size for unit and conductors. Route conductors (cord) through strain relief. Tighten strain relief.

3 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 Power Source Line Terminals

6 Input Conductors L1, L2 And L3

Connect input conductors L1, L2 and L3 to welding power source line terminals.

Close and secure access door on welding power source.

Disconnect Device Input Power Connections

7 Disconnect Device (switch shown in OFF position)

8 Disconnect Device (Supply) Grounding Terminal

9 Disconnect Device Line Terminals

Connect green or green/yellow grounding conductor to disconnect device grounding terminal first.

Connect input conductors L1, L2, And L3 to disconnect device line terminals.

10 Over-Current Protection

Select type and size of over-current protection using Section 5-3 (fused disconnect switch shown).

Close and secure door on line disconnect device. Follow established lockout/tagout procedures to put unit in service.

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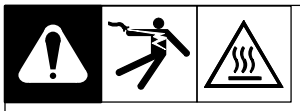
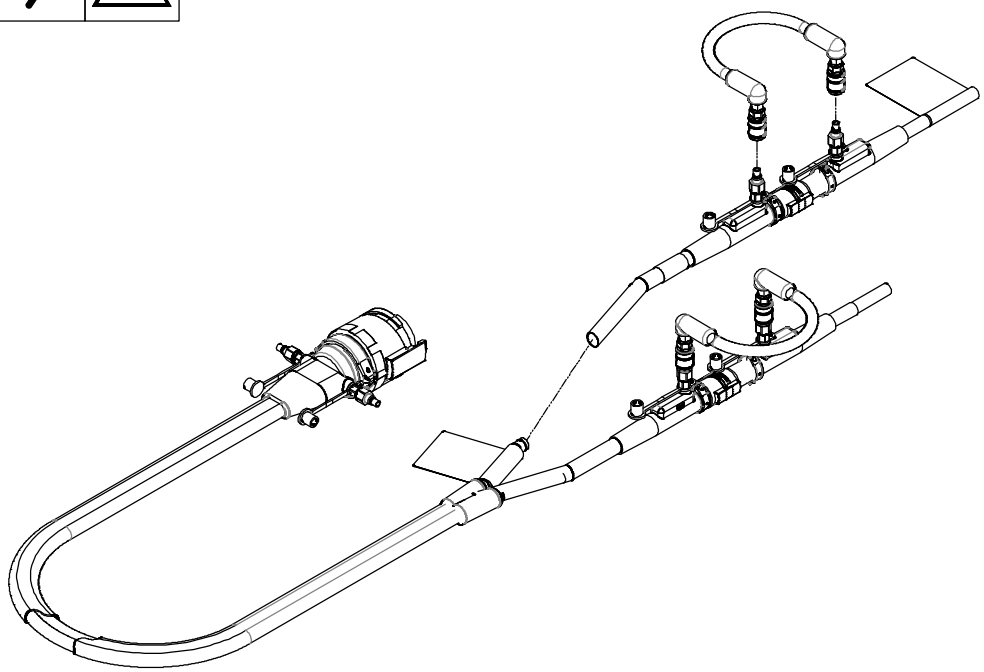
5-6. Coolant Jumper Connections





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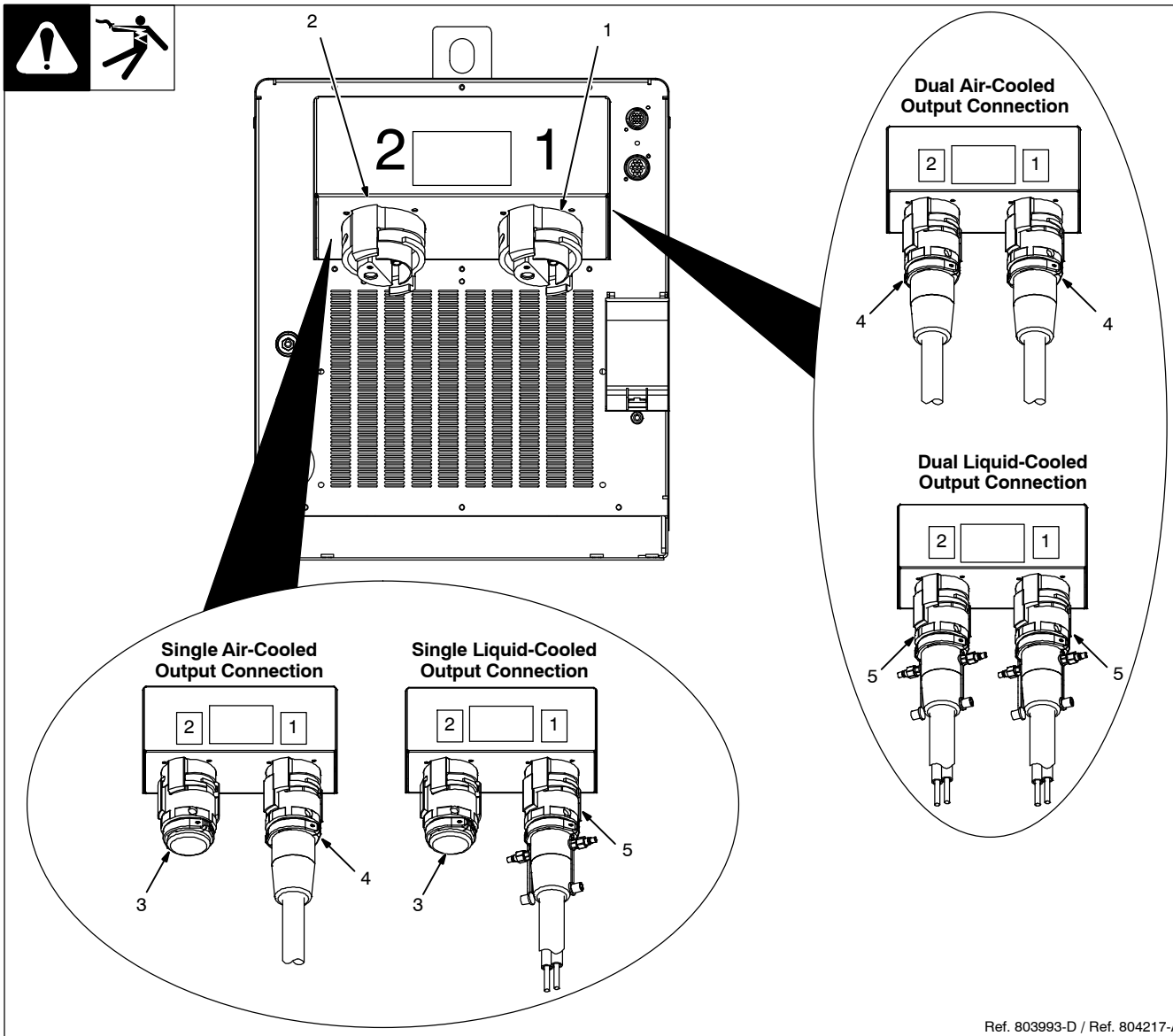
5-7. Power Source Output Connections



Ref. 803993-D / Ref. 804217-A

Steam and hot coolant can burn. Hose may rupture if coolant overheats.
Never disconnect both ends of hose when installed on hot workpiece. If coolant flow stops, leave one end of hose connected to allow hot coolant to return to cooler and relieve pressure. Remove hose from hot workpiece to prevent damage.

1 Output Connector 1
2 Output Connector 2
3 Protective Plug
4 Air-Cooled Extension Cable
5 Liquid-Cooled Extension Cable

The power source is capable of single or dual output. When connected for single power output, up to 35 kW is available at the single output connection. When connected for dual power, output power is divided between the two output connections.

Do not move or disconnect cables while output is on.

Single Air-Cooled Output Connection

Connect air-cooled output extension cable to Output Connector 1 or Output Connector 2. Connect Protective Plug to remaining Output Connector.

Single Liquid-Cooled Output Connection

Connect liquid-cooled output extension cable to Output Connector 1 or Output Connector 2. Connect Protective Plug to remaining Output Connector.

Dual Air-Cooled Output Connection

Connect air-cooled output extension cables to Output Connector 1 and Output Connector 2.

☞ *Extension cables must be the same length: 25 ft (7.6 m), 50 ft (15.2 m), or 75 ft (22.8 m).*

☞ *Blankets must be the same size.*

Dual Liquid-Cooled Output Connection

Connect liquid-cooled output extension cables to Output Connector 1 and Output Connector 2.

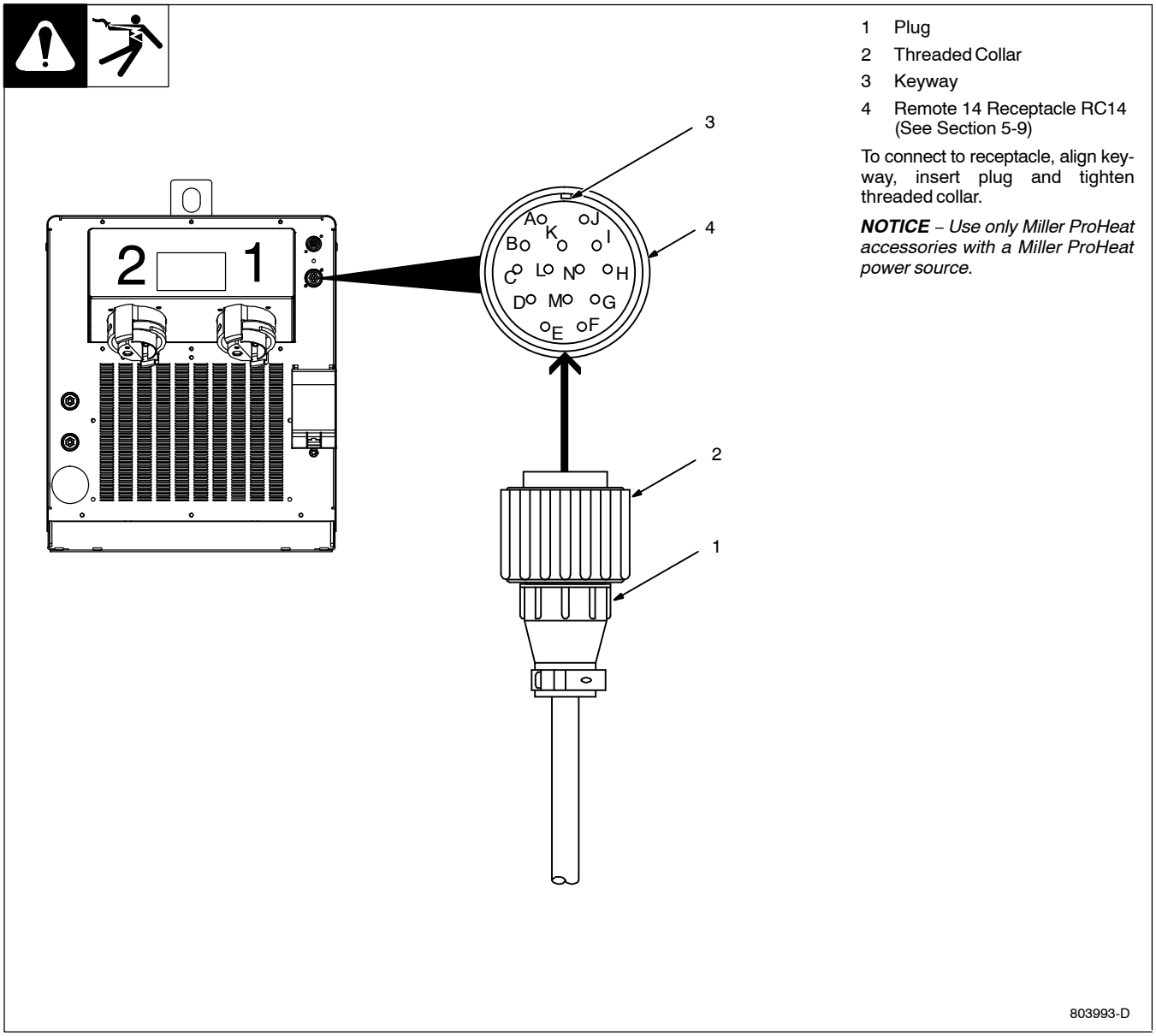
☞ *Extension cables must be the same length: 10 ft (3 m), 25 ft (7.6 m), or 50 ft (15.2 m).*

☞ *Heating cables must be the same length: 30ft (9.1 m), 50 ft (15.2 m), 80ft (24.2 m), or 140 ft (42.7 m).*

☞ *Total length of heating and extension cables must not exceed 360 ft (110 m). The extension cable is counted twice the length because it has a supply and return hose.*

***NOTICE** – Use only Miller ProHeat accessories with a Miller ProHeat power source.*

5-8. Remote 14 Receptacle RC14 Information and Connections



1 Plug
2 Threaded Collar
3 Keyway
4 Remote 14 Receptacle RC14 (See Section 5-9)

To connect to receptacle, align keyway, insert plug and tighten threaded collar.

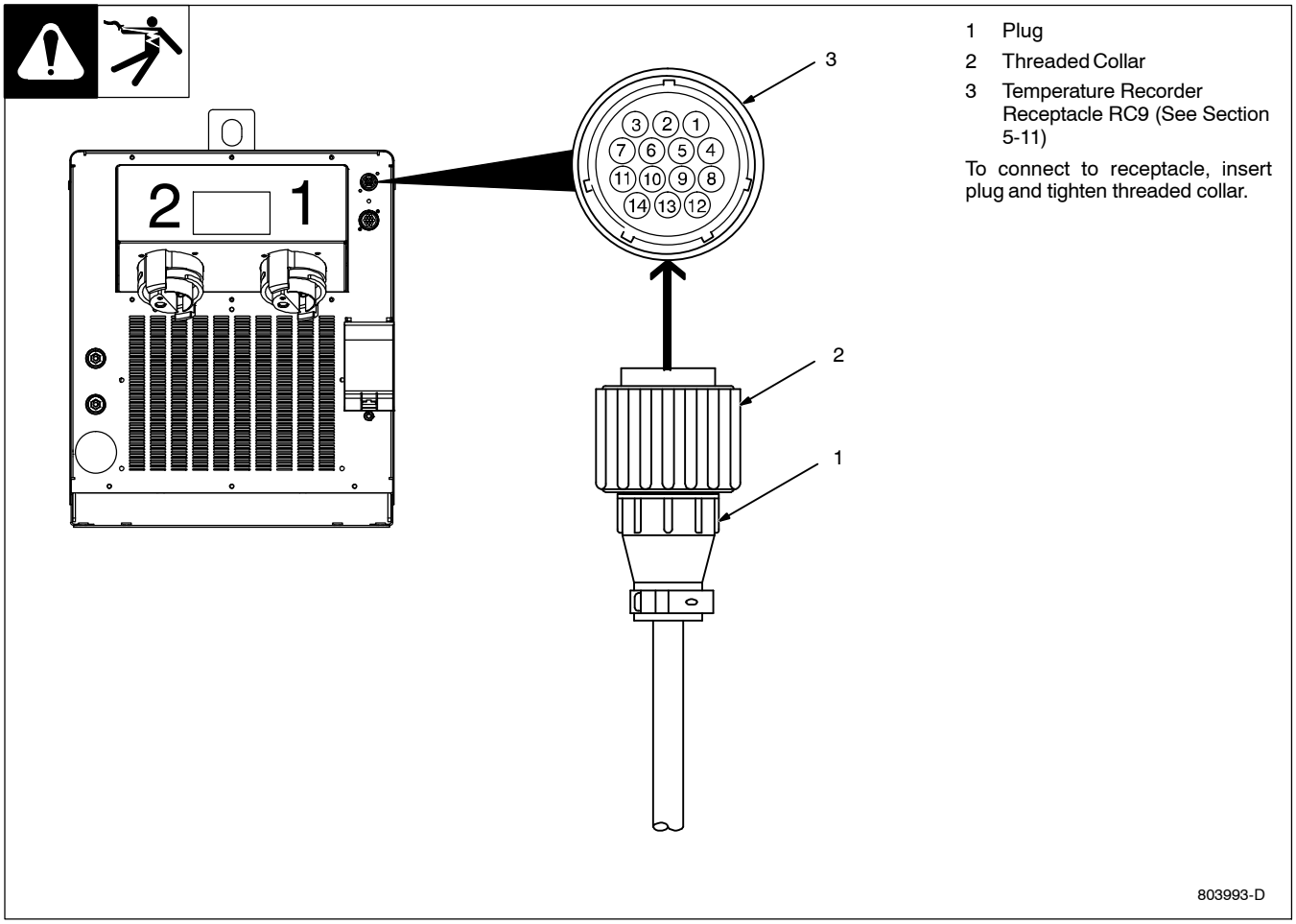
NOTICE *– Use only Miller ProHeat accessories with a Miller ProHeat power source.*

803993-D

5-9. Remote 14 Socket Information

Socket	REMOTE 14	Socket Information
A	**Remote Contactor**	+24 volts DC.
B		Contact closure to A completes 24 volts DC contactor control circuit.
C	**Remote Output Control**	Command reference; +10 volts DC.
D		Control circuit common.
E		Input command signal (potentiometer wiper or 0 to +10 volts DC).
G		Travel sense detect.
F, J	**Power Source Fault**	Absence of internal contact closure between F and J signals power source fault to remote control device (an external power source must be used).
H	**Remote Metering**	Tank 2 IRMS (1 volt/10 amperes).
I		Actual frequency output signal (1 volt/10 kHz).
L		Average power output signal (1 volt/10 kW).
M		Voltage output signal RMS (1 volt/100 volts).
N		Total current output signal RMS (1 volt/100 amperes).
K		Chassis common.

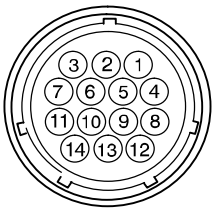
5-10. Temperature Recorder Receptacle RC9 Information And Connections



1 Plug
2 Threaded Collar
3 Temperature Recorder Receptacle RC9 (See Section 5-11)

To connect to receptacle, insert plug and tighten threaded collar.

5-11. Temperature Recorder Socket Information



Socket No.	Socket Information
1	Thermocouple No. 1 (TC1), 0-10 volt DC signal [0V = –50°F (–46° C), 10V = 1500°F (816°C)]
2	Thermocouple No. 2 (TC2), 0-10 volt DC signal [0V = –50°F (–46° C), 10V = 1500°F (816°C)]
3	Thermocouple No. 3 (TC3), 0-10 volt DC signal [0V = –50°F (–46° C), 10V = 1500°F (816°C)]
4	Thermocouple No. 4 (TC4), 0-10 volt DC signal [0V = –50°F (–46° C), 10V = 1500°F (816°C)]
5	Signal Common
6	Thermocouple No. 5 (TC5), 0-10 volt DC signal [0V = –50°F (–46° C), 10V = 1500°F (816°C)]
7	Thermocouple No. 6 (TC6), 0-10 volt DC signal [0V = –50°F (–46° C), 10V = 1500°F (816°C)]
8	Unused
9	Unused
10	Chassis Ground
11	Unused
12	Unused
13	Unused
14	Unused

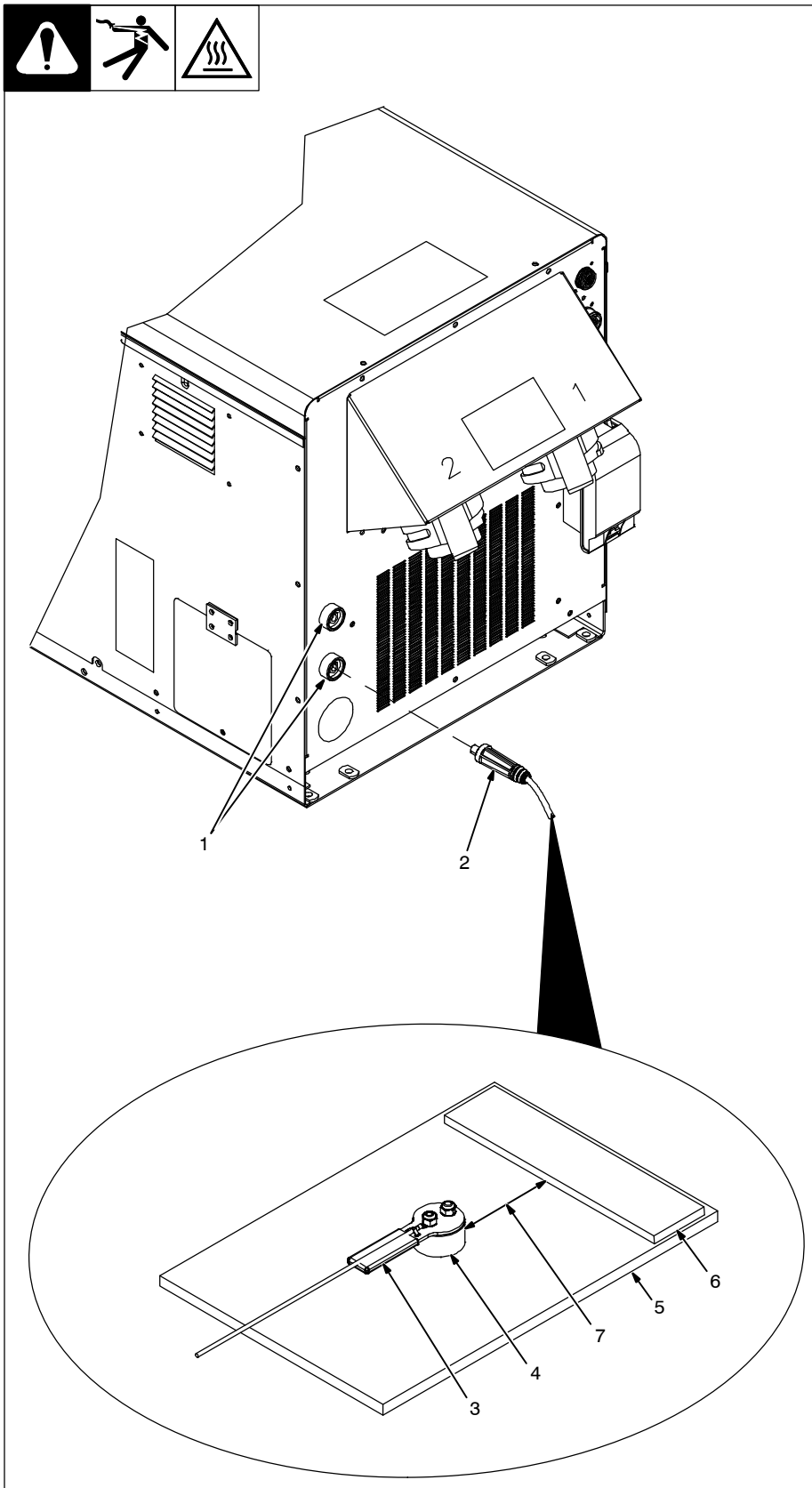
***** The voltage to temperature calculation is:

(DC Volts Out x 155) – 50 = °F

(DC Volts Out x 86.1) – 45.4 = °C

The ProHeat display should read ±6 °F or ±3.3°C.

5-12. Secondary Insulation Protection



Connect supplied ground lead(s) between the workpiece and power source to provide proper secondary insulation protection.
For single output, only one ground lead is required. For dual output , use both ground leads.

Secondary insulation protection circuitry automatically shuts down the power source output if a potentially hazardous condition exists at the heating device connected to the power source (e.g. insulation has broken down on a heating blanket or a heating coil causing the conductor to come into contact with the workpiece.

1 Receptacles

2 Plug

To connect plug, align key with key-way, insert end into receptacle, and rotate plug until tight.

3 Handle

4 Magnet

☞ *The secondary isolation magnet must be in contact with bare metal (free from rust, paint, grease, etc.).*

5 Workpiece

Use handle to place magnet on the workpiece.

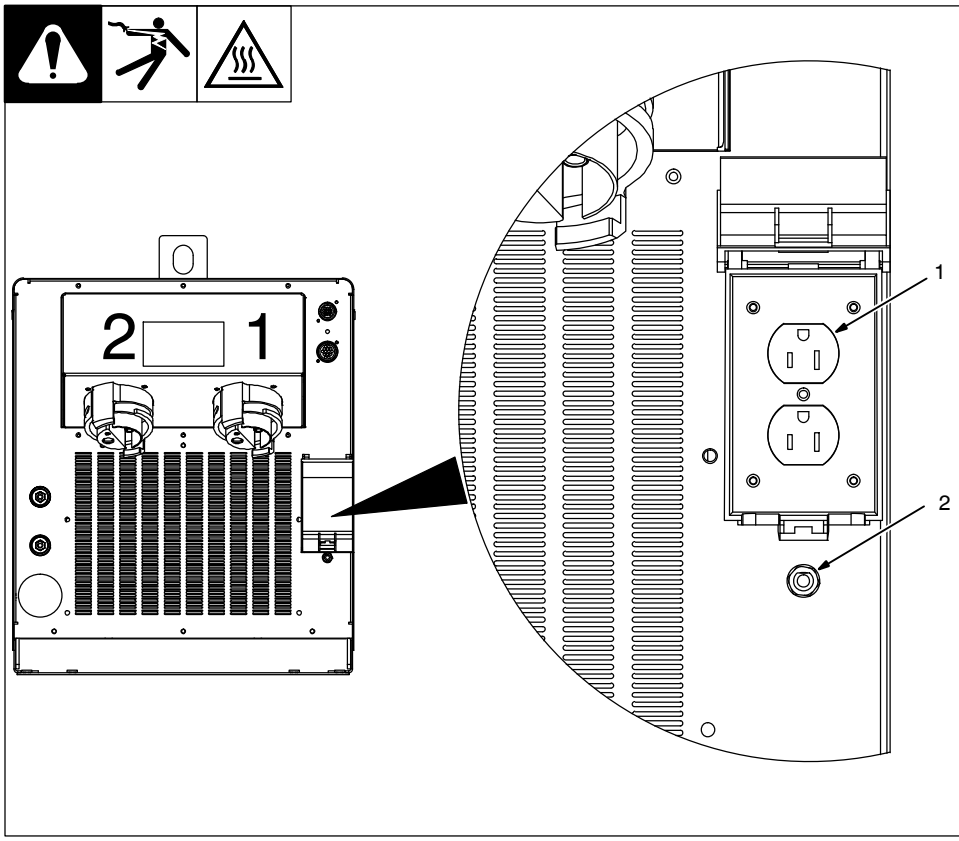
6 Heating Blanket or Heating Coil

7 12in Gap

The magnet and handle must be placed more than 12 inches from the heating blanket or heating coil. The spacing is required to prevent damage to the magnet assembly.

803994-E / 272889-A

5-13. 115 Volt AC Duplex Receptacle And Supplementary Protector



1 115 VAC 2.5 A Single-Phase AC Receptacle RC1

2 Supplementary Protector CB1 (2.5 A)

The receptacle supplies nominal 115 volts AC auxiliary power for use with the optional digital recorder. Maximum output from receptacle is 2.5 amperes.

CB1 protects 115 volt receptacle RC1 from overload. If CB1 opens, RC1 does not work.

5-14. Locating Thermocouples

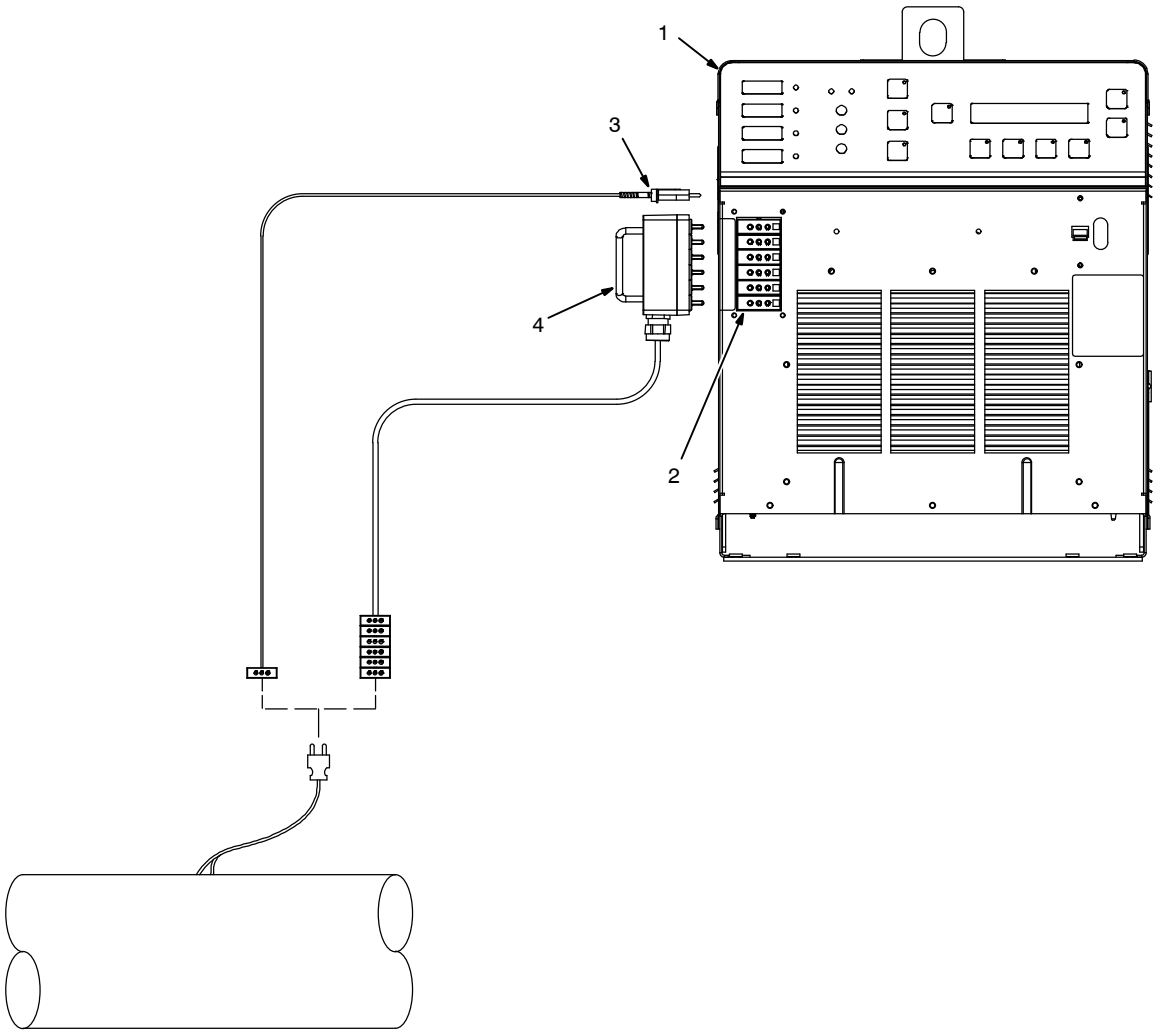
Thermocouple location is one of the most critical steps in the Heat Treatment Operation.

Thermocouples shall be located as follows to provide a survey of heating uniformly and enable time and temperature control:

1. Locate thermocouples to ensure that the full area of the heat band is monitored.
   - The code normally specifies the number of thermocouples to be used based on the pipe diameter.
   - The control thermocouple is placed in the plane of the weld (center of the heat zone).
   - The control thermocouple is placed at the top of the pipe in a standard pipe joint configuration. In other applications, the thermocouple should be located in the hottest portion of the weldment to be stress relieved.
2. Consider all nozzles and other welded attachments that cause potential heat sinks through metal mass or cold spots due to heat convection or conduction, and have additional thermocouples applied.
3. Attach a spare thermocouple beside control thermocouples.
4. Attach thermocouples to ensure uniformity of temperature in both thin and thick workpieces.
5. Physically inspect all thermocouples for continuity and mark them by an identification number corresponding to the recorder channel.
6. Match the drawings of the workpiece indicating the numerous thermocouple locations, controlling thermocouple locations, etc. to weld identification information.
7. The system is equipped with 3-pin thermocouple connections at the front of the unit. Six thermocouples can be attached to the power source.
   - The system is equipped with 3-pin connectors to accommodate shielded extension cables. The shielded cables protect from electrical interference.
8. Type K thermocouple wire has a positive and negative wire. The positive wire is marked as solid yellow or striped yellow. The connector screw terminals are marked positive and negative. Be sure to attach the wire to the connector with proper polarity.
9. Multiple type K thermocouple devices are supported, such as contact TC probes, welded on TC wire, and IR sensors with type K output. IR sensors with 4–20 mA outputs are also supported.

10. The following describes the thermocouple routing from work to power source.

- Type K thermocouple wire (two wire) is attached directly to the workpiece using a Thermocouple Attachment Unit (see next section for information on attaching thermocouples).
- The other end is fitted with a 2-pin type K connector.
- The 2-pin connector plugs into the 3-pin composite extension cable. The extension cable has a six-channel block of 3-pin female connectors. The pin size locates the position of the 2-pin connector on the extension.
- The extension cable contains six, 3-wire bundles of shielded cable.
- The 3-pin male extension cable plugs into the 3-pin female connector on the front of the power source.



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For temperature control mode, the power source must have (as a minimum) one thermocouple connected to receptacle TC1. If multiple thermocouples are desired, either use individual thermocouple plugs or the thermocouple extension cable.

To connect thermocouples to the power source, proceed as follows:

☞ *Do NOT weld thermocouples to workpiece while thermocouple cable is connected to the power source.*

Turn Off power source.

1 Power Source

2 Thermocouple Receptacles

3 Individual Thermocouple Extension Cable

4 Multiple Thermocouple Extension Cable

Align plug pin(s) with receptacle socket(s) and push plug into receptacle.

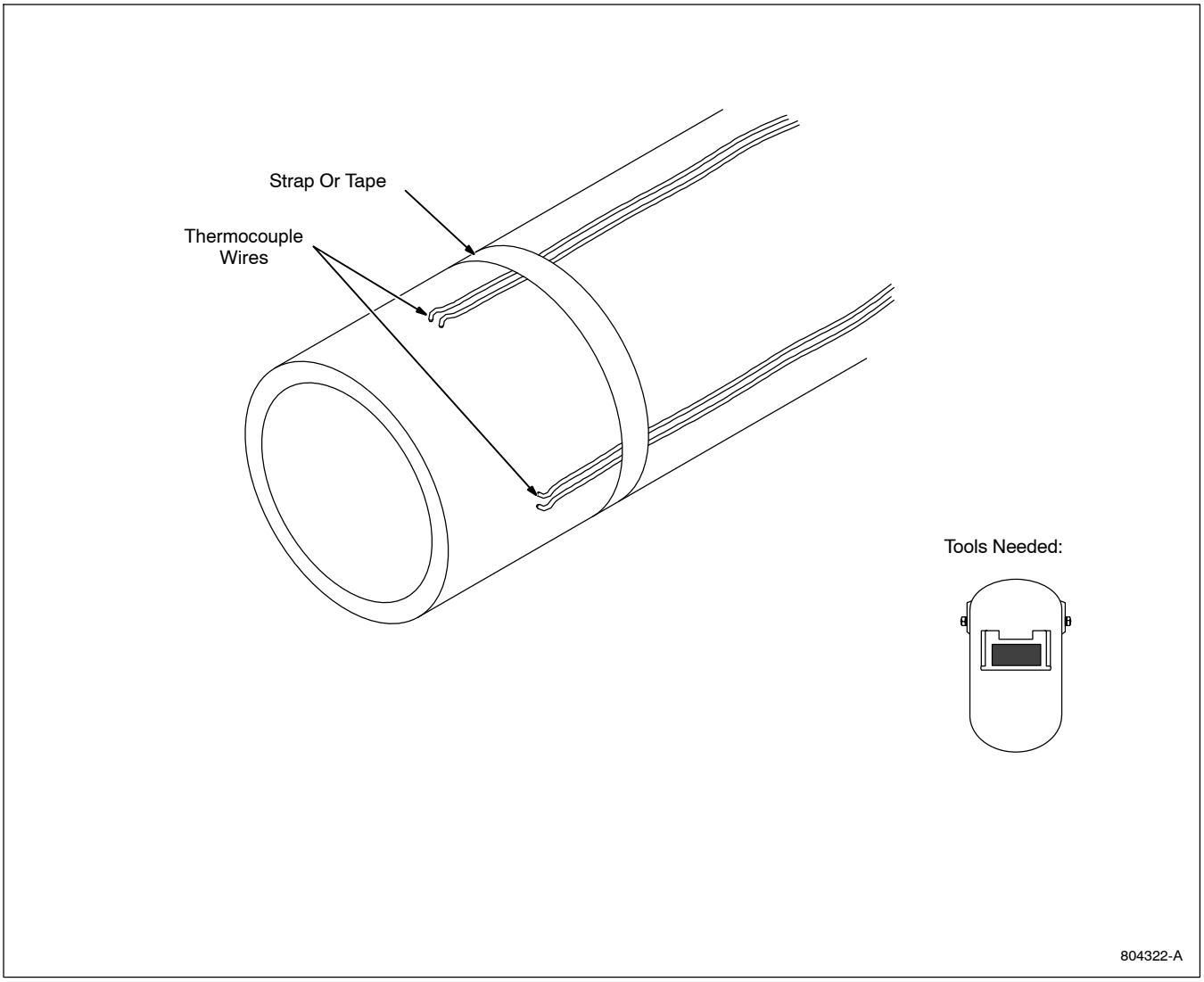
5-15. Attaching Welded Thermocouples

☞ *Do NOT weld thermocouples while connected to power source.*

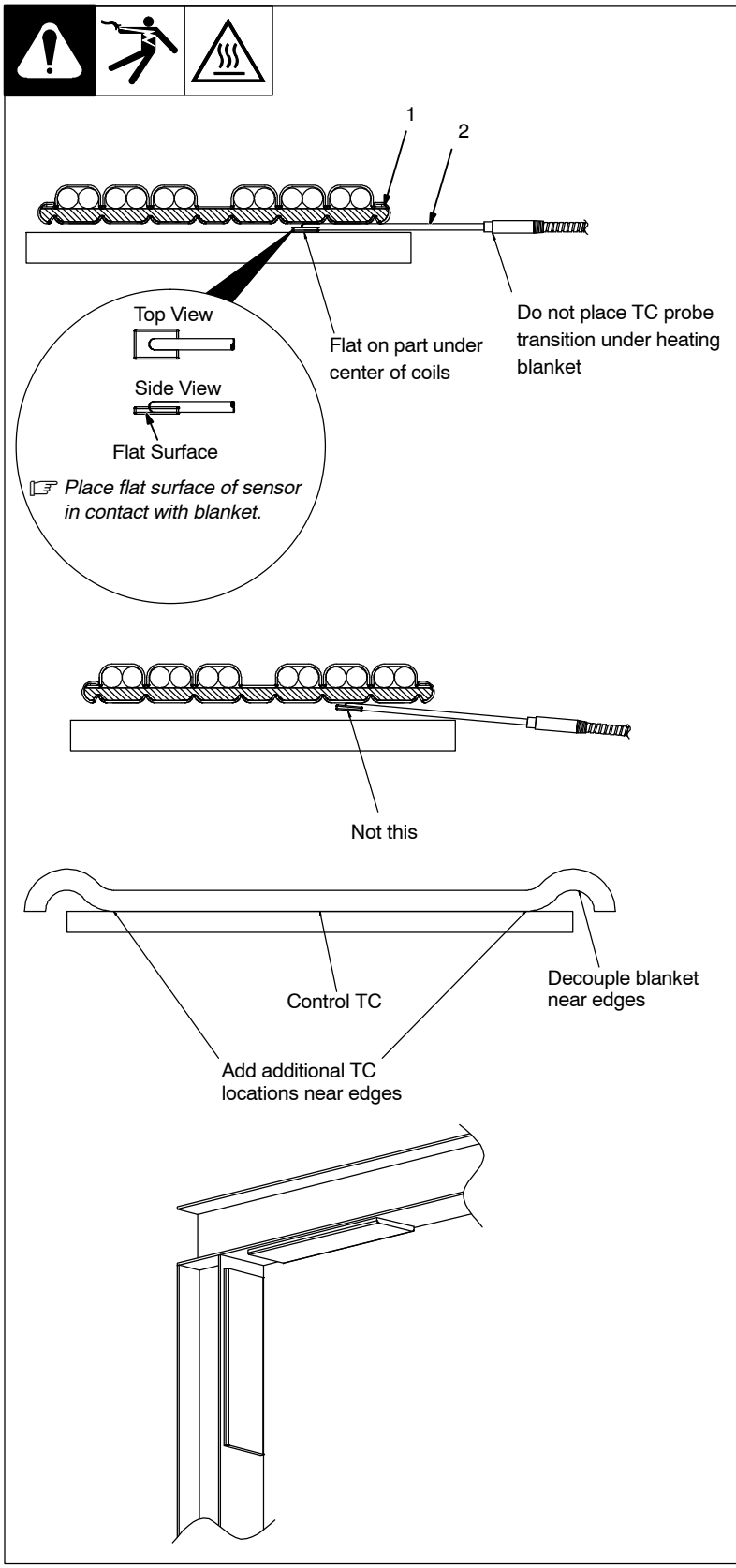
1. Attach thermocouples using a portable Thermocouple Attachment Unit (TAU). This unit spot welds thermocouple wire directly to the workpiece. This method of thermocouple attachment ensures accurate temperature measurement.
2. Clean (file or grind) any loose scale or rust from the workpiece at the places where the wires will be attached.
3. Clean the location for the lead magnet to minimize resistance. Place the magnet as near to the thermocouple positions as possible.
4. Strip 1/4 in. of insulation from the thermocouple wires.
5. Set the output variable control of the TAU to about eighty percent (80%).
6. Grasp one of the stripped wires with the tip of the jaws of the application pliers.

☞ *Do not touch both wires of the thermocouple to the pliers at the same time when energizing the Thermocouple Attachment Unit. This will cause the thermocouple wire to fuse to the pliers, rather than the workpiece.*

7. Press the end of the wire to the workpiece at ninety degrees to the surface, and maintain a firm pressure. Make sure the Thermocouple Attachment Unit is charged and wait for the ready light to glow.
8. Press discharge button, and the wire should weld to the workpiece. There will be a sharp crack and a slight arc flash.
9. Repeat the process with the other wire, placing it approximately 1/4 in. away from the first wire. Attach a spare thermocouple, and support both thermocouples approximately 18 in. back from the connection with a band or fiber tape.
10. Carefully bend the wire over at right angles. This brings the thermocouple wires out along or parallel to the workpiece. It also tests the strength of the weld. If the weld shows signs of breaking, remove the wire, restrip the end, and repeat the process.



5-16. Using Contact Thermocouple Sensors



1 Blanket

2 Contact Thermocouple Sensor (See Product Literature Sheet)

The welded thermocouples discussed previously can be used for preheating or stress relieving. Welded thermocouples are normally used in stress relieving applications because of their accuracy and ability to withstand high temperatures.

As an alternative, in preheating applications a contact thermocouple sensor can be used. This eliminates the need to weld thermocouples and the sensor can be moved during the preheat process to check temperatures at other locations on the joint. (Contact thermocouple sensors are limited to 500° F [260° C].)

☞ *If the contact thermocouple sensor is removed, the temperature recorder (if used) will display a short duration of heat drop.*

The contact thermocouple sensor can be plugged into the thermocouple extension cable or a Type K 25 ft. armored extension cable. One of these extensions is required for each sensor.

In preheating applications, the sensor must be placed under the induction coil. To be accurate, the sensor flat end must be held against the heated surface. If liquid-cooled or air-cooled coils overlap at any location in your installation, it is recommended that a second sensor be placed at that location.

NOTICE *– Failure to follow these recommendations could cause heat damage in the blanket or coil.*

Temperatures at the weld joint can be checked with temperature sensitive crayons to verify the preheat temperature.

Placing Contact Thermocouple Sensor

Place sensor between blanket and metal material. The sensor must be flat and in firm contact with the material being heated. The tip of the sensor should be positioned under the center of the wires of the blanket anywhere along the blanket length.

To prevent thermocouple sensor from pulling out of position, contact TC sensor securing band 301 073 is available.

NOTICE *– When using a contact thermocouple with air cooled blankets, position is critical. If any part of the blanket exceeds 400 ℉ (200 ℃) for extended periods of time, damage to the blanket will occur.*

Additional sensors may be placed at the ends of the part to protect from overheating. If a blanket is hanging off the end of the part or goes over a cutout, insulation may be added between the blanket and metal, slightly decoupling the coil, which causes the area to receive less eddy currents and generate less heat.

NOTICE *– When heating next to a joint, control sensor (TC#1) must be under the heating coil. A separate sensor may be placed at the joint to monitor joint temperature.*

When positioning blankets in vertical or overhead positions, ensure the non-insulated side of the blanket is able to radiate heat. Do not cover blanket with insulation, wood, etc. Trapping heat in the blanket may damage the blanket.

273097-A

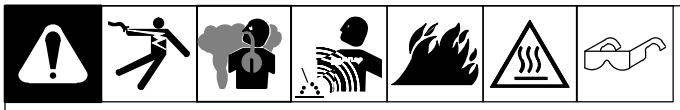
5-17. Using Non–contact Temperature Sensors

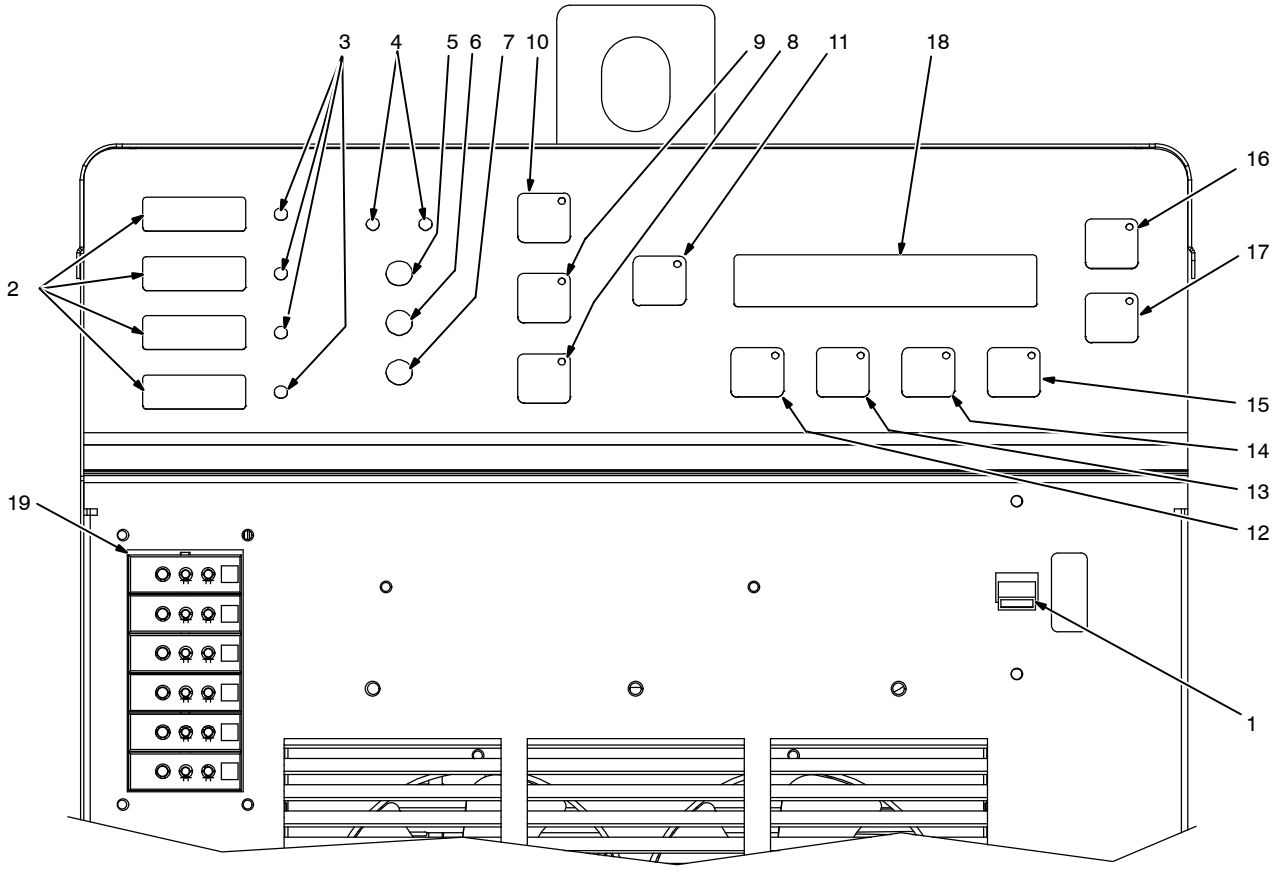
It is important to locate non-contact temperature sensors so that they are measuring as close to the heat zone as possible to achieve consistent temperature control of the system. The greater the distance between the heat zone and the area read by the sensor, the greater the temperature will fluctuate around the target temperature.

The spot measurement location should be within two inches (50 mm) of the heat zone.

SECTION 6 – COMPONENTS AND CONTROLS

6-1. Controls





803995-B

☞ *When a control panel button is pushed the yellow lamp lights to indicate activation.*

1 Power Switch

Use switch to turn power source On and Off.

2 TC1–4 Temperature Display

Provides temperature display of thermocouples 1 through 4.

3 Control Thermocouple LEDs

LEDs indicate which thermocouples (1–4) are used to control the heating process.

4 Temperature Units LEDs

LEDs indicate units for temperature measurements (°F or ° C).

5 Fault LED

LED lights to indicate a system fault condition.

6 Limit LED

LED lights to indicate a system limit condition.

7 Heat On LED

LED lights to indicate the power source output is energized.

8 Stop Button

Use button to stop a heating process.

9 Hold Button

Use button to hold a heating process.

10 Run Button

Use button to run a heating process.

11 Cursor Button

Use button to move selection cursor in the 4 x 40 LCD display (item 18).

12 Program Button

Use button to program the process control.

13 Run Status Button

Use button to display real time operating status.

14 Parameter Button

Use button to display real time power source operating parameters.

15 Cooler Button

Use button to turn cooler On and Off.

16 Increase Button

Use button to increase values in set-up screen.

17 Decrease Button

Use button to decrease value in program screen.

18 4 x 40 LCD Display

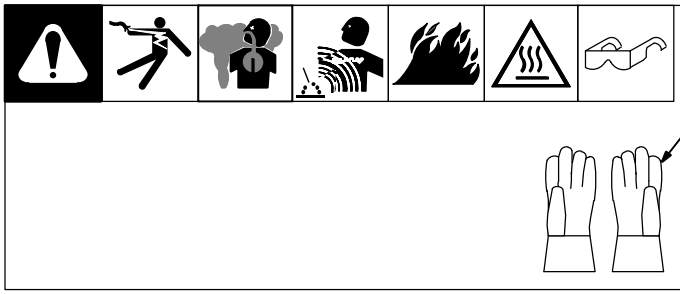
Displays programming, runs status, parameter, fault and limit conditions, and troubleshooting guide.

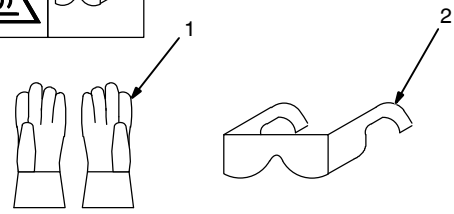
19 Thermocouple Input Receptacles

Use receptacles for type K thermocouple inputs.

SECTION 7 – SETUP AND OPERATION

7-1. Safety Equipment





Do not wear rings or watches during operation.

Wear the following during operation:

1 Dry, Insulating Gloves

2 Safety Glasses With Side Shields

sb3.1* 1/94

7-2. System Description

The ProHeat 35 Induction Heating Power Source is designed to function either as an air-cooled system or a liquid-cooled system. Depending on the system type (including Air-cooled, Liquid-cooled, and Rolling Inductor), the power source is automatically configured to operate and provide an output appropriate for the type of connected heating device.

A special identifier, embedded within the extension cable connector, provides the means for the power source to configure itself by recognizing the type of extension cable(s) attached to its output connectors.

Designed to provide a single level of output (up to 35 kW), the ProHeat 35 power source has two panel mounted connectors that are connected in parallel to the power source output. This design allows the system to operate with either a single output extension cable or two output extension cables.

If a single output extension cable is used, a protective plug (provided with the system) **MUST** be placed on the unused output connector or the system will not operate. If two output extension cables are used, they both **MUST** be of the same type (either both air-cooled or both liquid-cooled) or the system will not operate (in this case, the protective plug is not used). When two extension cables and heating devices are utilized on the system, the extension cable lengths and heating devices MUST be identical (see Section 5-7).

The ProHeat 35 is intelligent to the point that it will automatically adjust output power levels if internal system operating parameters or internal temperatures reach or exceed specific set limits (see Section 10).

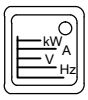
7-3. Important System Guidelines

NOTICE *– When using multiple ProHeat systems on the same workpiece, keep the the coil(s) from each system at least 1 ft (30 cm) apart. The ProHeat 35 may be damaged if coils are placed closer together.*

NOTICE *– Some residual heating can occur in ferrous materials placed near the output cables. Moving the output cables away from the ferrous materials could reduce inadvertent heating.*

Non–ferrous materials can be used for fixturing depending on part temperature. Examples include glastic, pegboard, wood, PVC, and fiberglass. If metallic materials need to be used, consider limited amounts of aluminum, brass, or copper.

7-4. Power Source/System Setup

To view the System Setup screen, simultaneously press the Parameters 

and Program  buttons and the following screen will appear on the display:

System Setup Screen 1

```
Deg Units...:>°F          SYSTEM SETUP1

Tolerance...: ±25

Max Output..: 35 KW    RI Clr Purge: 60s

Control Mode: Temp     RI Init KW: 0.0KW
```

To change a setting:

- Press the Cursor  button to move the cursor to the parameter to be changed.
- Press Increase  or Decrease  button to select desired set-up feature.

Possible selections:

Degree Units: °F / °C

Tolerance: ±5 to 99 in °F (±3 to 55 in °C)

Control Mode: Temp / Remote / Time / Manual

Temperature Mode

- Initial kW value used in Rolling Inductor mode only
- Uses IR to control power

Time Mode

- Does not use Initial kW setting
- IR sensors can monitor temperature but not control power

Remote Mode

- Functions same as Manual Mode but from a remote
- IR sensors can monitor temperature but not control power

Manual Mode

- Initial kW value not used
- IR sensors can monitor temperature but not control power

Rolling Inductor Initial kW: 0.0–35.0 kW

Power Output: 1 to 35 kW

Rolling Inductor Cooler Purge Time: 30–240 seconds

Degree Units – Selection will drive the °F / °C indicator LEDs.

- The factory default is °F.
- Changing from °F to °C will convert stored program values: ramp temperature, soak temperature, ramp rate, and temperature tolerance.

Tolerance – The factory default is ±25 °F.

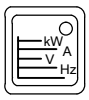
Control Mode – Either Temperature, Remote, or Power vs Time (Time), or Manual. For more details about methods of control, see Section 7-5.

- The factory default is temperature based control.

Rolling Inductor Initial kW – The factory default is 0.0. Max setting is dependant on Max Output setting.

Power Output – The factory default is 35 kW.

Rolling Inductor Cooler Purge Time – The factory default is 60 seconds.

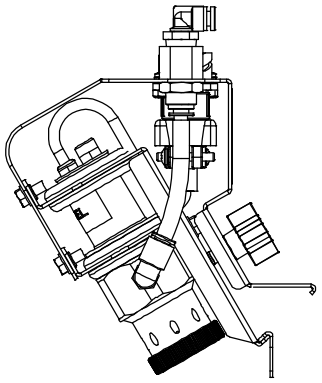
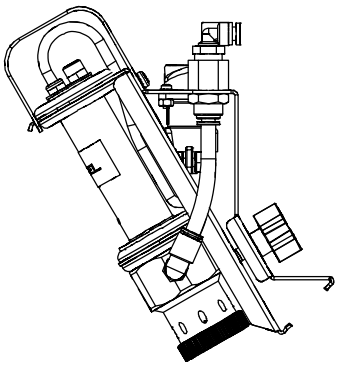
Simultaneously press the Parameters 

and Program  buttons a second time, and the following screen will appear on the display:

System Setup Screen 2

```
TC1,2 Type...:>IR4-20        SYSTEM SETUP2
IR Input Max.: 752      Trvl Detect..: On
IR Input Min.: 122      Trvl Speed...: IPM
Decouple Fault: On
```

Set proper scaling for IR Sensor. Miller has supplied two different sensors for the Rolling Inductor. The scaling must be set correctly to display the proper temperatures on the temperature display.

	Present Sensor	Original Sensor
		
Part Number	283080	265076
IR Input Max	752°F (400°C)	752°F (400°C)
IR Input Min	122°F (50°C)	212°F (100°C)
Dates Active	11-06-2018 to Present	07-21-2015 to 11-06-2018

Possible selections:

Input Type: K TC / IR 4–20 ma (TC 3–6 are fixed at K TC)

IR Input Max: Set the IR sensor's (20 mA) equivalent value

Travel Detect: On / Off – Functions as an On / Off switch with air and liquid-cooled cables. See Table 7-2 for information on functionality with Rolling Inductor.

IR Input Min: Set the IR sensor's (4 mA) equivalent value

Travel Speed IPM / CPM (inches per minute/centimeters per minute)

Decouple Fault: On / Off

Turning off the Decouple Fault allows the system to run with poorly coupled coils. This feature is only available when using liquid cooled cables.

A message will display each time the ProHeat is turned on to remind that the circuit is turned off.

```
F73: Decoupled/Open Coil
     Fault Disabled for
  Liquid Cooled Cables Only
  Press (-) to Acknowledge
```

Press the Decrease  button on the front panel to acknowledge the message.

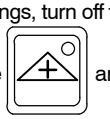
If using a remote On/Off switch, cycling from Off to On 2 times within 3 seconds will also acknowledge the message.

Display Contrast – press and hold the cursor and press the Increase  button to darken, or press the Decrease  button to lighten the contrast.

☞ *All parameters in System Setup are considered global, and any changes to the system set-up parameters will apply to all programs.*

☞ *The option to turn backlight on/off was removed at software revision 1.26. Backlight is now always on.*

7-4-1. Factory Defaults

To reset the system back to factory default settings, turn off the power source, and wait until the display goes blank. Turn on the power source. When the display lights, press and hold the Increase  and Decrease  buttons. A message will display Press Program to reset factory defaults. Release the Increase  and Decrease  buttons, and press the Program  button.

7-5. Programming

Programming allows the operator to setup a program for a particular heating process. The selections available are Temperature, Remote, Manual, or Power vs Time (Time).

7-5-1. Temperature-Based Control

Temperature-based control operates the system and controls the heating process based on temperature feedback from thermocouple inputs. Thermocouples must be used for this mode of operation or the system will not operate. Within the temperature-based mode there are four different processes available as follows: Preheat, Bakeout, PWHT (Post-Weld Heat Treat), and Custom Program.

Press the Program button to access the programming mode. Use the cursor button to move the cursor to the desired temperature-based process, then press the Program button again to select the process.

7-5-1-1. Preheat

The preheat process is a simple method of heating material to a desired temperature and holding that temperature for a specific period of time. When this process is selected, the following screen will appear on the LCD display:

Preheat Screen

```
Mode.......: Preheat
Control TC.: 1
Temperature: 400
Soak Time..: 01:00:00
```

The default position of the cursor is next to Control TC. Press the Increase  or Decrease  button to select the number of control thermocouples to be used for the program. Selections are as follows: 1, 1,2, 1,2,3, or 1,2,3,4. TC1 **MUST** always be a control thermocouple. TC2 thru TC4 can be used for controlling or monitoring. When a thermocouple is selected as control, the LED adjacent to the seven-segment display illuminates.

Use the Cursor  button to move the cursor to the desired selection (Temperature or Soak Time), and press the Increase  or Decrease  button to change the value to the desired setting.

☞ *The minimum and maximum temperature settings for preheat are 0 and 1450 ° F (–18 and 788 °C). The minimum and maximum soak times are 0 and 100 hours or extended. When the system is utilizing air-cooled blankets, the maximum temperature setting is 400 °F (204 °C). If the program setting is above 400 °F (204 °C), the following screen will appear on the LCD display when the Run button is pressed:*

Maximum Temperature Message Screen

```
Cannot enter Run mode
Programmed temperature settings
exceed air cooled limits
(400 °F, 204 °C)
```

7-5-1-2. Bake-Out

The bake-out process allows the operator to program a temperature and soak time as well as a cooling rate from bake-out if desired. When this process is selected, the following screen appears on the display:

Bake-Out Screen

```
Mode......: Bake-Out
Control TC:>1
Soak Temp.:  600  Soak Time: 01:00:00
Cool Temp.:  200  Cool Rate:  600 °/Hr
```

The default position of the cursor is next to Control TC. Press the Increase  or Decrease  button to select the number of control thermocouples to be used for the program. Selections are as follows: 1, 1,2, 1,2,3, or 1,2,3,4. TC1 **MUST** always be a control thermocouple. TC2 thru TC4 can be used for controlling or monitoring. When a thermocouple is selected as control, the LED adjacent to the seven-segment display illuminates.

Use the Cursor  button to move the cursor to the desired selection (Soak Temperature, Soak Time, Cool Temperature, or Cool Rate), and press the Increase  or Decrease  button to change the value to the desired setting.

☞ *The minimum and maximum soak and cool temperature settings for bake-out are 0 and 1450 °F(–18 and 788 ° C). The minimum and maximum soak times are 0 and 100 hours or extended. The minimum and maximum cool rates are 10 and 9999 °/hr. When the system is utilizing air-cooled blankets, the maximum temperature setting is 400 °F(204 °C). If the program setting is above 400 °F (204 °C), the following screen will appear on the LCD display when the Run button is pressed:*

Maximum Temperature Message Screen

```
Cannot enter Run mode
Programmed temperature settings
exceed air cooled limits
(400 °F, 204 °C)
```

7-5-1-3. PWHT (Post-Weld Heat Treat)

The post-weld heat treat process allows the operator to program a post-weld heat treat where ramp temperature (on increase and decrease) and ramp rates are the same. When this process is selected, the following screen appears on the display:

PWHT Screen

```
Mode......: PWHT
Control TC:>1,2
Ramp Temp.:  200  Ramp Rate:  600 °/Hr
Soak Temp.:  400  Soak Time: 01:00:00
```

The default position of the cursor is next to Control TC. Press the Increase  or Decrease  button to select the number of control thermocouples to be used for the program. Selections are as follows: 1, 1,2, 1,2,3, or 1,2,3,4. TC1 **MUST** always be a control thermocouple. TC2 thru TC4 can be used for controlling or monitoring. When a thermocouple is selected as control, the LED adjacent to the seven-segment display illuminates.

Use the Cursor  button to move the cursor to the desired selection (Ramp Temperature, Ramp Rate, Soak Temperature, or Soak Time), and press the Increase  or Decrease  button to change the value to the desired setting.

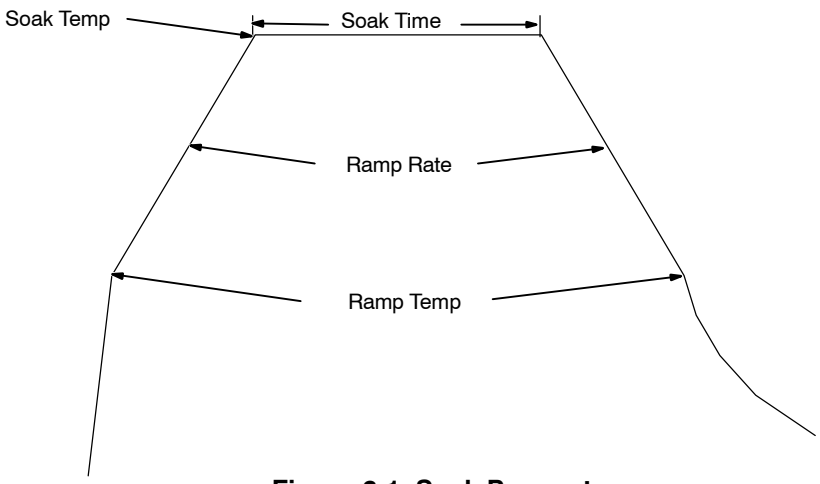


Figure 6-1. Soak Parameters

☞ *The minimum and maximum ramp temperature settings for PWHT are 0 and 1450 °F (–18 and 788 °C). The minimum and maximum ramp rates are 10 and 9999 °F/hr (6 and 5555 °C/hr). The minimum and maximum soak temperatures are 0 and 1450 °F (–18 and 788 °C). The minimum and maximum soak times are 0 and 100 hours or extended. When the system is utilizing air-cooled blankets, the maximum temperature setting is 400 °F (204 °C). If the program setting is above 400 °F (204 °C), the following screen will appear on the LCD display when the Run button is pressed.*

Maximum Temperature Message Screen

Cannot enter Run mode

Programmed temperature settings

exceed air cooled limits

(400 °F, 204 °C)

Maximum Temperature Message Screen

Cannot enter Run mode

Programmed temperature settings

exceed air cooled limits

(400 °F, 204 °C)

7-5-1-4. PWHT Operation

When a PWHT cycle is started, you may monitor where you are at in the cycle by selecting the Status Screen. From there you can determine what mode you are in, what the heat controller's current calculated target temperature is, and see the Soak Timer Countdown.

When using a single TC in the control loop, it is in control of the entire cycle. When using 2 - 4 control TCs, the ProHeat 35's heat control has the following characteristics:

- When ramping up from the Ramp temperature to the Soak temperature, the TC with the highest temperature is the TC in control.
- In many applications, the temperature of all the control TCs stay close together throughout the entire cycle, within the the programmed tolerance band (default is +/- 25°F) of the set point. In these typical cases, the unit continues from the Ramp cycle into the Soak cycle, and the Soak countdown timer starts.

  When at the Soak temperature set point, all control TC temperatures must be within the tolerance band before the Soak countdown timer will start. If all TCs are not within tolerance, heating continues until the hottest TC reaches the set point plus the tolerance band. The unit does not allow output above the set point plus the tolerance band. If all temperatures are not within the tolerance band, you have three options :

  1. Allow time for the heat to conduct around and through the material. This may allow the area with the coolest TC to heat up above the minimum (set point – tolerance) allowing the Soak cycle to continue.

  2. Manipulate the coil over the hot area, allowing that area to cool down. To accomplish this, you must stop the cycle, spread coil turns apart, remove coil turns, or pull the coil away (decoupling the coil) only over the area where the hot control TC is located. As a result, the output power will increase slightly allowing the cooler areas to heat up.

  3. Change the tolerance band. To accomplish this, stop the cycle, enter the Setup screen and increase the tolerance setting. Resume the cycle. Certain codes such as ASME B31.1 and B31.3, do not allow tolerance settings over +/- 25°F, so be sure to check the code, or check with your engineers to see if this is allowed.
- When ramping down from the Soak temperature to the Ramp temperature, the TC with lowest temperature is the TC in control.
- If the part cannot be heated at the requested rate (i.e. because of part mass, coil setup, etc.) the target temp displayed by the heat control will never exceed a 10°F difference from the control TC.

7-5-1-5. Custom Program

In Custom Program, the operator can create a custom program with multiple steps or nonsymmetrical heat treat programs where the heating and cooling rates and temperatures are different. When this process is selected, the following screen appears on the display:

☞ *This is the screen for initial use of the system. Subsequent use of custom program will revert to the last program used.*

Custom Program Screen

```
Mode.......: Custom Program
Segment....: >1
Type.......: End
Control TC.: 1
```

The default position of the cursor is next to Segment. Press the Increase  or Decrease  button to increase or decrease the segment number, unless the segment type is End. In this case, the segment number will advance to segment 1.

Use the Cursor  button to move the cursor to the desired selection (Type or Control TC), and press the Increase  or Decrease  button to change the value to the desired setting. When the cursor is moved to the Type selection, pressing the Increase  or Decrease  button changes the segment type to Step, Ramp, Soak, or End. The functions of each segment type are as follows:

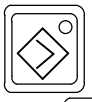
- Step increases the temperature in the part at full-programmed power. A maximum temperature of 1450° F (788° C) can be programmed.
- Ramp increases or decreases the temperature in the part at a controlled rate in degrees per hour. A maximum temperature of 1450° F (788° C) and a maximum rate of 9999° F/hr (5555° C/hr) can be programmed.
- Soak will hold the temperature for a programmed time. The minimum and maximum soak times are 0 and 100 hours or extended.
- End is programmed to indicate the completion of the cycle and termination of output power.

Step Function

When type is set to Step, the following screen appears on the display:

Custom Program Screen

```
Mode.......: Custom Program
Segment....:  1
Type.......:>Step
Temperature:  600
```

Use the Cursor  button to move the cursor to the Temperature position and the initial temperature can be adjusted using the Increase  or Decrease  button.

Pressing the Cursor  button again automatically advances the program to the next segment number.

Ramp Function

When type is set to Ramp, the following screen appears on the display:

Custom Program Screen

```
Mode.......: Custom Program
Segment....:  1
Type.......: Ramp
Temperature:  600  Ramp Rate:  600 °/Hr
```

Use the Cursor  button to move the cursor to the Temperature or Ramp Rate position and use the Increase  or Decrease  button to set the desired value.

When the cursor is in the Ramp Rate position, pressing the Cursor  button again automatically advances the program to the next segment number.

Soak Function

When type is set to Soak, the following screen appears on the display:

Custom Program Screen

```
Mode.......: Custom Program
Segment....:  1
Type.......:>Soak
Soak Time..: 00:01:00
```

Use the Cursor  button to move the cursor to the Soak Time position and use the Increase  or Decrease  button to set the desired value.

When the cursor is in the Soak Time position, pressing the Cursor  button again automatically advances the program to the next segment number.

End Function

When type is set to End, the following screen appears on the display:

Custom Program Screen

```
Mode.......: Custom Program
Segment....:> 2
Type.......: End
Control TC.: 1
```

The only changeable parameter in the End segment is selecting the number of thermocouples. Use the Cursor  button to move the cursor to the Control TC position. Press the Increase  or Decrease  button to select the number of control thermocouples to be used for the program. Selections are as follows: 1, 1,2, 1,2,3, or 1,2,3,4. TC1 **MUST** always be a control thermocouple. TC2 thru TC4 can be used for controlling or monitoring. When a thermocouple is selected as control, the LED adjacent to the seven-segment display illuminates.

A custom program can contain up to 10 segments. To view Program parameters, position the cursor at segment and use the Increase  or Decrease  button to advance through the segment numbers until the End segment. When a segment number is changed, appropriate segment parameter information appears on the display.

Typical 5-Segment Custom Program

Custom Program Screen

```
Mode.......: Custom Program
Segment....:  1
Type.......:>Step
Temperature:  600
```

Temperature increases to 600 degrees at full-programmed power.

Custom Program Screen

```
Mode.......: Custom Program
Segment....:  2
Type.......: Ramp
Temperature:>1250  Ramp Rate:  600 °/Hr
```

Controlled heating to 1250 degrees F at a ramp of 600 degrees per hour.

Custom Program Screen

```
Mode.......: Custom Program
Segment....:  3
Type.......: Soak
Soak Time..:>01:00:00
```

Soak at 1250 degrees F for a period of 1 hour.

Custom Program Screen

```
Mode.......: Custom Program
Segment....:  4
Type.......:>Ramp
Temperature:  600  Ramp Rate:  600 °/Hr
```

Controlled cooling to 600 degrees F at a rate of 600 degrees per hour.

Custom Program Screen

```
Mode.......: Custom Program
Segment....:  5
Type.......: End
Control TC.: 1
```

End segment ends the heat treat cycle. Controller is programmed to control the process using four thermocouples.

7-5-2. Remote Control

Remote Control operates the system from a remote device which energizes or de–energizes output as well as setting the desired output power level as a function of the maximum output power setting in the system setup screen. The run button on the front of the ProHeat 35 is disabled in remote mode.

If Remote was selected as the control mode in the system setup screen, the following screen appears for programming:

```
Mode....: Remote        Power..:  0.0 KW
Run Time:>00:03:00      Current:    0 A
                        Voltage:    0 V
                      Frequency:  4.5 KHz
```

Time is the only parameter that can be set. The values are 0 – 99:59:59 or extended.

☞ *The Run button on the front of the power source is disabled in this mode. Use remote device to toggle output On or off.*

7-5-3. Power vs Time Control

Power vs Time control operates the system and controls the heating process based on programmed time and power. Power increases over a programmed amount of time.

Press the Program button to access the programming mode. Use the cursor button to move the cursor between Mode, Segment, Type, Power, and Time.

```
Mode...: Timed
Segment:  1
Type...:>Power Level
Power..:  0.0 KW        Time: 00:00:00
```

The default position of the cursor is next to Program. Press the Increase  or Decrease  button.

Use the Cursor  button to move the cursor to the desired selection, and press the Increase  or Decrease  button to change the value to the desired setting.

<u>Possible selections Timed:</u>

Segment: 1 – 10

Type: Power Level, Slope, End

Power: 0.0 – 35 Time: 00:00:00 – 99:59:59 or extended

7-5-4. Manual Control

Manual control allows programming of a specific power level for a specific period of time. When this process is selected, the following screen appears on the display:

Manual Program Screen

```
Mode....: Manual        Power..:  0.0 KW
Command.:  0.0 KW       Current:    0 A
Run Time: 00:03:00      Voltage:    0 V
                      Frequency:  4.5 KHz
```

The only programmable selections are Command power and Run Time. Command can be adjusted to deliver up to 35 KW (based on maximum power selected in the set-up screen) for a period of up to 99 hours, 59 minutes, 59 seconds.

Power source operating power, current, voltage, and frequency are shown on the right-hand side of the display.

To reset the system back to factory default settings, turn off the power source, and wait until the display goes blank. Turn on the power source. When the display lights, press and hold the Increase  and Decrease  buttons. A message will display Press Program to reset factory defaults. Release the Increase  and Decrease  buttons, and press the Program  button.

7-5-5. Rolling Inductor—Manual Or Temperature Control Mode

NOTICE *– When using a Rolling Inductor, infrared temperature measurement and travel detection are highly recommended. The Rolling Inductor induces up to 20 kW into a small area, which can quickly heat a part to over 600 °F (315 °C) if it is not moving fast enough. This can damage the inductor or part. Using the travel detector, the system reduces output as travel speed decreases and disables output when travel stops.*

☞ *The travel detector is a sensitive instrument that can measure travel speeds down to one IPM. Once the part travel is stopped, there is a three second delay before output can be re-energized.*
Vibrations that are present for more than three seconds from sources such as fork lift traffic, trains, grinding, and handling the part, can trigger the sensor, and energize the output.
Always press Stop on the ProHeat front panel when part travel is stopped, to prevent inadvertent heating of the part.

Travel Detection

The Travel Detector can be mounted on the left or right side of the Rolling Inductor. It can also be mounted off of the inductor in a location that provides a similar travel speed as that of the inductor. A bracket of 3.75 inches long by 2.5 inches wide (96 by 64 mm) will allow for mounting of the Travel Detector.

☞ *Connect Rolling Inductor(s) to power source before turning power on.*

To view the System Setup screen, simultaneously press the Parameters  and Program  buttons and the following screen will appear on the display:

- Press Cursor  button to move cursor to the parameter to change. Press Increase  or Decrease  button to set parameters.

SYSTEM SETUP SCREEN 1

```
Deg Units...:>°F              SYSTEM SETUP1
Tolerance...: ±25
Max Output..: 35 KW      RI Clr Purge: 60S
Control Mode: Temp       RI Init KW: 0.0KW
```

Set Deg Units to F or C as required.

Set Tolerance value if required.

Set Control Mode to Manual or Temp as required.

Set Rolling Inductor Initial kW to a value between 0.0 and 35.0 kW

- The Rolling Inductor Initial kW can be increased when working on larger mass parts. It is recommended that the first part is heated with the kW set to a low value. Observe the maximum kW level that the heat cycle achieves and then set the starting kW to that value or less.
- Max Output kW can be reduced on smaller mass parts to minimize heat input.

Rolling Inductor Cooler Purge Time: 30–240 seconds

- The default Rolling Inductor Cooler Purge Time is set to 60 seconds for applications using the 60-foot inductor cables. This can be set down to 30 seconds for the standard Rolling Inductor with 30-foot cables. The ProHeat automatically doubles the time when two Rolling Inductors are connected.

Simultaneously press the Parameters  and Program  buttons a second time, and the following screen will appear on the display:

SYSTEM SETUP SCREEN 2

```
TC1,2 Type...:>IR4-20          SYSTEM SETUP2
IR Input Max.: 750        Trvl Detect..: On
IR Input Min.: 212        Trvl Speed...: IPM
Decouple Fault: On
```

Set Trvl Detect to On if using travel detection.

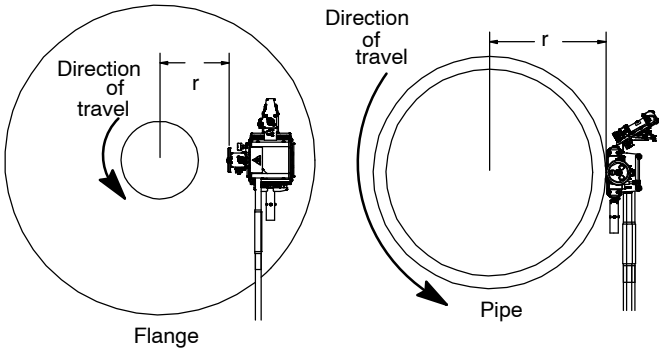
Travel detection is recommended for all Rolling Inductor applications. It assists in maintaining an even heat input to the part and regulates output power based on travel speed in Temp mode.

Set Trvl Speed units as needed.

☞ *IPM = Inches Per Minute:*
PI = 3.14159
r = Radius (distance from center of rotating part to travel detect wheel)
s = Seconds per rotation.
*IPM = (2 * PI * r * 60) / s*

Example: For a 24 in. diameter pipe, the radius = 12 in. If it takes 45 seconds to make one complete rotation, the formula would be:
*IPM = (2 * 3.14159 * 12 * 60) / 45*
IPM = (4523.9) / 45
IPM = 100.5

☞ *IPM information can be seen on the Run Status menu while heating.*



Press Program  button once to enter the Rolling Inductor Program screen.

The screen should look as shown below.

Rolling Inductor Program Screen

```
Mode....: Manual                Power...: 0.0 KW
Command.: >0.0 KW               Current: 0 A
Run Time: 00:03:00              Voltage: 0 V
                               Frequency: 4.5 kHz
```

Plug one end of the thermocouple extension cable into TC5 on the power source and the other end into the back of the Rolling Inductor.

If running two Rolling Inductors on the same power source, connect a second thermocouple extension cable from the second Rolling Inductor to TC6 on the power source.

☞ *Workpieces should be the same size and material when using two Rolling Inductors on one power source.*

NOTICE *– TC5 and TC6 connect to the Rolling Inductor internal thermocouple which monitors internal Rolling Inductor core temperatures. Measure workpiece temperature with temperature crayons, infrared sensor, or contact thermocouples within two inches of the Rolling Inductor.*

7-6. Run Status

Run status allows the operator to check status of a program during in-process heating. Depending on the control mode (Temperature or Manual) and the temperature based mode (Preheat, Bake-Out, PWHT, or Custom), different style screens appear on the display. Run status is for monitoring purposes only and has no selectable or changeable parameters.

7-6-1. Temperature Based Control

7-6-1-1. Preheat, Bake-Out And PWHT Run Status Screen

Run Status Screen

```
Mode.......: Preheat            TC5:   77
Target Temp: ----               TC6:   77
Countdown..: --:--:--  TvlIPM(Off):    0
Status.....: Stopped
```

Mode displays the programming mode (Preheat, Bake-Out, PWHT, or Custom Program). During active operation, Target Temp shows the target temperature based on the specific program, Countdown shows the time remaining in a soak segment, and Status shows the program segment type (step, soak, ramp, hold, or stopped). TC5 and TC6 display the temperature of thermocouples 5 and 6. This screen is for monitoring purposes only.

7-6-1-2. Custom Program (Not Applicable With Rolling Inductor)

Run Status Screen

```
Mode.......: Custom Program     TC5:   77
Target Temp: ----               TC6:   77
Countdown..: --:--:--       Segment:  1
Status.....: Stopped
```

During active operation, Target Temp shows the target temperature based on the active segment, Countdown shows the time remaining in a soak segment, and Status shows the program segment type (step, soak, ramp, hold, or stopped) of the active segment and the active segment number. TC5 and TC6 display the temperature of thermocouples 5 and 6. This screen is for monitoring purposes only.

7-6-2. Manual Control

Run Status Screen

```
Mode.....: Manual              TC5:   77
Power....:  0.0 KW             TC6:   77
Countdown: --:--:--    TvlIPM(Off):    0
Status...: Stopped
```

During active operation, Power shows the actual power delivered from the power source, Countdown shows the time remaining in the heating cycle, and Status indicates if the system is running or stopped. TC5 and TC6 display the temperature of thermocouples 5 and 6. This screen is for monitoring purposes only.

☞ *No changes can be made to the run status screen, and the Cursor, Increase and Decrease buttons are not functional.*

7-6-3. Remote Control

Run Status Screen

```
Mode.....: Remote              TC5: 77
Power....:  0.0 KW             TC6: 77
Countdown: 00:00:00   TvlIPM (Off): 0
Status...: Stopped
```

During active operation, Power shows the actual power delivered from the power source, Countdown shows the time remaining of the heating cycle, and Status indicates if the system is running or stopped. This screen is for monitoring purposes only.

☞ *No changes can be made to the run status screen, and the Cursor, Increase and Decrease buttons are not functional.*

7-6-4. Power vs Time Control

Run Status Screen

```
Mode...: Power vs Time       TC5: OPEN
Segment:  1                  TC6: OPEN
Type...: --:--:--    TvlIPM(Off):    0
Power..:  0.0 KW   Type: End
```

Mode displays the control mode. Also displayed are the present program segment, Segment type, current power level and remaining time of the current segment.

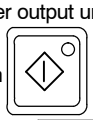
7-7. Parameters

During active operation, the Parameters screen allows the operator to monitor the power source output operating parameters. These parameters include output power, output amperage, output voltage, and output frequency. In addition, temperatures of thermocouples TC5 and TC6 are also displayed. The Parameters screen is for monitoring purposes only and has no selectable or changeable parameters.

Parameters Screen

```
Power....:  0.2 KW              TC5: OPEN
Current..:   20 A               TC6: OPEN
Voltage..:   52 V    Power Level
Frequency: 11.7 KHz  Countdown: 00:14:36
```

7-8. Cooler

The Cooler  button is used to turn the cooler On or Off on systems using liquid-cooled output cables. Systems using liquid-cooled output cables will not deliver output unless the cooler is On. If the cooler is not started prior to initiating a heating cycle, the system will automatically start the cooler when the Run  button is pressed. Pressing the Stop  button does not shut off the cooler. The cooler must be shut off separately by pressing the Cooler  button.

When power source output is energized, the cooler cannot be turned off. If the Cooler  button is pressed while output is energized, the following screen will appear on the display:

Cooler Message Screen

```
Cooler cannot be turned off
while output is on
```

☞ *The Cooler button is inactive when no cooler is detected and no liquid-cooled output cable is attached.*

☞ *When a Rolling Inductor is connected to the power source, the cooler will purge for time set in SYSTEM SETUP1 RI Clr Purge, which is typically 30–60 seconds per rolling inductor before allowing output to be enabled.*

7-9. Real-Time Operation

Each time the unit is first turned On it initiates a system check routine that includes verification of communication between circuit boards and checking for output isolation faults. During this check routine, all displays and LEDs illuminate and the following screen appears on the display:

Power Up Message Screen

```
ProHeat
Firmware Revision X.XX
Copyright (c) 2005 - 2015
Miller Electric Mfg. Co.
```

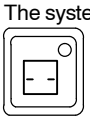
X.XX indicates the firmware revision number installed in the unit.

If an error is detected during the check routine, the system fault LED illuminates and an error message screen appears on the display (see Section 10-5).

When the check routine is completed successfully, the operator interface defaults to the following:

- The Stop  button indicator LED illuminates to indicate no heating cycle is in process.
- The temperature displays indicate actual temperature from the TC's (thermocouples). If no thermocouples are connected, the displays indicate OPEN.
- Control LEDs illuminate to indicate the number of control TC's in the last program.
- The appropriate degree units (°F or °C) light illuminates.
- The display defaults to the Run Status screen from the last program used and the Run Status  button indicator LED illuminates.
- If no fault or limit conditions are present, system status lights are not illuminated.

Once set up is complete for the desired program procedure (see Section 7-4), pressing the Run  button will initiate a heating cycle. When a program run is initiated, the Run  button yellow indicator LED illuminates and the Heat On blue indicator LED illuminates to indicate output is present to the coil. The cycle will continue until the end of the program is reached or the Stop  button is pressed.

The system has a hold function that will maintain a temperature or hold the soak time of any active temperature controlled program. Pressing the Hold  button will only activate the hold function while in the run mode. If the system is not in the run mode, the following screen will appear on the display:

Hold Message Screen

Must be running to enter Hold mode

In addition, when running in Manual operating mode, the Hold  button is not functional. If the system is running in Manual operating mode, pressing the Hold  button will cause the following screen to appear on the display:

Hold Message Screen

Hold mode not available when
temperature control is not active

Pressing the Hold  button will activate the hold function while running a temperature controlled program. While in the hold mode, the parameters for the program in process can be modified. The cycle will continue after pressing the Run  button. A change of program parameters during the hold will not change the original program. The original program parameters are maintained for the next heating cycle.

To make changes to a program while in run mode, press the Hold  button and the yellow indicator LED will illuminate, and the Run  button yellow indicator LED will turn off. When in hold, the system will maintain the actual temperature of the hottest thermocouple while the program is being changed.

- Press the Program  button and the yellow indicator LED will illuminate. The display will change to show the current mode of operation or the current segment of a Custom Program.
- Use the Cursor  button to move the cursor to the parameter that will be changed.
- Press the Increase  or Decrease  button to make desired changes.
- Press the Run  button to resume program operation and the yellow indicator LED will illuminate, and the Hold  button yellow indicator LED will turn off.

Any program parameter (temperatures, rates, times, or number of TC's) can be changed while in hold. In a custom based program, any segment number can be changed; however, if the operation of a segment has already been completed in a program, the change to that segment will not affect the program function.

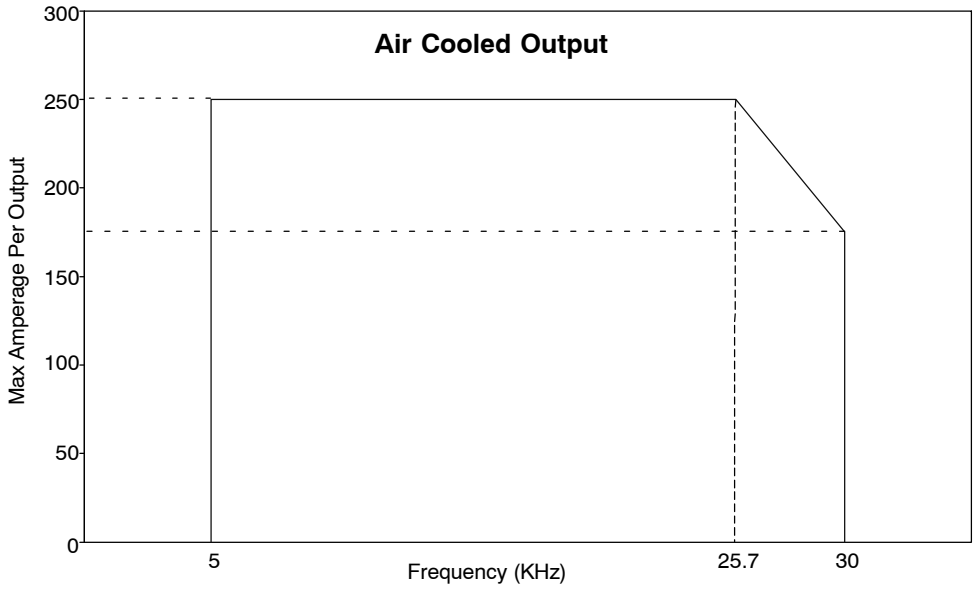
- Press the Stop  button to end the program.

7-10. System Operating Characteristics

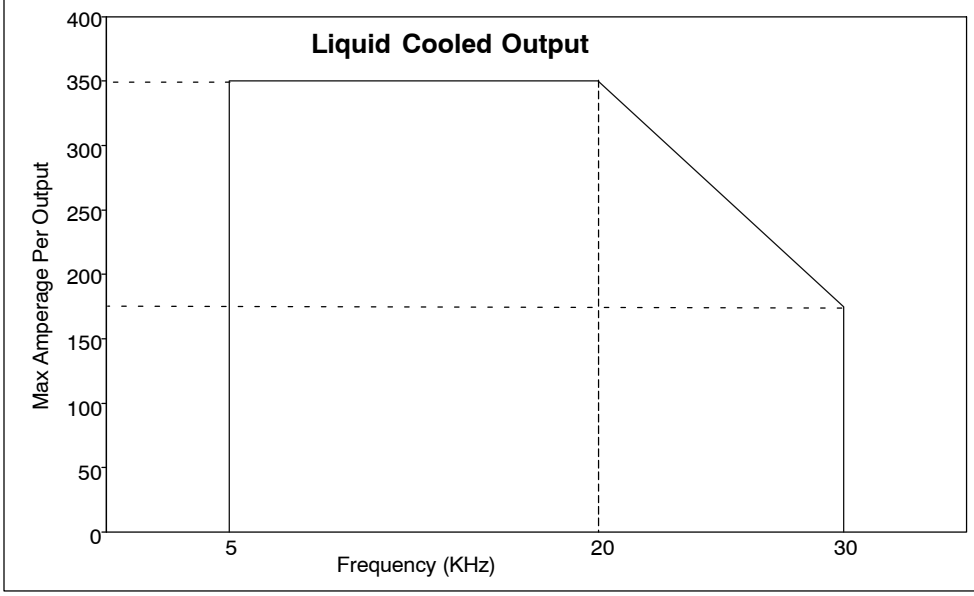
The power source delivers a high-frequency alternating current output that energizes the coil creating the magnetic field used to heat the workpiece. The power source output characteristics are a function of the configuration, type and number of coils used as shown in the following table:

Table 7-1. Power Source Output Characteristics

Output Type	Maximum Amperage	Maximum Voltage	Frequency Range
Air Cooled Single and Dual	250 A per output for 15 minutes. After 15 minutes, power steps down to limit current to 150 amperes per output for continuous operation.	700 V	5 – 25.7 kHz
	See Note 1	700 V	25.7 – 30 kHz
Single Liquid Cooled	350 A	700 V	5 – 20 kHz
	See Note 2	700 V	20 – 30 kHz
Dual Liquid Cooled	350 A per output/700 A total	700 V	5 – 20 kHz
	See Note 2	700 V	20 – 30 kHz



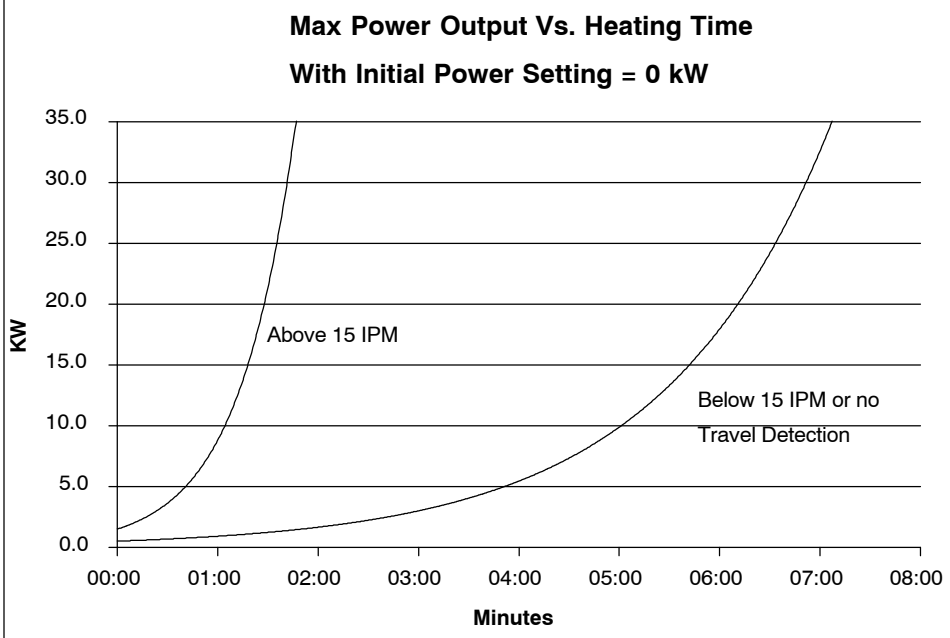
☞ *Note 1: In the frequency range of 25.7 to 30 KHz, the maximum output amperage decreases linearly from 250 down to 175 amperes per output. Regardless of frequency, after 15 minutes the maximum output is reduced to 150 amperes per output.*



☞ *Note 2: In the frequency range of 20 to 30 KHz, the maximum output decreases linearly from 350 down to 175 amperes per output.*

Table 7-2. Rolling Inductor Output Characteristics

Output Type	Maximum Amperage
Single Rolling Inductor	300 A
Dual Rolling Inductor	300 A Per Output The system maximum power is 35 kW, so each output will have approximately 17.5 kW, which uses less than 300 A



The Rolling Inductor can be operated with Manual Control, Temperature Control only, or Temperature Control with Travel Detection.

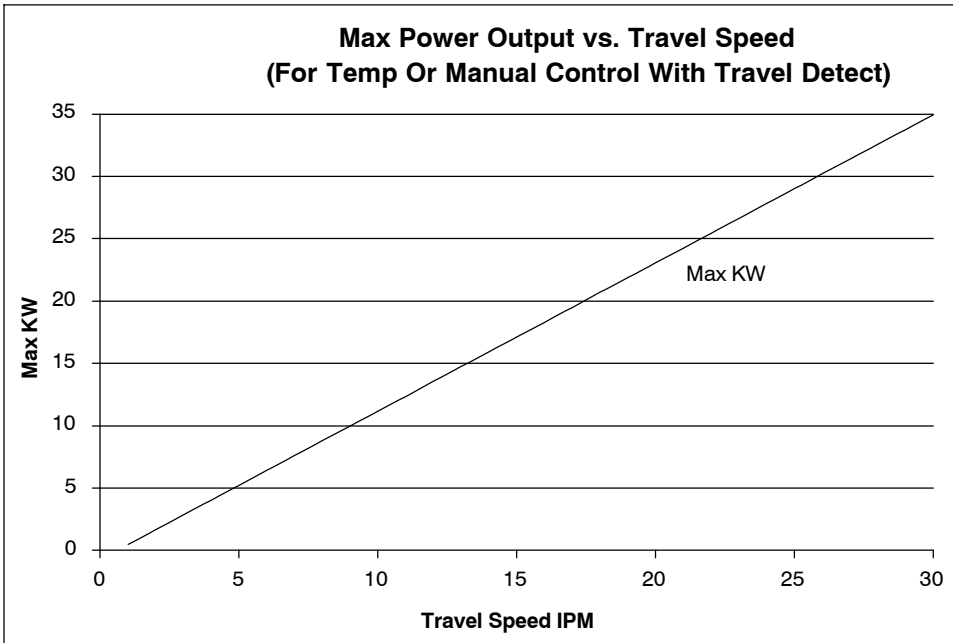
Manual Control provides Max Output power, as set in SYSTEM SETUP1 screen, at the start of the cycle.

Temperature Control provides output power starting at the RI Init KW value, as set in SYSTEM SETUP1 screen, at the start of the cycle. The curves illustrated increase as shown directly from the RI Init KW value.

The rate of power output is limited at travel speeds below 15 in./min (38cm/min) or when no travel detection is present to help prevent temperature overshoot in the part.

With travel detection and travel speeds above 15 in./min (38cm/min), the rate of power output is increased. In either case the maximum power output is limited to 300 amps per output, which is about 20 kW with one Rolling Inductor and 35 kW with two Rolling Inductors.

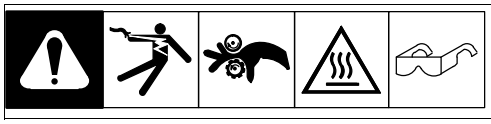
The graph illustrates the rate at which output power is increased with heating time.



With travel detection, the maximum power output is determined by the travel speed, as illustrated.

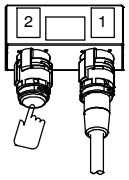
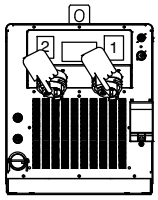
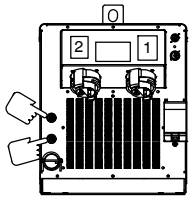
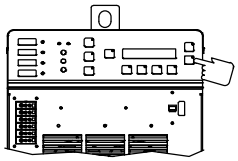
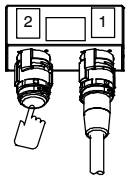
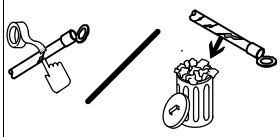
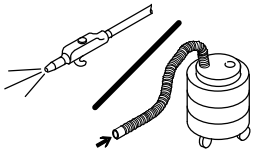
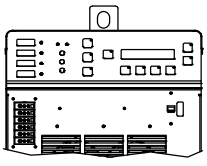
SECTION 8 – MAINTENANCE

8-1. Routine Maintenance

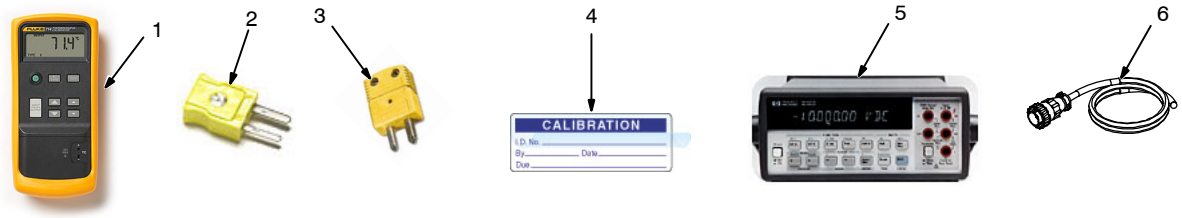


Disconnect power before maintaining.

☞ *Maintain more often during severe conditions.*

	✓ = Check ◇ = Change ● = Clean ☆ = Replace * To be done by Factory Authorized Service Agent				Reference
Daily	 ✓ Visually inspect condition of cords and cables. ☆ Damaged cords or cables.				
Every **3** Months	 ☆ Damaged or Unreadable Labels	 ● Output Connector Contacts	 ● Isolation Protection Lead Receptacle	 ● Operator Interface Overlay	Section 5-7, 5-12
	 ✓ Integrity Of Protective Plug, Replace If Necessary	 ✓☆Cracked Cables			
Every **6** Months	 ● Inside Unit				Section 10-10
Every **Year**	 ✓ Verify Unit Calibration				Sections 8-2, 8-3

8-2. Calibration Verification Equipment



1 Thermocoupler Calibrator

Suggested calibrator from Fluke item 714 or equivalent.

2 Type K Mini Connector

Suggested connector from Fluke item 80CK–M or equivalent.

A length of type K thermocouple wire is required. Connect red to negative and yellow to positive when wiring connectors.

3 Type K 2-Pin Male Connector

Suggested connector from Newport item OST–K–M or equivalent

4 Calibration Label

Suggested label from Q–CEES item QCC306BU or equivalent.

5 Precision Digital Voltmeter (DVM)

Suggested meters are Agilent Multimeter or Hewlett Packard Multimeter Model 34401A or equivalent. DVM must be able to read to three decimal places (0.000).

6 Interconnecting Cable

MILLER Part No. 300168 can be used to connect the Recorder to the DC power supply.

8-3. Calibration Verification Procedure

Calibration verification should be done every year. Use appropriate Certificate of Calibration to record calibration information. A spreadsheet could also be used to record the information.

8-3-1. Initial Set Up

1. Power switch off
2. Have qualified person connect primary power to ProHeat 35.
3. Turn ProHeat 35 power switch on.
4. Press and hold the Program button, then press Parameters to enter setup mode.
5. Press Cursor button 4 times to get to Control Mode line.
6. Press the Decrease button to change to Manual, if necessary.
7. Press the Run Status button. (TC5 and TC6 will show in upper right-hand corner of display)
8. Let unit idle for a minimum of 15 minutes before checking calibration.
9. Turn on Fluke 714 Thermocouple Calibrator and Precision DVM. Leave them on for a minimum of 15 minutes before checking calibration.
10. Verify TC1 and TC2 are set to K-Type. See Section 7-4 for detailed instructions.

8-3-2. TC Input/Output Check

1. Connect precision DVM (DC Volts set to display in thousandths) to RC9. This is the top connector located on the back of the ProHeat 35. Red lead to pin 1 and black to pin 5.
2. Set TC calibrator to 382.0 °F or 194.5 °C. Connect to TC1 input jack on front of ProHeat.
3. Verify TC display value of (±3°F) or (±2°C). RC9 output has a tolerance of (±6°F) or (±3.3°C). DVM reads 2.787 VDC (±0.038) (2.749 – 2.825).
4. Enter DVM values into calibration certificate If you are creating your own spreadsheet use the following calculation.

The voltage to temperature calculation is:
(DC Volts Out x 155) – 50 = °F
(DC Volts Out x 86.1) – 45.4 = °C

5. Repeat steps 1.–4. for TC2 – TC6 input jacks.

For TC2 move red precision DVM lead to RC9 pin 2.
For TC3 move red precision DVM lead to RC9 pin 3.
For TC4 move red precision DVM lead to RC9 pin 4.
For TC5 move red precision DVM lead to RC9 pin 6.
For TC6 move red precision DVM lead to RC9 pin 7.
Note: TC5 and TC6 will show in upper right-hand corner of display.

6. Repeat steps 1.–5. with TC calibrator set to 882.0 °F or 472.2 °C, verify TC display value (±3°F) or (±2°C). RC9 output has a tolerance of (±6°F) or (±3.3°C). DVM reads 6.013 VDC (±0.038) (5.975 – 6.041).
7. Repeat steps 1.–5. with TC calibrator set to 1382.0 °F or 750 °C, verify TC display value (±3°F) or (±2°C). RC9 output has a tolerance of (±6°F) or (±3.3°C). DVM reads 9.239 VDC (±0.038) (9.201 – 9.277).

8-3-3. Finishing Procedure

1. If ProHeat 35 was set for Temp in Control Mode follow steps 8-3-1, steps 4.–6. to change it back to Temp.
2. Turn ProHeat 35 power switch off.
3. Have qualified person disconnect primary power.
4. Remove precision DVM and TC calibrator.
5. Complete calibration label & place it on unit directly above TC1 display.
   I.D. No. (TC board serial number) Be sure the serial number matches the board in the machine.
   By (your initials) Date (today's date)
   Due (date 1 year from today)
6. Print a copy of the certificate to send with the ProHeat 35.
7. If entering data in a spreadsheet, save data.

Notes

Company Name
Street
PO Box
City, State, Zip Code

CERTIFICATE OF CALIBRATION VERIFICATION

TCI Serial Number: **Calibration Date:**
Certified by: **Re-Calibration Date:**

Company name does hereby certify the above instrument was calibrated against standards maintained by Company name and meets or exceeds all published specifications.
The accuracy of these standards is directly traceable to the National Institute of Standards and Technology.

	PRIMARY STANDARD 382 (°F)		PRIMARY STANDARD 882 (°F)		PRIMARY STANDARD 1382 (°F)	
	Voltage Out (V)	Equivalent Temp (°F)	Voltage Out (V)	Equivalent Temp (°F)	Voltage Out (V)	Equivalent Temp (°F)
CHANNEL 1						
CHANNEL 2						
CHANNEL 3						
CHANNEL 4						
CHANNEL 5						
CHANNEL 6						

Instrumentation Used:

Thermocouple Calibrator: **Serial Number:**
Calibrated Multimeter: **Serial Number:**

Company Name
Street
PO Box
City, State, Zip Code

CERTIFICATE OF CALIBRATION VERIFICATION

TCI Serial Number: **Calibration Date:**
Certified by: **Re-Calibration Date:**

Company name does hereby certify the above instrument was calibrated against standards maintained by Company name and meets or exceeds all published specifications.
The accuracy of these standards is directly traceable to the National Institute of Standards and Technology.

	PRIMARY STANDARD 194 (°C)		PRIMARY STANDARD 472 (°C)		PRIMARY STANDARD 750 (°C)	
	Voltage Out (V)	Equivalent Temp (°C)	Voltage Out (V)	Equivalent Temp (°C)	Voltage Out (V)	Equivalent Temp (°C)
CHANNEL 1						
CHANNEL 2						
CHANNEL 3						
CHANNEL 4						
CHANNEL 5						
CHANNEL 6						

Instrumentation Used:

Thermocouple Calibrator: **Serial Number:**
Calibrated Multimeter: **Serial Number:**

SECTION 9 – SAFETY PRECAUTIONS FOR SERVICING

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

9-1. Symbol Usage

safety_ihtm 2022-01

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.*

☞ *Indicates special instructions.*

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 these hazards.

9-2. Servicing 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.

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 the 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.

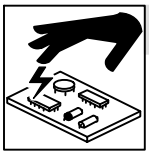
During servicing, keep everybody, especially children, away.

ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Turn Off induction heating power source and disconnect and lockout input power using line disconnect switch, circuit breakers, or by removing plug from receptacle, or stop engine before servicing unless the procedure specifically requires an energized unit.
- Do not work on equipment unless it has been verified that the machine case is not energized.
- Insulate yourself from ground by standing or working on dry insulating mats big enough to prevent contact with the ground.
- Do not leave live unit unattended.
- If this procedure requires an energized unit, have only personnel familiar with and following standard safety practices do the job.
- When testing a live unit, use the one-hand method. Do not put both hands inside unit. Keep one hand free.
- Disconnect input power conductors from deenergized supply line BEFORE moving an induction heating power source.

SIGNIFICANT DC VOLTAGE exists in inverter 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.



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.

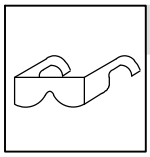
FIRE OR EXPLOSION hazard.

- Do not place unit on, over, or near combustible surfaces.
- Do not service unit near flammables.

ARC FLASH can kill.

Arc flash is the rapid and violent release of energy that occurs when electric current leaves its intended path and arcs to other conductors or to ground. Arc flash can be caused by equipment failure (faulty insulation, corrosion, dust), improper installation, human error (improper tool placement), and other factors. Conductive vapors can sustain the arc until over-current devices open the circuit. Individuals within the arc flash boundary are at risk.

- Do not work on energized equipment unless an assessment of arc flash risk from the electrical supply circuit has been conducted by a qualified person and you have been trained in safe work practices by your employer.
- Follow requirements in NFPA 70E for safe work practices and Personal Protective Equipment (PPE).

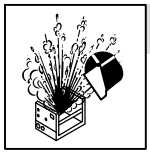


FLYING METAL or DIRT can injure eyes.

- Wear safety glasses with side shields or face shield during servicing.
- Be careful not to short metal tools, parts, or wires together during testing and servicing.

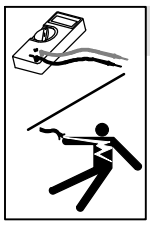
INDUCTION HEATING can burn.

- Do not touch hot parts bare handed.
- Allow cooling period before handling parts on equipment.
- Do not touch or handle induction head/coil during operation.
- Keep metal jewelry and other metal personal items away from head/coil during operation.
- To handle hot parts, use proper tools and/or wear heavy, insulated welding gloves and clothing to prevent burns.



EXPLODING PARTS can injure.

- Failed parts can explode or cause other parts to explode when power is applied to inverters.
- Always wear a face shield and long sleeves when servicing inverters.



SHOCK HAZARD from testing.

- Turn Off induction heating power source before making or changing meter lead connections.
- Use at least one meter lead that has a self-retaining spring clip such as an alligator clip.
- Read instructions for test equipment.

FALLING EQUIPMENT can injure.

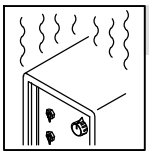
- Use lifting eye to lift unit only, NOT running gear, gas cylinders, or any other accessories.
- Use correct procedures and equipment of adequate capacity to lift and support unit.
- If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.
- Follow the guidelines in the Applications Manual for the Revised NIOSH Lifting Equation (Publication No. 94–110) when manually lifting heavy parts or equipment.

MOVING PARTS can injure.

- Keep away from moving parts such as fans.
- Have only qualified persons remove doors, panels, covers, or guards for maintenance and troubleshooting as necessary.
- Keep hands, hair, loose clothing, and tools away from moving parts.
- Reinstall doors, panels, covers, or guards when maintenance is finished and before reconnecting input power.

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

- Wearers of Pacemakers and other Implanted Medical Devices should keep away from servicing areas until consulting their doctor and the device manufacturer.

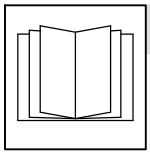


OVERUSE can cause OVERHEATING.

- Allow cooling period; follow rated duty cycle.
- Reduce current or reduce duty cycle before using induction heating equipment again.
- Do not block or filter airflow to unit.

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 install, test, and service H.F. producing units.
- 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.



READ INSTRUCTIONS.

- Use Testing Booklet (Part No. 150853) when servicing this unit.
- Consult the Owner's Manual for welding safety precautions.
- Use only genuine replacement parts from the manufacturer.
- Read and follow all labels and the Technical Manual carefully before installing, operating, or servicing unit. Read the safety information at the beginning of the manual and in each section.
- Perform installation, maintenance, and service according to the Technical Manual, industry standards, and national, state, and local codes.

9-3. 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.

9-4. 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.

For additional information on induction heating and EMF exposure, see the bulletin at this location:
https://www.millerwelds.com/–/media/miller–electric/files/pdf/safety/bulletins/bulletin–on–induction–heating–and–emf–exposure.pdf

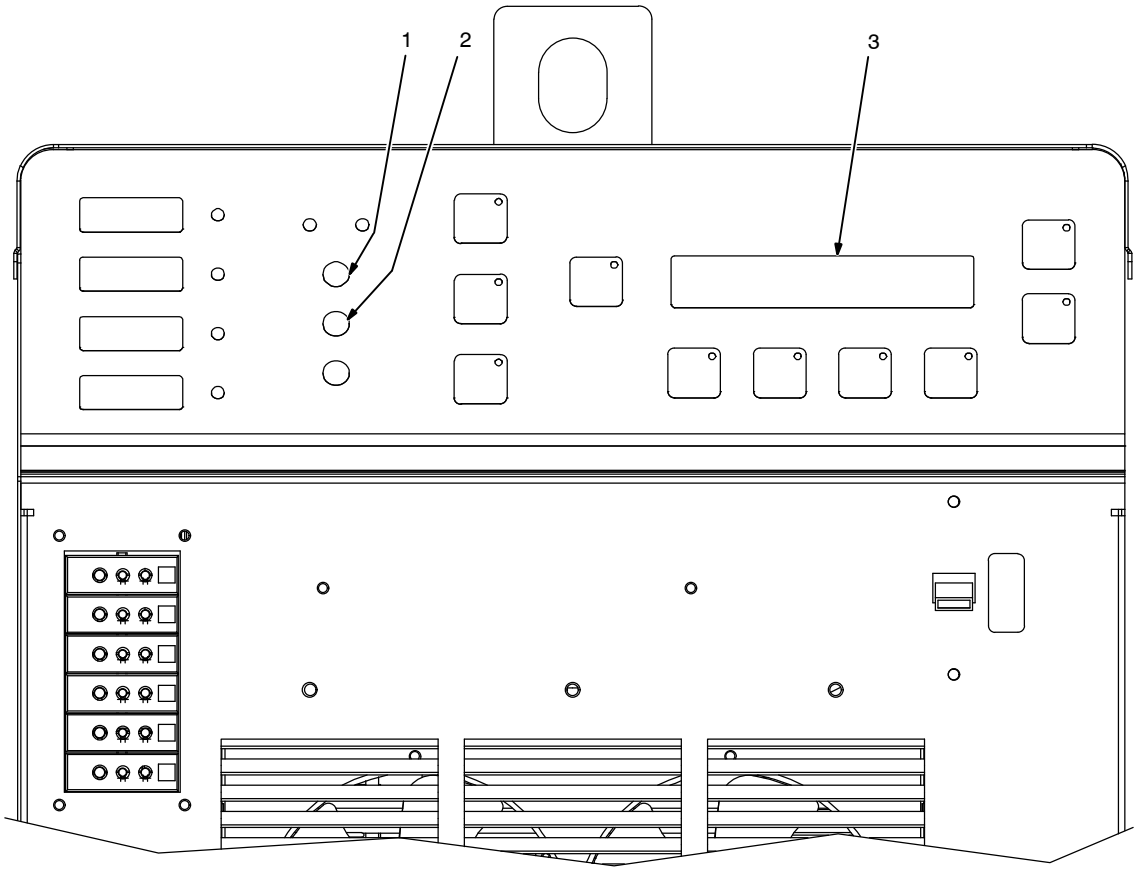
About Implanted Medical Devices:

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. If cleared by your doctor, then following the above procedures is recommended.

SECTION 10 – DIAGNOSTICS & TROUBLESHOOTING

The ProHeat 35 power source has on-board capabilities to aid in troubleshooting problems should any conditions occur during operation. This troubleshooting capability consists of the Fault LED, Limit LED, and message screens that appear on the front panel LCD display.

10-1. Operator Interface Indicators



803995-B

1 Fault LED

LED lights to indicate a system fault condition.

2 Limit LED

LED lights to indicate a system limit condition.

3 4 x 40 LCD Display

Displays programming, run status, parameters, fault and limit conditions, and troubleshooting guide.

10-2. Limit Conditions

A limit condition indicates that the system has encountered an open thermocouple or is outside the range of its optimum operating conditions or parameters. Should a limit condition occur during operation, the yellow Limit LED will flash to indicate a problem. If the active screen on the LCD display is Run Status or Parameters, a message describing the particular limit condition will appear on the display. If the active screen is Program, press the Run Status  button to display the limit condition.

In a limit condition, the power source will continue to deliver output power and protect itself from damage by reducing the output power. This situation allows the operator time to determine the best action to correct the problem as described by the limit message on the LCD display.

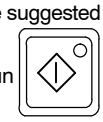
If a limit condition occurs, there are two selectable options:

- Acknowledge the limit and continue operation.
- Terminate operation to correct the problem causing the limit.

Pressing the Decrease  button will acknowledge the limit and continue operation with the existing set up. In the acknowledge state, the yellow Limit LED will stop flashing and remain on continuously. The LCD display will revert to an active screen once the Program  button, Run Status  button, or Parameters  button is pressed.

If a new limit condition should occur after the first is acknowledged, the yellow Limit LED will start flashing to indicate a new problem. To display the limit condition, press the Run Status  button and the LCD display will show a message describing the new and previous limit messages.

To obtain additional information regarding the limit condition and suggested solutions to resolve the limit, press the Increase  button, and the LCD display will indicate possible solutions based on the type of limit condition.

If the operator determines that the best course of action is to terminate operation and make suggested changes to the setup to eliminate the limit condition, press the Stop  button. After changes are made to the setup, press the Run  button to restart the process.

10-3. Limit Condition Codes

Limit Condition	Additional Information
L01: Thermocouple #1 Open	Check for open temperature sensor and repair Change to back-up temperature sensor
L02: Thermocouple #2 Open	Check for open temperature sensor and repair Change to back-up temperature sensor
L03: Thermocouple #3 Open	Check for open temperature sensor and repair Change to back-up temperature sensor
L04: Thermocouple #4 Open	Check for open temperature sensor and repair Change to back-up temperature sensor
L05: Thermocouple #5 Open	Check for open temperature sensor and repair Change to back-up temperature sensor
L06: Thermocouple #6 Open	Check for open temperature sensor and repair Change to back-up temperature sensor
L07: Output Voltage Limit	Tighten blanket against pipe surface Shorten extension cable
L08: Output Voltage Limit	Increase number of turns Increase coil space Shorten extension cable Increase insulation width
L09: Output Current Limit	Tighten blanket against pipe surface
L10: Output Current Limit	Increase number of turns Decrease coil space Tighten cable on insulation

Limit Condition	Additional Information
L11: Coolant Overtemp Limit	Check coolant flow and level Clean coolant filters and heat exchanger Increase number of turns Verify appropriate insulation thickness
L12: Power Source Overtemp Limit	Check for blocked vents Clean wind tunnel heat sinks
L13: Cable Connection	Check for loose/open output connection Verify all output cables are same type Verify receptacle plug connected Check cable 1 and cable 2 identification on diagnostic screen DIAG1 (see Section 10-7)
L14: Accessory Temperature Limit	Check Accessory TC connection Wait for accessory to cool
L15: Low Travel Speed	Increase travel speed. Check travel detector.

10-4. Fault Conditions

A fault condition occurs if the system encounters an isolation fault, encounters operating conditions outside operational limits, or if there is a serious problem with the system. Should a fault condition occur, the output is immediately turned off, the red Fault LED flashes and the Stop  button LED flashes. If the active screen on the LCD display is Run Status or Parameters, a message describing the particular fault condition will appear on the display. If the active screen is Program, press the Run Status  button to display the fault condition.

Pressing the Decrease  button will acknowledge the fault and the red Fault LED will stop flashing and remain on continuously. However, the Stop  button LED will continue to flash indicating that the process has stopped.

To obtain additional information regarding the fault condition and suggested solutions to resolve the fault, press the Increase  button, and the LCD display will indicate possible solutions based on the type of fault condition. In most cases, a fault condition will indicate that service is required.

10-5. Fault Condition Codes

Fault Condition	Additional Information
F51: Thermocouple #1 Internal Fault	Service required
F52: Thermocouple #2 Internal Fault	Service required
F53: Thermocouple #3 Internal Fault	Service required
F54: Thermocouple #4 Internal Fault	Service required
F55: Thermocouple #5 Internal Fault	Service required
F56: Thermocouple #6 Internal Fault	Service required
F57: CJT Sensor Internal Fault	Service required
F58: Output Voltage Fault	Air cooled systems: Tighten blanket against pipe surface Reduce length of extension cable Liquid cooled systems: Increase number of turns Increase coil space Reduce length of extension cable Increase insulation width Service required
F59: Output Current Fault	Service required
F60: Temperature Sensor Fault	Check control TC connections Check control TC extension cable Check control TC type in SYSTEM SETUP2
F61: Coolant Flow Fault	Check for coolant leak Clean for coolant blockage Check coolant filter and level Check coolant connections

Fault Condition	Additional Information
F62: Isolation Fault	Check for exposed conductor or for moisture on blanket Using conductive coolant in cooler (043810 low conductivity coolant is recommend).
F63: Line Voltage Fault	Check line voltage Check voltage values on diagnostic screen DIAG2 (see Section 10-7)
F64: Power Source Overtemp Fault	Verify power source vents and wind tunnel are unobstructed
F65: Current Source Fault	Service required
F66: Under Frequency Fault	Check for loose or open connections in output cable Decrease number of turns or add a second output Decrease coil space Service required
F67: Over Frequency Fault	Verify heating cable properly wrapped Verify material being heated is magnetic
F68: Cable Connection Fault	Check for loose/open output connection Verify all output cables are same type Verify receptacle plug connected Check cable 1 and cable 2 identification on diagnostic screen DIAG1 (see Section 10-7) Rolling Inductor only: Verify TC5, TC6 connection.
F69: Coolant Overtemp Fault	Check coolant flow and level Clean coolant filters and heat exchanger Increase number of turns Verify appropriate insulation thickness
F70: Internal Communication Fault	Service required
F71: Internal Thermistor Fault	Service required
F72: Coolant Thermistor Fault	Service required
F73: Decoupled/Open Coil	Check for loose/open output connection. Tighten coil/blanket. Increase number of turns
F74: Isolation Fault Self-Test Error	Service required
F75: Internal Power Supply Fault	Service required
F76: Current Source Control Fault	Service required
F77: Power Source Internal Comm Fault	Service required
F78: Output Current Sense Fault	Check for loose/open output connection or an extension cable connected with no coil attached at the end. Service required
F79: Accessory 1 overtemp fault	Check accessory TC connection Wait for accessory to cool
F80: Accessory 2 overtemp fault	Check accessory TC connection Wait for accessory to cool

10-6. Infrared Sensor Troubleshooting Guide

Problem	Cause	Potential Solution
Err	Infrared sensor is connected but temperature is not in range.	Verify settings on ProHeat are set for IR 4–20 mA, and temp range is set to 212°F–752°F (100°C–400°C) if infrared sensor is attached. Verify settings on ProHeat are set for K TC if thermocouple measuring device is attached.
Low	Infrared sensor is connected but temperature output is below sensor range.	The "Low" setting is +/– 41°F (5°C) of the low limit of the infrared sensor temperature range of 212°F (100°C).
		If necessary, use alternative method to verify temperature of material being heated.
High	Infrared sensor is connected but temperature output is above sensor range.	The "High" setting is +/– 41°F (5°C) of the high limit of the infrared sensor temperature range of 752°F (400°C).
		If necessary, use alternative method to verify temperature of material being heated.
Open	No thermal couple measuring device detected.	If infrared sensor is connected, verify settings on ProHeat are set for an infrared sensor. Verify continuity of cable connections replace if necessary.
		Verify infrared sensor is working correctly, replace if necessary.
		If thermocouple measuring device is connected, verify continuity of extension cable and measuring device, replace if necessary.

10-7. System Diagnostic Screens

Additional system diagnostics are available and accessible through the operator interface. Detail operational parameters can be accessed by pressing and holding the Run Status  button and pressing the Parameters 

button.

When this feature is initially activated, the following screen appears on the LCD display:

System Diagnostic Screen

```
RemCmd: 1023 Off     Cable1: LQD   DIAG1
 OutI1:    0 A       Cable2: LQD
 OutI2:    0 A       ClntFR: 0.60 GPM
IsrcFb:    0 A       ClrSts: Flowing
```

RemCmd – This is the value of the remote command and the status of the remote contactor.

☞ *Remote controls can be used to enable/disable output in all control modes. They only affect output power level when the control mode is set to Remote.*

Out I1 – This is the value of the output current on output 1.
Out I2 – This is the value of the output current on output 2.
Isrc FB – This is the value of the amperage in the current source inverter.
Cable 1 – This is the cable type hooked up to output number one. Possible labels:

- AIR – for an air-cooled cable
- LQD – for a liquid-cooled cable
- PLUG – for a protective plug
- OPEN – no cable or plug in place
- ROLL – rolling Inductor

Cable 2 – This is the cable type hooked up to output number two. Possible labels:

- AIR – for an air-cooled cable
- LQD – for a liquid-cooled cable
- PLUG – for a protective plug
- OPEN – no cable or plug in place
- ROLL – rolling inductor

ClntFR – This is the coolant flow rate (in GPM) from the cooler on a liquid-cooled system.

ClrSts – This is the status of the cooler. Possible labels:

- Off
- Flowing

The second diagnostic screen is available by again pressing and holding the Run Status  button and pressing the Parameters 

button.

System Diagnostic Screen

```
VLnA-B: 460V  Therm1:   75         DIAG2
VLnB-C: 460V  Therm2:   75  Therm5: OPEN
VLnC-A: 460V  Therm3:   75  ClrTmp:   77
  VBus: 650V  Therm4: OPEN  RmtFlw: Off
```

VLnA-B – This is the phase to phase line voltage between phases A and B.

VLnB-C – This is the phase to phase line voltage between phases B and C.

VLnC-A – This is the phase to phase line voltage between phases C and A.

VBus – This is the DC bus voltage.

Therm1 – This is the temperature of the current source primary heatsink.

Therm2 – This is the temperature of the bridge heatsink.

Therm3 – This the the temperature of the current source secondary heatsink.

Therm4 – Open (not used).

Therm5 – Open (not used).

ClrTmp – This is the temperature of the coolant on a liquid-cooled system.

- OPEN – no cooler is detected.

RmtFlw – This is the status of the relay contacts for remote coolant flow on a liquid-cooled system.

- OFF
- ON

☞ *RmtFlw feature is unsupported on the current platform.*

10-8. ProHeat 35 Firmware Versions And Compatibility

Release Date	Eff Stock And Serial No.	PC Board No.	PC Board Name	Revision No.	PC Board Stock No.	Reason
Original Release	907689, MG220055G-	PC2	Operator Interface	1.29- Currently 1.30	274028	
	907690 MF310067G-	PC1	Bridge Control uP	1.25- Currently 1.27	273113	
The Bridge Control PLD is 1.28, and has not changed since the ProHeat 35 was released. If possible, verify firmware revision levels prior to ordering circuit boards. If firmware revisions cannot be verified, contact Miller Service for instructions on updating firmware. All boards are compatible with firmware updates so the part number on old boards does not indicate firmware revision.						

Press and hold the the Run Status  and the Parameters 

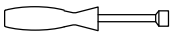
buttons for a minimum of four seconds to verify current firmware revisions.

System Firmware Revisions Screen

```
Firmware Revisions
Operator Interface      0.01
Bridge Control uP       0.01
Bridge Control PLD      1.00
```

10-9. Measuring/Discharging Input Capacitor Voltage Before Working On Unit

Tools Needed:



5/16, 3/8 in.

⚠ **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.**

Remove right side panel and disconnect fan motor FM3.

1 Current Source Interconnect Board PC4

2 Voltmeter

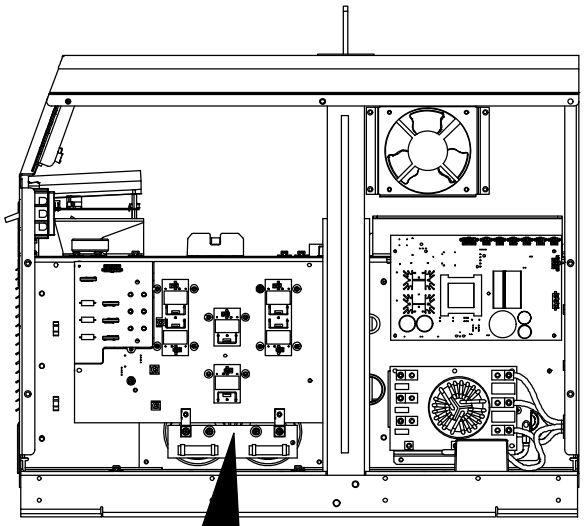
Measure the dc voltage across the + bus terminal and – bus terminal on PC4 as shown until voltage drops to near 0 (zero) volts.

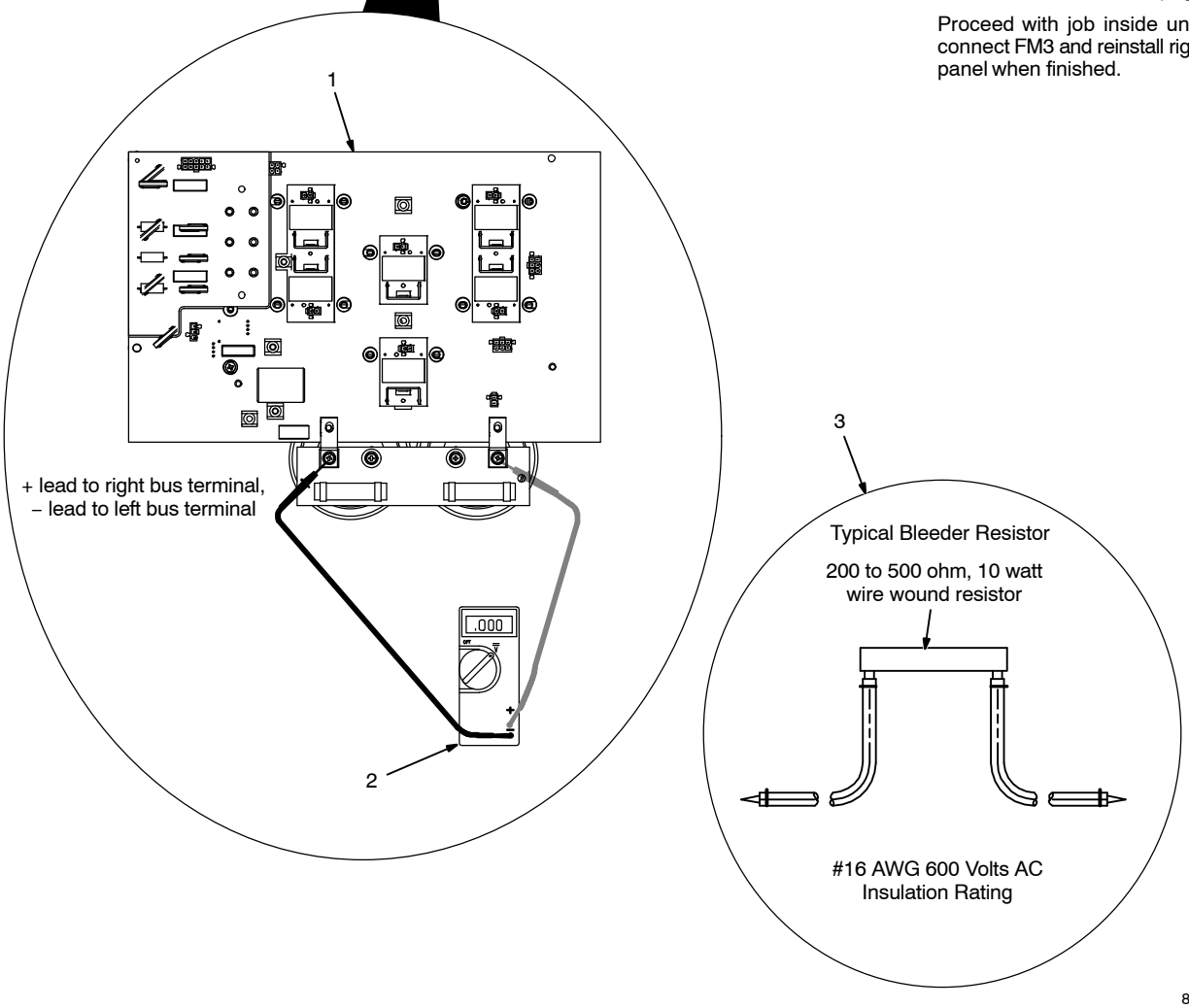
☞ *If the capacitor voltage does not drop to near zero after several minutes, use a bleeder resistor of between 200 and 500 ohms, at least 10 watts, and #16 AWG 600 volts ac insulation rated wire to discharge the capacitor(s).*

3 Typical Bleeder Resistor

An example of a typical bleeder resistor is shown on this page.

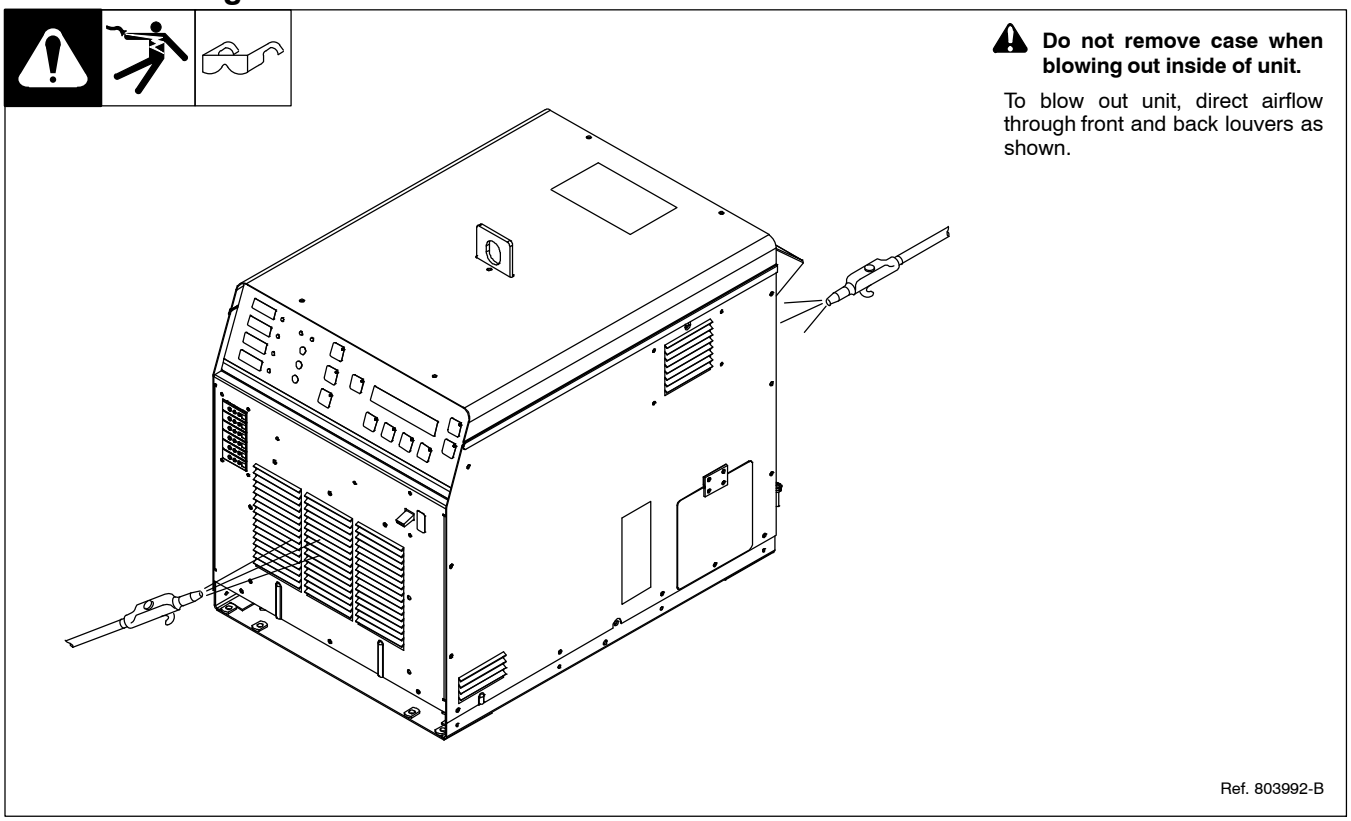
Proceed with job inside unit. Reconnect FM3 and reinstall right side panel when finished.





804519-D

10-10. 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. 803992-B

Notes

MATERIAL THICKNESS REFERENCE CHART

24 Gauge (.025 in.)

22 Gauge (.031 in.)

20 Gauge (.037 in.)

18 Gauge (.050 in.)

16 Gauge (.063 in.)

14 Gauge (.078 in.)

1/8 in. (.125 in.)

3/16 in. (.188 in.)

1/4 in. (.25 in.)

5/16 in. (.313 in.)

3/8 in. (.375 in.)

1/2 in. (.5 in.)

SECTION 11 – ELECTRICAL DIAGRAM

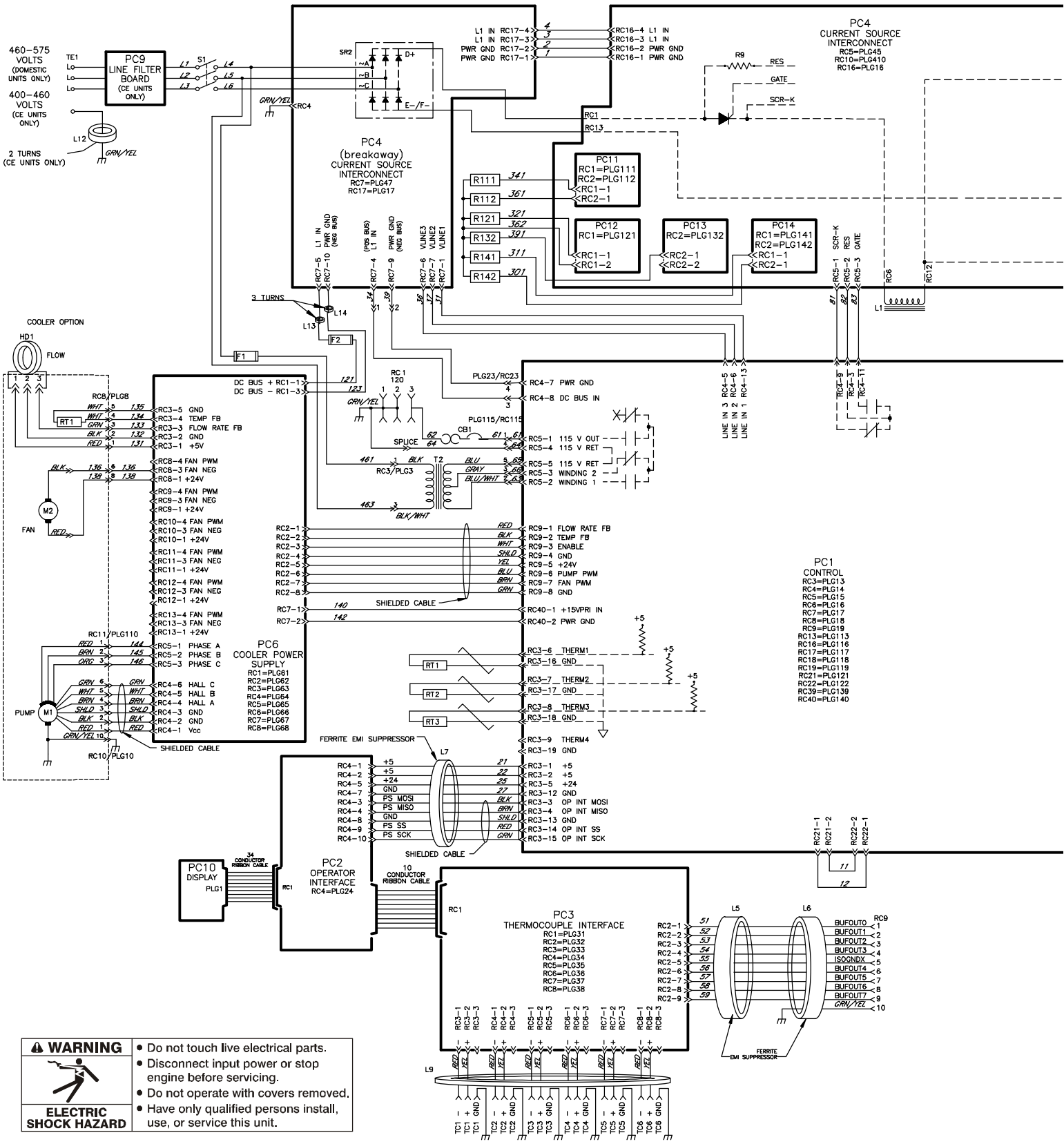
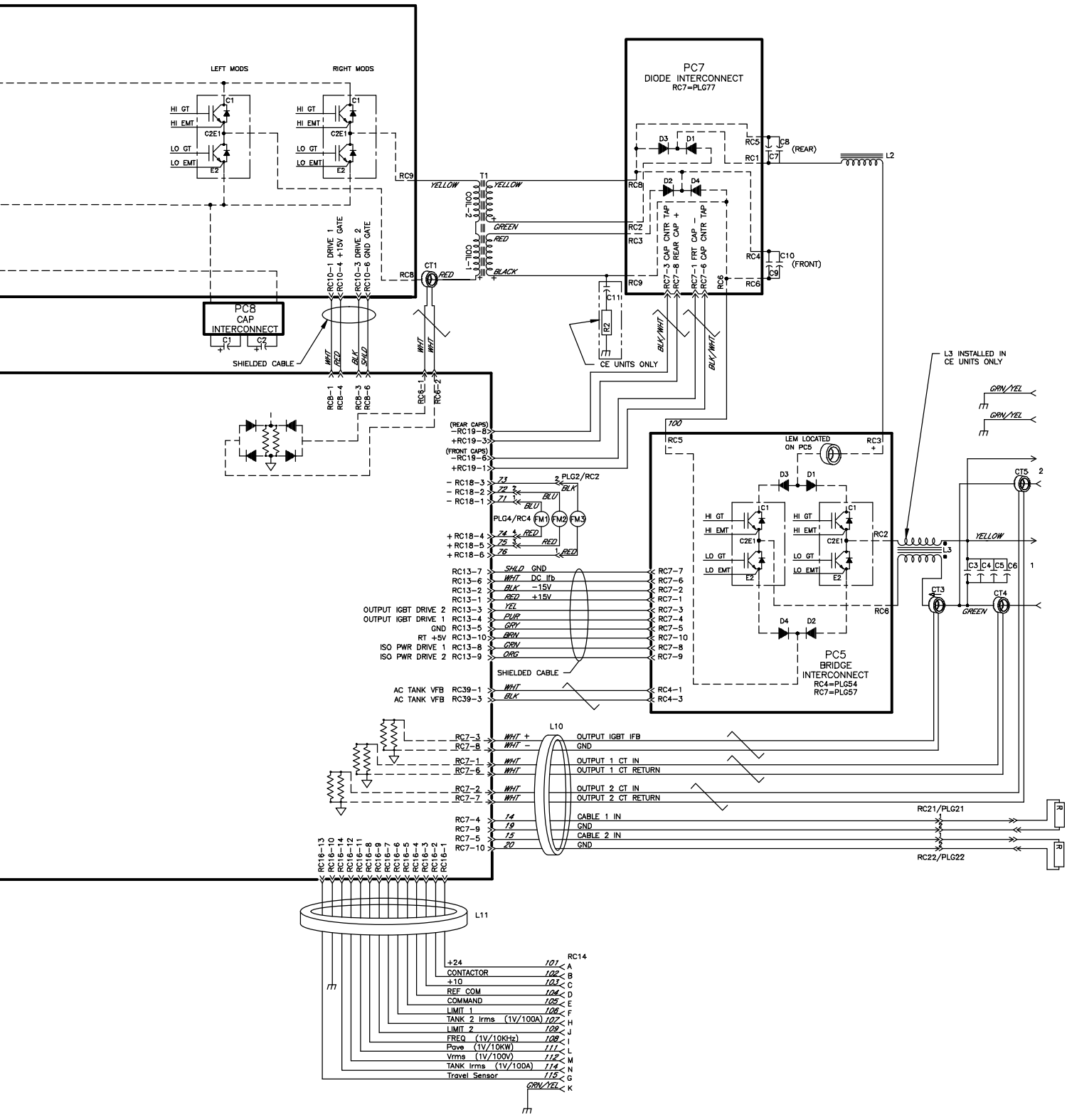
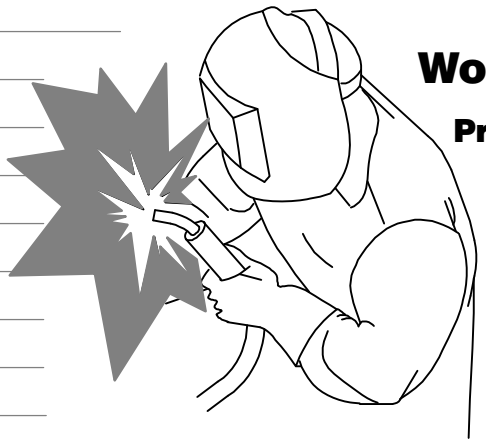


Figure 11-1. Circuit Diagram


LEFT MODS
RIGHT MODS
HI GT
HI EMT
LO GT
LO EMT
C1
C2E1
E2
PC7
DIODE INTERCONNECT
RC7=PLG77
D1
D2
D3
D4
RC1
RC2
RC3
RC4
RC5
RC6
RC8
RC9
C7
C8
C9
C10
(REAR)
(FRONT)
L2
T1
COIL 1
COIL 2
YELLOW
GREEN
RED
BLACK
CT1
C11
R2
CE UNITS ONLY
RC7-3 CAP CNTR TAP
RC7-8 REAR CAP +
RC7-1 FRT CAP -
RC7-6 CAP CNTR TAP
BLK/WHT
PC8
CAP
INTERCONNECT
C1
C2
SHIELDED CABLE
WHT
RED
BLK
SHLD
WHT
RC10-1 DRIVE 1
RC10-4 +15V GATE
RC10-3 DRIVE 2
RC10-6 GND GATE
RC8-1
RC8-4
RC8-3
RC8-6
RC6-1
RC6-2
L3 INSTALLED IN
CE UNITS ONLY
GRN/YEL
100
LEM LOCATED
ON PC5
RC5
RC3
CT5
CT3
CT4
L3
C3
C4
C5
C6
(REAR CAPS)
-RC19-8
+RC19-3
(FRONT CAPS)
-RC19-6
+RC19-1
- RC18-3
- RC18-2
- RC18-1
+ RC18-4
+ RC18-5
+ RC18-6
PLG2/RC2
PLG4/RC4
FM1
FM2
FM3
BLU
BLK
RED
RC13-7 SHLD GND
RC13-6 WHT DC Ifb
RC13-2 BLK -15V
RC13-1 RED +15V
OUTPUT IGBT DRIVE 2 RC13-3 YEL
OUTPUT IGBT DRIVE 1 RC13-4 PUR
GND RC13-5 GRY
RT +5V RC13-10 BRN
ISO PWR DRIVE 1 RC13-8 GRN
ISO PWR DRIVE 2 RC13-9 ORG
SHIELDED CABLE
AC TANK VFB RC39-1 WHT
AC TANK VFB RC39-3 BLK
RC7-7
RC7-6
RC7-2
RC7-1
RC7-3
RC7-4
RC7-5
RC7-10
RC7-8
RC7-9
RC4-1
RC4-3
PC5
BRIDGE
INTERCONNECT
RC4=PLG54
RC7=PLG57
L10
RC7-3 WHT + OUTPUT IGBT IFB
RC7-8 WHT - GND
RC7-1 WHT OUTPUT 1 CT IN
RC7-6 WHT OUTPUT 1 CT RETURN
RC7-2 WHT OUTPUT 2 CT IN
RC7-7 WHT OUTPUT 2 CT RETURN
RC7-4 14 CABLE 1 IN
RC7-9 19 GND
RC7-5 15 CABLE 2 IN
RC7-10 20 GND
RC21/PLG21
RC22/PLG22
R
RC16-13
RC16-10
RC16-14
RC16-12
RC16-11
RC16-8
RC16-9
RC16-7
RC16-6
RC16-5
RC16-4
RC16-3
RC16-2
RC16-1
L11
RC14
+24 101 A
CONTACTOR 102 B
+10 103 C
REF COM 104 D
COMMAND 105 E
LIMIT 1 106 F
TANK 2 Irms (1V/100A) 107 H
LIMIT 2 109 J
FREQ (1V/10KHz) 108 I
Pave (1V/10KW) 111 L
Vrms (1V/100V) 112 M
TANK Irms (1V/100A) 114 N
Travel Sensor 115 G
GRN/YEL K

271167-C

Notes



Work like a Pro!

Pros weld and cut safely. Read the safety rules at the beginning of this manual.

Warranty Questions?

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

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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.

Miller®

TRUE BLUE® WARRANTY

Effective January 1, 2022
(Equipment with a serial number preface of NC or newer)

This limited warranty supersedes all previous Miller warranties and is exclusive with no other guarantees or warranties expressed or implied.

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 US or Canada 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 in non–inverter products
2. 3 Years — Parts and Labor Unless Specified
   * Auto-Darkening Helmet Lenses (No Labor)
   * Engine Driven Welder/Generators (Including EnPak) **(NOTE: Engines are Warranted Separately by the Engine Manufacturer.)**
   * Insight Welding Intelligence Products (Except External Sensors)
   * 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 Weld Masks (No Labor)
   * Fume Extractors – Capture 5 and Industrial Collector Series
4. 1 Year — Parts and Labor Unless Specified
   * ArcReach Heater
   * AugmentedArc, LiveArc, and MobileArc Welding Systems
   * Automatic Motion Devices
   * Bernard BTB Air-Cooled MIG Guns (No Labor)
   * CoolBelt, PAPR Blower, and PAPR Face Shield (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)
   * Fume Extractors – Filtair 130, MWX and SWX Series, ZoneFlow Extraction Arms and Motor Control Box
   * HF Units
   * ICE/XT Plasma Cutting Torches (No Labor)
   * Induction Heating Power Sources, Coolers **(NOTE: Digital Recorders are Warranted Separately by the Manufacturer.)**
   * Insight Sensors
   * Load Banks
   * Motor-Driven Guns (except Spoolmate Spoolguns)
   * Positioners and Controllers
   * Racks (For Housing Multiple Power Sources)
   * Running Gear/Trailers
   * Subarc Wire Drive Assemblies
   * Supplied Air Respirator (SAR) Boxes and Panels
   * 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
   * 12 Volt Automotive-Style Batteries
6. 90 Days — Parts
   * Accessories (Kits)
   * ArcReach Heater Quick Wrap and Air Cooled Cables
   * Canvas Covers
   * Induction Heating Coils and Blankets, Cables, and Non-Electronic Controls
   * MDX Series MIG Guns
   * M-Guns
   * MIG Guns, Subarc (SAW) Torches, and External Cladding Heads
   * Remote Controls and RFCS-RJ45
   * Replacement Parts (No labor)
   * Spoolmate 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. IN NO EVENT SHALL MILLER BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING LOSS OF PROFIT) 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.

Model Name | Serial/Style Number

Purchase Date (Date which equipment was delivered to original customer.)

Distributor

Address

City

State | Zip

Register your product at www.millerwelds.com/support/product-registration

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 Protective Equipment (PPE)
- Service and Repair
- Replacement Parts
- Training (Schools, Videos, Books)
- 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.

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