300 TSW

PRO-WAVE®

AC/DC CC INVERTER ARC WELDER

Service Manual

Version: AA **Issue Date: August 10, 2005** **Manual No.: 0-4752**

Operating Features:

GTAW	300 AMP	CC	AC DC	3 PHASE	1 PHASE	460 V

WE APPRECIATE YOUR BUSINESS!

Congratulations on your new Thermal Arc product. We are proud to have you as our customer and will strive to provide you with the best service and reliability in the industry. This product is backed by our extensive warranty and world-wide service network. To locate your nearest distributor or service agency call 1-800-752-7621, or visit us on the web at **www.Thermalarc.com.**

This Operating Manual has been designed to instruct you on the correct use and operation of your Thermal Arc product. Your satisfaction with this product and its safe operation is our ultimate concern. Therefore please take the time to read the entire manual, especially the Safety Precautions. They will help you to avoid potential hazards that may exist when working with this product.

YOU ARE IN GOOD COMPANY!

The Brand of Choice for Contractors and Fabricators Worldwide.

Thermal Arc is a Global Brand of Arc Welding Products for Thermadyne Industries Inc. We manufacture and supply to major welding industry sectors worldwide including; Manufacturing, Construction, Mining, Automotive, Aerospace, Engineering, Rural and DIY/Hobbyist.

We distinguish ourselves from our competition through market-leading, dependable products that have stood the test of time. We pride ourselves on technical innovation, competitive prices, excellent delivery, superior customer service and technical support, together with excellence in sales and marketing expertise.

Above all, we are committed to develop technologically advanced products to achieve a safer working environment within the welding industry.

WARNINGS

Read and understand this entire Manual and your employer's safety practices before installing, operating, or servicing the equipment.

While the information contained in this Manual represents the Manufacturer's best judgement, the Manufacturer assumes no liability for its use.

Pro-Wave Inverter Welding Power Supply
Instruction Manual Number 430429-511 for:
Pro-Wave 300TSW Spec Number 10-3074

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82 Benning Street
West Lebanon, New Hampshire, USA 03784
(603) 298-5711

www.thermalarc.com

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Publication Date: August 10, 2005

Record the following information for Warranty purposes:

Where Purchased: _____

Purchase Date: _____

Equipment Serial #: _____

TABLE OF CONTENTS

TABLE OF CONTENTS

SECTION 1:
SAFETY INSTRUCTIONS AND WARNINGS

WARNING

PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS KEEP AWAY UNTIL CONSULTING YOUR DOCTOR. DO NOT LOSE THESE INSTRUCTIONS. READ OPERATING/INSTRUCTION MANUAL BEFORE INSTALLING, OPERATING OR SERVICING THIS EQUIPMENT.

Welding products and welding processes can cause serious injury or death, or damage to other equipment or property, if the operator does not strictly observe all safety rules and take precautionary actions.

Safe practices have developed from past experience in the use of welding and cutting. These practices must be learned through study and training before using this equipment. Anyone not having extensive training in welding and cutting practices should not attempt to weld. Certain of the practices apply to equipment connected to power lines; other practices apply to engine driven equipment.

Safe practices are outlined in the American National Standard Z49.1 entitled: SAFETY IN WELDING AND CUTTING. This publication and other guides to what you should learn before operating this equipment are listed at the end of these safety precautions. **HAVE ALL INSTALLATION, OPERATION, MAINTENANCE, AND REPAIR WORK PERFORMED ONLY BY QUALIFIED PEOPLE.**

1.01 Arc Welding Hazards

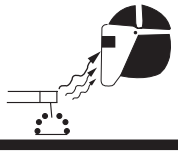
WARNING

ELECTRIC SHOCK can kill.

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

1. Do not touch live electrical parts.
2. Wear dry, hole-free insulating gloves and body protection.
3. Insulate yourself from work and ground using dry insulating mats or covers.
4. Disconnect input power or stop engine before installing or servicing this equipment. Lock input power disconnect switch open, or remove line fuses so power cannot be turned on accidentally.
5. Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.
6. Turn off all equipment when not in use. Disconnect power to equipment if it will be left unattended or out of service.
7. Use fully insulated electrode holders. Never dip holder in water to cool it or lay it down on the ground or the work surface. Do not touch holders connected to two welding machines at the same time or touch other people with the holder or electrode.
8. Do not use worn, damaged, undersized, or poorly spliced cables.
9. Do not wrap cables around your body.
10. Ground the workpiece to a good electrical (earth) ground.

11. Do not touch electrode while in contact with the work (ground) circuit.
12. Use only well-maintained equipment. Repair or replace damaged parts at once.
13. In confined spaces or damp locations, do not use a welder with AC output unless it is equipped with a voltage reducer. Use equipment with DC output.
14. Wear a safety harness to prevent falling if working above floor level.
15. Keep all panels and covers securely in place.



WARNING

ARC RAYS can burn eyes and skin; NOISE can damage hearing.

Arc rays from the welding process produce intense heat and strong ultraviolet rays that can burn eyes and skin. Noise from some processes can damage hearing.

1. Wear a welding helmet fitted with a proper shade of filter (see ANSI Z49.1 listed in Safety Standards) to protect your face and eyes when welding or watching.
2. Wear approved safety glasses. Side shields recommended.
3. Use protective screens or barriers to protect others from flash and glare; warn others not to watch the arc.
4. Wear protective clothing made from durable, flame-resistant material (wool and leather) and foot protection.
5. Use approved ear plugs or ear muffs if noise level is high.

WARNING

FUMES AND GASES can be hazardous to your health.

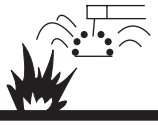
Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.

1. Keep your head out of the fumes. Do not breath the fumes.
2. If inside, ventilate the area and/or use exhaust at the arc to remove welding fumes and gases.
3. If ventilation is poor, use an approved air-supplied respirator.
4. Read the Material Safety Data Sheets (MSDSs) and the manufacturer's instruction for metals, consumables, coatings, and cleaners.
5. Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Shielding gases used for welding can displace air causing injury or death. Be sure the breathing air is safe.

Eye protection filter shade selector for welding or cutting (goggles or helmet), from AWS A6.2-73.

Welding or cutting	*Electrode Size*	*Filter*	*Welding or cutting*	*Electrode Size*	*Filter*
Torch soldering		2	**Gas metal-arc**		
Torch brazing		3 or 4	Non-ferrous base metal	All	11
Oxygen Cutting			Ferrous base metal	All	12
Light	Under 1 in., 25 mm	3 or 4	Gas tungsten arc welding	All	12
Heavy	1 to 6 in., 25-150 mm	4 or 5	(TIG)	All	12
Medium	Over 6 in., 150 mm	5 or 6	Atomic hydrogen welding	All	12
Gas welding			Carbon arc welding	All	12
Light	Under 1/8 in., 3 mm	4 or 5	Plasma arc welding		
Heavy	1/8 to 1/2 in., 3-12 mm	5 or 6	**Carbon arc air gouging**		
Medium	Over 1/2 in., 12 mm	6 or 8	Light		12
Shielded metal-arc	Under 5/32 in., 4 mm	10	Heavy		14
	5/32 to 1/4 in.,	12	**Plasma arc cutting**		
	Over 1/4 in., 6.4 mm	14	Light	Under 300 Amp	9
			Heavy	300 to 400 Amp	12
			Medium	Over 400 Amp	14

6. Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
7. Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and if necessary, while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.

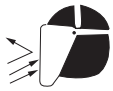


WARNING

WELDING can cause fire or explosion.

Sparks and spatter fly off from the welding arc. The flying sparks and hot metal, weld spatter, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode or welding wire to metal objects can cause sparks, overheating, or fire.

1. Protect yourself and others from flying sparks and hot metal.
2. Do not weld where flying sparks can strike flammable material.
3. Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
4. Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
5. Watch for fire, and keep a fire extinguisher nearby.
6. Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
7. Do not weld on closed containers such as tanks or drums.
8. Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock and fire hazards.
9. Do not use welder to thaw frozen pipes.
10. Remove stick electrode from holder or cut off welding wire at contact tip when not in use.



WARNING

FLYING SPARKS AND HOT METAL can cause injury.

Chipping and grinding cause flying metal. As welds cool, they can throw off slag.

1. Wear approved face shield or safety goggles. Side shields recommended.
2. Wear proper body protection to protect skin.

WARNING

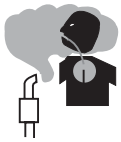
CYLINDERS can explode if damaged.

Shielding gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Since gas cylinders are normally part of the welding process, be sure to treat them carefully.

1. Protect compressed gas cylinders from excessive heat, mechanical shocks, and arcs.
2. Install and secure cylinders in an upright position by chaining them to a stationary support or equipment cylinder rack to prevent falling or tipping.
3. Keep cylinders away from any welding or other electrical circuits.
4. Never allow a welding electrode to touch any cylinder.
5. Use only correct shielding gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts in good condition.
6. Turn face away from valve outlet when opening cylinder valve.
7. Keep protective cap in place over valve except when cylinder is in use or connected for use.
8. Read and follow instructions on compressed gas cylinders, associated equipment, and CGA publication P-1 listed in Safety Standards.

WARNING

Engines can be dangerous.



WARNING

ENGINE EXHAUST GASES can kill.

Engines produce harmful exhaust gases.

1. Use equipment outside in open, well-ventilated areas.
2. If used in a closed area, vent engine exhaust outside and away from any building air intakes.

WARNING

ENGINE FUEL can cause fire or explosion.

Engine fuel is highly flammable.

1. Stop engine before checking or adding fuel.
2. Do not add fuel while smoking or if unit is near any sparks or open flames.
3. Allow engine to cool before fueling. If possible, check and add fuel to cold engine before beginning job.
4. Do not overfill tank — allow room for fuel to expand.
5. Do not spill fuel. If fuel is spilled, clean up before starting engine.

WARNING

MOVING PARTS can cause injury.

Moving parts, such as fans, rotors, and belts can cut fingers and hands and catch loose clothing.

1. Keep all doors, panels, covers, and guards closed and securely in place.
2. Stop engine before installing or connecting unit.
3. Have only qualified people remove guards or covers for maintenance and troubleshooting as necessary.
4. To prevent accidental starting during servicing, disconnect negative (-) battery cable from battery.
5. Keep hands, hair, loose clothing, and tools away from moving parts.
6. Reinstall panels or guards and close doors when servicing is finished and before starting engine.

WARNING

SPARKS can cause BATTERY GASES TO EXPLODE; BATTERY ACID can burn eyes and skin.

Batteries contain acid and generate explosive gases.

1. Always wear a face shield when working on a battery.
2. Stop engine before disconnecting or connecting battery cables.
3. Do not allow tools to cause sparks when working on a battery.
4. Do not use welder to charge batteries or jump start vehicles.
5. Observe correct polarity (+ and –) on batteries.

WARNING

STEAM AND PRESSURIZED HOT COOLANT can burn face, eyes, and skin.

The coolant in the radiator can be very hot and under pressure.

1. Do not remove radiator cap when engine is hot. Allow engine to cool.
2. Wear gloves and put a rag over cap area when removing cap.
3. Allow pressure to escape before completely removing cap.

WARNING

This product, when used for welding or cutting, produces fumes or gases which contain chemicals know to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety code Sec. 25249.5 et seq.)

NOTE

Considerations About Welding And The Effects of Low Frequency Electric and Magnetic Fields

The following is a quotation from the General Conclusions Section of the U.S. Congress, Office of Technology Assessment, Biological Effects of Power Frequency Electric & Magnetic Fields - Background Paper, OTA-BP-E-63 (Washington, DC: U.S. Government Printing Office, May 1989): "...there is now a very large volume of scientific findings based on experiments at the cellular level and from studies with animals and people which clearly establish that low frequency magnetic fields and interact with, and produce changes in, biological systems. While most of this work is of very high quality, the results are complex. Current scientific understanding does not yet allow us to interpret the evidence in a single coherent framework. Even more frustrating, it does not yet allow us to draw definite conclusions about questions of possible risk or to offer clear science-based advice on strategies to minimize or avoid potential risks."

To reduce magnetic fields in the workplace, use the following procedures.

1. Keep cables close together by twisting or taping them.
2. Arrange cables to one side and away from the operator.
3. Do not coil or drape cable around the body.
4. Keep welding power source and cables as far away from body as practical.

ABOUT PACEMAKERS:

The above procedures are among those also normally recommended for pacemaker wearers. Consult your doctor for complete information.

1.02 PRINCIPAL SAFETY STANDARDS

Safety in Welding and Cutting, ANSI Standard Z49.1, from American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33126.

Safety and Health Standards, OSHA 29 CFR 1910, from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers That Have Held Hazardous Substances, American Welding Society Standard AWS F4.1, from American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33126.

National Electrical Code, NFPA Standard 70, from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, from Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202.

Code for Safety in Welding and Cutting, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.

Safe Practices for Occupation and Educational Eye and Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 1430 Broadway, New York, NY 10018.

Cutting and Welding Processes, NFPA Standard 51B, from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

1.03 PRECAUTIONS DE SECURITE EN SOUDAGE A L'ARC

MISE EN GARDE

LE SOUDAGE A L'ARC EST DANGEREUX

PROTEGEZ-VOUS, AINSI QUE LES AUTRES, CONTRE LES BLESSURES GRAVES POSSIBLES OU LA MORT. NE LAISSEZ PAS LES ENFANTS S'APPROCHER, NI LES PORTEURS DE STIMULATEUR CARDIAQUE (A MOINS QU'ILS N'AIENT CONSULTE UN MEDECIN). CONSERVEZ CES INSTRUCTIONS. LISEZ LE MANUEL D'OPERATION OU LES INSTRUCTIONS AVANT D'INSTALLER, UTILISER OU ENTRETENIR CET EQUIPEMENT.

Les produits et procédés de soudage peuvent sauser des blessures graves ou la mort, de même que des dommages au reste du matériel et à la propriété, si l'utilisateur n'adhère pas strictement à toutes les règles de sécurité et ne prend pas les précautions nécessaires.

En soudage et coupage, des pratiques sécuritaires se sont développées suite à l'expérience passée. Ces pratiques doivent être apprises par étude ou entraînement avant d'utiliser l'equipement. Toute personne n'ayant pas suivi un entraînement intensif en soudage et coupage ne devrait pas tenter de souder. Certaines pratiques concernent les équipements raccordés aux lignes d'alimentation alors que d'autres s'adressent aux groupes électrogènes.

La norme Z49.1 de l'American National Standard, intitulée "SAFETY IN WELDING AND CUTTING" présente les pratiques sécuritaires à suivre. Ce document ainsi que d'autres guides que vous devriez connaître avant d'utiliser cet équipement sont présentés à la fin de ces instructions de sécurité.

SEULES DES PERSONNES QUALIFIEES DOIVENT FAIRE DES TRAVAUX D'INSTALLATION, DE REPARATION, D'ENTRETIEN ET D'ESSAI.

1.04 Dangers relatifs au soudage à l'arc

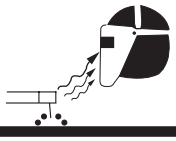
AVERTISSEMENT

L'ELECTROCUTION PEUT ETRE MORTELLE.

Une décharge électrique peut tuer ou brûler gravement. L'électrode et le circuit de soudage sont sous tension dès la mise en circuit. Le circuit d'alimentation et les circuits internes de l'équipement sont aussi sous tension dès la mise en marche. En soudage automatique ou semi-automatique avec fil, ce dernier, le rouleau ou la bobine de fil, le logement des galets d'entrainement et toutes les pièces métalliques en contact avec le fil de soudage sont sous tension. Un équipement inadéquatement installé ou inadéquatement mis à la terre est dangereux.

1. Ne touchez pas à des pièces sous tension.
2. Portez des gants et des vêtements isolants, secs et non troués.
3 Isolez-vous de la pièce à souder et de la mise à la terre au moyen de tapis isolants ou autres.
4. Déconnectez la prise d'alimentation de l'équipement ou arrêtez le moteur avant de l'installer ou d'en faire l'entretien. Bloquez le commutateur en circuit ouvert ou enlevez les fusibles de l'alimentation afin d'éviter une mise en marche accidentelle.
5. Veuillez à installer cet équipement et à le mettre à la terre selon le manuel d'utilisation et les codes nationaux, provinciaux et locaux applicables.
6. Arrêtez tout équipement après usage. Coupez l'alimentation de l'équipement s'il est hors d'usage ou inutilisé.
7. N'utilisez que des porte-électrodes bien isolés. Ne jamais plonger les porte-électrodes dans l'eau pour les refroidir. Ne jamais les laisser traîner par terre ou sur les pièces à souder. Ne touchez pas aux porte-électrodes raccordés à deux sources de courant en même temps. Ne jamais toucher quelqu'un d'autre avec l'électrode ou le porte-électrode.
8. N'utilisez pas de câbles électriques usés, endommagés, mal épissés ou de section trop petite.
9. N'enroulez pas de câbles électriques autour de votre corps.

10. N'utilisez qu'une bonne prise de masse pour la mise à la terre de la pièce à souder.
11. Ne touchez pas à l'électrode lorsqu'en contact avec le circuit de soudage (terre).
12. N'utilisez que des équipements en bon état. Réparez ou remplacez aussitôt les pièces endommagées.
13. Dans des espaces confinés ou mouillés, n'utilisez pas de source de courant alternatif, à moins qu'il soit muni d'un réducteur de tension. Utilisez plutôt une source de courant continu.
14. Portez un harnais de sécurité si vous travaillez en hauteur.
15. Fermez solidement tous les panneaux et les capots.



AVERTISSEMENT

LE RAYONNEMENT DE L'ARC PEUT BRÛLER LES YEUX ET LA PEAU; LE BRUIT PEUT ENDOMMAGER L'OUIE.

L'arc de soudage produit une chaleur et des rayons ultraviolets intenses, susceptibles de brûler les yeux et la peau. Le bruit causé par certains procédés peut endommager l'ouïe.

1. Portez une casque de soudeur avec filtre oculaire de nuance appropriée (consultez la norme ANSI Z49 indiquée ci-après) pour vous protéger le visage et les yeux lorsque vous soudez ou que vous observez l'exécution d'une soudure.
2. Portez des lunettes de sécurité approuvées. Des écrans latéraux sont recommandés.
3. Entourez l'aire de soudage de rideaux ou de cloisons pour protéger les autres des coups d'arc ou de l'éblouissement; avertissez les observateurs de ne pas regarder l'arc.
4. Portez des vêtements en matériaux ignifuges et durables (laine et cuir) et des chaussures de sécurité.
5. Portez un casque antibruit ou des bouchons d'oreille approuvés lorsque le niveau de bruit est élevé.

AVERTISSEMENT

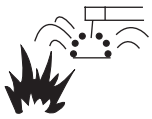
LES VAPEURS ET LES FUMEES SONT DANGEREUSES POUR LA SANTE.

Le soudage dégage des vapeurs et des fumées dangereuses à respirer.

SELECTION DES NUANCES DE FILTRES OCULAIRS POUR LA PROTECTION DES YEUX EN COUPAGE ET SOUDAGE (selon AWS á 8.2-73)

Opération de coupage ou soudage	Dimension d'électrode ou Epaisseur de métal ou Intensité de courant	Nuance de filtre oculaire	Opération de coupage ou soudage	Dimension d'électrode ou Epaisseur de métal ou Intensité de courant	Nuance de filtre oculaire
Brassage tendre au chalumeau	toutes conditions	2	Soudage á l'arc sous gaz avec fil plein (GMAW)		
Brassage fort au chalumeau	toutes conditions	3 ou 4	métaux non-ferreux	toutes conditions	11
Oxycoupage			métaux ferreux	toutes conditions	12
mince	moins de 1 po. (25 mm)	2 ou 3	Soudage á l'arc sous gaz avec électrode de tungstène (GTAW)	toutes conditions	12
moyen	de 1 á 6 po. (25 á 150 mm)	4 ou 5	Soudage á l'hydrogène atomique (AHW)	toutes conditions	12
épais	plus de 6 po. (150 mm)	5 ou 6	Soudage á l'arc avec électrode de carbone (CAW)	toutes conditions	12
Soudage aux gaz			Soudage á l'arc Plasma (PAW)	toutes dimensions	12
mince	moins de 1/8 po. (3 mm)	4 ou 5	Gougeage Air-Arc avec électrode de carbone		
moyen	de 1/8 á 1/2 po. (3 á 12 mm)	5 ou 6	mince		12
épais	plus de 1/2 po. (12 mm)	6 ou 8	épais		14
Soudage á l'arc avec électrode enrobees (SMAW)	moins de 5/32 po. (4 mm)	10	Coupage á l'arc Plasma (PAC)		
	5/32 á 1/4 po. (4 á 6.4 mm)	12	mince	moins de 300 amperès	9
	plus de 1/4 po. (6.4 mm)	14	moyen	de 300 á 400 amperès	12
			épais	plus de 400 amperès	14

1. Eloignez la tête des fumées pour éviter de les respirer.
2. A l'intérieur, assurez-vous que l'aire de soudage est bien ventilée ou que les fumées et les vapeurs sont aspirées à l'arc.
3. Si la ventilation est inadequate, portez un respirateur à adduction d'air approuvé.
4. Lisez les fiches signalétiques et les consignes du fabricant relatives aux métaux, aux produits consummables, aux revêtements et aux produits nettoyants.
5. Ne travaillez dans un espace confiné que s'il est bien ventilé; sinon, portez un respirateur à adduction d'air. Les gaz protecteurs de soudage peuvent déplacer l'oxygène de l'air et ainsi causer des malaises ou la mort. Assurez-vous que l'air est propre à la respiration.
6. Ne soudez pas à proximité d'opérations de dégraissage, de nettoyage ou de pulvérisation. La chaleur et les rayons de l'arc peuvent réagir avec des vapeurs et former des gaz hautement toxiques et irritants.
7. Ne soudez des tôles galvanisées ou plaquées au plomb ou au cadmium que si les zones à souder ont été grattées à fond, que si l'espace est bien ventilé; si nécessaire portez un respirateur à adduction d'air. Car ces revêtements et tout métal qui contient ces éléments peuvent dégager des fumées toxiques au moment du soudage.

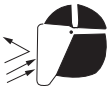


AVERTISSEMENT

LE SOUDAGE PEUT CAUSER UN INCENDIE OU UNE EXPLOSION

L'arc produit des étincellies et des projections. Les particules volantes, le métal chaud, les projections de soudure et l'équipement surchauffé peuvent causer un incendie et des brûlures. Le contact accidentel de l'électrode ou du fil-électrode avec un objet métallique peut provoquer des étincelles, un échauffement ou un incendie.

1. Protégez-vous, ainsi que les autres, contre les étincelles et du métal chaud.
2. Ne soudez pas dans un endroit où des particules volantes ou des projections peuvent atteindre des matériaux inflammables.
3. Enlevez toutes matières inflammables dans un rayon de 10, 7 mètres autour de l'arc, ou couvrez-les soigneusement avec des bâches approuvées.
4. Méfiez-vous des projections brulantes de soudage susceptibles de pénétrer dans des aires adjacentes par de petites ouvertures ou fissures.
5. Méfiez-vous des incendies et gardez un extincteur à portée de la main.
6. N'oubliez pas qu'une soudure réalisée sur un plafond, un plancher, une cloison ou une paroi peut enflammer l'autre côté.
7. Ne soudez pas un récipient fermé, tel un réservoir ou un baril.
8. Connectez le câble de soudage le plus près possible de la zone de soudage pour empêcher le courant de suivre un long parcours inconnu, et prévenir ainsi les risques d'électrocution et d'incendie.
9. Ne dégelez pas les tuyaux avec un source de courant.
10. Otez l'électrode du porte-électrode ou coupez le fil au tube-contact lorsqu'inutilisé après le soudage.
11. Portez des vêtements protecteurs non huileux, tels des gants en cuir, une chemise épaisse, un pantalon revers, des bottines de sécurité et un casque.



AVERTISSEMENT

LES ETINCELLES ET LES PROJECTIONS BRULANTES PEUVENT CAUSER DES BLESSURES.

Le piquage et le meulage produisent des particules métalliques volantes. En refroidissant, la soudure peut projeter du éclats de laitier.

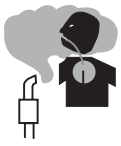
1. Portez un écran facial ou des lunettes protectrices approuvées. Des écrans latéraux sont recommandés.
2. Portez des vêtements appropriés pour protéger la peau.

AVERTISSEMENT

LES BOUTEILLES ENDOMMAGEES PEUVENT EXPLOSER

Les bouteilles contiennent des gaz protecteurs sous haute pression. Des bouteilles endommagées peuvent exploser. Comme les bouteilles font normalement partie du procédé de soudage, traitez-les avec soin.

1. Protégez les bouteilles de gaz comprimé contre les sources de chaleur intense, les chocs et les arcs de soudage.
2. Enchainez verticalement les bouteilles à un support ou à un cadre fixe pour les empêcher de tomber ou d'être renversées.
3. Eloignez les bouteilles de tout circuit électrique ou de tout soudage.
4. Empêchez tout contact entre une bouteille et une électrode de soudage.
5. N'utilisez que des bouteilles de gaz protecteur, des détendeurs, des boyauxs et des raccords conçus pour chaque application spécifique; ces équipements et les pièces connexes doivent être maintenus en bon état.
6. Ne placez pas le visage face à l'ouverture du robinet de la bouteille lors de son ouverture.
7. Laissez en place le chapeau de bouteille sauf si en utilisation ou lorsque raccordé pour utilisation.
8. Lisez et respectez les consignes relatives aux bouteilles de gaz comprimé et aux équipements connexes, ainsi que la publication P-1 de la CGA, identifiée dans la liste de documents ci-dessous.



AVERTISSEMENT

LES MOTEURS PEUVENT ETRE DANGEREUX

LES GAZ D'ECHAPPEMENT DES MOTEURS PEUVENT ETRE MORTELS.

Les moteurs produisent des gaz d'échappement nocifs.

1. Utilisez l'équipement à l'extérieur dans des aires ouvertes et bien ventilées.
2. Si vous utilisez ces équipements dans un endroit confiné, les fumées d'échappement doivent être envoyées à l'extérieur, loin des prises d'air du bâtiment.

AVERTISSEMENT

LE CARBURANT PEUR CAUSER UN INCENDIE OU UNE EXPLOSION.

Le carburant est hautement inflammable.

1. Arrêtez le moteur avant de vérifier le niveau e carburant ou de faire le plein.
2. Ne faites pas le plein en fumant ou proche d'une source d'étincelles ou d'une flamme nue.
3. Si c'est possible, laissez le moteur refroidir avant de faire le plein de carburant ou d'en vérifier le niveau au début du soudage.
4. Ne faites pas le plein de carburant à ras bord: prévoyez de l'espace pour son expansion.
5. Faites attention de ne pas renverser de carburant. Nettoyez tout carburant renversé avant de faire démarrer le moteur.

AVERTISSEMENT

DES PIECES EN MOUVEMENT PEUVENT CAUSER DES BLESSURES.

Des pièces en mouvement, tels des ventilateurs, des rotors et des courroies peuvent couper doigts et mains, ou accrocher des vêtements amples.

1. Assurez-vous que les portes, les panneaux, les capots et les protecteurs soient bien fermés.
2. Avant d'installer ou de connecter un système, arrêtez le moteur.
3. Seules des personnes qualifiées doivent démonter des protecteurs ou des capots pour faire l'entretien ou le dépannage nécessaire.

4. Pour empêcher un démarrage accidentel pendant l'entretien, débranchez le câble d'accumulateur à la borne négative.
5. N'approchez pas les mains ou les cheveux de pièces en mouvement; elles peuvent aussi accrocher des vêtements amples et des outils.
6. Réinstallez les capots ou les protecteurs et fermez les portes après des travaux d'entretien et avant de faire démarrer le moteur.

AVERTISSEMENT

DES ETINCELLES PEUVENT FAIRE EXPLOSER UN ACCUMULATEUR; L'ELECTROLYTE D'UN ACCUMU-LATEUR PEUT BRULER LA PEAU ET LES YEUX.

Les accumulateurs contiennent de l'électrolyte acide et dégagent des vapeurs explosives.

1. Portez toujours un écran facial en travaillant sur un accumu-lateur.
2. Arrêtez le moteur avant de connecter ou de déconnecter des câbles d'accumulateur.
3. N'utilisez que des outils anti-étincelles pour travailler sur un accumulateur.
4. N'utilisez pas une source de courant de soudage pour charger un accumulateur ou survolter momentanément un véhicule.
5. Utilisez la polarité correcte (+ et –) de l'accumulateur.

AVERTISSEMENT

LA VAPEUR ET LE LIQUIDE DE REFROIDISSEMENT BRULANT SOUS PRESSION PEUVENT BRULER LA PEAU ET LES YEUX.

Le liquide de refroidissement d'un radiateur peut être brûlant et sous pression.

1. N'ôtez pas le bouchon de radiateur tant que le moteur n'est pas refroidi.
2. Mettez des gants et posez un torchon sur le bouchon pour l'ôter.
3. Laissez la pression s'échapper avant d'ôter complètement le bouchon.

1.05 PRINCIPALES NORMES DE SECURITE

Safety in Welding and Cutting, norme ANSI Z49.1, American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33128.

Safety and Health Standards, OSHA 29 CFR 1910, Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers That Have Held Hazardous Substances, norme AWS F4.1, American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33128.

National Electrical Code, norme 70 NFPA, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

Safe Handling of Compressed Gases in Cylinders, document P-1, Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202.

Code for Safety in Welding and Cutting, norme CSA W117.2 Association canadienne de normalisation, Standards Sales, 276 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.

Safe Practices for Occupation and Educational Eye and Face Protection, norme ANSI Z87.1, American National Standards Institute, 1430 Broadway, New York, NY 10018.

Cutting and Welding Processes, norme 51B NFPA, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

1.06 LIMITED WARRANTY

LIMITED WARRANTY: Thermal Arc®, Inc., A Thermadyne Company, hereafter, “Thermal Arc” warrants to customers of itsauthorized distributors hereafter “Purchaser” that its products will be free of defects in workmanship or material. Should anyfailure to conform to this warranty appear within the time period applicable to the Thermal Arc products as stated below, Thermal Arc shall, upon notification thereof and substantiation that the product has been stored, installed, operated, and maintained in accordance with Thermal Arc’s specifications, instructions, recommendations and recognized standard industry practice, and not subject to misuse, repair, neglect, alteration, or accident, correct such defects by suitable repair or replacement, at Thermal Arc’s sole option, of any components or parts of the product determined by Thermal Arc to be defective.

THERMAL ARC MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED. THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHERS, INCLUDING, BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

LIMITATION OF LIABILITY: THERMAL ARC SHALL NOT UNDER ANY CIRCUMSTANCES BE LIABLE FOR SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, SUCH AS, BUT NOT LIMITED TO, LOST PROFITS AND BUSINESS INTERRUPTION. The remedies of the Purchaser set forth herein are exclusive and the liability of Thermal Arc with respect to any contract, or anything done in connection therewith such as the performance or breach thereof, or from the manufacture, sale, delivery, resale, or use of any goods covered by or furnished by Thermal Arc whether arising out of contract, negligence, strict tort, or under any warranty, or otherwise, shall not, except as expressly provided herein, exceed the price of the goods upon which such liability is based. No employee, agent, or representative of Thermal Arc is authorized to change this warranty in any way or grant any other warranty.

PURCHASER’S RIGHTS UNDER THIS WARRANTY ARE VOID IF REPLACEMENT PARTS OR ACCESSORIES ARE USED WHICH IN THERMAL ARC’S SOLE JUDGEMENT MAY IMPAIR THE SAFETY OR PERFORMANCE OF ANY THERMAL ARC PRODUCT. PURCHASER’S RIGHTS UNDER THIS WARRANTY ARE VOID IF THE PRODUCT IS SOLD TO PURCHASER BY NON-AUTHORIZED PERSONS.

The warranty is effective for the time stated below beginning on the date that the authorized distributor delivers the products to the Purchaser. Notwithstanding the foregoing, in no event shall the warranty period extend more than the time stated plus one year from the date Thermal Arc delivered the product to the authorized distributor.

POWER SUPPLIES	**ALL OTHER POWER SUPPLIES**	**LABOR**
MAIN POWER MAGNETICS (STATIC & ROTATING)	3 YEARS	3 YEAR
ORIGINAL MAIN POWER RECTIFIER	3 YEARS	3 YEAR
CONTROL PC BOARD	3 YEARS	3 YEAR
ALL OTHER CIRCUITS AND COMPONENTS INCLUDING BUT NOT LIMITED TO: CONTACTORS, RELAYS, SOLENOIDS, PUMPS, POWER SWITCHING SEMI-CONDUCTORS.	1 YEAR	1 YEAR
ENGINES: ENGINES ARE NOT WARRANTED BY THERMAL ARC, ALTHOUGH MOST ARE WARRANTED BY THE ENGINE MANUFACTURER. SEE THE ENGINE MANUFACTURE'S WARRANTY FOR DETAILS.	1 YEAR	1 YEAR
CONSOLES, CONTROL EQUIPMENT, HEAT EXCHANGES		
ACCESSORY EQUIPMENT		

NOTE: Dragster 85® excluded from this policy. Refer to Dragster 85 warranty in Dragster 85 Owner’s Manual.

Warranty repairs or replacement claims under this limited warranty must be submitted to Thermal Arc by an authorized Thermal Arc repair facility within thirty (30) days of purchaser’s notice of any Warranty Claim. No transportation costs of any kind will be paid under this warranty. Transportation charges to send products to an authorized warranty repair facility shall be the responsibility of the Purchaser. All returned goods shall be at the Purchaser’s risk and expense. This warranty supersedes all previous Thermal Arc warranties. Thermal Arc® is a Registered Trademark of Thermadyne Industries Inc.

September 27, 2004

SECTION 2: INTRODUCTION

2.01 Scope of Manual

This manual provides service instructions for theThermal Arc® 300TSW Inverter Arc Welder. Information in this edition is particularly applicable to the troubleshooting and repair of the equipment. For information on operating procedures, please refer to the 300TSW Inverter Arc Welder Operating Manual (430429-511).

NOTE

Service of this equipment is restricted to properly trained service technicians familiar with this equipment; unqualified personnel are strictly cautioned against attempting repairs or adjustments not covered in this manual, at the risk of voiding the warranty.

Read both this manual and the Operating Manual thoroughly. A complete understanding of the capabilities and functions of the equipment will assure obtaining the performance for which it was designed.

WARNING

There are extremely dangerous voltage and power levels present inside this unit. Do not attempt to diagnose or repair unless you have had training in high power electronics measurement and troubleshooting.

2.02 General Service Philosophy

Several key points are essential to properly support the application and operation of this equipment.

A. Application

Confirm that the equipment is capable of handling the application desired. Specifications supplied and described in Subsection 3 of this manual.

B. Modifications

No physical or electrical modifications other than selection of standard options and accessories are to be made to this equipment.

C. Customer/Operator Responsibilities

It is the customer/operator's responsibility to maintain the equipment and peripheral accessories provided by Thermal Dynamics in good operating order in accordance with the procedures outlined in the Operating Manual, and to protect the equipment from accidental or malicious damage.

D. Repair Restrictions

The electronics consists of printed circuit board assemblies which must be carefully handled, and must be replaced as units. No replacement of printed circuit solder-mounted components is allowed except as noted in this manual.

If the Printed Circuit Board is to be returned, the replaced Printed Circuit Board Assemblies must be properly packaged in protective material and returned intact per normal procedures.

2.03 Service Responsibilities

The Service Technician should be familiar with the equipment and its capabilities and should be prepared to recommend arrangements of components which will provide the most efficient layout, utilizing the equipment to its best possible advantage.

Maintenance work should be accomplished in a timely manner. If problems are encountered, or the equipment does not function as specified, contact:

Thermadyne, Inc.

Thermal Arc Technical Service Department

82 Benning Street

West Lebanon, New Hampshire, USA 03784

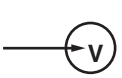
(603) 298-5711

http://www.thermadyne.com/tai

2.04 Symbol Chart

Note that only some of these symbols will appear on your model.

	On
	Off
	Dangerous Voltage
	Increase/Decrease
	Circuit Breaker
	AC Auxiliary Power
	Fuse
	Amperage
	Voltage
	Hertz (cycles/sec)
	Frequency
	Negative
	Positive
	Direct Current (DC)
	Protective Earth (Ground)
	Line
	Line Connection
	Auxiliary Power
 115V 15A	Receptacle Rating- Auxiliary Power

	Single Phase
	Three Phase
	Three Phase Static Frequency Converter-Transformer-Rectifier
	Remote
	Duty Cycle
	Percentage
	Panel/Local
	Shielded Metal Arc Welding (SMAW)
	Gas Metal Arc Welding (GMAW)
	Gas Tungsten Arc Welding (GTAW)
	Air Carbon Arc Cutting (CAC-A)
	Constant Current
	Constant Voltage Or Constant Potential
	High Temperature
	Fault Indication
	Arc Force
	Touch Start (GTAW)
	Variable Inductance
 V	Voltage Input

	Wire Feed Function
	Wire Feed Towards Workpiece With Output Voltage Off.
	Welding Gun
	Purging Of Gas
	Continuous Weld Mode
	Spot Weld Mode
t	Spot Time
t1	Preflow Time
t2	Postflow Time
	2 Step Trigger Operation Press to initiate wirefeed and welding, release to stop.
	4 Step Trigger Operation Press and hold for preflow, release to start arc. Press to stop arc, and hold for preflow.
t	Burnback Time
	Disturbance In Ground System
IPM	Inches Per Minute
MPM	Meters Per Minute

Art # A-04130

2.05 Description

The Thermal Arc™ Model 300TSW is a single/three-phase AC/DC arc welding power sources with Constant Current (CC) output characteristics. This unit is equipped with a Digital Volt/Amperage Meter, gas control valve, built in Sloper and Pulser, lift arc starter, and high-frequency arc starter for use with Gas Tungsten Arc Welding (GTAW), Gas Tungsten Arc Welding-Pulsed (GTAW-P) Gas Tungsten Arc Welding-Sloped (GTAW-S), and Shielded Metal Arc Welding (SMAW) processes. The source is totally enclosed in an impact resistant, flame resistant and non-conductive plastic case.

Note

Volt-Ampere curves show the maximum Voltage and Amperage output capabilities of the welding power source. Curves of other settings will fall between the curves shown.

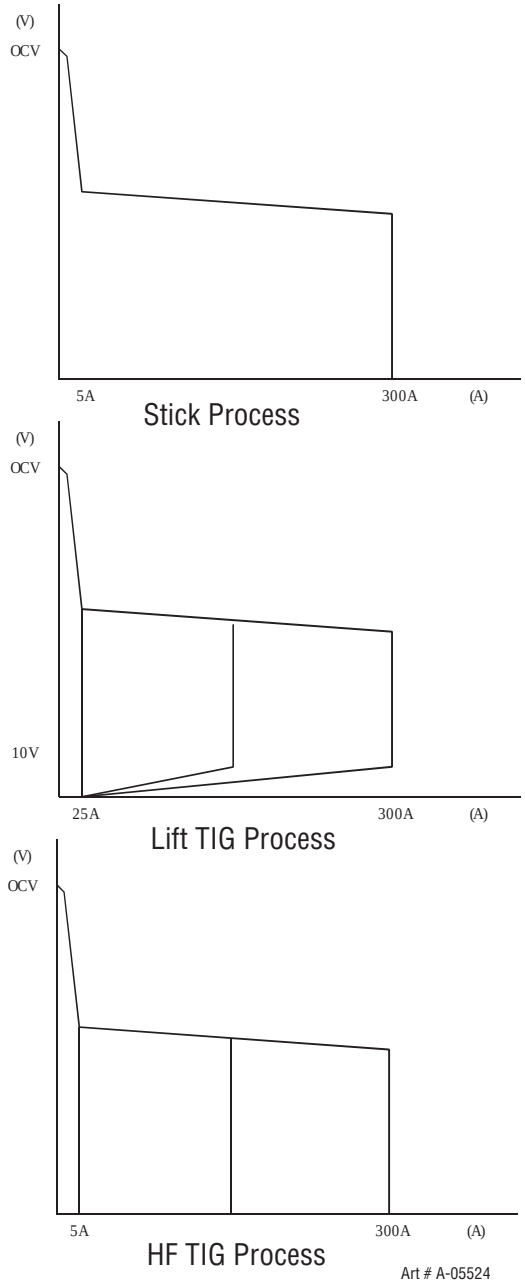


Figure 2-1: Model 300TSW volt-ampere curve

2.06 Functional Block Diagrams

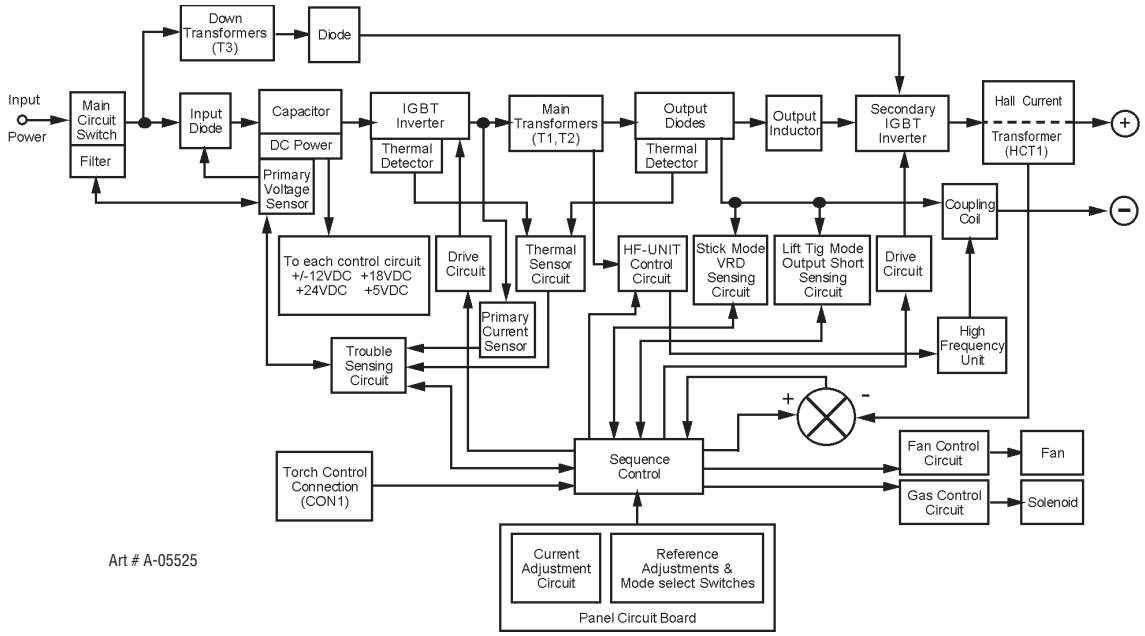


Figure 2-2: Functional Block Diagram

2.07 Transporting Methods

These units are equipped with a handle for carrying purposes.

WARNING

ELECTRIC SHOCK can kill. DO NOT TOUCH live electrical parts. Disconnect input power conductors from de-energized supply line before moving the welding power source.

WARNING

FALLING EQUIPMENT can cause serious personal injury and equipment damage.

Lift unit with handle on top of case.

Use handcart or similar device of adequate capacity.

If using a fork lift vehicle, place and secure unit on a proper skid before transporting.

2.08 High Frequency Introduction

The importance of correct installation of high frequency welding equipment cannot be overemphasized. Interference due to high frequency initiated or stabilized arc is almost invariably traced to improper installation. The following information is intended as a guide for personnel nstalling high frequency welding machines.

Warning: Explosives

The high frequency section of this machine has an output similar to a radio transmitter. The machine should NOT be used in the vicinity of blasting operations due to the danger of premature firing.

Warning: Computers

It is also possible that operation close to computer installations may cause computer malfunction.

2.09 High Frequency Interference

Interference may be transmitted by a high frequency initiated or stabilized arc-welding

machine in the following ways:

1. Direct Radiation

   Radiation from the machine can occur if the case is metal and is not properly grounded. It can occur through apertures such as open access panels. The shielding of the high frequency unit in the Power Source will prevent direct radiation if the equipment is properly grounded.

2. Transmission via the Supply Lead

   Without adequate shielding and filtering, high frequency energy may be fed to the wiring within the installation (mains) by direct coupling. The energy is then transmitted by both radiation and conduction. Adequate shielding and filtering is provided in the Power Source.

3. Radiation from Welding Leads

   Radiated interference from welding leads, although pronounced in the vicinity of the leads, diminishes rapidly with distance. Keeping leads as short as possible will minimize this type of interference. Looping and suspending of leads should be avoided where possible.

4. Re-radiation from Unearthed Metallic Objects

   A major factor contributing to interference is re-radiation from unearthed metallic objects close to the welding leads. Effective grounding of such objects will prevent re-radiation in most cases.

2.10 Specifications

Description (See NOTE)	**300TSW**
Power Source Part Number	700723
Plant Part Number	N/A
Cooling	Fan Cooled with Intelligent Operation
Welder Type & Welding process	Heavy Duty Inverter; AC/DC GTAW (TIG) & MMAW (Stick)
Welding Power Source mass	27kg
Dimensions	H420mm x W210mm x D450mm
Designed to European Standard	IEC 60974-1
Number of Phases	Three Phase
Nominal Supply Voltage	415V ±10%
Nominal Supply Frequency	50/60Hz
Mains Fuse& Circuitto suit factory fitted Lead that will achieve the following rated weld current/weld process: GTAW Current & Duty Cycle MMAW Current & Duty Cycle	 *22A/Phase 300A @ 25% 300A @ 25%
Maximum TIG Current & Duty Cycle	300A @ 25%
Maximum MMAW Current & Duty Cycle	300A @ 25%
GTAW Welding Current @ 100% Duty Cycle	160A
MMAW Welding Current @ 100% Duty Cycle	160A
Effective Input Current for Max Welding Current @	11A/Phase
Maximum Input Current for Max Welding Current	22A/Phase
Maximum Input Current for Short Circuit	22A/Phase
Single Phase Generator Requirement	**16kVA
Flexible Supply Cable Size Factory Fitted	25A Heavy Duty
Thermal Protection	Thermal Sensors
TIG Welding Current Range	10 – 300A (AC) 5 – 300A (DC)
Stick Welding Current Range	10 – 300A (AC) 5 – 300A (DC)
Nominal Open Circuit Voltage (OCV)	62V

2.11 Electrical Parameters For 300TSW

Check Open Circuit condition, at 415V and maximum output, to be within the following limits:

Set Weld Mode to Stick

Output Voltage	62 ± 2V
Input Current	2 ± 1 A

Enable VRD Set Weld Mode to Stick and, check VRD operation parameters

VRD green ON light is illuminated	Green VRD light is ON
Output Voltage	18V +10% -15%
When 200 Ohms is connected between welding terminals the inverter remains OFF	Green VRD light is ON
With the weld current set to 50A, momentarily short circuited	Red VRD light is ON
Inverter turn off time	0.2-0.3 seconds

Set Weld Mode to Lift TIG; check at 415V and 5A output, to be within the following limits by shorting pin A & B in the 14 pin socket:

Output terminal short circuited, Output Current	26 ± 4 A

Set Weld Mode to DC LIFT TIG in STD mode; check Maximum output condition, at 415V and maximum output, to be within the following limits:

Output Current	300 ± 10 A
Output Voltage	22V
Input Current	15 ± 4 A

Set Weld Mode to AC Stick, check Maximum output condition, at 415V and maximum output, to be within the following limits:

Output Current	300 ± 10 A
Output Voltage	32V
Input Current	22 ± 4 A

Cooling Fan Operation:

When the Power Source is first switched on there is approximately an 8 second delay before the Cooling Fan begins to operate. After approx 30 seconds the Cooling Fan will reduce to half speed.

2.12 Duty Cycle

The duty cycle of a welding power source is the percentage of a ten (10) minute period that it can be operated at a given output without causing overheating and damage to the unit. If the welding amperes decrease, the duty cycle increases. If the welding amperes are increased beyond the rated output, the duty cycle will decrease.

WARNING

Exceeding the duty cycle ratings will cause the thermal overload protection circuit to become energized and shut down the output until the unit has cooled to normal operating temperature.

CAUTION

Continually exceeding the duty cycle ratings can cause damage to the welding power source and will void the manufactures warranty.

NOTE

Due to variations that can occur in manufactured products, claimed performance, voltages, ratings, all capacities, measurements, dimensions and weights quoted are approximate only. Achievable capacities and ratings in use and operation will depend upon correct installation, use, applications, maintenance and service.

SECTION 3: INSTALLATION

3.01 Environment

The Pro-Wave 300TSW is designed for use in hazardous environments.

Examples of environments with increased hazardous environments are -

a. In locations in which freedom of movement is restricted, so that the operator is forced to perform the work in a cramped (kneeling, sitting or lying) position with physical contact with conductive parts;

b. In locations which are fully or partially limited by conductive elements, and in which there is a high risk of unavoidable or accidental contact by the operator, or

c. In wet or damp hot locations where humidity or perspiration considerably reduces the skin resistance of the human body and the insulation properties of accessories.

Environments with hazardous environments do not include places where electrically conductive parts in the near vicinity of the operator, which can cause increased hazard, have been insulated.

3.02 Location

Be sure to locate the welder according to the following guidelines:

- In areas, free from moisture and dust.
- Ambient temperature between 0 degrees C to 40 degrees C.
- In areas, free from oil, steam and corrosive gases.
- In areas, not subjected to abnormal vibration or shock.
- In areas, not exposed to direct sunlight or rain.
- *Place at a distance of 12" (304.79mm) or* more from walls or similar that could restrict natural airflow for cooling.

WARNING

Thermal Arc advises that this equipment be electrically connected by a qualified electrician.

3.03 Electrical Input Connections

WARNING

ELECTRIC SHOCK can kill; SIGNIFICANT DC VOLTAGE is present after removal of nput power.

DO NOT TOUCH live electrical parts.

SHUT DOWN welding power source, disconnect input power employing lockout/tagging procedures. Lockout/ tagging procedures consist of padlocking line disconnect switch in openposition, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

3.04 Electrical Input Requirements

Operate the welding power source from a single or three-phase 50/60 Hz, AC power supply. The input voltage must match one of the electrical input voltages shown on the input data label on the unit nameplate. Contact the local electric utility for information about the type of electrical service available, how proper connections should be made, and inspection required.

The line disconnect switch provides a safe and convenient means to completely remove all electrical power from the welding power supply whenever necessary to inspect or service the unit.

NOTE

These units are equipped with a three-conductor with earth power cable that is connected at the welding power source end for single or three-phase electrical input power.

Do not connect an input (WHITE, BLACK or RED) conductor to the ground terminal.

Do not connect the ground (GREEN) conductor to an input line terminal.

Refer to figure 3 and:

1. Connect end of ground (GREEN) conductor to a suitable ground. Use a grounding method that complies with all applicable electrical codes.
2. Connect ends of line 1 (BLACK) and line 2 (WHITE) and line 3 (RED) input conductors to a deenergized ine disconnect switch.
3. Use Table 1 and Table 2 as a guide to select line fuses for the disconnect switch.

NOTE:

For Single-Phase operation, connect the GREEN, BLACK and WHITE input conductors. Insolate the RED Conductor, it is not used for Single-phase operation.

Input Voltage	Fuse Size
208 VAC	100 Amps
230 VAC	90 Amps
460 VAC	25 Amps

Table 3-1: Electrical Input Connections

NOTE:

Fuse size is based on not more than 200 percent of the rated input amperage of the welding power source (Based on Article 630, National Electrical Code).

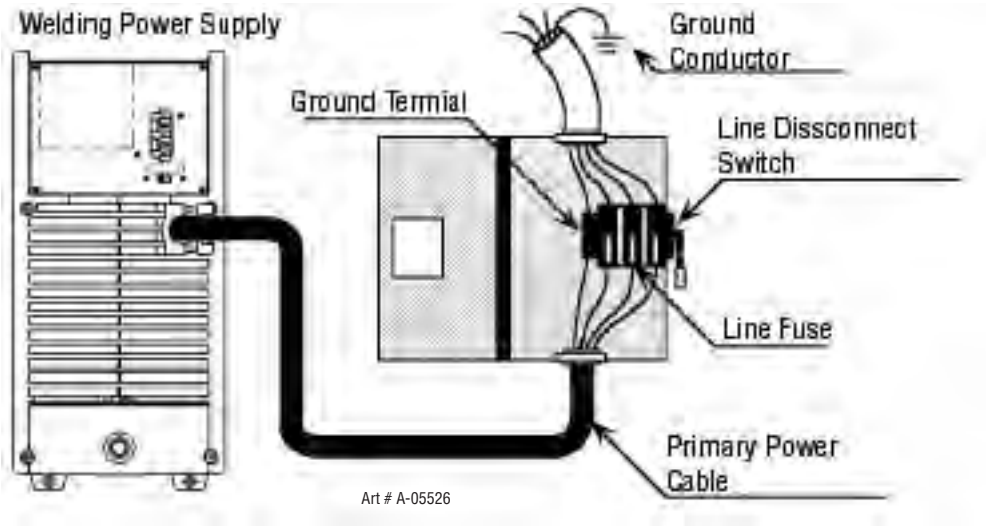


Figure 3-1 Electrical Input Connections

3.05 Input Power

Each unit incorporates an INRUSH circuit and input voltage sensing circuit. When the MAIN SWITCH is turned on, the inrush circuit provides a pre-charging of the input capacitors. SCR's in the Power Control Assembly (PCA) will turn on after the input capacitors have charged to full operating voltage (after approximately 5 seconds).

NOTE

Note the available input power. Damage to the PCA could occur if 575VAC or higher is applied.

The Following Primary Current Recommendations are required to obtain the maximum welding current and duty cycle from this welding equipment.

<table>
<tr><th rowspan="2">Model</th><th rowspan="2">Primary Supply Lead Size</th><th colspan="2" rowspan="2">Minimum Primary Current Circuit Size (Vin/Amps)</th><th colspan="2">Current & Duty Cycle</th></tr>
<tr><th>TIG</th><th>STICK</th></tr>
<tr><td rowspan="9">PRO-WAVE 300TSW</td><td rowspan="5">8/4 AWG minimum (Factory Fitted)</td><td rowspan="5">3 Phase</td><td>208/31</td><td rowspan="3">300A @ 25%</td><td>-</td></tr>
<tr><td>230/28</td><td>-</td></tr>
<tr><td>460/14</td><td>-</td></tr>
<tr><td>208/47</td><td>-</td><td rowspan="2">300A @ 25%</td></tr>
<tr><td>230/43</td><td>-</td></tr>
<tr><td rowspan="4">8/3 AWG minimum</td><td rowspan="4">1 Phase</td><td>208/67</td><td rowspan="2">300A @ 25%</td><td>-</td></tr>
<tr><td>230/60</td><td>-</td></tr>
<tr><td>208/96</td><td>-</td><td rowspan="2">300A @ 25%</td></tr>
<tr><td>230/87</td><td>-</td></tr>
</table>

Table 3-2: Primary Current Circuit sizes to achieve maximum current

SECTION 4:
OPERATOR CONTROLS

4.01 Pro-Wave 300TSW Controls

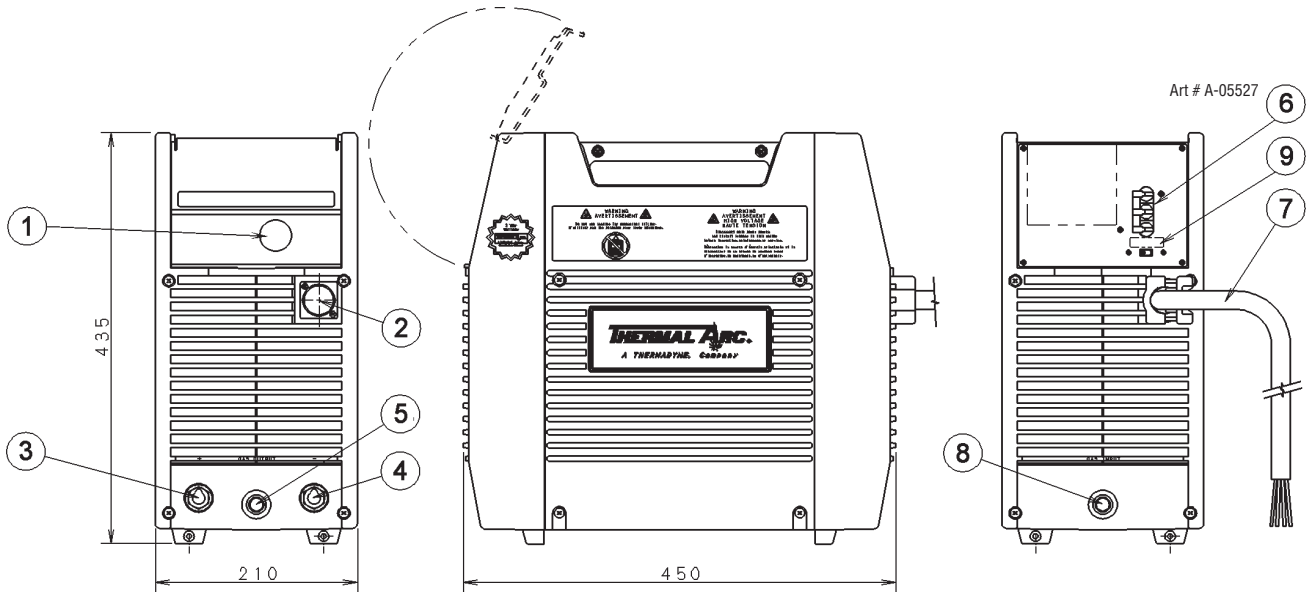


Figure 4-1: Pro-Wave 300TSW Power Source

1. **Control Knob***:* This control sets the selected weld parameter, rotating it clockwise increases the parameter and is indicated on the digital meter. Pushing the knob in previews the actual welding voltage while welding.
2. **Remote Control Socket***:* The 14 pin Remote Control Socket is used to connect remote current control devices to the welding Power Source. To make connections, align keyway, insert plug, and rotate threaded collar fully clockwise.

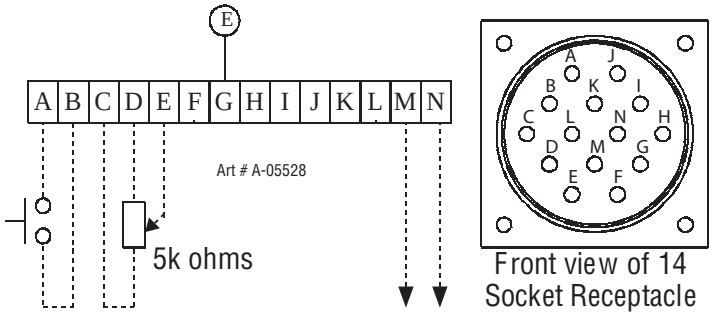


Figure 4-2: Front view of 14 Socket Receptacle

Socket Pin	Function
A	Torch Switch Input (24V) to energize weld current. (connect pins A & B to turn on welding current)
B	Torch Switch Input (0V) to energize weld current (connect pins A & B to turn on welding current)
C	5k ohm (maximum) connection to 5k ohm remote control
D	Zero ohm (minimum) connection to 5k ohm remote control
E	Wiper arm connection to 5k ohm remote control potentiometer
G	Mains Earth
F,H,I,J,K,L	Not Used
M	OK to move current detect signal for robotics applications
N	OK to move current detect signal for robotics applications

Table 4-1: 14 Socket Receptacle Socket Pin Index

3. **Positive Terminal***:* Welding current flows from the Power Source via heavy duty Dinse type terminal. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.
4. **Negative Terminal***:* Welding current flows from the Power Source via heavy duty Dinse type terminal. It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

CAUTION

Loose welding terminal connections can cause overheating and result in the male plug being fused in the bayonet terminal and/or melting of the housing (case).

5. **Gas Outlet:** The Gas Outlet is a 5/8 18 UNF female gas fitting.
6. **ON/OFF Switch:** This switch connects the Primary supply voltage to the inverter when in the ON position. This enables the Power Supply.

WARNING

When the welder is connected to the Primary supply voltage, the internal electrical components maybe at 500V potential with respect to earth.

7. **Input Cable***:* The input cable connects the Primary supply voltage to the equipment.
8. **Gas Inlet***:* The Gas Inlet is a 5/8 18 UNF female gas fitting.

4.02 Weld Process selection for Pro-Wave 300TSW

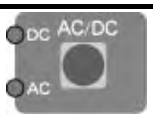
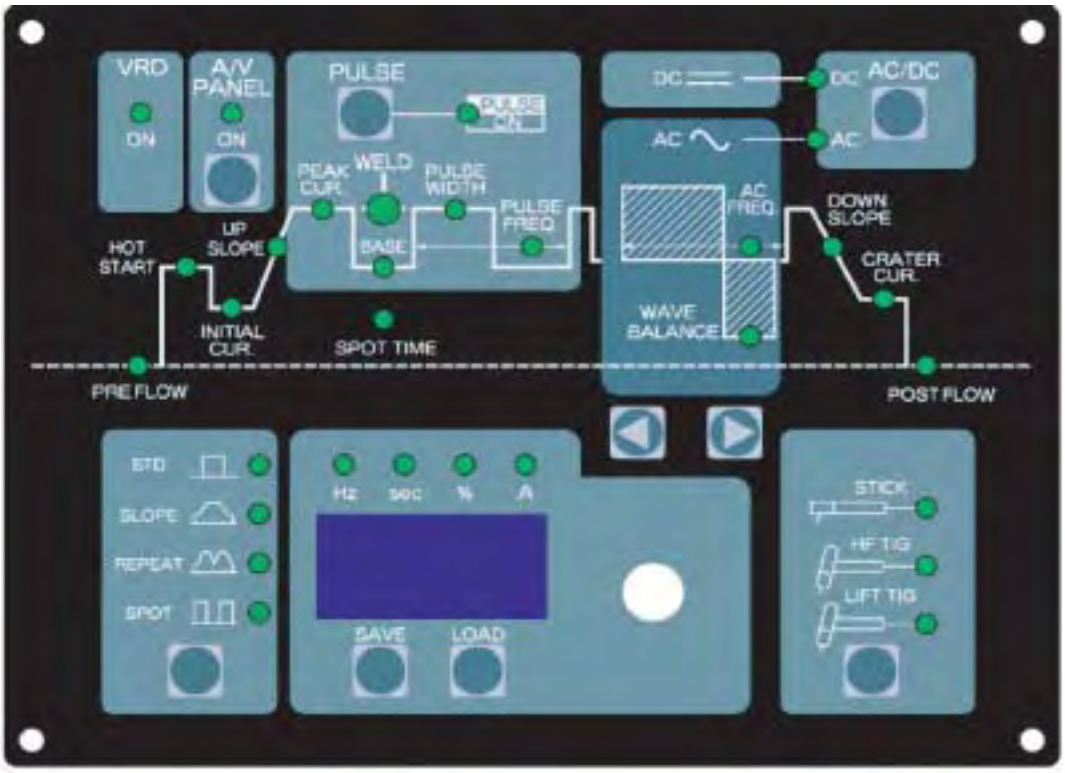
	Weld Mode			
Weld Process Selection	**STICK**	**HF TIG**	**LIFT TIG**	**Description**
 *STD*	Yes	Yes	Yes	2T operation in TIG Modes using remote devices to control contactor & current
 *SLOPE*	No	Yes	Yes	4T operation in TIG Modes with crater fill using a remote contactor device to control sequence.
 *REPEAT*	No	Yes	Yes	4T operation in TIG Modes with repeat operation and crater fill using a remote contactor device.
 *SPOT*	No	Yes	No	2T operation spot welding in HF TIG using a remote contactor device.
 *PULSE* ON/OFF	No	Yes	Yes	Pulse operation in TIG Modes
	Yes	Yes	Yes	Selects AC or DC weld current

Table 4-2: Weld selection versus weld mode for Pro-Wave 300TSW

4.03 Weld Parameter Descriptions for Pro-Wave 300TSW

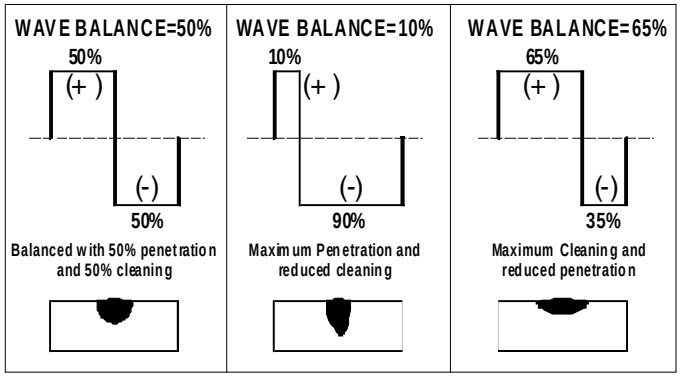
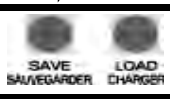


Art # A-05529

Figure 4-3: Pro-Wave 300TSW Front Panel

Parameter	Description
 *PRE-FLOW*	This parameter operates in TIG modes only and is used to get gas to the weld zone prior to striking the arc, once the torch trigger switch has been pressed. This control is used to dramatically reduce weld porosity at the start of a weld.
HOT START	This parameter operates in all weld modes except Lift TIG mode and is used to heat up the weld zone in TIG modes or improve the start characteristics for stick electrodes. e.g. low hydrogen electrodes. It sets the peak start current on top of the *BASE (WELD)* current. e.g. *HOT START* current = 130 amps when *BASE (WELD)* = 100 amps & *HOT START* = 30 amps
INITIAL CUR.	This parameter operates in *SLOPE* or *REPEAT* (4T) TIG modes only and is used to set the start current for TIG. The Start Current remains on until the torch trigger switch is released after it has been depressed.
UP SLOPE	This parameter operates in TIG modes only and is used to set the time for the weld current to ramp up, after the torch trigger switch has been pressed then released, from INITIAL CUR to PEAK or BASE current.
PEAK CUR.	This parameter sets the PEAK weld current when in *PULSE* mode
WELD	This parameter sets the TIG WELD current in *STD*, *SLOPE*, *REPEAT* and *SPOT* modes when *PULSE* is off. This parameter also sets the STICK weld current.

Table 4-3: Weld Paramerter Descriptions

Parameter	Description
BASE (Background Current)	This parameter sets the Background current when in Pulse TIG mode.
SPOT TIME	This parameter sets the duration of the *SPOT TIME* in *HF TIG* mode only
PULSE WIDTH	This parameter sets the percentage on time of the *PULSE FREQUENCY* for PEAK weld current when the *PULSE* is on.
PULSE FREQ.	This parameter sets the *PULSE FREQUENCY* when the *PULSE* is on.
AC FREQUENCY	This parameter operates in AC mode only and is used to set the frequency for the AC weld current.
WAVE BALANCE	This parameter is used for aluminum AC TIG mode and is used to set the penetration to cleaning action for the AC weld current. Generally *WAVE BALANCE* is set to 50% for AC *STICK* welding. The *WAVE BALANCE* control changes the ratio of penetration to cleaning action of the AC TIG welding arc. Maximum weld penetration is achieved when the *WAVE BALANCE* control is set to 10%. Maximum cleaning of heavily oxidised aluminium or magnesium alloys is achieved when the *WAVE BALANCE* control is set to 65%. 
DOWN SLOPE	This parameter operates in TIG modes only and is used to set the time for the weld current to ramp down, after the torch trigger switch has been pressed, to *CRATER CUR.* This control is used to eliminate the crater that can form at the completion of a weld.
CRATER CUR.	This parameter operates in *SLOPE* or *REPEAT* (4T) TIG modes only and is used to set the finish current for TIG. The CRATER Current remains on until the torch trigger switch is released after it has been depressed.
POST-FLOW 	This parameter operates in TIG modes only and is used to adjust the post gas flow time once the arc has extinguished. This control is used to dramatically reduce oxidation of the tungsten electrode.
	The SAVE/LOAD buttons are used to save and retrieve a total number of 5 programs into the 300TSW memory.

4.04 Weld Parameters for Pro-Wave 300TSW

Weld Parameter	Parameter Range	Factory Setting	Incremental Unit	Weld Mode		
				STICK	HF TIG	LIFT TIG
PRE-FLOW	0.0 to 1.0 sec	0.1 sec	0.1 sec	No	Yes	Yes
HOT START	0 to 70A	20A	1A	Yes	Yes	No
INITIAL CUR.	5 to 300A	30A	1A	No	Yes	Yes
UP SLOPE	0 to 15 sec	1 sec	0.1 sec	No	Yes	Yes
PEAK CUR.	5 to 300A	120A	1A	No	Yes	Yes
WELD CUR (TIG)	5 to 300A	80A	1A	No	Yes	Yes
WELD CUR (STICK)	5 to 300A	80A	1A	Yes	No	No
SPOT TIME	0.5 to 5.0 sec	2 sec	0.1 sec	No	Yes	Yes
PULSE WIDTH	15 to 80%	50%	1%	No	Yes	Yes
PULSE FREQ.	0.5 to 500Hz	100.0Hz	See Table 6	No	Yes	Yes
AC FREQUENCY	15 to 150Hz	50Hz	1Hz	Yes	Yes	Yes
WAVE BALANCE	10 to 65%	50%	1%	Yes	Yes	Yes
DOWN SLOPE	0 to 25 sec	3 sec	0.1 sec	No	Yes	Yes
CRATER CUR.	5 to 300A	30A	1A	No	Yes	Yes
POST-FLOW	0.0 to 60 sec	10 sec	0.1 sec	No	Yes	Yes

Table 4-4: Weld Parameters for Pro-Wave 300TSW

***PULSE FREQ.* Range**	**Incremental Unit**
0.5 to 20Hz	0.1Hz
20 to 100Hz	1Hz
100 to 500Hz	5Hz

Table 4-5: PULSE FREQ. Range and Incremental Units

4.05 Power Source Features

Feature	Description
New Digital Control	• Almost all welding parameters are adjustable.
Touch Panel Switches	• Touch switches eliminate mechanical damage.
Front Control Cover	• Protects front panel controls.
Digital Meter	• Displays selected weld parameter value. • Displays weld current when welding. • Displays weld current for 20 seconds after weld has been completed. • A selected weld parameter value can be adjusted at any time even while welding.
Intelligent Fan Control	• The intelligent cooling system is designed to reduce dust and foreign material build-up, whilst providing optimum cooling. • Fan speed reduces approximately 30 seconds after machine is turned on. • Fan speed increases when internal components reaches operating temperature.
ON/OFF switch	• Primary voltage Supply ON/OFF switch located on rear panel.
Voltage Reduction Device (VRD)	• Reduces the OCV when the power supply is not in use. Eliminates the need for add on voltage reducers and has no effect on arc starting. • VRD fully complies to IEC 60974-1 • When Stick mode is selected the green VRD light is ON when not welding and red when welding. • When in TIG modes VRD is off
Control Knob	• For the selected weld parameter, rotating the knob clockwise increases the parameter. • Rotating the knob counterclockwise decreases the parameter. • A selected weld parameter value can be adjusted at any time even while welding. • Pushing the knob in displays actual arc voltage.
Self Diagnosis Using Error Codes	• An error code is displayed on the *Digital Meter* when a problem occurs with Primary supply voltage or internal component problems. Refer to troubleshooting guide.

Table 4-6: Power Source Features

Feature	Description
Save/Load function	• A total number of 5 programs can be saved into the 300TSW memory. ***SAVE* the Current Weld Parameters into Memory** • Press the *SAVE* button • Select a memory location by rotating the control knob, 1 to 5 is displayed on the meter. • After selecting the desired memory location (ie 1 to 5), press the right scroll button and the machine will give a beep to confirm the weld parameters from the control panel are saved. ***LOAD* (retrieve) a Program to Control Panel** • Press the *LOAD* button. • Select a memory location by rotating the control knob, 1 to 5 is displayed on the meter. • After selecting the desired memory location (ie 1 to 5), press the right scroll button and the machine will give a beep to confirm the weld parameters are loaded onto the control panel.

4.06 SET-UP FOR SMAW (STICK) AND GTAW (TIG)

Conventional operating procedures apply when using the Welding Power Source, i.e. connect work lead directly to work piece and electrode lead is used to hold electrode. Wide safety margins provided by the coil design ensure that the Welding Power Source will withstand short-term overload without adverse effects. The welding current range values should be used as a guide only. Current delivered to the arc is dependent on the welding arc voltage, and as welding arc voltage varies between different classes of electrodes, welding current at any one setting would vary according to the type of electrode in use. The operator should use the welding current range values as a guide, then finally adjust the current setting to suit the application.

WARNING

Before connecting the work clamp to the work and inserting the electrode in the electrode holder make sure the Primary power supply is switched off.

CAUTION

Remove any packaging material prior to use. Do not block the air vents at the front or rear or sides of the Welding Power Source.

CAUTION

DO NOT change the Weld Mode or Weld Process Mode until after POST-FLOW time has finished.

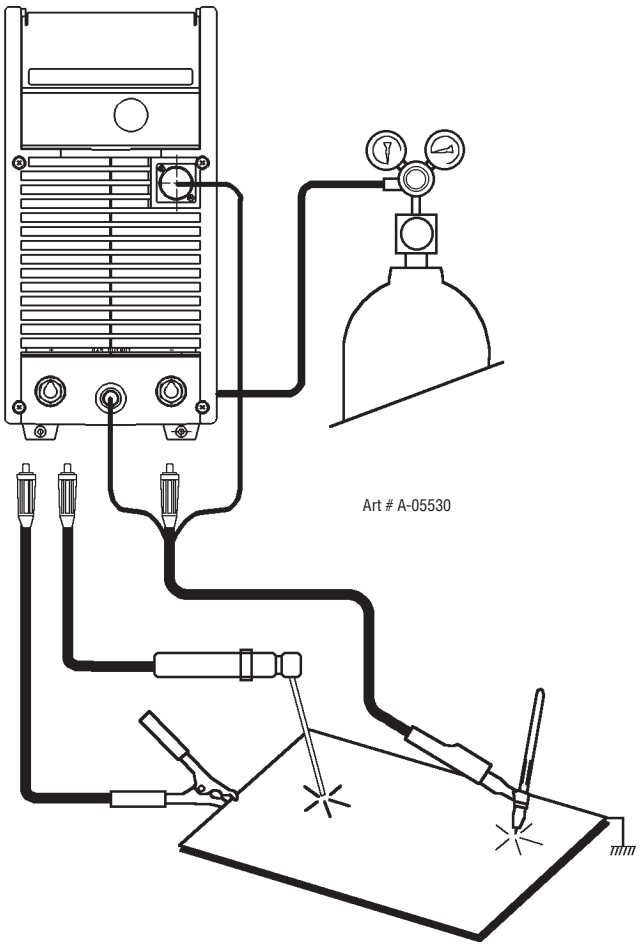


Figure 4-4: 300TSW AC/DC Set-up

4.07 Sequence of Operation

Art # A-05531

NOTE

Scroll Buttons are used to select the parameters to be set. The LED's show which function is being adjusted on the weld sequence graph. Refer to Symbols Table located in the front of the manual for Symbol descriptions.

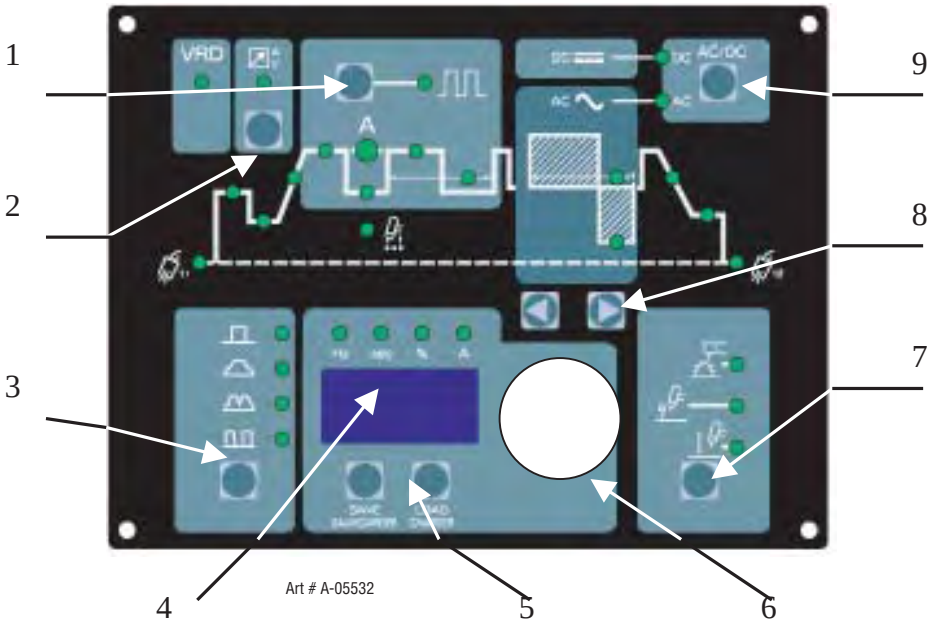


Figure 4-5: 300TSW Front Panel

1. Pulse function – Pressing this button enables the TIG current pulse functions.
2. Remote Current function – Pressing this buttons enables remote current functions.
3. TIG Mode Functions – Pressing this button scrolls through the output TIG function modes (Standard, Slope, Slope w/repeat, Spot).
4. Digital LED display – Welding amperage and parameter values are displayed in this window. Internal warnings such as over temperature, low or high input voltage applied are signaled to the operator by a warning sound and error message on the screen.
5. Save/Load Buttons – by using the Save & Load buttons the operator can easily save up to 5 welding parameter programs.
6. Control knob – allows the operator to adjust the output amperage within the entire range of the power source and sets each parameter value.
7. Process Button – This button selects between STICK, HF TIG and Lift TIG mode.
8. Scroll Buttons – used to select the parameters to be set. The LED's show which function is being adjusted on the Sequence Graph.
9. AC/DC Button – Selects between AC or DC welding output.

A. Stick Welding

· Connect work lead to negative terminal

· Connect electrode lead to positive terminal

· Switch machine on

· Set *AC* or *DC* weld current. If *AC* is selected then set *AC FREQ* to 60Hz & *WAVE BALANCE* to 50%.

· Connect remote control device if required

Use the Scroll Buttons to move to the parameter to be set. The LED will show which function is being adjusted on the weld sequence graph. Use the control knob to adjust each parameter.

· Set *HOT START*

· Set *WELD* current

Commence welding

B. AC or DC HF TIG Welding

Connect work lead to positive terminal

· Connect TIG torch to negative terminal

· Switch machine on

· Set *AC* or *DC* weld current. If *AC* is selected then set *AC FREQ* & *WAVE BALANCE*

· Connect a remote control device. A remote control device is required for use during LIFT TIG and HF TIG operation. See section 4.01, section 2 "*Remote Control Socket",* for complete details of the remote device.

Use the Scroll Buttons to move to the parameter to be set. The LED will show which function is being adjusted on the weld sequence graph. Use the control knob to adjust each parameter.

· Set *PRE-FLOW* time

· Set *HOT START* current

· Set *POST-FLOW* time

· Set *WELD* current

· Set *POST-FLOW* time

Slope Mode Parameters if required

· Set *INTIAL CUR* current

· Set *UP SLOPE* time

· Set (WELD) *PEAK CUR* current

· Set *BASE* current

· Set *DOWN SLOPE* time

· Set *CRATER CUR* current

Pulse Mode parameters if required

· Set *PULSE WIDTH* % for *PEAK CURRENT*

· *Set PEAK CURRENT*

· Set *PULSE FREQ*

Commence welding

C. Save-Load Operation

A total number of 5 programs can be saved into the 300TSW memory

SAVE the Current Weld Parameters into Memory

· Press the *SAVE* button

· Select a memory location by rotating the control knob, 1 to 5 is displayed on the meter

· After selecting the desired memory location (ie 1 to 5), press the right scroll button and the machine will give a beep to confirm the weld parameters from the control panel are saved.

LOAD (retrieve) a Program to Control Panel

· Press the LOAD button

· Select a memory location by rotating the control knob, 1 to 5 is displayed on the meter After selecting the desired memory location (ie 1 to 5), press the right scroll button and the machine give a beep to confirm the weld parameters are loaded onto the control panel

D. Slope Mode Sequence

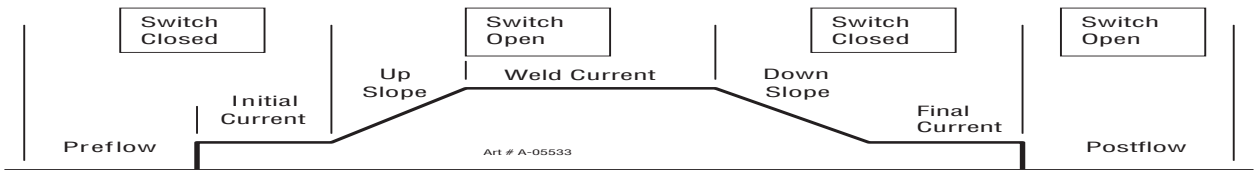


Figure 4-6: Slope Mode Sequence

NOTE

Slope function operates with a Remote ON/OFF device only.

1) To start Slope sequence Close remote switch contacts. Once the welding arc is established the Power Source will maintain initial current setting as long as the remote switch contacts areclosed.

    a) In the HF TIG mode, after Preflow time High Frequency is present at the torch. When the torch is positioned close to the work the welding current will transfer to the work and establish the arc at the initial current setting.

    b) In the Lift TIG mode, after preflow time Lift Start current is present at the torch. When the electrode is touched to the work and lifted off, the welding arc is established at the initial current setting.

2) Open Remote Switch – current increases to weld current. Once welding arc has reached weld current the power source will maintain weld current as long as the remote switch contacts areopen.

3) Close Remote Switch – Welding current decreases to final current setting. Once final weldingcurrent is reached the power source will maintain final current setting as long as the remote switch contacts are closed.

4) Open Remote Switch – Welding arc stops and post flow begins.

E. Slope Mode with repeat sequence

The repeat function is operated during the down slope cycle of the Slope Sequence and is active through the down slope period only. During the down slope period by opening the Remote Switch contacts the current will increase back to weld current. Within the Down Slope period the repeat function can be operated as many times as desired. To continue slope cycle and end slope sequence close remote switch contacts and allow weld current to reach final current setting. Once final current setting is reached opening the Remote Switch again will turn off the welding arc and post flow begins.

F. Pulse Controls

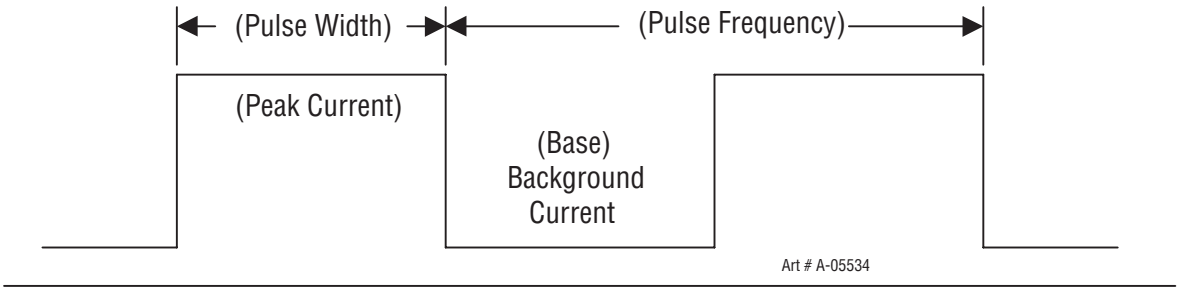


Figure 4-7: Pulse Controls

The Pulse controls are used primarily to control heat input. Pulse offers a number of advantages as follows:

1) Control puddle – size and fluidity (especially out of position).

2) Increase penetration

3) Travel speed control

4) Better consistent quality

5) Distortion on lighter or thinner materials.

Pulse-current provides a system in which the welding current continuously changes between two levels. During the periods of Peak current, heating and fusion takes place, and during the background (base) current periods, cooling and solidification take place. Pulse Width is the time in one cycle the current stays at the peak current setting. Pulse Frequency measured in Hertz is the number of cycles per second the current travels between peak and background current settings. It is as if the foot rheostat were moved up and down to increase and decrease the welding current on a regular basis. The faster you moved the foot rheostat up and down the faster the frequency.

4.08 Voltage Reduction Device (VRD)

WARNING

WELDING IN HAZARDOUS ENVIRONMENTS

Before welding in hazardous environments the VOLTAGE REDUCTION DEVICE (VRD) MUST BE TURNED ON. For example confined spaces, wet areas and hot humid conditions are classed as hazardous environments.

WARNING

VRD TURN ON PROCEDURE

Thermal Arc recommends that an AccreditedThermal Arc Service Provider TURNS ON the VOLTAGE REDUCTION DEVICE (VRD) as they have the knowledge and equipment to preform this operation

WARNING

TO EMPLOYERS

Workplace safety legislation imposes substantial duties on employers to provide a safe workplace and equipment for its employees. If an employer fails to do so criminal prosecution of the company and its senior officers and employees may result with substantial penalties including fines and in certain cases jail sentences. It is therefore essential employers acquire safe equipment and ensure its employees are properly trained in its use.

A. VRD Lights Operation

- VRD fully complies to IEC 90674-1
- With VRD TURNED ON and Stick mode selected, the green VRD light is ON when not welding
- With VRD TURNED ON and Stick mode selected, the red VRD light is ON when welding
- With VRD TURNED OFF and Stick mode selected, the red VRD light is ON when not welding and welding

B. VRD Specification

With the VRD TURNED ON, this equipment meets the following specifications

Description	Notes	
VRD Open Circuit Voltage	15.3 to 19.8V	Open circuit voltage between welding terminals
VRD Resistance	148 to 193 ohms	The required resistance between welding terminals to turn ON the welding power
VRD Turn OFF Time	0.2 to 0.3 seconds	The time taken to turn OFF the welding power once the welding current has stopped

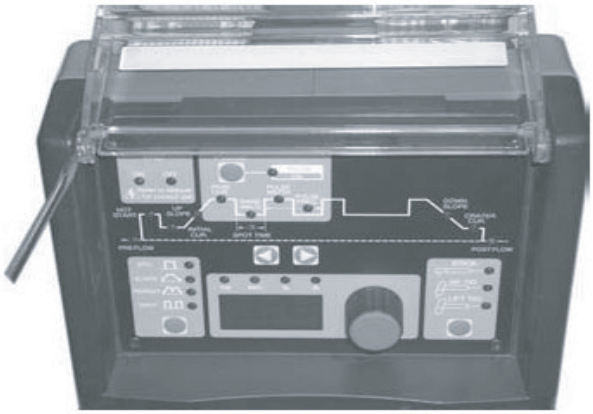
Table 4-8: VRD Specifications

C. VRD Maintenance

Refer to section 9 Routine Inspection,Testing & Maintenance.

D. Switching VRD ON/OFF

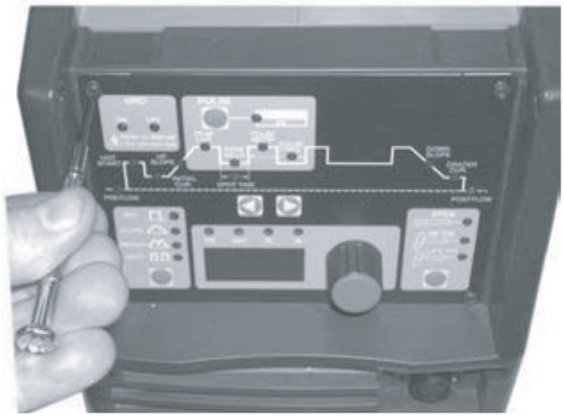
1. Remove the controls clear cover
   - Lift up the cover so it rests on the top of the unit.
   - Place a small flat bladed screw driver between the cover hinge and the front panel.
   - Gently lift the cover hinge out of the front cover mounting hole
   - Remove the controls clear cover



Art # A-05561

Figure 4-9: Controls Clear Cover

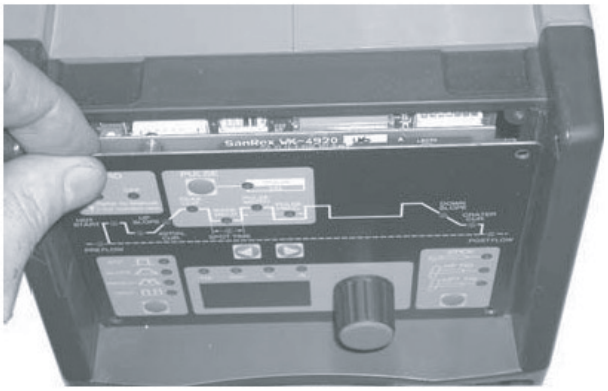
2. Remove the controls mounting screws
   - Remove the four controls mounting screws.



Art # A-05562

Figure 4-10: Control Panel Mounting Screws

3. Access the VRD Control
   - Gently pry back the front panel controls to access the VRD ON/OFF switch.



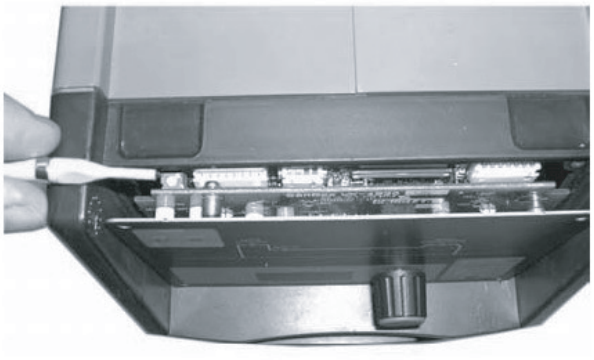
Art # A-05563

Figure 4-11: VRD Control

CAUTION

DO NOT pull back the front panel with excessive force as this will unplug the control PCB. Pulgging the control PCB back into the front panel controls can only be achieved by removing the side covers.

4. Turning the VRD ON/OFF
   - To turn VRD ON; rotate the trim potentiometer on the display PCB fully clockwise. When VRD is turned ON check that it operates as per VRD specification.
   - To turn VRD OFF; rotate the trim potentiometer on the display PCB fully counter-clockwise.



Art # A-05564

Figure 4-12: Turning the VRD ON/OFF

WARNING

The VRD ON/OFF trim potentiometer MUST ONLY be positioned fully clockwise OR fully counter-clockwise as the VRD function will be unknown for every other position.

4.09 Welding Parameter Setting (Factory Setting)

CAUTION

When replacing PCB5 (WK-4919) the Welding Parameter Factory Setting must be set.

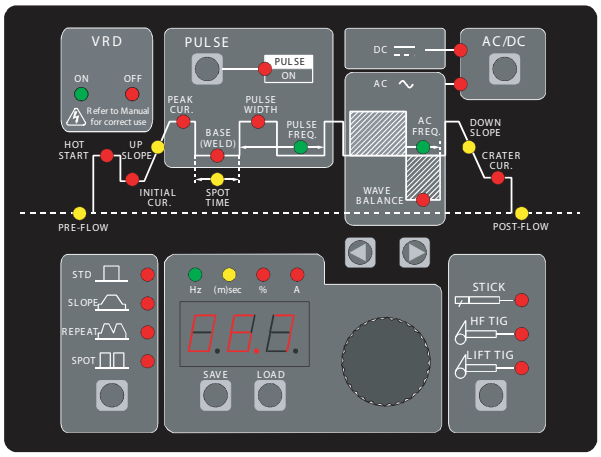


Figure 4-13: Front panel

1. Turn on the power source
2. After more than 8 sec, set weld mode to (DC) STICK mode If from the beginning, the display was in (DC) STICK mode, then push HF TIG and LIFT TIG button until it rotates back (1cycle) to the (DC) STICK mode display.
3. Set BASE current to 27A.
4. Push encoder button again until the LED welding parameter rotates to the BASE current setting.
5. Set BASE current to 46A.
6. To record the time changes press and hold the encoder button for more than 5 seconds or until the buzzer sounds three beeps.
7. Turn off the power source

SECTION 5: MAINTENANCE

5.01 Routine Inspection, Testing & Maintenance

WARNING

There are extremely dangerous voltages and power levels present inside this product. Do not attempt to open or repair unless you are an Accredited Thermal Arc Service Provider. Disconnect the Welding Power Source from the Mains Supply Voltage before disassembling.

An inspection of the power source, an insulation resistance test and an earthing resistance test

shall be carried out in accordance with clause 4.1 of **AS 1647.2**

a) For transportable equipment, at least once every 3 months; and

b) For fixed equipment, at least once every 12 months

The owners of the equipment shall keep a suitable record of the periodic tests.

NOTE

A transportable power source is any equipment that is not permanently connected and fixed in the position in which it is operated.

In addition to the above tests and specifically in relation to the VRD fitted to this machine, the following periodic tests should also be conducted by an accredited Thermal Arc service provider.

If this equipment is used in a hazardous location or environments with a high risk of electrocution then the above tests should be carried out prior to entering this location.

Welding equipment should be regularly checked by a qualified electrical tradesperson to ensure that:

- The main earth wire of the electrical installation is intact.
- Power point for the Welding Power Source is effectively earthed and of adequate current rating.
- Plugs and cord extension sockets are correctly wired.
- Flexible cord is of the multi-core tough rubber or plastic sheathed type of adequate rating, correctly connected and in good condition.
- Welding terminals are shrouded to prevent inadvertent contact or short circuit.
- The frame of the Welding Power Source is effectively earthed.
- Welding leads and electrode holder are in good condition.
- The Welding Power Source is clean internally, especially from metal filing, slag, and loose material. If any parts are damaged for any reason, replacement is recommended.
- The Cooling Fan should be replaced at approximately 12 months. This would depend upon the environment used and the hours of use.

SECTION 6:
BASIC TROUBLESHOOTING

WARNING

There are extremely dangerous voltages and power levels present inside this product. Do not attempt to open or repair unless you are an Accredited Thermal Arc Service Provider and you have had training in power measurements and troubleshooting techniques.

If major complex subassemblies are faulty, then the Welding Power Source must be returned to an Accredited Thermal Arc Service Provider for repair.

The basic level of troubleshooting is that which can be performed without special equipment or knowledge.

6.01 TIG Welding Problems

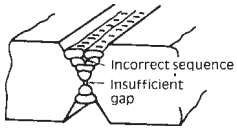
	Description	Possible Cause	Remedy
1	Excessive beard build-up or poor penetration or poor fusion at edges of weld.	Welding current is too low.	Increase weld current and/or faulty joint preparation.
2	Weld bead too wide and flat or undercut at edges of weld or excessive burn through.	Welding current is too high.	Decrease weld current.
3	Weld bead too small or insufficient penetration or ripples in bead are widely spaced apart.	Travel speed too fast.	Reduce travel speed.
4	Weld bead too wide or excessive bead build up or excessive penetration in butt joint.	Travel speed too slow.	Increase travel speed.
5	Uneven leg length in fillet joint.	Wrong placement of filler rod.	Re-position filler rod.

	Description	Possible Cause	Remedy
6	Electrode melts when arc is struck.	A. Electrode is connected to the '+' terminal. B. *Wave Balance* is greater than 50%.	A. Connect the electrode to the '-' terminal. B. Reduced Wave Balance to below 50% or increase the electrode size.
7.	Dirty weld pool.	A. Electrode contaminated through contact with work piece or filler rod material. B. Gas contaminated by air.	A. Clean the electrode by grinding off the contaminates. B. Check gas lines for cuts and loose fitting or change gas cylinder.
8.	Electrode melts or oxidizes when an arc is struck.	A. No gas flowing to welding region. B. Torch is clogged with dust. C. Gas hose is cut. D. Gas passage contains impurities. E. Gas regulator turned off. F. Torch valve is turned off. G. The electrode is too small for the welding current. H. *Wave Balance* is set above 50%.	A. Check the gas lines for kinks or breaks and gas cylinder contents. B. Clean torch. C. Replace gas hose. D. Disconnect gas hose from torch then raise gas pressure and blow out impurities. E. Turn on. F. Turn on. G. Increase electrode diameter or reduce the welding current. H. Reduced Wave Balance to below 50% or increase the electrode size.
9.	Poor weld finish	Inadequate shielding gas.	Increase gas flow or check gas line for gas flow problems.
10.	Arc flutters during TIG welding.	A. Tungsten electrode is too large for the welding current. B. Absence of oxides in the weld pool.	A. Select the right size electrode. Refer to Basic TIG Welding Guide for ways to reduce arc flutter. B. Refer to Basic TIG Welding Guide for ways to reduce arc flutter.
11.	Welding arc can not be established.	A Work Clamp is not connected to the work piece or the work/torch leads are not connected to the right terminals. B. Torch lead is disconnected.	A. Connect the work clamp to the work piece or connect the work/torch leads to the right welding terminals. B. Connect it to the '-' terminal.

	Description	Possible Cause	Remedy
	Welding arc can not be established. (cont)	C. Gas flow incorrectly set, cylinder empty or the torch valve is off.	C. Select the right flow rate, change cylinders or turn torch valve on.
12.	Arc start is not smooth.	A. Tungsten electrode is too large for the welding current.	A. Select the right sized electrode. Refer to the Basic TIG Welding Guide.
		B. The wrong electrode is being used for the welding job.	B. Select the right electrode type. Refer to Basic TIG Welding Guide.
		C. Gas flow rate is too high.	C. Select the correct rate for the welding job. Refer to Basic TIG Welding Guide.
		D. Incorrect shielding gas is being used.	D. Select the right shielding gas. Refer to Basic TIG Welding Guide.
		E. Poor work camp connection to work piece.	E. Improve connection to work piece.

6.02 Stick Welding Problems

	Description	Possible Cause	Remedy
1.	Gas pockets or voids in weld metal (Porosity).	A. Electrodes are damp.	A. Dry electrodes before use.
		B. Welding current is too high.	B. Reduce welding current.
		C. Surface impurities such as oil, grease, paint, etc.	C. Clean joint before welding.
2	Crack occurring in weld metal soon after solidification commences.	A. Rigidity of joint.	A. Redesign to relieve weld joint of severe stresses or use crack resistance electrodes.
		B. Insufficient throat thickness.	B. Travel Slightly slower to allow greater build up in throat.
		C. Cooling rate is too high.	C. Preheat plate and cool slowly.
3	A gap is left by failure of the weld metal to fill the root of the weld.	A. Welding current is too high.	A. Increase welding current
		B. Electrode too large for joint.	B. Use smaller diameter electrode.
		C. Insufficient gap.	C. Allow wider gap.
		D. Incorrect sequence.	D. Use correct build-up sequence.



Art # A-05567

Figure 6-1: Example of insufficient gap or incorrect sequence.

	Description	Possible Cause	Remedy
4.	Portions of the weld bead do not fuse to	A. Small electrodes used on heavy cold plate. B. Welding current is too low. C. Wrong electrode angle. D. Travel speed of electrode is too high. E. Scale of dirt on joint surface.	A. Use larger electrodes and preheat the plate. B. Increase the welding current. C. Adjust angle so the welding arc is directed more into the base metal. D. Reduce travel speed of electrode. E. Clean surface before welding.

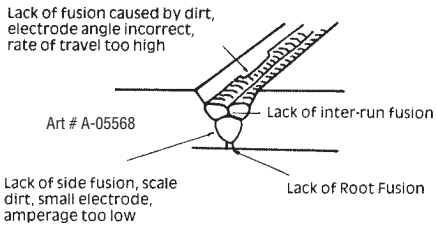


Figure 6-2: Example of lack of fusion.

	Description	Possible Cause	Remedy
5.	Non-metallic particles are trapped in the weld metal (Slag inclusion).	A. Non-metallic particles may be trapped in undercut from B. Joint preparation too restricted. C. Irregular deposits allow slag to be trapped. D. Lack of penetration with slag trapped beneath weld bead. E. Rust or mill scale is preventing full fusion. F. Wrong electrode for position in which welding is done.	A. If bad undercut is present, clean slag out and cover with a run B. Allow for adequate penetration and room for cleaning out the slag. C. If very bad, chip or grind out irregularities. D. Use smaller electrode with sufficient current to give adequate penetration. Use suitable tools to remove all slag from corners. E. Clean joint before welding. F. Use electrodes designed for position in which welding is done, otherwise proper control of slag is difficult.

Figure 6-3: Example of slag inclusion.

6.03 Power Source Problems

	Description	Possible Cause	Remedy
1.	The arc can not be established.	A. The Primary supply voltage has not been switched ON. B. The Welding Power Source switch is switched OFF. C. Loose connections internally.	A. Switch ON Primary supply voltage. B. Switch ON the Welding Power Source C. Have an Accredited Thermal Arc Service Agent inspect then repair the welder.
2.	Maximum output welding current can not be achieved with nominal Mains supply voltage.	Defective control circuit.	Have an Accredited Thermal Arc Service Agent inspect then repair the welder.
3	Welding current reduces when welding.	Poor work lead connection to the work piece.	Ensure that the work lead has a positive electrical connection to the work piece.
4.	No gas flow when the torch trigger switch is depressed.	A. Gas hose is cut. B. Gas passage contains impurities. C. Gas regulator turned off. D. Torch trigger switch lead is disconnected or switch/cable is faulty.	A. Replace gas hose. B. Disconnect gas hose from the rear of Power Source then raise gas pressure and blow out impurities. C. Turn gas regulator on. D. Reconnect lead or repair faulty switch/cable.

	Description	Possible Cause	Remedy
5.	Gas flow won't shut off	A. Weld Mode (*STD, SLOPE, REPEAT or SPOT*) was changed before *POST-FLOW* gas time had finished.	A. Strike an arc to complete the weld cycle. OR Switch machine off then on to reset solenoid valve sequence.
		B. Gas valve is faulty.	B. Have an Accredited Thermal Arc Service Agent inspect then repair the welder.
		C. Gas valve jammed open.	C. Have an Accredited Thermal Arc Service Agent replace gas valve.
		D. *POST-FLOW* control is set to 60 sec.	D. Reduce *POST-FLOW* time.
6.	The TIG electrode has been contaminated due to the gas flow shutting off before the programmed *POST-FLOW* Time has elapsed.	The Weld Process Mode (*STICK, HF TIG, LIFT TIG*) was changed before *POST-FLOW* gas time had finished.	Do not change Weld Process Mode before the *POST-FLOW* gas time had finished.

6.04 Error Code Details

Description	Possible Cause	Remedy	Remarks
E01 error code displayed Temperature sensor TH1 (protects IGBTs) is greater than 80°C for about 1 second.	A. The Welding Power Source's duty cycle has been exceeded. B. Cooling fan ceases to operate. C. Air flow is restricted by vents being blocked. D. PCB Power Supply - ve 12VDC is not present.	A. Let Power Source cool down then keep within its duty cycle. B. Refer to section Cooling Fan is not rotating. C. Unblock vents then let Power Source cool down. D. Check –ve 12VDC is present on connector CN16 between pins 3 and 4(gnd) on PCB2 (WK-4983) if not replace PCB2 (WK-4983).	Weld current ceases. Buzzer sounds constantly. Fan operates at max speed. E01 resets when TH1 decreases to 70°C for about 30 seconds.
E02 error code displayed Temperature sensor TH2 (protects secondary diodes) is greater than 80°C for about 1 second.	A. The Welding Power Source's duty cycle has been exceeded. B. Fan ceases to operate. C. Air flow is restricted by vents being blocked. D. PCB Power Supply - ve 12VDC is not present.	A. Let Power Source cool down then keep within its duty cycle. B. Refer to section Cooling Fan is not rotating. C. Unblock vents then let Power Source cool down. D. Check –ve 12VDC is present on connector CN16 between pins 3 and 4(gnd) on PCB2 (WK-4983) if not replace PCB2 (WK-4983).	Weld current ceases. Buzzer sounds constantly. Fan operates at max speed. E02 resets when TH1 decreases to 70°C for about 30 seconds.

Description	Possible Cause	Remedy	Remarks
E03 error code displayed Primary (input) current too high.	A. Primary current is too high because welding arc is too long.	A. Reduce length of welding arc.	Weld current ceases. Buzzer sounds constantly. Switch machine off then on to reset E03 error.
	B. Mains supply voltage is more than 10% below nominal voltage.	B. Have an Accredited Thermal Arc Service Agent or a qualified electrician check for low Mains voltage.	
	C. Accumulation of dust.	C. Refer to visual inspection section in the advanced troubleshooting guide	
	D. Secondary Diodes D2, D3, D4, D5, D6 short circuited	D. Check Secondary Diodes	
	E. Faulty Primary IGBT Q1, Q2	E. Check Primary IGBT Q1,Q2	
	F. Faulty Secondary IGBT Q3, Q4	F. Check Secondary IGBT Q3, Q4	
	G. Current Transformer CT1	G. Replace Current transformer CT1 if damaged. Check that Wiring and plug connectors at CT1 and connector CN13 on PCB2 (WK-4983) are firmly connected. To confirm CT1 current signal on connector CN13 Pins 3 and 4(GND) at PCB2 (WK-4983) refer to connector CN13.	
	H. Faulty HF unit.	H. Remove the quick-disconnect terminals from the HF unit terminals AC1 and AC2. Check between HF unit terminals AC1 and AC2 if they short circuited replace the HF unit.	

Description	Possible Cause	Remedy	Remarks
E04 error code displayed Output voltage exceeds the secondary voltage specification.	A. TIG torch cable and/or work lead are too long or leads are coiled.	A. Reduce the length of the TIG torch cable to less than 30m and/or work lead or un-coil leads.	Weld current ceases. Buzzer sounds constantly. Switch machine off then on to reset E04 error.
	B. Mains supply voltage is more than 10% below nominal voltage.	B. Check Mains voltage.	
	C. Defective Secondary IGBT PCB5 (WK-4919)	C. Turn Power Source Off. Disconnect connector plug from connector CN3 on PCB11 (WK-4963). Turn Power Source to On. If error code E04 has now cleared replace PCB11(WK-4963).	
	D. Defective Control PCB5 (WK-4919).	D. Replace control PCB5 (WK-4919). When replacing refer to PCB section.	
E11 error code displayed Over Primary supply (input) voltage at primary capacitors is exceeded for one second.	Primary supply voltage is greater than the nominal voltage plus 10%	Have an Accredited Thermal Arc Service Agent or a qualified electrician check the Primary voltage.	Weld current ceases. Buzzer sounds constantly. Error code E11 automatically will reset when the voltage reduces.
E12 error code displayed Under mains supply (input) voltage primary capacitors is reduced for one second.	Mains supply voltage is down to a dangerously low level.	Have an Accredited Thermal Arc Service Agent or a qualified electrician check the Mains voltage	Weld current ceases. Buzzer sounds constantly. Error code E12 automatically will reset when the voltage increases.

Description	Possible Cause	Remedy	Remarks
E14 error code displayed Under mains supply (input) voltage warning primary capacitors is reduced for one second.	A. DC Voltage is less than 423 VDC between terminals TB1 and TB6.	A. Check that mains voltage is greater than 300 VAC.	Weld current available. Buzzer sounds intermittently. Error code E14 automatically will reset when the voltage increases.
	B. Pre charge circuit at PCB1	B. Check connections and Pre-charged relay RY2 is functioning correctly at PCB1 (WK-4961). If not replace PCB1 (WK-4961). Or refer to section Replacing Pre charge circuit components.	
E81 error code displayed Wrong Primary supply (input) voltage connected.	A. The wrong mains supply (input) voltage is connected.	A. Check that 3 phases are present and that input voltage is between 374-457VAC.	No weld current is available. Buzzer sounds constantly. Switch machine off.
	B. Poor Input cable electrical connections	B. Check input cable connections.	
	C. Electrical connections between PCB9 (WK-4917) and PCB2 (WK-4983).	C. Check wiring and connections at connector CN1 on PCB9 (WK-4917) and connector CN1 on PCB2 (WK-4983) are connected firmly.	
	D. PCB plug connections from PCB2 (WK-4983) to PCB3 (WK-4819).	D. Check connections from PCB2 (WK-4983) to PCB3 (WK-4819) are connected firmly.	
	E. Faulty PCB3 (WK-4819)	E. If error code E81 still appears after checking the above then replace PCB3 (WK-4819).	

Description	Possible Cause	Remedy	Remarks
E82 error code displayed Link switch plug not connected.	A. Link switch plug not connected. B. Accumulation of dust. C. Faulty PCB3 (WK-4819)	A. Check link switch plug connection at connector CN4 on PCB3 (WK-4819). B. Refer to visual inspection section. C. If error code E82 still appears after checking the above then replace PCB3 (WK-4819).	No weld current is available. Buzzer sounds constantly. Switch machine off.
E83 error code displayed CPU checks mains supply (input) voltage when the on/off switch on rear panel of machine is turned ON.	A. The Primary supply (input) voltage fluctuates and is not stable. B. Connector plug connections from PCB2 (WK-4983) to PCB9 (WK-4917). C. PCB plug connections from PCB2 (WK-4983) to PCB3 (WK-4819). D. Defective PCB3 (WK-4819)	A. Check input power supply cable electrical connections. B. Check wiring and connections at connector CN1 on PCB9 (WK-4917) and connector CN1 on PCB2 (WK-4983) are connected firmly. C. Check connections from PCB2 (WK-4983) to PCB3 (WK-4819) are connected firmly. D. If error code E83 still appears after checking the above then replace PCB3 (WK-4819).	No weld current is available. Buzzer sounds constantly. Switch machine off then on to reset E83 error.

Description	Possible Cause	Remedy	Remarks
E85 error code displayed Primary Capacitors are not charging correctly	A. The Primary capacitors pre-charge circuit is not functioning correctly. B. PCB plug connections from Input Rectifier D1 to PCB1. C. Input Rectifier D1 D. Pre charge circuit at PCB1 E. Defective Detect PCB3 (WK-4819)	A. Measure between terminals TB1 and TB6 (-ve) at PCB1 (WK-4961). The DC voltage value should be 528-645VDC. B. Check wiring and connections from the Input Rectifier D1 to connector CN2 on PCB1 (WK-4961) are connected firmly. C. Check the Input Rectifier D1 D. Check connections and Pre-charge resistor R44 at PCB1 (WK-4961) and Pre-charge relay RY1 is functioning correctly at PCB1 (WK-4961). If not replace PCB1 (WK-4961). Or refer to Section Replacing Pre charge circuit components. E. Replace Detect PCB3 (WK-4819).	No weld current is available. Buzzer sounds constantly. Switch machine off.
E93 error code displayed Memory chip (EEPROM) on control PCB can not read/write weld parameters.	A. Memory chip (EEPROM) error on PCB5 (WK-4919) B. Accumulation of dust.	A. Replace PCB5 (WK-4919). When replacing refer to section on factory settings. B. Refer to visual inspection section.	Weld current ceases. Buzzer sounds constantly. Switch machine off.

Description	Possible Cause	Remedy	Remarks
E94 error code displayed Temperature sensor TH1 for IGBTs or sensor TH2 for secondary diodes D2,D3,D4,D5,D6.	A. Poor electrical connection between TH1 and/or Th2 and PCB	A. Check wiring and connections from TH1 and TH2 to connector CN8 on PCB5 (WK-4919) are connected firmly.	Weld current ceases. Buzzer sounds constantly. Switch machine off.
	B. Defective Thermistor TH1 and/or TH2	B. To check Thermistors THI and TH2 remove the plug from the CN8 connector. Measure between pins 1 and 2 in the plug for TH1, or pins 3 and 4 in the plug for TH2 they should measure in the 10k ohm to 24k ohm range (dependant on ambient temperature) the reading decreasing as the temperature of the power source increases. A shorted reading indicates a bad sensor and should be replaced.	
	C. Defective Control PCB5 (WK-4919)	C. Replace PCB5 (WK-4919).	

Description	Possible Cause	Remedy	Remarks
E99 error code displayed Mains supply (input) voltage has been turned off but control circuit has power from the primary capacitors.	A. Mains supply (input) voltage is not present	A. check mains input supply voltage.	Weld current ceases. Buzzer sounds constantly. Must switch machine off then on to reset E99 error.
	B. Mains supply (input) voltage has been turned off	B. Turn main switch on the power source to the on position.	
	C. Connector plug connections from PCB2 (WK-4983) to PCB9 (WK-4917).	C. Check wiring and connections at connector CN1 on PCB9 (WK-4917) and connector CN1 on PCB2 (WK-4983) are connected firmly.	
	D. Connector plug connections from PCB2 (WK-4983) to PCB3 (WK-4819).	D. Check the plug connectors between PCB2 (WK-4983) and PCB3 (WK-4819) are firmly connected.	
	E. Connector plug connections from PCB2 (WK-4983) to PCB5 (WK-4919).	E. Check the plug connectors CN17 on PCB2 (WK-4983) and CN2 on PCB5 (WK-4919) are firmly connected.	

SECTION 7: ADVANCED TROUBLESHOOTING

If the problem cannot be solved by the basic (external) trouble shooting guide, the Power Source enclosure will have to be removed. The advanced level of troubleshooting allows the technician with a few common tools to remove the plastic enclosure and analyse some failures.

Refer to section 7.01 for the necessary equipment and tools.

WARNING

Never open the Power Source enclosure unless the mains supply voltage to the Power Source is disconnected from the power point.

CAUTION

When removing the locking type connectors and board supporters, disengage the locking mechanism first and then disconnect them.

7.01 Test Equipment and Tools

a. Digital Multi-meter with diode test function and insulated shaft test probes.

b. Phillips, and slotted head screwdriver.

c. Long nose pliers, diagonal cutter and circlip pliers.

d. Nut driver and Open end spanner, 5.5mm, 7mm, 8mm, 10mm, 12mm, 17mm.

7.02 Removing the Enclosure

1. Confirm that the switch of power supply and the switch on switchboard (distribution panel) are all OFF.

WARNING

The capacitors inside the power supply will slowly discharged after you turn off the switch of the power source or the switch at power point (distribution panel). Wait at least 5 minutes for the discharge to complete.

2. Remove all screws and nuts on the side covers.

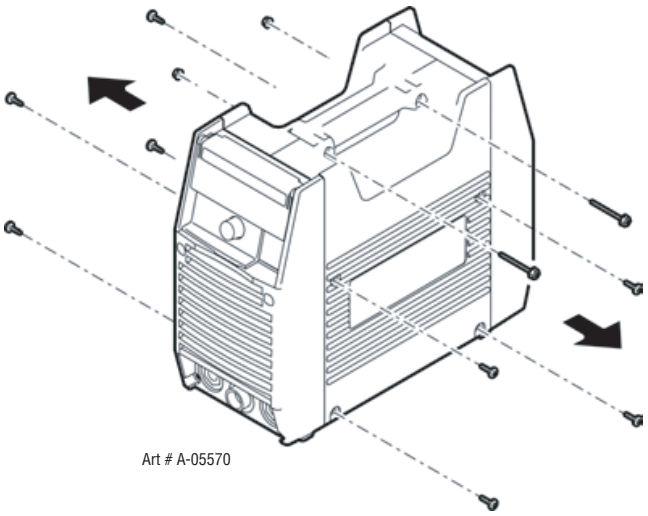


Figure 7-1: Removing side covers

3) Loosen the screws on the front panel and the rear panel by turning them approximately two turns CCW.

NOTE

DO NOT remove the screws completely.

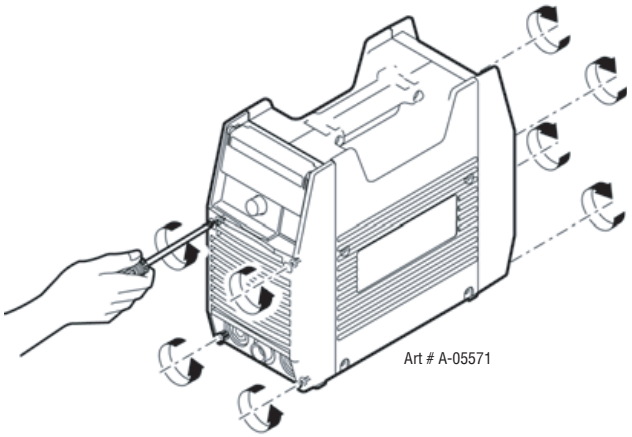


Figure 7-2: Removing front and rear panels

4) Pull the front panel slightly forward and pull the rear panel slightly backward.

   The interlocking hooks of the side case covers can now be disengaged from the front and rear panels.

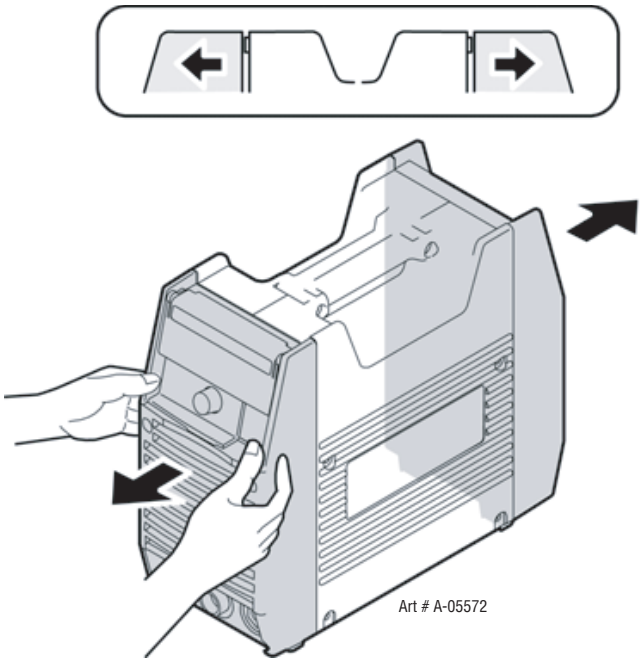


Figure 7-3: Front panel removal.

5) Remove the side covers.

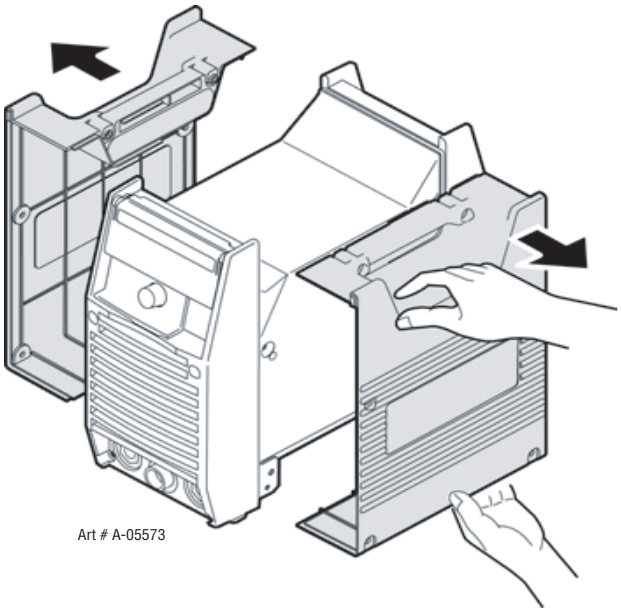


Figure 7-4: Side cover removal.

6) Remove protection cover sheet by removing the plastic tabs.

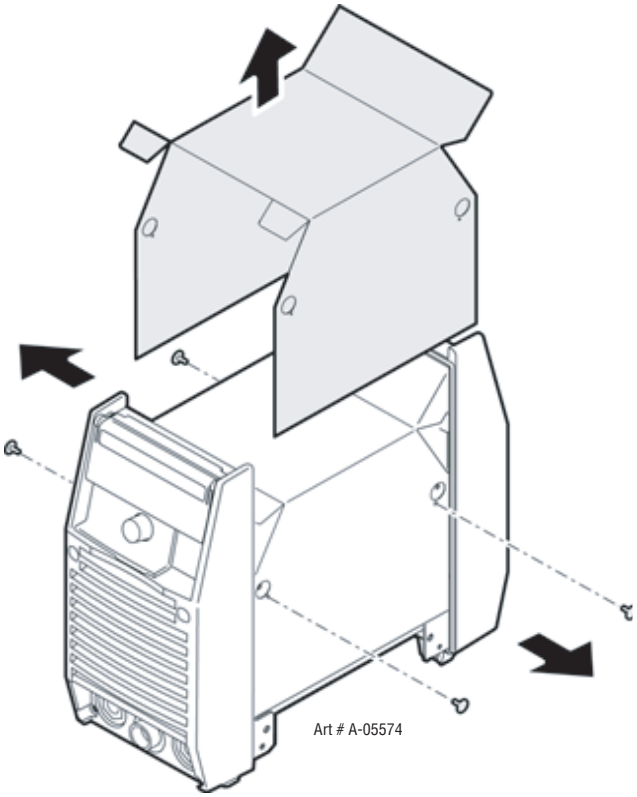


Figure 7-5: Protective cover removal.

Re-assembly of the above is a reversal of the removal procedure.

WARNING

*Leave the mains **supply** voltage disconnected from the Power Source during the visual inspection.*

7.03 Visually Inspect

Visually inspect the inside the Power Source. The high levels of power present in the Power Source can cause burning or arcing of components and PCBs when a failure occurs. Carefully inspect all components including the Input Rectifier, IGBT Modules, Secondary Diode Modules and the PCBs. Look in particular for the following:

a. Loose or broken wires or connectors.

b. Cracked or broken cores on the high frequency or magnet circuits.

c. Burned or scorched parts or wires or evidence of arcing.

d. Remove any accumulation of metal dust or filings which may have caused shorting or arcing.

e. If any parts are damaged, or if they are found to be faulty they must be replaced.

7.04 Advanced Power Source Malfunctions

Problem	Possible Cause	Remedy
1. Cooling Fan is not rotating, and	A. Airflow Obstructed	A. Clear any obstructions or dust that may inhibit cooling.
	B. Cooling Fan Wiring or Plug connector.	B. Check wiring between cooling fan and connector CN12 on PCB2 (WK-4983). Confirm that plug is firmly connected to connector CN12 on PCB2 (WK-4983).
	C. Ribbon Cable connection between PCB2 (WK-4983) and PCB5 (WK-4919).	C. Check Ribbon Cable connections at connector CN17 on PCB2 (WK-4983) and connector CN2 on PCB5 (WK-4919) are firmly connected.
	D. Defective Cooling Fan.	D. After Power Source is turned on for approx 8 seconds check at CN12 between Pins 1 and 2 (-ve) on PCB2 (WK-4983) for 24VDC supply to Cooling fan. (Note that after approx 30 seconds due to fan on demand circuit, the voltage will be dropped to 15VDC.). If voltage is present and Cooling fan is not rotating replace Cooling fan.
	E. Power Supply Voltage to the Cooling Fan circuit is not present on PCB2 (WK-4983).	E. After Power Source is turned on for approx 8 seconds check between CN12 pin1 on PCB2 (WK-4983) and CN23 pin2 (-ve) on PCB2 (WK-4983) for 24VDC unregulated supply to the Cooling Fan circuit. (Note that after approx 30 seconds due to cooling fan on demand circuit, the voltage will be dropped to 15VDC.) If 24VDC is not present replace PCB2 (WK-4983).
	F. Opto Coupler PHC4 on PCB2 (WK-4983) is not receiving the correct signal from the Control PCB PCB5 (WK-4919).	F. Check the Cooling Fan control signal is present from the Control PCB5 (WK-4919) by measuring between pins 2 and 3(-ve) on Opto coupler PHC4 on PCB2 (WK-4983). The signal should measure approx 1.4VDC (Note that if the Cooling Fan is in reduced speed mode the Cooling Fan control signal will measure approx 0.9V). If this voltage is not present replace PCB5 (WK-4919).

Problem	Possible Cause	Remedy
	G. Defective Cooling Fan driver circuit components on PCB2 (WK-4983).	G. After Power Source is turned on for approx 8 seconds check CN12 between Pins 1 and 2(-ve) on PCB2 (WK-4983) for 24VDC supply to Cooling fan. (Note that after approx 30 seconds due to cooling fan on demand circuit, the voltage will be dropped to 15VDC.) If 24VDC is not present replace PCB2 (WK-4983) or refer to Replacing Cooling Fan Driver circuit components on PCB2 (WK-4983).
2. No Welding Output and the Cooling Fan is rotating.	A. Check the Machine is switched into the correct mode.	A. Check the Machine is either in Stick mode or trigger switch is closed in Lift Tig or HF Tig mode.
	B. Ribbon Cable connection between PCB2 (WK-4983) and PCB5 (WK-4919).	B. Check Ribbon Cable connections at connector CN17 on PCB2 (WK-4983) and connector CN2 on PCB5 (WK-4919) are firmly connected.
	C. Poor IGBT Q1, Q2 Gate Driver Connections between PCB4 (WK-4984) and PCB7 (WK-5012) and/or between PCB4 (WK-4984) and PCB8 (WK-5012).	C. Check wiring and connections for Q1 Gate Driver signal between connector CN5 on PCB4 (WK-4984) and connector CN1 on PCB7 (WK-5012 mounted on IGBT) are connected firmly. Check wiring and connections for Q2 Gate Driver signal between connector CN4 on PCB4 (WK-4984) and connector CN1 on PCB8 (WK-5012 mounted on IGBT) are connected firmly.
	D. Poor IGBT Q1, Q2 Gate Driver Connections between PCB4 (WK-4984) and PCB2 (WK-4983).	D. Check connections between connector CN223 on PCB4 (WK-4984) and connector CN123 on PCB2 (WK-4983) are connected firmly.
	E. Poor IGBT Q3, Q4 Gate Driver Connections between PCB12 (WK-3367) and PCB11 (WK-4963) and between PCB13 (WK-3367) and PCB11 (WK-4963).	E. Check wiring and connections for Q3 Gate Driver signal between connector CN1 on PCB12 (WK-3367 mounted on IGBT) and connector CN4 on PCB11 (WK-4963) are connected firmly. Check wiring and connections for Q4 Gate Driver signal between connector CN1 on PCB13 (WK-3367 mounted on IGBT) and connector CN4 on PCB11 (WK-4963) are connected firmly.

Problem	Possible Cause	Remedy
	F. Poor IGBT Q3, Q4 Gate Driver Connections between PCB5 (WK-4919) and PCB11 (WK-4963).	F. Check wiring and connections for Q3, Q4 Gate Driver signals between connector CN3 on PCB5 (WK-4919) and connector CN3 on PCB11 (WK-4963) are connected firmly.
	G. Secondary Connections	G. Check connections are tight and are not burnt or cracked on output terminals, transformer, IGBT's, secondary diodes, inductor, coupling coil.
	H. Current Transformer CT1.	H. Replace Current Transformer CT1 if damaged. Check wiring and plug connectors at CT1 and CN13 on PCB2 (WK-4983) are firmly connected.
	I. Secondary Diodes D2, D3, D4, D5, D6 are short circuit or open circuit.	I. Check Secondary Diodes D2, D3, D4, D5, D6. Refer to section 18. Replace if values are not obtained.
	J. Defective IGBT Q1,Q2.	J. Check IGBT Q1, Q2.
	K. Defective IGBT Q3,Q4.	K. Check IGBT Q3, Q4.
	L. Power Supply Voltages are not present at PCB2 (WK-4983) and/or PCB5 (WK- 4919).	L. Check Power Supply Voltages are present at PCB2 (WK-4983) and connector CN1 on PCB5 (WK-4919). If not present replace PCB2 (WK-4983). Refer to section for PCB2 Power Supply Voltages and section for PCB5 (WK-4919) Power Supply Voltages.
3. No Gas flow when torch trigger is depressed but the Cooling Fan is rotating.	A. The Machine is in Stick Mode.	A. Switch to either Lift Tig or HF Tig Mode.
	B. Torch Trigger switch lead is disconnected or switch/cable is faulty.	B. Reconnect Trigger switch lead or repair faulty switch/cable.
	C. Gas hose	C. Check that gas hose is firmly connected into the fitting at the inlet and outlet. Confirm that the layout of the gas hose so that it is not bent or kinked. Confirm there are no breaks, burns or holes in the hose.
	D. Gas Solenoid valve is blocked.	D. Remove any obstructions from the Gas solenoid valve.
	E. Poor electrical connection to solenoid.	E. Make sure that the quick-disconnect terminals are connected firmly at solenoid. Check wiring and plug connector at CN12 at PCB2 (WK-4983) are firmly connected.

Problem	Possible Cause	Remedy
	F. Ribbon Cable connection between PCB2 (WK-4983) and PCB5 (WK-4919).	F. Check Ribbon Cable connections at connector CN17 on PCB2 (WK-4983) and connector CN2 on PCB5 (WK-4919) are connected firmly.
	G. Defective Gas solenoid valve.	G. If there is 24VDC present at the Gas Solenoid Valve connections and Gas Solenoid Valve is not operating then replace the Gas Solenoid Valve.
	H. Power Supply Voltage to the Gas Solenoid Valve circuit is not present on PCB2 (WK-4983).	H. After Power Source is turned on for approx 8 seconds check between connector CN12 pin1 on PCB2 (WK-4983) and connector CN23 pin2 (-ve) on PCB2 (WK-4983) for 24VDC unregulated supply to the Gas Solenoid Valve circuit. If 24VDC is not present replace PCB2 (WK-4983).
	I. Opto Coupler PHC3 on PCB2 (WK-4983) is not receiving the correct signal from the Control PCB PCB5 (WK-4919).	I. Check that the Opto coupler PHC3 on PCB2 (WK-4983) measures approx 1.4VDC between pins 1 and 2(-ve). If approx 1.4VDC is not measured replace PCB5 (WK-4919). Before replacing refer to section on routine inspection and maintenance.
	J. Defective Opto coupler PHC3 on PCB2 (WK-4983).	J. After Power Source is turned on for approx 8 seconds check connector CN12 Pins 3 and 4 on PCB2 (WK-4983) for 24VDC supply to Gas Solenoid. (Note that after approx 30 seconds due to cooling fan on demand circuit, the voltage will be dropped to 15VDC). If 24VDC is not present, replace PCB2 (WK-4983) or refer to Replacing Gas Solenoid Driver circuit components on PCB2 (WK-4983).
4. HF will not operate when torch trigger switch is depressed, but the Cooling Fan is rotating.	A. The Machine is in Stick or Lift Tig Mode.	A. Switch to HF Tig Mode.
	B. Check Torch Trigger Circuit is operating correctly.	B. Reconnect Trigger switch lead or repair faulty switch/cable.
	C. Check Machine will Weld in Stick Mode.	C. If not refer to No Welding Output and the Cooling Fan is rotating.
	D. Connection between High Frequency (H.F. Unit and Coupling Coil (CC).	D. Check that the quick-disconnect terminals from the coupling coil are inserted onto the terminals of H.F. Unit correctly and completely. Confirm there are no short circuits, burnt or broken wires between the H.F. unit and the Coupling Coil.

Problem	Possible Cause	Remedy
	E. Connection between High Frequency H.F. Unit and Current Limiting Resistor R2.	E. Check that the quick-disconnect terminals from R2 are inserted onto the terminals of H.F. Unit correctly and completely. Confirm there are no short circuits, burnt or broken wires between the H.F. unit and R2.
	F. Connection of AC1 and AC2 to High Frequency Unit terminals.	F. Check that the quick-disconnect terminal AC1 from busbar at Transformer T1, T2 secondary and AC2 from CN10 on PCB2 (WK-4983) are inserted onto the terminals of H.F. Unit correctly and completely. Confirm there are no short circuits, burnt or broken wires.
	G. Wire AC1 connection from the H.F. Unit to Transformer T1 and wire AC2 Connector plug connection to PCB2 (WK- 4983).	G. Check wire AC1 and connection to Transformer T1 is connected firmly. Check that wire AC2 at plug connector at CN10 on PCB2 (WK-4983) is connected firmly.
	H. H.F. Points Gap.	H. Check H.F. Points. Refer to Section 0.
	I. Resistor R2 short or open circuit.	I. Replace Resistor R2 if faulty (blown, burnt, cracked etc).
	J. Voltage is not present between terminals AC1 and AC2 at H.F. Unit.	J. Check that voltage at AC1 and AC2 at H.F. Unit is approx 140VAC. If not check relay RY3 refer to item K below.
	K. Defective HF relay RY3 on PCB2 (WK-4983).	K. Check that relay RY3 on PCB2 (WK-4983) contacts close when the trigger switch is depressed in HF TIG mode, if relay does not work then replace PCB2 (WK-4983).
	L. Defective HF Unit.	L. Remove the quick-disconnect terminals from the HF Unit terminals AC1 and AC2. If the HF Unit terminals between AC1 and AC2 test short circuit replace the HF Unit.
	M. Defective Coupling Coil.	M. Check the Coupling Coil and replace if necessary.
5. Front Control Panel does not light when the machine is turned on but the Cooling Fan is rotating.	A. PCB plug connections from PCB5 (WK-4919) to PCB6 (WK-4971).	A. Check that all four connectors between PCB5 (WK-4919) and PCB6 (WK-4971) are firmly connected. Check the condition of the pins on the connectors and the connectors themselves, if any bent pins or damaged connectors are found replace the suspect PCB.

Problem	Possible Cause	Remedy
	B. Ribbon Cable connection between PCB2 (WK-4983) and PCB5 (WK-4919).	B. Check ribbon cable connections at connector CN17 on PCB2 (WK-4983) and connector CN2 on PCB5 (WK-4919) are connected firmly.
	C. Connector plug connections from PCB2 (WK-4983) to PCB5 (WK-4919).	C. Check wiring and plug connectors at connector CN16 on PCB2 (WK-4983) and connector CN1 on PCB5 (WK-4919) are firmly connected.
	D. Power Supply Voltage is not present on PCB2 (WK-4983).	D. After Power Source is turned on for approx 8 seconds check Power Supply Voltages are present at PCB2 refer to 13.3 page 42. if not present replace PCB2 (WK-4983).
	E. Defective Control PCB5 (WK-4919).	E. Replace PCB5 (WK-4919).
	F. Defective Front Controls PCB6 (WK-4971).	F. Replace PCB6 (WK-4971).
6. Machine cannot be set using the front panel controls or welding mode cannot be changed, but the Cooling Fan is rotating.	A. Accumulation of dust.	A. Refer to visual inspection section in this manual.
	B. Defective Current Transformer CT1.	B. Turn Power Source to Off. Disconnect CT1, if Welding Mode can then be changed replace CT1.
	C. PCB plug connections from PCB5 (WK-4919) to PCB6 (WK-4971).	C. Check that all four connectors between PCB5 (WK-4919) and PCB6 (WK-4971) are firmly connected. Check the condition of the pins on the connectors and the connectors themselves, if any bent pins or damaged connectors are found replace the suspect PCB.
	D. Ribbon Cable connection between PCB2 (WK-4983) and PCB5 (WK-4919).	D. Check ribbon cable connections at connector CN17 on PCB2 (WK-4983) and connector CN2 on PCB5 (WK-4919) are connected firmly.
	E. Connector plug connections from PCB2 (WK-4983) to PCB5 (WK-4919).	E. Check wiring and plug connectors at connector CN16 on PCB2 (WK-4983) and connector CN1 on PCB5 (WK-4919) are firmly connected.
	F. Power Supply Voltage is not present on PCB2 (WK-4983).	F. After Power Source is turned on for approx 8 seconds check Power Supply Voltages are present at PCB2 (WK-4983). If not present replace PCB2 (WK- 4983).
	G. Defective Control PCB5 (WK-4919).	G. Replace PCB5 (WK-4919).

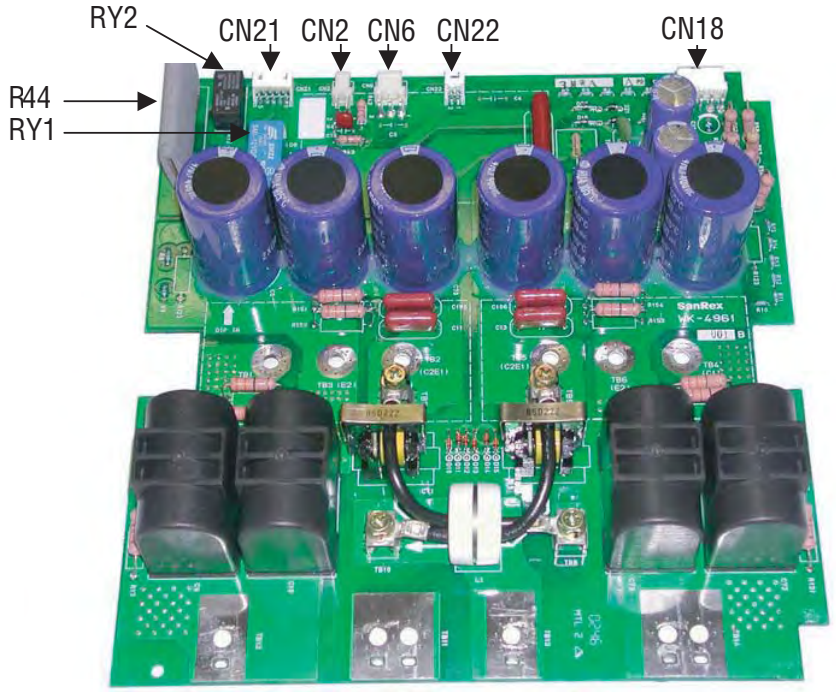
SECTION 8:
PCB DESCRIPTIONS

8.01 Main PCB (WK-4961)

Main PCB circuit description.

Input Rectifier reservoir Capacitor PCB. This PCB contains Input Rectifier Capacitors and Precharge circuit. Also RC dv/dt snubbers and primary current transformers.

Circuit Function	Parts Used
In rush current protection	R44, RY1, RY2
Input rectifier circuit	DC cut capacitor
Primary over current detection	CT1, CT2
Balance circuit	L1



Art # A-05575

Figure 8-1: Main PCB WK-4961

Main PCB PCB1 WK-4961 U01			
Connector	**Pin**	**Value**	**Description**
CN2	1	0-5	Gate on
	2	0-5	Gate on
CN6	1		Noise GND
	2		
	3		
CN18	1	0VDC	
	2	5VDC	
	3		
	4		
	5	800VDC max	

Main PCB PCB1 WK-4961 U01			
Connector	**Pin**	**Value**	**Description**
CN21	1	+12V	
	2	0/12V	pre-charge start
	3	0/12V	gate on
	4	approx. 5V	
	5	approx. 5V	
CN22	1	3V pulse	
	2	3V pulse	

8.02 Control Source PCB PCB2 (WK-4983)

Control Source PCB circuit description.

Auxiliary Power Supply and Interface PCB.

Circuit Function	Parts Used
Auxiliary power supply circuit	Auxiliary transformer T1
Gas Solenoid valve operation	Opto coupler PHC3
Output voltage detection	T6
Output short circuit detection	IC9
HF operation circuit	RY3
Cooling Fan operation circuit	PHC4, Q20, Q21
14 PIN socket connection	-
Hole CT connection	CT1

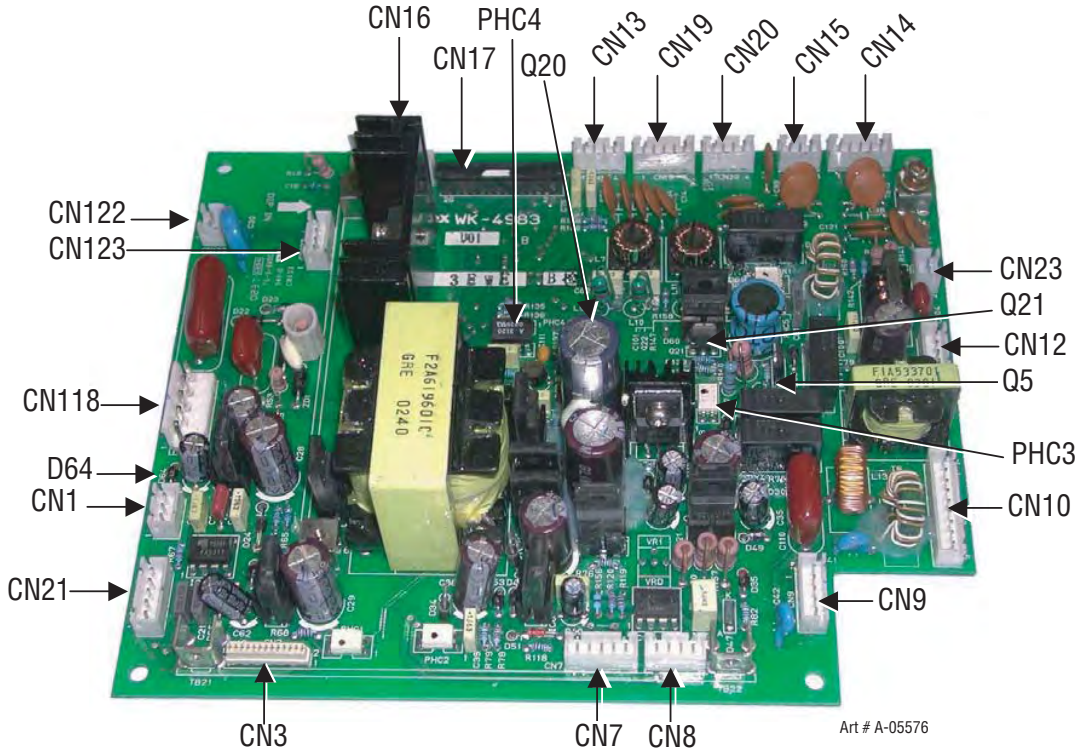


Figure 8-2: Control Source PCB WK-4983

Control Source PCB PCB2 WK-4983 U01			
Connector	**Pin**	**Value**	**Description**
CN1	1	300VDC	
	2		
	3	Not used	Not used
CN3	1-12		
CN7	1	0/5V	running enable
	2	0/5V	running enable
	3		
	4	0/5V	input voltage error
	5	0/5V	input voltage error
CN8	1	0/5V	internal process
	2	0/5V	internal process
	3	0/5V	internal process
	4	0/5V	internal process
CN9	1	30V 100kHz	
	2	30V 100kHz	
	3	Not used	Not used
	4	Not used	Not used
	5		
CN10	1	0-16V	output short detection
	2	Not used	Not used
	3	0-16V	output short detection
	4	Not used	Not used
	5		
	6	Not used	Not used
	7	0/70V	HF unit control
	8	Not used	Not used
	9	0/70V	HF unit control
CN12	1	0-24VDC	fan
	2	0-24VDC	fan
	3	0-24VDC	Gas Solenoid 300Pi only
	4	0-24VDC	Gas Solenoid 300Pi only
CN13	1	+12V	
	2	-12V	
	3	0-4V	CT1 Current Signal,Output Current=0-200A
	4	0-4V	CT1 Current Signal,Output Current=0-200A
CN14	1-5	Not used	Not used

Control Source PCB PCB2 WK-4983 U01			
Connector	**Pin**	**Value**	**Description**
CN15	1	short/open	ok to move
	2	Not used	Not used
	3	short/open	ok to move
CN16	1	+12VDC	
	2	+5VDC	
	3	-12VDC	
	4	GND	
	5		
	6		
	7		
CN17	1-26		
CN19	1	0/12	remote/panel signal
	2	0-10V	remote signal
	3	0-10V	remote signal
	4	0-10V	remote signal
	5	0/12	remote /panel signal
CN20	1	+12V	
	2		
	3	0-4V	voltage signal
	4	0-4V	Current signal
CN23	1	0-24V	Torch switch
	2	0-24V	Torch switch
CN118	1		
	2		
	3	Not used	Not used
	4	Not used	Not used
	5		
CN121	1		
	2		
	3		
	4		
	5		
CN122	1		
	2		

8.03 Power Supply Voltage Reference Points on Control PCB2 (WK-4983)

Power Supply Voltage Reference Points on Control PCB PCB2 WK-4983 U01				
Connector	**Pin**	**Value**	**Reference**	**Description**
CN16	1	+12VDC	CN16 Pin 4	Secondary Circuit Power Supply. Voltage Regulator IC4
CN16	2	+5VDC	CN16 Pin 4	Secondary Circuit Power Supply. Voltage Regulator IC5
CN16	3	-12VDC	CN16 Pin 4	Secondary Circuit Power Supply. Voltage Regulator IC6
CN16	4	GND		Secondary Circuit Power Supply GND.
CN12	1	+24VDC	CN23 Pin 2	Torch Trigger, Gas Solenoid, Cooling fan Unregulated Power Supply
CN10	9	+17VDC	CN10 Pin 7	VRD sensing circuit Voltage Regulator IC8
CN121	1	+12VDC	CN1 Pin 2	Primary Circuit Power Supply. Voltage Regulator IC7

Component	Point	Value	Reference	Description
Diode D64	Cathode	+5VDC	Anode (-ve)	Primary Circuit Power Supply. Voltage Regulator IC1

8.04 Detection PCB PCB3 (WK-4819)

Detection PCB circuit description.

Primary Voltage Detection and Isolation.

Circuit Function	Parts Used
Primary voltage detection	IC7
Input sequence circuit	IC7
Input 200/400V detection	IC7
Input power supply failure	IC7

NOTE

Ensure that the link is connected to CN4 of WK-4819 between pins 2 and 4.

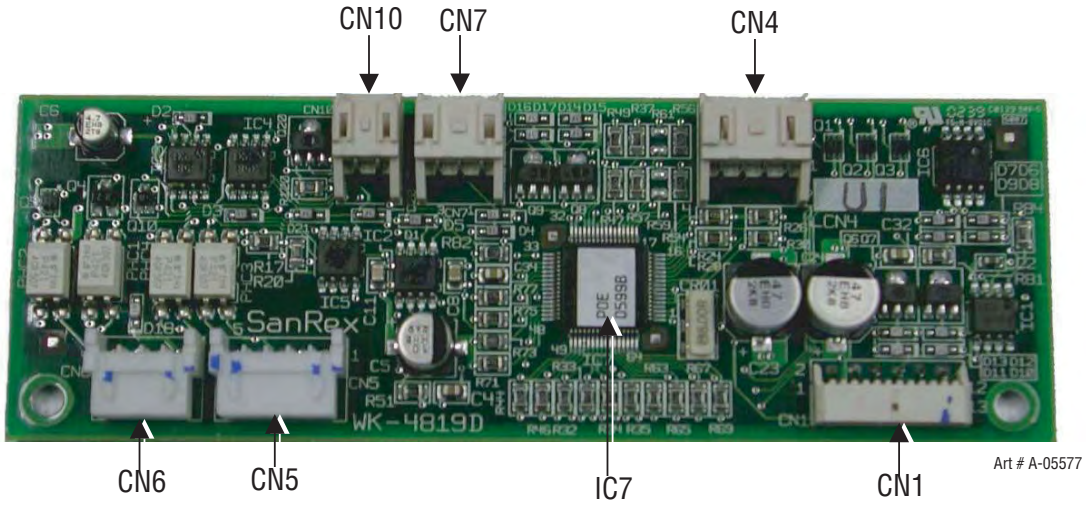


Figure 8-3: Detection PCB WK-4819

Detection PCB PCB3 WK-4819 U01			
Connector	**Pin**	**Value**	**Description**
CN1	1	+12V	Vdd for primary circuit (input)
	2	Not used	Not used
	3	+5V	Vcc for primary circuit (input)
	4	Not used	Not used
	5	0V	GND for primary circuit
	6	Not used	Not used
	7		Reserved (output)
	8	0V if pre-charge	pre-charge signal (output)
	9	Not used	Not used
	10	0-5V as primary DC voltage	primary DC voltage detect (input)
	11	0-5V as primary DC voltage	primary DC voltage detect (input)
	12	Not used	Not used
	13	0-5V as primary AC voltage	primary AC voltage detect (input)
CN4	1	Not used	Not used
	2		Link Plug
	3	Not used	Not used
	4		Link Plug
CN5	1	0V if on	input voltage on/off detect
	2	0V if on	input voltage on/off detect
	3	Not used	Not used
	4	0V if error	input voltage level detect
	5	0V if error	input voltage level detect
CN6	1	+5VDC	
	2	+5VDC	
	3		
	4		
CN7	1	+12VDC	
	2	Not used	Not used
	3	Not used	Not used
CN10	1	Not used	Not used
	2	Not used	Not used

8.05 IGBT Driver PCB PCB4(WK-4984)

IGBT Driver circuit description.

Isolated IGBT Gate Drive PCB.

Circuit Function	Parts Used
Primary IGBT gate driver circuit	Pulse transformer

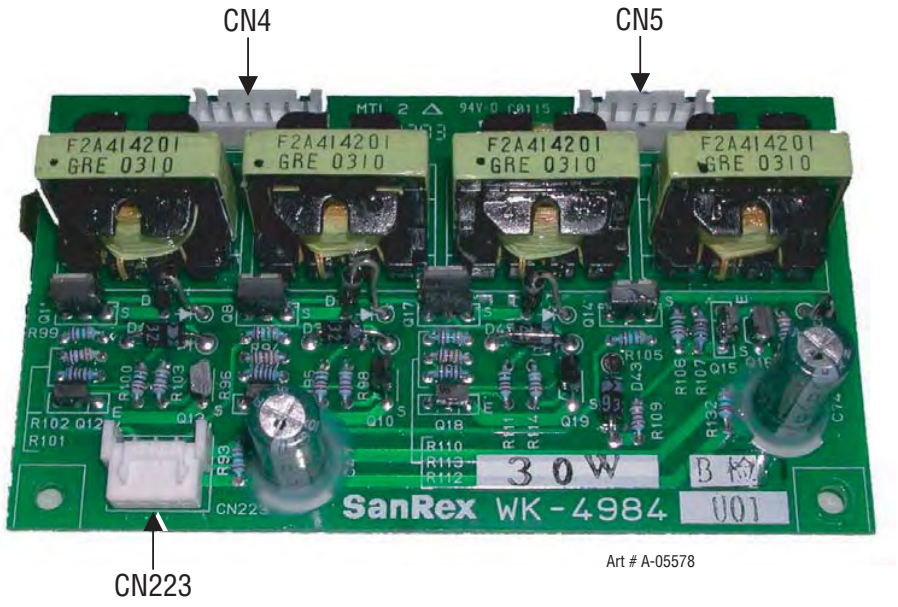


Figure 8-4: IGBT Driver PCB WK-4984

IGBT Driver PCB PCB4 WK-4984 U01			
Connector	**Pin**	**Value**	**Description**
CN4	1	0/20V 30kHz pulse	
	2	0/20V 30kHz pulse	
	3	Not used	Not used
	4	Not used	Not used
	5	0/20V 30kHz pulse	
	6	0/20V 30kHz pulse	
CN5	1	0/20V 30kHz pulse	
	2	0/20V 30kHz pulse	
	3	Not used	Not used
	4	Not used	Not used
	5	0/20V 30kHz pulse	
	6	0/20V 30kHz pulse	
CN223	1	+12V	
	2	0/5V	
	3	0/5V	
	4	+12V	

8.06 Control PCB PCB5 (Wk-4919)

Control PCB circuit description.

Control Display and user interface drive PCB.

Circuit Function	Parts Used
Control circuit	IC20
Sequence circuit	IC20
Protection circuit	IC20
Model selection circuit	DIP Switch DSW1, DSW2

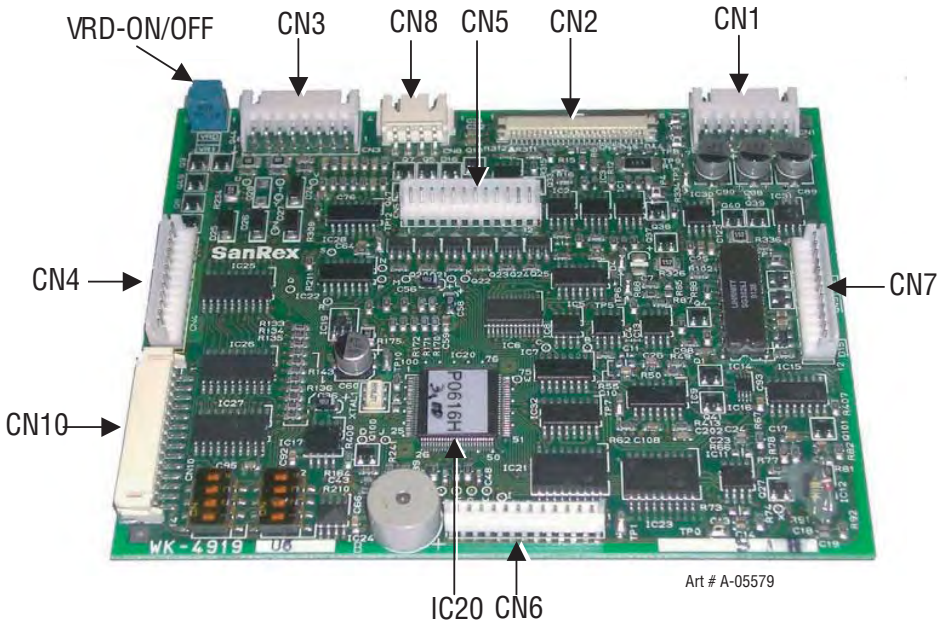


Figure 8-5: Control PCB WK-4919

Control PCB PCB5 WK-4919 U06			
Connector	**Pin**	**Value**	**Description**
CN1	1-7		
CN2	1	0/5V	input power detection
	2	0/5V	
	3	+5V	
	4	0/5V	send data
	5	0/5V	receive data
	6	0V	GND
	7	0/5V	output short detection
	8	0V	GND
	9	0/12V	gas valve drive signal
	10	0/5V	
	11	0/12V	HF drive signal
	12	3V peak	primary current signal
	13	2VDC as Io=100A	output current detection

Control PCB PCB5 WK-4919 U06			
Connector	**Pin**	**Value**	**Description**
CN2	14	2VDC as Io=100A	output current detection
	15	2VAC as Vo=10V	output voltage detection
	16	2VAC as Vo=10V	output voltage detection
	17	0/5V	output short detection
	18	0/12V	torch on/off signal
	19	0/12V	ok to move signal
	20	0/12V	panel/remote select signal
	21	+10V	
	22	0-10V	external analog signal
	23	0/12V	water pressure signal
	24	1V as Vo=10V	output voltage signal
	25	1V as Io=100A	output current signal
	26	Not used	Not used
CN3	1	+12V	
	2	0V	GND
	3	pulse of 12V peak	secondary IGBT drive signal
	4	pulse of 12V peak	secondary IGBT drive signal
	5	pulse of 12V peak	secondary IGBT drive signal
	6	0/12V	start compensation signal
	7	0V if error	over voltage error signal
CN4	1-12		
CN5	1-12		
CN6	1-12		
CN7	1-12		
CN8	1	0-5V by temp	temperature signal
	2	0-5V by temp	temperature signal
	3	0-5V by temp	temperature signal
	4	0-5V by temp	temperature signal

8.07 Power Supply Reference Points on PCB5 (WK-4919)

Power Supply Voltage Reference Points on Control PCB PCB5 WK-4919 U06				
Connector	**Pin**	**Value**	**Reference**	**Description**
CN1	1	+12VDC	CN1 Pin 4	Secondary Circuit Power Supply +12VDC
CN1	2	+5VDC	CN1 Pin 4	Secondary Circuit Power Supply +5VDC
CN1	3	-12VDC	CN1 Pin 4	Secondary Circuit Power Supply -12VDC
CN1	4	GND		Secondary Circuit Power Supply GND.

8.08 Front Controls PCB PCB6 (WK-4971)

Circuit Function	Parts Used
Operation circuit	Encoder
LED circuit	Switch
	LED

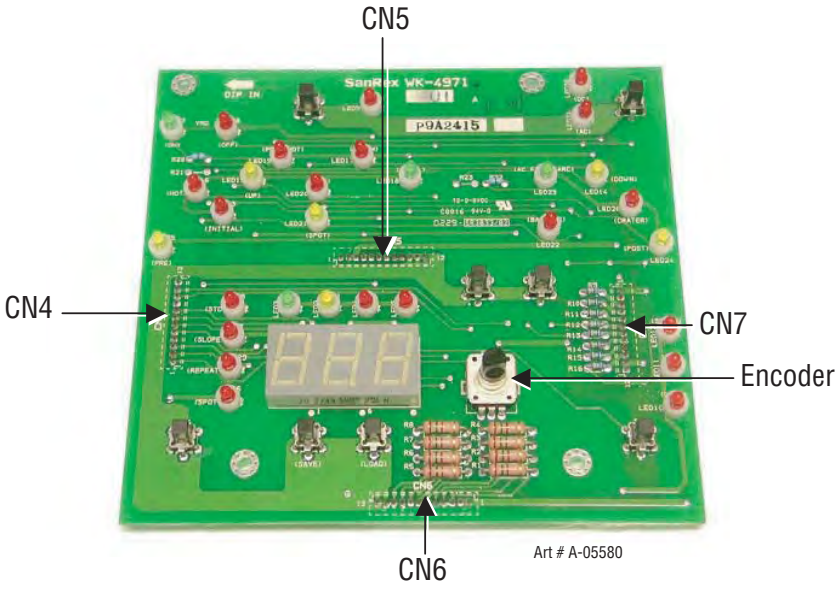


Figure 8-6: Front Controls PCB WK-4971

Front Controls PCB PCB6 WK-4971 U05			
Connector	**Pin**	**Value**	**Description**
CN4	1-12		
CN5	1-12		
CN6	1-12		
CN7	1-12		

8.09 Filter 430V PCB PCB9 (WK-4917)

Filter 430V PCB circuit description.

Transient Suppression PCB.

Circuit Function	Parts Used
Input filter circuit	Y Capacitor
Surge protection circuit	ZNR
Input voltage detection circuit	Discharge GAP, SA5

Figure 8-7: Filter 430V PCB WK-4917

Filter 430V PCB PCB9 WK-4917 U02			
Connector	**Pin**	**Value**	**Description**
CN1	1	Approx 5VDC	
	2	Approx 5VDC	

8.10 Start PCB PCB10 (WK-4970)

Start PCB circuit description.

Starting Arc stability and filter circuit.

Circuit Function	Parts Used
Output filter circuit	
Starting arc stability circuit	

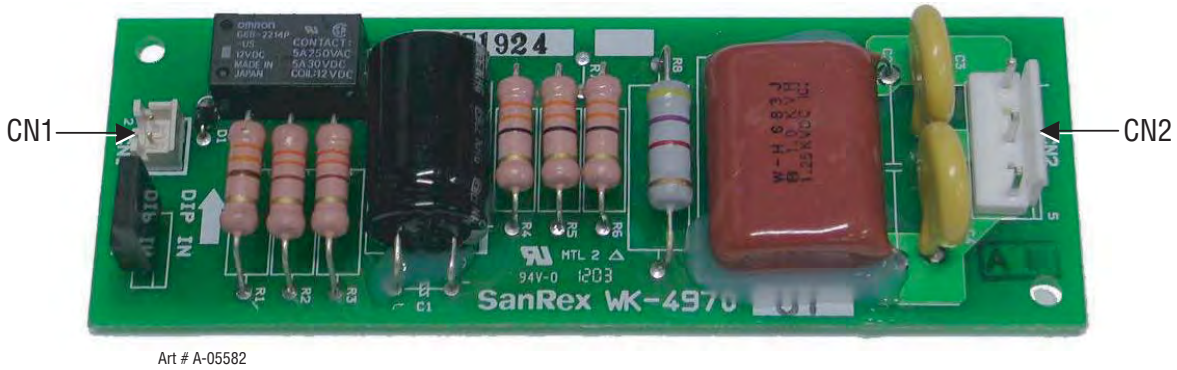


Figure 8-8: Start PCB WK-4970

Start PCB PCB10 WK-4970 U01			
Connector	**Pin**	**Value**	**Description**
CN1	1		
	2		
CN2	1-5		

8.11 Secondary IGBT Gate Driver PCB PCB11 (WK-4963)

Secondary IGBT Gate Driver PCB circuit description.

Secondary IGBT Gate Driver PCB.

Circuit Function	Parts Used
Secondary IGBT gate driver	Transformer
Super Impose circuit	PHC, IGBT

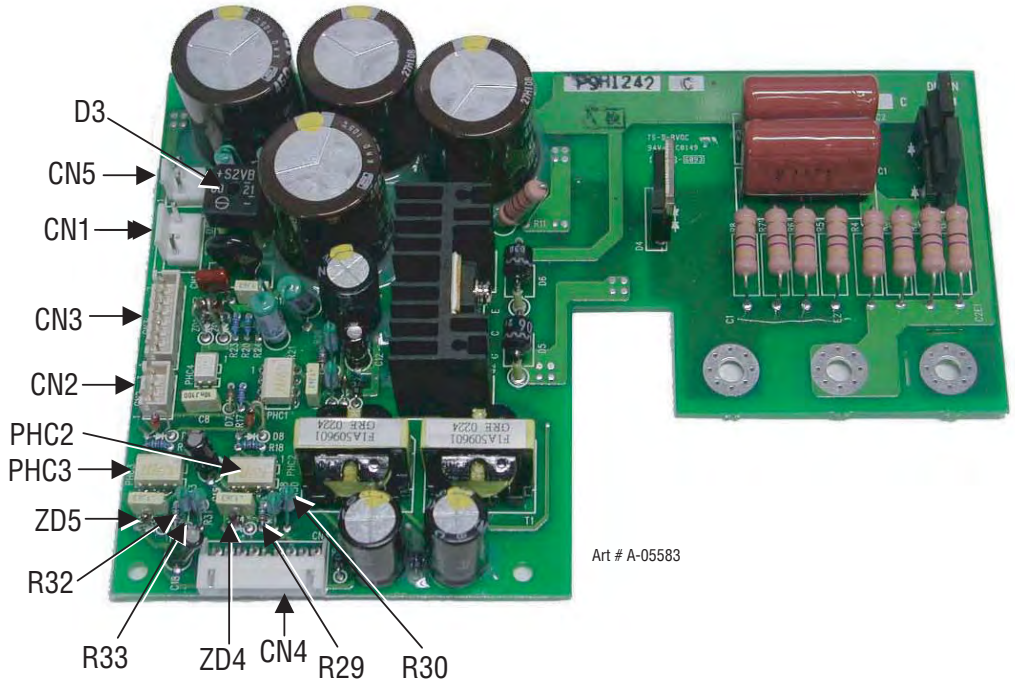


Figure 8-9: Secondary IGBT Gate Driver PCB WK-4963

Secondary IGBT Gate Driver PCB PCB11 WK-4963 U01			
Connector	**Pin**	**Value**	**Description**
CN1	1	270VAC	
	2	Not used	Not used
	3	270VAC	
CN2	1	30V 100kHz	
	2	Not used	Not used
	3	30V 100kHz	
CN3	1	+12V	
	2	+12V	
	3	10/12V as on/off	super impose signal
	4	10/12V as on/off	positive pole signal
	5	10/12V as on/off	negative pole signal
	6	0/12V as on/off	enable/disable of super impose
	7	0/5V as on/off	over voltage of output signal
	8	Not used	Not used

Secondary IGBT Gate Driver PCB PCB11 WK-4963 U01			
Connector	**Pin**	**Value**	**Description**
CN4	1	0/15V	negative pole
	2	0/15V	negative pole
	3	0/15V	negative pole
	4	0/15V	negative pole
	5	Not used	Not used
	6	0/15V	positive pole
	7	0/15V	positive pole
	8	0/15V	positive pole
	9	0/15V	positive pole
CN5	1		to external resister
	2	Not used	Not used

8.12 Filter PCB PCB14 (WK-5022)

Circuit Function	Parts Used
Input filter circuit	Capacitor
Input capacitor discharge circuit	-

Figure 8-10: Filter PCB (WK-5022)

Filter PCB PCB14 WK-5022 U01			
Connector	**Pin**	**Value**	**Description**
CN1	1		
	2	Not Used	Not Used
	3		
	4	Not Used	Not Used
	5		

8.13 300TSW Control PCB 5 (WK -4919) Switch Settings

CAUTION

When fitting a new Control PCB5 (WK-4919) the Welding Parameter Setting must be set. Refer to section 4.09 .

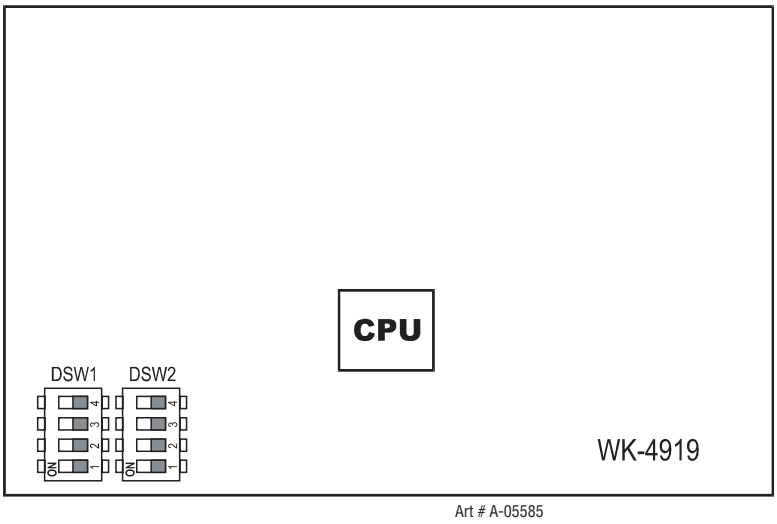


Figure 8-11: Control PCB5 (WK-4919)

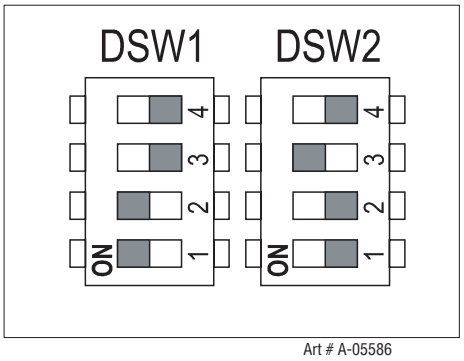


Figure 8-12: Control PCB5 Switch Settings

8.14 Test Procedure for Input Rectifier D1

Part No: 454160160

Type: DFA50BA160

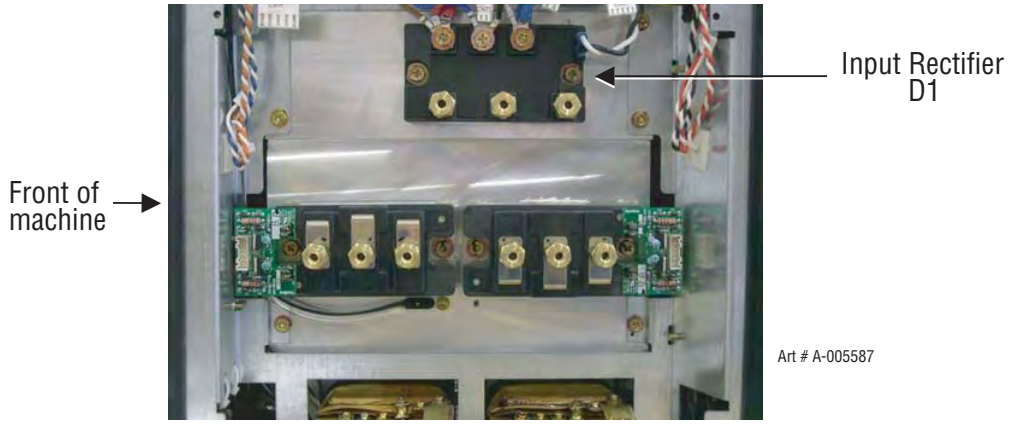


Figure 8-13: View with PCB1 (WK-4961) removed

Test Procedure:

a. In order to check Input Rectifier D1 remove PCB1 (WK-4961) from the Power Source Refer to Figure 8-13.

b. Disconnect the connections from the terminals of the Input Rectifier D1.

c. Verify the characteristic of the Input Rectifier D1 using a diode tester.

d. Refer to Table 8-1 below, **Figure 8-14** and **Figure 8-15** for the test points on Input Rectifier D1.

CAUTION

When installing the Input Rectifier D1 apply 1.5-2.5 N.m torque to the M5 mounting screws and the M5 Terminal screws. Clean and reapply heat sink compound (Shinetsu silicon G-747 or equivalent) uniformly to the base surface of the Input Rectifier. Refer to Data Sheet for further detail.

COMPONENT TESTED	TERMINALS		TESTER MODE	ACCEPTABLE VALUE
	Positive lead	Negative lead		
Diode of D1	3,4,5 0	0 3,4,5	Diode Test	0.3 to 0.5V Open circuit
Diode of D1	3,4,5 2	2 3,4,5	Diode Test	Open circuit 0.3 to 0.5V
SCR of D1	0 1	1 0	Diode Test	Open circuit Open circuit

Table 8-1: Input Rectifier D1 Test Points

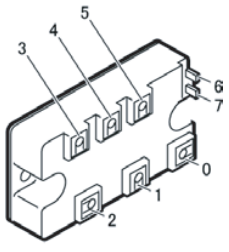


Figure 8-14: Input Rectifier D1 Test Points

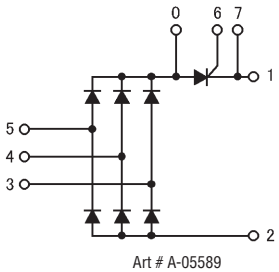


Figure 8-15: Input Rectifier D1 Circuit

Input Rectifier D1 Torque Values (Refer to CAUTION Above)	
Mounting Screws M5	1.5-2.5 N.m
Terminal Screws M5	1.5-2.5 N.m

Table 8-2: Input Rectifier D1 Torque Values

8.15 Test Procedure for IGBT Q1, Q2.

Part No: UOA705300 supplied complete with PCB WK-5012.

Type: CM100DUS-12F

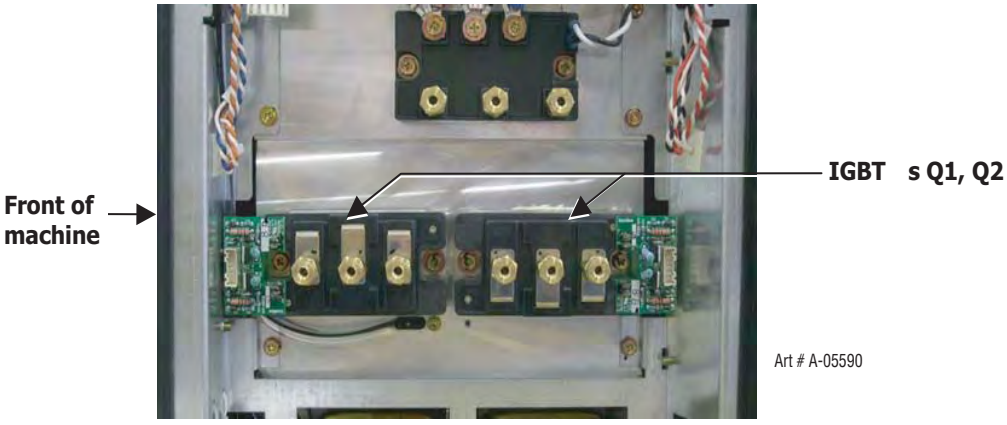


Figure 8-16: View with PCB1 (WK-4961) removed.

Test Procedure:

a. To check IGBT Q1, Q2 remove PCB1 (WK-4961) from the Power Source Refer to Figure 8-16

b. Disconnect the connections from the terminals of IGBT Q1, Q2.

c. Confirm there is no abnormal appearance on PCB7, PCB8 (WK-5012).

d. Verify the IGBT Q1, Q2 Collector – Emitter test using a diode tester.

e. Verify the IGBT Q1, Q2 Gate – Emitter test using an ohm meter.

f. Refer to Table 8-3, Figure 8-17 and Figure 8-19 for the test points on IGBT Q1, Q2.

CAUTION

When installing the IGBT Q1, Q2 apply 3.5-4.5 N.m torque to the M5 mounting screws. Apply 2.5-3.5 N.m torque to the M5 Terminal screws. Clean and reapply heat sink compound (Shinetsu silicon G-747 or equivalent) uniformly to the base surface of the IGBT. Refer to Data Sheet for further detail.

COMPONENT TESTED	TERMINALS		TESTER MODE	ACCEPTABLE VALUE
	Positive lead	Negative lead		
Collector-Emitter of Q1, Q2 with PCB7, PCB8	C1 C2E1	C2E1 C1	Diode Test	Open circuit 0.2 to 0.5V
Collector-Emitter of Q1, Q2 with PCB7, PCB8	C2E1 E2	E2 C2E1	Diode Test	Open circuit 0.2 to 0.5V
Gate-Emitter of Q1,Q2 with PCB7, PCB8	G1	E1	Ohms	2178-2222?
Gate-Emitter of Q1, Q2 with PCB7, PCB8	G2	E2	Ohms	2178-2222?

Table 8-3: IGBT Q1, Q2 Test Points

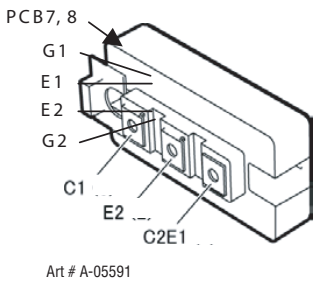


Figure 8-17: IGBT Q1,Q2 Test Points

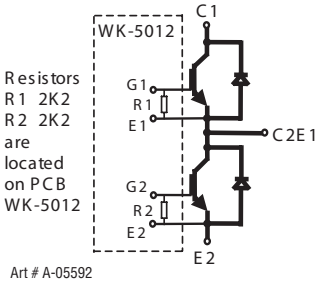


Figure 8-18: IGBT Q1, Q2 Circuit

IGBT Q1, Q2 Torque Values (Refer to CAUTION Above)	
Mounting Screws M5	3.5-4.5 N.m
Terminal Screws M5	2.5-3.5 N.m

Table 8-4: IGBT Q1, Q2 Torque Values

8.16 Test Procedure for IGBT's Q3, Q4

Part No: UOA705400 supplied with PCB WK-3367

Type: GCA200CA60

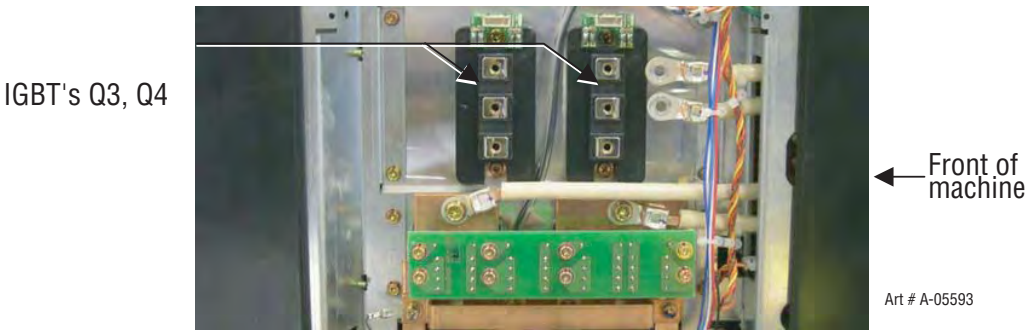


Figure 8-19: View with PCB11 (WK-4963) and links removed

Test Procedure:

a. In order to check IGBT Q3, Q4 remove PCB11 (WK-4963) and links from the Power Source See Figure 8-19.

b. Disconnect the connections from the terminals of IGBT Q3, Q4.

c. Confirm there is no abnormal appearance on PCB12, 13 (WK-3367).

d. Verify the characteristic of the IGBT Q3, Q4 using a diode tester.

e. Refer to Table 8-5 Figure 8-20 and Figure 8-21 for the test points on IGBT Q3, Q4.

CAUTION

When installing the IGBT Q3, Q4 apply 2.5-3.9 N.m torque to the M5 mounting screws and 1.5- 2.5 N.m torque to the M5 Terminal screws. Clean and reapply the heat sink compound (Shinetsu silicon G-747 or equivalent) uniformly to the base surface of the IGBT. Refer to Data Sheet for further detail.

COMPONENT TESTED	TERMINALS Positive lead	Negative lead	Tester Mode	ACCEPTABLE VALUE
Collector-Emitter of Q3, Q4 with PCB12, PCB13.	C1 (3) C2E1 (1)	C2E1 (1) C1 (3)	Diode Test	Open circuit 0.2 to 0.4V
Collector-Emitter of Q3, Q4 with PCB12, PCB13.	C2E1 (1) E2 (2)	E2 (2) C2E1 (1)	Diode Test	Open circuit 0.2 to 0.4V
Gate-Emitter of Q3, Q4 with PCB12, PCB13	G1	E1	Ohms	2178-2222 ohms
Gate-Emitter of Q3, Q4 with PCB12, PCB13	G2	E2	Ohms	2178-2222 ohms

Table 8-5: IGBT Q3, Q4 Test Points

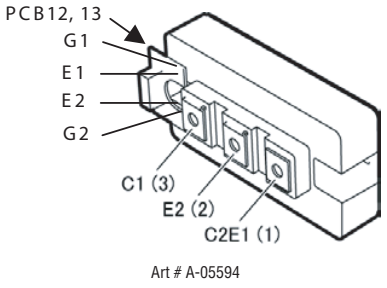


Figure 8-20: IGBT Q3, Q4 Test Points

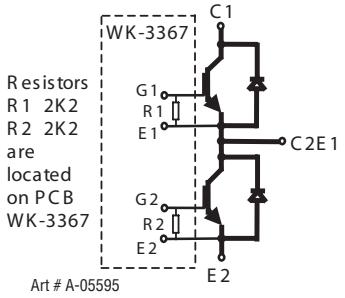


Figure 8-21: IGBT Q3, Q4 Circuit

IGBT Q3, Q4 Torque Values (Refer to CAUTION on Previous page)	
Mounting Screws M5	3.5-4.5 N.m
Terminal Screws M5	2.5-3.5 N.m

Table 8-6: IGBT Q3, Q4 Torque Values

8.17 Test Procedure for Secondary Diode D2, D3, D4, D5, D6

Part No: 4583A0060

Type: DBA200UA60

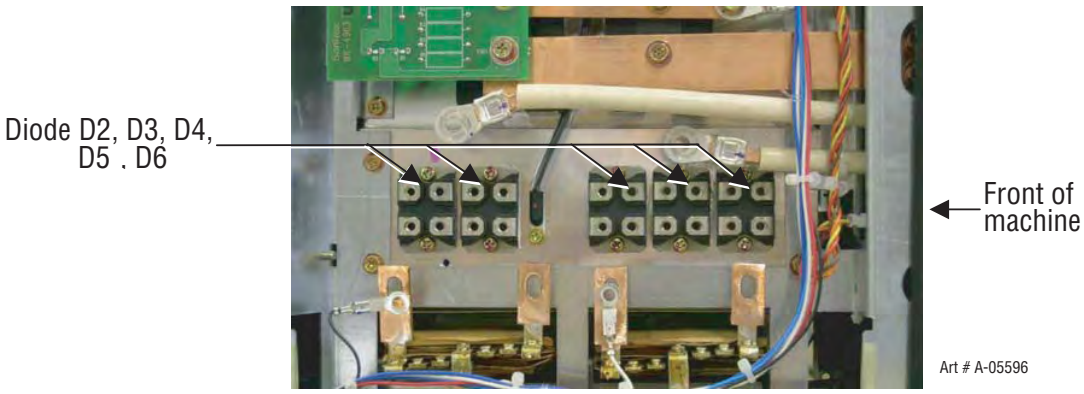


figure 8-22: View with PCB15 (WK-4962) and links removed.

Test Procedure:

a. Check the condition of Secondary Diodes from machine Output Terminals with a diode tester. Connect the positive diode tester lead to the negative output terminal and the negative diode tester lead to the positive output terminal the reading should be 0.2- 0.3V. If this value is not obtained refer to individual diode tests as below.

b. In order to check D2, D3, D4, D5, D6 remove PCB15 (WK-4962) and links from the Power Source See Figure 8-22.

c. Disconnect the connections from the terminals of the Diode.

d. Verify the characteristic of the Diode using a diode tester.

e. Refer to Table 8-7 and Figure 8-23 for the test points on D2, D3, D4, D5, D6.

CAUTION

In the event of replacing a failed diode it is recommended that if the remaining diodes are more than 3 years old or have been subjected to heavy use they should also be replaced at that time.

CAUTION

When installing the Diode apply 1.0-1.4 N.m torque to the M4 mounting screws and 1.0-1.4 N.m torque to the M4 Terminal screws. Clean and reapply heat sink compound (Shinetsu silicon G-747 or equivalent) uniformly to the base surface of the Diode. Refer to Data Sheet for further detail.

COMPONENT TESTED	TERMINALS		TESTER MODE	ACCEPTABLE VALUE
	Positive lead	Negative lead		
Diode1 of D2, D3, D4, D5, D6	Anode Cathode	Cathode Anode	Diode Test	0.2 to 0.3V Open circuit
Diode2 of D2, D3, D4, D5, D6	Anode Cathode	Cathode Anode	Diode Test	0.2 to 0.3V Open circuit

Table 8-7: D1, D2, D3, D4, D5, D6 Test Points

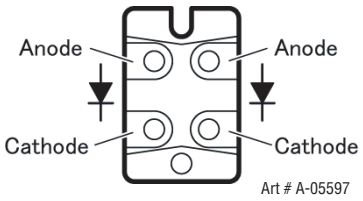


Figure 8-23: Diodes D2, D3, D3, D4, D5, D6 Test Points

Diode D2 D3 D4 D5 D6 Torque Values (Refer to CAUTION on previous page)	
Mounting Screws M4	1.0-1.4 N.m
Terminal Screws M4	1.0-1.4 N.m

Table 8-8: Diodes D2, D3, D4, D5, D6 Torque Values

8.18 High Frequency Points Gap Adjustment.

WARNING

The unit will generate a High Voltage component that can cause extreme personal harm and test equipment damage.

The H.F. unit is located underneath the heat sink assembly.

Confirm that the points are connected to H.F. Unit correctly and completely.

Confirm there is no dust or foreign debris between the space of the H.F. points.

If there are any abnormalities observed with the H.F. points, replace the H.F. points.

The H.F. points Gap is factory set for an optimal setting for most welding applications. It is recommended that the H.F. points Gap setting not be changed. The H.F. points Gap is factory set at 0.8mm.

If the H.F. points Gap is increased (larger than 0.8mm), the H.F. voltage increases and the frequency tends to decrease. If the H.F. points Gap is increased too much, H.F. will no longer be generated.

If the H.F. points Gap is decreased (smaller than 0.8mm), the H.F. voltage decreases and the frequency tends to increase.

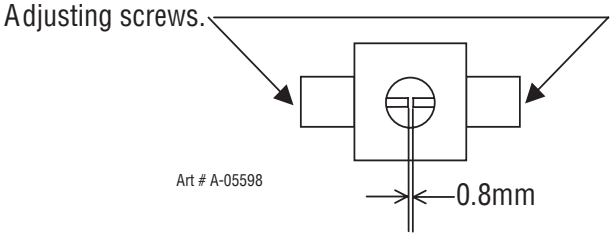


FIgure 8-24: HF Points

8.19 Replacing Pre Charge circuit components on PCB1 (WK-4961)

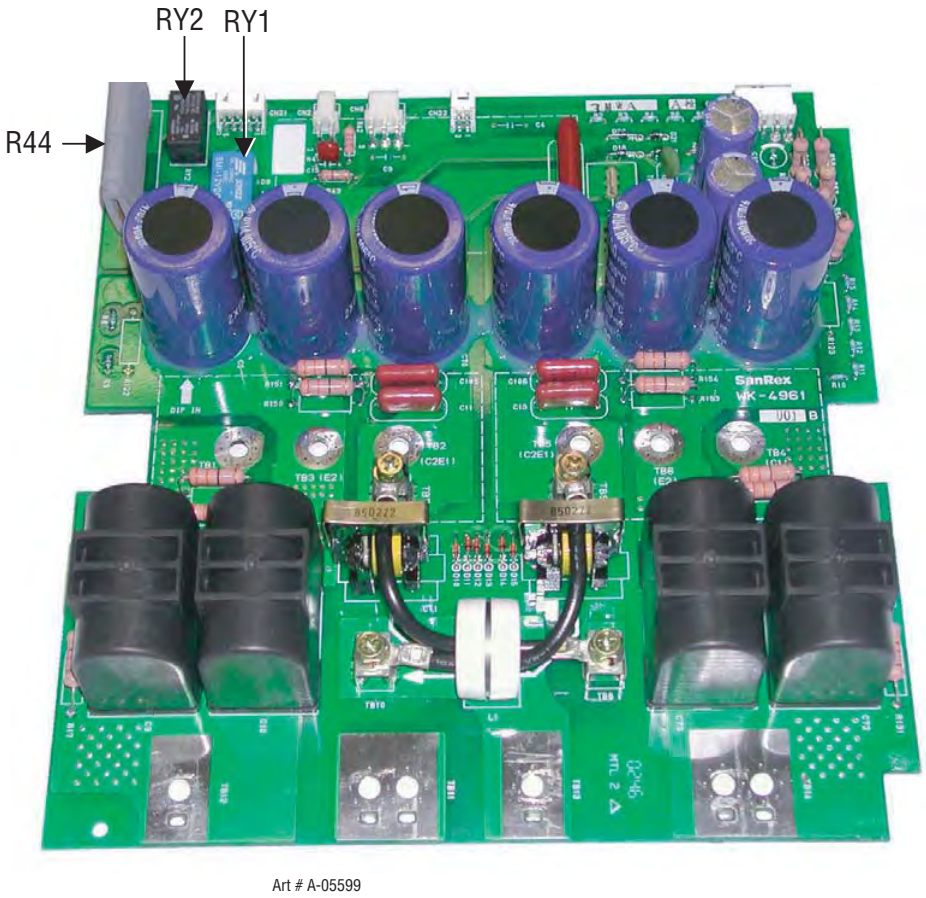
Pre Charge Kit Part Number : 710035

Contains the following: 1 x 12VDC 10A Relay (RY1)

1 x 12VDC 5A Relay (RY2)

1 x Resistor (R44)

Remove faulty components by carefully removing all solder using a de-soldering tool. Solder in replacement components as supplied with kit. Cover replaced components with an electrical grade varnish.



Art # A-05599

Figure 8-25: PCB1 (WK-4961) Pre Charge circuit components.

8.20 Replacing Cooling Fan/Gas Solenoid Driver circuit components on PCB2 (WK-4983)

Cooling Fan/Gas Solenoid Driver Kit Part Number : 710029

Contains the following: 1 x Transistor (Q20) Cooling Fan.

1 x Transistor (Q21) Cooling Fan

1 x Opto coupler (PHC4) Cooling Fan.

1 x Transistor (Q5) Gas Solenoid

1 x Opto coupler (PHC3) Gas Solenoid.

Remove faulty components by carefully removing all solder using a de-soldering tool. Solder in replacement components as supplied with kit. Cover replaced components with an electrical grade varnish.

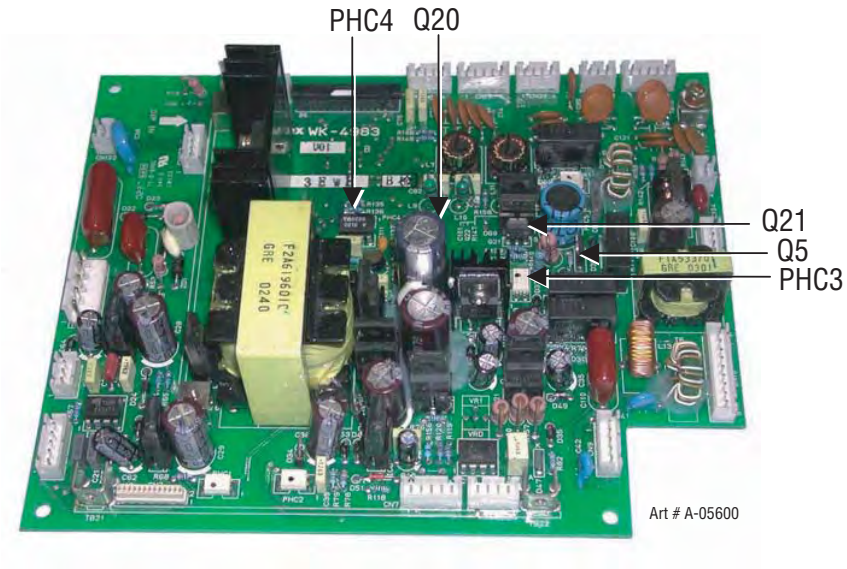


Figure 8-26: WK-4983 Cooling Fan and Gas Solenoid Driver Components.

8.21 Replacing IGBT Q3, Q4 Gate Driver circuit components on PCB11 (WK-4963)

IGBT Q3, Q4 Gate Driver Components Kit Part Number : 710032

Contains the following: 1 x Resistor (R29), 1 x Resistor (R30), 1 x Resistor (R32)

1 x Resistor (R33)

1 x Zener Diode (ZD4)

1 x Zener Diode (ZD5)

1 x Opto coupler (PHC2).

1 x Opto coupler (PHC3).

Remove faulty components by carefully removing all solder using a de-soldering tool. Solder in replacement components as supplied with kit. Cover replaced components with an electrical grade varnish.

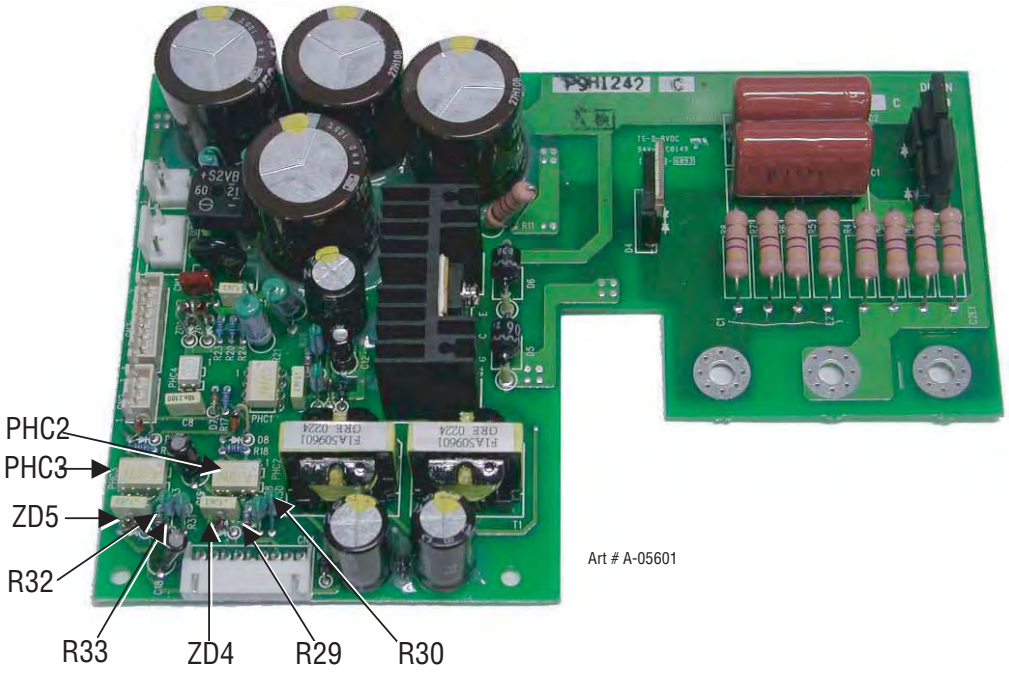


Figure 8-27: PCB11 (WK-4963) IGBT Q3, Q4 Gate Driver Components

SECTION 9: PARTS LIST

9.01 Equipment Identification

All identification numbers as described in the Introduction chapter must be furnished when ordering parts or making inquiries. This information is usually found on the nameplate attached to the equipment. Be sure to include any dash numbers following the Specification or Assembly numbers.

9.02 How To Use This Parts List

The Parts List is a combination of an illustration and a corresponding list of parts which contains a breakdown of the equipment into assemblies, subassemblies, and detail parts. All parts of the equipment are listed except for commercially available hardware, bulk items such as wire, cable, sleeving, tubing, etc., and permanently attached items which are soldered, riveted, or welded to other parts. The part descriptions may be indented to show part relationships.

To determine the part number, description, quantity, or application of an item, simply locate the item in question from the illustration and refer to that item number in the corresponding Parts List.

SPEC NUMBERS:

300TSW:

208-230/460V 50/60Hz, 1/3 phase 10-3074

9.03 300 TSW Parts List

Ref. Des.	Qty.	Description	Part Number
CC	1	Coupling Coil - F2A677800 CC	10-6767
CON1	1	Remote Socket - MS3102A20-27S	10-6768
CT1	1	Current Sensor -HC-TN200V4B15M 200A 4V	10-5003
D1	1	Diode - DFA100BA160	10-6769
D2	1	Diode -DBA200UA60	10-6629
D3	1	Diode - DBA200UA60	10-6629
D4	1	Diode - DBA200UA60	10-6629
D5	1	Diode - DBA200UA60	10-6629
D6	1	Diode - DBA200UA60	10-6629
D6	1	Diode - DBA200UA60	10-6629
FAN	1	Fan - 109E5724H507 DC 24V 16.8W (with Wire)	10-6770
FCH	1	Inductor - F2A677600 FCH	10-6771
HF.UNIT	1	HF. Unit (WK-4840 U02)	10-6632
	1	HF. Gap - U0A601100	10-6633
L105	1	Inductor - 1615MRE RING CORE	10-6538
PCB1	1	PCB, WK-4961 U01 MAIN PCB (with Cable EBA521700) with Thunder Label	10-6772
PCB2	1	PCB, WK-4983 U01 CTL.SOURCE	10-6773
PCB3	1	PCB, WK-4819 U01 DETECT PCB	10-6635
PCB4	1	PCB, WK-4984 U01 IGBT DRIVER	10-6774
PCB5	1	PCB, WK-5157 U05 AC CONTROL	10-6846-1
PCB6	1	PCB, WK-5037 U02 AC TIG PANEL	10-6775
PCB9	1	PCB, WK-4917 U04 FILTER 480V	10-6740
PCB10	1	PCB, WK-4970 U01 START.PCB	10-6776
PCB11	1	PCB, WK-4963 U01 2 IGBT PCB	10-6777
PCB14	1	PCB, WK-5100 U01 DISCHARGE PCB	10-6778
PCB15	1	PCB, WK-5246 U01 DI. SNUBBER with Thunder Label	10-6852
PCB16	1	PCB, WK-5040 U01 C TYPE RELAY	10-6780
PCB17	1	PCB, WK-5248 U01 GATE PCB-2	10-6853
PCB18	1	PCB, WK-5248 U01 GATE PCB-2	10-6853
PCB19	1	PCB, WK-5249 U01 RESISTOR PCB	10-6876
Q1	1	Transistor - CM100DUS12F-1 600V 100A (with WK-5247 U01)	10-6856
Q2	1	Transistor - CM100DUS12F-1 600V 100A (with WK-5247 U01)	10-6856
Q3	1	Transistor - GCA200CA60 (with WK-3367 U04)	10-6643
Q4	1	Transistor - GCA200CA60 (with WK-3367 U04)	10-6643
R2	1	Resistor - ERF20HMJ151 20W 150?	10-5081
R3	2	Resistor - JG23V101J 68W 100?	10-5137
S1	1	Switch - DCP-103SR100C-480V 3P	10-6857
S2	1	Switch - SDKGA4-A-1-A	10-6781
SOL	1	Solenoid Valve - 5505NBR1.5 DC24V 11VA/10W (with Gas Inlet and PC4-02)	10-6645
T1	1	Transformer - F2A705700 MTR	10-6782
T2	1	Transformer - F2A705700 MTR	10-6782
T3	1	Transformer - F2A869300 300A AC/DC DT	10-6877
TH1,2	1	Thermistor - ERTA53D203 (Two-piece group)	10-6784

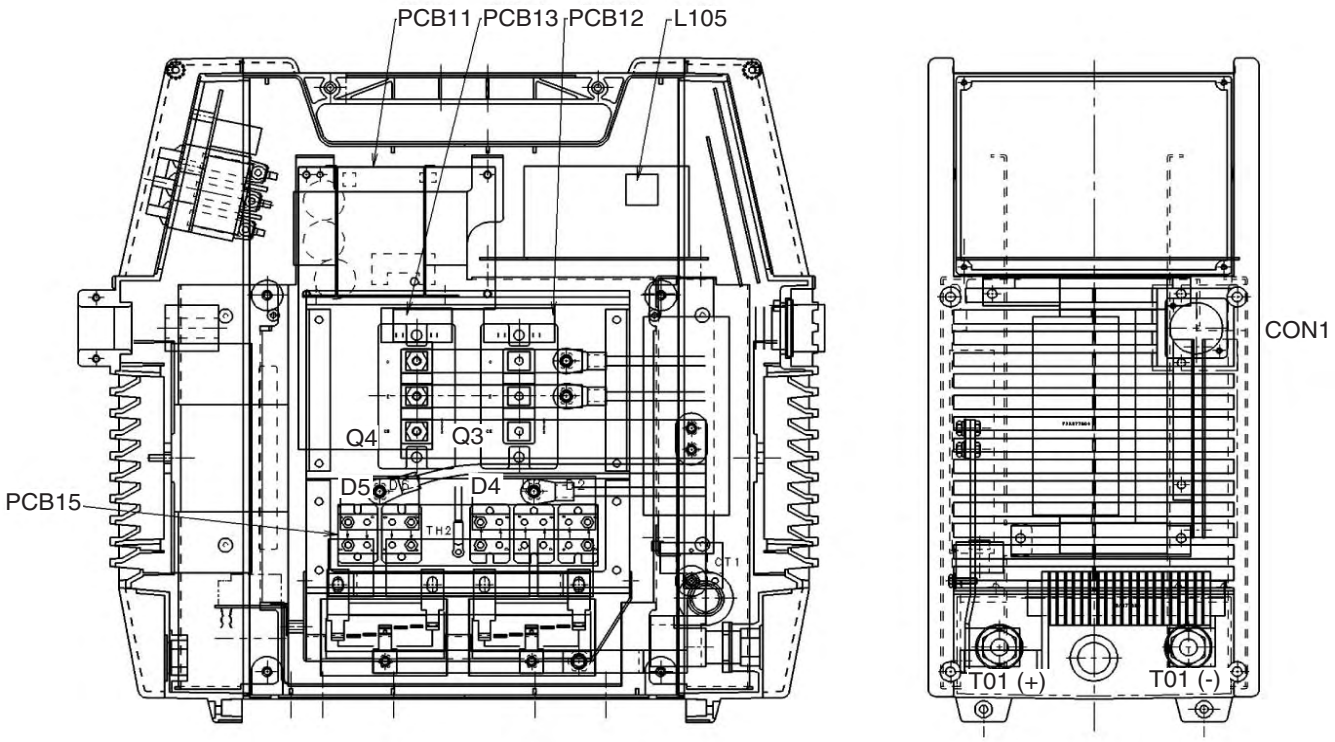
Ref. Des.	Qty.	Description	Part Number
	1	Front Panel - E0D004800	10-6785
	1	Rear Panel - E0D004900	10-6786
	2	Side Panel - E0D006200	10-6787
	1	Front Control Cover -J4B570500	10-6788
	1	Rear Control Cover - JDA173300	10-6789
	1	Protection Cover -E0C299200	10-6790
	1	Encoder Cover - EBA514400	10-6654
	1	PCB Cover - E1B547900	10-6792
	2	Name Label - N4A056400	10-6793
	2	Side Label - N4A009200	10-6657
	1	VRD Label - N4A155900	Ref. Only
	1	Warranty Label - N4A155800	Ref. Only
	1	Warning Label 1 - N0B891300	10-5497
	1	Warning Label 2 - N0B476400	10-5496
	1	Output Terminal Label - N4A040600	10-6794
	1	Gas Input Label - N4A040700	10-6733
	1	Gas Outlet - E5A925600 (with PC4-02)	10-6659
	2	C-Ring	10-5184
	2	Output Terminal (female) - TRAK-BE35-70S	10-6660
	1	Input Cable - SOOW AWG8X4C L=3.4m	Ref. Only
	1	Input Cable Clamp - EBA156800	10-6795
	1	Heatsink - E1B548900 FIN 1	10-6796
	1	Heatsink - E1B549000 FIN 2	10-6797
	1	Knob - 2628603	10-6798
	1	Knob Cap - 3028104	10-6799
	1	Control Cover Sheet - N0B882700	10-6800
	1	Flat Cable - EAA547301	10-6668
	3	Post11 (S1) - EBA643600 (M5-M5) 9	10-6751
	3	Post2 (Q4) - EBA425000 (M5)11.4	10-6801
	9	Post3 (D1,Q1,Q2) - EBA425100 (M5-M5)23	10-6802
	8	Post421 (D2-6) - BSB421 (M4)7.0	10-6803
	4	Post410 - 4SQ10	10-6867
	3	S1 Bus Bar - ECA321000	10-6868
	1	Transformer Bus Bar 1 - EBA365600	10-6804
	2	Q2,3 Bus Bar 1 - EBA429000	10-6806
	1	Q2,3 Bus Bar 2 - EBA429100	10-6807
	1	Q-(+) Bus Bar - EBA501200	10-6808
	1	D Bus Bar 2 - EBA364800	10-6810
	1	D Total Bus Bar 1 - ECA129100 D Total Bus Bar 1	10-6870
	1	D Total Bus Bar 3 - ECA129300 D Total Bus Bar 3	10-6871
	1	D Total Bus Bar 4 - ECA129400 D Total Bus Bar 4	10-6872
	1	D Total Bus Bar 5 - ECA129600A D Total Bus Bar 5	10-6878
	1	D Total Bus Bar 6 - ECA129700 D Total Bus Bar 6	10-6879
	4	Clip - #74 NATURAL (Plastic Tab)	10-5259

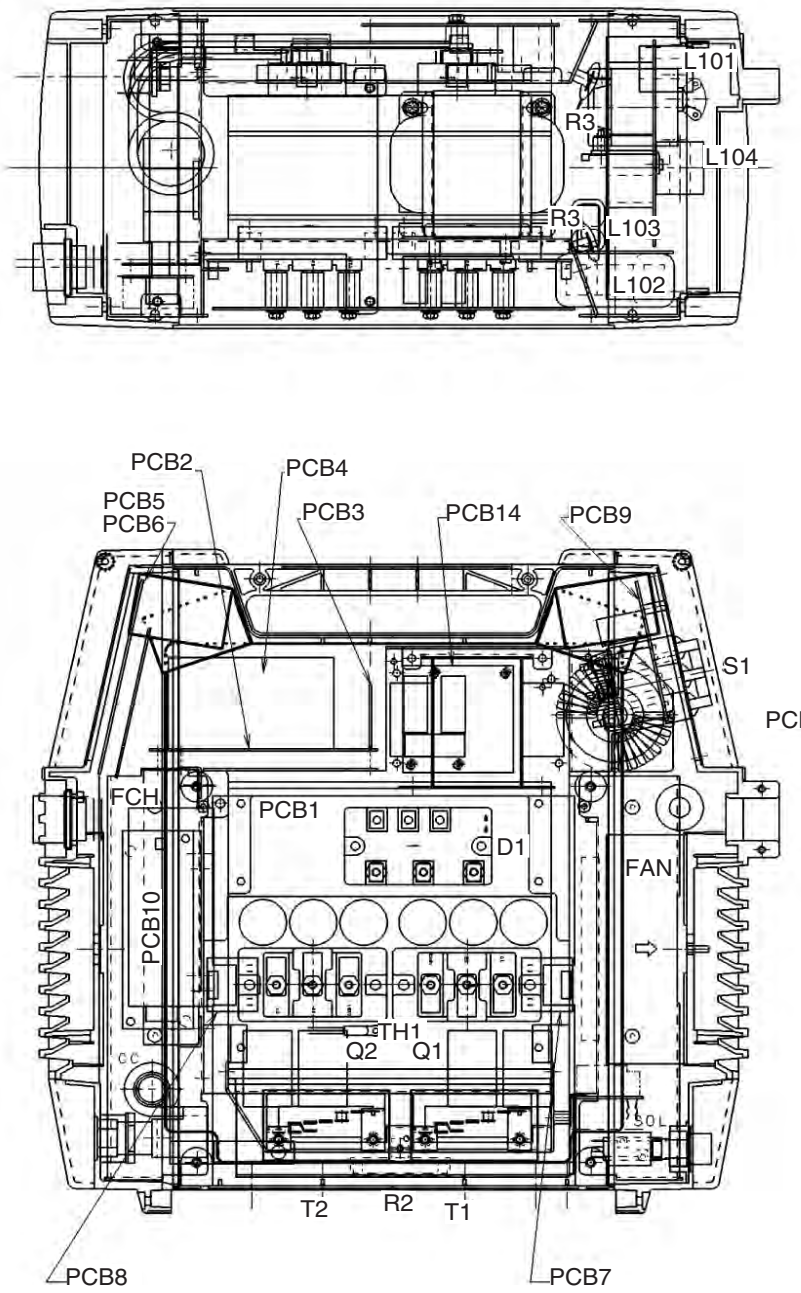
Ref. Des.	Qty.	Description	Part Number
	1	Right Chassis - J2C977100	10-6814
	1	Left Chassis - J2C976800	10-6815
	1	PCB10 Chassis - JDA013400	10-6816
	1	Transformer Chassis 2 - JDA024800	10-6817
	1	Transformer Chassis 1 - JDA026000	10-6818
	1	Transformer Hold Chassis 2 - JDA064300	10-6819
	2	Transformer Sheet - EBA460900	10-6820
	1	14-Pin Con Cover Set - 1070500-20 (with String and Clip)	10-6821
	1	Nylon Hose - T0425B Nylon Hose L=0.5m	10-6681
	2	Output Terminal (male) - TRAK-SK50	10-2020
	1	Operating Manual - K1A208900 300TSW	430429-511
	1	Service Manual	0-4752

APPENDIX 1: GENERAL INFORMATION

- Note the model and specification number shown on the equipment nameplate.

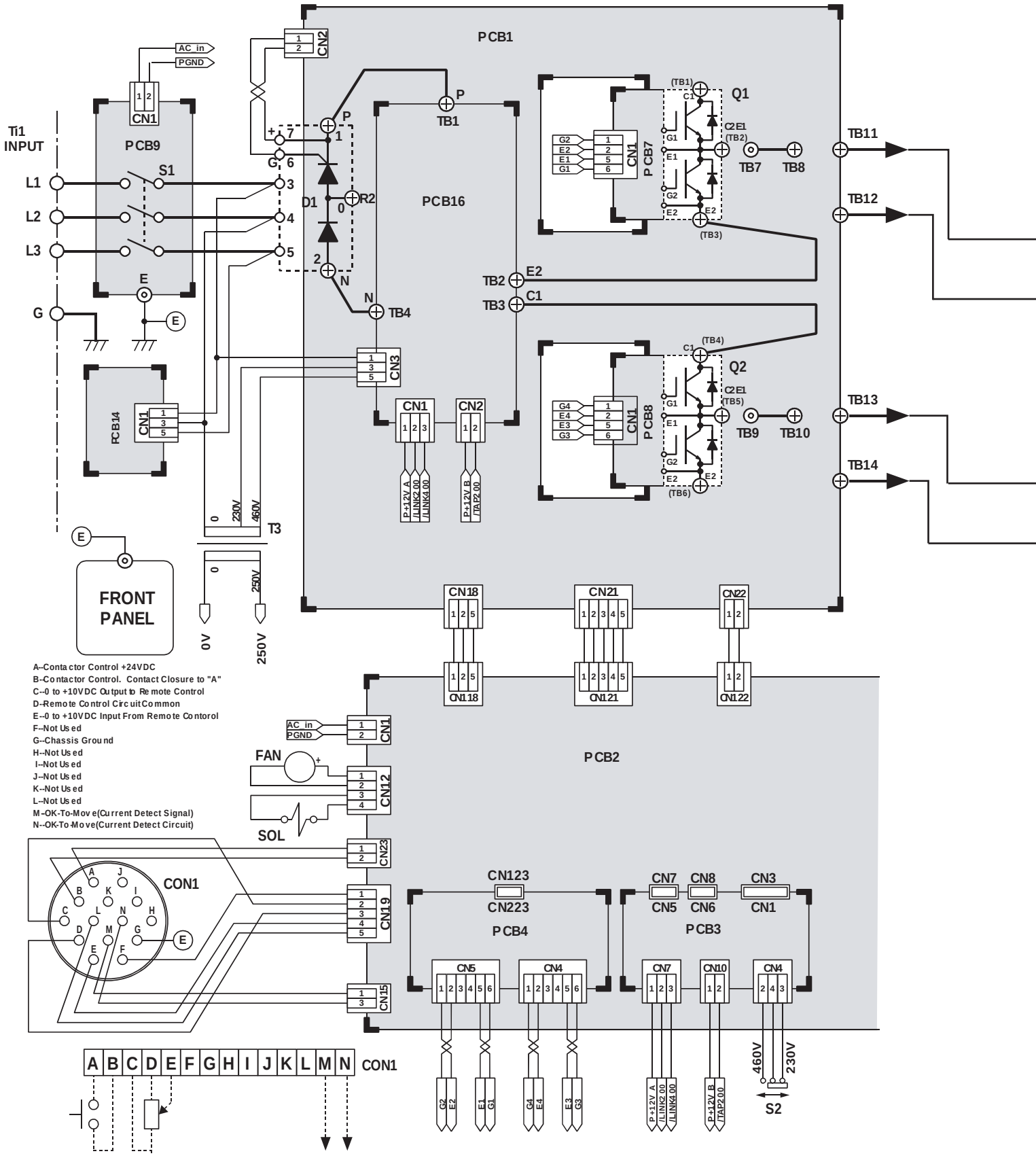
APPENDIX 2: PRO-WAVE 300 TSW PARTS ARRANGEMENT

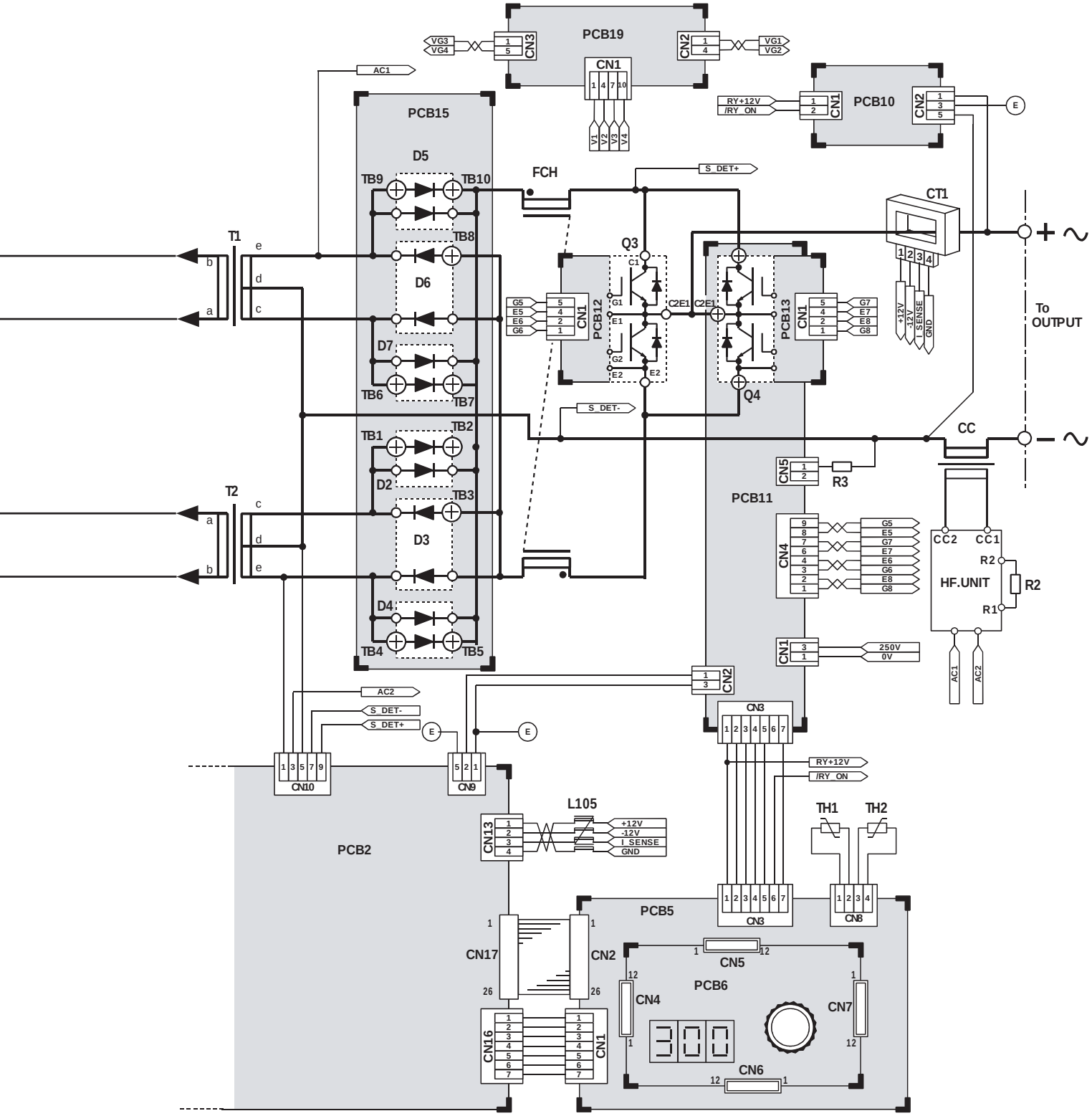



L101
R3
L104
R3
L103
L102
PCB2
PCB4
PCB5
PCB6
PCB3
PCB14
PCB9
S1
PCB1
T3
FCH
PCB1
D1
FAN
PCB10
TH1
Q2
Q1
T2
R2
T1
PCB8
PCB7
HF. UNIT

Art # A-05602

APPENDIX 3: PRO-WAVE 300 TSW INTERCONNECTION DIAGRAM




PCB19
CN1
CN2
CN3
VG3
VG4
VG1
VG2
V1
V2
V3
V4
PCB10
RY+12V
/RY_ON
PCB15
AC1
D5
D6
D7
D4
D3
D2
TB9
TB10
TB8
TB6
TB7
TB1
TB2
TB3
TB4
TB5
FCH
S_DET+
S_DET-
T1
T2
Q3
Q4
C1
G1
E1
G2
E2
C2E1
PCB12
PCB13
G5
E5
E6
G6
G7
E7
E8
G8
CT1
+12V
-12V
I_SENSE
GND
To
OUTPUT
CC
CN5
R3
PCB11
CN4
CC2
CC1
R2
HF.UNIT
R1
250V
0V
AC2
CN10
CN9
PCB2
L105
CN13
TH1
TH2
CN8
PCB5
CN17
CN16
PCB6
CN7
CN6

Art # A-05603

THERMAL ARC®

Global Customer Service Contact Information

Thermadyne USA

82 Benning Street

West Lebanon, NH 03784 USA

Telephone: (603) 298-5711

800-752-7621

Fax: 800-221-4401

Email: sales@thermalarc.com

Thermadyne Victor Brasil

Avenida Brasil

13629-Cordovil

Rio de Janeiro, Brazil 21012-351

Telephone: 55-21-2485-8998

Fax: 55-21-2-485-8735

Thermadyne Chile

Piloto Lazo #90

Cerrillos

Santiago, Chile 7278-654

Telephone: 56-2-557-2465

Fax: 56-2-557-5349

Thermadyne Europe

Europe Building

Chorley North Industrial Park

Chorley, Lancashire

England, PR6 7Bx

Telephone: 44-1257-261755

Fax: 44-1257-224800

Thermadyne Asia Pacific Pte Ltd

5 Shenton Way

#37-02 / 38-02 UIC Building

Singapore 068808

Telephone: 65-6832-8066

Fax : 65+ 6763 5812

Thermadyne, China

RM 102A

685 Ding Xi Rd

Chang Ning District

Shanghai, PR, 200052

Telephone: 86-21-69171135

Fax: 86-21-69171139

Thermadyne Asia Sdn Bhd

Lot 151, Jalan Industri 3/5A

Rawang Integrated Industrial Park - Jln Batu Arang

48000 Rawang Selangor Darul Ehsan

West Malaysia

Telephone: 603+ 6092 2988

Fax : 603+ 6092 1085

Cigweld, Australia

71 Gower Street

Preston, Victoria

Australia, 3072

Telephone: 61-3-9474-7400

Fax: 61-3-9474-7510

Corporate Headquarters
82 Benning Street
West Lebanon, NH 03784 USA
Telephone: (603) 298-5711
800-752-7621
Fascimile: 800-221-4401
Email: sales@thermalarc.com

www.thermalarc.com