VS 212

PORTAFEED®

CC/CV SEMIAUTOMATIC SOLID STATE CONTROLLED WIRE FEEDER

Art # A-07123_AC

Service Manual

Version No: AH **Issue Date:** March 3, 2011 **Manual No.:** 0-4936B

Operating Features:

15-100 DC | CC CV | 800 IPM | VS

THERMAL ARC®

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.

Portafeed VS 212 CC/CV Semiautomatic Solid State Controlled Wire Feeder
Service Manual Number 0-4936B for:
Part Numbers: W3512001 and W3512002

Published by:
Thermadyne Industries Inc.
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West Lebanon, New Hampshire, USA 03784
(603) 298-5711

www.thermalarc.com

Publication Date: June 2, 2006
Revision AH Date: March 3, 2011

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. Some of these practices apply to equipment

connected to power lines; other practices apply to engine driven equipment. Anyone not having extensive training in welding and cutting practices should not attempt to weld.

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.**

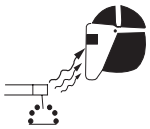
1.01 Arc Welding Hazards

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.
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.

Eye protection filter shade selector for welding or cutting (goggles or helmet), from AWS/ANSI Z49.1:2005

Welding or Cutting Operation	Electrode Size Metal Thickness or Welding	Filter Shade	Welding or Cutting Operation	Electrode Size Metal Thickness or Welding	Filter Shade
Torch Soldering	All	2	Gas Tungsten Arc Welding		
Torch Brazing	All	3 or 4	Light	Under 50 Amp	10
Oxygen Cutting			Medium	50 to 150 Amp	12
Light	Under 1 in., 25 mm	3 or 4	Heavy	150 to 500 Amp	14
Medium	1 – 6 in., 25 – 150 mm	4 or 5	Atomic Hydrogen Welding	All	12
Heavy	Over 6 in., 150 mm	5 or 6	Carbon Arc Welding	All	14
Gas Welding			Carbon Arc Gouging		
Light	Under 1/8 in., 3 mm	4 or 5	Light		12
Medium	1/8 – 1/2 in., 3 – 12 mm	5 or 6	Heavy		14
Heavy	Over 1/2 in., 12 mm	6 or 8	Plasma Arc Welding		
Shielded Metal-Arc Welding (Stick) Electrodes			Light	Under 20 Amp	6 to 8
Light	Under 5/32 in., 4 mm	10	Light	20 to 100 Amp	10
Medium	Under 5/32 to ¼ in., 4 to 6.4m	12	Medium	100 to 400 Amp	12
Heavy	Over ¼ in., 6.4 mm	14	Heavy	400 to 800 Amp	14
Gas Metal Arc Welding			Plasma Arc Cutting		
Light	Under 60 Amp	7	Light	Under 300 Amp	9
Light	60 to 160 Amp	11	Medium	300 to 400 Amp	12
Medium	160 to 250 Amp	12	Heavy	400 to 800 Amp	14
Heavy	250 to 500 Amp	14			

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.

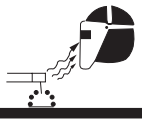
1.04 Dangers relatifs au soudage à l'arc

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.

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.

SELECTION DES NUANCES DE FILTRES OCULAIRS POUR LA PROTECTION DES YEUX EN COUPAGE ET SOUDAGE (lunettes ou casque) selon AWS/ANSI Z49.1:2005

Opération de coupage ou soudage	Dimension d'électrode ou Epiasseur de métal ou Intensité de courant	Nuance de filtre oculaire
Brassage tendre au chalumeau	toutes conditions	2
Brassage fort au chalumeau	toutes conditions	3 ou 4
Oxycoupage		
mince	moins de 1 po. (25 mm)	3 ou 4
moyen	de 1 á 6 po. (25 á 150 mm)	4 ou 5
épais	plus de 6 po. (150 mm)	5 ou 6
Soudage aux gaz		
mince	moins de 1/8 po. (3 mm)	4 ou 5
moyen	de 1/8 á 1/2 po. (3 á 12 mm)	5 ou 6
épais	plus de 1/2 po. (12 mm)	6 ou 8
Soudage á l'arc avec électrode enrobees (SMAW)		
mince	moins de 5/32 po. (4 mm)	10
moyen	5/32 á 1/4 po. (4 á 6.4 mm)	12
épais	plus de 1/4 po. (6.4 mm)	14
Soudage á l'arc sous gaz avec fil plein (GMAW)		
mince	ampérages inférieurs à 60 A	7
mince	60 à 160 A	11
moyen	160 à 250 A	12
épais	250 à 500 A	14

Opération de coupage ou soudage	Dimension d'électrode ou Epiasseur de métal ou Intensité de courant	Nuance de filtre oculaire
Soudage á l'arc sous gaz avec électrode de tungstène (GTAW)		
mince	ampérages inférieurs à 50 A	10
moyen	50 à 150 A	12
épais	150 à 500 A	14
Soudage á l'hydrogène atomique (AHW)	toutes conditions	12
Soudage á l'arc avec électrode de carbone (CAW)	toutes conditions	14
Gougeage Air-Arc avec électrode de carbone		
mince		12
épais		14
Soudage á l'arc Plasma (PAW)		
mince	ampérages inférieurs à 20 A	6 to 8
mince	20 à 100 A	10
moyen	100 à 400 A	12
épais	400 à 800 A	14
Coupage á l'arc Plasma (PAC)		
mince	ampérages inférieurs à 300 A	9
moyen	300 à 400 A	12
épais	400 à 800 A	14

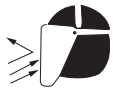
7. Ne soudez des tôles galvanisées ou plaquées au plomb ou au cadmium que si les zones à souder ont été grattées à fond, que si l'espace est bien ventilé; si nécessaire portez un respirateur à adduction d'air. Car ces revêtements et tout métal qui contient ces éléments peuvent dégager des fumées toxiques 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 ACCUMULATEUR 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 Declaration Of Conformity

CE

Manufacturer: Thermadyne Corporation
Address: 82 Benning Street
West Lebanon, New Hampshire 03784
USA

The equipment described in this manual conforms to all applicable aspects and regulations of the 'Low Voltage Directive' (European Council Directive 73/23/EEC as amended by Council Directive 93/68/EEC) and to the National legislation for the enforcement of this Directive.

The equipment described in this manual conforms to all applicable aspects and regulations of the "EMC Directive" (European Council Directive 89/336/EEC) and to the National legislation for the enforcement of this Directive.

Serial numbers are unique with each individual piece of equipment and details description, parts used to manufacture a unit and date of manufacture.

National Standard and Technical Specifications

The product is designed and manufactured to a number of standards and technical requirements. Among them are:

- CSA (Canadian Standards Association) standard C22.2 number 60 for Arc welding equipment.
- UL (Underwriters Laboratory) rating 94VO flammability testing for all printed-circuit boards used.
- CENELEC EN50199 EMC Product Standard for Arc Welding Equipment.
- ISO/IEC 60974-1 (BS 638-PT10) (EN 60 974-1) (EN50192) (EN50078) applicable to plasma cutting equipment and associated accessories.
- For environments with increased hazard of electrical shock, Power Supplies bearing the S mark conform to EN50192 when used in conjunction with hand torches with exposed cutting tips, if equipped with properly installed standoff guides.
- Extensive product design verification is conducted at the manufacturing facility as part of the routine design and manufacturing process. This is to ensure the product is safe, when used according to instructions in this manual and related industry standards, and performs as specified. Rigorous testing is incorporated into the manufacturing process to ensure the manufactured product meets or exceeds all design specifications.

Thermadyne has been manufacturing products for more than 30 years, and will continue to achieve excellence in our area of manufacture.

Manufacturers responsible representative:

Steve Ward
Operations Director
Thermadyne Europe
Europa Building
Chorley N Industrial Park
Chorley, Lancashire,
England PR6 7BX

SECTION 2: INTRODUCTION

2.01 How To Use This Manual

This Service Manual applies to just specification or part numbers listed on page i.

To ensure safe operation, read the entire manual, including the chapter on safety instructions and warnings.

Throughout this manual, the words **WARNING, CAUTION**, and **NOTE** may appear. Pay particular attention to the information provided under these headings. These special annotations are easily recognized as follows:

WARNING

A WARNING gives information regarding possible personal injury.

CAUTION

A CAUTION refers to possible equipment damage.

NOTE

A NOTE offers helpful information concerning certain operating procedures.

Additional copies of this manual may be purchased by contacting Thermadyne at the address and phone number in your area listed in the inside back cover of this manual. Include the Owner's Manual number and equipment identification numbers.

Electronic copies of this manual can also be downloaded at no charge in Acrobat PDF format by going to the Thermal Arc web site listed below and clicking on the Literature link:

http://www.thermalarc.com

2.02 Equipment Identification

The unit's identification number (specification or part number), model, and serial number usually appear on a nameplate attached to the rear panel. In some cases, the nameplate may be attached to the control panel. Equipment which does not have a name plate such as gun and cable assemblies is identified only by the specification or part number printed on the shipping container. Record these numbers on the bottom of page i for future reference.

2.03 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
A	Amperage
V	Voltage
Hz	Hertz (cycles/sec)
f	Frequency
	Negative
	Positive
	Direct Current (DC)
	Protective Earth (Ground)
	Line
	Line Connection
	Auxiliary Power
115V 15A	Receptacle Rating- Auxiliary Power

1 ~	Single Phase
3 ~	Three Phase
	Three Phase Static Frequency Converter-Transformer-Rectifier
	Remote
X	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
IPM	Inches Per Minute
MPM	Meters Per Minute
	Art # A-04130

2.04 General

The PORTAFEED® VS 212 is a portable, solid state controlled, voltage sensing wire feeder that operates on arc voltage and can be used with most constant voltage (CV) and constant current (CC) DC-type power sources. The only connection required between the power source and the wire feeder is the welding cable.

The unique design of this wire feeder allows operation in a constant wire feed speed mode when used with CV power sources, and in a voltage sensing wire feed speed mode (wire feed speed varies with respect to arc voltage) when used with CC power sources.

The PORTAFEED VS 212's steel-reinforced, flame-retardant case totally encloses the solid state control circuitry, welding wire, and wire drive system. A hinged, latched door allows quick and easy access to the contactor, welding wire, and feedhead assembly that features quick change, gear-driven drive rolls.

PORTAFEED VS 212 comes with:

- Robust injection molded case
- Changeable MIG gun cartridge system
- Digital display (model W3512002 only)
- Heavy duty contactor
- Internal parts storage
- Power cable and drive rolls
- Gas valve solenoid

The PORTAFEED VS 212, includes the following features:

1. An on/off rocker switch
2. A wire feed speed control knob
3. A welding gun holder
4. A carrying handle
5. A contactor
6. A gas valve
7. A CC/CV mode switch
8. An input circuit breaker for complete system protection
9. Electronic controlled protection circuitry to protect against an undervoltage, an overvoltage, a voltage spike, a shorted or locked motor, a shorted contactor coil, and a shorted gas valve
10. An electronic controlled dynamic brake
11. An electronic controlled current limit to motor
12. An electronic controlled start circuit for improved arc starting
13. A low voltage gun trigger circuit for operator safety
14. A feed roll kit
15. In addition to these standard features, specification number W3512002 also includes a digital display for wire feed speed/amps and arc voltage, with arc time and memory hold.
16. Trigger Hold Switch

The PORTAFEED VS 212 has been designed to comply with IEC 60974-1 (CE), CSA NRTL/C, and NEMA EW 3 standards.

2.05 Product Specifications

Portafeed VS212 Specifications	
Input Voltage Range	15-100 VDC
Maximum Input Current	10 Amps
Wire Speed Range (dependent on arc voltage)	50-800 IPM (1.27 - 20.32 MPM)
Wire Sizes	0.024 - 5/64'' (0.6 - 2.0 mm)
Max Wire Spool Capacity	12'' (304.8 mm) 44 Lbs. (20 kg)
Drive Rolls	2 (Both Gear Driven)
Welding Current (I)	425A at 60% Duty Cycle
Welding Gun Inlet Size (Std) Tweco Style #4	5/8'' (16mm) Nominal
Maximum Shielding Gas Inlet Pressure	100 psi (6.9 bar)
Degree of Protection	IP23C
Weight (Less wire)	44 lbs (20 kg)
Approvals	IEC 60974-5 (CE) CSA NRTL/C (pending) NEMA EW3

Table 2-1 Specifications

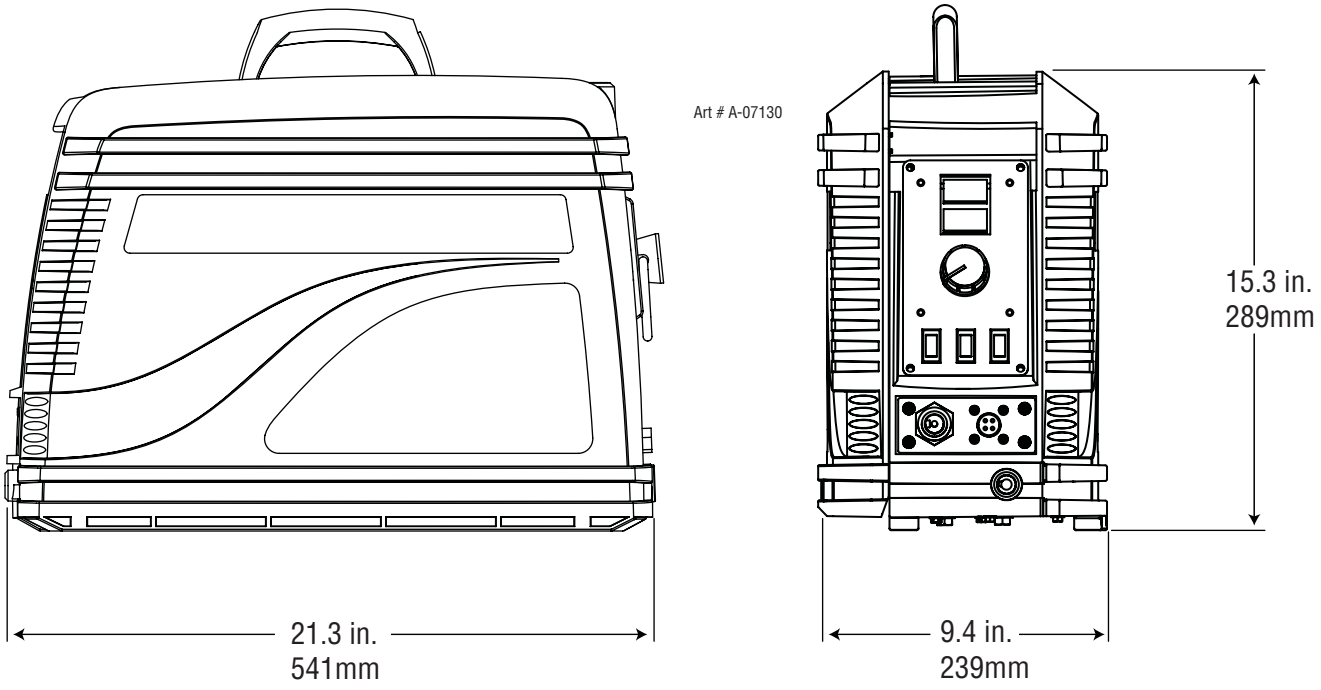


Figure 2-1: Dimensional Information

2.06 Features/Benefits

Robust injection molded case
Long lasting and unbreakable.

Changeable MIG gun cartridge system
Patent Pending. No external MIG gun adapters needed for other style guns with the integrated cartridge system.

Digital display (Model # W3512002)
Monitor wire speed, amps, volts, arc time and meter hold. Makes parameter set-up easy.

Heavy duty contactor
Longer life on higher amperage applications.

Internal parts storage
On the job storage for drive rolls, tips, nozzels, etc.

Machined feed head & tension arms
Insures wire alignment tolerances of ±002".

Inch switch & purge switch
'Cold' inching of wire at set wire feed speed and purging of gas without running wire.

Gun trigger hold (2T/4T)
Allows standard or latched gun trigger.

Heavy duty, removable voltage sensing lead
Allows storage of lead with less lead breakage.

MIG gun holder
A place to hold your MIG gun while not welding.

Lifting eye
Allows for hanging or moving of the feeder over the work area.

Gas valve solenoid
Controls 'on/off' flow of shielding gases.

Wire speed high/low range
Gives a finer dial control of larger diameter flux cored wires.

Ready to weld
Supplied with 2ft (.7m) power cable, Tweco connectors and .045in (1.2mm) drive rolls for hard/tubular wire. Geared top & bottom feed rolls. Excellent traction on the wire.

Quick change drive rolls
Change the feed rolls without tools.

2.07 Front Panel Controls And Connections

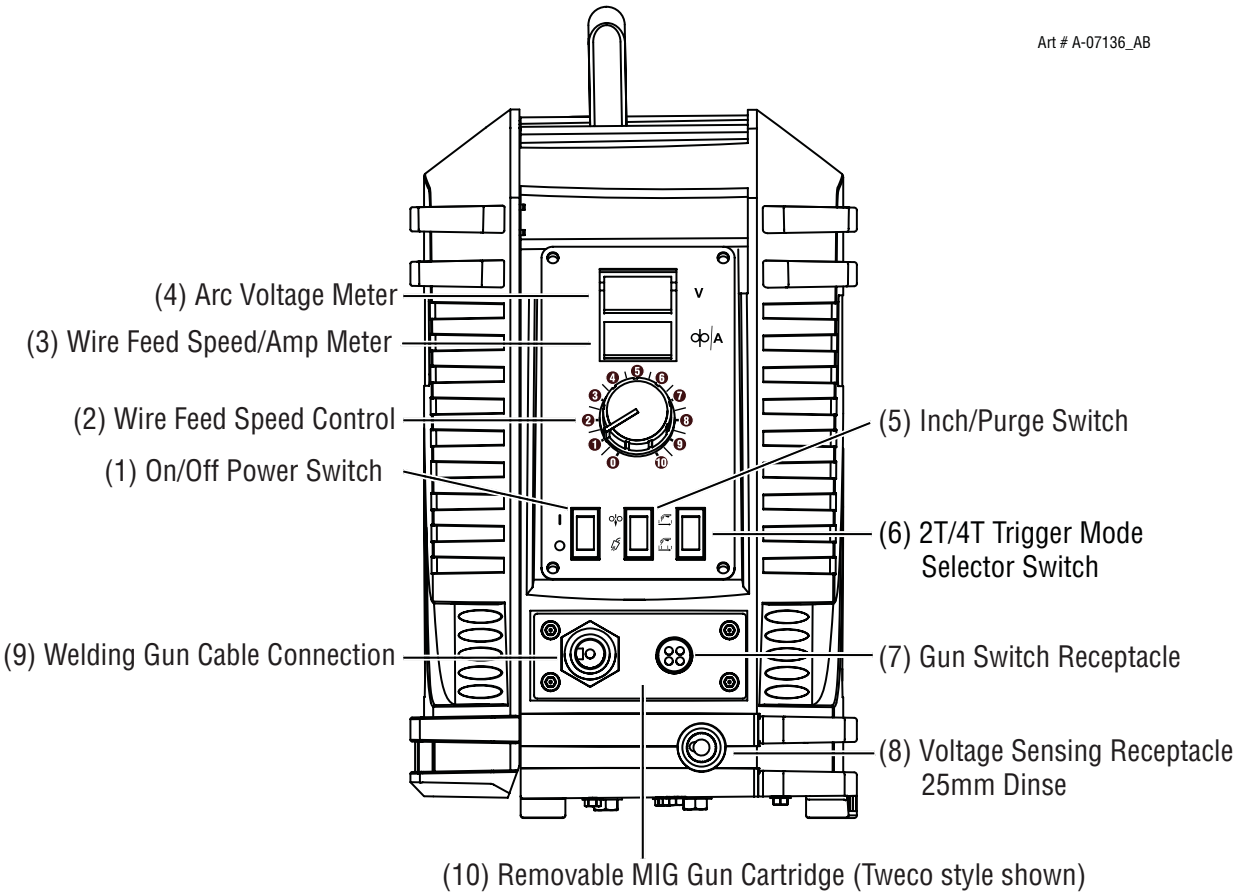


Figure 2-2: Front Panel Controls and Connections

1. **POWER ON/OFF SWITCH:** This switch controls input power only to the wire feeder and not to the power source.
2. **WIRE FEED SPEED CONTROL:** This knob controls the wire feed speed. The wire feed speed control can be adjusted during setup or actual welding.
3. **WIRE FEED SPEED/AMP METER:** The wire feed speed meter displays the actual wire feed speed output of the wire feeder. This meter can be changed to display the actual amperage output of the power source by adjusting the DIP switches located on the edge of the display board inside the unit. Refer to Section 4.07 for details. AVAILABLE IN MODEL W3512002 ONLY.
4. **ARC VOLTAGE METER:** The arc voltage meter displays the actual voltage output of the power source.
5. **INCH/PURGE SWITCH:** Depressing the INCH portion of the switch will feed wire at a speed set by the WFS control. The wire will not be electrically hot when using the INCH switch. Depressing the PURGE portion of the switch will allow shielding gas to flow out of the welding gun without feeding wire.
6. **2T/4T TRIGGER MODE SELECTOR SWITCH:** This switch selects either 2 Step or 4 Step gun switch mode.

   2T (Continuous Welding): This mode of welding is used to weld two or more components together with a continuous weld. When the MIG gun trigger switch is depressed welding commences. When the MIG gun trigger switch is released welding ceases.

   4T (Latch): This mode of welding is mainly used for long weld runs, as the operator need only press the trigger to activate the weld, then press the trigger again to stop. This replaces the need for the operator to depress and hold the trigger for the complete length of the weld run.
7. **GUN SWITCH RECEPTACLE:** The gun switch receptacle accepts the welding gun control wires. The gun switch receptacle is where a gun switch closure is inputted to the wire feeder.

8. **VOLTAGE SENSING RECEPTACLE:** This receptacle serves as the voltage sensing point for the wire feeder and must be connected to the work piece through the voltage sensing lead for proper operation. If the voltage sensing lead from the wire feeder and the weld cable from the power source are not connected to the work piece, the wire feeder will not work.
9. **WELDING GUN CABLE CONNECTION:** The welding gun cable is connected to the wire feeder at this point. Connections must be tight; otherwise, arcing or overheating could result.
10. **REMOVABLE MIG GUN CARTRIDGE (**Patent Pending): The whole cartridge is interchangeable to accept competitive types of MIG gun connections. No external adapters required. See Appendix 2 and 3 for installation information and to select the adapter for other MIG Gun styles, ie. Miller®, Lincoln® or Euro.

2.08 Rear Panel Controls And Connections

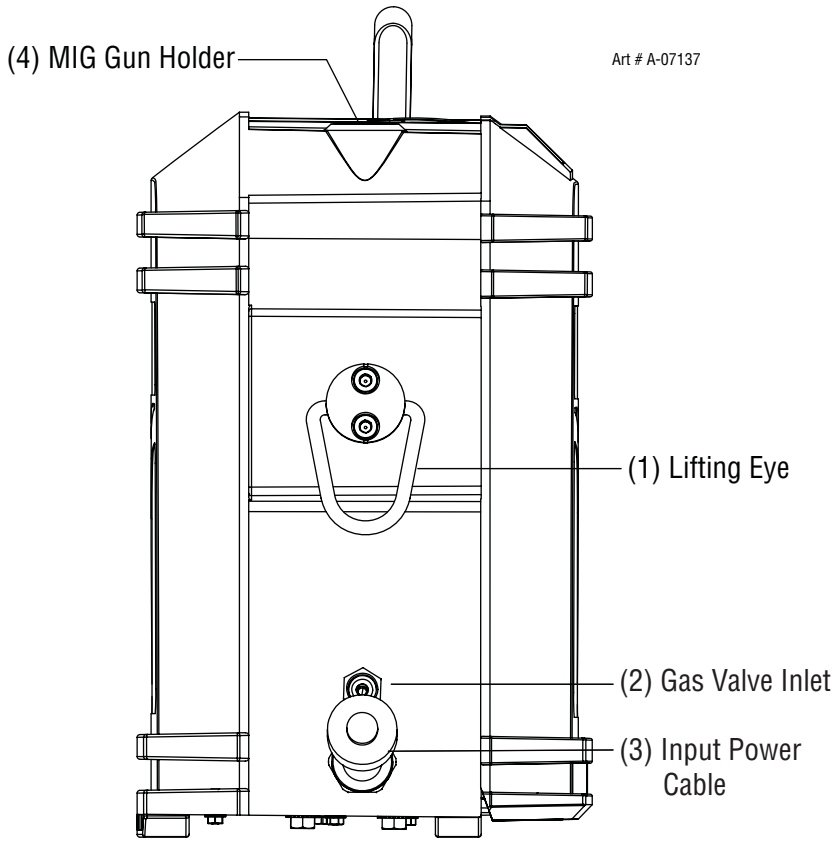


Figure 2-3: Rear Panel Connections

1. **LIFTING EYE:** Allows for hanging or moving of the feeder over the work area.
2. **GAS VALVE INLET:** This is where the shielding gas hose (if used) is connected to the wire feeder.
3. **INPUT POWER CABLE:** Power cable and TWECO® connectors (male and female supplied). Provides an inlet and secure fixture for the power cable from the welding power source.
4. **WELDING GUN HOLDER:** This is an insulated holder used to hold the welding gun when not welding.

2.09 Internal Controls And Connections

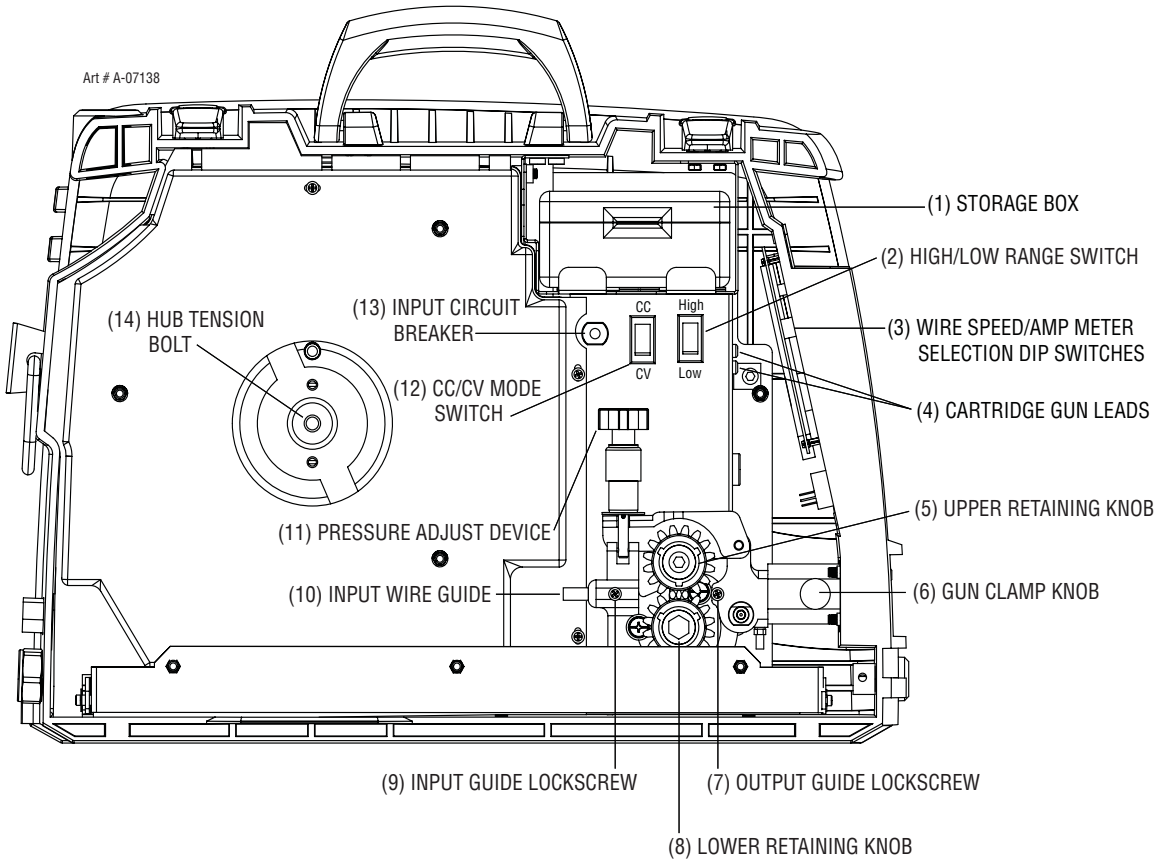


Figure 2-4: Internal Controls and Connections.

1. **STORAGE BOX:** On the job storage for drive rolls, tips, nozzels, etc. To remove, lift up to release velcro and slide it up and over the side retainers.
2. **HIGH/LOW RANGE SWITCH:** Gives a finer dial control over the wire speed, which is especially useful with larger diameter flux-cored wires.
3. **WIRE SPEED/AMP METER SELECTION DIP SWITCHES:** Set these switches to change the lower meter display from wire speed to amperage output of the power source. Refer to Section 2.08, item 3 and section 4.06 for DIP switch setting information.
4. **GUN LEADS:** These two spade terminals provide the MIG gun switch connection.
5. **UPPER RETAINING KNOB:** This knob is used to secure the bearing feed roll. Remove this knob to change the bearing feed roll.
6. **GUN CLAMP KNOB:** Tighten this knob to secure the welding gun to the wire feeder.
7. **OUTPUT GUIDE LOCKSCREW:** Tighten this screw to secure the output wire guide.
8. **LOWER RETAINING KNOB:** This knob is used to secure the drive feed roll. Remove this knob to change the drive feed roll.
9. **INPUT GUIDE LOCKSCREW:** Tighten this screw to secure the input wire guide.
10. **INPUT WIRE GUIDE:** This guide is required to direct the welding wire from the wire spool to the feed roll.
11. **PRESSURE ADJUSTMENT DEVICE:** Use the pressure adjustment device to adjust the amount of force the bearing feed roll exerts on the welding wire.

12. **CC/CV MODE SWITCH:** The CC position provides a voltage sensing wire feed speed mode of operation for use with constant current (CC) power sources. The CV position provides a constant wire feed speed mode of operation for use with constant voltage (CV) power sources.

NOTE

This switch does not select a CC or CV mode of operation. The mode of operation is set by the type of power source being used.

13. **INPUT CIRCUIT BREAKER:** This circuit breaker provides complete system protection for the wire feeder in the case of a fault or overload condition.

14. **HUB TENSION BOLT:** The hub tension bolt is used to adjust the wire spool tension which acts as a mechanical brake to assist in the stopping of the welding wire at the completion of a weld.

2.10 Power Source Compatibility

Since the PORTAFEED VS 212 operates on arc voltage, it will work with most constant current (CC) or constant voltage (CV) DC type power sources.

When connected to a PORTAFEED VS 212, the maximum allowed open circuit voltage (OCV) of the power source is 100 VDC. Open circuit voltages exceeding 100 VDC will damage or shorten the life of the unit.

NOTE

Because of the high open circuit voltage associated with most CC power sources, it is recommended to place the PORTAFEED VS 212 power switch in the OFF position when not welding. This procedure will prolong the life of electrical components connected to the power input lines.

When using the PORTAFEED VS 212, there must be at least 15 VDC between the output terminals of the power source during standby and while welding. Otherwise, the unit will not have enough input voltage to operate properly.

A contactor is a standard component of the PORTAFEED VS 212 and allows the welding wire to remain electrically cold until the gun switch trigger is depressed. This contactor is rated for 425 amps of welding current at a 60% duty cycle. If the weld current or duty cycle rating is exceeded, the contactor will be damaged or its life shortened.

Compatible Thermal Arc Power Sources
ArcMaster 400S, 300MST, 400MST, 400MSTP
Fabstar® 4030
PowerMaster® Series
Excel-Arc® Series
Scout, Raider 10000 (engine driven)

2.11 Options and Accessories

Refer to the Appendix 2 section of this manual for the list of available options and accessories for this product.

NOTES

SECTION 3: INSTALLATION

3.01 Connections

CAUTION

Make sure all connections are tight; otherwise, arcing or overheating could result.

WARNING

ELECTRIC SHOCK CAN KILL! DO NOT touch the metal portions of the voltage sensing lead when the power source output is on.

1. Using the supplied adapter, connect a weld cable from the power source to the power cable connection on the rear of the VS 212.
2. Connect a weld cable from the power source to the work connection.
3. Connect the voltage sensing lead from the wire feeder to the work connection.
4. Make the proper gas line connection from the gas supply to the wire feeder gas valve (if gas will be used).
5. Attach the welding gun to the wire feeder.
6. Connect the welding gun control leads to the wire feeder gun switch terminals located on the front of the wire feeder.

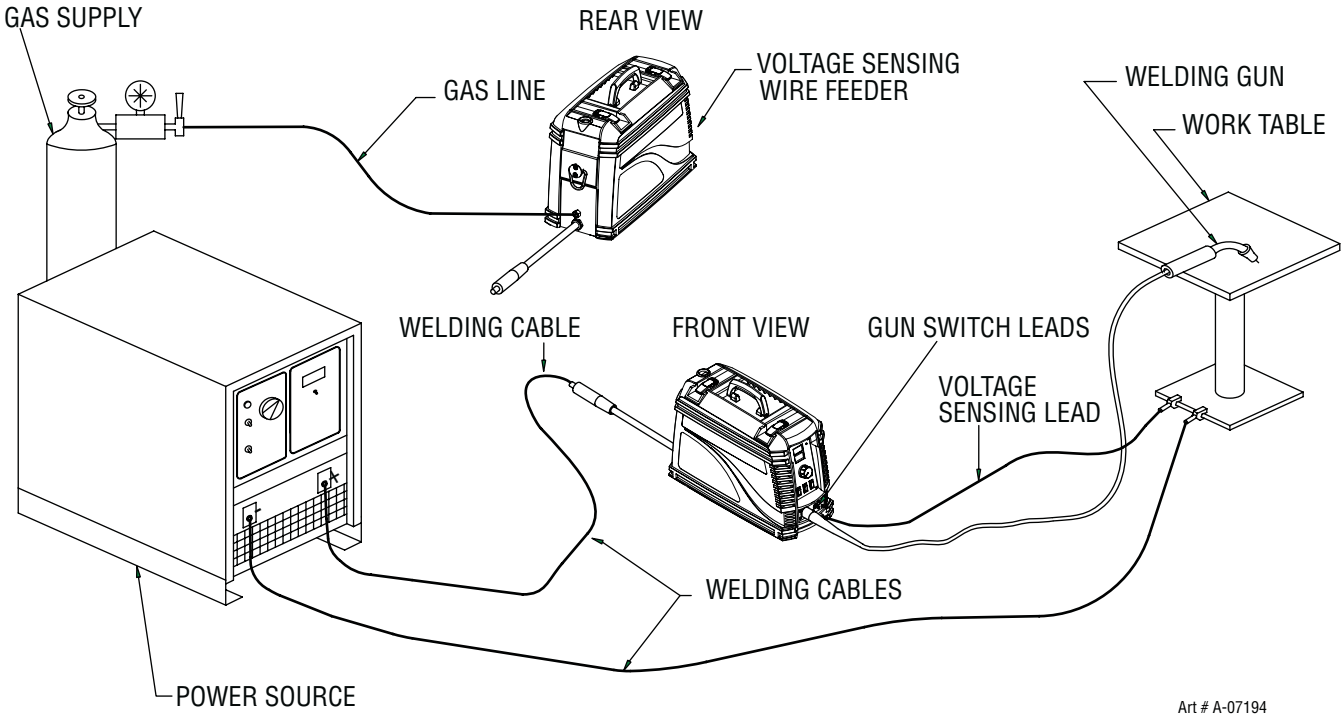


Figure 3-1: System Hook-up Outline

3.02 Installation Of Wire Spool

NOTE

The wire spool hub supplied with the unit is provided for mounting a 44 pound (20 kg) spool of wire. Optional adapters are available allowing a 10 (4.5 kg) or 15 (6.8 kg) pound spool of wire or a 14 (6.4 kg) pound coil of wire to be used.

1. Remove the wire spool hub nut by turning counterclockwise.
2. Slide the spool of wire over the wire spool hub.
3. Make sure that the alignment pin on the hub enters the hole in the backside of the wire spool.
4. Replace the wire spool hub nut and turn clockwise to a snug position.

NOTE

Install the welding wire spool so the wire feeds from the bottom of the spool into the input wire guide.

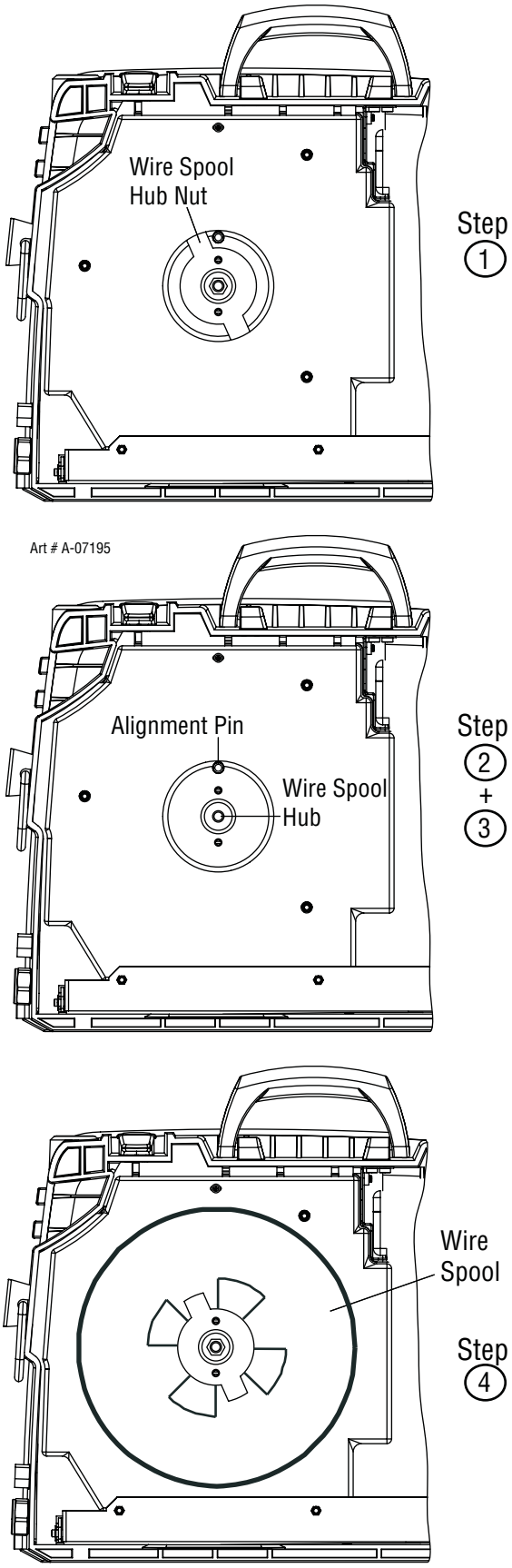


Figure 3-2: Wire Spool Installation

3.03 Adjustment Of Spool Tension

Adjust the wire spool tension so the wire will feed freely into the input wire guide. However, the spool of welding wire must not coast when wire feeding stops. To adjust the wire spool tension, tighten or loosen the hub tension bolt accordingly.

NOTE

Excessive tightening of the hub tension bolt will result in a shorter motor life.

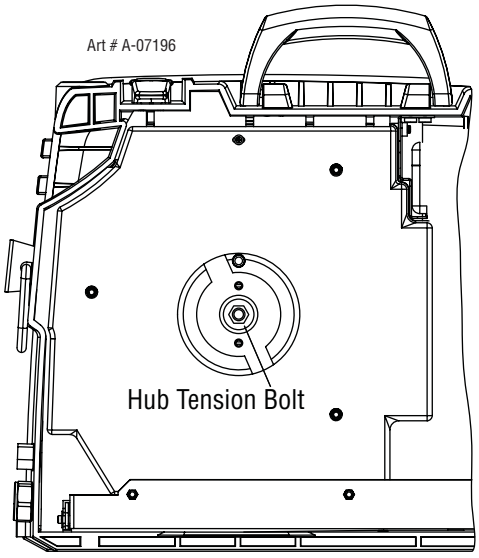


Figure 3-3: Hub Tension Bolt

3.04 Input And Output Wire Guide Installation

1. Install the input wire guide (the longer one) by loosening the input guide lockscrew and inserting the guide into the hole in the feedhead assembly. The recessed end of the guide should be towards the wire spool. Adjust the guide so that it is clear of the feed rolls and tighten the input guide lockscrew.
2. Install the output wire guide (with the conical end towards the feed rolls) in the same manner as the input guide. The conical end of the guide should be as close to the feed rolls as practical. Tighten the output guide lockscrew.

NOTE

Before tightening the input and output guide lockscrews, install the drive feed roll to help in the alignment of the wire guides.

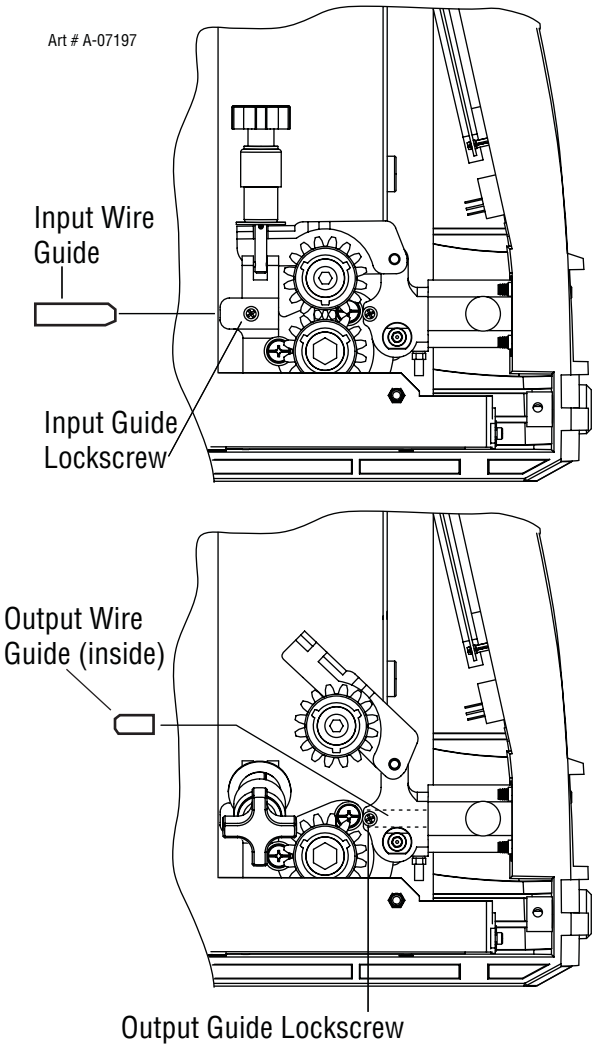


Figure 3-4: Wire Guide Installation

3.05 Selection And Installation Of Feed Rolls

Refer to feed roll kit chart in the Appendix chapter for the proper selection and ordering of feed roll kits. Kit includes an idler roll, a drive roll, an input wire guide, and an output wire guide for a specific wire type and size.

NOTE

All grooved feed rolls have their wire size or range stamped on the side of the roll. On rolls with different size grooves, the outer (visible when installed) stamped wire size indicates the groove in use.

Idler feed rolls are installed by unscrewing the upper retaining knob and removing the idler gear. The idler feed roll retaining knob is then removed from the idler gear, and the idler feed roll is placed over the lobes on the idler gear. The idler feed roll retaining knob is replaced, and this assembly is returned and secured with the upper retaining knob.

Drive feed rolls are installed by removing the lower retaining knob, placing the drive feed roll over the lobes on the drive gear, and securing with the lower retaining knob.

NOTE

Installation of all styles of feed rolls for this feeder is identical.

WARNING

The welding wire is electrically Hot if wire is fed by depressing gun switch. Electrode contact to work piece will cause an arc with gun switch depressed.

3.06 MIG Gun Compatibility And Installation and Removal

The Portafeed VS 212 wire feeder is designed to be used with most MIG welding guns. It comes configured from the factory to work with all Tweco guns. Refer to the Appendix 2 Options and Accessories for the ordering information of other MIG gun adapter cartridges. Refer to Section 7.10 for exploded view illustrations of the available MIG gun adapter cartridges.

Refer to Appendix 3 for more information on the MIG Gun Cartridge System.

1. To install the welding gun, loosen the gun clamp knob and insert the welding gun cable end into the feedhead until it stops.
2. Tighten the gun clamp knob and connect the welding gun control wires to the gun switch receptacle.
3. To remove, loosen the gun clamp knob and pull the gun cable end out.

NOTE

Before inserting the welding gun into the feedhead, make sure the gun clamp does not extend into the feedhead; otherwise, the welding gun cannot be properly inserted.

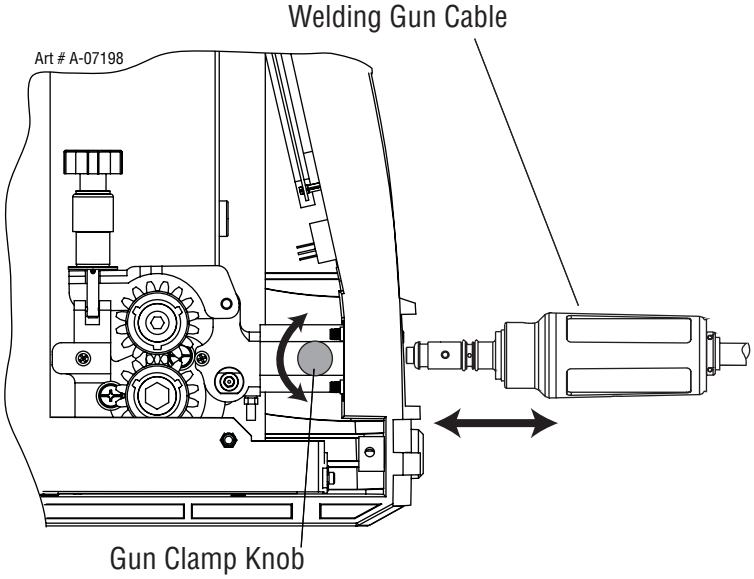


Figure 3-5: Installing Welding Gun

3.07 Threading Wire Into Feedhead

Refer to Figure 3-6.

WARNING

ELECTRIC SHOCK CAN KILL! Make certain the power source and wire feeder are turned OFF. Do not turn the power ON until told to do so in these instructions.

CAUTION

Use care when handling the spooled wire as the wire tends to unravel when loosened from the spool. Grasp the end of the wire firmly, and don't let it get away from you. Make sure that the end of the wire is straight and free of burrs.

1. Place end of the welding wire into the input wire guide. Feed it through the guide and over the drive roll groove closest to the feedhead casting.
2. Pass the wire through the output wire guide and into the welding gun assembly.
3. Lock in position with the pressure adjustment device. To adjust the amount of force the idler feed roll exerts on the welding wire, turn the pressure adjustment device clockwise for increased force or counterclockwise for decreased force.

NOTE

If the force applied to the wire is too great, the welding wire will bird nest in the feedhead and not feed properly.

4. Turn the welding machine and wire feeder ON, and set the wire feed speed control to midrange (refer to Figure 3-7). Remove contact tube from welding gun. Refer to Gun Manual. Press the gun switch or INCH switch until wire feeds out past the gun nozzle. Place contact tip over the wire and screw into place and tighten. Cut wire off at about 1/4 inch (6 mm) from the nozzle.

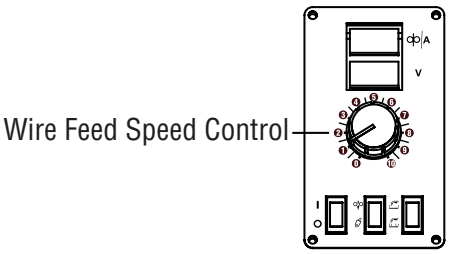


Figure 3-7: Wire Feed Speed Control

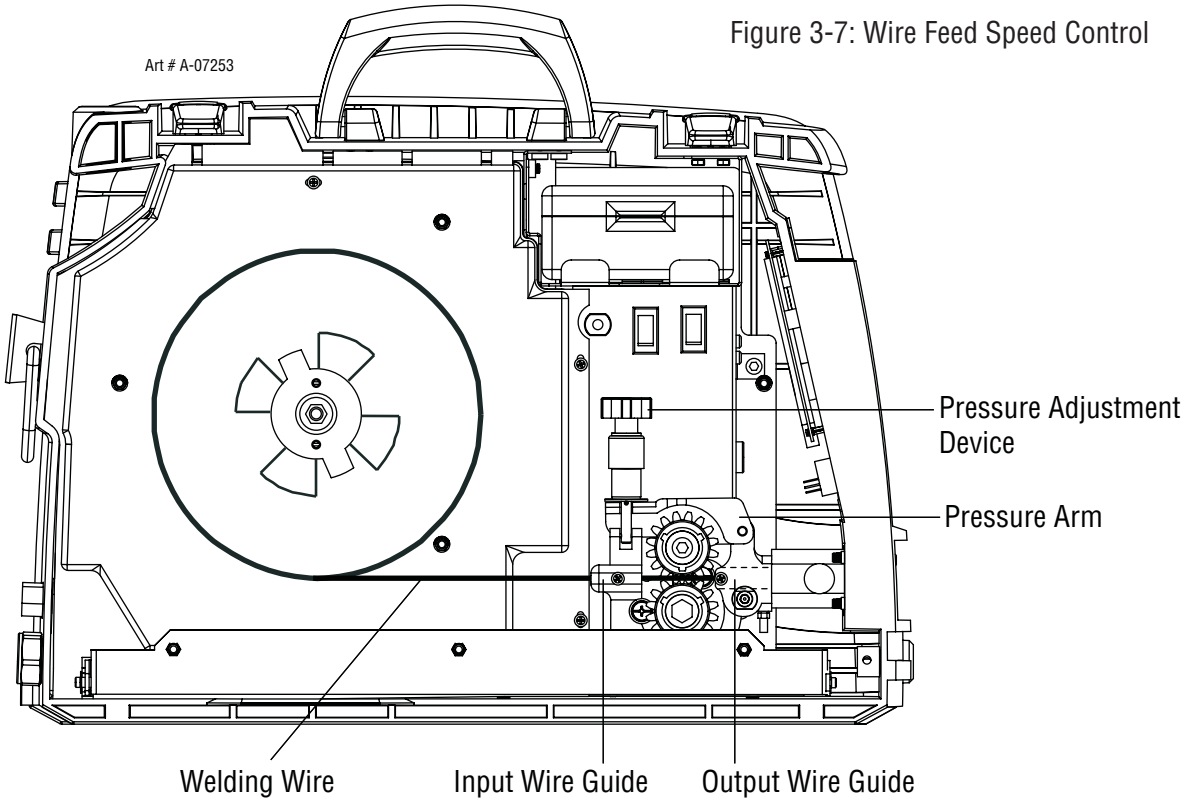


Figure 3-6: Wire Threaded Through Guides and Locked In Position

NOTES

SECTION 4: OPERATION

4.01 Prewelding Procedure

Follow all installation instructions for the welding power source, the welding gun, and the VS 212 CC/CV wire feeder before attempting to weld.

1. Make sure all necessary connections have been made (refer to Connections in the Installation chapter of this manual).
2. Turn ON the power source and the wire feeder.
3. Adjust the voltage control (on a CV machine) or current control (on a CC machine) to the desired value. The voltage or current control can be adjusted during setup or while welding.
4. The output contactor on the power source will have to be energized. In most cases, this will require a jumper to be added to the power source or a switch on the power source to be turned on. Read the power source owner's manual for proper connections or settings required.
5. Set the CC/CV mode switch on the wire feeder to the proper position (refer to paragraph 12, CC/CV Mode Switch on page 2-9 and figure 4-1).

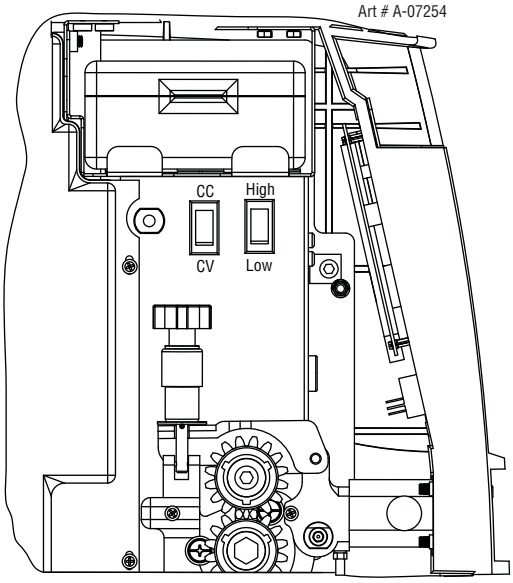


Figure 4-1: CC/CV Switch Location

6. If shielding gas will be used, depress the purge switch or gun switch and adjust the flow of gas.

WARNING

If the gun switch is depressed, the wire feeder will feed electrically hot welding wire. If this hot welding wire touches the work piece, a welding arc will be established.

7. Depress the inch switch (if equipped) or gun switch and adjust the wire feed speed to the desired value by means of the wire feed speed control. The wire feed speed control can be adjusted during setup or while welding.

W ARNING

If the gun switch is depressed, the wire feeder will feed electrically hot welding wire. If this hot welding wire touches the work piece, a welding arc will be established.

4.02 Welding Procedure

WARNING

In semiautomatic or automatic wire welding, the welding wire, wire reel (if used), input guide, feed rolls, output guide, feedhead, and welding gun metal parts are all ELECTRICALLY HOT.

Refer to Functional Timing Diagram below.

1. To start the weld, position the welding gun above the work piece and depress the gun switch trigger. The solid state control then enables the gas valve, wire feed motor, and power source.
2. To end the weld, release the gun switch trigger while pulling the welding gun away from the work piece. The solid state control then disables the gas valve, wire feed motor, and power source.

NOTE

After the weld is completed, it is recommended to pull the welding gun away from the work while releasing the gun switch. This allows the welding arc to partially extinguish at the work piece which reduces the arcing at the contactor contacts. Using this procedure will lengthen the life of the contactor contacts especially when welding at high amperage.

3. At the end of the work day or when welding has been completed, it is recommended that the gas be SHUT OFF at the cylinder, and the wire feeder and power source be turned OFF.

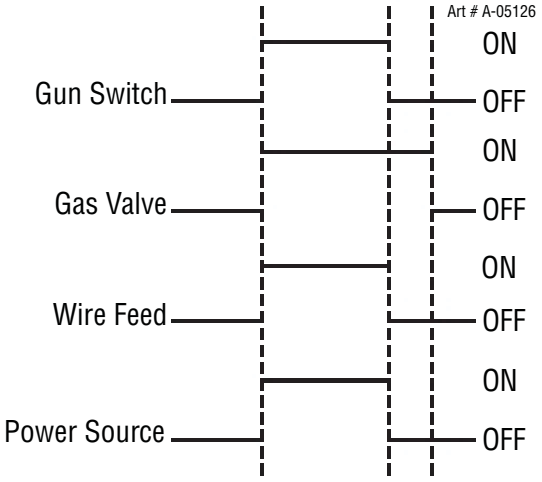


Figure 4-2: Functional Timing Diagram

4.03 Welding In CC Mode vs. CV Mode

1. **Welding in CC Mode:** When welding with a constant current (CC) power source, changes in wire feed speed will affect welding voltage.

   To adjust the amount of welding current from the CC power source, a control knob on the power source or an optional control knob on the wire feeder will have to be adjusted.

   The solid state control of a "slow run-in" circuit automatically reduces the initial wire feed speed when operating with a CC power source. This initial reduction in wire feed speed will compensate for the high open circuit voltage associated with CC power sources and improve arc starting performance.

B. **Welding in CV Mode:** When welding with a constant voltage (CV) power source, changes in wire feed speed will affect welding current. Changes in wire feed speed can be obtained by adjusting the wire feed speed control knob.

   To adjust the amount of welding voltage from the CV power source, a control knob on the power source will have to be adjusted.

4.04 Theory Of Operation

Refer to the System Schematic Diagram in the Appendix 4 chapter of this manual.

Input power is supplied through the on/off switch (S1) and input circuit breaker (CB1) to the bridge rectifier (CR1). CR1 ensures that the proper polarity input voltage is fed into the PC boards independent of the welding polarity.

When the gun switch on the welding gun is pulled, a short is provided on the gun switch receptacle (J4) causing the wire feed motor (M) to turn feeding wire, the gas valve (SOL1) to open allowing gas flow, and the contactor (K1) to close making the welding wire electrically hot.

When the gun switch on the welding gun is released, the short on the gun switch receptacle is removed causing the wire feed motor to stop feeding wire, the gas valve to close stopping gas flow, and the contactor to open making the welding wire electrically cold.

4.05 Adjusting Burnback Time

Burnback time is set at the factory, but the motor control printed circuit board contains a component that permits adjustment of burnback time.

Burnback time relates to the amount of welding wire remaining at the end of the welding gun after the welding process ends. Increasing burnback time results in less wire remaining at the end of the welding gun at the end of the weld. Decreasing burnback time results in more wire remaining at the end of the welding gun after the welding process ends.

WARNING

ELECTRIC SHOCK CAN KILL. Make certain the power source and wire feeder are both turned OFF before beginning the procedure.

1. Using a nut driver or socket, remove the wire spool hub .
2. Remove the internal cover (refer to Figure 4-3).

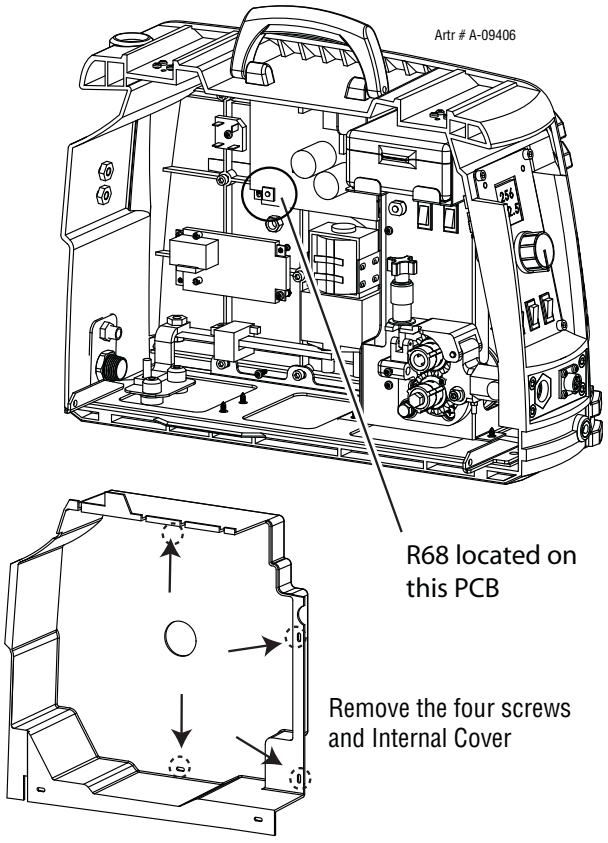


Figure 4-3: Accessing PCB for Burnback

3. Locate component R68 (Burnback) on the motor control printed circuit board (refer to Figure 4-3). The best procedure is to make only slight adjustments until the amount of burnback is acceptable. Component R68 has a single turn (300°) range of adjustment.

   To increase burnback time, adjust component R68 clockwise.

   To decrease burnback time, adjust component R68 counterclockwise.
4. Replace the internal cover.
5. Replace the wire spool hub (refer to 3.03 Adjustment Of Spool Tension in Section 3 of this manual).

4.06 Wire Feed Speed Ranges

The range of the wire feed speed adjustment knob on the front panel can be set to either High or Low. The High/Low switch is located on the inside panel next to the CC/CV switch. Refer to figure 4-4.

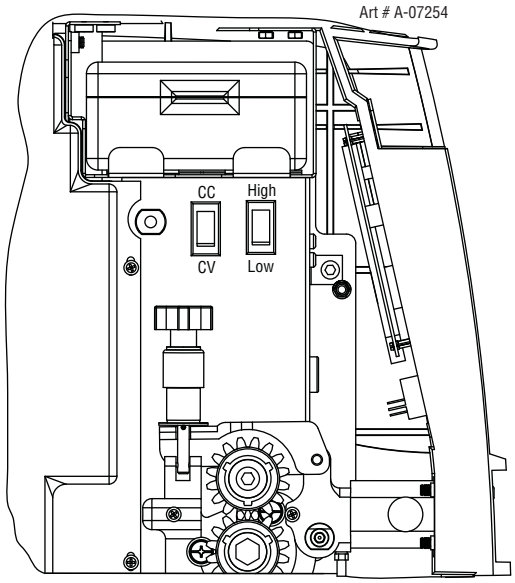


Figure 4-4: High/Low Switch Location

The low setting provides greater knob sensitivity, but over a narrower range. The high setting provides less sensitivity but yields a wider range.

The ranges are as follows:

Low 50 - 400 ipm (1.27 - 10.16 mpm)

High 50 - 800 ipm (1.27 - 20.32 mpm)

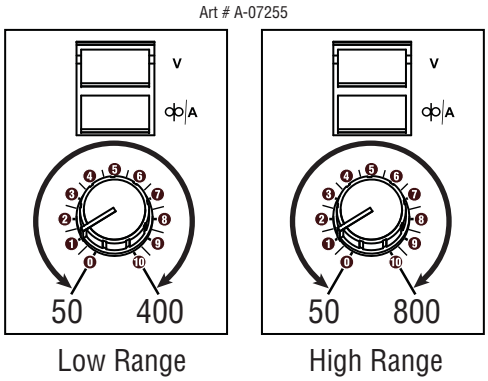


Figure 4-5: Low and High Feed Speed Ranges

4.07 Changing Meter Functions

NOTE

The VS212 can be ordered with a meter (W3512002) or without a meter (W3512001). The following 3 sections apply to the meter version.

The Portafeed VS 212 has two digital meters on the front panel. The top meter always displays the welding power supply's voltage output. However, the lower meter can be set to display either the wire feed speed *or* the welding power supply's current output. Furthermore, when it is set to display the wire feed speed, an additional setting can be made to display this parameter in either inches per minute (ipm) or in meters per minute (mpm). Refer to Figure 4-6.

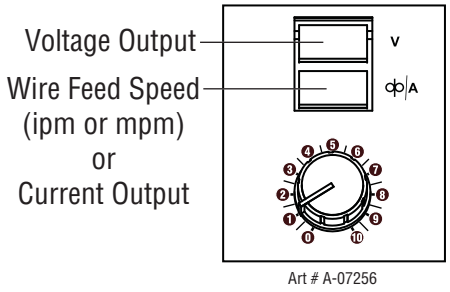


Figure 4-6: Digital Meter Functions

Changing The Lower Meter Functions:

1. Open the VS 212 case door.

NOTE

The power does not need to be turned off to change these settings.

2. Locate the 4 white DIP switches on the side of the meter display's printed circuit board. Refer to Figure 4-7.

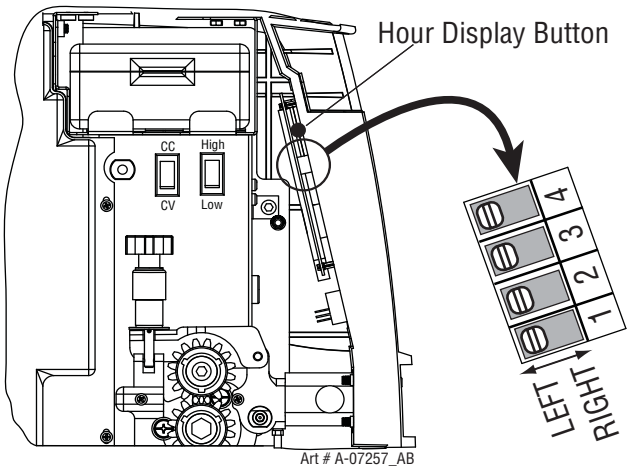


Figure 4-7: Meter DIP Switches

3. Using Table 4-1 as a reference, carefully slide each white DIP switch up or down to change the meter to the desired function.

DIP Switch #	1	2	3	4
UP Function	Hold Function "Off"	Wire Feed Speed Displayed	Wire Feed Speed in IPM	Currently Not In Use
DOWN Function	Hold Function "On"	Output Current Displayed	Wire Feed Speed in MPM	Currently Not In Use

Table 4-1: Lower Meter Switch Settings

4.08 Meter Hold Function

The meter hold function is enabled when DIP switch number 1 is set to the "On" position as defined in the tabe above. When this function is activated, the meter's displays are retained for 5 seconds after the last welding operation has ended. This provides the time needed for the operator to remove his welding shield and read the meters before the display goes blank.

4.09 Operation Hours Display

The total number of arc hours that the VS 212 has been operating can be displayed by pressing and holding the small black button located directly above the 4 DIP switches shown in Figure 4-7. The reading is displayed over both meters as follows:

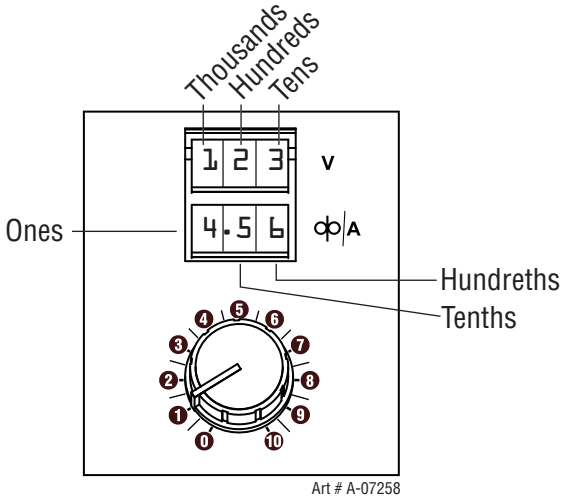


Figure 4-8: Displaying Operation Hours

For example, the above display would be read as:

1,234.56 hours

4.10 Protection And Safety Circuits

The following protection and safety circuits come standard with this wire feeder and are designed to protect (by disabling the wire feeder) against unfavorable operation and/or equipment damage.

1. **Undervoltage Protection:** If the input voltage drops below the specified voltage range for an extended period of time, an electronic circuit will activate, and the wire feeder will not operate. The undervoltage protection circuit will automatically deactivate when the input voltage enters an acceptable range.
2. **Overvoltage Protection:** If the input voltage rises above the specified voltage range for an extended period of time, an electronic circuit will activate, and the wire feeder will not operate. The overvoltage protection circuit will automatically deactivate when the input voltage enters an acceptable range.
3. **Input Current Protection: I**f the input current rises above the specified maximum input current for an extended period of time, the input circuit breaker will trip, and the wire feeder will not operate. The input circuit breaker will have to be manually reset if it were to trip.

4. **Motor Overcurrent Protection:** If the drive motor becomes locked or shorted, an electronic circuit will activate, and the motor will not operate. If this circuit activates, a light on the motor control printed circuit board labeled [Fault 2] will turn on. The motor overcurrent protection circuit will have to be manually reset by placing the power switch on the wire feeder in the off position for at least 60 seconds.

If this protection circuit activates and the drive motor is not locked, the drive motor is most likely shorted and will have to be replaced (refer to 'Troubleshooting Guide' section of this manual).

5. **Contactor And Gas Valve Overcurrent Protection:** If the contactor or gas valve becomes shorted, an electronic circuit will activate, and both the contactor and gas valve will not operate. If this circuit activates, a light on the 12 V driver printed circuit board labeled [Fault 1] will turn on. The contactor and gas valve overcurrent protection circuit will have to be manually reset by placing the power switch on the wire feeder in the off position for at least 60 seconds.

If this protection circuit activates, the contactor or gas valve is most likely shorted and one or both will have to be replaced (refer to section 5.06 Troubleshooting Guide in this manual).

SECTION 5: MAINTENANCE

5.01 Cleaning Of The Unit

About every 6 months, remove the interior panel cover to expose the printed circuit boards and other components. Using a vacuum cleaner or clean, dry, compressed air of not more than 25 psi (172 kPa, 1.72 bar) pressure, vacuum or blow out the interior of the wire feeder. While the interior panel cover is removed, check all electrical components for loose connections and correct if necessary.

5.02 Cleaning Of The Feed Rolls

About every 3 months, clean the grooves on the feed rolls using a small wire brush. If the feed roll has a smooth surface, wipe off the feed roll with a clean, dry cloth. After cleaning the feed rolls, tighten the upper and lower feed roll retaining knobs accordingly.

5.03 Gas Valve Maintenance

Foreign material inside the valve body is the major cause of gas valve failure or improper operation. Foreign material usually enters the valve body when disconnected gas lines are allowed to come in contact with the floor or ground before being connected or reconnected to the gas valve.

In general, sluggish operation and/or gas leakage are signs the gas valve needs to be cleaned internally. To clean the gas valve internally, follow these steps:

NOTE

Before disassembly of the gas valve, take note of the orientation of inlet (marked IN) and outlet ports with respect to electrical connections. The reassembled gas valve should have the same orientation.

1. Remove input power from the wire feeder, and depressurize the gas valve.
2. Remove the gas valve from the wire feeder.
3. Remove the (2) bracket screws and bracket from the yoke of the gas valve.
4. Slip the yoke (containing coil) off the plugnut/core tube sub-assembly.
5. Remove the plugnut/core tube sub-assembly with the body gasket attached.
6. Remove the core assembly and core spring.
7. All parts should now be inspected for foreign material and cleaned with a lint-free cloth. Do not nick or scratch any internal parts of the gas valve.
8. Reassemble the gas valve in reverse order of disassembly paying careful attention to Figure 5-2.

NOTE

Tighten (2) bracket screws evenly to insure proper body gasket compression. Torque bracket screws to 20 inch-pounds (2.26 Nm).

9. Assemble the gas valve to the wire feeder.

NOTE

It may be necessary to apply pipe compound sparingly to the gas adapter male threads only. Do not apply compound to female threads of gas valve or first two threads of male fittings. Also, make sure the inlet port (marked IN) side of the gas valve is connected to the main gas supply; otherwise, the gas valve will leak.

After maintenance, operate the gas valve a few times to be sure of proper operation. If the gas valve continues to show signs of improper operation, replace the gas valve assembly.

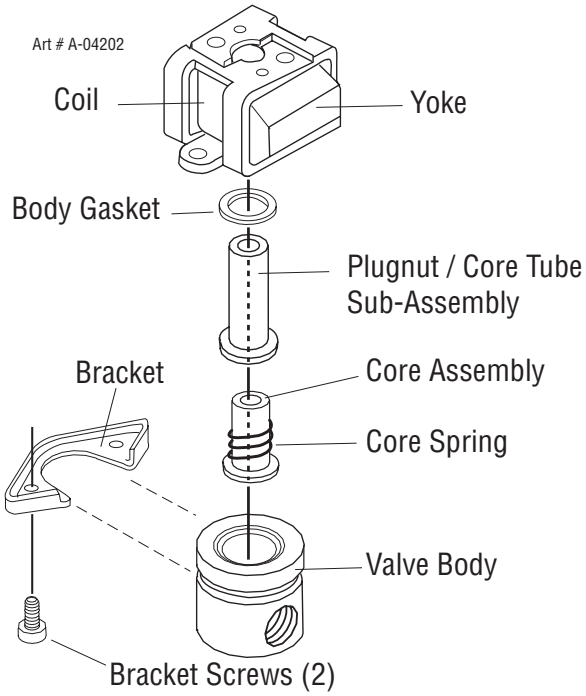


Figure 5-2: Gas Valve Assembly

SECTION 6: TROUBLESHOOTING

6.01 Troubleshooting Guide

NOTE

Refer to the Connection Diagram and the Schematic Diagram in the Appendix chapter of this manual for graphical assistance in disassembling and troubleshooting the wire feeder.

1. **Scope:** The troubleshooting guide is intended to be used by qualified service technicians. The troubleshooting guide contains information which can be used to diagnose and correct unsatisfactory operation or failure of the various components of the wire feeder. Each symptom of trouble is followed by a list of probable causes and the procedure necessary to correct the problem.
2. **Safety:** To ensure safe operation and service, read this entire manual before attempting to service or repair this machine. The service technician may be asked to check voltage levels while the machine is turned ON; to assure safety, use care and follow all instructions accordingly!

6.02 Troubleshooting Hints

Examine connections for proper assembly and contact before replacing an electrical component or printed circuit board. Wire lugs should be in tight contact with the lead's conductor and should be crimped to the lead's insulation. The mating surfaces of the connection should be clean and free of oxidation.

Before replacing a suspect printed circuit board, disconnect all wire plugs from the printed circuit board. Then, firmly reconnect all wire plugs to the printed circuit board and retest the machine to see if the problem persists. Faulty connections or wiring problems are often the cause of an equipment malfunction!

Do not pull on wires to disassemble connections. Firmly grasp each lug or connector when disconnecting. Pulling on wires for disassembly can damage the integrity of the connection and cause future malfunctions.

Prior to disassembly or servicing of the machine, note the wiring and connections in the machine. Reassembling should place the wires in the same location and routing as received from the factory. Keep wires and leads away from hot parts and sharp objects.

Most of the printed circuit boards in the machine contain static sensitive devices. Use a grounding strap or other suitable grounding means before attempting to service or make measurements on printed circuit boards.

All signals referenced in the following troubleshooting guide can be measured with a digital multimeter (DMM).

6.03 Troubleshooting Set-up

WARNING

ELECTRIC SHOCK can kill.

· Follow all safety precautions.

· Do not touch live electrical parts.

· Turn OFF input power before servicing the machine unless otherwise noted.

· Only qualified technicians are to service the machine.

WARNING

This machine contains static sensitive devices.

· Use static proof bags to store electronic components.

· Use grounded wrist strap.

· Use qualified personnel when testing or handling device.

NOTE

Refer to the Connection Diagram and the Schematic Diagram in the Appendix chapter of this manual for graphical assistance in disassembling and troubleshooting the wire feeder.

The acceptable tolerance (in most cases) on resistance and voltage measurements made with the DMM is ±10%.

Use only genuine replacement parts.

Set up the VS 212 as follows:

1. Connect Positive Power Supply Cable to the Input Power Cable (pigtail connector) on the back side of the unit.
2. Connect the Voltage Sensing Lead to the work piece, which is connected to the PS output connection.

   CV Power Supply output must be 15 - 100 VDC
3. Connect Gas Hose to Gas Inlet on the rear panel.
4. Connect MIG Gun.
5. Set WIRE FEED SPEED CONTROL to position "4".

   NOTE

   The upper and lower speed limits will vary, dependant upon the power supply output voltage
6. Set ON/OFF SWITCH to OFF position.
7. Set TRIGGER MODE SELECTOR SWITCH to 2T position.
8. Set CC/CV MODE SWITCH to CV position.
9. Set HIGH/LOW RANGE SWITCH to HIGH position.
10. Open the PRESSURE ADJUST DEVICE so wire will not feed when drive roll turns.
11. Set meter DIP switches on the Meter Display PCB as follows:

Switch #	Position
1	UP
2	UP
3	UP
4	N/A

6.04 Input Voltage & Power Supply Test

Turn ON/OFF switch to ON and observe/check the following:

Digital Display comes on (if so equipped):

TOP METER reads voltage supplied from the power supply.

BOTTOM METER reads minimum speed.

1. Measure and note the **Input Supply Voltage (V1)** which is supplied by the Power Supply between the Input Power Cable and the Voltage Sensing Lead.
2. Measure and note the voltage **(V2)** on PCB1 between J1-1 to J1-2. This voltage should measure approximately 1.5 VDC less than V1.
3. Measure and note the voltage **(V3)** on PCB1 between J2-5 to J2-2. This voltage should measure approximately 1.5 VDC less than V1.
4. Measure and note the voltage **(V4)** on PCB2 between J1-2 to J1-4. This voltage should measure approximately .7 VDC less than V3.
5. Measure and note the voltage **(V5)** on PCB2 between J1-1 to J1-4. This voltage should measure approximately .7 VDC less than V4.

This completes the Primary Power Test. If the above are all correct, then proceed to Section 6.05. If the above does not function as noted, then note the symptom and proceed to Section 6.07 Input Voltage & Supply Problems.

6.05 Logic Function Test

1. Push and hold the INCH/PURGE SWITCH (SW5) to the INCH position.

   Drive roll turns.

2. Turn the WIRE FEED SPEED CONTROL from minimum to maximum.

   Digital Display (if so equipped):

   BOTTOM METER will vary from minimum to maximum speed reading.

   Drive roll speed will vary from slow to fast.

3. Set the HIGH/LOW RANGE SWITCH (SW6) to LOW position.

   Digital Display (if so equipped):

   BOTTOM METER will drop to approximately 1/2 of the HIGH position reading.

   Drive roll speed drops approximately 1/2 speed.

4. Release SW5

   Drive roll stops turning

5. Depress SW5 to PURGE position

   Gas flows

6. Release SW5

   Gas flow stops

7. Depress the gun trigger

   Gas flows

   Contactor closes

   Drive roll turns

8. Release gun trigger

   Gas flow stops

   Contactor opens

   Drive roll stops

9. Set meter DIP switches on the Meter Display PCB as follows:

Switch #	Position
1	UP
2	UP
3	DOWN
4	N/A

   Digital Display (if so equipped):

   BOTTOM METER will change from Inches/Minute to Meters/Minute.

This completes the Logic Function Test. If the above are all correct, then proceed to Section 6.06. If the above does not function as noted, then note the symptom and proceed to Section 6.08 Logic Function Problems.

6.06 Wire Feed Test

1. Re-assemble the case. Install wire and appropriate Feed Rolls, Input and Outlet Guides. Re-engage the Pressure Adjust Device on the Feed Head Assembly. Set Power Supply Voltage, Wire Feed Speed appropriate for welding. Position the gun in a position ready to weld. Depress trigger and observe the following:

   Gas flows

   Contactor energizes

   Feed rolls turn

   Wire feeds

   Welding arc begins

   Digital Display (if so equipped):

   TOP METER reads voltage supplied from the power supply.

   BOTTOM METER reads wire feed speed preview.

2. Release gun trigger

   Welding are stops

   Gas flow stops

   Contactor de-energizes

   Feed roll stops turning

   Wire feed stops

3. Set meter DIP switches on the Meter Display PCB as follows:

Switch #	Position
1	DOWN
2	DOWN
3	DOWN
4	N/A

4. Position the gun in a position ready to weld. Depress trigger and observe the following:

   Gas flows

   Contactor energizes

   Feed rolls turn

   Wire feeds

   Welding arc begins

   Digital Display (if so equipped):

   TOP METER reads voltage supplied from the power supply.

   BOTTOM METER reads welding amperage.

5. Release gun trigger

   Welding are stops

   Gas flow stops

   Contactor de-energizes

   Feed roll stops turning

   Wire feed stops

   Digital Display (if so equipped):

   TOP METER holds welding voltage for 5 seconds after arc stops.

   BOTTOM METER holds welding amperage for 5 seconds after arc stops .

   After 5 seconds

   Digital Display (if so equipped):

   TOP METER displays power supply voltage.

   BOTTOM METER displays wire feed speed preview.

This completes the Wire Feed Test. If the above does not function as noted, then note the symptom and proceed to Section 6.09 Wire Feed Problems.

6.07 Input Voltage & Power Supply Problems

A. V1 is present but V2, V3 & V4 are low or zero (display is off).

1. SW1 is in OFF position

a. Turn SW1 | ON position

2. Defective SW1

a. Measure voltage across the switch between wires #1 & #2. If voltage is present, replace SW1.

3. CB1 is tripped

a. Reset CB1

4. BR1 is defective

a. Check continuity and replace if open or shorted.

B. V1 & V2 are present but V3 & V4 are low or zero (display is on).

1. PCB1 is defective

a. Replace PCB1

C. V1, V2 & V3 are present but V4 is low or zero (display is on).

1. PCB1 is defective

a. Replace PCB1

D. V1 - V4 are present but Digital Display is not on.

1. Digital Display is defective

a. Replace Digital Display

E. V1 - V4 are present but V5 is not present

1. PCB2 is defective

a. Replace PCB2

6.08 Logic Function Problem

A. Drive roll does not turn when SW5 is pushed to INCH position

1. Defective SW5

a. Check continuity between J2-2 to J2-5 on PCB3 while SW5 is in INCH position.

b. Replace SW5 if continuity is not found.

2. Defective PCB3

a. Measure at PCB2 between J2-2 to J3-1. Voltage is 12 VDC and drops to less than 1 VDC when in INCH position. If voltage does not drop, replace PCB3.

b. Check for 0 to 10K ohms variation at PCB3 between J4-12 to J4-13. Then check for fixed 10K ohms between J4-14 to J4-12. Replace PCB 3 if not correct.

3. Defective PCB2

a. Measure for DC voltage between wires # 23 and 24 to M1. If voltage is zero, replace PCB2

4. Defective M1

a. Measure for DC voltage between wires # 23 and 24 to M1. If voltage is present, replace M1.

B. CB1 trips when SW5 is put into INCH position

1. Defective M1

a. Replace M1.

C. Drive roll speed will not vary or is intermittent as WIRE FEED SPEED CONTROL is adjusted from min to max while SW5 is in INCH position.

1. Defective PCB3

a. Check for 0 to 10K ohms variation at PCB3 between J4-12 to J4-13. Replace PCB 3 if not correct.

2. Defective M1

a. Check DC voltages between wires # 23 to 24 to transition smoothly from low to high as WIRE FEED SPEED CONTROL is adjusted min to max. If voltage is correct, replace M1.

3. Defective PCB1

a. If voltage between wires # 23 to 24 is intermittent or does not vary smoothly, replace PCB1.

D. When SW6 is switched to LOW position, the drive roll does not slow to 1/2 speed.

1. *Defective SW6*
   a. Check continuity and replace if defective.
2. *Defective PCB3*
   a. Replace PCB3

E. Gas does not flow when SW5 is put into PURGE position.

1. *Gas supply to gas inlet is not turned on.*
   a. Turn on gas supply
2. *Defective SW5*
   a. Check continuity on PCB3 between J2-3 to J2-5 with SW5 in PURGE position. Replace SW5 if continuity is not found.
3. *Defective SOL1*
   a. Measure 12 VDC at PCB2 between J1-1 to J1-3. Replace SOL1 is voltage is present.
4. *Defective PCB3*
   a. Measure voltage from PCB1, J2-1 to PCB2, J1-6. Voltage is 12 VDC and drops to zero when SW5 is put into PURGE position. If voltage does not drop, replace PCB3.
5. *Defective PCB2*
   a. Measure for 12 VDC on PCB2 between J1-4 to J1-1.

F. Nothing happens when gun trigger is depressed.

1. *Defective gun trigger or open wire in MIG gun leads.*
   a. Check continuity and replace if open.
2. *Defective PCB3*
   a. Measure at PCB2 between J2-2 to J3-1. Voltage is 12 VDC and drops to less than 1 VDC when gun trigger is depressed. If voltage does not drop, replace PCB3.

G. When gun trigger is depressed, gas flows, feed rolls turn, but W1 does not close.

1. *Defective W1*
   a. Measure for 12 VDC between wires 9A to 14 on W1 coil when gun trigger is closed. If voltage is correct, replace W1.
2. *Defective PCB3*
   a. Measure for 12 VDC on PCB3 between J4-3 to J4-4. If voltage is 12 VDC, replace PCB3.

H. When gun trigger is depressed, gas flows, W1 closes, but feed roll does not turn.

1. *Defective PCB3*
   a. Measure at PCB2 between J2-1 to J3-1. Voltage is 12 VDC and drops to less than 1 VDC when gun trigger is depressed. If voltage does not drop, replace PCB3.

I. When DIP switch #3 on PCB3 is set in the down position, meter still displays speed in IPM.

1. *Defective PCB3*
   a. Replace PCB3

6.09 Wire Feed Problem

A. Wire does not feed when gun is depressed.

1. *Wire hub tension is too tight.*
   a. See Section 3.03
2. *Pressure Adjustment Device is too tight.*
   a. See Section 3.07, step 3
3. *Worn or incorrect feed rolls or guides*
   a. Relpace worn or incorrect feed rolls or guides
4. *Wire on spool is tangled or is not feeding off spool.*
   a. Replace wire spool

B. Wire "bird nests" inside feeder.

1. *Defective gun conduit*
   a. Replace gun conduit
2. *Excessive tension on Pressure Adjustment Device*
   a. See Section Section 3.07, step 3
3. *Damaged contact tip*
   a. Replace contact tip

C. Meter does not "hold" weld readings for 5 seconds after weld is stopped.

1. *Defective PCB3*
   a. Replace PCB3

D. Bottom meter will not display weld.

1. *Defective CS1*
   a. Replace CS1
2. *Defective PCB3*
   a. Replace PCB3

SECTION 7:
PARTS LIST

7.01 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.

7.02 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. Most parts of the equipment are listed except 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.

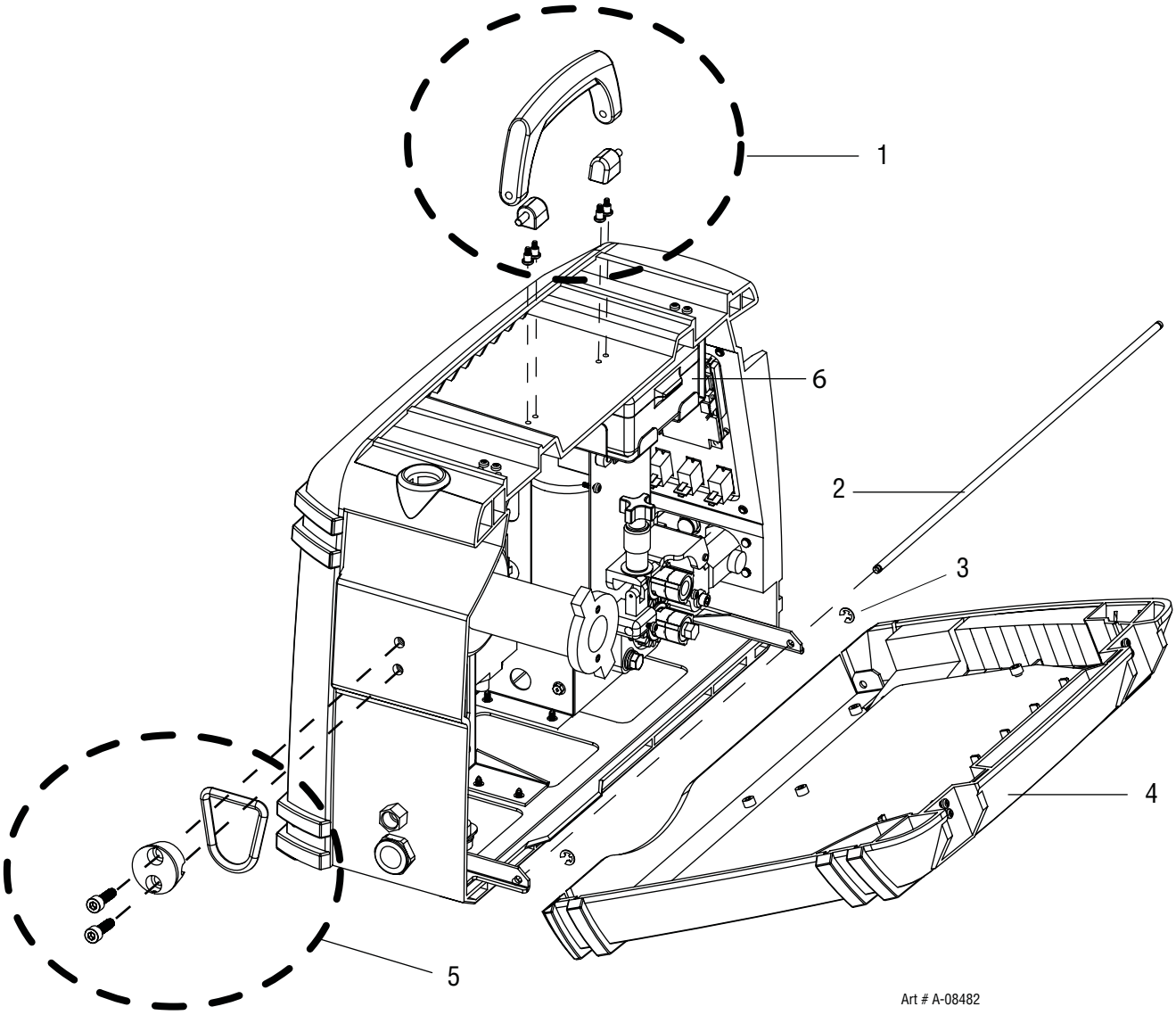
PART NUMBERS:

W3512001 (without digital meters)

W3512002 (with digital meters)

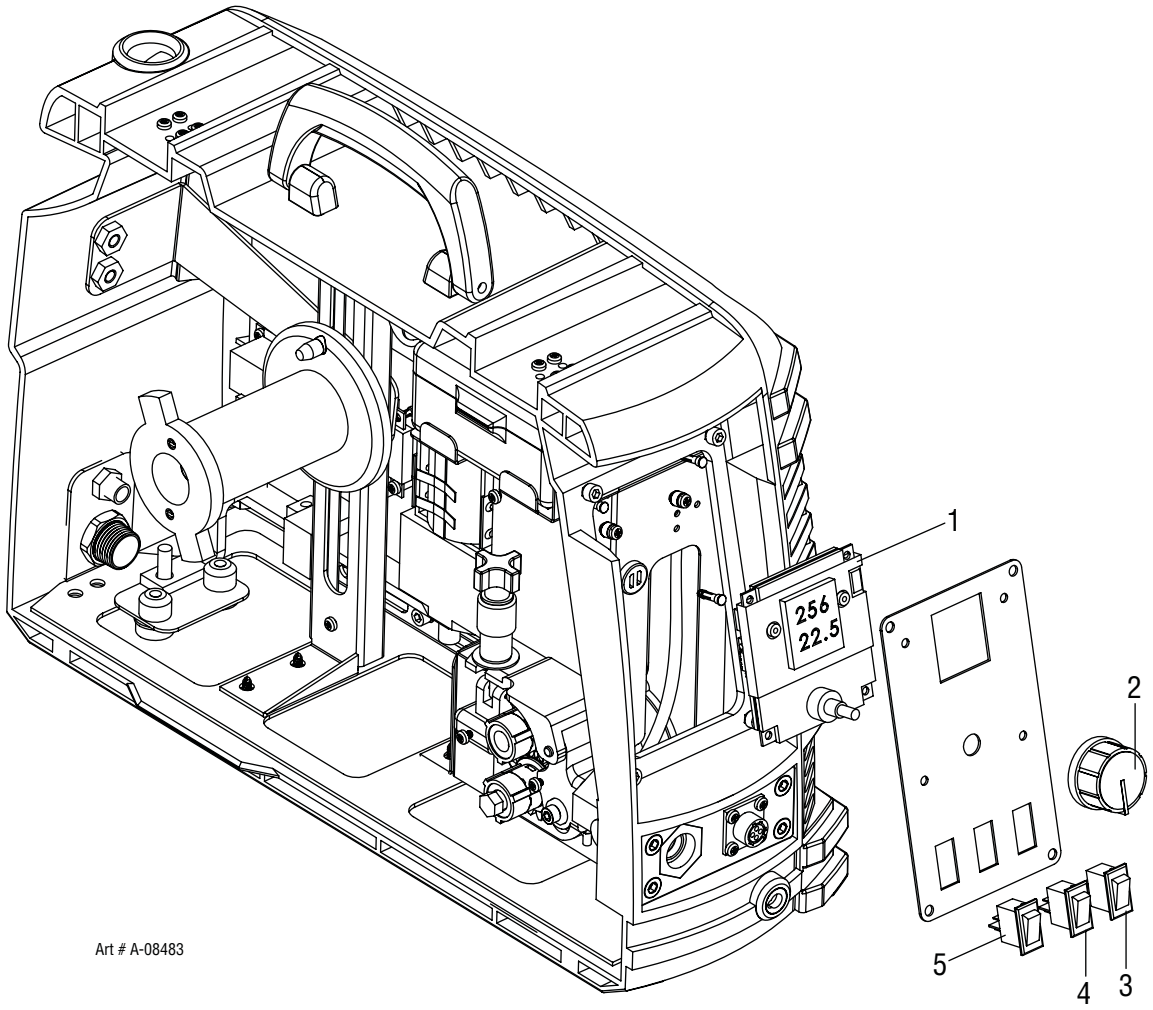
7.03 External Hardware

Item	Qty	Ref. Des.	Description	Part Number
1	1		Handle, Assembly, VS 212, WF	870972PKD
2	1		Hinge Bar, VS212,0.25" Dia, WF	870839WBLKPKD
3	2		Clip, Hinge Bar Retention, WF	870956PKD
4	1		Door, Assembly, VS 212, WF	870953PKD
5	1		Lifting Eye, VS 212, WF	870974PKD
6	1		Case, Storage, INT, WF	870865PKD



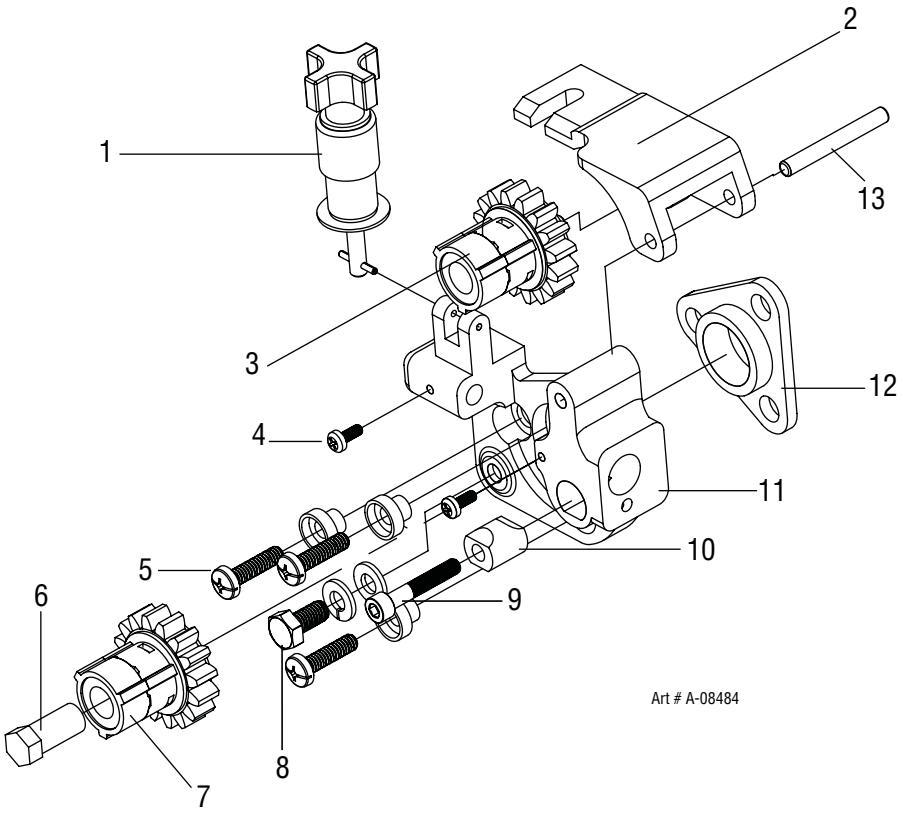
7.04 Front Panel

Item	Qty	Ref. Des.	Description	Part Number
1	1	PCB3	PCB,Logic,With Meters,VS212	871014PKD
1	1	PCB3	PCB,Logic,No Meters,VS212	870949APKD
2	1		Knob,Control,1/4" IDx1.6"	870696PKD
3	1	SW3	Switch, Rocker,SP, WF	870359
4	1	SW5	Switch, Rocker,SP,Mom, WF	870863PKD
5	1	SW1	Switch, Rocker,SP, WF	870367



7.05 Wire Feeder Replacement Parts

Item	Qty	Ref. Des.	Description	Part Number
1	1		Rod, Tension Subassembly, WF	870933PKD
2	1		Pressure Arm, 2R M/C, WF	870679PKD
3	1		Gear, Idler Assembly, WF	871001PKD
4	2		Screw, M4x10 Pan Head, WF	See note 1
5	3		Screw, M6x1, 30 MM long, WF	See note 1
6	1		Retainer, Drive Gear,2R Plate	870733PKD
7	1		Gear, Drive Roll, 2R Plate	870560PKD
8	2		Screw, M8 X 16 Hex Head, WF	See note 1
9	1		Screw, M6x1, 35MM Long, WF	See note 1
10	1		Clamp, MIG gun,2R Plate	171362
11	1		Feedplate, 2 Roll , WF	870558PKD
12	1		Insulator, Motor, 2R Plate	870695PKD
13	1		Pin,#6x50mm,2R & 4R Plate	870509PKD

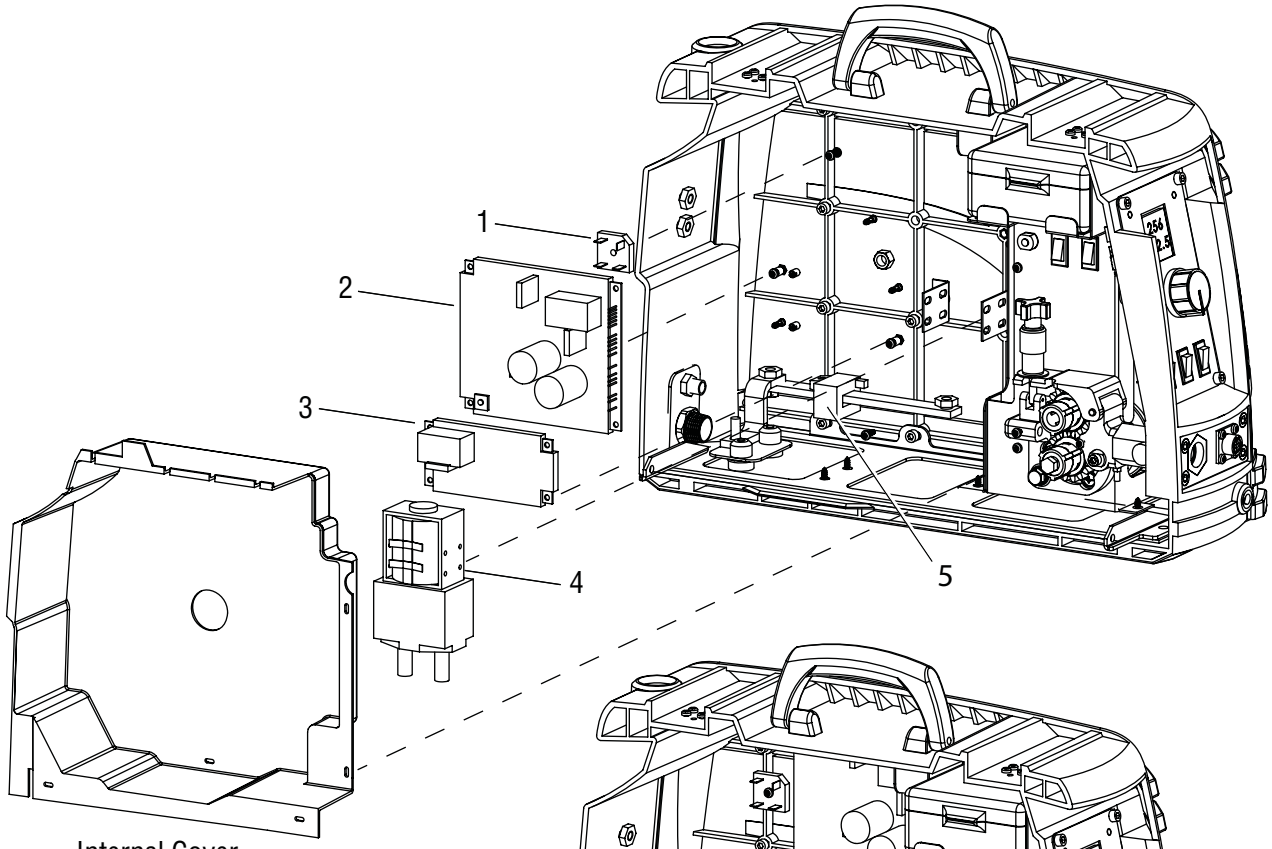


NOTE 1:

1. This part may be purchased at a local hardware store.

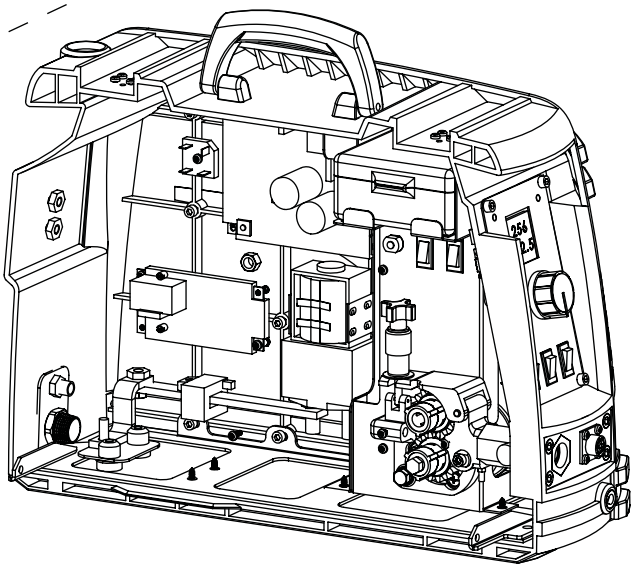
7.06 Internal Electrical Hardware (1)

Item	Qty	Ref. Des.	Description	Part Number
1	1	CR1	Rectifier, Bridge, 35A, 800V	409554-002
2	1	PCB1	PCB, Motor Control, WF	376395CPKD
3	1	PCB2	PCB,12V Driver, WF	170046B-001PKD
4	1	K1	Contactor, 425A, WF	870710PKD
5	1	CS1	Transducer, Current, WF	870858PKD



Internal Cover

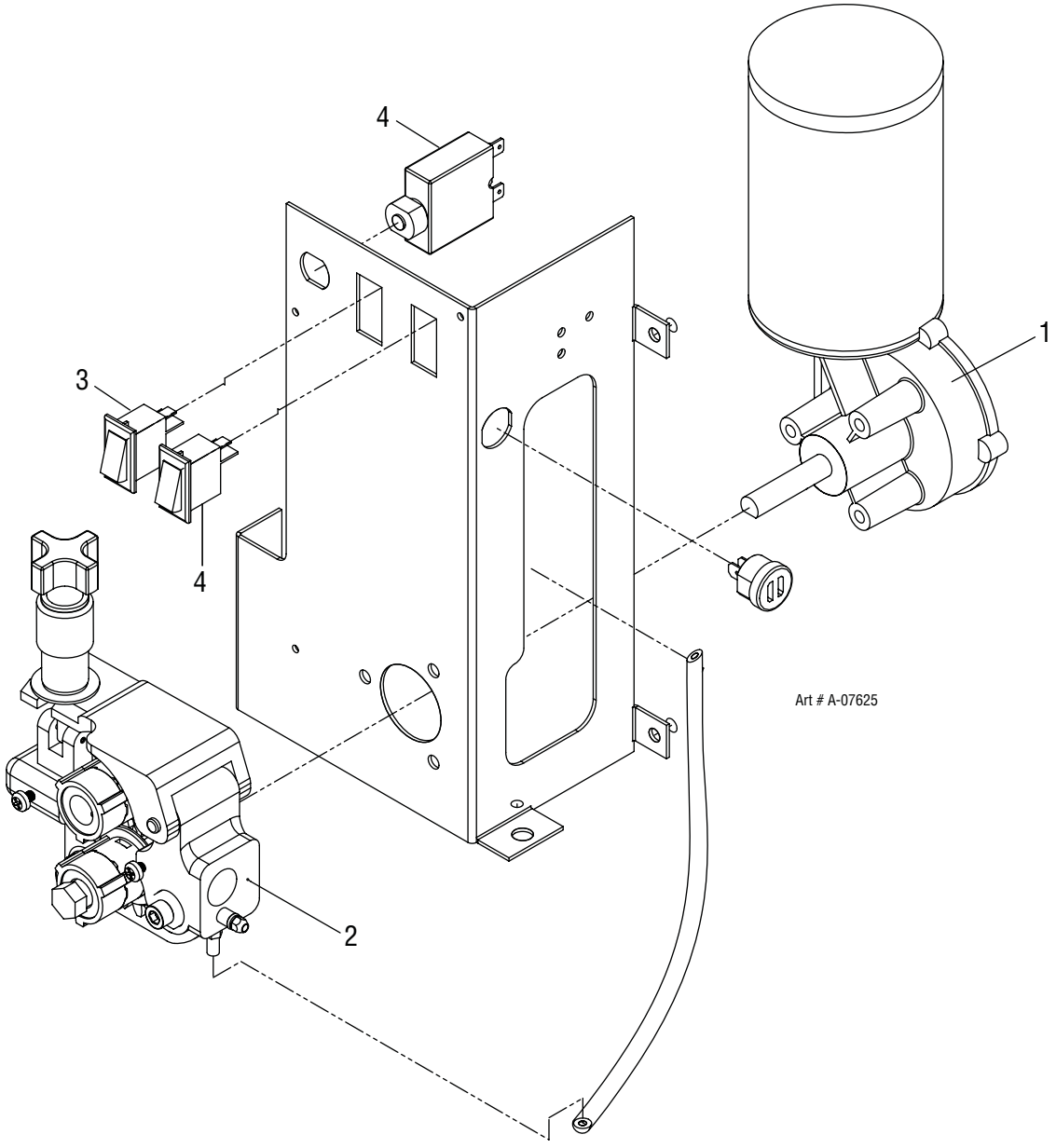
Artr # A-08485



Collapsed view with internal cover removed

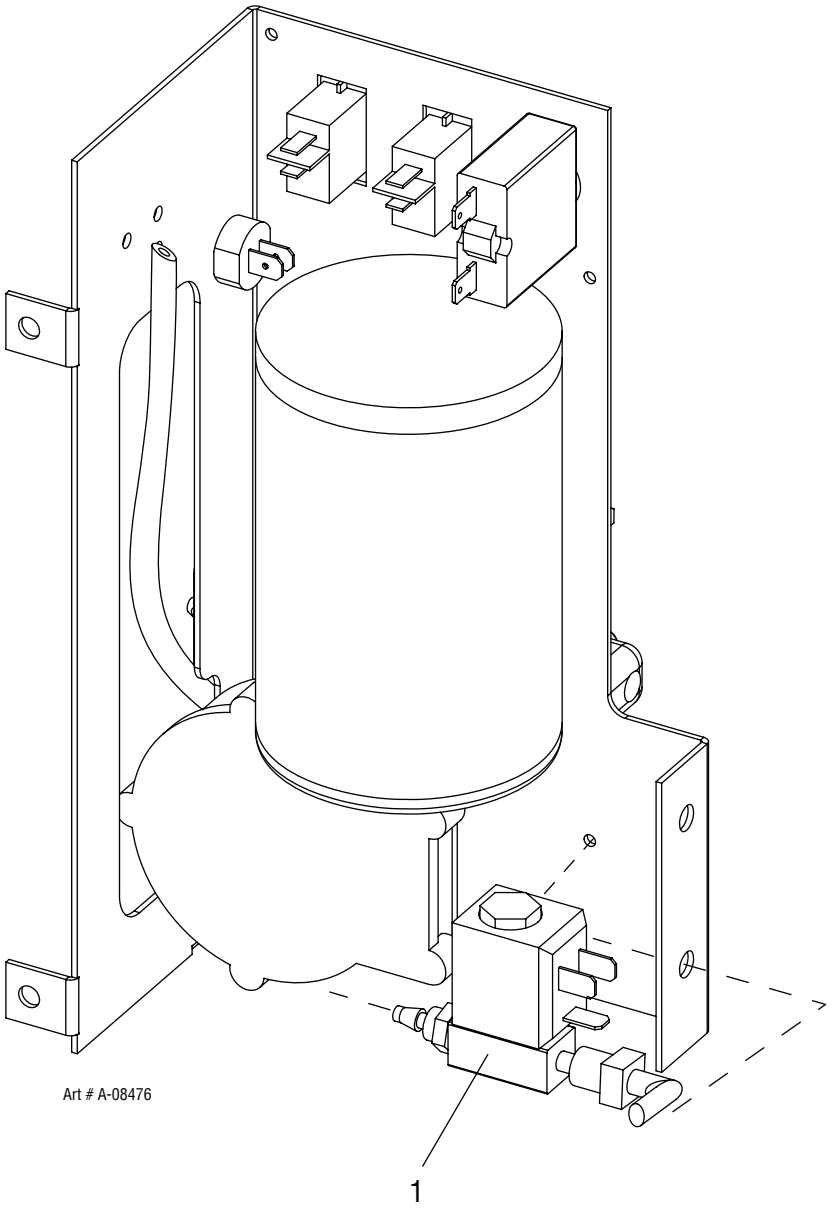
7.07 internal Electrical Hardware (2)

Item	Qty	Ref. Des.	Description	Part Number
1	1	M1	Motor,Wire Drive,3.2A 20VDC	870891PKD
2	1		Feed Plate Assy,2 Roll	870924PKD
3	2	SW2, SW6	Switch, Rocker,SP, WF	870359
4	1	CB1	Circuit Breaker, 8A, WF	203627-008



7.08 Solenoid Assembly

Item	Qty	Ref. Des.	Description	Part Number
1	1	SOL1	Solenoid, Valve 12VDC, WF	870945PKD

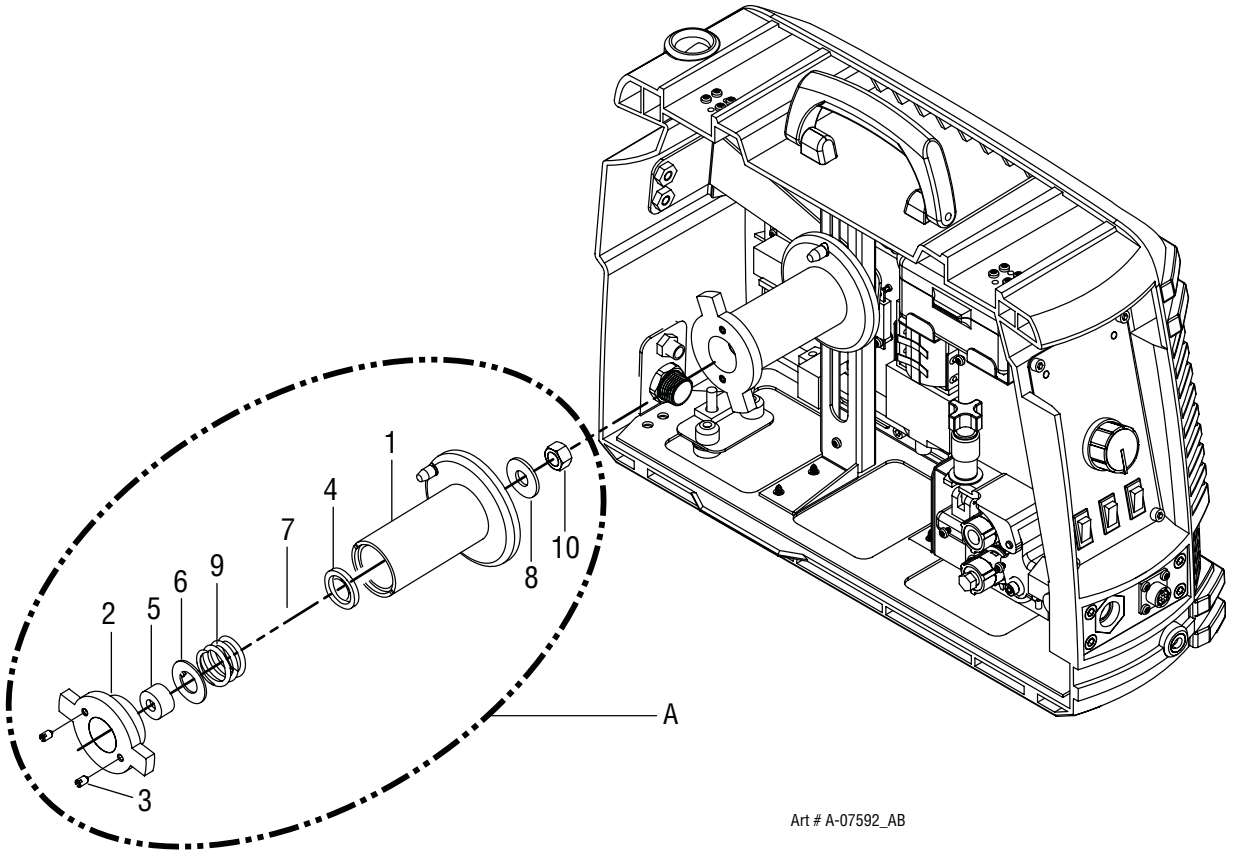


7.09 Spool Hub Assembly

Item	Qty	Ref. Des.	Description	Part Number
A	1		Hub, Spool, Wire, Assembly, WF	870939PKD
1	1		Hub, Wire Spool	405376
2	1		Nut, Wire Spool Hub	405377
3	2		Plunger, Spring, Nut Hub	170459-001
4	1		Washer,1-1/64",Flat,Nylon,Hub	405448
5	1		Spacer,Spool Hub	374552-001
6	1		Washer,3/4",Flat,Keyed,Hub	374551
7	1		Shaft, Wire Spool, WF	374546
8	1		Washer, 1/2", Flat,1.38 OD, WF	See Note 1
9	1		Spring,Spool Hub	400562-027
10	1		Nut, Hex, .5"-13 UNC, WF	See Note 1

NOTE 1:

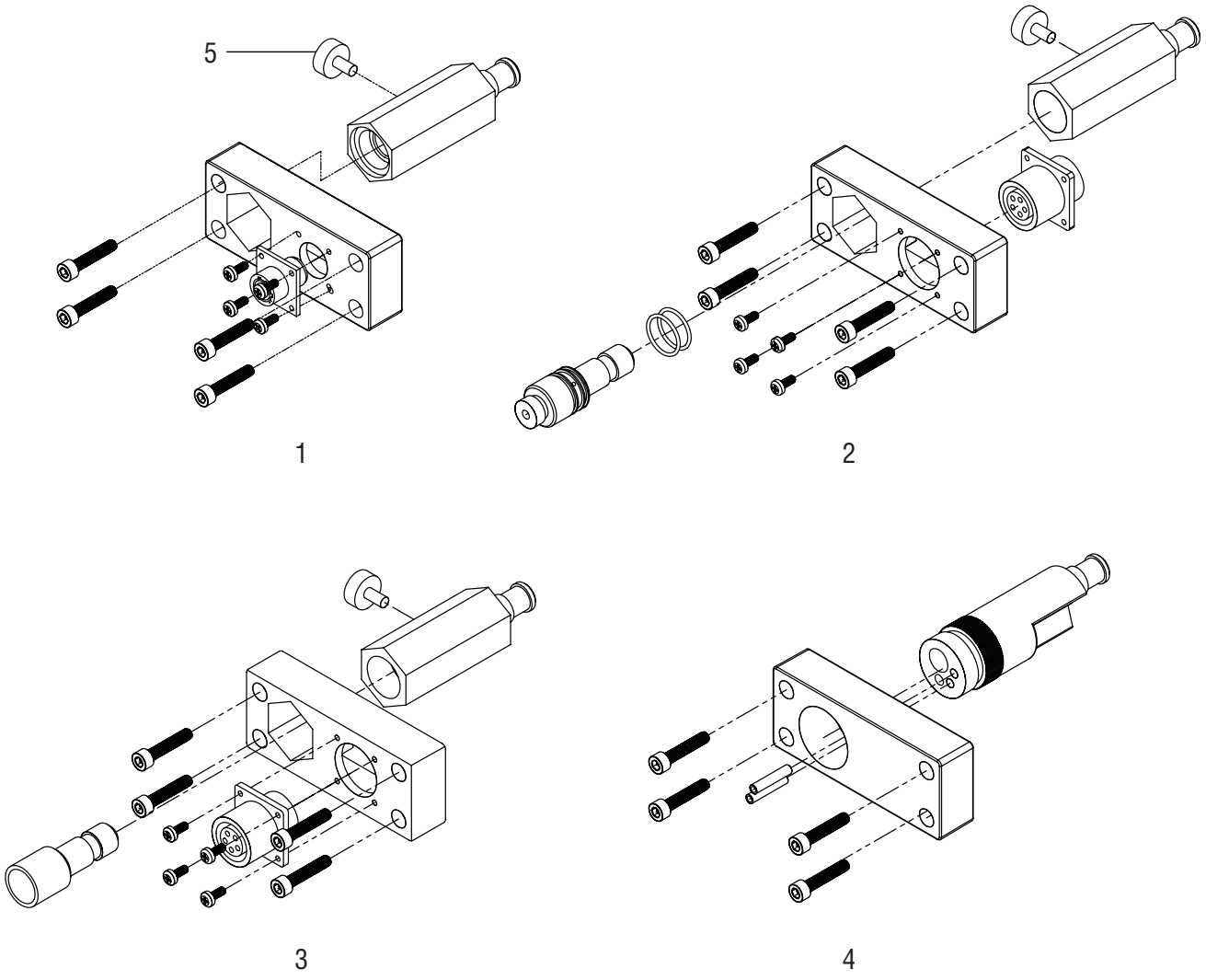
1. This part may be purchased at a local hardware store.



Art # A-07592_AB

7.10 MIG Gun Adapter Cartridges

Item	Qty	Description	Part Number
1	1	Cartridge, Assy Miller, WF	W4005001
2	1	Cartridge, Assy,Linc. Gas, WF	W4006002
3	1	Cartridge, Assy, Linc., WF	W4006001
4	1	Cartridge, Assy, EURO, WF	W4007001
5	1	Knob, Torch Locking	10-6187

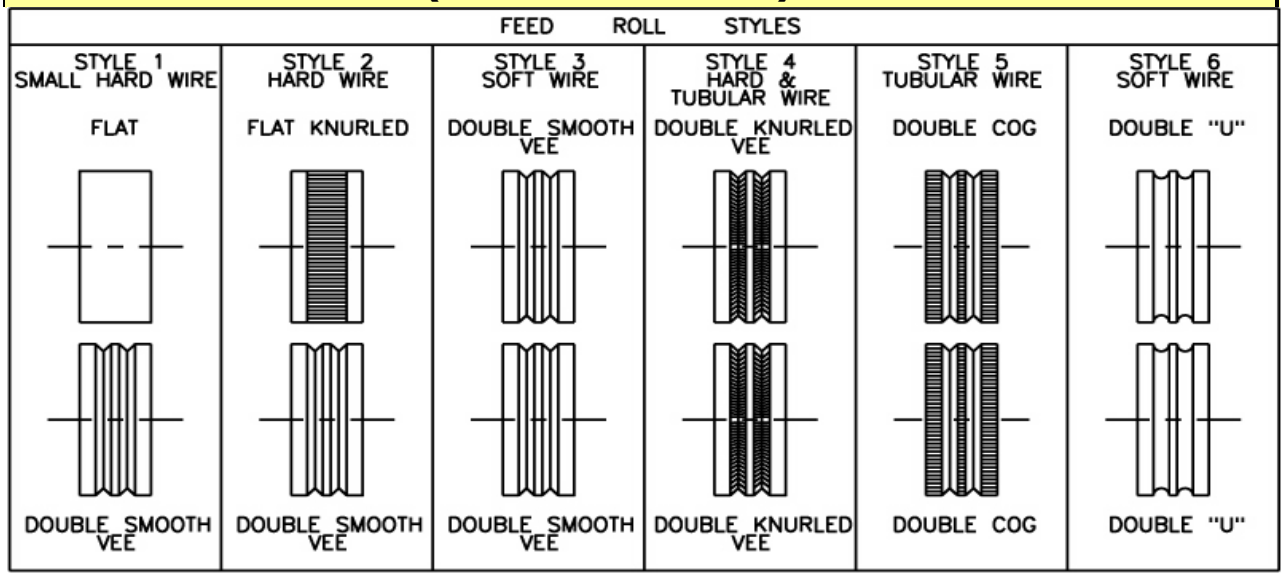


Art # A-08486

NOTES

APPENDIX 1: DRIVE ROLL KITS

FEED ROLL KITS (#375980-Series) 2 ROLL



	Style 1	Style 2	Style 3	Style 4	Style 5	Style 6
Top	Flat	Flat Knurled	Double Smooth "V"	Double Knurled "V"	Double Cog	Double "U"
Bottom	Double Smooth "V"	Double Smooth "V"	Double Smooth "V"	Double Knurled "V"	Double Cog	Double "U"
Wire Type	Hard	Hard	Soft/Hard/Tubular	Hard/Tubular	Tubular	Soft (Aluminum)
Wire Size						
.024" / 0.6mm	375980-031	-	-	-	-	-
.030", .035" / 0.8, 0.9mm	375980-001	375980-003	375980-010	-	-	-
.030", .035", .045" / 0.8, 0.9, 1.2mm	375980-028*	375980-029	-	-	-	-
.035" / 0.9mm	375980-040*	-	-	-	-	375980-032
.035", .045" 3/64" / 0.9, 1.2, 1.2mm	-	-	375980-030	-	-	-
.045" / 1.2mm	375980-002*	375980-004	-	375980-092	375980-022	-
3/64 / 1.2mm	-	-	375980-011	-	-	375980-033
.052" / 1.3mm	375980-090*	-	375980-012	-	-	-
.052", 1/16" / 1.3, 1.6mm	-	-	-	375980-017	375980-023	-
1/16" / 1.6mm	375980-005*	-	-	-	-	375980-034
.068" / 1.7mm	-	-	-	-	-	-
5/64" / 2.0mm	375980-006*	-	-	375980-018	-	-

Notes: 1) One Kit is supplied standard with each wire feeder.

2) Feed Roll Kits include: Feed Rolls; Input, Output , #375980-092 Guides

3) Narrow 30° "V"

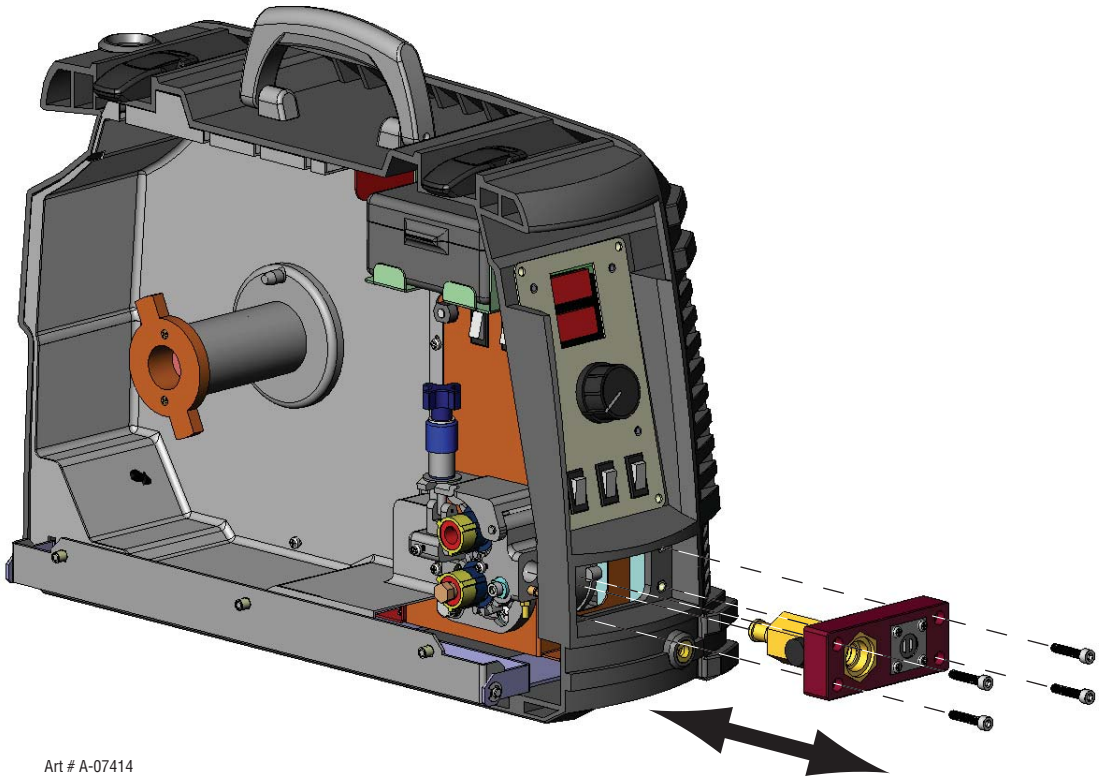
APPENDIX 2: OPTIONS AND ACCESSORIES

Product	*Part No.*	*Description*
Feed Roll Kits	375980-XXX	One kit (#375980-092) is supplied standard with each wire feeder, see Feed Roll Kit chart to select a different Feed roll style
Wire Spool / Coil Adapters		
10 lb (4.5kg), 8" spool	375585-001	
15 lb (6.8kg), 8" spool	375864-001	
14 lb (6.4kg) coil, Lincoln®	375942A	
Wire Feeder Cart	W4000001	Low profile, large caster cart
Roll Cage	W4003001	Protective tube steel roll cage
MIG Gun Adaptor Cartridge		Integrated cartridge to accept other style MIG guns. Wire feeder comes with Tweco #4 cartridge installed
Tweco® #4	W4004001	
Miller®	W4005001	
Lincoln® (gasless)	W4006001	
Lincoln®	W4006002	
Euro-style	W4007001	

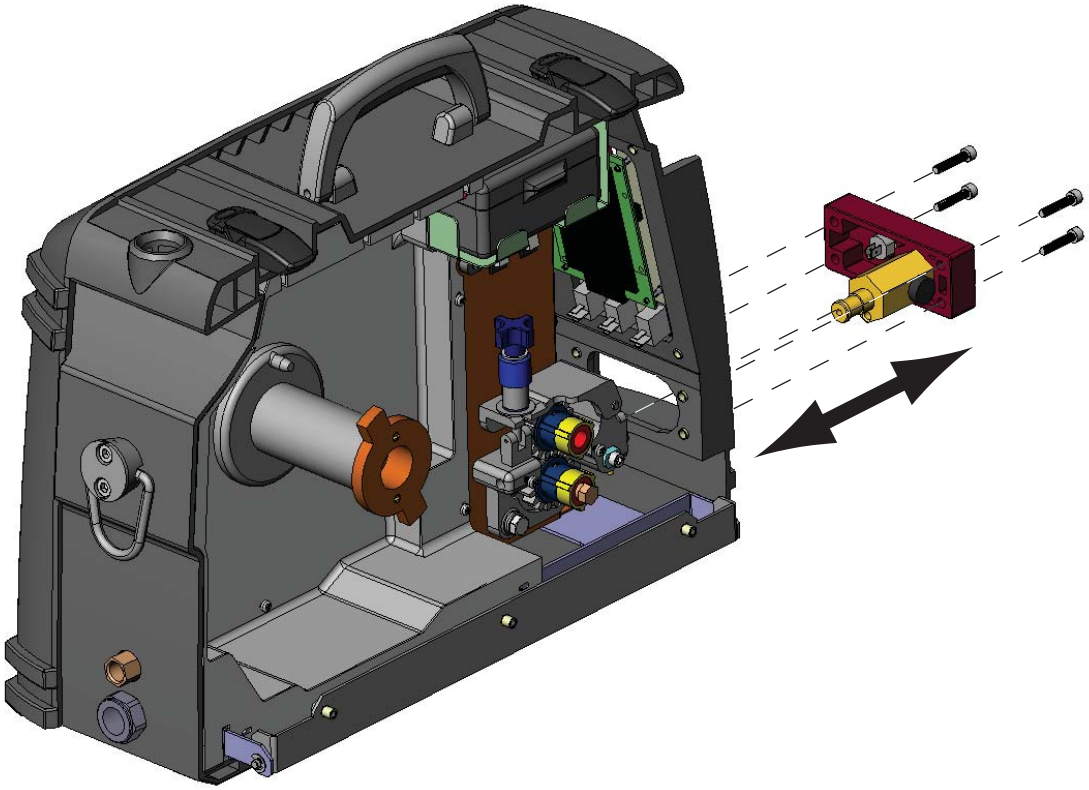
APPENDIX 3: MIG GUN CARTRIDGE SYSTEM

Removable Gun Cartridge System (Patent Pending)

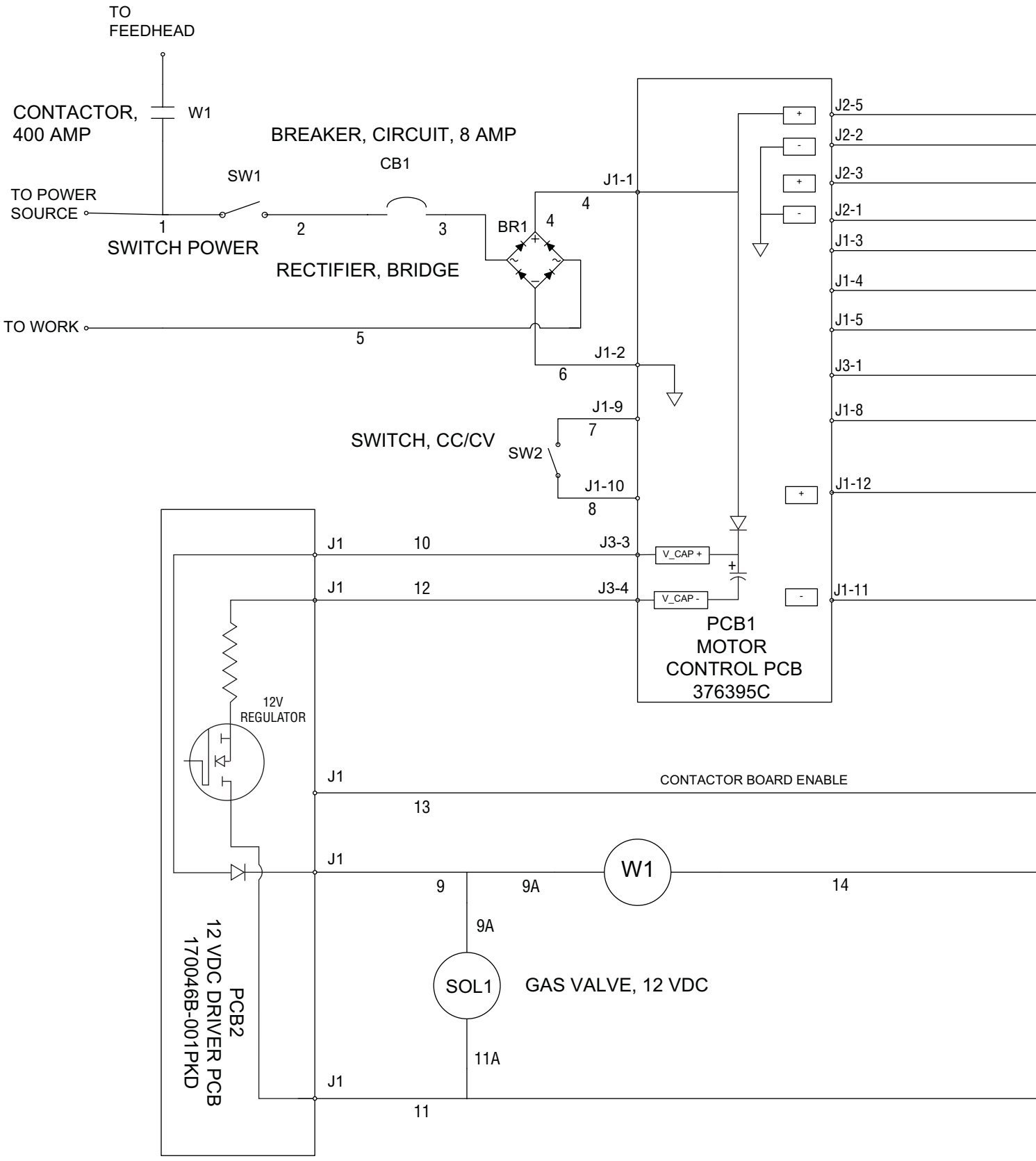
The MIG gun cartridge can easily be removed and replaced with a different cartridge that will fit other brands of MIG guns (Miller®, Lincoln®, Euro). Refer to Appendix 2 for specific models.



Art # A-07414



APPENDIX 4: SYSTEM SCHEMATIC



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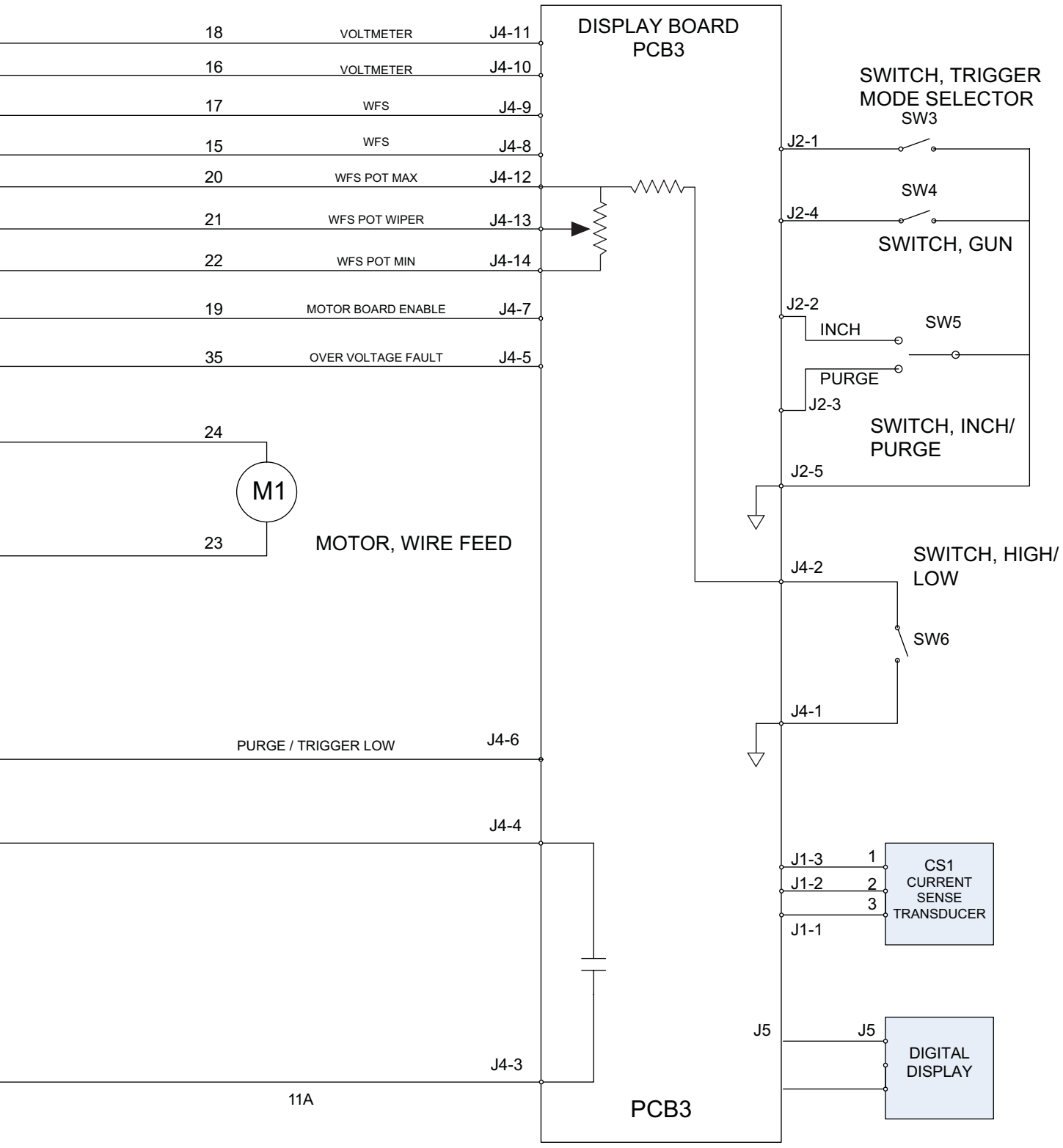

Art # A-07595_AB

VS 212 SCHEMATIC DIAGRAM

LIMITED WARRANTY

This information applies to Thermal Arc products that were purchased in the USA and Canada.

July 2007

LIMITED WARRANTY: Thermal Arc®, Inc., A Thermadyne Company ("Thermal Arc"), warrants to customers of authorized distributors ("Purchaser") that its products will be free of defects in workmanship or material. Should any failure to conform to this warranty appear within the warranty period 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 damage, 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.

This warranty is exclusive and in lieu of any warranty of merchantability, fitness for any particular purpose, or other warranty of quality, whether express, implied, or statutory.

Limitation of liability: Thermal Arc shall not under any circumstances be liable for special, indirect, incidental, or consequential damages, including 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, tort, including negligence or strict liability, or under any warranty, or otherwise, shall not 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, and Thermal Arc shall not be bound by any such attempt. Correction of non-conformities, in the manner and time provided herein, constitutes fulfillment of thermal's obligations to purchaser with respect to the product.

This warranty is void, and seller bears no liability hereunder, if purchaser used replacement parts or accessories which, in Thermal Arc's sole judgment, impaired 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 unauthorized 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.

Warranty repairs or replacement claims under this limited warranty must be submitted to Thermal Arc via an authorized Thermal Arc repair facility within thirty (30) days of purchaser's discovery of any defect. Thermal Arc shall pay no transportation costs of any kind 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 dated July 1st 2007 supersedes all previous Thermal Arc warranties. Thermal Arc® is a Registered Trademark of Thermal Arc, Inc.

WARRANTY SCHEDULE

This information applies to Thermal Arc products that were purchased in the USA and Canada.

July 2007

ENGINE DRIVEN WELDERS	WARRANTY PERIOD	LABOR
Scout, Raider, Explorer		
Original Main Power Stators and Inductors	3 years	3 years
Original Main Power Rectifiers, Control P.C. Boards	3 years	3 years
All other original circuits and components including, but not limited to, relays, switches, contactors, solenoids, fans, power switch semi-conductors	1 year	1 year
Engines and associated components are NOT warranted by Thermal Arc, although most are warranted by the engine manufacturer	See the Engine Manufactures Warranty for Details	

GMAW/FCAW (MIG) WELDING EQUIPMENT	WARRANTY PERIOD	LABOR
Fabricator 131, 181; 140; 180; 190, 210, 251, 281; Fabstar 4030; PowerMaster 350, 350P, 500, 500P; 320SP; 400SP; 500SP; Excelarc 6045. Wire Feeders; Ultrafeed, Portafeed		
Original Main Power Transformer and Inductor	5 years	3 years
Original Main Power Rectifiers, Control P.C. Boards, power switch semi-conductors	3 years	3 years
All other original circuits and components including, but not limited to, relays, switches, contactors, solenoids, fans, electric motors.	1 year	1 year

GTAW (TIG) & MULTI-PROCESS INVERTER WELDING EQUIPMENT	WARRANTY PERIOD	LABOR
160TS, 300TS, 400TS, 185AC/DC, 200AC/DC, 300AC/DC, 400GTSW, 400MST, 300MST, 400MSTP		
Original Main Power Magnetics	5 years	3 years
Original Main Power Rectifiers, Control P.C. Boards, power switch semi-conductors	3 years	3 years
All other original circuits and components including, but not limited to, relays, switches, contactors, solenoids, fans, electric motors.	1 year	1 year

PLASMA WELDING EQUIPMENT	WARRANTY PERIOD	LABOR
Ultima 150		
Original Main Power Magnetics	5 years	3 years
Original Main Power Rectifiers, Control P.C. Boards, power switch semi-conductors	3 years	3 years
Welding Console, Weld Controller, Weld Timer	3 years	3 years
All other original circuits and components including, but not limited to, relays, switches, contactors, solenoids, fans, electric motors, Coolant Recirculator.	1 year	1 year

SMAW (Stick) WELDING EQUIPMENT	WARRANTY PERIOD	LABOR
Dragster 85		
Original Main Power Magnetics	1 year	1 year
Original Main Power Rectifiers, Control P.C. Boards	1 year	1 year
All other original circuits and components including, but not limited to, relays, switches, contactors, solenoids, fans, power switch semi-conductors	1 year	1 year
160S, 300S, 400S		
Original Main Power Magnetics	5 years	3 years
Original Main Power Rectifiers, Control P.C. Boards	3 years	3 years
All other original circuits and components including, but not limited to, relays, switches, contactors, solenoids, fans, power switch semi-conductors	1 year	1 year

GENERAL ARC EQUIPMENT	WARRANTY PERIOD	LABOR
Water Recirculators	1 year	1 year
Plasma Welding Torches	180 days	180 days
Gas Regulators (Supplied with power sources)	180 days	Nil
MIG and TIG Torches (Supplied with power sources)	90 days	Nil
Replacement repair parts	90 days	Nil
MIG, TIG and Plasma welding torch consumable items	Nil	Nil

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