

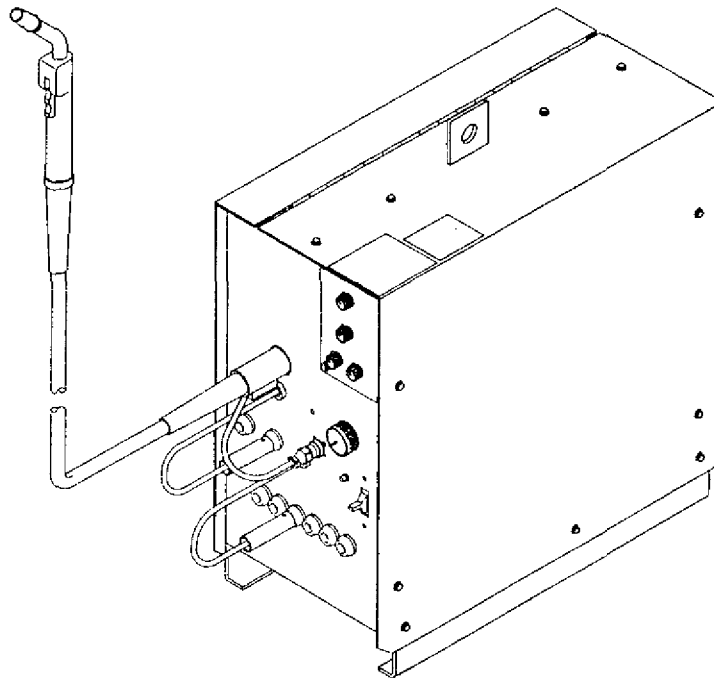


May 1991

FORM:OM-1301Q

Effective With Serial No. KA852519

MODEL: MILLERMATIC® 35
SKP-35



OWNER'S MANUAL

IMPORTANT: Read and understand the entire contents of this manual, with special emphasis on the safety material throughout the manual, before installing, operating, or maintaining this equipment. This unit and these instructions are for use only by persons trained and experienced in the safe operation of welding equipment. Do not allow untrained persons to install, operate, or maintain this unit. Contact your distributor if you do not fully understand these instructions.

MILLER ELECTRIC Mfg. Co.
A Miller Group Ltd. Company

P.O. Box 1079
Appleton, WI 54912 USA
Tel. 414-734-9821

LIMITED WARRANTY

EFFECTIVE: AUGUST 6, 1990

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

LIMITED WARRANTY – Subject to the terms and conditions hereof, MILLER Electric Mfg. Co., Appleton, Wisconsin warrants to its Distributor/Dealer that all new and unused Equipment furnished by MILLER is free from defect in workmanship and material as of the time and place of delivery by MILLER. No warranty is made by MILLER with respect to engines, trade accessories or other items manufactured by others. Such engines, trade accessories and other items are sold subject to the warranties of their respective manufacturers, if any. All engines are warranted by their manufacturer for two years from date of original purchase, except Deutz engines which have a one year, 2000 hour warranty.

Except as specified below, MILLER's warranty does not apply to components having normal useful life of less than one (1) year, such as spot welder tips, relay and contactor points. MILLERMATIC parts that come in contact with the welding wire including nozzles and nozzle insulators where failure does not result from defect in workmanship or material.

MILLER shall be required to honor warranty claims on warranted Equipment in the event of failure resulting from a defect within the following periods from the date of delivery of Equipment to the original user:

1. Arc welders, power sources, robots, and 1 year components
2. Load banks 1 year
3. Original main power rectifiers 3 years (labor – 1 year only)
4. All welding guns, feeder/guns and torches 90 days
5. All other MILLERMATIC Feeders 1 year
6. Replacement or repair parts, exclusive of labor 60 days
7. Batteries 6 months

provided that MILLER is notified in writing within thirty (30) days of the date of such failure.

As a matter of general policy only, MILLER may honor claims submitted by the original user within the foregoing periods.

In the case of MILLER's breach of warranty or any other duty with respect to the quality of any goods, the exclusive remedies therefore shall be, at MILLER's option (1) repair or (2) replacement or, where authorized in writing by MILLER in appropriate cases, (3) the reasonable cost of repair or replacement at an authorized MILLER service station or (4) payment of or credit for the purchase price (less reasonable depreciation based upon actual use) upon return of the goods at Customer's risk and expense. MILLER's option of repair or replacement will be F.O.B., Factory at Appleton, Wisconsin, or F.O.B. at a MILLER authorized service facility, therefore, no compensation for transportation costs of any kind will be allowed. Upon receipt of notice of apparent defect or failure, MILLER shall instruct the claimant on the warranty claim procedures to be followed.

ANY EXPRESS WARRANTY NOT PROVIDED HEREIN AND ANY IMPLIED WARRANTY, GUARANTY OR REPRESENTATION AS TO PERFORMANCE, AND ANY REMEDY FOR BREACH OF CONTRACT WHICH, BUT FOR THIS PROVISION, MIGHT ARISE BY IMPLICATION, OPERATION OF LAW, CUSTOM OF TRADE OR COURSE OF DEALING, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR PARTICULAR PURPOSE, WITH RESPECT TO ANY AND ALL EQUIPMENT FURNISHED BY MILLER IS EXCLUDED AND DISCLAIMED BY MILLER.

EXCEPT AS EXPRESSLY PROVIDED BY MILLER IN WRITING, MILLER PRODUCTS ARE INTENDED FOR ULTIMATE PURCHASE BY COMMERCIAL INDUSTRIAL USERS AND FOR OPERATION BY PERSONS TRAINED AND EXPERIENCED IN THE USE AND MAINTENANCE OF WELDING EQUIPMENT AND NOT FOR CONSUMERS OR CONSUMER USE. MILLER'S WARRANTIES DO NOT EXTEND TO, AND NO RESELLER IS AUTHORIZED TO EXTEND MILLER'S WARRANTIES TO, ANY CONSUMER.

RECEIVING-HANDLING

Before unpacking equipment, check carton for any damage that may have occurred during shipment. File any claims for loss or damage **with the delivering carrier**. Assistance for filing or settling claims may be obtained from the distributor and/or the equipment manufacturer's Transportation Department.

When requesting information about this equipment, always provide the Model Description and Serial or Style Number.

Use the following spaces to record the Model Designation and Serial or Style Number of your unit. The information is located on the data card or the nameplate.

Model _____

Serial or Style No. _____

Date of Purchase _____

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SECTION 1 - SAFETY RULES FOR OPERATION OF ARC WELDING POWER SOURCE SECTION 1 - RÈGLES DE SÉCURITÉ POUR LE FONCTIONNEMENT DU POSTE DE SOUDAGE À L'ARC

1-1. INTRODUCTION - We learn by experience. Learning safety through personal experience, like a child touching a hot stove is harmful, wasteful, and unwise. Let the experience of others teach you.

Safe practices developed from experience in the use of welding and cutting are described in this manual. Research, development, and field experience have evolved reliable equipment and safe installation, operation, and servicing practices. Accidents occur when equipment is improperly used or maintained. The reason for the safe practices may not always be given. Some are based on common sense, others may require technical volumes to explain. It is wiser to follow the rules.

Read and understand these safe practices before attempting to install, operate, or service the equipment. Comply with these procedures as applicable to the particular equipment used and their instruction manuals, for personal safety and for the safety of others.

Failure to observe these safe practices may cause serious injury or death. When safety becomes a habit, the equipment can be used with confidence.

These safe practices are divided into two Sections: 1 - General Precautions, common to arc welding and cutting; and 2 - Arc Welding (and Cutting) (only).

Reference standards: Published Standards on safety are also available for additional and more complete procedures than those given in this manual. They are listed in the Standards Index in this manual. ANSI Z49.1 is the most complete.

The National Electrical Code, Occupational Safety and Health Administration, local industrial codes, and local inspection requirements also provide a basis for equipment installation, use, and service.

1-2. GENERAL PRECAUTIONS

Different arc welding processes, electrode alloys, and fluxes can produce different fumes, gases, and radiation levels. In addition to the information in this manual, be sure to consult flux and electrode manufacturers for specific technical data and precautionary measures concerning their material.

A. Burn Prevention

Wear protective clothing - gauntlet gloves designed for use in welding, hat, and high safety-toe shoes. Button shirt collar and pocket flaps, and wear cuffless trousers to avoid entry of sparks and slag.

Wear helmet with safety goggles or glasses with side shields underneath, appropriate filter lenses or plates (protected by clear cover glass). This is a **MUST** for welding or cutting, (and chipping) to protect the eyes

1-1. INTRODUCTION - Contrairement à l'apprentissage de la vie, l'apprentissage de la sécurité par expérience personnelle, comme l'enfant qui touche un poêle chaud, est dangereux, imprudent et inutile. Instruisez-vous donc de l'expérience d'autrui.

Des méthodes de sécurité issues de l'expérience du soudage et du coupage sont décrites dans le manuel. La recherche, le progrès et l'expérience dans ce domaine ont développé un matériel fiable et des méthodes de sécurité pour l'installation, le fonctionnement et l'entretien. Des accidents se produisent lorsque le matériel est inadéquatement utilisé ou entretenu. La raison de ces méthodes de sécurité peut ne pas être toujours donnée. Certaines sont fondées sur le sens commun, d'autres demanderont à être expliquées par des livres techniques. Il est plus sage de suivre les règles.

Lisez et comprenez ces méthodes de sécurité avant d'essayer d'installer, de faire fonctionner ou de réparer l'appareil. Pour votre sécurité personnelle et celle d'autrui, conformez-vous à ces règles et aux manuels d'instructions.

Manquer d'observer ces méthodes de sécurité pourrait entraîner des blessures graves ou même la mort. Quand la sécurité devient une habitude, le matériel peut alors être utilisé en toute confiance.

Ces méthodes de sécurité sont divisées en deux sections: 1 - Précautions générales, communes au soudage et au coupage à l'arc, et 2 - Soudage à l'arc (et coupage) (uniquement).

Normes de référence: Des publications des normes américaines de sécurité sont aussi à votre disposition pour d'autres modes opératoires plus complets que ceux du présent manuel. Elles sont données dans l'Index des Normes de ces règles de sécurité. ANSI Z49-1 est la plus complète.

Les codes de l'ACNOR, les codes provinciaux et municipaux donnent aussi les exigences pour une installation, une utilisation et un entretien sûrs.

1-2. PRÉCAUTIONS GÉNÉRALES

Plusieurs procédés du soudage à l'arc, des électrodes alliés, et les flux peuvent produire des vapeurs, gaz, et niveaux de rayonnement différents. Pour tout renseignement supplémentaire à ce manuel, consultez aussi les fabricants des électrodes et des flux afin d'obtenir les renseignements techniques spécifiques et les mesures de précaution concernant leurs matériaux.

A. Prévention des brûlures

Portez des vêtements de protection - des gants à crispin spécialement désignés pour le soudage, un casque et des chaussures de sécurité. Boutonnez le col de votre chemise et les pattes de vos poches, et portez des pantalons sans revers pour éviter que des étincelles et du laitier ne s'y introduisent.

Portez un masque avec lunettes de sécurité ou avec écrans latéraux de protection, des lunettes filtrantes ou des couvre-lentilles (protégés par un verre clair). Pour le soudage ou le coupage (et le burinage), il est

from radiant energy and flying metal. Replace cover glass when broken, pitted, or spattered. See 1-3A.2.

Avoid oily or greasy clothing. A spark may ignite them.

Hot metal such as electrode stubs and workpieces should never be handled without gloves.

Medical first aid and eye treatment. First aid facilities and a qualified first aid person should be available for each shift unless medical facilities are close by for immediate treatment of flash burns of the eyes and skin burns.

Ear plugs should be worn when working on overhead or in a confined space. A hard hat should be worn when others work overhead.

Flammable hair preparations should not be used by persons intending to weld or cut.

B. Toxic Fume Prevention

Severe discomfort, illness or death can result from fumes, vapors, heat, or oxygen enrichment or depletion that welding (or cutting) may produce. Prevent them with adequate ventilation as described in ANSI Standard Z49.1 listed 1 in Standards index. NEVER ventilate with oxygen.

Lead -, cadmium -, zinc -, mercury -, and beryllium - bearing and similar materials, when welded (or cut) may produce harmful concentrations of toxic fumes. Adequate local exhaust ventilation must be used, or each person in the area as well as the operator must wear an air-supplied respirator. For beryllium, both must be used.

Metals coated with or containing materials that emit toxic fumes should not be heated unless coating is removed from the work surface, the area is well ventilated, or the operator wears an air-supplied respirator.

Work in a confined space only while it is being ventilated and, if necessary, while wearing an air-supplied respirator.

Gas leaks in a confined space should be avoided. Leaked gas in large quantities can change oxygen concentration dangerously. Do not bring gas cylinders into a confined space.

Leaving confined space, shut OFF gas supply at source to prevent possible accumulation of gases in the space if downstream valves have been accidentally opened or left open. Check to be sure that the space is safe before re-entering it.

Vapors from chlorinated solvents can be decomposed by the heat of the arc (or flame) to form PHOSGENE, a highly toxic gas, and other lung and eye irritating products. The ultraviolet (radiant) energy of the arc can also decompose trichloroethylene and perchloroethylene vapors to form phosgene. DO NOT WELD or cut where solvent vapors can be drawn into the welding or cutting atmosphere or where the radiant

OBLIGATOIRE de protéger ses yeux contre l'énergie de rayonnement et les éclats de métal. Remplacez le verre protecteur lorsqu'il est brisé, piqué ou qu'il a reçu des projections. Voir 1.3A.2.

Évitez de porter des habits imprégnés d'huile ou de graisse. Une étincelle pourrait les enflammer.

Ne manipulez jamais sans gants un métal chaud tel que des chutes d'électrode et des pièces à souder.

Premiers soins et traitement des yeux: Tout atelier devrait avoir à sa disposition un poste de premiers soins ainsi qu'une personne compétente, à moins qu'un service médical ne soit à proximité pour soigner immédiatement les brûlures des yeux et de la peau.

Portez des bouche-oreilles lorsque vous travaillez au plafond ou dans un espace restreint. Portez un casque lorsque d'autres personnes travaillent au plafond.

Les personnes devant souder ou couper ne doivent pas employer des préparations inflammables pour leurs cheveux.

B. Prévention des gaz toxiques

Les gaz, les vapeurs, la chaleur, un enrichissement ou un manque d'oxygène peuvent entraîner un malaise, une maladie ou même la mort. Remédiez-y par la ventilation décrite dans la Norme ANSI Z49.1 paragraphe 1 de l'Index des Normes. NE ventilez JAMAIS à l'oxygène.

En soudant ou en coupant, les plomb, cadmium, zinc, mercure et beryllium ou autres matériaux semblables peuvent créer des concentrations nocives de gaz toxiques. On doit avoir recours à une ventilation aspirante adéquate du local, ou alors toute personne sur les lieux, de même que le soudeur, doit porter un masque à adduction d'air. On doit employer les deux pour le beryllium.

Les métaux enrobés ou composés de matériaux émettant des gaz toxiques ne doivent pas être chauffés à moins que l'enrobage ne soit ôté de la surface à travailler, que le local ne soit bien ventilé, ou que le soudeur ne porte un masque à adduction d'air.

Ne travaillez dans un espace restreint que s'il est bien ventilé et, si nécessaire, portez un masque à adduction d'air.

On doit éviter les fuites de gaz dans un espace restreint. Les fuites de gaz en grande quantité peuvent transformer dangereusement la concentration d'oxygène. N'amenez pas de bouteilles de gaz dans un espace restreint.

En quittant un espace restreint, FERMEZ le robinet d'alimentation de gaz de la bouteille. Ainsi on pourra rentrer en toute sécurité dans la pièce, même si les robinets "aval" ont été ouverts par accident, ou si on les a laissés ouverts.

Les vapeurs de dissolvants chlorés peuvent être décomposées par la chaleur de l'arc (ou de la flamme) et former du PHOSGÈNE, gaz très toxique, et d'autres produits irritant les poumons et les yeux. L'énergie ultra-violette de l'arc peut aussi décomposer les vapeurs de trichloroéthylène et de perchloroéthylène pour former du phosgene. NE SOUDEZ PAS ou ne coupez pas dans des endroits où les vapeurs de dissolvants peuvent être attirées dans l'atmosphère de soudage ou de

energy can penetrate to atmospheres containing even minute amounts of trichloroethylene or perchloroethylene.

C. Fire and Explosion Prevention

Causes of fire and explosion are: combustibles reached by the arc, flame, flying sparks, hot slag or heated material; misuse of compressed gases and cylinders; and short circuits.

BE AWARE THAT flying sparks or falling slag can pass through cracks, along pipes, through windows or doors, and through wall or floor openings, out of sight of the goggled operator. Sparks and slag can fly 35 feet.

To prevent fires and explosion:

Keep equipment clean and operable, free of oil, grease, and (in electrical parts) of metallic particles that can cause short circuits.

If combustibles are in area, do NOT weld or cut. Move the work if practicable, to an area free of combustibles. Avoid paint spray rooms, dip tanks, storage areas, ventilators. If the work cannot be moved, move combustibles at least 35 feet away out of reach of sparks and heat; or protect against ignition with suitable and snug-fitting, fire-resistant covers or shields.

Walls touching combustibles on opposite sides should not be welded on (or cut). Walls, ceilings, and floor near work should be protected by heat-resistant covers or shields.

Fire watcher must be standing by with suitable fire extinguishing equipment during and for some time after welding or cutting if:

- a. appreciable combustibles (including building construction) are within 35 feet
- b. appreciable combustibles are further than 35 feet but can be ignited by sparks
- c. openings (concealed or visible) in floors or walls within 35 feet may expose combustibles to sparks
- d. combustibles adjacent to walls, ceilings, roofs, or metal partitions can be ignited by radiant or conducted heat.

Hot work permit should be obtained before operation to ensure supervisor's approval that adequate precautions have been taken.

After work is done, check that area is free of sparks, glowing embers, and flames.

An empty container that held combustibles, or that can produce flammable or toxic vapors when heated, must never be welded on or cut, unless container has first been cleaned as described in AWS Standard A6.0, listed 7 in Standards index.

This includes: a thorough steam or caustic cleaning (or a solvent or water washing, depending on the com-

coupage et où l'énergie de rayonnement peut pénétrer dans des atmosphères contenant des quantités même minuscules de trichloroéthylène ou de perchloroéthylène.

C. Prévention des incendies et des explosions

Les causes d'incendie et d'explosion sont les combustibles atteints par l'arc, la flamme, les étincelles, le laitier chaud ou les matériaux chauffés, le mauvais emploi des gaz comprimés et des bouteilles ainsi que les courts-circuits.

Sachez que les éclats d'étincelles ou la chute du laitier peuvent s'infiltrer dans les fissures, le long des tuyauteries, par les fenêtres et les portes et par les couvertures des murs ou du sol, sans que le soudeur portant des lunettes ne les voie. Les étincelles et les scories peuvent voler jusqu'à 35 pieds.

Pour prévenir les incendies et les explosions: Veillez à ce que votre appareil soit propre et en état de marche, dénué d'huile et de graisse, et de particules de métal sur les pièces électriques qui pourraient entraîner des courts-circuits.

Si des combustibles se trouvent à proximité, ne soudez pas, ne coupez pas. Si possible, déplacez votre travail loin des combustibles. Évitez les ateliers de peinture au pistolet, les cuves d'immersion, les entrepôts, les ventilateurs. Si cela n'est pas possible, placez les combustibles à au moins 35 pieds des étincelles et de la chaleur et protégez-les des étincelles avec des couvertures ou des écrans protecteurs adéquats, bien ajustés et ignifugés.

On ne doit pas souder (ou couper) le côté opposé des murs touchant les combustibles. Les murs, plafonds et planchers proches du travail doivent être protégés par des couvertures ou écrans protecteurs ignifugés.

Un surveillant doit se tenir à proximité avec un matériel de lutte contre l'incendie adéquat, pendant et quelque temps après le soudage ou le coupage si:

- a. Des quantités appréciables de combustibles (y compris une construction en chantier) se trouvent à moins de 35 pieds.
- b. Des quantités appréciables de combustibles sont à plus de 35 pieds mais peuvent être enflammées par des étincelles.
- c. Des ouvertures (cachées ou visibles) sur les planchers ou les murs à moins de 35 pieds peuvent exposer des combustibles aux étincelles.
- d. Les combustibles adjacents aux murs, plafonds, toits ou cloisons métalliques peuvent être enflammés par une chaleur rayonnante ou transmise.

Avant de commencer, avisez le contremaître pour qu'il s'assure que les précautions adéquates soient prises.

Une fois le travail terminé, vérifiez qu'il n'y ait pas d'étincelles, de cendres ardentes ou de flammes dans le local.

On ne doit jamais souder ni couper sur un récipient ayant contenu des combustibles, ou pouvant produire des vapeurs inflammables ou toxiques à la chauffe, à moins que le récipient n'ait été lavé au préalable, comme décrit dans la Norme AWS A6.0, figurant au paragraphe 7 de l'Index des Normes.

Cela comprend: un nettoyage à fond à la vapeur ou au caustique (ou un lavage avec dissolvant ou eau selon la solubilité du combustible) suivi d'une purge et d'une in-

bustible's solubility) followed by purging and inerting with nitrogen or carbon dioxide, and using protective equipment as recommended in A6.0. Waterfilling just below working level may substitute for inerting.

A container with unknown contents should be cleaned (see paragraph above). Do NOT depend on sense of smell or sight to determine if it is safe to weld or cut.

Hollow castings or containers must be vented before welding or cutting. They can explode.

Explosive atmospheres. Never weld or cut where the air may contain flammable dust, gas, or liquid vapors (such as gasoline).

D. Compressed Gas Equipment

Standard precautions. Comply with precautions in this manual, and those detailed in CGA Standard P-1, **SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS**, listed 11 in Standards index.

1. Pressure Regulators

Regulator relief valve is designed to protect only the regulator from overpressure; it is not intended to protect any downstream equipment. Provide such protection with one or more relief devices.

Never connect a regulator to a cylinder containing gas other than that for which the regulator was designed.

Remove faulty regulator from service immediately for repair (first close cylinder valve). The following symptoms indicate a faulty regulator:

Leaks - if gas leaks externally.

Excessive Creep - if delivery pressure continues to rise with downstream valve closed.

Faulty Gauge - if gauge pointer does not move off stop pin when pressurized, nor returns to stop pin after pressure release.

Repair. Do NOT attempt repair. Send faulty regulators for repair to manufacturer's designated repair center, where special techniques and tools are used by trained personnel.

2. Cylinders

Cylinders must be handled carefully to prevent leaks and damage to their walls, valves, or safety devices:

Avoid electrical circuit contact with cylinders including third rails, electrical wires, or welding circuits. They can produce short circuit arcs that may lead to a serious accident. (See 1-3C.)

ICC or DOT marking must be on each cylinder. It is an assurance of safety when the cylinder is properly handled.

jection d'azote ou de gaz carbonique, en utilisant un équipement de protection comme recommandé dans l'A6-0. L'atmosphère inerte peut être remplacée par un niveau d'eau arrivant au-dessous du travail à effectuer.

Vous devez laver un récipient dont la nature de contenu est inconnue (voir paragraphe ci-dessus). NE vous fiez PAS à l'odorat ou à la vue pour dire si l'on peut le souder ou le couper en toute sécurité.

Vous devez pratiquer un évent sur les pièces ou récipients creux avant de les souder ou couper: ils peuvent exploser.

Atmosphères explosives: Ne soudez ni ne coupez jamais dans des lieux où l'air peut contenir des poussières, gaz ou vapeurs liquides inflammables (tels que l'essence).

D. Gaz comprimé

Précautions générales: Suivez les précautions de ce manuel, et celles décrites à la Norme CGA P-1 (Précautions de sécurité pour la manipulation de gaz comprimés en bouteilles), paragraphe 11 de l'Index des Normes.

1. Détendeurs de pression

La soupape de sûreté d'un détendeur est destinée à protéger seulement le détendeur de la surpression. Elle n'a pas pour but de protéger les boyaux et le chalumeau: on protège ceux-ci par des soupapes de retenue conçues spécialement pour cette fonction.

Ne montez jamais un détendeur sur une bouteille contenant un gaz différent de celui pour lequel le détendeur a été conçu.

Enlevez immédiatement un détendeur défectueux pour le faire réparer (d'abord, fermez le robinet de la bouteille). Les symptômes suivants dénotent la défectuosité du détendeur:

Fuites - si le gaz fuit extérieurement.

Ascension excessive - si la pression de débit continue à monter, le robinet du chalumeau étant fermé.

Manomètre défectueux - si l'aiguille du manomètre ne s'écarte pas de la goupille de butée lors de la mise en pression, ou ne revient pas sur la goupille après l'échappement de la pression.

Réparation. N'ESSAYEZ PAS de réparer vous-mêmes. Envoyez les détendeurs défectueux à réparer aux ateliers de réparation agréés du fabricant, où des techniques et des outils spéciaux sont utilisés par un personnel formé.

2. Bouteilles

Les bouteilles doivent être manipulées avec soin pour prévenir les fuites ou dégâts à leurs parois, robinets ou systèmes de sûreté. Évitez qu'un circuit électrique soit en contact avec les bouteilles, y compris les rails de contact, les fils électriques ou les circuits de soudage. Cela pourrait créer des arcs courts-circuits pouvant entraîner des accidents graves (Voir 1.3C.).

Chaque bouteille doit porter les inscriptions ICC ou DOT. C'est un gage de sécurité pourvu que la bouteille soit bien manipulée.

Identifying gas content. Use only cylinders with name of gas marked on them; do not rely on color to identify gas content. Notify supplier if unmarked. NEVER DEFACE or alter name, number, or other markings on a cylinder. It is illegal and hazardous.

Empties: Keep valves closed, replace caps securely; mark MT; keep them separate from FULLS and return promptly.

Prohibited use. Never use a cylinder or its contents for other than its intended use, NEVER as a support or roller.

Locate or secure cylinders so they cannot be knocked over.

Passageways and work areas. Keep cylinders clear of areas where they may be struck.

Transporting cylinders. With a crane, use a secure support such as a platform or cradle. Do NOT lift cylinders off the ground by their valves or caps, or by chains, slings, or magnets.

Do NOT expose cylinders to excessive heat, sparks, slag, and flame, etc. that may cause rupture. Do not allow contents to exceed 130°F. Cool with water spray where such exposure exists.

Protect cylinders particularly valves from bumps, falls, falling objects, and weather. Replace caps securely when moving cylinders.

Stuck valve. Do NOT use a hammer or wrench to open a cylinder valve that can not be opened by hand. Notify your supplier.

Mixing gases. Never try to mix any gases in a cylinder.

Never refill any cylinder.

Cylinder fittings should never be modified or exchanged.

3. Hose

Prohibited use. Never use hose other than that designed for the specified gas. A general hose identification rule is: red for fuel gas, green for oxygen, and black for inert gases.

Use ferrules or clamps designed for the hose (not ordinary wire or other substitute) as a binding to connect hoses to fittings.

No copper tubing splices. Use only standard brass fittings to splice hose.

Avoid long runs to prevent kinks and abuse. Suspend hose off ground to keep it from being run over, stepped on, or otherwise damaged.

Coil excess hose to prevent kinks and tangles.

Protect hose from damage by sharp edges, and by sparks, slag, and open flame.

Examine hose regularly for leaks, wear, and loose connections. Immerse pressured hose in water; bubbles indicate leaks.

Identification du gaz: N'utilisez que les bouteilles indiquant la nature du gaz; ne vous fiez pas à la couleur pour reconnaître la nature du gaz. Adressez-vous à votre fournisseur si cela n'est pas indiqué.

N'EFFACEZ ou ne modifiez JAMAIS les noms, numéros ou autres indications sur une bouteille. Cela est illégal et dangereux.

Vides: Maintenez les robinets fermés, remplacez bien les chapeaux; inscrivez "Vides"; séparez-les des "Pleines" et retournez-les rapidement.

Emploi interdit: N'utilisez une bouteille ou son contenu que pour ce à quoi elle est destinée, mais JAMAIS comme support ou rouleau.

Placez les bouteilles pour qu'elles ne tombent pas. Lorsqu'un détendeur (et un boyau) est monté sur elles, placez les ou attachez-les debout.

Passages et lieux de travail. Enlevez les bouteilles d'un endroit où l'on pourrait les frapper.

Transport des bouteilles. Avec une grue, utilisez un support fiable tel qu'une plate-forme ou un cadre. NE SOULEVEZ PAS des bouteilles du sol par leur robinet ou chapeau, ou avec des chaînes, élingues ou aimants.

N'EXPOSEZ PAS les bouteilles à une chaleur excessive, aux étincelles, au laitier et aux flammes, etc., pouvant causer leur rupture. Le contenant ne doit jamais dépasser 55°C. Refroidissez en pulvérisant de l'eau si nécessaire.

Protégez les bouteilles et particulièrement les soupapes contre les chocs, les chutes, les chutes d'objets et la température. Remettez bien les chapeaux lorsque vous déplacez les bouteilles.

Robinet coincé. N'UTILISEZ PAS un marteau ou une clé métallique pour ouvrir un robinet de bouteille que l'on ne peut pas ouvrir à la main. Avisez votre fournisseur.

Mélange de gaz. N'essayez jamais de mélanger des gaz dans une bouteille.

Ne rechargez jamais une bouteille. Les éléments de la bouteille ne doivent jamais être modifiés ou remplacés.

3. Boyau

Utilisation interdite. N'utilisez jamais un boyau autre que celui approprié au gaz indiqué. La règle générale d'identification est: rouge pour les gaz combustibles, vert pour l'oxygène, et noir pour les gaz inertes.

Utilisez des bagues ou colliers appropriés au boyau (et non du fil ordinaire ou autre substitution) pour brancher les boyaux à l'appareillage.

N'utilisez pas des raccords en cuivre. N'utilisez que des accessoires standard en laiton pour raccorder un boyau.

Utilisez une petite longueur de boyau. Cela évitera les noeuds et l'usure prématurée. Suspendez le boyau au-dessus du sol pour éviter qu'il ne soit écrasé, piétiné ou endommagé.

Enroulez le surplus de boyau pour éviter les noeuds et emmêlements. Évitez que le boyau ne soit endommagé par des tranchants, étincelles, laitier et flamme nue.

Repair leaky or worn hose by cutting area out and splicing (1-2D3). Do NOT use tape.

4. Proper Connections

Clean cylinder valve outlet of impurities that may clog orifices and damage seats before connecting regulator. Except for hydrogen, crack valve momentarily, pointing outlet away from people and sources of ignition. Wipe with a clean lintless cloth.

Match regulator to cylinder. Before connecting, check that the regulator label and cylinder marking agree, and that the regulator inlet and cylinder outlet match. NEVER CONNECT a regulator designed for a particular gas or gases to a cylinder containing any other gas.

Tighten connections. When assembling threaded connections, clean and smooth seats where necessary. Tighten. If connection leaks, disassemble, clean, and retighten using properly fitting wrench.

Adapters. Use a CGA adapter (available from your supplier) between cylinder and regulator, if one is required. Use two wrenches to tighten adapter marked RIGHT and LEFT HAND threads.

Regulator outlet (or hose) connections may be identified by right hand threads for oxygen and left hand threads (with grooved hex on nut or shank) for fuel gas.

5. Pressurizing Steps:

Drain regulator of residual gas through suitable vent before opening cylinder (or manifold valve) by turning adjusting screw in (clockwise). Draining prevents excessive compression heat at high pressure seat by allowing seat to open on pressurization. Leave adjusting screw engaged slightly on single-stage regulators.

Stand to side of regulator while opening cylinder valve.

Open cylinder valve slowly so that regulator pressure increases slowly. When gauge is pressurized (gauge reaches regulator maximum) leave cylinder valve in following position: For oxygen, and inert gases, open fully to seal stem against possible leak. For fuel gas, open to less than one turn to permit quick emergency shutoff.

Use pressure charts (available from your supplier) for safe and efficient, recommended pressure settings on regulators.

Check for leaks on first pressurization and regularly thereafter. Brush with soap solution (capful of Ivory Liquid* or equivalent per gallon of water). Bubbles indicate leak. Clean off soapy water after test; dried soap is combustible.

E. User Responsibilities

Remove leaky or defective equipment from service immediately for repair. See User Responsibility statement in equipment manual.

*Trademark of Proctor & Gamble

Vérifiez régulièrement les fuites, l'usure et les raccordements lâches. Plongez le boyau sous pression dans de l'eau; les bulles indiqueront les fuites.

Réparation. Coupez la partie percée ou usée, et raccordez (1-2D3). N'UTILISEZ JAMAIS de ruban adhésif.

4. Branchements corrects

Avant de brancher le détendeur, nettoyez la sortie du robinet de la bouteille des impuretés qui peuvent obstruer les orifices et endommager les sièges. Sauf pour l'hydrogène, ouvrez momentanément le robinet, en éloignant la sortie des personnes et des sources inflammables. Essuyez avec un tissu propre et non gras.

Appareillez le détendeur à la bouteille. Avant de brancher, vérifiez que la marque du détendeur et la description de la bouteille concordent, et que l'orifice d'entrée du détendeur et l'orifice de sortie de la bouteille aillent ensemble. NE BRANCHEZ JAMAIS un détendeur conçu pour un gaz spécial (ou des gaz spéciaux) à une bouteille contenant d'autres gaz.

Serrez les branchements. Lorsque vous assemblez des branchements filetés, nettoyez et polissez les sièges où c'est nécessaire. Serrez. Si les branchements perdent, démontez-les, nettoyez et resserez avec une clef adéquate.

Adaptateurs. Placez, si besoin est, un adaptateur CGA (en vente chez votre fournisseur) entre la bouteille et le détendeur. Avec deux clefs, serrez l'adaptateur fileté À DROITE et À GAUCHE.

On peut reconnaître les branchements de sortie du détendeur (ou boyau) à l'aide du filetage à droite pour l'oxygène et à gauche (identifié par un écrou cannelé) pour les gaz combustibles.

5. Démarches de mise en pression

Purgez le détendeur de résidu de gaz avant d'ouvrir la bouteille (ou le robinet de canalisation) en serrant la vis de réglage (dans le sens des aiguilles d'une montre). Cette opération permet au siège de haute pression de s'ouvrir à la mise en pression, supprimant ainsi toute surchauffe de compression. Maintenez la vis de réglage des détendeurs à simple détente légèrement engagée. Avant d'ouvrir le robinet de la bouteille, assurez-vous que les boyaux sont branchés et que les soupapes aval sont fermées.

Tenez-vous latéralement au détendeur en ouvrant le robinet de la bouteille. Ouvrez-le lentement pour que la pression du détendeur monte progressivement. Lorsque le manomètre est mis sous pression (indique le maximum) le robinet de la bouteille de gaz inerte ou d'oxygène devra être ouvert à fond pour assurer l'étanchéité et celui de la bouteille de gaz combustible ouvert de moins d'un tour pour pouvoir le refermer rapidement en cas d'urgence.

Référez-vous aux tableaux de pression (distribués par votre fournisseur) pour un réglage recommandé de pression sûr et efficace sur les détendeurs. Vérifiez les fuites à la première mise en pression puis régulièrement, brossez avec une solution savonneuse (un bouchon d'Ivory Liquid* ou semblable par gallon d'eau). Les bulles indiquent une fuite. Enlevez l'eau savonneuse après examen; le savon sec est inflammable.

*Marque de Commerce de Proctor & Gamble

F. Leaving Equipment Unattended

Close gas supply at source and drain gas.

G. Rope Staging-Support

Rope staging-support should not be used for welding or cutting operation; rope may burn.

1-3. ARC WELDING - Comply with precautions in 1-1, 1-2, and this section. Arc Welding, properly done, is a safe process, but a careless operator invites trouble. The equipment carries high currents at significant voltages. The arc is very bright and hot. Sparks fly, fumes rise, ultraviolet and infrared energy radiates, weldments are hot, and compressed gases may be used. The wise operator avoids unnecessary risks and protects himself and others from accidents. Precautions are described here and in standards referenced in index.

A. Burn Protection

Comply with precautions in 1-2.

The welding arc is intense and visibly bright. Its radiation can damage eyes, penetrate lightweight clothing, reflect from light-colored surfaces, and burn the skin and eyes. Skin burns resemble acute sunburn, those from gas-shielded arcs are more severe and painful. **DON'T GET BURNED; COMPLY WITH PRECAUTIONS.**

1. Protective Clothing

Wear long-sleeve clothing (particularly for gas-shielded arc) in addition to gloves, hat, and shoes (1-2A). As necessary, use additional protective clothing such as leather jacket or sleeves, flame-proof apron, and fire-resistant leggings. Avoid outer garments of untreated cotton.

Bare skin protection. Wear dark, substantial clothing. Button collar to protect chest and neck and button pockets to prevent entry of sparks.

2. Eye and Head Protection

Protect eyes from exposure to arc. NEVER look at an electric arc without protection.

Welding helmet or shield containing a filter plate shade no. 12 or denser must be used when welding. Place over face before striking arc.

Protect filter plate with a clear cover plate.

Cracked or broken helmet or shield should NOT be worn; radiation can pass through to cause burns.

Cracked, broken, or loose filter plates must be replaced IMMEDIATELY. Replace clear cover plate when broken, pitted, or spattered.

E. Responsabilités de l'utilisateur

Ôtez immédiatement les parties percées ou défectueuses. Voir les Responsabilités de l'Usager du manuel de l'appareil.

F. Appareil laissé sans surveillance

Fermez l'alimentation de gaz à la source et purgez.

G. Liens et supports temporaires

Pour vos travaux de soudage ou de coupage, n'utilisez pas de la corde comme soutien, elle est inflammable.

1-3. SOUDAGE À L'ARC - Conformez-vous aux précautions des paragraphes 1.1 et 1.2 de cette section. Le soudage à l'arc bien exécuté est sûr, mais un soudeur négligent est un danger. Le poste de soudage transporte des courants élevés sous de fortes tensions. L'arc est très vif et chaud. Les étincelles volent, les vapeurs montent, l'énergie ultra-violette et infrarouge rayonnent, les soudures sont chaudes, et des gaz comprimés peuvent être utilisés. Le soudeur prudent évite les risques inutiles, se protège et protège autrui contre les accidents. Les précautions sont décrites ici et dans les normes données dans l'Index.

A. Protection contre les brûlures

Conformez-vous aux précautions du paragraphe 1.2. L'arc de soudage est intense et visiblement vif. Son rayonnement peut blesser les yeux, traverser les habits légers, se réfléchir sur les surfaces claires, et brûler la peau et les yeux. Les brûlures de la peau ressemblent à un gros coup de soleil. Celles d'arcs sous gaz protecteur sont plus graves et plus douloureuses. **NE VOUS BRÛLEZ PAS - SUIVEZ LES PRÉCAUTIONS.**

1. Vêtements de protection

Portez des vêtements à manches longues (surtout pour l'arc en atmosphère inerte) avec gants, masque et chaussures (1.2A.).

Si nécessaire portez en plus une veste ou des manches en cuir, un tablier et des guêtres ignifugées. De préférence ne portez pas de vêtements en coton non traité.

Protection de la peau. Portez des vêtements épais foncés. Boutonnez le col pour protéger la poitrine et le cou, et boutonnez les poches pour prévenir l'infiltration d'étincelles.

2. Protection des yeux et de la tête

Évitez que vos yeux soient exposés à l'arc. NE regardez JAMAIS un arc électrique sans protection.

Lorsque vous soudez, portez un écran ou masque avec verre filtrant teinté N° 12 ou plus foncé. Mettez-le sur le visage avant d'amorcer l'arc.

Protégez le verre filtrant d'un couvre-verre clair. NE PORTEZ PAS un masque fendu ou brisé; le rayonnement peut s'infiltrer et causer des brûlures.

Les verres filtrants fendus, brisés ou lâches doivent être remplacés IMMÉDIATEMENT. Remplacez un couvre-verre brisé, piqué ou taché par des projections.

Flash goggles with side shields **MUST** be worn under the helmet to give some protection to the eyes should the helmet not be lowered over the face before an arc is struck. Looking at an arc momentarily with unprotected eyes (particularly a high intensity gas-shielded arc) can cause a retinal burn that may leave a permanent dark area in the field of vision.

3. Protection of Nearby Personnel

Enclosed welding area. For production welding, a separate room or enclosed bay is best. In open areas, surround the operation with low-reflective, non-combustible screens or panels. Allow for free air circulation, particularly at floor level.

Viewing the weld. Provide face shields for all persons who will be looking directly at the weld.

Others working in area. See that all persons are wearing flash goggles.

Before starting to weld, make sure that screen flaps or bay doors are closed.

B. Toxic Fume Prevention

Comply with precautions in 1-2B.

Generator engine exhaust must be vented to the outside air. Carbon monoxide can kill.

C. Fire and Explosion Prevention

Comply with precautions in 1-2C.

Equipment's rated capacity. Do not overload arc welding equipment. It may overheat cables and cause a fire.

Loose cable connections may overheat or flash and cause a fire.

Never strike an arc on a cylinder or other pressure vessel. It creates a brittle area that can cause a violent rupture or lead to such a rupture later under rough handling.

D. Compressed Gas Equipment

Comply with precautions in 1-2D.

E. Shock Prevention

Exposed hot conductors or other bare metal in the welding circuit, or in ungrounded, electrically-HOT equipment can fatally shock a person whose body becomes a conductor. **DO NOT STAND, SIT, LIE, LEAN ON, OR TOUCH** a wet surface when welding, without suitable protection.

Vous devez porter des lunettes à écrans latéraux sous le masque pour protéger les yeux dans le cas où le masque ne serait pas abaissé sur le visage avant l'amorçage de l'arc. Regarder momentanément un arc sans protection (principalement un arc en atmosphère inerte à haute intensité) peut brûler la rétine et laisser un point sombre permanent dans le champ de vision.

3. Protection du personnel à proximité

Local de soudage fermé. Pour le soudage de production, il vaut mieux utiliser une salle séparée ou une baie fermée. Dans les locaux ouverts, entourez les travaux d'écrans ou panneaux peu réfléchissants et ininflammables. Laissez l'air circuler librement, particulièrement au niveau du sol.

Donnez des masques aux personnes qui regarderont directement la soudure.

Autres personnes travaillant sur les lieux. Veillez à ce que toutes les personnes portent les lunettes de protection.

Avant d'attaquer la soudure, assurez-vous que les rebords d'écran ou les portes soient fermés.

B. Prévention des gaz toxiques

Suivez les précautions du paragraphe 1.2B. L'échappement du moteur de la génératrice doit être ventilé à l'air extérieur. L'oxyde de carbone peut tuer.

C. Prévention des incendies et des explosions

Suivez les précautions 1.2C. Puissance nominale de l'appareil. Ne surchargez pas le poste de soudage à l'arc. Cela peut surchauffer les câbles et causer un incendie.

Les branchements lâches de câble peuvent surchauffer ou faire des étincelles et causer un incendie.

N'amorcez jamais un arc sur une bouteille ou autre récipient sous pression. Cela créerait un point de rupture entraînant à plus ou moins longue échéance l'explosion du réservoir.

D. Gaz comprimé

Suivez les précautions 1.2D.

E. Prévention des décharges électriques

Des conducteurs chargés ou métal nu incorporés au circuit de soudage ou à un appareil chargé sans mise à la terre peuvent donner une décharge fatale à la personne dont le corps devient conducteur. **NE SOUDEZ PAS DEBOUT, ASSIS, COUCHÉ, PENCHÉ** sur une surface humide ni en contact avec une telle surface sans protection appropriée.

To protect against shock:

Keep body and clothing dry. Never work in damp area without adequate insulation against electrical shock. Stay on a dry duckboard, or rubber mat when dampness or sweat can not be avoided. Sweat, sea water, or moisture between body and an electrically HOT part - or grounded metal - reduces the body surface electrical resistance, enabling dangerous and possibly lethal currents to flow through the body.

1. Grounding the Equipment

When arc welding equipment is grounded according to the National Electrical Code, and the work is grounded according to ANSI Z49.1 "Safety In Welding And Cutting," a voltage may exist between the electrode and any conducting object. Examples of conducting objects include, but are not limited to, buildings, electrical tools, work benches, welding power source cases, workpieces, etc. **Never touch the electrode and any metal object unless the welding power source is off.**

When installing, connect the frames of each unit such as welding power source, control, work table, and water circulator to the building ground. Conductors must be adequate to carry ground currents safely. Equipment made electrically HOT by stray current may shock, possibly fatally. Do NOT GROUND to electrical conduit, or to a pipe carrying ANY gas or a flammable liquid such as oil or fuel.

Three-phase connection. Check phase requirements of equipment before installing. If only 3-phase power is available, connect single-phase equipment to only two wires of the 3-phase line. Do NOT connect the equipment ground lead to the third (live) wire, or the equipment will become electrically HOT - a dangerous condition that can shock, possibly fatally.

Before welding, check ground for continuity. Be sure conductors are touching bare metal of equipment frames at connections.

If a line cord with a ground lead is provided with the equipment for connection to a switchbox, connect the ground lead to the grounded switchbox. If a three-prong plug is added for connection to a grounded mating receptacle, the ground lead must be connected to the ground prong only. If the line cord comes with a three-prong plug, connect to a grounded mating receptacle. Never remove the ground prong from a plug, or use a plug with a broken off ground prong.

2. Electrode Holders

Fully insulated electrode holders should be used. Do NOT use holders with protruding screws.

3. Connectors

Fully insulated lock-type connectors should be used to join welding cable lengths.

Pour vous protéger contre les décharges électriques, maintenez votre corps et vêtements secs. Ne travaillez jamais dans un endroit humide sans isolation adéquate contre les décharges électriques. Lorsque vous ne pouvez éviter l'humidité ou la sueur, placez-vous sur un caillebotis sec ou un tapis en caoutchouc. La sueur, l'eau de mer, ou l'humidité entre le corps et une pièce CHARGÉE, ou une pièce de métal à la masse, réduisent la résistance électrique de la surface du corps, permettant l'entrée de courants dangereux, voire mortels.

1. Mise à la terre de l'appareil

Lorsque l'appareil de soudage à l'arc est mise à la terre suivant la norme National Electrical Code, et la masse est mise à la terre suivant la norme ANSI Z49.1 "Safety in Welding and Cutting," une tension peut exister entre l'électrode et un objet conducteur. Certaines de ces objets sont par exemple (mais pas seulement), des bâtiments, des outils électriques, des établis, des châssis de postes de soudure, des pièces d'ouvrage, etc. **Ne jamais touchez l'électrode ou des objets en métal avant d'avoir mis le poste de soudure à l'arrêt.**

À l'installation, branchez les châssis de chaque élément (source de courant, commande, établi et circuit d'eau) à la terre. Les conducteurs doivent pouvoir conduire les courants telluriques en toute sécurité. L'appareil chargé par les courants vagabonds peut donner une décharge risquant d'être mortelle. **NE BRANCHEZ PAS VOTRE PRISE DE TERRE** à une conduite électrique, ou à un tuyau de gaz ou de liquide inflammable tel que l'huile ou un combustible.

Connexion triphasée. Avant l'installation vérifiez la phase nécessaire à l'appareil. Si seul le triphasé est disponible, ne branchez l'appareil monophasé qu'à deux des fils de la ligne triphasée. **NE BRANCHEZ PAS** le conducteur de terre de l'appareil au troisième fil (sous tension), autrement l'appareil serait chargé: condition dangereuse pouvant donner une décharge fatale.

Avant le soudage, vérifiez si la prise de terre est uniforme. En branchant, assurez-vous que les conducteurs touchent le métal nu du châssis de l'appareil.

Lorsqu'un appareil doit être alimenté à partir d'un coffret d'alimentation, le conducteur de terre doit être relié à celui-ci.

Si vous avez en plus une fiche à trois broches pour la terre, ne branchez le conducteur de terre qu'à la broche de terre. Si le cordon d'alimentation a une fiche à trois broches, reliez-le à une prise femelle tripolaire reliée à la terre. N'enlevez jamais la broche de terre d'une fiche ou n'utilisez jamais une fiche dont la broche de terre serait brisée.

2. Pince-électrodes

Utilisez des pince-électrodes bien isolées. **N'UTILISEZ PAS** des pince-électrodes avec vis saillantes.

3. Connecteurs

Utilisez des connecteurs à verrouillage bien isolés pour assembler de longs câbles.

4. Cables

Frequently inspect cables for wear, cracks and damage. **IMMEDIATELY REPLACE** those with excessively worn or damaged insulation to avoid possibly - lethal shock from bared cable. Cables with damaged areas may be taped to give resistance equivalent to original cable.

Keep cable dry, free of oil and grease, and protected from hot metal and sparks.

5. Terminals And Other Exposed Parts.

Terminals and other exposed parts of electrical units should have insulating covers secured before operation.

6. Electrode

- a. Equipment with output on/off control (contactor)

Welding power sources for use with the gas metal arc welding (GMAW), gas tungsten arc welding (GTAW) and similar processes normally are equipped with devices that permit on-off control of the welding power output. When so equipped the electrode wire becomes electrically HOT when the power source switch is ON and the welding gun switch is closed. Never touch the electrode wire or any conducting object in contact with the electrode circuit unless the welding power source is off.

- b. Equipment without output on/off control (no contactor)

Welding power sources used with shielded metal arc welding (SMAW) and similar processes may not be equipped with welding power output on-off control devices. With such equipment the electrode is electrically HOT when the power switch is turned ON. Never touch the electrode unless the welding power source is off.

7. Safety Devices

Safety devices such as interlocks and circuit breakers should not be disconnected or shunted out.

Before installation, inspection, or service, of equipment, shut OFF all power and remove line fuses (or lock or red-tag switches) to prevent accidental turning ON of power. Disconnect all cables from welding power source, and pull all 115 volts line-cord plugs.

Do not open power circuit or change polarity while welding. If, in an emergency, it must be disconnected, guard against shock burns, or flash from switch arcing.

Leaving equipment unattended. Always shut OFF and disconnect all power to equipment.

Power disconnect switch must be available near the welding power source.

4. Câbles

Vérifiez fréquemment l'usure, les fissures et l'altération des câbles. **REPLACEZ IMMÉDIATEMENT** ceux dont l'isolation serait trop usée ou altérée pour prévenir les décharges mortelles provoquées par un câble dénudé. Vous pouvez enrouler les parties endommagées de ruban adhésif en épaisseur suffisante pour donner une résistance de câble neuf. Maintenez les câbles secs, dépourvus d'huile et de graisse et mettez-les à l'abri du métal chaud et des étincelles.

5. Têtes de câbles et autres parties dénudées

Avant la mise en marche, les têtes de câbles et autres parties dénudées d'un appareil électrique doivent être munies de leurs couvre-fils isolants.

6. Électrode

- a. Appareil équipé d'une commande marche/arrêt (contacteur)

En général, les postes de soudure utilisés pour le soudage à l'arc sous protection gazeuse avec électrode fusible (GMAW), ou avec électrode tungstène (GTAW) et des procès semblables sont équipés d'une commande marche/arrêt de la puissance de sortie. Lorsque l'interrupteur est en position "MARCHE" et l'interrupteur du pistolet est fermé, le fil d'électrode devient chargé. Ne touchez jamais le fil électrode ou tout autre objet conducteur faisant contact avec le circuit d'électrode sans couper le courant au poste de soudure.

- b. Appareil non-équipé d'une commande marche/arrêt (sans contacteur)

Les postes de soudure utilisés pour le soudage à l'arc avec électrode enrobée (SMAW) et des procès semblables peuvent être non-équipés d'une commande marche/arrêt de la puissance de sortie. Lorsque l'interrupteur est en position "MARCHE" l'électrode devient chargé. Ne touchez jamais l'électrode sans couper le courant au poste de soudure.

7. Dispositif de sécurité

Le dispositif de sécurité-verrouillage et coupe-circuit ne doit pas être débranché ou déshunté.

Avant l'installation, l'inspection ou la réparation de l'appareil, mettez l'alimentation sur ARRÊT et enlevez les fusibles généraux (ou verrouillez les interrupteurs) pour éviter une remise en MARCHE accidentelle. Débranchez tous les câbles de la source de courant ainsi que les prises des cordons d'alimentation en 115 volts.

Lors du soudage, n'ouvrez pas le circuit d'alimentation et ne changez pas la polarité. S'il est débranché au cours d'une urgence, faites attention aux brûlures de décharge ou aux jaillissements d'étincelles.

Appareil laissé sans surveillance. Mettez toujours sur ARRÊT et débranchez l'appareil.

F. Protection For Wearers Of Electronic Life Support Devices (Pacemakers)

Magnetic fields from high currents can affect pacemaker operation. Persons wearing electronic life support equipment (pacemaker) should consult with their doctor before going near arc welding, gouging, or spot welding operations.

1-4. STANDARDS BOOKLET INDEX - For more information, refer to the following standards or their latest revisions and comply as applicable:

1. ANSI Standard Z49.1, SAFETY IN WELDING AND CUTTING obtainable from the American Welding Society, 550 Le Jeune Rd, P.O. Box 351040, Miami, FL 33135.
2. NIOSH, SAFETY AND HEALTH IN ARC WELDING AND GAS WELDING AND CUTTING obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
3. OSHA, SAFETY AND HEALTH STANDARDS, 29CFR 1910, obtainable from the U.S. Government Printing Office, Washington, D.C. 20402.
4. ANSI Standard Z87.1, SAFE PRACTICES FOR OCCUPATION AND EDUCATIONAL EYE AND FACE PROTECTION obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.
5. ANSI Standard Z41.1, STANDARD FOR MEN'S SAFETY -TOE FOOTWEAR obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018
6. ANSI Standard Z49.2, FIRE PREVENTION IN THE USE OF CUTTING AND WELDING PROCESSES obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.
7. AWS Standard A6.0, WELDING AND CUTTING CONTAINERS WHICH HAVE HELD COMBUSTIBLES obtainable from the American Welding Society, 550 Le Jeune Rd., P.O. Box 351040, Miami, FL 33135.
8. NFPA Standard 51, OXYGEN - FUEL GAS SYSTEMS FOR WELDING AND CUTTING obtainable from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
9. NFPA Standard 70-1978, NATIONAL ELECTRICAL CODE obtainable from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
10. NFPA Standard 51B, CUTTING AND WELDING PROCESSES obtainable from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

L'interrupteur d'arrêt doit toujours se trouver à proximité de la source de courant.

F. Protection pour toute personne portant des appareils électroniques de sauvetage (appareil pour le règlement de battement de coeur)

Inducteurs de courant élevé peuvent nuire le fonctionnement d'un appareil pour le "règlement de battement de coeur." Toute personne portant un appareil électronique de sauvetage (appareil pour le règlement de battement de coeur), devrait consulter un docteur avant d'approcher toute opération de soudage à l'arc, à la gouge ou à point.

1-4. INDEX DES NORMES - Pour plus de renseignements, référez-vous aux normes de l'ACNOR ou aux normes américaines suivantes:

1. ANSI Standard Z49.1, SAFETY IN WELDING AND CUTTING distribué par l'American Welding Society, 550 Le Jeune Rd., P.O. Box 351040 Miami, FL 33135
2. NIOSH, SAFETY AND HEALTH IN ARC WELDING AND GAS WELDING AND CUTTING distribué par le Superintendent of Documents, U.S. Government Printing Office, Washington D.C. 20402
3. OSHA, SAFETY AND HEALTH STANDARDS, 29CFR 1910, distribué par U.S. Department of Labor, Washington D.C. 20210
4. ANSI Standard Z87.1, SAFE PRACTICES FOR OCCUPATION AND EDUCATIONAL EYE AND FACE PROTECTION distribué par l'American National Standards Institute, 1430 Broadway, New York, NY 10018
5. ANSI Standard Z41.1, STANDARD FOR MEN'S SAFETY - TOE FOOTWEAR distribué par l'adresse donnée en 4.
6. ANSI Standard Z49.2, FIRE PREVENTION IN THE USE OF CUTTING AND WELDING PROCESSES distribué par l'adresse donnée en 4.
7. AWS Standard A6.0, WELDING AND CUTTING CONTAINERS WHICH HAVE COMBUSTIBLES distribué par l'adresse donnée en 1.
8. NFPA Standard 51, OXYGEN - FUEL GAS SYSTEMS FOR WELDING AND CUTTING distribué par la National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210
9. NFPA Standard 70-1978, NATIONAL ELECTRICAL CODE distribué par l'adresse donnée en 8
10. NFPA Standard 51B, CUTTING AND WELDING PROCESSES distribué par l'adresse donnée en 8

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| <p>11. CGA Pamphlet P-1, SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS obtainable from the Compressed Gas Association, 500 Fifth Avenue, New York, NY 10036.</p> <p>12. CSA Standard W117.2, CODE FOR SAFETY IN WELDING AND CUTTING obtainable from the Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.</p> <p>13. NWSA booklet, WELDING SAFETY BIBLIOGRAPHY obtainable from the National Welding Supply Association, 1900 Arch Street, Philadelphia, PA 19103.</p> <p>14. American Welding Society Standard AWSF4.1 "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", obtainable from the American Welding Society, 550 Le Jeune Rd., P.O. Box 351040, Miami, FL 33135.</p> <p>15. ANSI Standard Z88.2 "Practice for Respiratory Protection" obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.</p> | <p>11. CGA Pamphlet P-1, SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS distribué par la Compressed Gas Association, 500 Fifth Avenue, New York, NY 10036.</p> <p>12. CSA Standard W117.2, CODE FOR SAFETY IN WELDING AND CUTTING distribué par la Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.</p> <p>13. NWSA booklet, WELDING SAFETY BIBLIOGRAPHY distribué par la National Welding Supply Association, 1900 Arch Street Philadelphia, PA 19103.</p> <p>14. American Welding Societe Standard AWSF4.1 "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", distribué par l'American Welding Societe, 550 Le Jeune Rd., P.O. Box 351040, Miami, FL 33135.</p> <p>15. ANSI Standard Z88.2 "Practice For Respiratory Protection" distribué par l'American National Standards Institute, 1430 Broadway, New York, NY 10018.</p> |
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SECTION 2 – SAFETY PRECAUTIONS AND SIGNAL WORDS

2-1. GENERAL INFORMATION AND SAFETY

A. General

Information presented in this manual and on various labels, tags, and plates on the unit pertains to equipment design, installation, operation, maintenance, and troubleshooting which should be read, understood, and followed for the safe and effective use of this equipment.

The nameplate of this unit uses international symbols for labeling the front panel controls. The symbols also appear at the appropriate section in the text.

B. Safety

The installation, operation, maintenance, and troubleshooting of arc welding equipment requires practices and procedures which ensure personal safety and the safety of others. Therefore, this equipment is to be installed, operated, and maintained only by qualified persons in accordance with this manual and all applicable codes such as, but not limited to, those listed at the end of Section 1 – Safety Rules For Operation Of Arc Welding Power Source.

2-2. SAFETY ALERT SYMBOL AND SIGNAL WORDS

The following safety alert symbol and signal words are used throughout this manual to call attention to and identify different levels of hazard and special instructions.



This safety alert symbol is used with the signal words **WARNING** and **CAUTION** to call attention to the safety statements.



WARNING statements identify procedures or practices which must be followed to avoid serious personal injury or loss of life.



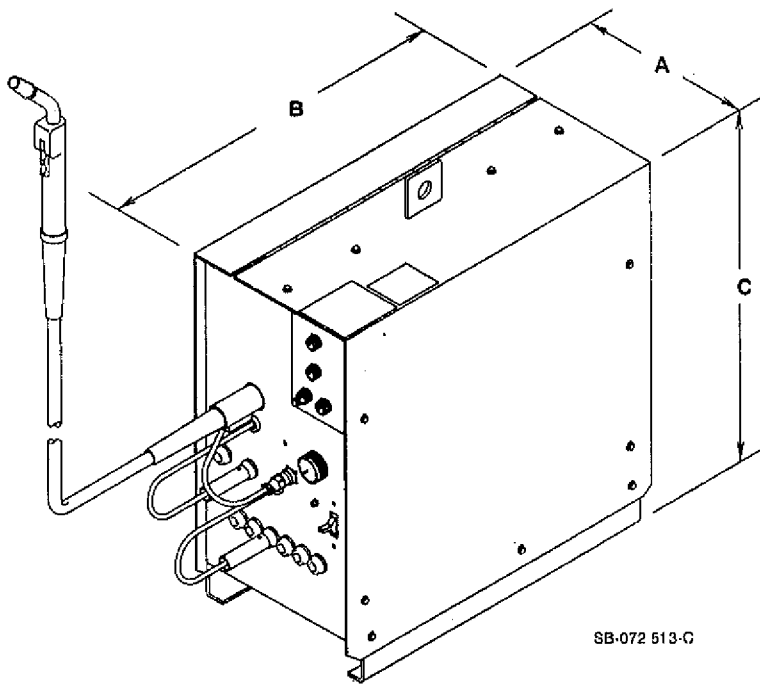
CAUTION statements identify procedures or practices which must be followed to avoid minor personal injury or damage to this equipment.

IMPORTANT statements identify special instructions necessary for the most efficient operation of this equipment.

SECTION 3 – SPECIFICATIONS

Table 3-1. Specifications

Rated Weld Output At 60% Duty Cycle	Max. Open-Circuit Voltage	Input At Rated Load Output 60 Hz Single-Phase					kva	kw	Control Circuit Voltage At Gun	Electrode Wire Feed Speed	Electrode Wire Diameter Capability
		Amperes At									
		200V	230V	460V	575V						
150 Amperes At 23Volts DC	32	26.5	24	12	9.6	5.5	4.8	24 Volts DC	60 to 486 ipm (1.5 to 12.3 mpm)	.023/.025 in. (0.6 mm) .030 in. (0.8 mm) .035 in. (0.9 mm)	



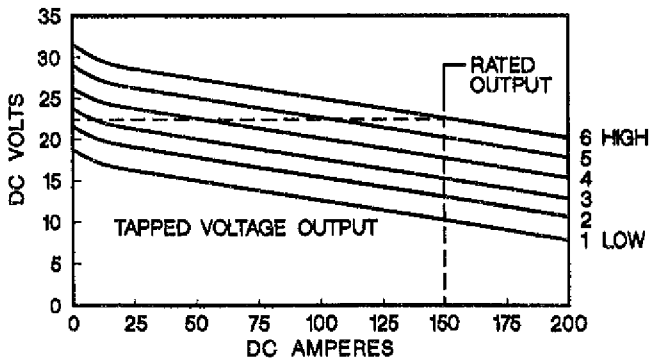
Dimensions	Weight	
	Net	Ship
A: Width 13-1/2 in. (343 mm)		
B: Length 27 in. (686 mm)	205 lbs.* (93 kg)	215 lbs.** (98 kg)
C: Height 30 in. (762 mm)		

*Add 2-3/4 lbs. (1.25 kg) for units with spot panel.
**Add 5 lbs. (2.27 kg) for units with spot panel.

SB-072 513-G

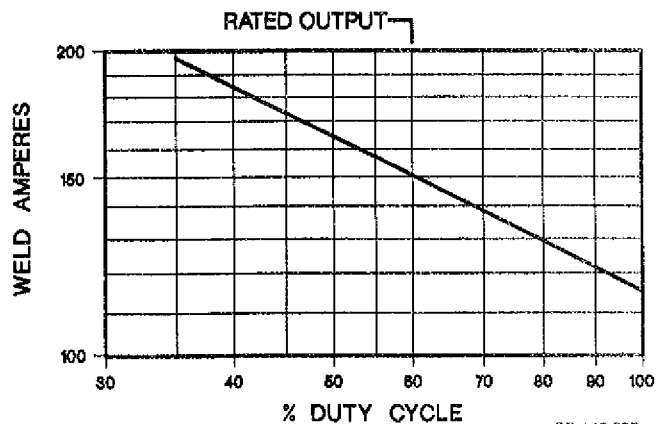
Figure 3-1. Overall Dimensions

Chart 3-1. Volt-Ampere Curves



SB-146 888

Chart 3-2. Duty Cycle



SB-146 887

3-1. VOLT-AMPERE CURVES (Chart 3-1)



The volt-ampere curves show the voltage and amperage output capabilities of the unit. Voltage and amperage adjustment is provided by the WIRE SPEED ADJUSTMENT control. Curves of other setting fall between the curves shown.

With the use of the volt-ampere curves, it is possible to determine the weld amperage at any particular load voltage.

3-2. DUTY CYCLE (Chart 3-2)

The duty cycle is the percentage of a ten minute period that a welding power source can be operated at a given output without overheating and damaging the unit. This welding power source is rated at 60 percent duty cycle when operated at 150 amperes. The unit can be operated at 150 amperes for six consecutive minutes, but it must operate at no load for the remaining four minutes to allow proper cooling. If the welding amperes decrease, the duty cycle increases.

Refer to the Duty Cycle chart (Chart 3-2) to determine the output of the welding power source at various duty cycles.



CAUTION: EXCEEDING DUTY CYCLE RATINGS will damage the welding power source.

- Do not exceed indicated duty cycles.

3-3. DESCRIPTION

This unit is a single-phase constant voltage dc arc welding power source and wire feeder system. This unit is designed for Gas Metal Arc Welding (GMAW) with short circuit or spray transfer. It is designed primarily for use as a dc Electrode Positive/Reverse Polarity machine. Rated weld output is 150 amperes, 23 volts dc, at 60% duty cycle.

Models with the optional SPOT PULSE WELD PANEL provide the controls for regulating spot weld time/pulse on time, burnback time, and pulse off time.

3-4. SUPPLIED EQUIPMENT (Figure 3-2)

The following equipment is supplied with the welding power source and requires customer installation or assembly:

- Running gear with gas cylinder rack and bracket.
- Wall receptacle (200/230 volt models only).
- Work cable, work clamp, and jack plug.
- GA-20C gun with 5/8 in. (16 mm) nozzle and two contact tubes for each wire size.
- Drive rolls for .023/.025, .030, and .035 in. (0.6, 0.8, and 0.9 mm) hard wire.

The welding power source is factory equipped with 9 ft. (2.7 m) power cord and gas valve.

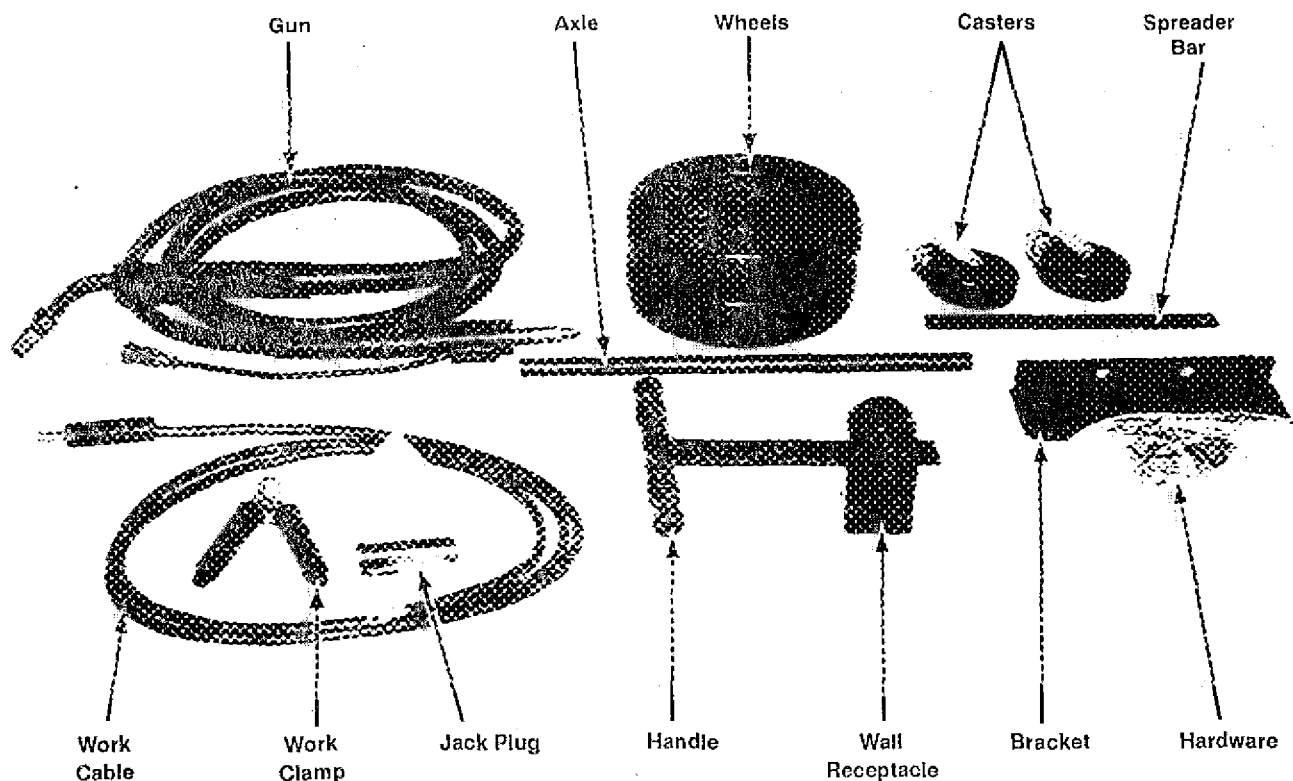


Figure 3-2. Supplied Equipment

3-5. ADDITIONAL REQUIRED EQUIPMENT (Figure 3-3)

The additional equipment required to complete the Gas Metal Arc Welding (GMAW) setup can be obtained from your local welding supplies distributor.

A. Gas Cylinder

Two types of gas are generally used with Gas Metal Arc Welding (GMAW) of thin gauge sheet steel. Carbon dioxide (CO₂) is the gas recommended for use with this welding power source/gun combination. A mixture of 75 percent argon and 25 percent carbon dioxide also gives favorable results. Obtain a cylinder of selected shielding gas from your supplier.

B. Regulator/Flowmeter

Regulator/flowmeters provide a constant shielding gas pressure and flow rate during the welding process. Because gases have different properties, each regulator/flowmeter is designed to be used with a specific gas or mixture of gases. Regulator/flowmeters cannot be changed from one gas to another unless the proper adapters are installed. Obtain the proper regulator/flowmeter for the type of gas used.

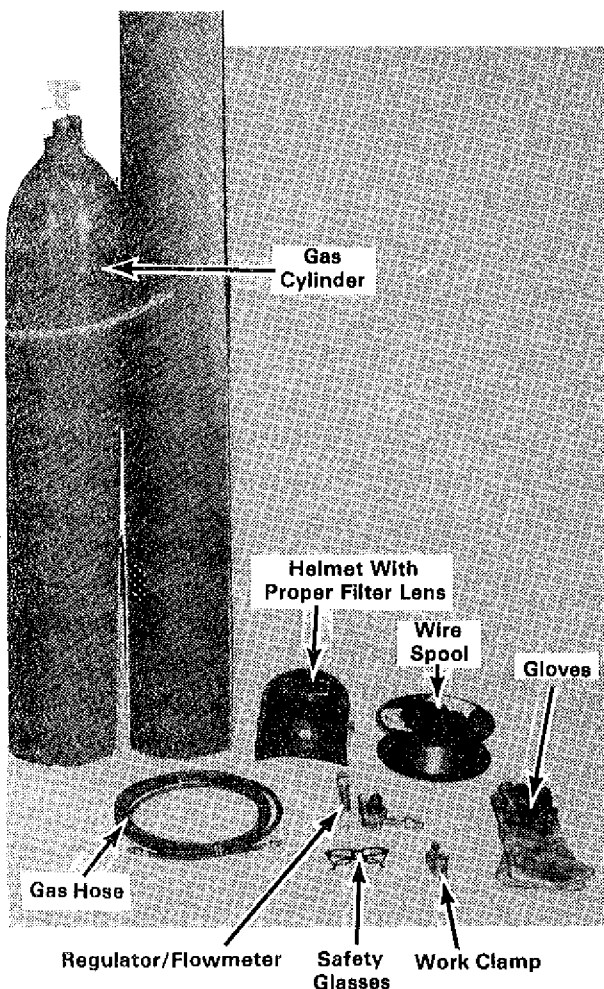


Figure 3-3. Additional Required Equipment

C. Gas Hose

Measure distance from gas cylinder to welding power source. Obtain good quality 5/8 in. (16 mm) outside diameter, S.A.E. gas hose, and install 5/8-18 right-hand thread fittings on both ends of hose.

D. Wire Spool For GMAW Process

Selection of the correct welding wire is important in Gas Metal Arc Welding (GMAW). There are many types to choose from, but certain wires are best suited for welding thin gauge sheet steel. The American Welding Society (AWS) classification for GMAW wires is usually indicated on the label of the wire spool. Two AWS wire classes recommended are E70S-6 and E70S-3. The E70S-6 provides a more fluid (wetter) weld puddle and a flatter bead than E70S-3. Obtain a spool of selected wire.

E. Personal Safety Equipment

When using this welding power source, wear a welding helmet, fitted with the proper filter lens, to protect the eyes from the welding arc. Also wear protective clothing, safety glasses, and gloves to prevent injury.

F. Offset/Punching Tool (Figure 3-4)

The repair of automotive sheet steel is easier when an Offset/Punching tool is used. This tool has a dual purpose, rotating head.

The damaged area is cut away and the jaws of the offset portion of the head are placed over the sheet steel. When pressure is applied to the handles, the tool indents a small offset in the sheet steel. A new piece of sheet steel, cut to size, is placed in position to overlap the offset portion. The new piece of sheet steel is welded into place, sanded, filled with body putty, and finish sanded.

The head of the tool can be rotated one-half turn to be used as a punching tool. The punching tool expedites riveting operations. The use of this tool will keep material use and finishing time to a minimum.

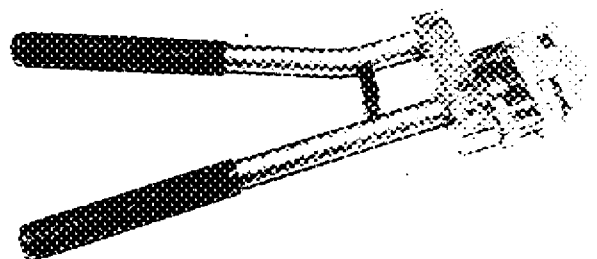


Figure 3-4. Offset/Punching Tool

3-6. OPTIONAL EQUIPMENT

The following equipment can be obtained to extend the capabilities of the basic unit or to suit special applications:

- A. SKP-35, Spot, Pulse, Continuous Panel (includes three spot nozzles) (for installation see Section 4-4)
- B. Gun cable holder
- C. 25 ft. (7.6 m) power cord extension.

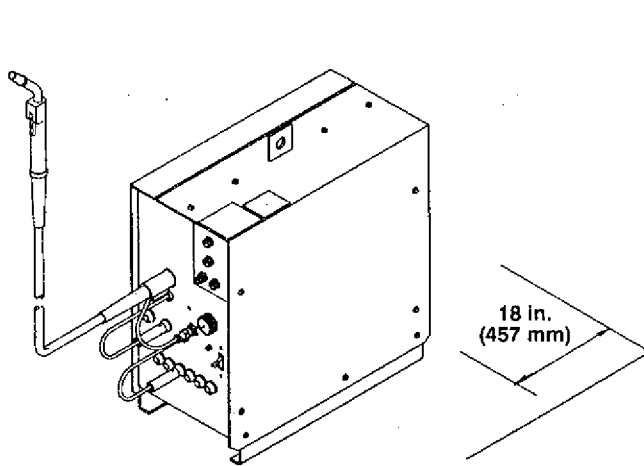
3-7. CONSUMABLE PARTS

The following parts are subject to wear or damage in normal use:

- A. Contact tubes
- B. Nozzles
- C. Gun liner
- D. Drive rolls.

SECTION 4 – INSTALLATION OR RELOCATION

4-1. SITE SELECTION (Figure 4-1)



SB-072 513-C

Figure 4-1. Location

Select an installation site which provides the following:

1. Correct input power supply (see unit nameplate)
2. Shielding gas supply
3. Adequate ventilation and fresh air supply
4. No flammables
5. A clean and dry area
6. Proper temperature that avoids extremes of heat or cold
7. Proper airflow around unit
8. Adequate space for opening side access doors for installation, maintenance, and repair functions.

Base mounting holes provide the capability to install and secure the unit on a running gear or in a permanent location.



WARNING: FIRE OR EXPLOSION can result from placing unit on or over combustible surfaces; **RESTRICTED AIRFLOW** can cause overheating and possible damage to internal parts.

- Do not locate unit over combustible surfaces.
- Maintain at least 18 inches (457 mm) of unrestricted space on all sides of unit, and keep underside free of obstructions.
- Do not place any filtering device over the intake air passages that provide airflow for cooling this unit.

Warranty is void if any type of filtering device is used at intake air passages.

4-2. TRANSPORTING METHODS

This welding power source is equipped with a lifting eye for moving the unit during installation. Weight capacity of the lifting eye only allows for supporting the welding power source.



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Disconnect input power conductors from deenergized supply line **BEFORE** moving welding power source.

FALLING EQUIPMENT can cause serious personal injury and equipment damage.

- Use lifting eye to lift unit only, **NOT** running gear, gas cylinders, or any other heavy accessories or devices.
- Use equipment of adequate capacity to lift the unit.
- If lifting or moving this unit with lift forks under the base, be sure that lift forks are long enough to extend beyond opposite side of the base.

Using lift forks too short can damage internal parts if tips of the lift forks penetrate the unit base, or may cause personal injury and/or equipment damage if unit falls off the lift forks.

4-3. RUNNING GEAR INSTALLATION (Figure 4-2)



WARNING: UNCONTROLLED TILTING OR TIPPING of unit can result in personal injury or equipment damage.

- Use equipment of adequate capacity to lift the unit.
- If using lift forks to handle this unit, be sure the lift forks are long enough to extend out of the opposite side of the base.
- Do not place any part of the body under the unit while it is suspended.

Place blocks under frame of unit before installing running gear.

1. Install the two 4 in. (102 mm) casters and spreader bar onto the front corners of the welding power source base as shown in Figure 4-2 using 3/8 in. hardware.
2. Block the unit up securely in middle to ease installation of rear wheel/gas cylinder rack assembly.
3. Slide axle through cylinder rack, and install a wheel on each end of axle with a 3/4 in. flat washer on each side of wheel.
4. Secure wheels in place with supplied retaining rings.

5. Install cylinder rack onto welding power source base using 5/16-18 x 3/4 cap screws and associated hardware (see Figure 4-2).
6. Remove the two front cap screws in top of welding power source wrapper and discard. Install running gear handle onto wrapper using 1/4-20 x 3/4 cap screws as shown in Figure 4-2.
7. Install cylinder bracket onto rear panel of welding power source as shown in Figure 4-2 using 1/4-20 x 3/4 cap screws and existing holes in rear panel.
8. Install safety chain onto cylinder bracket.

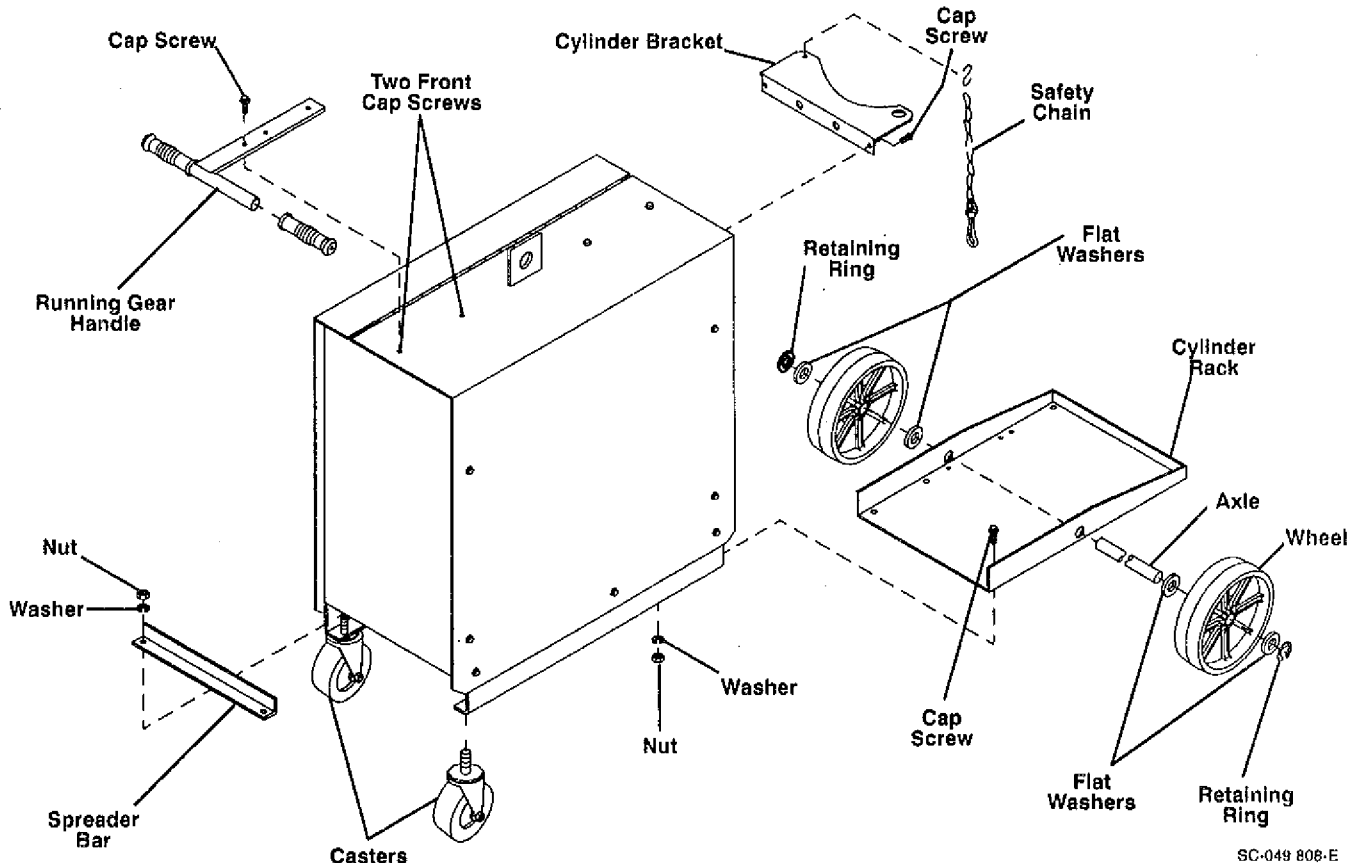
4-4. OPTIONAL SKP-35 PANEL INSTALLATION (Figure 4-3)



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down welding power source, and disconnect input power employing lockout/tagging procedures before inspecting or installing.

Lockout/tagging procedures consist of removing input power plug from receptacle, padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.



SC-049 808-E

Figure 4-2. Running Gear Installation

IMPORTANT: Retain all hardware removed during this procedure for reinstallation. All directions, such as left or right, are with respect to the operator facing the front panel.

1. Remove module cover plate from upper right-hand corner of front panel.
2. Locate wiring harness clamped to air baffle. Remove wiring harness from first clamp and carefully pull end of wiring harness with connectors through opening in front panel – it will come through approximately 2 in. (51 mm).
3. Disconnect jumpered connector from plug PLG2.
4. Connect receptacle RC55 from SKP-35 panel to PLG2. Be sure the connectors are locked together (see Figure 4-3).
5. Install SKP-35 panel into upper right corner of front panel, and secure using screws removed in Step 1.

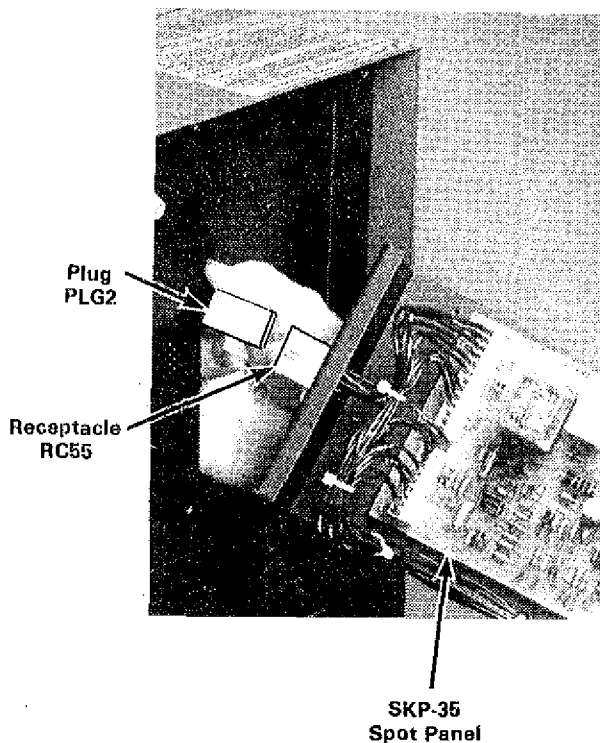


Figure 4-3. SKP-35 Panel Installation

4-5. SHIELDING GAS INSTALLATION

A. Gas Cylinder (Customer Supplied) (Figure 3-3)

Secure gas cylinder to running gear using safety chain on cylinder bracket. If the running gear is not to be used, chain cylinder to wall or other stationary support to prevent the cylinder from falling over and breaking off the valve.



WARNING: PRESSURIZED CYLINDERS can rupture causing serious personal injury and loss of life; FALLING CYLINDERS can cause serious injury and equipment damage.

- Keep cylinders away from welding or other electrical circuits.
- Never allow a welding electrode to touch any cylinder.
- Always fasten cylinder securely to running gear bracket, a wall, or other stationary support.

B. Regulator/Flowmeter (Customer Supplied) (Figure 4-4)

1. With the cylinder correctly installed, remove cylinder cap (see Figure 4-4). Stand to one side of the cylinder valve, and open the valve slightly. When gas flows from cylinder, close valve. This procedure gets rid of any dust or dirt that may have accumulated around the valve seat.
2. The regulator/flowmeter must be properly equipped with a stem, nut connectors, and gasket for use with either CO₂ cylinders or Argon/CO₂ cylinders.

IMPORTANT: A gasket should be installed to prevent leaks. Do not use lubricants or sealing agents.

3. Install gas regulator onto gas cylinder valve; keep the face of the regulator/flowmeter gauge in the vertical position, and tighten stem nut securely onto gas cylinder.
4. A shielding gas output fitting is provided at the rear of the welding power source for making gas connections. Attach one end of the gas hose to this output fitting. Attach other end of the gas hose to the regulator/flowmeter.

4-6. WORK CABLE ASSEMBLY

A 10 ft. (3 m) cable with a lug attached to one end is supplied with the unit. To install the work clamp and jack plug onto the cable, proceed as follows:

A. Work Clamp Installation (Figure 4-5)

1. Insert the end of the work cable with the terminal lug on it through one of two supplied insulating sleeves.
2. Lay the work cable inside the handle of the work clamp which has the flattest inner surface.
3. Align the smaller hole in the work clamp handle with the hole in the work cable terminal lug. Secure the terminal lug to the work clamp with the supplied nut and bolt.
4. Bend the tabs on the end of the work clamp handle around the work cable.
5. Slide the insulating sleeve on the work cable over the work clamp handle.

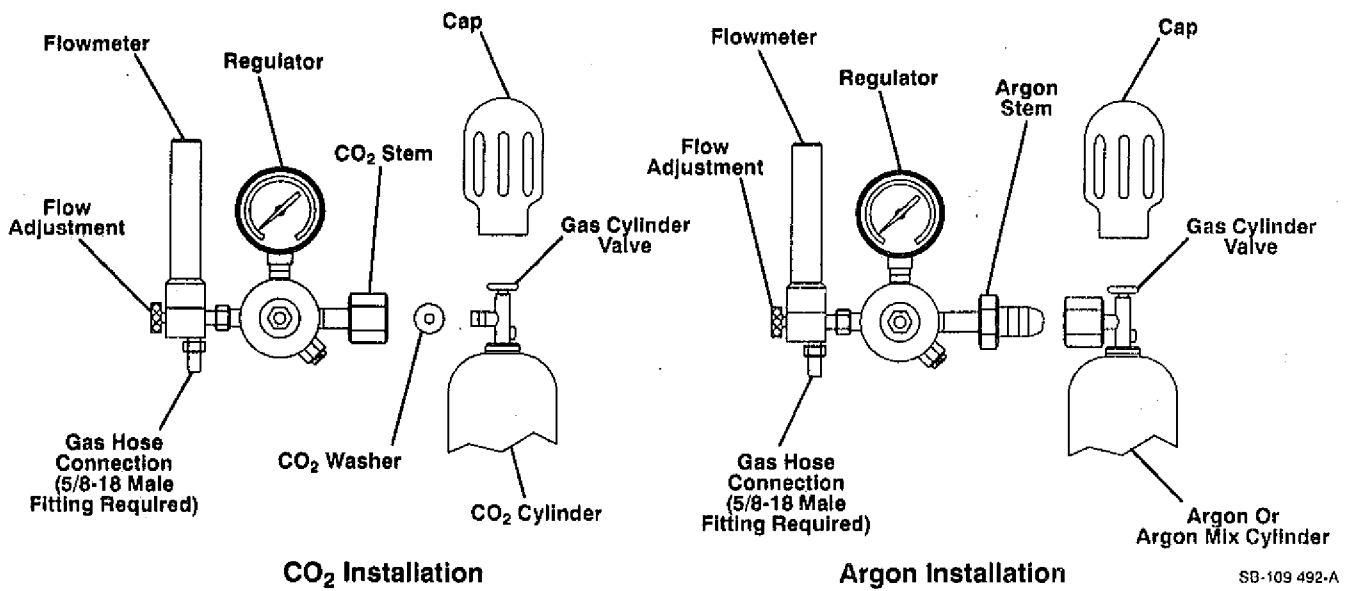


Figure 4-4. Typical Regulator/Flowmeter Installation

6. Slide the remaining insulating sleeve over the other work clamp handle.

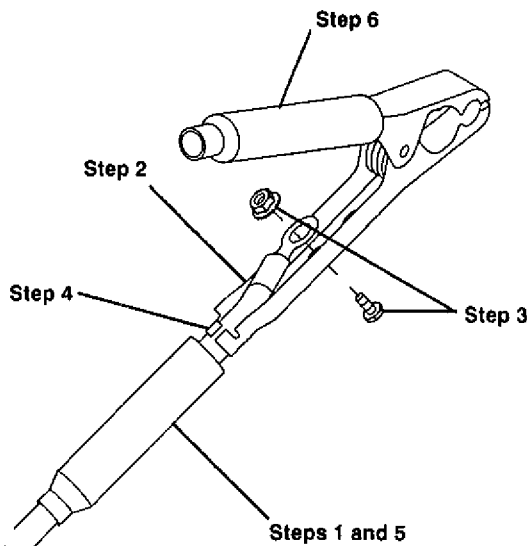


Figure 4-5. Work Clamp Installation

B. Jack Plug Installation (Figure 4-6)

The supplied jack plugs are used to connect the weld cables to the weld output receptacles. Install jack plugs onto weld cables as follows:

1. Remove 3/4 in. (19 mm) of insulation from one end of each weld cable.
2. Clamp cable in a vise with the uninsulated end extending upward out of vise approximately 1-3/4 in. (44 mm).
3. Place steel tie wire (item A, Figure 4-6) approximately 1/4 in. (6 mm) from end of insulation.
4. Make a half turn around cable bringing looped ends of tie wire together.

5. Insert a 3/8 in. (9.5 mm) diameter rod through looped ends of tie wire.
6. Twist tie wire (B) until entire tie wire is twisted and is tight around insulation of cable.
7. Cut off looped ends of tie wire.
8. Bend the twisted tie wire over and along the side (C) of uninsulated portion of cable.
9. Wrap the strip of copper foil tightly around uninsulated portion of cable and twisted tie wire (D).
10. Push the jack plug onto cable over copper foil (E).

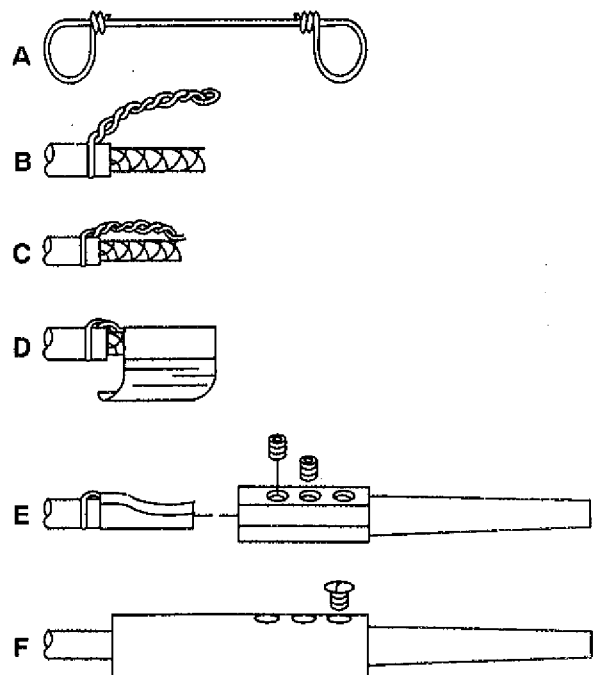
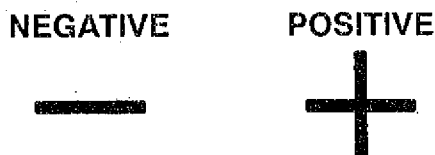


Figure 4-6. Jack Plug Installation

11. Insert the 1/4-20 setscrews into center and bottom holes in jack plug, and tighten (E).
12. Remove cable from vise, and insert jack plug into insulating sleeve. Slide insulating sleeve over jack plug and cable until hole in insulating sleeve lines up with remaining hole in jack plug (F).
13. Insert the 8-32 self-tapping screw (F) through hole in insulating sleeve into jack plug, and tighten.

4-7. WELD POLARITY SELECTION



WARNING: ELECTRIC SHOCK can kill; ARCING can burn skin or damage electrical connections.

- Do not touch live electrical parts.
- Shut down welding power source before making any twistlock plug connections.
- Do not change position of twistlock plug while welding.
- Secure twistlock plug in selected receptacle before welding.

IMPORTANT: Rotate jack plugs 1/4 turn clockwise to secure them in receptacles.

1. Connect jack plug on weld cable from unit into POSITIVE (+) weld output receptacle.
2. Connect jack plug from work cable into NEGATIVE (-) weld output receptacle.

IMPORTANT: For Electrode Negative/Straight Polarity Connections, reverse cable connections to weld output receptacles; electrode becomes negative.

4-8. GA-20C WELDING GUN CONNECTIONS



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down welding power source, and disconnect input power employing lockout/tagging procedures before inspecting or installing.

Lockout/tagging procedures consist of removing input power plug from receptacle, padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

A. Gun/Feeder Connector Installation (Figures 4-7 And 4-8)

IMPORTANT: The outlet guide is provided as part of the gun assembly.

1. Open access door.
2. Loosen the gun/feeder connector securing knob (see Figure 4-7).

IMPORTANT: Wire guides should be installed so that the tip of the guide is as close to the drive rolls as possible without touching.

3. Insert the gun/feeder connector, which includes outlet guide, through the access hole in the welding power source front panel and into the drive assembly as illustrated in Figures 4-7 and 4-8.
4. Tighten the gun/feeder connector securing knob.
5. Close and secure access door.

B. Gun Switch Connection (Figure 4-8)

GUN TRIGGER



The GUN TRIGGER receptacle is provided for making switch control connections. Align the keys on the gun switch connector with the keyway on the GUN TRIGGER receptacle, insert connector, and rotate threaded collar fully clockwise. When the gun switch is closed, the welding power source contactor energizes, shielding gas flows, and wire feeds.

4-9. WELDING WIRE SPOOL INSTALLATION (Figure 4-7)



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down welding power source, and disconnect input power employing lockout/tagging procedures before inspecting or installing.

Lockout/tagging procedures consist of removing input power plug from receptacle, padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

1. Open left side access door.
2. Remove retaining ring.
3. Slide spool of wire onto hub so that wire feeds off bottom of spool.
4. Rotate spool until hole in spool aligns with pin in hub. Slide spool onto hub until it seats against back flange of hub.
5. Compression spring is not required for 12 in. (305 mm) spools. For 8 in. (203 mm) spools, use compression spring. Reinstall retaining ring onto hub.
6. Close and secure access door.

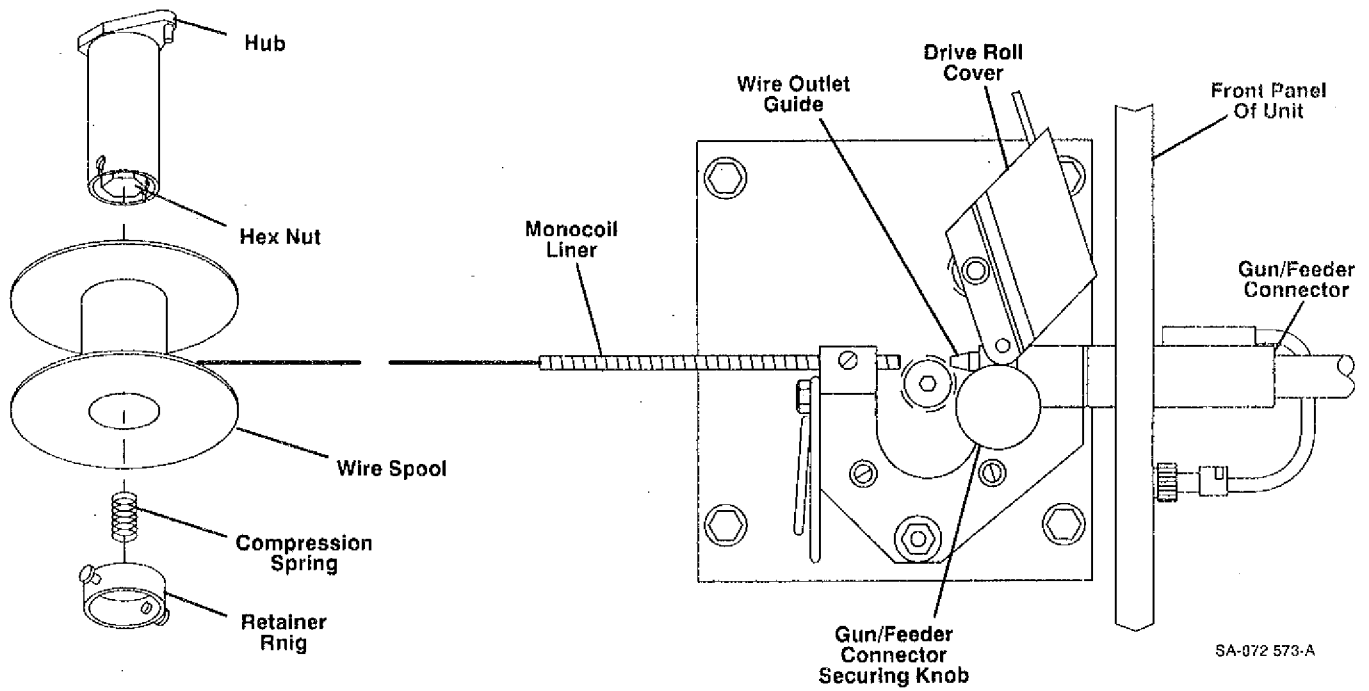
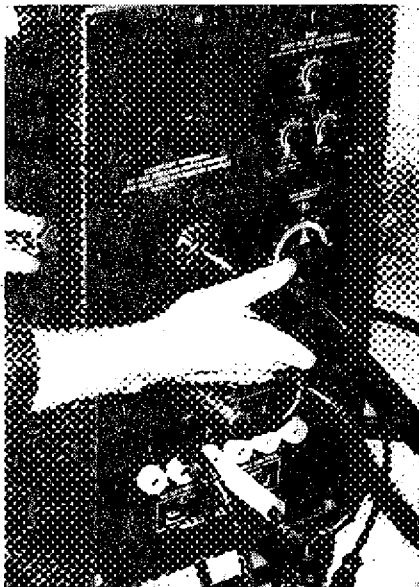


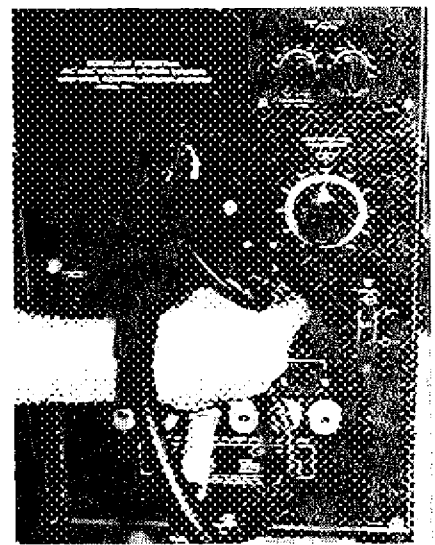
Figure 4-7. Gun/Feeder Connector And Wire Spool Installation



A.



B.



C.

Figure 4-8. Welding Gun Connections

4-10. HUB TENSION ADJUSTMENT (Figure 4-7)



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down welding power source, and disconnect input power employing lockout/tagging procedures before inspecting or installing.

Lockout/tagging procedures consist of removing input power plug from receptacle, padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

Check the hub tension by slowly pulling the wire toward the feed roll. The wire should unwind freely, but the hub tension should be sufficient to keep the wire taut and prevent backlash when the wire feeding ceases. If adjustment is required, loosen or tighten the hex nut on the end of the spindle support shaft accordingly.

4-11. ELECTRICAL INPUT CONNECTIONS



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down welding power source, and disconnect input power employing lockout/tagging procedures before inspecting or installing.

Lockout/tagging procedures consist of removing input power plug from receptacle, padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

A. Electrical Input Requirements

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

B. Jumper Link Installation (Figures 4-9 And 4-10)

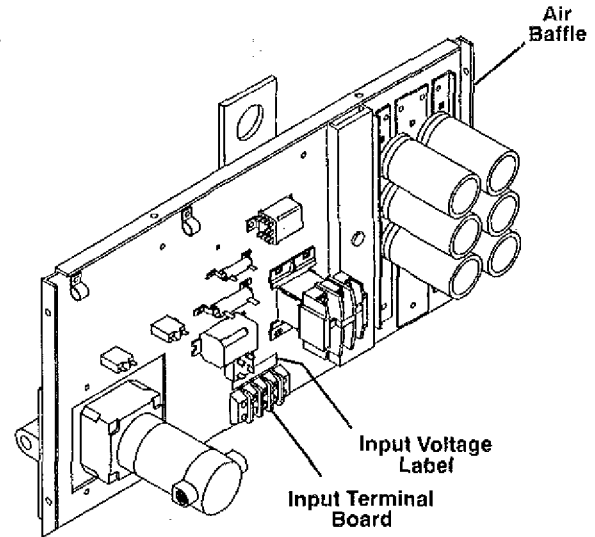


WARNING: Read and follow safety information at beginning of entire Section 4-11 before proceeding.

Jumper links are used to allow the equipment to operate from different line voltages. The jumper links may be in a bag attached to the input terminal board or installed on the input terminal board for the highest voltage shown on the input voltage label.

1. Remove the wrapper.

2. Compare position of jumper links on the input terminal board (see Figure 4-9) to the voltage link arrangement on input voltage label (see Figure 4-10).



Ref. SD-072 507-L

Figure 4-9. Input Terminal Board Location

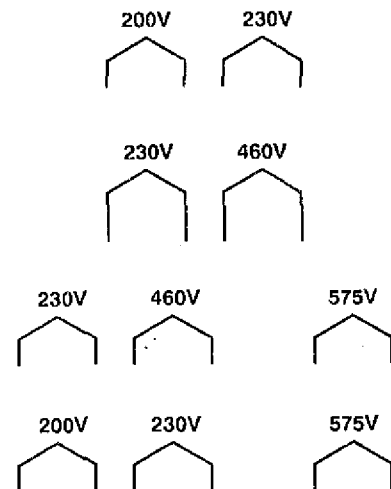


CAUTION: INCORRECT INPUT VOLTAGE JUMPER LINK PLACEMENT can damage unit.

- Position jumper links as shown on the input voltage label (see Figures 4-9 and 4-10).
- Store unused jumper links across linked terminals.

IMPORTANT: If the input voltages stated on nameplate or rating label are different from those in Figure 4-10, check the input voltage label in the unit or call Factory Service Department.

3. Install jumper links onto the input terminal board to match the available input line voltage.
4. Reinstall wrapper.



SA-117 070
SA-012 449
SA-021 192
SA-117 071

Figure 4-10. Input Voltage Labels

C. Wall Receptacle And Power Cable Connections (Figure 4-11)



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
 - Install a fusible line disconnect switch in the input circuit to the welding power source.
- Use Table 4-1 as a guide in selecting appropriate input conductor and fuse size.
- Connect input conductors to the welding power source before connecting to single-phase input power.
 - Read and follow safety information at beginning of entire Section 4-11 before proceeding.

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

All models are equipped with a three-conductor power cable. Models requiring 200 or 230 volts input are equipped with a three-prong polarized plug and wall receptacle. The wall receptacle should be installed in a convenient location by a competent electrician. Install the wall receptacle with the grounding terminal at the top, allowing the power cable to hang downward without undue bending or twisting.

Models having an electrical input voltage above 230 volts have prewired power cables with three conductors. The black and white conductors must be connected to the line disconnect switch, and the green conductor must be connected to a proper ground (see Figure 4-11). Use a grounding method that is acceptable to the local electrical inspection authority.



WARNING: ELECTRIC SHOCK can kill.

- Do not connect an input (white or black) conductor to the ground terminal.
- Do not connect the ground (green) conductor to an input line terminal.

Incorrect input connections can result in an electrically energized welding power source chassis. The ground terminal is connected to the welding power source chassis and is for grounding purposes only.

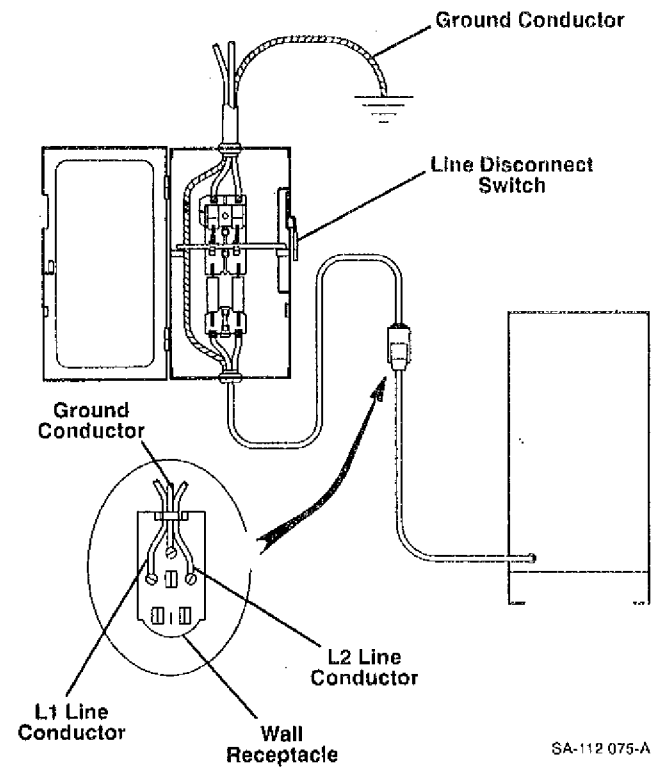


Figure 4-11. Wall Receptacle And Power Cable Connections

Table 4-1. Input Conductor And Fuse Size*

Input Voltage	200	230	460	575
Input Conductor Size (AWG)	10	10	14	14
Ground Conductor Size (AWG)	10	10	14	14
Fuse Size In Amperes	40	35	20	15

*Conductor size is based on the 1990 Edition of the National Electrical Code (NEC) specifications for allowable ampacities of insulated copper conductors, having a temperature rating of 167°F (75°C), with not more than three single current-carrying conductors in a raceway (Article 310 of NEC). (The ground conductor is not counted as a current-carrying conductor.)

*Fuse size is based on not more than 200 percent of the rated input amperage of the welding power source (Article 630 of NEC).

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4-12. WELDING WIRE THREADING (Figure 4-7)



WARNING: ELECTRIC SHOCK can kill; MOVING PARTS can cause serious injury.

- Do not touch live electrical parts.
- Keep away from moving parts.
- Do not energize welding power source or wire feeder until instructed to do so.

The welding wire and all metal parts in contact with it are energized while welding.

WELDING WIRE can cause puncture wounds; HOT SURFACES can cause severe burns.

- Do not press gun trigger until instructed to do so.
- Do not point gun toward any part of the body, any conductive surface, or other personnel when threading welding wire.
- Allow gun to cool before touching.

1. Open left side access door.
2. Install welding wire spool according to Section 4-9.

IMPORTANT: *Spooled wire has a tendency to unravel when loosened from the spool. Maintain a firm grip on the wire during the threading operation.*

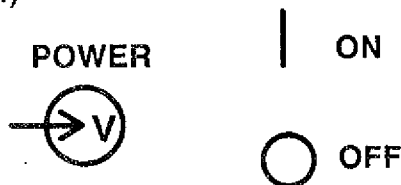
3. Unreel and straighten approximately 6 in. (152 mm) of wire from wire spool.
4. Cut off any wire that is bent, and remove any burrs or sharp edges.
5. Release pressure spring on drive roll assembly, and pivot upper drive roll up and away from lower drive roll.
6. Route welding wire into wire inlet guide, along lower drive roll groove, and into wire outlet guide (see Figure 4-7).
7. Pivot upper drive roll down onto lower drive roll.

8. Reinstall pressure spring. Be sure that welding wire is in groove of drive rolls.
9. Lay gun cable assembly out as straight and flat as possible.
10. Energize welding power source. If power source has spot welding capabilities, place the Selector switch in the CONTINUOUS position.
11. Depress and hold the gun trigger until the wire feeds approximately 1/4 in. (6 mm) out the gun nozzle. If wire feeds more than 1/4 in. out nozzle, cut wire off to 1/4 in.
12. Deenergize welding power source.
13. Adjust hub tension according to Section 4-10, if necessary.
14. Close and secure access door.

IMPORTANT: *For a smoother weld start, be sure weld-ing wire extends 1/4 in. (6 mm) out of contact tube and has a sharp end.*

SECTION 5 – OPERATOR CONTROLS

5-1. POWER SWITCH AND PILOT LIGHT (Figure 5-1)



Placing the POWER switch in the ON position energizes the welding power source. The pilot light comes on whenever the POWER switch is in the ON position and indicates that the unit is receiving input power.

Placing the POWER switch in the OFF position shuts down the welding power source and turns off the pilot light.

IMPORTANT: *When the POWER switch is in the ON position, the pilot light comes on, but the fan motor does not run unless the internal components are already warm. The fan motor is thermostatically controlled and only operates when additional cooling is required (see Section 5-4).*

5-2. VOLTAGE ADJUSTMENT SELECTOR (Figure 5-1)



CAUTION: ARCING can damage jack plug and receptacle contact surfaces.

- Do not change VOLTAGE ADJUSTMENT selector plug position while welding or under load.

Arcing causes the contact surfaces to become pitted. Eventually continuity is lost and the selector plug no longer works to select output range.

The VOLTAGE ADJUSTMENT selector jack plug and receptacles provide a selection of heat input to the weld. The higher the numbered receptacle, the hotter the weld.

IMPORTANT: *After installing selector plug into VOLTAGE ADJUSTMENT receptacle, rotate plug 1/4 turn clockwise to secure in place. When removing plug from receptacle, rotate plug 1/4 turn counterclockwise while withdrawing it from receptacle.*

5-3. WIRE SPEED ADJUSTMENT CONTROL (Figure 5-1)



The WIRE SPEED ADJUSTMENT control provides selection of the speed at which welding wire feeds into the weld. Rotating the WIRE SPEED ADJUSTMENT control clockwise increases wire feed speed.

The scale around the WIRE SPEED ADJUSTMENT control is calibrated in percent and does not indicate the actual wire feed speed.

IMPORTANT: *The WIRE SPEED ADJUSTMENT control may be adjusted while welding.*

IMPORTANT: *In the PULSE mode, the WIRE SPEED ADJUSTMENT control must be set at 50 percent or less when using VOLTAGE ADJUSTMENT taps 5 and 6.*

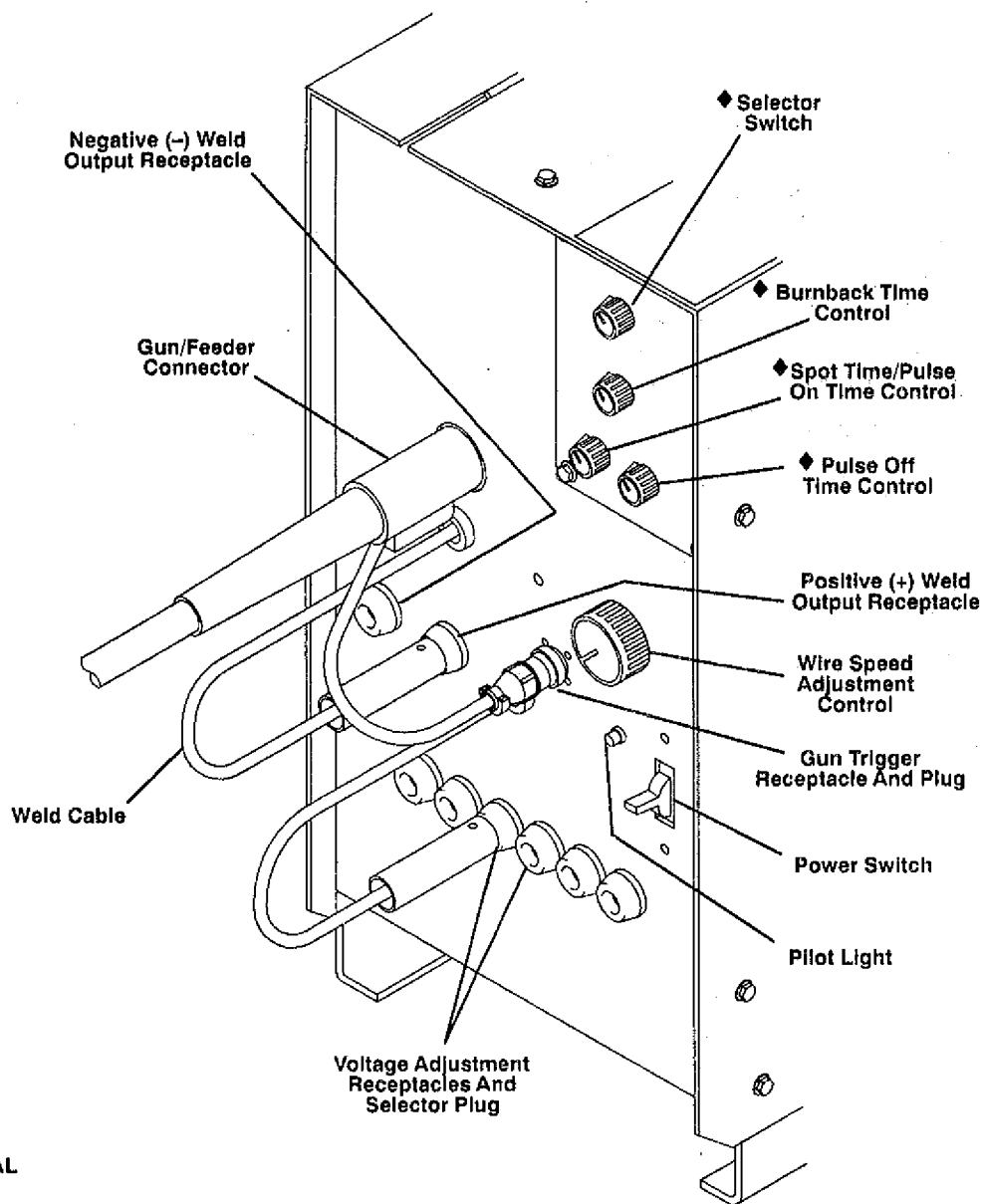


Figure 5-1. Operator Controls

5-4. FAN-ON-DEMAND™

The fan motor is thermostatically controlled and does not turn on with the unit POWER switch. The fan motor runs when main transformer T1 and/or rectifier assembly SR3 are warm. Under normal loading, the fan motor may not run. The fan motor turns off when T1 and SR3 are cool or when the unit POWER switch is turned off.

Normally-open thermostats TP1 and TP2, and relay CR2 control the fan motor.

5-5. OPTIONAL SPOT/PULSE PANEL CONTROLS (Figure 5-1)

IMPORTANT: In the PULSE mode, the WIRE SPEED ADJUSTMENT control must be set at 50 percent or less. Exceeding the 50 percent control setting may trip the

circuit breaker in the motor control circuit stopping wire feed.

A. Selector Switch

The Selector switch enables the operator to select continuous, spot, or pulsed wire feed operation.

1. Continuous Position

Placing Selector switch in the CONTINUOUS position and depressing the gun trigger feeds welding wire for as long as the gun trigger remains closed.

2. Spot Position

Placing Selector switch in the SPOT position and depressing the gun trigger feeds welding wire for the length of time set on the SPOT TIME control.

3. Pulse Position

Placing the Selector switch in the PULSE position and depressing the gun trigger feeds welding wire for the length of time set on the PULSE ON TIME control. At the end of the pulse on time, welding wire stops feeding for the length of time set on the PULSE OFF TIME control. The welding wire continues to pulse feed on and off for the selected times until the gun trigger is released. The pulse option provides better control of the heat input to the weld on thin gauge metals, thereby decreasing distortion and the likelihood of melt-throughs.

B. Spot Time/Pulse On Time Control

The SPOT TIME/PULSE ON TIME control enables the operator to select from 0.5 to 4 seconds of pulse time for spot operation or 0.25 to 2 seconds for pulse operation. Rotating the control clockwise increases spot/pulse on time. The control scale is calibrated in percent and does not indicate actual spot/pulse on time.

C. Pulse Off Time Control

The PULSE OFF TIME control enables the operator to select from 0.25 to 1 second of pulse off time for pulse operation. Rotating the control clockwise increases pulse off time. The control scale is calibrated in percent and does not indicate actual pulse off time.

D. Burnback Time Control

The BURNBACK TIME control provides a means of adjusting the time period (up to a maximum of 0.25 seconds) that the welding wire remains electrically energized after the wire feeding has stopped.

By adjusting this control properly, the welding wire will neither freeze in the weld puddle nor in the contact tube of the gun. If the welding wire freezes to the work, increase the burnback time. If the welding wire burns back into the contact tube, decrease the burnback time. Rotate the control clockwise to increase the burnback time, and rotate the control counterclockwise to decrease the burnback time. The scale surrounding the control is calibrated in percent and does not represent an actual burnback time.

SECTION 6 – SEQUENCE OF OPERATION



WARNING: ELECTRIC SHOCK can kill; MOVING PARTS can cause serious injury; IMPROPER AIRFLOW AND EXPOSURE TO ENVIRONMENT can damage internal parts.

- Do not touch live electrical parts.
- Keep away from moving parts.
- Keep all covers and panels in place while operating.

Warranty is void if the welding power source is operated with any portion of the outer enclosure removed.

ARC RAYS, SPARKS, AND HOT SURFACES can burn eyes and skin; NOISE can damage hearing.

- Wear correct eye, ear, and body protection.

FUMES AND GASES can seriously harm your health.

- Keep your head out of the fumes.
- Ventilate to keep from breathing fumes and gases.
- If ventilation is inadequate, use approved breathing device.

WELDING WIRE can cause puncture wounds.

- Do not point gun toward any part of the body, any conductive surface, or other personnel.

HOT METAL, SPATTER, AND SLAG can cause fire and burns.

- Watch for fire.

- Keep a fire extinguisher nearby, and know how to use it.
- Do not use near flammable material.
- Allow work and equipment to cool before handling.

MAGNETIC FIELDS FROM HIGH CURRENTS can affect pacemaker operation.

- Wearers should consult their doctor before going near arc welding, gouging, or spot welding operations.

See Section 1 - Safety Rules For Operation Of Arc Welding Power Source for basic welding safety information.

6-1. GAS METAL ARC WELDING (GMAW)-CONTINUOUS AND GAS METAL ARC WELDING-PULSED ARC (GMAW-P)



WARNING: Read and follow safety information at beginning of entire Section 6 before proceeding.

1. Install and connect unit according to section 4.

IMPORTANT: Be sure that work cable is installed into NEGATIVE (-) weld output receptacle and weld cable from unit is installed into POSITIVE (+) weld output receptacle (see Section 4-7).

2. Wear dry insulating gloves and clothing.
3. Thoroughly clean joint area of workpiece.

Table 6-1. Suggested Parameters For Continuous Gas Metal Arc Welding (GMAW)

Voltage Adjustment Receptacle		1	2	3	4	5	6
Metal Thickness	Gauges	22-18	18-16	16-14	14-12	12-10	10 or Heavier
	Inches	.035+	.047+	.059+	.067+	.104+	.134+
	Millimeters	.8+	1.2+	1.5+	1.9+	2.6+	3.4+
*Amperage For .030 in. (0.8 mm) Wire		30-55	55-85	85-105	105-130	130-150	150-180
*Amperage for .035 in. (0.9 mm) Wire		35-65	65-95	95-115	115-140	140-180	175-220

*Amperage values are obtained by adjusting the WIRE SPEED ADJUSTMENT control.



CAUTION: WELDING CURRENT can damage vehicle computers and other electronic components.

- Disconnect both battery cables before welding on a vehicle.
- Disconnect vehicle computer(s) before welding on a vehicle.
- Place work clamp as close to the weld as possible to avoid long electrical paths.
- Be sure all weld circuit connections are clean and tight.

4. Connect work clamp to clean, bare metal at work-piece.
5. Select and obtain proper welding wire, and thread as instructed in Section 4-12 of this Manual.
6. If applicable, place the Selector switch on the optional SKP-35 Panel in the CONTINUOUS position if continuous welding, and place the switch in the PULSE position if pulse welding (see Section 5-5).
7. If pulse welding, rotate the SPOT TIME/PULSE ON TIME and PULSE OFF TIME control to desired settings (see Section 5-5).
8. Set a voltage condition with the VOLTAGE ADJUSTMENT selector plug that is appropriate for the base metal thickness and type of shielding gas (see Section 5-2 and Table 6-1).

IMPORTANT: It is important that the selected voltage be appropriate for type of weld and thickness of material. Be sure that the weld bead is thoroughly fused with the base metal along the total length of the bead. If the weld bead does not penetrate the base metal, increase the weld voltage. If the edges of the bead cut into the base metal, decrease weld voltage.

9. Rotate the WIRE SPEED ADJUSTMENT control to 50. The control can be adjusted as required while welding.

10. Turn on shielding gas at the source.
11. Adjust shielding gas pressure, and purge shielding gas hose as follows:
 - a. Open left side access door, release pressure spring on drive roll assembly, and pivot upper drive roll up and away from lower drive roll.



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Do not touch welding wire or any metal part in contact with it while welding.

The welding wire and all metal parts in contact with it carry weld current whenever the gun trigger is depressed.

- b. Energize welding power source, and depress gun trigger for approximately 15 seconds to adjust regulator/flowmeter and to purge the gas hose.

IMPORTANT: Shielding gas flow rate of 15 to 25 cfm is typical. Welding out of position at high wire feed speeds or welding in a drafty environment will require more shielding gas.

- c. Deenergize welding power source.
- d. Close drive roll housing as follows:
 - Pivot upper drive roll down onto lower drive roll, and reinstall pressure spring.
- e. Close and secure side access door.
12. Wear welding helmet with proper filter lens according to ANSI Z49.1.
13. Energize welding power source.
14. Be sure welding wire extends approximately 1/4 in. (6 mm) out gun nozzle, position gun over joint, lower welding helmet, and depress gun trigger.

IMPORTANT: The welding wire is not energized until the gun trigger is pressed; therefore, the operator can accurately position gun on weld joint before lowering helmet and pressing gun trigger.

15. Readjust WIRE SPEED ADJUSTMENT control as necessary.

IMPORTANT: Adjust the wire speed to keep weld spatter at a minimum while maintaining a steady, quick-cracking sounding arc. (When optimum arc length is reached, arc will sound like frying bacon).

16. If pulse welding, readjust SPOT TIME/PULSE ON TIME and PULSE OFF TIME control as necessary.

6-2. GAS METAL ARC WELDING (GMAW)-SPOT (Models With Optional SKP-35 Panel Only)



WARNING: Read and follow safety information at beginning of entire Section 6 before proceeding.

1. Install and connect unit according to Section 4.

IMPORTANT: Be sure the work cable is installed into NEGATIVE (-) weld output receptacle and weld cable from unit is installed into POSITIVE (+) weld output receptacle (see Section 4-7).

2. Wear dry insulating gloves and clothing.



CAUTION: WELDING CURRENT can damage vehicle computers and other electronic components.

- Disconnect both battery cables before welding on a vehicle.
- Disconnect vehicle computer(s) before welding on a vehicle.
- Place work clamp as close to the weld as possible to avoid long electrical paths.
- Be sure all weld circuit connections are clean and tight.

3. Connect work clamp to clean, bare metal at workpiece.
4. Select and obtain proper welding wire, and thread as instructed in Section 4-12 of this manual.
5. Set spot weld parameters (weld voltage, wire feed speed, spot weld time, burnback time) as follows:
 - a. Obtain sample piece of metal the same type, but approximately twice the thickness of final workpiece, and clean surface to be welded.
 - b. Place Selector Switch on optional SKP-35 panel in CONTINUOUS position, and set welding voltage and wire feed speed parameters according to Steps 8 thru 15 in Section 6-1. (Set voltage and wire feed speed for metal thickness of sample metal.)

IMPORTANT: Use in CONTINUOUS position serves as coarse adjustment of unit for SPOT mode operation. Arc length and weld puddle can not be observed with spot

welding nozzle installed on gun. Several pieces of double thickness metal may be required to coarse adjust unit.

- c. After voltage and wire feed speed parameters have been set, deenergize welding power source, remove continuous welding nozzle from gun, and replace nozzle with appropriate spot welding nozzle.
- d. Obtain sample pieces of metal the same type and thickness of final workpiece.
- e. Place welding power source in SPOT mode, and rotate SPOT TIME/PULSE ON TIME and BURNBACK TIME controls to desired settings.

IMPORTANT: The correct burnback time allows the wire to burn back just free of the weld puddle. If the welding wire freezes to the workpiece at the end of the weld cycle, increase burnback time. If the welding wire burns back into the contact tube, decrease burnback time. If the wire burns back into the contact tube, it may be necessary to replace the contact tube in the gun. (See gun Owner's Manual for contact tube replacement procedure.)

- f. Make several practice spot welds to determine if weld parameters are set correctly. (Refer to Table 6-2 to check sample weld.)

To spot weld, place gun nozzle directly on workpiece, hold gun motionless, and depress gun trigger. When trigger is depressed, welding wire and shielding gas will feed for the length of time set on the SPOT TIME/PULSE ON TIME Control.

IMPORTANT: The welding wire is not energized until the gun trigger is pressed; therefore, the operator can accurately position gun on weld joint before lowering helmet and pressing gun trigger.

IMPORTANT: The gun trigger must be held closed until the SPOT TIME/PULSE ON TIME control has timed out, completing the spot weld cycle. If the trigger is released before the cycle is complete, the cycle stops, and the unit resets for another weld cycle.

6. After all weld parameters have been set, prepare weld joint (see Sections 9 and 10), and weld final workpiece.

6-3. SHUTTING DOWN

1. Stop welding.
2. Shut down welding power source.
3. Turn off shielding gas at the source.



WARNING: HIGH CONCENTRATION OF SHIELDING GAS can harm health or kill.

- Shut off gas supply when not in use.

Table 6-2. Checking Weld Parameters

Weld Appearance	Cause	Correction Procedure
Dark blue circle or small protrusion visible on reverse side of weld.	Voltage and wire feed speed parameters are set correctly.	None.
Small burn-through on reverse side of weld.	Voltage and wire feed speed parameters are set correctly, but spot time too long.	Decrease SPOT TIME/PULSE ON TIME Control setting.
Excessive burn-through on reverse side of weld.	Welding voltage set too high.	Repeat Steps 5a thru f in Section 6-2 to reset voltage and wire feed speed parameters.
No dark blue circle or small protrusion on reverse side of weld, but when welded pieces are pulled apart, a small hole is torn in bottom piece of metal.	Voltage and wire feed speed parameters set correctly, but spot time too short.	Increase SPOT TIME/PULSE ON TIME Control setting.
No dark blue circle or small protrusion on reverse side of weld, and when welded pieces are pulled apart, there is minimal penetration into lower piece of metal.	Welding voltage set too low.	Repeat Steps 5a thru f in Section 6-2 to reset voltage and wire feed speed parameters.

SECTION 7 – MAINTENANCE & TROUBLESHOOTING

7-1. ROUTINE MAINTENANCE

IMPORTANT: Every six months inspect the labels on this unit for legibility. All precautionary labels must be maintained in a clearly readable state and replaced when necessary. See Parts List for part number of precautionary labels.



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live-electrical parts.
- Shut down welding power source, and disconnect input power employing lockout/tagging procedures before inspecting, maintaining, or servicing.

Lockout/tagging procedures consist of removing input power plug from receptacle, padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

MOVING PARTS can cause serious injury.

- Keep away from moving parts.

HOT SURFACES can cause severe burns.

- Allow cooling period before servicing.
- Do not depress gun trigger while performing maintenance on gun.

Maintenance to be performed only by qualified persons.

A. Fan Motor

This unit is equipped with an exhaust fan and relies on forced draft for adequate cooling. The fan motor requires

no maintenance other than periodic cleaning according to Section 7-1B.

Table 7-1. Maintenance Schedule

Frequency*	Maintenance
Every month.	Units in heavy service environments: Check labels, weld cables, clean internal parts and drive rolls.
Every 6 months.	Check all labels (see IMPORTANT block, Section 7-1). Inspect gun and cables (Section 7-1C). Clean drive rolls (Section 7-1D).

*Frequency of service is based on units operated 40 hours per week. Increase frequency of maintenance if usage exceeds 40 hours per week.

B. Internal Cleaning



WARNING: Read and follow safety information at beginning of entire Section 7-1 before proceeding.

Every six months, blow out or vacuum dust and dirt from the inside of the welding power source. Remove the outer enclosure, and use a clean, dry airstream or vacuum suction for the cleaning operation. If dusty or dirty conditions are present, clean the unit monthly.

C. Inspection and Upkeep



WARNING: Read and follow safety information at beginning of entire Section 7-1 before proceeding.

Every six months, inspect the gun, hoses, and cables. If dusty or dirty conditions are present, inspect the unit monthly. Inspection should consist of the following:

1. Open side access door.
2. Inspect gun for broken areas, cracks, and loose parts; tighten, repair, and replace as required.
3. Repair or replace, as required, all hose and cable; give particular attention to frayed and cracked insulation and areas where hose and cables enter equipment.
4. Remove grease and grime from components, moisture from electrical parts and cable.



CAUTION: FLYING DIRT AND METAL CHIPS can injure personnel and damage equipment.

- Point gun liner only in a safe direction away from personnel and equipment when cleaning with compressed air.

5. Blow out the gun wire guide liner with compressed air when changing wire. This will remove any metal chips and dirt that may have accumulated.
6. Close and secure side access door.

D. Cleaning Of Drive Rolls



WARNING: Read and follow safety information at beginning of entire Section 7-1 before proceeding.

MOVING PARTS can cause serious injury.

- Keep away from moving parts.

HIGH ROTATIONAL SPEED can cause damage to drive rolls and injure personnel.

- Do not allow drive rolls to rotate at high speed if compressed air is used for cleaning the drive roll assembly.

It is necessary to remove the drive rolls for proper cleaning of the wire grooves (see Section 7-2 for removal and installation instructions). Use a wire brush to clean rolls.

IMPORTANT: Failure to properly maintain the drive rolls can result in a buildup of wire particles which decreases the efficiency of the wire feeding operation.

7-2. REPLACING DRIVE ROLL AND WIRE INLET GUIDE (Figure 7-1)

As a result of wear or a change in wire size, it may be necessary to replace the drive rolls and wire inlet guide. Proceed as follows:



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down welding power source, and disconnect input power employing lockout/tagging procedures before inspecting, maintaining, or servicing.

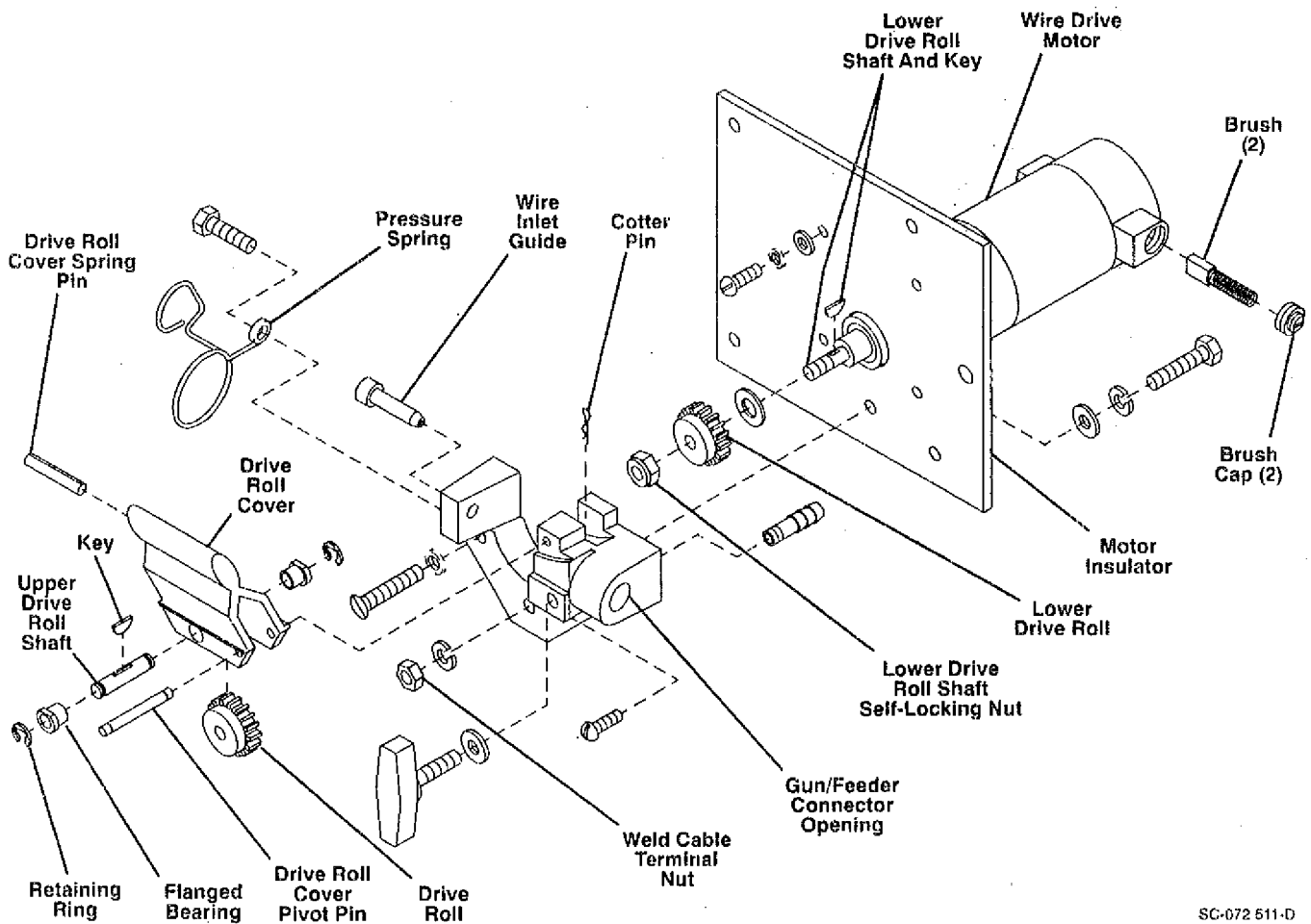
Lockout/tagging procedures consist of removing input power plug from receptacle, padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

A. Replacing Upper Drive Roll



WARNING: Read and follow safety information at beginning of entire Section 7-2 before proceeding.

1. Disassembly
 - a. Open and secure left side access door.
 - b. Release pressure spring from spring pin on drive roll cover.
 - c. Remove cotter pin from drive roll cover pivot pin.
 - d. Remove pivot pin, thereby freeing drive roll cover from drive assembly.
 - e. Remove retaining ring and flanged bearing from one end of drive roll shaft.
 - f. Push drive roll shaft out drive roll cover until drive roll falls from cover. Be sure that key remains in slot in drive roll shaft.
2. Assembly
 - a. Install drive roll into drive roll cover with gear section of drive roll facing the rear of the cover (side facing motor insulator). Be sure to align clearance hole in drive roll with the two shaft clearance holes in drive roll cover.
 - b. Align key in drive roll shaft with keyway in drive roll, and route end of drive roll shaft without retaining ring and bearing through hole in rear side of drive roll cover, through drive roll, and out front side of cover.
 - c. Reinstall flanged bearing and retaining ring removed in Step 1e onto end of drive roll shaft.
 - d. Reinstall drive roll cover and pivot pin into drive roll assembly.
 - e. Reinstall cotter pin onto pivot pin.
 - f. If installing or changing lower drive roll, proceed to Section 7-2B; otherwise, reengage pressure spring over spring pin on drive roll cover, and close and secure access door.



SC-072 511-D

Figure 7-1. Replacing Drive Rolls And Motor Brushes

B. Replacing Lower Drive Roll



WARNING: Read and follow safety information at beginning of entire Section 7-2 before proceeding.

1. Disassembly

- a. If applicable, release pressure spring from spring pin on drive roll cover.
- b. If applicable, pivot upper drive roll up, away from lower drive roll.
- c. Remove self-locking nut from end of lower drive roll shaft, and remove drive roll. Be sure that key remains in slot in drive roll shaft.

2. Assembly

- a. Install drive roll onto lower drive roll shaft aligning keyway in drive roll clearance hole with key in drive roll shaft. (Drive roll must be installed with gear section facing the motor insulator.)
- b. Reinstall self-locking nut onto drive roll shaft.
- c. Adjust horizontal position of lower drive roll in or out as necessary. To move the drive roll in towards the motor insulator, rotate the self-lock-

ing nut clockwise. To move the drive roll out away from the center panel of the unit, rotate the nut counterclockwise.

IMPORTANT: Be sure that upper and lower drive roll gears are properly meshed and the drive roll grooves are aligned when adjusting horizontal position of lower drive roll.

- d. Reengage pressure spring over spring pin on drive roll cover.
- e. If replacing wire inlet guide, proceed to Section 7-2C; otherwise, close and secure side access door.

C. Replacing Wire Inlet Guide

1. Loosen wire guide securing screw.
2. Remove wire guide from drive housing.
3. Install new wire guide through mounting hole in left side of drive housing (see Figure 7-1).

IMPORTANT: Wire guide should be installed as close to the drive rolls as possible without touching them.

4. Tighten wire guide securing setscrew.
5. Close and secure side access door.

7-3. DRIVE HOUSING REALIGNMENT (Figure 4-7)



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down welding power source, and disconnect input power employing lockout/tagging procedures before inspecting, maintaining, or servicing.

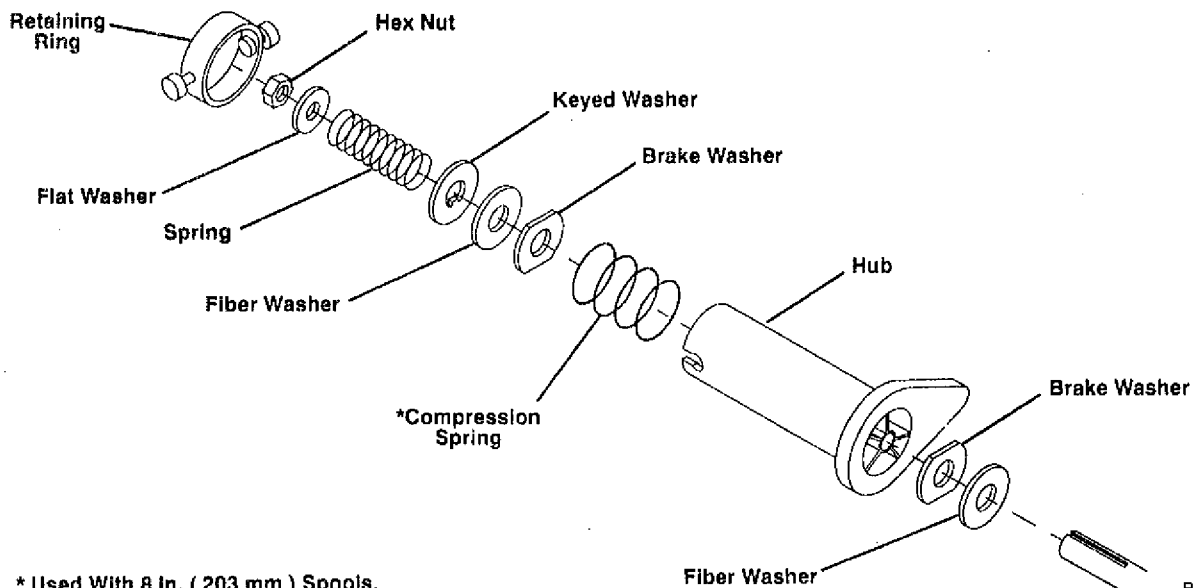
Lockout/tagging procedures consist of removing input power plug from receptacle, padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

The wire drive housing is made with mounting holes of sufficient clearance to provide adjustment of the wire guides up or down in relation to the drive rolls. This adjustment has been factory set, but if readjustment becomes necessary proceed as follows:

1. Open access door.
2. Loosen mounting bolts and the weld terminal nut, securing wire drive housing to the air baffle.
3. Slide drive housing upward or downward until the wire can be fed straight through the guides while seated in the drive roll.
4. Tighten mounting bolts and weld terminal nut.
5. Close and secure access door.

7-4. REPLACING HUB ASSEMBLY (Figure 7-2)

If it should become necessary to replace part or all of the hub assembly, reinstall the new hub assembly as follows:



* Used With 8 In. (203 mm) Spools.

Ref. SD-072 809-G

1. Slide the following items onto the single support shaft in order given:
 - a. Fiber Washer
 - b. Brake Washer
 - c. Hub
 - d. Brake Washer
 - e. Fiber Washer
 - f. Keyed Washer
 - g. Spring
 - h. Flat Washer
2. Rotate hex nut onto support shaft. Hex nut should be rotated only until a slight drag is felt while turning hub.
3. Install welding wire according to Section 4-12.
4. Reinstall retaining ring onto hub.

7-5. INSPECTING AND REPLACING MOTOR BRUSHES (Figure 7-1)



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down welding power source, and disconnect input power employing lockout/tagging procedures before inspecting, maintaining, or servicing.

Lockout/tagging procedures consist of removing input power plug from receptacle, padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

Figure 7-2. Hub Assembly

1. Open access door.
2. Remove the brush caps (two).
3. Remove brushes.
4. Examine brushes. Replace brushes if they are chipped or broken or if less than 1/4 in. (6 mm) of brush material remains.
5. Install brushes, and secure with caps.



CAUTION: DISASSEMBLY OF THE MOTOR FIELD MAGNETS can result in personal injury and equipment damage.

- *Limit drive motor repairs to brush replacement.*

The field magnets are very strong. If disassembly is attempted, injury to fingers and hands may result from the rotor being drawn back into the motor. The field magnets are matched sets, and operation may be affected if the magnets are tampered with. Warranty is void if the motor is tampered with.

6. Close and secure access door.

7-6. OVERLOAD PROTECTION



WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Shut down welding power source, and disconnect input power employing lockout/tagging procedures before inspecting, maintaining, or servicing.*

Lockout/tagging procedures consist of removing input power plug from receptacle, padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

A. Circuit Breaker CB1



WARNING: Read and follow safety information at beginning of entire Section 7-6 before proceeding.

The drive motor is protected from damage due to overload by circuit breaker CB1, located under the access door. Should an overload on CB1 occur, the contactor W coil would open thereby stopping all output from the welding power source.

If CB1 opens, manually reset the circuit breaker as follows:

1. Open access door.
2. Check for jammed wire or clogged gun liner, and correct problem. If motor overload occurs repeatedly, repair or replace the motor or liner.
3. Check for binding drive gear or misaligned drive rolls, and correct problem.

4. Reset circuit breaker CB1 (depress button); it may be necessary to allow a cooling period before the breaker can be reset.
5. Close and secure access door.
6. Resume operation.

B. Circuit Breaker CB2



WARNING: Read and follow safety information at beginning of entire Section 7-6 before proceeding.

Circuit breaker CB2 protects the 24 volts ac winding of transformer T1 from overload. CB2 is located under the access door. Should CB2 open, the contactor W coil would open thereby stopping all output from the welding power source. If CB2 opens, manually reset the breaker.

7-7. THERMAL OVERLOAD PROTECTION

Rectifier SR1 is protected from overheating by a normally-closed thermostat TP3 wired in series with the relay CR1 and contactor W coil circuit. Should overheating occur, TP3 would open causing CR1 and thereby the contactor to drop out (deenergize) and the wire drive motor to stop, thereby stopping all weld output. If this condition occurs, it will be necessary to allow a cooling period before resuming operation.

7-8. PRINTED CIRCUIT BOARD REPLACEMENT



WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Shut down welding power source, and disconnect input power employing lockout/tagging procedures before inspecting, maintaining, or servicing.*

Lockout/tagging procedures consist of removing input power plug from receptacle, padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.



CAUTION: ELECTROSTATIC DISCHARGE (ESD) can damage circuit boards.

- *Put on properly grounded wrist strap BEFORE handling circuit boards.*
- *Transport circuit boards in proper static-shielding carriers or packages.*
- *Perform work only at a static-safe work area.*

INCORRECT INSTALLATION or misaligned plugs can damage circuit board.

- *Be sure that plugs are properly installed and aligned.*

EXCESSIVE PRESSURE can break circuit board.

- *Use only minimal pressure and gentle movement when disconnecting or connecting board plugs and removing or installing board.*

7-9. TROUBLESHOOTING



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down welding power source, and disconnect input power employing lockout/tagging procedures before inspecting, maintaining, or servicing.

Lockout/tagging procedures consist of removing input power plug from receptacle, padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

MOVING PARTS can cause serious injury.

- Keep away from moving parts.

HOT SURFACES can cause severe burns.

- Allow cooling period before servicing.

Troubleshooting to be performed only by qualified persons.

It is assumed that the unit was properly installed according to Section 4 of this manual, the operator is familiar with the function of controls, the welding power source was working properly, and that the trouble is not related to the welding process.

The following table is designed to diagnose and provide remedies for some of the troubles that may develop in this welding power source. Use this table in conjunction with the circuit diagram while performing troubleshooting procedures. If the trouble is not remedied after performing these procedures, contact the nearest Factory Authorized Service Station. In all cases of equipment malfunction, strictly follow the manufacturer's procedures and instructions.

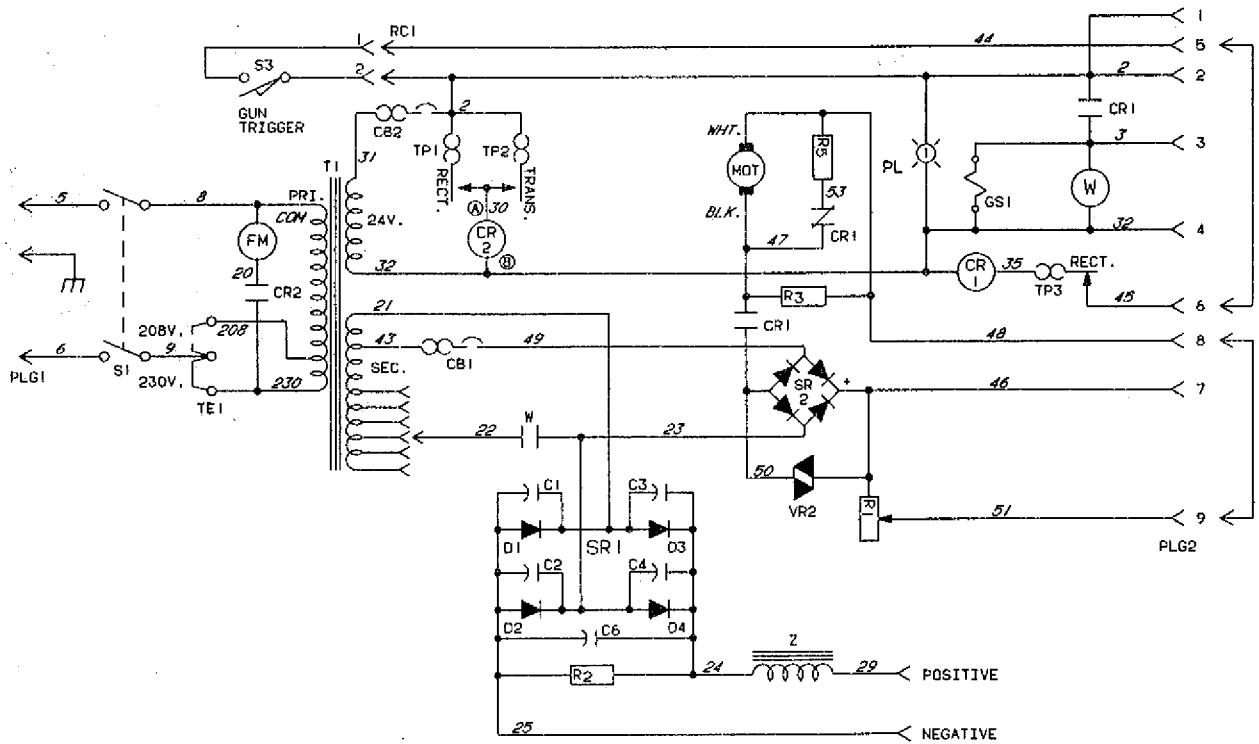
Table 7-2. Troubleshooting

TROUBLE	PROBABLE CAUSE	REMEDY
No weld output; wire does not feed.	Line Disconnect Switch in OFF position.	Place Line Disconnect Switch in ON position.
	Improper electrical input connections.	See Section 4-11 for proper input connections.
	Input voltage jumper links not in proper position.	See Section 4-11 for proper jumper link position.
	Line fuse(s) open.	Check and replace open line fuses.
	Main rectifier SR1 overheating (thermal shutdown).	Allow rectifier to cool down (see Section 7-7).
	Gun switch, or gun switch leads.	See gun Owner's Manual.
	POWER switch S1.	Replace S1.
	Switch control relay CR1.	Replace CR1.
No weld output; wire feeds.	VOLTAGE ADJUSTMENT plug not secure in receptacle.	Secure connection.
	Work clamp connection loose or incomplete due to rust, paint, etc. on surface of workpiece.	Check work connection for good metal-to-metal contact.
	Contact tube.	See gun Owner's Manual.
Low weld output.	Low input voltage.	Check for proper input voltage.
	Input voltage jumper link in wrong position.	See Section 4-11 for proper jumper link position.
Electrode wire stops feeding while welding.	Circuit breaker CB2.	Check and reset CB2 if necessary (see Section 7-6).
	Sharp or excessive bend in gun cables or liners.	Straighten gun cables and/or replace liners (see gun Owner's Manual).
	Incorrect hub tension.	Readjust hub tension (see Section 4-10).
	Contact tube opening restricted; burnback of wire into tube.	See gun Owner's Manual.

Table 7-2. Troubleshooting (Continued)

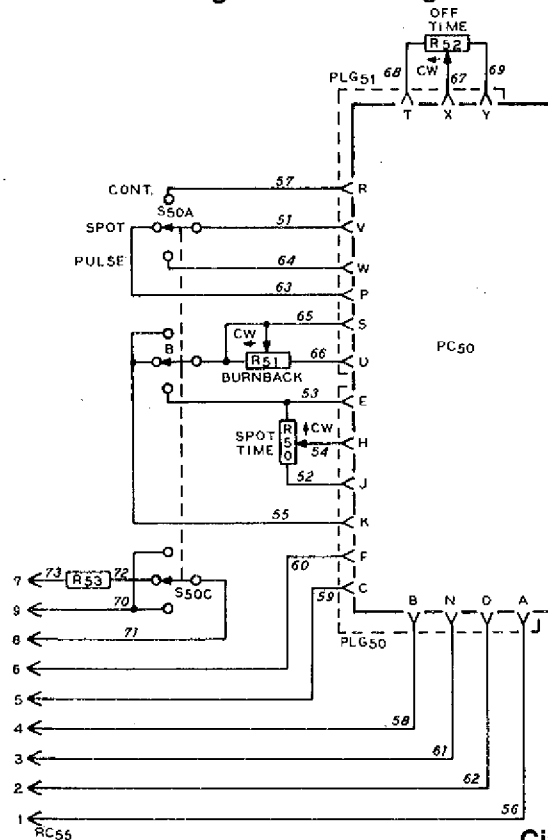
TROUBLE	PROBABLE CAUSE	REMEDY
Electrode wire stops feeding while welding. (Continued)	Friction in gun.	See gun Owner's Manual.
	Gun liner dirty, restricted.	See gun Owner's Manual.
	Broken or damaged gun liner.	See gun Owner's Manual.
	Worn drive rolls.	Replace drive rolls (see Section 7-2).
	Drive rolls misaligned.	Realign drive rolls (see Sections 7-2 and 7-3).
	Excessive loading of drive motor.	Clear restriction in drive assembly.
	Drive motor brushes.	Check and replace brushes if necessary (see Section 7-5).
	Drive Motor M.	Check and replace motor if necessary.
	Gun trigger switch inoperative or leads broken.	See gun Owner's Manual.
Unit shuts down while welding.	Fan motor FM.	Check and replace FM if necessary.
No open-circuit voltage.	VOLTAGE ADJUSTMENT plug not secure in receptacle.	Secure plug in receptacle.
	Contactor W points.	Contact nearest Factory Authorized Service Station.
	Gun switch.	See gun Owner's Manual.
	Transformer T1.	Contact nearest Factory Authorized Service Station.
	Plug PLG2 not secure in receptacle RC55 (models with optional Spot Weld Panel only).	Secure PLG2 into RC55.
Wire does not feed; open circuit voltage normal.	Circuit breaker CB1 or CB2.	Reset CB1 or CB2 (see Section 7-6).
	Rectifier SR2.	Contact nearest Factory Authorized Service Station.
	Wire feed motor M.	Replace M.
Spot weld timer does not time out (models with SKP-35 panel).	SKP-35 panel or circuit board PC50.	See Section 7-8, and contact nearest Factory Authorized Service Station.
Pulsed wire feed operation not available.	SKP-35 panel or circuit board PC50.	See Section 7-8, and contact nearest Factory Authorized Service Station.

SECTION 8 – ELECTRICAL DIAGRAMS



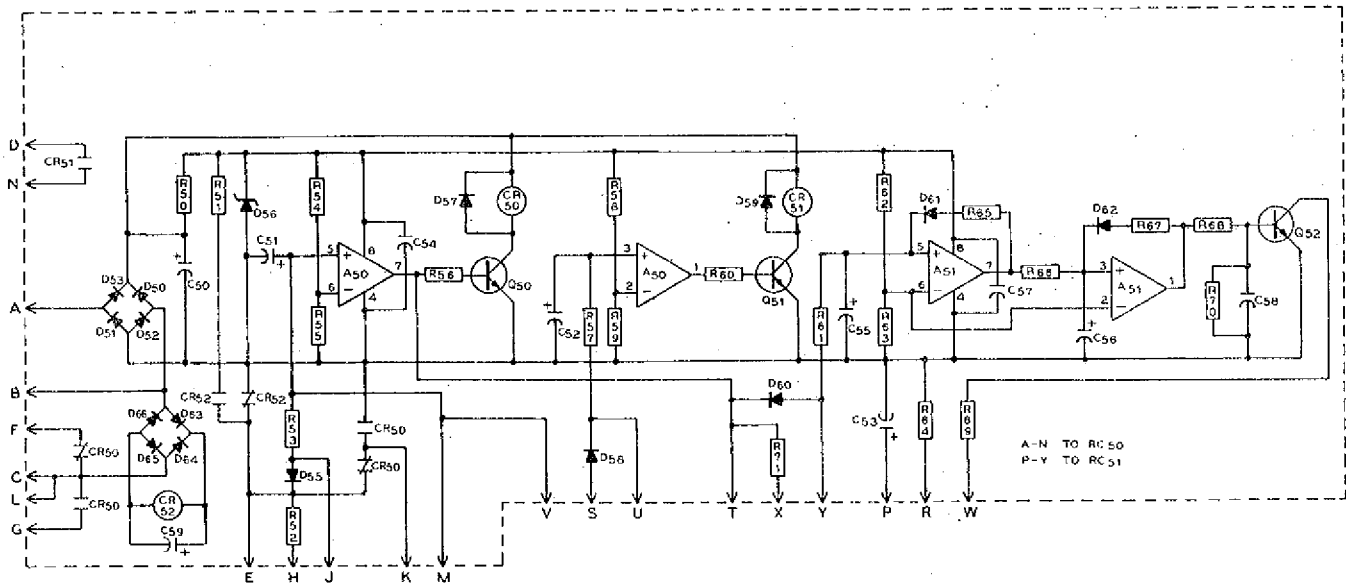
Circuit Diagram No. SB-119 142

Diagram 8-1. Circuit Diagram For Welding Power Source



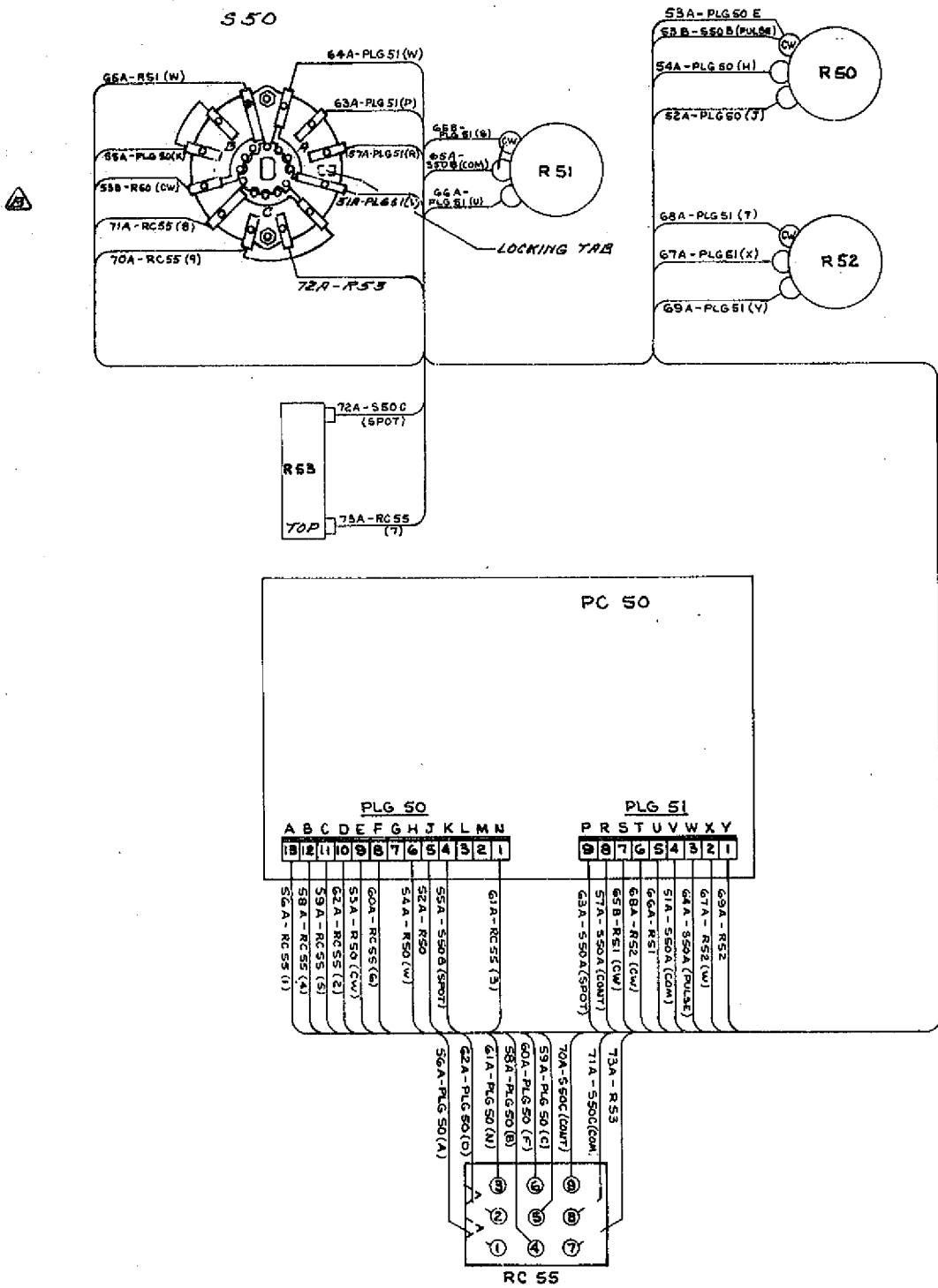
Circuit Diagram No. A-090 568-A

Diagram 8-2. Circuit Diagram For SKP-35 Panel



Circuit Diagram No. B-092 817-A

Diagram 8-3. Circuit Diagram For SKP-35 Panel Dual Timer/Pulser Board PC50



Wiring Diagram No. C-090 711-B

Diagram 8-4. Wiring Diagram For SKP-35 Panel

SECTION 9 – WELDING TECHNIQUES & TROUBLESHOOTING



CAUTION: WELDING CURRENT can damage vehicle components and other electronic components.

- *Disconnect both battery cables before welding on a vehicle.*
- *Place work clamp as close to the weld as possible to avoid long electrical paths.*
- *Be sure gun to power source as well as cable connections to work clamp are clean and tight.*
- *To be 100 percent free of risk, disconnect the computer(s) from the vehicle.*

9-1. GAS METAL ARC WELDING (GMAW) – CONTINUOUS SEAM

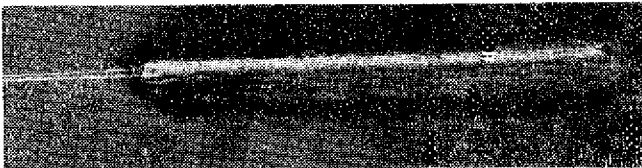
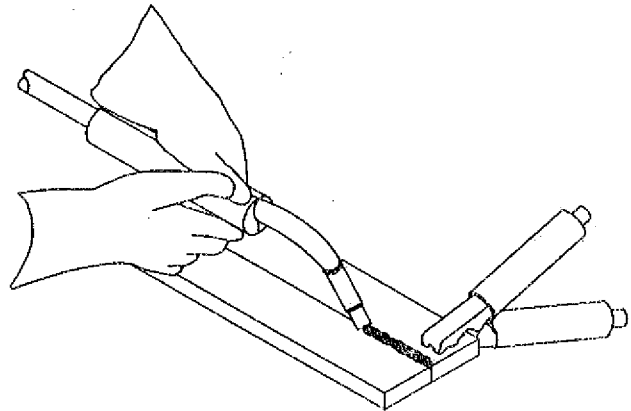


Figure 9-1. Continuous Seam

The ability to produce a good bead while using the Continuous Seam Gas Metal Arc process is dependent on several factors. One of the most important, after wire and shielding gas selection, is the way the gun is held. Cradle the gun in one hand and rest the side of the hand on the workpiece (avoid doing this on hot material); use other hand to hold gun and control the gun trigger. Position the gun either toward or away from the body at a 45 to 60 degree lead angle (see Figure 9-2). This will give a good view of the arc and make it easier to follow the seam while wearing a helmet. Maintain a 1/4 to 5/16 inch (6-8 mm) distance from the bottom of the gun nozzle to the workpiece during the arc starting and welding period. Do not pull the gun back from the seam when the arc starts, as this will create a long wire extension and result in a poor weld.

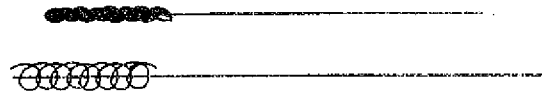
The welding wire is not energized until the trigger is pressed. Therefore the welding wire can be extended 1/4 inch (6 mm) beyond the gun nozzle and placed on the seam before lowering the helmet and pressing the gun trigger.



S-0421

Figure 9-2. Gun Position

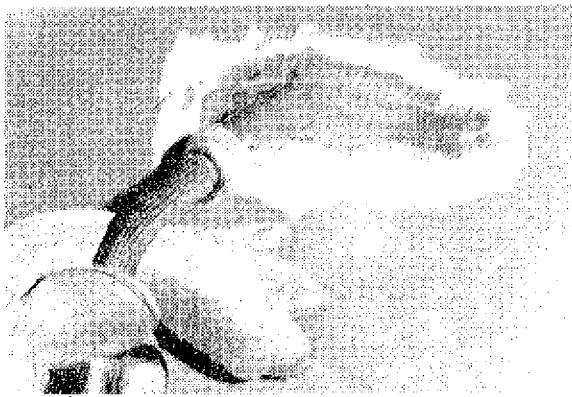
The gun can be moved along the seam in a steady movement known as the drag technique (see Figure 9-3), or it can be oscillated a few degrees beyond each side of the seam. The travel speed will be regulated by the type of weld bead required, the thickness of the material, welding current selected and the technique used. However, the average speed is 15 to 20 inches per minute (0.4-0.5 mpm).



S-0422

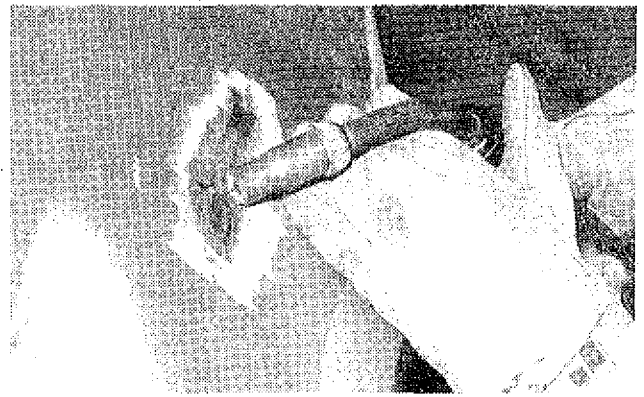
Figure 9-3. Welding Techniques

Other welding techniques that affect the weld characteristics in the GMAW welding process include the backhand and forehand technique, and the vertical up and vertical down positions. In the backhand technique the gun is positioned so that the electrode wire is feeding in the opposite direction of arc travel. The filler metal is being fed into the weld metal previously deposited. In the forehand technique the gun is angled so that the electrode wire is fed in the same direction as the arc travel. The backhand technique generally yields a more stable arc and less spatter on the workpiece.



Direction of Arc Travel →

Backhand Technique



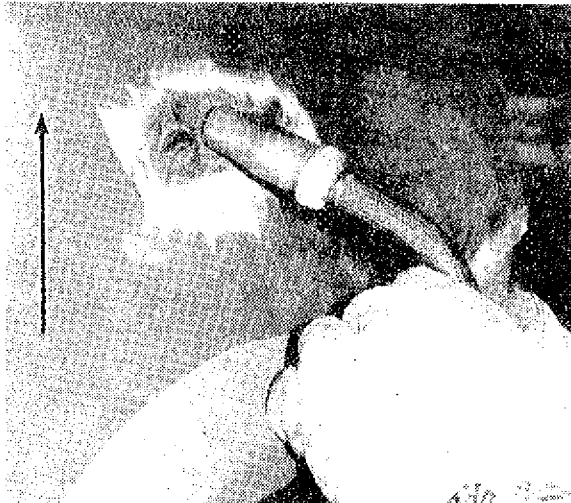
← Direction of Arc Travel

Forehand Technique

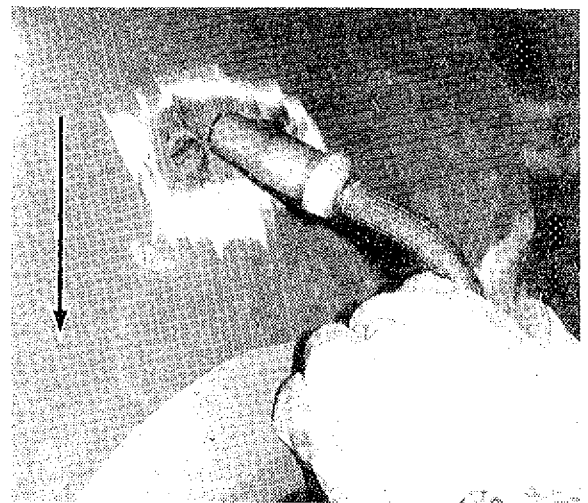
Figure 9-4. Longitudinal Gun Positions

The vertical up and/or vertical down techniques describe the direction of arc travel when the welding must be done in the vertical position. In both of these techniques gun positioning is extremely important because the arc must be kept on the leading edge of the puddle to ensure com-

plete weld penetration. The drag technique is generally employed when welding in the vertical position, but when bridging a gap, the arc can be oscillated from one side of the work to the other.



Vertical Up



Vertical Down

Figure 9-5. Welding In The Vertical Up And Vertical Down Position

9-2. GAS METAL ARC WELDING (GMAW)-PULSED

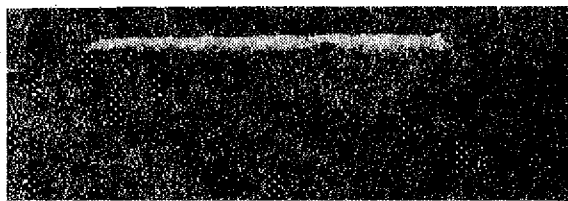


Figure 9-6. Pulsed Seam

In pulsed welding the filler metal is transferred to the work during the period of Pulse On Time, and cools during the period of Pulse Off Time. When the selector switch is placed in the PULSE position and the gun trigger is depressed, the welding wire feeds through the gun

for the length of time set on the SPOT TIME/PULSE ON TIME control. At the end of the pulse on time the welding wire stops feeding for the length of time set on the PULSE OFF TIME control. This on and off sequence continues for the amount of time selected on the time control until the gun trigger is released. The pulse option provides better control of the heat input to the weld on thin gauge metals, thereby decreasing distortion and the likelihood of burn throughs.

Set-up procedures for pulsed seam welding are the same as those for continuous seam welding except that the SELECTOR SWITCH is placed in the PULSE position and the SPOT TIME/PULSE ON TIME control and PULSE OFF TIME controls must be set to the desired positions.

9-3. GAS METAL ARC WELDING (GMAW)-SPOT



Figure 9-7. Spot Weld

Instead of having a continuous or pulsed weld to join two pieces of sheet steel together, welding in spot of 1 to 1-1/2 inches (25-38 mm) apart can be done. The MIG spot welding process fuses two pieces of sheet steel together by penetrating entirely through one of the pieces into the other. The spot process is designed to be used in any position. Little joint preparation is required other than cleaning the surfaces and ensuring that the two pieces overlap.

Spot welding is based on the same principles as continuous seam welding except that there is no travel speed involved; instead, there is a welding time interval. The weld is made by placing the welding gun directly on the top sheet and holding it motionless as shown in Figure 9-8. When the gun trigger is depressed, the electrode wire and shielding gas will be continuously fed. The arc will be maintained for the full length of time set on the SPOT TIME/PULSE ON TIME control and it will continue to penetrate in one place until the top sheet is welded with the bottom sheet. After the preset welding time has elapsed the wire will stop feeding, the contactor will open and the arc will be broken.

The GMAW spot welding process produces little heat, therefore little distortion results. Because of the low heat characteristics of this technique, it is often used when welds are made in close proximity to upholstery, rubber, or other flammable materials.

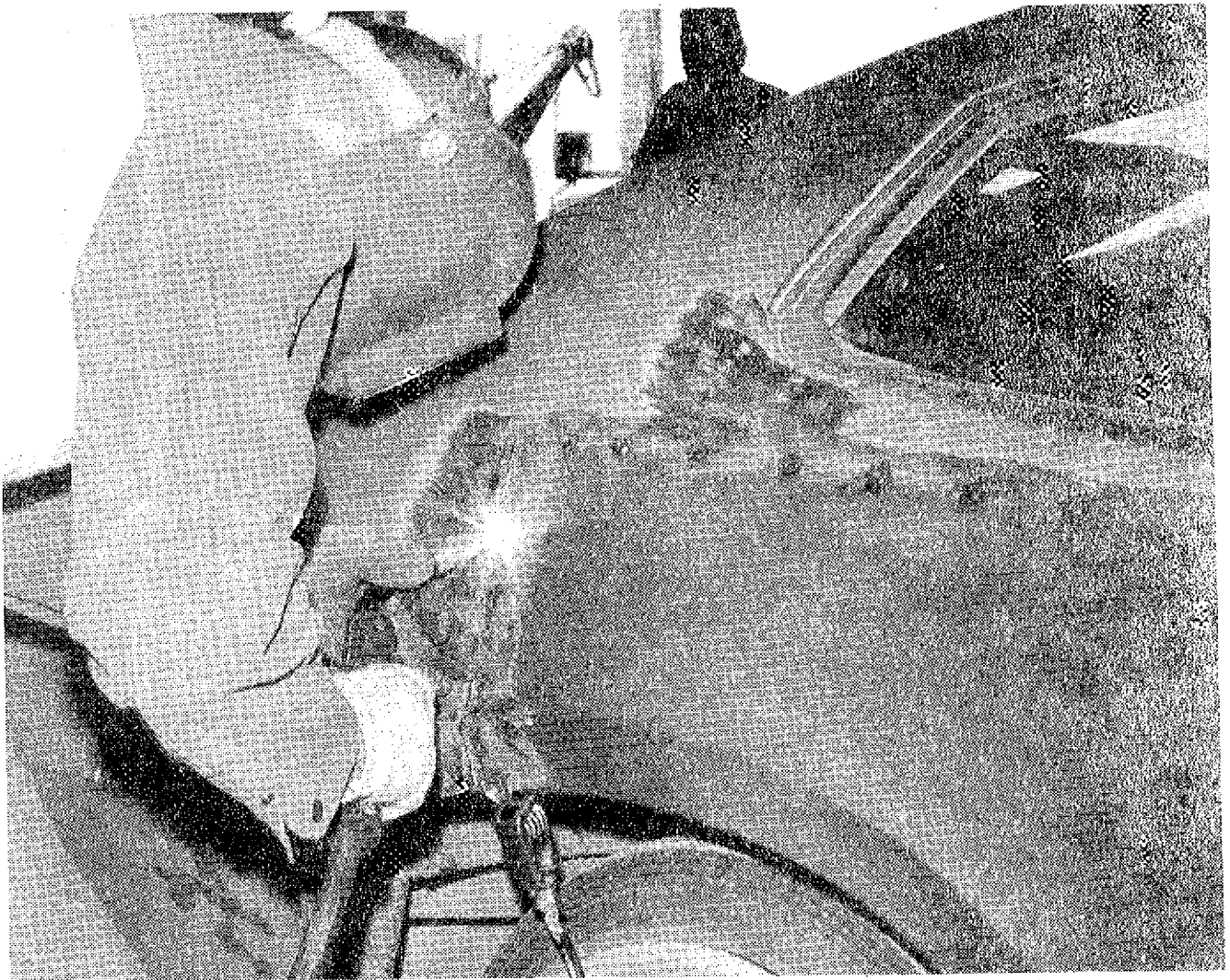


Figure 9-8. Fender Repair With Spot Nozzle

9-4. PLUG WELDS

Plug welds provide a means of joining two pieces of metal where the thickness of the top sheet is beyond the normal range of the welding power source or where sheet metal sections are too thin to be spot welded or pulsed welded without producing distortion or burn throughs. The plug weld is made by drilling or punching a hole in the top sheet, clamping the metal sections tightly together, and filling the hole with a weldment. The plug weld can be timed using the spot timer or untimed. Plug welds should be spaced 1 to 1-1/2 inches (25-38 mm) apart.

Plug welds on sample materials should be made so that proper parameters can be set.

9-5. SKIP WELDING

Skip welding provides a means of making a series of short welds, usually less than 3/4 in., (18 mm) in length each, consistent in size and appearance. Skip welding can be accomplished with this unit by setting a spot weld time and jogging the gun trigger off and on again each time the spot timer times out.

Skip welds on sample material should be made so that proper parameters can be set.

9-6. TROUBLESHOOTING THE GAS METAL ARC WELDING PROCESS

A. Porosity



Figure 9-9. Porosity

Possible Causes	Corrective Actions
1. Inadequate shielding gas coverage.	Remove spatter from the gun nozzle.
	Check gas hoses for leaks.
	Eliminate drafts (from fans, open doors, etc.) blowing into the welding arc.
	Place nozzle 1/4 to 5/16 in. (6-8 mm) from workpiece.
	Increase gas flow to displace all air from the weld zone.
	Decrease excessive gas flow to avoid turbulence and the entrapment of air in the weld zone.
	Hold gun at end of weld until molten metal solidifies.
Check for frozen CO ₂ regulator/flowmeter.	
2. Wrong gas.	Use welding grade shielding gas.
3. Dirty welding wire.	Use clean and dry welding wire.
	Eliminate pick up of oil or lubricant on welding wire from feeder or conduit.
4. Workpiece dirty.	Remove all grease, oil, moisture, rust, paint, undercoating, and dirt from work surface before welding.
	Use a more highly deoxidizing welding wire.
5. Welding wire extends too far out of nozzle.	Welding wire should extend 1/4 in. (6 mm) out of nozzle.

B. Excessive Spatter

Possible Causes	Corrective Actions
1. Excessive spatter when using CO ₂ shielding gas.	Select lower voltage range or adjust WIRE FEED SPEED control.

C. Incomplete Fusion (Lack of fusion)



Figure 9-10. Incomplete Fusion

Possible Causes	Corrective Actions
1. Workpiece dirty.	Clean weld surfaces of impurities (grease, oil, moisture, rust, paint, dirt, etc.) prior to welding.
2. Insufficient heat input.	Select higher voltage range or adjust WIRE FEED SPEED control.
3. Improper welding technique.	When using a weaving technique dwell momentarily on the side walls of the groove.
	Provide improved access at root of joints.
	Keep electrode directed at the leading edge of the puddle.
	Provide proper gun angle.

D. Lack of Fusion

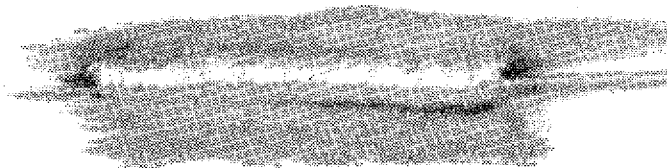


Figure 9-11. Lack of Penetration

Possible Causes	Corrective Actions
1. Improper joint preparation.	Material too thick. Joint preparation and design must be adequate to provide access to the bottom of the groove while maintaining proper welding wire extension and arc characteristics.
2. Improper weld technique.	Maintain normal gun angle to achieve maximum penetration (see Section 9-1).
	Keep arc on leading edge of the puddle.
3. Insufficient heat input.	Select higher voltage range and wire speed.
	Reduce the travel speed.
	Be sure welding wire extends 1/4 in. (6 mm) out of nozzle.

E. Excessive Penetration (Burn-Through)



Figure 9-12. Excessive Penetration

Possible Causes	Corrective Actions
1. Excessive heat input.	Select lower voltage range and reduce wire speed.
	Increase travel speed.

F. Cracks in Weld Metal

Possible Causes	Corrective Actions
1. Improper joint preparation.	Material too thick. Joint preparation and design must be adequate to provide access to the bottom of the groove while maintaining proper welding wire extension and arc characteristics.
2. Heat input too high causing excessive shrinkage and distortion.	Select lower voltage range and reduce wire speed.
	Increase travel speed.

G. Waviness of Bead



Figure 9-13. Waviness of Bead

Possible Causes	Corrective Actions
1. Welding wire extends too far out of nozzle.	Welding wire should extend 1/4 in. (6 mm) out of nozzle.
2. Unsteady hand.	Support hand on solid surface.

H. Humping



Figure 9-14. Humping

Possible Causes	Corrective Actions
1. Excessive heat input.	Select lower voltage range or increase travel speed.
	Weld in small segments and allow to cool between welds.

SECTION 10 – AUTO BODY REPAIR APPLICATION



CAUTION: WELDING CURRENT can damage vehicle computers and other electronic components.

- Disconnect both battery cables before welding on a vehicle.
- Place work clamp as close to the weld as possible to avoid long electrical paths.
- Be sure gun to power source as well as cable connections to work clamp are clean and tight.
- To minimize risk, disconnect the computer(s) from the vehicle.

10-1. POINTERS FOR WELDING AUTO BODY SHEET METAL

Before using this equipment to weld on a finished piece of work, make a few practice welds on a sample piece of material the same as that of the finished workpiece. Whenever possible, weld in the flat position since this is the easiest position to learn. Be sure that the material to be welded is clean and free of paint and rust. The work cable clamp must be attached to the parts being welded. Clean surface to ensure proper grounding and to complete the current path.

Use a .030 or .023 in. (0.8 or 0.6 mm) E70S-6 wire and argon/carbon dioxide shielding gas.

Use direct current straight polarity for reduced burn through. to obtain straight polarity (electrode wire to negative-work lead to positive) place the Negative/Positive weld output selector plug in the **NEGATIVE WELD OUTPUT RECEPTACLE** and connect the work (ground) lead to the **POSITIVE WELD OUTPUT RECEPTACLE**.

IMPORTANT: For maximum penetration on thicker materials such as 18 gauge (1.22 mm) and thicker, reconnect for direct current reverse polarity (work lead to negative, electrode wire to positive).

10-2. PROCEDURE FOR WELDING MILD STEELS

The following are some basic guidelines that can be used when using this welding power source to weld mild or high strength steels:

1. Use a power wire brush or sander to remove paint to bare metal in the area to be repaired. Two to three inches (51-76 mm) on either side of the weld area should be cleaned for applying body filler after welding is completed.
2. Remove damaged metal using hand cutters, shears, or a power hand grinder equipped with a cutting wheel.
3. Fit a new piece of sheet steel over the section which was removed. The new material should overlap the cut away section by one inch (25 mm).

4. Clamp the new metal in place, and prepare to spot weld.
5. Rotate the **VOLTAGE ADJUSTMENT** control to 50%, the weld timer at 30 to 40 percent, the burnback at 40 to 50 percent and the selector switch to the **SPOT** position.
6. Install the spot nozzle on the gun.
7. With the shielding gas and power source turned on, place the spot nozzle and press firmly against the new material about 1/2 to 3/4 in. (12-18 mm), from the edge. Fit up must be tight to assure good, repeatable spot welds.
8. Begin spot welding from the center out on each side. Distortion may occur if welding begins at the corners.
9. Space spot welds 1 to 1/2 in. (25-38 mm) apart around repair. Spot welds should be about 3/16 in. (5 mm) in diameter.

IMPORTANT: Do not make continuous welds around the repair as this will promote distortion and warpage.

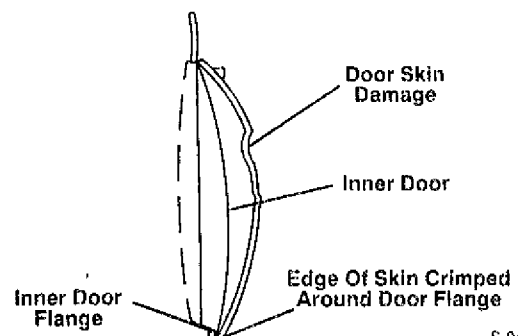
10. After welding, remove the clamp and grind spot flush to surface.
11. Smooth the joints with body filler and finish.

10-3. PROCEDURES FOR WELDING DOOR PANELS

IMPORTANT: Every experienced autobody repairman will have his own method of performing the following procedures. However, this information is presented to show how, in most cases, this welding power source can make the job easier and less time consuming.

If the door is severely damaged, but the damage is primarily in the outer panel, or "skin", the door can be easily repaired without necessarily installing a whole new door.

1. Remove exterior molding and hardware. It is not necessary to remove window regulator, remote control mechanisms, lock or runs.
2. Remove door assembly, and place on flat surface with edges of door extending over edges of surface to provide room to work.



S-0418

Figure 10-1. Cutaway Of Door Panel Damage

3. If door has an outer panel reinforcement, break the weld.
4. Grind off the hem flange and remove the old panel.
5. Repair any damage to the inner panel.
6. Position the new outer panel over door and bend the end flange over the inner flange.
7. Spot weld outer panel reinforcement to new door panel.
8. Spot weld new hem flange to inner panel.
9. Metal finish exterior surface, paint and assembly interior trim and hardware.

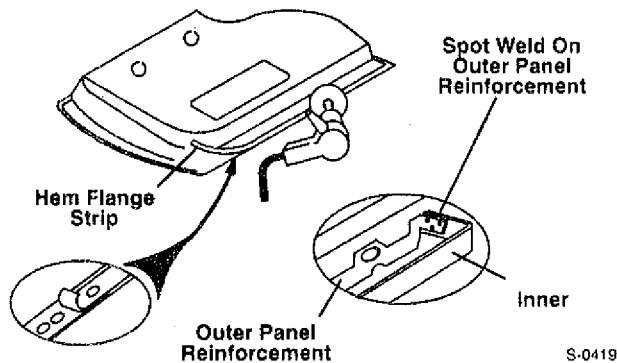


Figure 10-2. Hem Flange Removal

10-4. HOW TO PREVENT GLASS BREAKAGE AND SPATTER ON WINDOWS

Spatter and excessive heat can become problems when welding near windows. Protect the windows by keeping them covered and as far away from the heat zone as possible. When welding must be performed near windows, the windows should be covered and protected from excessive heat by using wet rags. A putty like substance which reduces heat transfer is available through your welding supplier. If burn through and spatter become problems, ensure that the correct voltage tap is being used for the size material being welded. Use an argon and CO₂ gas mixture and check travel speed.

10-5. PROCEDURES FOR WELDING FENDERS AND QUARTER PANELS

When a complete panel must be replaced it will be necessary to remove the bolts securing the panel to the rest of the structure, or to cut through the spot welds if the panel is welded in place. In most cases a front fender will be bolted in place, while the other panels will be either spot welded or continuous seam welded. The alignment of front fenders is usually simple because the bolt holes are often elongated so that the position of the new front fender can be shifted and correctly aligned. Generally all other panels are welded into place.

If the whole panel is to be replaced, the old panel must be removed by cutting along the weld if welded by continuous seam, or by drilling out the spot welds if it is spot welded in place. Car and body manufacturers have the

panels welded in different places, so it will be necessary to inspect the body to determine where the welds are located in each case. After the old panel is removed, the inner panels must be carefully checked, straightened or replaced.

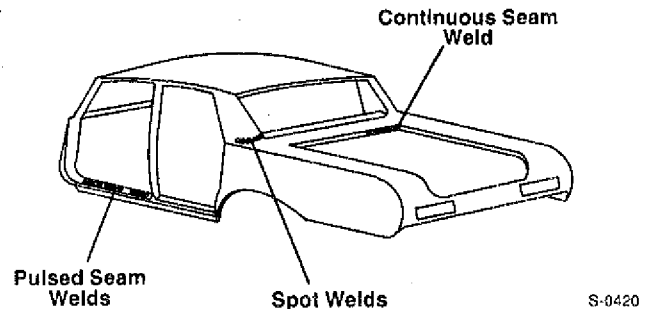


Figure 10-3. Automotive Body Sections Assembled With Continuous Seam, Pulsed, And Spot Welds

The new outer panel can then be placed and held in position by vice-grips or c-clamp. When welding, start at the center and proceed first in one direction and then the other. In order to ensure reduced distortion due to heat, weld only a section of 2 or 3 in. (51-76 mm) at a time. It is important to constantly check the over all temperature of the sheet steel around the welding area, because it is in this concentrated heat area that warpage and distortion will begin. Leave a gap and then weld another short section. When the weld is completed it can be hammered down, filled with body putty and sanded.

10-6. WELDING FRAMES AND HIGH STRENGTH (HSS) STEELS

The new HSS steels are used on many of the new economy compact cars. HSS steels can be found in the steel gussets, brackets, floor pans, and support members of these new models. HSS steels are thinner for weight reduction and are heat sensitive. As heat is applied, the strength decreases and cracking can occur, therefore the heat affected zone must be kept as small as possible. For this reason the MIG welding process has become the preferred method for welding HSS steels, and the oxacetylene welding or brazing processes, with its wider heat affective area, are normally not recommended.



Figure 10-4. Application Of Body Putty

SECTION 11 – PARTS LIST

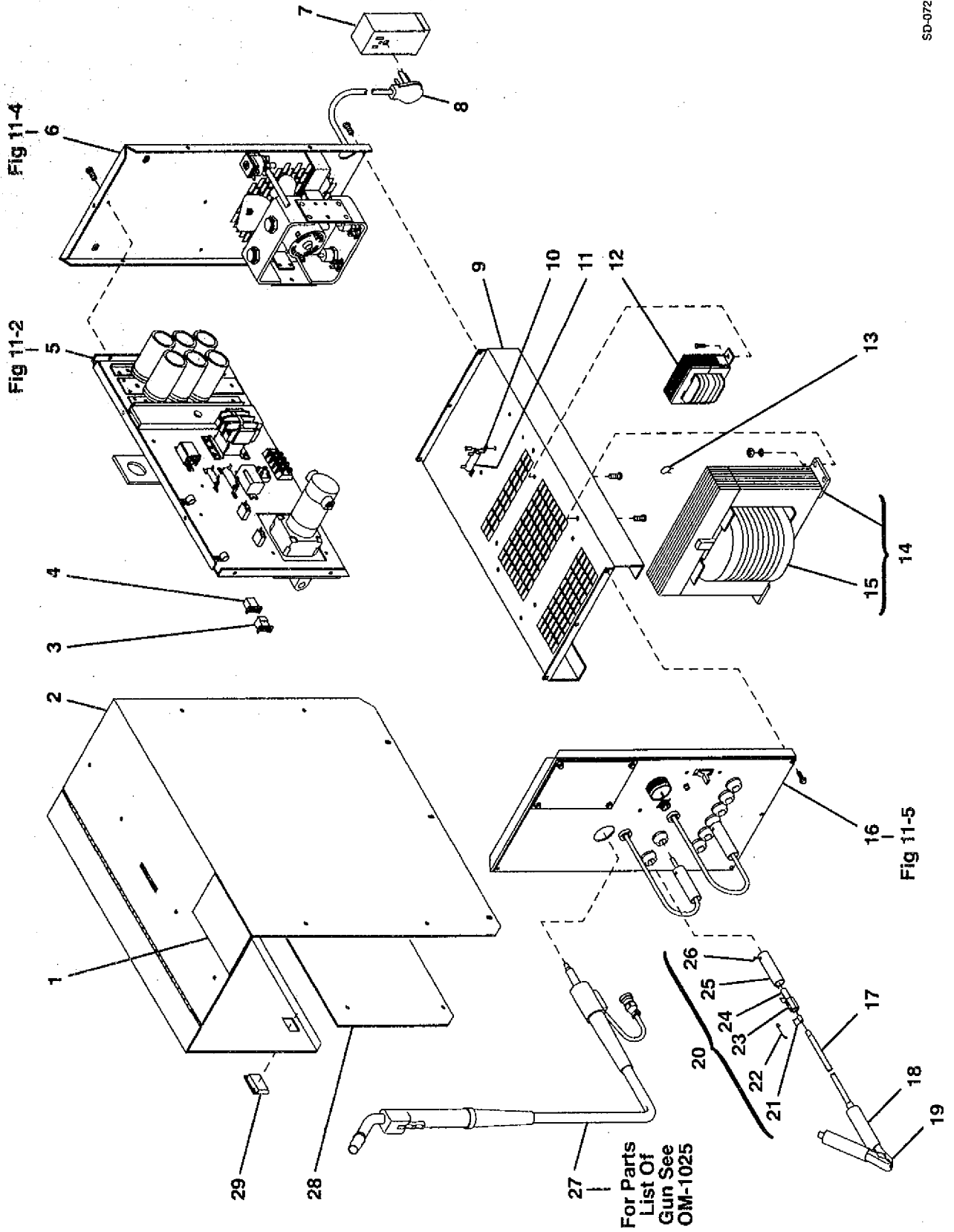


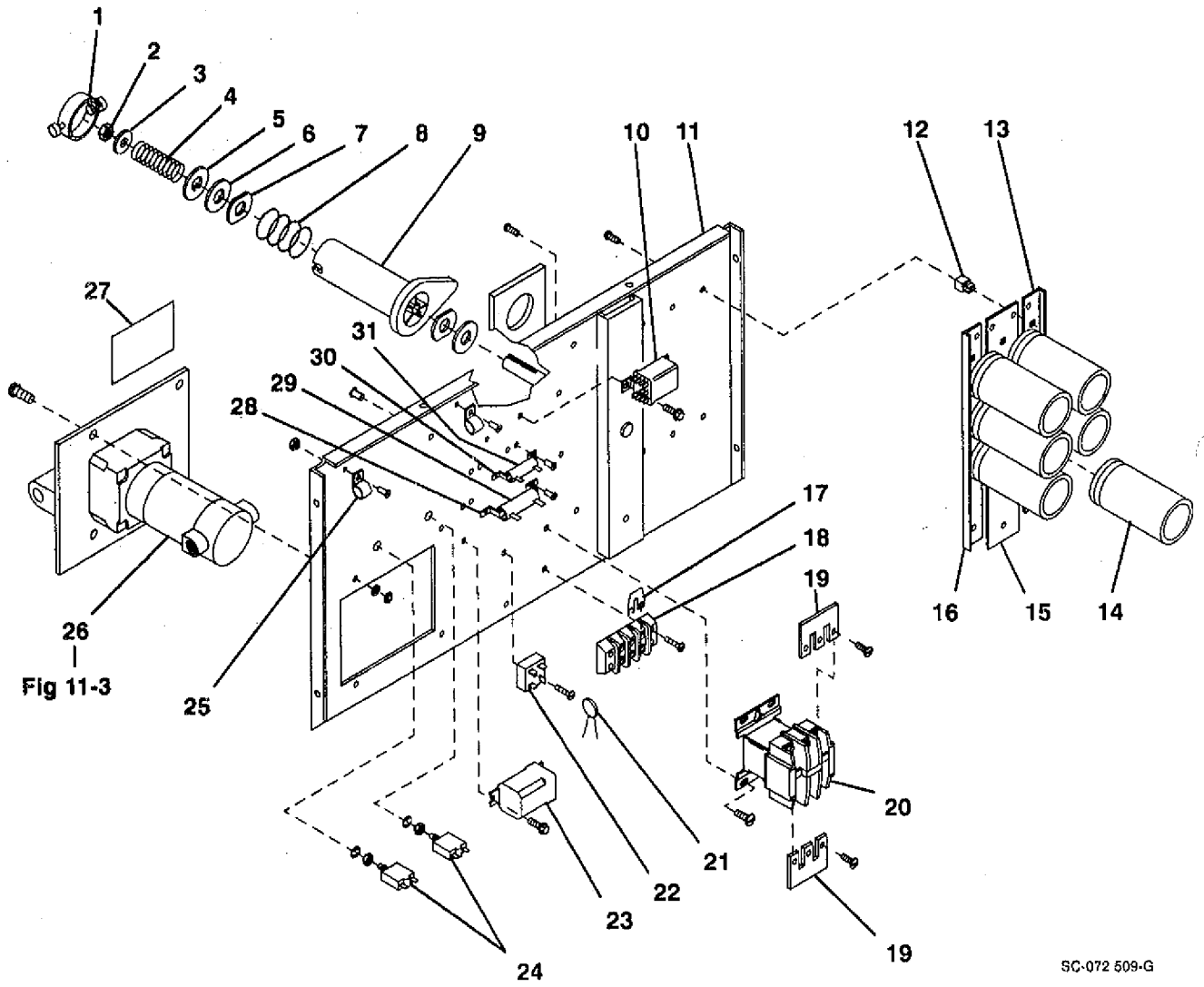
Figure 11-1. Main Assembly

Replace Coils At Factory Or Factory Authorized Service Station

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 11-1. Main Assembly				
1		134 464	LABEL, warning general precautionary	1
2		+115 521	WRAPPER	1
3		008 072	HOUSING PLUG & PINS, (consisting of)	1
		058 971	· TERMINAL, male 1 pin	8
4	PLG2	008 073	HOUSING RECEPTACLES & SOCKETS, (consisting of)	1
		058 972	· TERMINAL, female 1skt	8
5		Fig 11-2	BAFFLE, air w/components	1
6		Fig 11-4	PANEL, rear w/components	1
7		039 778	RECEPTACLE, str 2P3W 50A 250V	1
8	PLG1	023 210	CABLE SET, pwr 250V 10ga 3/c 9ft	1
8	PLG1	085 986	CABLE, pwr 10ga 3/c 9ft (over 230V)	1
9		083 175	SKID, base	2
10		605 741	CLIP, mtg resistor .312 ID core	2
11	R2	079 781	RESISTOR, WW fxd 25W 50 ohm	1
12	Z	083 912	STABILIZER	1
13	TP2	089 276	THERMOSTAT, NO	1
14	T1	093 173	TRANSFORMER, pwr main (200(208)/230) (consisting of)	1
15		092 028	· COIL, pri/sec	1
14	T1	093 174	TRANSFORMER, pwr main (230/460) (consisting of)	1
15		092 029	· COIL, pri/sec	1
14	T1	093 175	TRANSFORMER, pwr main (230/460/575) (consisting of)	1
15		092 030	· COIL, pri/sec	1
16		Fig 11-5	PANEL, front w/components	1
17		023 100	CABLE, interconnecting grd	1
18		026 843	INSULATOR, vinyl blk-43	2
19		010 368	CLAMP, grd 200A	1
20		039 901	PLUG, jack blk (consisting of)	1
21		019 833	· STRIP, cop .010 x 2.500 x .750	1
22		010 521	· WIRE, tie bag 16ga x 5 in	1
23		602 178	· SCREW, set stl sch .250-20 x .375knr cup point	2
24		101 219	· PLUG, jack 5/8 x 2-5/8	1
25		026 978	· INSULATOR, jack plug blk	1
26		602 160	· SCREW, slftpg type F filh 8-32 x .250	1
		602 171	· WRENCH, hex .125	1
27		++	GUN	1
28		115 522	PANEL, side	1
29		089 899	LATCH, slide flush style	2
		041 288	NO. 10B RUNNING GEAR, (Fig 11-8)	1

++For Parts List of Gun See OM-1025.

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.



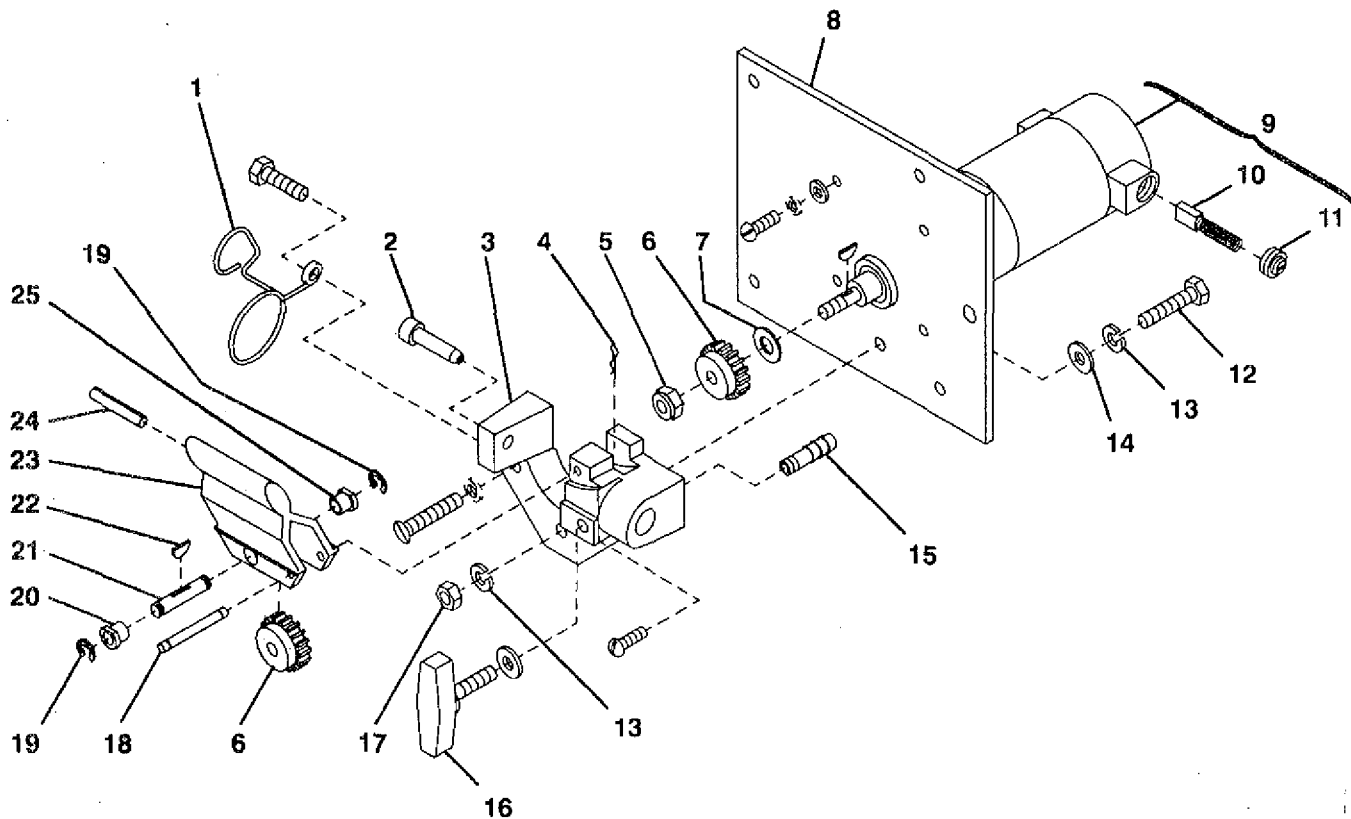
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Figure 11-2. Baffle, Air w/Components

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 11-2. Baffle, Air w/Components (Fig 11-1 Item 5)				
1		058 427	RING, retaining spool	1
2		085 980	NUT, stl hex full fnsh .625-11	1
3		605 941	WASHER, flat stl .640 ID x 1.000 OD x 14ga thk	1
4		057 543	SPRING, cprsn .845 OD x .091 wire x 1.500	1
5		057 971	WASHER, flat stl keyed 1.500dia x .125thk	1
6		010 191	WASHER, fbr .656 ID x 1.500 OD x .125thk	2
7		058 628	WASHER, brake stl	2
8		057 745	SPRING, cprsn 2.430 OD x .090 wire x 2.500	1
9		058 428	HUB, spool	1
		026 837	INSULATOR, term nyl	1
10	CR2	006 393	RELAY, encl 24VAC DPDT	1
11		044 995	BAFFLE, air	1
12		083 147	GROMMET, scr No. 8/10 panel hole .312 sq .500 high	6
13		082 907	ANGLE, mtg RH capacitor	1
14	C6	031 728	CAPACITOR, elcltlt 20000uf 35VDC	6
15		082 902	STRIP, mtg center capacitor	1
16		082 875	ANGLE, mtg LH capacitor	1
17		038 620	LINK, jumper term blk 30A	1
18	TE1	026 189	BLOCK, term 30A 3P	1
19		034 260	LINK, connecting contactor term	2
20	W	035 519	CONTACTOR, def prp 40A 3P 24V (consisting of)	1
		024 493	· COIL, cntor 24VAC 40A	1
21	VR2	046 685	VARISTOR, .6W 175VDC	1
22	SR2	035 704	RECTIFIER, integ 40A 800V	1
23	CR1	072 817	RELAY, encl 24VAC DPDT	1
24	CB1,2	083 431	CIRCUIT BREAKERS, man reset 1P 5A 250V	2
25		010 145	CLAMP, nyl .500 clamp dia	2
26		122 192	DRIVE ASSEMBLY, wire (Fig 11-3)	1
27		114 520	LABEL, before operating check	1
28		605 741	CLIP, mtg resistor .312 ID core	2
29	R3	059 642	RESISTOR, WW fxd 25W 10 ohm	1
30		052 704	CLIP, spring mtg resistor	2
31	R5	006 537	RESISTOR, WW fxd 12W .51 ohm	1

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
119 039 Figure 11-3. Drive Assembly, Wire (Fig 11-2 Item 26)				
1		057 551	SPRING, pressure drive roll	1
2		058 549	GUIDE, wire inlet 1/16	1
3		120 370	HOUSING, drive roll feeder	1
4		604 741	PIN, cotter hair .042 x .937	1
5		605 525	NUT, stl sflkg hex thin .312-24	1
6		057 590	GEAR, drive roll V groove .030-.035 wire keyed	2
7		010 929	WASHER, flat stl spr .375	1
8		044 994	INSULATOR, motor	1
9	M	119 040	MOTOR, gear PM 12V 1/25hp 3550RPM (consisting of)	1
10		130 820	BRUSH & SPRING	2
11		057 432	SCREW, cap holder brush	2
12		079 624	SCREW, cap stl hexhd sflkg .375-16 x 2.250	1
13		602 213	WASHER, lock stl split .375	2
14		010 910	WASHER, flat stl SAE .375	1
15		079 633	FITTING, hose brs barbed nipple 3/16tbg	1
16		079 772	KNOB, plstc T 1.500 lg x .312-18 x 2.000 bar	1
17		601 838	NUT, brs hex .375-16 jam hvy	1
18		058 359	PIN, pivot	1
19		605 854	RING, retaining	2
20		072 649	BEARING, drive assy wire	1
21		058 360	SHAFT, drive roll	1
22		605 287	KEY, woodruff .062 x .250	2
23		058 363	COVER, drive roll	1
24		010 918	PIN, spring CS .156 x 1.500	1
25		072 585	BEARING, drive assy wire	1

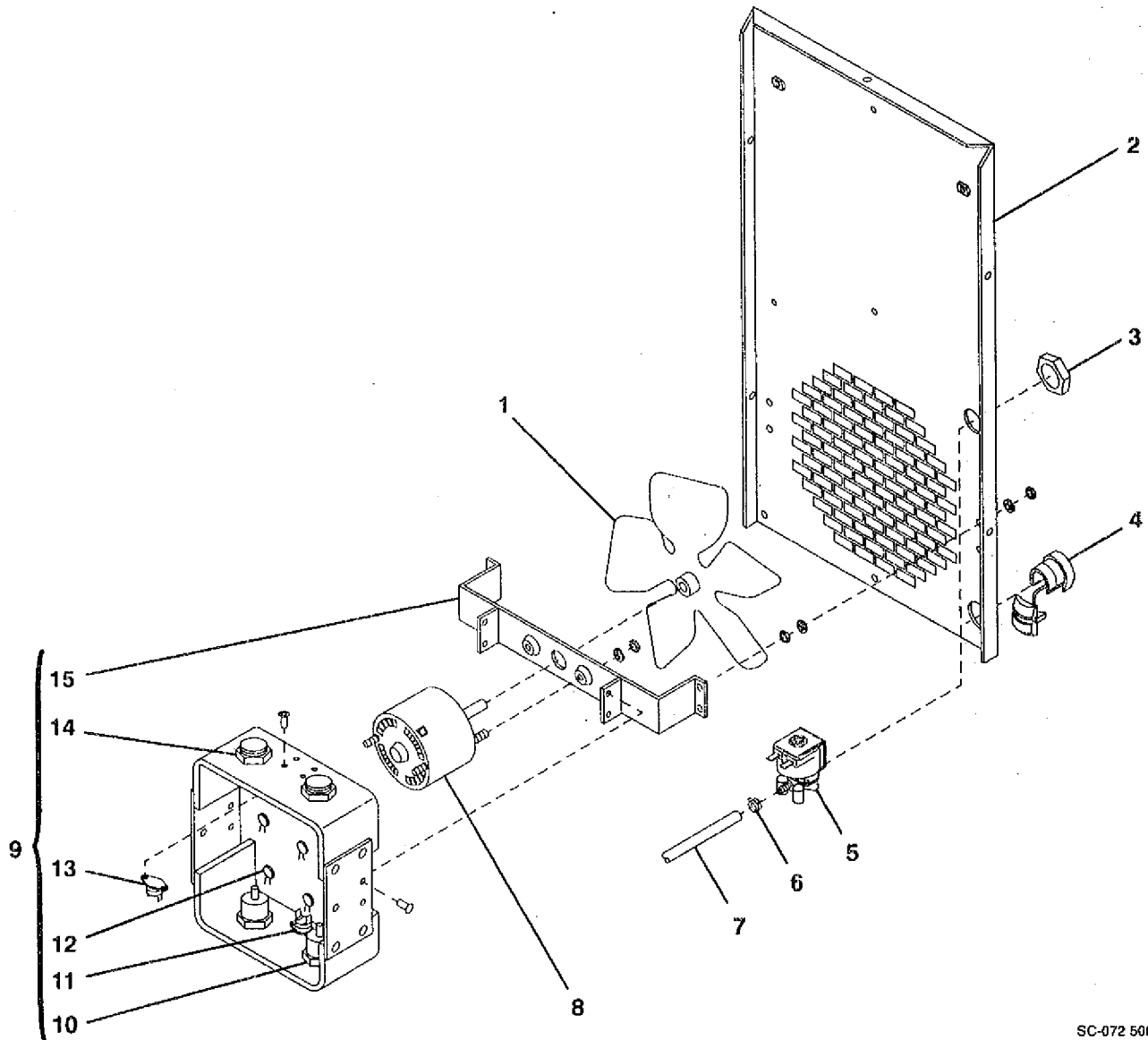


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Figure 11-3. Drive Assembly, Wire

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

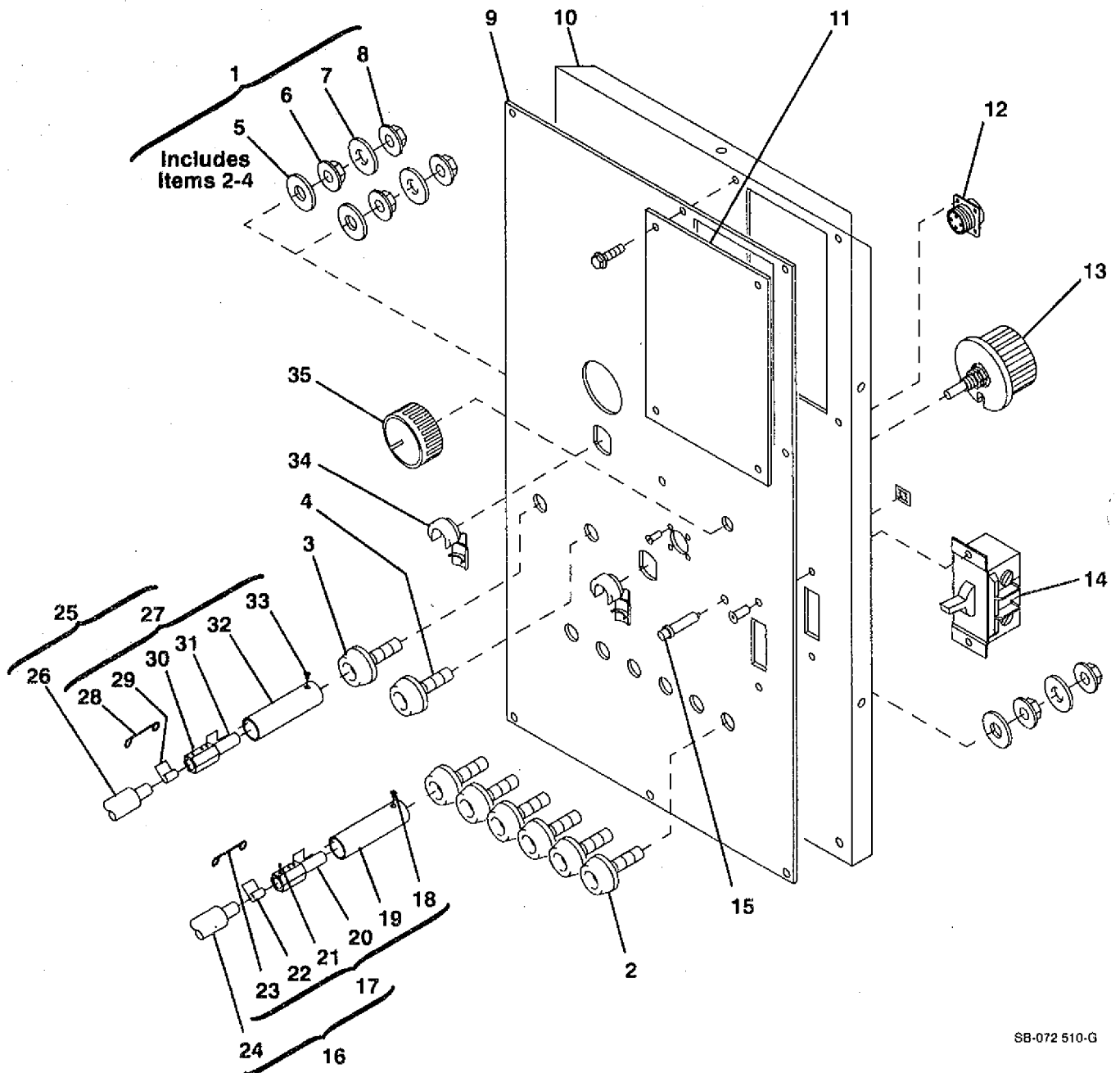
Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 11-4. Panel, Rear w/Components (Fig 11-1 Item 6)				
1		032 662	BLADE, fan 10 in 5wg .250 bore CW	1
2		134 982	PANEL, rear	1
3		605 227	NUT, nyl hex jam .750NPST	1
4		010 290	BUSHING, strain relief 1.030 ID x 1.090mtg hole	1
5	GS1	125 785	VALVE, 24VAC 2 way custom port 1/8orf	1
6		089 120	CLAMP, hose .375-.450 clp dia slftrng	1
7		604 550	HOSE, nprn brd No. 1 x .187 ID (order by ft)	3ft
8	FM	032 678	MOTOR, 1/50hp 230VAC 1500RPM	1
9	SR1	137 914	RECTIFIER, si diode (consisting of)	1
10		037 306	· DIODE, rect 150A 300V RP	2
11	TP1	086 323	· THERMOSTAT, NO close 125F open 105F	1
12	C1-4	031 689	· CAPACITOR, rectifier	4
13	TP3	604 515	· THERMOSTAT, NC open 212F close 192F	1
14		037 305	· DIODE, rect 150A 300V SP	2
15		137 912	· BRACKET, mtg fan motor	1



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Figure 11-4. Panel, Rear w/Components

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.



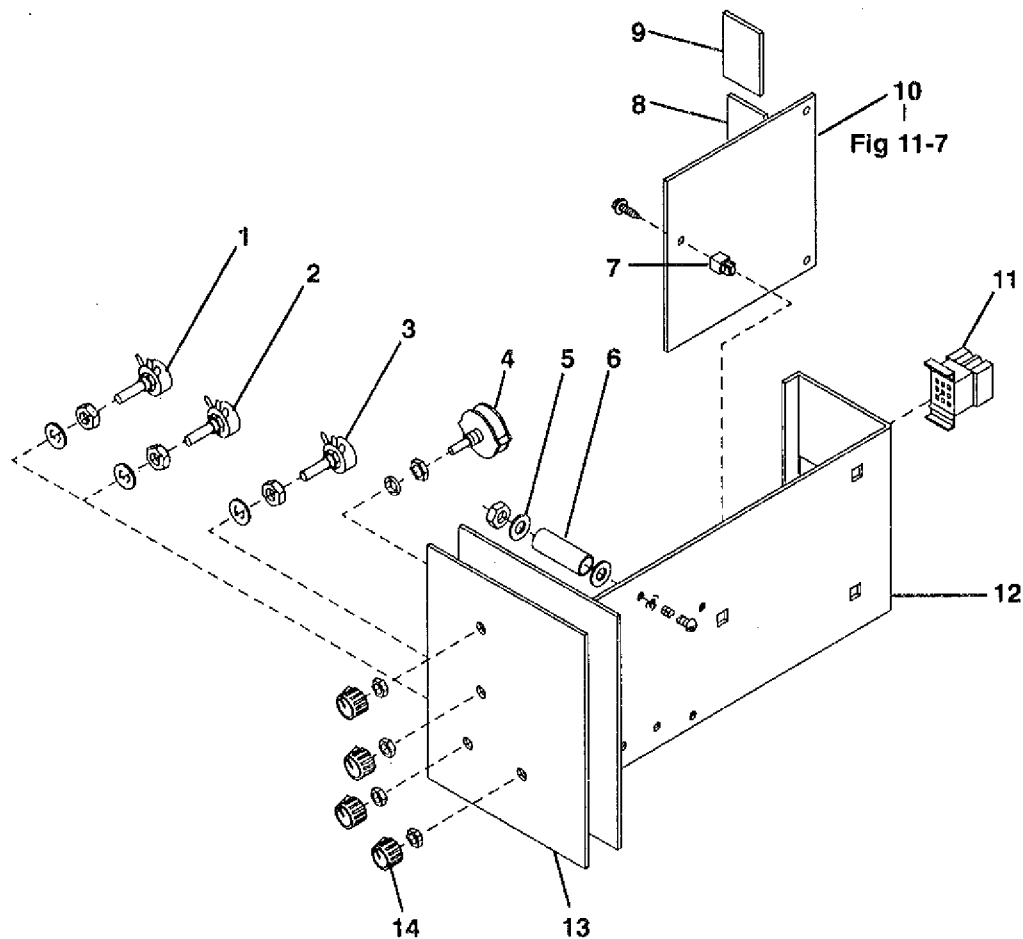
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Figure 11-5. Panel, Front w/Components

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 11-5. Panel, Front w/Components (Fig 11-1 Item 16)				
1		039 801	RECEPTACLE, jack plug blk (consisting of)	1
1		039 800	RECEPTACLE, jack plug red (consisting of)	1
1		057 608	RECEPTACLE, jack plug yellow (consisting of)	6
2		072 334	· RECEPTACLE & NUT, jack plug yellow	1
3		091 542	· RECEPTACLE & NUT, jack plug blk	1
4		091 541	· RECEPTACLE & NUT, jack plug red	1
5		010 291	· WASHER, flat nylafil .625 ID x 1.250 OD x .125thk	1
6		604 668	· NUT, stl siflkg hex med fnsh .500-20	1
7		605 787	· WASHER, lock stl intl tooth .500	1
8		601 881	· NUT, stl hex jam .500-20	1
9			NAMEPLATE, (order by model & serial number)	1
10		083 917	PANEL, front	1
11		087 274	COVER, open module	1
12	RC1	048 282	RECEPTACLE w/SOCKET, (consisting of)	1
		079 534	· TERMINAL, female 1skt 18-14 wire	4
13	R1	605 828	RHEOSTAT, WW 50W 1.5 ohm	1
14	S1	124 511	SWITCH, tgl DPST 40A 600VAC	1
15	PL1	048 573	LIGHT, ind red lens 28V	1
16		023 084	CABLE & PLUG, jack (consisting of)	1
17		039 878	· PLUG ASSEMBLY, (consisting of)	1
18		602 160	· SCREW, slftpg filh 8-32 x .250	1
19		026 975	· INSULATOR, jack plug yellow	1
20		101 219	· PLUG, jack 5/8 x 2-5/8	1
21		602 178	· SCREW, set stl sch .250-20 x .375 knr cup point	2
22		019 833	· STRIP, cop .010 x 2.500 x .750	1
23		010 521	· WIRE, tie bag 16ga x 5 in	1
24		600 318	· CABLE, weld cop strd No. 3 (order by ft)	3ft
25		044 943	PLUG, jack red (consisting of)	1
26		600 318	· CABLE, weld cop strd No. 3 (order by ft)	2ft
27		039 608	· PLUG ASSEMBLY, (consisting of)	1
28		010 521	· WIRE, tie bag 16ga x 5 in	1
29		019 833	· STRIP, cop .010 x 2.500 x .750	1
30		602 178	· SCREW, set stl sch .250-20 x .375 knr cup point	2
31		101 219	· PLUG, jack 5/8 x 2-5/8	1
32		602 814	· INSULATOR, jack plug red	1
33		602 160	· SCREW, slftpg filh 8-32 x .250	1
34		010 325	BUSHING, strain relief .840 ID x .875mtg hole	2
35		097 924	KNOB, pointer	1

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 11-6. SKP-35 Spot Panel (Optional)				
1	R50	028 769	POTENTIOMETER, C sltd sft 1/T 2W 750K ohm	1
2	R51	028 770	POTENTIOMETER, C sltd sft 1/T 2W 1 meg ohm	1
3	R52	028 768	POTENTIOMETER, C sltd sft 1/T 2W 350K ohm	1
4	S50	086 895	SWITCH, rotary 3 posn	1
5		073 914	WASHER, centering .437dia	2
6	R53	605 890	RESISTOR, WW fxd 15W .25 ohm	1
7		080 509	GROMMET, scr No. 8/10 panel hole .312sq .375 high	3
8	PLG51	135 560	HOUSING PLUG & SOCKETS, (consisting of)	1
		079 747	· TERMINAL, contact hdr 24-18 wire	9
9	PLG50	079 798	HOUSING, term hdr 13 pin	1
		079 747	TERMINAL, contact hdr 24-18 wire	13
10	PC50	097 897	CIRCUIT CARD, dual timer/pulser (Fig 11-7)	1
11	RC55	008 072	HOUSING PLUG & PINS, (consisting of)	1
		058 971	· TERMINAL, male 1 pin	8
12		086 650	PANEL, spot timer SKP-35	1
13			NAMEPLATE, (order by model and serial number)	1
14		097 922	KNOB, pointer	4
		087 255	LABEL, wired for SKP-35	1
		046 468	NOZZLE, spot outside corner .920 ID x 2.843	1
		046 469	NOZZLE, spot inside corner .920 ID x 2.375	1
		046 470	NOZZLE, spot flat .920 ID x 2.375	1

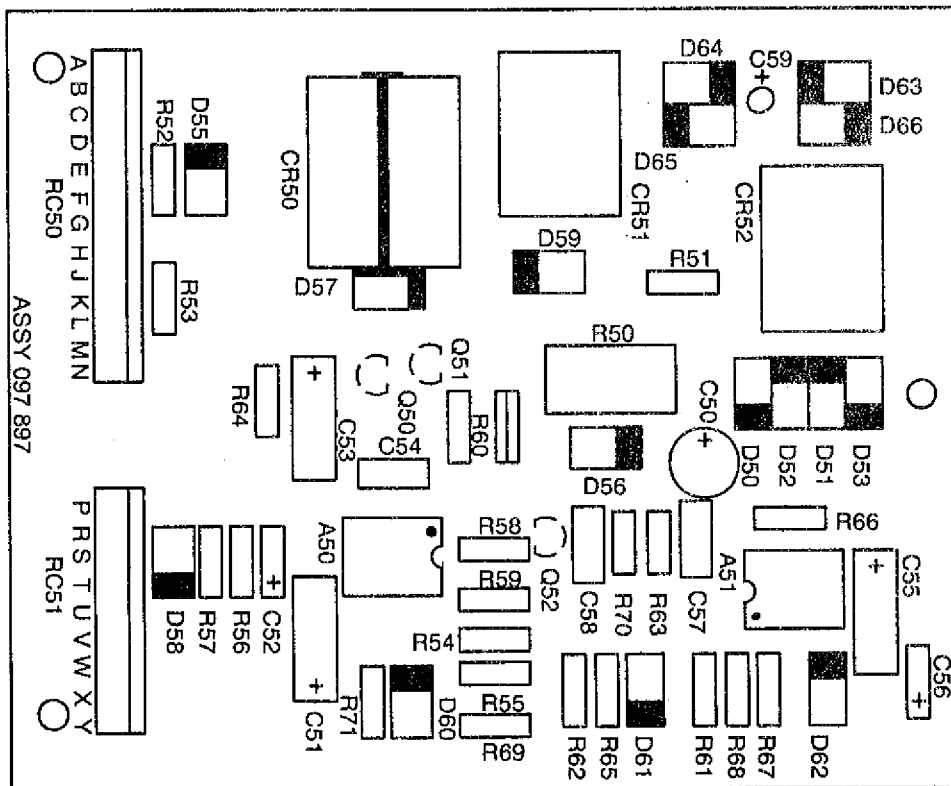


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Figure 11-6. SKP-35 Spot Panel (Optional)

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

Dia. Mkgs.	Part No.	Description	Quantity
PC50	097 897	Figure 11-7. Circuit Card, Dual Timer/Pulser (Fig 11-6 Item 10)	
A50,51	009 159	IC, linear 358	2
C50	039 482	CAPACITOR, elctlt 100uf 35VDC	1
C51,53,55	032 820	CAPACITOR, tantlm 2.2uf 35VDC	3
C52,56	073 714	CAPACITOR, tantlm .22uf 35V	2
C54,57,58	073 739	CAPACITOR, cer mono .1uf 50VDC	3
C59	090 573	CAPACITOR, elctlt 10uf 50V	1
CR50	027 810	RELAY, encl 24VDC 4PDT	1
CR51	099 019	RELAY, encl 24VDC SPST	1
CR52	099 018	RELAY, encl 24VDC SPDT	1
	079 844	SPRING, hold down relay	1
	091 861	SOCKET, relay 14skt	1
D50-53,55,57-66	026 202	DIODE, rect 1A 400V SP	15
D56	037 449	DIODE, zener 15V 1W SP	1
Q50,51	037 200	TRANSISTOR, NPN 200MA 40V	2
Q52	073 535	TRANSISTOR, NPN 100MA 60V	1
R50	030 018	RESISTOR, C 1W 820 ohm	1
R51	035 823	RESISTOR, CF 25W 100 ohm	1
R52,71	035 884	RESISTOR, CF .25W 100K ohm	2
R53,57,61,68,70	039 331	RESISTOR, CF .25W 4.7K ohm	5
R54,56,59, 60,62,66,67	035 827	RESISTOR, CF .25W 10K ohm	7
R55,58	035 886	RESISTOR, CF .25W 22K ohm	2
R63	039 333	RESISTOR, CF .25W 18K ohm	1
R64,69	039 327	RESISTOR, CF .25W 220 ohm	2
R65	035 887	RESISTOR, CF .25W 3.3K ohm	1
	092 648	RESISTOR, WW fxd zero ohm	1
RC50	079 795	TERMINAL, hdr 13 pin	1
RC51	072 670	TERMINAL, hdr 9 pin	1

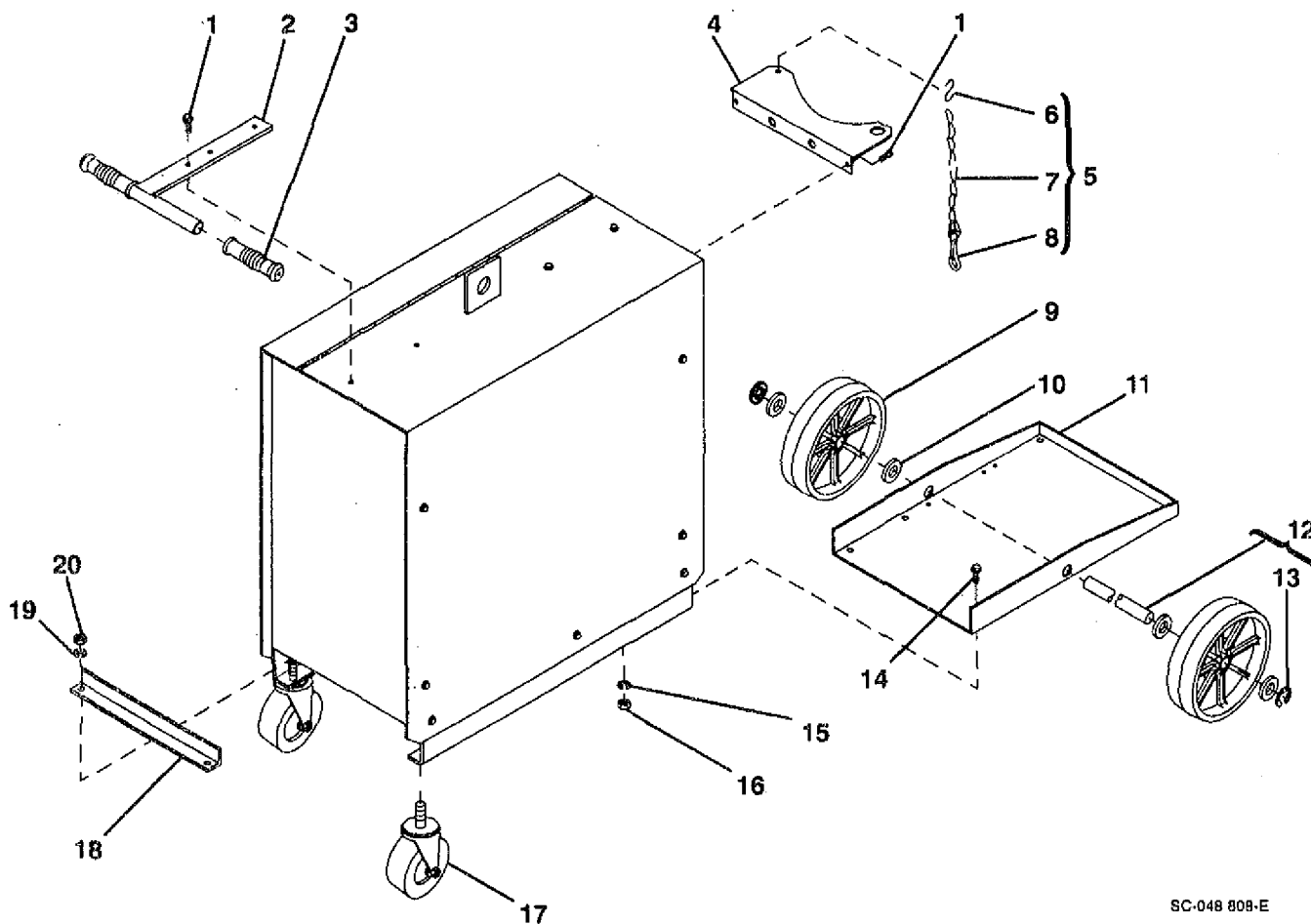


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Figure 11-7. Circuit Card, Dual Timer/Pulser PC50

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

Item No.	Part No.	Description	Quantity
Figure 11-8. No. 10B Running Gear			
1	601 954	SCREW, cap stl hexwhd .250-20 x .750	4
2	025 193	HANDLE, running gear	1
3	604 423	GRIP, handle 7/8 ID x 4-1/2	2
4	057 478	BRACKET, support tank	1
5	022 617	CHAIN, cyl racks (consisting of)	1
6	602 389	· HOOK, S blunt 1-1/2 in	1
7	602 387	· CHAIN, weldless 2/0 x 27 in	1
8	602 384	· SNAP, chain	1
9	070 799	WHEEL, rubolene 10 in dia x 2.250 wide x .750	2
10	602 250	WASHER, flat stl SAE .750	4
11	052 693	RACK, cylinder	1
12	052 692	AXLE, running gear (consisting of)	1
13	121 614	· RING, retain ext .750 shaft x .085	2
14	601 944	SCREW, cap stl hexhd .312-18 x .750	4
15	602 211	WASHER, lock stl split .312	4
16	601 869	NUT, stl hex jam .312-18	4
17	008 999	CASTER, plstc swvl 4 in dia	2
18	052 691	ANGLE, spreader cyl rack	1
19	602 213	WASHER, lock stl split .375	2
20	601 871	NUT, stl hex jam .375-16	2



SC-048 808-E

Figure 11-8. No. 10B Running Gear

BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

OPTIONS AND ACCESSORIES

ACCESSORIES



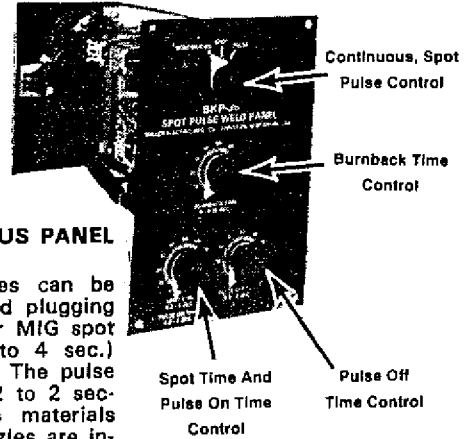
POWER CORD

Stock No. 057 609
Twenty-five (7.6) foot power cord extension with plug. For field installation.

GUN CABLE HOLDER
Stock No. 007 775
A convenient way to store gun and cable.

SKP-35, SPOT, PULSE, CONTINUOUS PANEL

Stock No. 086 271
Spot and pulsed welding capabilities can be added by removing the faceplate and plugging in the SKP panel. The spot mode for MIG spot welding adjusts welding time (0.3 to 4 sec.) and burnback time (0 to 0.25 sec.). The pulse mode can be adjusted to provide 0.2 to 2 seconds on/off time for welding thin materials without burn through. Three spot nozzles are included for use with the GA-20C gun. They are designed for standard use, outside corner and inside corners.



CONSUMABLE PRODUCTS FOR GA-20C GUN

SPOT NOZZLES

" 24 mm Orifice)
($\frac{1}{8}$ " 24 mm Orifice)
Type Stock No.
Standard 046 470
Outside Corner 046 468
Inside Corner 046 469

NOZZLE RETAINING NUT
Stock No. 082 083

CONTACT TUBE ADAPTOR
.023"/.025" (0.6 mm)
Stock No. 087 332
.030" (0.8 mm) and .035"
(0.9 mm) Stock No. 082 190

INSULATOR
Stock No. 082 241

NOZZLES
Orifice Size Stock No.
5/8" (16 mm) *049 929
1/2" (13 mm) 049 099
7/16" (11 mm) 049 098
*Standard

REPLACEMENT LINER
.023"/.025" (0.6 mm)
Stock No. 087 301
.030" (0.8 mm) and .035" (0.9 mm)
Stock No. 083 885

CONTACT TUBES
Wire Size Stock No.
.023"/.025" (0.6 mm) 087 299
.030" (0.8 mm) 000 067
.035" (0.9 mm) 000 068

.023/.025 WIRE DRIVE KIT
Stock No. 087 378
Includes drive roll (one flat drive roll used with standard grooved drive roll), gun liner, outlet guide, contact tube adaptor and two contact tubes.

REPLACEMENT DRIVE ROLLS
For .023/.025 (0.6mm) wire:
Stock No. 058 553 and 057 590
For .030" (0.8mm) and .035"
(0.9mm) wire:
Stock No. 057 590 (Two required)

