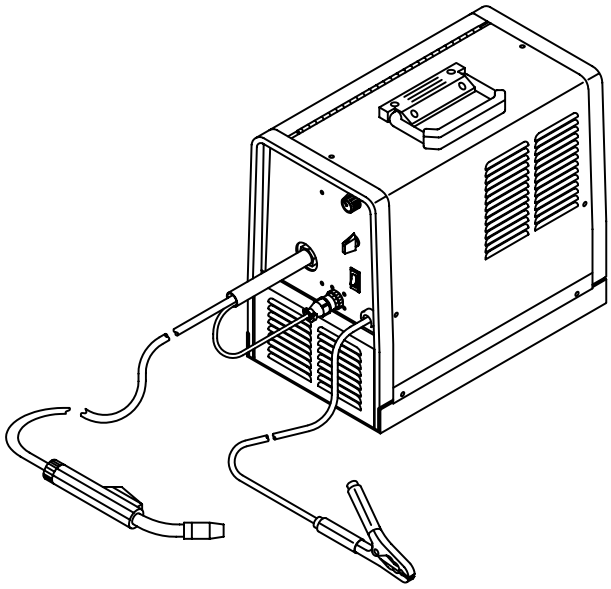
March 1993 Form: OM-1309A
Effective With Serial No. KC192204

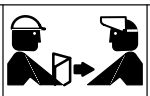
OWNER'S MANUAL



Millermatic® 90 / Millermatic® 130 And GA-17C Gun

- CV/DC Welding Power Source/Wire Feeder
- For FCAW And GMAW Welding
- 90 Amperes, 18 Volts At 20% Duty Cycle
- Uses 115 Volts AC, Single-Phase Input Power
- Overheating, Short-Circuit, And Motor Overload Protection
- Usable Range Of 30 To 130 Amperes
- Includes Gun, Welding Wire, Gas Valve, And Instructional Video

- Read and follow these instructions and all safety blocks carefully.
- Have only trained and qualified persons install, operate, or service this unit.
- Call your distributor if you do not understand the directions.



- Give this manual to the operator.

- For help, call your distributor
- or: MILLER ELECTRIC Mfg. Co., P.O. Box 1079, Appleton, WI 54912 414-734-9821

PRINTED IN USA

MILLER'S TRUE BLUE™ LIMITED WARRANTY

Effective January 1, 1992
(Equipment with a serial number preface of "KC" or newer)

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

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

Within the warranty periods listed below, MILLER will repair or replace any warranted parts or components that fail due to such defects in material or workmanship. MILLER must be notified in writing within thirty (30) days of such defect or failure, at which time MILLER will provide instructions on the warranty claim procedures to be followed.

MILLER shall honor warranty claims on warranted equipment listed below in the event of such a failure within the warranty time periods. All warranty time periods start on the date that the equipment was delivered to the original retail purchaser, or one year after the equipment is sent to the distributor.

1. 5 Years Parts – 3 Years Labor
   - Original main power rectifiers
2. 3 Years — Parts and Labor
   - Transformer/Rectifier Power Sources
   - Plasma Arc Cutting Power Sources
   - Semi-Automatic and Automatic Wire Feeders
   - Robots
3. 2 Years — Parts and Labor
   - Engine Driven Welding Generators (NOTE: Engines are warranted separately by the engine manufacturer.)
   - Air Compressors
4. 1 Year — Parts and Labor
   - Motor Driven Guns
   - Process Controllers
   - Water Coolant Systems
   - HF Units
   - Grids
   - Spot Welders
   - Load Banks
   - SDX Transformers
   - Running Gear/Trailers
   - Field Options

   (NOTE: Field options are covered under True Blue™ for the remaining warranty period of the product they are installed in, or for a minimum of one year — whichever is greater.)
5. 6 Months — Batteries
6. 90 Days — Parts and Labor
   - MIG Guns/TIG Torches
   - Plasma Cutting Torches
   - Remote Controls
   - Accessory Kits
   - Replacement Parts

MILLER'S True Blue™ Limited Warranty shall not apply to:

1. Items furnished by MILLER, but manufactured by others, such as engines or trade accessories. These items are covered by the manufacturer's warranty, if any.
2. Consumable components; such as contact tips, cutting nozzles, contactors and relays or parts that fail due to normal wear.
3. Equipment that has been modified by any party other than MILLER, or equipment that has been improperly installed, improperly operated or misused based upon industry standards, or equipment which has not had reasonable and necessary maintenance, or equipment which has been used for operation outside of the specifications for the equipment.

MILLER PRODUCTS ARE INTENDED FOR PURCHASE AND USE BY COMMERCIAL/INDUSTRIAL USERS AND PERSONS TRAINED AND EXPERIENCED IN THE USE AND MAINTENANCE OF WELDING EQUIPMENT.

In the event of a warranty claim covered by this warranty, the exclusive remedies 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 as determined by MILLER. Therefore no compensation or reimbursement for transportation costs of any kind will be allowed.

TO THE EXTENT PERMITTED BY LAW, THE REMEDIES PROVIDED HEREIN ARE THE SOLE AND EXCLUSIVE REMEDIES. IN NO EVENT SHALL MILLER BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING LOSS OF PROFIT), WHETHER BASED ON CONTRACT, TORT OR ANY OTHER LEGAL THEORY.

ANY EXPRESS WARRANTY NOT PROVIDED HEREIN AND ANY IMPLIED WARRANTY, GUARANTY OR REPRESENTATION AS TO PERFORMANCE, AND ANY REMEDY FOR BREACH OF CONTRACT TORT OR ANY OTHER LEGAL THEORY 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 FITNESS FOR PARTICULAR PURPOSE, WITH RESPECT TO ANY AND ALL EQUIPMENT FURNISHED BY MILLER IS EXCLUDED AND DISCLAIMED BY MILLER.

Some states in the U.S.A. do not allow limitations of how long an implied warranty lasts, or the exclusion of incidental, indirect, special or consequential damages, so the above limitation or exclusion may not apply to you. This warranty provides specific legal rights, and other rights may be available, but may vary from state to state.

In Canada, legislation in some provinces provides for certain additional warranties or remedies other than as stated herein, and to the extent that they may not be waived, the limitations and exclusions set out above may not apply. This Limited Warranty provides specific legal rights, and other rights may be available, but may vary from province to province.

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 distributor and/or equipment manufacturer's Transportation Department.

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

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

Model _____

Serial or Style No. _____

Date of Purchase _____

ERRATA SHEET

June 9, 1993 FORM: OM-1309A

Use above FORM number when ordering extra manuals.

After this manual was printed, refinements in equipment design occurred. This sheet lists exceptions to data appearing later in this manual.

CHANGES TO SECTION 6 – ELECTRICAL DIAGRAMS

Replace Figure 6-1. Circuit Diagram For Welding Power Source (see Page 2 on this Errata Sheet)

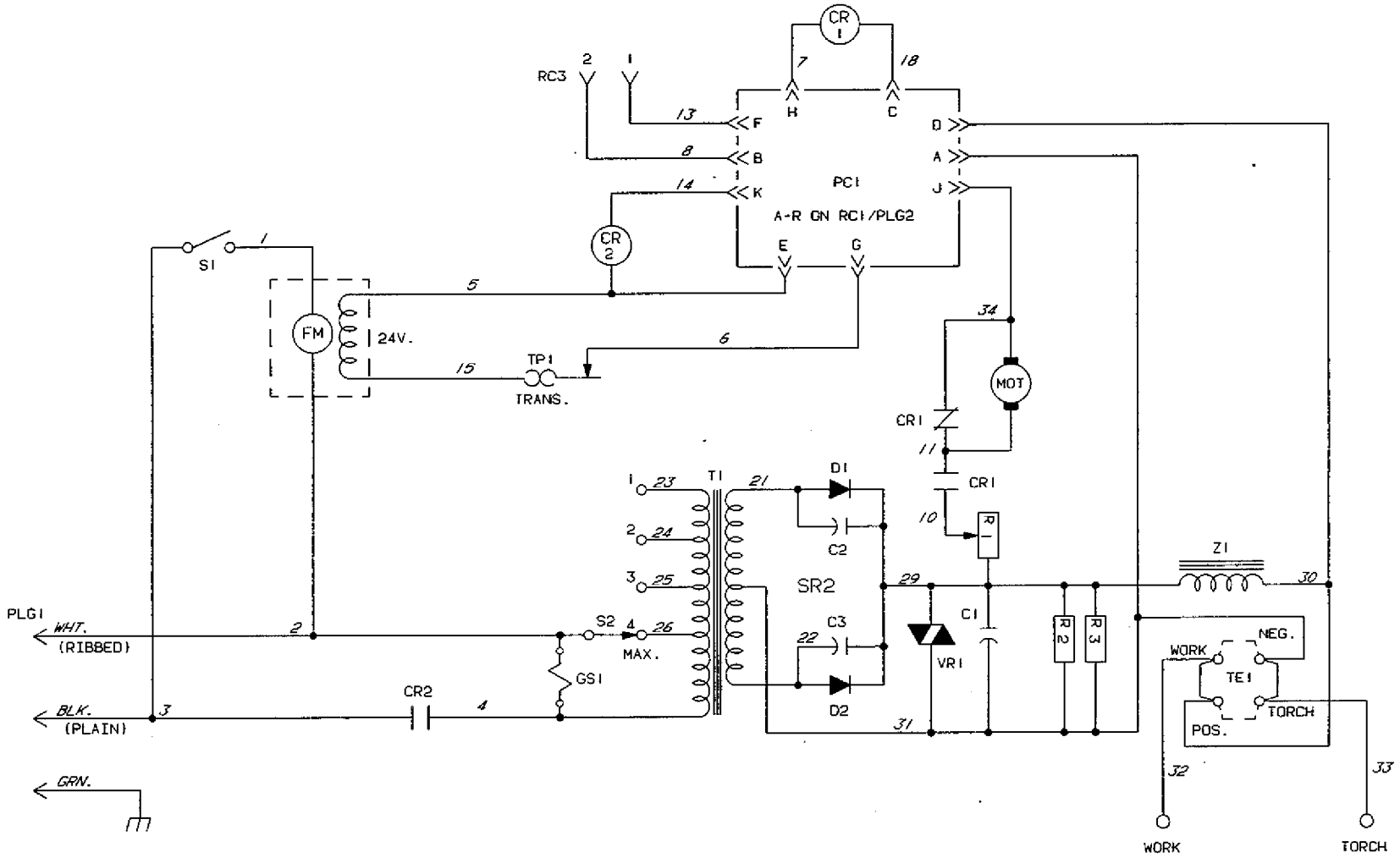
Replace Figure 6-2. Wiring Diagram For Welding Power Source (see Page 3 on this Errata Sheet)

CHANGES TO SECTION 8 – PARTS LIST

Change Parts List as follows:

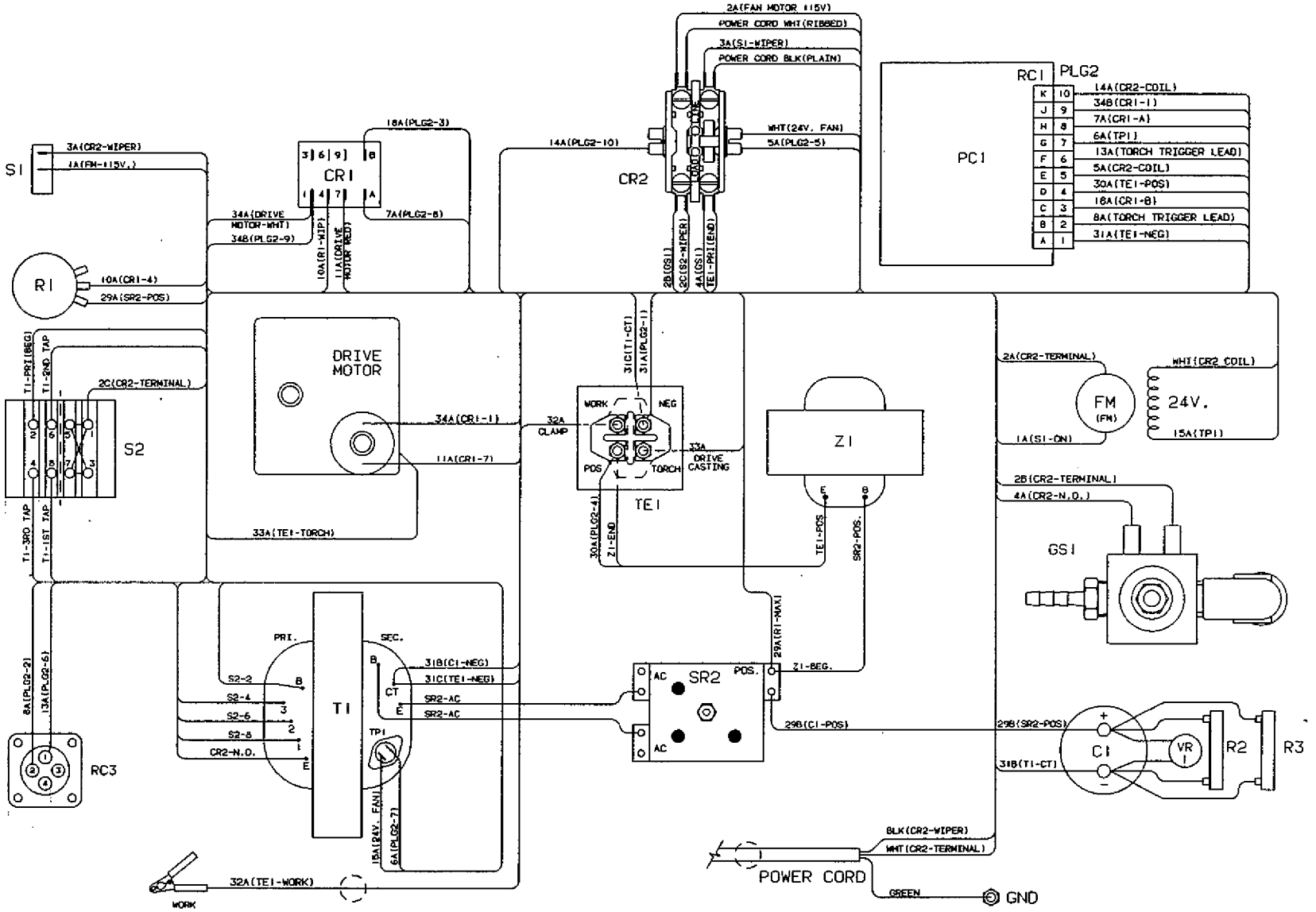
**	Dia. Mkgs.	Part No.	Replaced With	Description	Quantity
. 23-25		108 105	022 160	CLAMP, capacitor 3.000dia (qty chg) (Eff w/KD436311)	1
. 23-26		109 039	162 264	CAPACITOR, elctlt 91000uf 35VDC (qty chg deleted C2) (Eff w/KD436311)	1

**First digit represents page no – digits following dash represent item no.
BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.



SC-162 261

Figure 6-1. Circuit Diagram For Welding Power Source Effective With Serial No. KD436311



SC-162 262

Figure 6-2. Wiring Diagram For Welding Power Source Efective With Serial No. KD436311

PRÉCAUTIONS DE SÉCURITÉ EN SOUDAGE À L'ARC

MISE EN GARDE

LE SOUDAGE À L'ARC est dangereux.

PROTÉGEZ-VOUS, AINSI QUE LES AUTRES, CONTRE LES BLESSURES GRAVES POSSIBLES OU LA MORT. NE LAISSEZ PAS LES ENFANTS S'APPROCHER, NI LES PORTEURS DE STIMULATEUR CARDIAQUE (A MOINS QU'ILS N'AIENT CONSULTÉ UN MÉDECIN).

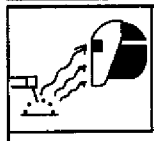
Le soudage, comme la plupart des activités industrielles, expose à certains risques. Le soudage n'est pas dangereux lorsqu'on prend des précautions. Les consignes de sécurité suivantes ne font que résumer l'information contenue dans les normes énumérées ci-après. Lisez et respectez toutes ces normes.

SEULES DES PERSONNES QUALIFIÉES DOIVENT FAIRE DES TRAVAUX D'INSTALLATION, DE RÉPARATION, D'ENTRETIEN ET D'ESSAI.

L'ÉLECTROCUTION peut être mortelle.

Une décharge électrique peut vous tuer ou vous brûler gravement. L'électrode et le circuit de soudage sont sous tension au démarrage. Le circuit d'entrée et les circuits internes des matériels sont aussi sous tension dès la mise en marche. En soudage automatique ou semi-automatique avec fil, ce dernier, le support de roquette, le logement des galets d'entraînement et toutes les pièces métalliques en contact avec le fil de soudage sont sous tension. Des matériels mal installés ou mal mis à la terre sont dangereux.

1. Ne touchez pas à des pièces sous tension.
2. Portez des gants et des vêtements isolants, secs et non troués.
3. Isolez-vous de la tôle à souder et de la mise à la terre au moyen de petits tapis isolants ou autres.
4. Déconnectez la prise d'entrée des matériels ou arrêtez leur moteur avant de les installer ou d'en faire l'entretien.
5. Veillez à installer ces matériels et à les mettre à la terre selon le manuel d'utilisation et les codes nationaux, provinciaux et locaux applicables.
6. Arrêtez tous les matériels après utilisation.
7. N'utilisez pas de câbles usés, endommagés, mal épissés ou de calibre trop petits.
8. N'enroulez pas de câbles autour de votre corps.
9. Mettez à la terre la tôle à souder au moyen d'une bonne prise de terre.
10. Ne touchez pas à l'électrode si vous êtes en contact avec le circuit de soudage (terre).
11. N'utilisez que des matériels en bon état. Réparez ou remplacez sur-le-champ les pièces endommagées.
12. Portez un harnais de sécurité si vous travaillez en hauteur.
13. Fermez solidement tous les panneaux et les capots.



Le RAYONNEMENT DE L'ARC peut brûler les yeux et la peau; le BRUIT peut endommager l'ouïe.

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

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

Les VAPEURS ET LES FUMÉES sont dangereuses pour la santé.

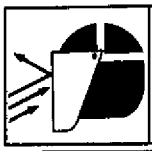
Le soudage dégage des vapeurs et des fumées qu'il est dangereux de respirer.

1. Écartez le visage pour éviter de respirer les fumées.
2. À l'intérieur, assurez-vous que l'aire de soudage est bien ventilée ou que les fumées et les vapeurs sont aspirées à l'arc.
3. Si la ventilation est mauvaise, portez un respirateur à adduction d'air approuvé.
4. Lisez les fiches signalétiques et les consignes du fabricant relatives aux métaux, aux produits consummables, aux revêtements et aux produits nettoyants.
5. Ne travaillez dans un espace confiné que s'il est bien ventilé; sinon, portez un respirateur à adduction d'air. Les gaz protecteurs de soudage peuvent déplacer l'oxygène de l'air et causer des blessures ou la mort. Assurez-vous que l'air est propre à la respiration.
6. Ne soudez pas à proximité d'opérations de dégraissage, de nettoyage ou de pulvérisation. La chaleur et les rayons de l'arc peuvent réagir avec des vapeurs et former des gaz hautement toxiques et irritants.
7. Ne soudez pas de tôles galvanisées ou plaquées en plomb ou en cadmium sans les avoir grattées à fond, car ces métaux, et tout revêtement qui en contient, peuvent alors dégager des fumées toxiques. Assurez-vous d'une bonne ventilation et portez un respirateur à adduction d'air si c'est nécessaire.

Le SOUDAGE peut causer un incendie ou une explosion.

L'arc produit des étincelles et des projections. Avec la chaleur intense dégagée par la tôle et les matériels, elles peuvent causer un incendie et des brûlures. Le contact accidentel de l'électrode avec un objet métallique peut provoquer des étincelles, un échauffement ou un incendie.

1. Protégez-vous, ainsi que les autres, contre les étincelles et les projections.
2. Ne soudez pas dans un endroit où des étincelles peuvent atteindre des matériaux inflammables.
3. Enlevez toutes les matières inflammables dans un rayon de 10,7 mètres autour de l'arc, ou couvrez-les soigneusement avec des bâches approuvées.
4. Méfiez-vous des étincelles et des éclats brûlants, susceptibles de pénétrer dans des aires adjacentes par de petites ouvertures ou fissures.
5. Méfiez-vous des incendies et gardez un extincteur à portée de la main.
6. N'oubliez pas qu'une soudure sur un plafond, un plancher, une cloison ou une paroi peut en enflammer l'autre côté.
7. Ne soudez pas un récipient fermé, comme un réservoir ou un tonneau.
8. Connectez le câble de soudage le plus près possible de la tôle de soudage pour empêcher le courant de suivre un parcours long et inconnu, et prévenir ainsi les risques d'électrocution et d'incendie.
9. Ne faites pas dégeler des tuyaux avec un chalumeau.
10. Videz votre carquois porte-électrodes ou coupez le fil au tube-contact après le soudage.
11. Portez des vêtements protecteurs non huileux, tels des gants en cuir, une chemise épaisse, un pantalon sans revers, des chaussures montantes et un casque.



LES ÉTINCELLES ET LES PROJECTIONS BRULANTES peuvent causer des blessures.

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

1. Portez un écran facial ou des lunettes à coques approuvées. Des écrans latéraux sont recommandés.
2. Portez des vêtements de protection individuelle appropriés.

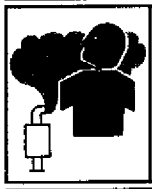
Les BOUTEILLES endommagées peuvent exploser.

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

1. Les bouteilles doivent être protégées contre les sources de chaleur intense, les chocs et les arcs de soudage.
2. Enchaînez verticalement les bouteilles à un support ou à un cadre fixe pour les empêcher de tomber ou d'être renversées.
3. Éloignez les bouteilles de tout circuit électrique ou de soudage.
4. Empêchez tout contact entre une bouteille et une électrode.
5. N'utilisez que des bouteilles de gaz protecteur, des détendeurs, des flexibles et des raccords conçus pour chaque application spécifique; ces matériels et les pièces connexes doivent être en bon état.
6. Ne mettez pas le visage devant le robinet de bouteille en l'ouvrant.
7. Remettez le chapeau de bouteille après utilisation.
8. Lisez et respectez les consignes relatives aux bouteilles de gaz comprimé et aux matériels connexes, ainsi que la publication P-1 de la CGA, énumérées dans les normes ci-dessous.

MISE EN GARDE

Les MOTEURS peuvent être dangereux.



Les GAZ D'ÉCHAPPEMENT DES MOTEURS PEUVENT ÊTRE MORTELS.

Les moteurs produisent des gaz d'échappement nocifs.

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

Le CARBURANT peut causer un incendie ou une explosion.

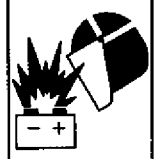
Le carburant est hautement inflammable.

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

Des PIÈCES EN MOUVEMENT peuvent causer des blessures.

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

1. Assurez-vous que les portes, les panneaux, les capots et les protecteurs sont bien fermés.
2. Avant d'installer ou de connecter un système, arrêtez-en le moteur.
3. Seules des personnes qualifiées doivent démonter des protecteurs ou des capots pour faire l'entretien ou le dépannage nécessaire.
4. Pour empêcher un démarrage accidentel d'un système pendant l'entretien, débranchez le câble d'accumulateur à la borne négative.
5. N'approchez pas les mains ou les cheveux de pièces en mouvement; elles peuvent aussi accrocher des vêtements amples et des outils.
6. Réinstallez les capots ou les protecteurs et fermez les portes après des travaux d'entretien et avant de faire démarrer le moteur.



Des ÉTINCELLES peuvent FAIRE EXPLOSER UN ACCUMULATEUR; L'ÉLECTROLYTE D'UN ACCUMULATEUR peut brûler la peau et les yeux.

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

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

La VAPEUR ET LE LIQUIDE DE REFROIDISSEMENT BRÛLANT SOUS PRESSION peuvent brûler la peau et les yeux.

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

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

PRINCIPALES NORMES DE SÉCURITÉ

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

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

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

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

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

Code for Safety in Welding and Cutting, norme CSA W117.2, Association canadienne de normalisation, Standards Sales, 176 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.

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

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

ARC WELDING SAFETY PRECAUTIONS

⚠ WARNING

ARC WELDING can be hazardous.

PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS KEEP AWAY UNTIL CONSULTING YOUR DOCTOR.

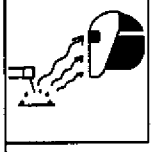
In welding, as in most jobs, exposure to certain hazards occurs. Welding is safe when precautions are taken. The safety information given below is only a summary of the more complete safety information that will be found in the Safety Standards listed on the next page. Read and follow all Safety Standards.

HAVE ALL INSTALLATION, OPERATION, MAINTENANCE, AND REPAIR WORK PERFORMED ONLY BY QUALIFIED PEOPLE.

ELECTRIC SHOCK can kill.

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

1. Do not touch live electrical parts.
2. Wear dry, hole-free insulating gloves and body protection.
3. Insulate yourself from work and ground using dry insulating mats or covers.
4. Disconnect input power or stop engine before installing or servicing this equipment.
5. Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.
6. When making input connections, attach proper grounding conductor first.
7. Turn off all equipment when not in use.
8. Do not use worn, damaged, undersized, or poorly spliced cables.
9. Do not wrap cables around your body.
10. Ground the workpiece to a good electrical (earth) ground.
11. Do not touch electrode if in contact with the work or ground.
12. Use only well-maintained equipment. Repair or replace damaged parts at once.
13. Wear a safety harness if working above floor level.
14. Keep all panels and covers securely in place.



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

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

NOISE

1. Use approved ear plugs or ear muffs if noise level is high.

ARC RAYS

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

FUMES AND GASES can be hazardous to your health.

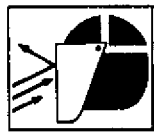
Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.

1. Keep your head out of the fumes. Do not breathe the fumes.
2. If inside, ventilate the area and/or use exhaust at the arc to remove welding fumes and gases.
3. If ventilation is poor, use an approved air-supplied respirator.
4. Read the Material Safety Data Sheets (MSDSs) and the manufacturer's instruction for metals, consumables, coatings, and cleaners.
5. Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Shielding gases used for welding can displace air causing injury or death. Be sure the breathing air is safe.
6. Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
7. Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and if necessary, while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.

WELDING can cause fire or explosion.

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

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



FLYING SPARKS AND HOT METAL can cause injury.

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

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

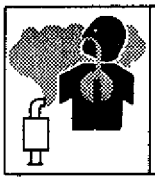
CYLINDERS can explode if damaged.

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

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

⚠ WARNING

ENGINES can be hazardous.



ENGINE EXHAUST GASES can kill.

Engines produce harmful exhaust gases.

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

ENGINE FUEL can cause fire or explosion.

Engine fuel is highly flammable.

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

MOVING PARTS can cause injury.

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

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

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

Batteries contain acid and generate explosive gases.

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

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

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

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

PRINCIPAL SAFETY STANDARDS

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

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

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

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

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

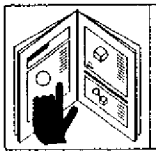
Code for Safety in Welding and Cutting, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.

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

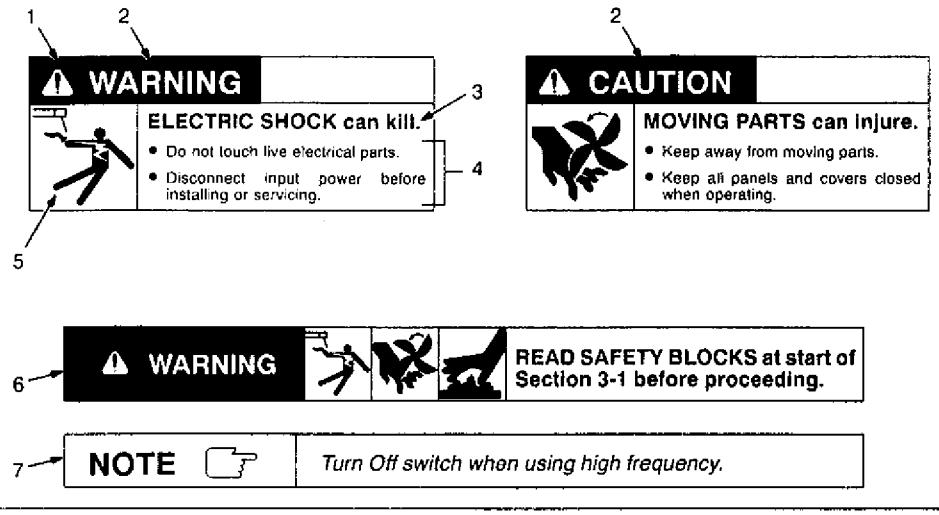
Cutting And Welding Processes, NFPA Standard 51B, from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

TABLE OF CONTENTS

SECTION 1 – SAFETY INFORMATION



- Read all safety messages throughout this manual.
- Obey all safety messages to avoid injury.
- Learn the meaning of WARNING and CAUTION.



1 Safety Alert Symbol

2 Signal Word

WARNING means possible death or serious injury can happen.

CAUTION means possible minor injury or equipment damage can happen.

3 Statement Of Hazard And Result

4 Safety Instructions To Avoid Hazard

5 Hazard Symbol (If Available)

6 Safety Banner

Read safety blocks for each symbol shown.

7 NOTE

Special instructions for best operation – not related to safety.

Figure 1-1. Safety Information

SECTION 2 – SPECIFICATIONS

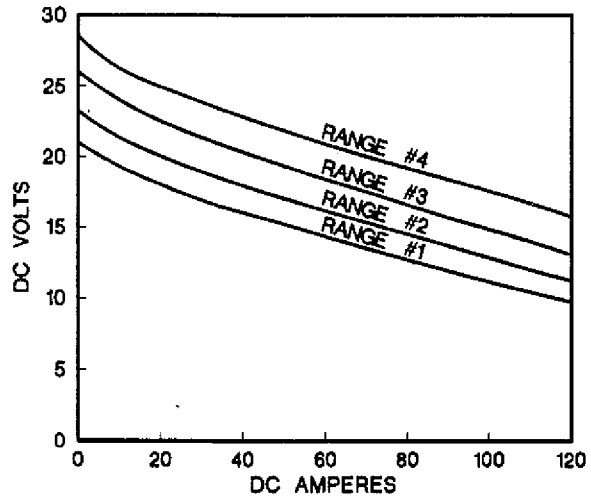
Table 2-1. Welding Power Source

Specifications	Description
Type Of Output	Constant Voltage/Direct Current (CV/DC)
Rated Weld Output	90 Amperes, 18 Volts DC At 20% Duty Cycle (See Section 2-2)
Amperage Range	30-130 A
Type Of Input	Single-Phase; 115 Volts AC; 60 Hertz
Input Amperes At Rated Output	20 Amperes
KVA/KW Used At Rated Output	3 kVA / 2.7 kW
Max. Open-Circuit Voltage	30 Volts DC
Control Circuit Voltage At Gun	24 Volts DC
Welding Processes	Shipped From The Factory Set For Flux Cored Arc Welding (FCAW) (Uses Wire With Flux Inside And Requires No External Shielding Gas)
	Gas Metal Arc Welding (GMAW) (Uses Solid Hard Or Aluminum Wire And External Shielding Gas)
Calculated Speed Range At No Load	283 To 716 ipm (7.1 To 17.9 mpm)
Approximate Wire Feed Range	5 To 800 ipm (0.13 To 20 mpm)
Wire Diameter Range	.023 To .035 in (0.58 To 0.89 mm)
Input Power Cord With Plug	7 ft (2.1 m)
Overall Dimensions	Length: 17 in (432 mm); Width: 10 in (254 mm); Height: 15-1/2 in (394 mm)
Weight (With Gun)	Net: 73 lb (33 kg); Ship: 80 lb (36 kg)

Table 2-2. Welding Gun

Specifications	Description
Ampere Rating	170 Amperes
Duty Cycle	60% Using CO_2 Shielding Gas Or Self-Shielding (Flux Cored) Wire
Wire Size Range	.023 To .035 In (0.58 To 0.89 mm)
Cable Length	10 ft (3 m)
Cooling Method	Air

2-1. Volt-Ampere Curves



The volt-ampere curves show the minimum and maximum voltage and amperage output capabilities of the welding power source. Curves of other settings fall between the curves shown.

ssb1.1 10/91 - SB-124 646-A

Figure 2-1. Volt-Ampere Curves

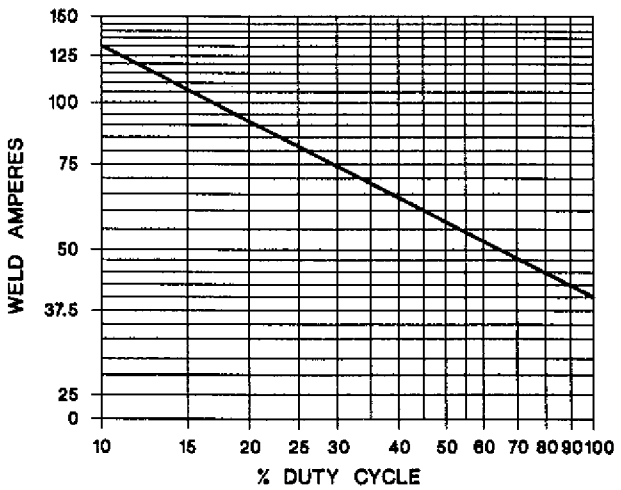
2-2. Duty Cycle

⚠ CAUTION

USING GUN BEYOND DUTY CYCLE RATING can damage gun.

- Do not use gun beyond rated amperage when using CO_2 shielding gas.
- Use gun at 30% duty cycle when using mixed shielding gas.

wlwarn8.1 10/91



Duty cycle is how long the unit can operate within a ten minute period without causing overheating or damage.

This unit is rated at 20% duty cycle allowing welding 2 minutes out of every 10 minutes.

This gun is rated at 60% duty cycle when using CO_2 shielding gas and 30% when using mixed shielding gas.

sb1.3 10/91 - SB-124 655-A

Figure 2-2. Welding Power Source Duty Cycle Chart

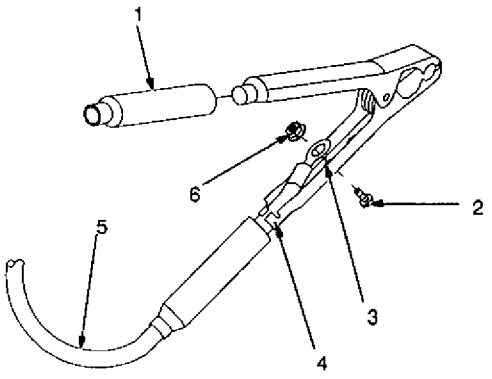
SECTION 3 – INSTALLATION

Table 3-1. Items Included With Welding Power Source

Item	Quantity
Welding Gun – Shipped Set To Feed .030 in (0.8 mm) Wire	1
Spool Of .030 in (0.8 mm) Wire AWS Class E71T-GS Flux-Cored	1
VHS Videotape (28 Minutes)	1
10 ft (3 m) Work Cable And Clamp	1
Contact Tubes (3 – .023 in, 2 – .030 in, And 3 – .035 in)	8

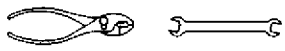
NOTE ☞ *Customer must supply proper shielding gas for desired application.*

3-1. Installing Work Clamp



1 Insulator
2 Bolt
3 Smaller Hole
4 Work Clamp Tabs
Bend tabs around work cable.
5 Work Cable From Unit
6 Nut

Tools Needed:



3/8, 7/16 in

Ref. ST-025 190-C

Figure 3-1. Installing Work Clamp

3-2. Gun Polarity For Wire Type

⚠ WARNING

ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Turn Off welding power source, and disconnect input power before inspecting or installing.

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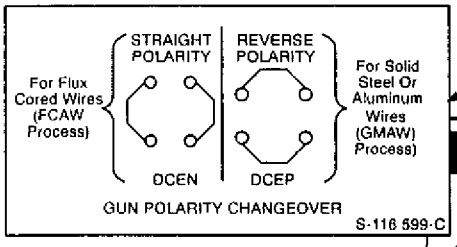
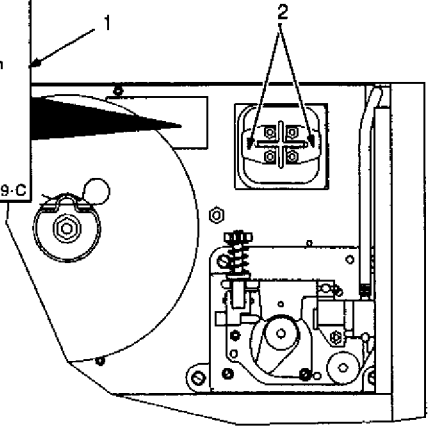
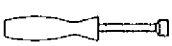




1 Polarity Changeover Label
2 Polarity Jumper Links
Always read and follow welding wire manufacturer's recommended polarity.
Close door.

Tools Needed:



3/8 in

Ref. ST-149 326-A

Figure 3-2. Gun Polarity Jumper Link Position

3-3. Installing Welding Gun

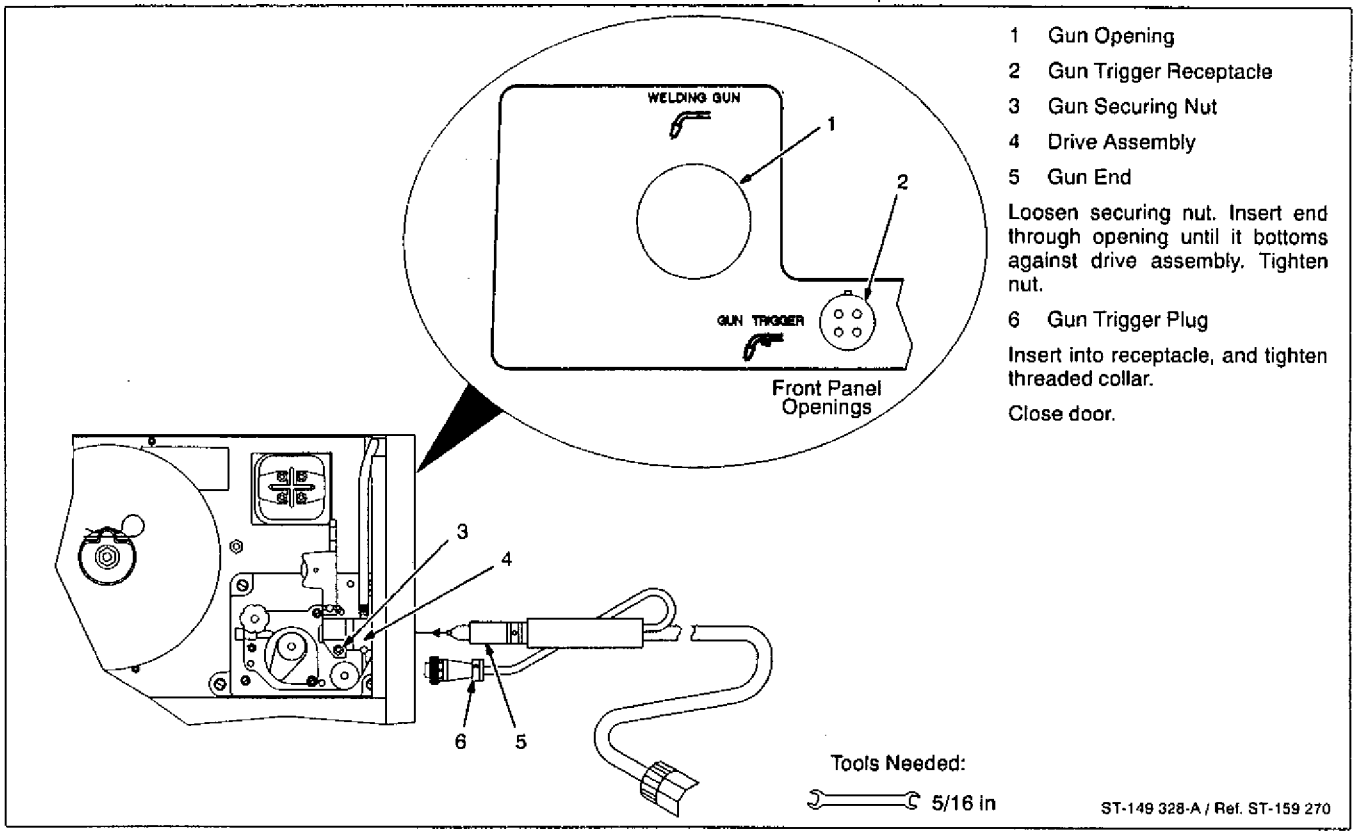


Figure 3-3. Gun And Trigger Connections

3-4. Selecting A Location And Connecting Input Power

⚠ WARNING

ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Have only qualified persons install unit.
- Installation must meet National Electrical Code and all other codes.

BLOCKED AIRFLOW causes overheating and possible damage to unit.

- Do not block or filter airflow.

Warranty is void if any type of filter is used.

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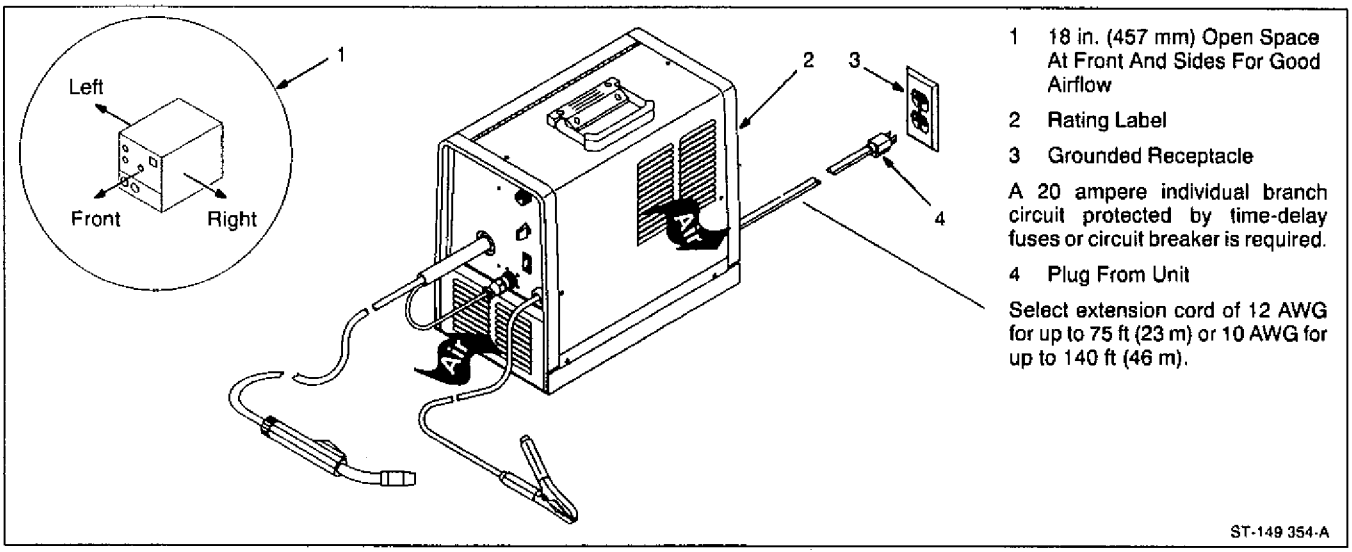

Figure 3-4. Location And Input Power Connections

3-5. Threading Welding Wire

⚠ WARNING

CYLINDERS can explode if damaged.

- Keep cylinders away from welding and other electrical circuits.
- Never touch cylinder with welding electrode.
- Always secure cylinder to running gear, wall, or other stationary support.

WELDING WIRE can cause puncture wounds.

- Do not press gun trigger until instructed to do so.
- Do not point gun toward any part of the body, other people, or any metal when threading welding wire.

ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.

The welding wire, drive rolls, drive assembly, and all metal parts touching the welding wire are electrically live when welding or feeding wire using gun trigger.

HOT SURFACES can burn skin.

- Allow gun to cool before touching.

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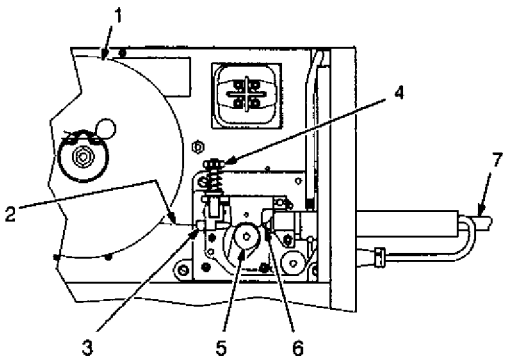
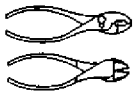


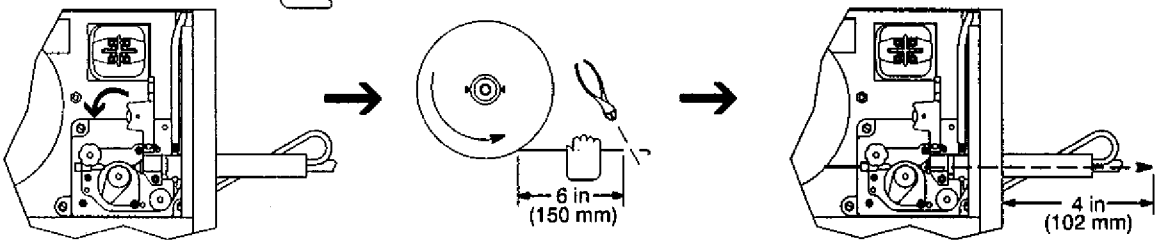
1 Wire Spool
2 Welding Wire
3 Inlet Wire Guide
4 Pressure Adjustment Knob
5 Drive Roll
6 Outlet Wire Guide
7 Gun Conduit Cable

Lay gun cable out straight.

Tools Needed:



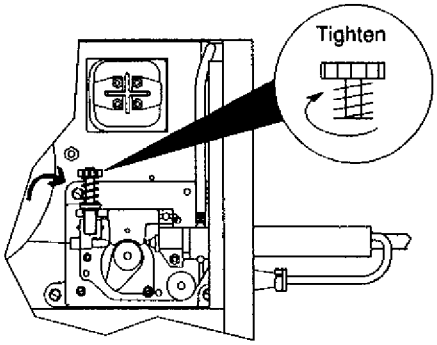
Hold wire tightly to keep it from unraveling.



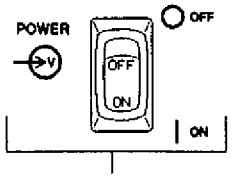
Open pressure assembly.

Pull and hold wire; cut off end.

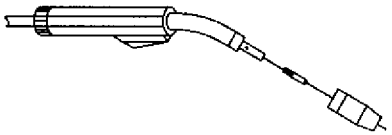
Push wire thru guides into gun; continue to hold wire.



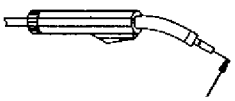
Close and tighten pressure assembly, and let go of wire.



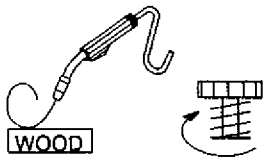
Set switch.



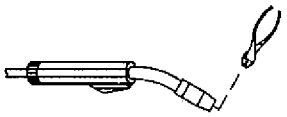
Remove gun nozzle and contact tube.



Press gun trigger until wire comes out of gun. Reinstall contact tube and nozzle.



Feed wire to check drive roll pressure. Tighten knob enough to prevent slipping.



Cut off wire. Close and latch door.

Ref. ST-149 326-A / Ref. ST-150 093 / Ref. ST-159 270 / S-0627-A

Figure 3-5. Threading Welding Wire

3-6. Installing Gas Supply

⚠ WARNING

CYLINDERS can explode if damaged.

- Keep cylinders away from welding and other electrical circuits.
- Never touch cylinder with welding electrode.
- Always secure cylinder to running gear, wall, or other stationary support.

BUILDUP OF SHIELDING GAS can harm health or kill.

- Shut off shielding gas supply when not in use.

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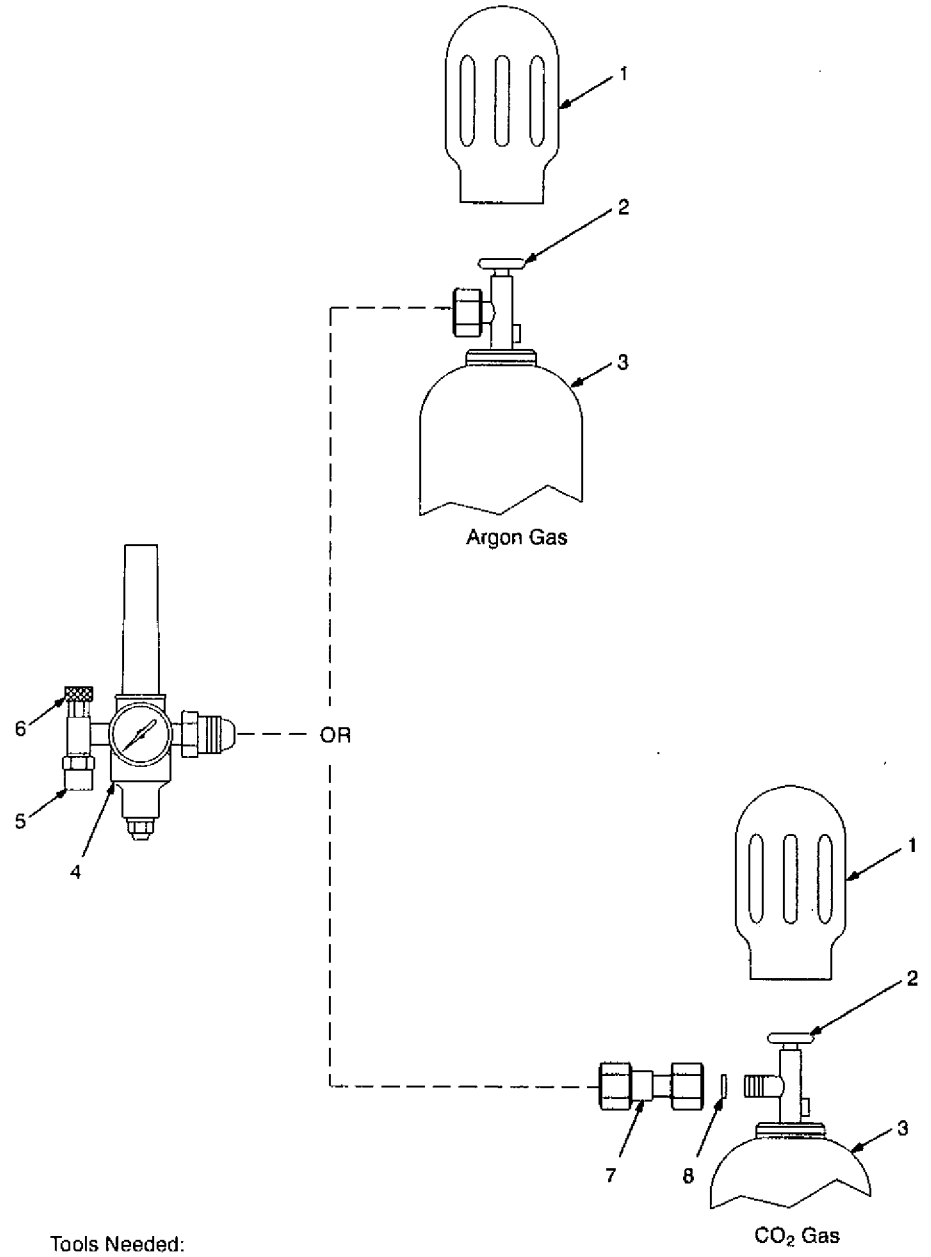


Obtain gas cylinder and chain to running gear, wall, or other stationary support so cylinder cannot fall and break off valve.

1 Cap

2 Cylinder Valve

Remove cap, stand to side of valve, and open valve slightly. Gas flow blows dust and dirt from valve. Close valve.

3 Cylinder

4 Regulator/Flowmeter

Install so face is vertical.

5 Gas Hose Connection

Fitting has 5/8-18 right-hand threads. Obtain and install gas hose.

6 Flow Adjust

Typical flow rate is 20 cfh (cubic feet per hour). Check wire manufacturer's recommended flow rate.

7 CO_2 Adapter

8 O-Ring

Install adapter with O-ring between regulator/flowmeter and CO_2 cylinder.

Tools Needed:

1-1/8, 5/8 in

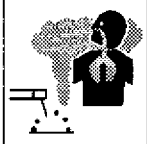
ssb3.1 12/92 – ST-158 697-A

Figure 3-6. Typical Regulator/Flowmeter Installation

⚠ WARNING

ELECTRIC SHOCK can kill.

- Always wear dry insulating gloves.
- Insulate yourself from work and ground.
- Do not touch live electrical parts.
- Keep all panels and covers securely in place.

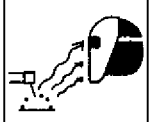


FUMES AND GASES can be hazardous to your health.

- Keep your head out of the fumes.
- Ventilate area, or use breathing device.
- Read Material Safety Data Sheets (MSDSs) and manufacturer's instructions for material used.

WELDING can cause fire or explosion.

- Do not weld near flammable material.
- Watch for fire; keep extinguisher nearby.
- Do not locate unit over combustible surfaces.
- Do not weld on closed containers.
- Allow work and equipment to cool before handling.



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

- Wear welding helmet with correct shade of filter.
- Wear correct eye, ear, and body protection.

MOVING PARTS can cause injury.

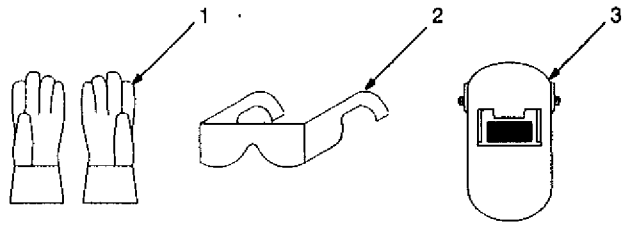
- Keep away from pinch points such as drive rolls.
- Keep all doors, panels, covers, and guards closed and securely in place.

MAGNETIC FIELDS FROM HIGH CURRENTS can affect pacemaker operation.

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

See Safety Precautions at beginning of manual for basic welding safety information.

swarn6.2* 10/91



1 Insulating Gloves

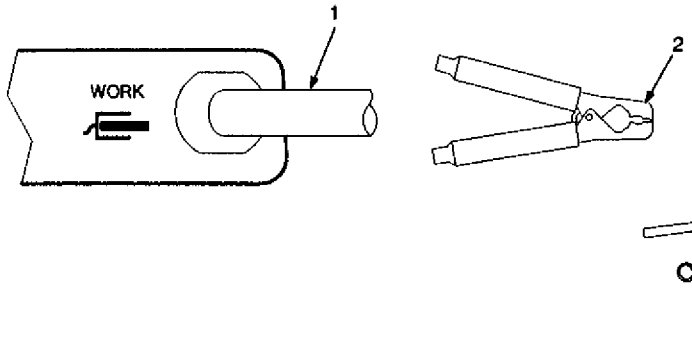
2 Safety Glasses With Side Shields

3 Welding Helmet

Wear dry insulating gloves, safety glasses with side shields, and a welding helmet with a correct shade of filter (see ANSI Z49.1).

sb3.1 10/91

Figure 4-1. Safety Equipment



1 Work Cable

2 Work Clamp

Use wire brush or sandpaper to clean metal at weld joint area. Use chipping hammer to remove slag after welding.

Connect work clamp to a clean, paint-free location on workpiece, as close to weld area as possible.

sb4.1 5/92 / Ref. ST-159 270

Figure 4-2. Work Clamp

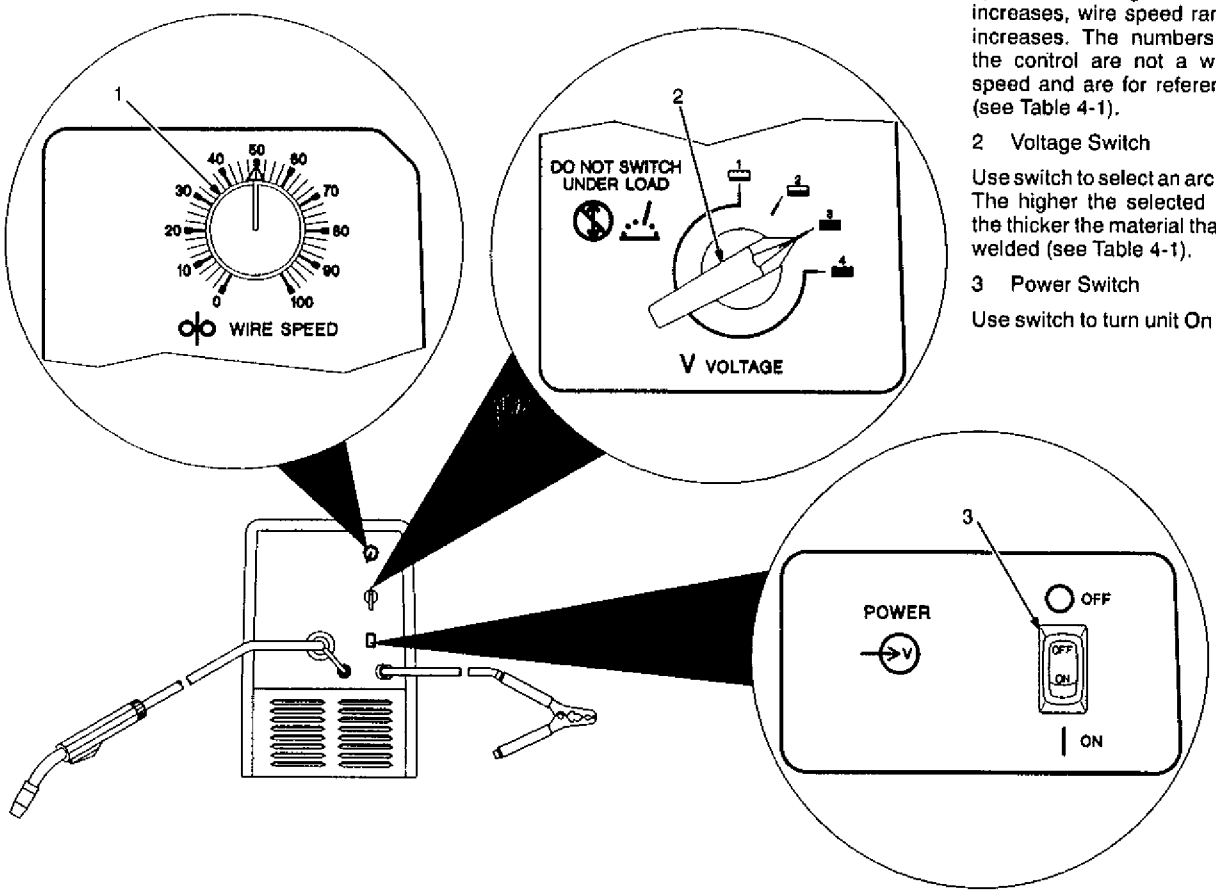
⚠ CAUTION

ARCING can damage switch.

- Do not change Voltage switch position while welding.

Arcing inside switch can damage contacts, causing switch to fail.

warn5.1* 9/91



1 Wire Speed Control

Use control to select a wire feed speed. As Voltage switch setting increases, wire speed range also increases. The numbers around the control are not a wire feed speed and are for reference only (see Table 4-1).

2 Voltage Switch

Use switch to select an arc voltage. The higher the selected number, the thicker the material that can be welded (see Table 4-1).

3 Power Switch

Use switch to turn unit On and Off.

ST-150 092

Figure 4-3. Controls

⚠ WARNING

BUILDUP OF SHIELDING GAS can harm health or kill.

- Shut off shielding gas supply when not in use.

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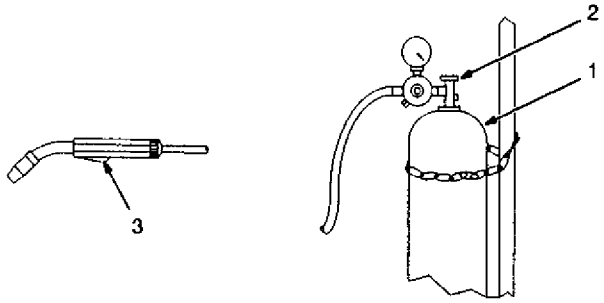


1 Shielding Gas Cylinder

2 Valve

3 Gun Trigger

Open valve on cylinder just before welding.

Gun trigger turns weld output and gas flow on and off.

Close valve on cylinder when finished welding.

sb5.1 6/92 – S-0780

Figure 4-4. Shielding Gas

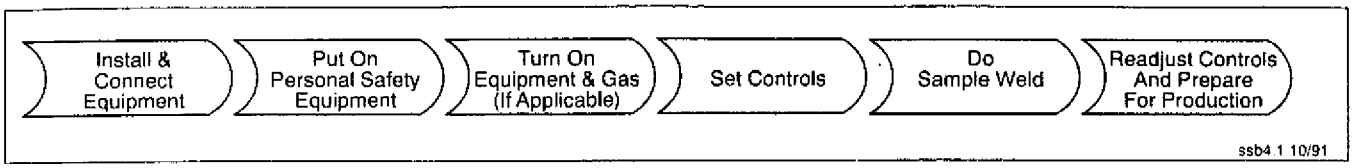


Figure 4-5. Sequence Of Operation For Hard And Flux Cored Wires

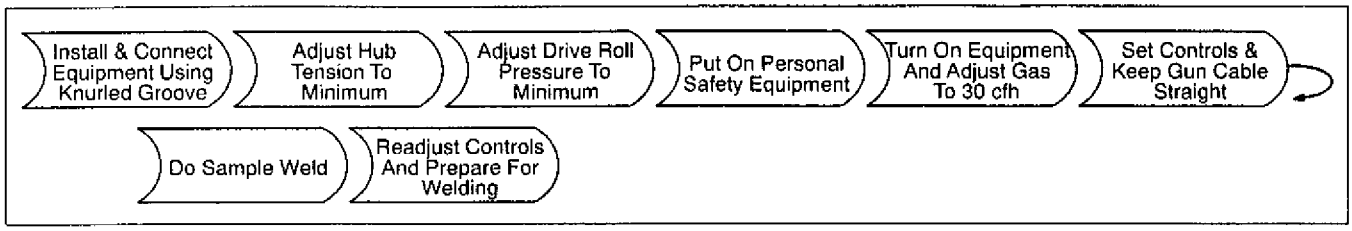


Figure 4-6. Sequence Of Operation For Aluminum Welding

Table 4-1. Suggested Welding Settings

Wire Type, Shielding Gas, And Flow Rate	Wire Diameter (inch)	Operator Control Settings*	Metal Thickness						
			1/8 in. (3.2 mm)	12 ga.	14 ga.	16 ga.	18 ga.	20 ga.	22 ga. And Thinner
E-71T-GS Flux Core	0.030	Voltage	4	3	3	1	1	1	–
		Wire Speed	30	30	20	25	20	20	–
	0.035	Voltage	4	3	2	1	1	1	–
		Wire Speed	30	25	25	25	25	20	–
ER70S-6, Mild Steel, CO_2, 20 cfh+	0.023	Voltage	4	4	3	2	2	1	1
		Wire Speed	50	50	50	45	40	30	30
	0.030	Voltage	4	4	3	3	2	1	1
		Wire Speed	40	40	40	40	40	40	35
ER70S-6, Mild Steel, 75% Argon 25% CO_2, 20 cfh+	0.023	Voltage	4	4	3	2	2	1	1
		Wire Speed	60	55	50	45	40	35	35
	0.030	Voltage	4	4	3	3	2	1	1
		Wire Speed	50	50	50	50	45	45	40
ER 308, Stainless Steel, Tri-Mix, 20 cfh+	0.023	Voltage	4	4	4	3	3	2	–
		Wire Speed	40	35	35	30	30	20	–
	0.030	Voltage	4	4	4	3	3	2	–
		Wire Speed	30	30	30	25	20	15	–
	0.035	Voltage	4	4	4	3	2	–	–
		Wire Speed	15	15	15	15	15	–	–
Aluminum, Argon, 30 cfh+	0.030	Voltage	–	4	3	2	1	–	–
		Wire Speed	–	85	80	75	70	–	–
	0.035	Voltage	–	4	4	2	2	–	–
		Wire Speed	–	55	60	60	55	–	–

*Do not change Voltage switch position while welding. Wire Speed value in Table 4-1 is a starting value only, and Wire Speed control setting can be fine tuned during welding.

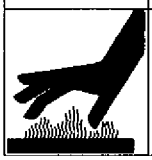
+cfh = cubic feet per hour

SECTION 5 – MAINTENANCE & TROUBLESHOOTING

⚠ WARNING

ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Turn Off welding power source, and disconnect input power before inspecting, maintaining, or servicing.



HOT PARTS can cause severe burns.

- Allow cooling period before maintaining or servicing.

MOVING PARTS can cause injury.

- Keep away from moving parts.
- Keep away from pinch points such as drive rolls.

Maintenance to be performed only by qualified persons.

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5-1. Routine Maintenance

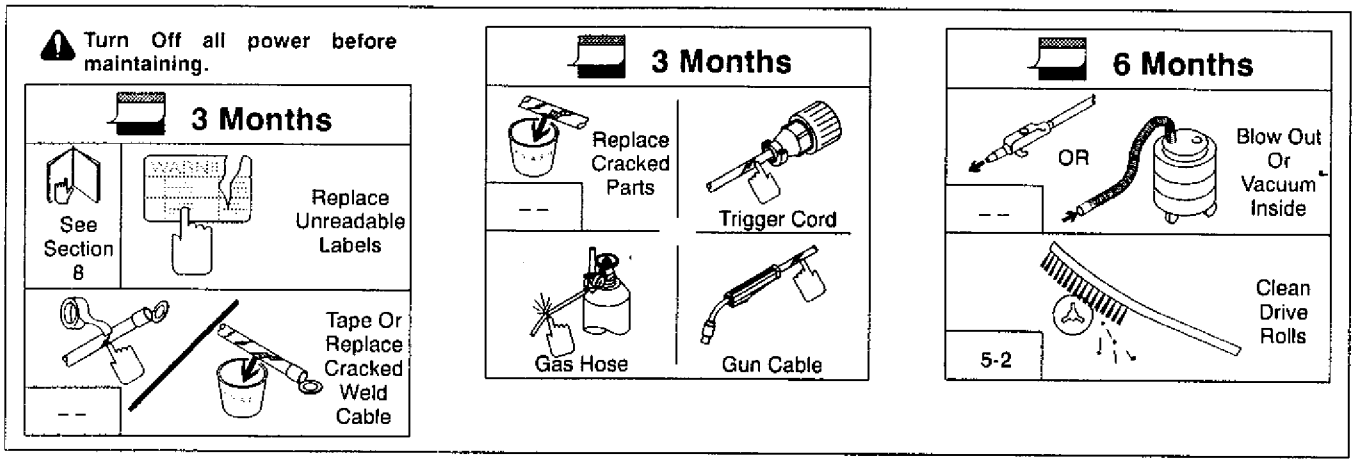

Figure 5-1. Maintenance Schedule

5-2. Overload Protection

⚠ WARNING

READ SAFETY BLOCKS at start of Section 5 before proceeding.

A. Motor Fuse F1

⚠ CAUTION

STATIC ELECTRICITY can damage parts on circuit boards.

- Put on grounded wrist strap BEFORE handling boards or parts.

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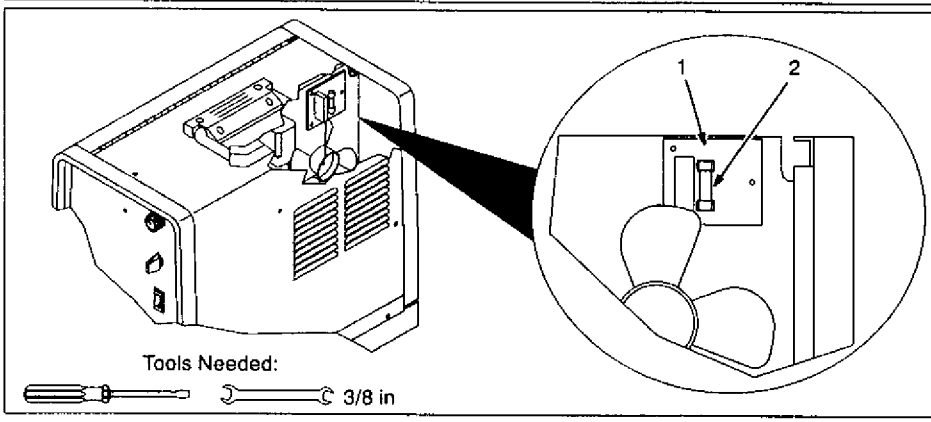


Turn Off and unplug unit. Unlatch door and remove door/wrapper.

1 Circuit Board PC1

Located behind fan.

2 Fuse F1 (See Parts List For Rating)

Pull fuse from fuse holder on PC1. To reinstall, push fuse into fuse holder.

Reinstall wrapper, and latch door.

ST-150 114 / ST-149 327

Figure 5-2. Fuse F1 Location

B. Overheating

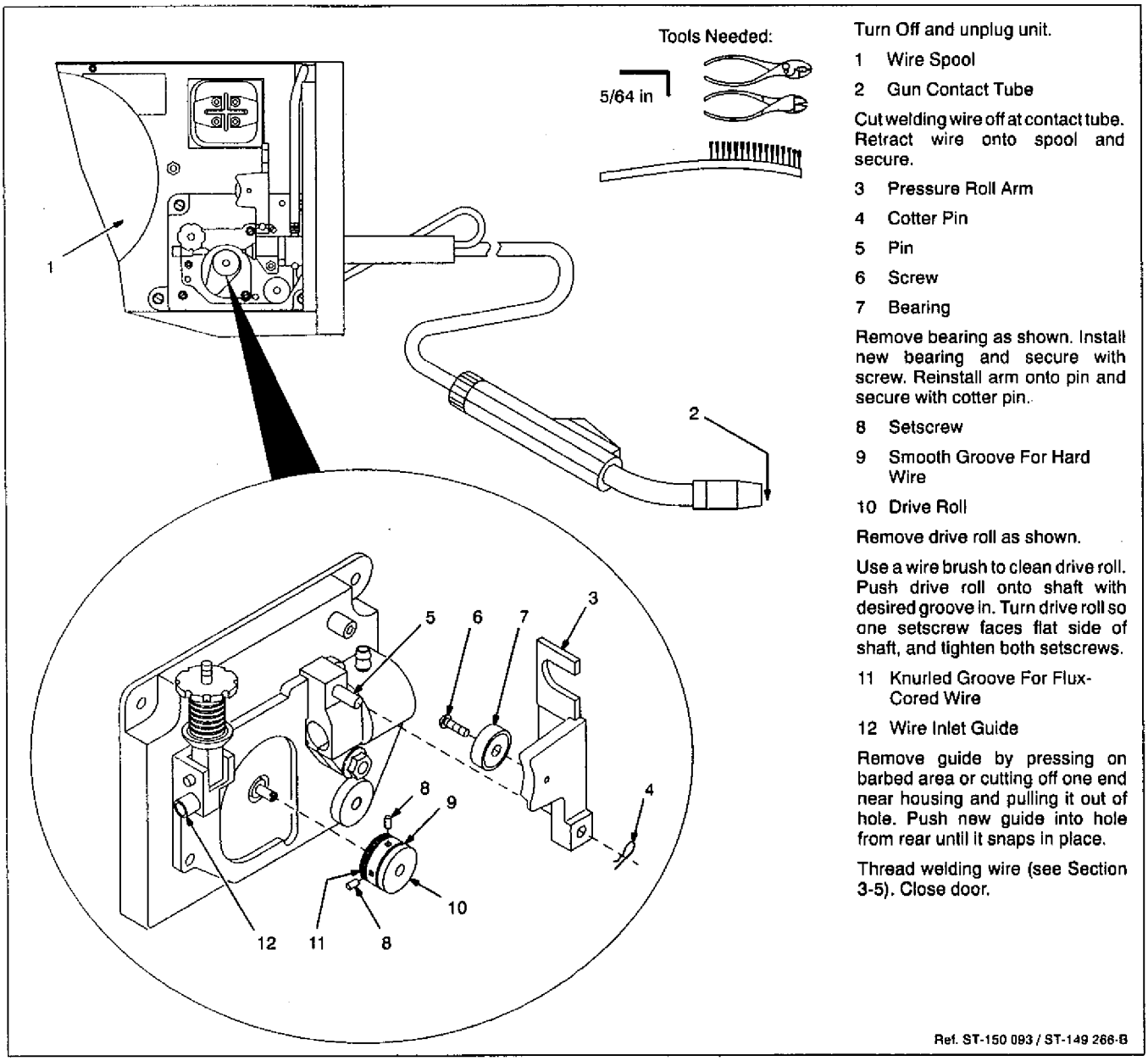
Thermostat TP1 protects the unit from damage due to overheating. If main transformer T1 gets too hot, TP1 opens and weld output stops. The fan keeps running to cool the transformer. Wait several minutes before trying to weld.

C. Short Circuit Shutdown

If contact tube is shorted and sticks to workpiece, the unit shuts down, but fan runs. To resume operation, release gun trigger, turn Off unit, and remove contact tube from workpiece. Check contact tube and replace if damaged. Turn On unit to continue operation.

5-3. Cleaning Or Repairing Drive Assembly

⚠ WARNING **READ SAFETY BLOCKS at start of Section 5 before proceeding.**



Turn Off and unplug unit.

1 Wire Spool

2 Gun Contact Tube

Cut welding wire off at contact tube. Retract wire onto spool and secure.

3 Pressure Roll Arm

4 Cotter Pin

5 Pin

6 Screw

7 Bearing

Remove bearing as shown. Install new bearing and secure with screw. Reinstall arm onto pin and secure with cotter pin.

8 Setscrew

9 Smooth Groove For Hard Wire

10 Drive Roll

Remove drive roll as shown.

Use a wire brush to clean drive roll. Push drive roll onto shaft with desired groove in. Turn drive roll so one setscrew faces flat side of shaft, and tighten both setscrews.

11 Knurled Groove For Flux-Cored Wire

12 Wire Inlet Guide

Remove guide by pressing on barbed area or cutting off one end near housing and pulling it out of hole. Push new guide into hole from rear until it snaps in place.

Thread welding wire (see Section 3-5). Close door.

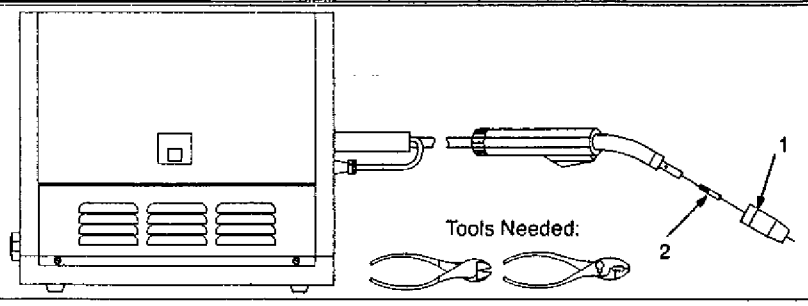
Ref. ST-150 093 / ST-149 266-B

Figure 5-3. Removing Drive Roll, Drive Bearing, And Wire Inlet Guide

5-4. Replacing Gun Contact Tube

⚠ WARNING

READ SAFETY BLOCKS at start of Section 5 before proceeding.



Turn Off and unplug unit.

1 Nozzle

Cut off welding wire at contact tube. Remove nozzle

2 Contact Tube

Remove contact tube and install new contact tube. Reinstall nozzle.

Ref. ST-149 326-A

Figure 5-4. Replacing Contact Tube

5-5. Cleaning Or Replacing Gun Liner

⚠ WARNING

READ SAFETY BLOCKS at start of Section 5 before proceeding.

⚠ CAUTION

FLYING METAL CHIPS AND DIRT can cause injury and damage equipment.

- Point gun away from people and in a safe direction when blowing out with compressed air.

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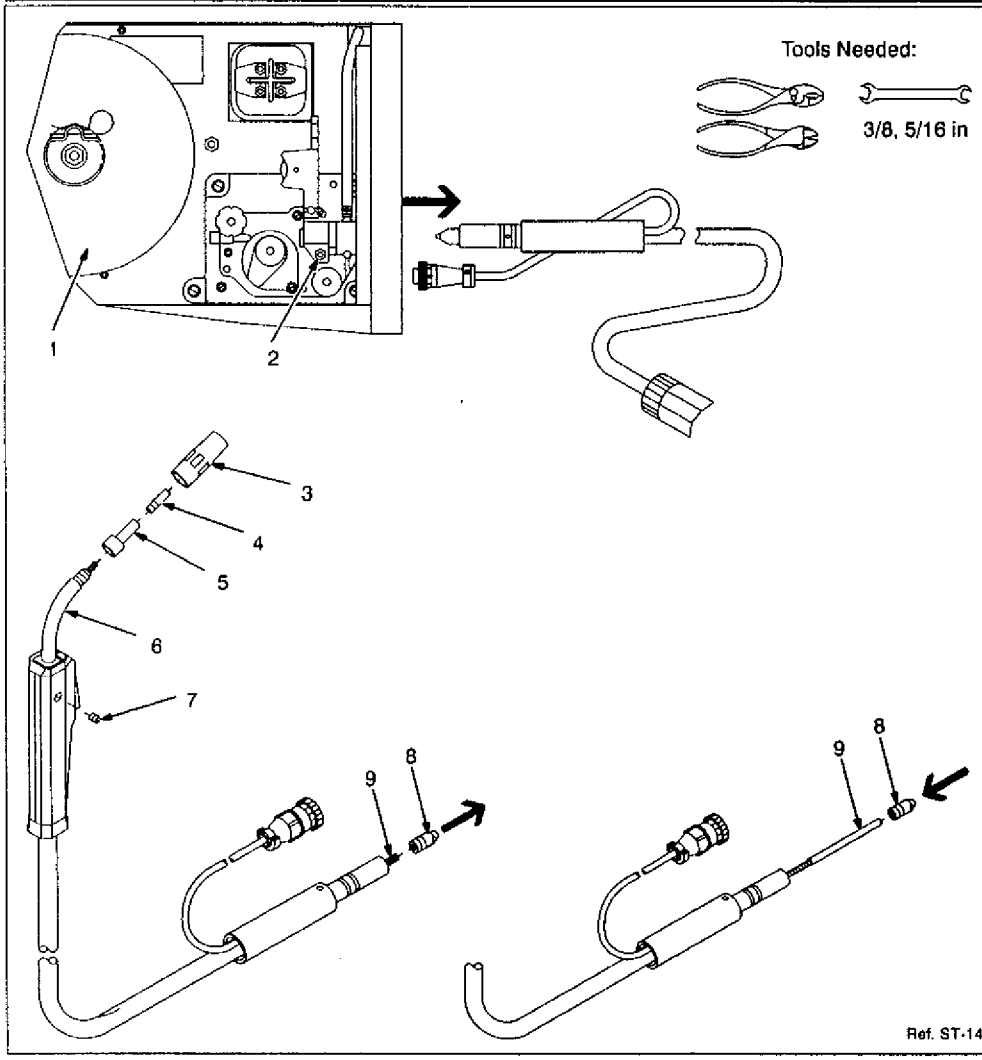


Turn Off and unplug unit.

1 Wire Spool

Cut welding wire off at contact tube. Retract wire onto spool and secure.

2 Gun Securing Nut

Loosen nut and remove gun and trigger plug.

3 Nozzle

4 Contact Tube

5 Contact Tube Adapter

6 Head Tube

7 Setscrew

8 Wire Outlet Guide

Disassemble gun as shown.

9 Liner

Pull liner from this end. Blow gun casing out with compressed air.

Insert new liner into gun casing. The liner end covered with tubing goes to the wire drive assembly.

Reinstall wire outlet guide so that 1/8 in (3 mm) of liner sticks out. Hand tighten guide, and then tighten two full turns more.

Cut liner off so that 3/8 in (9.5 mm) sticks out of head tube.

Tighten setscrew to secure liner in head tube. Overtightening setscrew crushes liner and causes wire feed problems.

Reassemble gun.

Reinstall gun (see Section 3-3). Thread welding wire (see Section 3-5). Close door.

Ref. ST-149 328-A / Ref. ST-124 473-E / Ref. ST-150 439-A

Figure 5-5. Replacing Gun Liner

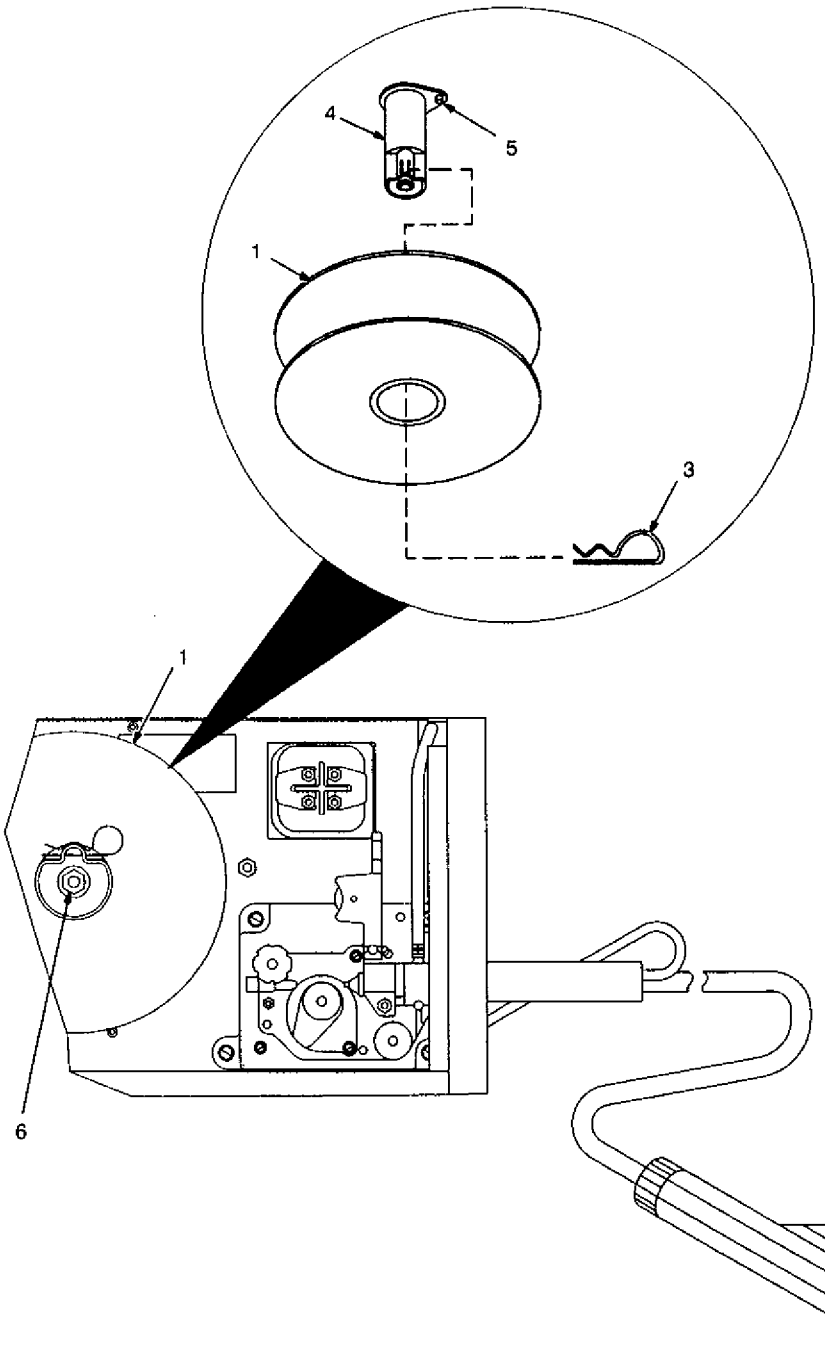
5-6. Installing Wire Spool And Adjusting Hub Tension

⚠ WARNING

READ SAFETY BLOCKS at start of Section 5 before proceeding.

NOTE ☞

If hub tension is too tight, motor fuse F1 can open(see Section 5-2). If hub tension is too loose, wire unravels and can become tangled inside unit.



Turn Off and unplug unit.

1 Wire Spool

2 Gun Contact Tube

If necessary, cut welding wire off at contact tube, and retract wire onto spool and secure.

3 Retaining Pin

Remove pin and pull off spool.

4 Hub

5 Hub Pin

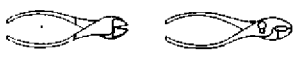
Slide spool onto hub so wire feeds off bottom. Turn spool until hub pin fits hole in back of spool. Push retaining pin through hub.

6 Hub Tension Nut

Grasp spool in one hand and turn while using a wrench to adjust hub tension nut. When a slight force is needed to turn spool, tension is set.

Close and secure pressure roll assembly. Thread welding wire (see Section 3-5). Close door.

Tools Needed:



Ref. ST-150 093 / S-0499

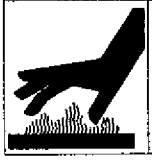
Figure 5-6. Installing Wire And Adjusting Tension

5-7. Troubleshooting

⚠ WARNING

ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Turn Off welding power source, and disconnect input power before inspecting, maintaining, or servicing.



HOT PARTS can cause severe burns.

- Allow cooling period before servicing gun or unit.

MOVING PARTS can cause injury.

- Keep away from moving parts.
- Keep away from pinch points such as drive rolls.

Troubleshooting to be performed only by qualified persons.

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Table 5-1. Welding Trouble

Trouble	Remedy	Section
No weld output; wire does not feed; fan does not run.	Secure power cord plug in receptacle.	3-4
	Replace building line fuse or reset circuit breaker if open.	3-4
	Secure gun trigger plug in receptacle or repair leads, or replace trigger switch.	3-3
	Check and replace Power switch S1 if necessary.	--
No weld output; wire does not feed; fan motor continues to run.	Thermostat TP1 open (overheating). Allow fan to run; the thermostat will close when the unit has cooled.	5-2B
	Check and replace motor fuse F1.	5-2A
	Check and replace switch control relay CR1 if necessary.	--
No weld output; wire feeds.	Connect work clamp to get good metal to metal contact.	Figure 4-2
	Replace contact tube.	5-4
	Check for proper connections at polarity changeover board TE1	3-2
Low weld output.	Connect unit to proper input voltage or check for low line voltage.	3-4

Table 5-2. Wire Drive/Gun Trouble

Trouble	Remedy	Section
Electrode wire feeding stops during welding.	Straighten gun cable and/or replace damaged parts.	5-5
	Adjust drive roll pressure.	3-5
	Change to proper groove.	5-3
	Readjust hub tension.	5-6
	Replace contact tube if blocked.	5-4
	Clean or replace wire inlet guide or liner if dirty or plugged.	5-3, 5-5
	Replace drive roll or pressure bearing if worn or slipping.	5-3
	Secure gun trigger plug in receptacle or repair leads, or replace trigger switch.	3-3
	Check and replace motor fuse F1.	5-2A
	Check and clear any restrictions at drive assembly and liner.	5-5
	Have nearest Factory Authorized Service Station check drive motor.	--

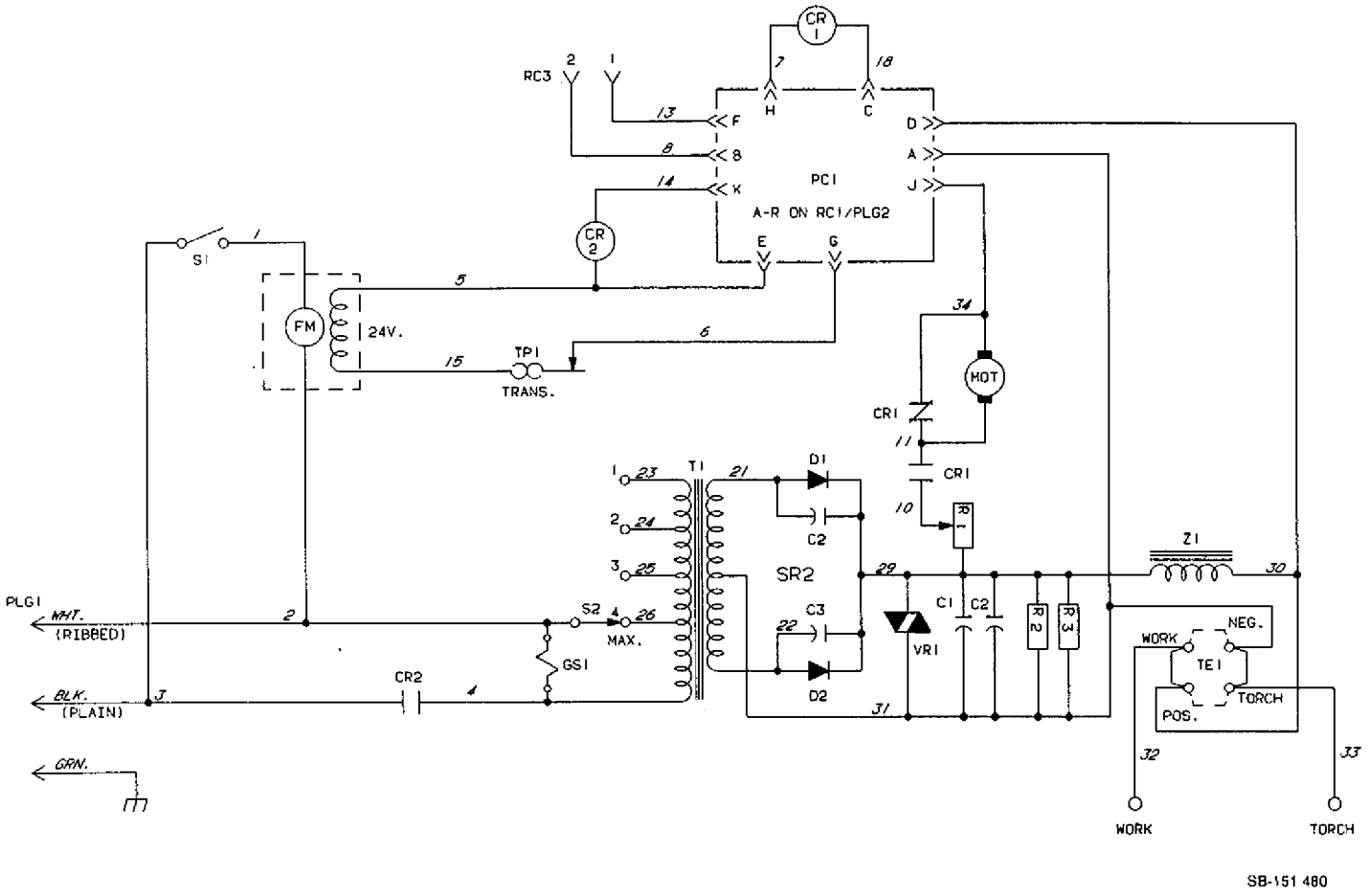

Figure 6-1. Circuit Diagram For Welding Power Source

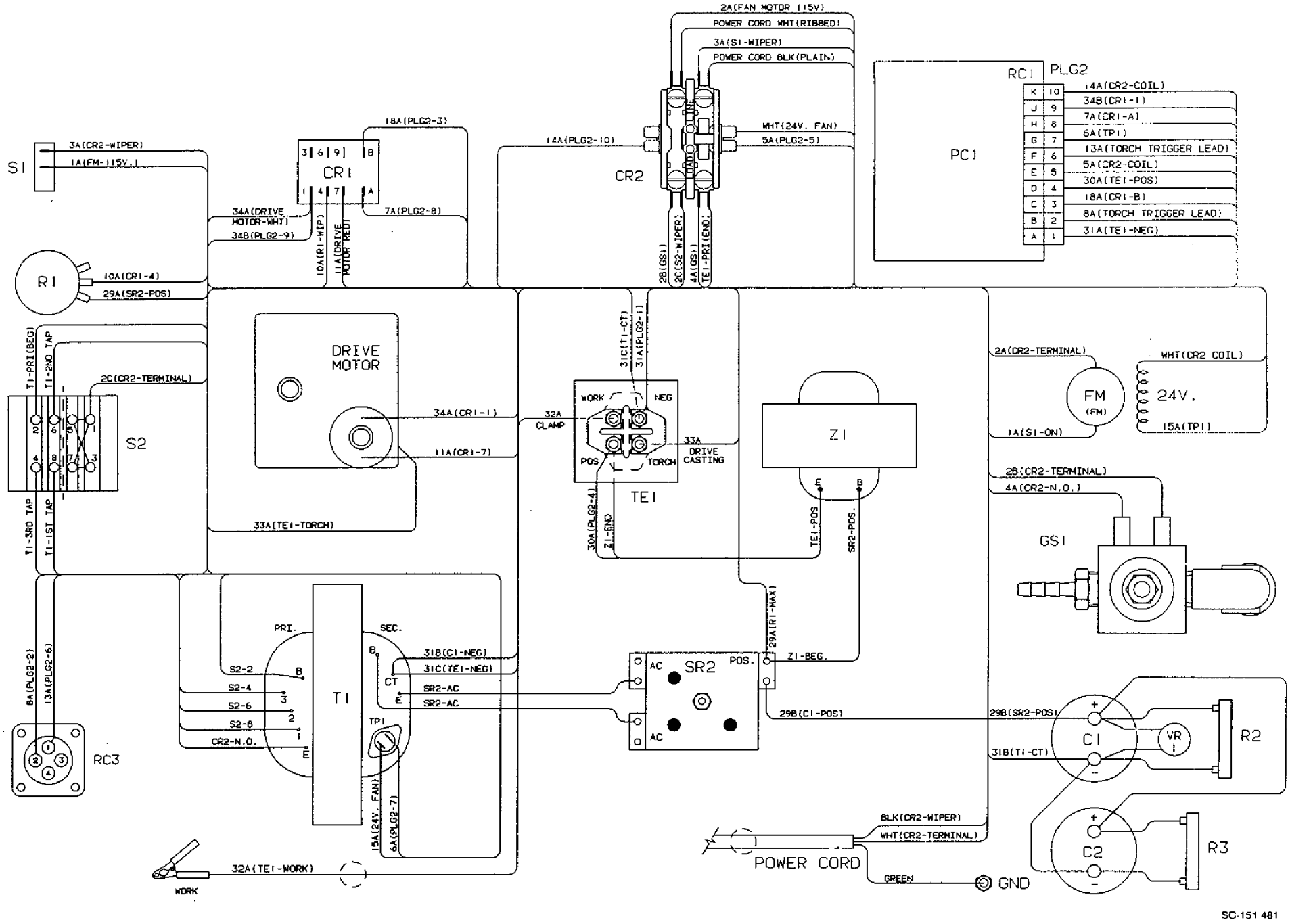

Figure 6-2. Wiring Diagram For Welding Power Source

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⚠ WARNING

ELECTRIC SHOCK can kill.

- Always wear dry insulating gloves.
- Insulate yourself from work and ground.
- Do not touch live electrical parts.
- Keep all panels and covers securely in place.

FUMES AND GASES can be hazardous to your health.

- Keep your head out of the fumes.
- Ventilate area, or use breathing device.
- Read Material Safety Data Sheets (MSDSs) and manufacturer's instructions for material used.

WELDING can cause fire or explosion.

- Do not weld near flammable material.
- Watch for fire; keep extinguisher nearby.
- Do not locate unit over combustible surfaces.
- Do not weld on closed containers.
- Allow work and equipment to cool before handling.

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

- Wear welding helmet with correct shade of filter.
- Wear correct eye, ear, and body protection.

MOVING PARTS can cause injury.

- Keep away from pinch points such as drive rolls.
- Keep all doors, panels, covers, and guards closed and securely in place.

MAGNETIC FIELDS FROM HIGH CURRENTS can affect pacemaker operation.

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

WELDING CURRENT can damage electronic parts in vehicles.

- Disconnect both battery cables before welding on a vehicle.
- Place work clamp as close to the weld as possible.

See Safety Precautions at beginning of manual for basic welding safety information.

swarn6.2 10/91

7-1. Flux Cored Arc Welding (FCAW) And Gas Metal Arc Welding (GMAW)

NOTE ☞

Welding wire is not energized until gun trigger is pressed; therefore, welding wire should extend not more than 1/2 in (13 mm) beyond edge of nozzle and tip of wire placed on seam before lowering helmet and pressing trigger.

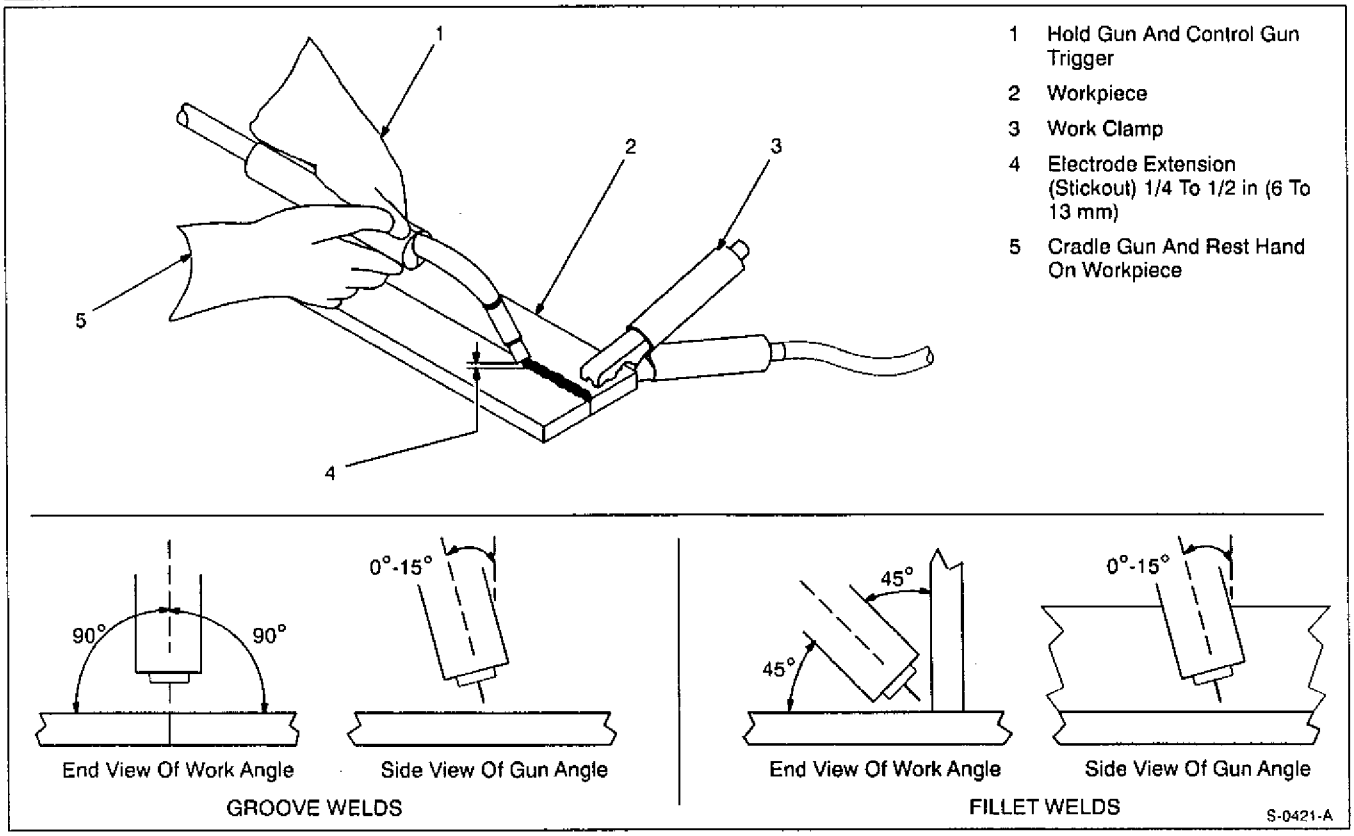


Figure 7-1. Holding And Positioning Welding Gun

NOTE ☞ *Weld bead shape depends on gun angle, direction of travel, electrode extension (stickout), travel speed, thickness of base metal, wire feed speed (weld current), and voltage.*

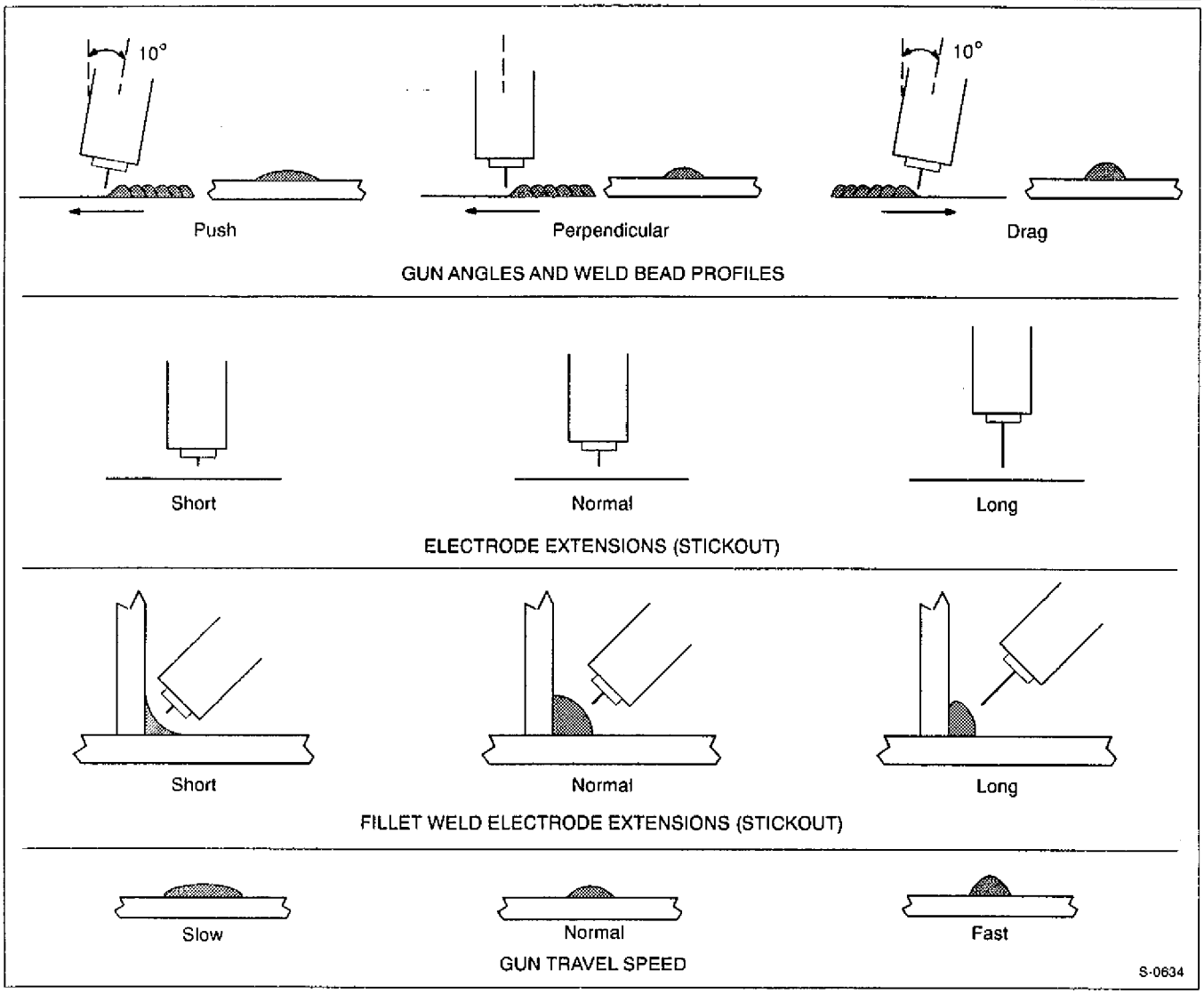


Figure 7-2. Conditions That Affect Weld Bead Shape

NOTE ☞ *Normally, a single stringer bead is satisfactory for most narrow groove weld joints; however, for wide groove weld joints or bridging across gaps, a weave bead or multiple stringer beads works better.*

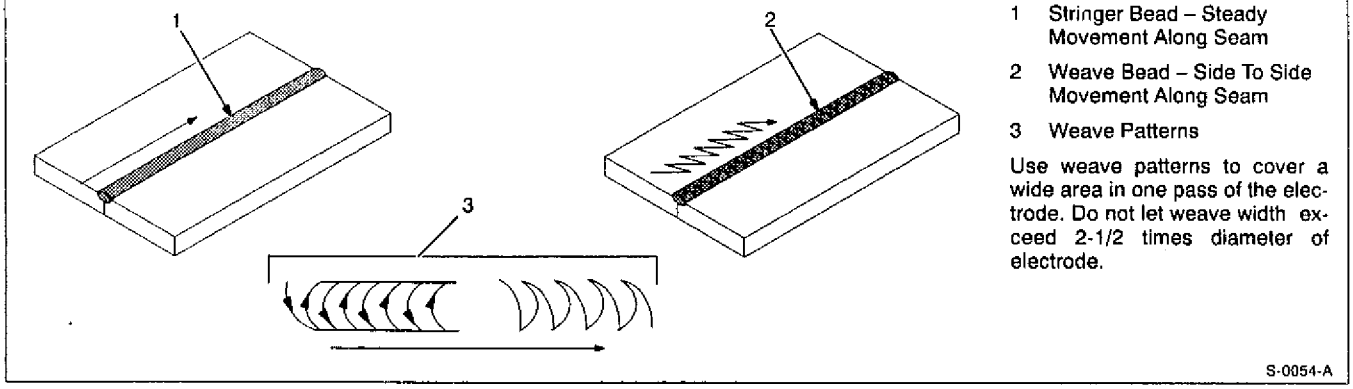


Figure 7-3. Gun Movement During Welding

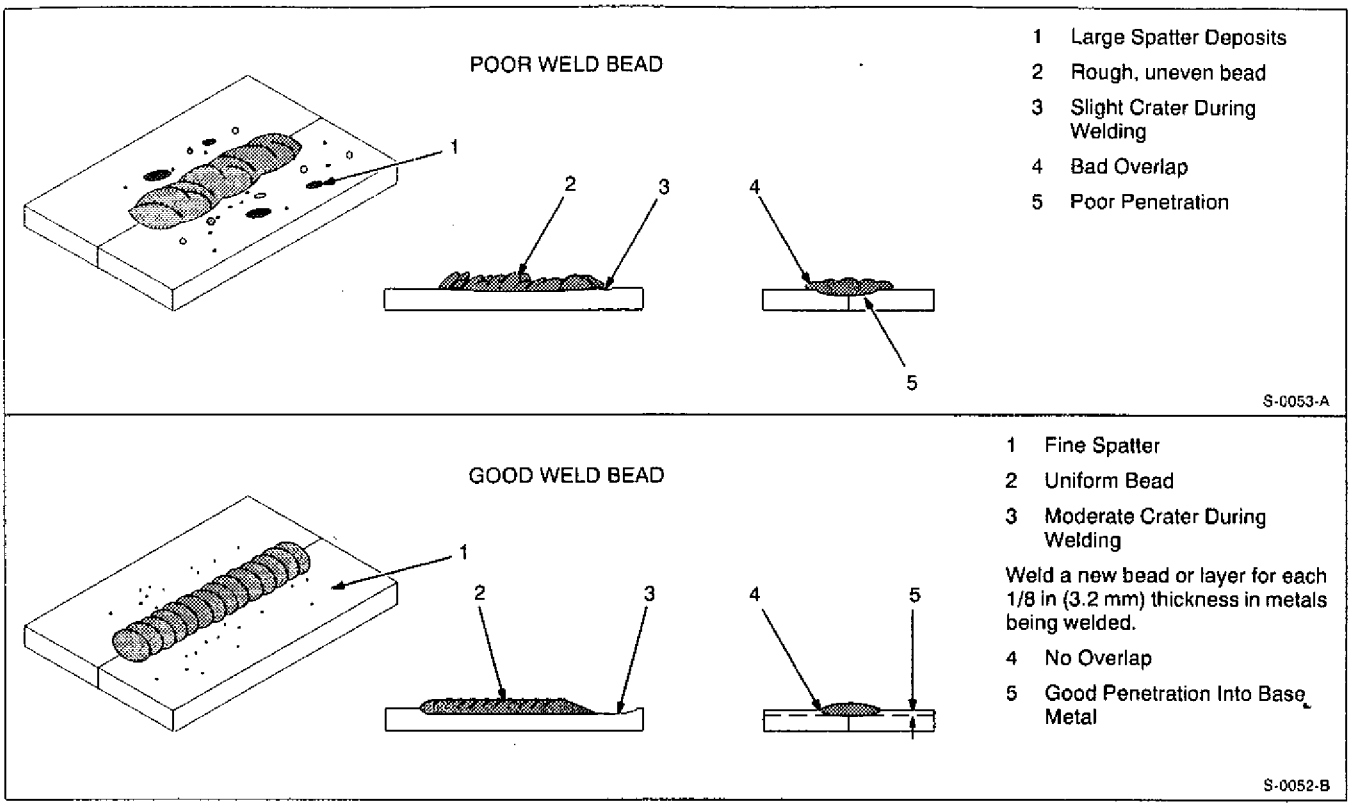
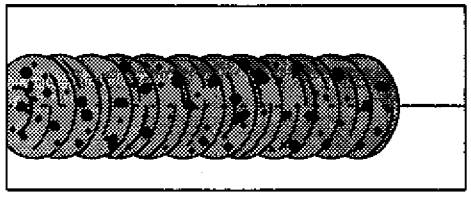


Figure 7-4. Weld Bead Characteristics

7-2. Welding Troubleshooting

Table 7-1. Porosity

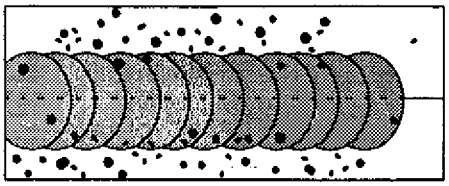


Porosity – small cavities or holes resulting from gas pockets in weld metal.

S-0635

Possible Causes	Corrective Actions
Inadequate shielding gas coverage.	Check for proper gas flow rate. Remove spatter from gun nozzle. Check gas hoses for leaks. Eliminate drafts near welding arc. Place nozzle 1/4 to 1/2 in (6-13 mm) from workpiece. Hold gun near bead at end of weld until molten metal solidifies.
Wrong gas.	Use welding grade shielding gas; change to different gas.
Dirty welding wire.	Use clean, dry welding wire. Eliminate pick up of oil or lubricant on welding wire from feeder or liner.
Workpiece dirty.	Remove all grease, oil, moisture, rust, paint, coatings, and dirt from work surface before welding. Use a more highly deoxidizing welding wire (contact supplier).
Welding wire extends too far out of nozzle.	Be sure welding wire extends not more than 1/2 in (13 mm) beyond nozzle.

Table 7-2. Excessive Spatter

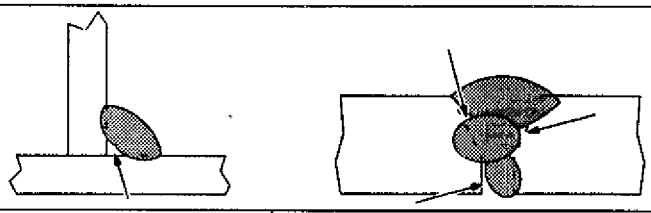


Excessive Spatter – scattering of molten metal particles that cool to solid form near weld bead.

S-0636

Possible Causes	Corrective Actions
Wire feed speed too high.	Select lower wire feed speed.
Voltage too high.	Select lower voltage range.
Electrode extension (stickout) too long.	Use shorter electrode extension (stickout).
Workpiece dirty.	Remove all grease, oil, moisture, rust, paint, undercoating, and dirt from work surface before welding.
Insufficient shielding gas at welding arc.	Increase flow of shielding gas at regulator/flowmeter and/or prevent drafts near welding arc.
Dirty welding wire.	Use clean, dry welding wire. Eliminate pickup of oil or lubricant on welding wire from feeder or liner.

Table 7-3. Incomplete Fusion

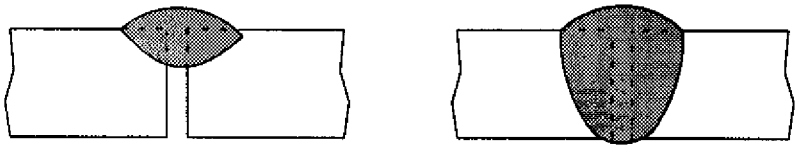


Incomplete Fusion – failure of weld metal to fuse completely with base metal or a preceeding weld bead.

S-0637

Possible Causes	Corrective Actions
Workpiece dirty.	Remove all grease, oil, moisture, rust, paint, undercoating, and dirt from work surface before welding.
Insufficient heat input.	Select higher voltage range and/or adjust wire feed speed.
Improper welding technique.	Place stringer bead in proper location(s) at joint during welding. Adjust work angle or widen groove to access bottom during welding. Momentarily hold arc on groove side walls when using weaving technique. Keep arc on leading edge of weld puddle. Use correct gun angle of 0 to 15 degrees.

Table 7-4. Lack Of Penetration



Lack of Penetration

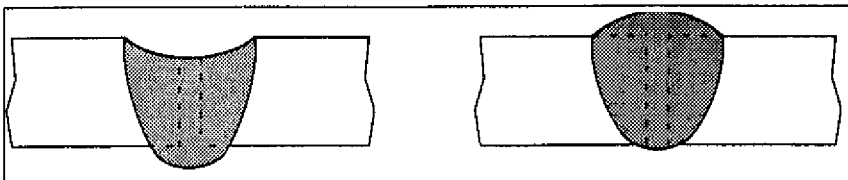
Good Penetration

Lack Of Penetration -- shallow fusion between weld metal and base metal.

S-0638

Possible Causes	Corrective Actions
Improper joint preparation.	Material too thick. Joint preparation and design must provide access to bottom of groove while maintaining proper welding wire extension and arc characteristics.
Improper weld technique.	Maintain normal gun angle of 0 to 15 degrees to achieve maximum penetration. Keep arc on leading edge of weld puddle. Be sure welding wire extends not more than 1/2 in (13 mm) beyond nozzle.
Insufficient heat input.	Select higher wire feed speed and/or select higher voltage range. Reduce travel speed.

Table 7-5. Excessive Penetration

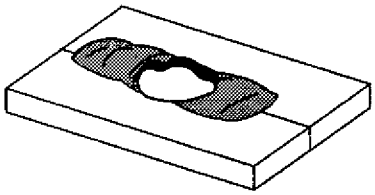


Excessive Penetration – weld metal melting through base metal and hanging underneath weld.

S-0639

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

Table 7-6. Burn-Through

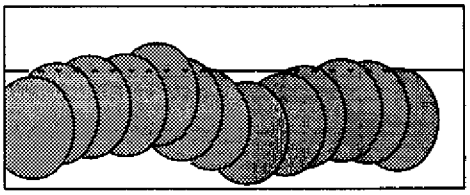


Burn-Through – weld metal melting completely through base metal resulting in holes where no metal remains.

S-0640

Possible Causes	Corrective Actions
Excessive heat input.	Select lower voltage range and reduce wire feed speed. Increase and/or maintain steady travel speed.

Table 7-7. Waviness Of Bead

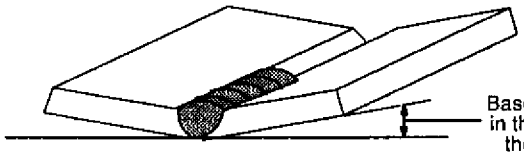


Waviness Of Bead – weld metal that is not parallel and does not cover joint formed by base metal.

S-0641

Possible Causes	Corrective Actions
Welding wire extends too far out of nozzle.	Be sure welding wire extends not more than 1/2 in (13 mm) beyond nozzle.
Unsteady hand.	Support hand on solid surface or use two hands.

Table 7-8. Distortion



Distortion – contraction of weld metal during welding that forces base metal to move.

S-0642

Possible Causes	Corrective Actions
Excessive heat input.	Use restraint (clamp) to hold base metal in position. Make tack welds along joint before starting welding operation. Select lower voltage range and/or reduce wire feed speed. Increase travel speed. Weld in small segments and allow cooling between welds.

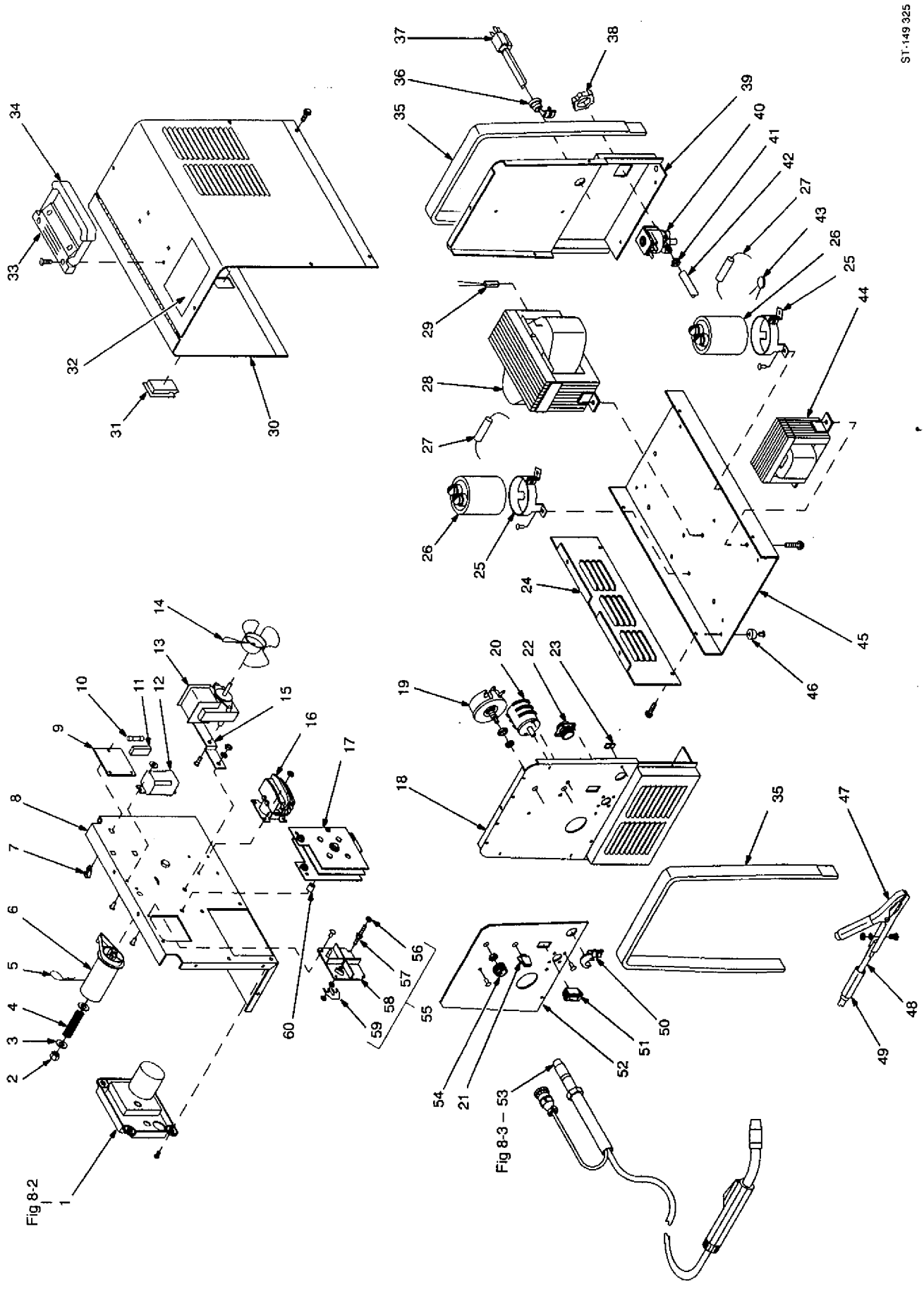


Figure 8-1. Main Assembly

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
			Figure 8-1. Main Assembly	
1		Fig 8-2	DRIVE ASSEMBLY, wire	1
2		010 909	NUT, stl slflkg hex reg .375-16	1
3		010 910	WASHER, flat stl SAE .375	2
4		073 355	SPRING, cprsn .625 OD x .093 wire x 1.000	1
5		111 998	PIN, cotter hair .120dia x 2.375 lg x .500 shaft	1
6		111 929	HUB, spool	1
7		134 201	STAND-OFF SUPPORT, PC card	3
8		147 562	BAFFLE, center	1
9	PC1	119 539	CIRCUIT CARD, shutdown/burnback	1
10	F1	*073 426	FUSE, mintr gl slo-blo 5A (incl w/PC1 Shutdown/Burnback Circuit Card)	1
11	PLG2	118 936	CONNECTOR, rect 10skt plug	1
		079 747	CONNECTOR, rect skt 24-18ga	10
12	CR1	006 393	RELAY, encl 24VAC DPDT	1
13	FM	111 931	MOTOR, fan 115V 50/60Hz 2600RPM .1818dia shaft	1
14		005 656	BLADE, fan 6 in 4wg 30deg .175 bore CW	1
15		120 675	BRACKET, mtg motor fan	1
16	CR2	129 696	CONTACTOR, def prp 25A 1P 24VAC coil	1
17	SR2	119 264	RECTIFIER, si 1ph 100A 200PIV	1
18		147 461	PANEL, front	1
19	R1	000 101	RHEOSTAT, WW 50W 16 ohm	1
20	S2	111 897	SWITCH, rotary 4posn 600V (consisting of)	1
21		127 023	KNOB, pointer .023 bore	1
22	RC3	048 282	RECEPTACLE w/SOCKETS, (consisting of)	1
		079 534	CONNECTOR, circ skt push-in 18-14ga	4
		079 532	CONNECTOR, circ 4 pin plug Amp 211882-1	
		079 535	CONNECTOR, circ pin push-in 18-14ga Amp 66359-6	
		048 834	CONNECTOR, circ clamp str rlf Amp 206062-4	
23		147 548	NUT, speed push-on-type std rect .215 lg x .061 wide	12
24		147 560	PANEL, side lower	1
25		108 105	CLAMP, capacitor 2.500dia	2
26	C1,2	109 039	CAPACITOR, elctlt 46000uf 35VDC	2
27	R2,3	117 116	RESISTOR, WW fxd 20W 50 ohm	2
28	T1	147 676	TRANSFORMER, pwr main 115 (consisting of)	1
		147 534	COIL, pwr main	1
29	TP1	125 552	THERMOSTAT, NC	1
30		+147 563	WRAPPER	1
		130 149	LABEL, weld parameters	1
31		089 899	LATCH, slide flush style	1
32		134 327	LABEL, warning general precautionary	1
33		126 415	CLAMP, saddle	1
34		126 416	HANDLE	1
35		146 753	BEZEL	2
36		111 443	BUSHING, strain relief .240/.510 ID x .875mtg hole	1
37	PLG1	147 545	CORD SET, 125V 5-15P 14ga 3/c 7ft (std 15A plug)	1
37	PLG1	151 752	CORD SET, 125V 5-20P 14ga 3/c 7ft (CSA req'd 20A plug)	1
38		605 227	NUT, nyl hex jam .750NPST	1
39		147 462	PANEL, rear	1
40	GS1	116 996	VALVE, 115VAC 2 way custom port 1/8 orf	1
41		149 332	CLAMP, hose .405-.485clp dia slfttng	2
42		134 834	HOSE, SAE .187 ID x .410 OD (order by ft)	3ft
43	VR1	087 156	VARISTOR, 10 joule 68VDC	1
44	Z1	149 398	STABILIZER	1
45		147 566	BASE	1
46		019 663	MOUNT, nprn 15/16 OD x 3/8	4
47		010 368	CLAMP, grd 200A	1
48		600 325	CABLE, weld cop strd No. 6 (order by ft)	16ft
49		026 843	INSULATOR, vinyl blk	2
50		111 644	BUSHING, strain relief .370/.430 ID x .875mtg hole	1
51	S1	111 997	SWITCH, rocker SPST 10A 250VAC	1

Item No.	Dia. Mkgs.	Part No.	Description	Quantity

Figure 8-1. Main Assembly (Continued)

. . 52			NAMEPLATE, (order by model and serial number)	1
. . 53		115 564	. . GA-17C GUN, (Fig 8-3)	1
. . 54		097 922	. . KNOB, pointer .875dia x .250 ID	1
. . 55	TE1	122 385	. . TERMINAL ASSEMBLY, chgov (consisting of)	1
. . 56		601 835	. . . NUT, brs hex 10-32	8
. . 57		038 887	. . . STUD, pri bd brs 10-32 x 1.375	4
. . 58		116 620	. . . TERMINAL BOARD, chgov	1
. . 59		038 618	. . . LINK, jumper term bd pri	2
. . 60		010 047	. . TUBING, stl .625 OD x 12ga wall x 1.000	1

*Recommended Spare Parts.
+When ordering a component originally displaying a precautionary label, the label should also be ordered.
BE SURE TO PROVIDE MODEL AND SERIAL NUMBER WHEN ORDERING REPLACEMENT PARTS.

Item No.	Dia. Mkgs.	Part No.	Description	Quantity

Figure 8-2. Drive Assembly, Wire (Fig 8-1 Item 1)

1	MOT	124 506	MOTOR, 12VDC	1
2		604 657	SCREW, cap stl hexhd .375-16 x 1.250	1
3		602 213	WASHER, lock stl split .375	1
4		010 910	WASHER, flat stl SAE .375	1
5		128 189	SCREW, cap stl hexhd .312-18 x 1.750	1
6		602 211	WASHER, lock stl split .312	1
7		604 538	WASHER, flat stl SAE .312	2
8		129 893	INSULATOR, housing drive	1
9		126 838	DRIVE ASSEMBLY, wire (consisting of)	1
10		090 416	PIN, hinge	1
11		124 817	HOUSING, wire drive	1
12		151 828	PIN, cotter hair .054 x .750	1
13		112 031	LEVER, pressure roll	1
14		090 443	BEARING, ball rdl sgl row .866 OD x .447 width x .315 bore (consisting of)	1
		111 622	SPACER, bearing .196 ID x .310 OD x .500 collar	1
15		114 415	SCREW, mach stl phflh 10-24 x .625	1
16		010 224	PIN, spring CS .187 x 1.000	1
17		058 549	GUIDE, wire inlet 1/16	1
18		085 242	FASTENER, pinned	1
19		085 244	WASHER, cupped stl .328 ID x .812 OD x .125	1
20		090 415	SPRING, cprsn .720 OD x .070 wire x 1.250	1
21		092 237	KNOB, adj tension	1
22		602 204	WASHER, lock stl ext tooth No. 10	3
23		604 537	NUT, stl hex full fnsh .312-18	1
24		605 853	SCREW, mach stl rdh 10-32 x .750	3
25		119 028	ROLL, drive V groove combination	1
26		602 169	SCREW, set stl sch 8-32 x .187 cup point	2
27		601 862	NUT, stl hex mscr 10-32	1
28		602 203	WASHER, lock stl split No. 10	1
29		602 096	SCREW, mach stl flh 10-32 x .750	1

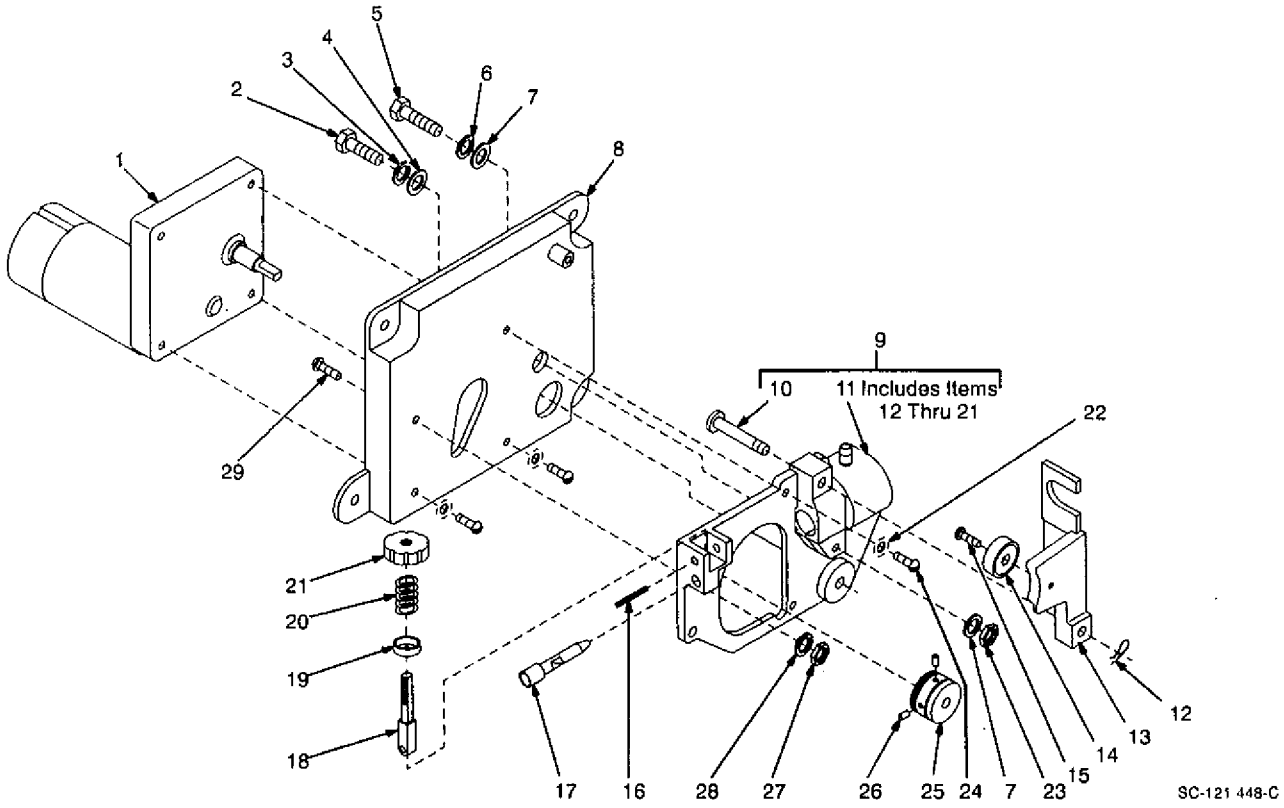


Figure 8-2. Drive Assembly, Wire

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

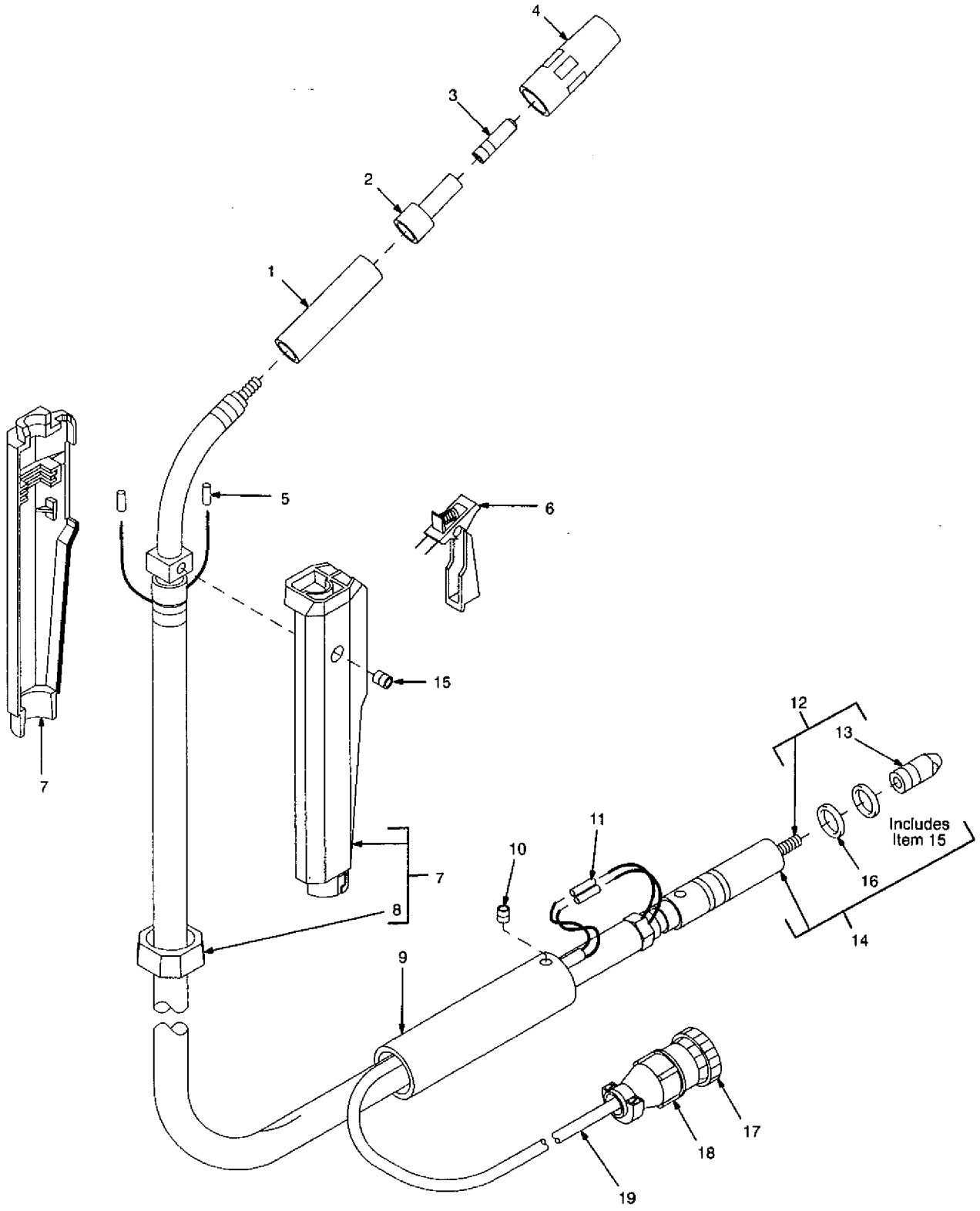


Figure 8-3. GA-17C Gun

Item No.	Part No.	Description	Quantity
	115 564	**Figure 8-3. GA-17C Gun (Fig 8-1 Item 53)**	
1	089 885	TUBING, nprn .375 ID x .062 wall (order by ft)	1ft
2	118 267	ADAPTER, contact tube	1
3	087 299	TUBE, cont scr .023 wire x 1.125 (not included with gun)	3
3	000 067	TUBE, cont scr .030 wire x 1.125 (quantity of 2 included with gun)	3
3	000 068	TUBE, cont scr .035 wire x 1.125 (quantity of 2 included with gun)	3
4	128 535	NOZZLE, slip type .545 orf	1
5	089 902	TERMINAL, rcpt skt 20-24 wire insulated	2
6	120 164	TRIGGER, switch assembly	1
7	124 697	HANDLE, gun (consisting of)	1
8	128 758	. RING, locking	1
9	133 147	STRAIN RELIEF, cable	1
10	602 173	SCREW, set stl sch 10-32 x .250 cup point	1
11	073 984	SPLICE, butt 22-16 wire plasti-grip	2
12	129 179	KIT, liner monocoil .030-.035 wire (consisting of)	1
13	120 995	. GUIDE, wire outlet .030-.045 wire	1
14	152 691	CABLE/CONDUIT, 10ft (consisting of)	1
15	154 731	. SCREW, set stl sch 10-24 x .312 cup point	1
16	079 974	. O-RING, .500 ID x .103CS rbr	2
17	079 878	HOUSING PLUG & PINS, (consisting of)	1
	079 535	. CONNECTOR, circ pin push-in 18-14ga	4
18	048 834	CONNECTOR, circ clamp str rlf	1
19	604 525	CABLE, port No. 18 2/c (order by ft)	2ft

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

OPTIONS AND ACCESSORIES

GA-71C REPLACEMENT GUN (#115 564) 10 ft. (3 m)
Rated 170 Amps at 60% duty cycle. Gun is designed to run .023 through .035 in. (0.6 through 0.9 mm) hard wire. Capable of running .045 in. (1.1 mm) gasless, flux-cored wire if cored wire kit (#152 099) is installed.

The GA-17C gun is available with various cable lengths. Refer to product literature Index No. M/9.11 for detailed information.

.045 IN. (1.1 MM) CORED WIRE KIT (#152 099)
For gasless flux-cored wire only. Includes liner, contact tube, nozzle, and drive roll.

1 LB. (4 in.) SPOOL ADAPTER (#042 535)
Allows power source to use 1 lb. (0.5 kg), 4 in. (203 mm) spool of welding wire.

RUNNING GEAR/CYLINDER RACK (#042 454)
Designed for a gas cylinder no larger than 8-1/2 in. (216 mm) diameter by 28 in. (711 mm) high.

CO_2 GAS CYLINDER KIT (#042 708)
Kit includes disposable CO_2 gas cylinder, gas regulator, and hardware to connect to power source.

MILLERMATIC 90 SET-UP & OPERATION VIDEOTAPE (#149 751)
Included with the Millermatic 90 power source.