

Single Phase - All-In-One - Low Cost

NWSA - 345  
540  
550

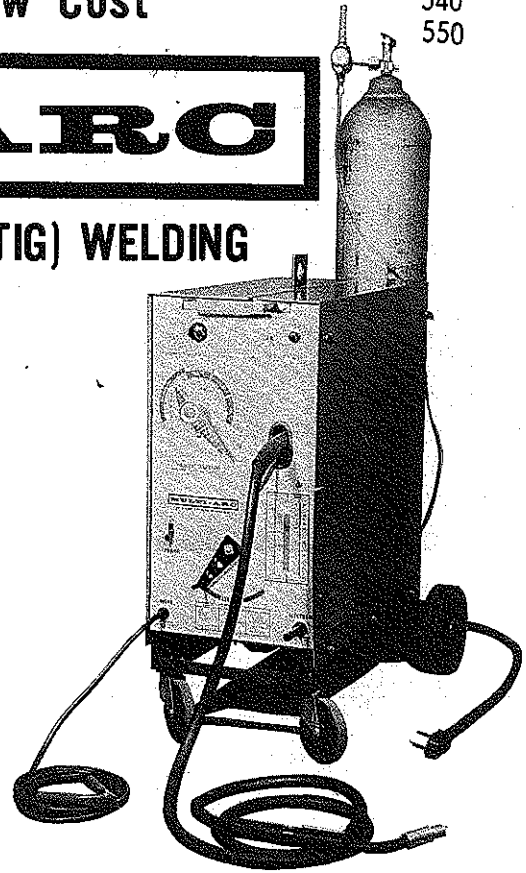
# MULTI-ARC

FOR GMA(MIG)\*AC/DC STICK\*SPOT\*GTA(TIG) WELDING

POWER SOURCE - WIRE FEEDER - ACCESSORIES

THE MULTI-ARC is designed to meet the requirements of light fabrication and repair work. It combines a constant voltage power source, wire feeder, and gun with an AC/DC drooping characteristic stick electrode and GTA (TIG) power source into a single package. Optional running gear with provision for mounting a shield gas cylinder is available where mobility is desired. The welding process is selected by a front panel-mounted five position switch. Welding parameters are set by a front panel dial and/or a hand crank-indicator arrangement.

In the GMA (MIG) dip-transfer modes, welding of steels up to 3/16" thick and optional one side spot welding of steels from 26 gauge to 16 gauge can readily be accomplished using CO<sub>2</sub> or mixed Argon/CO<sub>2</sub> shield gas. The wire feed speed control and the voltage control indicator are calibrated directly in material thickness. One side spot welding is facilitated by an optional front panel-mounted Spot Weld Control Panel.

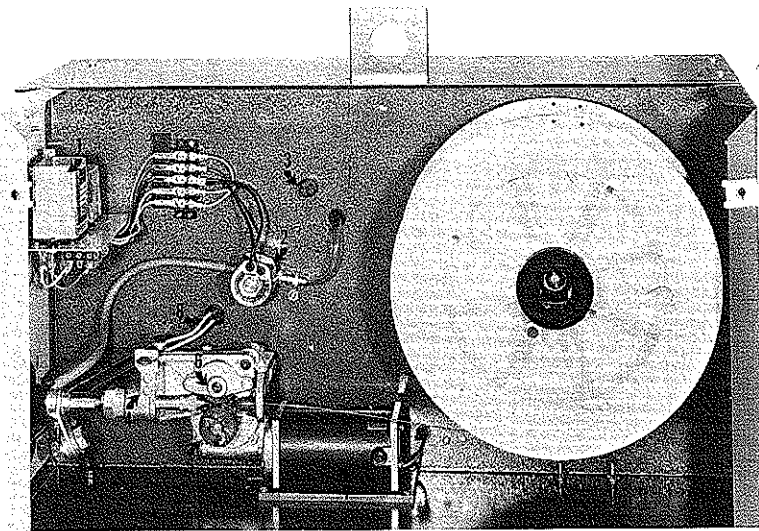


CATALOG NO. 302-E

## FEATURES

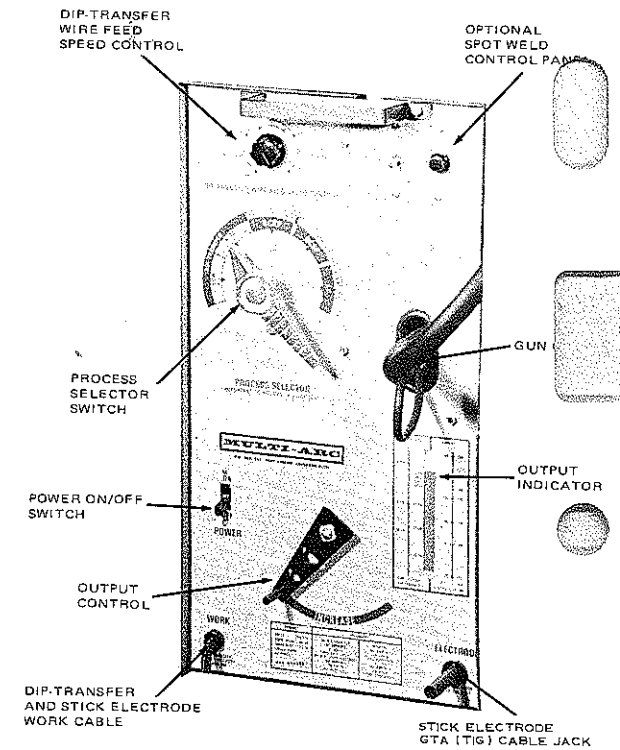
- Operates from readily available single-phase AC power through provided primary input cord and plug.
- Simple installation with no inter-connecting cables between power source and feeder.
- Directly calibrated dials and controls make setup quick and easy.
- All controls for power source and feeder on front panel.
- Continuous adjustment of voltage and wire feed speed while welding GMA (MIG) (dip-transfer) modes.
- Work cable and ground clamp are provided permanently connected through front panel.
- Continuous adjustment of current while welding in stick electrode or GTA (TIG) modes.
- On-Off power switch and contactor.
- Standard Feeder use .030 and .035 inch diameter wire on 8 or 12 inch diameter spools.
- Forced air cooling.
- Hermetically sealed silicon diode main rectifier.
- Thermal overload protection.
- Simple quick-release, self-compensating spring system insures proper roll pressure for each diameter wire.
- Gun is air-cooled and light weight for easy manipulation.
- For operator safety, trigger control circuit operates from 24 volts.
- Ready access to protected feeder section through hinged panel on right side.
- Gas solenoid is activated by gun trigger switch in GMA(MIG) dip-transfer modes.
- Addition of optional Spot Weld Control Panel facilitates spot welding from one side of work.
- Where mobility is desired, optional running gear is available with platform for shield gas cylinder.

FORNEY ARC WELDERS DIV. OF FORNEY IND., INC. Fort Collins, Colorado, U.S.A. Regina, Sask., Canada



**MULTI-ARC 160 WIRE FEEDER COMPARTMENT**

- 1 — Optional Spotweld Control Panel
- 2 — Shield Gas Solenoid
- 3 — Fuse
- 4 — Heavy Duty Drive Roll Stand With Self-Compensating Pressure Spring
- 5 — Drive Roll
- 6 — Smooth Non-Marking Pressure Roll
- 7 — Totally Enclosed Pre-Lubricated DC Motor
- 8 — Trigger Switch Connection



**FRONT PANEL**

## SPECIFICATIONS OF THE MULTI-ARC WELDER

**RATED OUTPUT**

GMA(MIG) SEMI-AUTOMATIC WIRE FEED  
 Dip-transfer 160 amps DC at 22v.  
 60% Duty Cycle

STICK ELECTRODE AND GTA (TIG)  
 AC and DC (straight or reverse polarity)  
 160 amps at 28 v 35% duty cycle

CURRENT RANGE (amps)  
 DC Stick Electrode — 25-160  
 AC Stick Electrode — 50-200

**MAXIMUM OPEN CIRCUIT VOLTS**

AC or DC Stick Electrode — 80  
 DC dip-transfer — 38

**INPUT AT RATED LOAD**

Single Phase — 60 Hz (cycles)  
 Volts ..... 208/ 230  
 Amperes..... 66/ 60  
 KVA ..... 13.8

NET WEIGHT 200 lbs. (Without wire spool and undercarriage.)

SHIPPING WEIGHT 230 lbs. (Without wire spool and undercarriage.)

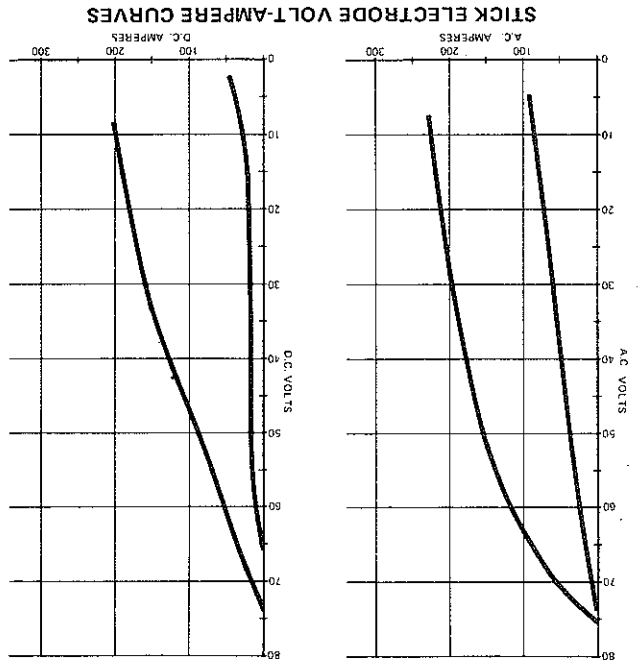
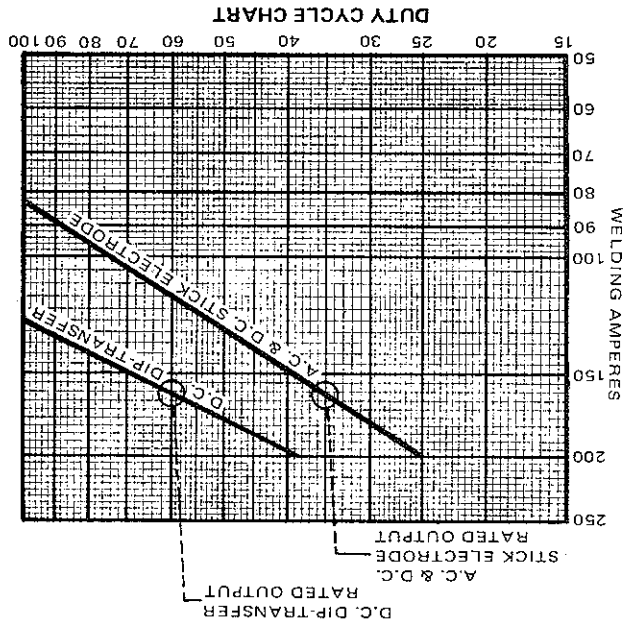
**SIZE**

Height (inches) ..... 30  
 Width (inches) ..... 15  
 Depth (inches)..... 29

The feeder includes a heavy duty drive roll stand capable of accommodating .030- and .035-inch diameter hard wire on 8- or 12-inch diameter spools. Drive rolls for both wire sizes are furnished. Space is provided in the wire feeder compartment for all Gun connections and for the electrode wire spool.

For stick electrode and GTA (TIG) welding (either ac, dscp, or dcrp), the Process Selector switch is set to the desired mode and the output current is adjusted by means of the hand crank and directly calibrated (in amps) front panel indicator.

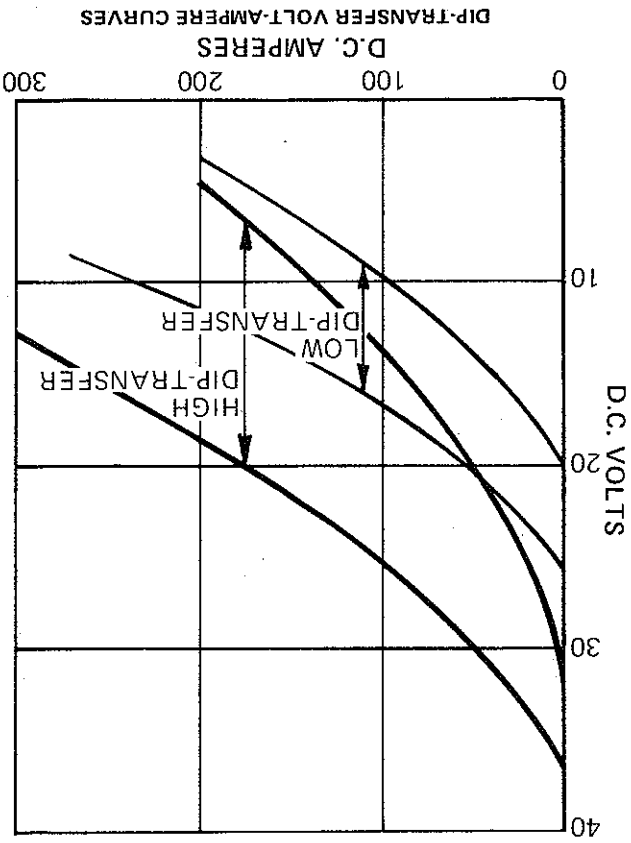
A high frequency arc starter and stabilizer is required for aluminum and magnesium welding.



**THE MULTI-ARC** is a completely self-contained unit for GMA (MIG) dip-transfer and one side GMA (MIG) spot welding and AC/DC stick electrode welding. Five position panel switch selects welding process.

**APPLICATIONS — The MULTI-ARC** provides GMA (MIG) dip-transfer welding of steel up to 3/16" thick (single pass) spot welding of steels from 26 gauge to 16 gauge, and stick electrode welding up to 200 amps. Designed for light fabrication, maintenance welding and for auto body repair shops. Saves time and money in performing repair jobs due to ease of welding, low distortion, simplified joint design and lower weld metal costs.

A front panel jack is provided for connection of the stick electrode holder cable or GTA (TIG) torch. A common (for both GMA (MIG) and stick electrode welding) work cable with clamp is permanently connected through the front panel. A primary input power cord with a plug conforming to NEMA 60-50P configuration is provided connected through the rear panel.



# HOW TO ORDER

The following equipment as listed will provide a complete Multi-Arc unit up to the bottle of gas. It is listed for your convenience in ordering.

CATALOG #	DESCRIPTION
302-E	Multi-Arc (Multi-Arc 160) complete with wire feeder and gun
AK 166-O	Multi-Arc Stick Electrode Kit consisting of 15' # 3 cable w/ 56000 electrode holder and 55710 helmet.
85270-E	Four wheel undercarriage with bottle rack
85271-E	Spot weld timer complete with spot nozzle and clamp
85288-E	Argon/CO <sub>2</sub> Regulator with restricted orifices
85276-E	Contact tip (.030/ .035) for GMA (MIG) gun (Suggest order of 6 ea. for replacements.)

The following items are normal repair or replacement items to the Multi-Arc Welder. They are listed for your convenience in ordering of these replacement parts. A complete and comprehensive parts list for the Multi-Arc is included in the Operational Instruction Manual with the unit.

CATALOG #	DESCRIPTION
85272-O	*R-Spot nozzle with clamp for spot welder timer (MS# 36R252)
85273-E	R-GMA (MIG) gun with 10' cable assembly for the Multi-Arc (MS# 330-U)
85274-O	R-11/ 16" nozzle for GMA (MIG) gun, Catalog # 85273-E (MS# 36R267)
85275-O	R-Spatter guard for GMA (MIG) gun # 85273-E (MS# 36R267)
85276-O	R-Contact tip (.030/ .035) for GMA (MIG) gun # 85273-E (MS# 36R282)
85277-O	R-Felt wiper plug for GMA (MIG) gun of 85273-E (MS# 36R261)
85278-O	R-Fiber washer for GMA (MIG) gun 85273-E (MS# 8R2330)
85279-O	R-Liner for GMA (MIG) gun 85273-E (MS# 36R265)
85280-O	R-"O" ring for GMA (MIG) gun 85273-E (MS# 36R273)
85281-O	R-Sheath for GMA (MIG) gun 85273-E (MS# 36R-274)
85282-O	R-Switch for GMA (MIG) gun 85273-E (MS# 24R2035)
85283-O	R-.030/ .035 Drive rolls for wire feeder of 302 (MS# 36R289)
85284-O	R-.045 Drive roll for wire feeder of 302
85285-O	Wire feed motor for Multi-Arc (MS# 11R2274)
85286-O	Inlet guide (feeder) for Multi-Arc (MS# 36R240)
85287-O	Inlet guide (gun) for Multi-Arc (MS# 36R285)
85288-E	Argon/CO <sub>2</sub> Regulator with restricted orifices (MS# ACG-10)
85289-E	R-Argon regulator - fixed flow for 85288 (806-8044)(MS# 22R1881)
85290-E	R-CO <sub>2</sub> Tank adapter for 85288 (WE-806)(MS# 22R1882)
85291-O	R-Hose barb 1/4" (WE-AW-17)(MS# 22R1859) for 85288
85292-O	R-Nut 5/8" - 18 RH Male (WE-14-A)(MS# 22R1850) for 85288
85293-O	R-Orifice adapter 1/4 NPT-578-18 RH Female/tapped (MS# 22G1829) for 85288
85294-O	R-Orifice screw 15 CFH Orifice Drill # 76 (MS# 22G1729) for 85288
85295-E	R-Orifice screw 20 CFH Orifice Drill # 71 (MS# 22G1727) for 85288
85296-E	R-Orifice screw 30 CFH Orifice Drill # 68 (MS# 22G1884) for 85288
85297-E	R-Orifice screw 40 CFH Orifice Drill # 65 (MS# 22G1885) for 85288
85298-E	R-CO <sub>2</sub> Tank Stem Washer (WE CO-5) for 85288
85315-O	R-Conversion kit, MIG gun for Multi-Arc (MS# 36G330)
85316-O	R-Sealing Bushing for MIG gun # 85273-E (MS# 36R326)
85317-O	R transfer sleeve for MIG gun # 85273-E (MS# 36R325)
85318-O	R spatter guard for MIG gun # 85273-E (MS# 36R324) new style long
85319-O	R adapter for MIG gun # 85273-E (MS# 36R270)
85325-E	Aluminum MIG gun for Multi-Arc
85326-E	Adapter kit for aluminum MIG gun # 85325-E

\*R—represents repair or replacement parts.

\*\*\* The shipment of the Multi-Arc unit is FOB destination.

\*\*\* Terms are cash at time of delivery or, if credit is established, billing is net 10th prox. (Replacement parts or billings less than \$200 are shipped freight collect, or where parcel post is used, prepaid and billed for postage.) All back ordered items are shipped freight or postage prepaid.

\*\*\* Orders for the Multi-Arc or parts for it may be placed with our nearest Dealer, Distributor, District Representative, or called collect or written to Forney Industries, Box 563, Fort Collins, Colorado 80521 (303) 482-7271.

# mig-stick-tig welder

FOR LIGHT INDUSTRIAL & MAINTENANCE WELDING

NWSA INDEX 340

# 160

AMP  
BULLETIN 325

## DESCRIPTION

A compact multi-purpose AC/DC welder designed for dip transfer (MIG) welding of steel or aluminum, AC or DC stick welding with any type electrode, and tungsten inert gas (TIG) welding of aluminum or stainless steel. Low cost, completely equipped package, includes welder power source, built-in wire feeder, 10' (3.05 m) MIG gun and cable, ground cable and clamp, gas hose, and primary cable with plug — ready to weld. An optional four wheel truck and gas bottle rack is available for portability. MIG spot welding can be performed by addition of a plug-in style spot timer.

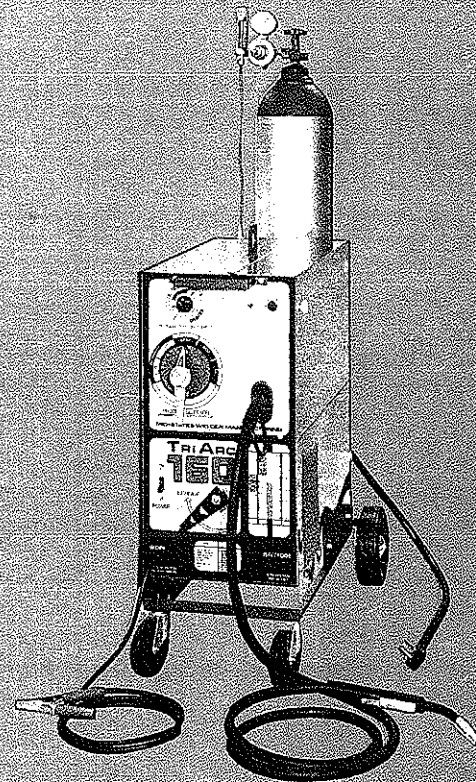
## FEATURES

**SINGLE PHASE** — connects to most readily available 208 or 230 volt AC power lines (other voltages optional), thereby eliminating costly three phase wiring — yet welding performance is equal to heavy duty three phase types.

**CONTROLS** — are designed for simplicity and ease of setting. Process selector switch selects desired mode of operation either Hi or Lo range dip transfer (MIG), or AC, DCSP, and DCRP for stick and TIG operations. Voltage and current control are conveniently set by simplified color code system which is calibrated in material thickness from 20 gauge up to 3/16" (.9 — 4.8 mm). Continuous vernier adjustment in each range allows precise tuning while welding — no fixed taps or plugs to restrict performance.

**WELDER TRANSFORMER** — unique variable transformer design provides both constant voltage welding power for MIG, and constant current power for Stick or TIG welding by means of switch and rotating control handle. Forced air cooling system keeps transformer at safe operating temperatures and thermostat protects against high overloads.

**UNITIZED CONSTRUCTION** — all-in-one package includes variable transformer, hermetically sealed silicon diode rectifiers, all welder power controls, and a built-in high performance wire feeder system — all conveniently mounted in one cabinet. Wire spool hub for 25 lb. (11.3 kg) coils is located behind hinged access door.



MODEL MST-160

**FEEDER AND GUN** — heavy duty wire drive stand is set up for .030/.035 (.8/.9 mm) hard wire. Simple quick-release spring maintains proper feed roll pressure on wire. Shielding gas is controlled by electric solenoid valve. Gun trigger operates at safe 24 volts. Low maintenance air-cooled gun and cable has extra capacity ratings of 300 amps in CO<sub>2</sub> or 200 amps in Argon.

## APPLICATIONS

Truly a 7-in-1 welding system used for MIG dip transfer, MIG spot welding, AC stick, DCSP stick, DCRP stick, AC TIG, and DC TIG welding applications. (See Optional Equipment required for some processes.) Spot welding from one side is possible on 26 gauge to 14 gauge (.5 — 1.9 mm) mild steel sheets with the MIG spot process. This multi-purpose system is especially suitable for job shops, metal fabrication, maintenance departments, vocational schools, ornamental iron shops, truck and body building, and many other businesses.



T.M.

**MID-STATES WELDER MANUFACTURING**

3800 WEST 51st STREET

CHICAGO, ILLINOIS 60632

# S P E C I F I C A T I O N S

MST-160 Process		Rated Output Amps at duty cycle %				Welding Current Range	Max OC Volts	Rated Pri. Input* single phase			Cabinet Dimensions W x D x H	Net Wgt. Lbs.	Shpg. Wgt. Lbs.
		60 Hz.		50 Hz.				Volts	Amps	KVA			
MIG	DC	160	60%	160	50%	40 - 180	38	208/ 230	33/30	6.9	15 x 29 x 30 (38) (74) (76) cm cm cm	200 (91) kg	225 (102) kg
STICK	AC	160	35%	160	25%	35 - 225	77		66/60	13.8			
	DC	160	35%	160	25%	25 - 170	72		66/60	13.8			
TIG	AC	160	20%	135	20%	35 - 225	77						
	DC	160	35%	160	25%	25 - 170	72						

\* Optional voltages - see Ordering Data

**OPTIONAL EQUIPMENT**

**RUNNING GEAR** - a four wheel rubber tired under-carriage with gas bottle platform is available for portability. Model HT-3.

**SPOT WELD TIMER** - mounts behind welder front panel to select time intervals for MIG spot welding. Includes burn-back control. Model WT-1.

**HIGH FREQUENCY ARC STARTER** - required for starting and maintaining the arc when TIG welding aluminum with AC. Model ML-10A.

**ACCESSORY KITS** - interconnecting cable kit conveniently connects High Frequency Arc Starter to welder power source. Kit 23.

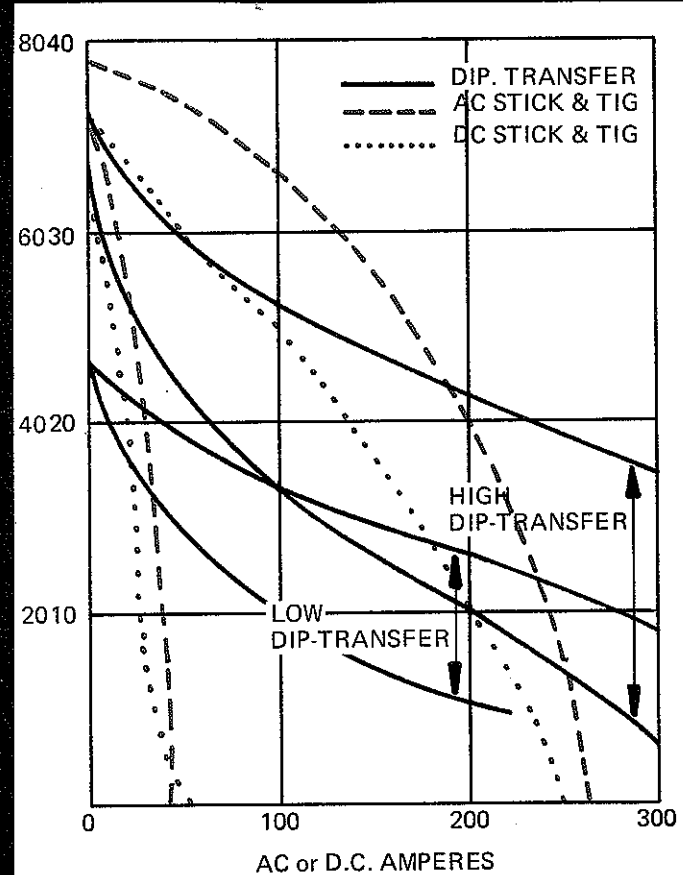
160 Amp TIG Torch Kit connects directly to welder for DCSP TIG welding. Includes 12-1/2 ft. (3.8 m) cables, hoses, collets, cups, tungsten, and other accessories. Must be used with High Frequency Arc Starter when welding aluminum with AC. Kit 18.

**STICK ELECTRODE KIT** - consists of 15 ft. (4.6 m) welding cable, electrode holder, and fiber glass helmet with lens. Plugs directly into welder receptacle. Kit 19.

**ALUMINUM CONVERSION KIT** - adapts standard MIG Gun for push feeding of 3/64" (1.2 mm) diameter aluminum wire. Includes "U" grooved drive rolls. Kit 24.

**SPOOL-ON-GUN** - permits MIG welding at distances up to 200 ft. (61 m) from power source. Guns are furnished less cable extensions and set up for either .030 or 3/64" (.8 - 1.2 mm) soft or hard wires. Model SPG-50LC. Control Adapter is required to connect Spool-On-Gun to welder and is easily mounted on front panel in place of Spot Weld Timer. SPA-3.

## OUTPUT CHARACTERISTICS



## ORDERING DATA

Description	Primary Input Volts		Stock Number
MST-160 Power Source/ Wire Feeder and MIG Gun, complete	208/230	60 Hz.	7846 - 0017
	220/380	50 Hz.	7846 - 0034
	230/460	60 Hz.	7846 - 0018
	575	60 Hz.	7846 - 0035
HT-3 Four Wheel Undercarriage WT-1 Spot Weld Timer KIT-19 Stick Electrode Kit KIT-24 Alum. Conversion Kit 3/64 KIT-18 160 amp Tig Torch Kit ML-10A Hi Frequency Starter KIT-23 Interconnecting Kit to ML-10A SPA-3 Spool-on-Gun Adapter SPG-50LC Gun less cables 3/64" SPG-50LC Gun less cables .030	115/230	50/60 Hz.	1384 - 1834
			7888 - 0020
			7989 - 0012
			7954 - 0004
			7901 - 0001
			7888 - 0006
			7989 - 0001
			7888 - 0032
7951 - 0011			
7951 - 0010			

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## SECTION 1- SAFETY RULES FOR OPERATION OF ARC WELDING MACHINE

### 1.1 GENERAL

- A. These rules apply to ac and dc welding generators, ac transformer and ac/dc welding machines, and dc transformer rectifier welding machines.
- B. In arc-welding operations, where electrically energized parts are exposed, observe the following safety rules to insure maximum personal safety and protect nearby persons.
- C. Failure to observe these safety precautions may expose not only you, but fellow workers as well, to serious injuries. Once these rules are learned and kept in mind, proceed with maximum assurance.

### WELDING MACHINE

#### 1.2 WELDING CABLES

DON'T overload cables.

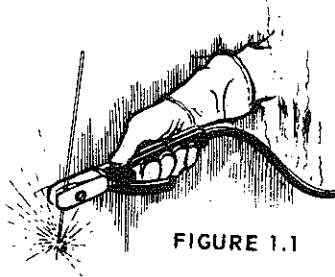


FIGURE 1.1

- A. Never use welding cables at currents in excess of their rated capacity. It will cause overheating and rapid deterioration of the insulation. It is also uneconomical.

DON'T use worn or poorly connected cables.

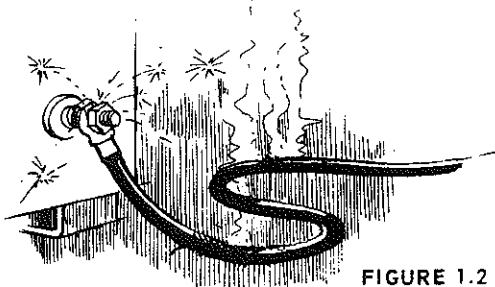


FIGURE 1.2

- B. Inspect the cables frequently. Immediately repair all breaks in the insulation with rubber and friction tapes. Tighten all cable connections and adequately insulate any joints where a connector may have an exposed conductive part. In addition to the potential hazard to life, a hazard occurs when exposed sections of cable come in contact with grounded metallic objects, causing an arc. Unprotected eyes may be injured and fire may result if combustible materials such as oil or grease are in the vicinity. The efficiency and quality of welding will be improved by elimination of these dangerous grounds, and by keeping connections tight.

#### 1.3 ELECTRODE HOLDER

DON'T use electrode holders with defective jaws.

- A. Keep the jaws of the electrode holder tight and the gripping surfaces in good condition to provide close contact with the electrodes. Defective jaws will permit the electrode to wobble, making control of the welding operations difficult.

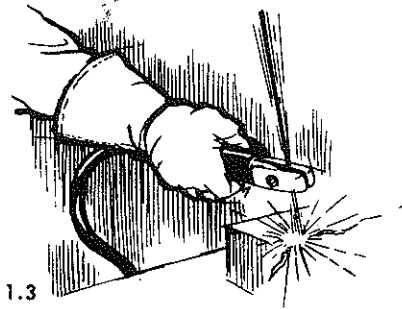


FIGURE 1.3

DON'T use electrode holder with loose cable connections.

- B. Keep the connections to the electrode lead to the holder tight at all times.
- C. Use only fully insulated electrode holders (and without protruding screwheads.)
- D. Never touch two electrode holders from two separate welding machines at the same time.

#### 1.4 CODE CONFORMANCE

- A. The machine and its equipment must be installed and maintained in accordance with the National Electrical Code and local requirements.

#### 1.5 PARALLEL CONNECTIONS

- A. See diagrams in the instruction manual applying to the welding machine used.

#### 1.6 POWER DISCONNECT SWITCH

- A. If the welding machine does not include a power disconnect switch, install one at or near the machine.

#### 1.7 POLARITY SWITCH

DON'T operate the polarity switch under load.

- A. The polarity switch (when supplied) is provided for changing the electrode lead from positive (reverse polarity) to negative (straight polarity). Never move it while under the load of a welding current. Operate this switch only while the machine is idling and the welding circuit is open. The potential dangers of opening the circuit while carrying high current are:
  - (1) An arc will form between the contact surfaces of the switch and severely burn them.
  - (2) The person throwing the switch may receive a severe burn from this arcing.

#### 1.8 RANGE SWITCH

DON'T operate the range switch under load.

- A. The range switch (when supplied) is provided for obtaining required current settings. It must never be operated while the machine is under the load of welding current. Operate the range switch only while the machine is idling and the welding circuit is open. The potential danger of switching the circuit while carrying high current is the formation of an arc between the contact surfaces which may severely burn them. Repeated occurrences of this arcing will eventually prevent operation of the contacts.

#### 1.9 EXHAUST GASES

DON'T use gas engine units in confined spaces without venting the exhaust gases.

- A. If gasoline or other fuel driven welding machines are operated indoors, provide means to pipe the

exhaust gases to the outside air to avoid carbon monoxide poisoning.

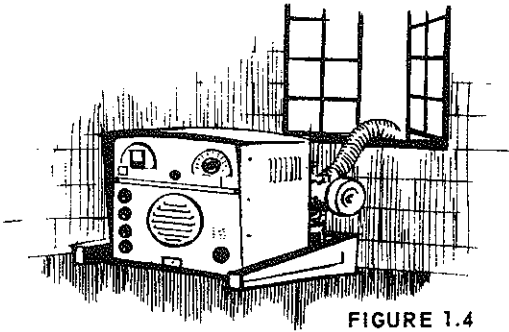


FIGURE 1.4

#### 1.10 POWER CIRCUIT GROUND

**DON'T** use welding machine without grounding frame or case.

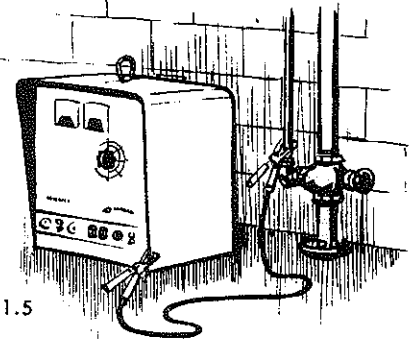


FIGURE 1.5

- A. Ground the ground cable of every power circuit to prevent accidental shock by stray current. The potential danger is that development of a stray current may give a fatal shock should a person, for example, place one hand on the welding machine and the other on the switch box, or other grounded equipment. Do not ground to pipelines carrying gases or flammable liquids and conduits carrying electrical conductors. Be sure conductors can safely carry the ground current. When connecting the welding machine, properly ground the machine frame or case.

### WELDING OPERATIONS

#### 1.11 CONTAINERS WHICH HELD COMBUSTIBLES

**DON'T** weld on containers which have held combustible or flammable materials or materials which, when heated, give off flammable or toxic vapors without proper cleaning, purging, or inerting.

- A. Welding on containers which have held flammable or combustible materials may be extremely dangerous. To prevent a fire or explosion of the container, follow the recommendations of the American Welding Society pamphlet A6.0 "Welding or Cutting Containers Which Have Held Combustibles".  
**DON'T** depend on your eyes or nose to decide if it is safe to weld on a closed container.
- B. Find out what was in the container or use an explosimeter. A very small amount of residual flammable gas or liquid can cause a serious explosion.  
**NEVER** use oxygen to ventilate a container.
- C. When you know the container held a gas or liquid which will readily dissolve in water:
  - (1) Flush out with water several times and then fill with water as far as work permits, posi-

tioning container to permit introduction of as much water as possible.

- (2) Before welding be sure there is a vent or opening to provide for release of air pressure.
- D. When you know the container held a gas or liquid which will not readily dissolve in water.
  - (1) Clean out thoroughly with steam or a cleansing agent and purge all air or inert with a gas such as carbon dioxide or nitrogen before repairing. Carbon dioxide is heavier than air and will tend to remain in the container if the opening is at the top.
  - (2) Use steam to clean out light material.
  - (3) Use a strong caustic soda solution to clean out heavy oils or grease.
  - (4) Be sure to purge all air or inert with a gas, such as nitrogen or carbon dioxide, no matter how well you have cleaned. There may still be traces of oil, grease, or other readily oxidizable material under the seams.
- E. Be careful when cleaning with steam or caustic soda - wear goggles and gloves.  
**DON'T** clean where there is poor ventilation.
- F. Ventilation is necessary to carry away harmful or explosive vapors.  
**DON'T** clean where there are open flames.
- G. When scraping or hammering to remove heavy sludge or scale, use a spark resistive tool and keep it wet to avoid sparks.
- H. Keep your head and arms as far away from your work as possible.

#### 1.12 HOLLOW CASTINGS

**DON'T** weld on hollow (cored) castings that have not been properly vented. The casting may explode.

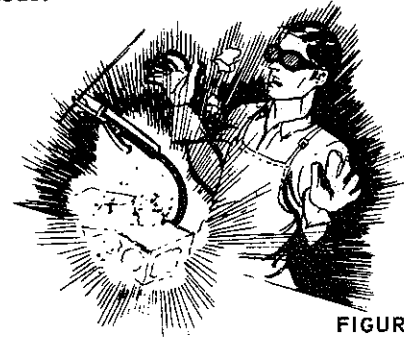


FIGURE 1.6

#### 1.13 EXPLOSION HAZARDS

**NEVER** weld in or near explosive atmospheres. Such atmospheres can be created by flammable gas leaks or by vapors from flammable liquids (gasoline, alcohol, etc.) or by combustible dusts.

#### 1.14 VENTILATION

**DON'T** weld in confined spaces without adequate ventilation.

- A. When welding in confined spaces, provide ventilation in accordance with United States of America Standard Z49.1, 1967. Always provide adequate ventilation by blowers, air lines, or other acceptable means. Never use compressed oxygen. The depletion of the oxygen supply, the heat of welding, and the fumes given off may cause severe discomfort or a serious illness.



- B. When toxic fumes from lead or cadmium bearing materials or any other substances are present in harmful concentrations, always use an air supplied respirator.

#### 1.15 SOLVENTS

- A. Do not weld where chlorinated hydrocarbon vapors from degreasing, cleaning, or spraying may reach or be drawn into air surrounding the welding operation. The heat of the arc can decompose solvent vapors to form phosgene, a highly toxic gas and and other irritating decomposition products.
- B. Do not weld where ultraviolet light from the electric arc can penetrate air containing even minute amounts of vapors from solvents such as trichloroethylene or perchloroethylene. Ultraviolet light can decompose the vapors to form phosgene, a highly toxic gas, and other irritating products.

#### 1.16 FIRE HAZARDS

DON'T weld near flammable or combustible materials.

- A. Fires can be caused by the arc, by contact with the heated metal, by slag, or sparks. Keep combustibles at least 35 feet from the arc or suitably protected. If welding must be done in a particular area, move the combustibles away. If they cannot be moved, cover them completely with fire resistive screens. Cover cracks or openings in floors or walls; sweep floor free of combustibles and wet down, if wood, being sure welder wears insulation shoe coverings. Avoid welding on partition walls in contact with combustibles. Heated metal on the other side of partition wall being welded upon can ignite combustibles in contact with the partition. Where other than a minor fire might develop, have a fire watcher stand by with suitable fire extinguishing equipment for at least one-half hour after the welding is completed.

#### 1.17 ELECTRICAL SHOCK-VOLTAGE

OPEN power circuits before checking machines.

- A. Before working on the wiring, switches, controls, etc., open the power line disconnect switch. In most welding shops the power supply used for arc welding machines is 230 or 460 volts. Open circuit voltages are usually less than 100 volts and welding or arc voltage drops are still lower. However, all of these voltages are capable of developing a harmful or fatal current to the body.

DON'T touch electrically "hot" parts.

- B. Never touch any exposed or non-insulated part of the cables, cable connectors, clamps, electrode holders, electrodes, or the power supply equipment to prevent harmful or fatal electric shock or burns.

#### 1.18 ELECTRICAL SHOCK-DAMPNESS

NEVER work in a damp area without suitable insulation against shock. Keep hands, feet, and clothing dry at all times.

- A. To prevent harmful body shocks, keep hands, feet and clothing dry. Never stand or lie in puddles of water, damp ground, or against grounded metal when welding without suitable insulation against shock. Always find a dry board or rubber mat to stand on when water, moisture, or perspiration cannot be avoided. Dampness between the body and

an energized or grounded metallic part lowers the resistance to the passage of current to the body which may produce a harmful or fatal shock. Salt in perspiration or sea water dangerously lowers contact resistances.

#### 1.19 STARTING UNDER LOAD

DON'T leave an uninsulated electrode holder, or a "live" electrode on the table top or in contact with a grounded metallic surface.

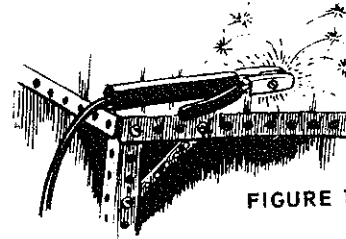


FIGURE 1.7

When it is not in use, never place an electrode holder in contact with the table top or other metallic surface in contact with welding ground. Provide an insulated hook or holder for the electrode holder. A potential danger is that a holder in contact with the ground circuit provides a dead short circuit on the welding machine. If the machine should be started up, this short circuit would cause an excessive load on the machine and may damage the insulation.

#### 1.20 FACE PROTECTION

DON'T use cracked or defective helmets or shields.

Keep the helmet, hand shields, or face shield in good condition. If cracks occur in the fibre material, replace the shield, since the leakage of arc rays may cause serious burns.

#### 1.21 EYE PROTECTION

NEVER under any circumstances, look at an electric arc without eye protection.



FIGURE 1.8

#### CAUTION

Make sure that flash goggles are used under the welding helmet at all times, particularly while gas shielded-arc welding.

- A. In some type of arc welding, such as gas shielded-arc welding, ultra-violet and infra red radiation from the arc is particularly intense and requires constant attention to avoid arc flashes to the welder when striking an arc to avoid exposure to other welders.

NEVER strike an arc without ascertaining that nearby persons either have the necessary protec-

tive equipment or are looking in the opposite direction.

- B. For welding operations in open areas, provide portable, non-reflecting screens to shield persons nearby from the rays of the arc. Eye burns from the arc, though not generally permanent injuries, are exceedingly painful. Such burns frequently referred to as "flashes", feel like hot sand in the eye. If the eye is focused on the arc without filter-glass protection, infra-red radiation can cause retinal scarring and impaired vision. For eye burns consult your first aid station or doctor.  
NEVER use cracked, ill-fitting, or defective plates.

- C. The filter glass plate provided in the helmets and shields must be of reputable manufacture conforming to the latest USA Standard Z2.1. Replace cracked or ill-fitting plates promptly.

NEVER use filter plates without a protecting cover glass.

- D. Keep a clean cover glass in front of the filter plate for the protection thereof. Frequent renewal of these cover glasses is necessary, since they become covered with spatter, reducing vision.

#### 1.22 CLOTHING

NEVER use poor, inadequate, or worn-out clothing. Wear heavy shoes, tightly laced. Keep clothing dry.

- A. Proper and dry, oil-free clothing is essential for the welder's protection. Clothing must not only keep off the spatter and molten particles, but must also obstruct the rays of the arc and, when necessary, insulate the body from harmful electrical currents.
- B. Wear leather or asbestos gloves at all times to protect the hands and wrists. Dark colored shirts are preferred to light ones because light ones reflect arc rays to exposed parts of the body. In the case of gas shielded-arc welding, light colors are more reflective and may cause eye burn due to the intense ultra-violet rays given off by the process. Avoid cotton fabrics when gas shielded arc welding.
- C. An arc burn on the skin resembles a sunburn, except that it is usually more severe. Clothing can be made flame resistant by treatment with a solution of 3/4 pound of sodium stannate in 1 gallon of water, then wrung out and dipped in a solution of 1/4 pound ammonium sulphate per gallon of water. Don't wash clothing so prepared in water, but dry clean.
- D. When welding operations are to be performed in vertical and overhead positions, leather sleevelets, aprons, and in some cases leggings and ear plugs should be used to prevent severe burns from spatter and molten metal.

#### 1.23 HOT METAL BURNS

NEVER pick up hot objects.

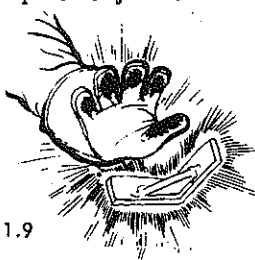


FIGURE 1.9

- A. Never pick up pieces of metal which have just been welded or heated, or the stub ends of electrodes which have been discarded.

#### 1.24 GRINDING AND CHIPPING

- A. Whenever it is necessary to grind or chip metal, wear protective goggles specifically designed for this purpose. Serious eye injuries may result from failure to wear protective goggles.

NEVER do any chipping or grinding without protective goggles.



FIGURE 1.10

#### 1.25 COMPRESSED GAS CYLINDERS

NEVER strike an arc on compressed gas cylinders. Always observe the following precautions in regard to compressed gas cylinders.

- A. Avoid accidental contact of the electrodes, electrode holder, or other electrically energized parts with a compressed gas cylinder or any other pressure vessel. Serious accidents or fires may result.
- B. Use I.C.C. or D.O.T. cylinders. They are manufactured and maintained in accordance with D.O.T. requirements and are safe so long as they are properly handled. Don't drop cylinders.
- C. Identify gas content by the name marked on the cylinder. If the cylinder is unmarked, do not use it. Return it to the supplier. Do not rely on color code.
- D. Never use a cylinder or its contents for other than intended purposes.
- E. Keep oil and grease away from oxygen cylinders and cylinder valves.
- F. Keep cylinders away from exposure to sparks, hot slag, open flame and all possible sources of ignition or excessive heat.
- G. Be careful that cylinders are not placed so as to become a part of an electrical circuit. Avoid third rails, wires and electric welding circuits.
- H. When transporting cylinders by crane, use cradle, platform or other suitable support.
- I. Never lift the cylinders by slings, by the caps or by electric magnets.
- J. Never use cylinders as supports or rollers.
- K. Never try to mix any gases in a cylinder.
- L. Never try to refill a cylinder.
- M. Mark or tag empty cylinders "Empty" or "MT".
- N. Send "Emptys" back to the supplier promptly.
- O. Keep "Emptys" and "Fulls" separate.
- P. Never tamper with or alter cylinder numbers or other markings. This is not only foolish but may be illegal.
- Q. Do not tamper with or change fittings on cylinders.
- R. If valves cannot be opened by hand, do not use hammer or wrench. Notify supplier.
- S. Protect cylinder valves from bumps, falls, falling objects, and from weather. Keep them covered with cylinder caps when moving cylinders.
- T. Keep valves closed on empty cylinders.
- U. See that your cylinders are clear of passageways

and active work areas and that they are secured against falling.

V. If adapter is required between cylinder and regulator, always use a standard adapter. These may

be obtained from your supplier. Where right and left hand threads are used on adapter, use two wrenches to insure leak proof connections.

W. Do not store cylinders in unventilated areas.

## 2 - INTRODUCTION

### 2.1 SCOPE

This manual provides installation, operation, maintenance information and spare parts list for the 160 Ampere MIG-STICK WELDING SYSTEM.

### 2.2 USE

The SYSTEM is a completely self-contained unit which can be used for dip-transfer welding of mild steels up to 3/16 inch in thickness as well as stick electrode and TIG welding of various types of materials. DC reverse polarity dip-transfer welding, stick welding with AC and DC, and TIG welding with DC straight polarity and AC are selected by means of the Process Selector Switch. An optional Spot Weld Control Panel permits timed gas-metal arc spot welds.

### 2.3 DESCRIPTION

The SYSTEM specifications are listed in Table 2 - 1.

TABLE 2 - 1

#### SPECIFICATIONS

INPUT VOLTAGE	208/230 Single Phase, 60 Hz
RATED INPUT AMPERES STICK ELECTRODE	66/60
RATED INPUT AMPERES DIP TRANSFER	33/30
RATED OUTPUT	
DC DIP TRANSFER	160 Amp @ 22 Volts, 60% Duty Cycle
DC STICK ELECTRODE	160 Amp @ 28 Volts, 35% Duty Cycle
AC STICK ELECTRODE	160 Amp @ 28 Volts, 35% Duty Cycle
DC SP TIG	160 Amp @ 28 Volts, 35% Duty Cycle
AC TIG	160 Amp @ 28 Volts, 20% Duty Cycle
CURRENT RANGE	
DC STICK ELECTRODE & TIG	25-160 Amperes
AC STICK ELECTRODE & TIG	35-200 Amperes

## MAXIMUM OPEN CIRCUIT VOLTAGE

DC or AC STICK ELECTRODE & TIG 80

DC DIP-TRANSFER 38

DIMENSIONS:	HEIGHT	30
	WIDTH	15
	DEPTH	29

NET WEIGHT 200 lbs.

SHIPPING WEIGHT 225 lbs.

The SYSTEM consists of a combination Wire Feeder Power Supply housed in one enclosure, and an Air-Cooled Gun. The Gun connects to the Wire Feeder through an opening in the front panel. The Wire Feeder section, consisting of motor, drive rolls, wire guides and spool hub, is accessible through the hinged right top side panel.

The operating controls mounted on the front panel are the Power ON-OFF Switch, Process Selector Switch, Output Hand Crank and Indicator and Dip-Transfer Wire Feed Speed Control. For dip-transfer welding, a control switch lever is provided on the Gun handle.

The work cable with Ground Clamp is permanently connected internally through the front panel and a receptacle is provided on the front panel for the stick electrode cable and TIG holder.

A primary power input cord with a 50 ampere plug conforming to NEMA 6-50 P configuration is provided at the rear of the machine.

An optional Spot Weld Control panel is available for field installation to facilitate a timed Gas-Metal Arc Spot Welding function.

## 3 - INSTALLATION

### 3.1 UNPACKING

This Equipment has been packed to prevent damage in transit. Unpack it carefully to prevent accidental damage by tools. After unpacking, examine the equipment for signs of damage, particularly to the front panel controls, and electrical components. Immediately report, in writing, any damage to the Distributor and the freight carrier. All claims for damage should be made to the Freight Carrier.

### 3.2 LOCATION

Locate the Equipment within 10 feet of the welding operation when used for dip-transfer welding. Keep away from grinding or other operations which produce chips or filings that will be drawn into the Equipment by the cooling fan. Allow at least 18 inches between the back of the Equipment and a wall, or other obstructions. Keep the Shield Gas Cylinder away from heat sources.

A good installation is essential if the Equipment is to provide satisfactory and dependable service.

Preventive maintenance consists of removing the covers from the Equipment and blowing out dust and dirt accumulation. Therefore it is desirable to locate the equipment so that the covers can be removed without difficulty.

### 3.3 PRIMARY ELECTRICAL INPUT CONNECTIONS

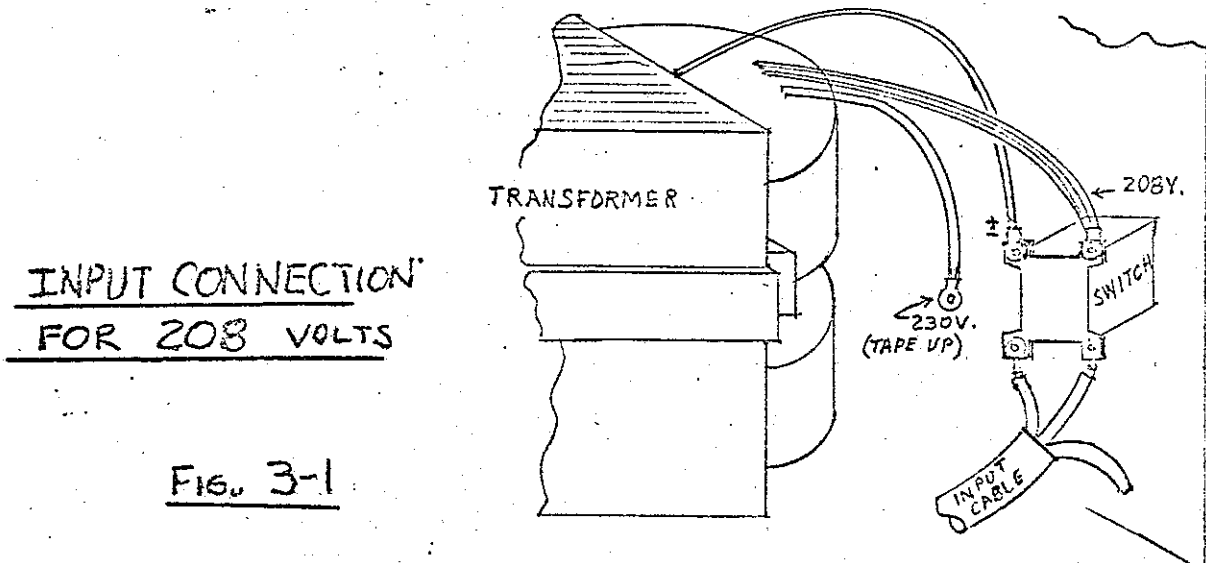
The standard Voltage System is designed to operate on 208 or 230 volts, single phase, 60 Hz. power. Special units designed for operation on other primary voltages are available from the factory.

The standard units leave the factory connected for 230 volt operation. To reconnect for 208 volts, see Figure 3-1.

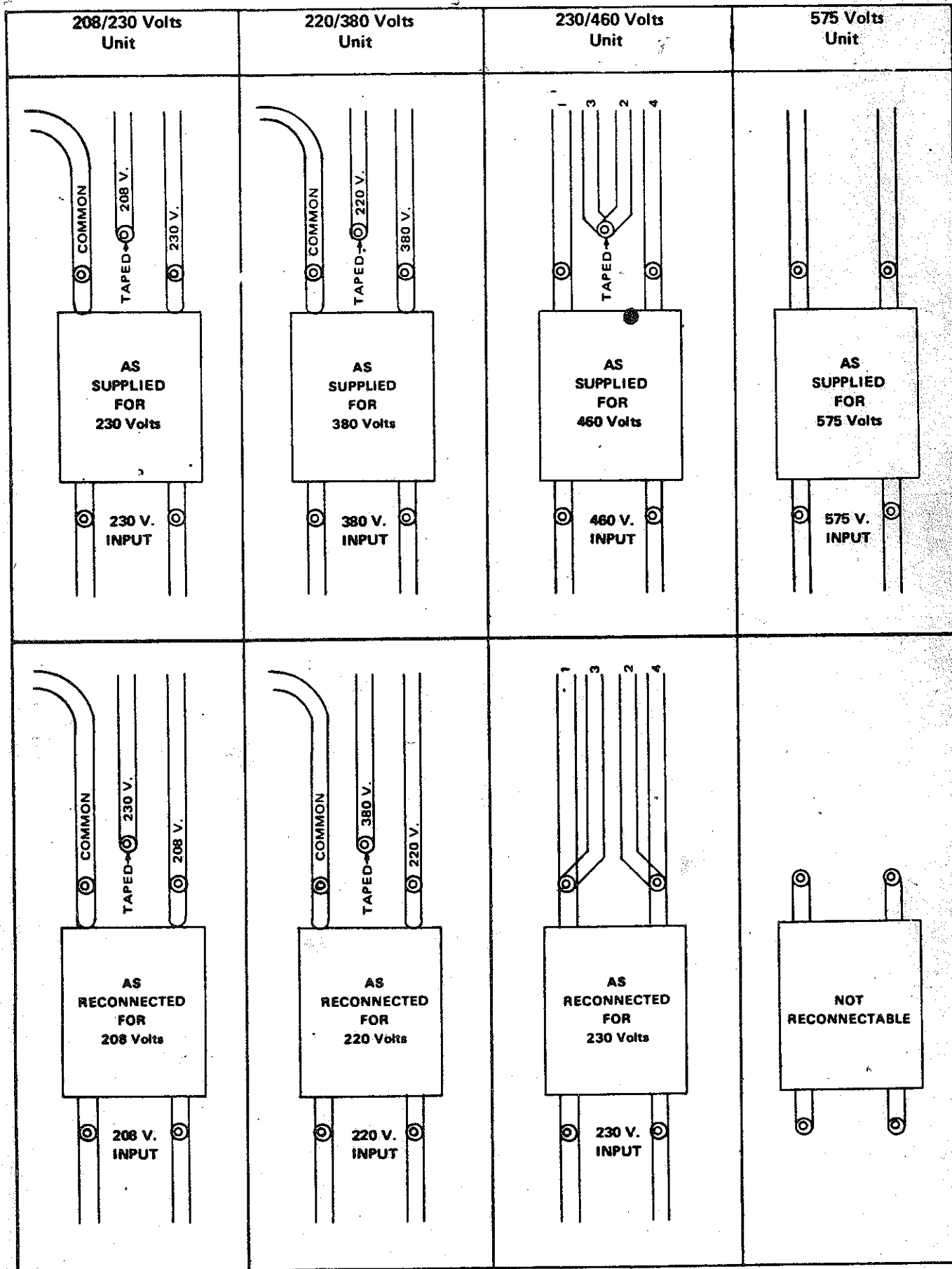
#### CAUTION

PRIOR TO CHANGING PRIMARY VOLTAGE CONNECTIONS, MAKE SURE THE EQUIPMENT IS COMPLETELY DISCONNECTED FROM THE INCOMING POWER. REMOVE THE PRIMARY INPUT PLUG FROM THE RECEPTACLE.

Remove the left hand side panel from the Equipment. Carefully disconnect the transformer lead tagged 230 from the top outside terminal of the Power Switch. Tape this lead up. Carefully connect the lead tagged 208 to the Power Switch. Make sure all leads are clear of each other, other components, and the case. Replace the left-hand side cover.







Primary Reconnections at Switch

This Equipment requires a single-phase input power supply of adequate capacity. Table 3-1 lists the proper size of input wiring and fusing.

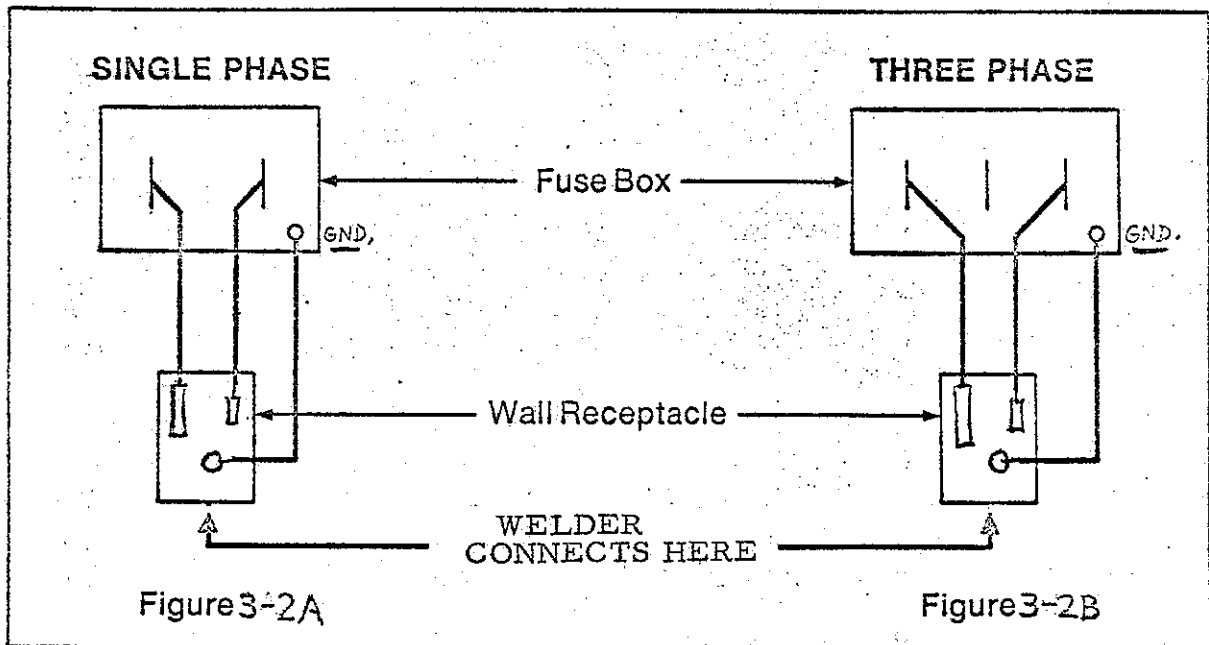
TABLE 3-1  
Based on National Electric Code - 1971

<u>PRIMARY INPUT VOLTAGE</u>	<u>GROUND &amp; INPUT WIRE AWG (COPPER)</u>	<u>CIRCUIT BREAKER OR FUSE SIZE</u>
208-230	#8	90

The input power cord is provided with an attachment plug cap. This plug-cap will mate with a 250 volt, 50 ampere receptacle conforming to NEMA 6-50 R configuration. This receptacle is available from local electrical Equipment Suppliers.

The receptacle should be wired to a separately fused disconnect or circuit breaker of the size listed in Table 3-1. This disconnect or breaker can be wired to a single phase supply or to two wires of a three phase supply. A third wire for grounding should also be connected between the disconnect and the receptacle. Figure 3-2A illustrates wiring to a single phase supply and Figure 3-2B illustrates wiring to a three phase supply.

All wiring should conform to local electrical codes and requirements. Consult the local power company about local codes or requirements.



### 3.4 CONNECTION OF THE WELDING GUN

Feed the machine end of the Gun cable assembly through the opening in the front panel of the Equipment. Fasten the fitting on the end of the conduit to the drive roll stand with the locking nut. Make sure the outlet guide is properly aligned with the drive rolls.

Connect the control wires to the control receptacle and the gas hose to the gas valve.

Bolt the power lead from welder to the cable lug on the Gun with the bolt provided.

### 3.5 DRIVE ROLLS

The drive roll installed in the Equipment feeds .035 inch diameter hard wire electrode. An extra drive roll was packed with the welding gun. This roll is used to feed .030 inch diameter wire.

#### IMPORTANT

THE DRIVE ROLL PRESSURE IS SELF-ADJUSTING BY MEANS OF THE LEAF SPRING LATCH AND WAS SET AT THE FACTORY FOR PROPER PRESSURE.

### 3.6 WELDING WIRE SPOOL

Install a spool of hard wire electrode of the proper diameter, as determined by the contact tip and drive rolls, as follows:

- a. Unscrew the nut from the hub.
- b. Place wire spool on the hub so that the wire unwinds as the spool rotates clockwise. Note that the hub pin must engage the hole in the spool.
- c. Replace the hub nut.

### 3.7 THREADING WELDING WIRE

Thread welding wire as follows:

- a. Release the spring from the catch and left the pressure roll arm.

#### CAUTION

BEFORE THREADING WELDING WIRE THROUGH CASING, MAKE SURE CHISEL POINT AND BURRS HAVE BEEN REMOVED FROM WIRE END SO IT CANNOT PUNCTURE CASING OR STICK IN MONO COIL LINER.

- b. Feed the wire from the spool through the inlet guide, across the drive roll groove through the outlet guide, and into the Gun/ cable.
- c. Holding the wire in the groove, lower the pressure roll arm and secure by inserting the spring in the catch. Check that the gears mesh.
- d. Switch the Process Selector to LOW DIP-TRANSFER and turn the POWER SWITCH on. Press the trigger on the welding gun and feed the wire up to the Gun with the Gun cable held straight. Observe that the wire feeds smoothly off the spool and through the drive rolls. It may be necessary to remove the contact tip from the Gun to permit the wire to start through the tip properly.

### 3.8 CONNECTION OF THE SHIELD GAS SUPPLY

Connect the gas inlet hose to the nipple on the regulator.

### 3.9 WELDING CABLE CONNECTIONS

Connect the work clamp solidly to the work piece or work table. Clamp on a bare metal area.

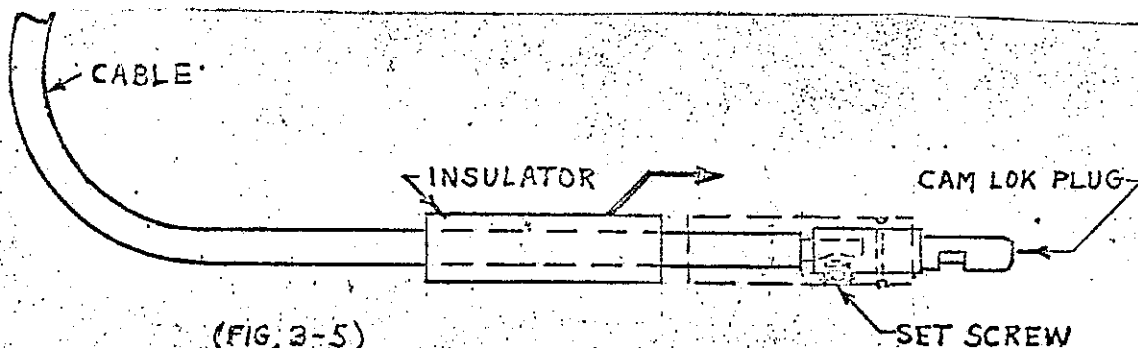
#### IMPORTANT

A GOOD ELECTRICAL CONNECTION TO THE WORK IS ESSENTIAL TO PROPER WELDING OPERATION.

It is recommended that the welding cables be kept as short as possible and be of adequate current carrying capacity. The resistance of the welding cables and connections cause a voltage drop which is added to the voltage of the arc. Excessive cable resistance may result in a reduction of the maximum usable current output of the Equipment.

The proper operation of this Equipment is to a large extent dependent on the use of welding cables and connections that are in good condition and of adequate size.

The unit is shipped with a connector which should be removed and attached to the Stick electrode holder cable. See Figure 3-5. Use No. 4 welding cable for lengths up to 50 feet. Use No. 3 welding cable for lengths over 50 feet. A special connector is available to be used in conjunction with a TIG holder.



## 4 OPERATION

### CAUTION

REVIEW AND COMPLY WITH ALL SAFETY PRECAUTIONS IN THE SAFETY SECTION AT THE FRONT OF THIS MANUAL.

#### 4.1 DIP TRANSFER WELDING

- a. Slowly open the valve on the shield gas cylinder.
- b. Set Wire Feed Speed control for the gage of steel to be welded. Set the hand crank so that the indicator shows the proper setting for the gage to be welded.

If steel of two different gage thicknesses is to be welded, determine the average of the two and make the settings accordingly. When welding aim the arc more toward the heavier metal.

### IMPORTANT

THE WIRE FEED SPEED CONTROL DIAL AND THE VOLTAGE INDICATOR ARE CALIBRATED FOR WELDING WITH EITHER .035 INCH DIAMETER ELECTRODE WIRE AND AG25 (75% AR+25% CO<sub>2</sub>) SHIELDING GAS OR .030 INCH DIAMETER ELECTRODE WIRE AND CO<sub>2</sub> SHIELDING GAS. FOR OTHER ELECTRODE WIRE DIAMETER-SHIELDING GAS COMBINATIONS SEE TABLE 4-1.

Electrode Wire Dia. (in)	Shielding Gas	Wire Feed Speed Control Correction	Hand Crank Indicator Correction
.035	CO <sub>2</sub>	None	Increase approx. one GA setting
		Decrease approx. one GA setting	None
.030	AG25	Increase approx. one GA setting	None
		None	Decrease approx. one GA setting

TABLE 4 - 1 CONTROL CORRECTIONS

- c. Set the Process Selector to DIP-TRANSFER HIGH or LOW as determined by the gage thickness. If the optional Spot Weld Control is installed make sure the Spot Weld ON-OFF Switch is OFF.
- d. Turn the Power Switch to ON.

### CAUTION

WHEN THE POWER SWITCH IS ON AND THE GUN SWITCH LEVER IS DEPRESSED, THE ELECTRODE WIRE BECOMES ELECTRICALLY HOT. DO NOT TOUCH THE WIRE AS IT MAY CAUSE SHOCK. DO NOT ALLOW THE WIRE TO TOUCH A GROUNDED METAL SURFACE AS IT WILL CAUSE AN ARC FLASH.

- e. Position the Gun about 3/8 inch above the work piece. Depress the Gun Switch Lever and weld.
- f. Fine adjustments in welding voltage (arc length) can be made with the hand crank and fine adjustment of the welding current (wire feed speed) can be made with the Wire Feed Speed Control. These adjustments can be made while welding.

### IMPORTANT

DO NOT TERMINATE THE ARC BY REMOVING THE GUN FROM THE WELD AREA. RELEASE THE GUN SWITCH LEVER TO STOP WELDING, BEFORE REMOVING THE GUN.

- g. For Spot Welding with the optional Spot Weld Control, install the spot weld nozzle on the Gun and set the Spot Weld ON-OFF switch to ON. Set the Process Selector to DIP-TRANSFER HIGH, and both the Wire Feed Speed Control and output indicator to Spot Weld. Set the Spot Weld Time Control for the desired weld duration.

When spot welding hold the Spot Weld nozzle against the work piece and allow no more than a slight gap, if any, between the materials to be welded.

The Spot Weld Control includes a burn back-delay circuit which has been preset at the factory for optimum time. If field adjustment is necessary, the slide wire resistor on the bottom of the Spot Weld Control panel can be adjusted. Increasing the resistance increases the length of burn back time, and decreasing the resistance shortens the burn back time. If the burn back time is too short, the electrode wire will stick in the weld crater; and if the burn back time is too long, the wire may burn back and fuse in the end of the contact tip.



- e. Connect the Gas Supply.
- f. Turn on power switch and weld.

4.3

DUTY CYCLE

The duty cycle of the Equipment is the percentage of a 10 minute period that it can operate safely at a given output current. This unit is rated at 160 amperes at 22 volts, 60 per cent duty cycle for DIP-TRANSFER welding. This means that the equipment can be safely operated in the dip-transfer mode at 160 amperes for 6 minutes out of every 10. If the welding current is decreased the allowable duty cycle will increase. See Figure 4 - 1.

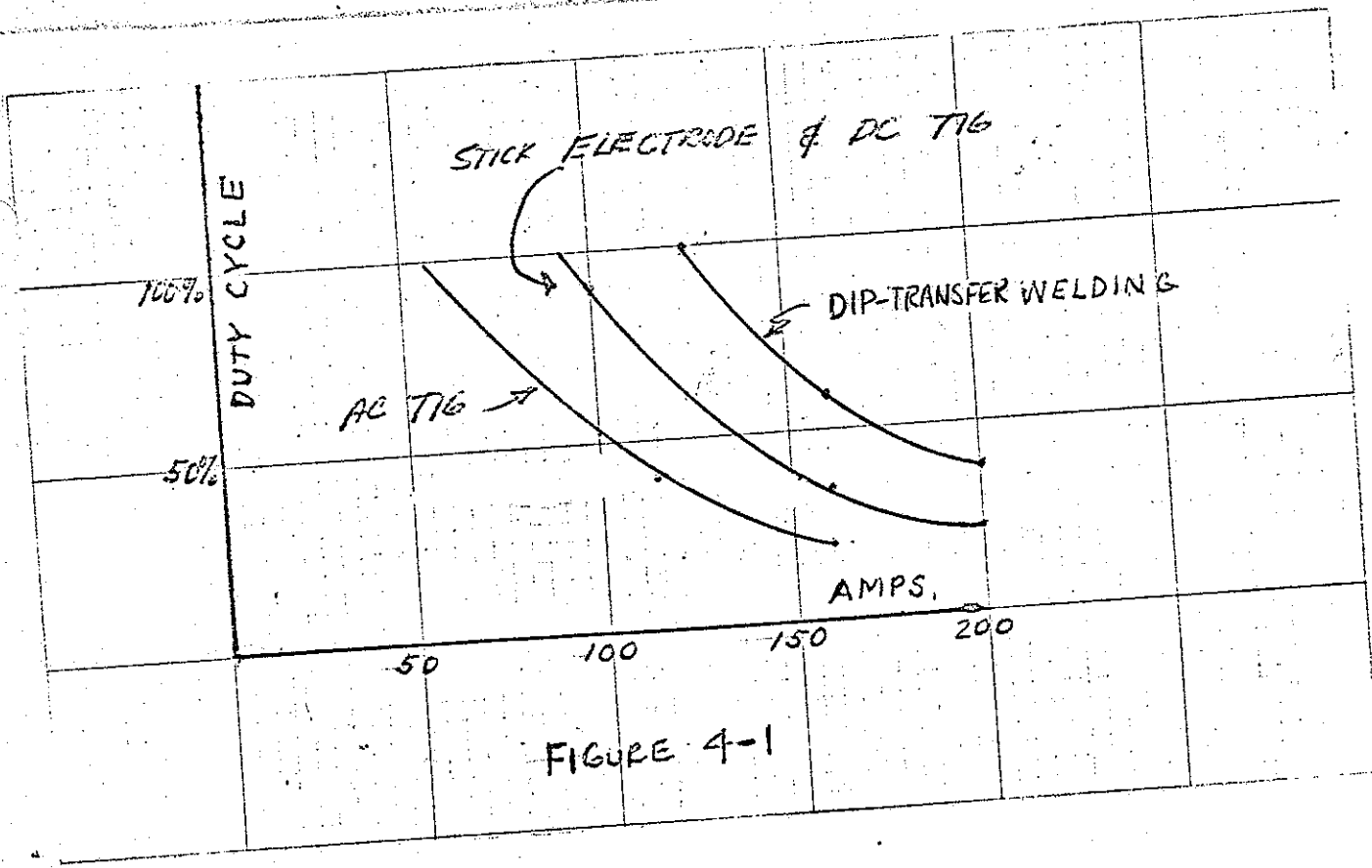


FIGURE 4-1

## INSTRUCTIONS FOR ADDING RUNNING GEAR KIT 13G2470

### RUNNING GEAR KIT INCLUDES:

1 PULL HANDLE	1 BOTTLE SUPPORT WITH CHAIN ATT.
1 BOTTLE RACK	1 CASTER MOUNTING ANGLE
2 CASTERS	4 CAP SCREWS, 3/8-16
2 WHEELS	4 LOCK WASHERS, 3/8
1 AXLE	4 NUTS, 3/8-16
2 FLAT WASHERS	4 CAP SCREWS, 1/4-20x1/2"
2 "PUSH ON" SPEED NUTS	8 CAP SCREWS, 1/4-20x3/4"
2 HUB CAPS	12 LOCK WASHERS, 1/4
	8 NUTS, 1/4-20

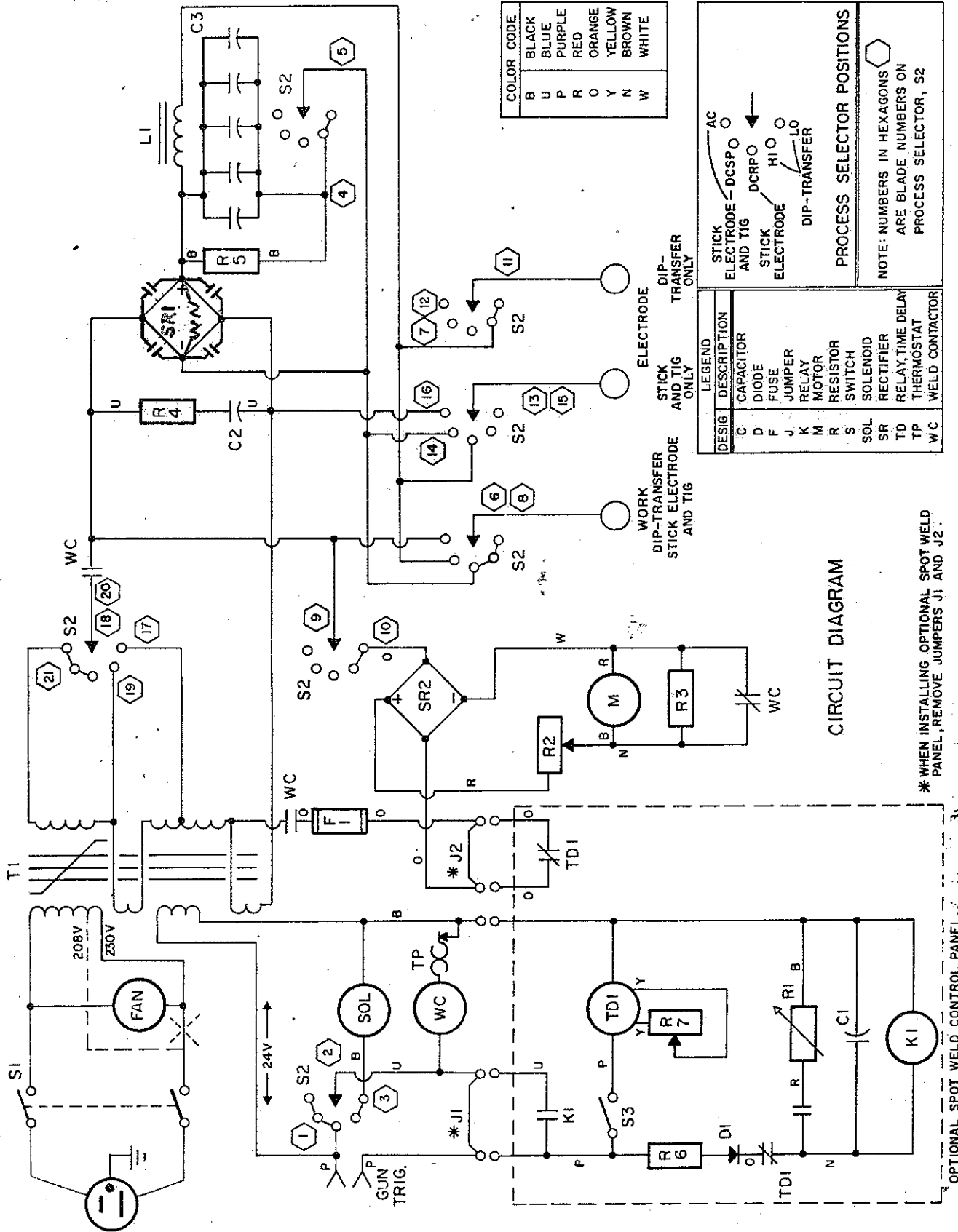
1. Remove all lumber from base of machine.
2. Raise back end of machine high enough so that bottle rack can be placed under mounting legs of base with the 4 holes in rack matching the 4 holes in the legs.
3. Insert 3/8-16 Cap Screws and add Lock Washers and Nuts.
4. Slide axle through holes in sides of bottle rack.
5. Add flat washer next to side of rack and then add wheel, making sure that wheel is turned so the protruding hub is next to the washer.
6. Push speed nut on to axle all the way up to the wheel. Then force hub cap over the end of axle. Repeat steps #6 & #7 for the other wheel.
7. Lower back end on to wheels and raise front end of machine to mount casters.
8. Place caster mounting angle, with flange up, on top of front holes of base mounting legs.
9. Place 1 caster under the leg and insert 4 long cap screws (1/4-20x3/4) through the 4 holes in the leg and mounting angle. NOTE: Screws must be inserted from bottom with lock washers and nuts on top.  
  
Repeat the procedure for the other caster.
10. The Pull Handle is mounted with 2 cap screws (1/4-20x1/2) and lock washers using the 2 tapped holes at the top of the front panel of the machine.
11. The Bottle Support is mounted with 2 cap screws (1/4-20x1/2) and lock washers using the 2 tapped holes near the top of the back panel of the machine.

NOTE: It is recommended that the axle be welded to the underside of the gas cylinder tray to keep it from turning and wearing on the narrow edges of the holes.

## INSTRUCTIONS FOR INSTALLING SPOT TIMER PANEL

1. Remove 4 screws holding small cover plate at upper right corner of front panel of machine.
2. Remove 2 white jumper leads from terminal block inside machine.
3. Fasten Spot Timer assembly in place of cover plate using same screws just removed.
4. Connect terminal strip from Spot Timer to terminal block, matching lead colors on each.

The Spot Weld Timer Control is now ready to use.



COLOR CODE	
B	BLACK
U	BLUE
P	PURPLE
R	RED
O	ORANGE
Y	YELLOW
N	BROWN
W	WHITE

DESIG	DESCRIPTION
C	CAPACITOR
D	DIODE
F	FUSE
J	JUMPER
K	RELAY
M	MOTOR
R	RESISTOR
S	SWITCH
SOL	SOLENOID
SR	RECTIFIER
TD	RELAY, TIME DELAY
TP	THERMOSTAT
WC	WELD CONTACTOR

AC  
 STICK ELECTRODE - DCSP0  
 DCRPO  
 STICK ELECTRODE  
 H1 O  
 LO  
 DIP-TRANSFER

PROCESS SELECTOR POSITIONS  
 NOTE: NUMBERS IN HEXAGONS ARE BLADE NUMBERS ON PROCESS SELECTOR, S2

CIRCUIT DIAGRAM

\* WHEN INSTALLING OPTIONAL SPOT WELD PANEL, REMOVE JUMPERS J1 AND J2.

OPTIONAL SPOT WELD CONTROL PANEL

PARTS LIST

<u>ITEM</u>	<u>PART NO.</u>	<u>DESCRIPTION</u>
1	36R260	Wiper Cap
2	8R2330	Fiber Washer
3	36R261 @	Wiper Plug, (Felt)
4	36R264	Retainer, (Liner)
5	36R265 @	Liner
6	36R267 @	Nozzle (11/16) (2)
7	36R268 @	Spatter Guard
8	36R282 @	Contact Tip (5)
9	36R270	Adapter
10	36R271	Nozzle Grip
11	7R2142	Set Screw
12	36R272	Gooseneck
13	36R273 @	"O" Ring
14	36R274 @	Sheath (Goosenedk)
15	36R275	Cap
16	36R276	Cover (Trigger)
17	36R277	Trigger
18	24R2035 @	Switch
19	36R278	Switch Plate
20	7R2144	Screw (Nylon Face)
21	36R279	Handle
22	36R280	Service Con duit
23	11R2283	Knife Terminal
24	36R246	Retaining Nut
25	36R284	Adapter (Feeder)
26	36R285	Bushing
27	36R286	Sleeve
28	36R287	Retainer
29	36R288	Adapter Liner

reassemble in reverse order. Check that trigger slants AWAY from handle and that the switch clicks.

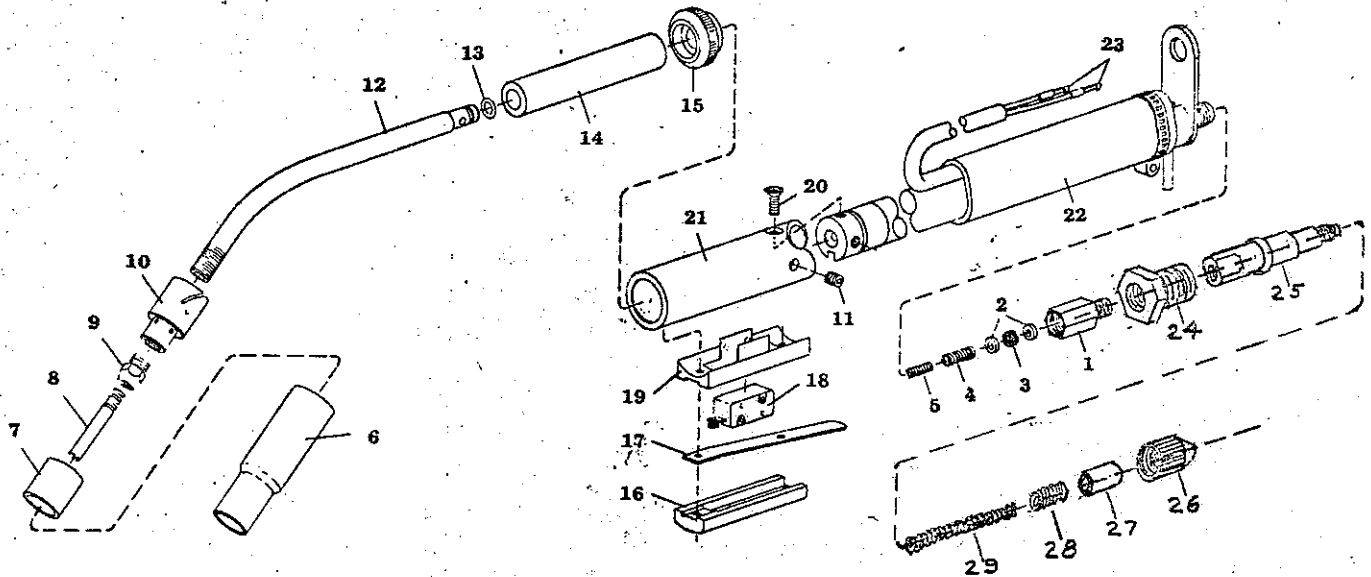
- c. **HANDLE AND CONDUIT** — Remove gooseneck and switch (steps a and b), remove nylon/steel screw from handle and slide service conduit with switch leads straight out of handle. DO NOT TWIST (it may damage keys inside handle). Before reassembly, line up the conduit fitting groove with the switch opening in the handle, and check that the switch leads are in the groove (see sketch). Insert conduit in handle without twisting so that the groove straddles the keys. When holes align, reinstall insulated, nylon/steel screw. CAUTION — DO NOT use other than an insulated screw.

- d. **LINER** — Lay conduit straight (see TO-INSTALL step 1,A).

Remove wiper cap (1,B) and remove old liner from feeder end. Push new liner through feeder end of service conduit until it butts against contact tip (1, D, inset) and complete steps 1,E through G. The felt wiper plug cleans wire of dirt and chips; if worn and ineffective, replace plug.

3. **TO CHANGE SWITCH LOCATION:** Remove 2 setscrews, (step 2, a above) and turn gooseneck 180° (without removing it from handle). Align holes and replace setscrews.
4. **TO EASE SPATTER REMOVAL:** Spray a thin film of anti-spatter compound on contact tip and nozzle. Clean tip and nozzle of accumulated spatter frequently and reapply SPATTER SCAT. DO NOT strike nozzle to remove spatter.

## PARTS



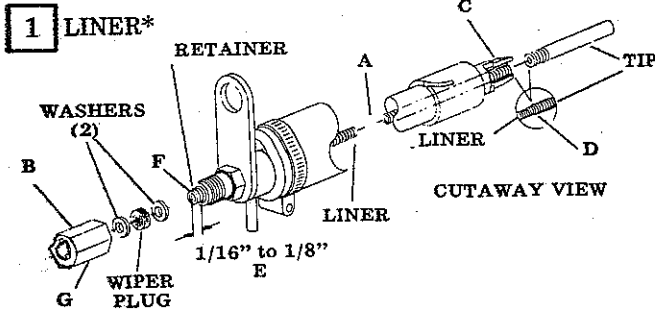


# INSTRUCTIONS FOR WELDING GUN USED ON 160 AMPERE MIG-STICK WELDING SYSTEM

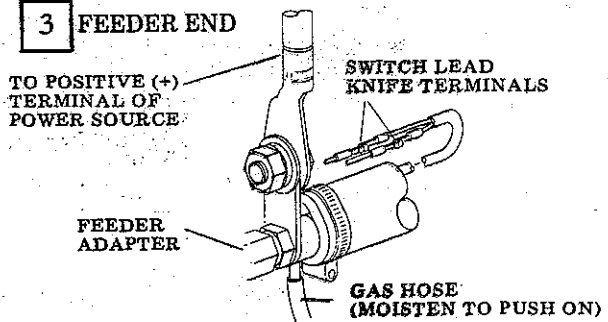
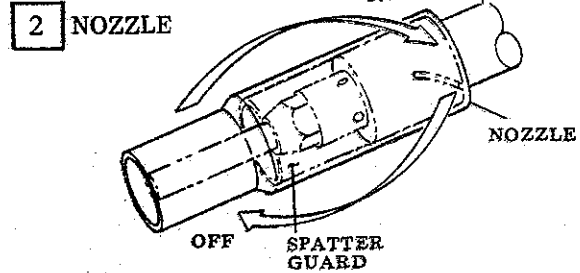
## SAFETY

- Before installing, checking, or servicing the Gun, shut OFF all power and gas supplies, and disconnect power source from wire feeder. Pull fuses or lock (or tag) switches.
- When working in relatively confined spaces where gas supplies are large enough to seriously lower the oxygen content of the atmosphere, provide adequate ventilation at all times and be sure to turn off the valve at the gas supply when shutting down so that the area will be safe to work in or to re-enter.
- Do not lay the Gun where the trigger can accidentally be pressed. If power is ON, electrode wire becomes electrically HOT and will flash on contact with grounded metal. An arc flash may injure unprotected eyes and may start a fire.
- To avoid damage to the Gun, do not exceed current rating.

## TO INSTALL:



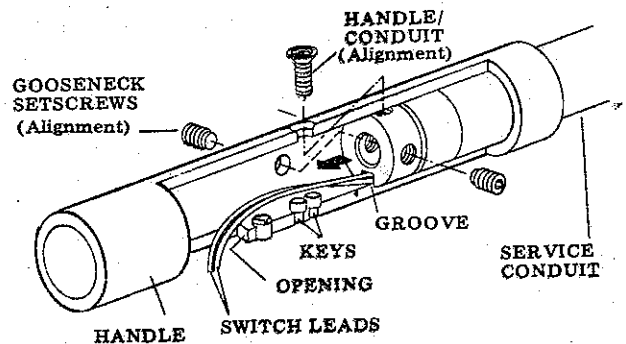
- Lay service conduit straight.
- Remove wiper cap.
- Push liner into tip adapter until just visible.
- Screw in contact tip so it butts against liner; tighten with pliers.
- Screw retainer on liner until it sticks out 1/16 to 1/8-inch from conduit fitting.
- With sharp side cutters, cut liner flush with retainer, and remove burr.
- Re-install wiper cap (with wiper plug and washers inside).



\*Alternate method of trimming liner: Coil service conduit in three 14" dia. loops and with sharp side-cutters, cut liner flush with tip adapter. Remove burr from bore. Lay conduit straight and install contact tip as in step (D). (If difficult to screw in tip, loosen wiper cap 3 turns, install tip, then retighten cap).

## OPERATING AND SERVICE

- CHECK before welding that:
  - Tip adapter is wrench tight.
  - Contact tip is correct for wire size and screwed tight.
  - Spatter guard is in nozzle and nozzle is clean.
  - Nozzle is tight on gooseneck. If loose, pry up the 3 prongs on nozzle grip, enough for firm grip.
  - Gooseneck metal tube is not exposed; it is electrically HOT when trigger is pressed (see SAFETY section). If insulating sheath is cut or worn, replace it.
- TO REPLACE PARTS (See exploded parts drawing opposite):
  - GOOSENECK — Remove 2 setscrews through holes in handle and with slight twist, pull out gooseneck. To replace, moisten the O-ring on the gooseneck to aid insertion. Insert with slight twist, align holes, (see sketch in step c) and replace setscrews.
  - SWITCH — Remove screws, cover, trigger, switch leads, and switch plate. Spread plate tabs and pop switch out. Snap in replacement switch and



For AC and DC stick electrode, and DCSP TIG welding this Equipment is rated at 160 amperes at 28 volts at 35 per cent duty cycle. Therefore when used for stick electrode welding at 160 amperes, it can safely be used for 3-1/2 minutes out of every 10. If used at 200 amperes for AC stick electrode it should not be used more than 2 minutes out of every 10.

For AC TIG welding this equipment is rated at 160 amperes at 20% duty cycle. This means that it should not be used for more than 2 minutes out of each 10 minute period if AC TIG welding at 160 amperes. At 100 amperes on AC TIG it can be used for 5 minutes out of every 10.

### CAUTION

NEVER OPERATE THIS EQUIPMENT WITH THE COVERS REMOVED. IN ADDITION TO A SAFETY HAZARD, IMPROPER COOLING MAY RESULT IN DAMAGE TO THE TRANSFORMER AND OTHER COMPONENTS. THE WARRANTY IS VOID IF THE EQUIPMENT IS OPERATED WITH COVERS REMOVED.

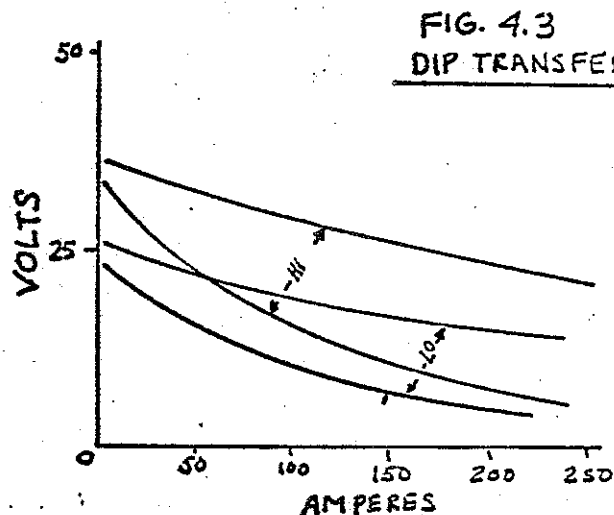
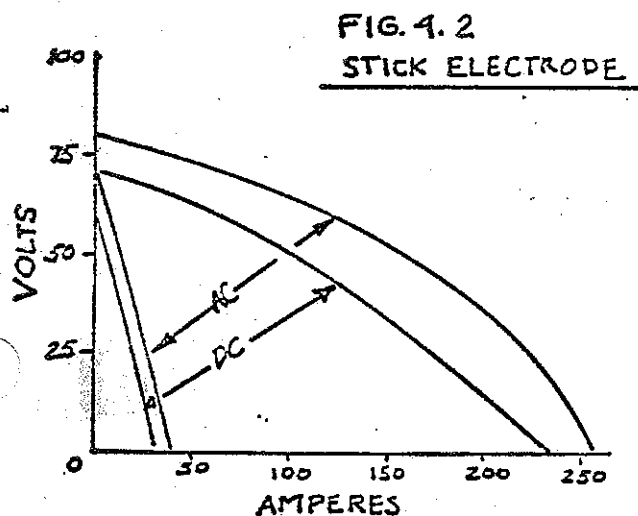
This Equipment is provided with a thermostat in the transformer windings which will open and prevent the contactor from closing if the transformer windings are overheated.

If the thermostat opens, allow the Equipment to idle with the fan running for approximately 15 minutes before attempting to weld again.

#### 4.4 VOLT-AMPERE CURVES (FIGURES 4.2, 4.3)

The volt-ampere curves show the output voltage available at any given output current for the maximum and minimum settings of the output Indicator for the various Process Selector positions. Output voltages between these maximum and minimum curves are available at intermediate settings of the Indicator.

The actual operating point of load voltage and current is determined by type of process, electrode, shield gas, wire feed speed and operator technique.



## 5 MAINTENANCE

### IMPORTANT

THE MAINTENANCE DESCRIBED IN THIS SECTION SHOULD BE UNDERTAKEN ONLY BY A COMPETENT PERSON EXPERIENCED IN MAINTAINING SUCH ELECTRO-MECHANICAL EQUIPMENT. DO NOT ATTEMPT ANY REPAIRS OTHER THAN THOSE GIVEN BELOW. IF FURTHER SERVICE IS REQUIRED, CONTACT THE NEAREST AIRCO REPRESENTATIVE.

### CAUTION

ALWAYS SHUT OFF ALL POWER AND GAS SUPPLIES BEFORE ATTEMPTING INSPECTION OR MAINTENANCE. DISCONNECT THE LINE CORD PLUG FROM RECEPTACLE. DO NOT TOUCH ELECTRICALLY HOT PARTS.

#### 5.1 INSPECTION AND UPKEEP

Inspect and maintain the Equipment as often as required by operating conditions:

Keep Equipment in clean and safe operating condition free of oil, grease, and (in electrical parts) liquid and metallic particles that can cause short circuits. Clean weekly with a low-pressure jet of dry compressed air.

Regularly check cylinder valves, regulators, hoses, and gas connections for leaks with soap solution.

Check for and tighten loose hardware including electrical connections. Loose power connections overheat during welding.

Immediately replace all worn or damaged power cables and connectors. Check for frayed and cracked insulation, particularly in areas where conductors enter equipment.

The electrode wire and all metal parts in contact with it are electrically energized while welding. Inspect these parts periodically for defective insulation and other electrical hazards.

## CAUTION

IF UNINSULATED CABLE AND PARTS ARE NOT REPLACED, AN ARC CAUSED BY A BARED CABLE OR PART TOUCHING A GROUNDED SURFACE MAY DAMAGE UNPROTECTED EYES OR START A FIRE. BODY CONTACT WITH A BARED CABLE, CONNECTOR, OR UNCOVERED CONDUCTOR CAN SHOCK, POSSIBLY FATALY.

Keep power cables dry, free of oil and grease, and protected at all times from damage by hot metal and sparks.

Clean dirt and metal particles from drive roll groove weekly; replace roll if badly worn.

Oil the fan motor with a few drops of SAE 20 non-detergent oil every 3 months.

The threaded brass adjusting screw of the transformer should be kept lubricated with lubricant such as Chicago Manufacturing and Distributing Co. Extreme Pressure Lube #3. The plastic strips which are part of the moving iron section of the transformer can be lubricated with Lien Chemical No. 806 Supreme #20.

### 5.2 TROUBLE SHOOTING

If the equipment does not function properly use the following Trouble Shooting Guides for probable causes and remedies of listed symptoms.

TABLE 5 - 1  
TROUBLE SHOOTING GUIDE - GENERAL

<u>WELD CONDITION</u>	<u>POSSIBLE CAUSE</u>	<u>REMEDY</u>
1. No weld or control power	a. Primary input power not available. b. Faulty connection, line cord or power switch. c. Blown fuse .	a. Check for voltage to receptacle and that plug is connected. b. Repair or replace cord or switch as necessary, c. Replace fuses.

<u>WELD CONDITION</u>	<u>POSSIBLE CAUSE</u>	<u>REMEDY</u>
2. No welding power	a. Thermostat has opened.  b. Shorted diode in main rectifier.  c. Open in wiring.	a. Wait 15 minutes with fan running.  b. Check diodes and replace if required.  c. Check all wiring.
3. Fan does not run	a. See Weld Condition 1.  b. Defective fan motor.	a. See Weld Condition 1.  b. Replace fan motor.
4. Erratic welding current	a. Poor work piece connection.  b. Loose welding connections.	a. Check work piece grounding connection.  b. Check all connections
5. Welding output voltage and/or current too low	a. Low line voltage.  b. Welding cables too long or too small.  c. Loose connection.	a. Use correct voltage.  b. Use correct cable size.  c. Check all welding cable connections.

TABLE 5-2  
TROUBLE SHOOTING GUIDE DC DIP-TRANSFER  
CONTINUOUS WELDING

<u>WELD CONDITION</u>	<u>POSSIBLE CAUSE</u>	<u>REMEDY</u>
1 Stringy irregular bead, poor penetration	a. Gun moved too fast.  b. Controls are not set properly for metal gage thickness.	a. Move Gun slower along seams.  b. Reset controls properly.
2 Bead not centered	a. Nozzle not aligned.	a. Move Gun nozzle parallel to and centered over seam.

<u>WELD CONDITION</u>	<u>POSSIBLE CAUSE</u>	<u>REMEDY</u>
3. Bead too large	a. Gun moved too slowly,	a. Move Gun faster along seam,
4. Unstable arc, excess spatter, weld porous	a. Shield gas flow is too low or stopped, b. Gun nozzle is too far from work, c. Controls not set properly for metal gage thickness,	a. See condition 5, b. Maintain 1/4" wire protusion, hold closer to work, c. Res et controls properly,
5. Shield gas flow low or stopped	a. Cylinder valve closed, b. Cylinder empty, c. Faulty regulator or adaptor, d. Faulty gas solenoid valve.	a. Slowly open valve, b. Replace if gauge so indicates. c. Check flow at outlet replace faulty item. d. Replace solenoid valve.
6 Wire stubs on work while welding	a. Controls not set properly for metal gage thickness,	a. Reset controls properly,
7. Wire burns back into contact tip	a. Contact tip loose, b. Tip too close to work, c. Wire feed slipping, d. Contact tip damaged, e. Drive or pressure roll dirty or worn,	a. Firmly tighten with pliers, b. Maintain 1/4" wire protusion; hold Gun further from work. c. Increase pressure on pressure roll by bending spring. d. Trim back tip 1/16" Max. Replace if still faulty. e. Clean rolls or replace.



TABLE 5-3  
TROUBLE SHOOTING GUIDE -DC GAS METAL ARC  
SPOT WELDING

<u>WELD CONDITION</u>	<u>POSSIBLE CAUSE</u>	<u>REMEDY</u>
1 Poor penetration	a. Weld time too short.  b. Gap between metal pieces is too great.  c. Controls not set properly for spot welding	a. Increase weld time control settings.  b. Close the gap.  c. Set control properly See. Para. 4.1.g.
2 Hole burned through one or both metals	a. Weld time too long.  b. Gap between metal pieces is too great.  c. Metal flange too narrow or weld is too close to edge.  d. Control not set properly for spot welding.	a. Decrease weld time control setting.  b. Close the gap.  c. Reposition weld or decrease weld time control setting.  d. Set controls properly. See. Para. 4.1.g.

6 - SPARE AND REPLACEMENT PARTS

6.1 SPARE PARTS

To assure minimum downtime, it is recommended that the spare parts noted by the symbol @ in the Part No. column of the parts list be kept on hand. The recommended quantity if more than one, is in parenthesis () following the item description.

6.2 PARTS INFORMATION

The following parts lists identifies each part by stock number, description, and quantity used.

### 6.3 ORDERING INFORMATION

To assure proper operation, use only genuine parts and products with this equipment. To order replacement parts, proceed as follows:

- a. Give the Part Number, description and quantity of each part required.
- b. Give the Part Number, serial number and description of the equipment on which the parts will be used.
- c. Indicate any special shipping instructions.

<u>PARTS LIST - POWER SUPPLY/FEEDER</u>			
<u>PART NO.</u>	<u>DIA.</u> <u>MKG.</u>	<u>DESCRIPTION</u>	<u>QUANTITY</u>
27R2286	T1	Transformer Assembly 208/230	1
24R648	S1	Line Switch	1
29R2080		Primary Input Cord	1
11R2272		Fan Motor (230 Volt)	1
11R2273		Fan Blade 10"	1
24G2030	S2	Process Selector Switch	1
18G1881	WC	Welding Contactor Assembly	1
		Contact Set for Contactor - Specify Mfg. on Contactor	
17G1637	SR1	Main Power Rectifier Assembly	1
		Includes:	
17R1634		Silicon Diode (Cathode Stud)	2
17R1635		Silicon (Anode Stud)	2
19R1772	R4	Resistor, 27 Ohm, 2 W	1
4R120A	C2	Capacitor, 4 MFD, 230 V	1
19R1802	R5	Bleeder Resistor, 50 Ohm 50 W	1
4R1233	C3	Capacitor, 10,000 MFD, 50 V	5
27G2005	L1	D C Inductor	1
11R2245	F1	Fuse 6 Amp ABC	1
17R1636	SR2	Wire Feed Rectifier	1
19R1804	R2	Wire Feed Speed Control	1
11R2274	M	Wire Feed Motor	1
36R238		Drive Roll. 035	1

<u>PART NO.</u>		<u>DESCRIPTION</u>	<u>QUANTITY</u>
36R239		Drive Roll .030	1
36R240		Inlet Guide	1
19R1788	R3	Drive Motor Shunt Resistor	1
11R2207		Fuse Holder	1
11R2271		Terminal Strip	1
24G2012	TP	Thermostat	1
22G1878	SOL	Solenoid Valve	1
9RI608		Cam Lok Receptacle	1
		Ground Cable Assembly	1
14R2366		Indicator Strip	1
13R2457		Indicator Spring	1
3G2316		Cabinet Base	1
3G2317		Cabinet Front Panel	1
3G2318		Cabinet Back Panel	1
3G2320		Cabinet Left Side Panel	1
3G2323		Cabinet Right Side Panel Assy.	1
3G2325		Cabinet Wire Feed Shelf Panel Assembly	1

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PARTS LIST FOR SPOT TIMER PANEL

<u>PART NO.</u>		<u>DESCRIPTION</u>	<u>QUANTITY</u>
3G2327		Spot Timer Mounting Panel	1
18R1880	TD1	Timer includes Rheostat & Knob	1
24R220	S3	Switch	1
18R1857	K1	Delay Relay	1
4R1231	C1	Capacitor 80 MFD, 115 V	1
19R1803	R1	Adjustable Resistor	1
19R1795	R6	Resistor	1
19R1614	D1	Silicon Diode	1
36R252		Spot Nozzle with Clamp	1

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PARTS LIST FOR RUNNING GEAR

<u>PART NO.</u>	<u>DESCRIPTION</u>
13G2463	Handle
13G2464	Bottle Support
7R2063	"S" Hook
13R2332	Chain 22" Long
13G2467	Bottle Tray
13G2468	Caster Mounting Angle
6R1323	Caster
6R1322	Wheel
13G2469	Axle
7R2135	Speed Nut
7R2130	Hub Cap