ARC-MASTER 501

For the Following Specs:
- 500108A-1

OWNER'S MANUAL Number **430429-288**
Revised December 1, 1997

IMPORTANT: Read these instructions before installing, operating, or servicing this system.

THERMAL ARC INC., TROY, OHIO 45373-1085, U.S.A.

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INTRODUCTION

How To Use This Manual

This Owner's Manual usually applies to just the underlined specification or part numbers listed on the cover. If none are underlined, they are all covered by this manual.

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

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

WARNING gives information regarding possible personal injury. Warnings will be enclosed in a box such as this.

CAUTION refers to possible equipment damage. Cautions will be shown in bold type.

NOTE offers helpful information concerning certain operating procedures. Notes will be shown in italics.

Equipment Identification

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

Receipt Of Equipment

When you receive the equipment, check it against the invoice to make sure it is complete and inspect the equipment for possible damage due to shipping. If there is any damage, notify the carrier immediately to file a claim. Furnish complete information concerning damage claims or shipping errors to Thermal Arc, Order Department, 2200 Corporate Drive, Troy, Ohio 45373-1085. Include all equipment identification numbers as described above along with a full description of the parts in error.

Move the equipment to the installation site before uncrating the unit. A lifting eye extends through the top of the cabinet on most equipment to facilitate handling with a hoist or crane. Use care to avoid damaging the equipment when using bars, hammers, etc., to uncrate the unit.

WARNING: Falling machine due to lifting eye failure may cause death or serious injury.

- Lifting device may fail when overloaded.
- This lifting device is designed to lift the power source **ONLY**. If the machine is equipped with a trailer or accessories over 100 pounds, **DO NOT LIFT** by lifting eye.
- Avoid sudden jerks, drops, or swinging.
- Check lifting device components visually for looseness and signs of metal fatigue.
- Before changing any hardware, check grade and size of bolts, and replace with bolts of equal or higher size and grade.

Additional copies of this manual may be purchased by contacting Thermal Arc at the address given above. Include the Owner's Manual number and equipment identification numbers.

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DESCRIPTION OF EQUIPMENT

General

The ARC-MASTER 501 is a primary inverter DC power source that can be used for constant voltage, constant current, and pulse welding processes. The DC output is produced by a transistorized primary inverter operating at a frequency of 20 kHz, which allows for quiet, efficient operation. The output is rated at 500 amperes/40 volts at 100% duty cycle, for all modes of operation. An auxiliary 120 volt/10 ampere AC output is also provided, with circuit breaker protection.

Controls for the following welding processes are built into the ARC-MASTER 501: Shielded Metal Arc Welding (Stick), Gas Tungsten Arc Welding (TIG), Gas Metal Arc Welding (MIG), and Pulsed Gas Metal Arc Welding (Pulsed MIG). As an integral part of the Pulsed Mig control, the power source contains pre-programmed weld schedules for 24 wire/gas combinations. All 24 schedules may also be programmed by the operator. An optional Programming Pendant (204180-1) is required to do this. The following controls are incorporated into the front panel of the power source: Process select switch, Amperage/Voltage/Pulse Frequency control, Inductance/Arc-Force control, Remote/Local control switch, Digital amps/volts meter and switch, Pulse Mig schedule select switch, and indicator lights.

The ARC-MASTER 501 also contains the following protection features to assure continued, reliable operation: Input over and undervoltage shutdown, overcurrent shutdown, short circuit protection, overtemperature shutdown, output open circuit voltage limitation, and fan thermostat.

Specifications

Input Data					
Line Voltage	**Line Current**	**kVA**	**Eff.**	**PF**	**Output**
200 VAC/60 Hz	88 Amps	30.5	86%	.81	100% @ 500A/40V
230 VAC/60 Hz	80 Amps	31.9	86%	.77	100% @ 500A/40V
400 VAC/60 Hz	44 Amps	30.5	86%	.81	100% @ 500A/40V
460 VAC/60 Hz	37 Amps	29.5	86%	.84	100% @ 500A/40V
400 VAC/50 Hz	44 Amps	30.5	86%	.81	100% @ 500A/40V

Maximum Average Output Current:	500 Amps (100% duty cycle)
Minimum Average Output Current:	10 Amps
Maximum Pulse Current:	600 Amps
Short-Circuit Limit:	800 Amps
Overcurrent Shutdown:	525 Amps
Maximum Open Circuit Voltage:	50 Volts
Voltage Adjust Range for CV:	10 – 40 Volts
Current Adjust Range for CC:	0 – 500 Amps
Operating Temperature Range	0 – 40°C
Input Line Variations	±10% (for all line voltages)
Line Regulation	±1%
Load Regulation	±1%

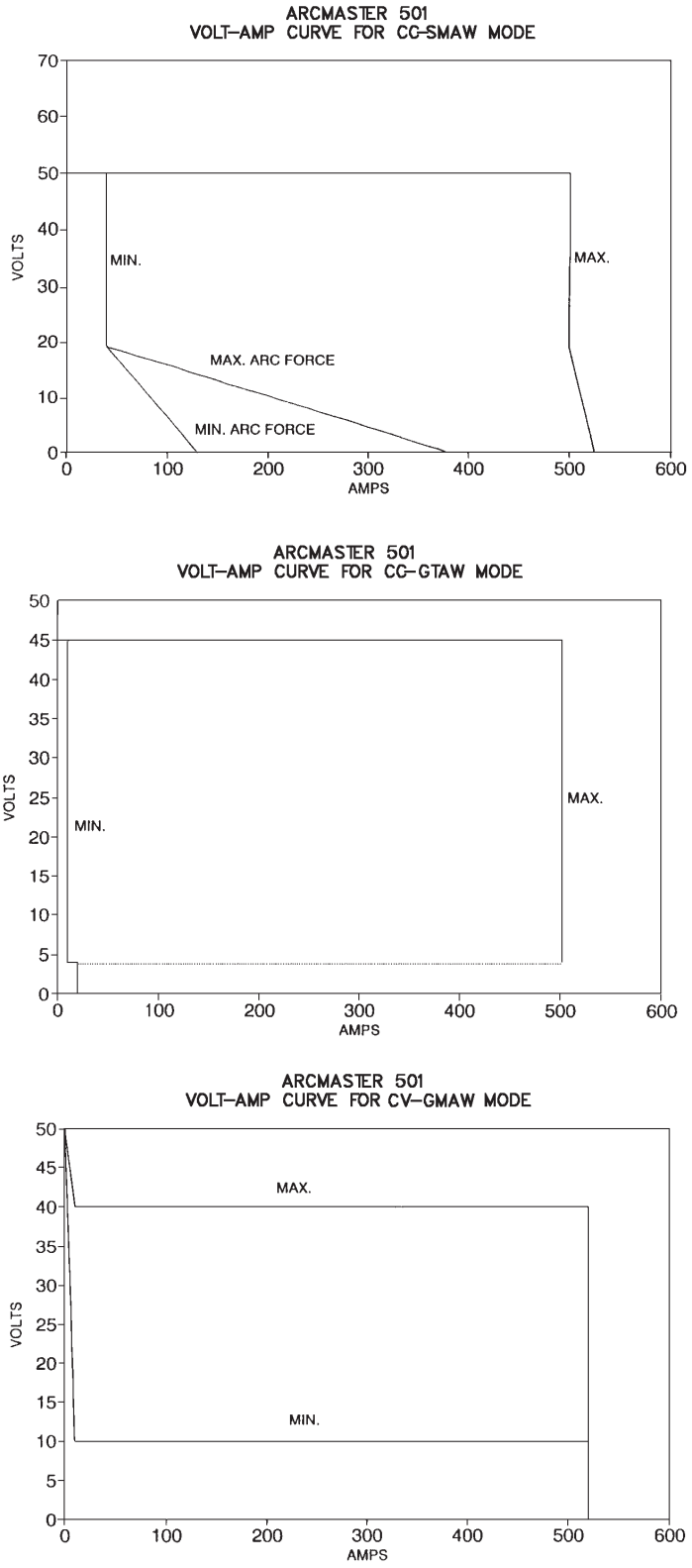
ARCMASTER 501
VOLT–AMP CURVE FOR CC-SMAW MODE
VOLTS
AMPS
MIN.
MAX.
MAX. ARC FORCE
MIN. ARC FORCE
ARCMASTER 501
VOLT–AMP CURVE FOR CC–GTAW MODE
VOLTS
AMPS
MIN.
MAX.
ARCMASTER 501
VOLT–AMP CURVE FOR CV–GMAW MODE
VOLTS
AMPS
MAX.
MIN.

Figure 3-1

Protection Features

The machine has several built-in protection features designed to assure reliability.

a. **Short-Circuit Current Limit** — The output current is limited to a safe absolute maximum value as listed in the specifications. This current limit circuit is active for all modes of welding, and will instantly limit the current during short-circuit conditions. The circuit will not shut the power source off.

b. **Overcurrent Shutdown** — If the average welding current exceeds the shutdown limit listed above (for a couple of seconds), the power source will shut itself off and turn on the RED overload indicator light. The green Ready-to-Weld light will also shut off. The power source will remain off with the RED light on until it is reset by momentarily turning the AC power ON/OFF switch to the OFF position.

c. **Overtemperature Shutdown** — A fan thermostat will turn the fan on as the machine heats up. The fan will remain on until the machine cools back down; on hot days the fan may run continuously. In the event that the fan is unable to cool the machine because of blocked air flow, excessive ambient temperature, overload, etc., one of two protection thermostats will shut the machine off. If the machine is shut off because of overtemperature, the RED overload indicator light will turn on, and the green Ready-to-Weld light will shut off. The fan will continue to operate to cool the machine. The power source will remain off with the RED light on until it is reset by momentarily turning the AC power ON/OFF switch to the OFF position.

d. **Input Voltage Detection** — If the input voltage is too high or too low, the machine will not operate. If this condition is detected, the GREEN Ready-to-Weld light will shut off (or not come on initially). The red overload indicator light will be off. On initial power up, the GREEN Ready-to-Weld light will not turn on until the internal voltages have stabilized (a couple of seconds). The power source will remain off until it is reset by momentarily turning the AC power ON/OFF switch to the OFF position.

CAUTION: Application of the incorrect voltage or incorrect voltage changeover link arrangements could result in damage to the power source. See Installation chapter of manual and verify input connections and voltage.

e. **Open Circuit Voltage Limitation** — Under most conditions when an arc is not present, the output voltage of the power source will be limited to approximately 50 volts.

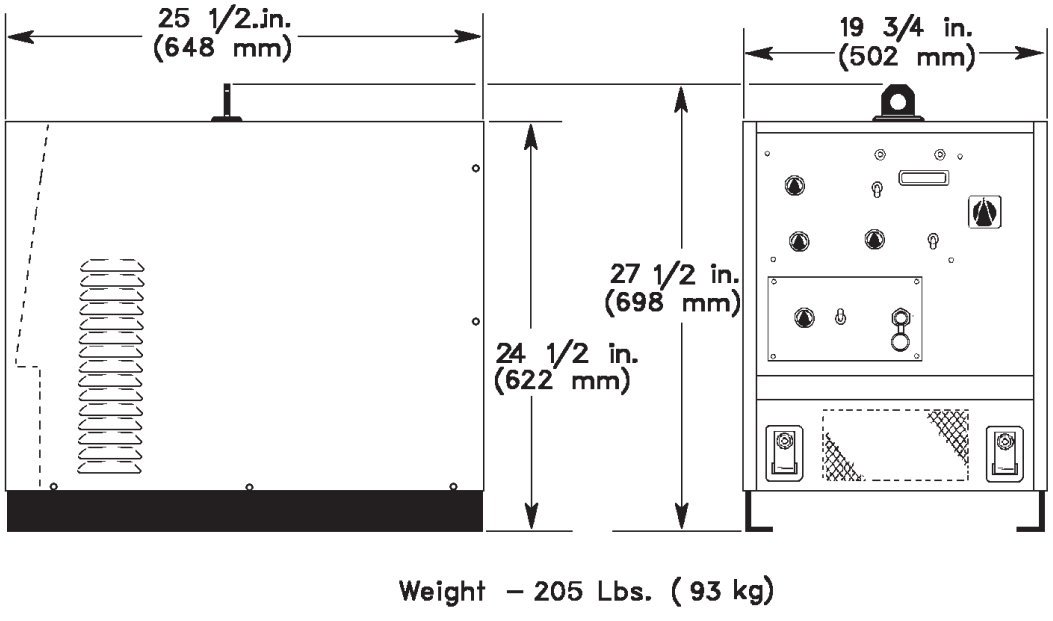

Figure 3-2 Dimensions

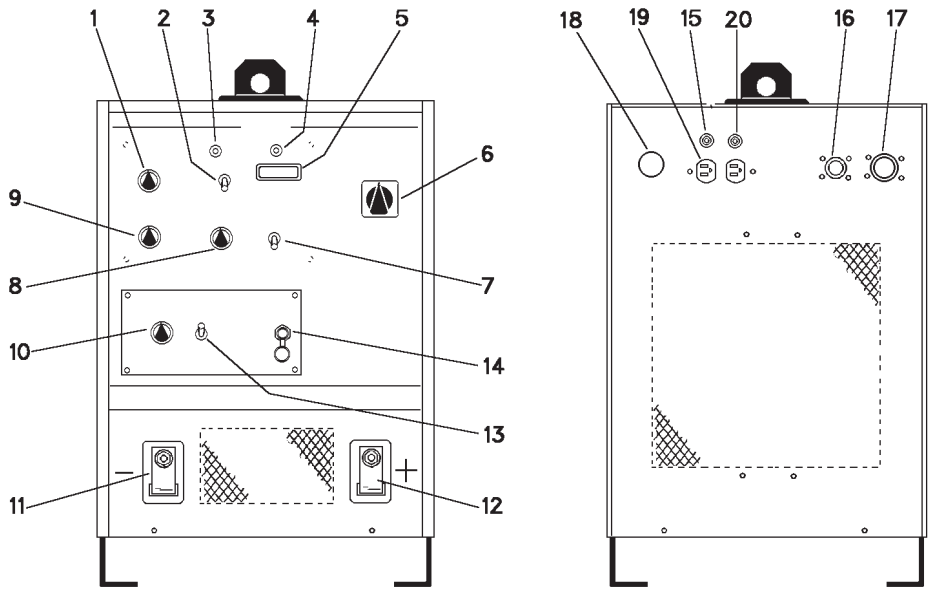

Figure 3-3 Control and Rear Panel

Description of Controls and Features

(See Figure 3-3)

1 — Process Select Switch: This four-position switch is used to set the power source according to the welding process used. Position 1 (SMAW) is used for shielded metal arc welding (stick) and carbon arc gouging. In position 1, the power source operates in the constant current mode, with arc force. Position 2 (GTAW) is used for gas tungsten arc welding (TIG). In position 2, the power source operates in constant current mode with a lift arc starting circuit activated and arc force disabled. Position 3 (GMAW/FCAW) is used for gas metal and flux cored arc welding (MIG). In position 3, the power source operates in the constant voltage mode, with variable electronic inductance control. Position 4 (Pulsed GMAW) is used for pulsed gas metal arc welding (pulsed MIG). In position 4, the schedule select switch is activated allowing preprogrammed pulse parameters to control the welding process.

2 — Remote/Local Control Switch: This switch determines if the output of the power source is controlled by the front panel control dial or remotely through the 19-pin amphenol on the rear of the power source.

3 — Overload Indicator (RED): This red light will turn on for either an overcurrent or overtemperature condition.

4 — Ready Indicator (GREEN): This green light will be on whenever the power source is Ready-to-Weld. If the green light is not on, the power source will not produce any output power.

5 — Digital Meter Display: The digital meter is used to preset the output voltage, current, pulse frequency, or arc length whenever the power source is not welding. When the power source detects that an arc has been established, the digital display automatically switches to displaying either actual welding volts or amps, depending on the position of the meter amps/volts switch.

In the preset mode (no arc), the display will change based on the welding process selected by the process select switch. For positions 1 and 2, the meter will display preset welding amps. For position 3, the meter will display preset welding volts. For position 4, the meter will display preset pulse frequency (when the STD/AVC switch is in the STD position) or arc length (when the STD/AVC switch is in the AVC position). The meter does not display exact frequency (Hertz) or arc length (Volts), but a reference number from 0 to 440. When the STD/AVC switch is in the STD position, 0 represents the lowest pulse rate (approximately 30 pulses per second) and 440 the highest (approximately 300 pulses per second). For the STD/AVC switch in the AVC position, 0 is the shortest arc length possible, and 440 the longest.

6 — AC Power ON/OFF Switch: This switch is used to control the three-phase input power applied to the power source. When this switch is in the ON

position, the digital meter display should light up, and the green Ready-to-Weld light should be on.

7 — Meter Amps/Volts Switch: This switch controls whether the digital meter displays welding amps or welding volts after an arc has been established. This switch has no effect prior to striking an arc.

8 — Output Local Amps/Volts Control: This control pot. sets the output welding amps, volts, or pulse rate, depending on the position of the welding process select switch. For all processes except GTAW (TIG), this control is only active when the remote/local switch is in the local position. For TIG this control sets the maximum welding amps available, and the remote control allows control from 0 to this maximum. Clockwise is increasing output.

9 — Arc Force/Inductance Control: This control pot. is active for SMAW (stick) and GMAW (MIG). In SMAW mode, this pot. controls the amount of arc force, with maximum arc force being full clockwise. The higher the arc force setting, the more drive the arc will have. In GMAW mode, this pot. controls the electronic inductance feature, with maximum inductance being full counterclockwise. More inductance makes the arc softer and less spattery. Less inductance makes the arc harsher with more drive. The inductance should be set according to the wire and gas used, and the type of weld characteristic desired.

10 — Schedule Select Switch: This 12-position switch is used to select the wire/gas combination for Pulsed GMAW welding. This switch is only active when the welding process select switch is in position 4 (Pulsed GMAW). Set this switch according to the chart on the front panel of the power source to the wire/gas combination being used. Other gas/wire combinations can be used but may require some trial and error to determine the correct schedule to run these on. See Operation chapter of this manual for more details on the Pulsed GMAW operation.

11 — Output Negative Terminal: Connection point for negative welding lead.

12 — Output Positive Terminal: Connection point for positive welding lead.

13 — STD/AVC Select Switch: This switch is used to select Standard (STD) Pulsed GMAW schedules (schedules 1–12) or Automatic Voltage Control (AVC) Pulsed GMAW schedules (schedules 13–24). See the Operation's chapter of this manual for more details on Pulsed GMAW.

14 — Programming Pendant plug: Optional Programming Pendant (204180-1) plugs in here. This option allows the user to customize any or all of the 24 pulsed-MIG schedules to their particular application. Once a schedule is changed, the pendant can be removed and the ARC-MASTER will use the new settings.

15 — Circuit Breaker: This 10-amp pushbutton breaker provides protection for the 120-V AC circuit. This circuit breaker protects the duplex receptacle as well as the 120-V AC power provided through the 19-pin amphenol.

16 — 5-Pin Amphenol Plug: This amphenol plug allows interface to a number of simple Thermal Arc wire feeders. It provides a solid-state contactor On/Off control. The pinout is as follows:

A) Contactor circuit
B) Contactor circuit (A-B closure turns power source on)
C) 24 VAC L1
D) 24 VAC L1
E) 24 VAC L2

17 — 19-Pin Amphenol Plug: This amphenol plug allows interface to more complex Thermal Arc wire feeders and other controls where remote output control as well as contactor control is required. The pinout is as follows:

A) Contactor circuit
B) Contactor circuit (A-B closure turns the power source on)
C) Positive Output Volts
D) 24 VAC L2
E) 120 VAC
F) 120 VAC Neutral
G) Chassis ground
H) Remote Control Maximum (top side of pot.)
J) Remote Control Input (wiper of pot.)
K) Remote Control Minimum (bottom side of pot.)
L) Control circuit common
M) Arc established = + 15 volts
N) Open
P) 24 VAC L2
R) 115 VAC Neutral
S) Open
T) Open
U) Scaled Output Current Signal (100 Amps/Volt)
V) Negative Output Volts (same as pin L)

18 — Opening for Input Power: This is the access opening for the three-phase input power connections.

19 — Duplex Receptacle: This receptacle can provide up to 10 amps of 120-V AC auxiliary power for powering wire feeders, water circulators, etc.

20 — Circuit Breaker: This 10-amp pushbutton breaker provides protection for the 24 V AC circuit.

INSTALLATION

Location

For best operating characteristics and longest unit life, take care in selecting an installation site. Avoid locations exposed to high humidity, dust, high ambient temperature, or corrosive fumes. Moisture can condense on electrical components, causing corrosion or shorting of circuits. Dirt on components helps retain this moisture.

Adequate air circulation is needed at all times in order to assure proper operation. Provide a minimum of 12 inches (305 mm) of free air space on all sides of the unit. Make sure that the ventilator openings are not obstructed. Ventilation air flow is from rear to front.

Voltage Changeover

Remove cabinet right side panel for access to LINE VOLTAGE CHANGEOVER circuitry. Check line voltage connections against instructions on VOLTAGE CHANGEOVER FIGURES (Figures 4-2 through 4-5). If necessary, rearrange link connections.

Connecting Welding Machine to Line Voltage

The input power should be connected to the unit through a fused disconnect switch, or other suitable disconnecting means furnished by the user. Access is provided in the rear panel of the machine for the entry of the input conductors.

DANGER: ELECTRIC SHOCK CAN KILL. Open the disconnect switch, or breaker, and determine that no voltage is present, before connecting wires between welding machine and power supply.

CAUTION: The method of installation, conductor size, and overcurrent protection shall conform to the requirements of the local electrical code, the National Electrical Code, or other national codes, as applicable. All installation wiring and machine reconnection shall be done by qualified persons.

Table 4-1 provides minimal information for selection of line conductors, fuses, and the equipment grounding conductor. This information is from the National Electrical Code NFPA 70-1981 Edition. Install this equipment per the latest edition, available from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

Line Volts	Rated Line Amps	Approx. Line Fuse Size	Copper Line Wire Size*	Copper Grounding Conductor Min. Size
200	88	100	No. 6	No. 8
230	80	90	No. 6	No. 8
400	44	50	No. 8	No. 8
460	37	40	No. 8	No. 8

Table 4-1 Recommended Wire and Fuse Size Table

* Conductor size shall be modified as required for line voltage drop and ambient temperature. Sizes listed are based on 90°C conductor insulation, designated as FEP, FEPB, RHH, and THHN.

Connect the three-phase line leads to terminals L1, L2, and L3 on the line switch inside the welding machine cabinet. See Figure 4-1.

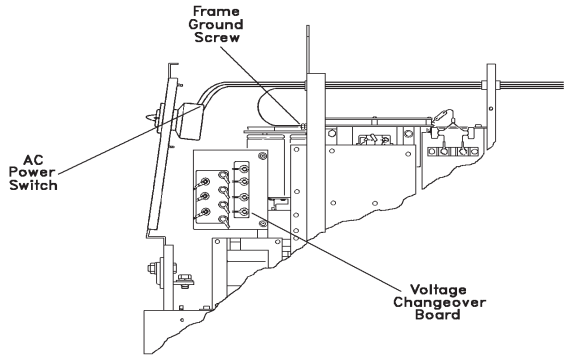

Figure 4-1

Connection Instructions

1. Check nameplate of welder to be certain that it is designed for the line voltage to which it is to be connected.

2. Remove right side panel and check the voltage changeover link arrangement per Figures 4-2 through 4-5 to assure that the power source is configured correctly.

> **CAUTION: Application of the incorrect input voltage or improper arrangement of the voltage changeover links could result in damage to the power source when power is applied.**

3. Check your local electrical codes for the proper line wire sizes and method of installation. Table 4-1 can be used as a minimum guideline.

4. Connect the three-phase power line to the top of the AC power ON/OFF switch as shown in Figure 4-1. It is important that these three connections be tightened properly to assure that they do not overheat.

5. Connect the power system safety ground to the screw labeled “GROUND” located on the central lifting yoke panel.

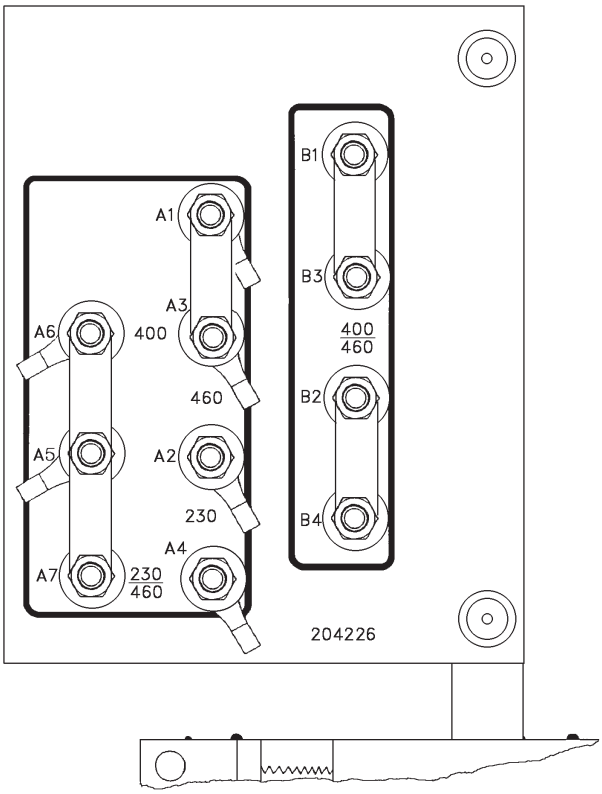

Figure 4-2 200 Volt Link Arrangement

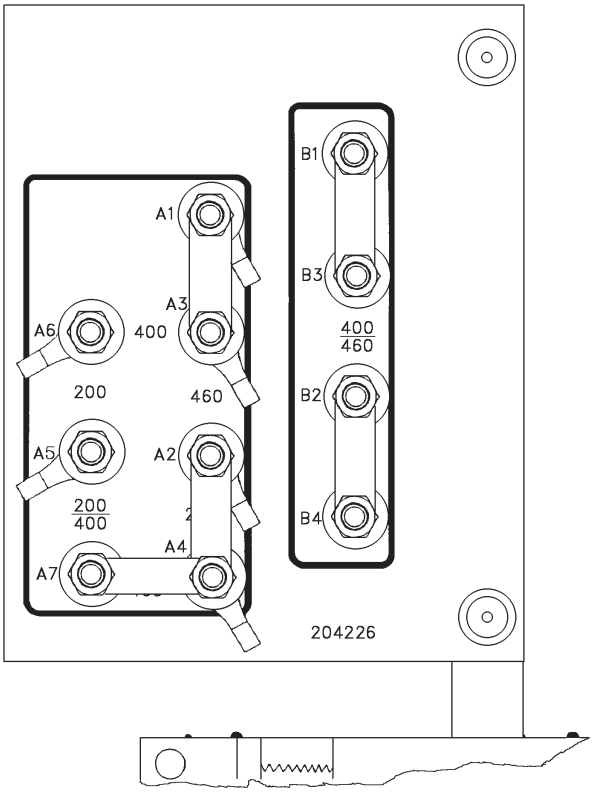

Figure 4-3 230 Volt Link Arrangement

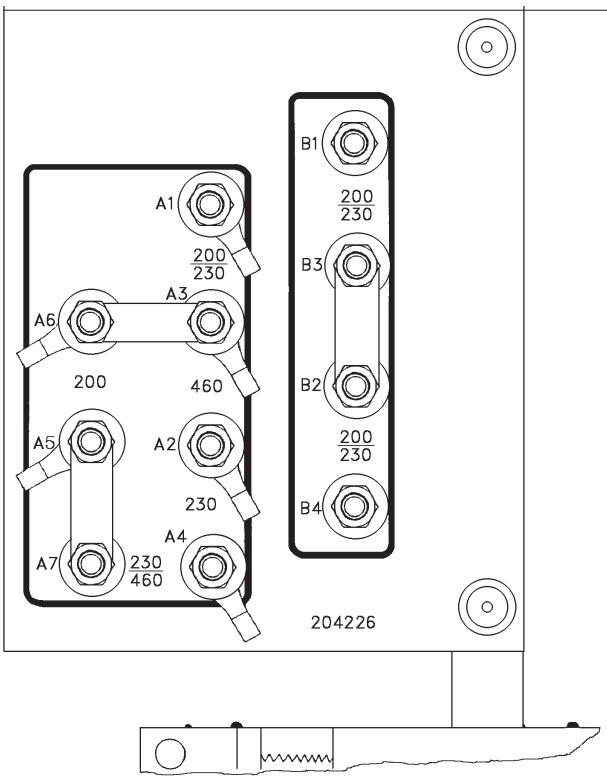

Figure 4-4 400 Volt Link Arrangement

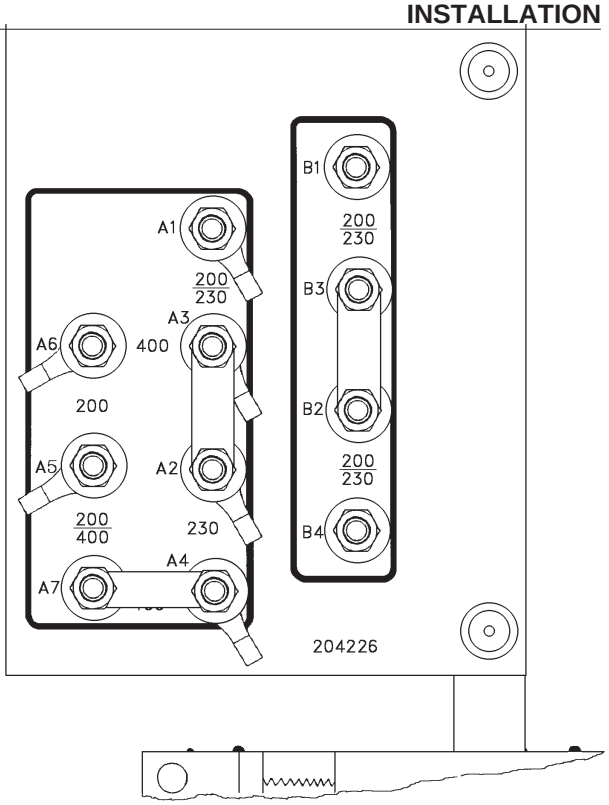

Figure 4-5 460 Volt Link Arrangement

WARNING: Never connect the safety ground screw to one of the three line phases. This would represent a serious electrical shock hazard. The wiring to this machine should be performed by a qualified person only.

Grounding

The frame of this welding machine should be grounded for personnel safety, and to assure operation of the overcurrent protection. The grounding method, and the equipment grounding conductor size and type shall conform to local and national codes.

For the National Electrical Code, the equipment grounding conductor shall be green, green with a yellow stripe, or bare.

If flexible power cable is used, use a cable assembly which includes the equipment grounding conductor. If metallic armored cable or conduit is used, the metal sheathing or conduit must be effectively grounded per local and national codes.

Rubber-tire mounted equipment shall be grounded to conform to local and national codes. The grounding assists in providing protection against line voltage electrical shock and static shock. The grounding serves to discharge the static electric charge which tends to build up on rubber-tire mounted equipment. This static charge can cause painful shock and lead to the erroneous conclusion that an electrical fault exists in the equipment.

If a system ground is not available, consult the electrical code enforcement body for instructions. The welding machine should be connected to an adequate driven ground rod, or to a water pipe that enters the ground not more than 10 feet (3 meters) from the machine.

The equipment grounding conductor size is listed in Table 4-1 as a guide if no local or national code is applicable.

Attach the equipment grounding conductor to the stud provided on the yoke panel. Determine that the

ground wire size is adequate before the machine is operated.

CAUTION: Be sure to replace the cabinet side to assure adequate internal ventilation and prevent component failure.

Welding Leads

Connect the welding leads to the output bus bar terminals of the power source. Selection of the proper size of welding leads should be based upon both the rated ampacity of the wire as well as the voltage drop on the cable. For Pulsed-GMAW welding, it is often more important to size the welding leads for voltage drop. If the voltage drop is excessive on the leads, the power source will have difficulty producing the peak pulse current with the correct voltage at the arc. When considering voltage drop, the entire loop (electrode plus work lead) must be considered.

Refer to Table 4-2 as a basic guideline to the required copper cable sizes. For Pulsed-GMAW welding, the cable size should be selected based on peak pulse current rather than average welding amps. The peak pulse current will vary with the different welding schedules.

As a general rule, the welding cables should be kept as short as possible and placed close together. When Pulse-GMAW welding with long cables (greater than 100 feet total length), try to avoid coiling up the cables if possible. A damaged or frayed cable should not be used, and all connections must be properly tightened.

Avg. Welding Amps or Peak Pulse Amps	TOTAL LENGTH OF LEAD CIRCUIT IN FEET (AND METERS) (ELECTRODE LEAD PLUS WORK LEAD)				
	50 Feet (15.2 M)	100 Feet (30.5 M)	150 Feet (45.7 M)	200 Feet (61.0 M)	250 Feet (76.2 M)
100	#4	#4	#2	#1	#1
150	#3	#3	#1	#1/0	#2/0
200	#2	#2	#1/0	#2/0	#3/0
250	#1	#1	#2/0	#3/0	#4/0
300	#1/0	#1/0	#3/0	#4/0	2 — #2/0
350	#2/0	#2/0	#4/0	2 — #2/0	2 — #2/0
400	#3/0	#3/0	#4/0	2 — #2/0	2 — #3/0
450	#3/0	#3/0	#4/0	2 — #3/0	2 — #3/0
500	#4/0	#4/0	2 — #2/0	2 — #3/0	2 — #4/0
550	#4/0	#4/0	2 — #2/0	2 — #4/0	2 — #4/0
600	#4/0	#4/0	2 — #3/0	2 — #4/0	2 — #4/0

NOTE: Lead size shown is for 90°C (194°F) insulation, 30°C (86°F) ambient, and not over 4.5 volts lead drop.

Table 4-2

Pulsed-GMAW Schedule Selection

The Arcmaster has two different sets of Pulsed-GMAW weld schedules:

1) Default Factory Schedules
2) Metric Schedules

Tables 5-2 and 5-3 list the two sets of schedules and their differences. The Arcmaster comes set from the factory to the default schedules. To change to the metric schedules, jumper J8 on the pulsed mig panel assembly must be moved. Most users do not need to do this.

To change to the Metric schedules, follow these directions.

1) Turn off power to the Arcmaster

2) Remove the pulsed-mig panel assembly from the front of the machine by removing the four mounting screws. Disconnect the ribbon cable from the pulse-mig panel.

3) Move jumper J8 (Figures 4-6) to pins 3 and 4.

4) Reconnect ribbon cable and install assembly back in machine.

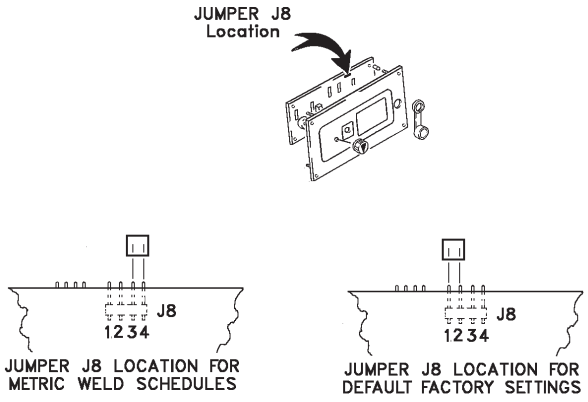

Figure 4-6

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OPERATION

General

Read and understand the safety instructions at the beginning of this manual prior to operating this machine.

WARNING: Be sure to put on proper protective clothing and eye safeguards (welding coat, apron, gloves, and welding helmet, with proper lenses installed). See Safety Instructions and Warnings chapter included in this manual. Neglect of these precautions may result in personal injury.

WARNING: Make all connections to the power source including electrode and work cables, as well as remote control cables, with the power source turned off. These connections could be electrically live with the power switch ON.

The Operation chapter of this manual is intended as a guideline to the operation of the ARC-MASTER 501 power source, and not as a tutorial on welding processes and techniques.

SMAW Operation

(See Figure 5-1)

1. Connect the welding leads to the power source with the correct polarity. Figure 5-1 shows typical connections for DCEP welding. Make sure connections are properly tightened.

2. Turn AC ON/OFF switch to the ON position. The digital meter display should be on, and the green “READY” light should be on.

3. Turn the welding process select switch to the “SMAW” position. Open circuit voltage will now be present on the electrode and work cables. The digital meter displays preset welding amps, and will not display output open circuit voltage.

4. Adjust the AMPS/VOLTS control to the correct amperage setting for the material and electrode being used. For LOCAL (front panel) control, make sure that the REMOTE/LOCAL switch is in the LOCAL position. If a remote control pendant is being used, set the REMOTE/LOCAL to the REMOTE position, and adjust the amperage pot on the pendant. In either case the meter will display the preset welding amps.

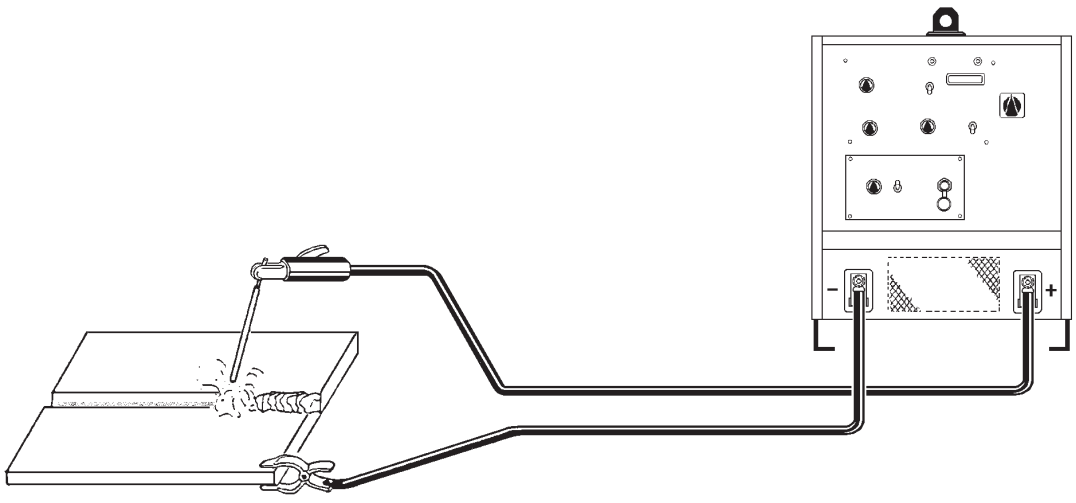

Figure 5-1

5. Set the ARC FORCE control to the desired arc force setting. Full clockwise is maximum arc force. The higher the arc force setting the more drive or dig the arc will have. Maximum arc force will increase the short circuit current considerably higher than the normal welding current. Minimum arc force will still cause the short circuit current to increase, but to a much lesser extent. This control is useful when welding out-of-position.

6. The power source is now ready to weld.

GTAW Operation

(See Figure 5-2)

1. Connect the work lead and torch lead to the power source. Figure 5-2 shows typical connections for DCEN (straight polarity). This is the normal connection for TIG welding.

2. Provide suitable shielding gas connections and controls to the torch. The power source does not provide connections for the shielding gas.

3. Select the proper tungsten size and type for the job. Table 5-1 gives a basic guideline to the amperage ranges of various tungstens.

4. Connect a remote control such as a foot pedal control to the 19-pin amphenol connector on the rear of the power source. In the GTAW mode, the power source will not produce any output current without some type of remote control to provide an A-B closure on the amphenol connector.

5. Turn the AC power switch to the ON position. The digital meter display should be on and the green “READY” light should be on.

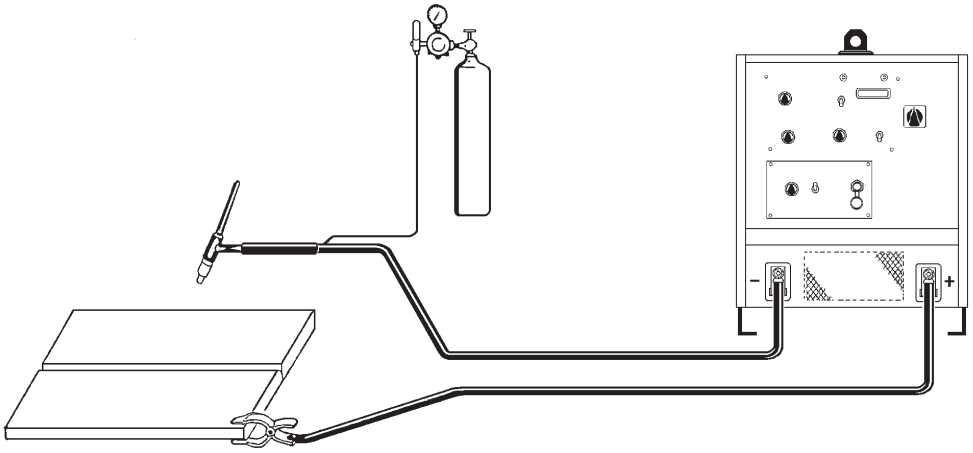

Figure 5-2

Electrode Diameter Inches	Welding Current, Amps	
	DCEN	DCEP
	Using pure or thoriated tungsten electrodes	
.020	5-35	———
.040	30-100	———
1/16	70-150	10-20
3/32	150-225	15-30
1/8	200-275	25-40
5/32	250-350	40-55
3/16	300-500	55-80
1/4	400-650	80-125

Table 5-1 Typical Current Ranges for Tungsten Electrodes

6. Turn the welding process select switch to the "GTAW" position.

7. Set the REMOTE/LOCAL control to LOCAL. Adjust the AMPS/VOLTS control to the desired welding amperage. This will be the maximum amperage available with the remote current control. If remote current control is not used, this will be the actual welding amps.

8. If remote current control is being used, set the REMOTE/LOCAL switch in the REMOTE position.

9. To strike an arc, first energize the power source by depressing the foot pedal, or gun switch, or by turning remote contactor switch ON.

10. Make sure gas flow has been initiated.

11. Gently rest the cup of the torch on the workpiece.

12. Rock the torch until the tungsten briefly contacts the work; this will initiate the "LIFT-ARC" feature of the power source. Lift or rock the tungsten back off of the work to initiate the welding arc. During the time the tungsten is touching the work, the power source will automatically limit the output current to 20 amps. As the arc is initiated, the current will automatically change to the preset value. To minimize the heating of the end of the tungsten, it should be left in contact with the work only briefly.

13. To end the weld, release the foot pedal, or turn contactor switch off. Turn off shielding gas supply.

GMAW/FCAW Operation

1. Connect the wire feeder to the power source as described in the owner's manual for the wire feeder.

2. Connect the welding leads to the power source; make sure connections are properly tightened.

3. Turn AC ON/OFF switch to the ON position. The digital meter display should be on, and the green "READY" light should be on.

4. Turn the welding process select switch to the "GMAW/FCAW" position. The digital meter displays preset welding volts.

5. Adjust the AMPS/VOLTS control to the correct voltage setting for the material and wire being used. For LOCAL (front panel) control, make sure that the REMOTE/LOCAL switch is in the LOCAL position. If a remote control pendant, or wire feeder with remote voltage control option is being used, set the REMOTE/LOCAL to the REMOTE position, and adjust the voltage pot. on the pendant or wire feeder. In either case the meter will display the preset welding volts.

6. Set the INDUCTANCE control to the desired inductance setting. Full clockwise is minimum inductance. Lower values of inductance give a faster cooling puddle with a "harsher" type of arc. Higher inductance settings give a very soft arc and a slower cooling puddle. As a general rule, most materials can be welded with a mid-range setting. Mild steel wires can use minimum to mid-range, while stainless steel can use mid-range to maximum. The inductance control should be adjusted to a setting that best suits the user.

NOTE: The inductance control is primarily used for the short-circuiting transfer mode of MIG welding. For globular and spray transfer modes, the inductance control has minimal effect.

7. The power source is now ready to weld. To initiate the weld, activate the torch switch on the MIG torch.

8. To end the weld, release the torch switch while holding the torch in place at the end of the weld. This will allow the wire conditioning circuit in the power source to condition the end of the wire for the next weld. The wire conditioning circuit will tend to leave the wire with a very small ball on the end of the wire, thus making the next start easier.

Pulsed GMAW

General

Pulsed-GMAW (referred to as Pulse-MIG) is a welding process that involves the pulsing of the welding current from a high value (peak current) to a low value (background current) to produce a clean spatter-free weld. The intent of this manual is not to present a comprehensive coverage of this welding process, but to give an explanation of the terms used and how they apply to the ARC-MASTER 501 power source.

Explanation of Terms: (See Figure 5-3)

I_{pk}: I_{pk} is the amplitude of the high pulse of welding current (peak current). The current is forced to this high value by the power source for a brief time (T_{peak}). The peak current melts the wire and forms a droplet. This droplet is then propelled to the weld pool.

V_{pk}: V_{pk} is the amplitude of the arc voltage during the high pulse of weld current.

T_{pk}: T_{pk} is the amount of time that is spent at the peak current. This time must be sufficient to form a droplet.

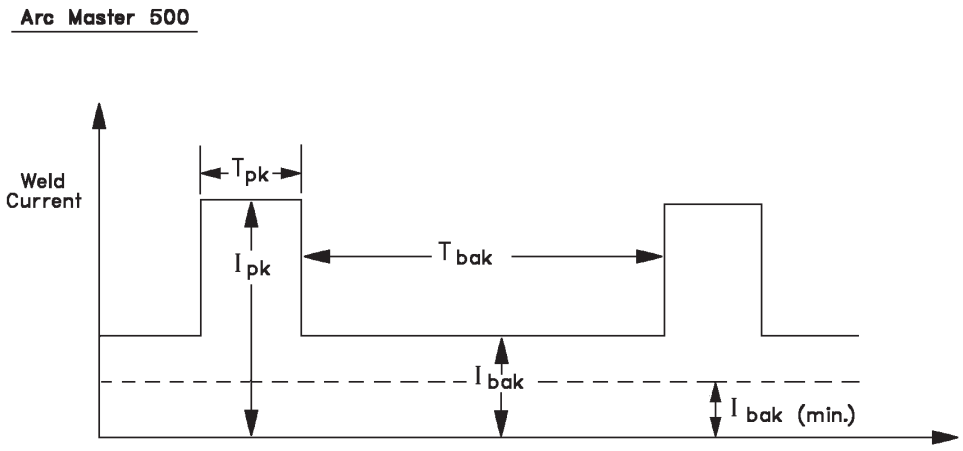

Figure 5-3 Pulse Waveforms

I$_{bak}$: I_{bak} (background current) is the low value of the weld current. The background current serves to preheat the wire and maintain the arc between the wire and the workpiece. The background current must not be allowed to go too low, or the arc becomes unstable and difficult to maintain.

V$_{bak}$: V_{bak} is the amplitude of the arc voltage during the background time.

T$_{bak}$: T_{bak} (background time) is the amount of time that the weld current is at the low value. Normally, this would be a larger amount of time than is spent at peak current.

Pulse Rate: The pulse rate is the number of pulses of current that are produced per second. The ARC-MASTER 501 allows a pulse rate of approximately 30–300 pulses per second.

Pulsing Frequency: Pulsing frequency is the same as pulse rate. A pulse rate of 60 Hz means that the power source produces 60 pulses of current per second.

I$_{bak}$ (min): I_{bak} (min) refers to a minimum background current level. If the current falls below this minimum level, it becomes difficult to maintain a stable arc.

Arc Length: The distance between the end of the wire electrode (the wire being fed through the torch or gun) and the weld pool. This distance is usually set to give a smooth, spatter-free weld.

The Arcmaster power source provides two ways to control the arc while pulse MIG welding, each with 12 independent weld schedules. The two types of arc control and a brief explanation of each follows:

1) Standard Mode (STD): When the STD/AVC switch (See Figure 3-2) is in the STD position, the pulse frequency is preset by the user and weld schedules 1–12 are active. The pulse frequency can be varied by adjusting the AMPS/VOLTS control (See Figure 3-2). A meter setting of 0 will give the lowest frequency (approximately 30 pulses per second), while a setting of 440 gives the highest (approximately 300 pulses per second). The AMPS/VOLTS control must be adjusted to give the desired arc length for the given wire feed speed, material thickness, gas, etc.

2) **Automatic Voltage Control (AVC):** When the STD/AVC switch is in the AVC position, the arc length is set by the user, and schedules 13–24 are active. The pulse frequency will vary during the weld to maintain the pre-set arc length. A pre-set value of 0 will give an extremely short arc length, while 440 will give a very long arc length. The optimum setting will probably be in the 125 to 225 range on the meter. The meter setting is a reference number only and has no relation to the actual welding voltage.

The Arcmaster comes with 24 preprogrammed weld schedules for use in the Pulsed-MIG mode. Schedules 1–12 are for the STD mode, and schedules 13–24 are for the AVC mode. Each schedule was developed around the particular wire/gas combination given in tables 5-2 (standard schedules) and 5-3 (Metric schedules). These schedules should give good results for most applications. It is possible to use a number of other wire and gas combinations other then those listed. It will be necessary, however, for the user to determine the optimum weld schedule to use.

For welding applications where none of the 24 schedules will give adequate results, any or all 24 schedules can be changed by the operator to fit the application. In order to change them, an optional **Programming Pendant** (204180-1) is required. The programming pendant plugs into the PROGRAMMING PENDANT connector located on the front of the ARC-MASTER (Item 18, Figure 3-2). Using the Pendant, a schedule can easily be modified by changing I_{pk}, T_{pk}, and V_{BAK} to give the proper weld characteristics.

SCHEDULE STD	WIRE TYPE	WIRE SIZE (inches)	Ist (Amps)	Tpk (msec)	Ipk (Amps)	Bak (Volts)	GAS MIXTURE
1	Mild Steel	.035	350	2.5	300	20.0	92% Ar 8% CO2
2	Mild Steel	.045	450	2.5	350	20.0	92% Ar 8% CO2
3	Mild Steel	1/16	600	2.2	500	21.0	92% Ar 8% CO2
4	Stainless Steel	.030	275	2.7	225	19.0	81% Ar 1% CO2 18% He
5	Stainless Steel	.035	350	2.6	275	18.0	81% Ar 1% CO2 18% He
6	Stainless Steel	.045	400	2.8	325	19.0	81% Ar 1% CO2 18% He
7	Aluminum	3/64	350	1.4	275	17.0	100% Ar
8	Aluminum	1/16	500	1.4	350	17.0	100% Ar
9	Silicon Bronze	.035	350	2.0	260	17.0	100% Ar
10	Silicon Bronze	.045	375	2.2	300	18.0	100% Ar
11	Metal Core (FCAW)	.045	450	1.5	450	16.0	92% Ar 8% CO2
12	Metal Core (FCAW)	1/16	600	1.5	600	18.0	92% Ar 8% CO2
SCHEDULE AVC	**WIRE TYPE**	**WIRE SIZE (inches)**	**Ist (Amps)**	Tpk (msec)	**Ipk (Amps)**	**Bak (Amps)**	**GAS MIXTURE**
13	Mild Steel	.035	350	1.8	350	40	92% Ar 8% CO2
14	Mild Steel	.045	400	2.3	400	55	92% Ar 8% CO2
15	Mild Steel	1/16	500	2.4	500	60	92% Ar 8% CO2
16	Stainless Steel	.030	270	2.5	270	35	81% Ar 1% CO2 18% He
17	Stainless Steel	.035	250	2.7	250	40	81% Ar 1% CO2 18% He
18	Stainless Steel	.045	400	2.8	350	40	81% Ar 1% CO2 18% He
19	Aluminum	3/64	375	1.4	250	40	100% Ar
20	Aluminum	1/16	500	1.7	350	40	100% Ar
21	Silicon Bronze	.035	300	2.0	200	35	100% Ar
22	Silicon Bronze	.045	450	2.5	350	50	100% Ar
23	Metal Core (FCAW)	.045	450	1.5	450	50	92% Ar 8% CO2
24	Metal Core (FCAW)	1/16	500	2.5	500	60	92% Ar 8% CO2

Jumper J8 (See Figure 4-6) in position 1 activates these schedules. The Arcmaster is shipped from the factory with J8 set for these weld schedules.

Table 5-2 Default Factory Schedules

SCHEDULE STD	WIRE TYPE	WIRE SIZE (mm)	Ist (Amps)	Tpk (msec)	Ipk (Amps)	Bak (Volts)	GAS MIXTURE
1	Mild Steel	1.0	350	2.0	350	20.0	80% Ar 20% CO2
2	Mild Steel	1.2	450	2.3	385	20.0	80% Ar 20% CO2
3	Mild Steel	1.6	600	2.1	520	21.0	80% Ar 20% CO2
4	Stainless Steel	0.8	280	2.7	240	18.0	97.5% Ar 2.5% CO2
5	Stainless Steel	1.0	350	2.6	290	18.0	97.5% Ar 2.5% CO2
6	Stainless Steel	1.2	400	2.8	325	18.0	97.5% Ar 2.5% CO2
7	Aluminum	1.2	350	1.4	275	17.0	100% Ar
8	Aluminum	1.6	500	1.4	350	17.0	100% Ar
9	Silicon Bronze	1.0	350	2.0	260	17.0	100% Ar
10	Silicon Bronze	1.2	375	2.2	300	18.0	100% Ar
11	Metal Core (FCAW)	1.2	550	2.4	450	23.0	80% Ar 20% CO2
12	Metal Core (FCAW)	1.6	600	3.0	580	24.0	80% Ar 20% CO2
SCHEDULE AVC	**WIRE TYPE**	**WIRE SIZE (mm)**	**Ist (Amps)**	**Tpk (msec)**	**Ipk (Amps)**	**Bak (Amps)**	**GAS MIXTURE**
13	Mild Steel	1.0	390	2.0	325	40	80% Ar 20% CO2
14	Mild Steel	1.2	485	2.2	435	50	80% Ar 20% CO2
15	Mild Steel	1.6	600	2.5	520	70	80% Ar 20% CO2
16	Stainless Steel	0.8	200	2.5	270	20	97.5% Ar 2.5% CO2
17	Stainless Steel	1.0	500	2.7	250	40	97.5% Ar 2.5% CO2
18	Stainless Steel	1.2	400	2.8	350	40	97.5% Ar 2.5% CO2
19	Aluminum	1.2	375	1.4	250	20	100% Ar
20	Aluminum	1.6	500	1.7	350	35	100% Ar
21	Silicon Bronze	1.0	300	2.0	200	20	100% Ar
22	Silicon Bronze	1.2	450	2.5	350	50	100% Ar
23	Metal Core (FCAW)	1.2	500	3.5	350	25	80% Ar 20% CO2
24	Metal Core (FCAW)	1.6	500	3.0	435	35	80% Ar 20% CO2

Table 5-3 Metric Weld Schedules

Operation, Standard Mode (STD)

1. Connect the wire feeder to the power source as described in the owner's manual for the wire feeder.

2. Connect the welding leads to the power source; make sure connections are properly tightened.

3. Turn AC ON/OFF switch to the ON position. The digital meter display should be on, and the green "READY" light should be on.

4. Set the STD/AVC switch to the STD position. This puts the machine into the standard pulse-MIG weld mode. Schedules 1–12 will be active.

5. Turn the welding process select switch to the "Pulsed GMAW" position. The digital meter displays preset pulse rate. The meter does not display the actual number of pulses per second but a reference number indicating the relative number of pulses per second. The range of the meter is 0–440. The power source will produce approximately 30 pulses per second at a setting of 0, and approximately 300 pulses per second at a setting of 440. The actual number of pulses per second varies with each weld schedule.

The pulse rate can be considered similar to voltage for conventional MIG welding. A higher pulse rate gives a longer arc, with higher voltage and more

heat input. As with conventional MIG welding, the power source must be adjusted to correspond with the correct heat input for a given wire feed speed setting.

6. Adjust the AMPS/VOLTS control to the correct pulse rate setting for the material and wire being used. For LOCAL (front panel) control, make sure that the REMOTE/LOCAL switch is in the LOCAL position. If a remote control pendant, or wire feeder with remote voltage control option is being used, set the REMOTE/LOCAL switch to the REMOTE position, and adjust the voltage pot. on the pendant or wire feeder.

NOTE: The electronic inductance control has no effect for Pulsed-MIG welding.

7. The power source is now ready to weld. To initiate the weld, activate the torch switch on the MIG torch.

NOTE: While welding, the digital meter display switches to either actual welding amps or welding volts depending on the position of the AMPS/VOLTS switch.

8. To end the weld, release the torch switch. As with conventional GMAW welding, a wire conditioning sequence will leave the wire with a very small ball on the end, thus making the next arc strike easier.

Operation, Automatic Voltage Control Mode (AVC)

1. Connect the wire feeder to the power source as described in the owner's manual for the wire feeder.

2. Connect the welding leads to the power source; make sure connections are properly tightened.

3. Turn AC ON/OFF switch to the ON position. The digital meter display should be on, and the green "READY" light should be on.

4. Set the STD/AVC switch to the AVC position. This puts the machine into the automatic voltage control (AVC) mode. Schedules 13–24 will now be active. Select the desired weld schedule using the Pulsed MIG Schedule Select switch.

5. Turn the welding process select switch to the "Pulsed-GMAW" position. The digital meter displays preset arc length. The meter does not display the actual arc length but a reference number indicating the relative arc length. The meter range is 0 to 440. It is suggested that the user start with a setting of 150. In most cases, this will give an adequate arc length. Several test welds should be made, and the arc length adjusted accordingly in order to give a smooth, spatter-free weld. In the AVC mode, the arc length will remain relatively constant as weld stick-out or wire feed speed change. Large changes in wire feed speed may require that the arc length be adjusted.

6. For LOCAL (front panel) control, make sure that the REMOTE/LOCAL switch is in the LOCAL position. If a remote control pendant, or wire feeder with remote voltage control option is being used, set the REMOTE/LOCAL switch to the REMOTE position, and adjust the voltage pot on the pendant or wire feeder.

NOTE: The electronic inductance control has no effect for Pulsed-MIG welding.

7. The power source is now ready to weld. To initiate the weld, activate the torch switch on the MIG torch.

NOTE: While welding, the digital meter display switches to either actual welding amps or welding volts depending on the position of the AMPS/VOLTS switch.

8. To end the weld, release the torch switch. As with conventional GMAW welding, a wire conditioning sequence will leave the wire with a very small ball on the end, thus making the next arc strike easier.

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MAINTENANCE

If this equipment does not operate properly, stop work immediately and investigate the cause of the malfunction. Maintenance work must be performed by an experienced, qualified person only. Any electrical work must be performed by an electrician or other person properly trained in servicing electrical equipment. Do not permit untrained persons to inspect, clean or repair this equipment. Use only recommended replacement parts when servicing this machine.

DANGER: HIGH VOLTAGE may be present internally even with the power switch in the OFF position. Before inspecting, cleaning, or servicing, disconnect and lock out input power to the power source.

For uninterrupted, satisfactory service from this welding machine, it is necessary to keep the machine clean, dry, and well ventilated. At least every three months, or more often as necessary, wipe and blow out all dirt from the machine's interior, with air pressure of not over 25 psi.

As normal preventive maintenance, at the time of the three-month cleaning, a full inspection of the welding machine and setup should be performed. Check warning labels on the machine for readability; replace if necessary. Check input and output connections as well as frame ground connections to the machine to insure that they are tight and the wires are not frayed or overheated. Inspect internal wiring of machine for loose or frayed connections; tighten or repair as necessary. It would also be advisable to check connections to wire feeders, fixtures, etc., at this time. Any damaged cables or hoses should be replaced.

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TROUBLESHOOTING

WARNING: Disconnect the power source from the input power source before carrying out any service or repair work. Hazardous voltages can be present in the machine whenever input power is connected.

FRONT PANEL STATUS			
Indicator			
Green Ready Light	**Red Overload Light**	**Digital Meter Display**	**Condition or Causes**
ON	OFF	ON	Normal Operation
OFF	OFF	OFF	1. No power to machine, check fuses. 2. Incorrect input voltage, or voltage links in wrong position. 3. Loose wiring connections in machine, check ribbon cables and other connections to printed circuit boards. 4. Faulty control or front panel circuit board.
OFF	ON	ON	1. Overcurrent shutdown, reset power source. 2. Overtemperature shutdown, allow to cool and reset power source.
OFF	OFF	ON	1. Under or overvoltage detected on input. Check line voltages and voltage link arrangement. 2. Loss of one phase.

WARNING: ALL SERVICE SHOULD BE PERFORMED BY TRAINED PERSONNEL ONLY.

Troubleshooting Guide

The following guide lists several potential problems, and lists a number of items to check, or possible causes for each.

Fan does not run

The fan will not normally run until the machine requires cooling. If the fan never comes on, and the overload light comes on after several minutes of welding, check the following: Links missing or placed incorrectly on voltage changeover board, damaged or obstructed fan blade, faulty or loose wiring to fan or fan thermostat, defective fan thermostat, defective fan motor.

No output from machine

Is green “READY” light on?

If not, see table above.

Is some type of contactor control or gun switch connected?

The power source requires an A-B closure on one of the amphenol connectors, except in "SMAW" mode, before it will produce output voltage. To check power source: disconnect welding leads, turn process select switch to "SMAW" and measure output voltage with a V-O-M. Open circuit voltage should be approximately 50 volts.

No wire feed

Check connections to feeder.

Check and reset circuit breaker on power source if necessary.

Check wire supply.

Check for damaged or incorrect torch liner and tip.

No gas flow

Check gas cylinders and regulator for proper setting.

Check for kinked or leaking hoses and loose connections.

Erratic arc

Check for loose electrode or ground connections.

Check for good gas flow of correct mixture.

Check for correct polarity of welding leads.

Incorrect Pulse MIG schedule selected for pulse welding.

Contact tip wear or improper size.

Check torch liner.

Is wire feeding smoothly? Check feed rolls.

If TIG welding, is tungsten sharpened correctly? Check size of tungsten. Is gas flow OK?

Gun and tip overheat

If pulse welding, is the rating of the torch adequate for the application?

No output control

Is REMOTE/LOCAL switch in correct position?

Check connections to remote control if used.

With no arc and REMOTE/LOCAL in LOCAL, does volts/amps control change setting on digital meter?

If not, replace circuit board.

Spattery arc

Is electronic inductance set correctly?

If pulse welding, is arc length too short?

If so, adjust pulse rate or wire feeder to lengthen arc.

PARTS LIST

Equipment Identification

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

How To Use This Parts List

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

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

An “Application Code” is used to distinguish parts that are applicable only to certain Specifications and/or Assemblies. This code is found in the rightmost column of the Parts List. If an item in the Parts List applies to all Specifications or Assemblies, the word “ALL” will be in the Application Code column. Refer to the following list to determine the appropriate Application Codes for the Specifications or Assemblies covered by this manual. If only the assembly or specification number is listed, the use of an Application Code does not apply to this manual.

How To Select Recommended Spares

The first two columns of the Parts List are used to show the recommended quantity of parts which are typically required for spares or replacement purposes. The quantities under Class 1 are for parts that are consumed or that may need replacement in two years or less depending on operating hours. Class 2 quantities are for parts that may need replacement under unusual service conditions or additional operating hours. These are suggested quantities based on expected usage or the minimum package quantity. Class 1 spares are repeated under Class 2 but the quantities may be larger to allow for additional operating hours. Contact your equipment dealer for assistance in establishing the spare parts program best suited for your needs.

SPECIFICATION NUMBER

500108A-1

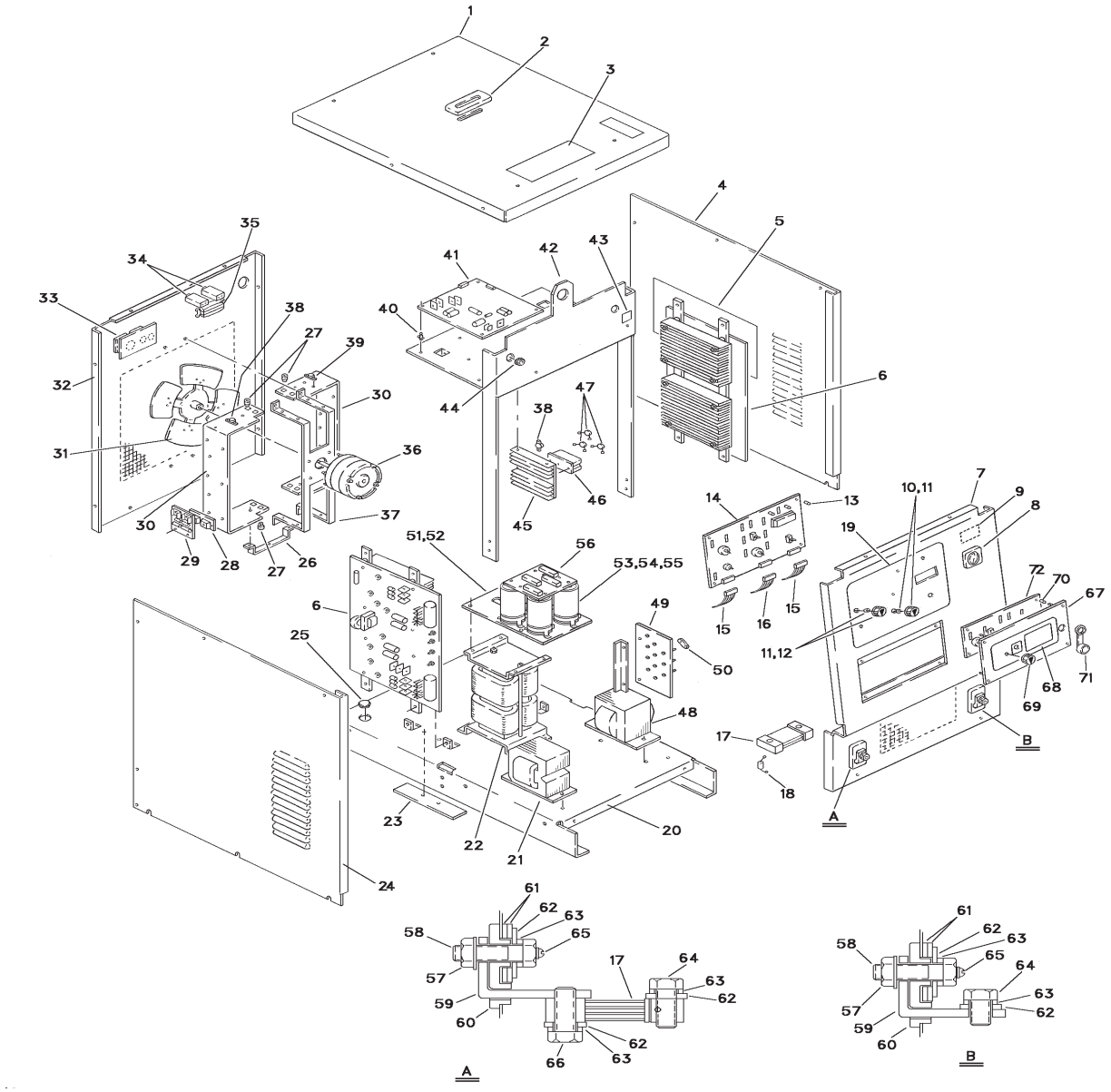

Figure 8-1 Arc-Master 501 Welder Assembly

Parts List for Figure 8-1

Quantity Recomm. Spares Class 1	Class 2	Item No	Part Number	Description	Qty per Assy	Application Code
			500108A-1	Welder - Arc-Master 501	1	
		1	204121-3	. Panel - Top	1	
		2	12CW-2170	. Boot - Lifting Eye	1	
		3	204036	. Label - Precautionary, Static	1	
		4	204122-3	. Panel -Side, Right	1	
		5	204230	. Label - Voltage Changeover	1	
		6	203765	. Board - P.C., IGBT	2	
		7	204001-1	. Panel - Front	1	
	1	8	203163-1	. Switch - Rotary, Power	1	
		9	408891	. Label - Warning	1	
		10	409870	. Washer - Insulator	1	
		11	406806-3	. Knob - Control, 1-3/8	3	
		12	404454	. Reducer - Hole	1	
		13	204600-1	. Spacer	4	
	1	14	203979	. Board - Regulator, Control (For Details See Figure 8-2)	1	
		15	204038-5	. Cable - Ribbon Assembly	2	
		16	204038-2	. Cable - Ribbon Assembly	1	
		17	492318	. Shunt - 500 Amp	1	
		18	368705-38	. Capacitor - W/Leads	2	
		19	203997A	. Label - Control, Overlay	1	
		20	204000-1	. Base - Mounting	1	
		21	203982	. Choke - Filter	1	
		22	830163	. Transformer - Power	1	
		23	204256-1	. Plate - Cover	2	
		24	204123-3	. Panel - Side, Left	1	
		25	403091-6	. Plug - Hole, Plastic	2	
		26	204012	. Bar - Bus	1	
		27	406319-1	. Grommet - Mounting	8	
		28	203205	. Diode - Ultra-Fast Recovery	6	
		29	204386	. Board - Snubber Assembly	6	
		30	204025	. Heat Sink	2	
		31	404887	. Fan	1	
		32	204214-1	. Panel - Rear	1	
		33	204184A-1	. Board - P.C. Amphenol	1	
		34	203627-7	. Circuit Breaker - Pushbutton	2	
		35	402670	. Receptacle - Duplex, 3 Wire	1	
	1	36	12TW-595-1	. Motor - Fan	1	
		—	Not Illustrated			

Parts List for Figure 8-1

Quantity Recomm. Spares Class 1	Quantity Recomm. Spares Class 2	Item No	Part Number	Description	Qty per Assy	Application Code
		37	204080-1	. Bracket - Fan Motor	1	
		38	404044-3	. Thermostat - Overload	2	
		39	404044-6	. Thermostat - Overload	1	
		40	404915-2	. Spacer - P.C. Board	8	
		41	204711	. Board - P.C., IGBT Control	1	
		42	204017-1	. Panel - Lifting Yoke	1	
		43	830116	. Label - Frame Ground	1	
		44	405362-2	. Bushing - Snap	3	
		45	205007	. Heat Sink - Input Rectifier	1	
		46	205005-1	. Rectifier - Power	1	
		47	202258-6	. Suppressor - Semiconductor	3	
		48	204225	. Transformer - Control	1	
		49	204226	. . Board - Voltage Changeover	1	
		50	CW-811	. Link - Voltage Changeover	5	
		51	204583-1	. Bracket - Mounting Capacitors	1	
		52	204602	. Insulator - Capacitor	1	
		53	408026-1	. Capacitor - Electrolytic	4	
		54	350488-94	. Insulator - Mylar	4	
		55	361052-3	. Clamp Mounting Capacitor	4	
		56	204587	. Board - P.C., Capacitor Kit	1	
		57	400614-1	. Nut - Flanged, ST. 1/2-13	2	
		58	351505	. Screw - 1/2x13x1-3/4 ST.	2	
		59	5CW-974	. Bus - Cable Stud	2	
		60	5CW-975	. Busing - Insulator	2	
		61	5CW-976A	. Washer - Insulating	4	
		62	No Number	. Washer - Flat, 1/2, ST.	5	
		63	No Number	. Washer - LK, ST. 1/2	5	
		64	No Number	. Screw - 1/2-13x1-1/4, HHC, ST.	2	
		65	No Number	. Screw - #6-32x1/4 Rd. Hd. MH, ST.	2	
		66	No Number	. Screw - 1/2-13x1-1/2, HHC, ST.	1	
	1		204119B-3	. Panel - Pulsed Mig Assembly	1	
		67	204531-1	. . Panel - Pulsed Mig	1	
		68	204532A	. . Overlay - Pulsed Mig	1	
		69	406806-3	. . Knob - Control	1	
		70	422241	. . Insulator	6	
		71	204197	. . Cap - Protective	1	
		72	204539-1	. . Board - P.C., Pulsing Control, Assembly (For Detail See Figure 8-2)	1	
			—	Not Illustrated		

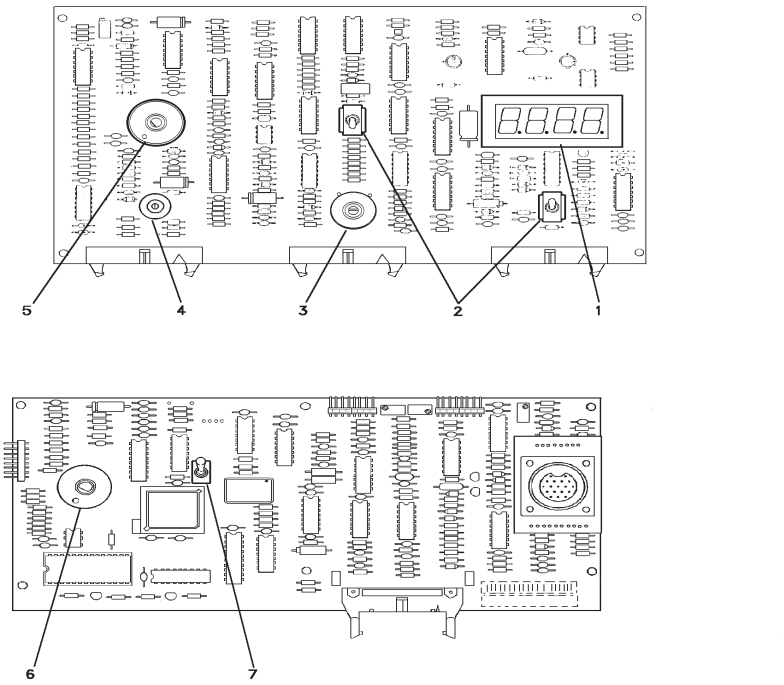

Figure 8-2 PC Boards

Parts List for Figure 8-2

Quantity Recomm. Spares Class 1	Quantity Recomm. Spares Class 2	Item No	Part Number	Description	Qty per Assy	Application Code
			Ref.	Board - PC Regulator, Control	Ref	
		1	203203-1	. Display - Digital	1	
		2	409997-1	. Switch - DPDT, PC Mount, Toggle	2	
		3	203980-1	. Potentiometer - 3-3/4 Turn	1	
		4	406355-1	. Potentiometer - 100K, 1/2 W, 10%	1	
		5	203969-1	. Switch - Rotary, 3 Pole, PCB. Mount	1	
			Ref.	Board - PC Microcontroller	Ref.	
		6	170586-2	. Switch - Rotary, Single Pole, 12 Position	1	
		7	406356-1	. Switch - Toggle, PC Mount, SPDT	1	

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DIAGRAMS

- Note the model and specification number shown on the equipment nameplate.
- Locate these numbers in the model and specification number columns below.
- Use only those diagrams and instructions that are applicable.

SPECIFICATION NUMBER	MODEL	SCHEMATIC AND CONNECTION DIAGRAM	VOLTAGE CHANGEOVER DIAGRAM
500108A-1	ARC-MASTER 501	205008 Sheets 1 and 2	204232