

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

NOTICE

This document and the information contained herein is the property of Arc Machines, Inc.. It is proprietary and submitted and received in confidence. It shall be used only for the purpose for which it is submitted and shall not be copied in whole or in part without the prior express written permission of Arc Machines, Inc.

The information in this document has been carefully reviewed and is believed to be accurate. However, no responsibility is assumed for inaccuracies.

Information and instructions in this document are subject to change and Arc Machines, Inc. reserves the right to change specifications and data without notice.



WARNING



The nature of the GTAW process creates some POTENTIAL HAZARDS. In accordance with international safety regulations the EXCLAMATION SYMBOL indicates that this equipment is considered HAZARDOUS until an operator has been made aware of these POTENTIAL HAZARDS by **READING THIS MANUAL**. The LIGHTNING FLASH SYMBOL indicates that there are potential electrical hazards. The use and display of these symbols make it the OPERATOR'S RESPONSIBILITY TO INSURE THAT HE HAS READ AND/OR BEEN MADE AWARE OF ALL OF THE SAFETY-RELATED ITEMS CONTAINED IN THIS MANUAL.

Publication date : First Edition - August 15, 1989

Copyright 1989 by Arc Machines, Inc.

All rights reserved

REV.	DCO #	CHANGE DESCRIPTION	DATE	APR
A	N/A	Revised Pg I, ii, iii,iv	9/29/93	GPE
B	2357	Revised to include required IEC-974 information	8/15/96	GPE
C	3059	Added M227/207-CW info: pg. iv, v, 1.1, 3.7, 4.12, 7.5, 7.7, 8.1, 8.2, 8.3.	04/20/98	GPE
D	3583	Revised page 7.4 Step 13 add new Current Offset adj.	3/20/00	GPE
E	3684	Removed ref to Miller coolant page 8.2	7/20/00	GPE
F	5779	Removed 207A-HP (OBS)	8/10/10	DC
G	E6678	Added battery ram note on page 7.11	4/29/14	XJ
H	E6843	Added 207A-HP (Re-activated)	11/17/15	XJ

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

EFFECTIVITY

Features and operation of the Model 207A, Model 207A-1 and Model 207A-HP are derived mostly from SOFTWARE. This document is based on the latest STANDARD version of SOFTWARE at the time of last revision (see revision page).

Some deviations in actual operation, from this document, are possible depending on the software version of a particular machine. Please feel free to contact Arc Machines Service Department for documentation or information on how software updates effect this document.

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

TABLE OF CONTENTS

SECTION	DESCRIPTION	PAGE
SECTION I	INTRODUCTION	
1.0	Introduction	1.1
1.1	Safety Precautions	1.2
1.2	Operational Precautions	1.5
1.3	Shock Hazard Warning	1.7
SECTION II	SPECIFICATIONS	
2.0	Electrical	2.1
2.1	Physical Construction	2.3
2.2	Programmable Functions and Ranges	2.3
2.3	Multi-Level Functions	2.3
2.4	Ambient Temperature Range	2.4
2.5	Cable Operating Length Limits	2.4
SECTION III	INSTALLATION	
3.0	Inspection	3.1
3.1	Power Connections	3.1
3.2	Welding Gas Connections	3.2
3.3	Adapter Cable to M-207A Installation	3.7
3.4	Weld Head Installation	3.7
SECTION IV	SYSTEM FUNCTIONS	
4.0	Introduction	4.1
4.1	Functional Description, General	4.1
4.2	Weld Library and Weld Description	4.3
4.3	Weld Sequence	4.3
4.4	Panel Keys	4.9
4.5	Operate Mode Switch	4.11
4.6	Faults	4.12
4.7	Sensor 1,2,3 Faults	4.13
4.8	Set-Up Functions	4.13
4.9	Glossary of Abbreviations	4.15
4.10	Glossary of Terms	4.16

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

TABLE OF CONTENTS

<i>SECTION</i>	<i>DESCRIPTION</i>	<i>PAGE</i>
<i>SECTION V</i>	<i>OPERATION</i>	
5.0	Introduction	5.1
5.1	Initial Power On	5.1
5.2	Use of Next/Prev	5.2
5.3	Weld Schedule Selection	5.4
5.4	Viewing Function Values	5.5
5.5	Overriding Function Values Before Seq	5.6
5.6	Overriding Function Values During Seq	5.7
5.7	Set Up Functions	5.7
5.8	Auto Rotation Calibration	5.11
5.9	Manual Rotation Calibration	5.13
5.10	Welding Operation	5.15
5.11	Printer Operation	5.16
<i>SECTION VI</i>	<i>PROGRAMMING</i>	
6.0	Introduction	6.1
6.1	Create A Weld Schedule	6.1
6.2	Modify A Weld Schedule	6.4
6.3	Copy a Weld Schedule	6.5
6.4	Transfer/Receive A Weld Schedule	6.6
6.5	Delete A Weld Schedule	6.7
<i>SECTION VII</i>	<i>CALIBRATION</i>	
7.0	Introduction	7.1
7.1	Equipment Required	7.1
7.2	Current Servo	7.2
7.3	General Maintenance	7.5
7.4	System Fault Corrections	7.6
7.5	Error Messages	7.9
7.6	Miscellaneous Maintenance Items	7.10
<i>SECTION VIII</i>	<i>OPTIONS</i>	
8.0	Introduction	8.1
8.1	M227/207-CW & M207-CW Cooling Unit	8.1
8.2	M-207-RP Remote Pendant	8.3
8.3	M-207-EMM External Memory Module	8.7

**MODEL 207A, 207A-1, and 207A-HP
OPERATION MANUAL**

<i>FIGURE</i>	<i>DESCRIPTION</i>	<i>PAGE</i>
<i>FIGURE 1</i>	<i>SYSTEM CONFIGURATION</i>	<i>1.4</i>
<i>FIGURE 2</i>	<i>INSTALLATION LOCATIONS</i>	<i>3.3</i>
<i>FIGURE 3</i>	<i>AC POWER SET-UP</i>	<i>3.4</i>
<i>FIGURE 4</i>	<i>CABLE CONNECTIONS</i>	<i>3.5</i>
<i>FIGURE 5</i>	<i>SEQUENCE TIMING CHART</i>	<i>4.7</i>
<i>FIGURE 6</i>	<i>PANEL KEY LOCATIONS</i>	<i>4.8</i>
<i>FIGURE 7</i>	<i>USE OF NEXT/PREV KEYS</i>	<i>5.3</i>
<i>FIGURE 8</i>	<i>M227/207-CW & M207-CW INSTALLATION</i>	<i>8.6</i>

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

SECTION I - INTRODUCTION

1.0 INTRODUCTION

This manual is intended to assist users of this equipment in set up and basic operation. Automatic fusion welding requires a good deal of operator expertise which requires AMI supplied training. THIS MANUAL IS NOT INTENDED AS A SUBSTITUTE FOR THAT TRAINING.

The basic Model 207A (M-207A) welding power supply is part of a complete welding system intended for fusion welding of metal tubes, pipes and fittings (see Figure 1). The complete system consists of the M-207A power supply, adapter cable, gas lines and any of the AMI Model 9 (M-9) series of tube welding heads (M-9 heads sold separately).

The M-207A power supply provides GTAW current with pulsation controls, high frequency arc starting, purge gas controls, weld head arc rotation and automatic timing functions. The M-207A is supplied (as standard) ready to weld. Users need only to supply input AC power, regulated gas source with flow meter and the appropriate weld head or manual torch.

Some operating conditions may require optional components such as the remote pendant option (M-207-RP), weld head cooling unit option (M227/207-CW or M207-CW) and extension cables. The M-207A family of options also includes quality assurance options such as chart recorders and Weld Data Recording Software.

The system can also be used as a manual welding power source using an optional manual torch with a variety of manual welding options such as a variable current foot controller or a remote start/stop switch.

NOTE


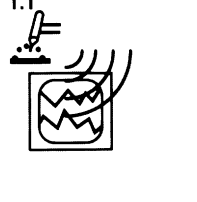
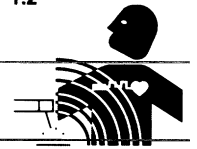



In-depth weld development instructions, weld head set-up, maintenance and troubleshooting are contained in other manuals, documents and training classes and are not included in this manual. Contact your AMI representative for more information about these items.

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

SECTION I - INTRODUCTION

1.1 SAFETY PRECAUTIONS





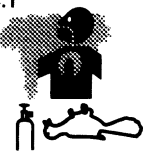


This section contains cautions and warnings concerning the operation of this equipment and welding equipment in general. However, in addition to reading this manual and before operating this or any welding equipment, users should reference and be familiar with “ANSI-49.1 Safety in Welding and Cutting”. This standard is published by the American National Standards Institute and the American Welding Society.

<p>1</p> 	<p>WARNING: Touching energized electrical parts can cause fatal shocks and burns. When in weld sequence the electrode and work are electrically energized. Incorrectly installed or improperly grounded equipment is a hazard.</p>
<p>1.1</p> 	<p>WARNING: This equipment is authorized to use a type of arc starter that produces a High Frequency Radio Wave (sometimes called HF and/or RF Starting). It can cause interference and sometimes even damage to nearby electronic equipment (such as computers) that are un-protected or poorly protected against such interference.</p>
<p>1.2</p> 	<p>WARNING: Magnetic Fields from High Currents can affect pacemakers. PACEMAKER WEARERS KEEP AWAY UNTIL CONSULTING YOUR DOCTOR.</p>
<p>1.3</p> 	<p>WARNING: Disconnect the input power to the machine before opening or servicing. Discharge all circuits that store high voltage such as capacitor packs. Only QUALIFIED service personnel should open this equipment.</p>
<p>2</p> 	<p>WARNING: Welding can cause fires or explosions. Do not weld near FLAMMABLE or EXPLOSIVE MATERIALS. Watch for fire. Have proper type of extinguisher in work area.</p>
<p>2.1</p> 	<p>WARNING: Welding Operators should wear non-flammable protective clothing, footwear and head gear.</p>

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

SECTION I - INTRODUCTION

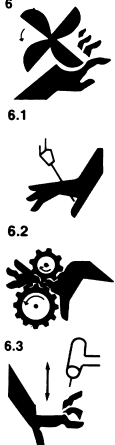
1.1 SAFETY PRECAUTIONS

<p>2.2</p> 	<p>WARNING: Never weld on sealed containers or pipes. This may result in an EXPLOSION.</p>
<p>2.3</p> 	<p>WARNING: Welding produces high temperatures in both the welded components and the welding equipment. Both can cause severe burns. Do not touch recently welded components. Avoid touching internal components of the welding system soon after use. Avoid touching torch components and welding fixtures soon after welding.</p>
<p>3</p> 	<p>WARNING: The welding arc emits ultra-violet (UV) radiation and the molten weld gives off infra-red. Both can burn eyes and skin if unprotected. Suitable eye and skin protection must be worn.</p>
<p>4</p> 	<p>WARNING: Weld materials can emit toxic fumes during welding. WELD ONLY IN AREAS WITH ADEQUATE VENTILATION.</p>
<p>4.1</p> 	<p>WARNING: Most GTAW gases like Argon are non-toxic, however, Argon is heavier than air and will displace the normal atmosphere in enclosed areas. DO NOT WELD IN ENCLOSED AREAS WITH OUT PROPER VENTILATION OR RESPIRATORS.</p>
<p>5</p> 	<p>WARNING: AMI factory training is essential for all Welding Operators and Maintenance Technicians who operate AMI equipment.</p>
	<p>WARNING: Some systems, such as the M207A-HP, are intended solely for in-door use and must be kept dry. Before operating, storing or handling, always make sure that the M-207A, M-207-RP Pendant, weld heads and cables are not exposed to rain or standing water. SYSTEM COMPONENTS ARE NOT WEATHER-PROOF.</p>

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

SECTION I - INTRODUCTION

1.1 SAFETY PRECAUTIONS

	<p>WARNING: Keep hands and fingers clear from moving parts such as fans, gears rotors, Wire Feed, Rotation and AVC Mechanisms.</p>
	<p>WARNING: The M-207A Power Supply is not intended for pipe thawing or heating in any form.</p>
	<p>WARNING: The M-207A weighs in excess of 75 lbs. Be sure to follow local, OSHA, International or employers guidelines for proper methods of lifting and re-locating this equipment.</p>

1.2 OPERATIONAL PRECAUTIONS

The following is a check list for operating personnel to follow to insure minimum system down-time due to improper operation and handling:

1. **TOO AVOID** severe equipment damage **VERIFY** that the M-207A is connected to the correct Input AC power (see section 3.1).
2. Before operating, check all fittings and connectors for proper seating and that all protective boots are in place. If not properly seated or protected, short circuits, poor connections or inert gas leaks could occur.
3. The M-207A is intended for typical GTAW gases **ONLY**. **NEVER CONNECT OXYGEN OR ACETYLENE TO THE M-207A.**
4. Before operating, insure that all cables are routed or protected in such a way that they will not be subject to heat, equipment and/or personnel traffic. Insure that the cables **DO NOT** come in contact with **HOT PIPE**.
5. When storing or handling cables, always keep the protective boots and dust caps on all connectors and fittings until ready to install. A major cause of downtime in any automatic welding system is improper care and use of cables.

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

1.2 OPERATIONAL PRECAUTIONS

6. Before operating, insure that the M-207 has adequate air flow. Do not restrict the intakes or exhaust vents of the power supply.
7. Before operating, always insure that there is bare metal contact between the weld head components which connect to GROUND (clamp inserts, etc.) and the tube or pipe to be welded.
8. When storing or handling weld heads, always keep them in the protective containers they are shipped in, or optional carrying case, until ready to install.
9. When operating, storing or handling, insure that the system is protected against dirt, dust, etc. **NEVER GRIND NEAR AN EXPOSED WELD HEAD OR THE M-207A.**
10. Do not use acid, corrosives, liquid "Easy Out" or any liquid substance on the M- 207A or any AMI weld head. When cleaning, use only a light solution of Isopropyl alcohol on a soft cloth .
11. When handling, take extreme care to avoid dropping the M-207A, weld heads, cables or any accessories.
12. Do not attempt to move tube end into position using the weld head as a lever.
13. Do not add any lubrication like graphite, oil or grease to the weld heads or power supply unless it is specified in the operation or maintenance manual for that equipment.

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

1.3 SHOCK HAZARD WARNING

As already stated in this manual “High Voltage” is present on exposed internal terminals. The ELECTRODE (tungsten and M-9 rotors) is also an “exposed terminal” and by its nature the GTAW process requires electrical potential to be present on the electrode during arc starting and of course during the welding.

All AMI Power Supplies contain a “bleeder” circuit to ground any residual potential after welding or after an aborted or bad “arc start” attempt. However, these circuits take a few seconds to operate or COULD FAIL.

“THE ELECTRODE SHOULD ALWAYS BE CONSIDERED A POSSIBLE SHOCK HAZARD”. This is especially true when ever the system is in “weld sequence” ready to weld, is welding or has just finished welding. However, equipment/component failure, system abuse, or improper maintenance could result in electrical potential at the weld head “even when not in weld sequence”.

The users/operators of this equipment must take all precautions necessary to avoid contact with the ELECTRODE at “ALL TIMES”. The only exception is when actually replacing or adjusting the electrode and this should be done “WITH THE POWER TURNED OFF”.

If performed with the power “ON” the system must be in test mode out of weld sequence and the USER MUST OBSERVE COMMON SAFETY PRACTICES such as grounding the electrode to insure discharge before actually touching it.

REMEMBER, there is a “POSSIBLE” shock hazard in all welding power supplies at “ALL” times.



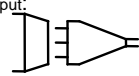
Most AMI Power Supplies feature High Frequency (HF) Arc Starting. This is a High Voltage/High Frequency electrical transmission process. To eliminate any HF shock possibility “AVOID ALL CONTACT” with the Welding WORK (ground), the ELECTRODE or the WELD HEAD during arc start.

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

The following contains only general specifications about the M-207A Power Supply. More detailed information is available in AMI Specification No. 207.

2.0 ELECTRICAL

1. RATING PLATE DEFINITIONS

1) Company: ARC MACHINES, INC.		Country: USA		3) Model: Model 207A		6) Standards: NEMA EW1 IEC 974-1	
8) Process:  G.T.A.W		10) Type: ----- DC		9) Output: Minimum 3A / 5V		Maximum 150A / 20V	
23) Shock Rating: 		11) No-load Voltage: U₀ = 59V		12) Duty Cycle: X = 100% ALL RATED OUTPUTS			
15) Input:  1 ~ 50/60 HZ		18) Voltage: U₁ = 110V 220V		19) Input Current: I_{1max} = 30A I_{1eff} = 30A 20A 20A		21/22) Rating/Class: IP21	

- 1) - Manufacturer and Country of Origin
- 3) - Model Number Rating Plate applies to.
- 4) - Serial Number (located on M-207A Center Plate, not on rating plate).
- 6) - International and USA Standards that the equipment meets.
- 8) - Weld Process symbol for GTAW welding.
- 9) - Rated minimum output amperes and output voltage (same all models). Rated maximum output amperes and output voltage. M-207A maximum rated current is 150 amperes at 20 volts M207A-HP and M207A-1 are limited to rated maximum of 100 amperes at 20 volts. All Models are limited to 100 Amperes while connected to 110 VAC.
- 10) - Symbol that output is Direct Current (DC) only.
- 11) - Rated No Load Output Voltage (open circuit voltage) is 59 volts for M-207A and M207A-HP and 79 volts for M-207A-1.
- 12) - All M-207A models are 100 % Duty Cycle for their rated outputs (9).
- 15) - Input Voltage type contains symbol for single (1) phase Alternating Current (AC) input at 50 or 60 Hz frequency.
- 18) - Nominal Input Voltage value is 110 VAC or 220 VAC
- 19) - Rated maximum required supply current. Given for both **I₁** maximum (**I_{1max}**) and **I₁** effective (**I_{1eff}**). Both are rated at 30 Ampere service for 110 VAC operation and 20 ampere service for 220 VAC operation.

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

2.0 ELECTRICAL

1. RATING PLATE DEFINITIONS

- 21) - International Protection (IP) rating. M-207A and M-207A-1 are rated IP21 which includes protection against a limited amount of exposure to rain (does not make it weather proof or intended for all weather usage). M207A-HP is rated IP2XC which is the same as IP21 with the exception of exposure to rain. Do not expose the M207A-HP to rain.
 - 22) - All M-207A models are class I. No symbol is used for class I equipment.
 - 23) - “S” Symbol indicates a welding power source which is suitable for an environment with an increased electric shock hazard.
2. INPUT POWER, DETAIL - All M-207A Models, as shipped standard, can operate on the following Single Phase input AC:

<i>Voltage</i>	<i>Tolerance</i>	<i>Freq.</i>	<i>Max Input Current</i>
100 VAC	+ 32%, -10%	50/60 Hz	30 amperes
110 VAC	+ 20%, -18%	50/60 Hz	30 amperes
115 VAC	+ 15%, -22%	50/60 Hz	30 amperes
120 VAC	+ 10%, -25%	50/60 Hz	30 amperes
200 VAC	+ 32%, -10%	50/60 Hz	20 amperes
208 VAC	+ 27%, -13%	50/60 Hz	20 amperes
220 VAC	+ 20%, -18%	50/60 Hz	20 amperes
230 VAC	+15%, -22%	50/60 Hz	20 amperes
240 VAC	+ 10%, -25%	50/60 Hz	20 amperes

+/- % indicates the allowable input voltage change to maintain performance as specified. Maximum input current is based on maximum output current at maximum arc voltage. See section 3.1 for installation.

3. OUTPUT POWER - Straight polarity, constant current DC regulation intended for GTAW welding only. Static characteristic of all power supplies is flat.

All Models = 3 to 100 amperes DC using 100 to 120 VAC input.
M207A-1, M207A-HP = 3 to 100 amperes DC using 200 to 240 VAC input.
M207A = 3 to 150 amperes DC using 200 to 240 VAC input.

2.2 SECTION II - SPECIFICATIONS

2.0 ELECTRICAL

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

4. CIRCUIT BREAKER - ON/OFF, two pole, 30 Ampere at 250 VAC.

2.1 PHYSICAL CONSTRUCTION - (power supply only)

Cabinet material - aluminum
 Height - 10.9 in (276.9 mm) cover closed
 - 9.3 in (236.2 mm) cover removed
 Width - 22.75 in (577.9 mm)
 Depth - 19.25 in (489.0 mm) including handle
 Weight - 78 lbs (35.4 kg) (M207A and M207A-1)
 75 lbs (34.0 kg) (M207A-HP)

2.2 PROGRAMMABLE and OPERATIONAL FUNCTIONS

PREPURGE TIME	=	010 - 999 seconds
POSTPURGE TIME	=	000 - 999 seconds
UPSLOPE TIME	=	00.0 - 99.9 seconds
DOWNSLOPE TIME	=	00.0 - 99.9 seconds
ROTATION START DELAY	=	00.0 - 99.9 seconds
ROTATION MODE SETTINGS	=	CONT - STEP - OFF
PRIMARY ROTATION SPEED	=	0.00 - 20.0 RPM
BACKGROUND ROTATION SPEED	=	0.00 - 20.0 RPM
PULSE MODE SETTINGS	=	ON - OFF
PRIMARY PULSE TIME	=	0.00 - 9.99 seconds
BACKGROUND PULSE TIME	=	0.00 - 9.99 seconds
LEVELS	=	1 - 99
LEVEL TIME (each level)	=	000 - 999 seconds*
PRIMARY CURRENT	=	3 - 150 amperes*
BACKGROUND CURRENT	=	3 - 150 amperes*

* = Can be in increments of 0.1

2.3 MULTI-LEVEL FUNCTIONS - The following functions can be programmed to change value during a given weld sequence.

FUNCTION	POSSIBLE CHANGES
LEVEL TIME	= 1 to 99 levels

2.3 MULTI-LEVEL FUNCTIONS (continued)

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

<u>FUNCTION</u>	<u>POSSIBLE CHANGES</u>
PRIMARY CURRENT.....	= 1 to 99 levels
BACKGROUND CURRENT.....	= 1 to 99 levels
PRIMARY PULSE TIME	= 1 to 99 levels
BACKGROUND PULSE TIME	= 1 to 99 levels
PULSE MODE (ON/OFF).....	= 1 to 99 levels
PRIMARY ROTATION.....	= 1 to 99 levels
BACKGROUND ROTATION RPM.....	= 1 to 99 levels
ROTATION MODE (CONT/STEP/OFF).....	= 1 to 99 levels
2.4 AMBIENT TEMPERATURE RANGE - 32 F (0 C) to 110 F (45 C).	
2.5 CABLE OPERATING DISTANCE LIMITS - Standard	= 25' (7.6 m)
	Maximum = 100' (30.5 m)

The standard distance consists of a 15' adapter cable and a 10' weld head cable combined together. The maximum distance is achieved by adding extension cables to the standard cables.

The above are considered normal limits. With special options, distances of 500 feet or more can be achieved. Consult an AMI representative for more information.

SECTION III - INSTALLATION

3.0 INSPECTION

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

1. After unpacking, inspect all items for obvious physical damage and loose parts. If damage is evident, contact a factory representative before using.

NOTE

If water condensation is apparent, dry the unit before using.

2. All M-207A models are shipped with a variety of peripheral equipment such as gas hoses, fittings, manuals (including this one) and electrical drawings. An exact list of these items is included with each power supply shipment. This manual will reference some of those items so before beginning installation these items should be located and be available.

3.1 POWER CONNECTION



WARNING



Do not connect the M-207A power supply to any AC power other than the ones listed in section 2.0.2.

The M-207A can operate on 9 different input line voltages and must be set up for the one you are using. Use the following procedure to insure that the M-207A is set-up for the correct AC power.

1. The M-207A is supplied with a 25' power cord. One end has a connector on it that plugs into the side of the M-207A. The wires on the other end are pig-tailed (no connector). A suitable AC line connector, matching the input power, must be supplied and installed by the user. Color coding of the power cord is as follows:

Black = Hot (high line side)
White = Neutral (low line side)
Green/Yellow = Ground (protective earth ground)

NOTE

For additional ground reference there is a ground symbol silk-screened next to the ground pin on the M-207A Input AC connector on the Input Panel.

3.1

SECTION III - INSTALLATION

3.1 POWER CONNECTION

2. Install the AC line connector onto the power cord.

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

NOTE

DO NOT PLUG THE M- 207A INTO THE AC POWER SOURCE UNTIL ALL INSTALLATION STEPS ARE COMPLETE.

3. Insure that the circuit breaker (CB-1) is in the down or OFF position (see figure 2 and 3).
4. Using figure 2 and 3 as a reference, locate the power SELECT SWITCH (next to the input power connector). The switch is concealed by a cover plate and only the top of the switch handle can be seen through a hole in the plate. The plate is labeled as to what voltage the switch is currently set for.
5. If the M-207A is to be run on 100, 110, 115 or 120 VAC this switch must be in the 110 VAC position. If it is to be run on 200, 208, 220, 230 or 240 VAC it must be in the 220 VAC position. If it is in the correct position, proceed to step 3.2.
6. To change the power select switch position, remove the cover retaining screws (see figure 3) and remove the cover. Set the switch to the alternate position and install the cover plate. It must be flipped over so the hole in the plate will fit over the switch handle in the new position. This will automatically expose the alternate voltage label on the other side.

3.2 WELDING GAS CONNECTIONS

NOTE

The M207A-HP is supplied with slightly different hoses and fittings (for clean room use) than the M207A. The following instructions are for M-207A but do, in general, still apply to an M207A-HP with slight material variances.

1. Three gas hoses are supplied with M-207A. These hoses are made of material selected specifically for automatic welding. **HOSES MADE FROM OTHER MATERIAL ARE NOT RECOMMENDED** (especially rubber, nylon or tygon).
2. One 10 foot (3m) hose should be installed from the gas regulator/flowmeter (user supplied) to the ARC GAS INPUT fitting on the M-207A. This hose is supplied with all fittings required to mate with the M-207A and most domestic (USA) inert gas flow meters.

3.2

SECTION III - INSTALLATION

3.2 WELDING GAS CONNECTIONS

2. (continued)

NOTE

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

The arc gas line is controlled by a solenoid and flow sensor in the M-207A and MUST BE connected to the M-207A (not directly to the weld head or torch).

After installing the hose and fittings loosely by hand, tighten the retaining nuts slightly with a wrench to insure there are no leaks, but do not over-tighten. The use of plumbers tape or grease is not recommended.

CAUTION

The M-207A arc gas solenoid valve is rated at 50 PSI (345 KPa) maximum pressure, DO NOT EXCEED THIS RATING.

3. The other 10' (3 m) hose is intended for I.D. PURGE GAS INPUT and its connection to and through the M-207A is optional. It is supplied with fittings to connect from the gas source regulator/flowmeter to the PURGE GAS input bulkhead fitting on the M-207A.

The M-207A does not supply a solenoid for control of I.D. PURGE GAS. The line feeds straight through to the output quick-disconnect. If the output hose is plugged in, gas will flow at all times. This feature is best for bench-type weld development but not normally used for field I.D. purging of long lengths of tube.

If you wish to use this option, install the hose and fittings loosely by hand, tighten the retaining nuts slightly with a wrench to insure there are no leaks, but do not over-tighten. The use of plumbers tape or grease is not recommended (see figure 4).

4. The 25 foot (7.6 m) hose is intended to supply the I.D. purge from the M-207A to the weld. One end has a quick-disconnect on it that mates with the PURGE GAS output bulkhead fitting on the M-207A. If used, the quick-disconnect provides a convenient method for starting or stopping the flow of I.D. purge gas. If you wish to use this option, insert the male quick-disconnect of the hose into the M-207A connector labeled PURGE OUTPUT (see Figure 2 and 4).

3.6

SECTION III - INSTALLATION

3.3 ADAPTER CABLE TO M-207A INSTALLATION

NOTE

Although the Adapter Cable is used with most M-9 weld heads, some do not use it

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

(such as the M9-500). Consult your weld head manual for more details.



WARNING



Always turn the power supply off before making any cable or connection changes to the M-207A power supply.

1. One end of the adapter cable ALWAYS connects to the weld head. The other end connects to the M-207A or to a weld head extension cable. The connector types and keyways are different for each item (except gas). Use the following steps for connection to the M-207A (see figure 2 and 4).
 2. Connect the GROUND and ELECTRODE connectors to their respective terminals on the M-207A. Align the keyways, push in and twist clockwise until fully locked.
 3. Weld head CONTROL connector - Just before installing, unscrew the dust caps on the cable and M-207A connector labeled WELD HEAD CONTROL. Insert the cable connector into the M-207A panel connector. Note the positioning keyway and NEVER FORCE or use tools on the cable connections. Hand tighten the connecting ring after the pins are firmly seated.
 4. Insert the cable male gas quick-disconnect into the M-207A ARC GAS OUTPUT connector. Do not insert it in the purge gas output connector.
 5. If the M227/207-CW or M207-CW optional cooling unit is being used, insert the two coolant quick-disconnects into the COOLANT IN and COOLANT OUT connectors on the CW. The cable coolant connectors are interchangeable and it does not matter which one goes to in or out. See section 8.1 for CW installation instructions.
- 3.4 WELD HEAD INSTALLATION - The weld head cable connects to the adapter cable. Refer to figure 2 and 4 as you perform this installation.

NOTE

Although the Adapter Cable is used with most M-9 weld heads, some do not use it (such as the M9-500). Consult your weld head manual for more details.

3.7

SECTION III - INSTALLATION

3.4 WELD HEAD INSTALLATION (continued)

1. Insert the adapter cable GROUND, ELECTRODE AND GAS connectors into the mating weld head cable connectors.

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

2. After the ELECTRODE, GROUND and GAS connectors are secure and checked, slide the rubber boots on each line together and secure them in place. These boots provide both a safety factor to prevent shorting to ground and also act as a retainer to prevent the connectors from coming apart.
3. Unscrew the CONTROL connector dust caps on both cables just before installing. Insert the adapter connector into the head connector. Note the positioning keyway and NEVER FORCE or use tools on the cable connections. Using just your hand, tighten the connecting ring until the pins are firmly seated. Screw the two dust caps together to prevent them from swinging around.
4. Installation is now complete.

CAUTION

Before proceeding with POWER ON it is EXTREMELY important to have a basic understanding of SYSTEM FUNCTIONS. Read section IV (system functions) before proceeding with OPERATION (section V) or PROGRAMMING (section VI).

3.8

SECTION IV - SYSTEM FUNCTIONS

4.0 INTRODUCTION

The M-207A is intended for use with AMI orbital welding heads and has functions designed for these weld heads. This section describes what these functions are

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

and may, where needed for clarification, indicate how they are commonly (but not always) used.

Step 4.1 is general description; the remaining steps describe, in more detail, the items of steps 4.1. Only FUNCTION is discussed here. Details of function ranges and tolerances can be found in section II of this manual and in AMI Specification No. 207. Details about operating these functions can be found in section V.

4.1 FUNCTIONAL DESCRIPTION, GENERAL

1. **LIBRARY** - The heart of the M-207A is its MEMORY. The values of each function, for a given weld, are only programmed one time. After that the M-207A will store the function values (for that weld) by WELD SCHEDULE NUMBER (#) and description.

When a particular weld type is needed to be made the Operator can locate it in the WELD SCHEDULE LIBRARY by description or by weld schedule number (#).

2. **WELD SEQUENCE AND LEVELS** - Selected weld schedules are started by manually initiating the SEQUENCE START. Once the sequence is started the system operation of functions is totally automatic.

In addition to functions to start and stop the weld, the weld sequence includes the ability to preset changes in function values and modes. These changes are called LEVELS and as many as 100 levels can be used for each weld sequence. All weld schedules start with (and must have) Level 1.

If preset changes are desired they will be set in LEVELS 2, 3, etc. The LEVELS advance from 1 to 2, 2 to 3, etc. automatically as a function of time.

3. **CURRENT SOURCE AND CONTROL** - The M-207A is a pulsed, 150 ampere, constant current, straight polarity, GTAW power source. The current value(s) can be set between 3 and 150 Amps

4.1

SECTION IV - SYSTEM FUNCTIONS

4.1 FUNCTIONAL DESCRIPTION, GENERAL

4. **TRAVEL FUNCTION** - The system is equipped with a motor servo controller that provides the power and regulation for rotating the arc around

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

the weld seam. The system controls the movement in revolutions per minute (RPM).

NOTE

The motor servo can only work properly if the weld head being used is equipped with a motor assembly designed for operation on the M-207A.

5. PULSATION - The system can rapidly change or PULSE back and forth between two (2) different values of CURRENT and two different values of TRAVEL. The normal or HIGH value is designated the PRIMARY value. The other or LOW value is designated the BACKGROUND value.

This pulsation is done as a function of time by using the PRIMARY and BACKGROUND PULSE TIMES to set an exact amount of time for each PRIMARY and BACKGROUND function to occur.

6. OVERRIDES - The weld schedule programmer can set the M-207A to allow the operator to change the value of some weld schedule functions. The programmer can also set limits to the amount of changes the operator can make to each function.
7. FAULT STATUS - The system continuously monitors certain functions such as gas flow, coolant flow (if used), system temperature and input AC. If there are any problems the system will alert the operator and in some cases, where weld quality might be affected, the system will stop the welding process.
8. GAS FUNCTIONS - As stated, the M-207A is intended for the GTAW process. This process requires a welding gas (usually inert) for operation, and the M-207A is equipped with a gas solenoid and input/output connectors for the control of the welding (arc) gas.
9. PRINT FUNCTIONS - Built into the M-207A is a thermal Printer. The printer allows copies of the Library and complete weld schedule to be made.

4.2

SECTION IV - SYSTEM FUNCTIONS

4.2 WELD LIBRARY AND WELD DESCRIPTION

Each weld schedule programmed into the system memory is identified and displayed (when selected) with the following information:

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

1. # = Individual WELD SCHEDULE NUMBER from 001 to 100.
 2. OD = Outside diameter in inches or mm of the weld.
 3. WALL = Wall thickness in inches or mm of the weld.
 4. TYPE = Uses abbreviations to identify the type of weld the schedule is for (see section 4.9 for list).
 5. MAT = Uses abbreviations to identify the base material the schedule is for (see section 4.9 for list).
 6. QTY = Indicates the number of times this weld schedule has been used since last reset.
- 4.3 WELD SEQUENCE - Although the M-207A can be used as a manual welding power source, it is primarily intended to follow an automatic SEQUENCE. After a weld schedule is selected and the weld is setup, the SEQUENCE will be manually started by the operator and the following events will occur automatically (see figure 5 for the timing chart):
1. EVENT 1: PREPURGE - Welding gas will start to flow (for the entire weld) from the gas source (user supplied) through the power supply to the weld head. Complete gas coverage should be obtained before the arc is struck. How long it flows before the arc is struck is called the PREPURGE TIME. Minimum programmable time is 10 seconds.
 2. EVENT 2: ARC START - When PREPURGE time is complete a high frequency pulse will be generated to establish an arc between the electrode and the weld joint.
 3. EVENT 3: LEVEL 1 TIME, START LEVEL, UPSLOPE, TRAVEL START DELAY - When the arc starts the following functions all start at the same time:
 1. LEVEL 1 TIME - When the arc is established all weld functions are considered to be in LEVEL 1. The LEVEL 1 Timer will start to count and the M-207A will stay in LEVEL 1 until this time is complete.
 2. WELD CURRENT START LEVEL - As the arc is established the weld current will jump to a small value. This current is used to stabilize the arc and is called the START LEVEL. Its value is adjustable and may need to be changed depending on certain conditions.

4.3

SECTION IV - SYSTEM FUNCTIONS

4.3 WELD SEQUENCE

3. EVENT 3: LEVEL 1 TIME, START LEVEL, UPSLOPE, TRAVEL START DELAY -

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

3. WELD CURRENT UPSLOPE - Sometimes it may be necessary to raise the weld current to full value slowly. This is called UPSLOPE. When the arc is established the weld current will start to rise to the PRIMARY and BACKGROUND (if pulsed) value programmed in LEVEL 1. The time it takes to rise to full value is the UPSLOPE TIME.
 4. PRIMARY and BACKGROUND PULSE TIMES - When the arc is established and the LEVEL 1 PULSE MODE is programmed to the ON position, the weld current will be pulsing between the PRIMARY and BACKGROUND VALUES (it may be upsloping at first). The amount of time it stays in the PRIMARY is set by the PRIMARY PULSE TIME; it will be followed by the BACKGROUND PULSE TIME, then the PRIMARY PULSE TIME and so on.
 5. TRAVEL START DELAY - Rotation of the arc should not occur in most cases until full penetration of the weld has been achieved. When the arc is established the TRAVEL START DELAY time will begin to count. When this programmable period of time is complete the weld head will start to rotate the arc.
4. EVENT 4: FULL LEVEL FUNCTIONS - Sometime after the arc is established, depending on the weld schedule, the UPSLOPE and TRAVEL START DELAY will be completed and all of the following functions will be in effect:
1. LEVEL 1 TIME - Will be counting towards 0. During its count all of the below functions will be occurring:
 2. LEVEL 1 PULSE MODE - Can be programmed to be ON or OFF. If ON the system will pulse between PRIMARY and BACKGROUND function values.
 3. LEVEL 1 PRIMARY PULSE TIME - If the LEVEL 1 PULSE MODE is ON this function will operate (see Event 3).

4.4

SECTION IV - SYSTEM FUNCTIONS

4.3 WELD SEQUENCE

4. EVENT 4: FULL LEVEL FUNCTIONS -

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

4. LEVEL 1 BACKGROUND PULSE TIME - If the LEVEL 1 PULSE MODE is ON this function will operate (see Event 3).
5. LEVEL 1 PRIMARY AMPS - After UPSLOPE the system will be regulating this programmed value of current.
6. LEVEL 1 BACKGROUND AMPS - If the LEVEL PULSE MODE was programmed to ON, the system will be pulsing between the PRIMARY VALUE and the BACKGROUND VALUE.
7. LEVEL 1 TRAVEL MODE - After the TRAVEL START DELAY time is complete the travel function will be allowed to operate in 1 of 3 programmable modes.

OFF = Will prevent rotation from occurring.
CONTINUOUS = Runs the travel at the PRIMARY-RPM speed only, regardless of PULSE MODE.
STEP = Will pulse the travel between the PRIMARY-RPM and BACKGROUND-RPM speed. If the TRAVEL MODE is in STEP but the PULSE MODE is in OFF them only PRIMARY will occur (without pulsing there are no background functions).
8. LEVEL 1 PRIMARY-RPMS - After the TRAVEL START DELAY time is complete the travel function will begin. If the LEVEL 1 TRAVEL MODE is programmed to the CONTINUOUS mode the travel will be rotating the arc at the PRIMARY-RPM rate. If the mode is in STEP it will rotate the arc at the PRIMARY-RPM speed each time the LEVEL 1 PRIMARY PULSE TIME occurs.
9. LEVEL 1 BACKGROUND-RPM - If the LEVEL 1 PULSE MODE is ON and the TRAVEL MODE is in STEP the system will rotate the arc at the BACKGROUND-RPM each time the LEVEL 1 BACKGROUND PULSE TIME occurs.

4.5

SECTION IV - SYSTEM FUNCTIONS

4.3 WELD SEQUENCE

4. EVENT 4: FULL LEVEL FUNCTIONS -

NOTE

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

Travel direction is programmable CLOCKWISE or COUNTER-CLOCKWISE. After the TRAVEL START DELAY the arc will rotate in the programmed direction. The direction is not programmable by LEVELS. It will rotate the arc in the same direction for the entire WELD SEQUENCE.

5. EVENT 5: LEVEL 2 TO LAST PROGRAMMED LEVEL - As the arc is rotated around the weld it is usually necessary to program changes in the current, pulse times, modes and rotation speed. These changes are called LEVELS and up to 100 can be programmed for each sequence. Each LEVEL contains the same functions and options as EVENT 4. Each LEVEL TIME determines the duration of that level.
6. EVENT 6: DOWNSLOPE - When the last programmed LEVEL is complete the WELD SEQUENCE will begin the process of stopping. To avoid cratering and cracking of the weld the current needs to be reduced slowly. The last LEVEL PRIMARY-AMP value and BACKGROUND-AMP value (if pulsed) will start to decrease towards 0. This time is called DOWNSLOPE and is programmable.
7. EVENT 7: POSTPURGE - At the end of DOWNSLOPE, when the current is less than 3 amperes, the arc will go out. All functions except gas flow will stop. The gas should not be stopped until the weld and electrode are cooled enough to prevent oxidation. How long the gas continues to flow is programmable and is called the POSTPURGE TIME.
8. EVENT 8: RETURN TO HOME AND RESET - When POSTPURGE is complete the gas will shut off. The M-9 welding head rotor will usually not be in the proper position for head removal from the weld. When the gas shuts off the rotor will return to the open (home) position and the weld head can be removed from the weld. The system will then reset and be ready to make another weld sequence.

4.6

SECTION IV - SYSTEM FUNCTIONS

- 4.4 PANEL KEYS - The following are descriptions of all active operating keys contained on the system (see figure 6).

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

1. ALL STOP KEY - Active only during weld sequence in test or weld mode. When pressed it will stop the sequence, turn off the arc with no downslope and start the postpurge process (see 4.3 event 7).
2. C KEY - Used for screen clear or cancel, it usually will end (without storing) the screen will prompt the operator to indicate what will happen if the C key is pressed.
3. CE KEY - The clear entry key is used to clear numbers entered with the numeric keys before the enter key is pressed. Use this key when a mistake is made using the numeric keys.
4. ENTER KEY - Used at the end of each step to indicate completion and to move to the next step or screen.
5. F KEY - These are function keys numbered 1 to 16. Each key is aligned with a portion of the display and are used to activate, cycle or alter the item displayed above or below it. Each key will alter different functions depending on what screen is being displayed. Use of the F keys is always prompted by the screens.
6. L KEY - The M-207 is multi-lingual. Pressing this key will change the display from English to French or to German if pressed again or to Swedish or to Japanese if continued to be pressed.. The L key is always active..
7. LIB KEY - Used to access the LIBRARY (weld schedule memory/storage).
8. MANUAL PURGE KEY - Active at all times. Used for manually turning on the gas solenoid. When ON, the gas solenoid will be energized and it will stay ON until this key is manually pressed again.
9. NEXT LEVEL KEY - Active when weld schedules with more than one level are being displayed. An * will appear on the display to indicate that more levels are programmed for that weld schedule.
10. NEXT SCREEN KEY - Active when another screen (more data) is available for a weld schedule or function. An * will appear on the display to indicate that more data is available on the next screen.

4.9

SECTION IV - SYSTEM FUNCTIONS

4.4 PANEL KEYS

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

11. NUMERIC KEYS - Used to select weld schedule number (#) or to enter numbers during programming, overriding and set-up functions.
12. PREV LEVEL KEY - Same as NEXT LEVEL but levels appear in reverse order.
13. PREV SCREEN KEY - Same as NEXT SCREEN but screens appear in reverse order.
14. PRINT KEY - Only works if the printer option is used. If pressed when the status is displayed a copy of system hours and software revision will be printed. If pressed during the library screen a copy of the entire library will be printed. During a weld schedule screen a copy of that entire weld schedule will be printed. The key will not be active at any other time. It cannot be used during an actual weld sequence. The date will be printed on every copy.
15. PRO KEY - Active only if the OPERATE MODE SWITCH is in the PROGRAM position. Pressing the pro key from the status screen will access the programming modes. During programming the PRO key is used to store information.
16. SEQ START KEY - Active with the schedule screen. When pressed this key will start the weld sequence (see 4.3).
17. SEQ STOP KEY - Active only during weld sequence screen. When pressed this key will stop the weld sequence and start the downslope function (4.3 event 6).
18. SET UP KEY - Active at all times except during a weld sequence. When pressed this key will allow access to various set-up options (see 4.8).
19. TVL CW JOG KEY - Active at all times. When pressed the electrode will rotate clockwise.
20. TVL CCW JOG KEY - Active at all times. When pressed the weld head will rotate the electrode in the counterclockwise direction.

4.10

SECTION IV - SYSTEM FUNCTIONS

4.4 PANEL KEYS

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

21. WELD/TEST KEY - At power on the M-207A will always be in the TEST mode. In TEST mode a weld sequence can be run but NO ARC will be struck. The user must press this key to initiate WELD mode. Once this is done the M-207A will stay in WELD mode as long as the same weld schedule is displayed. Changing schedules will cause the system to return to the TEST mode.
22. STOP PRINT KEY - This key will allow the user to stop the printing process for any reason.
23. PAPER FEED KEY - This key allows the user to advance the paper in the printer.

4.5 OPERATE MODE SWITCH

This is a three position switch with a locking key. When set to the desired position (mode) the key can be removed to prevent any non-key holder from changing the mode.

The OPERATE MODE SWITCH sets the M-207A to be run in any of three separate modes as described below:

1. OPERATE/WELD SELECT POSITION - The OPERATE mode is for standard welding operations. It allows access to all weld schedules and set-up screens. All normal system operations, such as weld sequence, etc. are performed in this mode. In this mode the operator CANNOT perform any PROGRAMMING functions or changes to the memory such as creating, modifying, transferring or deleting.
2. MODE LOCK - After a weld schedule has been selected it may be locked-in to prevent selection of any other weld schedule. This feature is intended primarily for when the operator is welding out-of-sight of the M-207A or if a supervisor wishes to insure that ONLY a particular weld schedule is used.
3. PROGRAM/OPERATE - In order to CREATE, MODIFY, TRANSFER, COPY or DELETE a weld schedule in the system memory, the mode switch must be set to this position. All system operations, such as weld sequence, can also be performed in this mode.

4.5 OPERATE MODE SWITCH

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

CAUTION

Authorization and access to the OPERATE MODE KEY should be controlled. When the switch is set to the PROGRAM mode the operator may permanently MODIFY (change) or DELETE weld schedule information contained in the system memory.

4.6 FAULTS

The M-207A has the ability to monitor certain functions. If they are not working correctly a system fault (FLT) will alert the operator to the problem.

The following is a description of each type of fault (FLT):

1. **TEMP FLT** - Power supply internal TEMPERATURE IS TOO HIGH. Creates an ALL STOP condition if the occurs during weld sequence.
2. **COOL FLT** - Insufficient TORCH COOLANT FLOW. Active only with the CW option. Creates an ALL STOP condition if it occurs during weld sequence.
3. **LPVS FLT** - Problems with the LOW VOLTAGE DC POWER SUPPLIES. Create SEQ STOP if it occurs during weld sequence.
4. **GAS FLT** - TORCH GAS FLOW is not detected. Creates an ALL STOP if it occurs during a weld.
5. **INPUTAC FLT** - The M-207A cannot achieve desired outputs because of inadequate AC input. Creates a SEQ STOP if it occurs during a weld.
6. **SENSOR 1,2,3** - User defined (see 4.7).
7. **BAD START** - Indicates that the system was unable to sustain an arc.
8. **STUB OUT** - If the Arc Voltage gets too low or the electrode should touch the puddle then a stub out will occur.
9. **HIGH VOLTS** - If the Arc Voltage gets too high a fault will occur.

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

4.6 FAULTS (continued)

The method of alerting the operator depends on what the fault is and when it occurs. A problem with TEMP, LVPS or INPUTAC when the M-207A is first turned on will create a FAULT SCREEN and the fault must be corrected before the M-207A will proceed with any other functions.

A problem with COOL, GAS or SENSOR is common at power on or when preparing for welding. These items will only create the FAULT SCREEN if they occur during a weld sequence. BAD START appears only during weld sequence (after pre-purge) and does not create a fault screen.

STUB OUT and HIGH VOLTS will only occur during a weld and will cause an ALL STOP condition. After postpurge the normal "return to home" sequence will also be disabled.

4.7 SENSOR 1, 2, 3 FAULTS

The M-207A has 3 separate inputs that the user can define for creating a fault condition based on some external problem. The most common would be connecting a gas analyzer (s) to the M-207A to detect excessive Oxygen in the I.D. purge of a weld.

The user must make these connections and use the SET-UP screen (see 4.8) to define what a fault is for this external input.

4.8 SET-UP FUNCTIONS

The following SET-UP functions provide some customizing and calculation features to enhance system performance:

1. **CALCULATE** - Calculates TUNGSTEN LENGTH or performs IPM to RPM conversions or calculates total LEVEL TIME required. All of these calculations are used during weld procedure development.
2. **WELD-SELECT** - The optional REMOTE PENDANT may select up to 4 pre-determined weld schedules from memory. This function defines which of the schedules may be selected.

4.8 SET-UP FUNCTIONS

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

3. **HEAD-CAL** - Provides a method for calibrating a M-9 weld head to the power supply.
4. **REV** - Used to display the SOFTWARE REVISION of an M-207A. Depending on intended use, M-207A's may have different software revisions.
5. **PRINT EMM** - Used to print a copy of the EMM memory.
6. **ARC V FLT** - Used to de-activate STUB OUT and HIGH VOLT faults. These faults are usually needed to be turned off for manual welding, see section 7.4.7.
7. **AMP - TIME** - Used to change the least significant digit of Level Current or Level Time from whole numbers or tenths (000 or 000.0).
8. **SENSORS** - Used to activate and define external fault inputs.
9. **QTY-RESET** - Used to reset the quantity count for each weld schedule or for the entire library.
10. **START LEVEL** - Used to set the value of INITIAL current used at arc start.
11. **DATE RESET** - Used to reset DATE.
12. **CANNED PROG** - Used to LOCK or UNLOCK PROGRAM MODE for canned programs in positions 71 to 100.
13. **PRINTER** - Used to select AUTO or MANUAL print mode.
14. **WELD DATA RECORDING** - Used to activate both entry of WELD ID# before sequence and to activate recording weld information into a memory card after each sequence.
15. **OPERATOR ID/NAME** - Used to enter the ID number or name of the weld operator.
16. **SERIAL NUMBER** - Used to enter the M-207A Serial Number for Weld Data Record feature.

SECTION IV - SYSTEM FUNCTIONS

4.9 GLOSSARY OF DISPLAY SYMBOLS AND ABBREVIATIONS - The M-207A

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

displays contain many abbreviations. The following is an alphabetical listing (symbols last) of most abbreviations.

AL	= Aluminum
AMP	= Amperage
AF	= Automatic weld fitting
BCK	= Background (low value of a function that pulses).
CAL	= Calibrate or calibration
CCW	= Counterclockwise - looking at M-9 from COVER SIDE.
CONT	= Continuous (constant value, no pulsing)
COOL	= Coolant flow
CS	= Carbon steel
CW	= Clockwise - looking at M-9 from COVER SIDE.
DLY	= Delay time
EXT	= External input or function
FLT	= Fault
FTG	= Fitting other than AF
HAS	= Hastaloy
INC	= Inconel
INPUTAC	= In put power AC voltage check
IPM	= Inches per minute
LIB	= Library, listing of programmed weld schedules
LVL	= Level or levels
LVPS	= Low voltage DC power supply check
MAT	= Material
MNL	= Monel
OD	= Outside diameter
OK	= Means monitored function is operating properly.
PRE-PURGE-POST	= Prepurge, postpurge columns.
PRI	= Primary function value
PRI-AMP-BCK	= Primary speed, background amp columns
PRI-PULSE-BCK	= Primary time, background speed columns
PRI-RPM-BCK	= Primary speed, background speed columns
PRO	= Program mode
QTY	= Quantity of weld made since last reset
QTY RESET	= Select to reset weld quantity
REV	= Software revision
ROT	= Rotation or travel start delay time

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

ROT DLY = Rotation or travel start delay time
RPM = Revolutions per minute
SKT = Socket type weld
SP = Special material and weld type.
SS = Stainless steel
SYS HOURS = System hours indicate total power-on time.
TEMP = Power supply internal temperature
TI = Titanium
T/TS = Tube to tubesheet
= Weld schedule number
* = Indicates that more information is available

4.10 GLOSSARY OF DISPLAY TERMS - The M-207A displays contain many terms that do not relate directly to a function or sequence. The following is a listing of those terms:

AMIWELD = Name, type and revision of software
ARC GAP = Distance needed between electrode and weld
ARC HOURS = Total hours system has been welding
BAD START = Problem has occurred with RF start.
CALCULATE = Function calculates RPM or tungsten length.
CANCEL = Ends step without storing or completing
COPY = Allows a schedule to be copied with a new #.
CREATE = For creating a new weld schedule
DATE RESET = Resets date function
DELETE = Used to delete a weld schedule from memory
INVALID NUMBER = Can appear under the following conditions:
 1. Attempting to CREATE a weld schedule that already exists.
 2. Selecting a weld schedule that does not exist.
MODE LOCK = Screen cannot be changed. Weld schedule (if selected) will be locked in.
MODIFY = Used to permanently change a weld schedule.
OPERATE/WELD SELECT = Operate mode only, cannot program
OVERRIDES = Ability to change a value temporarily.
PROGRAM/OPERATE = Ability to program or operate.
RING = Insert ring is used for filler material.

SECTION IV - SYSTEM FUNCTIONS

4.10 GLOSSARY OF DISPLAY TERMS (continued)

Doc. No. 740044

Rev H

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

ROTOR OD	= Outside diameter of M-9 rotor.
SENSOR 1, 2, 3	= User defined faults.
STORE	= Puts weld information into memory.
TRANSFER	= Allows copying of memory to another M-207A or to the M-207-EMM.
TYPE	= Describes the basic type of weld.
WALL	= Wall thickness of the weld.
WARNING	= Used to indicate that if step is continued a permanent loss of information will result.

4.17

SECTION V - OPERATION

5.0 INTRODUCTION

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

Operation covers those steps that must be taken to actually perform a weld. Programming and development of schedules are not covered in this section.

It is very important to insure before operating, that the operator has INSTALLED the M-207A per section III and has a good understanding of functions from section IV. Function explanations are not covered in this section.

The M-207A uses two displays to provide information and instructions for use. For the most part, the information and instructions presented on these displays are adequate explanation of operation. This section is only intended as a guideline to get started with, for first-time users, AFTER HAVING ATTENDED AN AMI M-207A TRAINING CLASS.

5.1 INITIAL POWER ON/STATUS SCREEN

1. Before connecting or energizing the AC power; verify that all input power set up requirements of step 3.1 have been complied with.



WARNING



Applying the wrong input AC voltage to an M-207A (for how it is set up) CAN CAUSE THE INPUT VARISTORS TO FAIL. Before turning the power ON **MAKE SURE THE INPUT POWER SET UP IS CORRECT FOR THE POWER BEING USED.**

2. The M-207A can be turned on without the adapter cable, gas hoses or weld head connected. However, to verify proper operation they must be connected. Insure that all of these connections are made per steps 3.2, 3.3 and 3.4.
3. Plug in the AC power cable to the AC source. Move the circuit breaker (CB1) to the ON position.
4. After a few seconds the STATUS SCREEN will appear as shown on the next page:

5.1

SECTION V - OPERATION

5.1 INITIAL POWER ON/STATUS SCREEN

4. (continued)

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

NOTE

If the input power is too low it is possible for the screens not to turn on, or to be scrambled or get a fault screen indicating a LVPS fault. If these conditions occur recycle CB1. If they continue to occur check the input power and the power setup of the M-207A

UPPER SCREEN

TO WELD PRESS LIB	TO PROGRAM PRESS PRO
SYS HOURS - 00000.0	ARC HOURS - 00000.0

LOWER SCREEN

TEMP-OK	INPUTAC-OK	GAS-OK	LVPS-OK
COOL-OK	SENSOR 1-OK	2-OK	3-OK

Actual hours will appear where the above shows 0. COOL, GAS OR SENSOR 1, 2, 3 may indicate FLT where OK appears. This is considered normal at power-up.

5.2 USE OF NEXT/PREV SCREENS/LEVELS

Weld schedules contain more data than can be shown at one time. To display this data the NEXT/PREV SCREEN keys and NEXT/PREV LEVEL keys must be used. These keys are located at the corners of the lower display. When there is more data on another screen or level, a flashing * will appear in the appropriate corner (s) to indicate that more information is available.

Screen/Level keys are used in selection of a weld schedule and all weld schedules use 4 basic screens that appear in the following order:

1. PROMPT SCREEN - Appears when a weld schedule is called up from memory.
2. LEVEL 01 AMPS - TIME - PULSE = Displays the value of AMPS, LEVEL TIME and PULSE TIMES for LEVEL 1.
3. LEVEL 01 RPM - MODES = Displays the value of ROTATION RPM, PULSE MODE and TRAVEL MODE for LEVEL 1.
4. PURGE - SLOPE - ROT DELAY = Displays the time for PREPURGE, POSTPURGE, UPSLOPE, DOWNSLOPE and ROTATION START DELAY.

Pressing the NEXT SCREEN key will advance the display in the above order. When viewing screen 2, 3 or 4 (above) pressing the PREV SCREEN key will reverse the order.

5.2

SECTION V - OPERATION

5.2 USE OF NEXT/PREV SCREENS/LEVELS (continued)

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

The weld schedule can be programmed to have up to a 100 levels of screen 2 and 3. When viewing screen 2 or 3 the operator can press the NEXT LEVEL key to view the values for the next level (if programmed). When displaying level 2 or greater, pressing the PRE LEVEL key will then display the previous level.

Pressing the NEXT SCREEN or PREV SCREEN key after using the NEXT LEVEL or PREV LEVEL key will display the next screen for that level, except if the next screen is screen 1 or 4 above, these screens are the same for all levels.

Reference figure 7 for a flow chart on the use of NEXT/PREV SCREEN and LEVEL keys.

5.3 WELD SCHEDULE SELECTION

The following describes how to select a weld schedule from the library. The OPERATE MODE switch must be in the OPERATE or PROGRAM position. Be sure to have read section 5.2, use of NEXT/PREV keys before proceeding.

1. Press the C key until the STATUS screen appears.
2. Press the LIB key and the following display will appear:

```
-----  
USE SCREEN KEYS TO FIND # PRESS ENTER  
OR IF # IS KNOWN ENTER #--- PRESS ENTER  
-----  
#    OD  WALL  TYPE  MAT   QTY *  
001  1.500 .065  TUBE  SS    0010*
```

Instructions are displayed on the upper screen. The first weld schedule in memory (may not be #001) will be displayed on the lower screen.

3. If you know what weld schedule you want, enter its number using the numeric keys. The numbers will appear in the --- area as you enter them. If you make a mistake press CE and start over. When you have entered and verified the correct number press the ENTER key. After a few seconds your selected weld schedule will appear on the display. Proceed to step 5 (below).

5.4

SECTION V - OPERATION

5.3 WELD SCHEDULE SELECTION

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

4. To find the weld schedule you want press the NEXT SCREEN key. The next weld schedule in memory will be displayed. Continue pressing the NEXT SCREEN key until the desired weld schedule appears. When the desired schedule appears, press the ENTER key. After a few seconds your selected weld schedule will appear on the display.
5. When the weld schedule is called up from memory it will appear on the screens like this:

#	OD	WALL	TYPE	MAT	QTY	READY
001	1.500	.065	TUBE	SS	0010	TO TEST

USE NEST SCREEN FOR VALUES THEN F KEYS *
TO CHANGE VALUES - USE SEQ START TO WELD

READY TO TEST may say FAULT _____ with an explanation in the _____ space as to what the fault is. The fault must be corrected before proceeding.

5.4 VIEWING FUNCTION VALUES

NOTE

Insure that section 5.2, NEXT/PREV SCREEN/LEVEL has been reviewed before proceeding.

1. Pressing the NEXT SCREEN key after the weld schedule has been selected from the library will result in the following screen:

#	OD	WALL	TYPE	MAT	QTY	READY
001	1.500	.065	TUBE	SS	0010	TO TEST

LVL-TIME	PRI--AMP--BCK	PRI-PULSE-BCK
01	000	0.00

The above shows amperes, pulse times and level time (duration) for level 1 of the schedule.

2. After reviewing this information the operator can do one of the following:
 1. Make changes to these level 1 functions (see 5.5).

5.5

SECTION V - OPERATION

5.4 VIEWING FUNCTION VALUES

2. (continued)

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

2. Press the NEXT LEVEL or NEXT SCREEN key to review the entire weld schedule as depicted in figure 7 and make changes if desired (see 5.5).
3. Press the SEQ START key to run this weld sequence. (See 5.9)

5.5 OVERRIDING FUNCTION VALUES, BEFORE SEQUENCE START

Each weld schedule in the M-207A library can be programmed to allow unlimited, limited or NO changes to be made to the function values of the weld schedule. If the weld schedule allows changes to be made use the following procedure.

1. Use the NEXT SCREEN and/or NEXT LEVEL keys until the function value to be changed appears on the screen.
2. Directly above and below each function value is an F key. When either one is pressed the first time, the function to be changed will start to blink.
3. When the function to be changed is blinking, the value can be changed two ways. A small INCREASE in the value can be made by pressing the UPPER F key. A DECREASE in the value can be made by pressing the LOWER F key. Each time the F key is pressed the value will change by the smallest programmable increment.

Large changes should be done using the numeric keys. With the function blinking (step 2) enter the new value using the numeric key pad. Verify that the new value appears on the display. If you make a mistake press the CE key and try again.

4. When the new value is displayed and verified, press the ENTER key. The function will stop blinking and the system is ready to change another value or to operate.

5.6

SECTION V - OPERATION

5.6 OVERRIDING FUNCTION VALUES, DURING WELD SEQUENCE

It is possible to over-ride the value of the following functions during Weld Sequence:

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

Level Time	Primary Amps	Background Amps
Primary Pulse Time	Background Pulse Time	Primary RPM
Prepurge Time	Post Purge Time	Background RPM
Travel Start Delay		

Overrides during sequence can only be done by use of the F KEYS (see in 5.5.3). The numeric keypad cannot be used.

You cannot override during weld sequence the Pulse Mode, Travel Step Mode, Upslope Time, Downslope Time or Travel Direction.

5.7 SET UP FUNCTIONS

There are two types of SET UP screens. Both are accessed with the SET UP key. One type appears when the SYSTEM MODE is set to OPERATE and both appear when the SYSTEM MODE is set to PROGRAM.

NOTE

The SET UP screens offer special functions that can ENHANCE or in some cases CHANGE the way the M-207A operates. It is important for the user to understand these features. Under some conditions, if not properly set, undesirable performance can occur.

1. SET UP FUNCTIONS IN OPERATE MODE - Pressing the SET UP key on the M-207A panel when on the STATUS SCREEN or WELD SCREEN with the SYSTEM MODE set to OPERATE will access the first of two SET UP screens that contain the following functions:
 1. CALC - Pressing the F key under this choice will access a prompt screen for either calculating Tungsten Length, converting IPM to RPM or calculating total Level Time. Select which one you wish to perform and follow the on screen instructions.
 2. WELD SELECT - This feature is used to select up to 4 different weld schedules to be accessible by the M-207-RP Option. See Section 8.2 for more details.

SECTION V - OPERATION

5.7 SET UP FUNCTIONS

1. SET UP FUNCTIONS IN OPERATE MODE

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

3. HEAD CAL - This feature is used to calibrate Travel (rotation) speed of the Weld Heads and **MUST BE USED ANY TIME A CHANGE OF WELD HEADS IS MADE.** See Section 5.7 for operation.
4. REV - Pressing the F key under this will show the current software REVISION installed. This can be important when discussing problems or features with an AMI representative.

NOTE

The following are on the second SET UP screen and are accessed by pressing NEXT SCREEN from the first SET UP screen.

5. PRINT EMM - Pressing the F key under this choice will create a Print out of the LIBRARY contained in M-207-EMM Option (EMM must be installed, see 8.3).
6. AMP - TIME - This feature allows the user to change the programmable increments of LEVEL AMPS or LEVEL TIME from 000 (whole numbers) to 000.0 (tenths).

NOTE

This is not on an individual WELD # basis. All WELD # will be changed automatically. If a WELD # was originally programmed for 87.7 amperes and this is changed to whole numbers the WELD # when accessed will then call for 87 amperes (it will drop the digit, not round off).

7. ARC V FAULT - This feature can turn this FAULT ON or OFF. When ON a STUB OUT will be created if the ARC VOLTAGE goes below 5V or a HIGH VOLTS fault if the VOLTAGE goes over 20 V. However, in manual welding these conditions can occur without anything being wrong. **THIS FEATURE NEEDS TO BE SET TO OFF FOR MANUAL WELDING.**

NOTE

The following are on the third SET UP screen (in operate mode) and are accessed by pressing NEXT SCREEN from the second SET UP screen.

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

SECTION V - OPERATION

5.7 SET UP FUNCTIONS

1. SET UP FUNCTIONS IN OPERATE MODE

8. WELD DATA RECORDING (WDR) - Selecting this feature will access another screen that will allow the user to turn on WDR and/or turn on WELD ID recording.

From this screen WDR STORAGE can be selected as “NOT SAVED” or “PCMCIA”. If “NOT SAVED” is selected then WDR is turned OFF and operation is normal. If “PCMCIA” is selected then the system will request a WELD ID be entered at the beginning of sequence and will record the weld data into a PCMCIA card at the end of sequence. This PCMCIA card can be used in conjunction with AMI OLP PC software to be used for Weld Record Data keeping.

From the same screen WELD ID can be selected as “NOT PROMPTED” or “PROMPTED”. It can be set to “PROMPTED” anytime. However, if WDR STORAGE is set to PCMCIA then WELD ID automatically defaults to “PROMPTED” and cannot be changed. When set to prompted it will require that the WELD ID be entered at the beginning of sequence. This weld ID will be recorded in the PCMCIA card (if WDR is on) and will appear on the Weld Schedule Print if printed at the end of sequence.

9. OPERATOR ID / NAME - This feature will allow the operator to enter his ID number or name. If entered it will appear on the weld schedule print out at the end of sequence (if printed) and it will be recorded by Weld Data Recording onto a PCMCIA card if that feature is being used. Once entered it will be remembered by the system as the operator until it is cleared.
10. SERIAL NUMBER - This feature will allow the operator to enter the Power Supply Serial number. If WDR is being used the Serial Number information will be recorded in the PCMCIA card for use with OLP.

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

SECTION V - OPERATION

5.7 SET UP FUNCTIONS

2. SET UP FUNCTIONS IN PROGRAM MODE - If the System Mode is set to PROGRAM these additional functions can be shown after the first two SET UP screens.

1. START LEVEL - Right after the arc is struck an initial current is used to stabilize the arc. This is called START LEVEL and can be programmed for a value from 5 to 100 amperes. The START LEVEL current is only used for a very short period of time but can make the difference between good starts and bad starts. Always set this value as high as possible yet still make good repeatable welds without excess penetration at the start.
2. SENSORS - The M-207A FAULT detection system (see 7.4) has an EXTERNAL input feature that allows the user to monitor up to 3 external functions (such as an Oxygen Analyzer) and create a M-207A FAULT if that external feature should fail.

Pressing the F key under this will allow the user to turn any or all of the 3 Sensors ON and select whether the FAULT should occur with a LOW input signal or HIGH input signal. Reference AMI drawing 45B072514 for pin connections and electrical signal information about High and Low.

3. PRINTER MODE - The M-207A can be set up to make a print out of the Weld # automatically (AUTO) after every Sequence. If set to MANUAL a print will only be made if the PRINT key is pressed after a weld sequence.

NOTE

The following SET UP functions are accessed, in PROGRAM MODE, by pressing the NEXT SCREEN key from the third SET UP screen. Remember they do not appear if the system mode is in OPERATE.

4. CANNED PROGRAMS - WELD #'S 71 to 100 can be LOCKED or UNLOCKED. If LOCKED they cannot be MODIFIED, DELETED or have new ones CREATED (even in the program mode). Even if LOCKED they can still be copied to any available # between 1 and 70.

If UNLOCKED positions 71 to 100 become accessible to anyone with a key for the MODE switch.

They are called CANNED programs because AMI ships the M-207A with a few common weld procedures in these positions.

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

SECTION V - OPERATION

5.7 SET UP FUNCTIONS

2. SET UP FUNCTIONS IN PROGRAM MODE

5. DATE RESET - Prints contain the DATE of print. The DATE can be RESET by using this feature.
6. QTY - RESET - The M-207A keeps count of how many times an individual WELD # is successfully run. It also TOTALS this count for the entire LIBRARY. This information can be viewed on the LIBRARY Screen and is also printed when a PRINT of the LIBRARY or individual WELD # is made.

Pressing the F key will access a prompt screen for selecting to reset (to 0) the Weld Quantity count for an individual WELD # or the TOTAL for the entire LIBRARY.

5.8 AUTO ROTATION CALIBRATION

NOTICE

For proper operation, weld head rotation speed must be calibrated for the power supply it is connected to. If weld heads are switched they must be re-calibrated on the system before welding commences.

Weld Head ROTATION speed can be calibrated AUTOMATICALLY by the M-207A or MANUALLY by the user. See Section 5.9 for MANUAL calibration. The following procedure applies to the AUTO CAL feature for M-9 and M-96 type welding heads only, any other weld head will probably require MANUAL calibration:

1. Insure that the weld head is connected per section III and the M-9 manual. Rotation speed calibration is done automatically by the M-207A by moving the rotor and measuring actual speed. Before proceeding CHECK THAT THE ROTOR IS FREE TO ROTATE SAFELY and check that the M-207A operate mode switch is set to OPERATE or PROGRAM.
2. To use the automatic calibration function press the SET UP key. This can be done from the STATUS screen or a WELD SCHEDULE screen. Then press the F key under HEAD CAL and the following screen will appear:

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

SECTION V - OPERATION

5.8 AUTO ROTATION CALIBRATION

2. (continued)

AUTO TRAVEL SPEED CALIBRATION
WELD HEAD SELECTION MENU

SELECT MAX. RPM (STAMPED ON HEAD TAG)
20.0 2.0 OTHER MANUAL

Read the Serial Number Tag on the Weld Head and note the MAX RPM rating (a M9-500 is 20 RPM).

3. Use the F key under either 20.0, 2.0 or OTHER (anything in between) (note that the choice not blinking is the current one selected) and the following screen will be displayed:

CHECK THAT THE HEAD IS SAFE TO ROTATE
PRESS ENTER TO START CALIBRATION

USE C KEY TO RETURN TO SET UP SCREEN

4. When the ENTER key is pressed the M-207A will proceed to move the rotor automatically and calibrate it. MAKE SURE IT IS SAFE TO ROTATE BEFORE STARTING.
5. When calibration is complete the lower display will appear as follows:

USE C KEY TO RETURN TO SET UP SCREEN
CALIBRATION COMPLETE

6. If the system cannot rotate the head or complete the calibration for some reason (like the head is not connected or it is jammed) the following will appear:

UNABLE TO CALIBRATE WELD HEAD

Check again that the head is properly connected and free to rotate.

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

5.8 AUTO ROTATION CALIBRATION

7. For operation on other systems and MANUAL calibration all AMI weld heads have a Calibration Potentiometer. An exact setting of this POT is not required for AUTO CAL but if it is set near one end the system may not be able to accurately calibrate. If this occurs the following screens will appear:

WELD HEAD POT OUT OF AUTO CAL RANGE
PRESS C TO ABORT AUTO CAL

WELD HEAD TRAVEL SPEED TOO SLOW
TURN POT CCW PRESS ENTER TO RECALIBRATE
CW

Before actually turning the POT look again at the MAX RPM of the head and make sure it was the one you selected in step 2. Selecting the wrong MAX RPM will make this screen appear. If it was selected correctly adjust the POT IN THE DIRECTION INDICATED AND PRESS enter again to repeat the calibration.

5.9 MANUAL ROTATION CALIBRATION

For Weld Heads other than M-9 or M-96 it will be necessary to MANUALLY calibrate them. If a user does a lot of weld head changes between systems he may also choose to MANUALLY calibrate his M-9 weld heads as well. Use the following procedure to manually calibrate rotation speed.

1. To use the MANUAL calibration function press the SET UP key. This can be done from the STATUS screen or a WELD SCHEDULE screen. Then press the F key under HEAD CAL and the following screen will appear:

AUTO TRAVEL SPEED CALIBRATION
WELD HEAD SELECTION MENU

SELECT MAX. RPM (STAMPED ON HEAD TAG)
20.0 2.0 OTHER MANUAL

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

2. Press the F key under MANUAL. The screen will return to the first SET UP screen and the system is now set for MANUAL calibration. Press the C key to return to the STATUS screen.
3. To manually calibrate the user will need to have a Weld Schedule in the Library programmed in accordance to the Calibration Procedure contained in the operation manual for the particular Weld Head being used.

A MANUAL calibration schedule will always be run in TEST Mode and usually contains the following:

PRE-PURGE-POST UP-SLOPE-DOWN ROT-DLY
000 000 00.0 00.0 CCW 00.0

LVL-TIME PRI-AMP-BCK PRI-PULSE-BCK
1 *** 000 000 0.00 0.00

LVL PULSE ROT PRI--RPM--BCK
1 OFF CONT *** ***

LVL-TIME PRI-AMP-BCK PRI-PULSE-BCK
2 005 000 000 0.00 0.00

LVL PULSE ROT PRI--RPM--BCK
2 OFF OFF 0.0 0.0

4. LEVEL 1 TIME needs to be set for the time it will take to rotate ONE REVOLUTION at the selected LEVEL 1 PRI--RPM rate. The RPM rate is usually set at a rate that the head is most frequently used at.

LEVEL 2 is added with ROTATION turned OFF. This is to allow the operator time to see if 1 revolution was completed before the "Return to Home" functions engages at the end of Sequence.

5. Create the appropriate Weld Schedule and connect the Weld Head to be calibrated (as in section 5.7). Insure that it is safe to rotate the head and that the rotor has been JOGGED to the open position. Call up the appropriate schedule from the Library and press the sequence start. When the first level is complete check that the rotor has made one revolution (do this before level 2 is complete). If it has not adjust the Trim Potentiometer on the weld head and repeat until the head does make one revolution.

SECTION V - OPERATION

5.10 WELDING OPERATION

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

NOTE

Before running a weld schedule the weld head must be calibrated to the M-207A. When a weld head is switched from one power supply to another it must be re-calibrated to the new power supply. If the weld head being used has not been calibrated, perform the calibration procedure per step 5.8 or 5.9.

All of this step is based on the OPERATE MODE switch being in the OPERATE or PROGRAM position.

1. Select the desired weld schedule from the library (see 5.3). Entry of weld schedules into the library is a programming function and not discussed in this section.
2. Install the weld head per section III and the weld head manual.
3. Install the correct tungsten and the material to be welded into the M-9 weld head as described in the weld training manual and weld head manual.
4. Turn on the gas source (at the regulator/flowmeter). Press the MANUAL PURGE key and set the required flow rate for the weld and weld head being used. Continue manual purge until all lines are filled with the gas and all moisture and impurities have been removed. How long this takes depends on the conditions. When this is done, turn the purge OFF by pressing the MANUAL PURGE key again.
5. When the weld schedule has been selected the upper display will indicate that the system is in the TEST mode. Pressing the SEQ START key at this time will run the complete weld schedule without an arc. First-time operation of the system should be done this way to insure that rotation and all sequence functions are working properly.
6. When all items are prepared properly for welding (not covered in this manual) and system operation has been verified, press the WELD/TEST key. The upper display will now say READY TO WELD. INSURE THAT THE ARC CAN BE STRUCK SAFELY.
7. Press the SEQ START key. The system will start to purge gas and the display will appear as follows:

5.15

SECTION V - OPERATION

5.10 WELDING OPERATION

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

7. (continued)

(bar-graph meters will appear here)

PRE-PURGE-POST UP-SLOPE-DOWN ROT-DLY*

60 60 0.0 9.0 CW 1.5

When prepurge starts, the time programmed will start counting down on the screen. The upper display will be bar graphs that will indicate approximate value of current, voltage and rotation speed.

8. As the sequence progresses (see 4.3) the screens will change to follow its progress.
9. When the sequence is complete (end of postpurge) the rotor (on M-9 weld heads) will return to the open (home) position and the weld head can be removed from the weld. The system is now ready to make another weld.

5.11 PRINTER OPERATION

1. The printer receives its power form the M-207A and does not require any external manipulations (other than installing the paper roll).
3. The printer is activated by using the PRINT key on the M-207A panel or the PRINT key on the M-207-RP remote pendant. The PRINT keys will only activate the printer under the conditions of step 4.
4. The printer will produce a copy of the following information at the following times.
 1. STATUS SCREEN - When the STATUS screen is displayed and the PRINT key is pressed a copy of SYSTEM HOURS, ARC HOURS, DATE and the SOFTWARE REVISION NUMBER will be printed.

5.16

SECTION V - OPERATION

5.11 PRINTER OPERATION

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

4. (continued)

2. LIBRARY SCREEN - When the LIB key is pressed and any of the library screens are being displayed a copy of the description of ALL WELD SCHEDULES in memory can be printed. This print out will include each WELD SCHEDULE NUMBER, OD, WALL, TYPE, MATERIAL, QUANTITY of the welds performed and the DATE. At the bottom of the print out will be the total QUANTITY of welds performed by the system.

3. INDIVIDUAL WELD SCHEDULE - When a weld schedule has been selected from memory a complete copy of all of the function values can be printed by pressing the PRINT key. This can be done at any time any portion of a weld schedule is being displayed *EXCEPT* during an ACTUAL WELD SEQUENCE.

A statement at the bottom of the print out will show whether ALL PARAMETERS PERFORMED AS PROGRAMMED the last time the weld was used. If the PRINT key is pressed after each weld is made, a hard copy record of performance can be kept. The DATE is also included on each print out. If Operator ID has been programmed (see SET UP) the Operators name or ID will be printed. If WELD ID has been selected the WELD ID will also be printed.

5. An auto-print function can also be set up to have the system automatically make a print out after each Weld Sequence (in Weld Mode). If this mode is selected the printer will automatically print out a copy of the complete weld schedule after the first weld sequence. After each sequence (without changing weld #) the printer will print the Library Description, Date and the "All Parameters performed as programmed" statement.
6. There is another print function contained on the Set-Up Screen. This function is to print a copy of the LIBRARY in the memory of the Optional M207-EMM unit. See SET UP for further information.

SECTION VI -PROGRAMMING

6.0 INTRODUCTION

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

Programming is simply the name used to describe the process of entering or changing the values for functions in a particular weld schedule. The PROGRAM mode may be used to CREATE a new weld schedule or to MODIFY (make changes) to an existing weld schedule. The PROGRAM mode is also used to create a new weld schedule by COPYING an existing weld schedule and then MODIFYING the copy of the original with the desired changes.

In addition to the CREATE, MODIFY AND COPY functions, the PROGRAM mode also allows the user to make BACK UP copies of the memory to an external memory device. This function provides both security in case of a failure in system memory and provides a method to TRANSFER the memory from one system to another to insure multiple system users of identical weld schedule libraries.

CAUTION

*AUTHORIZATION AND ACCESS TO THE "**PROGRAM**" MODE SHOULD BE CONTROLLED BECAUSE "**DELETION**" OF WELD SCHEDULES FROM MEMORY IS ALSO A FEATURE OF THE MODE.*

This section explains very basic operation of each of these programming functions. For the most part the M-207A is self teaching because of the instructions on the screen for each type of function; only general information is given in this section.

To CREATE a weld schedule the OPERATE mode switch must be in the PROGRAM position. All programming modes start from the STATUS screen. Before attempting any program functions a complete understanding of system functions is required. Insure that section IV has been reviewed before proceeding with this section.

6.1 CREATE A WELD SCHEDULE

1. Press the C key until the STATUS screen appears. Press the PRO key and the following screen will appear on the displays.

USE F KEYS TO SELECT PROGRAMMING MODE
OR USE C KEY TO RETURN TO STATUS SCREEN

CREATE	MODIFY	COPY	DELETE	TRANSFER
***	***	***	***	***

6.1

SECTION VI - PROGRAMMING

6.1 CREATE A WELD SCHEDULE

1. (continued)

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

NOTE

Use of the C key - Anytime during programming the entire process can be stopped by pressing the C key. If this is done the M-207A will ask the programmer to confirm that cancellation of the programming sequence is desired. If the C key is pressed again, all data ENTERED TO THAT POINT for THAT weld schedule will be ignored (not put in memory) and the system will return to the status screen. If the C key is pressed the first time by accident then press the CE key to continue programming without loss of data.

- To CREATE a weld schedule press the F key below the word CREATE (step 1); the following screen will appear:

ENTER NEW WELD # - THEN PRESS ENTER KEY
PRESS C KEY TO CANCEL WELD PROGRAMMING

001

Enter the number using the numeric keys. Look at the lower screen and confirm that the numbers entered are correct; if not, press CE and re-enter the numbers. When correct, press the ENTER key. If the number is already used the system will reject the number and ask the programmer to try again.

- The description screen will appear when an acceptable weld schedule number has been entered:

ENTER WELD OD - THEN PRESS THE ENTER KEY
PRESS C KEY TO CANCEL PROGRAMMING MODE

#	OD	WALL	TYPE	MAT
001	0.000	0.00	----	---

NOTE

The weld description and all values for LEVEL 1 of the weld schedule must be entered in the order provided by the M-207A. They cannot be skipped, you must enter a number (even if it is 0) for each item before progressing to the next item.

- Enter the O.D. (in inches or millimeters) using the numeric keys. Verify the correct number on the screen and then press the ENTER key.

6.2

SECTION VI - PROGRAMMING

6.1 CREATE A WELD SCHEDULE

- After pressing the ENTER key follow the instructions on the screen for entering the WALL thickness.

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

- The M-207A will then give you a choice of 8 TYPES of welds. Use the F keys to pick the type and then press ENTER. Then use the same method for MAT (material).
- Single Level functions will then appear:

ENTER VALUE FOR BLINKING ITEM THEN PRESS ENTER KEY				
PRE-PURGE-POST	UP-SLOPE-DOWN	ROT--DLY		
000	000	00.0	00.0	CCW 00.0

Use the numeric keys to enter the prepurge time; verify and then press the ENTER key; then use the same method for postpurge, upslope and downslope; then use the F key to select the direction of rotation; then use the numeric keys again to enter the rotation start delay time.

The same method of instruction and entering is used for LEVEL 1 values of pulse mode, rotation mode, primary and background RPM speed, level time, primary amperes, background amperes, primary pulse time and background pulse time.

NOTE

If pulse mode is set to OFF the system will not ask for background functions, backgrounds are only needed when pulsing. However, the M-207A will automatically default a value for pulse times in case the pulse mode should be turned to ON later in a MODIFY operation. There must always be a value for Pulse Times.

- As noted, the system follows an exact sequence through LEVEL 1. When the last LEVEL 1 value is entered the screen will ask if you want to create LEVEL 2; if so press the NEXT LEVEL key. If you are done, press the PRO key and go to step 9.

If NEXT LEVEL is used the system will copy all values of level 1 and switch to MODIFY mode. In the MODIFY mode you only have to make changes to level 2 functions that are different from level 1. See section 6.2 for MODIFY mode instructions.

6.3

SECTION VI - PROGRAMMING

6.1 CREATE A WELD SCHEDULE

- When the PRO key has been pressed, indicating the end of level programming, the system will display the OVERRIDE screen:

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

USE F KEYS TO SELECT ITEM - %
PRESS ENTER KEY WHEN ALL % ARE SET

TIME	AMP	RPM	PRG	SLP	PLS	DLY
100	100	100	100	100	100	100

The system automatically defaults to 100 % override. This means the operator can make up to a 100 % change to any of these functions.

10. If you wish to limit the amount of change to certain functions then use the F key for that function and use the numeric keys to enter the desired % of change to be allowed. When one F key is pressed, pressing another will turn the first one off and activate the second function. When all **OVERRIDE %** are set, press the **ENTER** key.
11. The system will then ask if you want to **STORE** the weld schedule in memory or to **MODIFY** it. **REMEMBER THAT UNTIL IT HAS BEEN STORED IT DOES NOT EXIST IN MEMORY.** It is usually better to **STORE** at this time and if changes are needed, recall it from memory using the **MODIFY** function. To **STORE** press the F key under the word **STORE** and then press **ENTER**. To **MODIFY** press the F key under the word **MODIFY** and then press **ENTER** and go to step 6.2.

6.2 MODIFY A WELD SCHEDULE

The **OPERATE** mode switch must be in the **PROGRAM** position to **MODIFY**. Modifying an existing weld schedule in memory starts from the **STATUS** Screen **OR** at the end of **LEVEL 1** programming in the **CREATE** mode. If modifying from the **CREATE** mode proceed to step 2.

1. Press the **PRO** key. Use the F key to select **MODIFY** and then press the **ENTER** key. The system will then ask you what weld schedule number you wish to **MODIFY**. Use the numeric keys to enter the number, verify and then press the **ENTER** key.

6.4

SECTION VI - PROGRAMMING

6.2 MODIFY A WELD SCHEDULE

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

2. Modifying a weld schedule works similar to reviewing a weld schedule in the operate mode (see section V). Use the NEXT/PREV SCREEN and NEXT/PREV LEVEL keys to find the function and level to be modified.
3. When the function value or mode to be modified is found use the F key above or below it to enable it to be modified. Use the numeric keys to enter the new value, for changes of mode use the F key again.

Verify the correct change and then press the ENTER key. If more changes are needed, find the next item with SCREEN and LEVEL keys and use the same method to modify it.

To DELETE a LEVEL use the NEXT/PREV keys to find the Level Time for the Level to be deleted. Enter 0 time to DELETE the LEVEL. All subsequent Levels will advance one number.

When all items have been modified press the PRO key. The system will ask if you want to STORE or continue MODIFYING. Remember, NONE OF THE CHANGES MADE ARE ENTERED INTO MEMORY UNTIL THEY ARE STORED.

6.3 COPY A WELD SCHEDULE

To COPY a weld schedule you must start from the STATUS screen and the OPERATE mode switch must be in the PROGRAM position.

1. Press the PRO key. Then use the appropriate F key to select COPY and then press the ENTER key.
2. The screen will then ask you what weld schedule number you wish to COPY. Use the numeric keys, verify and then press the ENTER key. The system will then ask you what the weld schedule number should be for the COPY. Use the numeric keys, verify and the press the ENTER key.
3. The system will then proceed to COPY the weld schedule. When it is copied the program screen will appear and MODIFY can be selected to modify the COPIED weld schedule.

6.5

SECTION VI - PROGRAMMING

6.3 COPY A WELD SCHEDULE

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

4. If you ask for a weld schedule that does not exist or try to COPY it to an existing number the system will notify you that it is an INVALID NUMBER and to press the CE key and try again.

6.4 TRANSFER/RECEIVE WELD SCHEDULE MEMORY

NOTE

The M-207-EMM option is required to perform library TRANSFER. Actual operation described in this section can change slightly depending on the use of “canned programs.” Before using this function be sure to have read the operation section 5.6.2 about the LOCK, UNLOCK feature of Weld #'s 71 to 100.

If a user has more than one M-207A, it is usually a good idea to keep both libraries identical. This is done by TRANSFERRING a COPY of the LIBRARY of one system into the M-207-EMM; then taking the M-207-EMM to another M-207A and TRANSFERRING a COPY of it into that M-207A.

For single-system users it will also be important to have a security copy of the memory that can be stored separate from the M-207A. If something should happen to the M-207A memory such as component failure, tampering or accidental deletion, the M-207-EMM copy can then be used to restore the memory in the M-207A.

1. The TRANSFER function allows the user to perform the following functions:
 1. TRANSFER the ENTIRE LIBRARY from the M-207A to the M-207-EMM.
 2. RECEIVE the ENTIRE LIBRARY from the M-207-EMM.
 3. RECEIVE an individual weld schedule from the M-207-EMM to the M-207A.
2. To perform any of the above, the M-207-EMM must be plugged into the slot provided on the M-207A upper housing (see figure 2).
3. The TRANSFER function must begin from the STATUS screen and the OPERATE mode switch must be in PROGRAM.

6.6

SECTION VI - PROGRAMMING

6.4 TRANSFER/RECEIVE WELD SCHEDULE MEMORY

4. Press the PRO key, then press the F key above or below the word TRANSFER
The Screen will then ask if you want to TRANSFER THE ENTIRE LIB,

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

RECEIVE THE ENTIRE LIB or RECEIVE ONE WELD #. Use the appropriate F key to select your choice and then press the ENTER key.

CAUTION

Prior to TRANSFERRING data from the M-207A to the M-207-EMM the M-207-EMM memory is erased. Any data stored in the EMM previously will be LOST. The M-207-EMM is intended to copy the ENTIRE memory of an M-207A.

Individual weld schedules **CANNOT** be added one at a time to the M-207-EMM from the M-207A (TRANSFER mode). Individual weld schedules CAN BE added one at a time to the M-207A from the M-207-EMM (RECEIVE mode). See section 8.3 for more cautions.

6.5 DELETE A WELD SCHEDULE

CAUTION

USE OF THIS FUNCTION WILL RESULT IN THE LOSS OF A WELD SCHEDULE IN MEMORY.

1. The DELETE function must start from the STATUS screen and the OPERATE mode switch must be in the PROGRAM position.
2. Press the PRO key; then press the F key above or below the word DELETE. Use the numeric keys to enter the weld schedule number to be DELETED. A WARNING will appear that pressing ENTER will DELETE this Schedule; VERIFY and then press the ENTER key or press the C key if you change your mind.

Another WARNING will be given at this time to confirm that you wish to DELETE this Schedule. Confirm and verify again and then press the ENTER key again. THE WELD SCHEDULE WILL BE DELETED at this time.

3. Deletion of a Level within a Schedule is part of the MODIFY option (see section 6.2.2).

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

SECTION VII - CALIBRATION

7.0 INTRODUCTION

This procedure is intended for calibration/certification of system performance by the user. Except for the Current Servo all system functions are controlled by the processor and no calibration points or steps are required. Rotation calibration is contained in section 5 and is automatically done by the M-207A. It can be verified by a physical count of rotation versus time if required.

An examination of internal electronics will find several adjustment points. These points are "Factory Pre-set" only and ARE NOT to be adjusted by the user.

CAUTION

All personnel attempting to calibrate, trouble-shoot, or repair this system must be familiar with its operation. They must understand the circuits and have a complete understanding of the controls and their interrelationships.



WARNING



All personnel must be aware of the location of hazardous voltage--carrying conductors, terminals, heat sinks, etc., and must employ safety precautions when working with the welding machine.

Any testing or recording instruments connected to any points in the machine or to the welding head may be exposed to extremely high transient voltage at the time the arc starter operates. **ENSURE THAT ALL TEST EQUIPMENT IS DISCONNECTED DURING ARC START.**

NOTE

Rotation (Travel) Calibration, in conjunction with a Weld Head, is performed on a frequent basis and is covered as part of Section V (operation).

7.1 EQUIPMENT REQUIRED FOR CALIBRATION

1. Digital Multimeter (DMM), minimum 4 - digit readout. Suggested: Fluke Model 8060A or equal. The meter must have floating inputs (not connected to line or chassis ground) of minimum 1 megohm input impedance. Battery operated devices are recommended.
2. Screwdriver, calibration, small slot with 6" shaft.
3. Hex wrench set
4. M-9 Weld Head rated for 100 amperes and pipe/tube that will not melt away with 100 amperes or manual torch set up on flat plate (see step 7.2.2).
5. AMI External Shunt, 1 mv/amp, PN 1357238-01 (optional)
6. Argon or other acceptable GTAW gas source.

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

SECTION VII - CALIBRATION

7.2 CURRENT CALIBRATION

The M-207A contains components for measuring the actual amount of current. Normal calibration is intended for adjusting the circuitry based on measuring these devices.

True verification of current output for Quality Control purposes must be done with an External Calibration Shunt that is calibrated by an independent agency and controlled by a users QC or QA department. An external shunt adequate for this use is sold as a M-207A option.

This procedure is written to include both calibration using the internal devices for measuring and for using the external shunt option provided by AMI.

A weld schedule is required for calibration. The first time calibration is done it will have to be CREATED. Step 1 below has a place for writing in the Weld # when it is created.

1. Select Weld Schedule Number _____ and verify that it is programmed as follows:

PRE-PURGE-POST	UP-SLOPE-DOWN	ROT--DLY
30	30	1.0 1.0 CW 0.0

LVL	PULSE	ROT	PRI--RPM--BCK
1	OFF	OFF	0.00 0.00

LEVEL 1

LVL	TIME	PRE-AMP-BCK	PRI-PULSE-BCK
1	10	100	0 0.00 0.00

LVL	PULSE	ROT	PRI--RPM--BCK
2	OFF	OFF	0.00 0.00

LEVEL 2

LVL	TIME	PRE-AMP-BCK	PRI-PULSE-BCK
2	15	10	0 0.00 0.00

The system is calibrated at 100 amps in level 1 and at 10 amps in level 2. To give yourself enough time to check each value it is suggested that you make at least 4 levels as above making all odd number levels 100 amp and all even levels 10 amps.

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

SECTION VII - CALIBRATION

7.2 CURRENT CALIBRATION

2. Set up a Weld Head rated for 100 amperes continuous duty and insert a tube, or pipe, or copper rod that can withstand 100 amperes of continuous current with no rotation. If these items are not available then use a Hand Torch on a large plate with the torch fixed so it cannot change the gap during calibration. It is also possible to purchase a Carbon Pile (load bank) that will take the place of a torch or weld head.

CAUTION

In any case make sure that when an arc is struck nothing will be overheated or melt.

3. The test points and adjustments for Current Calibration are located on the Center Plate under the computer cover (front panel housing).

NOTE

To access the adjustment, turn the Power Off and unscrew the two computer cover retaining screws in the front. Lift up on the cover and expose the center plate. Prop the cover up so it will not fall but still allow operation.

Locate test points TP-REF and TP-CUR. Locate the Adjustment Screw labeled "Current Gain". It will be used during calibration.

4. If an External Shunt is to be used connect it between the Work (ground) connector on the Power Supply and the Work (ground) connector of the Weld Head Adapter Cable or manual torch cable. Current is always measured along the ground return path.
5. Insure everything is ready to strike an arc. Turn M-207A power ON. The system should return to your calibration weld procedure. Set the Weld/Test Mode to WELD.
6. Set up the DMM to read on the 200 mv DC scale if you are using the external shunt. Set it up to read on the 20 VDC scale if you are using the center plate test points.
7. If you are using the external shunt prepare to insert them into the red and black test point on the shunt.
8. If you are using the center plate test points prepare to insert them into TP-REF (black lead) and TP-CUR (red lead).

7.3

SECTION VII - CALIBRATION

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

7.2 CURRENT CALIBRATION

9. **DO NOT INSERT THE PROBES UNTIL AFTER THE ARC IS STRUCK.**

The high frequency start may damage some meters.

10. Press the SEQ START key.

11. As soon as the arc is struck (after prepurge) insert the Probes into the center plate test points or into the external shunt if it is being used.

12. During all ODD numbered Levels (100 amperes) the DMM should read as follows:

$$\begin{aligned} \text{Center Plate Test Points..} &= 4.00 \text{ VDC } \pm 0.02 \text{ VDC} \\ &(3.98 \text{ VDC to } 4.02 \text{ VDC}) \end{aligned}$$

$$\begin{aligned} \text{AMI External Shunt} &= 100 \text{ mv DC } \pm 0.05 \text{ mv DC} \\ &(99.95 \text{ mv to } 100.05 \text{ mv}) \end{aligned}$$

If out of tolerance adjust the "Current Gain" trim resistor adjusting screw on the Center Plate.

13. During all EVEN numbered Levels (10 amperes) the DMM should read as follows:

$$\begin{aligned} \text{Center Plate Test Points..} &= 0.400 \text{ VDC } \pm 0.002 \text{ VDC.} \\ &(0.398 \text{ VDC to } 0.402 \text{ VDC}) \end{aligned}$$

$$\begin{aligned} \text{AMI External Shunt} &= 10 \text{ mv DC } \pm 0.05 \text{ mv DC} \\ &(9.95 \text{ mv to } 10.05 \text{ mv}) \end{aligned}$$

If out of tolerance adjust the "Current Off Adj" trim resistor adjusting screw on the Center Plate.

NOTE

Repeat Steps 12 and 13 until no adjustment is required.

14. Press the SEQ STOP key.

15. After Postpurge turn the power off, remove all test leads and lower the computer cover and install the retaining screws.

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

7.3 GENERAL MAINTENANCE INSTRUCTIONS



CAUTION



Always disconnect the AC power cable from the line voltage before attempting to work with this welding power supply.

1. **AIR FILTER** - The M-207A power supply has one (1) foam air filter. Inspect this air filter regularly. The foam filter may be washed in water and detergent, dried and reused or replaced. Do not operate unit without filter in place. There is a similar filter on the Water Cooling Unit that requires the same inspection and cleaning.
2. **COOLANT** - The water tank in the optional CW unit holds approximately three (3) U.S. gallons. Check water level periodically. Using different weld heads will remove water from tank over a period of time. Fill the tank per instructions of section VIII.
3. **Cleaning exterior and interior surfaces** - Prolonged use in dusty shop or outside environments may cause the outside surfaces to accumulate a coating of dirt and dust. Do not use shop air (usually too wet) to blow dust particles away from the panels. Either wipe it off with a damp cloth or use a vacuum cleaner with a soft brush. Where a vacuum brush can not reach, use a clean, soft paint brush and then vacuum.

CAUTION

Always disconnect the power input cable from the junction box or wall-plug before cleaning.

DO NOT USE ANY SOLVENTS, SPRAY-ON CLEANERS OR WATER on any of the inside parts. All outside surfaces may be cleaned with a soft cloth or sponge, damp, NOT SOAKED, with a mild detergent solution.

4. **INPUT/OUTPUT PANEL CONNECTIONS** - Periodic inspection of the M-207A panel and the electrode, gas and water return quick-disconnects on all cables should be performed. Damaged, dented or deformed connectors may cause poor or unsafe operation and water or gas leakage. The O-ring inside the weld head electrode and gas quick-disconnects should be periodically cleaned and re-greased.

7.5

SECTION VII - CALIBRATION

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

7.4 SYSTEM FAULT CORRECTIONS

When a System Fault occurs prior to or during welding it is required for the operator to clear the fault condition before welding. When a fault occurs during sequence or attempting sequence the FAULT SCREEN will appear.

Some faults are only temporary and the fault is corrected when the arc goes out. But all faults will cause the FAULT SCREEN to appear and let the operator know why the sequence was stopped.

The following is a general description of the cause of each type of fault and some recommendation for correction. In all cases, when the fault is corrected the operator must press the C key to clear the FAULT SCREEN. If the fault is truly corrected the system will automatically return to the weld schedule it was on when the fault occurred.

1. TEMP - The M-207A has internal temperature sensors (thermal switches). If the Power Supply internal temperature rises above safe limits a TEMP fault occurs. This can only occur if there is some type of blockage of air circulation, fan failure or component failure within the Power Supply OR THE SYSTEM IS BEING OPERATED IN AN AMBIENT AIR TEMPERATURE BEYOND ITS RATED 110 DEGREES F.

This Fault should only occur during an actual weld sequence. If it occurs when the machine is not welding then a serious internal problem exists. In this case turn the Power Supply OFF and call an AMI Service representative.

If it occurs during welding, check for blockage of the air intakes on the side of the machine and for cleanliness of the filters. They may need cleaning. If no blockage exists and the filters are clean then cease all welding operations and call an AMI Service representative.

2. INPUTAC - Monitors the available line current. If the system cannot supply the desired DC amperage of the weld schedule it looks to see if the line voltage is adequate for that amount of current.

This fault could occur if a weld schedule is asking for 110 amperes or more and the M-207A is being operated on 120 VAC. The M-207A can only supply over 100 amperes when operated on 200 VAC or higher.

7.6

SECTION VII - CALIBRATION

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

7.4 SYSTEM FAULT CORRECTIONS

3. GAS - This fault will only occur at the beginning of or during a Weld Sequence. If the arc gas flow through the system should stop, or be too low, a fault will occur.

Check that the Gas Source (user supplied) is turned on and that adequate gas is available. Check all Gas Hoses and connections for free flow, this is usually the problem.

If there is no problem with the source or with hoses and connection then an internal failure of the flow switch, solenoid or internal hosing is possible. Contact an AMI Service representative.

4. LVPS - The system continuously monitors its internal Low Voltage (DC) Power Supplies. If they are not up to standard then the system may not be able to perform to specification.

There are several ways this could occur. The most common would be too low of an AC input voltage. Check the line voltage to see that it is correct and that the Power Supply is set up for that voltage (see sections 3).

The other reason would be a failure of the LVPS. Always check the AC input first and if that is O.K. call an AMI Service representative.

4. COOL - Monitors the coolant flow out of the optional cooling unit. If it is not at least 0.2 GPM a fault will occur. This fault will only exist if the CW unit is turned ON. If it is off no fault will occur.

Check the hoses and flow path of coolant to and from the weld head, this is usually the problem. If all looks good then an internal failure of the CW pump or flow switch is possible, contact an AMI Service representative.

5. SENSOR 1, 2, 3 - These faults must be turned on and set up by the user. Contact whoever set them up.

7.7

SECTION VII - CALIBRATION

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

7.4 SYSTEM FAULT CORRECTIONS

6. **STUB OUT** - This fault will only occur when an arc is present and will no longer exist when the arc goes out. If the arc voltage gets too low or the electrode should touch the weld puddle then a fault will occur. It creates an ALL STOP but does not operate the “return to home” function after Postpurge.

The operator should check to see if the electrode is stuck to the tube being welded. Clear the obstruction and jog the rotor to the open position. Remove the tube and replace the electrode, then press the C key to clear the fault.

Check the required tungsten length and arc gap required for the weld. Something caused the arc gap to get too small. This FAULT can be “turned OFF” by use of the SET UP screens, see section 5.6.2. It is recommended to turn it OFF when MANUALLY welding.

7. **HIGH VOLTS** - If the arc voltage should get too high during a weld sequence this fault will occur. It usually occurs if a hole should be made in the weld and the arc can extend over to the opposite side of the weld. Check the weld procedure and arc gap required for the weld. This FAULT can be “turned OFF” by use of the SET UP screens, see section 5.6.2.

It is recommended to turn this OFF when MANUALLY welding or when using large Arc Gaps (0.050”) and low current in HELIUM or HELIUM mixed gases. These conditions tend to create very high Arc Voltages and could cause an undesirable FAULT if this option is left ON.

8. **BAD START** - If for any reason the M-207A cannot achieve a stable Arc at the end of PREPURGE the system will display this statement.

There can be several reasons for this to occur. The most common are poor cable, ground and electrode connections, bad gas, bad tungstens, dirty tungstens, etc. *Another extremely common cause of BAD START is too short of a PREPURGE time.* The RF starter charges during prepurge and too short a time will cause the RF starter to fire when not fully charged. The RF is transmitted from the M-207A to the electrode, if anything creates resistance or an alternate path for the RF the start can be weak.

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

7.4 SYSTEM FAULT CORRECTIONS

8. BAD START - (continued)

When a BAD START occurs check the electrode connection and electrode condition first. Also check to insure that CERRIATED electrodes are being used. They have proven to be much more effective than THORIATED electrodes for RF transmission and longer life.

BAD STARTS can also be caused by not having the proper START LEVEL set. See Section 5.6.2 for START LEVEL information.

RF starting problems can be very difficult to solve because of all the items that can cause problems. If continued RF problems occur call the AMI Service Dept. for help in finding the problem.

9. NO DISPLAYS/DISPLAYS SCRAMBLED - The LVPS FAULT is meant to detect Low Voltage. However, if the Voltage is really low the Displays will not even turn on or the information being displayed can be scrambled.

In these cases check the input AC voltage first and insure that the M-207 is set for the correct input Voltage.

Another possible reason for no display or scrambled displays is RF interference. Although the M-207A is protected against this certain conditions are still possible to occur that can cause this.

Outside RF from another type of source such as a HF welding machine or a radio transmitter near by could cause a problem. If these conditions continue contact the AMI Service Dept. for possible solutions.

7.5 ERROR MESSAGES

1. MEMORY CHECK

At Power On the weld schedule memory storage is checked for any type of corruption. If any of the checks fail the system will display the following:

LIBRARY MEMORY ERROR RELOAD FROM EMM
PRESS PRINT FOR MEMORY STATUS REPORT

7.5 ERROR MESSAGES

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

1. MEMORY CHECK (continued)

NOTE

When the print key is pressed any weld schedule with a directory or link error will automatically be "DELETED". Any schedule with a sum check error will be flagged corrupted on the print out and the user should call up that weld schedule and verify the parameter values.

A typical print out could look like this:

```
ARC MACHINES, INC.                COPYRIGHT 1996
                                AMIWELD 207A 2.1
SYS HOURS - xxxxx.x             ARC HOURS - xxxxx.x
                                15 AUG 1996
SCHEDULE xxx DELETED
SCHEDULE xxx CORRUPTED          PLEASE VERIFY
SCHEDULE xxx DELETED
SCHEDULE xxx DELETED
```

Use the M-207-EMM to restore the deleted schedules.

7.6 MISCELLANEOUS MAINTENANCE ITEMS

1. BATRAM - The system BATRAM has a life of from 2 to 5 years. The following describes what happens to the BATRAM settings and functions when the BATRAM is replaced:
 1. System Hours and Arc Hours - Will reset to 0.
 2. Day/Date information - Will have to be reset.
 3. AutoCal Offsets Reset - All Heads calibrated with Auto-Cal will need to be re-calibrated.
 4. Total Weld Count (Schedule and Library) - Will reset to 0.
 5. Last Language used - Will default to English until reset.
 6. Remote Sensor set ups will have to be reset.
 7. Whole or Tenth increments for Amps and Level Time will reset to whole.
 8. Canned programs Locked or Un-locked will default to Locked.
 9. Operators Name will clear.
 10. Power Supply Serial Number will clear.
 11. Last Weld ID entered will clear.
 12. WDR mode will default to "NOT SAVED"

7.10

SECTION VII - CALIBRATION

7.6 MISCELLANEOUS MAINTENANCE ITEMS

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

1. BATRAM (continued)

Replacing the BATRAM requires accessing the inside of the M-207A. A complete replacement procedure is available in the M-207A Maintenance Manual (#740078).

NOTE

To prevent data loss change batteries annually.

2. RS232 COMMUNICATIONS

The M-207A can shut down the RS232 port on it own if it detects non-intelligent information on it. This can be caused by ambient light or improper set up. The RS232 port will not be re-activated until the power has been re-set. If you are having problems with RS232 communications, re-set the power and try again.

NOTE

Always keep the plastic dust covers on the RS232 port when not in use.

SECTION VIII - OPTIONS

8.0 INTRODUCTION

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

The following are installation and operation instructions for M-207A options. Some options have their own manual and these items are not discussed in this section.

WARNING

Always turn the power supply OFF before making any cable or connection changes to the M-207A power supply.

8.1 M227/207-CW & M207-CW COOLING UNIT SPECIFICATIONS/INSTALLATION

1. Specifications -

1. AC Input Power - supplied from the M-207A power supply.
2. Coolant capacity - 3 gallons (11.4 liters).
3. Circulation - 0.3 GPM (1.1 lpm) with most M-9 Heads.

2. Physical Construction -

1. Material - aluminum cabinet/Polyethylene tank.
2. Height - 14.00 inches (355.6 mm)
3. Width - 22.75 inches (577.9 mm)
4. Depth - 19.25 inches (489.0 mm)
5. Weight - 70 lbs. (31.75 kg) M227/207-CW filled
6. Weight - 50 lbs. (22.7 kg) M207-CW filled

3. Pump - Both M227/207-CW & M207-CW water pumps have built-in pressure regulators set at 60 PSI, and flow rate FAULT detect switches.

4. Installation

1. Insure that the M-207A is OFF, remove the power cable from the M-207A and set the CW ON/OFF switch to the OFF position (see figure 8).
2. The cooling unit is shipped dry and requires 3 gallons (11.4 liters) of *CLEAN DISTILLED* or *DE-IONIZED* water. In areas where freezing temperatures are expected, add 2 gallons (7.6 liters) of *CLEAN DISTILLED* or *DE-IONIZED* water and 1 gallon (3.8 liters) of pure ethylene glycol. **DO NOT USE AUTOMOTIVE ANTI-FREEZE!**

8.1

SECTION VIII - OPTIONS

8.1 M227/207-CW & M207-CW COOLING UNIT SPECIFICATIONS/INSTALLATION

4. Installation

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

2. (continued)

NOTE

All cooling systems are subject to problems from mineral buildup, algae and bacteria. Frequent changes of coolant and flushing of the system are necessary to keep any cooling system running efficiently. Frequency of changes is strictly dependent on the environment and quality of coolant used. Monitor your cooling system carefully and often.

3. Before mounting the CW on to the M-207A remove the fill cap and add the coolant mixture. Replace the fill cap. Remove the pins attached to each corner post (see figure 8). First time installers should find the CW Power Cable location and find the location of the mating connector on the bottom of the M-207A.
 4. Move the M-207A onto the CW unit and insert the corners onto the posts of the CW Unit. Carefully tilt the front of the M-207A up slightly. With the M-207A still slightly tilted connect the CW Power Cable to the mating connector on the bottom of the M-207A (it is keyed and can only be inserted one way). Lower the M-207A slowly (feed any excess cable back into the CW unit). Secure the CW unit with the pins that were removed (figure 8).
 5. Install the adapter cable coolant hoses per section III. Re-connect the M-207A power cable.
5. Operation -
1. When all connections have been made per Section III and a coolant flow path is created, turn the M-207A ON and set the CW ON/OFF switch to ON. The pump should start circulating coolant.

WARNING

DO NOT OPERATE the water cooling unit **WITHOUT** coolant in the tank **OR WITHOUT** a water flow path (water OUT to IN through a weld head).

8.2

SECTION VIII - OPTIONS

8.1 M227/207-CW & M207-CW COOLING UNIT SPECIFICATIONS/INSTALLATION

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

5. Operation -

2. Both M227/207-CW & M207-CW contain flow sensors. Any time the CW unit is turned ON a signal will be sent to the M-207A that indicates if the flow is adequate. If it is the M-207 STATUS screen (at power up) displays COOL-OK. If it is not OK the screen will display COOL-FLT. Any time there is a COOL-FLT the problem must be corrected in order to weld.
3. If coolant is not needed, turning the CW unit OFF will disconnect the fault function. THE COOLANT FAULT ONLY WORKS IF THE CW IS TURNED ON.
4. The above is the basic operation. The only decision to be made is whether COOLANT is required. Some weld heads need it, some do not, depending on the type of weld and duty cycle. Consult with an AMI representative as to cooling requirements.

8.2 M-207-RP REMOTE PENDANT

WARNING

Always turn the power supply OFF before making any cable or connection changes to the M-207A power supply.

1. Installation

1. Insert the M-207-RP cable connector into the M-207A panel connector labeled REMOTE.
2. If a M-207-RP extension is used, it is installed between the M-207A and the M-207-RP.

2. Operation

NOTE

A complete understanding of system operation is necessary for proper use of the RP. Section IV and section V of this manual must be read and understood before proceeding with RP operation.

8.3

SECTION VIII - OPTIONS

8.2 M-207-RP REMOTE PENDANT

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

2. Operation (continued)
 1. The following functions and features are provided by the Remote Pendant:
 1. Sequence Start key
 2. Sequence Stop key
 3. All Stop key
 4. Rotation jog CW key
 5. Rotation jog CCW key
 6. Weld/Test mode key
 7. Manual Purge key
 8. Print key
 9. 8 character digital status display
 10. Weld # key
 11. Amps Up key
 12. Amps Down key
 2. Items 1 to 8 above are duplicates of keys contained on the M-207A panel. They work exactly the same as the keys on the panel. When the RP is connected these keys and the identical ones on the M-207A panel are active at the same times. Pressing either key will perform the function desired. For further information about the use of these keys see section IV and section V of this manual.
 3. The 8-character digital display is used to indicate to the operator what particular mode or area of a weld schedule the system is in.

When the M-207A is first turned on the RP display will say NO SEQ. This indicates to the operator that no weld schedule has been selected. When a schedule is selected the display will show 001 TEST. This indicates the weld schedule number selected (001) and the system is in TEST mode. It could indicate WELD or FLT depending on the system status.

When the weld sequence is started the display will indicate progression through PREPURGE, UPSLOPE, LVL 01 (etc.), DOWNSLOPE and then POSTPURGE.

SECTION VIII - OPTIONS

8.2 M-207-RP REMOTE PENDANT

2. Operation (continued)

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

4. As previously noted, the M-207A can store in memory up to 100 weld schedules. Any 4 of these schedules can be programmed to be selected from the RP. The Weld # key is used to select one of these 4 weld schedules.

To initially set up which schedules can be selected from the M-207-RP press the SET UP key on the M-207A (this operation cannot be done from the RP). The SET UP screen can be obtained from the STATUS screen or a Weld Schedule screen.

Press the F key under WELD SELECT and the screen will then ask what WELD # should be in position 1, then position 2, 3 and 4. You do not have to select all 4, just the ones you want selectable from the M207-RP. When all choices (up to 4) are made, go back to the STATUS screen.

The M-207-RP will now be able to select one of the Weld #'s entered. Press the Weld # key to select the first of the selected schedules. The first weld the first of the selected schedules. The first Weld # number will be displayed. Each time the key is pressed the next Weld # selected will be displayed.

5. The Amps Up and Amps Down keys are used to Override the PRIMARY CURRENT before welding. They do not work during Sequence and they do not change Background. The first actuation of either key enables the function and displays the value of Level 1 Primary Amps. The next time either key is pressed the value will change (up or down) by the smallest increment (usually 1 amp).

Each time either key is pressed the current will be changed by one increment.

The same amount of change will be made to all Levels of Primary Amps. The amount of change that can be made will be controlled by the Override limits programmed and the percentage will be based on the smallest value of Primary Amps in any level.

SECTION VIII - OPTIONS

8.3 M-207-EMM EXTERNAL MEMORY MODULE

MODEL 207A, 207A-1, and 207A-HP OPERATION MANUAL

1. The M-207-EMM is used to TRANSFER a COPY of the library of one M-207A to another M-207A to maintain identical libraries for multiple system users. It is also used as a security device to retain a copy of the library which cannot be changed accidentally.

WARNING

Always turn the power supply OFF before making any cable or connection changes to the M-207A power supply.

2. To install the EMM, turn the M-207A OFF. The EMM has a connector on one side of the module. This connector should be inserted into the slot on the side of the M-207A labeled EMM. It is keyed and can only be inserted one way. When installed, turn the M-207A ON and perform the desired TRANSFER or RECEIVE functions as described in Section VI of this manual.
3. When finished with the EMM it should be stored in a secure, dry location away from any large magnetic or electrical sources.
4. The EMM uses a type of memory that does not require batteries and has an unlimited shelf life. However, it does have a limited number of erase cycles. Erasing occurs anytime you are COPYING from a M-207A to the EMM. Erasing of the EMM memory does not occur when you are TRANSFERRING from the EMM to the M-207A. Eventually the EMM will require replacement. However, this is not anything to be particularly concerned with. Even if you erased the EMM every day (very high usage) it would last 27 years.
5. A copy of the EMM Library can be printed by using the EMM PRINT function on the SET UP screen, see Section 5.6.1.

CAUTION

The M-227-EMM and the M-207-EMM look alike (although labeled differently). *Do not confuse them and attempt to use an M-227-EMM with a M-207A.*