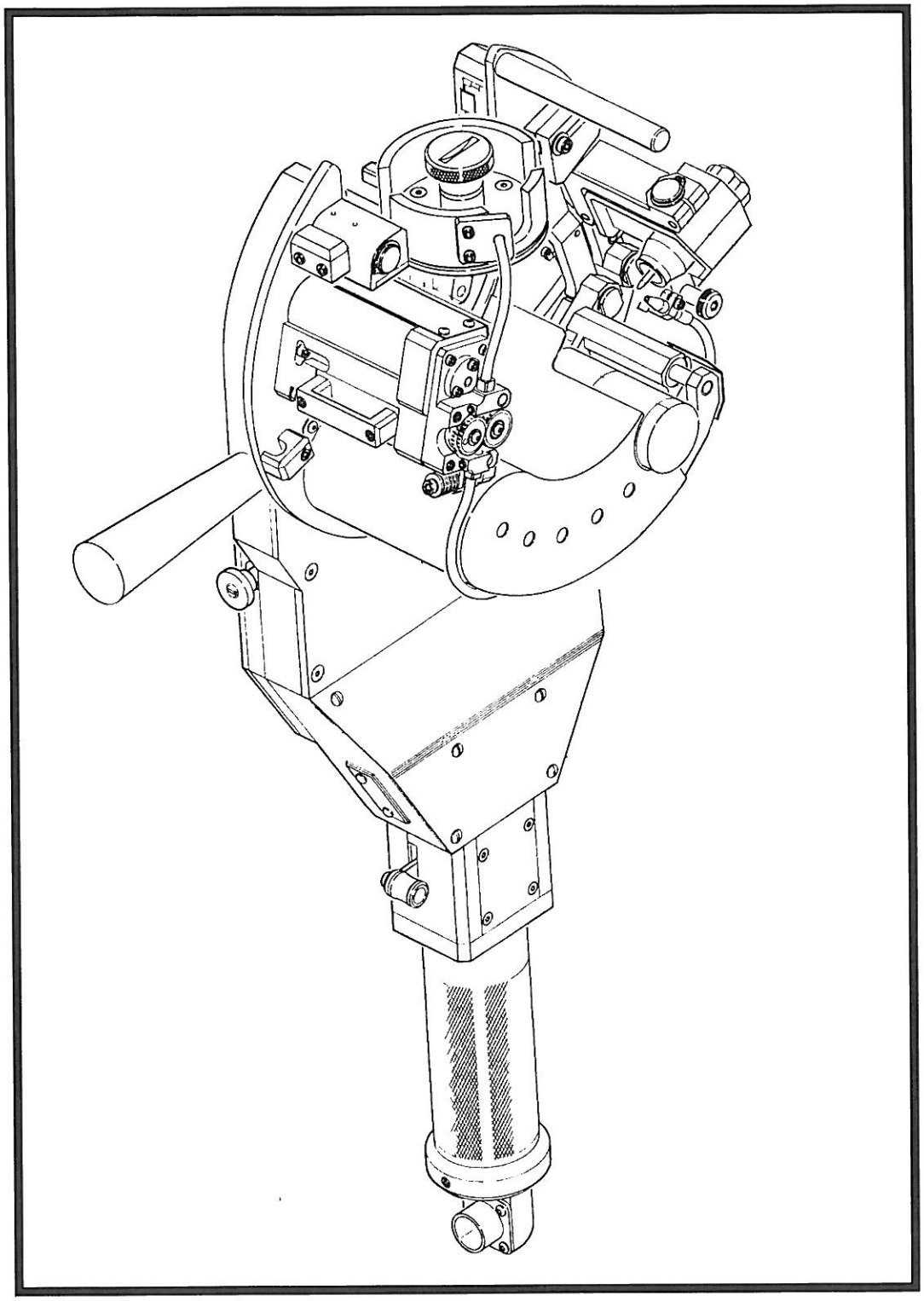


MODEL 79 WELD HEAD
OPERATION MANUAL

Doc # 740082
Rev A

MODEL 79 WELD HEAD OPERATION MANUAL

NOTICE

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 THEY HAVE READ AND/OR BEEN MADE AWARE OF ALL OF THE SAFETY-RELATED ITEMS CONTAINED IN THIS MANUAL.

Publication date : First Edition - 5 March 1997

REV.	DCO #	CHANGE DESCRIPTION	DATE	APR
NO		FIRST ISSUE	03-05-97	GPE
A	5424	CLARIFY ATTACHMENT	1/28/10	DC

Doc # 740082
Rev. A

MODEL 79 WELD HEAD
OPERATION MANUAL

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

MODEL 79 WELD HEAD 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 Gas Tungsten Arc Welding (GTAW) welding with filler requires a good deal of operator/welder expertise which requires AMI supplied training. THIS MANUAL IS NOT INTENDED AS A SUBSTITUTE FOR THAT TRAINING.

The M-79 Weld Head comes in a variety of different sizes (M79-3500, M79-2375, M79-6625, etc.). However, all M-79 Weld Heads have a common design and are used essentially the same. This manual is intended to cover the entire M-79 Product Line and not just one version. Model (size) specific performance specifications can be found in the appropriate AMI Weld Head Specification. Model specific wiring and parts information can be found in the appropriate Illustrated Parts Breakdown Manual (IPB) supplied with each Weld Head.

Any basic Model 79 Welding Head is part of a complete welding system intended for the welding of metal tubes, pipes and fittings. The complete system consists of an appropriate AMI Power Supply, Adapter Cable, Gas Lines and the M-79 Weld Head.

The standard AMI power supply provides GTAW current with pulsation controls, high frequency or touch arc starting, purge gas controls, weld head arc rotation, cold wire feed, Arc Voltage Control, Torch Weave/Steering (Oscillation) and automatic timing functions. Users need only to supply input AC power, regulated torch shielding gas source with flow meter and the M-79 Weld Head.

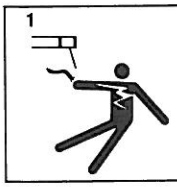
NOTE

A complete understanding of Orbital Welding techniques and the use of an AMI pipe welding Power Supply is required before installation or operation of a M-79 is attempted. Detailed descriptions of Power Supply general system operation, modes or functions mentioned in this manual can be found in the appropriate pipe welding power supply Operation Manuals and are not covered in this document.

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.

1.1 SAFETY PRECAUTIONS

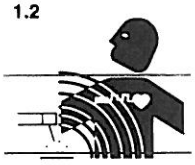
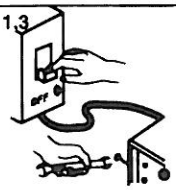
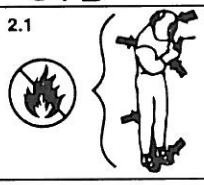
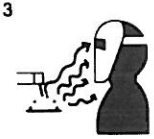
This section contains cautions and warnings concerning the operation of this equipment and welding equipment in general. However, in addition to reading this manual and before operating this or any welding equipment, users should reference and be familiar with "***ANSI-49.1 Safety in Welding and Cutting***".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

	**WARNING**: Touching energized electrical parts can cause a fatal shock or burns. When in weld sequence the electrode and work are electrically energized. Incorrectly installed or improperly grounded equipment is a hazard.

MODEL 79 WELD HEAD OPERATION MANUAL

SECTION I - INTRODUCTION

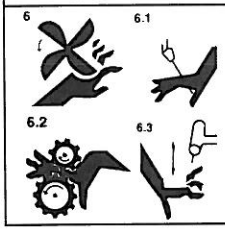
1.1 SAFETY PRECAUTIONS

1.1 	**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.
1.2 	**WARNING**: Magnetic Fields from High Currents can affect pacemakers. PACEMAKER WEARERS KEEP AWAY UNTIL CONSULTING YOUR DOCTOR.
1.3 	**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.
2 	**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.
2.1 	**WARNING**: Welding Operators should wear non-flammable protective clothing, footwear and head gear.
2.2 	**WARNING**: Never weld on sealed containers or pipes. This may result in an EXPLOSION.
2.3 	**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.
3 	**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.
4 	**WARNING**: Weld materials can emit toxic fumes during welding. WELD ONLY IN AREAS WITH ADEQUATE VENTILATION.

MODEL 79 WELD HEAD OPERATION MANUAL

SECTION I - INTRODUCTION

1.1 SAFETY PRECAUTIONS

	**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.
	**WARNING**: AMI factory training is essential for all Welding Operators and Maintenance Technicians who operate AMI equipment.
	**WARNING**: Before operating, storing or handling, always make sure that the Power Supply, Pendant, weld heads and cables are not exposed to rain or standing water. SYSTEM COMPONENTS ARE NOT WEATHER-PROOF.
	**WARNING**: Keep hands and fingers clear from moving parts such as fans, gears, rotors, Wire Feed, Rotation, OSC and AVC Mechanisms.

1.2 OPERATIONAL PRECAUTIONS

The following is a basic 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 Power Supply is connected to the correct Input AC power before turning power on..
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-79 is intended for typical GTAW gases ONLY. *NEVER CONNECT OXYGEN OR ACETYLENE TO THE M-79.*
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.
6. Before operating, insure that the Power Supply has adequate air flow. Do not restrict the intakes or exhaust vents of the power supply.

1.2 OPERATIONAL PRECAUTIONS

7. Before operating, always insure that there is bare metal contact between the weld head components which connect to GROUND (clamps, 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, until ready to install.

9. When operating, storing or handling, insure that the M-79 is protected against dirt, dust, etc. NEVER GRIND NEAR AN EXPOSED WELD HEAD or POWER SUPPLY.

10. Do not use acid, corrosives, liquid "Easy Out" or any liquid substance on the M-79. When cleaning, use only a light solution of Isopropyl alcohol on a soft cloth .

11. When handling, take extreme care to avoid dropping the power supply, weld heads, cables or any accessories.

12. Do not attempt to move the 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.

14. Never use a M-79 or any AMI Power Source for the purposes of pipe thawing.

1.3 SHOCK HAZARD WARNING

The ELECTRODE (tungsten) is 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 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 M-79 during arc start.

1.4 RF AND EMI EMISSIONS

1. WHY RF?

"It has long been recognized that in the practice of welding and cutting, there are circumstances where it is required to assist the process using radio frequency voltage. In order to arc weld an electric arc must be created, because of safety and economic concerns, the no load voltage of arc power sources is kept as low as practical. Thus, a source of high voltage with a high safety factor must be utilized. Radio Frequency voltage is the best method of meeting these criteria for many reasons." (quoted from CISPR/B/63).

2. RF REGULATION

The FCC regulates the RF emission limitations for welding equipment by the use of an IEC (international) regulation created by the Special Committee on Radio Interference (known as CISPR) subcommittee B. The regulation of record is:

CISPR/B/63

"CODE OF PRACTICE FOR THE USE OF WELDING AND CUTTING POWER SOURCES UTILIZING RADIO FREQUENCY VOLTAGE FOR STARTING OR STABILIZING THE ARC."

The regulation states that due to the variety of work requirements and conditions it is virtually impossible to establish fixed, normalized and predictable tests and test setups for RF limits that would actually mean something. Instead of limits they state the following:

"The manufacturer must design and produce equipment that is functional but at the same time, design this equipment to keep electromagnetic radiation at a minimum."

"The user has the responsibility to install and use the power source per the instructions of the manufacturer. Through this practice, it is reasonable to assume that the probability of electromagnetic disturbances will be significantly reduced. However, if some electromagnetic disturbances are felt, then it is the responsibility of the USER of the equipment to resolve the situation."

3. RF PROTECTION

AMI policy is to comply with the IEC (and thus FCC) regulations. Our design rules and procedures include testing and observing this area. We can assure our customers that every effort has been made to reduce RF emissions to the absolute minimum from our power sources.

However, this does not mean that a user will not have occasional problems with RF interference with other equipment due to the use of our equipment. This is the nature of RF starting.

Most RF noise interference problems are going to be either set-up related or caused by poor or no filtering on the behalf of the equipment that is being interfered with. Most problems are easily correctable but each one must be looked at on a "case by case basis."

4. EMI SUPPRESSION

AMI Power Supplies are equipped with a heavy-duty Pi-Network filter, connected to the input power line, to prevent propagation of EMI either into or out of the Power Supply. The all-metal enclosures and internal shields prevent radiated EMI.

1.5 MODEL 79 BASIC COMPONENTS

For purposes of description, each M-79 consists of the following five (5) basic assemblies (Reference Figure 1):

1. Drive/Clamp Main Housing Assembly

    1. This Housing contains:
        1. Rotation Motor and Handle Assembly.
        2. Rotation Calibration Potentiometer.
        3. "One Size Fits All" Clamping Assembly.
        4. "Return to Home" sensing switch.
        5. "Return to Home" disable switch.
        6. Torch Plate Mounting Rotor.

2. Torch Plate Assembly

    1. The Standard Torch Plate Assembly contains:
        1. Liquid Cooled GTAW Torch.
        2. Torch Lead/Lag and Tilt adjustments.
        3. Wire Manipulator Assembly.
        4. Wire Feed Motor (except M-2375 and smaller)
        5. Wire Feed Spool (except M-2375 and smaller)
        6. Arc Voltage Control Motor (for arc gap control)
        7. Torch Oscillation and Cross-seam steering Motor.

3. Service Cable Assembly

    1. The standard 10' (3 m) Service Cable Assembly connects to the torch and contains:
        1. Two (2) Torch Coolant Hoses (in/out) which also contain the electrode cable.
        2. Torch (arc) Gas Hose

        On Models using the M95-WF Remote Wire Feed Option this cable also contains a Wire Liner Sleeve with replaceable Wire Liner Assembly.

4. Control Cable Assembly and Adapter Y

    1. The Standard 10' (3 m) Control Cable Assembly connects to the Torch Plate Assembly and contains the AVC, Torch Oscillation and Wire Feed Motor Servo electrical wiring.
    2. The Adapter Y allows the Control Cable and Handle Cable to both be connected to the Power Supply Control Adapter Cable (not required for use with an M95-WF Option).

5. Handle/Rotation Cable Assembly

    1. The Standard 10' (3 m) Handle Cable connects to the Drive Clamp Handle and contains:
        1. Torch Rotation Motor Drive and Tachometer wiring.
        2. Ground Fault Sense Wiring.
        3. "Return to Home" and "Auto-wrap" feature wiring.

NOTE

A Ground Cable is also required for operation but this Cable is supplied with the AMI Power Supply being used.

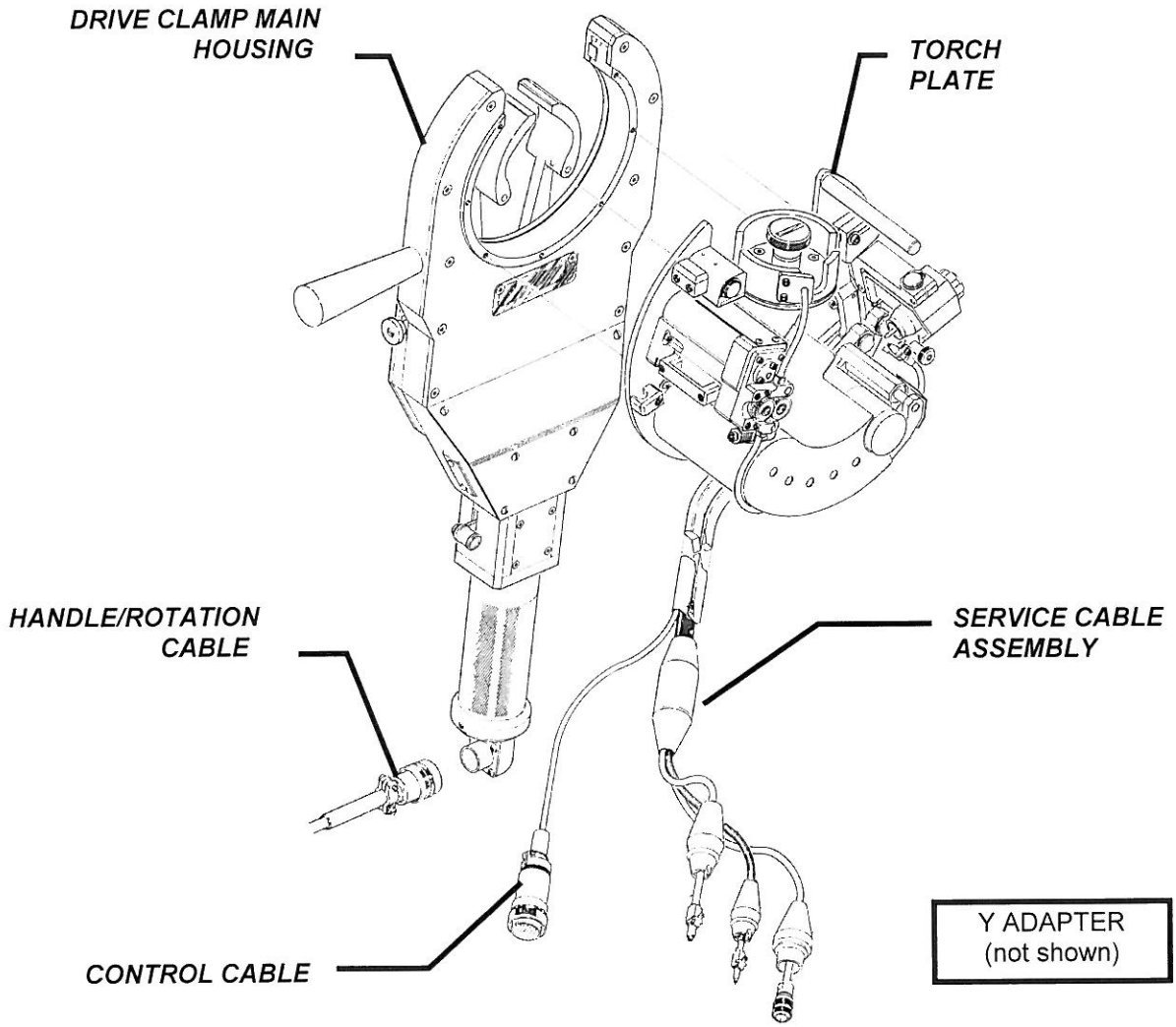


FIGURE 1

Doc# 740082
Rev. A

SECTION I - INTRODUCTION

1.6 GENERAL PERFORMANCE SPECIFICATIONS

Each version of the Model 79 (M79-2375, M79-3500, M79-6625, etc.) is designed for a specific diameter range which can require different performance ranges with-in a function. Each version has a separate and detailed specification that outlines its exact performance range. For more detailed information please consult the specification for your particular M-79 version. The remainder of this section is common performance items for most versions:

1. ROTATION

Motor	= 28 VDC permanent magnet
Intended Servo Type	= Closed Loop Velocity Servo
Velocity Feedback	= 0 to 5 VDC maximum analog tachometer feedback.
Intended Regulation/Tolerance ..	= In RPM +/- 2 % of program value.

2. WIRE FEED

Motor	= 28 VDC permanent magnet
Intended Servo Type	= Closed Loop velocity Servo
Velocity Feedback	= 0 to 5 VDC maximum analog tachometer feedback.
Intended Regulation/Tolerance ..	= In IPM +/- 2 % of program value.

3. ARC VOLTAGE CONTROLLER (AVC)

Motor	= 28 VDC permanent magnet
Intended Servo Type	= Closed Loop Position Servo
Position Feedback	= Arc Voltage measured from the electrode at the Torch to the Welding Work (Pipe) at the weld head clamp.
Intended Regulation/Tolerance ...	= In Arc Voltage +/- 1 % of program value.

AVC response speed will vary from version to version. See each version specification for details.

4. TORCH OSCILLATION

Motor	= 28 VDC permanent magnet
Intended Servo Type	= Closed Loop Position Servo
Position Feedback	= Linear or Rotary Potentiometer depending on design.
Intended Regulation/Tolerance ...	= In 0.001 inches +/- 1 % of program value or 0.015 inch minimum value.

Oscillator response speed will vary from version to version. See each version specification for details.

NOTE

Tolerances stated are as intended in the design and selection of components. Actual performance tolerance is a function of the AMI Power Supply/Controller Unit.

SECTION I - INTRODUCTION

1.6 GENERAL PERFORMANCE SPECIFICATIONS

5. TORCH COOLING

All M79 Torches require a minimum of 0.2 GPM (0.75 lm) coolant flow through the torch assembly.

6. WELD HEAD TEMPERATURE RANGE AND PRE-HEAT

1. The Weld Head Maximum operating temperature is not definable in exact temperature. The limiting factor is motor winding temperature. This temperature can vary greatly depending on motor torque, motor duty cycle, time the Head is on hot pipe and the amperage level being used. Weld Head surface temperature and internal Weld Head temperature can also vary greatly.

2. Motor winding temperature will not be excessive if the Weld Head body temperature does not exceed 140 degrees F (60 degrees C). During normal non-preheated pipe welding applications the Model 79 body temperature will not exceed 140 degrees F provided the Weld Head is removed as soon as the weld is completed or when welding operations are delayed.

3. As equipped standard no M-79 versions is intended for un-restricted pre-heat applications. However, operation on pre-heated pipe up to 500 F (260 C) is possible by using certain procedures and adding insulation where needed. Each pre-heat application must be looked at individually and Arc Machines, Inc. recommends contacting the factory for exact operating requirements when high preheats are a factor.

SECTION II - INSTALLATION

2.0 INSTALLATION INSPECTION

Before installing a M-79 Weld Head, perform a general inspection of the head as follows (see Section 1.5 and Figure 1 for basic component locations):

1. Check the Service Cable Coolant and Gas hoses for damage (cracks, holes, leaks, wear, etc.)
2. Check the Coolant and Gas quick disconnect fittings for clean and tight connections.
3. Check the Weld Head Control Cable and Weld Head Handle Cable for frays and the Connector for tightness and good thread condition.
4. Insure that all torch components are connected and that no hardware, brackets or pieces are loose or obviously missing.

NOTE

Each M-79 version comes with a specific Accessory Kit containing some tools, spares and miscellaneous accessory items. This installation instruction may refer to some of these items and it is possible that your Weld Head version and kit may not use or require that item.

2.1 WELD HEAD CONNECTION

1. Connect the M-79 Coolant Return, Gas and Electrode quick disconnects to the Weld Head Service Adapter Cable supplied with the welding Power Supply/Controller Unit.

2. Install the protective rubber boots on all connections. The rubber boots have a cut-out allowing the retaining clips (on the gas and water return) to be recessed and locked (see Figure 2, 3 & 4). Make sure the mating Electrode Quick Disconnects are SECURELY connected and seated and cannot be pulled apart without engaging the release ring. Make sure the mating halves of the electrode boots are securely connected and cannot come apart during cable movements.

NOTE

The following is for installation with M-79 versions that have a Wire Feeder on the Weld Head.

3. Connect one end of the Handle Cable to the M-79 connector on the bottom of the M-79 Clamp Assembly Handle. The connectors are keyed and should screw together easily, **DO NOT FORCE**. If it is difficult to connect, check the keyway and condition of the threads. Connect the other end to the Y Adapter Assembly supplied with the M-79.
4. Connect the Weld Head Control Cable Connector (from the Torch Plate) to the Y Adapter.
5. Connect the Control Adapter Cable from the Power Supply or Extension to the Y Adapter.

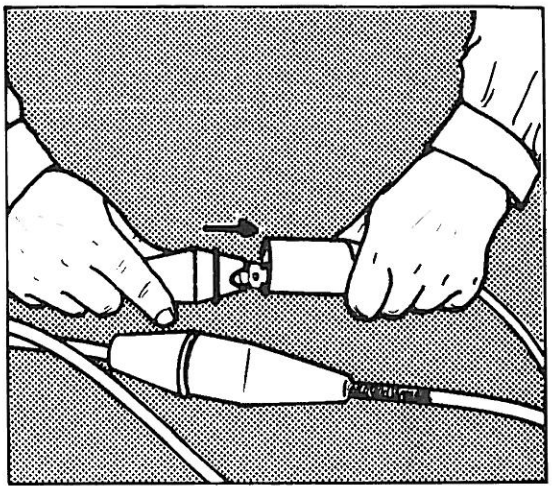


FIGURE 3

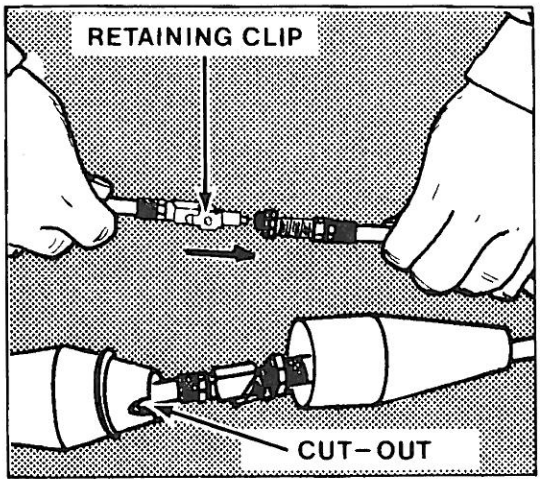


FIGURE 2

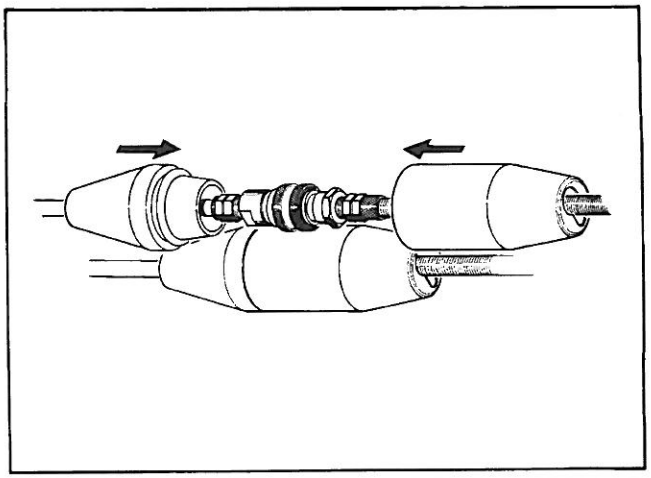


FIGURE 4

FIGURE 2, 3, 4

SECTION II - INSTALLATION

2.1 WELD HEAD CONNECTION (continued)

NOTE

The following steps should be used when using the M95-WF Remote Wire Feed Option on M79 Weld Head Versions that do not have Wire Feeders on the Weld Head.

6. Connect one end of the Handle Cable to the M-79 connector on the bottom of the M-79 Clamp Assembly Handle. The connectors are keyed and should screw together easily, **DO NOT FORCE**. If it is difficult to connect, check the keyway and condition of the threads. Connect the other end to the appropriate bulk head connector on the M95-WF Remote Wire Feed Option junction box.

7. Connect the Weld Head Control Cable Connector (from the Torch Plate) to the appropriate bulk head connector on the M95-WF Remote Wire Feed Option junction box.

8. Connect the Control Adapter Cable from the Power Supply or Extension to the Input Cable Connector on the M95-WF Remote Wire Feed Option.

NOTE

All Weld Head and Power Supply/Controller electrical Connectors are equipped with threaded Dust Covers. Insure that these are in place when connectors are not in use and that they are connected to their mating Dust Cover when the connectors are in use.

2.2 INITIAL WELD HEAD MOUNTING AND DIAMETER CHANGE

1. First time mounting or anytime the diameter to be welded is changed requires that the following adjustments be made:

    1. Clamping Jaws adjusted for the diameter.
    2. Torch position and AVC range be adjusted for the diameter.
    3. Torch Lead/Lag and Tilt Angles checked and adjusted.

    Failure to adjust these items or improper adjustment can result in poor weld repeatability and lack of function range adjustments needed during a weld. These adjustments are only required when a change in weld diameter is made.

2. The Torch Plate and the Main Housing/Clamp Assembly are "U" shaped. Before the Weld Head can be installed the open end of the "U" on the torch plate must be aligned with the Main Housing "U". This will be called the OPEN position. If it is not in the OPEN position then follow the Power Supply directions for "Jogging" and JOG the Rotation until the torch plate is in the open position.

3. Insure that the clamping Jaws and Clamp Handle (lever) are in the fully closed position (the handle will be towards the weld head as near as possible (see Figure 5).

4. Turn the Clamp Adjust Wheels (either one) and adjust the opening of the Clamps to the approximate O.D. size to be mounted on.

5. JOG the AVC to its maximum UP position.

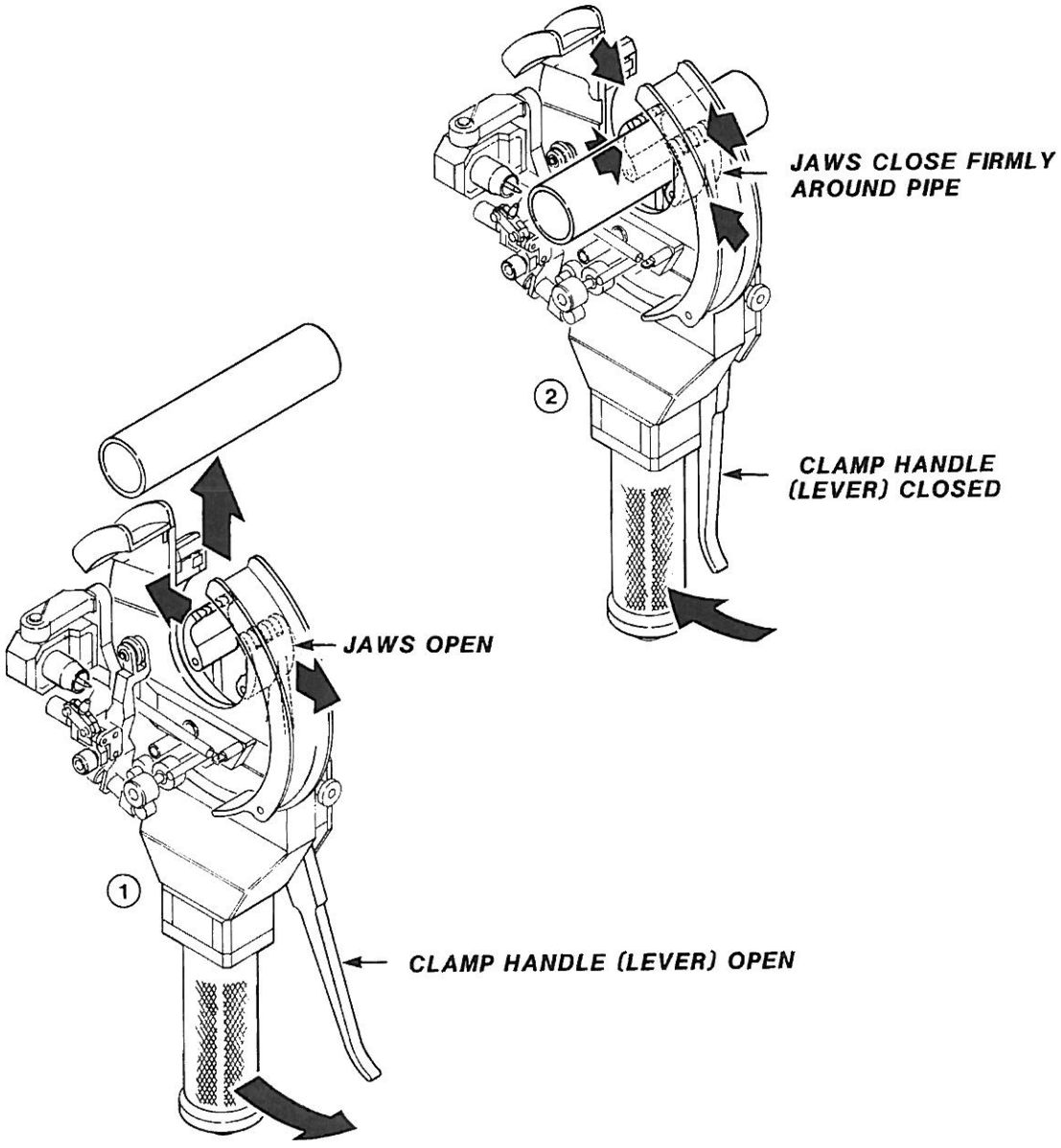

JAWS CLOSE FIRMLY
AROUND PIPE
2
CLAMP HANDLE
(LEVER) CLOSED
JAWS OPEN
1
CLAMP HANDLE (LEVER) OPEN

FIGURE 5

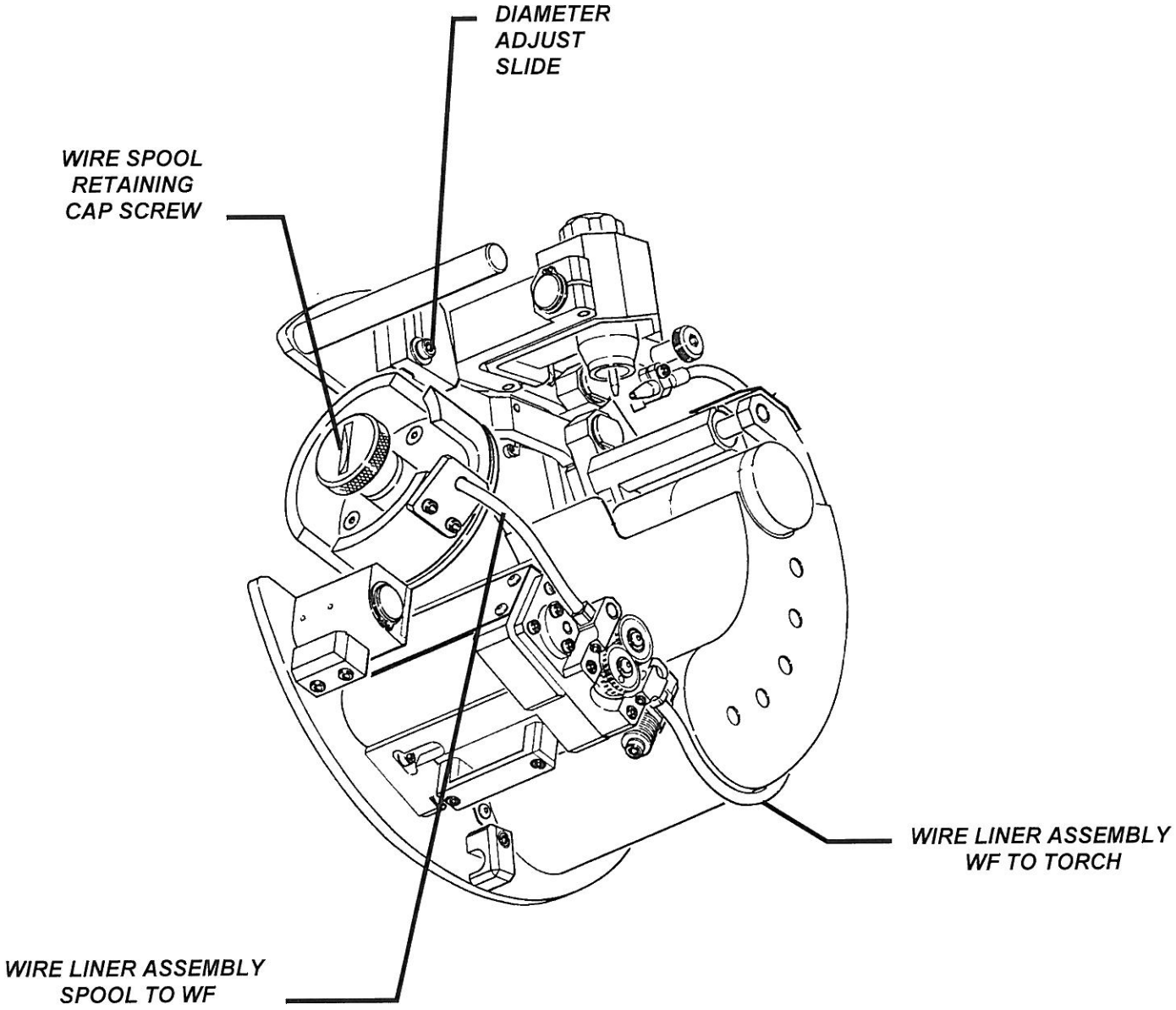

DIAMETER
ADJUST
SLIDE
WIRE SPOOL
RETAINING
CAP SCREW
WIRE LINER ASSEMBLY
WF TO TORCH
WIRE LINER ASSEMBLY
SPOOL TO WF

FIGURE 6

SECTION II - INSTALLATION

2.2 INITIAL WELD HEAD MOUNTING AND DIAMETER CHANGE

6. Loosen the Hex Head Screw that retains the Torch Assembly Diameter Adjust Slide. Slide the Torch Assembly all the way out to its maximum diameter and leave loose for now (see Figure 6).

7. Holding the M-79 by the Handle with one hand, pull the clamp lever out away from the head. This will open the Clamping Jaws fully and allow the pipe to be welded to be inserted into the "U" section of the Torch Plate (see figure 5).

8. Start closing the Clamp Handle. If the Clamping jaws contact the pipe and prevent the Handle from closing all the way then turn the Clamp Wheels again until the jaws open enough to allow the Clamp Handle to close.

9. If the Clamp Handle closes and the pipe is still loose in the Clamp then adjust the Clamp Wheels again until the jaws are closed enough to create a solid mount. The jaw diameter should be set for a very firm grip but not enough to dent or distort the pipe or clamps.

10. Once the head is firmly clamped the Torch Assembly Diameter Adjustment Slide can be pushed down. The position of the slide will be the top of the AVC stroke so for most applications this should be moved so the tip of the electrode is about 0.25" (6.3 mm) above the surface of the pipe to be welded.

If the Torch Assembly is adjusted to high above the pipe there may not be enough AVC stroke to reach the ROOT of the weld. If adjusted to close to the pipe there may not be enough room for the weld CAP pass and desired arc gap.

Most M-79 versions have enough AVC stroke that this adjustment is only critical when welding on Heavy Wall (thick) applications.

11. Tighten the Hex Head Screw. Insure that it is tight enough to prevent slippage of the Slide. Check that the Electrode can be adjusted down to the ROOT area and adjusted up above the eventual CAP area. If the Electrode cannot be moved enough then re-adjust the Slide position until enough adjustment is achieved.

12. Tighten all adjustment locking screws to insure that the set-up stays adjusted for the desired diameter and wall.

13. Once set-up for a particular size the operator should only have to JOG the Torch Plate to the open position and open the Clamp Handle (lever) to remove the Head and insert it on another identical size pipe.

2.3 WIRE INSTALLATION

Most Model 79 versions above 3500 have the Wire Feeder and Wire Spool Holder built onto the Torch Plate Assembly, follow step 2.3.1 for wire installation for those heads. Most versions below 2375 use the M95-WF Remote Wire Feed Option, follow steps 2.3.2 for wire installation for those versions.

SECTION II - INSTALLATION

2.3 WIRE INSTALLATION (continued)

1. On Board Wire Feed Versions (M79-3500 and up)

    1. Wire installation requires that the system must be turned ON and able to JOG wire.

    2. Remove the Wire Liner assembly from the Torch to the Wire Feed Section (see Figure 6)

        Alternative Method - In most cases it is only necessary to remove the Wire Liner at the Wire Feed assembly and not from the Torch. However, if problems are encountered during Step 2.3.1.9, then the entire Liner Assembly should be removed.

        NOTE

        Installation of the Wire into the Torch Liner Assembly is done by hand. Do not use the Wire Feed Motor to feed wire through the liner assembly during installation.

    3. Remove the Wire Spool Retaining Cap Screw (or nut on larger spools).

    4. Holding the Wire Spool firmly, remove the end of the wire from the retaining hole on the Spool. Allow 4 to 6 inches of wire to unwind. Be sure to hold your thumb over the rest of the wire to keep it from unwinding.

    5. Cut the bent or twisted end of the wire off, leaving undamaged, dull wire on the end. If your cutters are leaving a sharp end it may be required to file the end before insertion into the liner (see Figure 7).

    6. Thread the end of the wire into the liner that goes from the spool to the Wire Feeder until it engages with the Wire Feed Drive Rollers.

    7. Jog the wire until the Drive Rollers grab the wire and feed about 12 inches of wire out the other side of the Wire Feed Assembly.

    8. Slide the Spool into the Spool Holder and install the Wire Spool Retaining Cap Screw (or spool nut on larger spools).

    9. Thread the wire by hand into the Torch to Wire Feeder Liner assembly until the wire comes out of the Nozzle. The Wire Nozzles are not self feeding, sometimes it may be required to remove the Nozzle and thread the wire into the Nozzle by hand (see Figure 8).

    10. After the wire is threaded in the Liner, slide the Liner up the Wire Feeder and re-engage the Liner Fitting locking screw. Re-connect the Nozzle end to the Torch Manipulator.

    11. After replacing the wire and re-installing the nozzle and liner always jog several feet of wire out and cut it off flush with the nozzle. This will remove any bends or kinks caused by the installation.

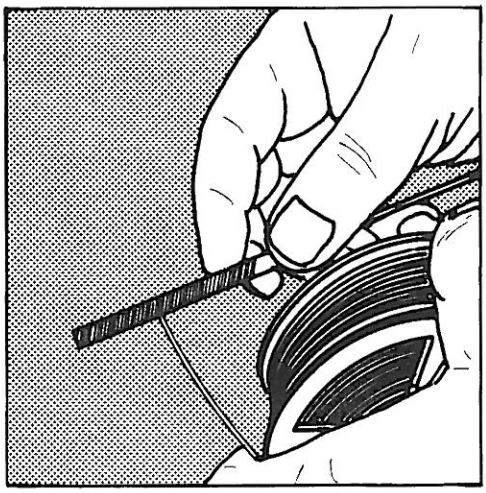


FIGURE 7

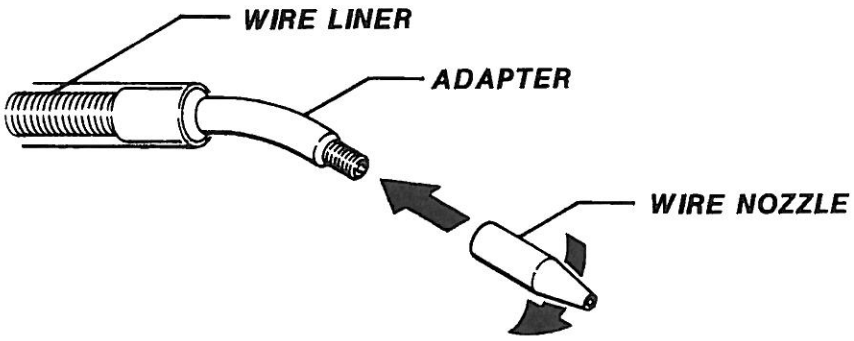


FIGURE 8

FIGURE 7, 8

SECTION II - INSTALLATION

2.3 WIRE INSTALLATION (continued)

2. M-79 Versions using the M95-WF Remote Wire Feed Option (M79-2375 and below)

1. Wire installation requires that the system must be turned ON and able to JOG wire. This requires that the M-95-WF option be set up properly and connected to the Power Supply per its own installation instructions.

2. The entire Wire liner is integrated into the Torch Service cable Assembly. The Wire Liner Assembly consists of:

1. Wire Feed Nozzle that threads onto the Nozzle Adapter.
2. Nozzle Adapter, this is a curved Stainless interface between the OUTER liner and the nozzle.
3. Armored OUTER liner.
4. Inner Liner.
5. M-95-WF connection FITTING.

3. Loosen the Wire Entry/Nozzle Bracket Retaining Screws and remove the Wire Nozzle from the curved Stainless Steel Adapter (unscrew it). Let the Adapter and liner dangle loose.

4. JOG about 12 inches of wire out of the end of the M-95-WF Roller/Tension Housing.

5. Insert the wire into the M-95 Liner FITTING and slowly push the fitting down the wire and into the end of the Roller/Tension Housing. Tighten the FITTING set screw to secure the liner and fitting.

NOTE

If the wire tip is sharp, it will cut the inner Liner and reduce the life of the Liner. It will also make the feeding of the wire harder. Dull the tip of the wire with a file before threading (see Figure 7).

6. Keep the Service cable as straight as possible and JOG the wire until it comes out of the Nozzle Adapter.

7. Insert the wire into the Nozzle and then thread the Nozzle onto the Adapter.

8. During installation it is quite common to make abnormal bends and kinks in the wire. These must be removed before welding. JOG wire out until it flows smoothly with no changes in direction caused by bends or kinks.

SECTION III - OPERATIONAL NOTES AND CALIBRATION

3.0 OPERATION AND CALIBRATION

When installed, the M-79 Weld Head becomes an integral part of a Pipe Welding System. The majority of the M-79 performance and operational requirements are controlled by the Power Supply. This section deals only with the Calibration and Initial Operation requirements of the M-79 only. Consult your AMI Power Supply Operation Manual for more details about functions and Welding.

As stated in the Section 1, automated welding requires a good deal of operator expertise and management expertise in how to set-up an effective use of this equipment. This expertise can only be obtained through training and practice. It cannot be obtained from this manual.

THIS MANUAL IS NOT INTENDED AS A SUBSTITUTE FOR TRAINING

3.1 CALIBRATION

1. Most of the calibrated functions are contained in the Power Supply/Controller Unit, however all AMI Weld Heads must be calibrated (matched) for the Wire Feed Speed and Travel Speed to the Power Supply/Controller that it is used on. **ANYTIME** the M-79 or the M-95-WF Wire Feed Option are changed from one Power Supply to another it must be checked again for calibration of these two (2) functions.

2. Calibration of the Wire Feed for a M-79 with built-in Wire Feeder or with a M-95-WF Option is the same as Wire Calibration for most AMI Pipe Weld Heads. Follow the procedure given in the Operation Manual for the Power Supply/Controller unit in use and the Calibration section of the M-95-WF Operation Manual.

3. Methods of Travel (rotational) Speed calibration will vary depending on the Power Supply model being used. The Travel calibration *procedure* for most Pipe Welding Power Supplies will require calibrating the weld head in IPM (Inches per Minute) of travel. The M-79 must be calibrated in RPM (Revolutions per minute) not IPM. Adjust the *procedure* as follows:

4. Rotation Calibration - Perform the following steps to calibrate the M-79 Rotation Speed:

    1. Make sure the M-79 is free of obstructions and is able to safely rotate the Torch Plate Assembly.

    2. Prepare the Power Supply/Controller as directed in the Manual for the Power Supply. Follow these procedures until the step for actually checking the distance traveled.

    3. A Travel Calibration procedure should simply set the Power Supply for a given constant speed for a given period of time with a known starting point and then operate the sequence and measure the travel.
    4. If the Power Supply Procedure does cover calibration in RPM then simply set the machine to rotate at 1 RPM for 1 minute. Insure that no Travel Start Delays or Travel Stop Delays are used and that the Travel Mode is Continuous and not Stepped. The M-79 must be calibrated in the direction going toward the wire feed nozzle (CW on most M-79's).

    Insure that the System Mode is in TEST.

SECTION III - OPERATIONAL NOTES AND CALIBRATION

3.1 CALIBRATION

4. Rotation Calibration

5. Press SEQUENCE START. When the sequence is over the Weld Head should have made 1 revolution. If it has gone to far or to little then adjust the Calibration potentiometer located above the handle where it says "CAL" or "CALIBRATE". Repeat the test sequence until the M-79 rotates the correct amount.

3.2 CALCULATING WELDING RPM SPEED FROM IPM

1. Most welding procedures and guidelines for weld procedure development discuss welding speed in terms of Inches per Minute (IPM). The M-79 travels in RPM and actual IPM will vary depending on the WELD DIAMETER. Use the following formula to calculate RPM based on IPM (note that some AMI Power Supplies have an option that does this for you).

$$\text{Welding Speed RPM} = \frac{\text{Desired Weld Speed in IPM}}{\text{Weld Diameter} \times 3.14}$$

To use:

1. Multiply the Weld Diameter by 3.14 (pi). This gives the total distance to be traveled in one revolution (circumference). Insure that you use the diameter of the weld surface, not the pipe itself. The diameter of the ROOT pass is a lot smaller than the CAP pass.

2. Divide the above into the Desired IPM Weld Speed. This will give you the RPM setting that should be used to achieve the desired welding speed.

3.3 OPERATIONAL NOTES

1. Operational Precautions - The following items should be noted and care taken during the operation to insure proper operation and longer Weld Head life expectancy:

    1. Extreme care should be taken to protect the Weld Head Cable Assembly.

        1. Never wrap the cables against their natural flow.
        2. Never allow the cables to sit on pre-heated pipes.
        3. Never run the cables in walkways or exposed areas.
        4. Never grind around the cables, weld head or power supply.
        5. Always watch the cables ANYTIME the Weld Head is in motion to prevent binding or fraying against sharp objects.

    2. Never allow the Weld Head to sit on a hot pipe, when not welding, and bake. When Welds are completed or delayed, remove the Head.

    3. The Weld Head, during normal operations, will get very warm. Advise all welding personnel to take precautions to prevent burns when handling the HOT Weld Head.

    4. Additional precautions are mentioned in Section I and all welding personnel should be advised of these precautions.

SECTION III - OPERATIONAL NOTES AND CALIBRATION

3.3 OPERATIONAL NOTES

2. Torch Set-Up - The following items must be set-up and/or checked on the Torch Assembly after mounting and prior to welding (see Figure 9):

NOTE

Be sure that the Torch Assembly has been set for the proper diameter (see Section 2) before setting or checking the following items. Improper Diameter set-up can affect the setting and range of other functions.

1. Electrode Cross-Seam position - Insure that electrode is placed where the bead is supposed to go. Use the Cross-Seam Steering Wheel Function on the Power Supply or Pendant to move the electrode.

2. Torch LEAD/LAG Angle - in normal the Electrode should be perpendicular to the top of the pipe. This is called 0 LEAD/LAG angle. Some weld procedures require the Electrode to be leaned toward the filler wire (LEAD angle) or away from the wire (LAG angle). Set the LEAD/LAG angle by loosening the Torch Mount Bracket at the Torch Mount Arm and rotating the Torch to the proper angle and then re-tighten.

3. Torch Tilt IN/OUT - Some weld passes require that the Torch be TILTED toward one of the walls. Set the TILT angle by loosening the Torch at the Torch Mount Bracket and Rotating to the desired TILT and then re-tighten.

NOTE

The use of a Protractor is recommended for a precise setting of TILT and LEAD/LAG.

4. Electrode Stick-out - How far the electrode sticks out beyond the Gas Cup can affect many things including Gas Coverage, Wire Entry Angle and ability to reach the joint. This distance should be set per the procedure by loosening the BACK CAP and moving the electrode to the desired distance and then re-tighten the BACK CAP.

5. Wire Entry Angle - Some M-79 versions have several different Wire Entry Angle Brackets, of different degrees, that can be used and some have only a single fixed angle. Before welding insure that the proper wire entry angle bracket is installed.

6. Wire to Electrode Gap Adjust - Changes in ARC GAP cause changes in the width and depth of penetration. The AVC must be adjusted on occasions to maintain the desired ARC GAP. The Wire to Electrode GAP setting should be part of the weld procedure and the operator should use the nozzle UP/DOWN adjust knob to set the proper distance prior to welding. This way if the wire is not entering the puddle correctly the ARC GAP must have changed and the AVC can be adjusted. However, this only works if the Wire to Electrode Gap is properly set (per weld procedure) before welding.

   To set - Feed wire out under the electrode and measure the gap with feeler gauges. Before measuring or setting make sure any BENDS or KINKS in the wire have been fed out and that the CAST is the same as will be seen during the weld (CAST is the natural bend of the wire). Use the UP/DOWN adjust knob on the manipulator to correctly position the Wire.

SECTION III - OPERATIONAL NOTES AND CALIBRATION

3.3 OPERATIONAL NOTES

2. Torch Set-Up

7. Wire Cross-Seam Adjust - The CAST of the wire off of the spool will change slowly as the wire is fed. The Wire entry point must be kept stable. Use the Cross-Seam Adjust Knob to keep the wire where it is supposed to be. Normal Welds require the wire to enter directly under the electrode but some welds may have the wire favoring one side or the other.

3.4 RETURN TO HOME/AUTO-WRAP FEATURES

1. When using the M-79 on a M-227 or M-215 an Automatic "Return to Home" feature can be used. This feature rotates the head back to the open position after welding and allows the head to be removed.

2 Under some circumstances this may not be desired. It can be disabled by switching positions on the Return to Home Switch located on the side of the Main Clamp/Drive Housing.

3. After mounting, the M-79 is intended to have the Service Cable pre-wrapped one time before welding.

THE M-79 SHOULD ALWAYS UN-WRAP THE SERVICE CABLE DURING THE WELD.

If this is not done the Cable will be wrapped over backwards during a WELD and THIS WILL SHORTEN THE EXPECTED LIFE OF THE CABLE or RESTRICT THE ROTATION..

4. The M-227 Power Supply and some software versions of the M-215 also have an AUTO-WRAP feature. When engaged this function will automatically PRE-WRAP the cable one time. If the Return Home switch (see 2 above) is OFF this function will not work. REMEMBER THIS FUNCTION ONLY WORKS ON CERTAIN POWER SUPPLIES.

CAUTION

Engaging in AUTO-WRAP function again after the cable is already pre-wrapped will result in another wrap being put on. The head will not maintain control over two wraps and there may not be enough slack in the cable to support two wraps.

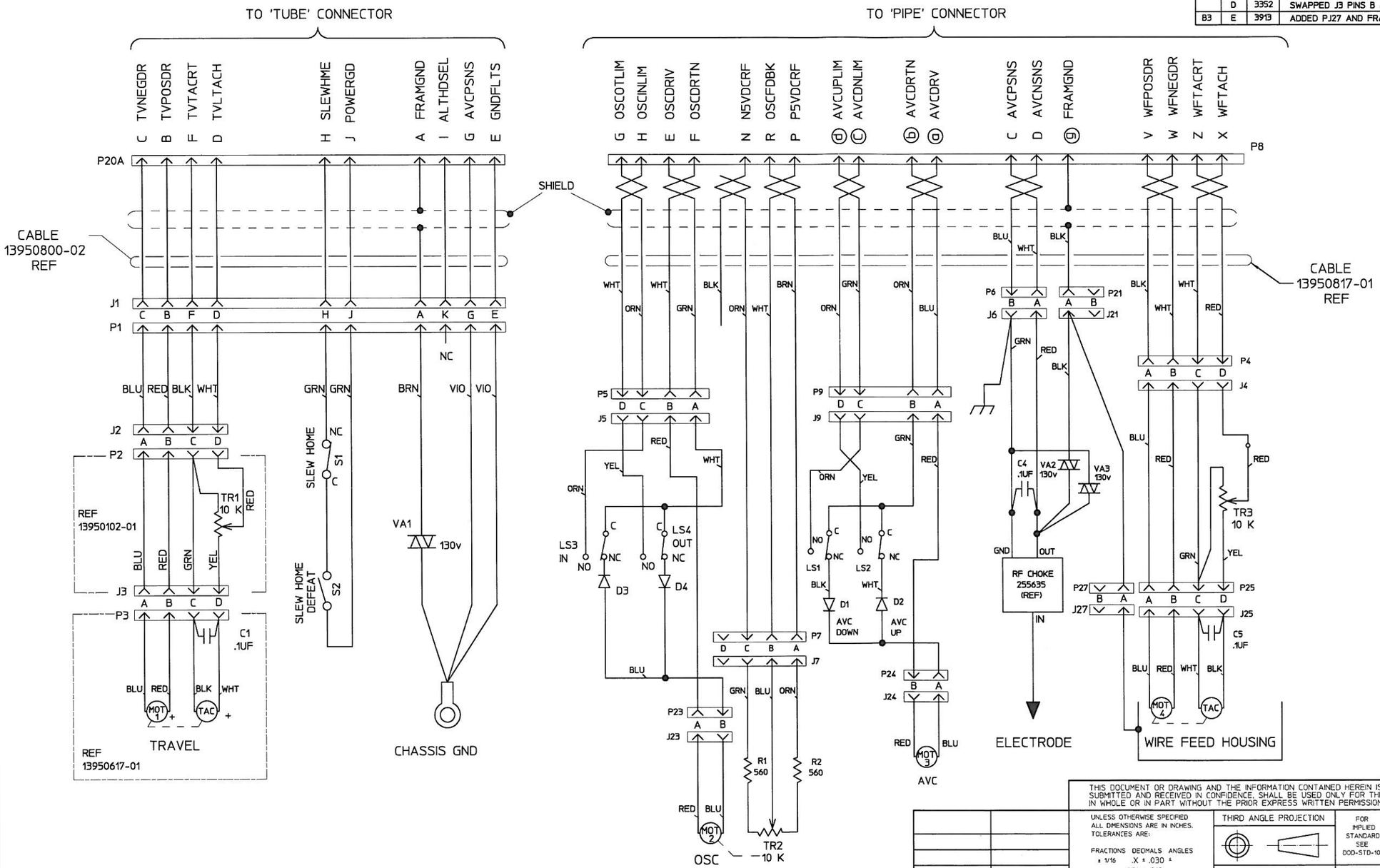
3.5 SOFTWARE VERSION NOTATION

Some older power supply software versions such as M-227 STD 1.4 (and lower) and M-215 STD 1.9 (and lower) do not have a weld schedule screen for any M-79 version. Some software versions only have a generic M-95 program and some have M-95 version specific screens (M95-2375, M95-6625, etc.). These M-95 screens may or may not be compatible with a M-79 version. Running a M-79 on this older software may require using a different weld head (M15, M81) screen and adjusting the program values (such as travel IPM, etc.) to achieve the desired performance of the M-79. Contact an AMI Service or Sales representative for more detailed information regarding your particular software version.

NOTES:

1. UNLESS OTHERWISE NOTED, DIODES ARE 1N5062.

ZONE	LTR	DCO	REVISIONS	DATE	BY	APPR.
	A	2569	ADDED REFERENCE DESIGNATORS TO CAPACITORS, COLORS TO WIRES & NOTE 1. D1 WAS D3 (AT AVC DOWN) & D2 WAS D4 (AT AVC UP) AND POLARITIES WERE REVERSED. CORRECTED PINS OF CONNECTORS. REFERENCE DESIGNATOR J WAS GIVEN TO MALE CONNECTORS AND VICE VERSA.	1-11-97	KB	GPE
	B	2920	CORRECTED P8-c WAS AVCUPLIM P8-d WAS AVCDNLIM	11-13-97	dm	LEC II
	C	3056	CHANGED RESISTORS R1 & R2 FROM 5.11K TO 560 OHM FOR OSC. AMPL. CORRECTION W/ NEW TYPE BALL-SCREW.	04-23-98	LEC II	GPE
	D	3352	SWAPPED J3 PINS B & C YEL. / GRN WIRE COLORS.	06-29-99	LEC II	
B3	E	3913	ADDED PJ27 AND FRAME GROUND CONNECTION.	10-30-01	TB	



41790103	79-3500 TOP ASSY
NEXT ASSY.	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES. TOLERANCES ARE:
FRACTIONS ± 1/16 DECIMALS .X ± .030 .XX ± .010 .XXX ± .005 ANGLES ±
ALL MACHINED SURFACES TO BE ✓
MATERIAL —

THIRD ANGLE PROJECTION

FOR IMPLIED STANDARDS SEE DOD-STD-100

APPROVALS	DATE
DRAWN: MC	3-10-95
CHECKED: LEC	3-10-95
APPR: GPE	8-01-96
QUOTATION	

ARC MACHINES, INC.

DESCRIPTION
WIRING DIAGRAM
WELD HEAD M79-3500

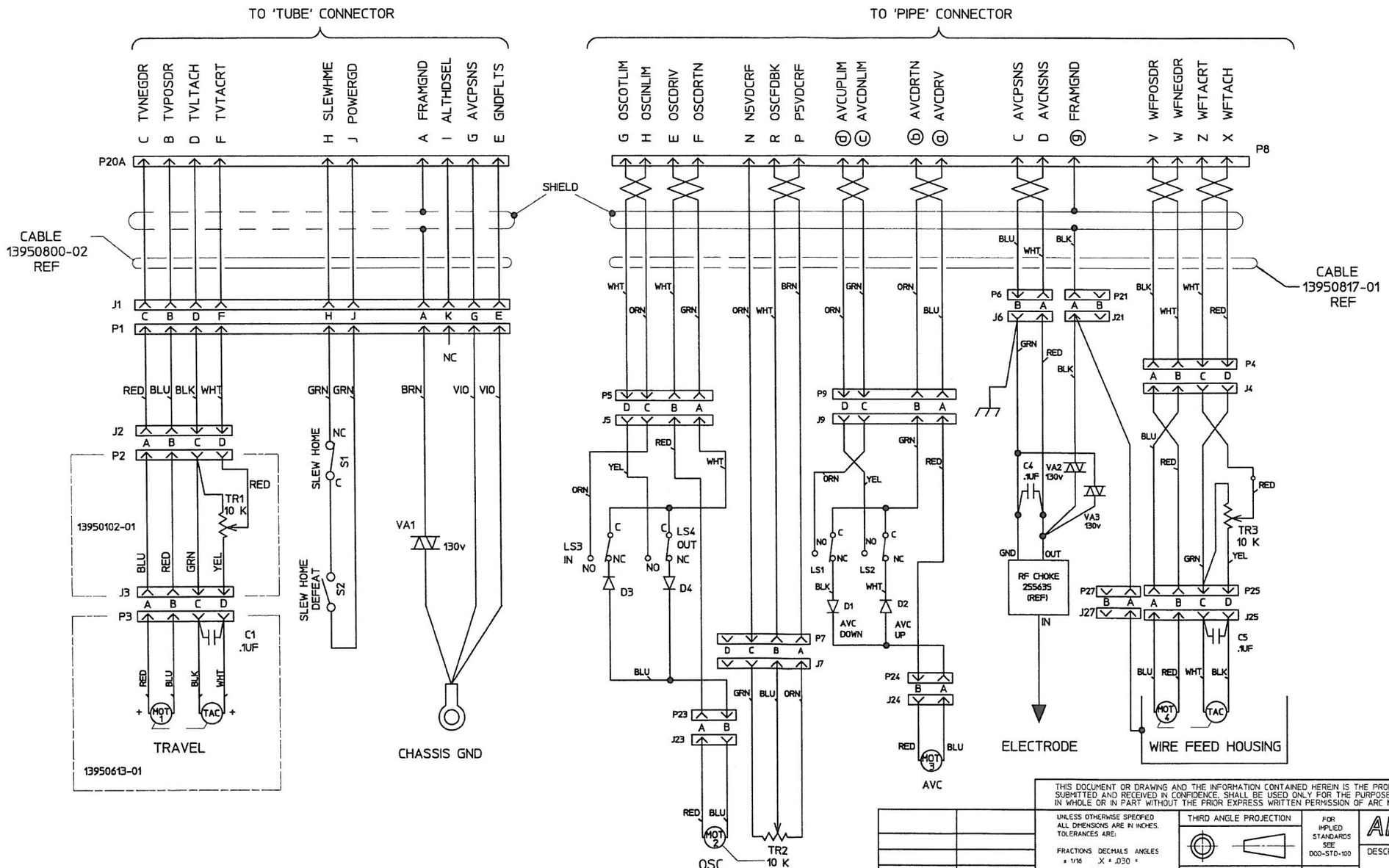
SIZE	MODEL NO	DRWG. NO.	REV.
D	79-3500	47791700	E

SCALE NONE | DO NOT SCALE DRAWING | SHEET 1 OF 1

NOTES:

1. UNLESS OTHERWISE NOTED, DIODES ARE 1N5062.

ZONE	LTR.	DCO	REVISIONS	DATE	BY	APPR.
A5	A1		DELETED RESISTORS R1, R2	2-5-97	L.G.	GPE
D4	A2		CORRECTED P8-d WAS AVCDNLIM P8-c WAS AVCUPLIM	11-13-97	DM	GPE
D4	B	3352	SWAPPED J3 PINS C & D WIRE COLORS GRN/YEL.	06-30-99	LEC	GPE
C7	C	3522	SWAPPED J1 PINS F & D TO MATCH CABLE DWG	12-16-99	GE	GPE
B3	D	3913	ADDED FRAME GROUND CONNECTION AND PJ27	10-30-01	TB	
B2	INA	4424	REPLACED BY M79A-6625	1-22-07	DM	LECII



INACTIVE
DATE: 1-22-2007 BY: DM
SEE DWG NO. : 47791703
APPROVED BY: LEC
DCO: 4424

41790100	79-6625 TOP ASSY
NEXT ASSY.	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES. TOLERANCES ARE:
FRACTIONS ± 1/16 DECMALS .X ± .030 .XX ± .010 .XXX ± .005 ANGLES ±
ALL MACHINED SURFACES TO BE ✓
MATERIAL —

THIRD ANGLE PROJECTION

FOR IMPLIED STANDARDS SEE DOD-STD-100

APPROVALS	DATE
DRAWN: KB	1-20-97
CHECKED:	
APPR: GPE	6-30-99
QUOTATION	

ARC MACHINES, INC.

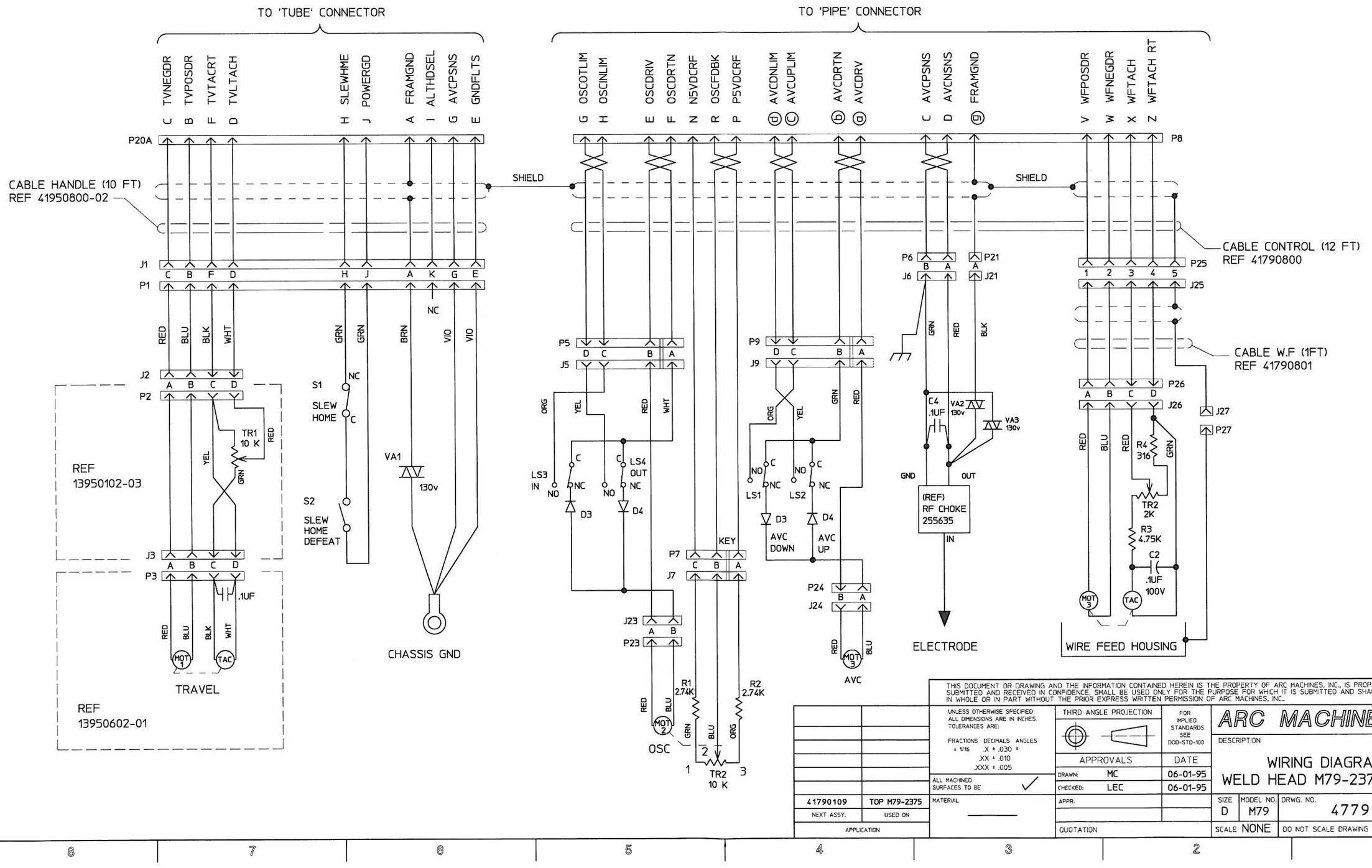
DESCRIPTION
WIRING DIAGRAM
WELD HEAD M79-6625

SIZE	MODEL NO.	DRWG. NO.	REV.
D	79	47791701	INA

SCALE NONE | DO NOT SCALE DRAWING | SHEET 1 OF 1

NOTES:

ZONE	LTR.	DCO	REVISIONS	DATE	BY	APPR.
---	A	3261	ADDED, MISSING WIRE COLORS,GND & OUT DESIG.TO RF CHOKE, LOWER CASE SYMBOL TO P8, CHANGED, P & J DESIG. TO CONN 5,6,9,21,24,25. POLARTY OF D3,D4. P8-X WAS P8-Z	3-18-99	DM	GPE
B7	B	3352	WIRE COLORS AT J3-C WAS YEL, J3-D WAS BLK	6-30-99	DM	



41790109	TOP M79-2375
NEXT ASSY.	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES. TOLERANCES ARE:

FRACTIONS DECIMALS ANGLES
± 1/16 .X ± .030 °
.XX ± .010
.XXX ± .005

ALL MACHINED SURFACES TO BE ✓

MATERIAL —

THIRD ANGLE PROJECTION

FOR IMPLIED STANDARDS SEE DOD-STD-100

APPROVALS	DATE
DRAWN: MC	06-01-95
CHECKED: LEC	06-01-95
APPR:	
QUOTATION	

ARC MACHINES, INC.

DESCRIPTION

WIRING DIAGRAM WELD HEAD M79-2375 AVC/OSC

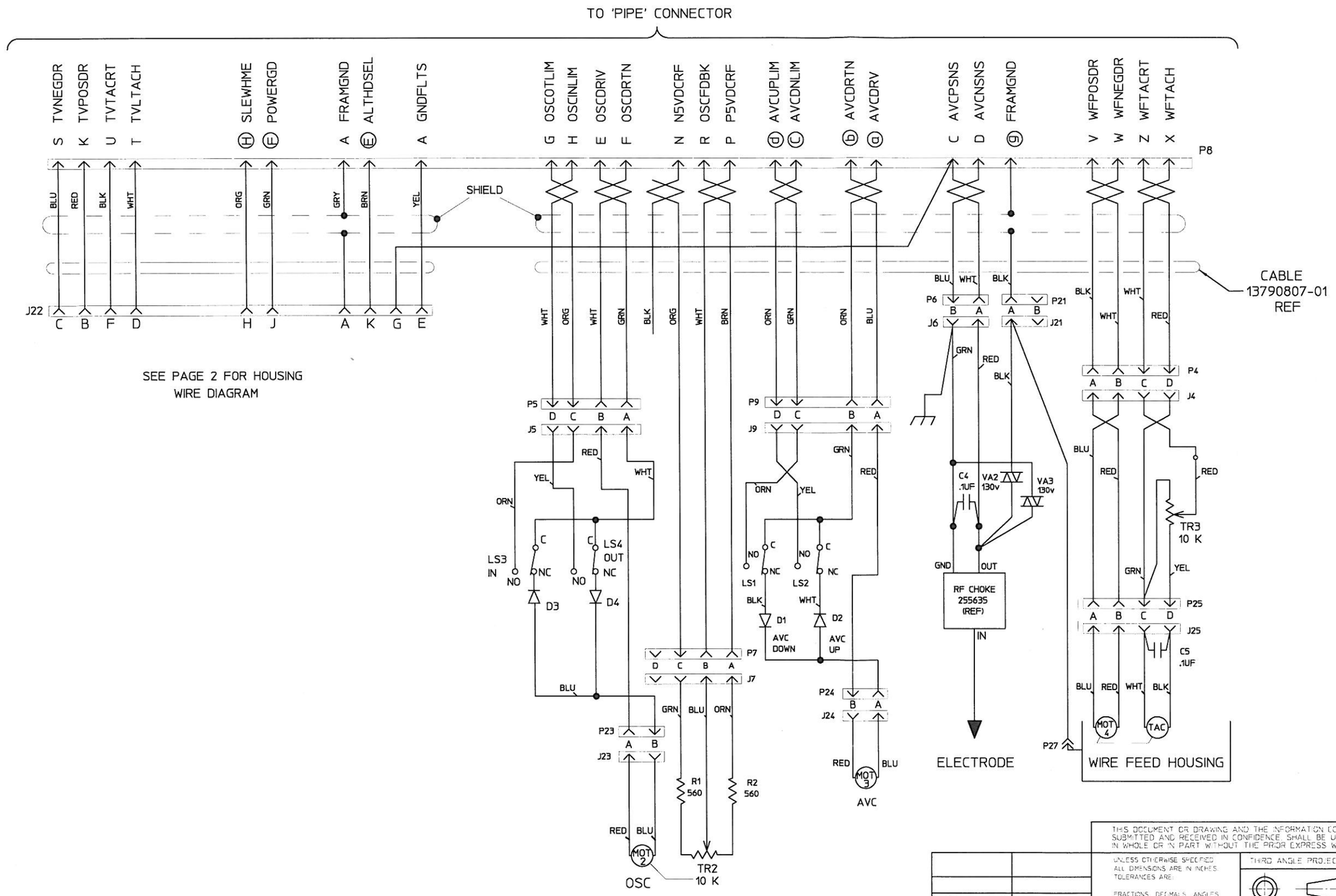
SIZE	MODEL NO.	DRWG. NO.	REV.
D	M79	47791702	B

SCALE NONE | DO NOT SCALE DRAWING | SHEET 1 OF 1

ZONE	LTR	ECO	REVISIONS	DATE	BY	APPR
---	A	4424	TITLE BLOCK DESCR. WAS M79-4500 ONLY	1-12-07	I. M.	LEC
---	B	4497	TITLE BLOCK DESCR. WAS M79-4500/6625.	1-04-08	I. M.	LEC
S1-B3	C	4775	SWAP WIRE FEED MOTOR / TACH WIRES AT J4	4/10/08	EO	

NOTES:

1. UNLESS OTHERWISE NOTED, DIODES ARE 1N5062.
2. CONN P27 IS LUG CONNECTED BY MOTOR MTG SCREW.



41790101-02	79A-6625
41790124	79A-4500
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES. TOLERANCES ARE: FRACTIONS ± 1/16, DECIMALS X ± .030, XX ± .010, XXX ± .005, ANGLES ±

ALL MACHINED SURFACES TO BE ✓

MATERIAL —

THIRD ANGLE PROJECTION

FOR IMPLIED STANDARDS SEE DOD-STD-100

APPROVALS		DATE
DRAWN	LEC	6-03-03
CHECKED	TN	6-03-03
APPR	LEC	6-10-03
QUOTATION		

ARC MACHINES, INC.

DESCRIPTION

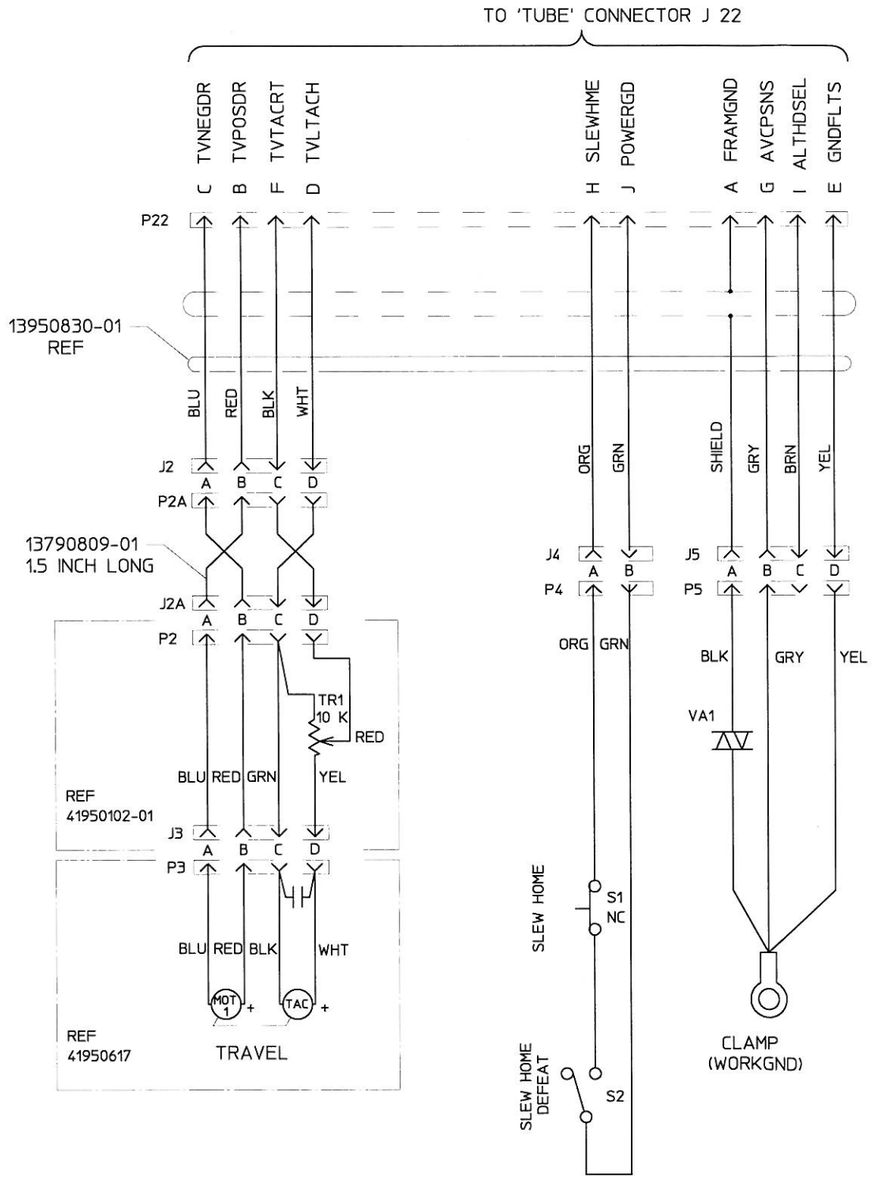
WIRING DIAGRAM
M79A-3500/4500/6625

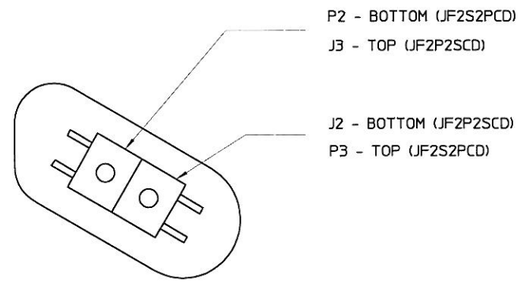
SIZE	MODEL NO.	DRWG. NO.	REV.
D	79	47791703	C

SCALE NONE | DO NOT SCALE DRAWING | SHEET 1 OF 2

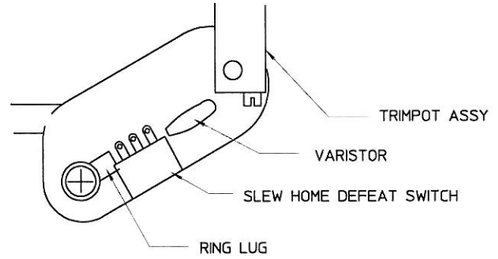
NOTES:

ZONE	LTR	ECO	REVISIONS	DATE	BY	APPR





COMPONENT POSITIONS



	M79A-6625
	M79A-4500
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES TOLERANCES ARE:
FRACTIONS ± 1/16 DECIMALS .X ± .030 .XX ± .010 .XXX ± .005 ANGLES ±
ALL MACHINED SURFACES TO BE ✓
MATERIAL —

THIRD ANGLE PROJECTION

FOR IMPLIED STANDARDS SEE DOD-STD-100

APPROVALS		DATE
DRAWN	LEC	6-03-03
CHECKED	LEC	6-03-03
APPR	TN	6-03-03
QUOTATION		

ARC MACHINES, INC.

DESCRIPTION
WIRING DIAGRAM
M79A-3500/4500/6625

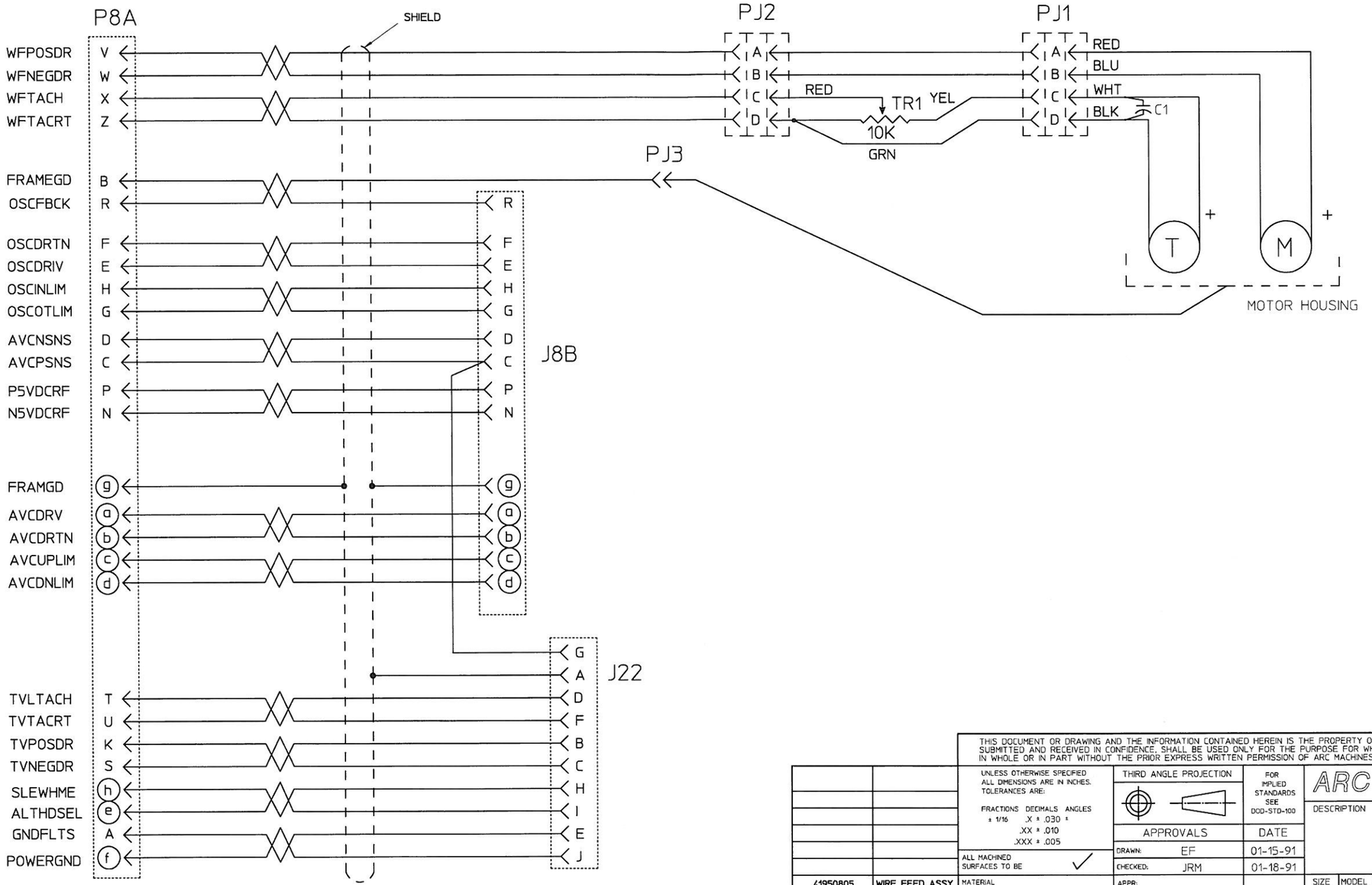
SIZE	MODEL NO.	DRWG NO.	REV.
D	79	47791703	C

SCALE NONE | DO NOT SCALE DRAWING | SHEET 2 OF 2

NOTES:

ZONE	LTR.	DCO	REVISIONS	DATE	BY	APPR.
	A1		R2 WAS 274 OHMS	4-1-91	JRM	
	A2		TR1 WAS 56LR500	5-3-91	JRM	
	A	1502	TR1 WAS 500 OHMS	7-12-91	JRM	GPE
C6	B	1482	DELETE RES R1 AND R2, TR1 WAS 2K	02-12-92	MC	GPE
	C	2201	REDRAWN ON CAD, ADDED J22 & J8B AND P8A WAS: P8	05-16-95	MC	GPE
	D	2262	SWAP PINS W WITH V AND Z WITH X ON P8A .	10-24-95	LEC II	

WIRING DIAGRAM



UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES. TOLERANCES ARE:
FRACTIONS ± 1/16 DECIMALS .X ± .030 .XX ± .010 .XXX ± .005 ANGLES ±
ALL MACHINED SURFACES TO BE ✓
MATERIAL

THIRD ANGLE PROJECTION

FOR IMPLIED STANDARDS SEE DOD-STD-100

APPROVALS	DATE
DRAWN: EF	01-15-91
CHECKED: JRM	01-18-91
APPR:	
QUOTATION	

ARC MACHINES, INC.

DESCRIPTION
REMOTE WIRE FEEDER
M95 WELD HEAD

41950805	WIRE FEED ASSY
NEXT ASSY.	USED ON
APPLICATION	

SIZE	MODEL NO.	DRWG. NO.	REV.
D	95-WF	47951701	D

SCALE NONE | DO NOT SCALE DRAWING | SHEET 1 OF 1