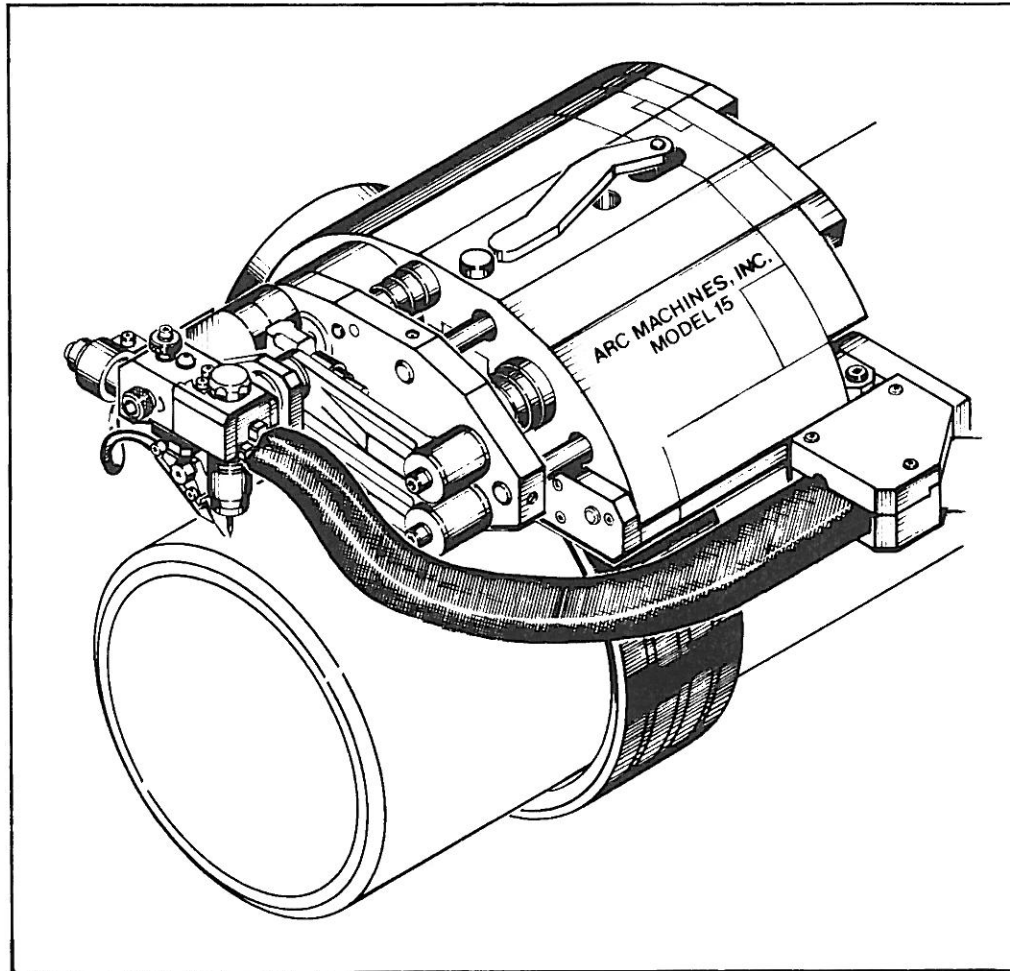


ARC MACHINES, INC.



MODEL 15 WELD HEAD OPERATION MANUAL

***MODEL 15 WELD HEAD
OPERATION MANUAL***

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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 – 19 June 1985
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REV.	DCO #	CHANGE DESCRIPTION	DATE	APR
A	4083	Revised to ISO standards, transferred to WORD document	02-03-03	LEC
B	5424	Clarify attachments	2-11-10	D.C.

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MODEL 15 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-15 Weld Head can be configured in many versions. However, all M-15 Weld Head versions have a common design and are used essentially the same. This Manual is intended to cover the entire M-15 Product Line and not just one version. Version specific performance specifications can be found in the appropriate AMI Weld Head Specification. Version specific wiring and parts information can be found in the appropriate Illustrated Parts Breakdown Manual (IPB) supplied with each Weld Head.

The Model 15 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-15 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-15 Weld Head.

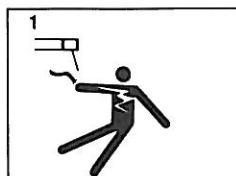
NOTE

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-15 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 15 WELD HEAD OPERATION MANUAL

SECTION I - INTRODUCTION





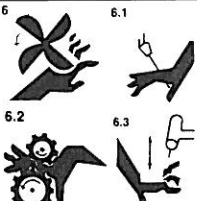
1.1 SAFETY PRECAUTIONS (continued)

<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>
<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>

MODEL 15 WELD HEAD OPERATION MANUAL

SECTION I - INTRODUCTION

1.1 SAFETY PRECAUTIONS (continued)

	WARNING: Weld materials can emit toxic fumes during welding. WELD ONLY IN AREAS WITH ADEQUATE VENTILATION.
	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-15 is intended for typical GTAW gases ONLY. *NEVER CONNECT OXYGEN OR ACETYLENE TO THE M-15.*
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.

1.3

***MODEL 15 WELD HEAD
OPERATION MANUAL***

SECTION I - INTRODUCTION

1.2 OPERATIONAL PRECAUTIONS (continued)

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.
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-15 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-15. 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-15 or any AMI Power Source for the purposes of pipe thawing.
15. Proper operation of the wire feeder (and acceptable welds) depends on the spools being filled properly without contaminating the wire and also winding properly to insure the wire comes off the spool smoothly and consistently.

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".

***MODEL 15 WELD HEAD
OPERATION MANUAL***

SECTION I - INTRODUCTION

1.3 SHOCK HAZARD WARNING (continued)

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-81 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."

***MODEL 15 WELD HEAD
OPERATION MANUAL***

SECTION I - INTRODUCTION

1.4 RF AND EMI EMISSIONS (continued)

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 BASIC COMPONENTS

For purposes of description the Model 15 consists of five (5) basic assemblies. A brief description of each is as follows (Refer to Figure 1).

1. Main Weld Head Housing (Figure 1, Item 1)

1. This is a one (1) piece machined aluminum housing that contains the rotation Drive Motors, the Torch Oscillation Motor and the Arc Voltage Control (AVC) Motor.
2. The main housing mounts to the Guide Ring Assembly (see Section 1.5.5) on the pipe to be welded. The gears on the underside of the Main Housing engage the gear teeth on the Guide Ring. The Main Housing rides directly on the Guide Ring.
3. The Weld Head Main Housing is held on the Guide Ring by Latch Roller assemblies that lock the Weld Head onto the Guide Ring.

2. Torch and Wire Manipulator Assembly (Refer to Figure 1, Item 2 - "A" Torch Shown)

1. The Torch Assembly contains a TIG water cooled Torch with Torch Position adjustments. The Torch Assembly also contains Wire Feed entry adjustments.
2. The Model 15 can be equipped with three (3) different Torch Assemblies. The Model "A", "C" and "D" Torch Assemblies provide different options for clearance and operation techniques. Special torches are documented separately and are not contained in this manual.

***MODEL 15 WELD HEAD
OPERATION MANUAL***

SECTION I - INTRODUCTION

1.5 BASIC COMPONENTS (continued)

3. Cable and Connector Assembly (Refer to Figure 1, Item 3)
 1. The Cable and Connector Assemblies supply the pervious two assemblies with cooling water, Electrode Power (welding Current), welding Inert Gas and Electrical Control wiring for Weld Head Motor functions.
4. Wire Feed Assembly (Refer to figure 1, item 4) Single Wire Feed (CCW) model shown (Standard).
 1. The Wire Feed Motor assembly is mounted on the Main Housing. This unit provides puller filler wire feed capability. The Wire Feed Assembly contains a Drive Motor with Wire Feed Gears and a Wire Spool Holder assembly designed to use 4 inch-2 pound wire spools.
 2. The Mode 15 Weld Head is designed to use one (1) or two (2) Wire Feed Assemblies. The Dual Wire Feed Option provides automatic Wire Feeder selection as a function of the Travel Mode direction. The CCW Wire Feeder (standard) is operational in the CCW direction of travel. The CW Wire Feeder (optional) is operational in the CCW direction of travel. The CW Wire Feeder (optional) is operational in the CW direction of travel. Use of the Dual Wire Feed option requires the use of dual-entry torch.
5. Weld Head Guide Rings and Guide Track (Refer to figure 1, Item 5)
 1. The Guide Rings or Guide Track provide the Drive Surface (Gear Teeth) for the Weld Head and align the Weld Head to follow the Weld Seam or joint.
 2. The Guide Rings come in standard Pipe Sizes from four (4) inch to forty four (44) inch or larger.
 3. Any Guide Ring can be mounted on a pipe one (1) pipe size smaller. Example: A 12 inch Pipe Guide Ring can be mounted on a 12 inch Pipe or a 10 inch Pipe.
 4. The Guide Ring is a two (2) piece split device that is connected by four (4) Captive screws (2 on each side). The Guide Rings have multiple spring loaded feet for mounting and alignment, and solid feet for locking the Guide Ring on the Pipe.
 5. Two (2) Latch Roller Assemblies (sized for that Guide Ring size) come with each Guide Ring. The Latch Rollers mount on the Weld Head Housing to lock the Weld Head onto the Guide Ring.

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MODEL 15 MAJOR ASSEMBLIES

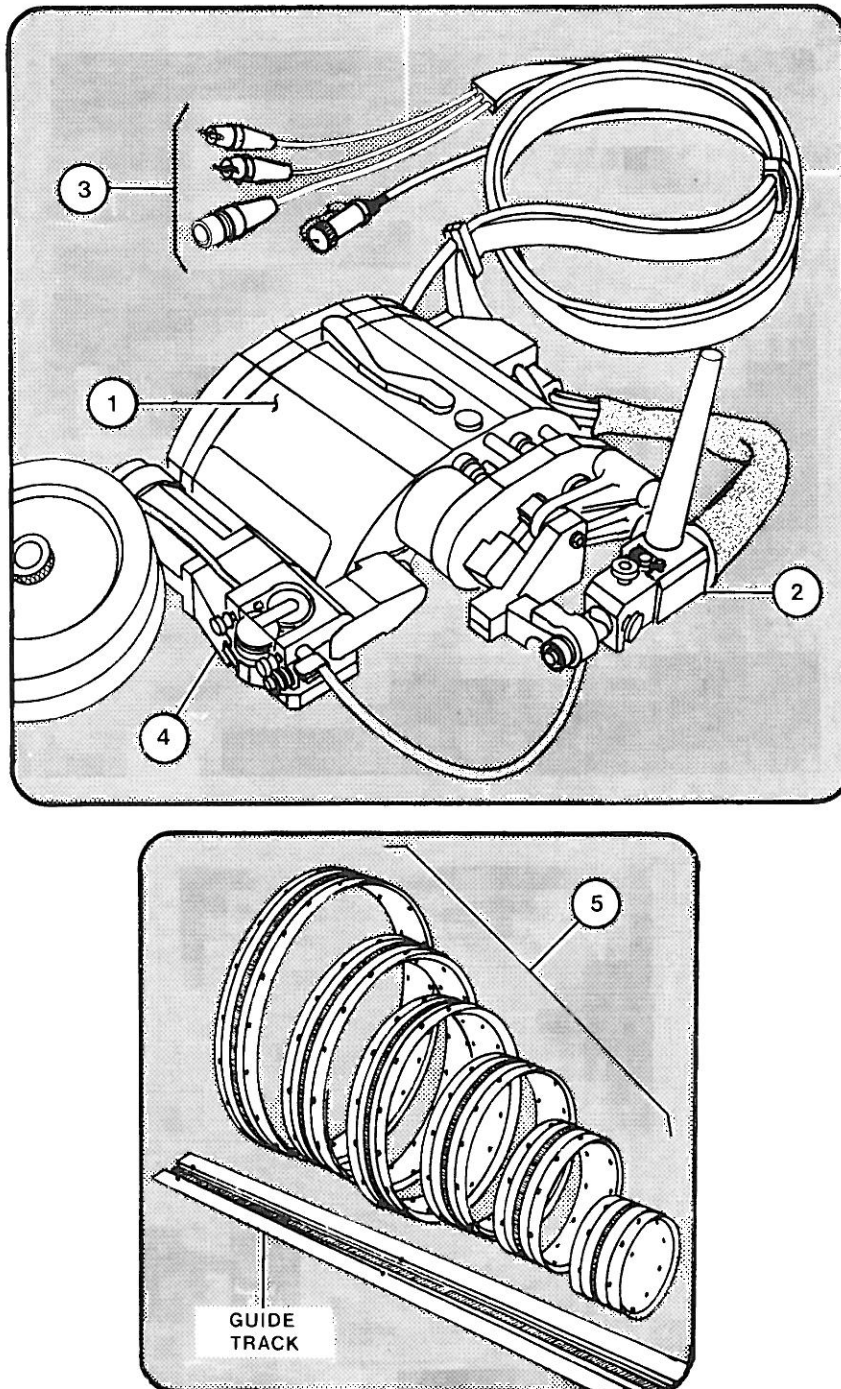


FIGURE 1

***MODEL 15 WELD HEAD
OPERATION MANUAL
SECTION II - SPECIFICATION***

2.0 INTRODUCTION

The welding head described herein is one element in the Model 15 (M-15) automatic pipe welding system. In concert with guide rings of the proper size and one of several AMI Power Supplies, high-quality orbital pipe welds can be made for a range of pipe sizes from 4-inch and up with excellent productivity. The M-15 and M15-415 are identical Weld Heads except they are designated for operation on Specific Power Supplies. For clarity, this specification will only reference the M-15 and unless noted, all ranges and parameter apply to all versions.

2.1 GENERAL DESCRIPTION

1. Basic Functions

The AMI M-15 Pipe Welding Head is a rugged, precision tool with low radial clearance. It is intended for field use in the nuclear, shipbuilding, chemical, petrochemical and construction industries where weld quality requirements are stringent and the use of the GTAW process is cost-effective.

When connected to one of several AMI automatic pipe welding systems, the M-15 provides the following functions:

1. Carriage Travel (rotation around or along the weld seam).
2. Wire Feed (cold or hot wire GTAW filler).
3. Automatic Voltage Control (arc gap control).
4. Torch Oscillation (welding weave).
5. Torch Steering (cross-seam adjustment).
6. GTAW Torch options up to 400 Ampere.
7. High-Frequency or Touch Start Arc Ignition.

2. Working Envelope Construction

The M-15 welding head may be utilized to weld pipes with tight radial obstructions. The low profile of the M-15 was not achieved by sacrificing durability. Consideration throughout the design process was given to the fact that the weld head must work and continue to work under construction and manufacturing environments. This attention to the real world environment is reflected in everything from the one-piece housing, machined from a ten-pound block of aluminum, to the protective boots over the water and gas connections.

3. Weld Head Travel and Guide Ring

A two-piece guide ring assembly provides guidance relative to the weld joint. The M-15 attaches to the guide ring with a single, latching lever, which loads a pair of tapered cam followers against a wedge section on each side of the guide ring inside surface. The cam followers are located on the centerline of the head and ball-bearing rollers at each end of the head engage the outside guide ring and the head. This configuration provides significant overall weld head stability. The M-15 is propelled around the track by a pair of geared motors which engage a bull gear on the guide ring with a pair of spur gears. Guide rings use a two-piece construction with captive socket head fasteners.

***MODEL 15 WELD HEAD
OPERATION MANUAL***

SECTION II – SPECIFICATION

2.1 GENERAL DESCRIPTION (continued)

4. Guide Ring Mounting

Each guide ring has multiple pairs of spring-loaded feet at intervals around the ring. Each guide ring also has 3 or 4 sets of solid feet located at 120 or 90 degrees (depending on ring size) intervals. The two halves of the Guide Ring are mounted onto the pipe and are held together by 4 captive screws. The spring-loaded feet then hold the guide ring in place (even on vertical pipe) while the operator aligns the ring with the weld seam. The solid feet are then used to lock the guide ring in place.

Guide rings may also be used on up to two smaller pipe sizes by replacing the regular solid feet with solid extension feet. This action does increase the radial clearance. A set of extension feet for the next smaller pipe size is provided with each guide ring. Other standard and special sizes are available on request.

NOTE: Reference AMI Specification No. 15-GR for further details about Guide Rings and track assemblies.

5. Wire Feeder

The Wire Feeder assembly attaches to the forward end of the M-15 housing with a pivot clamp so that it may be adjusted to provide minimum radial clearance. The Wire Feeder uses a permanent magnet D.C. gear motor with integral tachometer. The wire spool holder is attached to the Wire Feeder with an adjustable pivot clamp (for maintaining minimal radial clearance).

6. Torch Oscillator/Cross-Seam Steering

The oscillator mechanism utilizes a precision torque motor driving an integral covered ball-screw between a pair of hardened stainless steel ways. The round ways are supported by two sets of precision ball-bushings with integral wipers. A covered rectilinear slide-pot provides precision position feedback for the oscillator control system. A pair of limit switches prevent the oscillator from driving into the stops, even in the event of a control malfunction.

7. Arc Voltage Control (AVC)

The AVC mechanism is mounted on a moving portion of the oscillator mechanism. Even though the AVC motor is covered, it is further protected by its location inside a cavity within the main housing. The AVC motor is also a precision torque motor which produces vertical travel of the torch assembly in the true radial plane, with no measurable backlash or free play in any plane. The AVC mechanism also had integral limit switches to prevent travel into the stops.

8. Cabling

The control, weld power, gas and coolant connections are terminated to the reverse side of the housing with a rugged strain relief which prevents any cable motion from being reflected to the torch. An in-line connection 10' down the cable provides a convenient break point so that one man can easily carry the weld head in congested area.

***MODEL 15 WELD HEAD
OPERATION MANUAL***

SECTION II - SPECIFICATION

2.1 GENERAL DESCRIPTION (continued)

9. Torches

The M-15 can be used with many different torch options. See Section 8.0 (torch options) for more torch details. Most M-15 Torch Options feature the following functions and adjustments:

1. Cross-seam torch tilt (manual or motorized versions)
2. Lead/Lag torch tilt (manual or motorized versions)
3. Wire nozzle entry angle adjustment or bracket
4. Wire nozzle cross-seam (manual or motorized versions)
5. Electrode to wire nozzle height (manual or motorized versions)

2.2 PHYSICAL DETAILS

The M-15 can be equipped with many different torches. Each torch has different functions, features and dimensions that can affect the overall physical details of the M-15. Where applicable, dimensions may not be given or several dimensions will be noted. For further details check the individual torch specification or outline drawing that applies to your application.

1. Welding Range

1. Minimum O.D. = 4.5" (114.3 mm)
Minimum I.D. = 12.0" (304.8 mm) on 4" pipe Guide Ring (head only no torch)
2. Maximum O.D. = No Limit, can be mounted on any diameter including flat plate.

NOTE: The smallest M-15 Guide Ring possible is for 4" pipe. This makes the minimum diameter 4.5" while maintaining the stated radial clearance. Where practical, smaller diameters can be welded by using Guide Ring extension feet, but an increase in radial clearance will also be the result.

3. Maximum Wall Thickness = Dependent on torch type, Options and Accessories

NOTE: Each torch type has a maximum wall limit as it is configured standard. This limit is derived by the stated Torch Radial clearance. Wall thickness capability can be increased (by options) to almost any thickness with a corresponding increase in the torch size and radial clearance.

2. Radial Clearances

Radial Clearance is the amount of room the M-15 requires in order to fit between the surface of the pipe and any type of obstructions around the pipe. Any amount less than stated will not allow enough room for the weld head to pass by the obstruction.

NOTE: In addition to adequate radial clearance, there must be adequate clearance for the mounting of the track and the installation and removal of the Weld Head.

**MODEL 15 WELD HEAD
OPERATION MANUAL**

SECTION II - SPECIFICATION

2.2 PHYSICAL DETAILS (continued)

2. Radial Clearances (continued)

Radial Clearance for the M-15 varies depending on pipe diameter, Torch Type and Torch Configuration. The dimensions given in Figure 1 are based on a type "A" single wire feed manipulator torch and basically reflect the smallest of the many possible M-15 configurations. Consult the specific AMI Outline Drawing and Torch Specification for configurations other than with a M-15 type "A" Torch.

Figure 1

Nominal Mounting O.D. (mm)	M-15 Radial Clearance with Torch Type "A"	Nominal Mounting O.D. (mm)	M-15 Radial Clearance with Torch Type "A"
4.500 (114.3)	3.69 (93.7)	26.00 (660.4)	4.33 (110.0)
5.563 (141.3)	3.72 (94.5)	28.00 (711.2)	4.28 (108.7)
6.625 (168.3)	3.72 (94.5)	30.00 (762.0)	4.36 (110.7)
8.625 (219.1)	3.78 (96.0)	32.00 (812.8)	4.40 (111.8)
10.75 (273.1)	3.78 (96.0)	34.00 (863.6)	4.38 (111.3)
12.75 (323.9)	3.78 (96.0)	36.00 (914.4)	4.41 (112.0)
14.00 (355.6)	3.82 (97.0)	38.00 (965.2)	4.43 (112.5)
16.00 (406.4)	3.85 (97.8)	40.00 (1016.0)	4.56 (115.8)
18.00 (457.2)	4.00 (101.6)	42.00 (1066.8)	4.56 (115.8)
20.00 (508.0)	4.06 (103.1)	44.00 (1117.6)	4.56 (115.8)
22.00 (558.8)	4.06 (103.1)	FLAT TRACK	4.35 (110.5)
24.00 (609.6)	4.09 (103.8)		

The radial clearances above are for either the carriage or the Wire Spool depending on pipe diameter. In normal use the Type "A" Torch radial does not exceed either the carriage or Wire Spool radial requirements. In some cases lower radial clearances are possible through special modification or wire spool options.. Consult with an AMI Technical Representative for any applications not covered here.

3. Axial Clearance

Minimum Axial Clearance depends on Torch Type and Options, if any (many options extend axial clearance). The following Axial Clearances are based on a type "A" Torch configurations with NO OPTIONS. The Torch to Rear of Head dimensions are based on the Guide Ring mounted so as to place the Electrode over the joint centerline and have the torch in the MIDDLE of its Cross-Seam Adjust. Reference **AMI Outline Drawing 40150036 and 40150057.**

1. Axial Clearance Electrode to Rear = 11.57" (293.9 mm) with no options
2. Axial Clearance Electrode to Bulkhead = 0.875" (22.2 mm)
3. Minimum straight length of pipe required for mounting = 7.50" (190.5 mm) from Weld Centerline.

***MODEL 15 WELD HEAD
OPERATION MANUAL***

SECTION II - SPECIFICATION

2.3 FUNCTION PERFORMANCE

NOTE: Regulation methods and tolerances given are actually controlled by the Power Supply/Controller Unit. They are given here only as assurance that the devices used in the M-15 to perform these functions can meet these criteria.

1. Travel (Rotation)

1. Maximum Travel Speed = 20.0 IPM (508 mm/min.)
2. Minimum Travel Speed = 0.2 IPM (5.1 mm/min.)
3. Regulation Type = Rotation speed in IPM using Tachometer Feedback (5 vdc).
4. Motor Type = Permanent Magnet DC motor.
5. Regulation Tolerance = +/- 1% or +/- 0.1 IPM (2.5 mm/min.)

NOTE: Travel Speed is measured in Inches Per Minute on the *outside surface* of the Guide Ring and not on the Weld Diameter or surface of the pipe..

40 IPM and 10 IPM Motor Options are available. See Options Section 9.0 and the Option Specification for more details.

2. Wire Feed

1. Maximum Speed = 200 IPM (5.1 m/min.)
2. Minimum Speed = 5.0 IPM (0.13 m/min.)
3. Regulation Type = Wire Feed speed in IPM using Tachometer Feedback (5 vdc).
4. Motor Type = Permanent Magnet DC motor.
5. Regulation Tolerance = +/- 1% or 1.0 IPM (.025 m/min.) whichever is greater.
6. Wire Size, Standard = 0.030" (0.76 mm) to 0.045" (1.1 mm)
Using "V" Groove serrated rollers.
7. Wire Feed Capacity = Industry Standard 2 pound (0.9 kg) 4" wire spools.
8. This Wire Feeder, related Wire Liners and Wire Feed Nozzles are intended primarily for mild carbon steels and most austenitic Stainless Steel wires not exceeding 0.045 inch in diameter.

Harder wires such as high chrome or Stellite may require special roller, liner or nozzle options. Larger wire sizes will also require special roller, liner and nozzle options.

The standard "V" groove serrated rollers can, depending on usage, nick or mark the wire. In cases of aluminum, this is not desirable and the use of size specific "U" groove smooth rollers may be necessary. Standard Wire Liners use Teflon inner sleeves. In the case of aluminum welding or in radiation environments, this is not recommended and in most cases should be replaced with a Nylon based liner.

Your application wire feed needs should be discussed with an AMI representative before final configuration of the wire feeder.

NOTE: 300 IPM Wire Feed Assembly Options are available. See Section 9.0 for more details.

***MODEL 15 WELD HEAD
OPERATION MANUAL***

SECTION II - SPECIFICATION

2.3 FUNCTION PERFORMANCE (continued)

3. Torch Oscillator and Cross-Seam Adjust (steering)

- 1 The Torch Osc. provides both Cross-Seam adjustment for steering and it also provides the electro-mechanical ability to oscillate (weave) across the weld seam during a weld sequence.

2. Total Mechanical Movement = 2.00" (50.8 mm)

Theoretically consisting of:

1. Maximum Osc Amplitude (weave) = +/- 0.50" (12.7 mm)
2. Minimum Osc Amplitude = 0.020" (0.50 mm)
3. Cross-Seam Adjustment = +/- 0.50" (12.7 mm)

NOTE: Amplitude is either side of torch position for a maximum total amplitude of 1.0". Cross-Seam Adjustment (steering) is the torch position and the torch position can be moved this amount either side of mechanical center. The term "theoretical" is used because the actual limits both for steering and amplitude are controlled by the power supply and some power supplies can offer more of one and less of the other but together the Torch can never move in excess of the 2.0" total mechanical stroke.

3. Regulation is a closed loop position servo using +/- 5 vdc reference through a precision rectilinear feedback potentiometer.
4. Regulation is in thousandths-of-an-inch and the accuracy is +/- 1% or 0.010" (0.25 mm) whichever is greater.
5. A worst case acceleration and deceleration time is 50 milliseconds. (The time required to go from zero to full speed or from full speed down to zero.)
6. Maximum Speed = 120 IPM (3.0 m/min.)

NOTE: Operating speed is determined by movement time called excursion versus the amplitude distance. An Amplitude and Excursion time that would require a greater speed than this is possible to program in most AMI Power Supplies.

4. Arc Voltage Control (AVC)

1. The AVC provides a means of maintaining a uniform arc length as the weld head rotates around the weld. The AVC mechanism provides motorized torch travel in a plane which is radial to the pipe centerline. The AVC mechanism is built into and attached to the moving portion of the oscillator mechanism.

The AVC motor and gearbox consists of a precision torque motor which is coupled to a miniature zero-backlash gear train. The rotary output of the AVC motor and gearbox is coupled to the torch through a unique and very rigid dual lever configuration, called a parallelogram, which translates the rotary motion into liner motion.

2. AVC Mechanical Stroke = 1.75" (44.5 mm)

**MODEL 15 WELD HEAD
OPERATION MANUAL****SECTION II - SPECIFICATION****2.3 FUNCTION PERFORMANCE (continued)**

4. Arc Voltage Control (AVC)
 3. Regulation is a closed loop position servo measuring the arc voltage at the Torch for position reference.
 4. Regulation is in Volts DC (vdc) and the accuracy is +/- 1 % or 0.1 VDC whichever is greater.

2.4 "A" TORCH RANGE AND FEATURES

As stated in Section 2.1.9, the M-15 can use many different torches. The following describes the basic features of the M-15 type "A" Torch only. See Section 8.0 and individual torch specifications for more information about other torches.

1. Torch Type "A"

The "A" Torch is the smallest, lightest and simplest of the M-15 torches. It features a single Wire Feed Manipulator and its primary advantage besides simplicity is its small size. It contains the following standard features:

1. Current Rating = 300 Ampere, Liquid cooled, 100% duty cycle
2. Cooling Requirement = 0.2 GPM (0.8 l/min.)
3. Electrode , Standard = 0.125" (3.2 mm)
Optional = 0.093" (2.4 mm)

NOTE: AMI recommends the use of 2% ceriated-type tungsten electrodes only. Electrode tips should be precision-ground to a uniform and repeatable tip dimension.

4. Gas Lens, Standard = HW-20 Type, 0.125" (3.2 mm) un-modified
Included = HW-27 Type, 0.125" (3.2 mm) modified short (.31") shaft
Optional = HW-20 Type, 0.093" (2.4 mm) un-modified
Optional = HW-27 Type, 0.093" (2.4 mm) modified short (.31") shaft

NOTE: Gas lenses supplied by Arc Machines, Inc. under AMI's part number are specially designed for optimum gas coverage. Use of other gas lenses is at the risk of the operator or user and may result in poor equipment performance.

5. Gas Cup, Standard = HW-20 Type, #7 un-modified
Included = HW-27 Type, #10, 1.19 long modified (short)
Optional = HW-20 Type, #6 or #8 or chisel
6. Collet/Back Cap, Standard = 0.125" (3.2 mm)
Optional = 0.093" (2.4 mm)

NOTE: The M-15 "A" Torch Back Cap features a custom snap-in/snap-out collet that can easily be changed. The M-15 comes with a short Back Cap requiring the tungsten to be cut to length and a long Back Cap that can accommodate a full 7" stick of tungsten.

***MODEL 15 WELD HEAD
OPERATION MANUAL***

SECTION II - SPECIFICATION

2.4 TORCH RANGE AND FEATURES

1. Torch Type "A" (continued)

- 7. Wire Cross-Seam Adjust = +/- 0.25" (6.4 mm)
- 8. Wire to Electrode Adjust = +/- 0.25" (6.4 mm)
- 9. Wire Entry Angle Adjust = 15 to 45 degrees
- 10. Manipulator to Torch Body Adjust = +/- 0.25" (6.4 mm)

NOTE: Using the Wire to Electrode Adjust also changes the Wire Entry Angle or vice-versa. To leave one as is and adjust the other must be done with the Manipulator to Torch Body Adjustment.

- 11. In/Out Torch Tilt = +/- 30 degrees
- 12. Lead/Lag Tilt = +/- 25 degrees
- 13. Wire Nozzle Diameter, Standard = 0.035" (0.89 mm)
Included = 0.045" (1.1 mm)
Optional = .025", .030" and .062"
- 14. Wire Liner, Standard = Armored with 0.062" I.D. Teflon inner sleeve. Other liner types available.
- 15. Miscellaneous Features:
 - 1. Standard Torch Parts allow for welding up to 1.5" (38.1 mm) wall thicknesses. Use of optional Gas Lens/Gas Cup/Manipulator Extenders can allow welding on up to 5.0" (127 mm) wall.
 - 2. Torch is mounted to M-15 via 1 of 5 standard mounting brackets to allow the positioning of the torch up/down in relation to the Weld Head body.
 - 3. The Torch features a spring-loaded break-away mount that will prevent most accidental breakage of torch parts.
- 16. Reference **AMI Outline Drawing 40150057** for full dimensional details when the M-15 is configured with a type "A" Torch.

2.5 CABLES

- 1. The interface connections for control, weld power, gas and coolant are secured through a strain relief mounted rigidly to the reverse side of the weld housing. The strain relief provides mechanical and thermal protection for the cable assembly and prevents any cable motion from being felt at the torch. An in-line connection is provided 10' down the cable, so that the weld head has maximum portability. A transition from water-cooled electrode cable to a standard cable is also made at the in-line connection.

The 40-foot adapter service and control cables are provided with the automatic pipe welding system and these cables make the transition between the weld head and the console. Additional 50- or 75-foot extension cable assemblies are available as an option which will allow weld head operation up to 200 feet away from the console.

**MODEL 15 WELD HEAD
OPERATION MANUAL****SECTION II - SPECIFICATION****2.6 TEMPERATURE RANGE/PREHEAT CONDITIONS**

1. No minimum or maximum preheat or ambient temperature range is given. Actual working conditions, head type, welding duty cycle, weld parameters and other conditions vary too much to specify exact temperature limits.
2. All temperature range assessments are based upon the maximum allowable Motor Armature Winding Temperature that can be tolerated by the motors of the Weld Head.
3. Winding temperature depends on pipe temperature, ambient air temperature, operating duty cycle and Motor Torque Demanded (how hard are the motors being run?).
4. As a guideline, we state that the M-15 weld head housing temperature should not exceed 140°F (60°C) at any time. The standard M-15 can be installed on short duration pre-heated welds in excess of 250°F (121°C) and not exceed this. On the other hand, this number can be exceeded in non-preheated applications with high duty cycles and high welding currents. It all depends on the application.
5. Liquid-cooled Guide Ring Options and other special items are available for pre-heat applications. Consult with an AMI representative for specific information based on the actual application.

2.7 TORCH OPTIONS

The following is a list of torch options available as of this specification revision. For torch details reference individual specifications for each torch and the **AMI M-15 Outline** drawing noted for each configuration.

Torch Type	Description	Outline Drawing No.	Specification No.	Comments
“A”	Single Wire Feed Entry	40150057	See Section 5.0 of this spec	
“C”	Dual Wire Feed Entry	40150055	No. M-15-“C”	Dual WF option recommended
“N”	Dual Wire Feed Entry Direct View Cameras Motorized Manipulators	40150078	No. M-15-“N”	Dual WF Option recommended. PAL or NTSC versions
“NGT-B”	Narrow Gap Osc Tungsten Single Wire Feed Entry Direct View Cameras	40150075	No. M-15-“NGT-B”	see 48470007 for recommended preps
“FDV-ID”	Dual Wire Feed Entry Direct View Cameras	40150070	No. M-15-“FDV-ID”	Dual WF Option recommended. PAL or NTSC versions
“P”	Dual Wire Feed entry Direct View Cameras Motorized Manipulators	40150079	No. M-15-“P”	Dual WF Option recommended. PAL or NTSC versions
“305-NGT”	Narrow Gap Osc Tungsten Single Wire Feed Entry Direct View Cameras	40150080	No. M-15-“305-NGT”	see 48470007 for recommended preps

**MODEL 15 WELD HEAD
OPERATION MANUAL****SECTION II - SPECIFICATION****2.7 TORCH OPTIONS (continued)**

Torch Type	Description	Outline Drawing No.	Specification No.	Comments
"HW"	Hot Wire Narrow Gap Single Wire Feed Entry no vision no motorized manipulators	40150040	No. M-15-"HW"	
"Shell"	Hot Wire Narrow Gap Single Wire Feed Entry Direct View Cameras 3 axis Motorized Manipulators Motorized In/Out Tilt	40150071	No. M-15-"Shell"	For 1G down hand 60" diameter curve
"M"	Hot Wire Narrow Gap Single Wire Feed Entry Direct View Cameras no motorized Manipulators	40150072	No. M-15-"M"	For 1G down hand 19" diameter curve
"Omega"	Dual Wire Feed entry Direct View Cameras motorized manipulators	40150063	No. M-15-"Omega"	For Omega seal access
"ID"	ID needle type torches	40150041	See Outline only	Special applications

2.8 OPTIONS

The following is a list of the most common M-15 Options. Where noted reference the Option Specification for more details. Consult with an AMI Sales representative for other options or special applications.

1. **M-15-CW Dual Wire Feeder Option:** Provides an additional Wire Feeder and spool holder on the CW side of the Head. Recommended for use with any Dual Wire Entry Torch. This Option enables the weld head to weld in the Counter Clockwise or Clockwise direction. This eliminates the need to rewind after each pass. It also allows for double up or double down weld passes to be run. See **Specification No. M-15-CW** and **AMI Outline Drawing 40150055** for details.
2. **M-15 AVC/OSC Interchange Option:** Allows the AVC Servo to be used as the Oscillator and allows the Oscillator Servo to be used as the AVC. Required when needing to tilt the torch parallel with the weld head rotation axis. See **Specification No. M-15-"AVC/OSC"** and **AMI Outline Drawing 40150076** for details.
3. **M-15 Right Angle Drive:** Allows the weld head to be mounted perpendicular to the pipe instead of parallel to it. Requires the AVC/OSC Interchange Option (above). Can be used in some applications to reduce the M-15 Axial Clearance. Reference **AMI Outline Drawing 40150059** for dimensional information.
4. **M-15 AVC Reversal:** Allows the torch to be mounted upside down and the AVC to operate in reverse. Required for large diameter I.D. welding. Reference **AMI Outline Drawing 40150077** for dimensional and bracket information.

***MODEL 15 WELD HEAD
OPERATION MANUAL***

SECTION II - SPECIFICATION

2.8 OPTIONS (continued)

5. M-15 Adjustable Angle AVC (Tilt): Allows the torch and AVC movement to be tilted to up to a 60-degree angle (usually 45). Required for fillet welds or any time the torch needs to be tilted beyond 15 to 20 degrees. See **Specification No. M-15-“AVC TILT”** and **AMI Outline Drawing 40150058** for details.
6. M-15 I.D. Track Adapter: Allows the M-15 to be mounted on I.D. Track. See **Outline Drawing 40150073** for dimensional information.
7. M-15 Positioning Encoder: Mounts as a trailing device on the Wire Feeder and provides head to track positional information to certain AMI power supplies or customer supplied instruments. See **Specification No. M-15-Encoder**.
8. M-15-CCW 300 IPM Wire Feeder: Replaces standard 200 IPM CCW Wire Feeder. See **Specification M-15-CW** for more details.
9. M-15-CW 300 IPM Wire Feeder: Provides an additional 300 IPM Wire Feeder and spool holder on the CW side of the Head. See **Specification No. M-15-CW** for details.
10. M-15-CCW 12 Inch Wire Spool Holder: Provides a Wire Spool Holder Assembly capable of mounting an Industry standard 12 inch Wire Spool. For 1 G down hand welding only, not for 5G welding. See **Specification No. M-15-CW** for details.
11. M-15-CCW 8 inch Wire Spool Holder: Provides a Wire Spool Holder for the CCW side that can accommodate an Industry Standard 8 inch Wire Spool. See **Specification No. M-15-CW** for details.
12. M-15-CW 8 inch Wire Spool Holder: Provides a Wire Spool Holder for the CW side that can accommodate an Industry Standard 8 inch Wire Spool. See **Specification No. M-15-CW** for details.
13. M-15 Vacuum Pump: Required for operation of Suction Foot Mounted Guide Rings and Tracks. See **Specification No. M-15-Pump** for details.
14. M-15 High Speed Rotation Option: Motor Option for up to 40 IPM maximum Travel Speed.
15. M-15 Low Speed Rotation Option: Motor Option for maximum Travel Speed of 10 IPM. Recommended for use when heavy loads are placed on the M-15 Weld Head. This Option significantly increases the amount of drive torque available.
16. M-15 Guide Ring and Track Options: The M-15 has a great variety of special application Guide Rings and Track Assemblies. Reference AMI Specification No. 15-GR for more Guide Ring details.

***MODEL 15 WELD HEAD
OPERATION MANUAL***

SECTION III - INSTALLATION

3.0 INSTALLATION INSPECTION

1. Before installing the Model 15 weld Head, perform a general inspection of the head as follows:
 1. Check the water and gas hoses for damage (cracks, holes, wear, etc.).
 2. Check the water and gas quick disconnects for clean and tight connections.
 3. Check the Weld Head control cable for frays and the connectors for tightness. Check thread condition of electrical connectors.
 4. Insure that all assemblies are connected and no hardware, brackets or pieces are missing.

3.1 WELD HEAD CONNECTION

1. Connect the Model 15 water return, gas (Refer to Figures 2 and 3) and electrode quick disconnects to the 40-foot Power Supply Adapter Cable (supplied with the Power Supply). Install the protective rubber boots on all connections when made. The rubber boots have a cut-out allowing the retaining clips to be recessed for clearance.
2. Connect the Model 15 control cable connector (multi-pin electrical connector) to the Power Supply forty (40) foot control cable. The connector is keyed, and should slide in. The connector ring should turn easily. **DO NOT FORCE.** If it is difficult to connect, check the keyway and condition of the threads.
3. Connect the forty (40) foot adapter to the Power Supply. Align all keyways as shown (Refer to Figures 4 through 7). **DO NOT FORCE.**

3.2 WELD HEAD GUIDE RING MOUNTING

NOTE: For the purpose of description, the front of any device will be considered toward the torch assembly or weld joint and the rear will be toward the cable assembly located on the Weld Head.

1. Shipped with the Guide Ring in the Accessory kit containing the following (Refer to Figure 8):
 1. 4 sets (8 total) of short Solid feet
 2. 4 sets (8 total) of long Solid feet
 3. 1 each Guide Ring Foot Adjustment tool
 4. 1 set (2 each) Latch Rollers
2. In each half of the Guide Ring are multiple sets of spring loaded feet (quantity varies with Guide Ring size). The Guide Ring comes with all positions filled with spring loaded feet (Refer to Figures 9 and 10). In most cases this is not adequate to actually lock the Guide Ring on the Pipe. A certain number of spring loaded feet should be replaced with solid feet.

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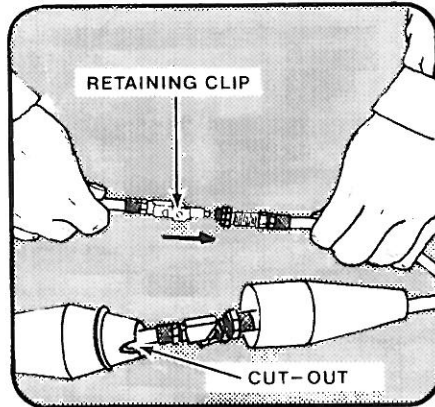


FIGURE 2

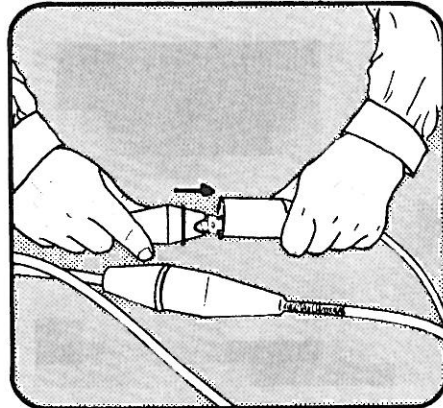


FIGURE 3

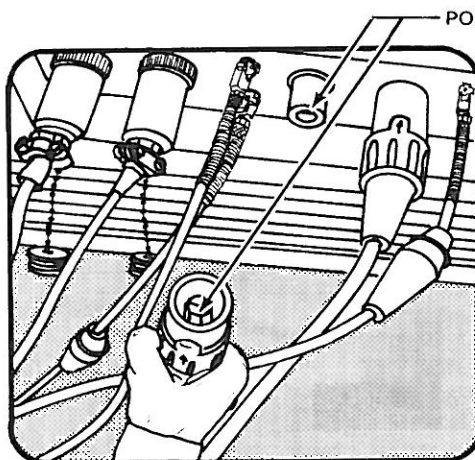


FIGURE 4

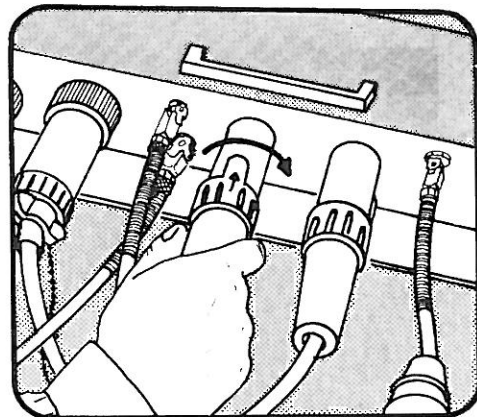


FIGURE 5

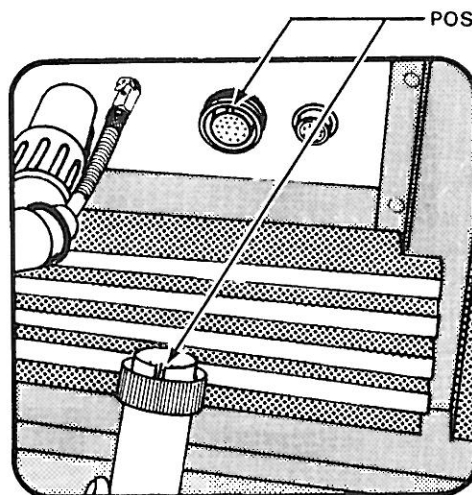


FIGURE 6

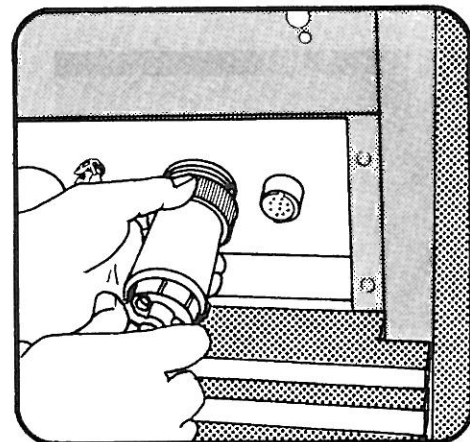


FIGURE 7

**MODEL 15 WELD HEAD
OPERATION MANUAL**

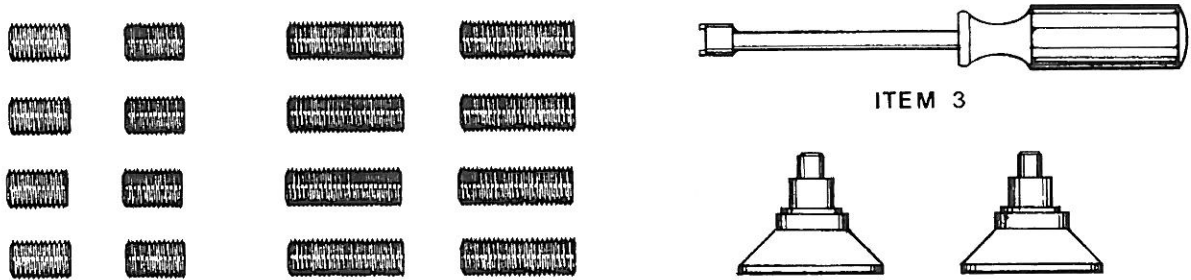


FIGURE 8

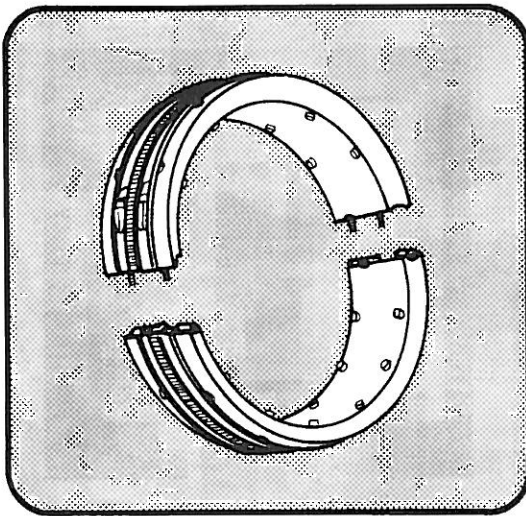


FIGURE 9

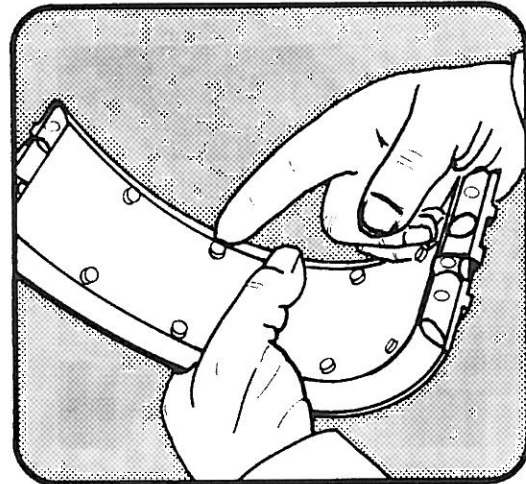


FIGURE 10

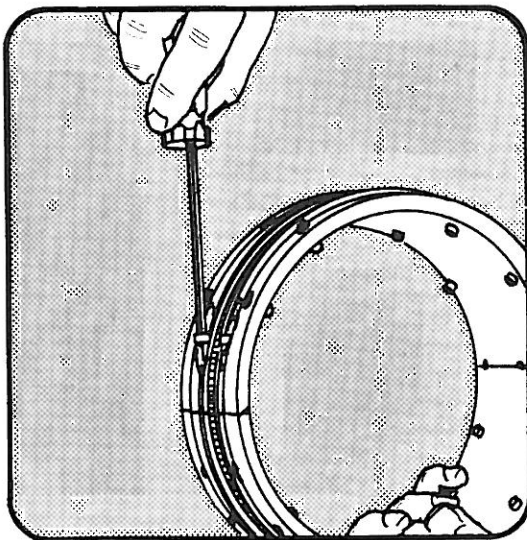


FIGURE 11

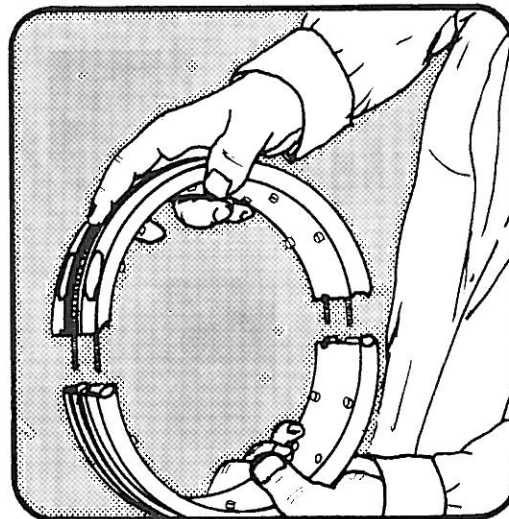


FIGURE 12

***MODEL 15 WELD HEAD
OPERATION MANUAL
SECTION III - INSTALLATION***

3.2 WELD HEAD GUIDE RING MOUNTING

3. Separate the two halves of the Guide Ring by unscrewing the captive screws (refer to Figures 11 and 12).
4. Remove 3 or 4 sets of spring loaded feet using the adjustment tool. Replace with Short solid feet using a slot (Blade) screw driver (Refer to Figure 13). If the Guide Ring has an EVEN number of feet, remove 4 sets of feet 90 degrees apart. If the Guide Ring has an ODD number of feet, remove 3 sets of feet 120 degrees apart (Refer to Figure 14).

NOTE: Guide Ring feet cannot be removed from the outside of the Guide Ring. They must be screwed toward the center of the Guide Ring to be removed (Refer to figure 13).

1. The solid feet should be screwed up into the Guide Ring as far as possible before mounting the Guide Ring on pipe (Refer to Figure 15).
5. Before mounting the Guide Ring, it is essential that the area where the Guide Ring will clamp be clean, bare metal (grind clean as shown in figure 16). The Guide Ring Feet must make electrical contact with the pipe surface (360 degrees around the pipe).
6. The Guide Ring front edge should be mounted approximately 5.25 to 5.75 inches from the Weld Joint Centerline. Distance will vary depending on the Torch Type. This is an optimum distance that will put the torch oscillator in the center of its mechanical stroke. On most pipe joints this distance can be within ± 0.250 inches tolerance.

NOTE: Distance stated is for an "A" or "C" type torch. Distance will be different for other Torch types.

7. Connect the two halves of the Guide Ring together with the pipe in the middle. Tighten the captive screws until the two pieces have no gap between them (Refer to Figures 17 and 18).
8. The Guide Ring should now be gently connected to the Pipe. It should stay in place but be moveable if pressure is applied. If it is too loose or too tight use the adjustment tool to loosen or tighten the spring feet.

NOTE: The spring feet should not be compressed completely and all spring feet should protrude the same distance from the Guide Ring (Refer to Figure 19).

9. Align the Guide Ring parallel to the weld joint. Remember, the more accurate the alignment, the less steering will be necessary while welding (refer to Figure 20).
10. Tighten the solid feet down. Do this evenly and slowly so the solid feet do not mis-align the Guide Ring (Refer to Figure 21).
11. When properly tightened, the Guide Ring should be firmly connected to the Pipe, and Mounting or Rotating the Weld Head should not move it.

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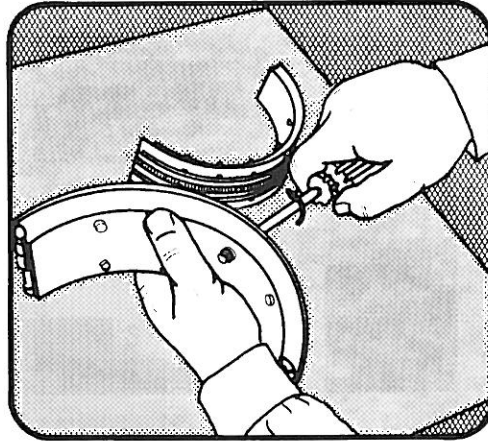


FIGURE 13

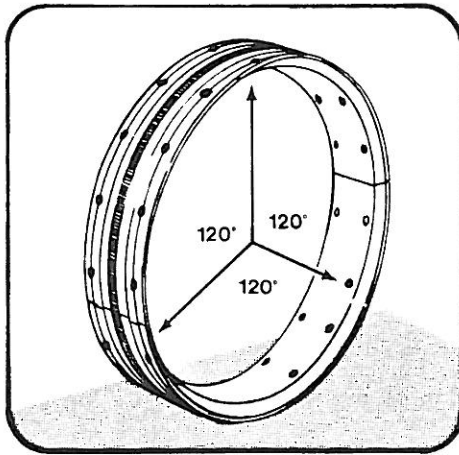


FIGURE 14A

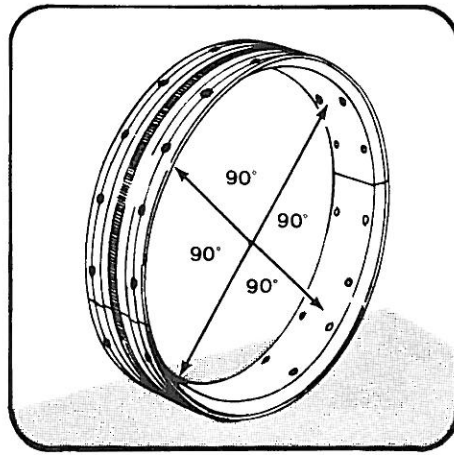


FIGURE 14B

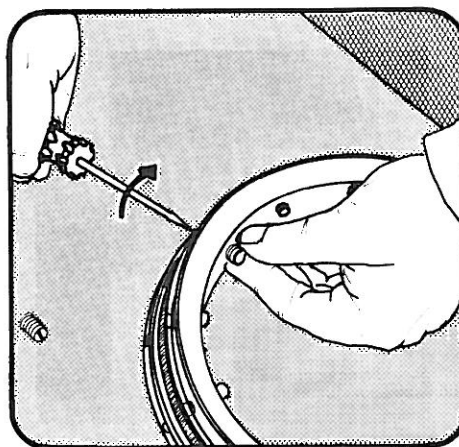


FIGURE 15

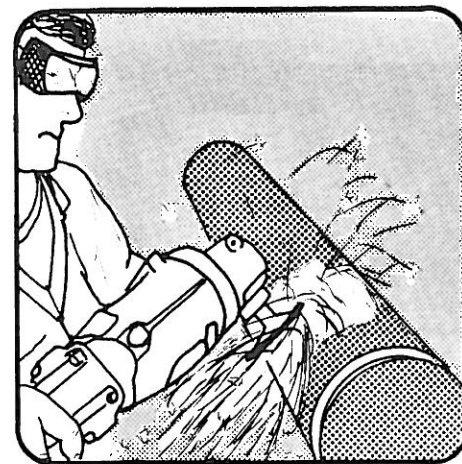


FIGURE 16

**MODEL 15 WELD HEAD
OPERATION MANUAL**

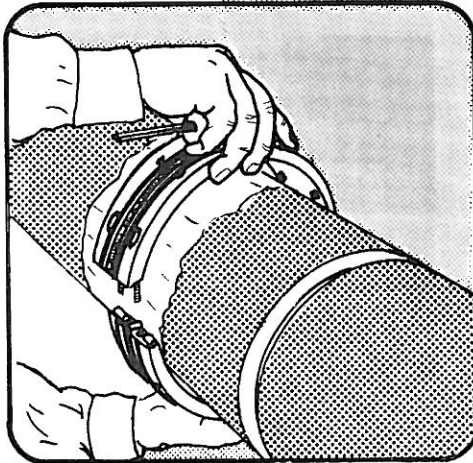


FIGURE 17

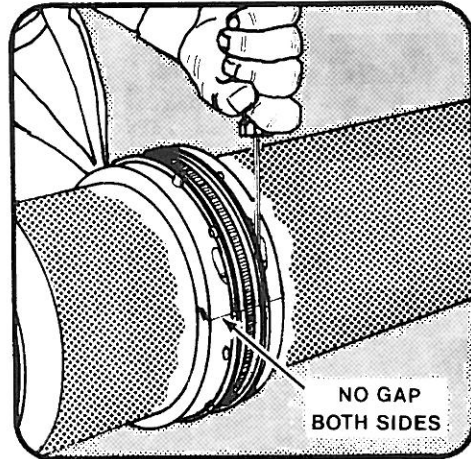


FIGURE 18

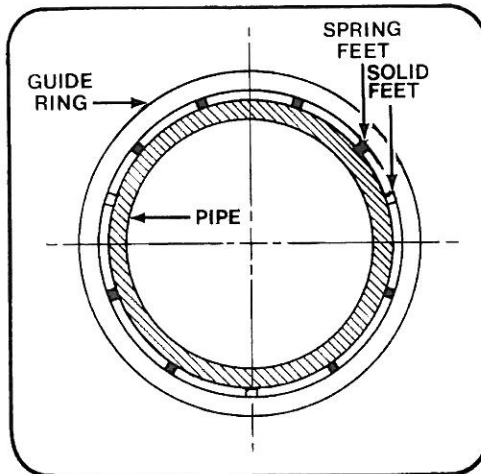


FIGURE 19

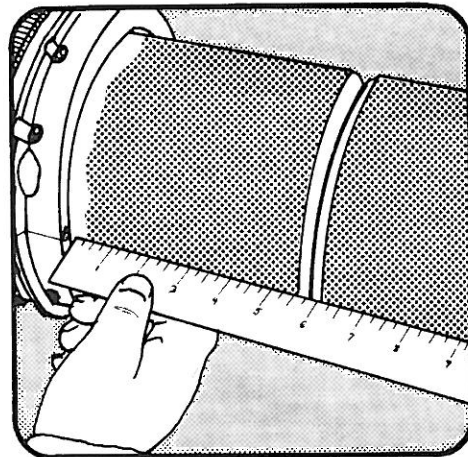


FIGURE 20

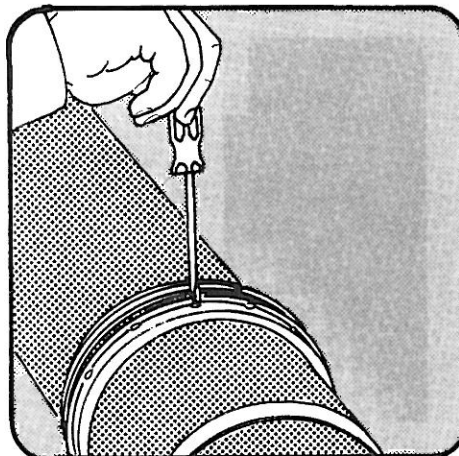


FIGURE 21

***MODEL 15 WELD HEAD
OPERATION MANUAL***

SECTION III - INSTALLATION

3.3 WELD HEAD MOUNTING

1. Select the Proper Latch Rollers for the Guide Ring size the Head is to be mounted on (Refer to Figure 22).
- 2.. Install the Latch rollers on the Weld Head (Refer to Figures 23 through 26).
3. Engage the Weld Head Latch Release Button and open the Latch Lever 90 degrees. This Spreads the Latch Rollers apart so the Guide Ring can be inserted between them. (Refer to Figure 27).
4. Set the Head onto the Guide Ring, insuring the Guide Ring sets in the channel of the Drive Gears. Close the Latch Lever, locking the Latch Rollers onto the Guide Ring lip (Refer to Figures 28 and 29).

WARNING:

THE LATCH LEVER IS SPRING LOADED, AND IS NOT LOCKED IN THE OPEN POSITION. CAUTION SHOULD BE USED NOT TO CLOSE THIS LEVER UNTIL READY. NEVER LEAVE THE HEAD UNATTENDED WITH THE LATCH LEVER OPEN.

5. After mounting, Jog the Head forward and reverse a few times to allow the Gears to mesh up (Refer to Figure 30).
6. Gently try to open the Latch Lever without depressing the Release button. If it opens, the head is not seated properly. Do not force the Latch Lever!

3.4 FILLER WIRE INSTALLATION

NOTE: The Model 15 is designed to use 4 inch 2 pound machine wound spools of wire. Do not use hand wound spools of wire. Erratic operations could result.

1. Remove the Wire Spool Cover by unscrewing the Retaining Nut (Refer to Figure 31).
2. Remove the Wire Liner Assembly from the wire feed Gear Box (Refer to Figure 32).
3. Remove the wire nozzle from the torch assembly, then unscrew the nozzle from the wire liner assembly (Refer to Figures 33 and 34).

CAUTION: Most wire liner assemblies have a Teflon inner liner and an armored metal outer liner. Attempting to install the wire without removing the liner assembly will usually result in gouging or poking holes in the Teflon liner. Also, the wire nozzles are not self-feeding, and it is not always possible to get the wire to feed through the nozzles without removing them first.

4. Wire Spool Preparation:
 1. Holding the wire spool firmly, remove the wire end from the locking hole on the wire spool. Allow approximately 4 inches of wire to keep it from unwinding.
 2. Cut bent or twisted end off, leaving straight undamaged wire (Refer to Figure 35).

**MODEL 15 WELD HEAD
OPERATION MANUAL**

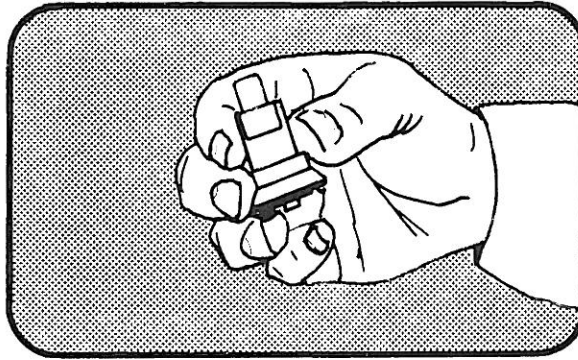


FIGURE 22

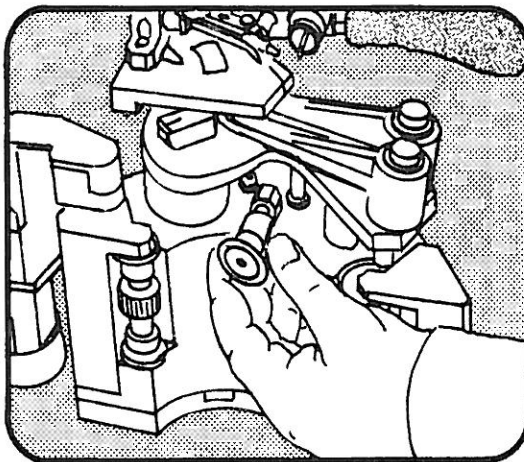


FIGURE 23

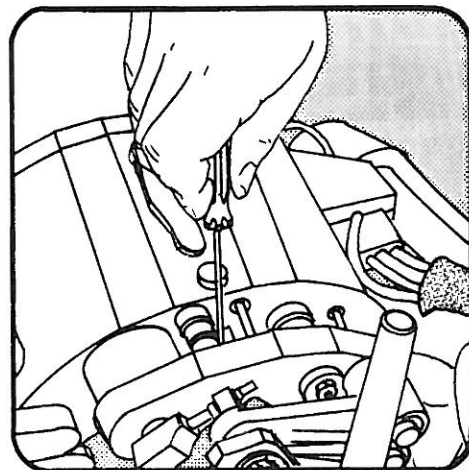


FIGURE 24

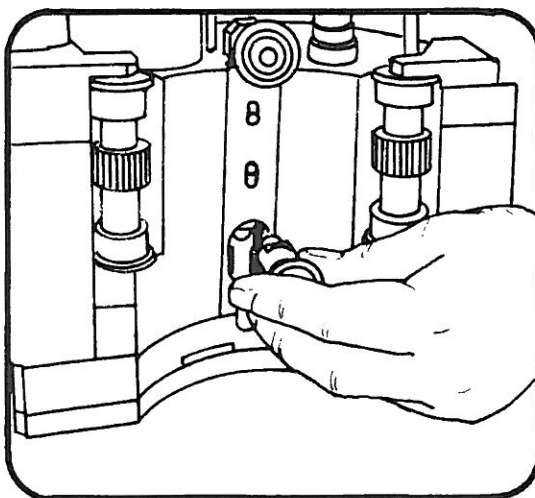


FIGURE 25

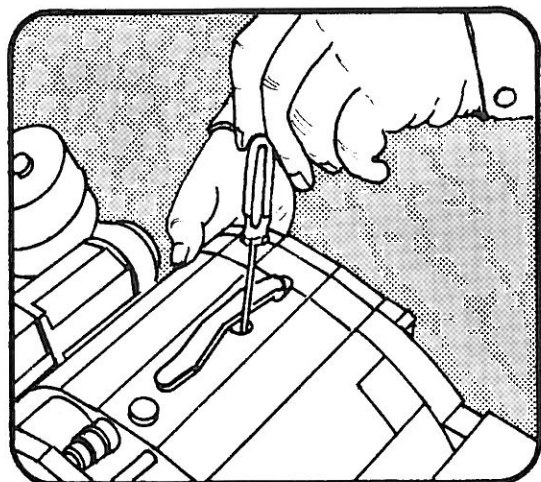


FIGURE 26

**MODEL 15 WELD HEAD
OPERATION MANUAL**

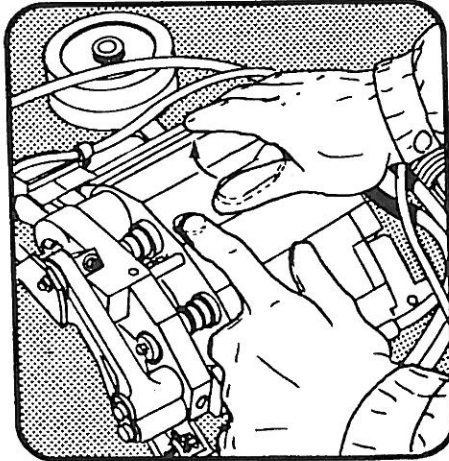


FIGURE 27

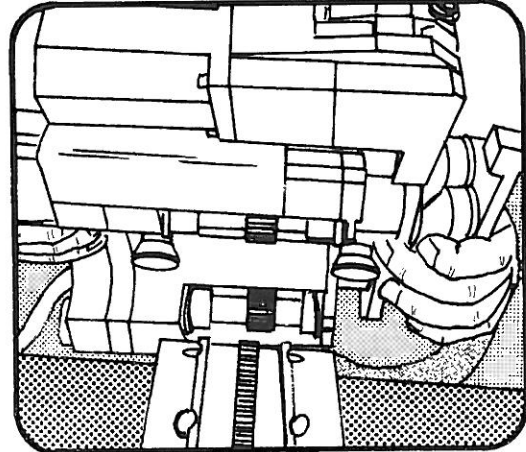


FIGURE 28

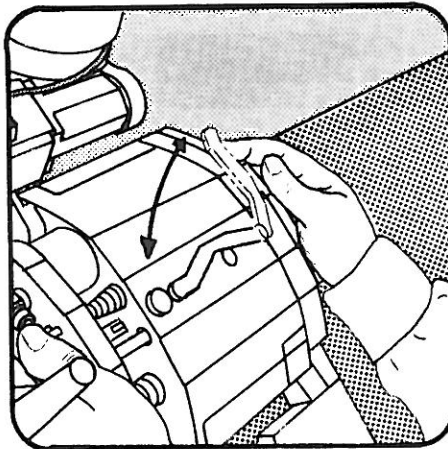


FIGURE 29

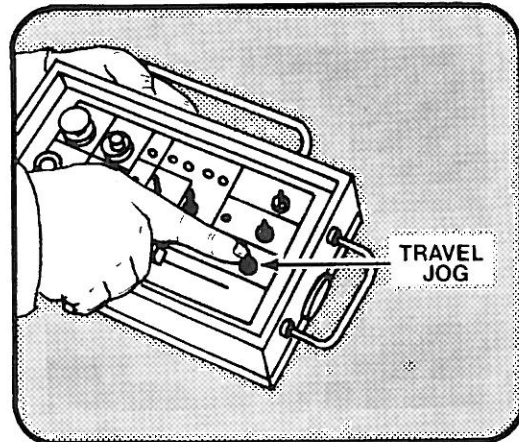


FIGURE 30

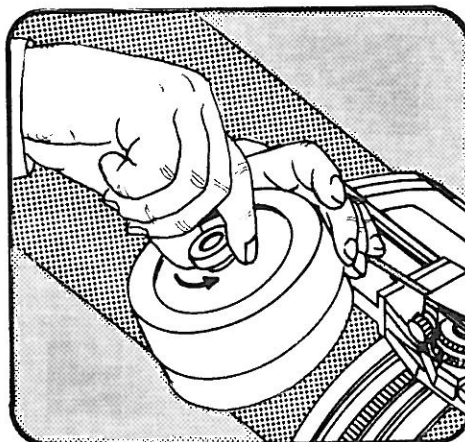


FIGURE 31

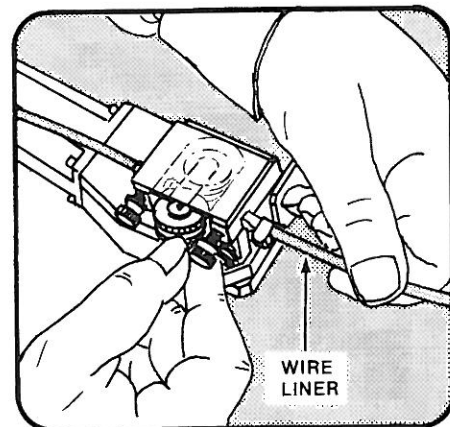


FIGURE 32

***MODEL 15 WELD HEAD
OPERATION MANUAL***

SECTION III - INSTALLATION

3.4 WIRE INSTALLATION

4. Wire Spool Preparation (continued)

3. Using a small file, file the end of the wire to remove burrs, preventing possible damage to the wire liner (Refer to Figure 36).
5. The spindle inside the wire Spool Holder should rotate. It should not, however, spin freely. If it is too loose or too tight, turn the tension adjusting screw inside the spindle to loosen or tighten. It is necessary to hold the retaining nut on the bottom of the spool when adjusting the spindle tension (Refer to Figure 37).
6. Remove the wire liner from the inside spool holder if necessary, and begin to install the spool of wire into the spool holder, threading the end of the wire into the wire liner at the same time (Refer to Figures 38 and 39). Push the wire by hand until it comes into contact with the wire feed Roller Gears. Jog the wire feed forward and engage the wire so it feeds into the rollers and through to the front side of the wire feed assembly (Refer to Figure 40).
7. Jog the wire forward until the bare length of wire is longer than the wire liner assembly removed in step 3.4.B (Refer to Figure 40). Hand thread the wire into the liner until it protrudes out the end (Refer to Figure 41). Re-connect the wire liner to the wire feed assembly. Screw the wire liner assembly onto the torch (Refer to Figures 42 and 43).
- 8.. Cut back any protruding wire, as shown in Figure 44.
- 9.. Replace wire spool holder cover and retaining nut. Tighten nut until snug (Refer to Figure 45).

3.5 TORCH SET UP

Reference Figure 46 for the Model 15 "A" Torch, Figure 47 for the "C" Torch and Figure 48 for the "N" Torch.

1. The torch assembly requires the following adjustments and must be set up in accordance with a qualified weld procedure:
 - Item 1 - Torch Tilt In and Out Angle.
 - Item 2 - Torch Lead/Lag Angle.
 - Item 3 - Wire Entry Angle Adjust.
 - Item 4 - Wire In/Out Position Adjust.
 - Item 5 - Torch (Tungsten) to Manipulator Position Adjust. ("A" and "C" Torches only)
 - Item 6 - Electrode Stick Out.
 - Item 7 - Gas Cup, Gas Lens.
 - Item 8 - Camera View Angle Adjust ("N" Torch only)
 - Item 9 - Illumination Adjust ("N" Torch only)

**MODEL 15 WELD HEAD
OPERATION MANUAL**

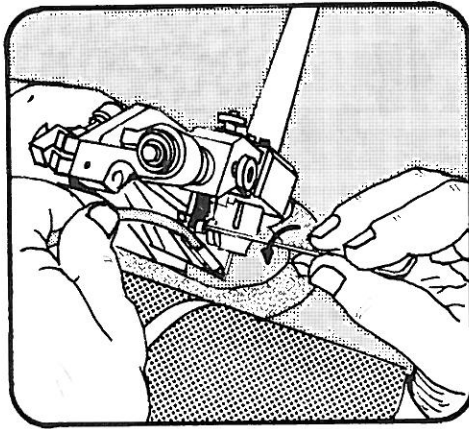


FIGURE 33

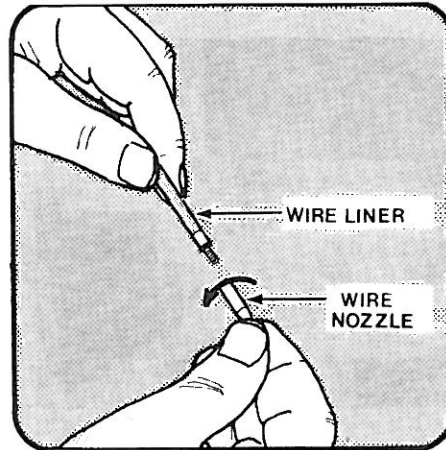


FIGURE 34

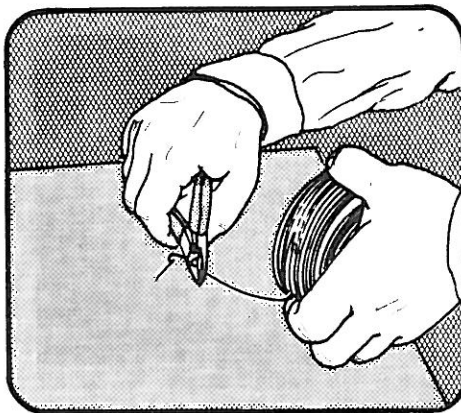


FIGURE 35

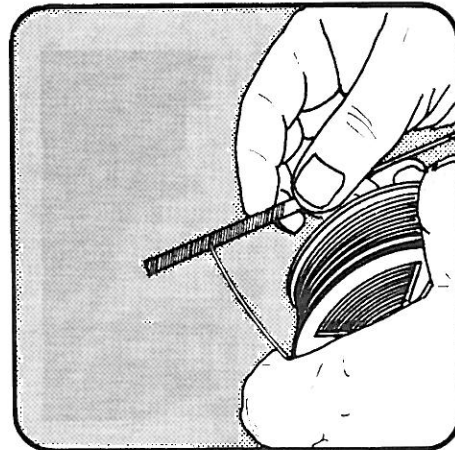


FIGURE 36

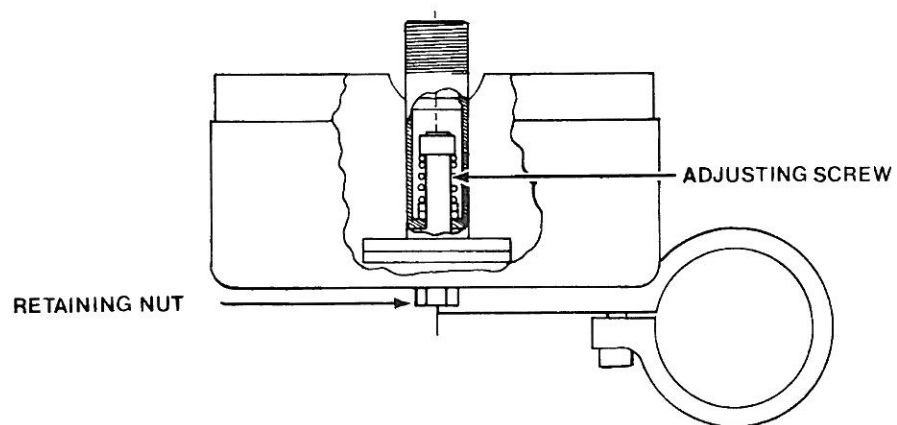


FIGURE 37

**MODEL 15 WELD HEAD
OPERATION MANUAL**

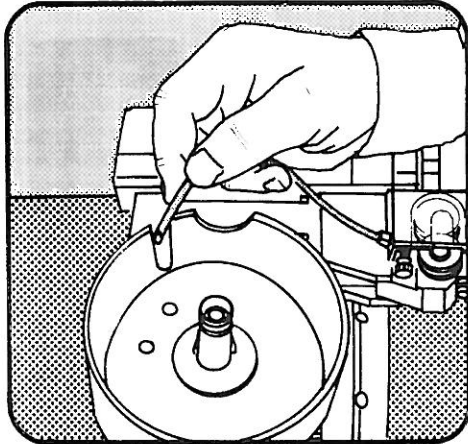


FIGURE 38

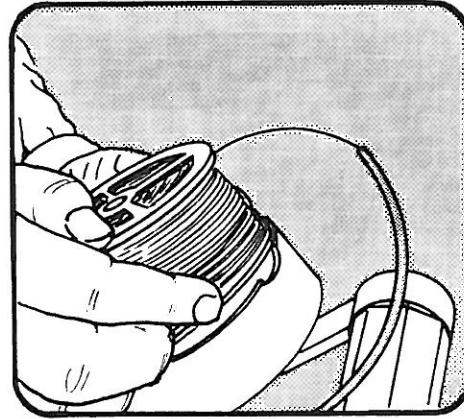


FIGURE 39

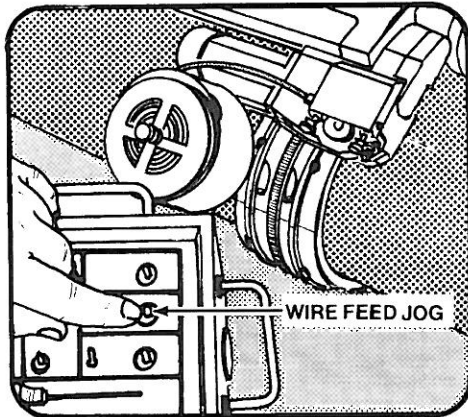


FIGURE 40

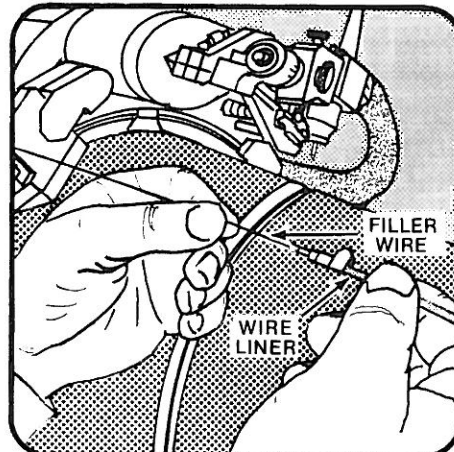


FIGURE 41

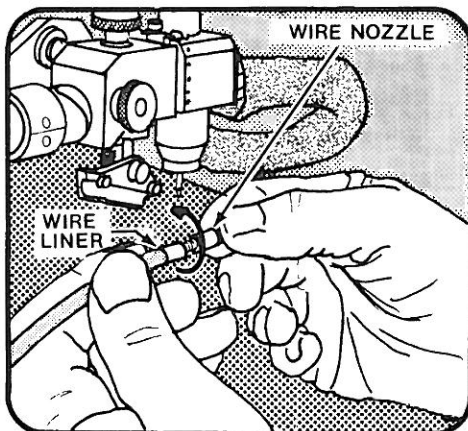


FIGURE 42

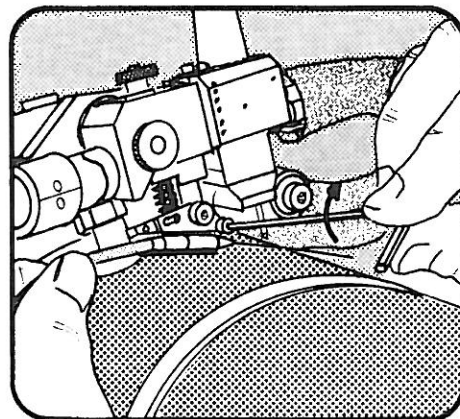


FIGURE 43

***MODEL 15 WELD HEAD
OPERATION MANUAL***

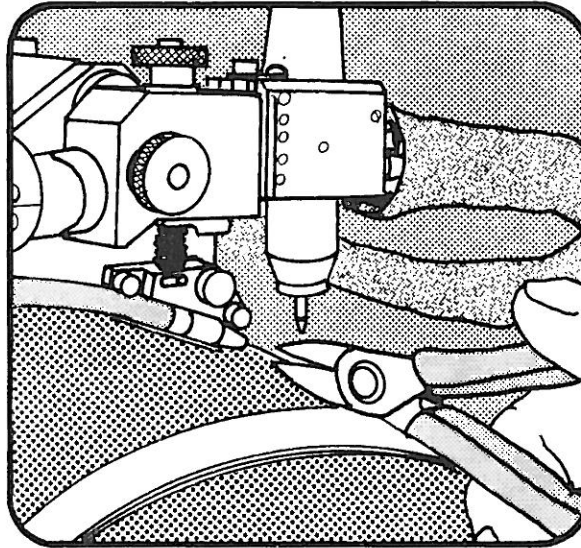


FIGURE 44

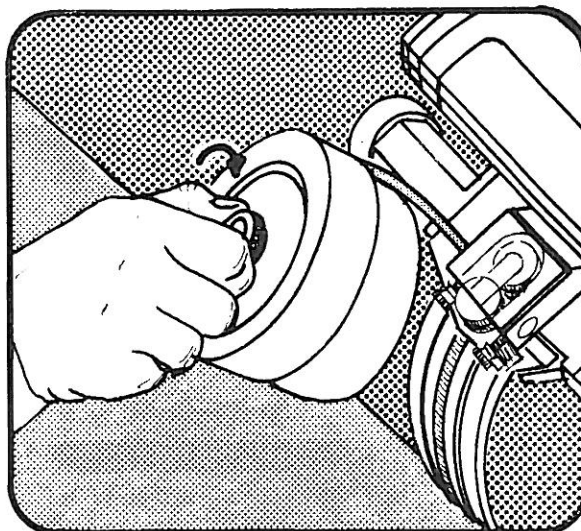


FIGURE 45

**MODEL 15 WELD HEAD
OPERATION MANUAL**

MODEL 15 "A" TORCH

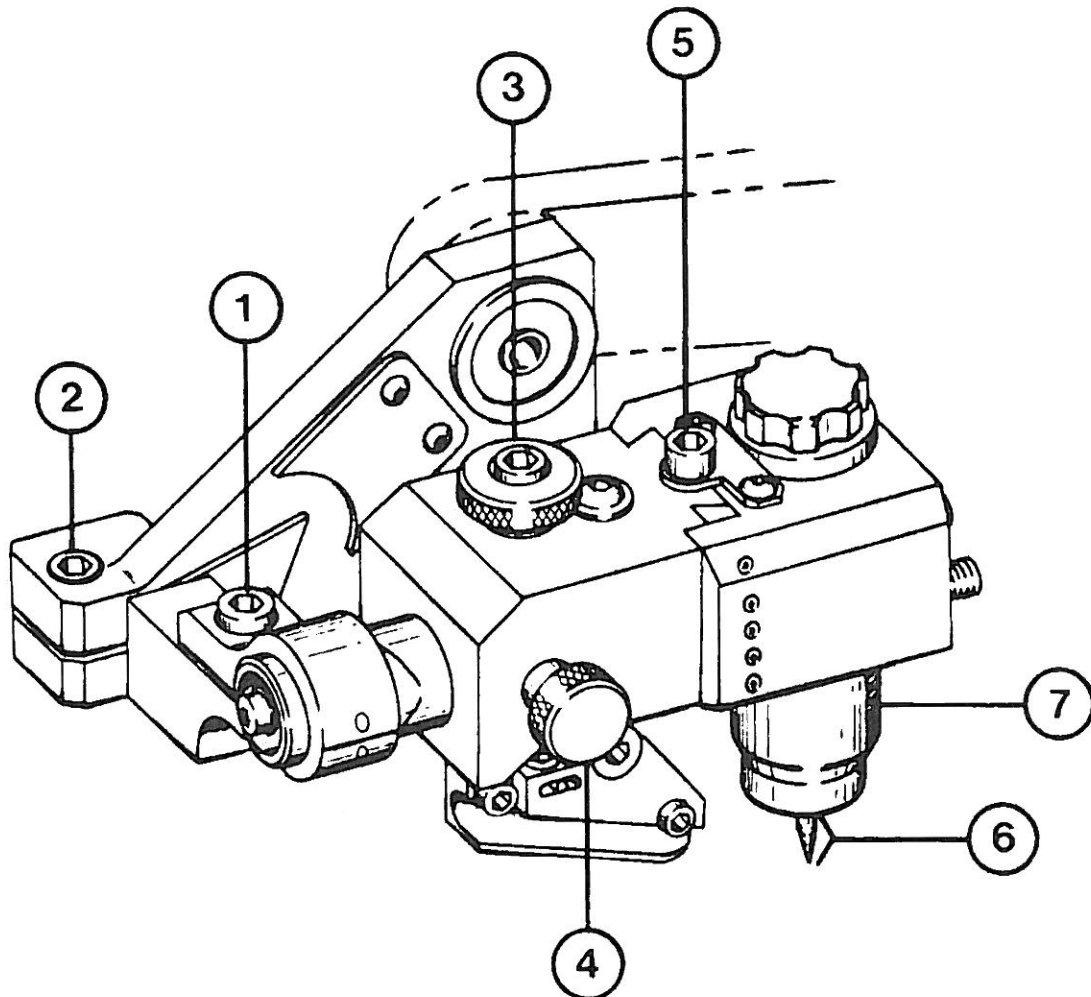


FIGURE 46

**MODEL 15 WELD HEAD
OPERATION MANUAL**

MODEL 15 "C" TORCH

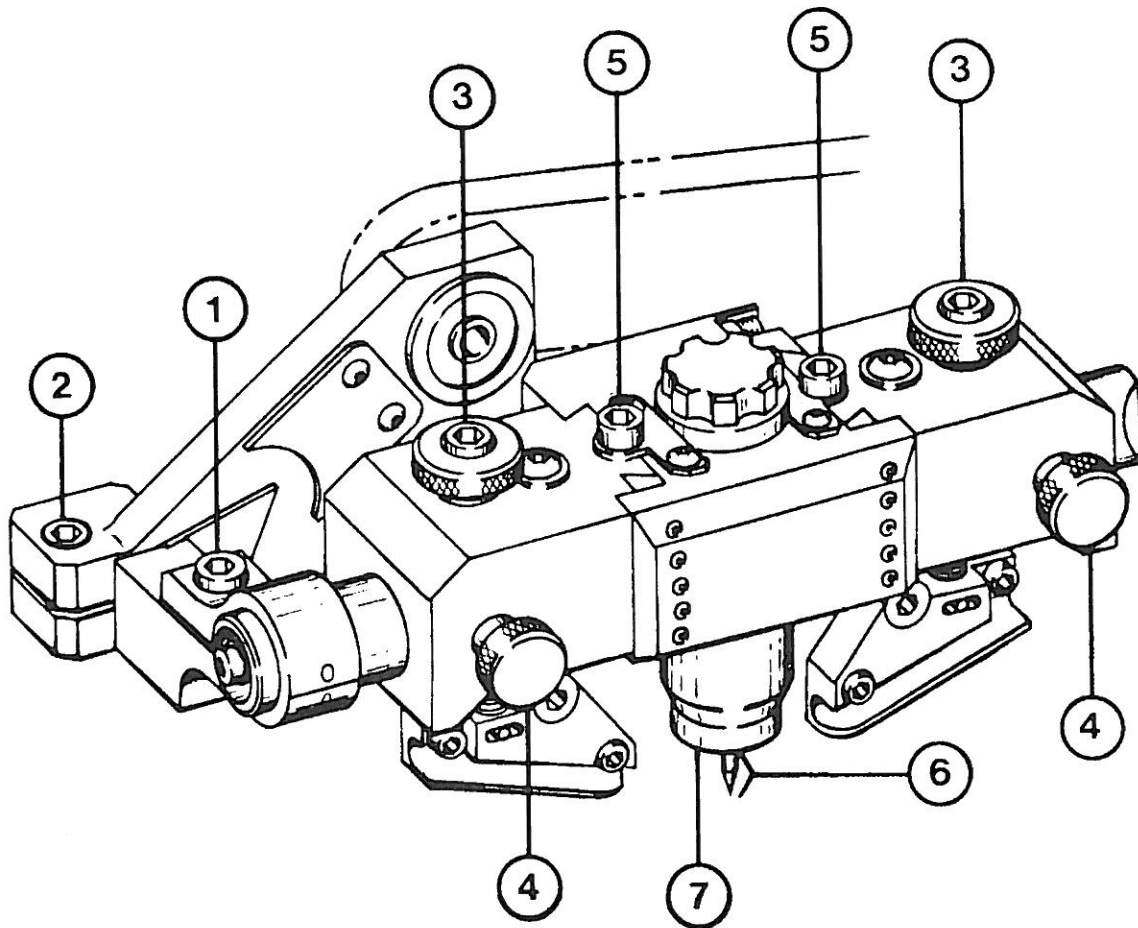


FIGURE 47

***MODEL 15 WELD HEAD
OPERATION MANUAL***

MODEL 15 "N" TORCH

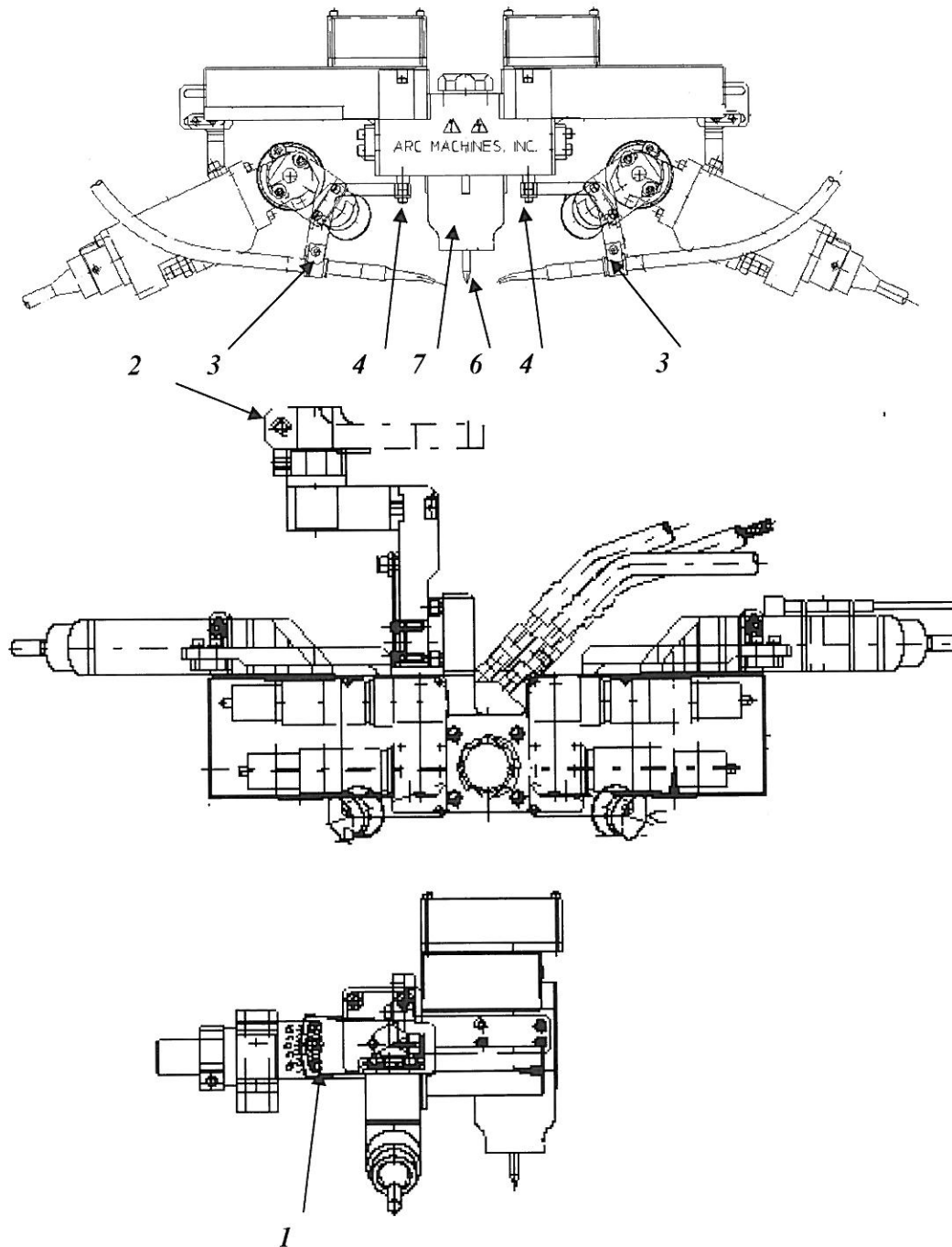


FIGURE 48

***MODEL 15 WELD HEAD
OPERATION MANUAL***

SECTION IV – CALIBRATION

4.0 SYSTEM OPERATION

When installed, the Model 15 Weld Head becomes an integral part of a Welding System consisting of the Weld Head and the Power Supply. Calibration and Operation involve both products. Consult the Operation Manual for the Power Supply before Calibrating or Operating the Model 15 Weld Head.

4.1 CALIBRATION GENERAL

1. Most calibrating functions are contained in the Power Supply/Controller Unit, however all AMI Weld Heads must be calibrated (matched) for Wire Feed Speed and Travel Speed to the Power Supply/Controller that it is used on. ANYTIME a Weld Head is changed from one Power Supply to another it must be checked for calibration of these (2) functions.
2. Calibration of the Travel speed for a Model 15 is the same as all other AMI Pipe Weld Heads. Follow the procedure given in the Operation and Maintenance Manual for the Power Supply/Controller Unit in use. The Travel Calibration Potentiometer is located on the Weld Head Rear Plate and Labeled "CAL"
3. Calibration of the Wire Feed for a Model 15 is the same as all other AMI Pipe Weld Heads. Follow the procedure given in the Operation and Maintenance Manual for the Power Supply/Controller Unit in use. The Wire Feed Calibration Potentiometer is located on the Wire Feed Drive Roller Assembly and is labeled "CAL".

4.2 TRAVEL CALIBRATION PROCEDURE

Perform the following steps to calibrate the Model 15 Travel Speed:

1. Mount the Model 15 on any diameter pipe with the appropriate guide ring and rollers and arrange for unobstructed travel.
2. Using a permanent ink marker or equivalent, mark the edge of the guide ring surface with 2 marks spaced 4 inches apart.
3. Select a reference point on the Weld Head (leading edge of the Wire Feed Assembly is good). Jog the Weld Head so the reference point is in line with the first mark on the guide ring and will move toward the second mark in the CCW (counter-clockwise) direction.
4. Program the Power Supply in accordance to the Travel Calibration Procedure contained in the Power Supply Operation and Maintenance Manual.
5. Program the following changes in the parameters:

Travel Speed - 4.0 IPM
Time - 60 SEC (Total Time Travel)
Timer Mode - Auto

***MODEL 15 WELD HEAD
OPERATION MANUAL***

SECTION IV – CALIBRATION

4.2 TRAVEL CALIBRATION (continued)

6. Insure that System Mode (Weld/Test) is in Test.
7. Press the Sequence START Button. After Sequence is completed and the M-15 has come to a stop, check to see that the Weld Head reference mark is lined up with the second mark on the Guide Ring. The distance should be 4.0 inches (+/- 0.04 in.).
8. If out of tolerance, adjust the TRAVEL CALIBRATION Potentiometer located at the rear of the Weld Head. Turn clockwise to increase speed. Jog the Head to the first Guide Ring reference mark and repeat Step 7 and 8 until correct.
9. Set the TRAVEL MODE to the CW (clockwise) Mode. Jog the M-15 to the second reference mark so travel is towards the first reference mark.
10. Press SEQUENCE START. The M-15 should travel 4.0 inches +/- 0.04 in. If it does not consult the Operation Manual for the Power Supply being used. There are Null and Offset Adjustments that may need to be made to the Power Supply.

4.3 WIRE FEED CALIBRATION

The Model 15 can be used with several different Power Supply models. However, ANYTIME a Weld Head is changed from one Power Supply to another, calibration must be checked for Wire feed Speed. To insure calibration accuracy over the entire range of wire feed speeds and direction, a full calibration of the Power Supply WIRE FEED SERVO Section is recommended. Refer to the Calibration Section of the Operating and Maintenance Manual of your Power Supply.

1. Tighten the tension on the Wire feed Drive Rollers until the wire can be jogged without slipping. Cut the wire off flush with the nozzle tip. Insure that WIRE ON/OFF in the ON position.
2. Program the Power Supply in accordance to the Wire Feed Calibration Procedure contained in the Power Supply Operation and Maintenance Manual.
3. Program the following changes in parameters:

Wire feed Speed - 40.0 IPM
Time - 60 SEC (Total Wire feed time)
Timing Mode - Auto
4. Insure that System Mode (Weld/Test) is in TEST.
5. Press the SEQUENCE START Button. After the Sequence is complete and the wire has stopped, cut the wire flush with the nozzle and measure its length. It should be 40 inches (+/- 0.4 in.).

If wire length is not correct, adjust the Wire feed Calibration Point located on the front of the Wire feed Assembly. Turn the CW to increase speed. Repeat Steps 4 and 5 until it is correct.
6. If the M-15 also has a CW Wire feeder (2 Wire feed Assemblies) set the TRAVEL MODE to the CW direction. Repeat steps 4 and 5 for this wire feeder.

***MODEL 15 WELD HEAD
OPERATION MANUAL***

SECTION V – ELECTRICAL SCHEMATICS

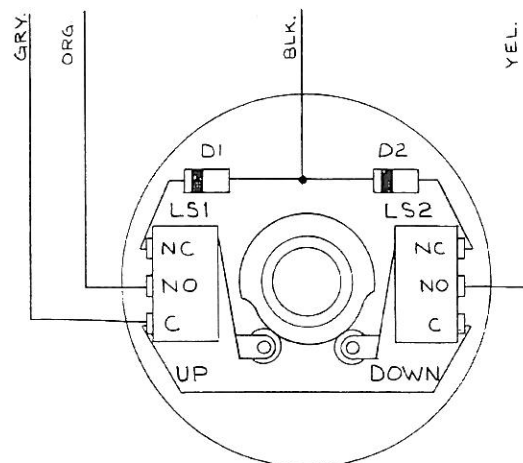
5.0 WELD HEAD WIRING DIAGRAMS

CAUTION

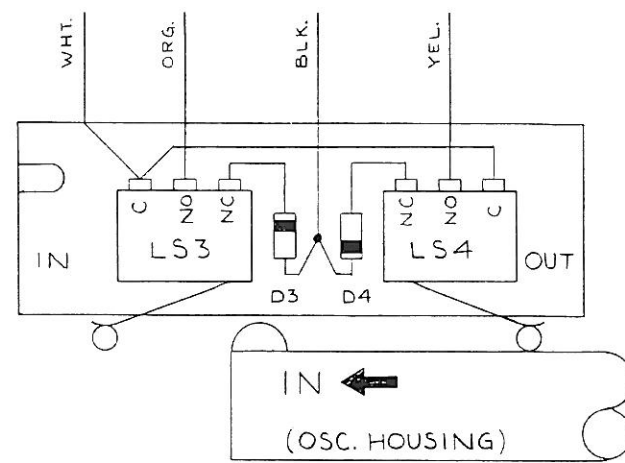
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Detailed, up to date, revised copies of these documents are available from AMI upon request. Please contact an AMI Service representative for further information.

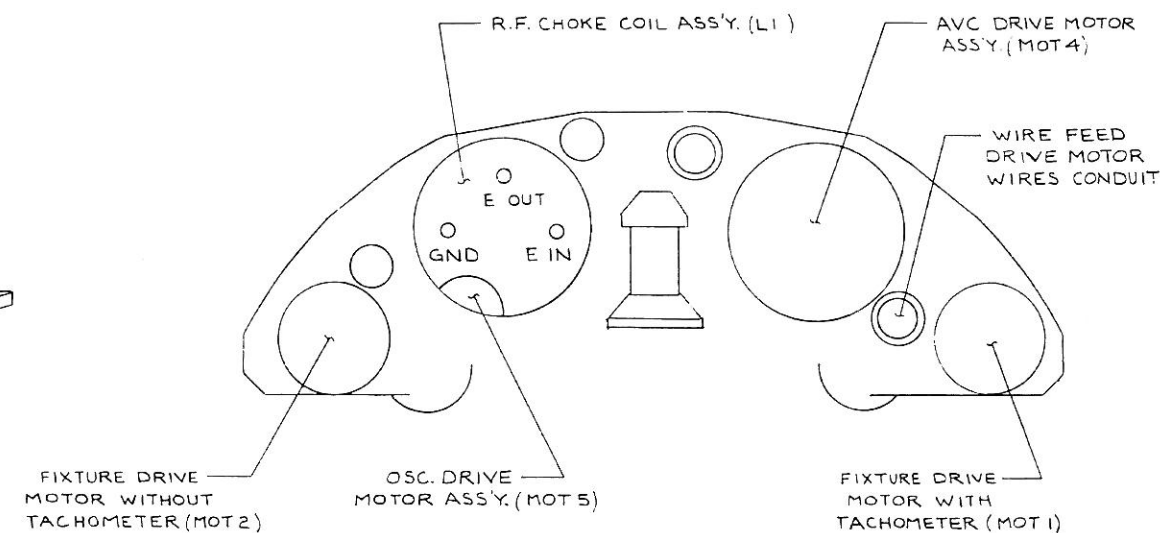
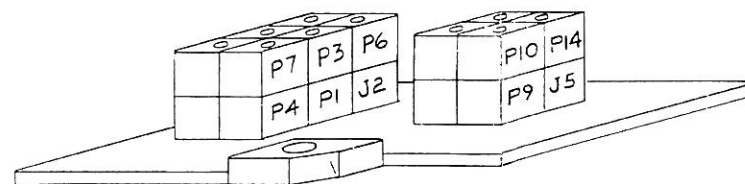
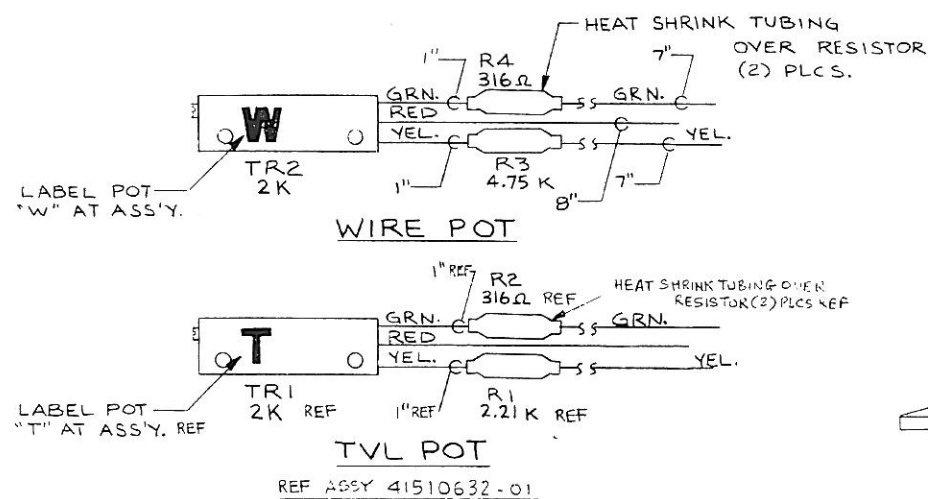
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		C	ADD AVC CABLE ASSY SEE © SHT-2	2-28-83
		D	ADD C1 & C2 CK06BX104K	5-18-84
		E	CORRECTION TO PJ18, REMOVE PJ18A SHT-2	9-18-84
581		F	Show Wire Relay	1-4-88
972		G	SH 2: P8 PIN P4R WAS REVERSED	3-8-89
1581	B7	H	TR 1 & 2 WAS 500 Ω , R1 WAS 8.87K R2 WAS 681 Ω , R3 WAS 9.09K & R4 WAS 274 Ω	5-26-92
1897	B7	J	REMOVED PIN NO.5 (23 FROM TR1 & TR2 REMOVED DIMS 7" AT GRN & YEL WIRES, 8" AT RED WIRE FROM TR1 & TR2 ADDED REF TO ALL CALLOUTS; REF ASSY 41510632-01 TO TVL POT	10-16-97
3884	SHT 2	K	ADDED AVC NOT TEST INSTRUCTIONS	7-3-01



AVC LIMIT SWITCH WIRING
STD. M-15



OSCILLATOR LIMIT SWITCH
WIRING



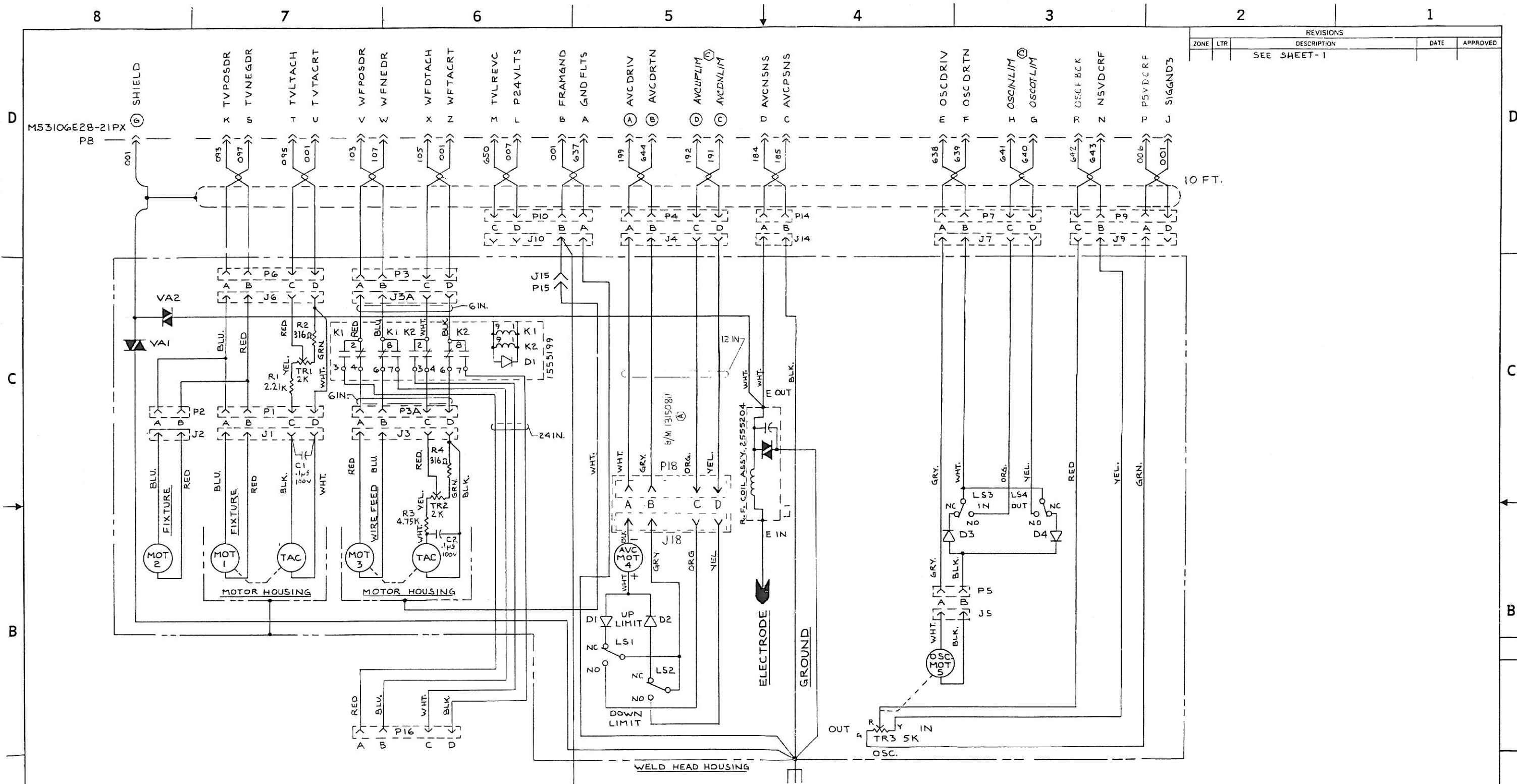
BACK END VIEW

7. WIRE FEED DRIVE MOTOR (MOT 3) ROTATION IS "CCW" FACING SHAFT END WITH J3 PIN A POSITIVE (+) AND J3 PIN B NEGATIVE (-).
6. LS3 : IN LIMIT , LS4 : OUT LIMIT.
5. OSC. DRIVE MOTOR (MOT 5) BALL SCREW MOVEMENT IS "RETRACT" WITH J5 PIN A POSITIVE (+) AND J5 PIN B NEGATIVE (-).
4. AVC DRIVE MOTOR (MOT 4) ROTATION IS "CCW" FACING SHAFT END WITH J4 PIN A POSITIVE (+) AND J4 PIN B NEGATIVE (-).
3. FIXTURE DRIVE MOTOR (MOT 2) ROTATION IS "CCW" FACING SHAFT END WITH J2 PIN A POSITIVE (+) AND J2 PIN B NEGATIVE (-).
2. FIXTURE DRIVE MOTOR (MOT 1) ROTATION IS "CCW" FACING SHAFT END WITH J1 PIN A POSITIVE (+) AND J1 PIN B NEGATIVE (-).
1. REF. DWG. NO. 135156-01 B/M.

NOTES:

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLES = .015 = .001 = .001		CONTRACT NO.		APPROVALS		DATE	
MATERIAL		DRAWN R. BILEK		CHECKED RO		4-5-83	
FINISH		M-115		M-105		NEXT ASSY USED ON	
APPLICATION		DO NOT SCALE DRAWING		SCALE NONE		SHEET 1 OF 2	
ARC MACHINES INC.				WIRING DIAGRAM MODEL 15 PIPE WELD HEAD			
SIZE		CODE IDENT NO		DRAWING NO.		REV.	
D		475156-01		K			



REVISIONS			
ZONE	LTR	DESCRIPTION	DATE
SEE SHEET-1			
APPROVED			

AVC MOTOR TEST INSTRUCTIONS

TESTING AVC MOTOR SHAFT DIRECTION CONNECTING POS. (+) OF TEST P/S TO PIN A OF J18 AND NEG (-) OF P/S TO PIN B OF J18. VIEWING FROM FRONT OF MOTOR SHAFT, AVC ARM SHOULD MOVE GOING UP (SHAFT SHOULD TURN CCW).

NOTE: THIS TEST SHOULD BE PERFORMED ONLY WITH M15 WELDHEAD MOTOR FULLY WIRED WITH DIODES, LIMIT SWITCHES AND J18 CONNECTED.

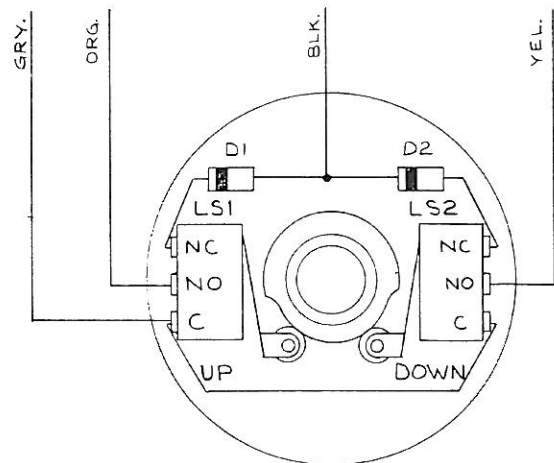
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=	.XX =	=
=	.XXX =	=
MATERIAL		
FINISH		
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NEXT ASSY	M-105	
USED ON		
APPLICATION		
DO NOT SCALE DRAWING		

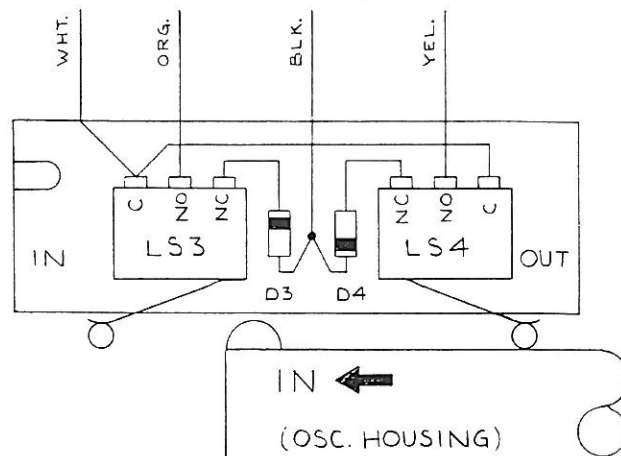
CONTRACT NO.	
APPROVALS	
DRAWN R. BILEK	DATE 3-22-83
CHECKED RO	DATE 3-28-83
G.P.	

ARC MACHINES INC.			
WIRING DIAGRAM MODEL 15 PIPE WELD HEAD			
SIZE D	CODE IDENT NO	DRAWING NO	REV K
		475156-01	
SCALE		SHEET 2 OF 2	

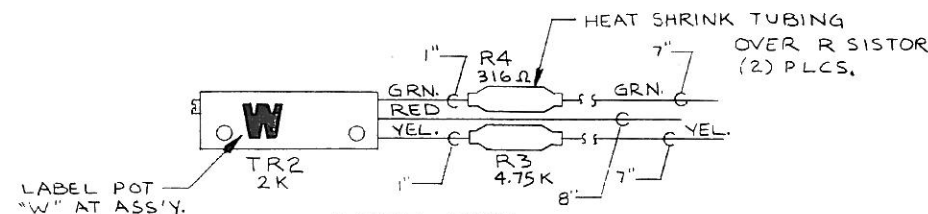
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		B	ADD C1-3 CKOG BX104K	5-18-84
125		C	UPDATED SIGNAL NAMES SHT 2	11-3-86
972		D	SH 2: PB PIN P & R WAS REVERSED	3-8-89
1581	B7	E	TR1 & 2 WAS 500 Ω , R1 WAS 8.87K R2 WAS 681 Ω , R3 WAS 9.09K R4 WAS 274 Ω	5-27-92
2897	B7	F	REMOVED PIN NOS 12,3 FROM TR1 & TR2 REMOVED DIMS 7" AT GRN & YEL WIRES B'AT RED WIRE FROM TR1 & TR2 ADD REF TO ALL CALLOUTS; REF ASSY 4150632-01 TO TVL POT	10-16-97
3884	SHT 2	G	ADDED AVC NOT TEST INSTRUCTIONS	7-3-98



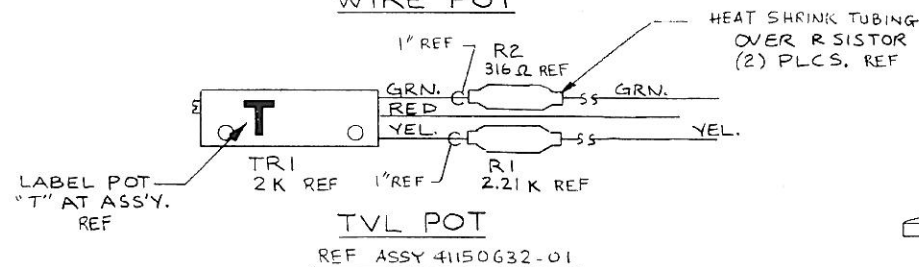
AVC LIMIT SWITCH WIRING
STD. M-15



OSCILLATOR LIMIT SWITCH
WIRING

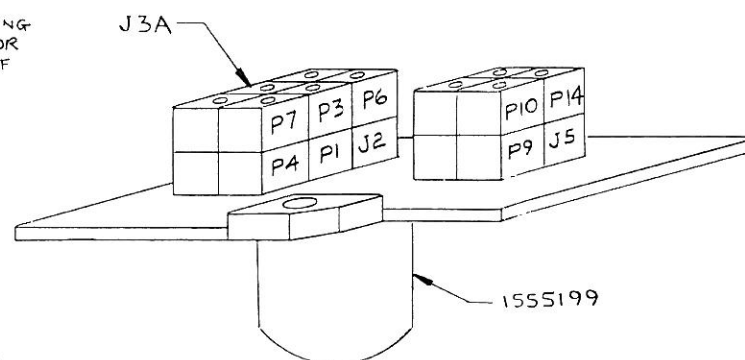


WIRE POT

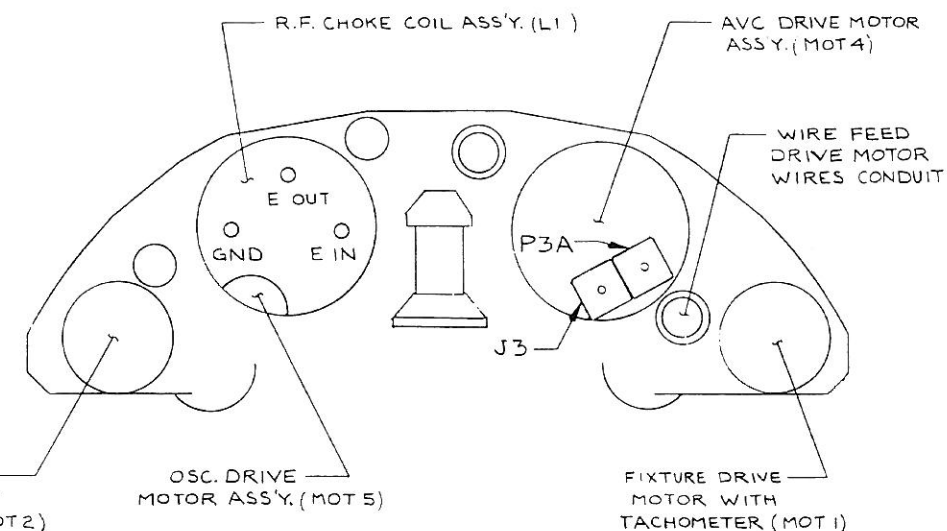


TVL POT

REF ASSY 4150632-01



DUAL WIRE FEED



BACK END VIEW

8. AUX. WIRE FEED DRIVE MOTOR (MOT 6) ROTATION IS "CW" FACING SHAFT END WITH J16 PIN A POSITIVE (+) AND J16 PIN B NEGATIVE (-).
7. WIRE FEED DRIVE MOTOR (MOT 3) ROTATION IS "CCW" FACING SHAFT END WITH J3 PIN A POSITIVE (+) AND J3 PIN B NEGATIVE (-).
6. LS3 : IN LIMIT , LS4 : OUT LIMIT.
5. OSC. DRIVE MOTOR (MOT 5) BALL SCREW MOVEMENT IS "RETRACT" WITH J5 PIN A POSITIVE (+) AND J5 PIN B NEGATIVE (-).
4. AVC DRIVE MOTOR (MOT 4) ROTATION IS "CCW" FACING SHAFT END WITH J4 PIN A POSITIVE (+) AND J4 PIN B NEGATIVE (-).
3. FIXTURE DRIVE MOTOR (MOT 2) ROTATION IS "CCW" FACING SHAFT END WITH J2 PIN A POSITIVE (+) AND J2 PIN B NEGATIVE (-).
2. FIXTURE DRIVE MOTOR (MOT 1) ROTATION IS "CCW" FACING SHAFT END WITH J1 PIN A POSITIVE (+) AND J1 PIN B NEGATIVE (-).
1. REF. DWG. NO. 135156-3 B/M.

NOTES:

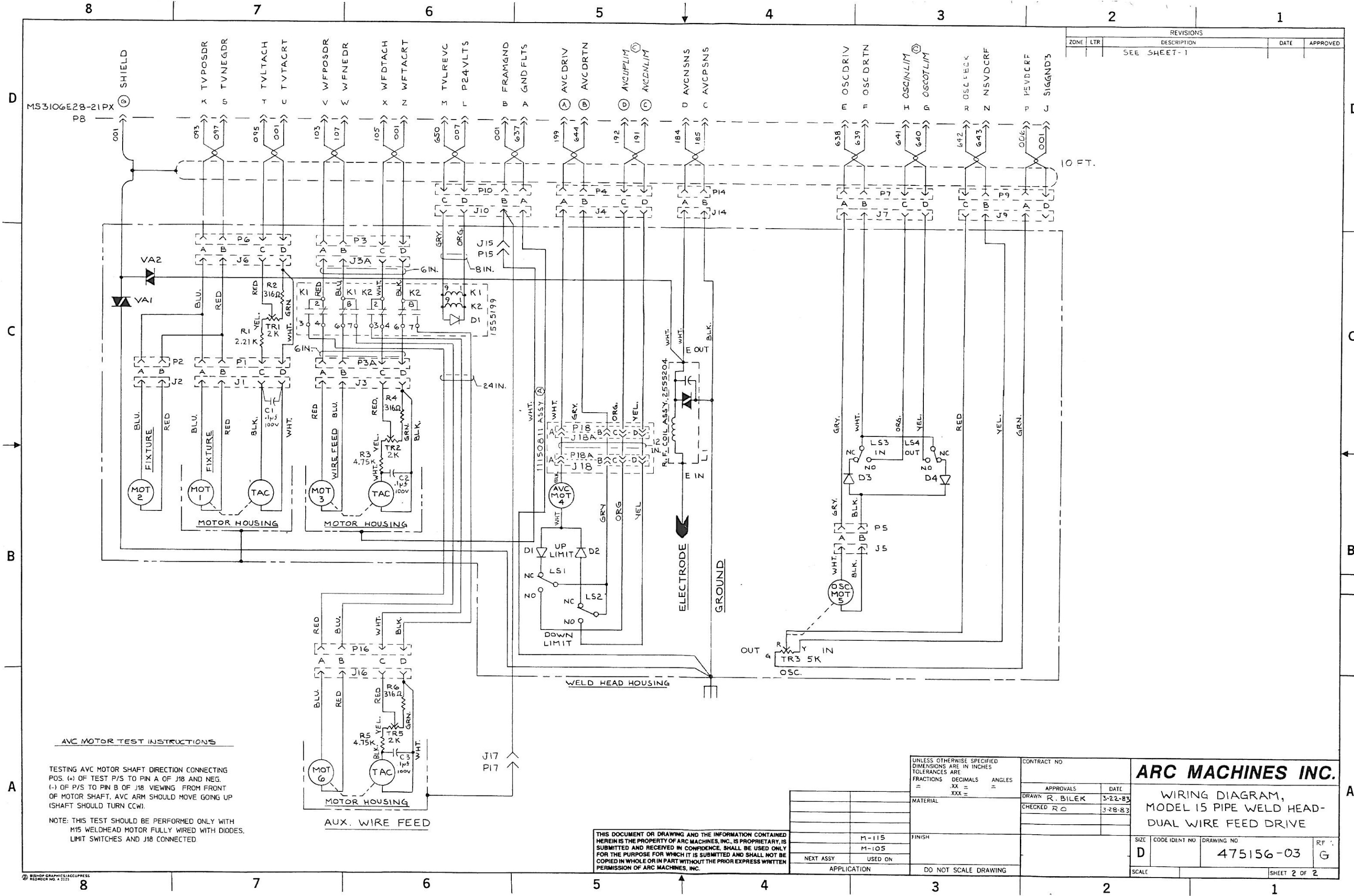
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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLES ± .005 ± .001 ± .001		CONTRACT NO.	
MATERIAL		APPROVALS	
FINISH		DATE	
NEXT ASSY USED ON		DRAWN R. BILEK	
APPLICATION		CHECKED RD	
DO NOT SCALE DRAWING		DATE 4-5-83	

ARC MACHINES INC.

WIRING DIAGRAM
MODEL 15 PIPE WELD HEAD
DUAL WIRE FEED DRIVE

SIZE	CODE IDENT NO	DRAWING NO.	REV
D		475156-03	G
SCALE No A/C		SHEET 1 OF 2	



REVISIONS			
ZONE	LTR	DESCRIPTION	DATE
SEE SHEET-1			

AVC MOTOR TEST INSTRUCTIONS

TESTING AVC MOTOR SHAFT DIRECTION CONNECTING POS. (+) OF TEST P/S TO PIN A OF J18 AND NEG. (-) OF P/S TO PIN B OF J18 VIEWING FROM FRONT OF MOTOR SHAFT, AVC ARM SHOULD MOVE GOING UP (SHAFT SHOULD TURN CCW).

NOTE: THIS TEST SHOULD BE PERFORMED ONLY WITH M15 WELDHEAD MOTOR FULLY WIRED WITH DIODES, LIMIT SWITCHES AND J18 CONNECTED

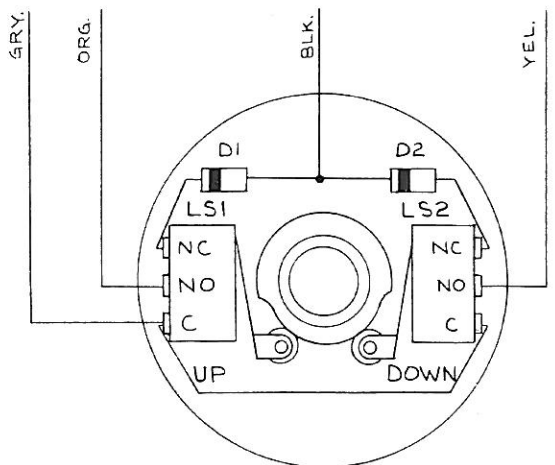
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CONTRACT NO.		APPROVALS		DATE
DRAWN R. BILEK		CHECKED R. O.		3-22-83
MATERIAL		FINISH		
M-115		M-105		
NEXT ASSY USED ON		APPLICATION		DO NOT SCALE DRAWING
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLES = .XX = .XXX = °		SIZE D		CODE IDENT NO. 475156-03
		DRAWING NO.		RF G
		SCALE		SHEET 2 OF 2

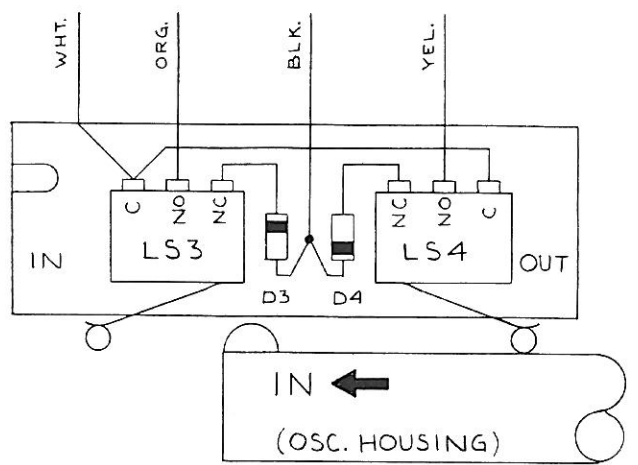
ARC MACHINES INC.

WIRING DIAGRAM, MODEL 15 PIPE WELD HEAD-DUAL WIRE FEED DRIVE

D
C
B
A

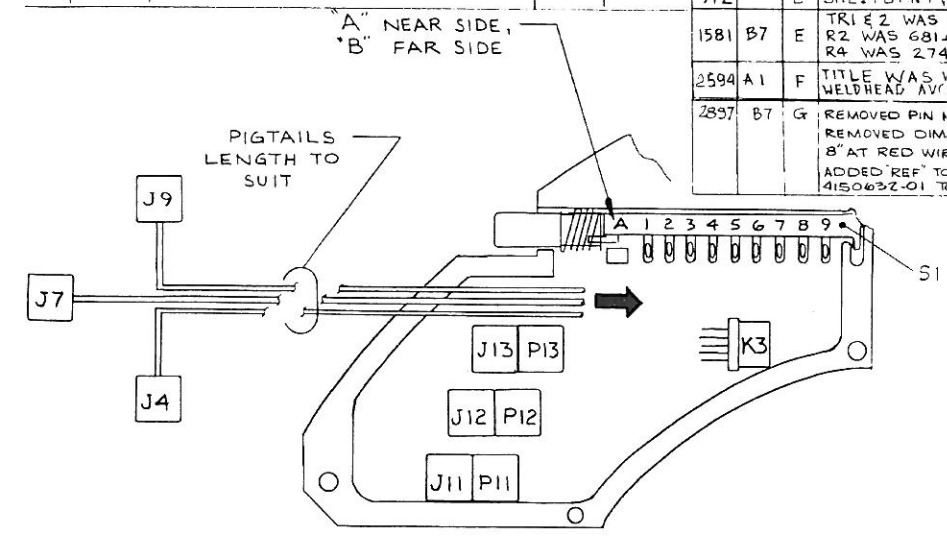


AVC LIMIT SWITCH WIRING
STD. M-15

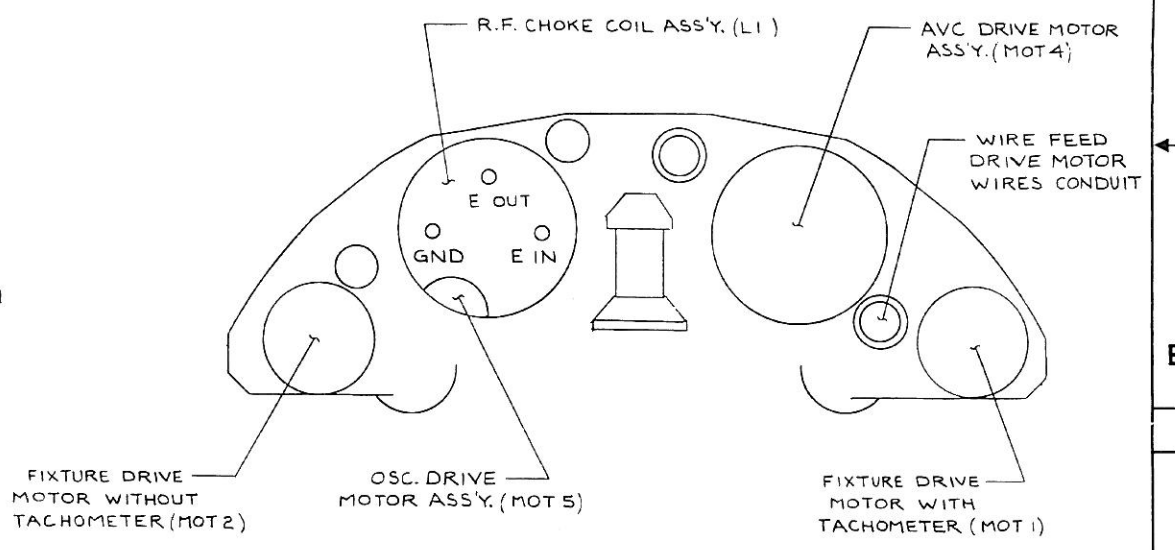
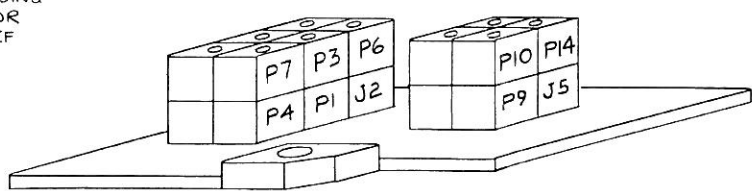
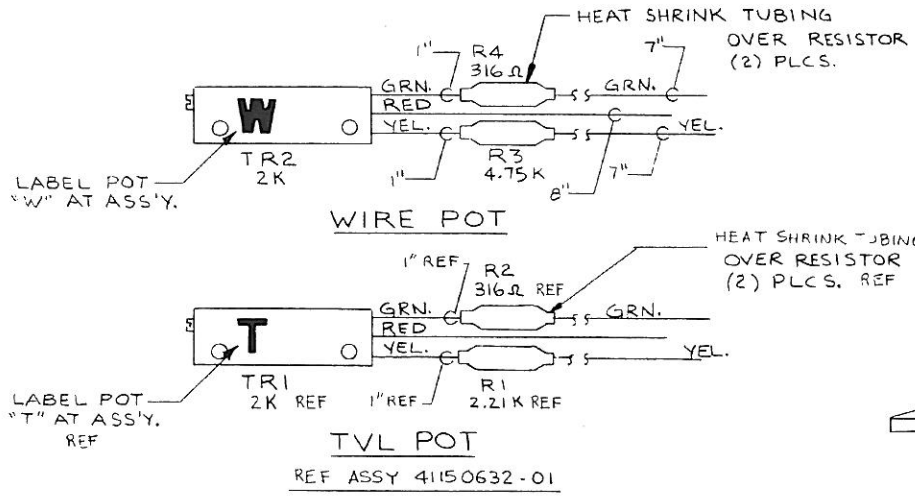


OSCILLATOR LIMIT SWITCH
WIRING

3004 SHT 2 H				ADDED AVC MOT TEST INSTRUCTIONS				7-3-01 DM			
				REVISIONS							
DCO	ZONE	LTR	DESCRIPTION		DATE	APPROVED					
		A	ADD AVC CABLE ASS'Y. SEE SHT 2		12-28-83	RD					
		B	ADD C1,2 CK06BX104K		5-16-84	RD					
125		C	UPDATED SIGNAL NAMES		11-4-86	CPE					
972		D	SH2: PB PIN P1R WAS REVERSED		3-9-89	MLC					
1581	B7	E	TR1 E2 WAS 500Ω, R1 WAS 8.87K R2 WAS 681Ω, R3 WAS 9.09K Ω R4 WAS 274Ω		5-27-92	MH					
2594	A1	F	TITLE WAS WIRING DIAGRAM MODEL 15 WELDHEAD AVC/OSC SWITCHER		1-29-97	L					
2837	B7	G	REMOVED PIN NOS 1,2,3 FROM TR1 & TR2 REMOVED DIMS 7" AT GRN & YEL WIRES 8" AT RED WIRE FROM TR1 & TR2 ADDED REF TO ALL CALLOUTS; REF ASSY 4150632-01 TO TVL POT		10-16-97	MS					



AVC/OSC. SWITCHER



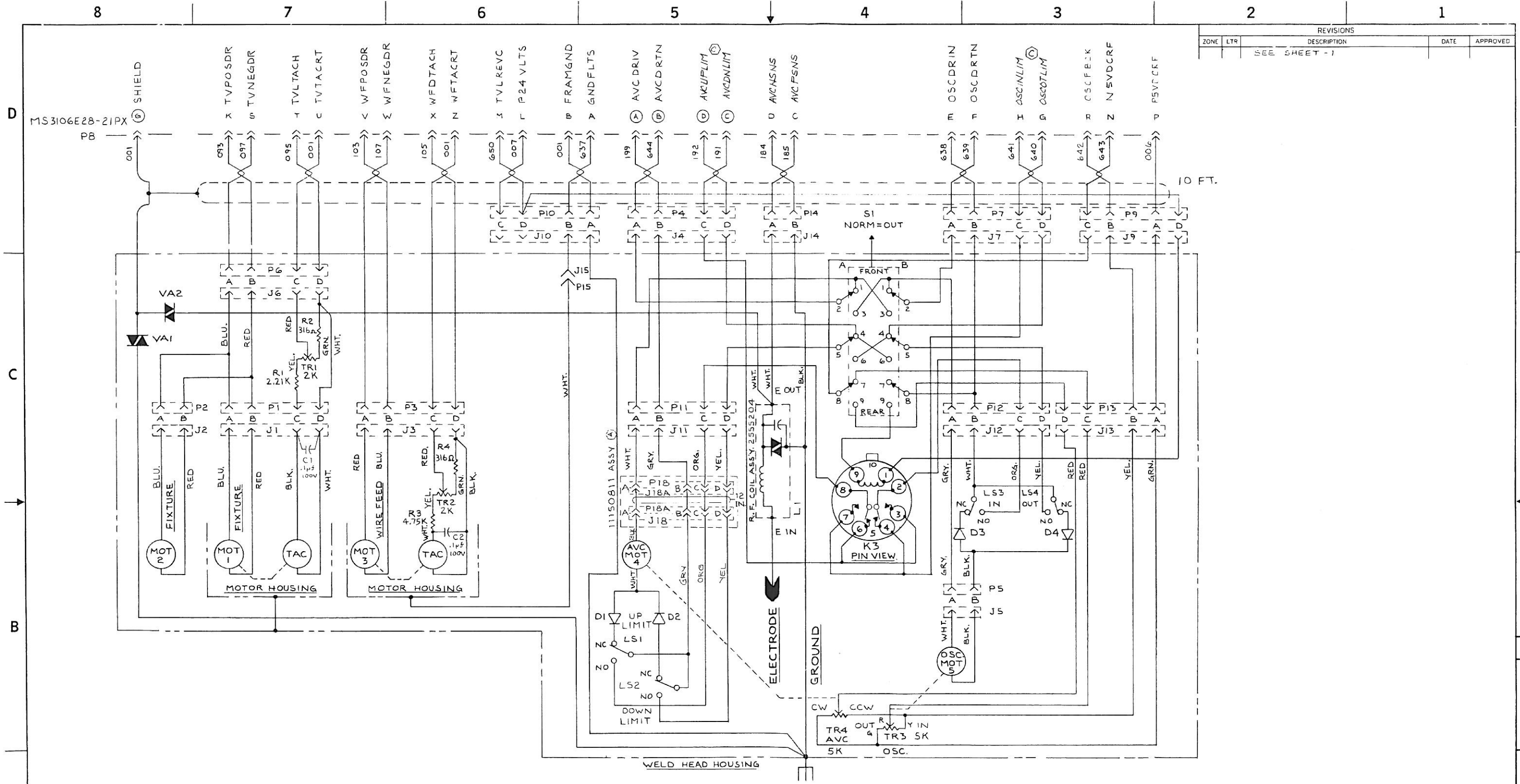
BACK END VIEW

7. WIRE FEED DRIVE MOTOR (MOT 3) ROTATION IS "CCW" FACING SHAFT END WITH J3 PIN A POSITIVE (+) AND J3 PIN B NEGATIVE (-).
6. LS3 : IN LIMIT , LS4 : OUT LIMIT.
5. OSC. DRIVE MOTOR (MOT 5) BALL SCREW MOVEMENT IS "RETRACT" WITH J5 PIN A POSITIVE (+) AND J5 PIN B NEGATIVE (-).
4. AVC DRIVE MOTOR (MOT 4) ROTATION IS "CCW" FACING SHAFT END WITH J4 PIN A POSITIVE (+) AND J4 PIN B NEGATIVE (-).
3. FIXTURE DRIVE MOTOR (MOT 2) ROTATION IS "CCW" FACING SHAFT END WITH J2 PIN A POSITIVE (+) AND J2 PIN B NEGATIVE (-).
2. FIXTURE DRIVE MOTOR (MOT 1) ROTATION IS "CCW" FACING SHAFT END WITH J1 PIN A POSITIVE (+) AND J1 PIN B NEGATIVE (-).
1. REF. DWG. NO. 135156-4 B/M.

NOTES:-

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QTY REQD		CODE IDENT	PART OR IDENTIFYING NO		NOMENCLATURE OR DESCRIPTION		
PARTS LIST							
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLES . XX = ° XXX =			CONTRACT NO		ARC MACHINES INC. WIRING DIAGRAM MODEL 15 PIPE WELD HEAD AVC/OSC INTERCHANGE.		
			APPROVALS				DATE
			DRAWN	R. BILEK			4-5-83
			CHECKED	RD			5-5-83
MATERIAL							
FINISH							
M-115					SIZE		
M-105					CODE IDENT NO		
NEXT ASSY					DRAWING NO		
USED ON					475156-04		
APPLICATION			DO NOT SCALE DRAWING		REV		
					D		
					H		
					SCALE		
					SHEET / OF 2		



REVISIONS			
ZONE	LTR	DESCRIPTION	DATE
		SEE SHEET - 1	

AVC MOTOR TEST INSTRUCTIONS

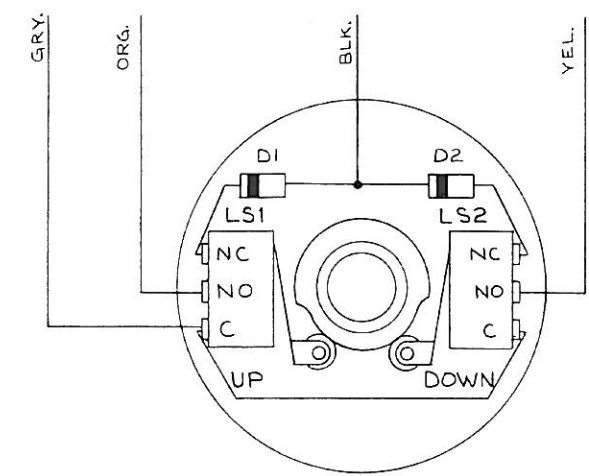
TESTING AVC MOTOR SHAFT DIRECTION CONNECTING POS. (+) OF TEST P/S TO PIN A OF J18 AND NEG. (-) OF P/S TO PIN B OF J18. VIEWING FROM FRONT OF MOTOR SHAFT, AVC ARM SHOULD MOVE GOING UP (SHAFT SHOULD TURN CCW).

NOTE: THIS TEST SHOULD BE PERFORMED ONLY WITH M15 WELDHEAD MOTOR FULLY WIRED WITH DIODES, LIMIT SWITCHES AND J18 CONNECTED.

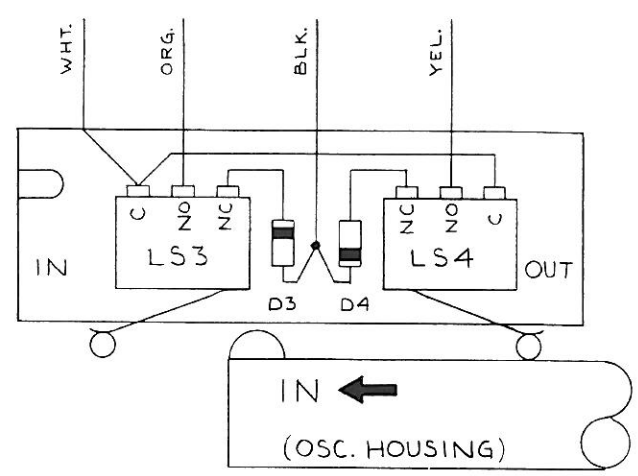
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QTY REQD	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION
PARTS LIST			
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE FRACTIONS DECIMALS ANGLES = .XXX =		CONTRACT NO.	
MATERIAL		APPROVALS DATE	
FINISH		DRAWN R. BILEK 3-16-83	
NEXT ASSY USED ON		CHECKED RD 3-28-83	
APPLICATION		DO NOT SCALE DRAWING	
SIZE D		CODE IDENT NO	DRAWING NO
SCALE		475156-04	REV. H
		SHEET 2 OF 2	

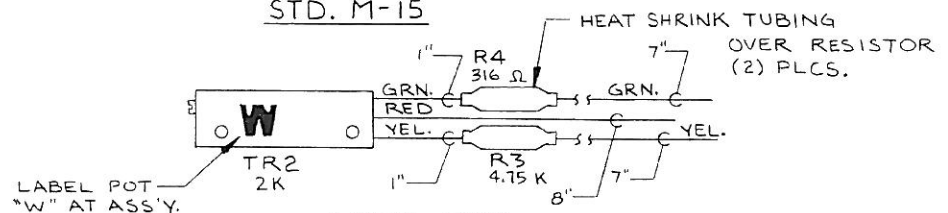
AVC LIMIT SWITCH WIRING
STD. M-15



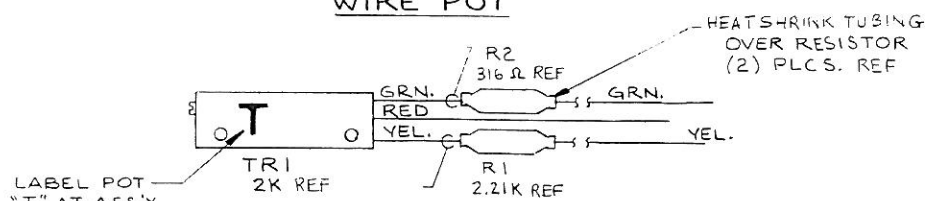
OSCILLATOR LIMIT SWITCH
WIRING



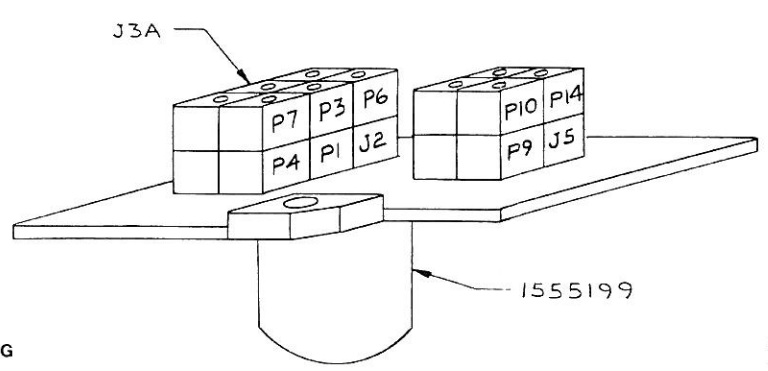
WIRE POT



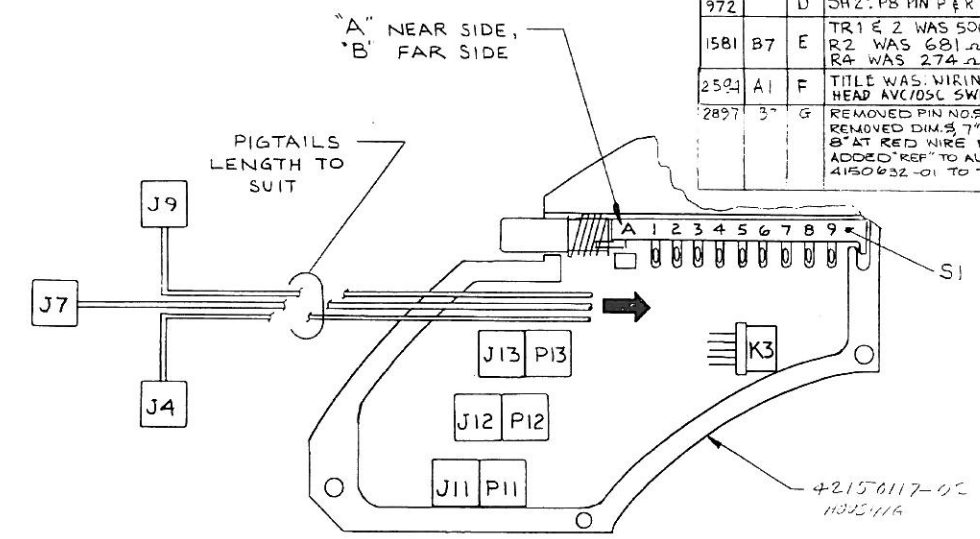
TVL POT



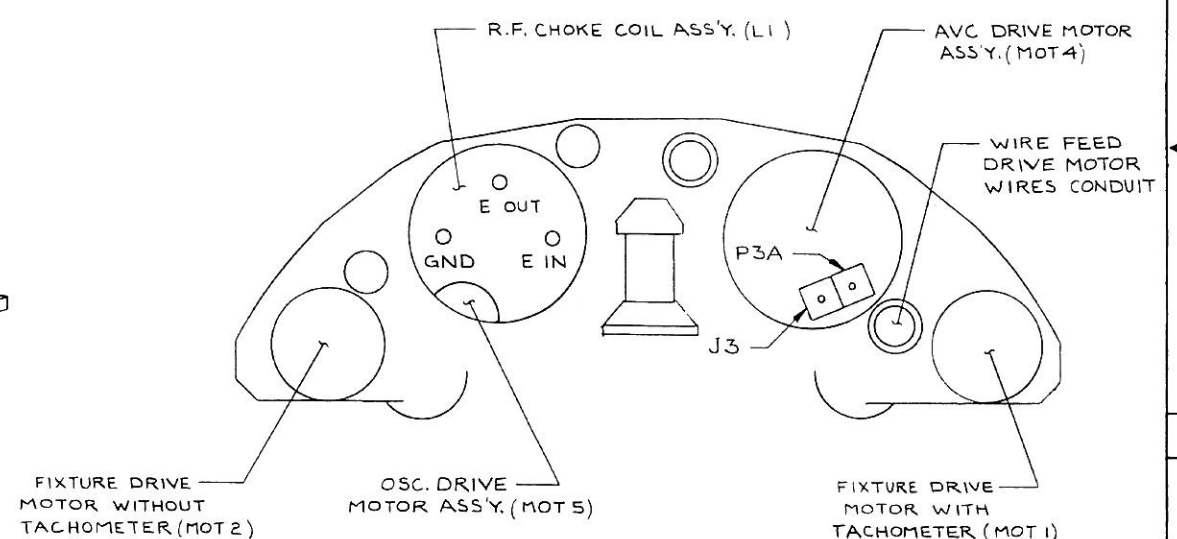
DUAL WIRE FEED



AVC/OSC. SWITCHER



BACK END VIEW



8. AUX. WIRE FEED DRIVE MOTOR (MOT 6) ROTATION IS "CW" FACING SHAFT END WITH J16 PIN A POSITIVE(+) AND J16 PIN B NEGATIVE (-).
7. WIRE FEED DRIVE MOTOR (MOT 3) ROTATION IS "CCW" FACING SHAFT END WITH J3 PIN A POSITIVE (+) AND J3 PIN B NEGATIVE (-).
6. LS3 : IN LIMIT , LS4 : OUT LIMIT.
5. OSC. DRIVE MOTOR (MOT 5) BALL SCREW MOVEMENT IS "RETRACT" WITH J5 PIN A POSITIVE (+) AND J5 PIN B NEGATIVE (-).
4. AVC DRIVE MOTOR (MOT 4) ROTATION IS "CCW" FACING SHAFT END WITH J4 PIN A POSITIVE (+) AND J4 PIN B NEGATIVE (-).
3. FIXTURE DRIVE MOTOR (MOT 2) ROTATION IS "CCW" FACING SHAFT END WITH J2 PIN A POSITIVE (+) AND J2 PIN B NEGATIVE (-).
2. FIXTURE DRIVE MOTOR (MOT 1) ROTATION IS "CCW" FACING SHAFT END WITH J1 PIN A POSITIVE (+) AND J1 PIN B NEGATIVE (-).
1. REF. DWG. NO. 135156-6 B/M.

NOTES:

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M-115	FINISH
M-105	USED ON
NEXT ASSY	APPLICATION

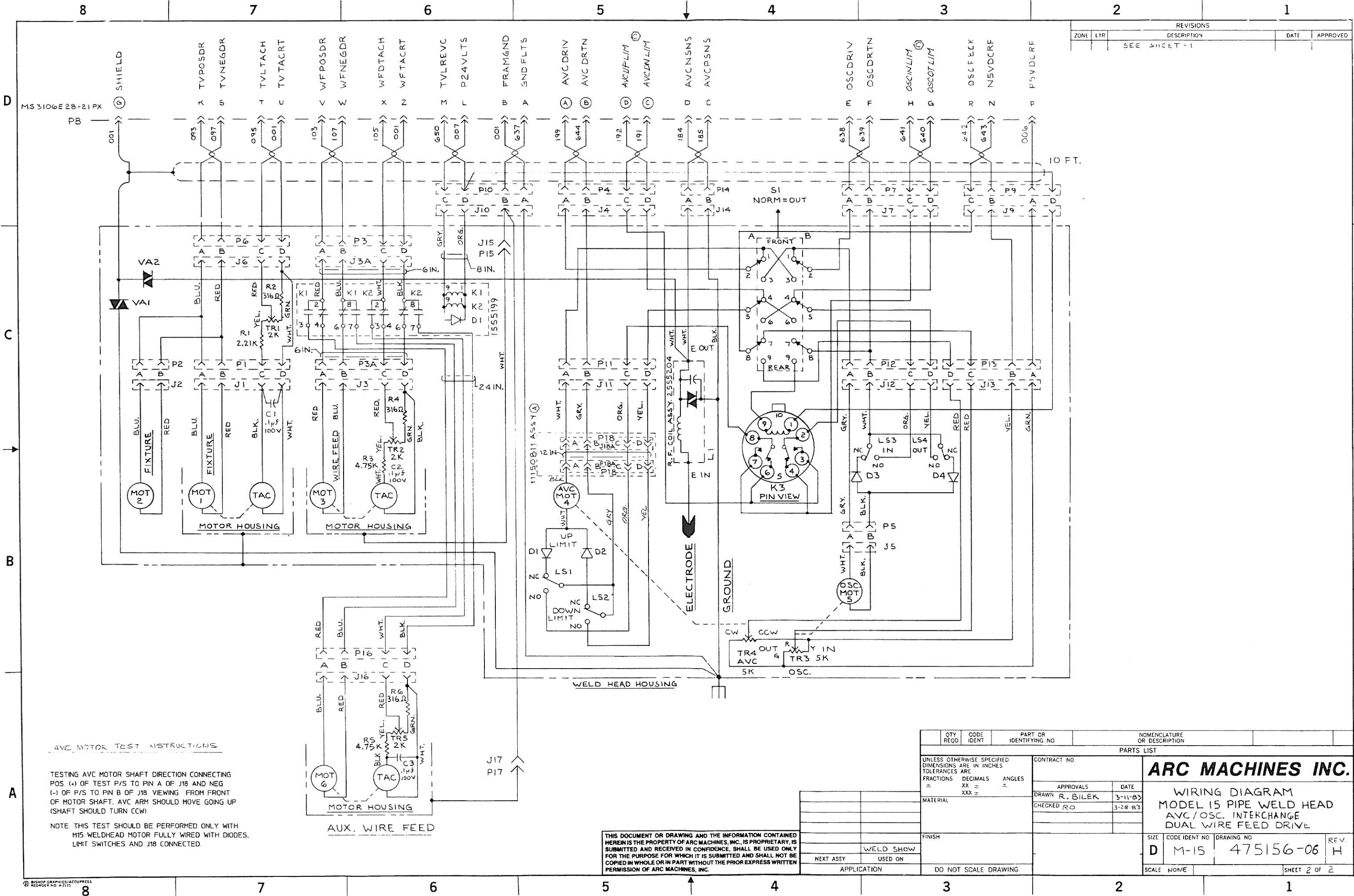
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PARTS LIST			
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES = .XX ± .XXX ±			
CONTRACT NO		APPROVALS	
MATERIAL		DATE	
FINISH		DRAWN R. BILEK 4-5-83	
APPLICATION		CHECKED RO 4-5-83	
DO NOT SCALE DRAWING		SCALE N O W C	

ARC MACHINES INC.

WIRING DIAGRAM
MODEL 15 PIPE WELD HEAD
AVC/OSC INTERCHANGE
DUAL WIRE FEED

SIZE D CODE IDENT NO 475156-06 H SHEET 1 OF 2

DCO	ZONE	LTR	DESCRIPTION	DATE	APPROVED
		A	ADD AVC CABLE ASSY SEE (A) SHT 2	12-27-83	RO
		B	ADD C1-3 CK06BX104K	5-18-84	RO
125		C	UPDATED SIGNAL NAMES SHT 2	11-9-86	MLC
972		D	SH2: PB PIN P & R WAS REVERSED	3-9-89	MLC
1581	87	E	TR1 & 2 WAS 500Ω, R1 WAS 8.87K R2 WAS 681Ω, R3 WAS 9.09K & R4 WAS 274Ω	5-28-92	MLC
2524	A1	F	TITLE WAS: WIRING DIAGRAM MODEL 15 WELD HEAD AVC/OSC SWITCHER DUAL WIRE FEED	1-29-97	MLC
2897	3	G	REMOVED PIN NOS 12,3 FROM TR1 & TR2 REMOVED DIM. 3.7" AT GRN & YEL WIRES 8" AT RED WIRE FROM TR1 & TR2 ADDED "REF" TO ALL CALLOUTS, REF ARBY 4150632-01 TO TVL POT	10-16-97	MLC



REVISIONS			
ZONE	LTR	DESCRIPTION	DATE
SEE SHEET - 1			

AVC MOTOR TEST INSTRUCTIONS

TESTING AVC MOTOR SHAFT DIRECTION CONNECTING POS (+) OF TEST P/S TO PIN A OF J18 AND NEG (-) OF P/S TO PIN B OF J18. VIEWING FROM FRONT OF MOTOR SHAFT, AVC ARM SHOULD MOVE GOING UP (SHAFT SHOULD TURN CCW).

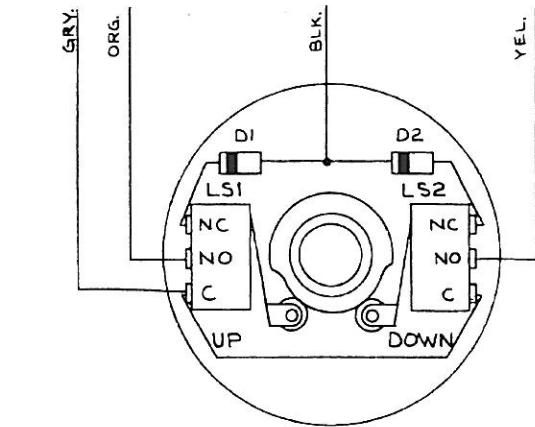
NOTE THIS TEST SHOULD BE PERFORMED ONLY WITH M15 WELDHEAD MOTOR FULLY WIRED WITH DIODES, LIMIT SWITCHES AND J18 CONNECTED.

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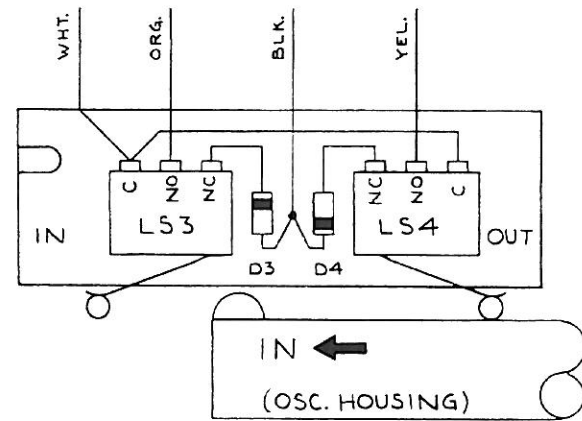
QTY REQD	CODE IDENT	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION
PARTS LIST			
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLES XX = .XXX = °			
MATERIAL		CONTRACT NO	APPROVALS DATE
FINISH		WELD SHOW	CHECKED R.D. 3-28-83
NEXT ASSY USED ON		APPLICATION	DO NOT SCALE DRAWING
SIZE		CODE IDENT NO	D M-15
DRAWING NO		475156-06	REV. H
SCALE		NONE	SHEET 2 OF 2

ARC MACHINES INC.

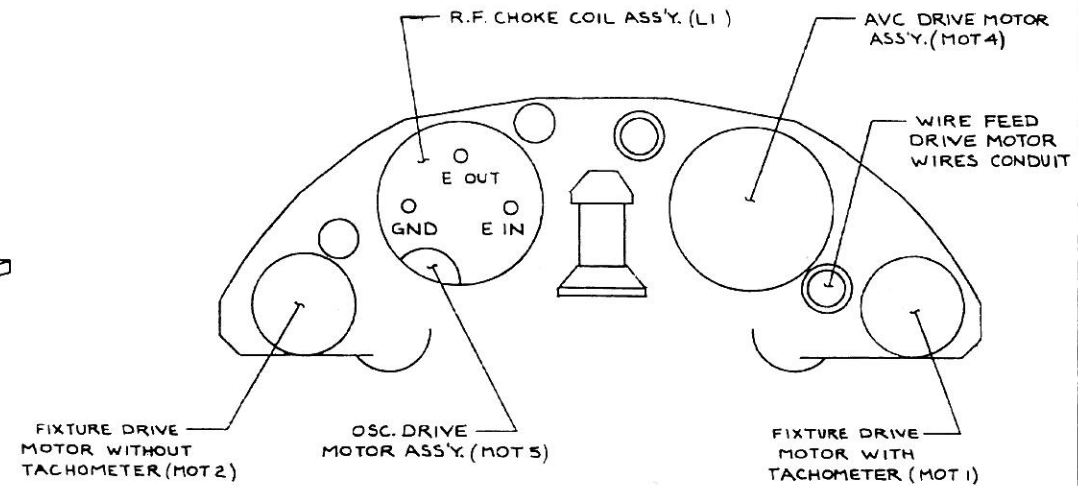
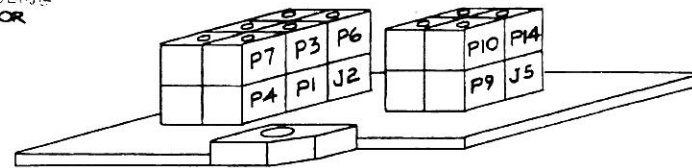
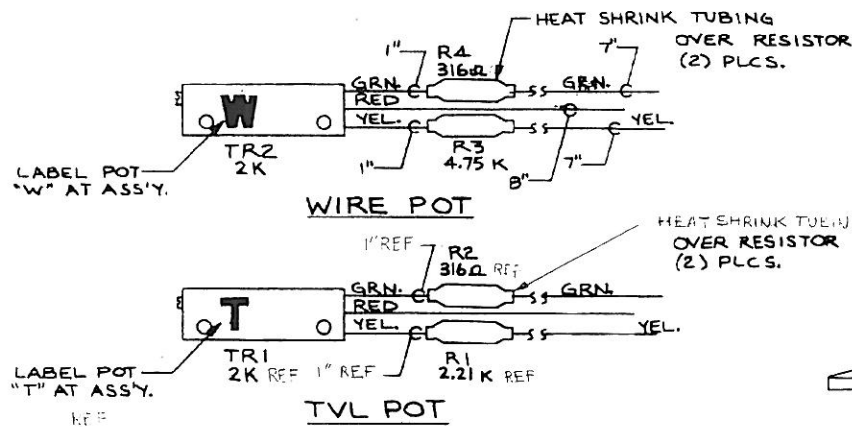
WIRING DIAGRAM
MODEL 15 PIPE WELD HEAD
AVC/OSC. INTERCHANGE
DUAL WIRE FEED DRIVE



AVC LIMIT SWITCH WIRING
STD. M-15



OSCILLATOR LIMIT SWITCH
WIRING



BACK END VIEW

1. FIXTURE DRIVE MOTOR (MOT 1) ROTATION IS "CCW" FACING SHAFT END WITH J1 PIN A POSITIVE (+) AND J1 PIN B NEGATIVE (-).
2. FIXTURE DRIVE MOTOR (MOT 2) ROTATION IS "CCW" FACING SHAFT END WITH J2 PIN A POSITIVE (+) AND J2 PIN B NEGATIVE (-).
3. AVC DRIVE MOTOR (MOT 4) ROTATION IS "CCW" FACING SHAFT END WITH J4 PIN A POSITIVE (+) AND J4 PIN B NEGATIVE (-).
4. OSC. DRIVE MOTOR (MOT 5) BALL SCREW MOVEMENT IS "RETRACT" WITH J5 PIN A POSITIVE (+) AND J5 PIN B NEGATIVE (-).
5. LS3 : IN LIMIT , LS4 : OUT LIMIT.
6. WIRE FEED DRIVE MOTOR (MOT 3) ROTATION IS "CCW" FACING SHAFT END WITH J3 PIN A POSITIVE (+) AND J3 PIN B NEGATIVE (-).

NOTES:

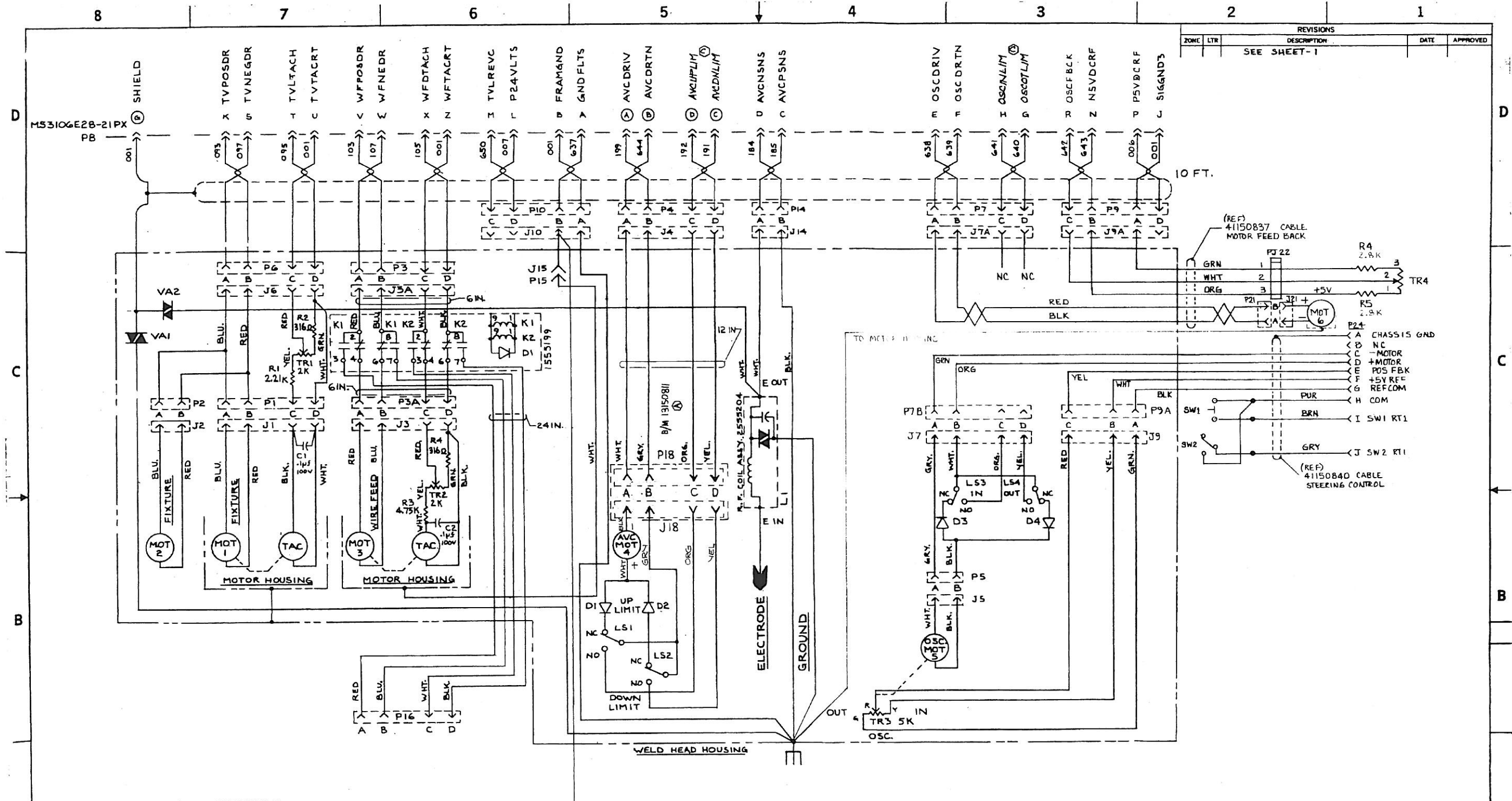
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411507324	M15 T/P
NEXT ASSY	USED ON
APPLICATION	DO NOT SCALE DRAWING

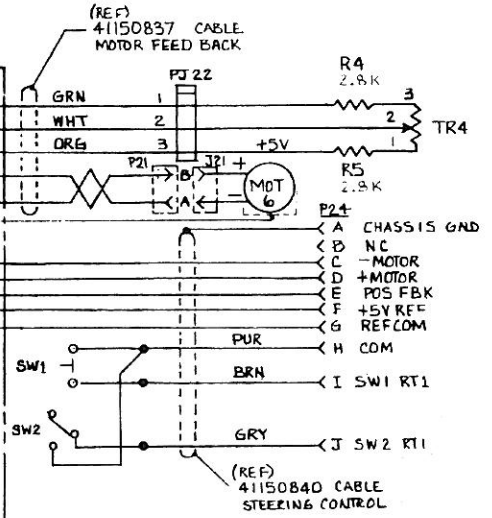
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ± .XX ± .XXX ±	CONTRACT NO.
MATERIAL	APPROVALS
FINISH	DATE

DRAWN MC	DATE 01-10-95
CHECKED LECT	DATE 01-10-95
606	DATE 2-27-96

ARC MACHINES INC.			
WIRING DIAGRAM MODEL 15 PIPE WELD HEAD NGT-B TORCH			
SIZE D	CODE IDENT NO.	DRAWING NO.	REV. E
SCALE NONE		475156-10	
SHEET 1 OF 2			



REVISIONS			
ZONE	LTR	DESCRIPTION	DATE
SEE SHEET-1			



AVC MOTOR TEST INSTRUCTION

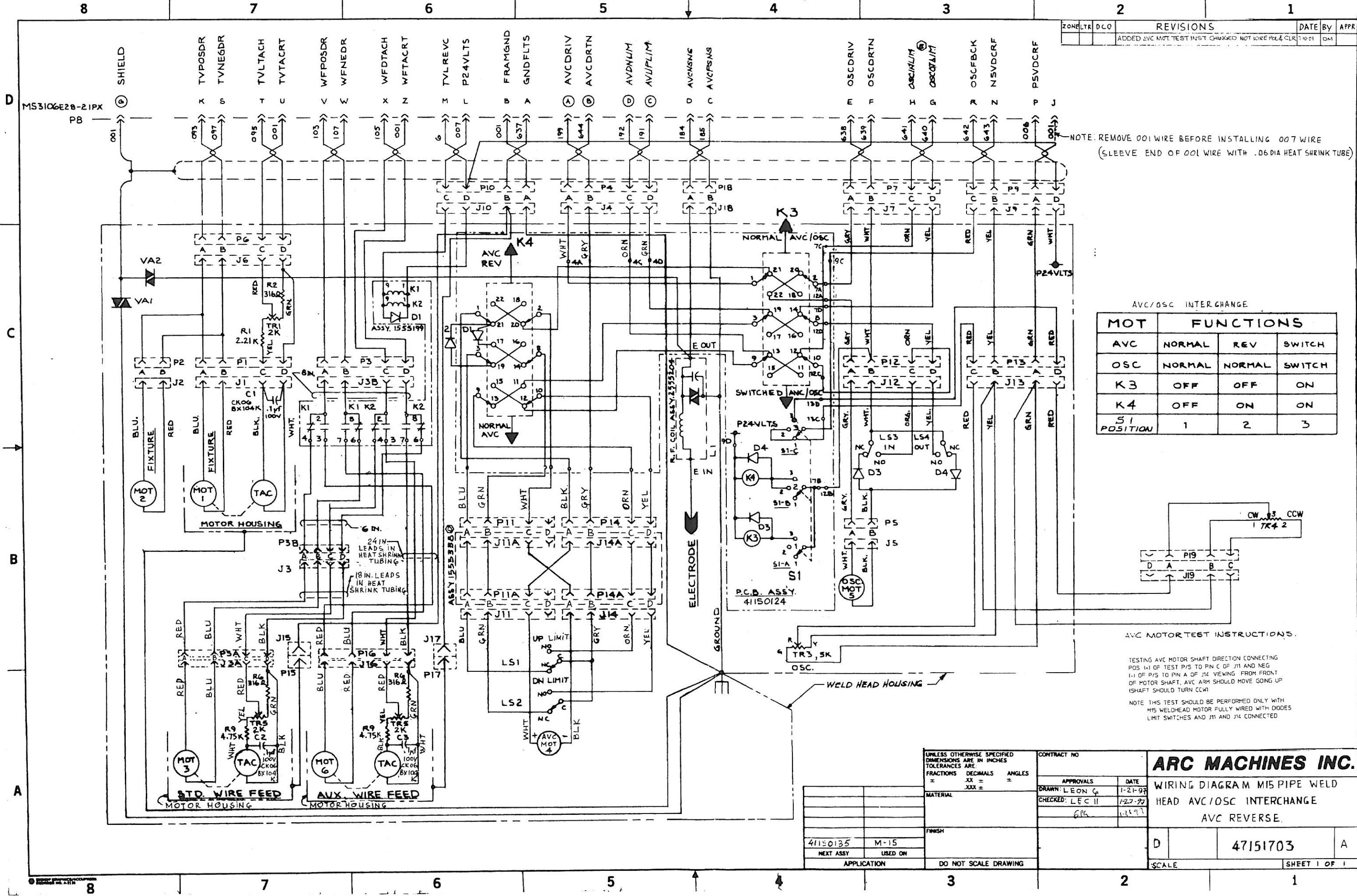
TESTING AVC MOTOR SHAFT DIRECTION CONNECTING POS (+) OF TEST P/S TO PIN A OF J18 AND NEG. (-) OF P/S TO PIN B OF J18. VIEWING FROM FRONT OF MOTOR SHAFT, AVC ARM SHOULD MOVE GOING UP (SHAFT SHOULD TURN CCW).

NOTE: THIS TEST SHOULD BE PERFORMED ONLY WITH M15 WELDHEAD MOTOR FULLY WIRED WITH DIODES, LIMIT SWITCHES AND J18 CONNECTED.

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES = .005 = .005 = .005		CONTRACT NO.	
MATERIAL		APPROVALS	
FINISH		DATE	
411507:24 M15 TOP		DRAWN MC 01-10-95	
NEXT ASSY USED ON		CHECKED LEC II 01-10-95	
APPLICATION		DO NOT SCALE DRAWING	
		SCALE	
		SHEET 2 OF 2	

ARC MACHINES INC.	
WIRING DIAGRAM	
MODEL 15 PIPE WELD HEAD	
NGT-B TORCH	
SIZE	CODE IDENT NO.
D	475156-10
REV.	E

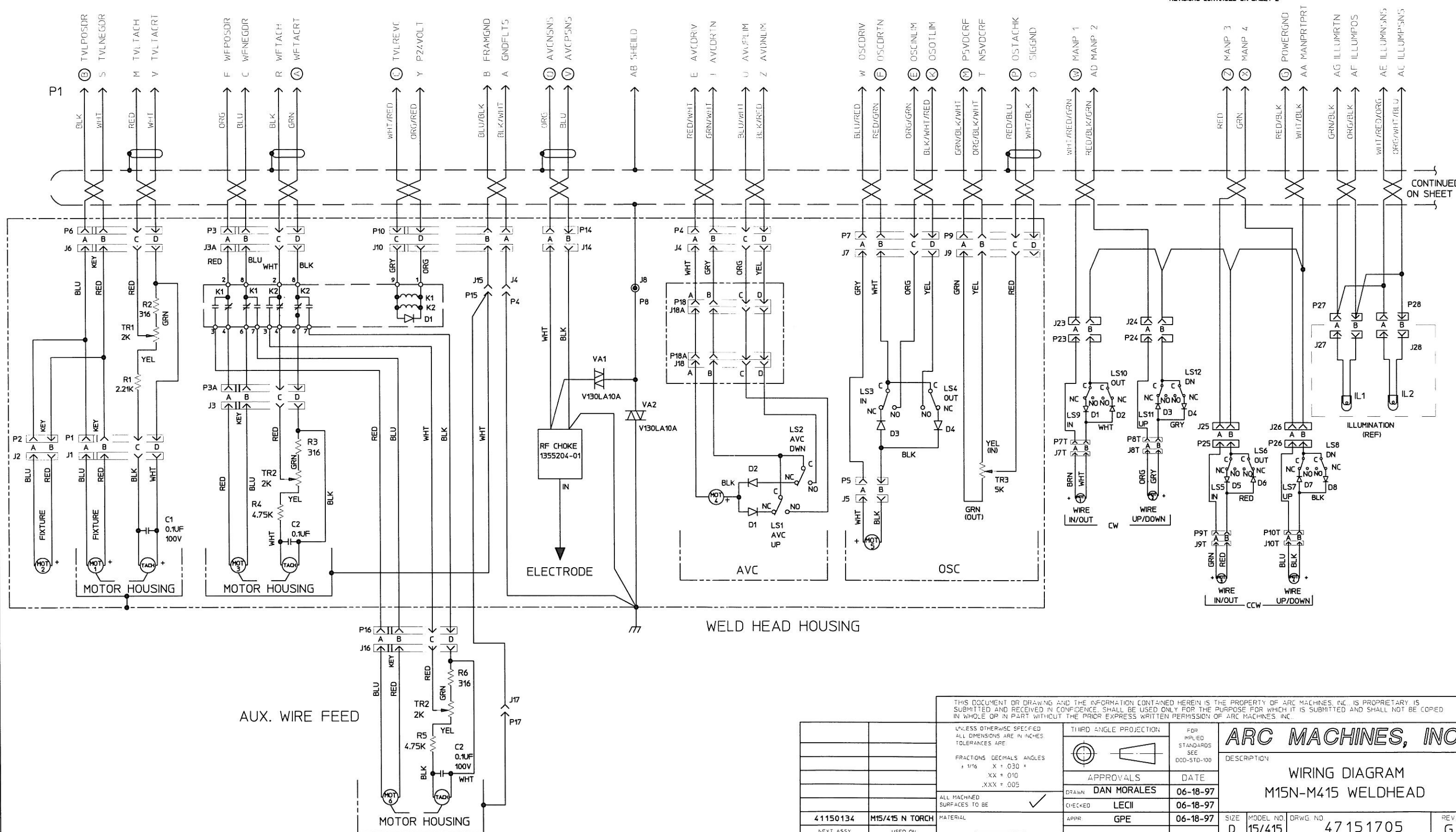


NOTES:

- USE CONTRASTING INK FOR MARKING
REFERENCE DESIGNATORS TO CONNECTORS.

ZONE	LTR	DOC	REVISIONS	DATE	BY	APPR
B	3103		CHANGED P1 DESIGNATIONS. ADDED WIRE COLORS TO TP.	6-16-98	DM	GPE
C	3143		CHANGED RF CHOKE P/N WAS 1355357-03. CHANGED WIRE COLORS: P7A WAS RED P7B WAS BLU, P8A WAS WHT, P8B WAS BLK, P9A WAS RED, P9B WAS BLU, TR3 WAS 10K. TORCH CONNECTORS PJ 7-10 ADDED T POSTFIX (P7T).	10-19-98	LC	GPE
D	3194		ADDED PAGE 2. OPTIONAL TLT TORCH INFORMATION.	12-01-98	LEC	GPE

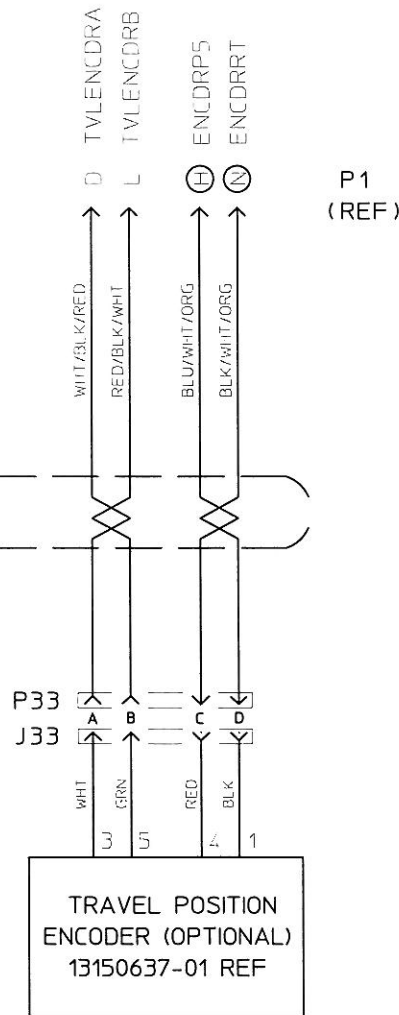
REVISIONS CONTINUED ON SHEET 2



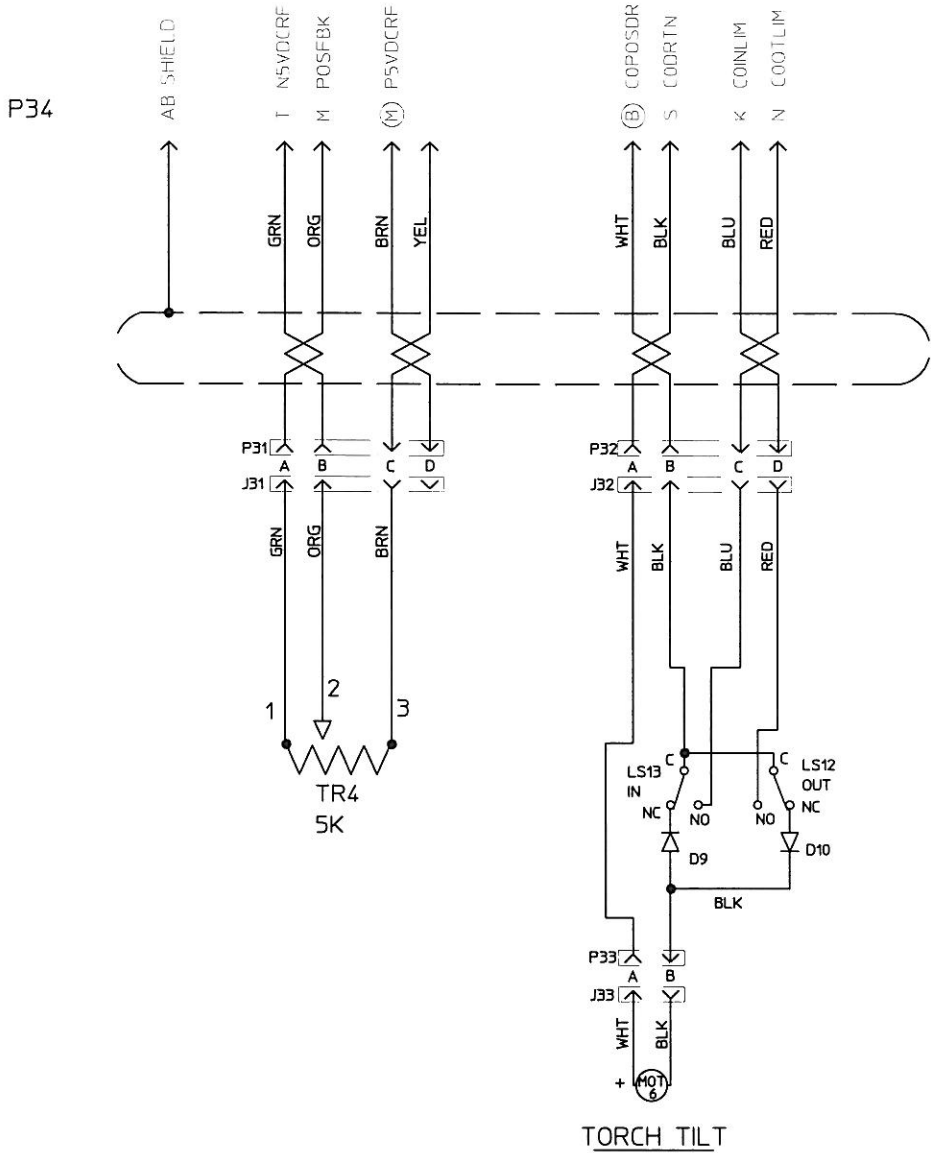
NOTES:

1. ALL LIMIT SWITCH DIODES ARE P/N 1N5626.
2. TORCH TILT $\pm 15^\circ$, ± 0.63 VDC.

CONTINUED
ON SHEET 1



OPTIONAL CONNECTOR



TORCH TILT

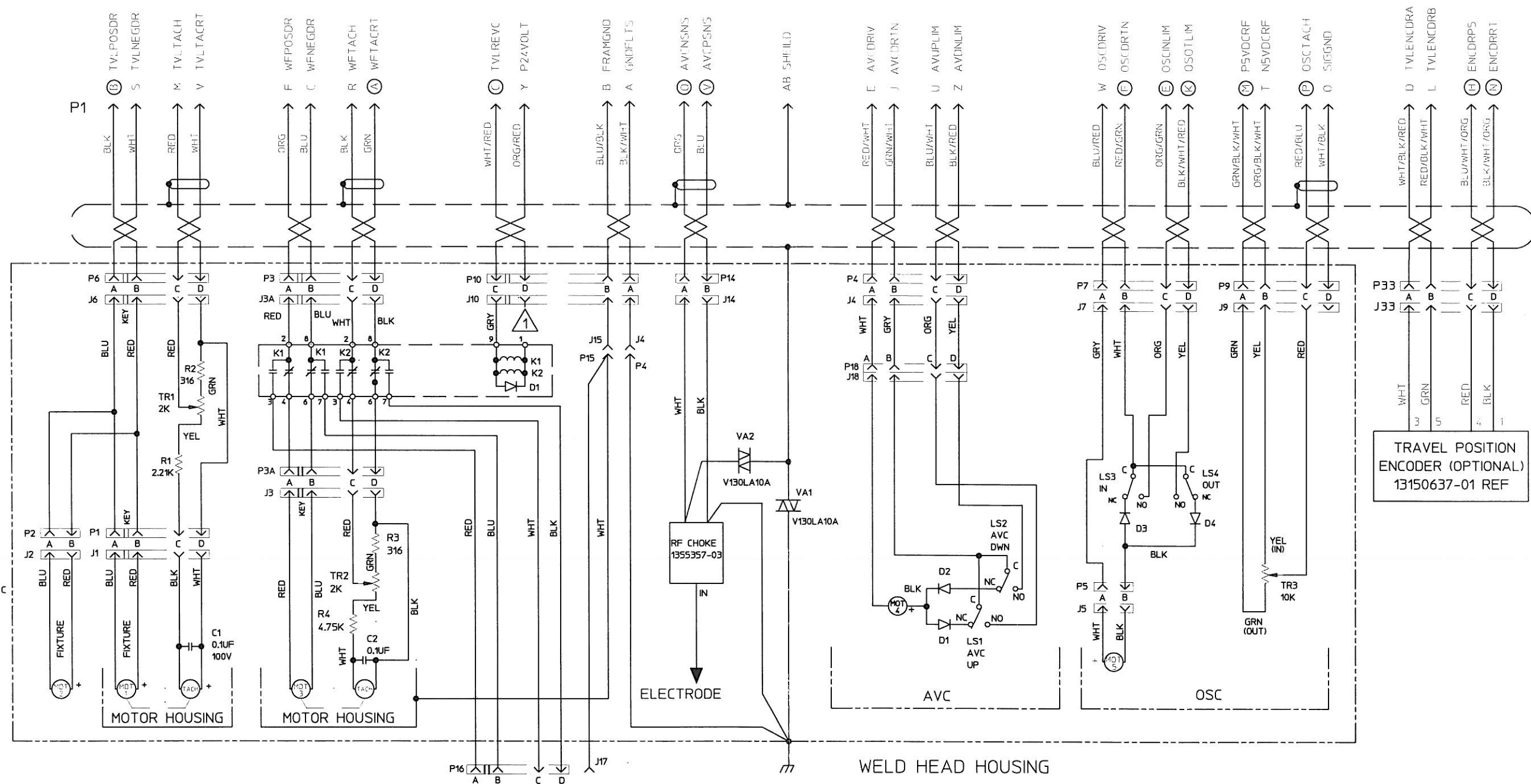
ZONE	LTR	DOC	REVISIONS	DATE	BY	APPR
E	3226		REPLACED ENCODER WIRING WITH ANALOG POT.	1-20-99	LEC II	
SHT 2	F	3291	ADDED OPTIONAL TRAVEL POSITION ENCODER WIRING	4-05-99	MH	
	G	3750	REVISED CONN POILARITY ON P3,J3A,P10,J10,J7,P9,J9.	10-18-00	DM	GPE

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		UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES. TOLERANCES ARE: FRACTIONS DECIMALS ANGLES 1/16 X .030 XX .010 XXX .005	THIRD ANGLE PROJECTION FOR IMPLIED STANDARDS SEE DDD-STD-100
		ALL MACHINED SURFACES TO BE	APPROVALS DRAWN LEC II CHECKED
SEE SHEET 1		MATERIAL	DATE 12-01-98
NEXT ASSY. USED ON			
APPLICATION			
		ARC MACHINES, INC.	DESCRIPTION WIRING DIAGRAM M15N-M415 WELDHEAD
SIZE D	MODEL NO 15/415	DRWG. NO. 47151705	REV. G
SCALE NONE	DO NOT SCALE DRAWING		SHEET 2 OF 2

NOTES:

1. CONNECT (ORG) WIRE J10-D TO K1-1 FOR DUAL WIRE FEED.

ZONE	LTP	DCO	REVISIONS	DATE	BY	APP
A		3103	CHANGED P1 DESIGNATIONS & WIRE COLORS	6-17-98	DM	GPE
C2	B	3291	ADDED PJ33 & WIRING FOR OPTION TRAVEL POS. ENCODER	4-05-99	MH	GPE
C6	C	3302	ADDED NOTE 1.	4-22-99	DM	GPE
D		3750	REVISED POLARITY ON CONN P3,J3A,P10,J10,J7,P9,J9,P33,J33.	10-18-00	DM	GPE



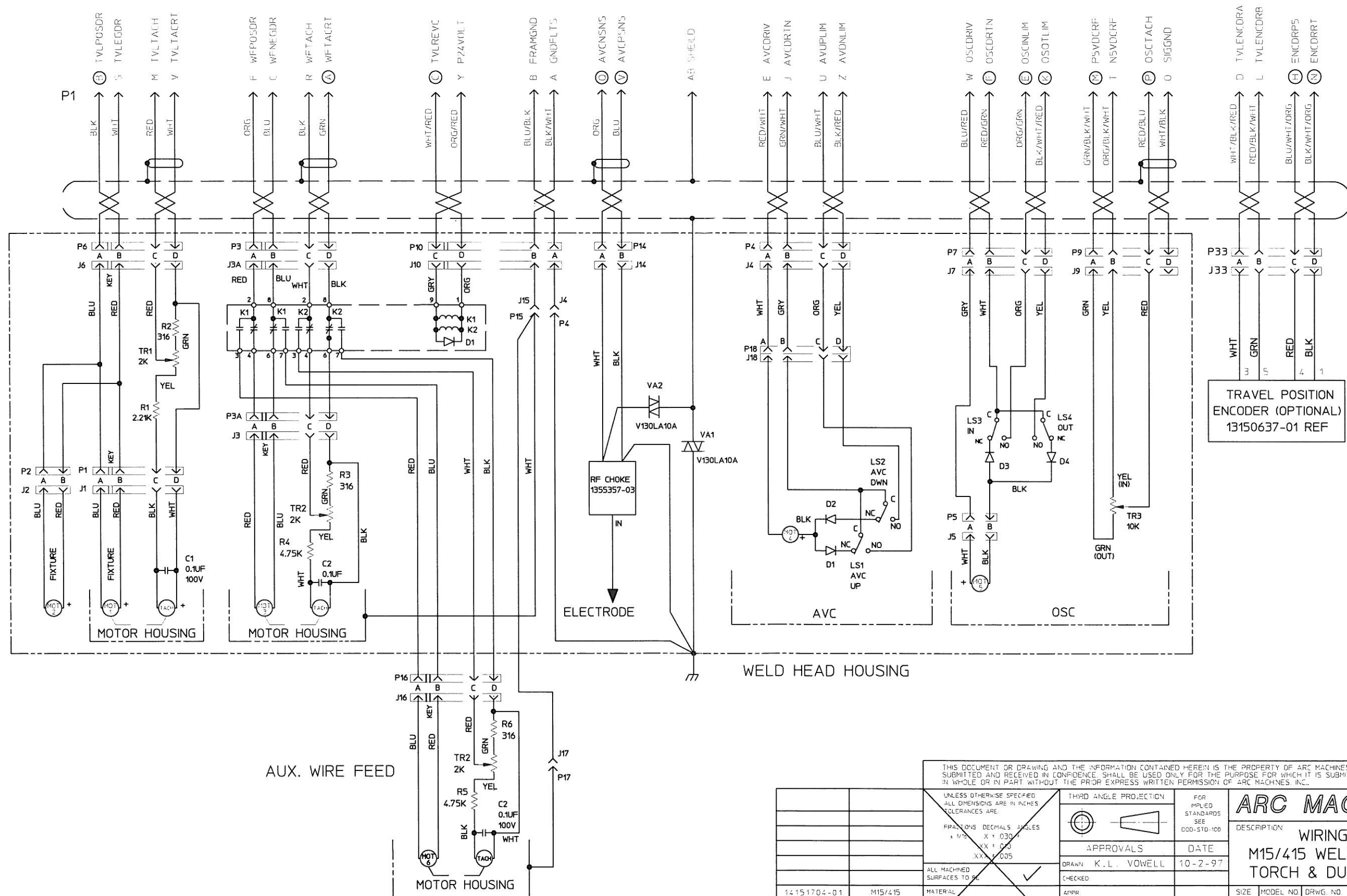
WELD HEAD HOUSING

TRAVEL POSITION
ENCODER (OPTIONAL)
13150637-01 REF

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UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES 1/16 .030 ° 1/32 .015 ° 1/64 .005 °		THIRD ANGLE PROJECTION	FOR IMPLIED STANDARDS SEE 100-STD-100
ALL MACHINED SURFACES TO BE		APPROVALS	DATE
14151704-01 M15/415		DRAWN K. L. VOWELL	10-2-97
NEXT ASSY. USED ON		CHECKED	
APPLICATION		APPR	
		QUOTATION	
ARC MACHINES, INC.			
DESCRIPTION WIRING DIAGRAM			
M15/415 WELDHEAD WITH -A- TORCH & SINGLE WIRE FEED			
SIZE D	MODEL NO 15/415	DRWG. NO 47151706	REV. D
SCALE NONE	DO NOT SCALE DRAWING	SHEET 1 OF 1	

NOTES:

ZONE	LTR	DCO	REVISIONS	DATE	BY	APPR
A	3103		CHANGED P1 PIN DESIGNATIONS & WIRE COLORS	6-17-98	DM	
C2	B	3291	ADDED PJ33 & WIRING FOR OPTIONAL POS. ENCODER	4-08-99	MH	
C		3750	REVISED CONN POLARITY ON P3,J3A,P10,J10,J7,P9,J9P33,J33.	10-18-00	DM	GPE



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UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES 1/2 0.030 1/2 1/4 0.015 1/4 XX 0.005		THIRD ANGLE PROJECTION		FOR IMPLIED STANDARDS SEE DOD-STD-100	
ALL MACHINED SURFACES TO BE		APPROVALS		DATE	
14151704-01		M15/415		10-2-97	
NEXT ASSY. USED ON		DRAWN K.L. VOWELL		CHECKED	
APPLICATION		APPR		QUOTATION	

ARC MACHINES, INC.

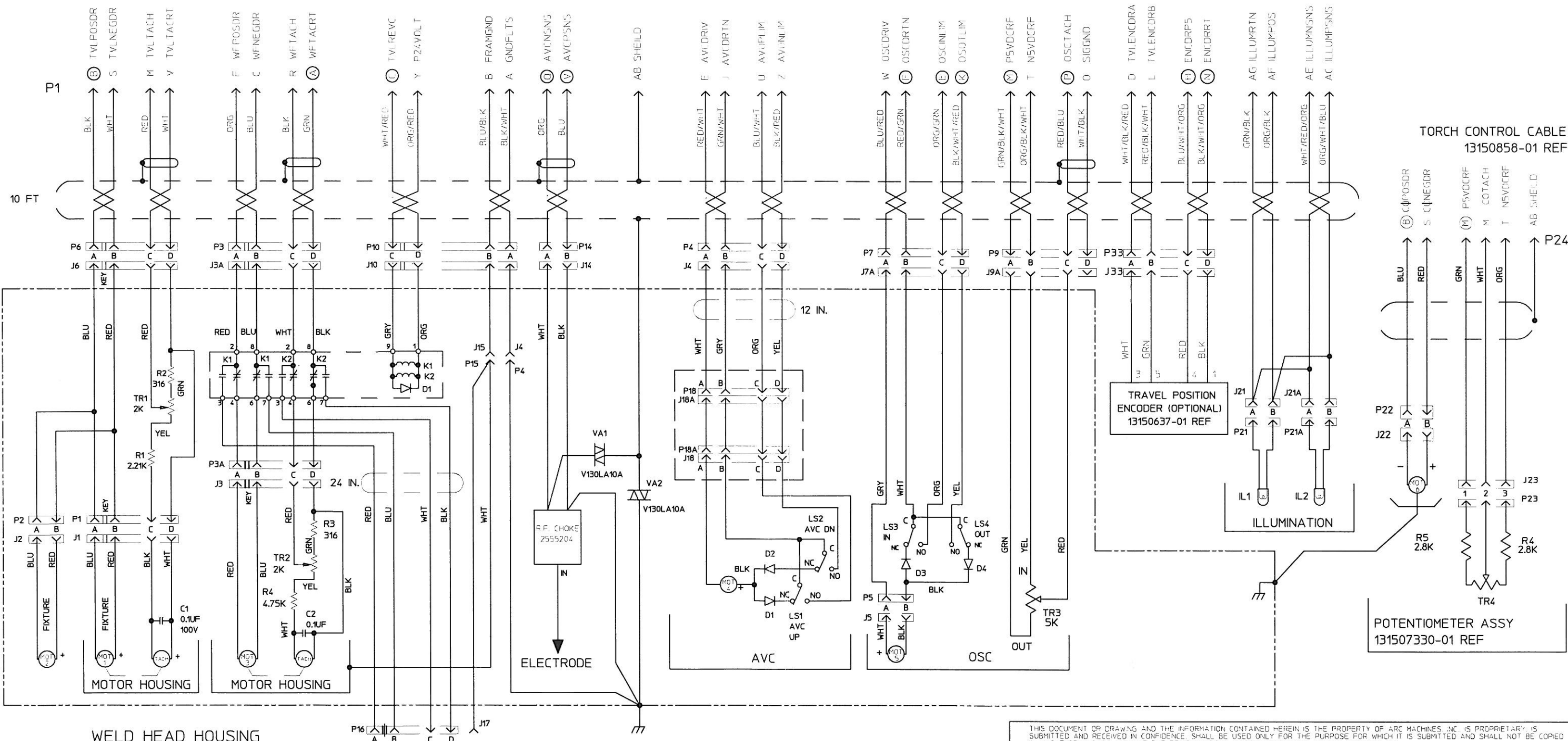
DESCRIPTION
WIRING DIAGRAM
M15/415 WELDHEAD WITH -C-TORCH & DUAL WIRE FEED

SIZE	MODEL NO.	DRWG. NO.	REV.
D	15/415	47151707	C
SCALE	DO NOT SCALE DRAWING	SHEET 1 OF 1	

NOTES:

ZONE	LTR	DCD	REVISIONS	DATE	BY	APP
	A	3103	CHANGED P1 DESIG. ADDED WIRE COLORS. CHANGED JOG CONTROL CIRCUIT	6-23-98	DM	GPE
C4	B	3291	ADDED PJ33 & WIRING FOR OPTIONAL POS. ENCODER	4-08-99	MH	GPE
C2	C	3361	SWAPPED S WITH (B) OF P24 (TORCH OSC OUT NOW OUT)	6-24-99	LEC	GPE
C1	D	3617	REVISED PIN/SOCKET DIRECTION AT PJ23 & P24	5-03-00	MH	GPE
	E	3750	CHANGED CONN POLARITY ON P3,J3A,P10,J10P9,J9A,P33,J33	10-18-00	DM	GPE

CONTROL CABLE
13150857-01 REF



WELD HEAD HOUSING

TORCH CONTROL CABLE
13150858-01 REF

TRAVEL POSITION
ENCODER (OPTIONAL)
13150637-01 REF

ILLUMINATION

POTENTIOMETER ASSY
131507330-01 REF

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UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES + .125 X + .030 XX + .010 XXX + .005		THIRD ANGLE PROJECTION		FOR IMPLIED STANDARDS SEE DOD-STD-100	
ALL MACHINED SURFACES TO BE		APPROVALS		DATE	
14151704-01 M15-415 NGT-B		DRAWN K.L. VOWELL		10-6-97	
NEXT ASSY. USED ON		CHECKED			
APPLICATION		APPR			
		QUOTATION			
		SIZE D		MODEL NO 15/415	
		DRWG. NO. 47151708		REV. E	
		SCALE NONE		DO NOT SCALE DRAWING	
		SHEET 1 OF 1			

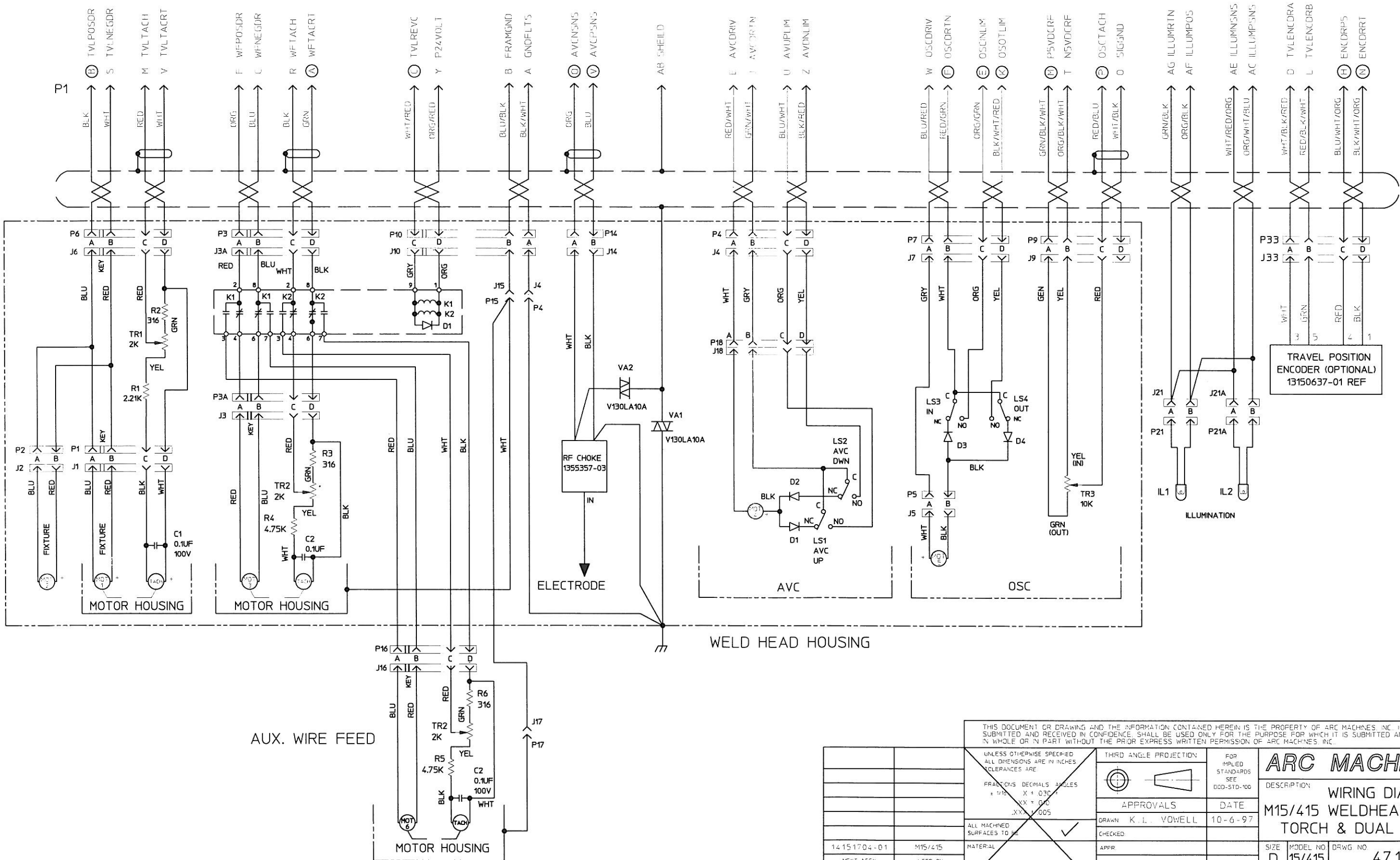
ARC MACHINES, INC.

DESCRIPTION
WIRING DIAGRAM
M15/415 WELDHEAD
WITH NGT-B TORCH

NOTES:

CONTROL CABLE
13150857-01 REF

ZONE	LTR	DCO	REVISIONS	DATE	BY	APP
	A	3103	CHANGED P1 PIN DESIGNATIONS & WIRE COLORS	6-17-98	DM	GPE
C4	B	3291	ADDED PJ33 & WIRING FOR OPTIONAL POS. ENCODER	4-08-99	MH	GPE
C3	C	3617	REVISED PIN LETTERS AT PJ9, ILLUMINATION DESIGNATORS	5-03-00	MH	GPE
	D	3750	REVISED POLARITY ON CONN P3,P3A,P10,J10,P7,J7,P9,J9,P33,J33	10-24-00	DM	GPE



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UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES 1/16" 0.03125" 30° 1/32" 0.015625" 15° 1/64" 0.0078125" 7.5° ALL MACHINED SURFACES TO BE NEXT ASSY. USED ON		THIRD ANGLE PROJECTION APPROVALS DRAWN K.L. VOWELL CHECKED APPR QUOTATION	
FOR IMPLIED STANDARDS SEE 800-STD-100		DATE 10-6-97	
14151704-01 M15/415		47151709	
SCALE NONE		DO NOT SCALE DRAWING	
SHEET 1 OF 1		REV. D	

ARC MACHINES, INC.

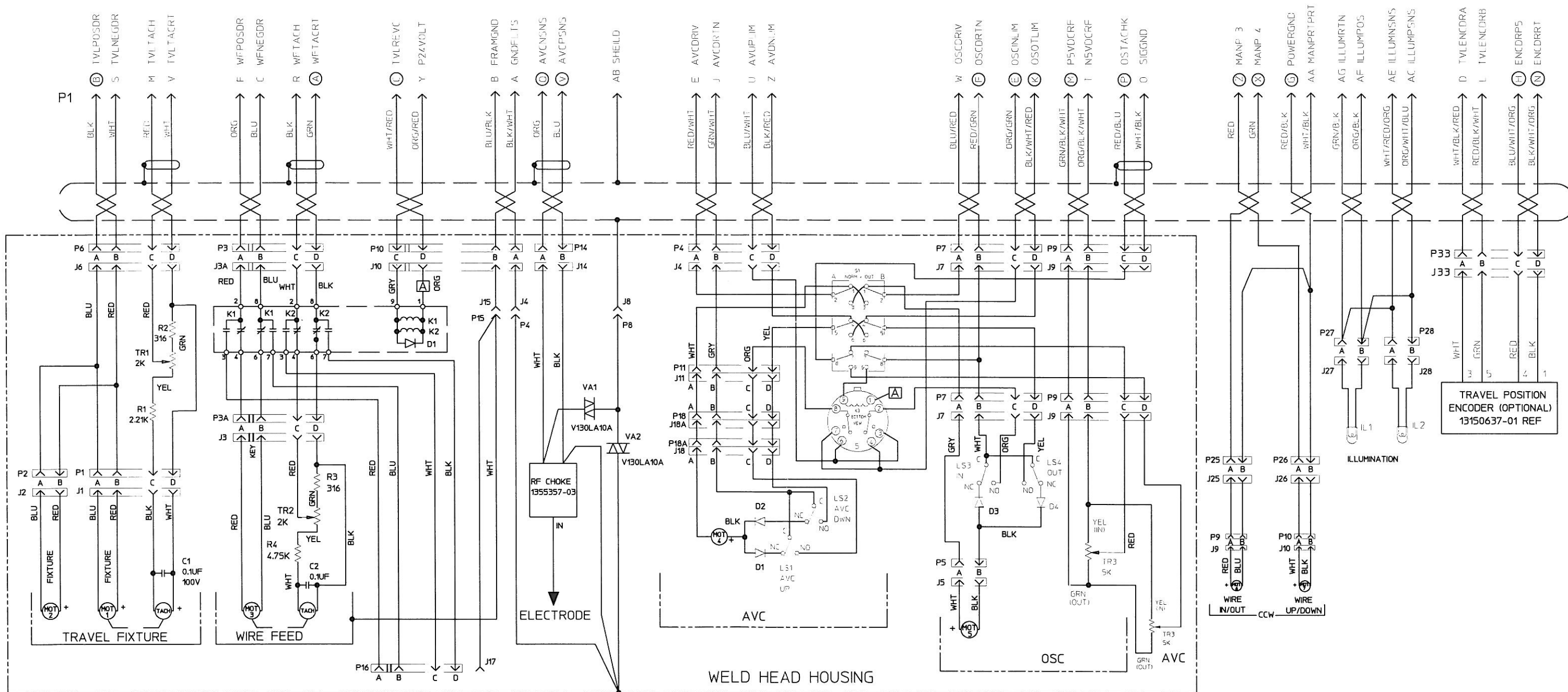
DESCRIPTION
WIRING DIAGRAM
M15/415 WELDHEAD WITH F-DVID
TORCH & DUAL WIRE FEED

SIZE D MODEL NO 15/415 DRWG NO 47151709 REV. D
SCALE NONE DO NOT SCALE DRAWING SHEET 1 OF 1

NOTES:

1. USE CONTRASTING INK FOR MARKING
REFERENCE DESIGNATORS TO CONNECTORS.
2. ADD JUMPER 'A' FROM J14-B(24V) TO P1 OF K3 RELAY.
3. REMOVE CONNECT WIRE J10-D (24V) ON PIN 1 OF K1
& K2 IF PRESENT.

ZONE	LTH	ECO	REVISIONS	DATE	BY	APPR
C1	A	3291	ADDED PJ33 & WIRING FOR OPTIONAL POS. ENCODER	4-08-99	MH	
B		3750	REVISED POLARITY ON CONN P3,P3A,P10,J10,P7,J7,P33,J33	10-24-00	DM	GPE

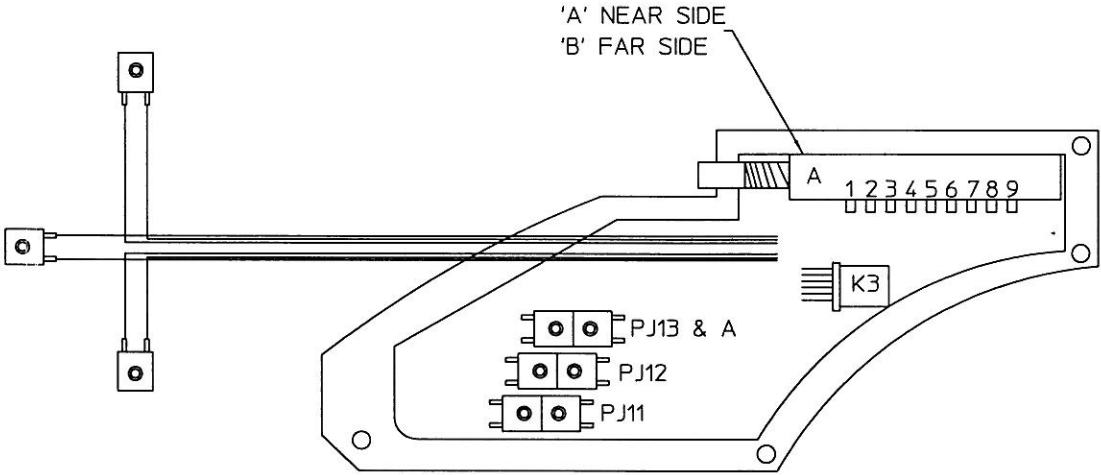
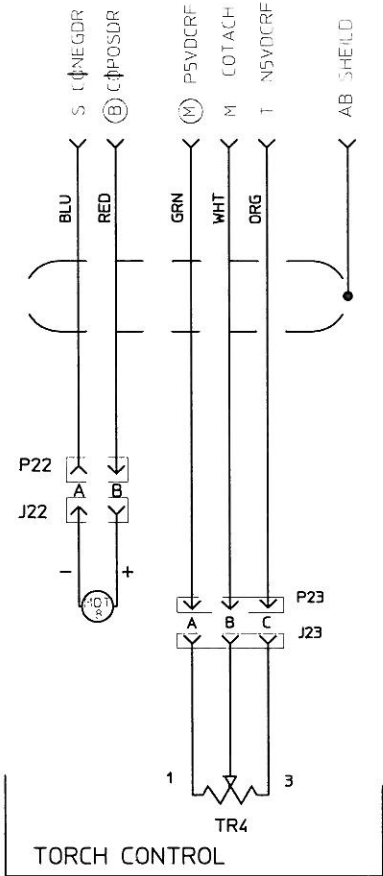


NOTES:

ZONE	UTP	DCD	REVISIONS	DATE	BY	APPR
			SEE SHEET 1 FOR REVISIONS			

M-415 OPTIONAL
CONNECTOR

CABLE P/N:
13150858-01



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		APPROVALS		DATE		DESCRIPTION	
UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES TOLERANCES ARE:		DRAWN LEC II		10-9-98		WIRING DIAGRAM M15-415 HOT WIRE	
FRACTIONS DECIMALS ANGLES		CHECKED				SIZE MODEL NO DRWG NO	
1/16 XX ± .030		APPR				D 15-415 47151710	
ALL MACHINED SURFACES TO BE		QUOTATION				SCALE NONE DO NOT SCALE DRAWING SHEET 2 OF 2	
MATERIAL						REV. B	
NEXT ASSY. USED ON							
APPLICATION							