



M8 SERIES WELD HEADS OPERATION MANUAL

MODEL 8 SERIES 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 the appropriate Arc Machines, Inc. Power Supply and/or Weld Head Operation Manual. The LIGHTNING FLASH SYMBOL indicates that there are potential electrical hazards. The use and display of these symbols make it the OPERATOR'S RESPONSIBILITY TO INSURE THAT HE HAS READ AND/OR BEEN MADE AWARE OF ALL OF THE SAFETY-RELATED ITEMS CONTAINED IN THESE MANUALS.

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MODEL 8 SERIES WELD HEAD OPERATION MANUAL

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MODEL 8 SERIES WELD HEAD OPERATION MANUAL

1.0 INTRODUCTION

This manual covers set up and maintenance of the Model 8 series weld heads. The operator should have a working understanding of the power supply being used and should understand this manual before operating the weld head.

2.0 UNPACKING

When unpacking the weld head use extreme caution in removing the plastic bag covering the cable connectors. Tools such a knife or other sharp object can cut the cables.

3.0 CABLE HOOK UP

CAUTION

Always turn the power supply off before making any cable connections.

The Model 8 series weld heads come supplied with an integral 10ft (3 m) cable. This cable is NOT connected directly to the power supply. It must be mated to the power supply via an adapter pig-tail or adapter cable. Extension cables may also be used. The use of an extension cable does not eliminate the requirement for an adapter. If an extension cable is used, it is connected between the power supply and the adapter. After making connections, slide the protective rubber boots together. See fig. 1.



Fig. 1

Connect the power and ground fittings by pulling the brass ring back and inserting the male fitting into the female fitting, until it is fully seated. If it is not fully seated, it will leak water or potentially come apart.

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3.0 CABLE HOOK UP (Contd.)

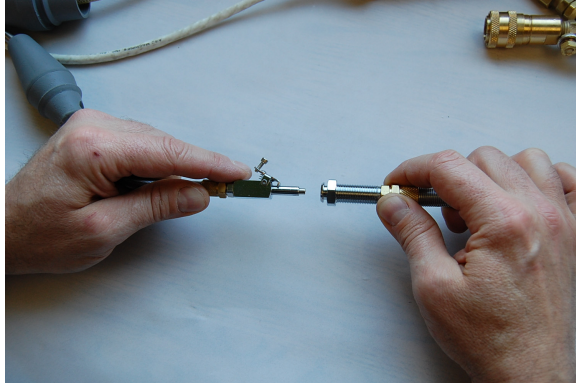


Fig. 2

To connect the male to female (chrome) gas fittings, unscrew the (4-40) socket head screw to allow the latch to open far enough to fully seat the two fittings. Lightly tighten this screw to prevent accidental disconnection of this fitting.



Fig. 3

Connect the motor control connector by aligning the key to the slot, and lightly tightening the outer ring. Be careful not to cross-thread this ring.

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3.0 CABLE HOOK UP (Contd.)

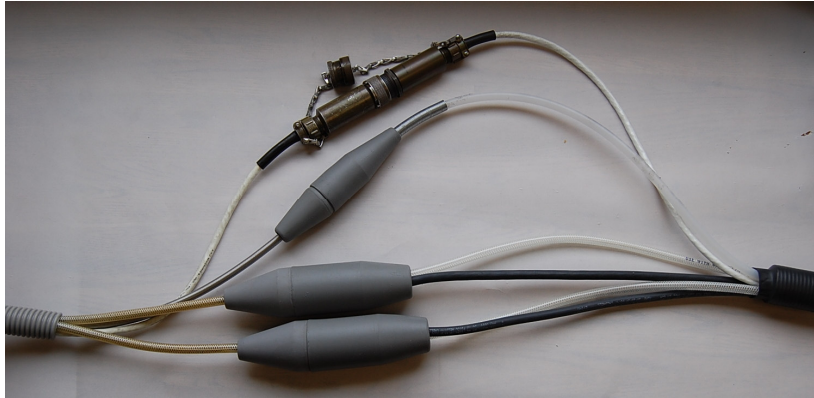


Fig. 4

Slide the boots together securely to protect the connectors and fittings from dirt, and to prevent the power and ground connectors from coming in contact with each other.

4.0 WATER COOLING

The Model 8 series heads are plumbed for water cooling, and are cooled via the power supply's (optional) cooling unit. Although water cooling is not required for all applications, it should always be used when welding tube or pipe wall thicknesses of 0.083" (2.1mm) or heavier, or when doing high-duty-cycle work. Consult the factory for recommendations.

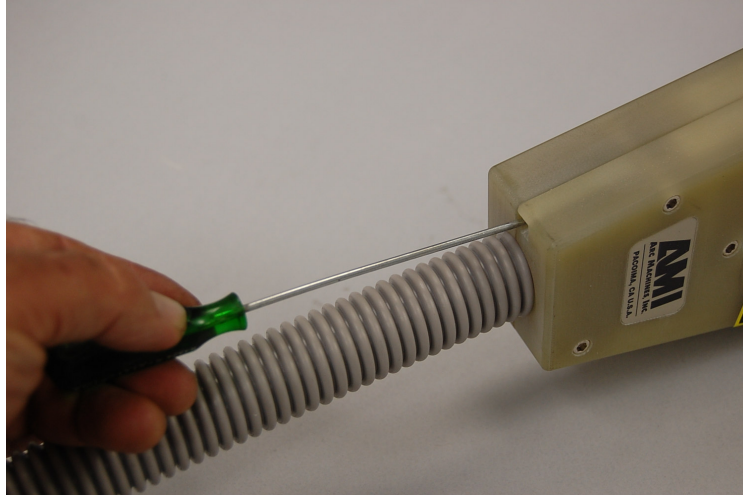
5.0 ROTATION (SPEED) AUTO-CALIBRATION

Before welding, the electrode rotation motor in the weld head must be calibrated to the power supply. Most power supplies include an auto calibration function in the software. Refer to the power supply operation manual for specifics on auto calibration.

- 5.1 Should the power supply indicate that the weld head requires calibration adjustment the calibration potentiometer can be accessed at the bottom of the weld head, where the cable is attached. See fig 5. Follow the instructions on your power supply in making adjustments to the potentiometer. Repeat this procedure until the power supply indicates that the head is calibrated.

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5.0 ROTATION (SPEED) AUTO-CALIBRATION (Contd.)



Rotation calibration potentiometer.
Fig. 5

5.2 ROTATION (SPEED) MANUAL CALIBRATION

Some power supplies do not have auto calibration software. In this case, the weld head motor is manually calibrated by creating a weld program that should rotate the electrode 360 degrees. ie: 1 RPM for a total of 60 seconds, 2 RPM for a total of 30 seconds, 3 RPM for a total of 20 seconds, etc. Select a speed (RPM) and corresponding time close to or equal to the speed that you intend on welding at to achieve the most accurate calibration.

5.3 The power supply must be in the “TEST” mode. Create a one level weld schedule at your selected RPM. Amperage and pulse rate settings may be set to any value, as during rotation calibration no arc will be established. Set rotation mode to “CONT” (continuous rotation). Set rotation delay and downslope times to 0.0.

5.4 Add one additional level with a duration of 5 or more seconds, with the rotation mode set to “OFF”. This additional level (with rotation off) will hold the electrode at its stopped position allowing the operator to see if it traveled too far or not far enough.

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ROTATION (SPEED) MANUAL CALIBRATION (cont'd.)

- 5.5 Be sure the power supply is in the "TEST" mode, and run the program. Should the electrode rotate too fast (traveling more than 360 degrees), stopping beyond the home position, slow it down by turning the potentiometer counter clockwise (CCW). Should the rotation be too slow (rotating less than 360 degrees) stopping before it reaches a full 360 degrees, turn the potentiometer clockwise (CW). Continue this procedure until the electrode stops after 360 degrees of travel.

6.0 CLAMP INSERT & GAS SEAL INSTALLATION

Clamp inserts are designed for a specific tube or pipe size. Select the appropriate clamp for the specific tube or pipe to be welded. A set of clamps fits one side of the weld head. Except for some special applications, or when using the Model 8 with a gas seal on one side and a clamp on the other, two sets of clamps are required. One set fits on each side of the head.

CAUTION

Use of the wrong size clamp, or clamping the head on the curved section of an elbow or other irregular surface can result in damage to the clamp insert, weld head clamp latch and/or hinge.

Note: A set of clamp inserts is made from one piece, and then split into two halves. Each half is marked with matching alphanumeric characters. Keeping matched sets together (on the same side of the weld head) will result in the highest level of weld joint concentricity.

- 6.1 Before mounting the clamp insert into the head be sure both the clamp and weld head clamp mounting groove are clean and free of dirt, oil or other contaminants. The clamp mounting screw need only be lightly snug.

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6.0 CLAMP INSERT & GAS SEAL INSTALLATION (Contd.)

- 6.2 Some fittings and components do not have enough straight/round surface for the weld head to grip with a clamp insert. However, orbital welding is still sometimes practical by manual tack welding the two components together first, and mounting a gas seal on the side of the weld head where this fitting is to be positioned.

The hole in the gas seal is designed to be approximately 1/8" (3mm) larger than the diameter of the fitting being welded, to allow shielding gas to escape. Before welding, the gas seal must be positioned around the fitting so the (1/16") gap between the gas seal and the fitting is somewhat uniform. See fig. 6

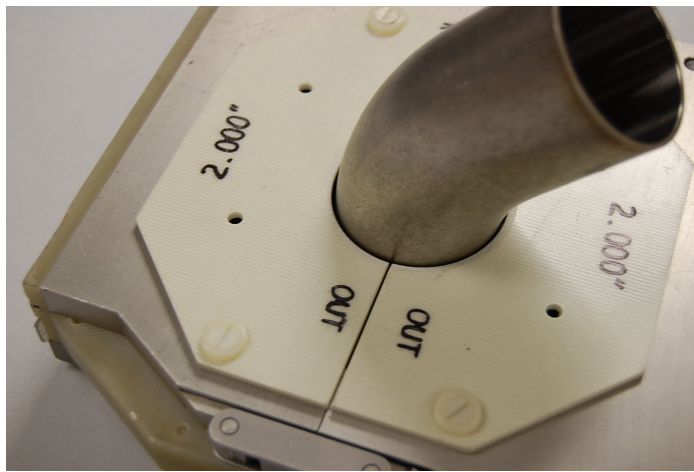


Fig. 6

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7.0 ELECTRODE GEOMETRY & INSTALLATION

CAUTION

To prevent the possibility of electrical shock, the power supply must be in the "TEST" mode before proceeding with electrode installation or removal. Take extreme care that fingers or foreign objects are clear of the rotor when jogging.

The recommended electrode type is 2% Ceriated. (AWS Spec. A5.12/A5.12M, Orange tip). This type of electrode provides superior arc starting and longer life than 2% Thoriated electrodes. Other types can also be used. Consult factory for recommendations.

The Model 8 series heads accommodate both 1/16" (1.6mm) or 3/32" (2.3mm) diameter electrodes. The mounting holes in the rotor are approximately 180 degrees apart.

CAUTION

Do not install a 1/16" electrode into the 3/32" electrode mounting hole, and never install more than one electrode.

- 7.1 The ceramic heat shield installed in the rotor is to be used in either the 1/16" or 3/32" electrode position. If it is mounted in the wrong location, remove the two button head screws that hold the heat shield strap and reattach it at the other electrode location. Be careful not to drop the screws into the weld head.
- 7.2 The electrode length ultimately determines the arc gap, and the arc gap determines the arc voltage which affects the heat input into the weld. Thus a consistent arc gap from weld to weld is essential for weld repeatability. In order to determine the electrode diameter, length and tip diameter for a specific application, see figures 7 – 11.

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7.0 ELECTRODE GEOMETRY & INSTALLATION (cont'd.)

Use this chart to determine the Rotor O.D.

Model	Rotor O.D.
8-2000	3.452" (87.68mm)
8-4000	5.310" (134.87mm)
8-6625	8.094" (205.59mm)

Fig. 7

Use this chart to establish an appropriate Arc Gap and Electrode Tip diameter

Tube/Pipe Wall Thickness	Recommended Arc Gap	Recommended Tip Diameter
0.020"-0.035" (.5 -1.0mm)	0.020"-0.030" (0.5-0.8mm)	0.010"-0.020" (.25-.50mm)
0.035"-0.085" (1.0-2.1mm)	0.050"-0.070" (1.3-1.8mm)	0.030" (0.8mm)
0.091"-0.154" (2.3-3.9mm)	0.070"-0.090" (1.8-2.3mm)	0.040" (1.0mm)

Fig. 8

Use the formula below along with your Rotor O.D. and Arc Gap to establish the electrode length.

$$\frac{\text{ROTOR O.D.} - \text{TUBE O.D.}}{2} - \text{ARC GAP} = \text{ELECTRODE LENGTH}$$

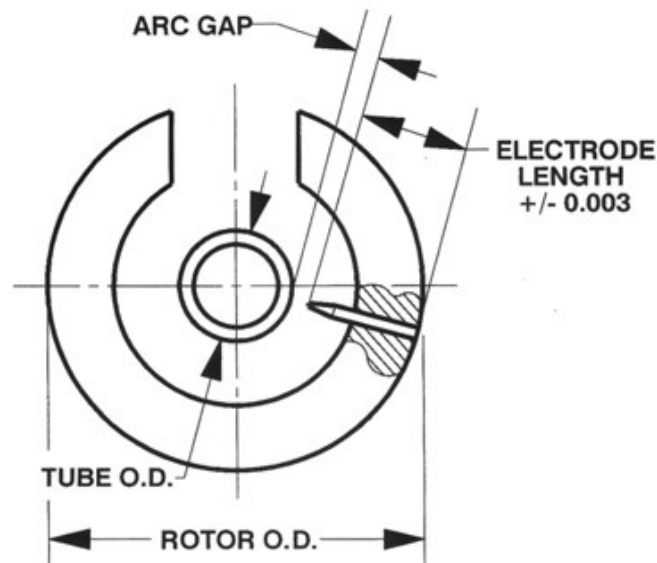


Fig. 9

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7.0 ELECTRODE GEOMETRY & INSTALLATION (cont'd.)

Use this chart to determine the electrode diameter.

Tube/Pipe Wall thickness	Electrode Diameter
0.020" – 0.035" (.50 – 1.0mm)	0.040" or 1/16" (1.0 or 1.6mm)
0.049" – 0.083" (1.2 – 2.1mm)	1/16" (1.6mm)
0.091" – 0.154" (2.3 – 3.9mm)	3/32" (2.3mm)

Fig. 10

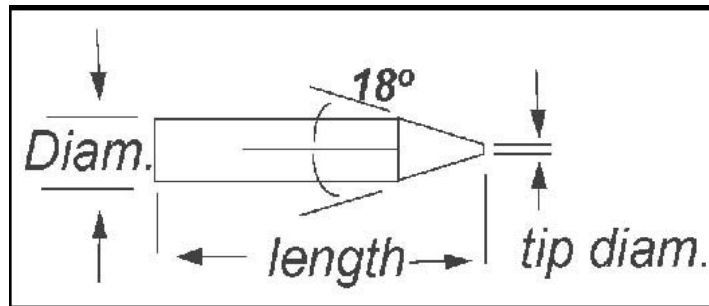


Fig. 11

- 7.3 Using the "JOG" button on the power supply or remote operators pendant, jog the rotor around until the electrode (or electrode mounting hole) is in the 12 o'clock position. See fig. 12.
- 7.4 Lay the weld head on its side to prevent accidental dropping of the electrode into the weld head. Loosen the electrode set screw.

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7.0 ELECTRODE GEOMETRY & INSTALLATION (cont'd.)

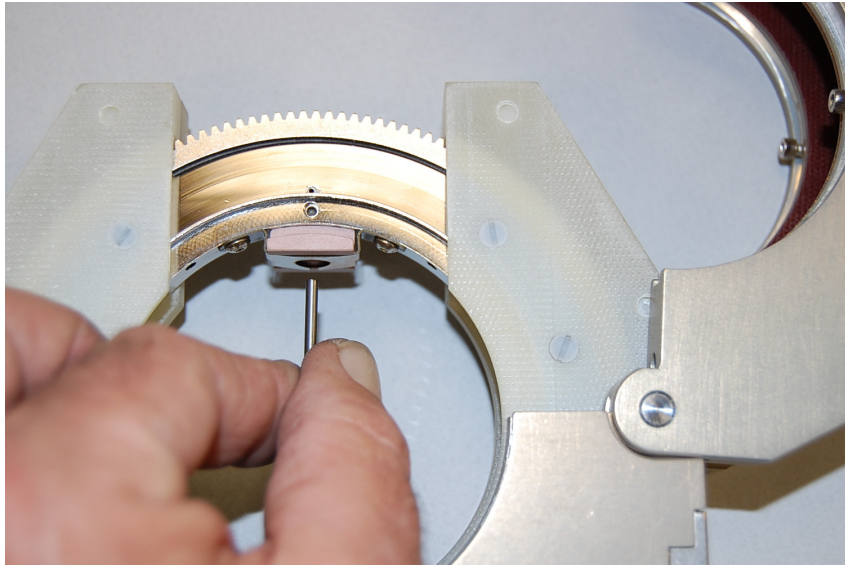


Fig. 12

Note: Be sure that the electrode mounting hole is free of foreign matter in order for the electrode to be properly seated against the electrode-stop roll pin.

- 7.3 Install the electrode from the rotor I.D. as shown in fig. 13. Tighten the electrode set screw when the electrode is fully seated against the electrode-stop roll pin. If the electrode is not fully seated against this pin, the arc gap between the electrode and the tube will be incorrect.

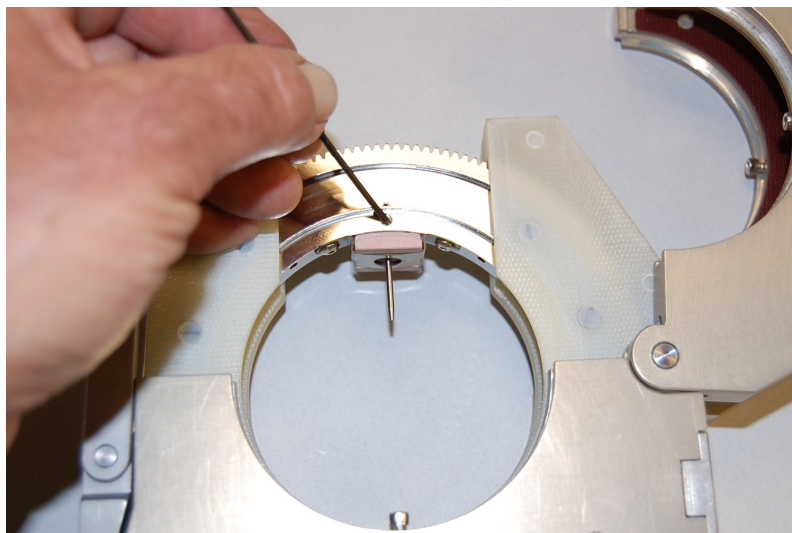


Fig. 13

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7.0 ELECTRODE GEOMETRY & INSTALLATION (cont'd.)

7.4 Spare electrode set screws are located in the weld head housing near the cable attachment. See fig. 14.

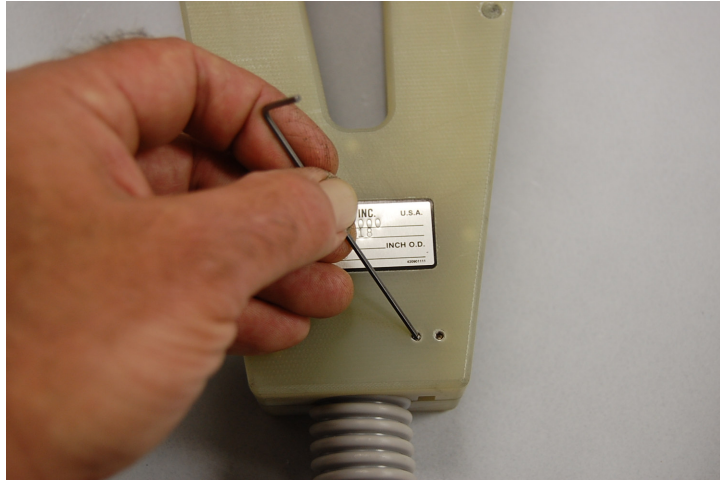


Fig. 14
Spare electrode set screws.

8.0 SHIELDING GAS

The type of shielding gas used has a profound effect on the character of the arc and the depth of weld penetration. The most commonly used shielding gas and backup (I.D. purge) gas used is Argon. Gas mixtures of 95% Argon/5% Hydrogen or 75% Helium/25% Argon are sometimes used to achieve deeper penetration. Consult the factory for recommendations.

8.1 The Model 8 series weld heads work best when the arc gas is set to the proper flow rate. Excessive flow rates can blow the arc, and flow rates set too low can cause excessive weld oxidation (discoloration) and electrode contamination. Use the manual purge button on the power supply to open the arc gas solenoid, and set the flow rate on your flow meter at your gas source.

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8.0 SHIELDING GAS (cont'd.)

8.2 Prepurge time and post purge time are also a factor in minimizing weld oxidation and electrode life. Refer to chart below for recommended arc gas flow rates and minimum recommended pre & post purge times.

Note: The chart below (fig. 15) indicates the minimum recommended purge times. **Using longer purge times will extend the life of the electrode and produce cleaner welds.**

Model	Recommended Arc Gas Flow Rate (CFH)	Recommended Minimum Pre/post purge time (seconds)
8-2000	15 - 30 (7.0-14.1LPM)	30
8-4000	15 - 30 (7.0-14.1LPM)	30
8-6625	20 - 35 (9.4-16.5 LPM)	30

Fig. 15

Note: If the system is being hooked up for the first time, or if it has been a number of hours since it was last used, it's a good idea to initiate the manual purge button on the power supply to clear the lines of oxygen for a few minutes before initiating a weld sequence.

9.0 RETURN-TO-HOME (ROTOR) POSITION ADJUSTMENT

The Model 8 series weld heads will return the rotor to the "home" (open) position at the end of the weld program, after the post purge time has timed-out. A properly adjusted rotor will stop with both ends of the rotor flush or slightly recessed in the housing. See fig. 16. A rotor that needs adjustment will either stop with one side of the rotor protruding out from the housing, or in a worst case, the rotor does not stop at all after it returns to home, in which case, the power supply would have to be shut down before attempting any adjustment.

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9.0 RETURN-TO-HOME (ROTOR) POSITION ADJUSTMENT (cont'd.)

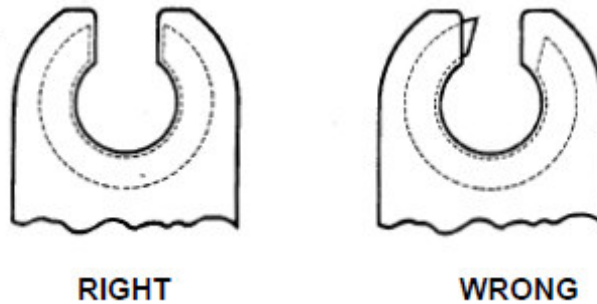


Fig. 16

Should your Model 8 require return-to-home adjustment, follow these steps:

- 9.1 Be sure the power supply is either turned off or in the “TEST” mode.
- 9.2 Remove the access plate. See fig. 17.
- 9.3 Loosen the screw that holds the bracket attached to the return –to-home limit switch. See fig. 17.
- 9.4 Slide the limit switch bracket slightly toward the rotor, (to stop the rotor sooner) or slightly away from the rotor (to stop the rotor later) and re-tighten the bracket screw.

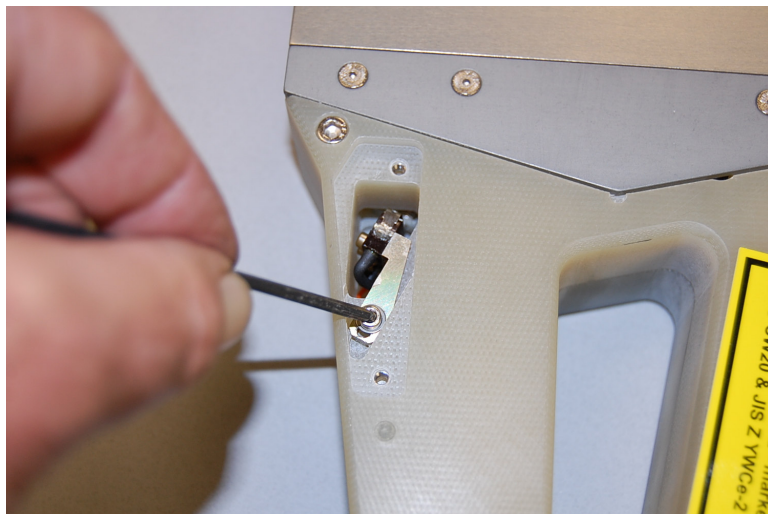


Fig. 17

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9.0 RETURN-TO-HOME (ROTOR) POSITION ADJUSTMENT (cont'd.)

9.5 Turn on the unit, and open a weld schedule.

9.6 Be sure the machine is in the “TEST” mode, and be sure the rotor is safe to rotate. No tools or fingers in the way. Touch “START”, then immediately touch “STOP”. The rotor should return to the “HOME” position. Should the rotor not stop in the correct “HOME” position, repeat steps 9.3 – 9.6.

9.7 Replace the access plate.

10.0 CLEANING & MAINTENANCE

All of the connectors at the end of the cable must be kept clean and free of grease, oil, dirt or other contaminants. Keep the cap on the electrical multi-pin connector when not in use.

From time to time (depending on the cleanliness of the tube/pipe being welded, the type and quality of the arc gas and the number of welds done) the rotor and weld head housing will build up soot, which should be cleaned on a regular basis.

10.1 Use isopropyl alcohol and Scotch Brite or steel wool to clean the both brass (male and female) power and ground connectors. Rinse off all debris and dry before using.

10.2 After cleaning the brass power and ground connectors, use a very small amount of o-ring lube, oil or grease on the female (brass) connector o-ring to facilitate easier connecting and disconnecting

10.3 Use a clean lint-free cloth and isopropyl alcohol to clean the rotor, (black) rotor guide ring, weld head housing and view window.

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11.0 STORAGE

If the weld head has been used with water-cooling, and is to be stored for more than 1 month, the residual water or water/coolant mix should be purged from the hoses and weld head to minimize internal corrosion.

This is also important if the weld head is to be stored where the temperature might fall below freezing, as trapped water can freeze and damage weld head and/or hose internals.

Although you may not be storing the adapter and /or extension cables, leave them hooked up to the weld head when purging out the water.

- 11.1 To drain the coolant from the weld head and cables, use Arc Machines, Inc. fitting part number 294-PB-06. Unplug the water “supply” line from the cooling unit, (leaving the water “return” line connected to the cooling unit) and attach the (female) fitting (294-PB-06) to the disconnected “supply” line. See Fig. 18.



Fig. 18

- 11.2 Using a pressurized air source of maximum 20 PSI, (139 Kp) (1.38 Bar) blow air into the fitting to force the water out of the cables and weld head, and back into the cooling unit. See Fig. 18.

**CAUTION, DO NOT USE AIR PRESSURE
ABOVE 20 PSI (139 Kp) (1.38 Bar)**

MODEL 8 SERIES WELD HEAD OPERATION MANUAL

11.0 STORAGE (cont'd.)

- 11.2 Attach the dust cap to the electrical connector, and store the weld head in a clean, dust-free area.
- 11.3 Store the head with the clamp housing latches un-latched.