

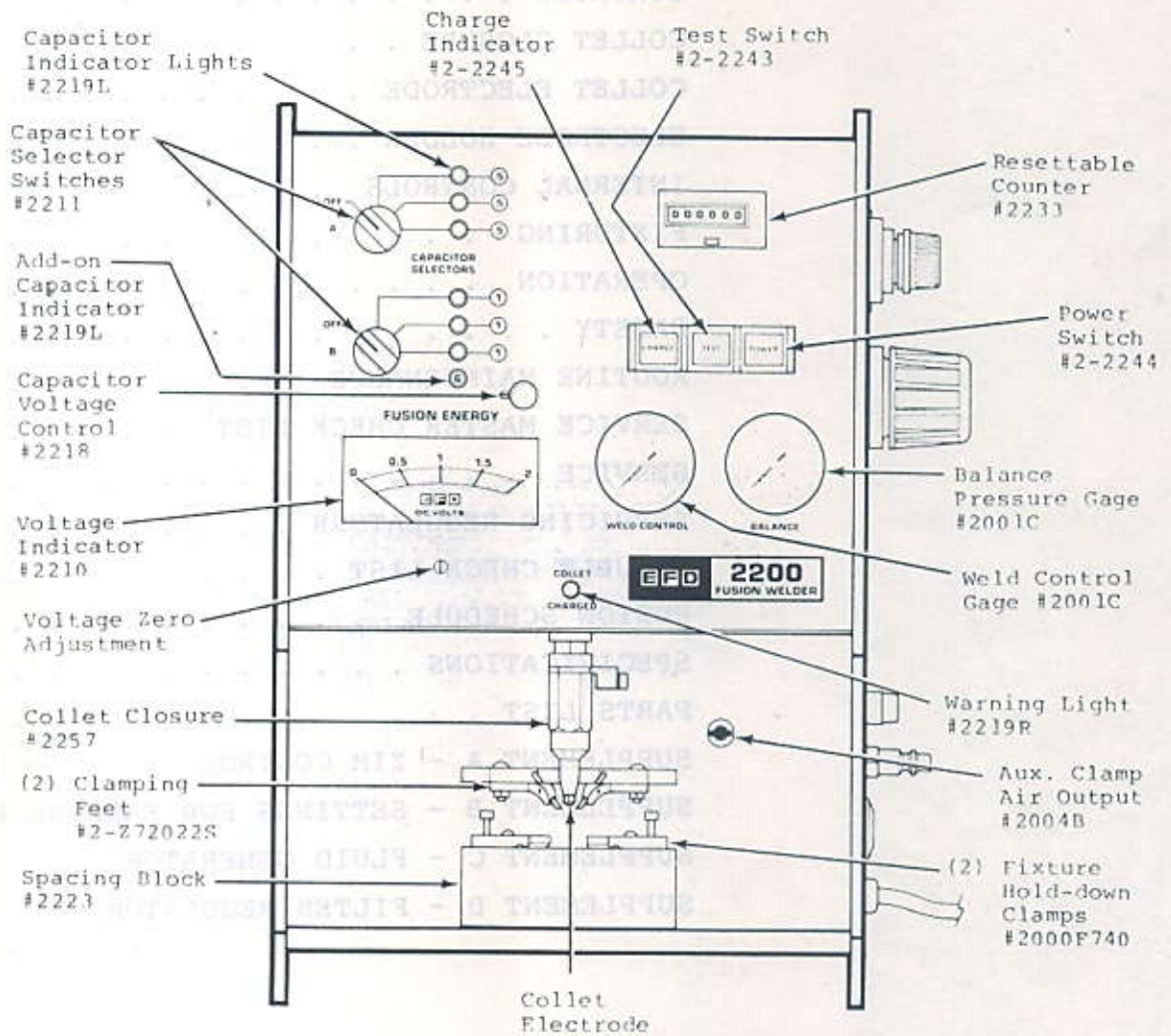
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SUPPLEMENT A - ZIM CONTROL	
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## Accessories and Tools supplied with the EFD-2200:

- |  |  |
|--|--|
| (1) 5/64 Hex Wrench (Electrode Holder)   | (1) 2000F750 5-Micron Filter Regulator       |
| (1) 5/32 Hex Wrench (Clamp Foot Screw)   | (1) Hose Assembly and Quick Connect          |
| (1) 1/8 Hex Wrench (Powder Leads, Clamp) | (1) Collet Wrench                            |
| (1) .050 Hex Wrench (Clamp Foot Rods)    | (1) 7/16 Open Wrench (Jam Nuts)              |
| (1) 3/32 Hex Wrench (Non Rotating Guide) | (1) 1/2 Open Wrench (Closure Air Feed Elbow) |
| (1) Bristol Spline Wrench (Collet Stop)  | (1) Adjustable Wrench                        |
| (1) Test Pack, including:                | (1) 3/16 Hex Wrench (Fixture Block)          |
| 100 .045 Nickel Silver Posts             |  |
| 25 1/2" Brass Discs                      |  |
| 1 2" Fixture Plate                       |  |
| 1 9043 Collet (installed)                |  |

# Nomenclature



FRONT VIEW



# Nomenclature

Adjust Clamp Pressure  
#2-2002CLP

Weld Control  
Regulator  
#2-2236WELD

Clamp Pressure Gage  
#2001C

Balance Pressure  
Regulator  
#2-2236BAL

Clamp  
Spacer  
#2242

Clamp Feet  
Support  
#2250

Power  
Lead  
#2229A

Ground  
Lead  
#2229B

Fan Vent  
Holes

Fuse (15 amp)  
#2240

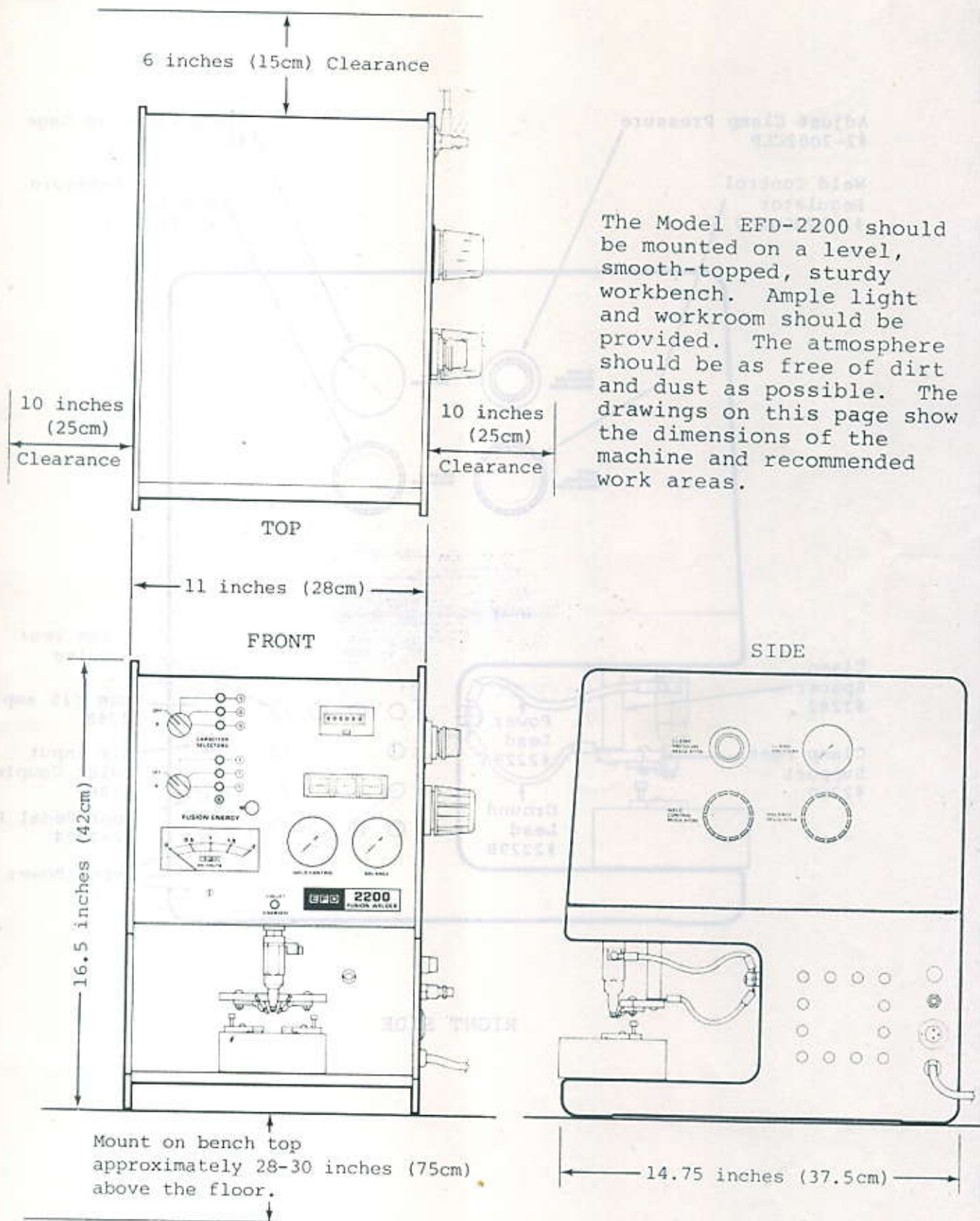
Air Input  
Quick Coupler  
#2066

Foot Pedal Receptacle  
#2-2224

Input Power Cord

RIGHT SIDE

# Installation





# Installation

## ELECTRICAL CONNECTION

The EFD-2200 is wired for use with 105-125 VAC, 50/60 Hz, single phase power. The transformer may be wired for 210-230 VAC. The machine is internally grounded, and requires a grounded power input supply. The line circuit should be fused at 20 amperes. The EFD-2200 is fused at 15 amperes.

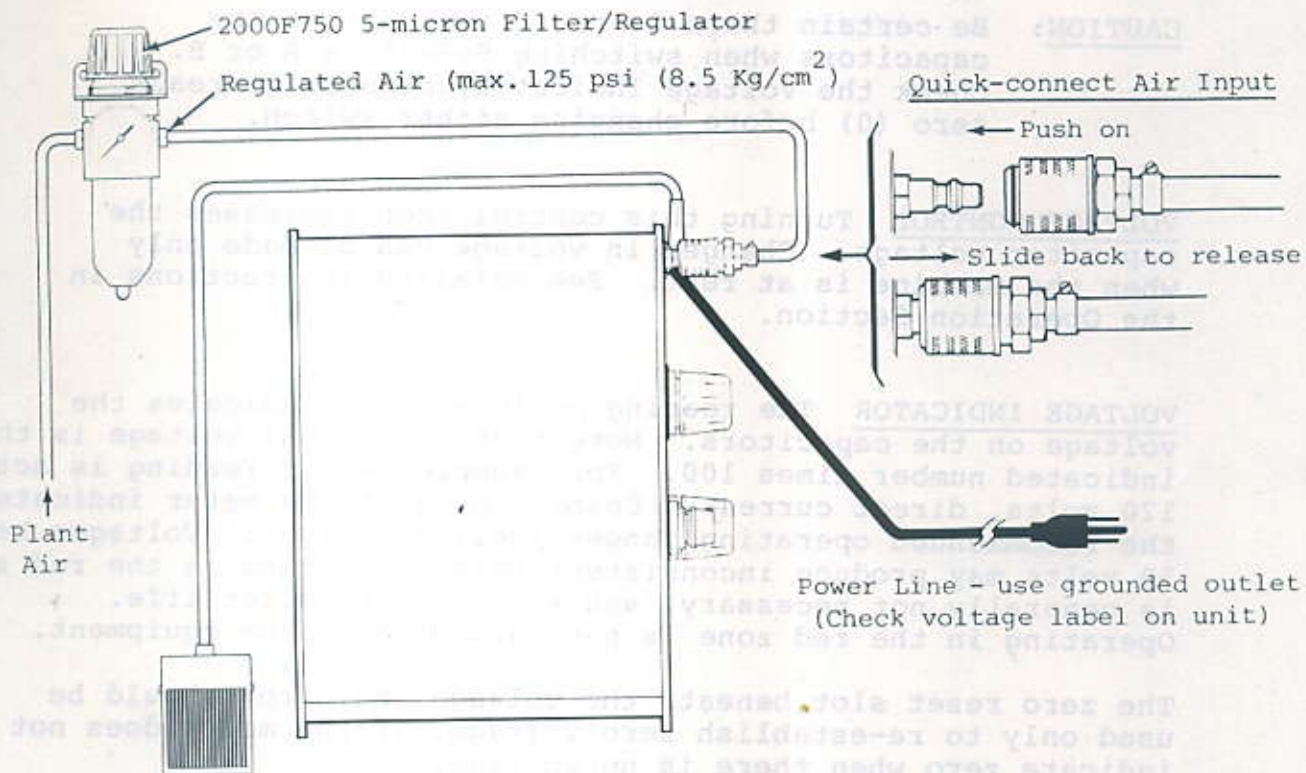
## FOOT PEDAL

Insure that power is off. Push in the (3) connector right-angle plug, making sure the click-lock secures the connection. Bring the foot pedal down behind the bench, and onto the floor.

## AIR CONNECTION

The EFD-2200 requires a stable, constant supply of compressed air of at least 90 psi (6.2 Kg/cm<sup>2</sup>). Supply pressure to the machine should not exceed 125 psi (8.5 Kg/cm<sup>2</sup>). Air must be 5-micron filtered.

Mount the 2000F750 5-micron filter regulator as shown. Set the output pressure between 90 psi (6.2 Kg/cm<sup>2</sup>) and 125 psi (8.5 Kg/cm<sup>2</sup>). Attach the air quick connect to the EFD-2200 as indicated. For additional information, reference Supplement D in the back of this manual.





# Controls

POWER ON Push in switch, which will illuminate red, indicating power is on.

TEST Push in switch, which will illuminate yellow. The Test Switch is used when establishing voltage. When the Test Switch is ON, the driver cylinder will not fire, nor will the counter operate.

CHARGE This is an indicator only, that illuminates orange when the capacitor circuit is activated.

CAPACITOR SELECTORS Two switches are provided. In the OFF position, the capacitors will not be charged. Selector A adds 1400 mfd capacity at each position as it is turned clockwise. Selector B adds 2500 mfd in each position, independent of Selector A. The maximum capacity of Selector A is 4200 mfd; of Selector B, 7500 mfd. The total maximum capacity is 11,700 mfd.

NOTE: A white indicator shows which capacitors are in the circuit. On machines equipped with an extra 15,000 mfd, an auxiliary white light indicates when this capacitor bank is switched into the circuit.

CAUTION: Be certain there is no voltage across the capacitors when switching Selectors A or B. Check the Voltage Indicator, be sure it reads zero (0) before changing either switch.

VOLTAGE CONTROL Turning this control knob increases the capacitor voltage. Changes in voltage can be made only when the machine is at rest. See detailed instructions in the Operation Section.

VOLTAGE INDICATOR The reading on this meter indicates the voltage on the capacitors. Note that the actual voltage is the indicated number times 100. For example, a 1.2 reading is actual 120 volts, direct current. Color coding of the meter indicates the recommended operating ranges (yellow & blue). Voltages below 50 volts may produce inconsistent welds. Voltage in the red zone is generally not necessary, and will reduce collet life. Operating in the red zone is not hazardous to the equipment.

The zero reset slot beneath the voltage indicator should be used only to re-establish zero voltage, if the meter does not indicate zero when there is no voltage.



COLLET CHARGED This neon light indicates the voltage potential across the collet and clamps. It illuminates at approximately .9 (or 90) volts. When it is illuminated you should not touch the collet, or you will experience a DC shock. This shock is not dangerous, but it is uncomfortable.

RESETTABLE COUNTER Each machine cycle is registered on the counter (except during test mode). It is useful to keep track of individual job runs. It may be reset to zero by pushing in the reset button.

WELD CONTROL The weld control gage indicates the heat time during the actual fusion/welding. The Weld Control Regulator is used to increase or decrease this time. Normal setting is about 70 psi. Increasing this setting decreases the melt time during the weld cycle.

BALANCE The balance indicator shows the counter pressure that provides smooth, controlled driver cylinder impact. The balance control is set at 30 psi. For special applications, this setting may be changed.

NOTE: Weld Control and Balance Settings can be locked by pulling out the regulator knobs about 1/4". To reset, push in the knobs to unlock.

CLAMP PRESSURE The clamp pressure gage and regulator determine the clamping pressure. Normally, this is set between 40 psi and 50 psi. It should not be set below 40 psi. Lower clamp pressure will cause arcing or burning of clamp on the base metal.

The clamp pressure can be locked by turning the locking screw in the center of the knob, clockwise.

CAUTION: When adjusting to a lower setting, the Weld Control, Balance, or Clamp Pressure Regulators, turn the knob counter-clockwise so that the gage indicates 5 to 10 psi below the desired setting. Then, slowly turn the knob clockwise to the required setting.

## Controls

**DRIVER CYLINDER** Care must be taken not to score or damage the piston rod. This cylinder must move freely and smoothly downwards. When removing the collet closure or electrode holder, carefully hold the jam nut with the wrench provided, and rotate the collet closure or electrode holder to remove.

The air pressure to operate the collet closure comes through the piston rod. Teflon tape is used on the threads of the piston rod to seal it in the collet closure or electrode holder.

The non-rotating guide is located inside the machine.

Occasionally slide back the cover and inspect the air hose that connects to the top of the piston rod. Be sure that the hose is not rubbing on the non-rotating device. The piston rod should move up and down smoothly.

**CLAMP CYLINDER** This cylinder has a double rod, like the driver cylinder. The non-rotating clamp is located inside the machine.

**NOTE:** Weld Control and Balance Setting can be unlocked by pulling out the regulator knobs and turning the push in the knobs to unlock.

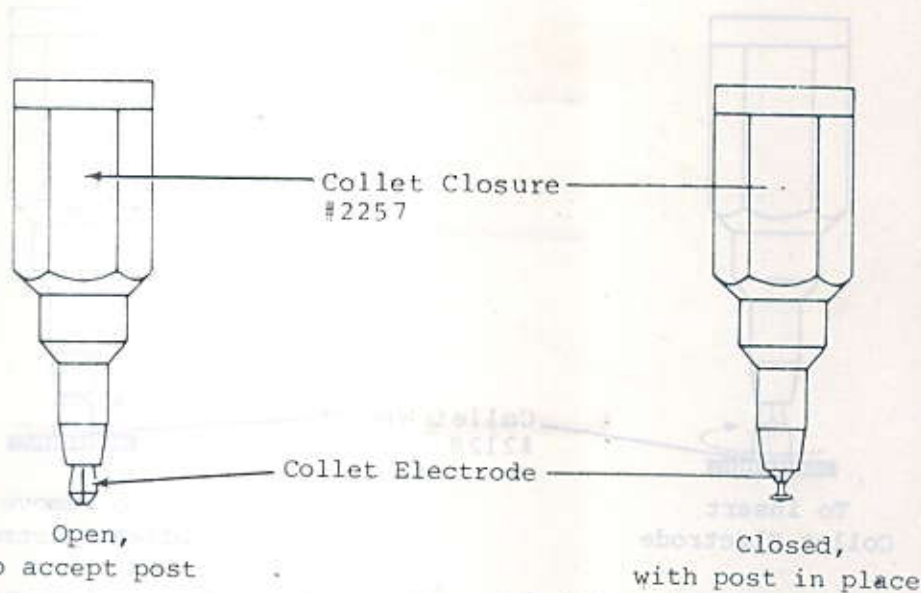
**CLAMP PRESSURE** The clamp pressure can be determined by pulling out the clamping pressure knob and turning the push in the knob to unlock. The clamp pressure can be locked by turning the knob clockwise.

The clamp pressure can be locked by turning the knob clockwise.

**CAUTION:** When adjusting to a lower pressure, Balance, or Clamp Pressure knob counter-clockwise so that the knob is below the desired setting. 5 to 10 psi below the desired setting. slowly turn the knob clockwise to the desired setting.



## Collet Closure



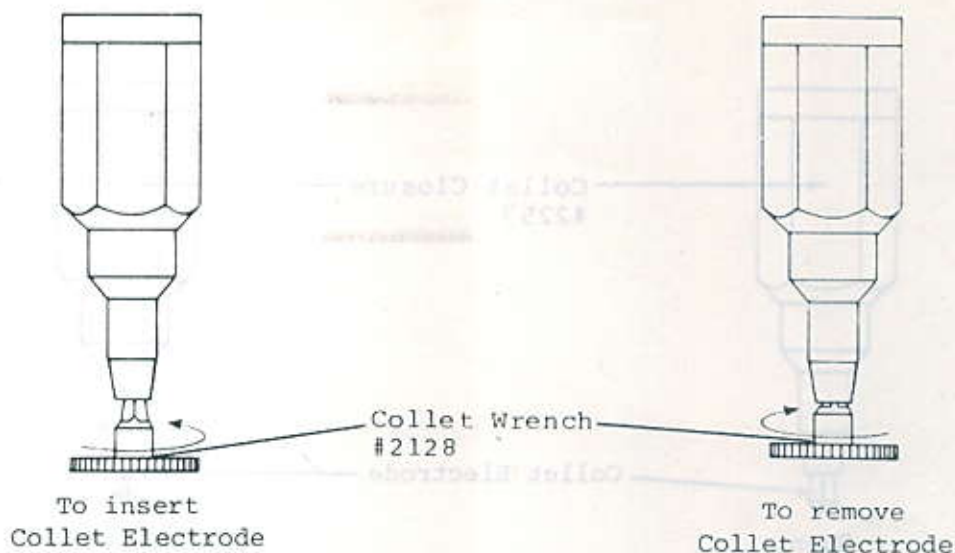
At rest, the Collet Electrode extends downward and is open to receive the post. For each different diameter post, a corresponding size Collet Electrode must be used.

When the Foot Switch is pressed, the Collet Electrode is drawn up into solid contact with the Collet Closure, providing tight mechanical gripping and good electrical conductivity.

The Collet Electrode is a precision device subject to mechanical and electrical wear. The number of cycles it will last depends in part on careful handling. It is bad practice to allow the Collet Electrode to come down without a post and make contact with the base piece or fixturing material. Such action will appreciably shorten its life.

**CAUTION:** The Collet must be tight in the Collet Closure, and rechecked to be sure it does not loosen. If the Collet is loose, it will cause burning inside the closure, and require replacement.

# Collet Closure



A special Collet Wrench is provided for insertion and removal of the Collet Electrode. Three prongs on the end of this Wrench engage slots in the Collet Electrode. Be sure the Collet Electrode is snugged tightly, but do not overtighten.

To insert the Collet Electrode:

1. Be sure air is connected to the machine.
2. Insert Collet Electrode by hand and thread it partially into Collet Closure, careful to avoid cross-threading.

When the Collet Electrode is worn, or when a new diameter post is used, it must be changed.

Never use pliers or any tool other than the Collet Wrench on the Collet Electrode.

To remove the Collet Electrode:

1. Be sure air is connected.
2. Insert Collet Wrench and turn until Collet Electrode is loose.
3. Remove Collet Wrench and drop out Collet Electrode.

**IMPORTANT:** After about 10,000 to 15,000 cycles when using smooth posts, the Collet Electrode becomes worn and unable to hold the post (in the At-Rest position).

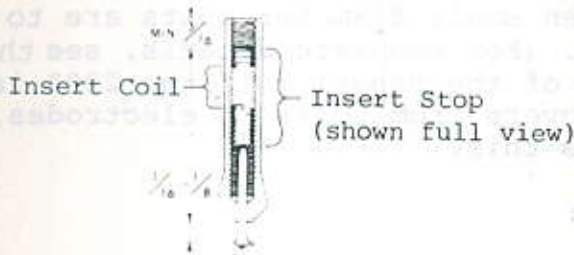
**WHEN THIS OCCURS THE COLLET ELECTRODE MUST BE REPLACED.**

Attempts to use the Collet Electrode beyond this point will cause electrical pitting on the post and faulty, unreliable fusions.

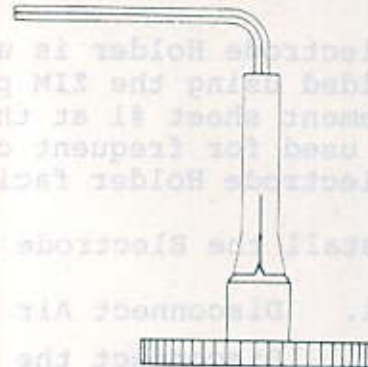


# Collet Electrode

Bristol Spline Wrench  
#2292



Cross-sectional view  
showing Insert Stop  
located inside  
Collet Electrode



Adjustment of  
Insert Stop

The Insert Stop is located within the Collet Electrode and requires adjustment for various length posts. The post should project approximately  $1/16"$  to  $1/8"$  beyond the nose of the Collet Electrode. The Insert Stop provides:

1. Stoppage of post so that flange is  $1/16"$  to  $1/8"$  below nose of Collet Electrode.
2. Special tapered hole to accept pointed end of post and prevent damage on impact.

Insert the post and determine what adjustment of the Insert Stop is necessary. Once the proper adjustment is made, the Insert Stop will not move because of a special Insert Coil that holds it in place.

1. Insert Collet Electrode nose in Collet Wrench and grip firmly in one hand.
2. Insert Bristol Spline Wrench in opposite end and engage Insert Stop. Make adjustment.

**IMPORTANT:** The Insert Stop should be positioned so that the top end is not less than  $3/16"$  from the end of the Collet Electrode.

If this dimension is exceeded, the Insert Stop will interfere with the seating of the Collet Electrode and severely shorten its life.

**NOTE:** Collet Electrodes for studs over  $.132"$  diameter, or electrodes for special shaped parts, require replacement of Collet Closure with an Electrode Holder. In these cases, the electrodes will be held with a set screw. See instructions on next page.

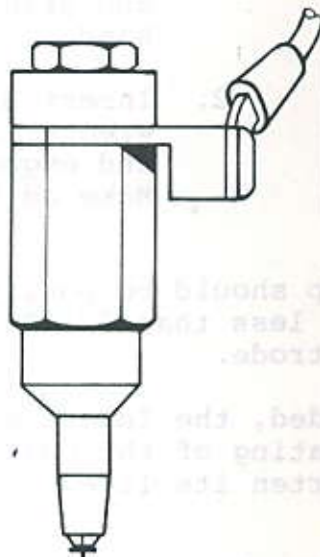
# Electrode Holder

The standard Electrode Holder supplied with the 2200 accepts electrodes and collets with 1/4" diameter shanks.

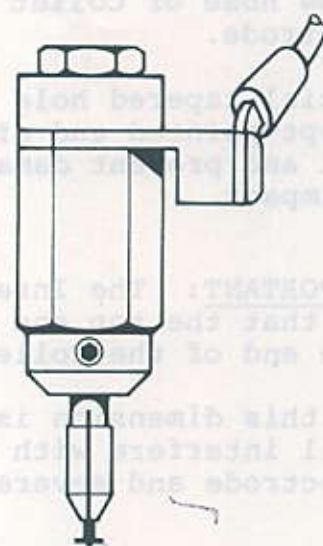
The Electrode Holder is used when small diameter posts are to be welded using the ZIM process. (For complete details, see the supplement sheet #1 at the back of the manual.) If the 2200 is to be used for frequent change-overs from posts to electrodes, the Electrode Holder facilitates this.

To install the Electrode Holder:

1. Disconnect Air input.
2. Disconnect the power lead.
3. Pull the collet closure down a little, and put a wrench on the jam nut.
4. With a large wrench, turn the collet closure loose, and remove.
5. Thread on the electrode holder. When it is in proper position, with power lead terminal to the right, tighten the jam nut.
6. Re-attach the power lead. Be sure connection is tight.
7. Use wrench to loosen or tighten collet or electrode.



COLLET CLOSURE  
#2257

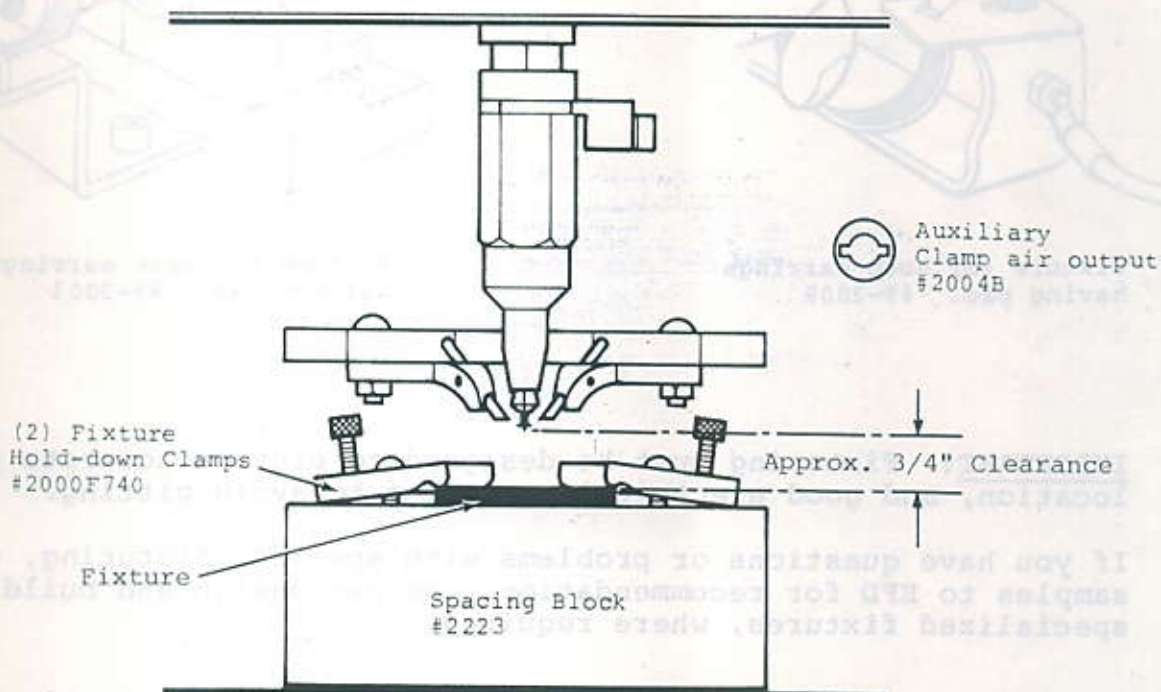


ELECTRODE HOLDER  
#2256A



It is important that the fixturing must offer both rigid support and the accurate location of the base piece. There must be no deflection of the base piece when the post contacts it during the fusion cycle. The fixture may be electrically conductive or non-conductive.

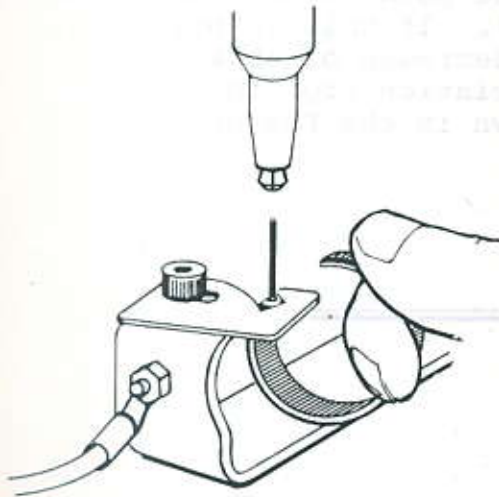
Regardless of the type of fixture employed, the distance between the inserted post head and the point of contact should be approximately  $\frac{3}{4}$ " (1.9 cm). If this is not practical, and a slight increase or decrease of this dimension is required, some minor deviation from the Voltage or Weld Control settings shown in the Fusion Schedule may be necessitated.



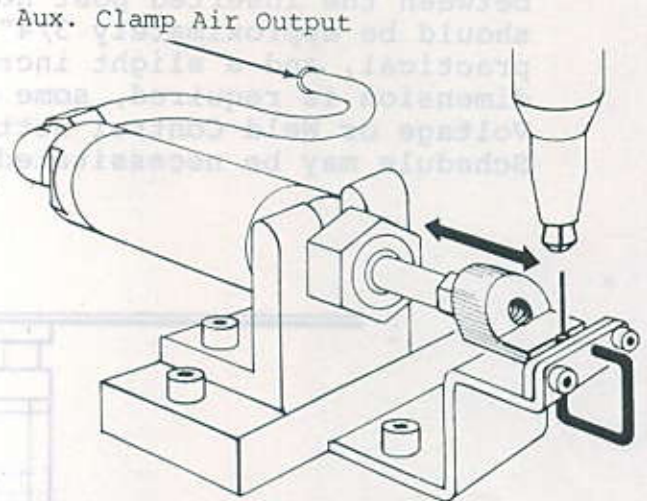
Many types of fixturing systems may be used. Impressions in lead/tin may be used to hold small parts. The impression material should be about 1.5 inches in diameter. Use the hold-down clamps provided to secure fixture as shown. Besides lead, any other metal or plastic or phenolic may be used. Be certain that fixture height, with base piece, does not reduce the stroke of the post to less than  $\frac{3}{4}$ ".

## Fixturing

For larger parts, or specialized fixtures, the base block may be removed and replaced. Two example of specialized fixtures are shown below. Both of these, which fit a variety of hoops are available from stock.



Fixture for hoop earrings having pad. #9-2009



Fixture for wire earrings without pad. #9-2001

**IMPORTANT:** Fixturing must be designed to provide accurate post location, and good electrical grounding to avoid pitting.

If you have questions or problems with specific fixturing, send samples to EFD for recommendation. We can design and build specialized fixtures, where required.



## THE FIRST STEP - use the Test Pak supplied

Each 2200 comes with a Test Pak to assist in learning how the machine works. The Test Pak includes welded samples, posts, and base parts. The 2200 is shipped with a 9043 Collet installed, and a fixture plate clamped on the base block. The posts are nickel silver and the test pieces are 3/4" round brass metal.

Set-up the EFD-2200 as outlined. Turn the machine on. Insert one of the test posts into the collet and one of the brass base pieces into the fixture holder.

Following the previous instructions, use either the settings from the test sample setting sheet included with the 2200 or the settings below.

Weld Control                      70 psi (Read on front page)

Balance                              30 psi

Clamp Pressure                      40 psi

Capacitors                          1.5

Set selector switch "A" to second position.

Set bottom switch "B" to second position.

(A - 2 x .5)                      (B - 2 x 1.0)

Voltage                              .8

NOTE: To establish Voltage Setting, follow these instructions:

- A. Press in Test Switch.  
(Be sure it illuminates yellow.)
- B. Depress the Foot Pedal and hold it down.
- C. Observe the Voltage Needle Indication.
- D. If it is below .8, release Foot Pedal and allow Volt Meter to return to 0. Turn the Capacitor Voltage Control slightly clockwise. Repeat Step B. If the voltage is still below .8, release the Foot Pedal, wait until the voltage indicated is 0 (zero), and readjust clockwise.
- E. If voltage is above .8, proceed as in D, except turn Capacitor Voltage Control counter-clockwise.



# Operation

At this point the correct weld settings are established. Turn off the Test Switch by pushing it in. The yellow light will go out.

To fire the 2200, simply depress the Foot Switch, and hold it closed until the weld has been made.

Be certain a post is in the collet, and the base metal is in the fixture. The weld will cause a sharp "pop" noise.

When the Foot Pedal is released, the collet and clamps return to the At-Rest position.

NOTE: If the Foot Pedal is released before the weld takes place, the machine immediately stops, the collet and clamp foot retract, and the capacitor energy is internally discharged.

Complete the first weld. Test it with pliers, trying to remove the post.

If the post comes off, examine the weld area. If it looks shiny, increase the Weld Control Regulator to 72 or 73 psi. Repeat the weld procedure. If the weld area looks dull, or cold, decrease the Weld Control to about 68 psi. (Remember to turn the Regulator below 68 psi, and reset on the increase.)

Make 4 or 5 correct welds. The most common cause of weld failure is too low a setting on the Weld Control. Simulate this condition by dropping the Weld Control Setting 5 to 8 psi below the value that produces a good weld. Keep dropping the pressure, and testing the welds, until one comes off. Notice the shiny weld area. This indicates that the weld time was so long that the molten material actually began to solidify before the post touched the base piece.

Remove the 9043 Collet, using the Collet Wrench, and put the Fixture, Collet, Test Parts and Posts away for future reference.

Set the 2200 to do the specific required application. Normally, EFD will test the studs you want to use, and supply the correct settings when the machine is delivered.



Below are several comments which may be helpful:

1. To check stud location during set-up, insert stud in collet, and disconnect the air at the input. This will allow you to pull down the clamp and driver cylinders. Make adjustments on the fixture to insure proper post location, and secure the fixture clamps.
2. To achieve a completely clean weld, apply a drop of water to the weld area just prior to the weld cycle. It is best to mix up a small container of water with a drop or two of any commercial wetting agent. This will prevent the water from forming a droplet, and allow it to form a thin film.

NOTE: EFD can supply special water drop dispensers if the application calls for volume production. Contact EFD for price and details.

3. Always make several welds, testing each one, before starting a production run. It is also good practice to occasionally check welded posts to insure high quality.
4. When you receive posts, studs, or other nibbed parts, use up one bag at a time. Never mix different bags. If there is a variation in nib sizes (which can affect the weld, or require slight changes in settings) it will likely occur from lot to lot. Not within the same bag.
5. Collet life depends on many factors. The post should be inserted vertically to avoid bending the collet. Oxidized studs will decrease collet life. The higher the voltage and capacitor settings used, the shorter the collet life.
6. If you use the auxiliary clamp air output and do not require the vertical clamp to move, slide closed the clamp shut-off air valve located internally adjacent to the clamp cylinder.

Remember, if you have any problems, call on Contract Fusion. We have over 70 welders in our contract shop, and well over 20 years solving application problems. Each year, EFD machines weld over 250 million studs and posts.



## MECHANICAL:

Keep fingers clear of Clamping Feet and Collet Closure. A speed control valve prevents the Clamps from obtaining high impact velocity, so that they are not harmful. The Collet Closure has a small impact force that is insignificant. HOWEVER, IF THERE IS A POST IN THE COLLET, THE SMALL NIB MAY PUNCTURE THE SKIN.

## ELECTRICAL:

A low voltage D.C. potential is developed between the Clamping Feet and the Collet Electrode during the charging cycle. The Indicator on the Power Head lights when this potential exists. Contact across Feet and Closure should be avoided when this light is on, although only a momentary and harmless electrical shock would result if the hand or fingers should inadvertently complete the circuit; however, the shock could be harmful in the unlikely event that a short circuit existed elsewhere in the equipment.

The Foot Switch operates 24 VAC voltage, and is completely grounded.

## OPTICAL:

The flash of the Plasma Arc is too brief to affect the eyes or require shielding. Occasionally, minute particles are expelled during the fusion cycle and, although these particles are normally harmless, the use of eye protection is recommended. This is particularly true when welding aluminum, since aluminum tends to expel more particles.

## ACCESSORY FEATURES:

A plexiglass shield is supplied and should be mounted under the control panel to protect the operator from minute particles. Insert the two spring-loaded hinges into the holes located on the inside edge of each side panel near the bottom of the front control panel.

Besides the standard foot pedal, EFD can supply interlocking palm switches, with or without special circuitry to prevent overriding these switches.



# Routine Maintenance

The Model EFD-2200 has been designed to provide accurate and reliable performance for many years. Use of the simple routine maintenance procedures listed below will insure continued excellent performance of the machine.

## SCHEDULE

Procedure	Daily	Weekly	Monthly
Capacitors			
Tighten all Screws			X
Lubrication (use light oil)			
Driver Cylinder		X	
Clamp Cylinder (bottom & top piston rods)		X	
Fusion Circuit			
Inspect Collet & Tighten (Replace when worn or burned)	X		
Inspect Power Leads (Tight connections)		X	
Inspect Clamping Feet (Dress Contact Pads)	X		
Fixture			
Inspect for pitting or dirt particles	X		
Machine			
Clean exterior		X	
Air Supply System			
Drain water from Air Filter		X	
Clean Air Filter (as required)			X

# Service Master Check List

Do not turn switches unless  
Fusion Energy indicates "0"

Always push on when  
checking Fusion Energy  
Reading

Refer to  
Fusion Schedule

Replace bulbs if  
burned out

Apply a few drops  
of light oil

Keep Clamp  
Feet tight

Check to be sure  
Regulators do not  
creep

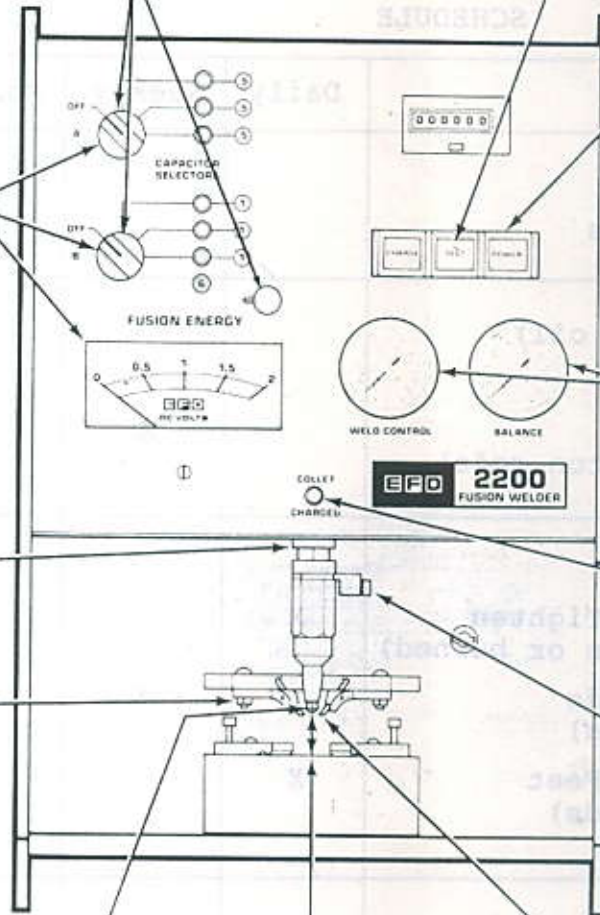
Never touch  
Collet Closure  
when  
illuminated

Tighten lead

Be sure Collet Electrode  
is always tight.  
Replace when worn

Keep gap  $3/4"$  to  $7/8"$   
from Stud to Base  
Piece

Be sure Collet and  
Fixture Clamps do not  
touch



**IMPORTANT:** Periodically remove cover and tighten all capacitor screws.

Apply light oil to driver and clamp cylinder top and bottom rods weekly.

Periodically check filter bowl. Drain if water accumulates.



Normal service will involve routine maintenance and changing of collet electrodes and fixtures.

The four areas that can cause trouble are:

1. Failure to drain water from filter/regulator, thus permitting water into the welder.
2. Failure to lubricate and protect the driver cylinder piston rod.
3. Creeping pressure regulators.
4. Prolonged machine on in test mode.

If water gets into the machine, it will be necessary to carefully drain hose connections at the cylinder inputs and regulators' outputs.

If the Driver Cylinder is scored, and no longer operates smoothly, the cylinder must be replaced. Check first to be sure nothing is binding the free movement of the cylinder rod. Check the air hose that connects to the top of the piston rod (inside the power supply). Be sure it does not impede free vertical movement. Check the power and clamp leads (to the collet closure and clamp foot bar). Be sure they flex properly and do not impede the cylinder rod motion.

If either the Balance or Weld Control Regulator creeps (as observed by pressure gage movement) the regulator must be carefully cleaned.

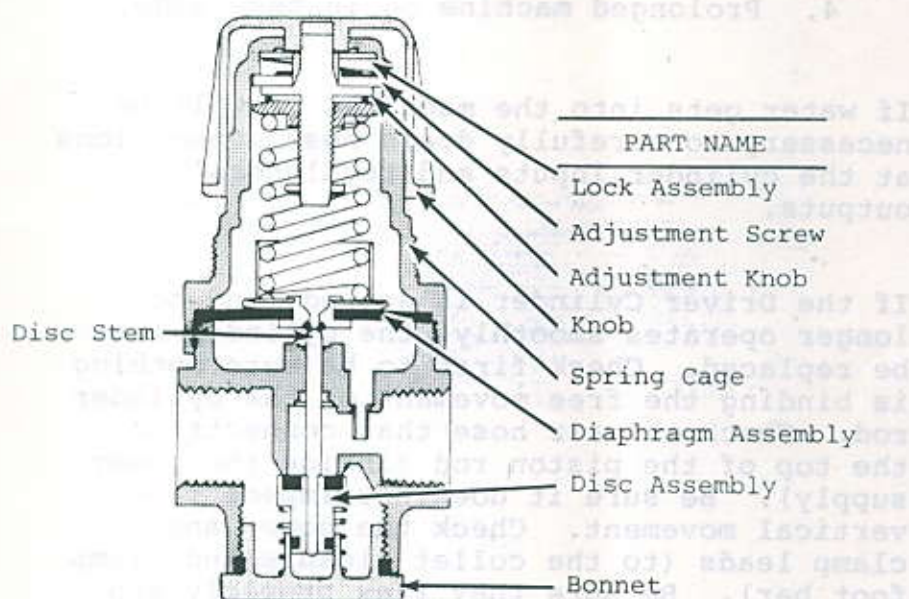
If the foot pedal is depressed for long periods in test mode, the clamp solenoid may burn out. The delay capacitor circuit raises the voltage in the clamp coil to over 165 VAC which exceeds operating voltage. Normal operation, or times of a minute or two will not harm the solenoid.

# Servicing Regulators

## CLEANING

**NOTE:** To clean, it is not necessary to remove regulator from the 2200. Refer to drawing as guide in reassembly.

If the air supply is kept clean, the regulator should provide long periods of uninterrupted service. Erratic regulator operation or loss of regulation is most always due to dirt in the disc area. To clean, shut off air line pressure and disassemble the regulator by unscrewing bonnet counter-clockwise. Clean parts with denatured alcohol and blow out body with compressed air. When reassembling, make sure the disc stem fits into center hole of diaphragm assembly. If diaphragm assembly is replaced, make sure disc stem fits into its center hole, tighten bonnet slightly more than hand tight (to 45 inch pounds torque.)



For cleaning the 2000F750 Input Regulator, follow the above instructions.

To maintain maximum filtering efficiency and to avoid excessive pressure drop, the filter must be kept clean. Turn drain valve to remove any bowl accumulation before it reaches level of lower baffle. A visible coating of dirt or condensate on filter element or excessive pressure drop indicates cleaning is necessary.

Wash porous bronze filter elements with denatured alcohol. Clean bowl only with household soap.

**CAUTION:** Never use carbon tetrachloride, trichlorethylene, thinner, acetone or similar solvents in cleaning any part.



# Trouble Check List

## GENERAL

If you are having difficulty with any aspect of the EFD-2200's performance, reference to the following paragraphs will help you to pinpoint the trouble spot.

ALWAYS REFER FIRST TO THE MASTER CHECK LIST DIAGRAM

and then to this Section before calling for technical assistance, since normally this procedure will result in finding a solution to the problem with a saving of time in placing the machine back in operation.

## FUSIONS

Inconsistent post attachments - machine operates normally.

### Possible Cause

### Remedy

Fusion energy not correct.

Turn to Test and cycle machine several times, allowing needle to return to zero each time. Note where needle stops. Check for consistency. If this varies, check input line voltage. If line voltage varies more than 10 volts, a constant voltage regulator may be required.

Air pressure incorrect.

Check gages. Check for proper settings or creeping variations. Correct regulators if required (see instructions). Check to be sure air pressure is 80 minimum and not fluctuating.

Faulty Collet Electrode.

Check and replace if worn or burned. Be sure Collet Closure is functioning and post is securely gripped.

Faulty Driver Cylinder.

Check for proper sliding action (disconnect air); if sluggish or sloppy, replace. Be sure there is no binding; that air hose to top piston rod moves freely; that power and clamp leads flex freely.

# Trouble Check List

<u>Possible Cause</u>	<u>Remedy</u>
Faulty Clamping Feet.	Check Clamping Feet contact with work piece. Clean and dress Contact Pads. Be certain proper contact is made. It is particularly important that the base piece is securely held and is properly backed to prevent any possible deflection. If Clamp Feet are ok, try increasing clamp pressure.
Faulty connections in power circuit.	Check, clean, and tighten as necessary. Replace broken power or clamp leads.
Faulty posts.	Check for correct material, and for Nib dimensions and tolerances. When there is doubt, return a sample lot for inspection.
Base material.	Check to be sure material is a consistent alloy and properly fusible.
<u>FUSIONS</u>	Occasionally fusions are of poor quality.

<u>Possible Cause</u>	<u>Remedy</u>
Periodic influence of any of the above factors.	Eliminate, step by step, the above problems. Carefully observe voltage, air pressure, gages and Power Head operation until erratic operating condition is identified.

## POWER SUPPLY

<u>Possible Cause</u>	<u>Remedy</u>
Does not operate, no power	Check fan for operation. Check indicator bulbs. Check fuse. Check input line. Re-establish voltage continuity.



# Trouble Check List

## Possible Cause

## Remedy

Power Supply is on but non-cycling.

Check Foot Switch for continuity. Check Initiation Relay to be sure it is plugged in and operates.

Is on, Clamps operate but there is no meter reading, or Charge signal, and Collet Closure does not come down.

Check Time TDR. Is there a loose connection? Using a 115 VAC meter, place the probes on Terminal 3 & 5. Cycle machine. If you get a reading, check to see if the Control Relay clicks on when the machine is cycled. If it does not, replace the Time TDR.

Is on, but Clamps do not come down.

Check Clamp Solenoid. Replace if it does not operate. Check clamp control shut-off slide valve. In forward position (toward front), clamp will operate. In rearward position, clamp will not operate.

When Foot Switch is pressed, machine hums and meter needle only moves a fraction and drops back to zero.

Check for faulty energy cell (see instructions below). Numbers on panel refer to cells numbered on right side of Bank (viewed from rear). Exchange cell for one not being used.

Check Rectifier for continuity. Using ohmmeter probes, take reading across Rectifier, then reverse probes. One way should produce no continuity. If so, Rectifier is operating properly. To test, put one probe on #1 Terminal of Phase Controller, and the second probe on the visible terminal of the Rectifier. To replace the Rectifier, remove the (2) bolts that hold the chassis, then remove the chassis. Disconnect the Rectifier and remove the holding nut.

Indicator Lights do not operate.

Check first for burned-out bulbs. If bulbs are all right, check above symptoms and remedy.

# Trouble Check List

<u>Possible Cause</u>	<u>Remedy</u>
Power Supply operates normally but Clamps, Driver Cylinder, or Collet, do not operate.	Check the appropriate solenoid. Check to be certain Clamp Slide Valve has not been moved to closed position.
All systems operate normally but no spark or fusion, and voltage is indicated on meter.	Check Power Cables. Be sure they are properly tightened, with no breakage. Never use solder to fix a broken power or clamp lead. Use only crimp terminals.
All systems operate normally but Fusion Energy Meter indicates no voltage.	Check energy cell voltage. Use D.C. voltmeter and check reading across number 1 cell. Put machine on Test and hold Foot Switch on for reading.  If there is a D.C. potential over 100 VDC, check meter connections. Replace if meter movement is faulty.  If there is no voltage potential, check TDR and Control Relay. Replace if either is faulty.

## ENERGY STORAGE CELLS

<u>Symptom</u>	<u>Remedy</u>
Internal short.	Using an AC-DC ohmmeter, set Selector at R1. Place one probe on buss bar and the other probe on the positive terminal of the cell to be tested. Hold these probes in contact for about 20 seconds and then remove. Change Selector to lowest scale DC. Put the negative probe on the buss bar and the positive on the positive terminal. If the meter holds the indicated charge for 5 seconds, the cell is functioning properly. If it does not hold the charge, replace. (Capacitor must be disconnected from the Capacitor Bank to get an accurate reading.)



# Trouble Check List

## CLAMPS

<u>Symptom</u>	<u>Remedy</u>
Arcing.	Arcing is caused by physical contact between Collet Closure and Clamping Feet. Reset Clamping Feet to correct. (See section on Fixturing.)
Striking too hard.	Reduce clamp pressure.
Clamping Foot marks base piece.	Dress Clamping Foot Contact Pad. (See section on Fixturing.) Be sure clamp pressure is a minimum of 40 psi.

## COLLET ELECTRODE

<u>Symptom</u>	<u>Remedy</u>
Does not hold post and/or burns out too soon.	<ol style="list-style-type: none"> <li>(1) Be sure Collet is not being accidentally brought down without post.</li> <li>(2) Keep a post in the Collet when air is disconnected to retain resiliency of jaws.</li> <li>(3) Be sure the Insert Stop is not backed up too high. (See section on Collet Electrode.)</li> <li>(4) Be sure post is being inserted vertically, and not being forced at an angle.</li> </ol>

# Trouble Check List

## BASE PIECE

<u>Symptom</u>	<u>Remedy</u>
Pitting in Fixture.	Pitting can only occur if; (1) Clamping Feet do not securely hold base piece, or (2) Clamping Feet do not make contact before the post does.

## COLLET CLOSURE

<u>Symptom</u>	<u>Remedy</u>
Collet sticks in the retracted position.	Remove the Collet and put a drop of oil on the outside.  To remove, tap the closure shell with a screw driver handle.
Collet does not release post after fusion.	Try oiling Collet, described above. If Collet Closure does not perform correctly, cause may be internal arcing. Depending on damage, Collet Closure may need to be replaced.

## STUD/POST

<u>Symptom</u>	<u>Remedy</u>
Point is marked.	Replace Insert Stop. (See section on Collet Electrode.)
Post shank is pitted.	Replace Collet Electrode.
Post not	Check Fixture and align it properly.



# Fusion Schedule

Specifications

Exact settings of the machine for various types of posts and base materials must be found by trial. The following guides will provide initial test settings. Variations from these settings should be accomplished primarily by varying the Pressure.

Head Diameter	Pressure	Balance	Fusion Energy	Energy Storage Bank Selector A	Selector B
.050-.075	70-72	30	.5-.75	Position 2	Position 2
.075-.105	70-74	30	.75-1.0	Position 2	Position 2
.105-.125	68-74	30	1.0-1.5	Position 3	Position 3
.125-.187	68-74	30	1.3-1.9	Position 3	Position 3

Note: extra capacitor pack recommended

The following chart indicates the combinations of metals that can be fused. Fusion quality is indicated by the following:

- E Excellent
- G Normally satisfactory fusion
- GA Satisfactory if post is annealed prior to fusion
- L Limited - depends on application
- C Conditional - consult Electron Fusion Devices, Inc.

Metal alloys should be considered weldable. Brasses should be lead-free. Steels should be low carbon. Aluminum alloys 1100, 4043, 6061, 5056, and similar alloys are excellent. Stainless should be 302 or 304.

Base Metal	Studs/Posts					
	Nickel Silver	Brass	Aluminum	Gold & Silver	Steel	Stainless
Nickel Silver	E	E	C	E	G	E
Gilding (copper)	E	E	C	E	G	E
Brass (65-35, 70-30)	E	E	C	E	E	E
Gold	E	E	C	E	C	E
Silver	E	E	C	E	C	E
White Metal	GA or C	C	C	C	C	-
Steel	L	G	C	C	E	E
Aluminum	GA	C	E	C	-	C
Copper	E	E	C	E	E	E
Titanium	G	G	G	G	G	G
Stainless	E	E	C	E	E	E

# Specifications

## Fusion Schedule

### EFD 2200 SPECIFICATIONS

Power: 115 VAC, 15 amps (230 VAC available) 50/60 Hz

Air Input: Filtered, Max. 125 psi (8.5 kg/cm<sup>2</sup>)  
Min. 80 psi (5.6 kg/cm<sup>2</sup>)

Power Consumption: 2 Amps maximum

Transformer: .84 KVA

Maximum Weld Area: .250 in. (6.35 mm)

Automatic Discharge System

Capacitors: 11,200 mfd standard (26,200 mfd optional)

Capacitor Switching: Front panel control

Solid State Voltage Controller: 40 amp

Counter: 6 digit reset

Regulators: 80 CFM

Clamp Pressure: Regulatable with gage

Charge Time: Internal controlled

Air Consumption: .25CFM

Driver Cylinder Solenoid: 75 CFM

Throat Behind Weld Area: 5.63 in. (14.29 cm)

Max. Height of Fixturing: 1.5 in.

Pneumatic Collet Closure: Air input through driver cylinder

Driver Cylinder and Clamp Cylinder:

Double rod for extreme close tolerance repeatability

Timing: Solid state

Controlling Relays: Plug in modules

Discharge Relay: Special 50 amp controller type

Voltage Meter: 3-1/2"

24 VAC Foot Switch Voltage

Cycle Speed: Exceeds 1800/hour optimum

Weight: 82 lbs. (37.2 kg)

Dimensions:

Height: 16.5 in. (42 cm)

Width: 11.0 in. (28 cm) (Plus 2 in. for knobs)

Depth: 14.75 in. (37.5 cm)



ZIM® Control (Zero Inertia Mass) - Application and Instructions

**FEATURES:** With the EFD ZIM Control, it is possible to weld small diameter posts to extremely thin metal parts, or pre-enamelled parts, without damaging the base piece.

ZIM differs from normal fusion/welding in that the collet holding the post is mechanically stopped before it contacts the base piece.

**APPLICATION:** Because of the mechanical stop, the use of ZIM is restricted to earwire posts and tie tacks up to .045" diameter. The use of ZIM for larger diameter posts is unreliable.

ZIM Control works well when fusion/welding stainless steel posts to brass, copper, silver, gold or copper-plated steel. ZIM also works with gold-filled, rolled gold, and nickel silver posts. ZIM is not recommended for welding silver posts to silver.

ZIM is ideal for welding posts to very thin stampings, down to .008" thick. ZIM is also recommended for welding posts to preset rhinestone settings, and enamelled or cloisonne parts.

ZIM Control is standard on all EFD2200 Fusion/Welders, and can be supplied as a retrofit to EFD2000 and EFD125. Contact Contract Fusion for conversion costs and requirements.

**SUMMARY:** Step-by-step instructions are shown on the back of this page. If you have any questions, call Contract Fusion at 1-800-562-9270. In Rhode Island, call 438-1298. ZIM Control should only be used for above special applications. Normal operation is the standard recommended process outlined in the manual.

Use of the ZIM Control requires the EFD electrode holder. Collets used for ZIM Control must be non-pneumatic types, such as 9-F series.



## Instructions for using ZIM<sup>®</sup> (Zero Inertia Mass) Control

### Installation

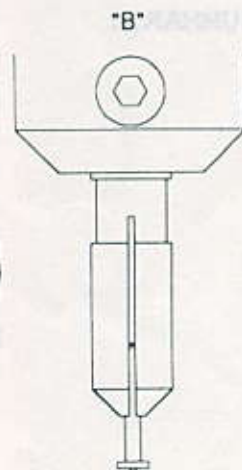
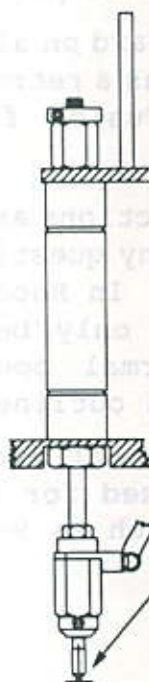
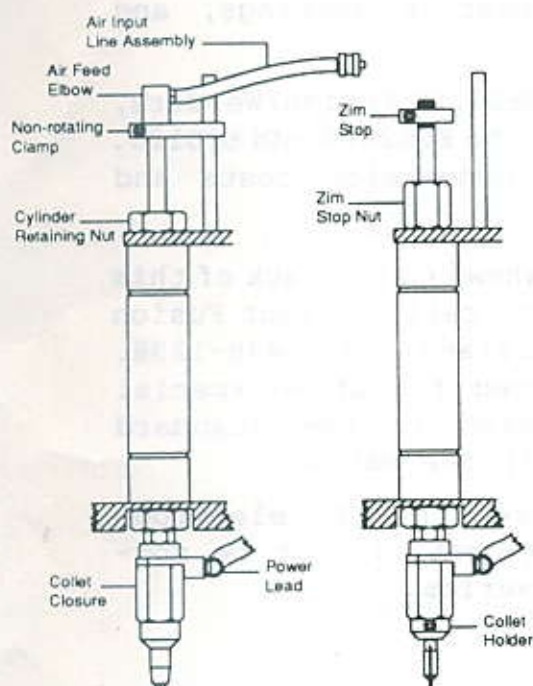
1. Disconnect the air and power inputs and slide back the top cover.
2. Disconnect the power lead #2229A from the collet closure #2257 and remove the collet closure from the drive cylinder.
3. Install the collet holder #2256A and reconnect the power lead.
4. Disconnect and remove the air input line assembly, collet air feed elbow #2251, non-rotating clamp #2214B and cylinder retaining nut.
5. Install the ZIM stop nut #2228B and the ZIM stop #2228A. Tighten the ZIM stop clamp screw after proper height adjustments have been made. (See Setup Instructions)

### Setup Instructions

1. Install the electrode into the electrode holder. Insert a post into the electrode until post flange is approximately one post flange thickness from touching the end of the electrode.
2. Manually bring the cylinder down (air must be disconnected) onto the piece to be welded as shown in diagram "A".
3. Adjust the ZIM stop #2228A to touch the ZIM stop nut #2228B, when the cylinder is in position shown in diagram "A". This will allow the post to touch the base piece and will keep the electrode and the inertia of the cylinder from impacting the base piece. Tighten the ZIM stop clamp screw.

### Loading a post into the collet

1. Insert the post into the electrode so that 1/2 to 1/3 of the post is extending from the electrode as shown in diagram "B".
2. If marking on the base piece occurs, adjust the ZIM stop to bring the electrode further away from the base piece.





Replacement Parts

<u>Part No.</u>	<u>Description</u>
2001C	Weld Control or Balance Gage
2-2003CLP	Clamp Solenoid Assembly
2-2015C	Foot Switch Assembly
2048	2500 mfd Capacitor
2049	1400 mfd Capacitor
2051	Control Relay (125 VAC)
2-2121	Collet Closure Solenoid Assembly
2128	Collet Wrench
2208C	Chassis Assembly
2210	Volt Meter
2211	Capacitor Selector Switch
2216	Discharge Relay
2217	Phase Controller
2219L	Capacitor Indicator Lamp
2-2220	Driver Solenoid Assembly
2221	Driver Cylinder
2221A	Clamp Cylinder
2229A	Power Lead
2229B	Clamp Lead
2230	Timer TDR
2233	Reset Counter
2237	Power Rectifier
2240	Fuse
2246	Initiation Relay (24 VAC)
2253	Clamp Timing Capacitor
2254	Driver Timing Capacitor
2255	Timing Diode
2256A	Electrode Holder
2256B	Electrode Holder - 3/8"
2256EC	Electrode Holder - Ear Clip
2257	Collet Closure
2258	Clamp Speed Control
2259	Driver Flow Control
2290	Allen Wrench for ZIM Bar
2292	Spline Wrench for Internal Collet Stop
2-272022S	Special Clamp Feet Assembly

For additional parts or requirements, please contact Contract Fusion.

Suggested Settings for Earwire Posts to Prolong Collet Life.

These settings should be used for ZIM as well as normal operation.

If the welder has been specified for earwire post usage, the correct size collet will be installed prior to shipment, and a supply of test posts will be included.

Set up the welder as shown in the manual, but use the settings indicated below for initial tests.

Weld Control                      70 psi

Balance                              30 psi

Clamp Pressure                      40 psi

Capacitors

Selector switch A turned to center setting.

Selector switch B turned to center setting.

Fusion Energy (voltage)    .5-.7

After making several test welds, make adjustments as follows, if necessary.

1. Too Hot: Increase weld control pressure (1) or (2) lbs., and retest. Continue until minimal spatter occurs.
2. Too Cold: If post is easily broken off, decrease weld control pressure by (1) or (2) lbs. NOTE: When decreasing pressure, be certain to turn regulator below required setting and increase pressure to required setting.

Included with this 2200 will be settings used for earwire posts, on your specific parts (if samples were made prior to shipment).