MICRO WELD

MODEL HP-1

CERAMIC FUSION

BUTT WELDERS

MICRO PRODUCTS COMPANY

SERVICE MANUAL

TABLE OF CONTENTS

1.0 SPECIFICATIONS MODEL HP1

Type of Welding Process	Ceramic Fusion
Welding Range	4/0 to 8ga AWG-Copper 250MCM to 8GA Aluminum
Material Suitability	Strand or Bunched Conductor
Standard Operating Voltages	460/230 Volts
Maximum Line Demand 460 Volt	37amps@100% duty cycle 117amps@10% duty cycle
Maximum Line Demand 230 Volt	74amps@100% duty cycle 234amps@10% duty cycle
Single Phase AC Transformer	24 KVA @ 50% duty cycle
Clamp Method Upset Method	Pneumatic, Foot Controlled Pneumatic, Adjustable
Mounting	4-Caster Wheels

Dimensions and Weights

Height Overall	46”-Truck
Floor or Bench space	39” x 29” Truck Type
Welding Die Height	41” – Truck Type
Weight	640 LBS – Truck Type

FEATURES OF MICRO-WELD CERAMIC FUSION WELDING EQUIPMENT

- Micro Weld quality and workmanship
- Heavy-duty construction & components
- East to operate controls
- Low maintenance costs
- Easy to set welding parameters
- Safety electrical switch circuits
- Heavy-duty weld heat selection switch
- No-upset burr formation during weld process, all strands locked into weld coalescence
- Sensitive straight slide movable headpiece assembly equipped with ball bearings

2.0 GENERAL OPERATING INSTRUCIONS

2.1 ELECTRICAL HOOK-UP INSTRUCTIONS

First determine that available electrical service in your plant corresponds to the nameplate rating located on welder housing. Electrical wiring to welder must be of sufficient size to deliver full ampere load with no appreciable loss during weld cycle. The welder will not operate properly if there is more than a 10% variation in the line voltage. In general, the welder should be fused with a slow blow fuse of the 100% duty cycle rating. The minimum power cable size to the welder can be obtained by using this same current rating.

Refer to National Electrical Code and local electrical regulations for adequate power sizes; disconnect methods and fusing guidelines.

Remember line voltages to the welding machine are potentially dangerous should the power cords be damaged or severed. The welding voltages at the welding dies will not harm an operator since they do not exceed 10 volts.

2.2 SAFETY PRECAUTIONS
(See section 11.0)

2.2.1 ELECTRICAL

Maintain electrical cable to welder in good repair. Welder must be grounded and connections securely tightened. Heat Switch must not be changed to new position while a weld cycle is in process. Disconnect electrical service before serving welder – high voltages are located within the base of the welder.

2.2.2 MECHANICAL

Operator while using welder must wear safety glasses. Keep all safety guards on welders and use properly. Operators must be instructed on basic operation of unit to prevent injury. Check nameplate rating and keep within material size range for each welder.

2.3 WATER HOOK-UP
(If so equipped)

It is important that if a welder is to be operated for an extended period of time and heats up, water lines must be connected to the welder. Connect hoses to inlet and outlet provided at the back of the welder. A Shut-off valve should

be installed in the inlet line and the hose from the outlet should run to an open sight drain. Water should be turned off when welder is not in use.

2.4 AIR HOOK-UP

Set air regulators for from 20 to 80 lbs. A safety pop-off valve will be activated when air gauge is set for over 100 lbs.

2.5 WELDING DIES

The dies and shoes supplied with the welder will handle most size and material types within the range of the welder. For new weld applications consult the factory for special die and shoe sets.

3.0 BASIC OPERATING PARTS

3.1 WELD HEAT SELECTION SWITCH

Welding heat is selected by means of a heavy-duty tap switch, offering twelve (12) steps of voltage. The switch is located conveniently on the lower front of the welder. Number one (1) indicates high heat; twelve (12) indicates low welding heat. Other numbers are equally graduated from high to low to allow just the right amount of voltage for the weld operation.

3.2 LIMIT SWITCH

The weld switch is located on the upset cylinder bracket behind the upset cylinder. Limit switch adjustment is made by moving the switch-initiating barrel along the threaded stud mounted in the movable headpiece. The weld limit switch controls the cut of current flow to the welding dies.

3.3 HEAD SPACING MECHANISM

The open head space adjustment bolt and locking jam nut are located on the upset cylinder mounting plate to the immediate left front of the upset cylinder, The open space scale also located on the front of the upset cylinder mounting is a quick reference guide for determining the amount of open space by lining up the pointer on the movable head endplate with the graduations on the scale. When the pointer is in line with no. “0” on the scale, there is 3/8” between the inside of the welding dies. There

is an increase of ¼" spacing between the dies for each graduation on the scale.

The headpiece closed stop is preset at the factory and should require no field attention. This setting will prevent the dies from touching each other if the upset is activated with no stock in the dies. To check this setting push movable headpiece to the full closed space then you should measure 3/8" between the welding dies.

3.4 CLAMP ARMS

The clamp arms are air operated. The foot controlled air valves are used to initiate the air clamp cylinders. The foot valves are located at the bottom of the welder housing. The right foot pedal operates the right clamp arm, and the left pedal operates the left clamp arm. To clamp stock place it in the proper welding die grooves and press the top edges of the tilt pedal on the foot valve. To release stock, press on bottom edge of foot valve tilt pedal. Air flowing into each clamp cylinder is slowed by a flow valve that is preset at the factory. CAUTIOM: Care must be used when clamping stock, be sure hands are clear of clamp arms.

3.5 WELDING DIES

The welding dies (lower) and shoes (upper), serve two purposes:

1. To carry current for welding.
2. To prevent slippage during weld cycle.

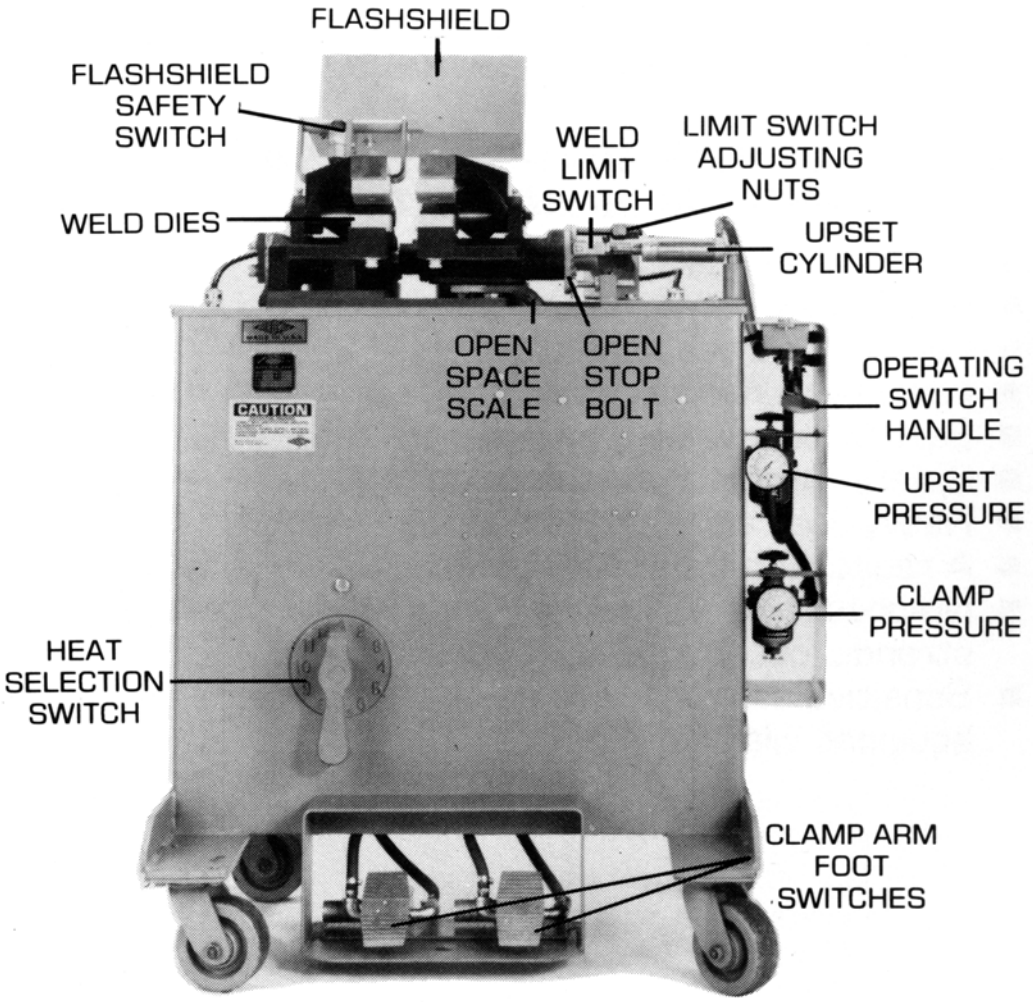
3.6 WELD SPLIT SLEEVE

The split sleeve serves two purposes:

1. To provide proper alignment.
2. To form weld zone keeping all strands together.

With the unique design each sleeve can be used many times.

4.0 BASIC OPERATING PARTS LOCATION



5.0 TYPICAL OPERATING SEQUENCE

5.1 All insulating materials must be removed from conductors where they contact lower welding dies.

5.2 Set weld heat selection switch to recommended chart setting.

5.3 Set upset pressure to recommended chart setting (PSI).

5.4 Adjust the head open space to proper chart setting.

5.5 Twist end of conductor in direction of natural lay, pulling outward.

5.6 Carefully square cut conductor end so no individual wires extend beyond cut. Note: Use a sharp sheer, because end preparations are important.

5.7 Select correct ceramic sleeve or split sleeve set for wire to be welded.

5.8 Thread conductor into sleeve so that the wire ends are midway through sleeve. Rotating sleeve in direction of lay will assist threading procedures.

5.9 Clamp preset conductor and sleeve into welding die set, so that the sleeve is centered between open welding dies.

5.10 Thread other prepared conductor into sleeve and allow the conductor to gently but firmly contact first conductor. Positive contact to wire ends is important for a good weld. Clamp that conductor into welding die.

5.11 Rotate and center ceramic (or split) sleeve to assure free movement of conductors during the weld process.

5.12 Lower the flash guard and raise up on the operating lever until it initiates the operation switch, hold for 1 to 3 seconds to assure a complete weld cycle.

5.13 Unclamp welded conductors and remove sleeve. Fracture expendable type or disassemble reusable type.

5.14 The inside diameter of the sleeve slightly exceeds the nominal conductor size; therefore the weld zone is slightly larger than conductor diameter.

6.0 SPECIAL ADJUSTMENTS

6.1 HEADPICE OPEN SPACE ADJUSTMENTS

The typical open space for the HP Welder should be set at 4-1/2 on the open space scale. If the open space need adjusting, loosen the locknut on the open space bolt to increase the open space turn clockwise, to decrease the open space turn the bolt counterclockwise after adjusting retighten locknut. (See suggested settings).

6.2 LIMIT SWITCH

The weld limit switch adjustment is typically set at 4-1/2 on the threaded rod scale. If the weld limit needs adjusting loosen the locknut on the threaded rod, turn activating nut clockwise to cut off sooner or turn the nut counterclockwise to cut off later. (See suggested settings).

6.3 UPSET PRESSURE

A pressure regulator with gauge controls the upset pressure. To change the upset pressure loosen the locknut on the adjusting knob screw, to increase pressure turn knob clockwise, to decrease pressure turn knob counterclockwise, retighten locknut after adjustment has been made.

6.4 CLAMP PRESSURE

A pressure regulator with gauge controls the clamp pressure. To change the clamp pressure, loosen the locknut on the adjusting knob screw, to increase pressure turn knob clockwise to decrease pressure turn knob counterclockwise, retighten locknut after adjustment has been made.

7.0 PREVENTIVE MAINTENANCE TECHNIQUE

Keep in Mind that these welders are precision built to last many years, but will require good maintenance procedures. They are designed to be as automatic as possible with a minimum dependence on the ability of the operator. Adjustments must be made by those thoroughly familiar with the operating principles of the welders.

7.1 WELDING DIE NOTES

7.1.1 Welding dies and die shoes in poor condition are the primary caused of bad welds.
7.1.2 Check die sets for excessive wear and replace if necessary.
7.1.3 Clean weld die bottoms to remove oxides with emery cloth placed on a flat surface.
7.1.4 Clean die seats with emery cloth to brighten contact areas.
7.1.5 After cleaning of dies be sure to wipe off with soft clean cloth.
7.1.6 Completely tighten dies into seats to assure a good contact.
7.1.7 Worn die shoes will not hold stock during a weld cycle, change steel faces or replace complete shoes.

7.2 WEEKLY

7.2.1 Tighten all loose parts.

7.3 QUARTERLY

7.3.1 Repeat above service items.
7.3.2 Check grease requirements on clamp arms pivot shafts and lubrication points.
7.3.3 Check anneal parts and replace all worn or broken assemblies
7.3.4 Check contacts on magnetic contactor for worn contacts.
7.3.5 Clean heat switch contacts with low residue cleaner and recoat with petroleum jelly.

7.4 ANNUALLY

7.4.1 Repeat previously noted items.
7.4.2 Check for wear in clap arm pivots.
7.4.3 Clean inside and outside of welder.
7.4.4 Check grease requirements on headpiece slide shafts, grease lightly.
7.4.5 Caution: make sure that power supply is disconnected before servicing welder in anyway!

7.5 WELDING DIES AND DIE SHOES INFORMATION

Description:

Welding dies – Lower conducting electrode and clamp jaw.

Welding die shoes – Upper clamping member.

Welding dies and die shoes in poor condition are the main causes of bad welds.

Care of die sets:

7.5.1 Use a brass or fiber blade to remove particles of flashings that build-up on die sets. Excessive flash build-up causes die burns on material and shorting of die sets.

7.5.2 Do no attempt to clamp material that is not suited for welder into die sets. Undersize materials will slip and burn die grooves, oversize materials will overstress clamping parts.

7.5.3 Do not use welding die sets for a vise. These parts will not withstand the mechanical abuse.

7.5.4 Whenever welding dies are replaced, clean bottoms of dies and corresponding die seats to a bright and clean condition before bolting them tightly into place. An oxidized surface will insulate the welding dies and reduce effective welding voltage.

7.5.5 Welding die shoes must swivel freely within the clamp arm pivots to prevent cracking of die shoes. File down die shoe boss if necessary.

7.5.6 Welding die set will ear with use and must be changed occasionally for good welding results. Keep and adequate supply of replacement parts available. Wire and rod slippage is a problem caused by poor die sets and a major cause of wire breaks.

8.0 SUGGESTED SETTINGS

SIZE	MATERIAL	WELD HEAT SETTING	HEAD OPEN SPACE	LIMIT SWITCH SETTING	AIR UPSET	AIR CLAMP
8 GA	Copper	10	4 ½	4 ½	20 PSI	60 PSI
6 GA	Copper	9	4 ½	4 ½	20 PSI	60 PSI
4 GA	Copper	8	4 ½	4 ½	20 PSI	60 PSI
3 GA	Copper	8	4 ½	4 ½	25 PSI	60 PSI
2 GA	Copper	8	4 ½	4 ½	25 PSI	60 PSI
1 GA	Copper	7	4 ½	4 ½	25 PSI	60 PSI
1/0	Copper	7	4 ½	4 ½	30 PSI	60 PSI
2/0	Copper	7	4 ½	4 ½	40 PSI	60 PSI
3/0	Copper	6	4 ½	4 ½	45 PSI	60 PSI
4/0	Copper	6	4 ½	4 ½	50 PSI	60 PSI
8 GA	Aluminum	12	4 ½	4 ½	15 PSI	60 PSI
6 GA	Aluminum	11	4 ½	4 ½	15 PSI	60 PSI
4 GA	Aluminum	10	4 ½	4 ½	15 PSI	60 PSI
3 GA	Aluminum	10	4 ½	4 ½	20 PSI	60 PSI
2 GA	Aluminum	10 or 9	4 ½	4 ½	20 PSI	60 PSI
1 GA	Aluminum	9	4 ½	4 ½	25 PSI	60 PSI
1/0	Aluminum	9	4 ½	4 ½	25 PSI	60 PSI
2/0	Aluminum	9	4 ½	4 ½	30 PSI	60 PSI
3/0	Aluminum	8	4 ½	4 ½	35 PSI	60 PSI
4/0	Aluminum	8 or 7	4 ½	4 ½	40 PSI	60 PSI

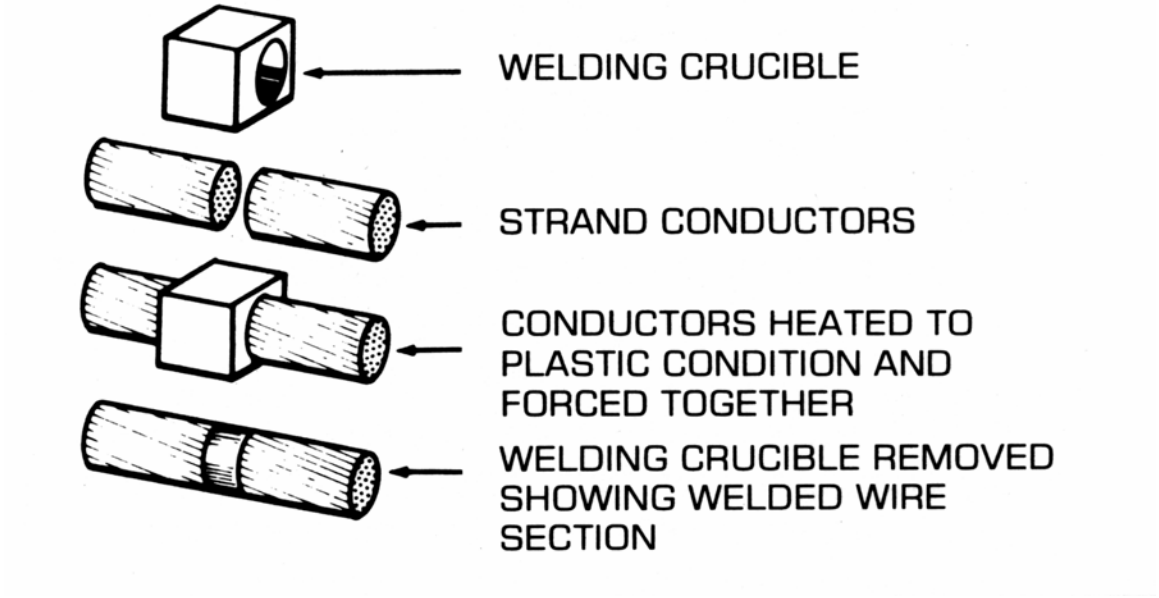
NOTE: These settings are approximate and may be varied to obtain the best weld.

8.1 WELDED STRAND OR BUNCHED COPPER AND ALUMINUM WIRE CONDUCTORS

Theory: Welds are formed within a ceramic tube or block and no filler materials are needed.

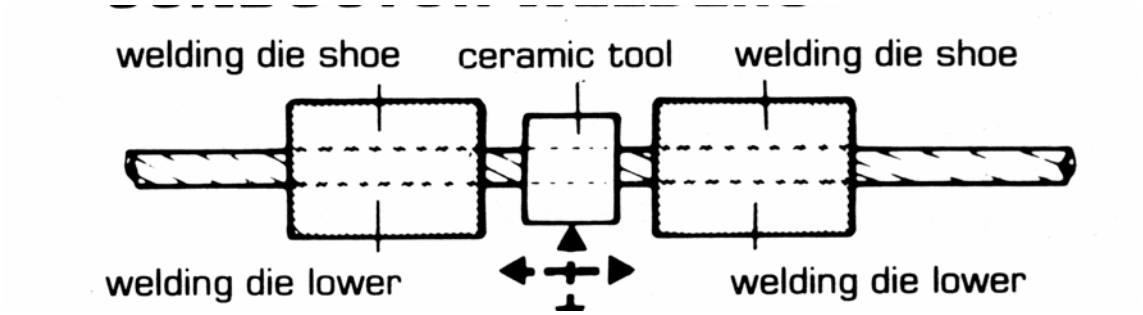
Wire ends are resistance heated to a plastic condition and hot forged together within a ceramic tool, which acts as a crucible. The resultant coalescence (weld) locks all single filaments into a solid weld zone…Since strand conductors have configuration voids on the faying surfaces, the plastic material normally forced to the outside on a normal weld, is forced into the voids eliminating the upset burr common with standard upset weld. (This type of weld is not suitable for solid wire.)

8.2 CERAMIC FUSION TECHNIQUE



9.0 DIAGNOSTIC CHART FOR TROUBLE-SHOOTING

9.0.1 SERVICE HINTS FOR STRAND CONDUCTOR WELDERS



Conductors must be able to slide freely within ceramic tools during weld cycle, therefore rotate and move ceramic tool side to side prior to welding. Be sure to center ceramic tool between die sets.

Example of porosity in weld zone

Example of a void in weld zone

Porosity and voids in weld zone may be corrected by using one or more of the following suggestions.

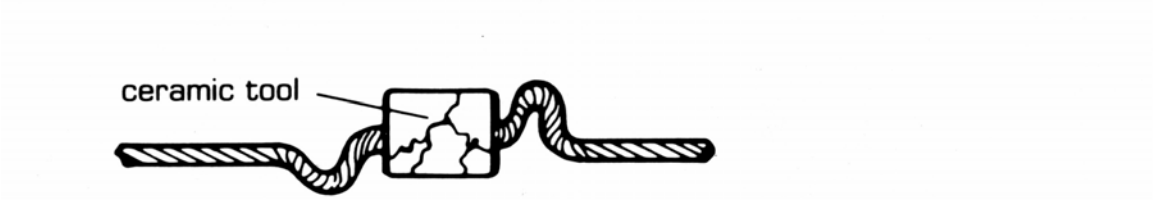
1. Increase upset pressure.
2. Decrease weld heat
3. Readjust timing point of weld heat cut-off, limit switch adjustment, to allow heat to cut-off slightly sooner.
4. Check to make sure conductor is not binding in ceramic tool.

Example of poorly fused weld nugget because of small solid area.

Example of properly fused weld nugget (approximate solid area of two times diameter of conductor).

Amount and length of weld nugget (solid portion of weld) can be varied by one or more of the following suggestions.

1. Increase starting space between die sets when weld nugget is small.
2. Decrease space between die sets when weld nugget is too large.
3. Adjusting limit switch to hold on or cut-off current at a different position.



Fracturing of ceramic tools and bent conductors can be corrected by one or more of the following methods.

1. Decrease weld heat to prevent excessive softening of conductors on either side of sleeve.
2. Decrease starting space so as to decrease length of upset and amount of conductor exposed to heat.
3. Decrease upset pressure and still maintain a fused area.
4. A few of the very small stranded and bunched conductors just do not have enough mechanical strength to be processed by this process.

9.1 ELECTRICAL TROUBLE-SHOOTING OF WELDER

(Caution!! Extreme care should be exercised when making these tests. Dangerous voltages are present in the welder. Only persons familiar with electrical safety precautions should perform these tests.)

9.1.1 TROUBLE-SHOOTING TABLE
(See section 9.1.3)

This electrical trouble-shooting table is furnished as a suggested method of trouble-shooting the welder. The individual steps of the table should be performed in the order given, to make the tests valid. The electrical schematic (section 10) furnished for these tests show the table test points. The table may be used for welders with a different but closely related wiring by using corresponding test points. During all tests, line voltage should be connected to L1 & L2 of the welder. The heat switch should be set to the #1 position.

9.1.2 FINAL ELECTRICAL CHECKS

Set the heat switch to the number 1 position, connect the voltmeter across the welding dies. Press the operating switch. The meter reading will typically be less than 10 VAC. Consult the weld specification sheet for this value. Rotate the heat switch through all settings. If the voltage is not read at any setting, the heat switch may be defective. Actuate the weld limit switch; observe the reading goes to zero. Release the weld limit and operating switches, the reading should remain at zero.

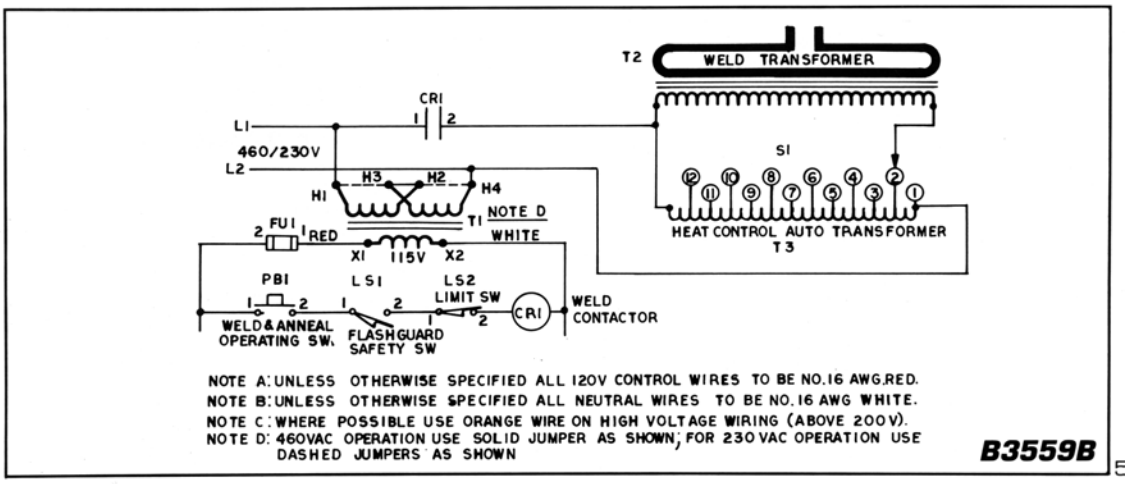
9.1.3

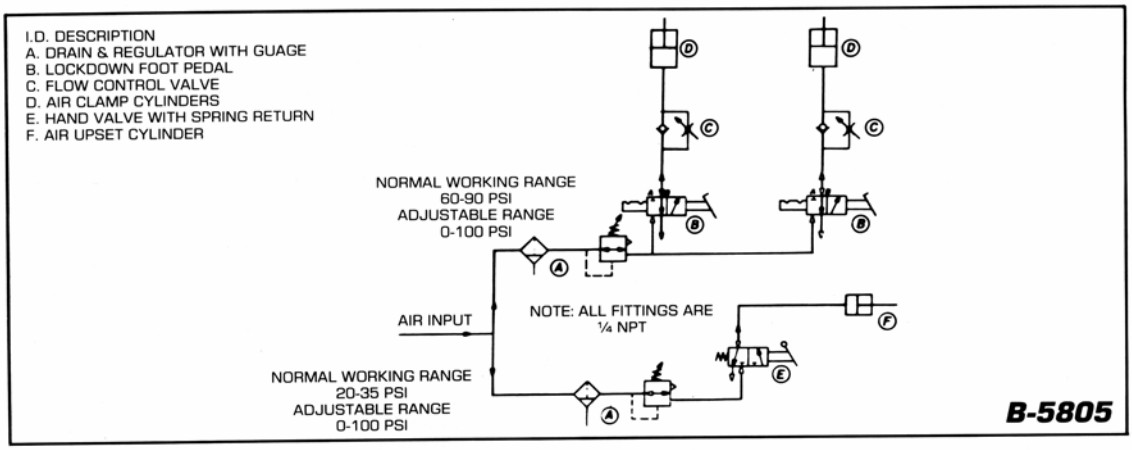
TEST LEAD CONNECTION	METER READING	PROBLEM IF NO READING	PRESS OPERATING SWITCH	WELD LIMIT SWITCH ACTUATED	PRESS ANNEAL SWITCH
X1 X2	115 VAC	Bad control transformer (T1)			
X2 FU1-1	115 VAC	Bad fuse connection			
X2 FU1-2	115 VAC	Open fuse			
X2 LS1-1	115 VAC	Open wire to operating switch			
X2 LS1-2	115 VAC	Bad operating switch	X		
X2 LS2-1	115 VAC	Open wire to flashguard switch	X		
X2 LS2-2	115 VAC	Open flashguard switch	X		
X2 LS3-1	115 VAC	Open wire to weld limit switch	X		
X2 LS3-2	115 VAC	Bad weld limit switch	X		
L2 CR1-1	Line voltage	Open wiring to contactor			
L2 CR1-2	Line voltage	Bad contactor	X		
L1 S1-1	Line voltage	Open wire to heat switch	X		

NOTE: To perform repair consult section 13 for parts identification.

10.0 ELECTRICAL SCHEMATIC

10.0 ELECTRICAL SCHEMATIC





11.0 SAFETY REMINDERS

The following accident prevention information is presented to eliminate potential hazards while operating, inspecting or repairing Micro-Weld electric resistance welding equipment.

Important safety compliance information for Micro-Weld Welders.

GENERAL

1. Qualified personnel, prior to using equipment, must instruct an operator on basic operation and malfunction methods.
2. Safety eyeglasses must be worn by all personnel operating or servicing welders.
3. Use safety equipment properly and keep safety equipment on welders.
4. Determine that both operating voltages and hertz (cycles) of power supply correspond to ratings listed on welder nameplate located on welder housing.
5. Check nameplate ratings and keep within capacities and material categories stated therein.
6. Adjustments or repairs must be made by persons thoroughly familiar with operating principles of welder.
7. Welder must be disconnected from power supply prior to maintenance or repair procedures.

ELECTRICAL

1. Refer to National Electrical Code and local regulations for adequate electrical wiring to power welder. Do not operate welder with inadequate electrical power supply cords or cable.
2. All welders must be grounded through power supply and welder ground connection terminal securely tightened.
3. All welders must be able to be disconnected from power source either by a double breaking disconnect switch or unplugged by standard rated plugs.
4. All welders must be fused to prevent injury should an electrical malfunction occur. Welders must never be fused for an ampere load that exceeds the ratings stated on welder nameplate. Normally welders are fused using the nameplate rated load; time lag parameters functional to standard fuses allow this specification.
5. Electric power cords to welder must be kept in good condition. Report any damage or potential hazards to maintenance personnel.
6. The weld heat selection switch, potentiometer or range selection devices must not be changed to a new position while a weld operation is in process.

12.0 BUYERS GUIDE

HOW TO ORDER PARTS:

You must provide
1. Machine Model
2. Machine Serial Number
3. Voltage

Then identify part(s) on part list (last page in book) and provide MICRO with the circled number.

CALL MICRO at 800-872-1068
OR FAX MICRO at 630-787-9360

Provide MICRO with your company name and purchase order number.

13.0 PARTS LIST

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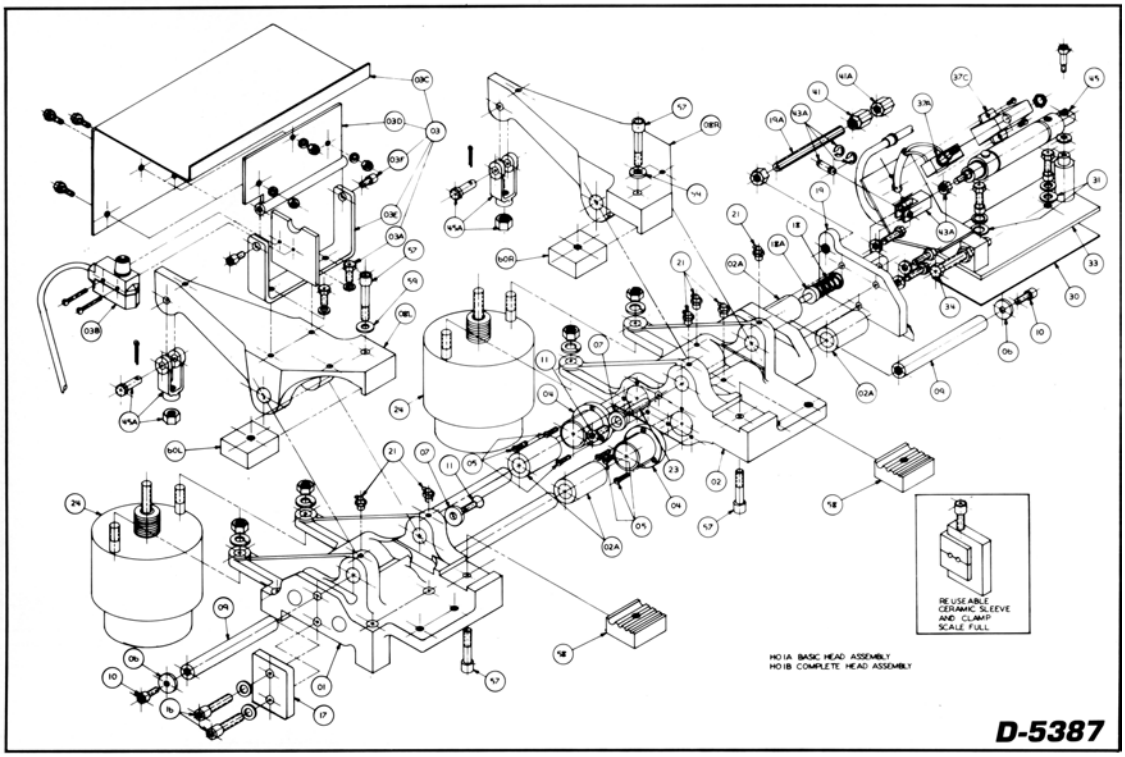

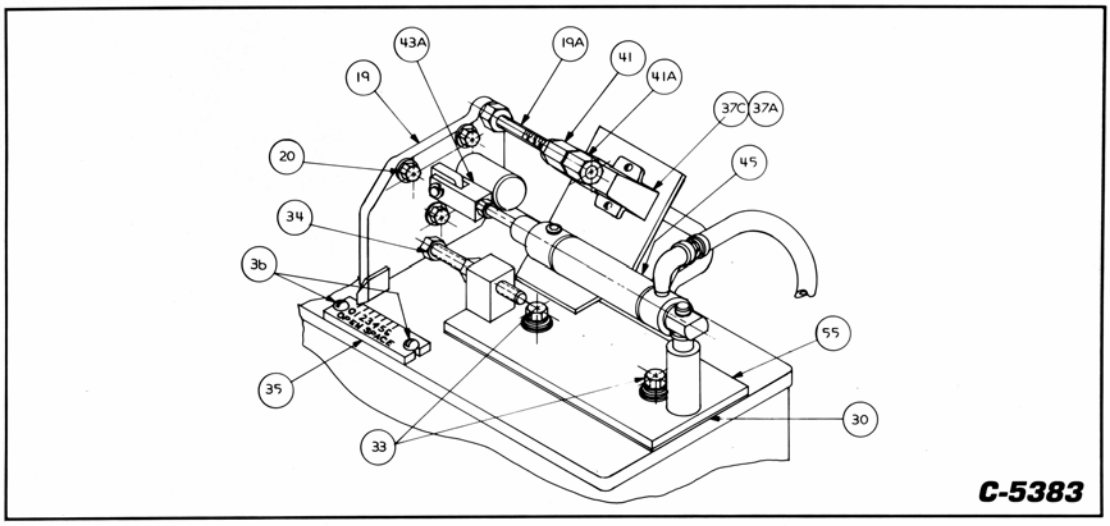

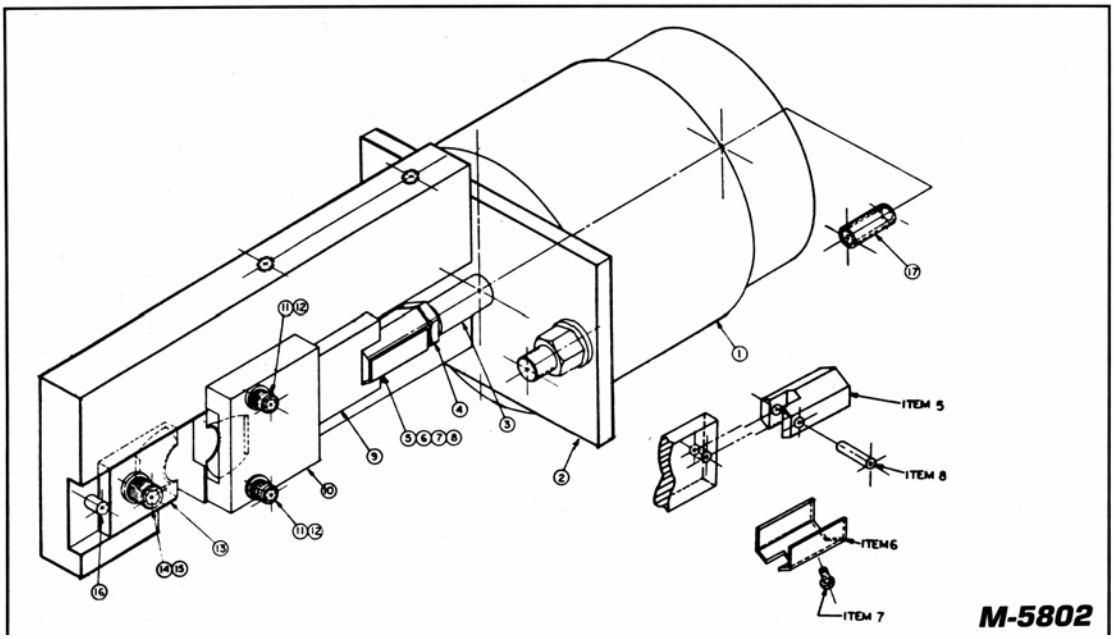

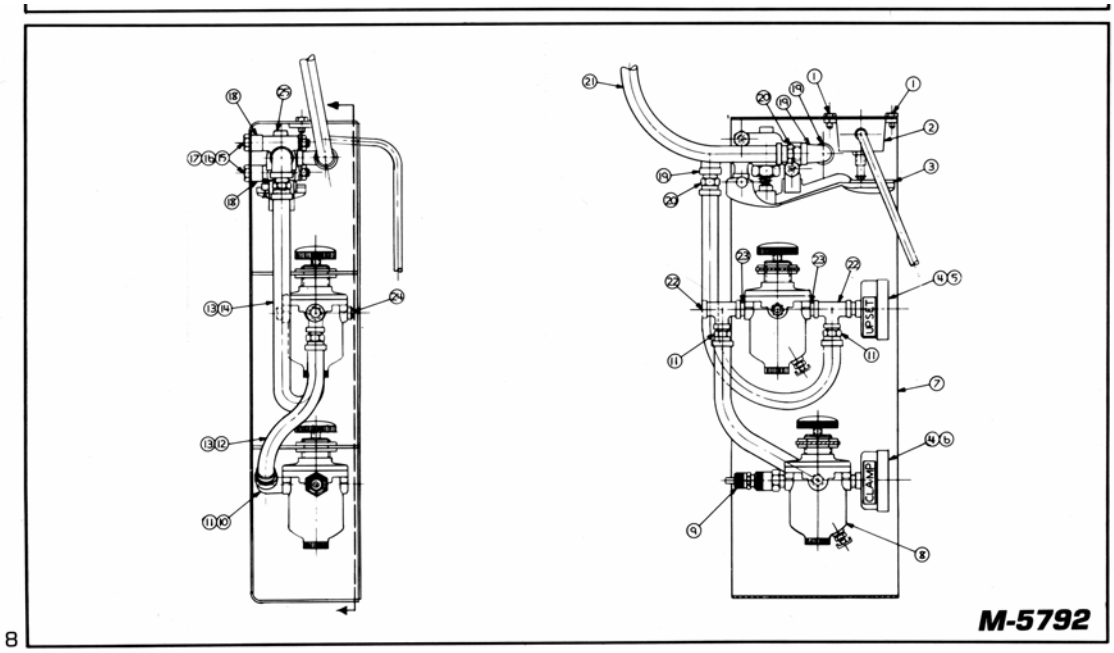

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PARTS LIST HP WELDER		
MODEL/ PART NO	**DESCRIPTION**	**ITEM #**
HP-01A	Head assembly, stationary & movable casting w/shafts, match machined, state serial number	31051
HP-01B	Complete headpiece w/all parts	31059
HP-02A	Bearing, headpiece replacement	48402
HP-04	Protection sleeve, slide shafts	31014
HP-05	Screw, sleeve mounting	90821
HP-06	Washer, clamp arm pin, outer	31546
HP-07	Washer, clamp arm pin, inner	31006
HP-08L	Clamp arm, left	31017
HP-08R	Clamp arm, right	31030
HP-09	Clamp arm pivot pins	31000
HP-10	Bolt, clamp arm pin, outer	90632
HP-11	Bolt, clamp arm pin, inner	90835
HP-15	Bolt, transformer secondary strap, movable head	90509
HP-16	Bolt, transformer secondary strap, stationary head	90659
HP-17	End plate, transformer secondary strap, stationary head	51000
HP-18	Return spring, headpiece	80014
HP-19	End plate assembly, movable	41068
HP-19A	Limit switch scale screw	31009
HP-20	End plate mounting screw	90260
HP-21	Grease fitting, stationary head, bent	48422
HP-23	Closed head stop button	31012
HP-24	Clamp cylinder, type #20, complete	77703
HP-25	Boot, shaft protecting type #20	77715
HP-26	Diaphragm, type #20	77710
HP-30	Insulation, upset frame	41011
HP-31	Insulating washers & tube set	31069
HP-32	Steel washers	92751
HP-33	Upset frame mounting screw	90260
HP-34	Bolt & nut, head adjusting, open	90302
HP-35	Scale, open head positioning	41005
HP-36	Scale mounting screw	91048
HP-37A	Limit switch, roller activated	57811
HP-37B	Limit switch, magnetic proximity	77819
HP-37C	Cover, limit switch, roller type	51001
HP-41	Actuator, limit switch, cut-off	31008
HP-41A	Limit switch actuator locknut	31007
HP-43A	Clevis, upset cylinder	77812
HP-45	Upset cylinder	77812
HP-45A	Clevis	Application
HP-53A	Protection plate, transformer	41012
HP-53B	Protection plate riser	41009
HP-55	Upset cylinder mounting plate	41010
HP-57	Welding die attaching screw, lower	90660

PARTS LIST HP WELDER		
MODEL/ PART NO	**DESCRIPTION**	**ITEM #**
HP-58R	Welding die set, 4 pieces, radius groove, state size	31046
HP-58AR	Welding dies, radius groove, lower blocks only, state size	31037
HP-59	Steel washers, die shoe mounting	92753
HP-60	Die shoes, pair w/inserts	31053
HP-60F	Die shoes, flat copper type no grooves	31036
HP-60L	Steel die shoe, left	31001
HP-60R	Steel die shoe, right	31002
HP-61	Complete set of inserts	31052
HP-61L	Steel insert, left	31004
HP-61R	Steel insert, right	31005
HP-61S	Straight steel insert	31003
HP-62	Insert mount screw	90704
HP-68	Auto transformer used w/12 point tap switch	51019
HP-68P	Auto transformer primary	51018
HP-72	Weld contactor, 460 volt	57610
HP-72	Weld contactor, 230 volt	57611
HP-72A	Repair kit, contactor	57631
HP-74	Terminal block, power input	53000
HP-75	Terminal block mounting screw	90205
HP-76	Weld heat selection switch, 12 point	56547
HP-77	Weld transformer, 2 tap primary, state voltage and serial number	51027
HP-78P	Replacement primary coil, 2 tap	53047
HP-78S	Weld transformer, secondary	51026
HP-79	Shunt support bracket	51004
HP-80	Shunt support bracket	51004
HP-81	Swivel caster	48108
HP-82	Stationary caster	48117
HP-82W	Replacement wheel only	Special
HP-85	Door	41014
HP-97	Foot pedal muffler	77892
HP-98	Foot valve complete	90611
HP-99	Foot valve mounting screw	90611
HP-109	Vise, standard	78112
HP-110	Mounting bracket, standard vise	60022
HP-111	Bolt & nut, vise mounting	90261
HP-123	Flow control valve, clamp arm	77862
HP-124	Safety flashguard	31056
HP-124A	Bolts, flashguard attaching	90232
HP-124B	Flashguard switch	57813
HP-125	Control transformer, switch circuits	57601
HP-125A	Fuse, control transformer	58100

PARTS LIST HP WELDER		
MODEL/ PART NO	**DESCRIPTION**	**ITEM #**
SS-900	Complete weld tool w/holder, 2, 3 or 4 match, state size	31064
SS-901	Insert only weld tool, 2,3 or 4 grooves, state size	31035
SS-902	Insert only weld tool, blank	31034
SS-903	Holder only, welding tool	31045