Original Instructions
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EMERSON

Ultraweld L20
Actuator

Operating Manual

Branson Ultrasonics Corp.
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BRANSON

Manual Change Information

At Branson, we strive to maintain our position as the leader in ultrasonics metal welding, plastics joining, cleaning, and related technologies by continually improving our circuits and components in our equipment. These improvements are incorporated as soon as they are developed and thoroughly tested.

Information concerning any improvements will be added to the appropriate technical documentation at its next revision and printing. Therefore, when requesting service assistance for specific units, note the Revision information found on this document, and refer to the printing date which appears on this page.

Copyright and Trademark Notice

Foreword

Congratulations on your choice of a Branson system!

The Branson Ultraweld L20 Series system is process equipment for the joining of metal parts using ultrasonic energy. It is the newest generation of product using this sophisticated technology for a variety of customer applications. This Operating Manual is part of the documentation set for this system, and should be kept with the equipment.

Thank you for choosing Branson!

Introduction

This manual is arranged into several structured chapters which will help you find the information you may need to know to safely handle, install, set up, program, operate, and/or maintain this product. Please refer to the Table of Contents of this manual to find the information you may be looking for. In the event you require additional assistance or information, please contact our Product Support department (see 1.5 How to Contact Branson for information on how to contact them) or your local Branson representative.

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Chapter 1: Safety and Support

1.1 Safety Requirements and Warnings

This chapter contains an explanation of the different Safety Notice symbols and icons found in this manual and provides additional safety information for ultrasonic welding. This chapter also describes how to contact Branson for assistance.

1.1.1 Symbols Found in This Manual

These symbols used throughout the manual warrant special attention:

WARNING	General Warning
	**WARNING** indicates a hazardous situation or practice which, if not avoided, can result in serious injury or death.

CAUTION	High Voltage Hazard
	High voltage. Turn power off before servicing.

CAUTION	Loud Noise Hazard
	Loud noise hazard. Ear protection must be worn.

CAUTION	General Warning
	**CAUTION** indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. It can also alert the user to unsafe practices or conditions that can damage equipment if not corrected.

NOTICE	
	**NOTICE** is used to address practices not related to personal injury. It contains important information. It might also alert the user about unsafe practices or conditions that can damage equipment if not corrected.

1.1.2 Symbols Found on the back of the product

The Ultraweld L20 Actuator has several warning labels on it to alert the user of items of concern or hazard. The following warning symbols appear on the L20 Actuator:

Figure 1.1 Safety Label Found on the Front of the Actuator

Figure 1.2 Safety Labels Found in the Back of the Unit

Figure 1.3 Safety Labels Found Near Bolt-Down Locations

1.2 General Precautions

Take the following precautions before servicing the Power Supply:

CAUTION	Loud Noise Hazard
	Sound level emissions of up to 84.9 dB have been measured using a standard test load. To prevent the possibility of hearing loss, use appropriate hearing protection.

WARNING	High Voltage Hazard
	Be sure the power switch is in the Off position before making any electrical connections.

NOTICE	
	Sound level and frequency of the noise emitted during the ultrasonic assembly process may depend upon **a.** type of application, **b.** size, shape and composition of the material being assembled, **c.** shape and material of the holding fixture, **d.** welder setup parameters and **e.** tool design. Some parts vibrate at an audible frequency during the process. Some or all of these factors may result in sound levels of up to 84.9 dB. In such cases operators may need to be provided with personal protective equipment. See 29 CFR (Code of Federal Regulations) 1910.95 Occupational Noise Exposure. For all other countries, follow your local regulations.

- To prevent the possibility of an electrical shock, always plug the Power Supply into a grounded power source
- Power supplies produce high voltage. Before working on the Power Supply module, do the following:

  Turn off the Power Supply;

  Unplug main power; and

  Allow at least 2 minutes for capacitors to discharge
- High voltage is present in the Power Supply Controller. Do not operate with the cover removed
- High line voltages exist in the ultrasonic Power Supply module. Common points are tied to circuit reference, not chassis ground. Therefore, use only non-grounded, battery-powered multimeters when testing these modules. Using other types of test equipment can present a shock hazard
- Be sure power is disconnected from the Power Supply before setting a DIP switch
- Keep hands from under the horn. Down force (pressure) and ultrasonic vibrations can cause injury
- Do not cycle the welding system if either the RF cable or converter is disconnected
- Avoid situations where fingers could be pinched between the horn and the fixture

1.2.1 Intended Use of the System

The Branson Metal Welding Controller and Ultraweld L20 Actuator are components of an ultrasonic welding system. These are designed for a wide variety of welding or processing applications:

- Welding of non-ferrous metals
- Welding of copper to copper
- Welding of copper to aluminum
- Welding of aluminum to aluminum
- Termination of non-tinned wire to terminals

1.3 Regulatory Compliance

This product meets electrical safety requirements and EMC (Electromagnetic Compliance) requirements for North America, Great Britain and the European Union.

1.4 Warranty

For warranty information please reference the warranty section of Terms and Conditions found at: www.emerson.com/branson-terms-conditions.

1.5 How to Contact Branson

Branson is here to help you. We appreciate your business and are interested in helping you successfully use our products. To contact Branson for help, use the following telephone numbers, or contact the field office nearest you (business hours from 8 a.m. to 4 p.m. Central and Eastern Times Zones).

- **North American Headquarters (all departments):** (203) 796-0400
- **Parts Store:** Direct Number for Parts Store in Brookfield (203) 796-9807

Tell the operator which product you have and which person or department you need. If after hours, please leave a voice message with your name and return telephone number.

1.5.1 Before Calling Branson for Assistance

This manual provides information for troubleshooting and resolving problems that could occur with the equipment (see Chapter 7: Maintenance). If you still require assistance, Branson Product Support is here to help you. To help identify the problem, use the following questionnaire which lists the common questions you will be asked when you contact the Product Support department.

Before calling, determine the following information:

1. Your company name and location
2. Your return telephone number
3. Have your manual with you
4. Know your equipment model and serial numbers (found on a gray data label on the units). Information about the Horn (part number, gain, etc.) or other tooling may be etched into the tooling. Software- or firmware-based systems may provide a BIOS or software version number, which may be required
5. What tooling (horn) and booster are being used?
6. What are the setup parameters and mode?
7. Is your equipment in an automated system? If so, what is supplying the “start” signal?
8. Describe the problem; provide as much detail as possible. For example, is the problem intermittent? How often does it occur? How long before it occurs if you are just powering up? If an error is occurring, which error (give error number or name)?
9. List the steps you have already taken
10. What is your application, including the materials being processed?
11. Have a list of service or spare parts you have on hand (tips, horns, etc.)
12. Notes:

    _____
    _____
    _____

1.6 Returning Equipment for Repair

Before sending equipment for repair, provide as much information with the equipment to help determine the problem with the system. Use the following page to record necessary information.

1.6.1 Returning Equipment for Repair

To return equipment to Branson, you must first obtain an RGA number from a Branson representative, or the shipment may be delayed or refused.

If you are returning equipment to Branson for repair, you must first call the Repair department to obtain a Returned Goods Authorization (RGA) number. (If you request it, the repair department will fax a Returned Goods Authorization form to fill out and return with your equipment).

Branson Repair Department

120 Park Ridge Road

Brookfield, Connecticut 06804 U.S.A.

Direct telephone number: (203) 796-0575

Fax number: (203) 796-0574

- Provide as much information as possible that will help identify the need for repair
- Carefully pack the equipment in original packing cartons
- Clearly label all shipping cartons with the RGA number on the outside of cartons as well as on your packing slip, along with the reason for return
- Return general repairs by any convenient method. Send priority repairs by air freight
- You must prepay the transportation charges FOB Brookfield, Connecticut, U.S.A.

1.6.2 Get an RGA Number

RGA # _____

If you are returning equipment to Branson, please call the Repair Department to obtain a Returned Goods Authorization (RGA) number. (At your request, the Repair Department will fax an RGA form to fill out and return with the equipment.)

1.6.3 Record Information About the Problem

Before sending equipment for repair, record the following information and send a copy of it with the equipment. This will greatly increase Branson's ability to address the problem.

1. Describe the problem; provide as much detail as possible. For example, is the problem intermittent? How often does it occur? How long before it occurs after powering up?

   _____
   _____
   _____
   _____

2. Is your equipment in an automated system?

   _____
   _____

3. If the problem is with an external signal, which signal?

   _____
   _____

4. If known, include plug/pin # (e.g., P29, pin #3) for that signal:

   _____
   _____

5. What are the Weld Parameters?
   _____
   _____
   _____
6. What is your application? (Type of weld, metal material, etc.)
   _____
   _____
7. Name and phone number of the person most familiar with the problem:
   _____
   _____
8. Contact the Branson office prior to shipping the equipment.
9. For equipment not covered by warranty, to avoid delay, include a Purchase Order.

Send a copy of this page with the equipment being returned for repair.

1.6.4 Contact Information

Call your local Branson Representative, or contact Branson by calling (203) 796-0400.

My Local Branson Representative's name is:

_____
_____

I can reach this representative at:

_____
_____

1.6.5 Pack and Ship the Equipment

1. Carefully pack the system in original packing material to avoid shipping damage. Plainly show the RGA number on the outside of cartons as well as inside the carton along with the reason for return. Make a list of all components packed in the box. KEEP YOUR MANUAL.
2. Return general repairs by any convenient method. Send priority repairs by air freight. Prepay the transportation charges FOB the repair site (either the Branson field office or Brookfield, Connecticut USA location).

NOTICE	
	Items that are sent Freight Collect will be refused.

1.7 Obtaining Replacement Parts

You can reach Branson Parts Store at the following telephone numbers:

- Direct Telephone Number: (203) 796-9807
- Fax number: (203) 926-2678

Many parts can be shipped the same day if ordered before 2:30 p.m., Eastern time.

A parts list is found in Chapter 7: Maintenance of this manual, listing descriptions and EDP part numbers. If you need replacement parts, coordinate the following with your purchasing agent:

- Purchase order number
- Ship to information
- Bill to information
- Shipping instructions (air freight, truck, etc.)
- Any special instructions (for example, "Hold at the airport and call"). Be sure to give a name and phone number
- Contact name information

Chapter 2: The Ultraweld L20 Actuator

2.1 Models Covered

This manual contains instructions for installing, setting up and operating the Ultraweld L20 Actuator.

An Ultraweld L20 Actuator requires a compatible Branson Metal Welding Power Supply to function. The power supply operation is covered in separate manuals and user documents.

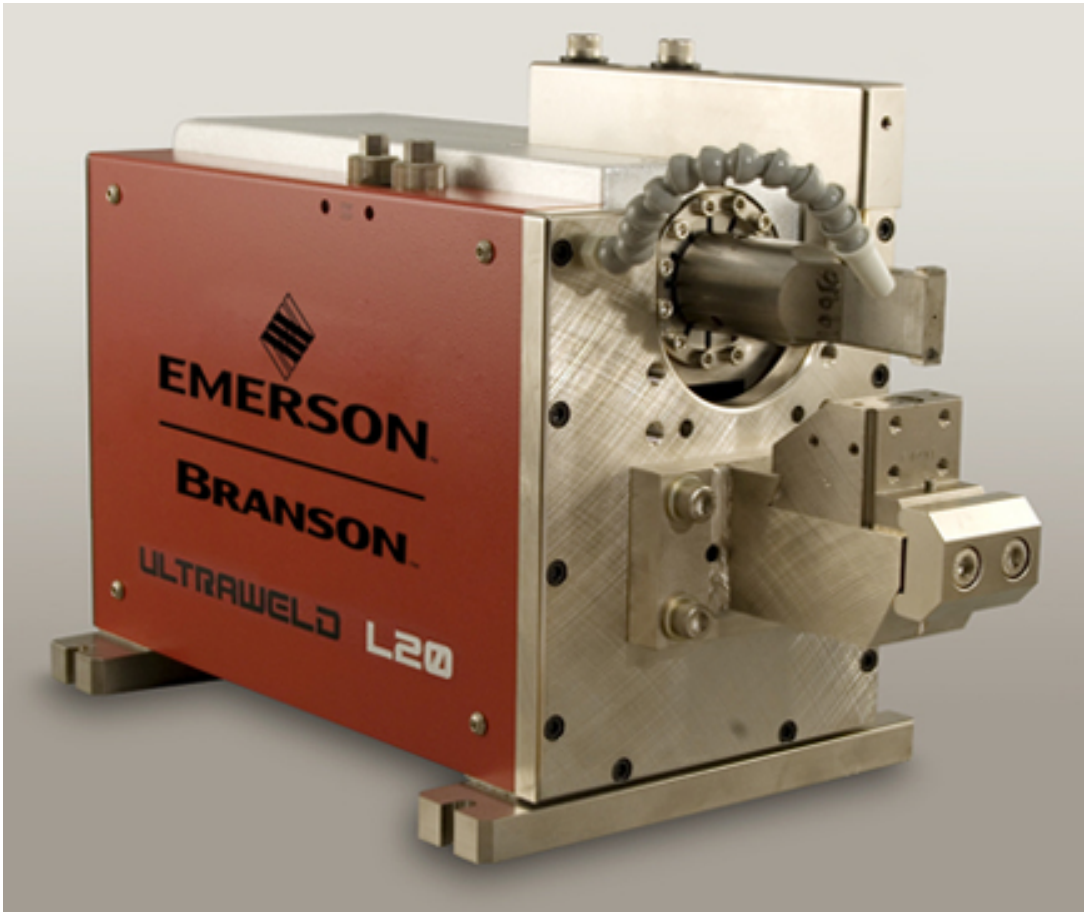
2.1.1 Power Supply Manual Set

The Following documentation is available for Branson Metal Welding Power Supplies compatible with Ultraweld L20 actuators:

- Ultraweld L20 VersaGraphix Controller Instruction Manual (DCM00060)
- Ultraweld L20 Touch Screen Controller Instruction Manual (DCM00002)

2.2 Overview of These Models

Figure 2.1 The Ultraweld L20 Actuator (Shown with Optional Nodal Support)



The Branson Ultraweld L20 system is comprised of a power supply, ultrasonic stack assembly, application tooling, and mechanical actuator.

The Ultraweld L20 Actuator is the part of the system that rigidly holds and moves the converter, booster and horn assembly known as the ultrasonic stack.

A pneumatic cylinder drives the actuator to apply a precise pressure to the parts to be welded during the weld cycle.

The Ultraweld L20 Actuator requires a compatible Branson Metal Welding Power Supply for power and control of the actuator's operation and to provide ultrasonic power to the converter in the actuator.

The Ultraweld L20 Actuator is designed with full, built-in pneumatic controls, and mechanical controls.

2.2.1 Polar Shell & Ultrasonic Stack

The converter-booster-horn assembly, or ultrasonic stack, is supported in a steel polar shell by means of two diaphragm springs. The diaphragm springs are mounted at either end of the booster and are securely bolted to the polar shell. The diaphragm shaped springs are made from titanium and are acoustically tuned at the 20 kHz operating frequency. This system permits efficient transmission of ultrasonic vibration along the axis of the ultrasonic stack while providing rigid mounting.

2.2.2 The Pneumatic System

The pneumatic system included on the Ultraweld L20 Actuator consists of solenoid valves, an air cylinder, an electronic pressure regulator, and 4 flow control valves. The ultrasonic stack's rate of descent and rate of return are controlled by the Down Speed and Up Speed control valves, respectively, located at the back of the unit. The front nozzle air flow is controlled by the Cooling Control valve, also located at the back of the unit. The converter cooling flow is controlled by a flow control valve located inside the unit.

2.2.3 The Linear Encoder

The linear encoder is a sensing device that tracks polar block movement. The accuracy of the encoder is ±0.002 in (±0.05mm).

2.2.4 Converter

The 20 kHz electrical energy from the power supply is applied to the transducer element or converter, which transforms the high frequency electric current into high frequency mechanical vibrations at the same frequency. The heart of the converter is a lead-zirconate-titanate electrostrictive element that, when subjected to an alternating voltage expands and contracts. The converter's efficiency of changing electrical energy to mechanical vibrations exceeds ninety-five percent.

2.2.5 Booster

A booster couples the converter to the horn and helps determine the amplitude of vibration produced at the face of the horn. The booster is a resonant half-wave metal device made of titanium or aluminum and is designed to resonate at the same frequency as the converter with which it is to be used.

A booster has two functions:

- A rigid mounting for the converter/booster/horn stack
- An amplitude-of-vibration increaser or decreaser as ultrasonic energy is transmitted from the converter through the booster to the horn. The ratio of input to output amplitude is called the gain

2.2.6 Horn

The horn is a half-wave length resonant metal device that transfers the ultrasonic vibrations from the booster to the weld tip. The horn is made of steel (titanium for replaceable tip tooling) and is designed to resonate at 20 kHz. The acoustical efficiency of steel and titanium helps to maintain constant amplitude throughout the operating temperature of the welder.

Since the horn is a vital part of the ultrasonic assembly system, it should not be altered without proper training and advice from Branson.

Depending upon the particular application at hand, the horn may be either a solid horn as shown in Figure 2.1, or a Horn with a replaceable tip that can be rotated or replaced.

2.2.7 Welding Tip (Replaceable Tip Tooling)

The welding tip is designed to grip the upper component of the part to be welded, and to couple the ultrasonic vibrations through that element into the bonding area. Welding tips are fabricated from high-speed tool steel and heat-treated to precise specifications to provide maximum life. The tip is coated to further enhance tool life and to provide corrosion resistance. The tip design offers multiple weld surfaces by indexing the tip on the horn to a new weld area.

2.2.8 Tip Nut (Replaceable Tip Tooling)

The tip nut is made of titanium and is designed to securely clamp the tip onto the horn. The horn welding-tip/ tip-nut assembly is an efficient system for transmitting ultrasonic vibration to the parts to be welded and offers an interchangeable tool at a low cost.

2.2.9 Anvil

The anvil is made of high grade tool steel and coated for maximum wear and corrosion resistance. The tool design allows it to be rotated to present multiple weld surfaces.

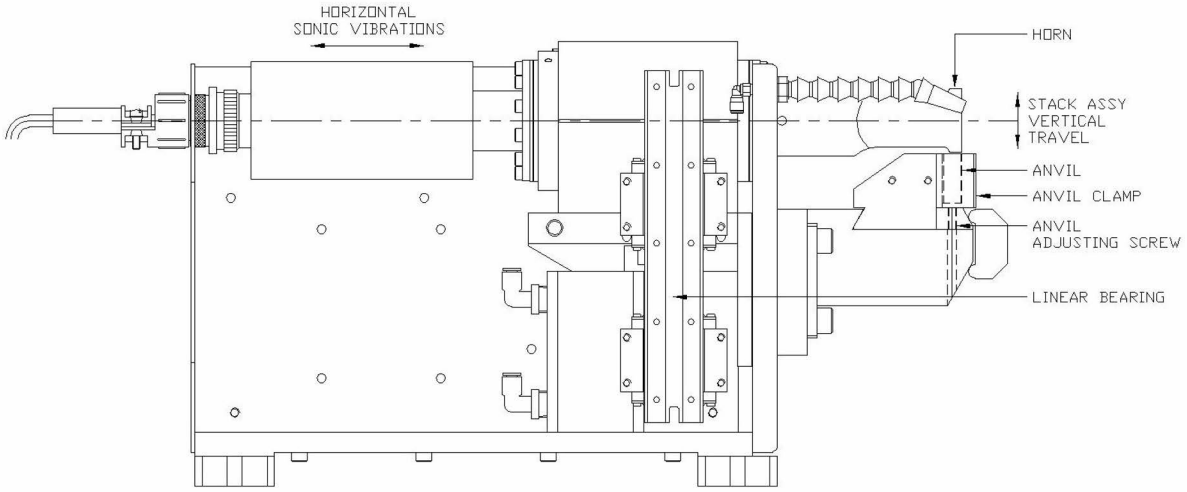
2.2.10 Actuator

The ultrasonic stack is mounted into a steel polar block and securely clamped in place. The polar block is mounted to a linear bearing which provides precise vertical travel of the stack assembly, while providing excellent rigidity to resist any loss of ultrasonic energy in the horizontal direction of sonic vibrations. See Figure 2.2.

2.2.11 Application Tooling

Application tooling is designed and manufactured to position and weld component materials to meet customer specifications. Application tooling typically consists of a horn/ tip nut, anvil, anvil clamp, anvil holder, and tool support (see Figure 2.2).

Figure 2.2 Actuator Slide Mechanism



2.3 Features

The Ultraweld L20 Actuator is designed for automated, semi-automated and/or manual production operations. The following list describes the Ultraweld L20 Actuator features:

- A precision roller bearing slide to assure smooth operation and extreme accuracy
- Precise adjustments for accurate setting of both upper and lower positive stops
- Conveniently located flow controls offering easy adjustment of head speed in both directions
- A polar mounted ultrasonic stack to facilitate linear and axial setup and efficient transmission of ultrasonic energy to the horn
- Titanium horns with low cost replaceable tips or solid tool steel horns for fast setup and minimum tooling cost
- Fixturing which is changed quickly and easily for various applications by means of a dovetail mounting
- Optional vortex cooling to allow high-speed operation without heat buildup

2.4 Controls

- **Up Speed:** Controls the upward speed of the ultrasonic stack. This control is used to raise the stack quickly for other mechanism actions and for quick part removal
- **Down Speed:** Controls the downward speed of the ultrasonic stack. This control is used to prevent damaging the parts to be welded, and increasing/decreasing cycle times to get better weld results
- **Cooling Air:** Controls the cooling air flow rate coming out of the cooling hose on the front of the actuator. Cooling air is used to keep the weld area and the converter within a reasonable temperature during welding
- **Down Stop:** The down stop is used to prevent contact between the Horn and Anvil if the welder is cycled without the part(s) to be welded. A minimum gap of 0.0004 in (0.10mm) is recommended
- **Up Stop:** The up stop is used to limit the upward travel of the horn. It is used to limit the upward travel to reduce cycle times and to ease the loading and unloading of parts

2.5 Ultrasonic Theory

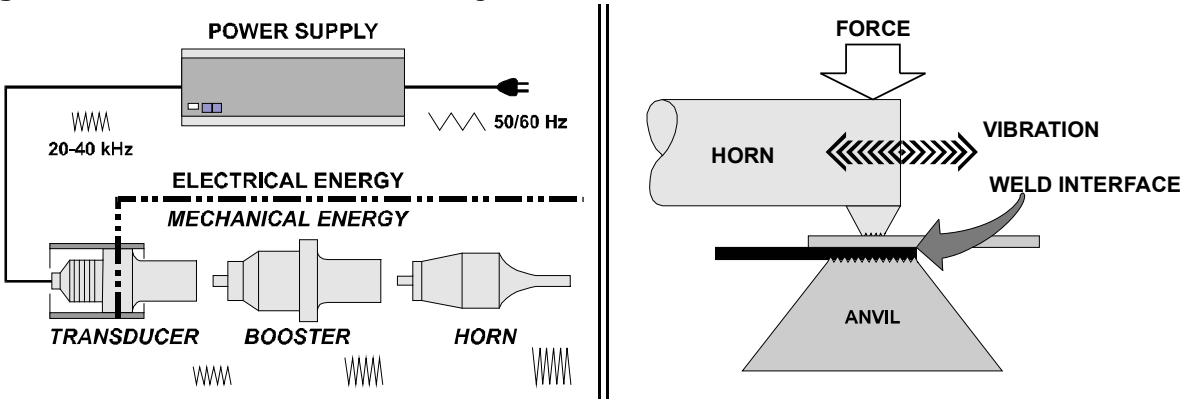
2.5.1 What Is an Ultrasonic Weld?

Ultrasonic welding joins metal parts by applying the energy of high frequency vibrations onto the interface area between the parts to be welded.

2.5.1.1 How Does It Work?

Electrical Energy is transformed into high frequency mechanical vibration. This mechanical vibration is transferred to a welding tip through an acoustically tuned horn. The parts are "scrubbed" together under pressure at 20,000, 40,000, or 60,000 cycles per second. This high frequency vibration, applied under force, disperses surface films and oxides, creating a clean, controlled, diffusion weld. As the atoms are combined between the parts to be welded, a true, metallurgical bond is produced.

Figure 2.3 How does Ultrasonic Welding Work?



2.5.2 Benefits of Ultrasonic Welding

Ultrasonic metal welding exhibits unique welding properties that include:

- Excellent electrical, mechanical, and thermal connections between similar and dissimilar metals
- Low heat build up during the ultrasonic process (no annealing of materials)
- Compensation for normal surface variations of the material
- Ability to clean surface oxides and contaminants prior to welding
- Ability to weld large areas using minimal energy
- Ability to weld thin materials to thick materials
- Low cost per weld

2.5.3 How Is an Ultrasonic Weld Made?

Although the theoretical process of producing an ultrasonic weld is uncomplicated, the interactions of the various weld parameters are important and should be understood. When producing an ultrasonic weld, there are three primary variables that interact; they are:

- **Time:** The duration of applied ultrasonic vibration
- **Amplitude:** The longitudinal displacement of the vibration
- **Force:** The compressive force applied perpendicular (normal) to the direction of vibration

The power required to initiate and maintain vibration (motion) during the weld cycle can be defined as:

Table 2.1 Calculating Power

P = F x A x f	Where: • P = Power (watts) • F = Force* (N) • A = Amplitude (microns) • f = Frequency (Hertz)

*Force = (Surface Area of the Cylinder) X (Air Pressure) X (Mechanical Advantage)

Energy is calculated as;

Table 2.2 Calculating Energy

E = P x T	Where: • E = Energy (joules) • P = Power (watts) • T = Time (seconds)

Thus the complete 'Weld To Energy' process would be defined as:

E = (F x A x f) x T

A well designed ultrasonic metal welding system will compensate for normal variations in the surface conditions of the metals by delivering the specified energy value. This is achieved by allowing Time (T) to adjust to suit the condition of the materials and deliver the desired energy.

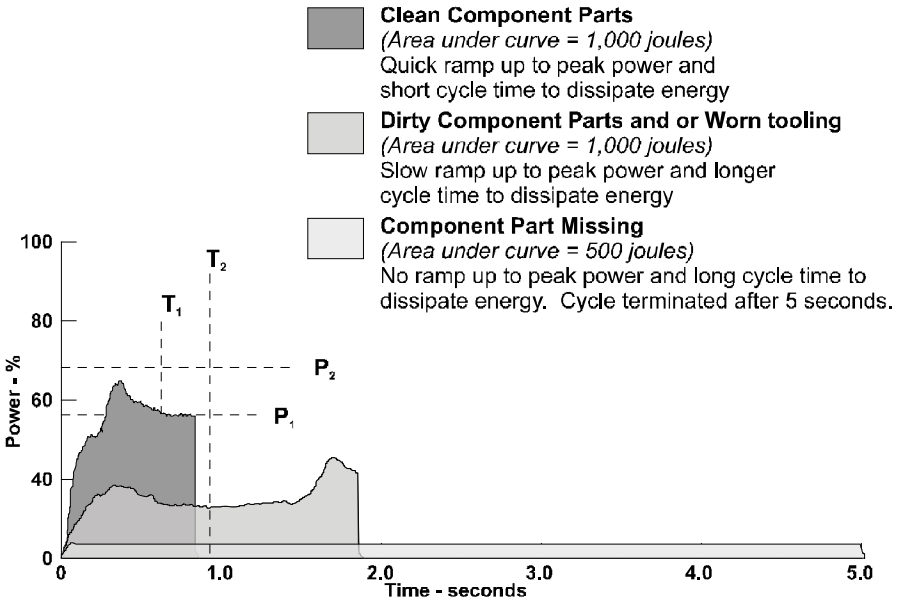
2.5.4 Welding to Energy - Why?

Most metal welding applications are produced by 'Welding To Energy' in order to compensate for the various surface oxides and contaminants associated with the metals being joined. In a few applications 'Welding To Time' or 'Welding To Height' will yield better results. Since the majority of all metal welds are produced using energy as the controlling factor we will confine our discussion to that condition.

Welding to energy is necessary because of the non-metallic oxides that form on the metal's surface as well as other contaminates such as grease and dirt. To producing quality welds reliably it is necessary that the surfaces to be joined are clean. The high frequency scrubbing action, combined with pressure, cleans the weld interface at the beginning of the weld process.

The following graph (Figure 2.4) illustrates a weld produced. The weld 'power graph' is sometimes to referred to a weld 'footprint'. It can be used to visualize the weld cycle and assists in parameter optimization. Graphs from consecutive welds will vary slightly as the system dynamically adjusts time to accommodate varying surface conditions. The weld power data is gathered by sampling the power used in 5 millisecond intervals.

Figure 2.4 Weld Power Graph for Clean and Dirty Components and when Part is Missing

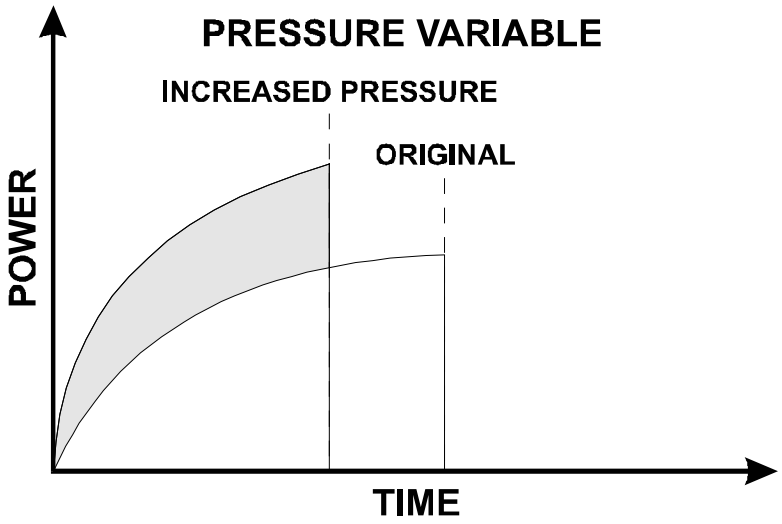


2.5.5 Power

The converter/ booster/ horn, (stack assembly), requires minimal electrical power to initiate and maintain motion (vibration) at a 'no-load' condition. As the mechanical load increases, the power required to maintain the mechanical vibration also increases. The maximum power required during a weld cycle is 'Peak Power'.

By increasing Pressure and maintaining all other parameters, the mechanical load or force on the weld joint increases, therefore, the amount of Power required to maintain the vibration of the stack increases. Subsequently, because of the increased Power Level, less time is required deliver the same amount of Energy. This relationship is illustrated on Figure 2.5.

Figure 2.5 Pressure Variable with Increased Power

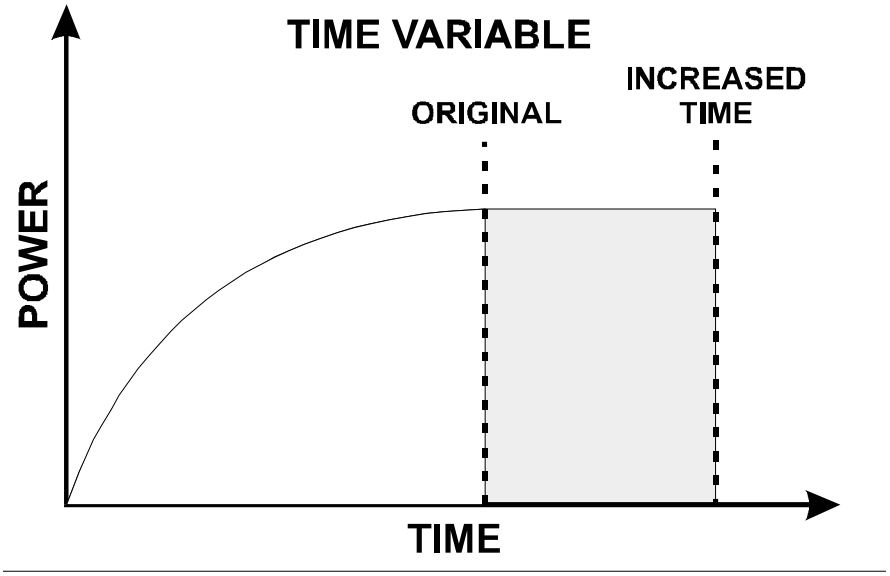


The difference in the appearance of each of the above weld graphs is the result of increased Power loading. Based upon an increase in Pressure, additional Power is required to maintain the motion of vibration. Thus, the same amount of energy is delivered in less time. This approach is typically used to raise the loading of the power supply during a weld cycle to the desired level as determined by the application.

2.5.6 Time

The time required to deliver the necessary energy is defined as the Weld Time. For most welds, the time required will be less than one second. If more energy is required and all other weld parameters are maintained, the weld time will increase (Figure 2.6).

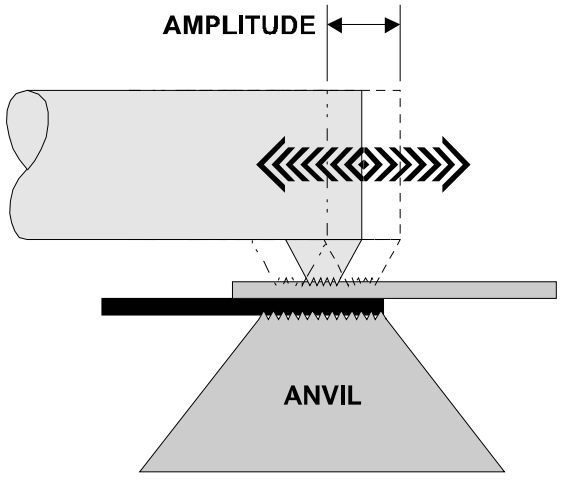
Figure 2.6 Pressure Variable with Increased Time



2.5.7 Amplitude

An ultrasonic tool is a resonant acoustical device. The term Amplitude is used to describe the amount of longitudinal expansion and contraction that the tooling endures as it vibrates (Figure 2.7). The amplitude correlates to the scrubbing action at the weld interface. This scrubbing action combined with pressure is what advances the weld by a diffusing or mixing of the base materials.

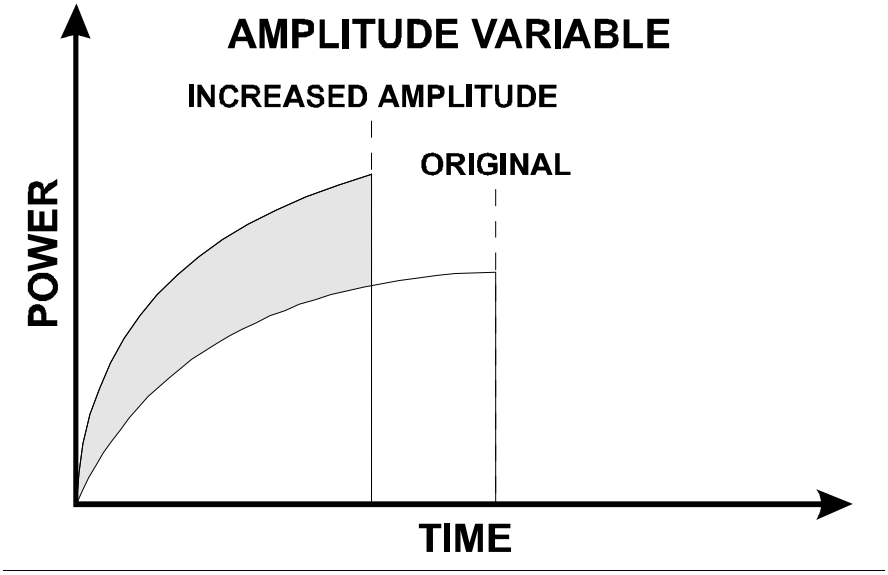
Figure 2.7 Scrubbing Action on Weld Interface



As previously mentioned, the converter/ booster/ horn, (stack assembly), requires minimal electrical power to initiate and maintain vibration in a 'no-load' condition. As the amplitude increases, the power required to maintain the increased velocity of vibration also increases. Subsequently, because of the increased Power less time is required deliver

the same amount of Energy. This relationship is illustrated in the following power diagram (Figure 2.8):

Figure 2.8 Amplitude's Influence on Weld Power and Time

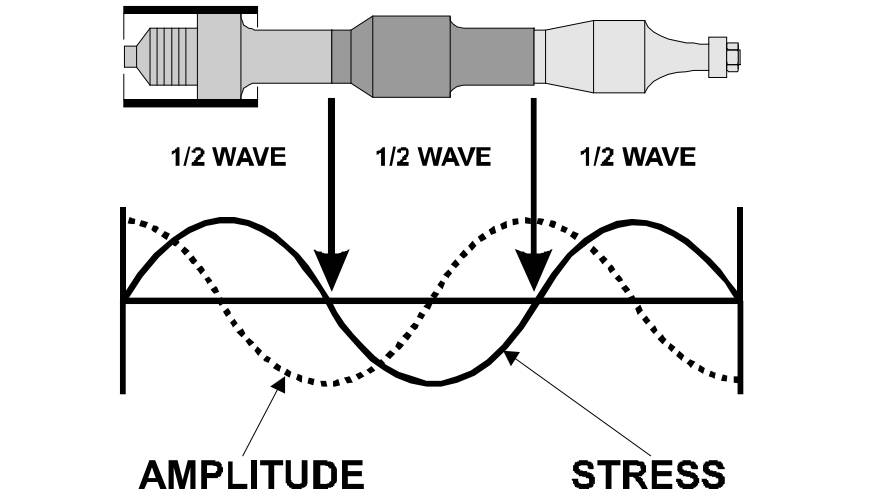


2.5.8 Resonant Frequency

The ultrasonic tooling acts as a spring having node points and anti-node points. The mechanical energy used to vibrate the tool is created by the converter. As the vibrations are propagated through the acoustical tool, a harmonic resonance is established consisting of nodes and antinodes. This action results in a resonant wave being transferred through the tooling (Figure 2.9). The efficiency of the resonant wave transfer depends on the natural resonant frequency of the horn and is determined by two factors:

- The speed of sound through the material
- The geometric shape of the object

Figure 2.9 Harmonic Resonance on Ultrasonic Tooling.



2.5.9 Avoiding an Overload Condition

It is possible to increase the Amplitude and or the Pressure to a point where the power available is not adequate to initiate or maintain vibration under the given mechanical load. At this point, the power supply will stall resulting in an Overload condition.

NOTICE	
	Electronic circuits in the system will protect the power supply if an overload condition exists.

2.5.10 Welding to Time

In specific applications, 'Welding To Time' may be desired. As previously mentioned, there are three primary variables that interact; they are:

- **TIME:** The duration of applied ultrasonic vibration
- **AMPLITUDE:** The longitudinal displacement of the vibration
- **FORCE:** The compressive force applied perpendicular (normal) to the direction of vibration

Generally, welding for a specific time will produce acceptable results when:

- The equipment is installed on an automated production line and each station must complete its process within a certain time limit
- Very small low energy welds on clean components are being made

2.5.11 Welding Temperature

Ultrasonic welding produces a localized temperature rise from the combined effects of elastic hysteresis, interfacial slip and plastic deformation. The weld interfaces reach approximately 1/3 the temperatures needed to melt the metals. Since the temperature does not reach the melting point of the material, the physical properties of the welded material are preserved. As the ultrasonic welding process is an exothermic reaction, as welding time increases so does weld temperature.

2.6 Terminology

Actuator: A mechanical device which houses the converter/booster/horn (stack) assembly in a rigid mounting and is utilized to move the stack up or down. This allows for precise control of welding pressure while delivering mechanical vibrations from the ultrasonic stack to the work piece(s).

After Burst: A short duration (burst) of ultrasonic energy that begins after completion of the AFTER BURST DELAY. (Also see AFTER BURST DELAY & AFTER BURST DURATION).

After Burst Delay: The amount of time, in seconds, between the completion of the ultrasonic welding cycle and the start of the AFTER BURST. (See Also AFTER BURST & AFTER BURST DURATION).

Amplitude: Amplitude is the peak-to-peak displacement of mechanical motion as measured at the face of the horn tip. Amplitude is measured either in thousandths of an inch or in microns (e.g. a standard 40 kHz Converter produces approximately 0.0004" or 10 microns of amplitude), Inches x 25.4 = microns. -- This is adjustable depending on system frequency and application tooling.

Anti-Node: The anti-node is the area of the horn and booster that exhibits maximum longitudinal displacement and where the internal dynamic forces are equal to zero. This area is at the face and back surface on half-wave technology.

Anvil: A device specially designed to grip the lower component and hold it stationary against the energy of vibration(s) which allows a weld to be created.

BBR: Nonvolatile random access memory (battery back-up random access memory). Equipped with long life built in batteries, this memory area preserves weld parameters and menu settings when the system is powered off. (Also known as BRAM.)

Booster: The central component of an ultrasonic stack assembly. A device which transfers mechanical energy from the Converter to the ultrasonic horn. The booster will, depending on design, increase, decrease, or maintain the specific amplitude as received from the converter.

Calibration: The process of adjusting a device to a known position for purposes of inspection and/or monitoring position, direction, speed, and/or velocity.

Consumable Spare Tooling: The tooling portion of the ultrasonic system that wears and requires replacement due to production use. This includes but is not limited to ultrasonic horns, replaceable tips, anvil, and positioning mask. A Spare Tooling Specification Sheet is included within the Actuator Operation Manual to document the spare tooling for a specific metal welding application.

Controller: The portion of the welding system that provides specific settings & instruction(s) to the overall welding system.

Converter: A device which utilizes a PZT (lead-zirconate-titanate) electrostrictive element to change high frequency electrical energy into high frequency mechanical energy.

Counter: A programmable device used to monitor system cycles and alert personnel when specific conditions are met.

Data: Any representation(s) of instructions, characters, information, or analog quantities to which meaning may be assigned.

Default: A chosen system setting or parameter in which the system does not require external data input. In some cases the default value will be changed based upon equipment use.

Dynamic Spring: An, adjustable, energy storage mechanism (shock absorber) which allows for stack follow through upon engagement of application tooling with the work pieces to be welded.

Energy: Energy is the area beneath the ultrasonic power curve and is calculated in joules, (Watts X Seconds = Joules). When the ultrasonic welding system is setup in the "Weld In Energy" mode the system will deliver the amount of energy as programmed. **NOTE:** The maximum (default) time allowed for delivering ultrasonic energy is five (5) seconds.

Energy Mode: A welding method in which the ultrasonic power supply is active until the required amount of energy is delivered (see ENERGY).

Fixture: A device for positioning and or holding a component for assembly.

Force: The amount of mechanical pressure that is used to deliver (bring down) the mechanical actuator. This programmed force is also called TRIGGER FORCE and is used to engage the knurl pattern into the component part(s) prior to the initiation of ultrasonic energy.

Frequency: The number of complete oscillations per second expressed in Hertz (Hz) or kilohertz (1 kilohertz = 1000 Hz). Typically 20 kHz or 40 kHz.

Gain: The ratio of the amplitude of motion produced by the Converter and delivered by the horn is called the gain. It is determined by the difference in mass on either side of the nodal point.

Height: A value, in millimeters (mm), as registered by a linear encoder upon completion of an ultrasonic welding cycle. -- Programmable, in millimeters, with Upper Control Limit & Lower Control Limit.

Height Encoder: A device utilized to monitor position, direction, speed, and/or velocity.

Horn: An acoustically designed metal tool that delivers mechanical energy from the converter/ booster into the work piece. Most applications utilize half wave technology.

Hold Time: The amount of time after delivery of ultrasonic energy until the stack tooling begins to retract from the component material(s).

Joint: The area where the surfaces are welded together.

Linear Height Encoder: See Height Encoder.

Loading Meter: A meter which indicates the power drawn from the ultrasonic power supply.

Maintenance Counter: Used to alert production personnel of the need to review/ inspect application tooling and/or the ultrasonic system for preventive maintenance purposes. (See Counters.)

Mode: The method of operating the system (See also WELDING MODE).

Node: The node is the area of the horn, (and booster), that exhibits no longitudinal displacement and where the internal dynamic forces are at the maximum. This area is in the center location on half-wave technology.

Parameter(s): Programmable units used to control and or monitor the ultrasonic process. --Include but not limited to ENERGY, FORCE, PRESSURE, AMPLITUDE.

Parts Counter: Used to monitor system cycles and alert personnel when specific conditions are met. (See Counters.)

Peak Power: Peak power is the maximum amount of power in watts that was required to keep the ultrasonic stack in motion during the weld cycle.

Power: Power, measured in watts, is a function of pressure and amplitude. The amount of power, (watts) required to keep the ultrasonic stack in motion is monitored and used to develop a power curve. This power curve is used to calculate the amount of energy delivered/ dissipated, (Watts = Joules / Time). The power as displayed on the control box is peak power.

Power Supply (Ultrasonic): An electronic device that converts 50/60 cycle electrical current into 20 kHz, (20,000), 40 kHz (40,000), or 60 kHz, (60,000) cycles per second high frequency electrical energy.

Power Supply Overload (Ultrasonic): The point or limit at which the amount of power in watts, required to keep the ultrasonic stack in motion, exceeds the available power from the power supply. The system will go into an overload condition in order to prevent system damage.

Pre-Height: A pre-sonic inspection display, in millimeters (mm), as registered by a linear encoder prior to initiation of the ultrasonic welding cycle. -- Programmable, in millimeters, with Upper Control Limit & Lower Control Limit.

Presets: Welding parameters stored in the controller memory.

Pressure: The amount of mechanical pressure supplied to the ultrasonic stack assembly while delivering ultrasonic energy to the components.

Quality Widows & Limits: Programmable values used by the system to compare actual process data. Actual process data must be within limits or an alarm be issued.

Squeeze Time: The amount of time after the ultrasonic tooling engages the component (s) and before delivery of ultrasonic energy. -- Adjustable from 0 - 2 seconds.

Stress: Stress is the amount of dynamic force per cross sectional area.

Time: Time is the duration of the ultrasonic, mechanical, activity. Time is a component used to calculate the amount of ultrasonic energy delivered during a weld cycle, (Time = Joules / Watts).

Tip: Device specially designed to grip the upper component, to be welded, and to direct the ultrasonic energy into the work piece, (Also Horn Tip & Replaceable Horn Tip).

Tip Nut: Device specially designed to securely clamp a replaceable tip onto the horn.

Trigger Force: See Force.

Tuning: Adjusting to optimize power supply performance according to resonance frequency, especially with regard to the horn and converter.

Velocity: The rate of motion at a specific time [velocity = distance time] Also referred to as speed.

Chapter 3: Shipping and Handling

3.1 Shipping and Handling

The Ultraweld L20 Actuator is a system of metal and electro-pneumatic components that move the ultrasonic tooling in the ultrasonic welding system and control aspects of the weld process. Many of its components can be harmed if the unit is dropped, shipped under improper conditions, or otherwise mishandled.

3.1.1 Environmental Specifications

The following environmental guidelines should be respected in the shipping of the Ultraweld L20 Actuator unit.

Table 3.1 Environmental Requirements

Environment	Range
Storage / Shipping Temperature	-13º F to +131º F (-25º C to +55º C)
Humidity	30% to 90% non condensing

3.2 Receiving and Unpacking

Branson Metal Welding actuator units are carefully checked and packed before dispatch. It is recommended, however, that you follow the inspection procedure below after delivery.

To inspect the Ultraweld L20 Actuator when it is delivered:

Table 3.2 Receiving and Unpacking

Step	Action
1	Verify that all parts are complete according to the packing slip.
2	Check the equipment immediately after delivery to ensure that it has not been damaged during transport.
3	Report any damage claims to your carrier immediately.
4	Determine if any component has become loose during shipping and, if necessary, tighten screws.

NOTICE	
	If the goods delivered have been damaged during shipping, please contact the forwarding agent immediately. Retain packing material (for possible inspection or for sending back the unit).

CAUTION	Heavy Object
	The Actuator and the Controller are heavy. Handling, unpacking, and installation might require assistance of a colleague or the use of a lifting device.

3.3 Returning Equipment

If you are returning equipment to Branson, please call your Branson Representative or Customer Service to receive approval to return goods to Branson.

If you are returning equipment for repair refer to 1.6 Returning Equipment for Repair of this manual, for the appropriate procedure.

Chapter 4: Installation and Setup

4.1 About Installation

This chapter is intended to help the installer with the basic installation and setup of your new Ultraweld L20 system. This chapter will bring the reader to the point at which the system is functionally "ready to weld".

CAUTION	Heavy Object
	The Ultraweld L20 Actuator and related components are heavy. Handling, unpacking, and installation can require help or the use of lifting platforms or hoists.

International safety labels are found on the power supply and actuator. Those that are of importance during installation of the system are identified in the figures in this and other chapters of the welding system manuals.

4.2 Handling and Unpacking

If there are any visible signs of damage to the shipping containers or the product, or you later discover hidden damage, take pictures, and NOTIFY YOUR CARRIER IMMEDIATELY. Save the packing material.

1. Unpack the Ultraweld L20 components as soon as they arrive. Refer to the following procedures.
2. Verify you have all of the equipment ordered. Some components are packed inside other boxes.
3. Inspect the controls, indicators, and surfaces for signs of damage.
4. Save all packing material. Evaluation systems will be returned using this material.

4.2.1 Unpack the Power Supply

Power supplies are shipped in a cardboard carton. Power supplies weight approximately 36 lbs (16 kg).

1. Open the box, remove foam top packing half and lift the power supply out.
2. Remove the toolkit(s) and other components shipped with the power supply. These items may be shipped in small, separate boxes, or underneath the power supply in the box.
3. Save the packing material; evaluation systems will be returned using this packing material.

4.2.2 Unpack the Ultraweld L20 Actuator

CAUTION	Heavy Object
	Equipment exceeds 40 lb. Sling required to lift.

The actuator is assembled and ready to install. L20 Actuators weight approximately 97 lbs (44 kg).

Move the shipping container close to the intended installation location, leave it on the floor.

1. Open the top of the cardboard box, remove the insert from the top of the box and set it aside.
2. The toolkit, mounting bolts, and converter and/or booster are shipped with the actuator but in separate shipping box(es). Unpack the converter, booster, toolkit and bolts from their packages.
3. Save the packing material.

4.3 Take Inventory of Small Parts

Table 4.1 Standard small parts included with Power Supply and/or Actuator

Part or Kit	Description	Qty	Comments
11008-09-001	HANDLE, EXTENSION	1	Toolkit M1A50A19
11008-09-002	SOCKET, 5/8” MODIFIED	1	
X3A50325	SPACER, 6MM	1	
101-118-039	WRENCH SPANNER #0472	1	
211-099	PASTE, MOLYKOTE GN METAL 2.8 OZ	1	
211-205	EMORY, 600 GRIT(SHEET) 00346007	1	
211-206	PAD, METAL FINISH 41028416 MSC	1	
211-636	CANVAS BAG W/BRANSON LOGO	1	
211-658	SET, ALLEN, 1.5-5MM, HEX:05051628	1	
211-659	WRENCH HEX ALLEN, 6MM, 88350137	1	
211-660	WRENCH HEX, 8MM,05051925 MSC	1	
48000-03-011	WRENCH, SPANNER	1	
M1A50A42	SHIM, .001	1	
M1A50A45	SPACER, 1MM MSC 81757700	1	
M1A00117	SINGLE PALM BUTTON W/E-STOP	N/A	Optional
M1A00137	FOOTSWITCH ASSEMBLY	N/A	
M1A00A10	DUAL PALM BUTTON ULTRAWELD 20	N/A	
M1A00A11	OPTO-TOUCH START SWITCH ASSY	N/A	
211-968	Wrench, 1-3/8 Open End, 1/2 Dr	N/A	

4.3.1 Cables

Three cables connect the power supply and actuator: the analog data cable, the control cable, and the RF cable. If the system is to be automated, you may also need a remote start cable. Check your invoice for cable types and cable lengths.

Table 4.2 List of Cables

EDP number	Description	Comments
101-266-8R	CABLE, ANALOG DATA	EN Compliant Part
101-640-8	CABLE, CONTROL	EN Compliant Part
101-240-177	CBL EXT 15' RF SHLD J931CS CE	EN Compliant when used with Converter 101-135-065
J1A00230	CABLE,AUTOMATION INTERFACE,10'	

4.4 Installation Requirements

4.4.1 Location

The actuator may be installed in a variety of positions. The Ultraweld L20 is often manually operated using a foot switch, and so it can be installed at a safe and comfortable workbench height (approximately 30-36 inches) with the operator sitting or standing in front of the system. The power supply may be located up to 20 feet away from the Ultraweld L20 Actuator.

The power supply must be accessible for user parameter changes and settings, and must be placed in a horizontal orientation. The power supply should be positioned so it does not draw in dust, dirt or material via its rear fans. Refer to the illustrations on the pages that follow for a dimensional drawing of each component.

4.4.2 Environmental Specifications

Table 4.3 Environmental Specifications

Environmental concern	Acceptable Range
Humidity	30% to 90%, non-condensing
Ambient Operating Temperature	+5° C to +50° C (41° F to 122° F)
IP Rating	2X
Operating Altitude	1000 m (3280 ft)

Figure 4.1 Power Supply Dimensional Drawing (VersaGraphiX)

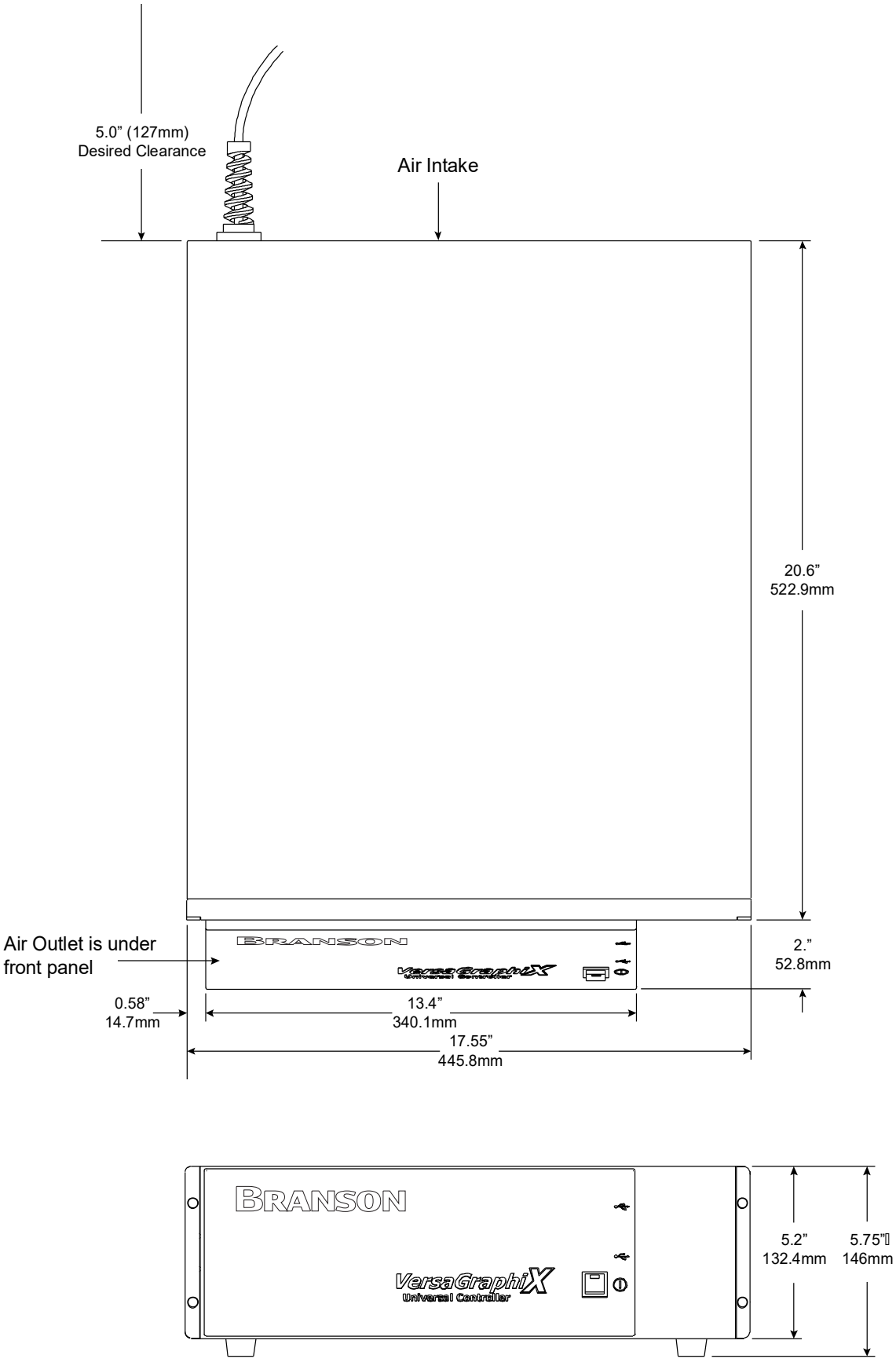


Figure 4.2 Power Supply Dimensional Drawing (Touch Screen)

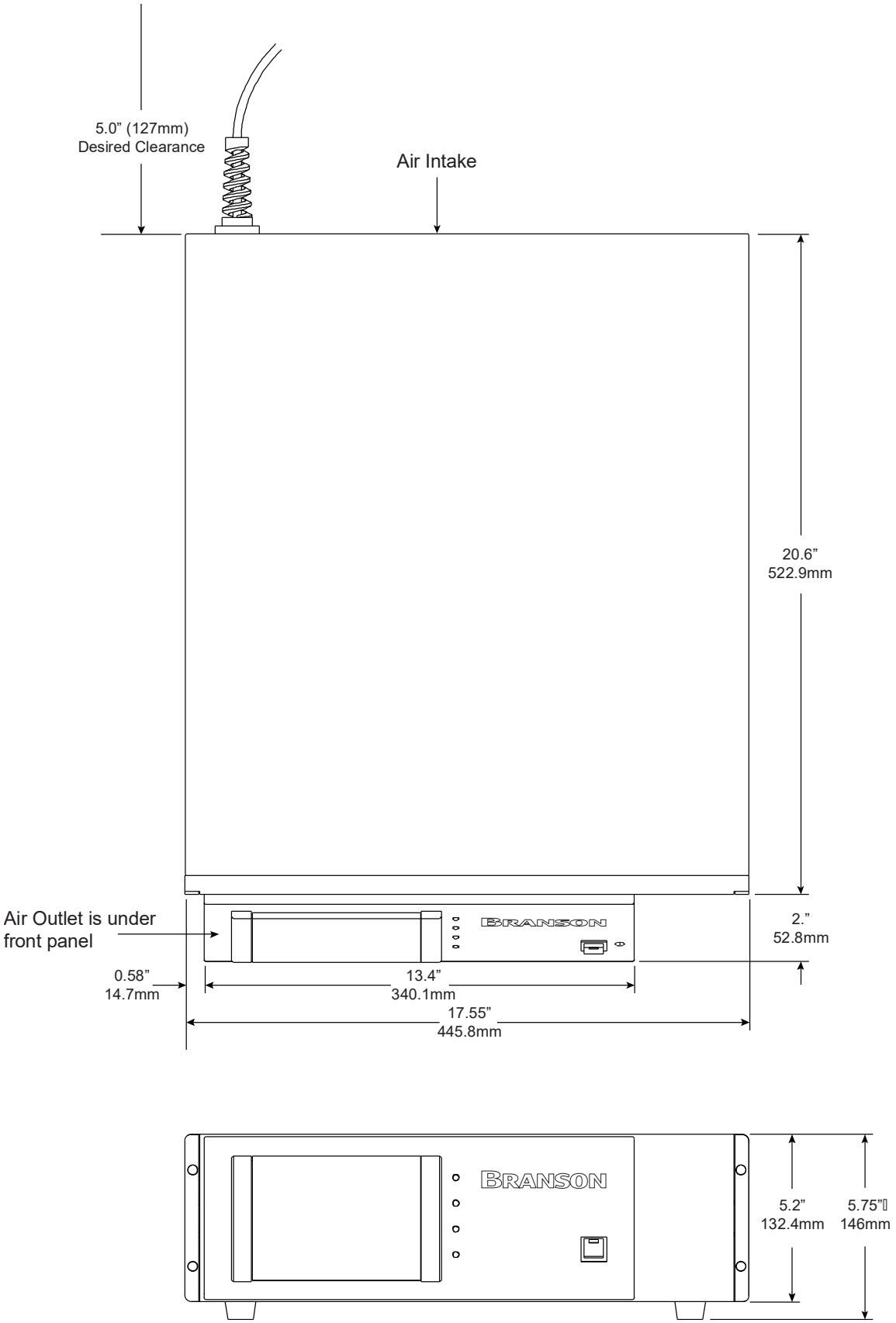
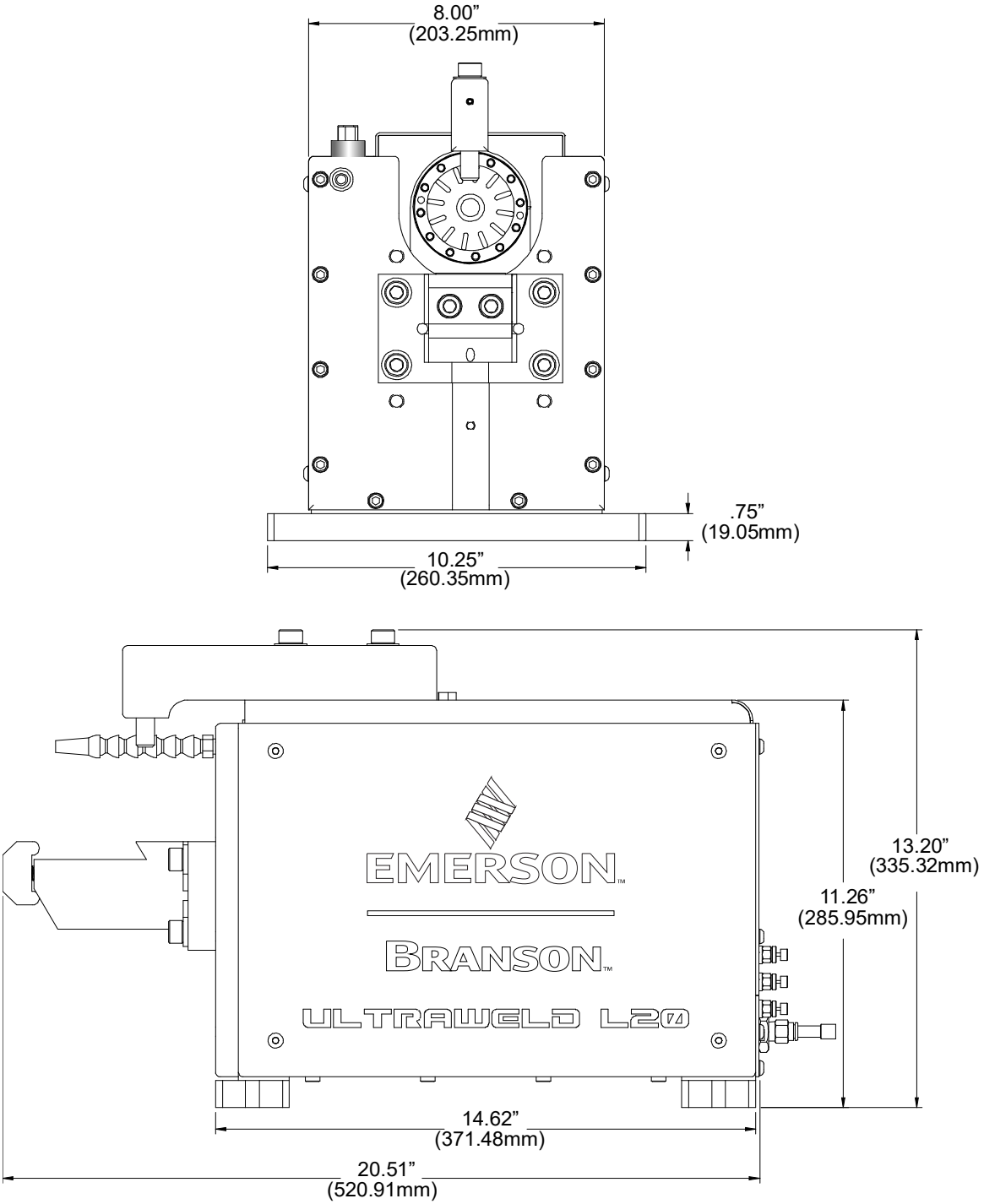


Figure 4.3 Ultraweld L20 Actuator Dimensional Drawing



4.4.3 Electrical Input Power Ratings

Plug the Power Supply into a single-phase, grounded, 3-wire, 50 or 60 Hz power source. Table 4.4 lists the current and fuse ratings for the various models.

Table 4.4 Input Power requirements

Model	Power	Current Rating	NEMA Connector
20 kHz models	2200 W 200V - 230V	14 Amp Max. @ 200V / 20 Amp fuse	NEMA L6-20P Plug
	3300 W 200V - 230V	21 Amp Max. @ 200V / 20 Amp fuse	NEMA L6-20P Plug
	4000 W 200V - 230V	25 Amp Max. @ 200V / 25 Amp fuse	NEMA L6-30P Plug
	5500 W 3 phase 480V		

4.4.4 Air Cylinder Consumption

The Ultraweld L20 air consumption rate can be estimated using the table below:

Table 4.5 Cubic Feet of air per minute per inch of stroke length (each direction)

Air Pressure (PSI)	10	20	30	40	50	60	70	80
100mm Bore	0.0118	0.0166	0.0214	0.0262	0.0310	0.0358	0.0406	0.0454
63mm Bore	0.0047	0.0066	0.0085	0.0104	0.0123	0.0142	0.0161	0.0180

Add 0.034 cubic foot per minute (CFM) for each second of actual weld time to account for converter cooling air per weld cycle.

Example:

The Ultraweld L20 Actuator (100mm Bore) running at full pressure (80PSI) and full stroke length (48mm=1.9”) at a cycle of 20 parts per minute. The air consumption (in CFM) will be:

Consumption per stroke = 0.0454 CFM per inch of stroke x 3.8” (total stroke) = 0.1771 CFM per stroke.

If the weld time is 1 second, we add 0.034 CFM of actual weld time to account for converter cooling air per weld cycle.

Consumption per cycle = 0.1771 + 0.034 = 0.2111 CFM per cycle.

Consumption = 0.2111 CFM per cycle x 20 cycles per minute = 4.222CFM.

The example above is to be considered a worse case condition for an Ultraweld L20 Actuator to run at.

4.4.5 Factory Air

The factory compressed air supply must be "clean, dry and unlubricated" air with a regulated maximum pressure of 100 psig (690 kPa). Depending on your application, the actuator requires between 70 to 80 psi. Use a lockout device on the air line if required.

WARNING	General Warning
	Synthetic air compressor lubricants containing WD-40 or Silicone will cause internal actuator damage and failure due to the solvents contained within these types of lubricants.

4.4.5.1 Pneumatic Connections to Actuator

Air connection to the Ultraweld L20 Actuator is made to the air inlet connector on the rear of the actuator with a quick-connect safety pneumatic coupling. Refer to Chapter 5: Technical Specifications for a pneumatic schematic.

4.5 Installation Steps

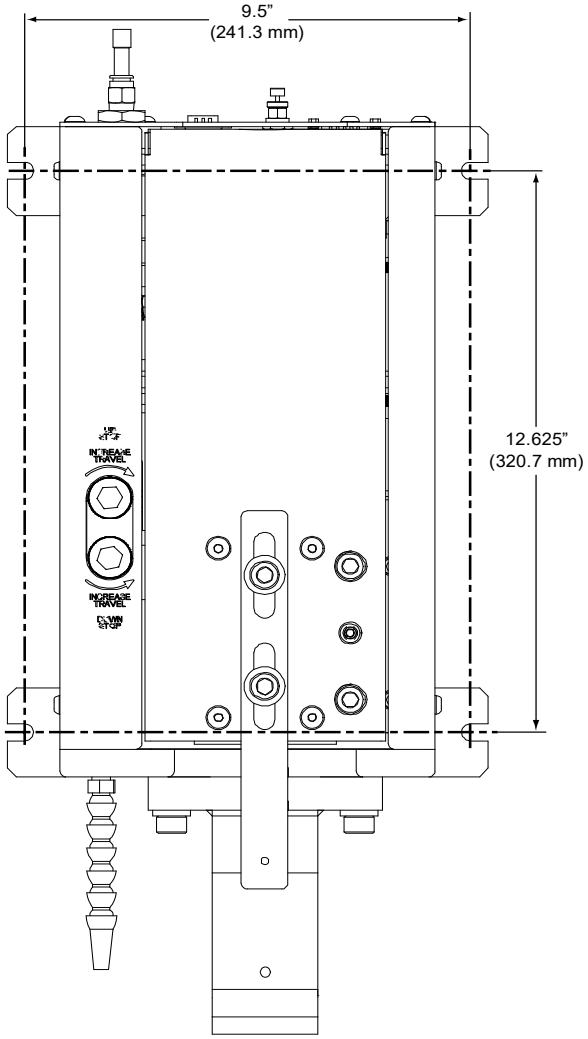
4.5.1 Mounting the Ultraweld L20 Actuator (Bench Mounting)

The Ultraweld L20 Actuator must be bolted to your workbench to prevent undesired movement. Open-end slots are provided at the Ultraweld L20 mounting feet, and will accept your 5/16 inch or M8 cap screws.

CAUTION	General Warning
	You must secure the actuator to your work surface using four bolts to prevent undesired movement.

1. Mount the Ultraweld L20 Actuator to your workbench using four socket-head cap screws (customer provided, 5/16 inch or M8).
2. Connect factory air to the air inlet connector on the rear of the actuator with a quick-connect safety pneumatic coupling

Figure 4.4 Ultraweld L20 Mounting Centers



4.5.2 Mounting the Power Supply

The power supply is designed to be placed on a workbench (rubber feet on bottom) within cable length limits of the actuator. It has two rear-mounted fans which draw cooling air from rear to front, which must be free from obstruction. Do not place the power supply on the floor or in other locations that will allow dust, dirt or contaminants to be drawn into the power supply.

The controls on the front of the power supply must be accessible and readable for setup changes (touchscreen models).

All electrical connections are made to the rear of the power supply, which should be positioned in your workspace with adequate clearance (approximately 4 inches or more on either side, and 5 inches to the rear) for cable access and ventilation. Do not place anything on top of the power supply case.

In the event the system is to be installed in a high dust environment, the use of a fan filter kit (101-063-614) is required.

See Figure 4.1 and Figure 4.2 for dimensional drawing of compatible Power Supplies.

Figure 4.5 Connections on Rear of a VersaGraphiX Power Supply

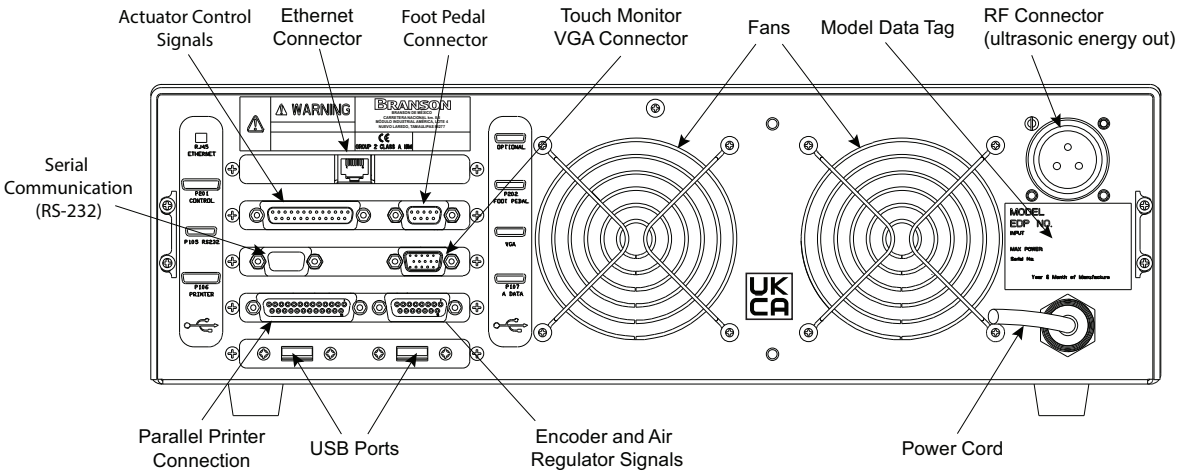
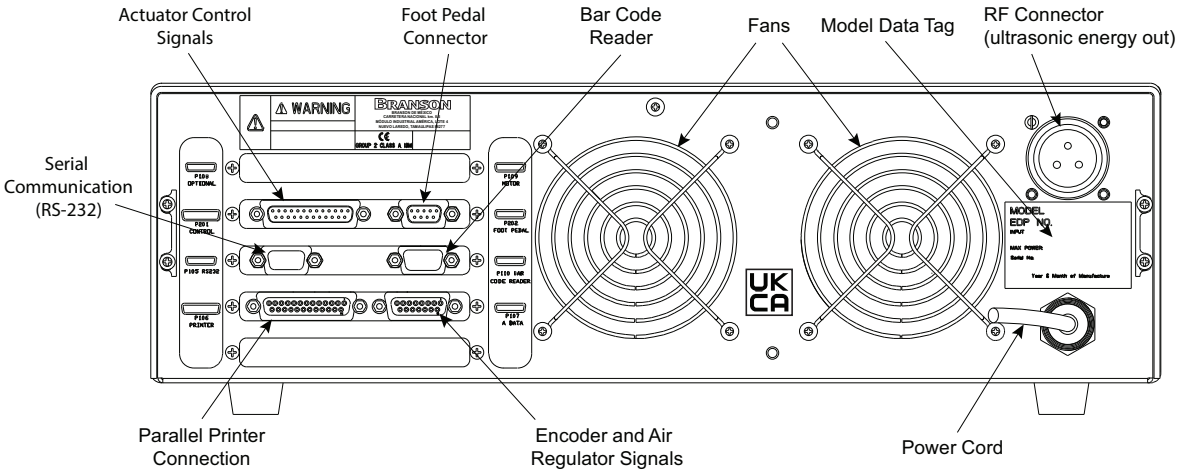


Figure 4.6 Connections on Rear of a Touch Screen Power Supply



The cable lengths are limited based on the operating frequency of the welding system. Performance and results can suffer if the RF cable is crushed, pinched, damaged or modified. Contact your Branson Representative if you have special cable requirements. In

some cases, remote operation from a User I/O or a Remote Terminal can be used to solve a distance limitation.

4.5.3 Input Power (Main)

The system requires single-phase input power, which you connect to the Power Supply using the integral power cord. See Table 4.4 for plug and receptacle requirements for your specific power level.

Refer to the unit's Model Data Tag to be sure of the power rating of the Model in your system.

4.5.4 Output Power (RF Cable)

Ultrasonic Energy is delivered to a screw-on MS receptacle connection on the rear of the Power Supply, which is connected to the Ultraweld L20 Actuator.

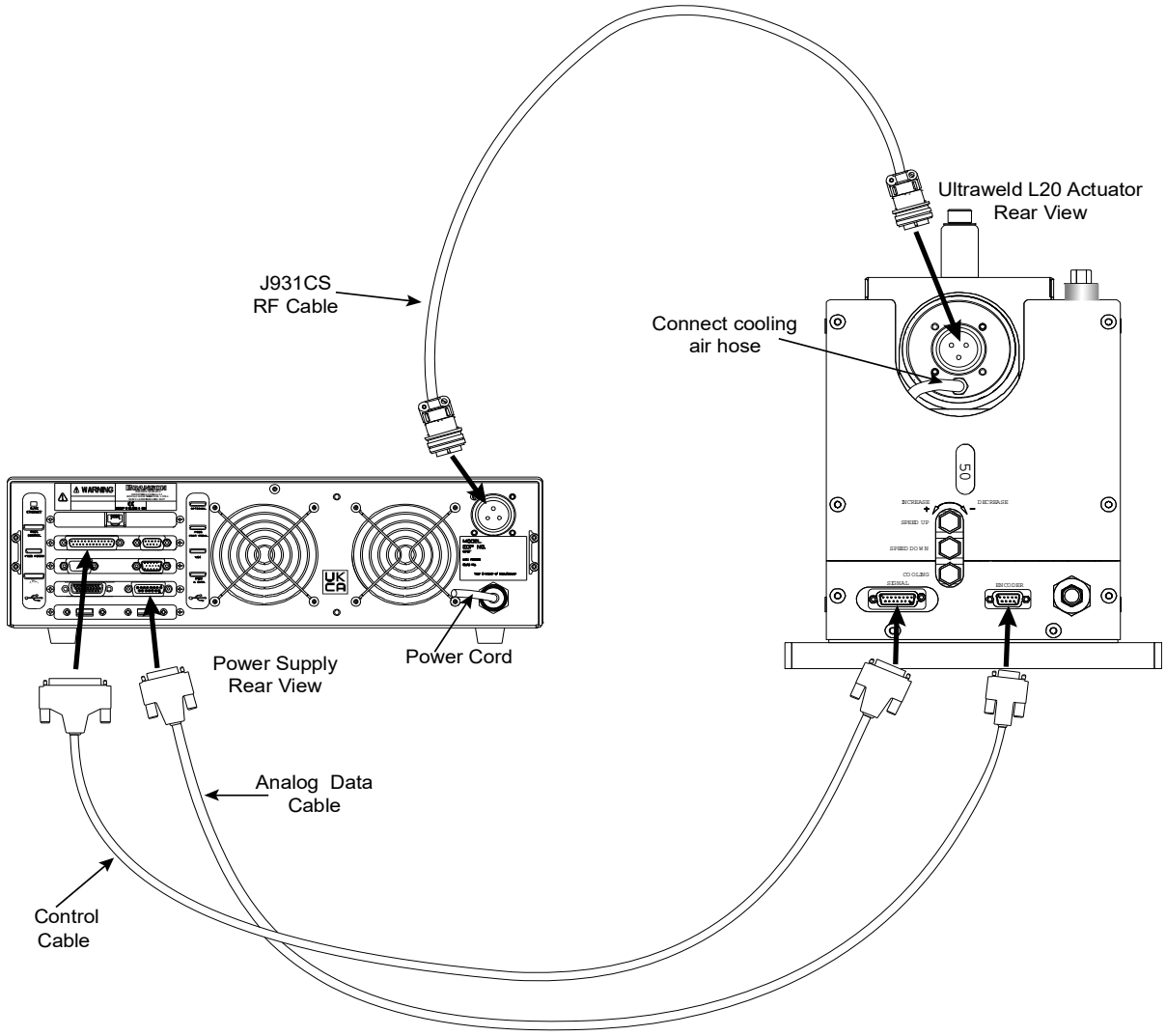
WARNING	General Warning
	Never operate the System with the RF Cable disconnected or if the RF Cable is damaged.

4.5.5 Interconnect Between Power Supply and Actuator

The Ultraweld L20 Actuator has three electrical connections between the Power Supply and the Actuator: the RF Cable, the Analog Data Cable, and the Control Cable.

There can be other connections to the Actuator, and other connections to the Power Supply, but these are the three standard connections, depicted in Figure 4.7.

Figure 4.7 Electrical Connections from Power Supply to an Ultraweld L20 Actuator



4.6 Safety Devices

The removal, bridging or disabling of safety devices is not condoned for production operation. Individual safety devices mentioned below may only be disabled if super-ordinate safety devices are employed in their place.

4.6.1 Emergency Stops

In case of danger, hit the red, emergency stop Which is found on the red, top portion of the foot pedal. Twist the emergency stop to reset the system. The actuator, power supply, and related fixtures are returned to the "Home" position. If dual anti-tie start buttons are used, there must be a red emergency stop associated in line. Free access to the emergency stop button must be maintained.

4.6.2 Actuator Covers

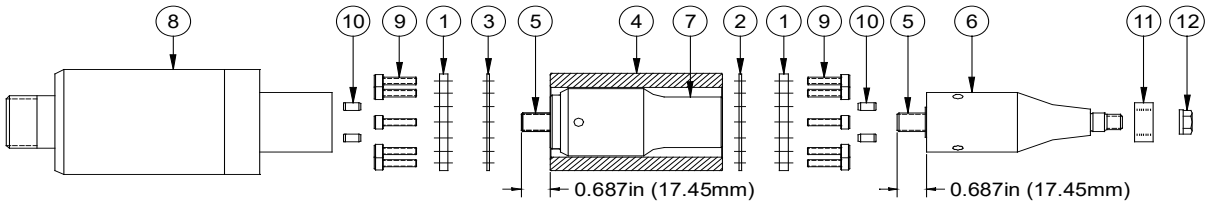
The Ultraweld L20 Actuator is equipped with covers which should only be removed for maintenance and installation purposes.

4.7 Ultrasonic Stack Assembly

Refer to Figure 4.8 for item listings when assembling the ultrasonic stack.

1. Apply an even, light coat of Molykote G-n paste (about equal in size to half a paper match head) to the mating surfaces of the Converter, Booster and Horn. Do NOT apply paste to threaded opening or to stud threads or to diaphragm. Do NOT use silicone grease.
2. Place the Rear Diaphragm Spring (Item 3 – 0.500” diameter center hole) and Clamp Ring (Item 1) onto the studded end of the Booster (Item 7). Then thread the Booster into the Converter. Be careful to center the Diaphragm Spring on the Booster and then torque Booster and Converter to 55 ft/lbs (74.6 N-m) using two spanner wrenches. Do not clamp on the Converter.
3. Slide the Booster/Converter subassembly in through the rear of the polar shell. Assemble the twelve M5 SHCS’s to fasten in an alternating pattern the Clamp Ring to the rear of the polar shell.
4. Place a Clamp Ring and the Front Diaphragm Spring (Item 2 – 0.750" diameter center hole) onto the studded end of the Horn (Item 6). Then thread the Horn into the Booster. Assemble the twelve M5 SHCS’s to fasten in an alternating pattern the Clamp Ring to the front of the polar shell. Be careful to center the Diaphragm Spring on the Horn and then torque Booster and Horn to 80 ft/lbs (108.5 N-m).
5. Install the replaceable tip and loosely thread on the tip nut (applicable to replaceable Tip Horns only). The Tip (or Horn blade) will have to be made square and parallel to the Anvil prior to welding.

Figure 4.8 Exploded Ultrasonic Stack Assembly



ITEM	DESCRIPTION
1	CLAMP RING
2	DIAPHRAGM SPRING, FRONT
3	DIAPHRAGM SPRING, REAR
4	POLAR SHELL
5	1/2-20 STUD
6	HORN

ITEM	DESCRIPTION
7	BOOSTER
8	CONVERTER (105 STYLE)
9	SOCKET HEAD CAP SCREW
10	DOWEL PIN
11	TIP
12	TIP NUT

WARNING	General Warning
	Do not operate ultrasonics while the tip is loose.

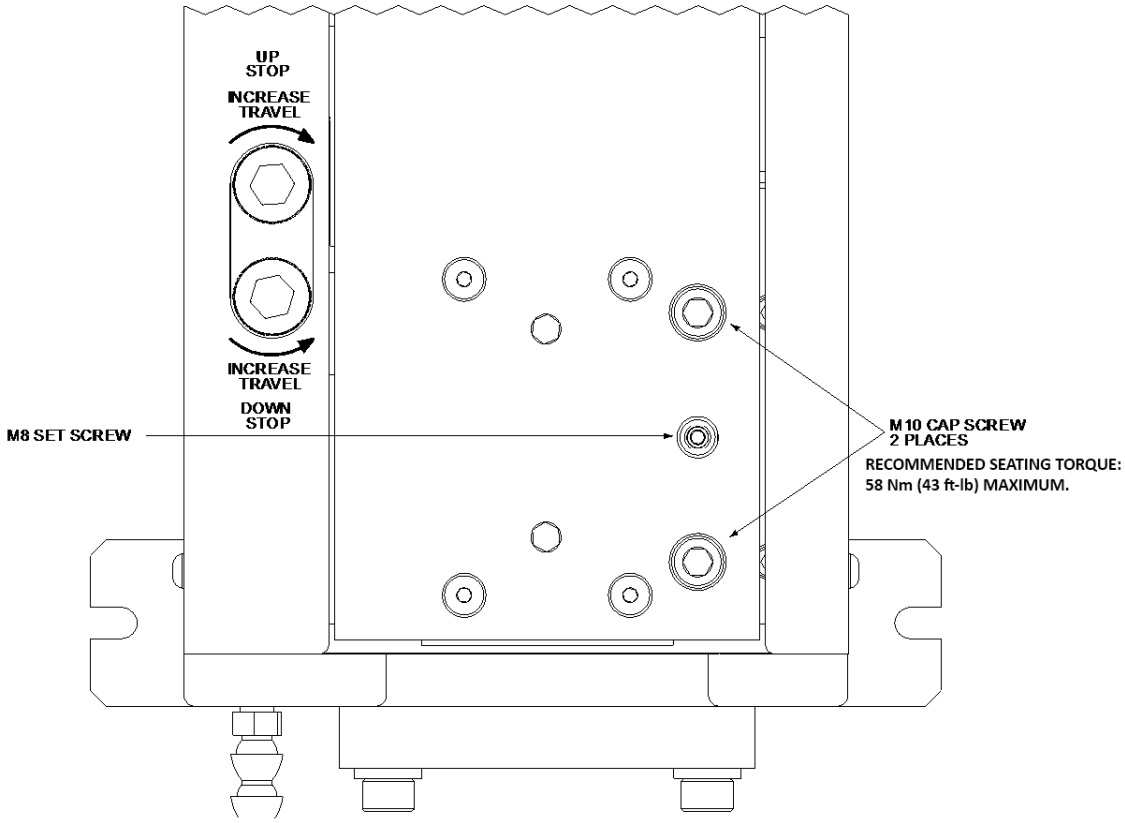
WARNING	General Warning
	Do not operate ultrasonics without connecting the converter lead wire and ground.

4.7.1 Installing the Stack in the Actuator

The ultrasonic stack must first be assembled. To install the stack:

1. Make sure that the system power is turned off by disconnecting the power plug.
2. Loosen the two M10 screws on top of the polar block.
3. Insert the stack into the polar block. Note: If the stack does not fit into the polar block, tighten the spreading M8 set screw located in between the clamping screws.
4. Adjust the stack to the desired position.
5. If the spreading set screw has been tightened to loosen the stack, unscrew it to achieve clamping of the stack.
6. Tighten the two M10 screws on top the polar block in an alternating pattern to achieve equal clamping force.
7. Re-check position of the stack relative to the tooling surface.
8. Adjust stack accordingly to achieve proper alignment.

Figure 4.9 Mounting the Stack on the Ultraweld L20 Actuator

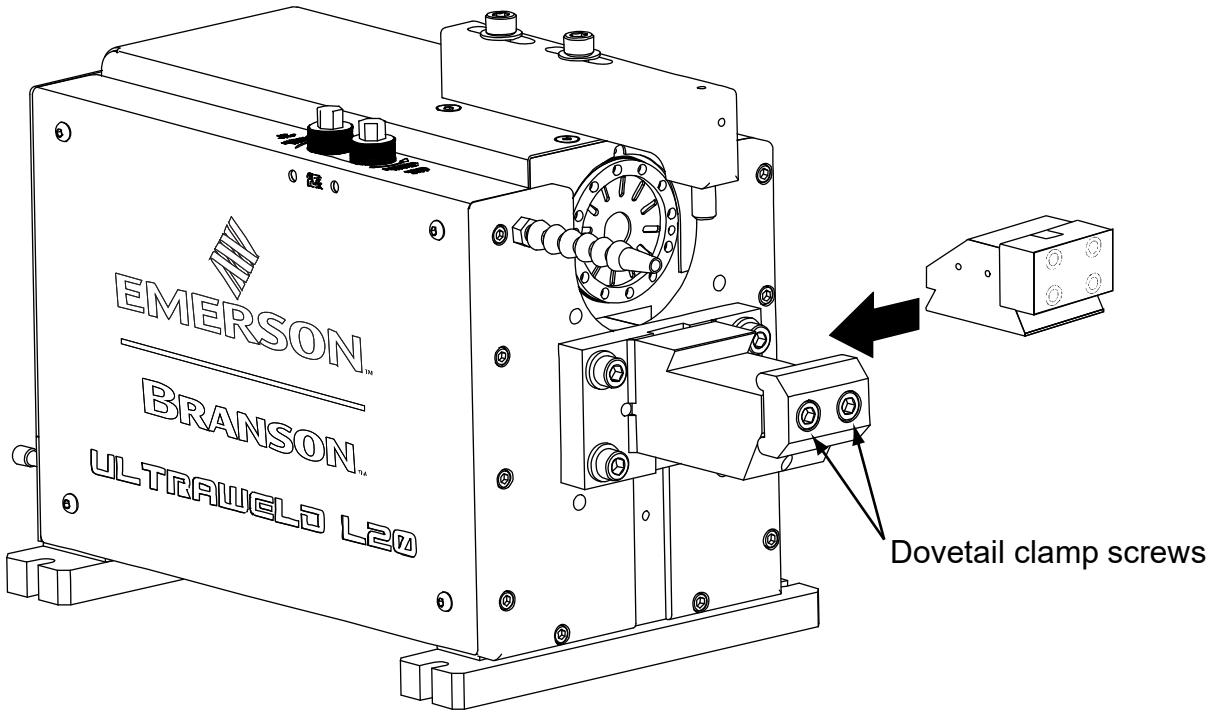


4.8 Mounting the Fixture on the Tool Support

The Ultraweld L20 Actuator allows for quick tooling installation by means of a dovetail mounting design. To install your fixture onto the tool support:

1. Loosen the two dovetail clamp screws.
2. Slide the anvil onto the tool support.
3. Tighten the two dovetail clamp screws.

Figure 4.10 Mounting the Fixture on the Tool Support



4.9 Testing the Installation

1. Turn on the air supply connections.
2. Ensure there are no leaks in the air supply connections.
3. Turn on the power supply. The power supply will begins its normal self-check.
4. Make sure the horn is in the up position and is not in contact with any object.
5. Go to the Maintenance screen for VersaGraphix or the Maintain button for Touch Screen Controller.
6. Go to Sonic screen and push test button, the horn should vibrate while the button is pushed.
7. In the screen that follows, select the key that corresponds to Cal Actuator.
8. If the power supply goes into overload please contact Branson Customer service. If the horn does vibrate make sure R.F. cable is connected and try again.
9. Fit a test part onto the fixture.
10. Press the foot-pedal or the start switches to make a weld.

In summary, if the power supply does not display an alarm message and the actuator descends and retracts correctly, your ultrasonic welder is ready for operation.

4.10 Still Need Help?

Branson is pleased that you chose our product and we are here for you! If you need parts or technical assistance with your Ultraweld L20 system, call your local Branson representative or contact Branson Customer Service. See 1.6.4 Contact Information.

Chapter 5: Technical Specifications

5.1 Technical Specifications

5.1.1 Requirement Specifications

The Ultraweld L20 Actuator requires compressed air. The factory air source must be "clean and dry air", that is, without moisture or lubricants. The Actuator requires 70 psi minimum pressure for operation and cooling, and can require up to 80 psi maximum, depending on the application. The following table lists environmental specifications for the ultrasonic welder. The following table lists environmental specifications for the ultrasonic welder.

Table 5.1 Environmental Specifications

Environment	Range
Humidity	30% to 90% non condensing
Ambient Temperature	+5º C to +40º C (+41º F to +104º F)
Storage / Shipping Temperature	-13º F to +131º F (-25º C to +55º C)
Operating Altitude	1000 m (3280 ft)
IP Rating	2X

All electrical input power connections are to the Power Supply.

5.1.2 Performance Specifications

The following table details some of the performance specifications associated with the Ultraweld L20 Actuator.

Table 5.2 Ultraweld L20 Actuator Performance Specifications

Height Encoder Accuracy	±0.05mm (0.002 in)
Maximum Stroke	48mm / 1.9 in

5.2 Physical Description

Refer to Chapter 4: Installation and Setup for dimensional information.

5.2.1 Standard Items

Slide Mechanism

The slide system is based on a precision roller bearing slide which provides precise alignment of the anvil, smooth linear motion and long term reliability.

Mechanical Stops

The Ultraweld L20 Actuator has two mechanical stops to limit the horn travel: the down stop and the up stop.

The down stop is used as a safety to prevent contact between the Horn and Anvil if the welder is cycled without the part(s) to be welded.

The up stop is used to limit the upward travel of the horn. Two examples for the use of the up stop are limiting the upward travel to quicken cycle times and for easier loading and unloading of components.

Polar Shell & Ultrasonic Stack

The converter-booster-horn assembly, or ultrasonic stack, is supported in a steel polar shell by means of two diaphragm springs. The diaphragm springs are mounted at either end of the booster and are securely bolted to the polar shell. The diaphragm shaped springs are made from titanium and are acoustically tuned at the 20 kHz operating frequency. This system permits efficient transmission of ultrasonic vibration along the axis of the ultrasonic stack while providing rigid mounting.

Linear Encoder

The linear encoder measures the distance traveled by the horn. Depending on the weld mode settings, it can:

- Weld in height mode
- Weld in energy with height compensation
- Inspect the height of the parts to be joined (pre-height)
- Inspect the height of the parts after being welded (height)

Tool Support

The Ultraweld L20 tool support allows for quick tooling installation by means of a dovetail mounting design.

Pneumatic System

The pneumatic system is contained within the actuator's enclosure. Refer to Figure 5.1.

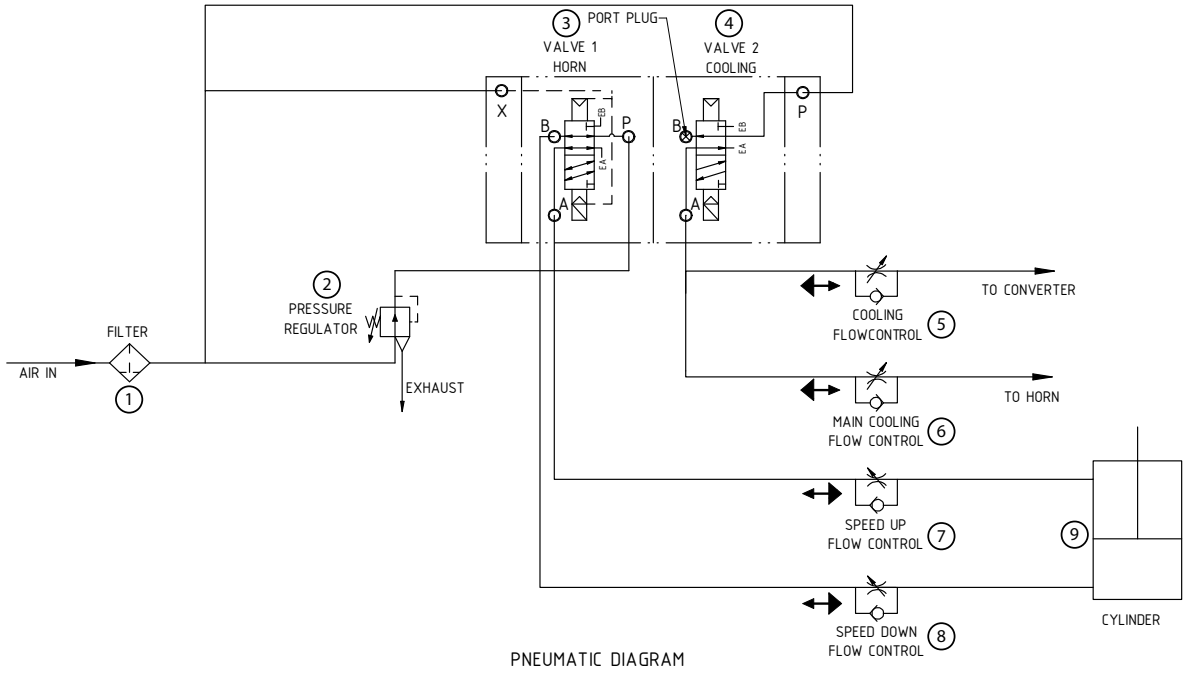
The system consists of:

1. A cooling solenoid valve.
2. A horn solenoid valve.
3. A pressure regulator.
4. A quick exhaust valve.

5. An air cylinder.
6. A down speed flow control valve.
7. An up speed flow control valve.
8. A main cooling flow control valve.
9. A converter cooling flow control valve.

The horn's rate of descent (Down Speed); the horn's rate of ascent (Up Speed); and the main cooling flow (Cooling) are adjusted at the back. The converter's cooling flow is adjusted on the control valve located inside the actuator.

Figure 5.1 Ultraweld L20 Actuator Pneumatic Schematics



Chapter 6: Operation

6.1 Actuator Controls

This section describes how to operate a weld cycle using the Ultraweld L20 Actuator. For more detailed information on making and altering settings, refer to your Power Supply Manual.

CAUTION	General Warning
	Keep hands away from under the horn when setting up and operating the Actuator. Down force (pressure) and ultrasonic vibrations can cause injury.

The Ultraweld L20 Actuator is controlled by the Power Supply. The Actuator sends operating cycle data, and status information to the power supply. The Power Supply sends operating parameters to the Actuator, determining how and when cycles are initiated and terminated. Refer to your Power Supply manual for tuning testing, setup and operating instructions.

6.2 Initial Actuator Settings

The Ultraweld L20 Actuator is controlled by the Power Supply, however there are several functions that are part of the Actuator. These include:

- Factory air source
- Down speed control
- Up speed control
- Cooling air
- Down stop
- Up stop

Each of these will affect the operation of the actuator.

6.2.1 Factory Air Source

Factory air must be turned on, supplying the actuator's air pressure regulator with air pressure. If factory air is too low (below 70 psi maintained) the actuator will not weld or operate reliably. Factory air is also used to provide cooling air to the converter.

Factory air input may affect weld results for applications requiring more weld pressure buildup.

NOTICE	
	Factory air pressure must be higher than the maximum system requirements. The compressed air system must have sufficient capacity to serve all of the systems connected to it. The use of an accumulator may be required to provide continuous air flow.

6.2.2 Down Speed Control

The Speed Down knob, located on the rear of the actuator, controls the downward speed of the ultrasonic stack. This is useful to prevent damaging the parts to be welded, increasing/decreasing cycle times to get better weld results.

To DECREASE the downward speed, turn the indicated knob clockwise.

To INCREASE the downward speed, turn the indicated knob counter-clockwise.

6.2.3 Up Speed Control

The Speed Up knob, located on the rear of the actuator, controls the upward speed of the ultrasonic stack. This is useful for raising the stack quickly for other mechanism actions and for quick part removal.

To DECREASE the upward speed, turn the indicated knob clockwise.

To INCREASE the upward speed, turn the indicated knob counter-clockwise.

6.2.4 Cooling Air

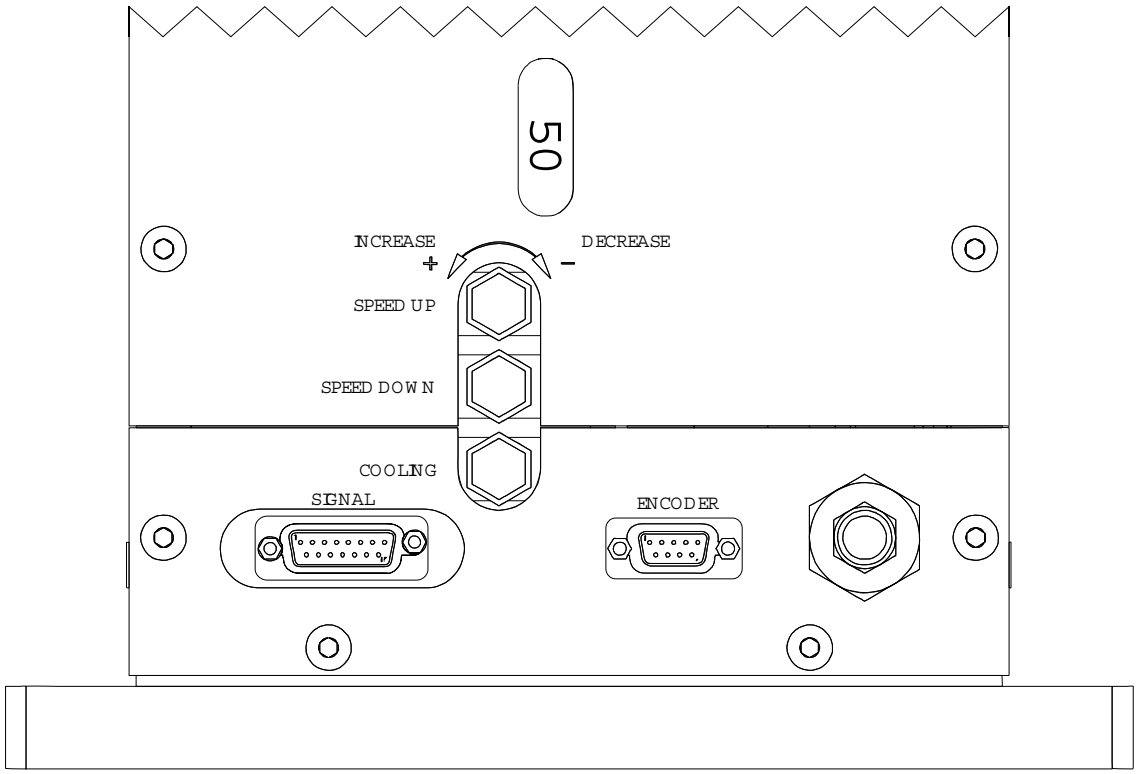
The Cooling knob, located on the rear of the actuator, controls the flow of air delivered to the front nozzle. Cooling air is designed to keep the weld cooled to a reasonable temperature during welding.

To INCREASE cooling air flow rate, turn the cooling air control knob counter-clockwise.

To DECREASE cooling air flow rate, turn the cooling air control knob clockwise.

CAUTION	General Warning
	Compressed airflow should be directed away from the operator at all times.

Figure 6.1 Speed Controls and Cooling Knob Location



6.2.5 Down Stop Adjustment

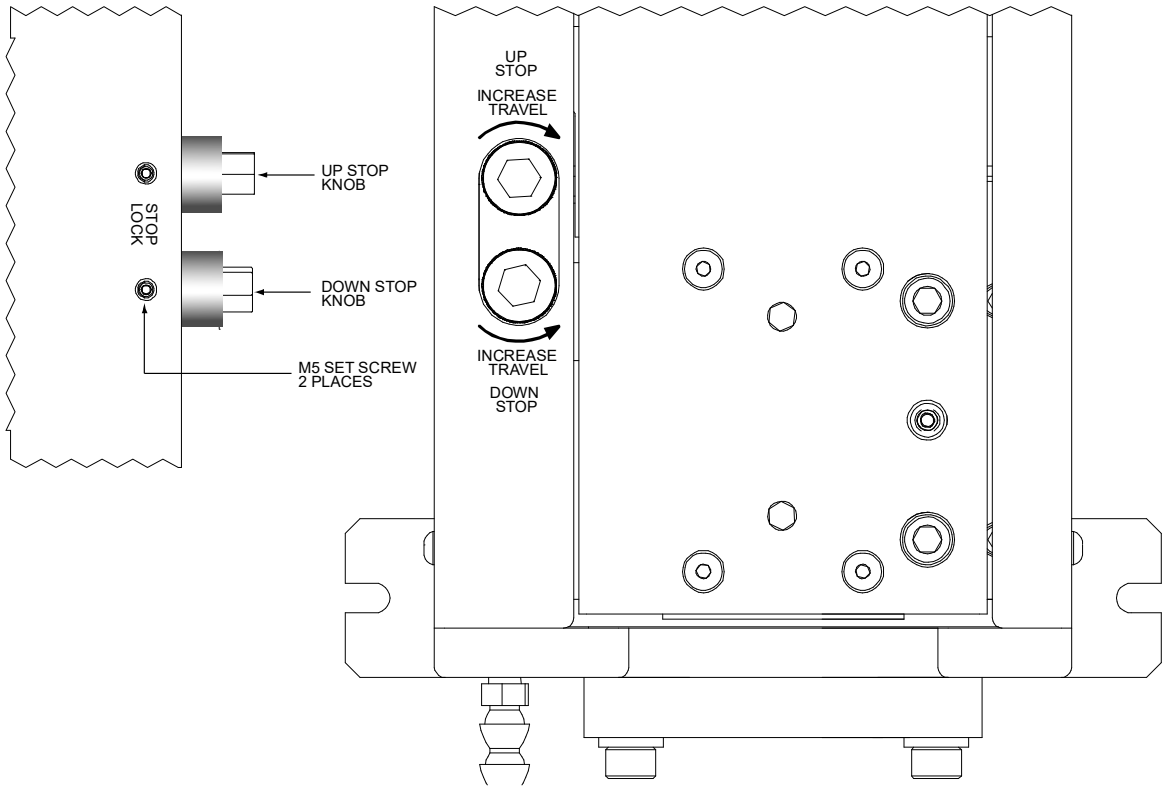
The down stop is used as a safety mechanism to prevent contact between the Horn and Anvil if the welder is cycled without the part(s) to be welded. Unless otherwise specified, a 0.004” (0.10 mm) gap between the Horn and Anvil is recommended. See Figure 6.2 for the Down Stop location.

NOTICE	
	Some applications require no down stop due to thickness of the material.

To adjust the down stop:

1. Loosen the forward set crew (located on the left side facing the front of the actuator) so that the down stop knob moves smoothly.
2. Turn the Down Stop Knob clockwise to increase the maximum downward travel end position.
3. Turn the Down Stop Knob counter-clockwise to decrease the maximum downward travel end position.
4. Tighten the forward set screw when the desired down travel location is achieved.

Figure 6.2 Up/Down Stop Knob Locations



6.2.6 Up Stop Adjustment

The up stop is used to limit the upward travel of the Horn. Two examples for the use of the up stop are limiting the upward travel to quicken cycle times and for easier loading and unloading of components. See Figure 6.2 for the up stop location.

To adjust the up stop:

1. Loosen the rearward set screw (located on the left side facing the front of the actuator) so that the up stop knob moves smoothly.
2. Turn the Up Stop Knob clockwise to increase the maximum upward travel end position.
3. Turn the Up Stop Knob counter-clockwise to decrease the maximum upward travel end position.
4. Tighten the rearward set screw when the desired upward travel location is achieved.

CAUTION	General Warning
	Increasing the Up Stop gap too much can result in an unsafe weld condition (pinch point). The Up Stop travel distance should be kept to an absolute minimum for safety reasons.

6.2.7 Torque Check

Proper tightness of tooling is critical to assure efficient transmission of ultrasonic energy into the weld nugget. Please check the tightness of the following areas during a tool change or whenever looseness is suspected.

Table 6.1 Tooling Torque

Area	Suggested Torque
Horn to Booster	
Solid Blade Horn to Booster	80 ft/lbs (108 N.m)
Replaceable Tip Horn to Booster	100 ft/lbs (135 N.m)
Converter to Booster	55 ft/lbs (75 N.m)
Tip Nut (if used)	70 ft/lbs (95 N.m) (Unless Otherwise Specified)

6.2.8 Emergency Stop

The emergency stop is found on the red, top portion of the foot pedal. When engaged it will prevent the actuator from running, and will also immediately terminate a weld cycle and cause the actuator to return to its “Home” position. It does not remove power from the system. The power supply will indicate that the system is in emergency stop mode and emit a beep sound when the emergency stop is engaged. Push the emergency stop foot pedal to reset the system.

6.2.9 Tool Gap Requirements

Tooling includes the Horn (or Horn Tip), Anvil and all surfaces that contact the weld nugget during processing. The tooling should be inspected to confirm a gap as per the application tooling set up sheet. If the tooling is in contact during the application of ultrasonic energy, severe damage may result to the tooling and power supply.

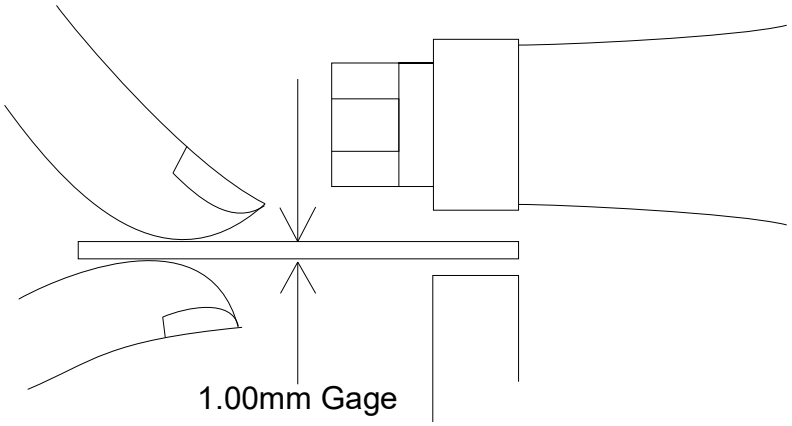
NOTICE	
	This test should be checked whenever the tooling is changed. Also perform this test whenever you suspect tool contact.

NOTICE	
	Most tooling that contacts the weld nugget is designed with several weld surfaces. When one surface is worn and no longer useful, an alternate surface may be used resulting in extended tool life.

To set the Tool Gap:

1. Set the air regulator at the same pressure as the weld pressure.
2. Ensure that there are no work pieces between the Horn and Anvil.
3. Navigate to the Maintenance menu on the power supply, then press the HORN button. This will cause the Horn to descend to its stop.
4. Measure this crash gap as per the application tooling setup sheet.
5. Press the HORN button again to raise the Horn and adjust the down stop screw located on the top of the actuator.

Figure 6.3 Tool Gap



The Branson Ultraweld L20 is capable of accurate height measurements and can adjust for weld pressure and crash gap settings. All tool setups especially crash gap must be complete before this procedure.

6.3 Operating the Actuator

For detailed information about Ultraweld L20 Actuator controls, refer to 2.4 Controls

6.3.1 Check Welder Performance

Ensure that nothing is touching the tip on all four sides. With the tooling disengaged and unloaded, press the "TEST" button on the power supply for no longer than one second. If there is a loud squealing noise, the problem may be in the following areas:

1. The Tip may not be secured properly.
2. The Horn may not be secured properly.
3. Tooling may be in contact with each other.

NOTICE	
	For information on locating the "TEST" button on your particular Power Supply model please refer to your Power Supply manual.

6.3.2 Establishing Weld Parameters

With the tooling properly set up and with the ultrasonic stack tuned, welding may be performed. Optimize the weld settings in the following manner:

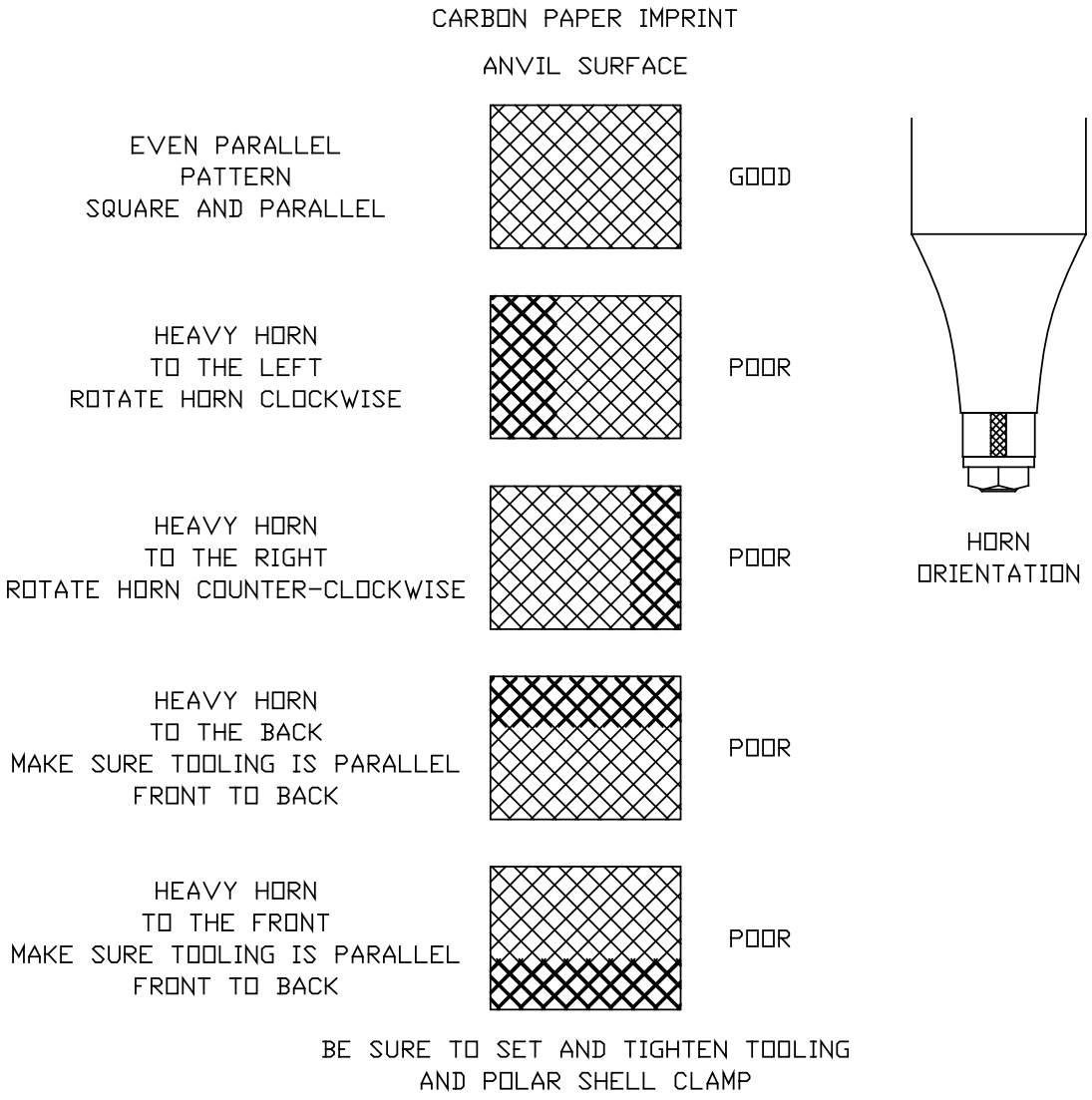
NOTICE	
	Weld parameters may already be established. Refer to Parameter Preset Information located in the Special Information Section.

1. Set weld energy and pressure for initial weld trials to minimum values: 50 joules and 15 PSIG for air pressure as a starting point.
2. Place the parts to be welded securely into the fixture.
3. Cycle the welder by actuating the foot switch or the start switches.
4. Inspect the welded joint.
5. Increase/decrease the values for energy, and air pressure as necessary to reach an acceptable level of welding.

6.3.3 Knurl Pattern Imprint Evaluation

The imprint that the tooling creates on the interface is a result in the aligning the welding tip to the anvil. If the weld appears heavy to a certain side, readjustment of the tooling will be required to get even weld results across the weld surface. Typically, using carbon paper will give the best results. Figure 6.4 shows what typical imprints will look like and the corrective action to be taken

Figure 6.4 Knurl Pattern Imprint Evaluations



6.4 Safety Circuit Alarms

The Safety Control System within the Controller constantly monitors the system's safety related components for correct operation. When this system detects a fault condition, operation is interrupted and the system immediately goes to a safe state. A beeper is used to signal a safety system alarm.

Use the following procedure to troubleshoot safety circuit alarms:

1. Verify that the 9-pin footswitch cable is properly connected to the back of the Controller.
2. Power down and then power up the Controller to reset the system.
3. If the alarm persists, call Branson Support. See 1.6.4 Contact Information.

Chapter 7: Maintenance

7.1 Periodic and Preventive Maintenance

7.1.1 Maintenance Safety

Safety devices, especially covers, guards and ground cables should only be removed when it is absolutely essential for the completion of maintenance work. If safety devices were removed prior to starting maintenance work, be sure to re-install those devices after finishing the maintenance work. The following installation and maintenance operations must be performed prior to any disassembly of equipment:

WARNING	General Warning
	• Use LOTO (Lock Out Tag Out) lockable plug cover over line cord plug during any maintenance • All system components must be disconnected from the main electrical supply • Remove the plug from the main electrical supply and secure it from being re-inserted accidentally • All system components must be disconnected from the main air supply • Disconnect the air hose from the main air supply and release system air pressure via the pressure regulator

7.1.2 Periodic Maintenance

In order to maintain optimum operating conditions, it is important to perform various maintenance and equipment inspections at periodic intervals. Please observe the following recommendations.

7.1.2.1 Daily Maintenance:

- Drain water and contaminants from the airline filters, if required

7.1.2.2 On Every Tool Rotation

- Inspect the clamping surfaces of the Tip, the Tip Nut and the Horn for fretting
- Vacuum and clean out any copper residue or dirt in the actuator

7.1.2.3 After 40k-50k Cycles Maximum (subject to change based on weld application):

- Vacuum and clean inside of power supply
- Calibrate pressure regulator
- Clean and torque the stack interface
- Calibrate amplitude

7.1.3 Recondition the Stack (Converter, Booster, and Horn)

The transmission of ultrasonic energy along the stack requires a tight and clean interface between the Converter, Booster, Diaphragm Springs and Horn.

NOTICE	
	Remove the stack and check the interfaces after 40k-50k cycles or whenever a problem is suspected.

7.1.3.1 Ultrasonic Stack Disassembly

WARNING	High Voltage Hazard
	Be sure that the power supply is off to prevent any possible electrical shock from the high voltage contact on the converter.

1. Disconnect the cable at the rear of the Converter (Item 8).
2. Remove the Tip Nut and Tip (applicable to replaceable tip horns only). Check the Tip and Nut to be sure that the clamp surfaces are clean and smooth. Follow the instructions in 7.1.3.3 Reconditioning Tip and Nut Clamping Surfaces (Replaceable Tip Horns Only).

NOTICE	
	Clean only the clamp surface, not the knurl area.

3. Using the torque wrench and the Torque Wrench Adapter, remove the Horn (Item 6) from the Stack Assembly.
4. Remove the twelve M5 SHCS's (Item 9), the Clamp Ring (Item 1) and the Front Diaphragm Spring (Item 2).
5. Remove the twelve M5 SHCS's (Item 9) from the back end of the Polar Shell (Item 4).
6. The Converter (Item 8), Clamp Ring (Item 1), Rear Diaphragm Spring (Item 3) and Booster (Item 7) can now be slipped out of the Polar Shell (Item 4) towards the rear of the actuator.

Figure 7.1 Ultrasonic Stack Assembly.

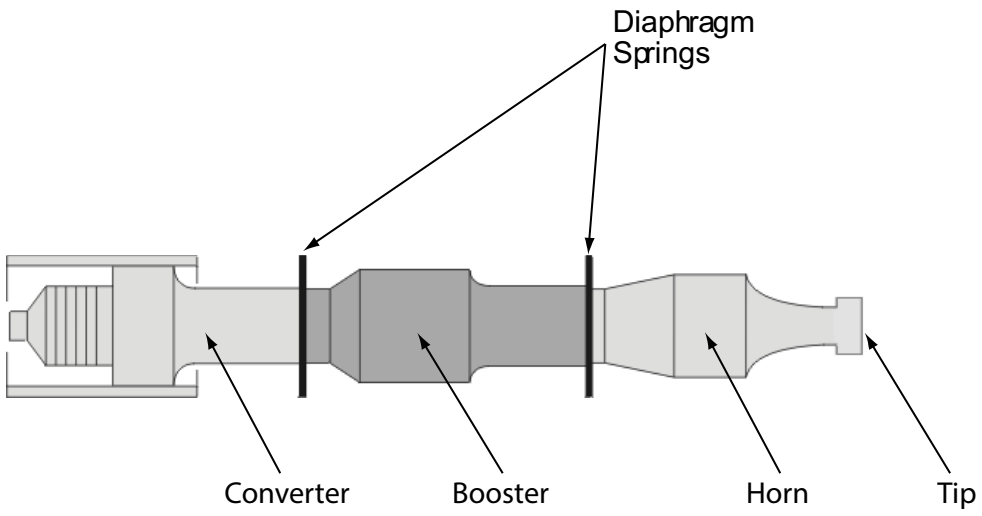
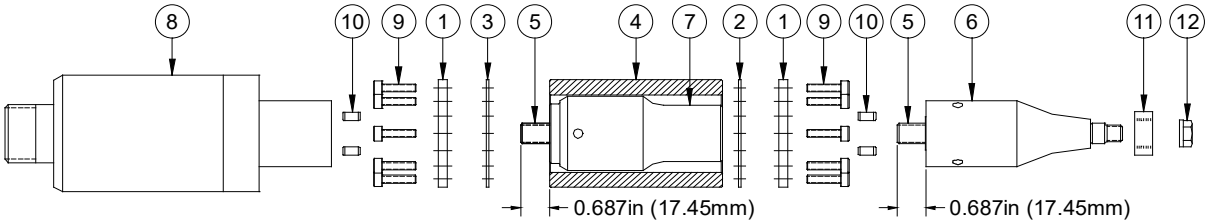


Figure 7.2 Exploded Ultrasonic Stack Assembly



ITEM	DESCRIPTION
1	CLAMP RING
2	DIAPHRAGM SPRING, FRONT
3	DIAPHRAGM SPRING, REAR
4	POLAR SHELL
5	1/2-20 STUD
6	HORN

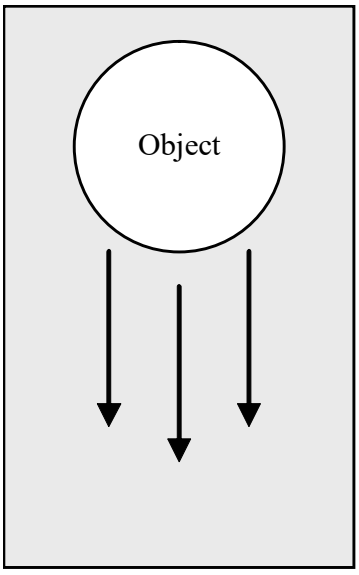
ITEM	DESCRIPTION
7	BOOSTER
8	CONVERTER (105 STYLE)
9	SOCKET HEAD CAP SCREW
10	DOWEL PIN
11	TIP
12	TIP NUT

7. With two spanner wrenches carefully separate the Booster from the Converter. Check and clean the mating surfaces of these components with an oilstone or 600-grit paper as shown below.

   Place 600 grit emery on a hard, flat surface. Place component on emery with the mating side you wish to clean face down.

   Do not press down. Using only the weight of the converter, booster, or horn as downward pressure, drag the component across the emery in a single, straight, long stroke (Figure 7.3).

Figure 7.3 Cleaning object mating surface direction



   Turn the component 90 degrees and repeat step 2. Repeat this procedure until all mating surfaces are clean.

8. Clean and then polish away any roughness on the Diaphragm Spring.
9. Assemble the stack per the steps in the next section.

7.1.3.2 Ultrasonic Stack Assembly

NOTICE	
	See Figure 7.2 for item listings.

1. Clean Horn, Converter, Booster and diaphragm surfaces with solvent to remove all contaminants and previously used paste.
2. Apply an even, light coat of Molykote G-n paste (about equal in size to half a paper match head) to the mating surfaces of the Converter, Booster and Horn. Do NOT apply paste to threaded opening or to stud threads or to diaphragm. Do NOT use silicone grease.
3. Place the Rear Diaphragm Spring (Item 3 – 0.500” diameter center hole) and Clamp Ring (Item 1) onto the studded end of the Booster (Item 7). Then thread the Booster into the Converter. Be careful to center the Diaphragm Spring on the Booster and then torque Booster and Converter to 55 ft/lbs (74.6 N-m) using two spanner wrenches. Do not clamp on the Converter.
4. Slide the Booster/Converter subassembly in through the rear of the Polar Shell. Assemble the twelve M5 SHCS’s to fasten in an alternating pattern the Clamp Ring to the rear of the Polar Shell.
5. Place a Clamp Ring and the Front Diaphragm Spring (Item 2 – 0.750" diameter center hole) onto the studded end of the Horn (Item 6). Then thread the Horn into the Booster. Assemble the twelve M5 SHCS’s to fasten in an alternating pattern the Clamp Ring to the front of the Polar Shell. Be careful to center the Diaphragm Spring on the Horn and then torque Booster and Horn to 80 ft/lbs (108.5 N-m).
6. Replace the Tip and loosely thread on the Tip Nut. (applicable to replaceable Tip Horns only) The Tip (or Horn blade) will have to be made square and parallel to the Anvil prior to welding.

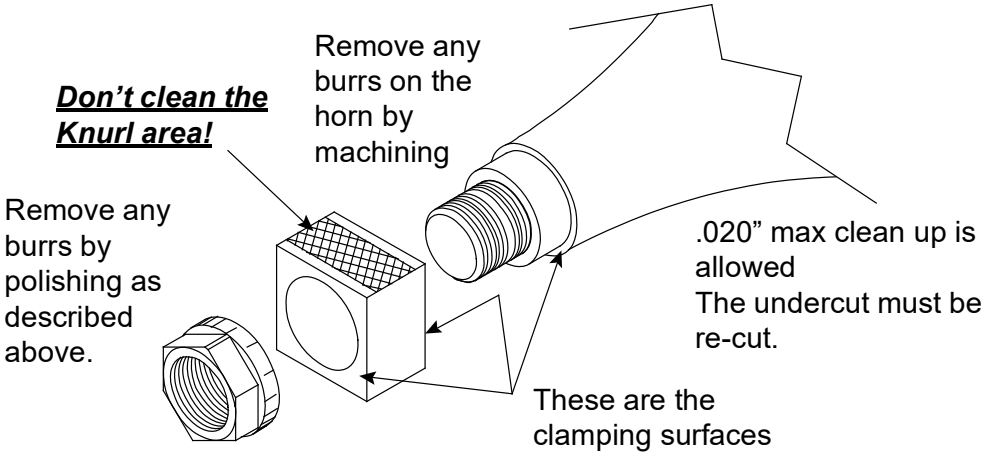
CAUTION	General Warning
	Do not operate ultrasonics while the tip is loose.

7.1.3.3 Reconditioning Tip and Nut Clamping Surfaces (Replaceable Tip Horns Only)

After prolonged use, burrs may form on the clamping surfaces of the tooling. These burrs may be removed from the Tip and Tip Nut by polishing with 600 grit emery paper placed on a flat surface. With light pressure, polish the clamp faces in a Figure 7.3 pattern.

The burrs on the horn clamping surface must be removed by machining back the Horn clamp surface. The least amount of material should be removed, but in no case should more than .020” be removed. The undercut at this clamping surface must also be re-cut

Figure 7.4 Reconditioning Tip and Nut Clamping Surfaces



CAUTION	General Warning
⚠	In no case should more than .020" of material be removed from the Horn clamp surface.

7.1.3.4 Lubrication Schedule

Actual lubrication interval is under the influence of each application and environment.

NOTICE	
ℹ	When re-mounting the slide block to the rail for any reason, care must be taken to avoid dislodging rollers from the tracks within the slide block.

Branson recommends the following schedule as an initial plan to follow:

After 1 month of normal operation:

1. Inspect interior of actuator for possible grease discharge.
2. Re-lubricate slide with specified grease until slide reservoir is full (minimum of 0.6 CC).
3. Allow full travel of the slide unit inside the actuator.
4. Cycle the slide 10-20 to re-circulate the grease.

After 3 months of normal operation:

1. Inspect interior of actuator for possible grease discharge.
2. Re-lubricate slide with specified grease until slide reservoir is full (minimum of 0.6 CC).
3. Allow full travel of the slide unit inside the actuator.
4. Cycle the slide 10-20 to re-circulate the grease.

After 6 months of normal operation:

1. Remove slide assembly from actuator.
2. Inspect the slide block and rail for damage or unusual wear.
3. Re-lubricate slide with specified grease until slide reservoir is full (minimum of 0.6 CC).
4. If slide is damaged or wear is apparent, contact your Branson Representative or Branson Customer Service.
5. Using a setup rail (Branson #105-355); slide the block the full length of the rail 5-10 times manually to re-circulate the rollers through the grease reservoir.
6. Re-assemble the slide assembly within the actuator.

If, after the 1st and 2nd inspections, the slide grease is abnormally low, has discoloration, or there is dust/dirt in the slide block, more frequent inspections will be required.

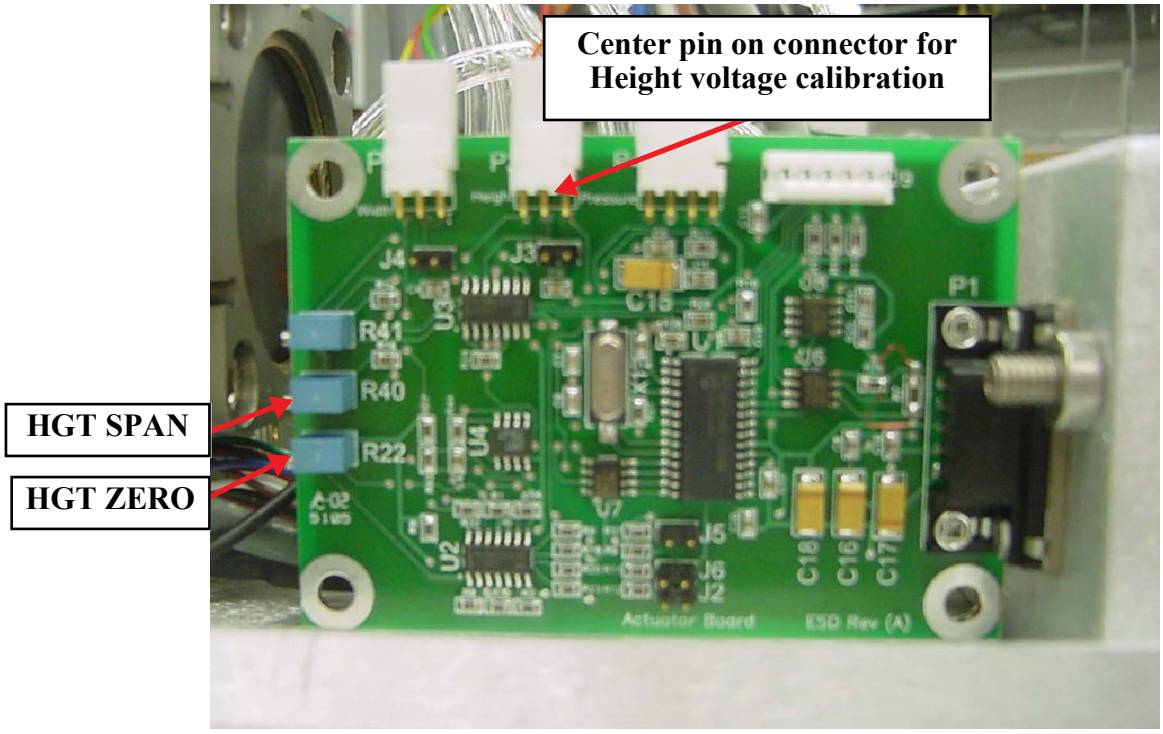
7.2 Calibration

This product does not require scheduled calibration. However, if you are operating under requirements that mandate periodic calibration, for example, the FDA's Good Manufacturing Practices, contact your Branson representative for additional information.

7.2.1 Encoder Board Calibration

Encoder board calibration is factory set and generally does not need to be changed. Any calibration required due to tool wear or adjustment is built into the controller software and may be accomplished using touchscreen commands (refer to your power supply manual). If a new encoder board is installed it will be necessary to calibrate Height as follows.

Figure 7.5 Encoder Board Calibration



7.2.1.1 Height Zero and Span Adjustment

1. From the Controller Maintenance Screen, enter the Height Calibration Screen.
2. Press **HORN** button to lower the horn.
3. Remove the top cover from the actuator and locate the actuator board.
4. Read voltage that is displayed on controller screen.
5. Voltage should read between +2 to +50 millivolts DC. If not, adjust the HGT ZERO (R22) potentiometer (see Figure 7.5) until the voltmeter reads between +2 to +50 millivolts DC (voltage must be positive).
6. From the Controller Maintenance Screen, raise the horn (press HORN button).
7. Adjust R40 until the displayed Calibrated Height reaches approximately 2300 mV and stop turning R40 to set the maximum value.

7.2.1.2 Height Zero and Span Adjustment (alternate)

1. Verify that R22 (102-242-632R Board) is adjusted fully clockwise.
2. From the Main screen, press MAINTAIN.
3. Press HEIGHT
4. Adjust R40 until the displayed Calibrated Height reaches approximately 1974 mV and stop turning R40 to set the maximum value.
5. Using the L-Tool, press the encoder shaft down until it stops at the bottom.
6. Verify that the displayed Calibrated Height is between 2 mm to 8 mm.
7. Slowly let the encoder shaft rise with the L-Tool.

7.2.1.3 Height Calibration

CAUTION	General Warning
	Read all steps completely and exercise caution as tooling moves during the calibration process.

1. Position a 1 mm shim on the tip.
2. From the controller press CALIBRATE. The horn comes down 8 times on the 1 mm shim. “Calibration Step 1 done” message is displayed.
3. Position a 6 mm shim on the tip.
4. From the controller press CALIBRATE. The horn comes down 8 times on the 6 mm shim. “Calibration done” message is displayed. If message “Unsuccessful Calibration” is displayed, repeat steps 1 through 4.

7.3 Troubleshooting

This section shows how to fix some of the possible errors and problems which may occur in normal use of the Ultraweld L20 welding system.

7.3.1 Weld Overload

Weld overloads are premature shut downs of the power supply. Overloads signify excessive loads and must be corrected if continued reliability of the equipment is to be maintained. Hardware internal to the power supply are controlling this function and it can not be defeated.

The control system analyzes the end of weld characteristics to check for overloads. If the system determines an overload an alarm occurs. The control halts action until the system is reset.

Some of the possible causes for overloads are:

- The tool clearances are too small, horn and anvil touch during welding
- Excessive air pressure with low amplitude
- Defective Stack assembly
- Defective Power Transistors in power supply

7.3.2 Low Air Pressure

The control system and its components were designed to run with a clean air supply of from 90 to 100 psi. The control system monitors the air pressure from the low air pressure switch (optional). The low pressure threshold is set from the controller. An alarm occurs when incoming line pressure the drops below the set pressure.

7.3.3 Ready Check

The system undergoes a Ready Check operation at every startup, the end of every weld, and at the exit of Setup mode. This procedure checks the height encoder position. If an incorrect height value is returned, an alarm occurs.

Some of the possible causes of a Ready Check alarm are:

- The horn is stuck in the closed position
- Maintenance has moved the height encoder to an out of limit condition
- Defective encoder or electronics
- Encoder not plugged into its connector

7.3.4 Troubleshooting Chart

Table 7.1 Troubleshooting

Problem	Solution
System will not turn on.	• Power cable plugged in • Power turned on at the outlet • Check internal fuses on the Controller Line Board
Plant fuse fails or circuit breaker trips when plugging the unit into an electrical outlet.	• Inspect power cord, replace if shorted • Check line filter, replace if failed

Table 7.1 Troubleshooting

Problem	Solution
Plant fuse fails or circuit breaker trips during weld cycle	• Check current rating of the plant fuse or the circuit breaker, replace if failed
Line fuse fails	• Check fuse current rating, replace if incompatible • Check fan motor, replace if failed
Horn will not move down or up	• System not connected to air supply • Air not turned on
Get Emergency Stop when system is turned on	• Check Emergency Stop Switch • All cables properly connected • Twist red switch on foot pedal (if system is equipped with one)
No Sonics when test button is pressed	• RF Cable connected • Check RF cable for broken wire • Ribbon cable in power supply between SPM and programmer unplugged
No sonics during weld cycle	• Check all cable connections • Check start cable for broken wires • Check inside power supply for loose start cable from rear of unit to programmer board • Check thermal switch in power supply
Overloads when welding	• Stack not tuned properly • Tooling not set up properly • Crash gap not set properly • Tip nut cracked, replace if needed • Check weld parameters • Check stack interfaces for fretting • Check for loose or failed horn or booster, tighten or replace as necessary
When touching the system you get a slight electrical shock	• Inspect power cord, replace if needed • Inspect system ground, repair if needed
Tooling heats up after machine runs a while	• Cooling air is not turned on or is not on long enough • Cooling air is not directed at tooling
Low weld strength	• Check weld parameters • Check tooling gaps • Check knurl on tooling • If worn replace tooling • Increase Energy • Check the Down stop adjustment • Check for part contamination • Ensure all hardware is tight

Table 7.1 Troubleshooting

Problem	Solution
Excessive welding	• Reset parameters • Reset amplitude • Reset pressure • Measure and re-calibrate amplitude display
Time limit error or peak power error displayed after weld cycle	• Reset limits • Check tip, rotate or replace if worn • Check anvil for wear, rotate or replace if worn • Check air pressure setting • Check up stop for proper adjustment • Process settings have to be opened up due to part variance or limits should be adjusted according to the part/wire being run • Check anvil clamp for proper torque
Squealing sound during welding or when test key is depressed	• Reset gaps • Re-square horn/tip and reset gaps • Reset horn tip and gap
Weld heights are inconsistent	• Re-calibrate encoder with 1mm gauge • Ensure the connector for the encoder is tightly plugged into the actuator card
Horn is stuck in down position	• Check air pressure • Ensure air lines are installed properly • Check for kinks in air lines
Air leaking from machine	• Ensure all air line connections are tight • Check for cracked or broken air lines
Unusual sound during weld cycle	• Check tooling gap • Check converter • Check stack assembly
Squealing sound from power supply when unit is turned on	• Check cooling fans in rear of unit
Maintenance counter alarm	• Reset maintenance counter
Actuator moves sluggish	• Check air lines for contamination **NOTICE** Air must be filtered to 5 microns and be oil and water free. • Check solenoid valve, replace if needed • Check air regulator
System has READY CHECK message	• The horn is stuck in the closed position • Maintenance has moved the height encoder to an out of limit condition • Defective encoder or electronics • Encoder not plugged into the actuator card

Table 7.1 Troubleshooting

Problem	Solution
Time, height and energy inconsistent	• Switch to energy mode & open height window • Make some sample welds • Check the time and the height of the welds for consistency • If the time or weld thickness varies greatly, check the air regulator

7.4 Parts Lists

The following tables list the available Accessories (Table 7.2) and Parts (Table 7.3 and Table 7.4) for the Ultraweld L20 Actuator:

Table 7.2 Available Accessories

Description	EDP Number
Low Gain Booster (1 : 0.6)	11003-02-133
Medium-Low Gain Booster (1 : 0.8)	10000-00-180
Medium-Low Gain Booster (1 : 0.9)	11008-03-133
1 to 1 Gain Booster (1 : 1)	11003-02-033
Medium-High Gain Booster (1 : 1.11)	A8A03A12
Medium-High Gain Booster (1 : 1.28)	10000-00-080
High Gain Booster (1 : 1.6)	11003-02-233
Super High Gain Booster (1 : 1.8)	K1A90A09
Ultra High Gain Booster (1 : 1.9)	K1A90A15
Converter 105	101-135-033R
Horn Solid 2-Lobe Pocket	L1A90A62
Horn Solid 2-Lobe Special	N5A92145
Horn MTS Thread on Tip	G3A90A43
Horn Half Wave Solid Cantil	L1A90A83
Tip Nut	11003-01-043
Tip	G3A90A71

The following table lists items that are highly recommended to have readily available to prevent extended equipment down time and/or setup time.

Table 7.3 Primary Spare Items

Description	EDP Number
Actuator Board	102-242-632R
Linear Encoder	103-096
Spring, Front Diaphragm	N5A50A46
Spring, Rear Diaphragm	N5A50A47

The following table lists items that are recommended to have readily available to prevent extended equipment down time and/or setup time.

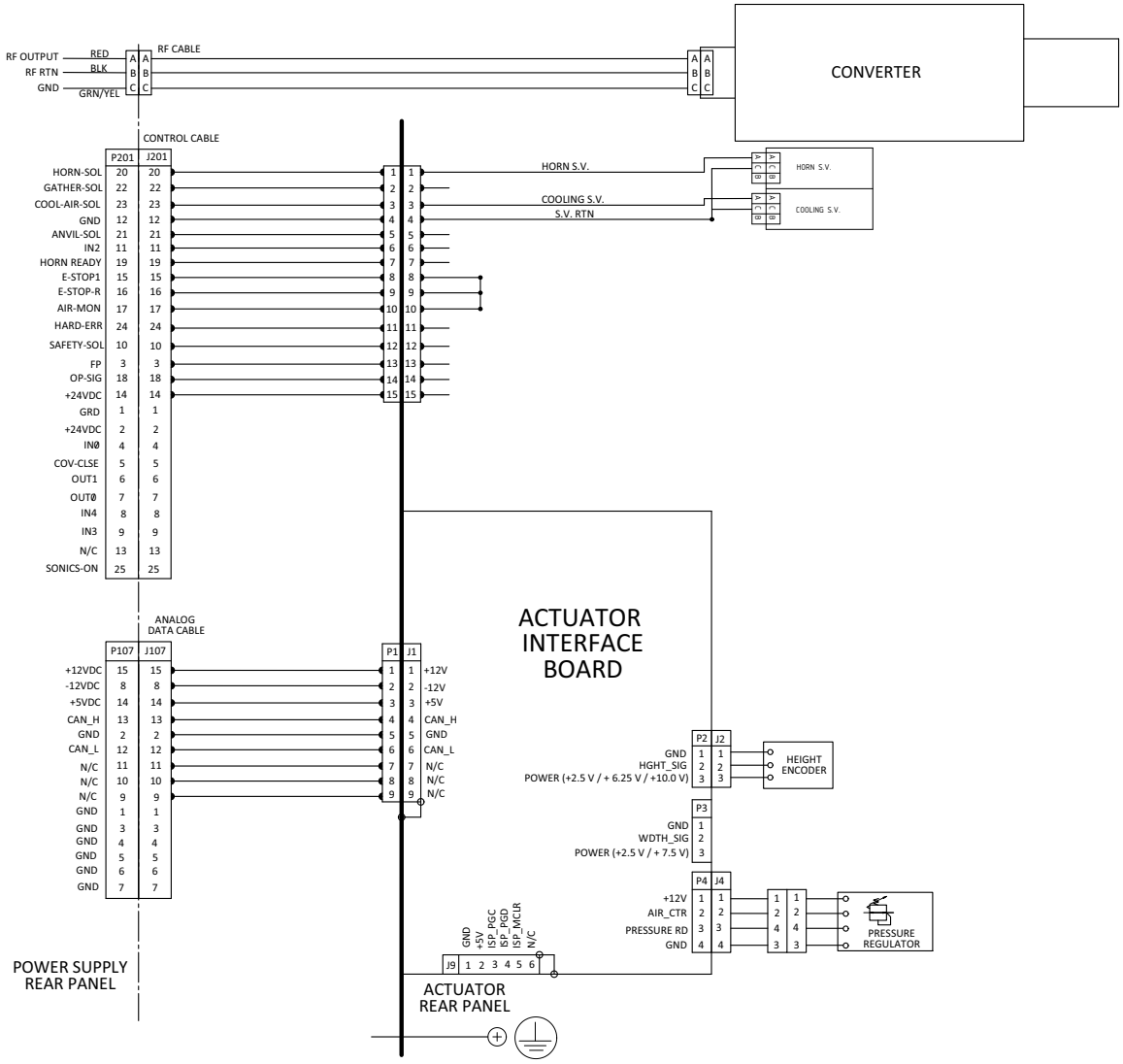
Table 7.4 Secondary Spare Items

Description	EDP Number
Solenoid Valve Assembly	206-151
Electronic Pressure Regulator	207-048
Air Cylinder (63mm Bore)	205-231
Air Cylinder (100mm Bore)	205-230
Slide	105-356

Appendix A: Interconnect Diagram

A.1 Interconnect Diagram

Figure A.1 Ultraweld L20 Interconnect Diagram



Appendix B: Declaration of Conformity

B.1 Declaration of Conformity

Figure B.1 Declaration of Conformity

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EC DECLARATION OF CONFORMITY
According to the Machinery Directive 2006/42/EC
and the EMC Directive 2014/34/EU.

We, the manufacturer

BRANSON DE MEXICO
Carretera Nacional km 8.5
Modulo Industrial America, Lote 4
Nuevo Laredo, Tamaulipas 88277
Mexico

represented in the community by

BRANSON ULTRASONICS, a.s.
Piestanska 1202
915 01 Nove Mesto nad Vahom
Slovak Republic

expressly declare under our sole responsibility that the equipment L20 Ultrasonic Welder System consisting of**:**

Branson welder model Ultraweld L20 Spot used with a Branson ultrasonic power supply model (TS or VGX) L20 (20:2.2 or 20:3.3 or 20:4.0) and associated cables.

in the state in which it was placed on the market, fulfills all the relevant provisions of the Machinery Directive **2006/42/EC** and the EMC Directive **2014/30/EU**. The safety objectives set out in the Low Voltage Directive **2014/35/EU** were kept in accordance Annex 1 No. 1.5.1 of the Machinery Directive 2006/42/EC.

The object of this declaration is in conformity with relevant Union harmonization legislation. The equipment, to which this declaration relates, is in conformity with the following standards:

EN 60204-1:2018
EN ISO 12100:2010
EN ISO 13849-1:2015
EN ISO 13849-2:2012
EN ISO 13850:2015
EN 55011:2016/A1:2017
EN 61000-6-2:2005

DocuSigned by:
Luis Benavides
0182358F CDE 147C...

Nuevo Laredo, Tamaulipas, MX
April 8, 2022

Luis Benavides
Branson Product Safety Officer

CE Marking Affixed: 2022

CE

CC: Technical Publications

Person authorised to compile the technical file:
BRANSON ULTRASONICS, a.s.
Piestanska 1202
91501 Nove Mesto nad Vahom
Slovak Republic

Figure B.2 UK Declaration of Conformity

UK DECLARATION OF CONFORMITY

UK CA

We, the manufacturer

BRANSON DE MEXICO
Carretera Nacional km 8.5
Modulo Industrial America, Lote 4
Nuevo Laredo, Tamaulipas 88277
Mexico

expressly declare under our sole responsibility that the equipment L20 Ultrasonic Welder System consisting of**:**

Branson welder model Ultraweld L20 Spot used with a Branson ultrasonic power supply model (TS or VGX) L20 (20:2.2 or 20:3.3 or 20:4.0) and associated cables,

in the state in which it was placed on the market, fulfills all the relevant provisions of:

Supply of Machinery (Safety) Regulations **2008**
Electromagnetic Compatibility Regulations **2016**
Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations **2012**.

The object of this declaration is in conformity with relevant UK Statutory Instruments and their amendments. The equipment, to which this declaration relates, is in conformity with the following designated standards:

EN 60204-1:2018
EN ISO 12100:2010
EN ISO 13849-1:2015
EN ISO 13849-2:2012
EN ISO 13850:2015
EN 55011:2016/A11:2020
EN 61000-6-2:2005/AC:2005

DocuSigned by:
Luis Benavides
018235BFCDE147C...

Brookfield, CT, USA
October 19, 2022

Luis Benavides
Branson Product Safety Officer

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