Original Instructions
DCM01190 - REV. 04

EMERSON

Ultraseal 20 EX

Metal Welding System

Product Manual

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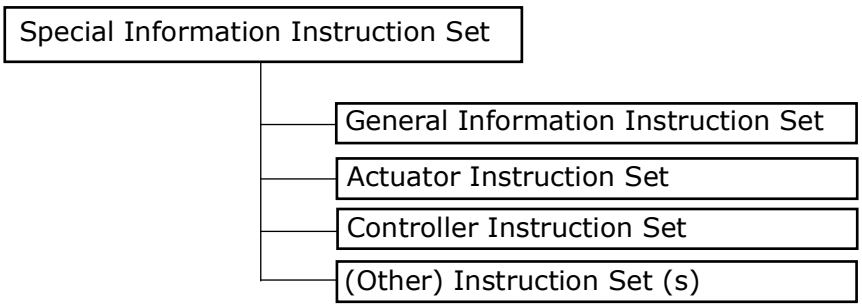
BRANSON

Introduction

This is the product manual for your BRANSON Metal Welding ultrasonic welding system.

Several combined Instruction Sets form the contents of this manual. This section contains information which relates most uniquely to you as the customer, your particular system and application. It also documents other Instruction Sets used in the manual. The figure below illustrates how the manual is organized.

Branson Metal Welding Product Manual



Using this manual

It is highly recommended that you read and understand the contents of this manual prior to operating your Branson Metal Welding system. Each Instruction Set has a table of contents and is intended to logically group information in a manner which the user will find convenient.

Classification of Hazards

The safety indications in this manual are divided into different classes. The figure below shows the assignment of symbols (pictograms) and signal words to the specific hazards and its potential consequence.

WARNING	
	A potentially dangerous situation that could cause injury to persons and serious damage to equipment.

CAUTION	
	A situation that may cause damage to the equipment.

NOTICE	
	Useful information, an application hint or other important or useful information.

Original Instructions
DCM00003 - REV. 07

EMERSON

MWX100 / Ultrasplice
Systems

Instruction Manual

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BRANSON

Introduction

This Instruction Set includes common information which relates to Branson products. It will help you in setting up your system and to understand the fundamentals of the ultrasonic metal welding process.

Thank You

Thank you, and congratulations on selecting Branson MWX100/ ULTRASPLICE Systems for your welding production. This system has been developed to produce the highest quality welds at the lowest cost per weld.

If you should experience difficulty or have any recommendations for improvement, please do not hesitate to contact us.

Please be advised that the MWX100/ ULTRASPLICE machine is protected under the United States and International patents listed below. This operator's manual is also protected by copyright and may not be copied without prior written permission by Branson.

Trademarks

MWX100 and ULTRASPLICE are registered trademarks of Branson Ultrasonics Corp.

Copyright

Table of Contents

List of Figures

Chapter 1: Safety and Support

Chapter 2: Introduction

Chapter 3: Shipping and Handling

Chapter 4: Troubleshooting

Chapter 5: Maintenance

List of Tables

Chapter 1: Safety and Support

1.1 Intended Use

This equipment is for the joining of metal parts using ultrasonic energy. A complete system includes an actuator, controller and tooling (which delivers mechanical energy to the work pieces). Some systems also include special fixturing and machine automation. Branson systems may only be utilized to weld soft, ductile, metal parts together with Branson-supplied weld tooling (such as horns, tips, anvils, and converters) unless an explicit, written, contrary agreement between the ordering party and Branson has been consummated.

1.2 Safety, Personal

1.2.1 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.

1.2.2 Emergency Stops

In case of danger, hit the red, emergency stop which is found on the red, top portion of the foot pedal. The actuator, power supply and related fixturing 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.

1.2.3 Controller Cover

The power supply is equipped with a top cover which should only be removed for maintenance and installation purposes.

1.2.4 Safety Guidelines

For operating safety, please observe the following precautions:

- Plug the power supply into a grounded electrical supply to avoid electrical shock
- Ensure that no one is in contact with system moving parts when operating
- Keep hands away from the horn tip as high force and ultrasonic vibration can cause injury to hands and fingers
- Do not test ultrasonics when the converter is removed from the actuator. Without the converter there is the danger of damage or shock
- Before adjusting or repairing the ultrasonic stack or power supply, disconnect the line power
- Any unauthorized modification of the units control circuitry or wiring may cause a malfunction, which could result in injury to operating personnel
- Do not operate the equipment until repairs and adjustments have been made and the equipment is in good working order

1.3 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:

- 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

1.4 Safety, System

1.4.1 System Protection Monitoring (SPM)

The SPM (System Protection Monitoring) stops ultrasonics when the power supply has been overloaded or when inappropriate or defective horns are used.

1.4.2 Thermal Switch

A thermal switch is contained within the power supply to automatically disconnect power to the machine if the unit gets too hot. This will occur if the exhaust fans from the generator are inadvertently blocked or clogged.

1.4.3 Daily Functional Safety Checks

- Check the machine tip and anvil for any signs of grinding, cracking, or galling that could be the result of misalignment or tooling contact. Replace tooling that has excessive wear
- Check for any loose material or debris in the welding cavity, cleaning it out
- Check all parameter settings on the controller to ensure they are properly set for the weld to be made
- Drain water and contaminants from the airline filters as necessary

1.5 Contacting Branson

1.5.1 Spare Parts & Replacement Tooling

Spare parts or replacement tooling for the ultrasonic welding system may be ordered directly from Branson. A spare tooling specification sheet is included in the Special Information Instruction Set. Additional part listings are contained in the Actuator and Touchscreen Controller Instruction Set sections of this manual.

Branson will work with you and recommend components you need and should carry in inventory based upon your manufacturing philosophy and or production needs. We will quote price, delivery and can coordinate special arrangements such as expedited service or blanket orders.

When Ordering Spare or Replacement Parts, have the purchasing agent Fax the order to us with the following information provided:

- Purchase Order Number,
- Branson Part Number, Quantity, and Date Required,
- Ship To Information, (including "Ship to the Attention of")
- Bill To Information
- Shipping Instructions, (such as air freight, truck, etc.)
- Special Instructions, (such as "Hold at Pick-Up Counter and Call" -- Be sure to provide a name and a phone number)

1.5.2 Questions or Problems

If you have any questions or are experiencing a problem, call the local Branson field sales and/or service representative. He or she will be familiar with your equipment and application and, in most cases, will be able to help you. He or she may have the replacement part you need, in stock, that will return your system to operation in the shortest possible time.

If necessary, the representative will contact Branson for additional service and, in some cases, will put you into contact with the appropriate personnel. If the local representative is unavailable, please call us directly.

Before you call, take the following steps:

- Have this manual with you
- Know how your system has been set up and equipped, including your MBOS version
- Be able to describe the situation or problem
- Have a list of steps that you have already taken
- Have a list of spare parts in your inventory
- Have the name and phone number of the Local Branson Representative

1.5.3 Returning Equipment

In order to properly and efficiently handle an equipment return to Branson, the following procedure must be followed. Contact your Local Sales Manager or Branson Customer Service for assistance. Proper handling and identification of your equipment will expedite servicing and/or return.

Call Branson and Receive a Return Authorization Number (RA#) from Branson Customer Service.

- Properly package the equipment to prevent damage
- Clearly mark the RA# on the outside of the package
- Include a copy of the completed Return Authorization Form inside the package
- Return general repairs by any convenient method. Send priority repairs via Air Freight
- Prepay the transportation charges, (FOB Brookfield, CT)

Complete the following in the Return Authorization Form:

- Customer Information Section
- Description of Problem
- Equipment Information

1.5.4 New Applications

Branson is always eager to work with you on a new ultrasonic application. Whether it be a manual workstation, a semi or fully automated system, Branson has the personnel and technical competence to support your requirements. Branson's application laboratory, product and automation engineering, customer service and manufacturing capabilities are second to none. Branson is the world leader in ultrasonic metal welding and our business philosophy is practiced to assure customer success.

Application assistance is always available. For initial application review, contact your Local Sales Manager who can indicate initial feasibility and assist you in completing an Ultrasonic Weld Evaluation Request For. Please complete one (1) request form for each application.

Please fill out the Ultrasonic Evaluation Request Form, complete the customer and application information section and forward it to Branson along with enough component material to produce 24 assemblies, (if this is not practical please advise). A feasibility evaluation will be performed and samples returned, for review, along with a system quotation/ proposal. Be sure to include drawings of the completed assembly and include the electrical, mechanical, and production requirements. Complete the form as completely as possible. The Branson Sales Representative can assist you.

1.6 Warranty

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

Chapter 2: Introduction

2.1 Ultrasonic Theory

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.

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 (Figure 2.1). The parts are "scrubbed" together under pressure at 20,000 or 40,000 cycles per second. This high frequency vibration, applied under force, disperses surface films and oxides, creating a clean, controlled, diffusion weld (Figure 2.2). As the atoms are combined between the parts to be welded, a true, metallurgical bond is produced.

Figure 2.1 Transforming Electrical Energy into high frequency mechanical vibration

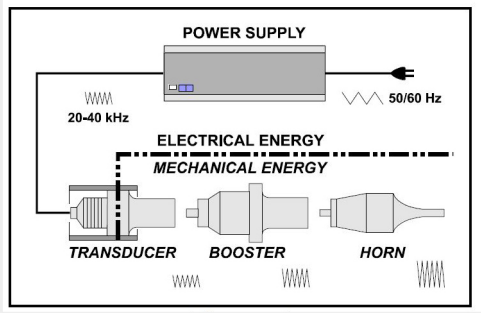
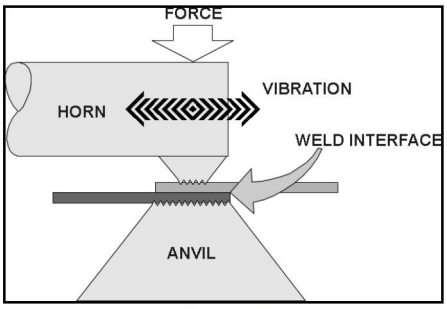


Figure 2.2 High frequency vibration Welding



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

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.

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

$$P = F \times A$$

Where:

- P = Power (watts)
- F = Force * (psi)
- A = Amplitude (microns)

NOTICE	
	Force is determined by multiplying: Force = (Surface Area of the Cylinder) X (Air Pressure) X (Mechanical Advantage)

Energy is calculated as:

$$E = P \times T$$

Where:

- E = Energy (joules)
- P = Power (watts)
- T = Time (seconds)

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

$$E = (F \times A) \times T$$

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.

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.

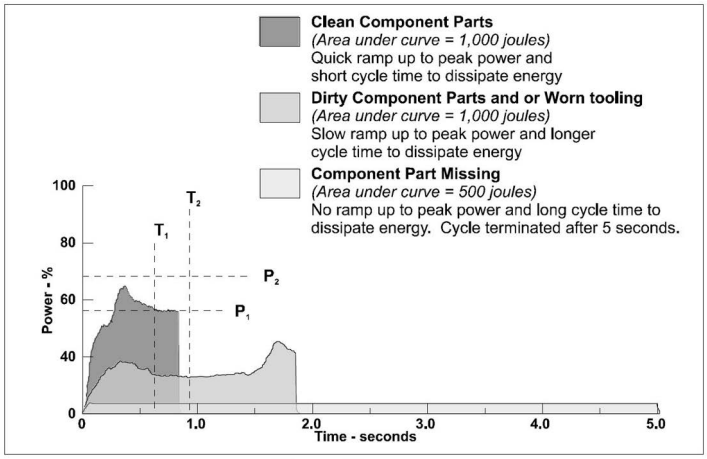
Welding to energy is necessary because of the non-metallic oxides that form on the metal's surface as well as other contaminates such as grease and dirt. To producing quality welds reliably it is necessary that the surfaces to be joined are clean. The high frequency scrubbing action, combined with pressure,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

The following graph (Figure 2.3) illustrates a weld produced. The weld 'power graph' is sometimes 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.

Power

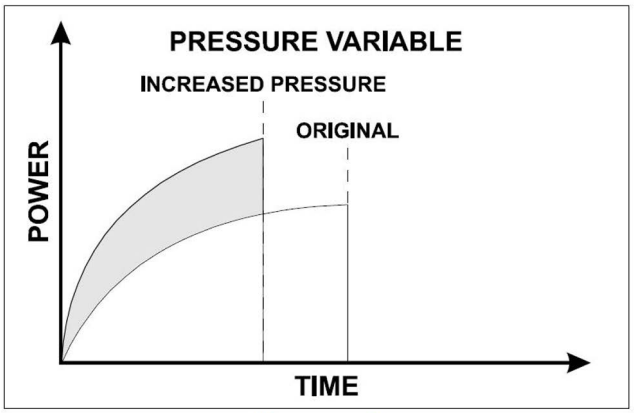
The converter/ booster/ horn, (stack assembly), requires minimal electrical power to initiate and maintain motion (vibration) at a 'no-load' condition. As the mechanical load increases, the power required to maintain the mechanical vibration also increases. The maximum power required during a weld cycle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

Figure 2.3 Weld 'power graph' (weld footprint)



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 to deliver the same amount of Energy. This relationship is illustrated in the following diagram (Figure 2.4):

Figure 2.4 Pressure, Power, and Time relationship

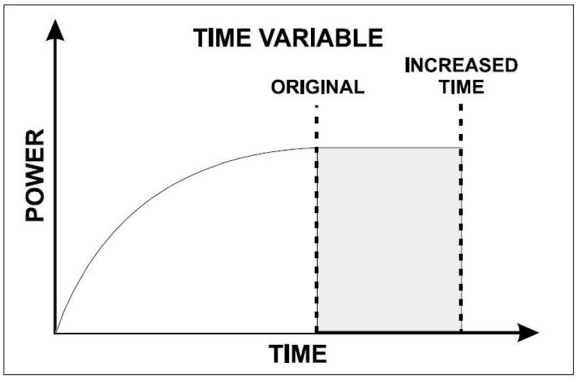


The difference in the appearance of each of the above weld graphs is the result of increased Power loading. Based upon an increase in Pressure, additional Power is required to maintain the motion of vibration. Thus, the same amount of energy is delivered in less time. This approach is typically used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

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 2.5).

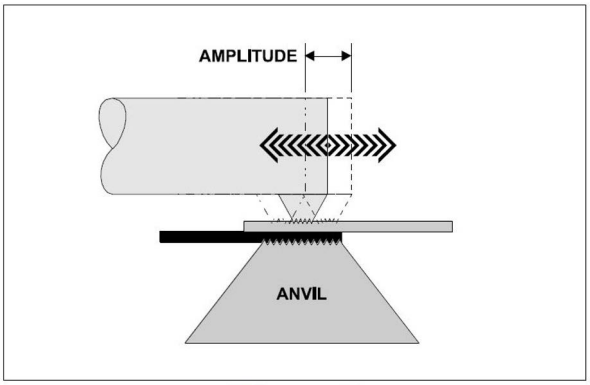
Figure 2.5 Weld Time



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 2.6). 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.

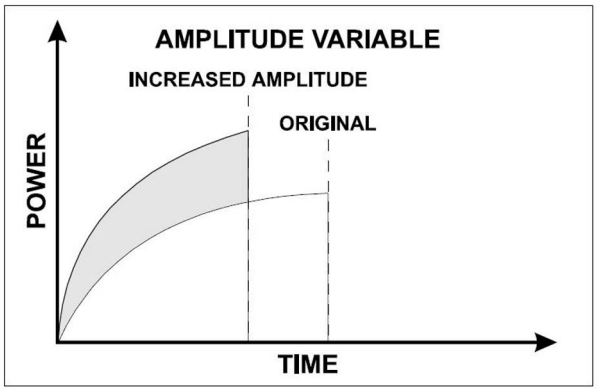
Figure 2.6 Amplitude



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 power diagram (Figure 2.7):

Figure 2.7 Power, Time, and Energy relationship

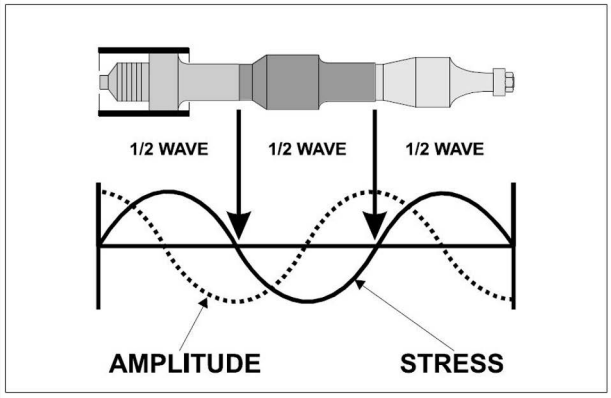


Resonant Frequency

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 anti-nodes. This action results in a resonant wave being transferred through the tooling (Figure 2.8). 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 2.8 Resonant Frequency



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. Electronic circuits in the system will protect the power supply if this condition exists.

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

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.

2.2 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 for efficient 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. (Also See: AFTER BURST & AFTER BURST DURATION).

After Burst Duration: The amount of time, in seconds, that AFTER BURST energy is delivered. (Also See: AFTER BURST & AFTER BURST DELAY).

Amplitude: Amplitude is the peak-to-peak displacement of mechanical motion as measured at the face of the horn tip. Amplitude is measured in thousandths of an inch or in microns. (i.e. A standard 40 kHz converter produces approximately .0004" or 10 microns of amplitude), Inches x 25,400 = microns. -- With 'Advanced Power Supply' 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.

Baud Rate: A communications measure describing the speed at which signals are transmitted serially (the number of signal events per second).

BBRAM: 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 BBR).

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 energy (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.

Clock: An electronic circuit that generates timing pulses to synchronize the operations of various other circuits in a device(s).

Communications: Transmission of information between points of origin and reception without alteration of the sequence and or structure of that information content.

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 Operation Manual to document the spare tooling for a specific metal welding application.

Continuous Sonics Mode: A system setting in which the power supply will deliver ultrasonic electrical energy until the start signal is terminated.

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

Converter: A device which utilizes a lead-zirconate-titanate electrorestrictive 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.

Hand Shaking: The procedure (signal exchange) when a connection is established between two electronic devices. A common example is the signal exchange between a terminal and a MODEM. These signals (hardware and software) are used to control the flow of data (start/stop) between devices.

Height: A display 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, (40 kHz = 2.2" ±, 20 kHz = 5.5" ±).

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 welded surfaces.

Linear Height Encoder: (See: Height Encoder).

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

Maintenance Counter: A programmable device used to alert production personnel of the need to review / inspect application tooling and/or the ultrasonic system for preventive maintenance purposes. The device increments one (1) count for each system cycle. (See: Counters).

Mode: The method of operating the system (also see 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: A programmable device 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 40 kHz, (40,000) or 20 kHz, (20,000) 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.

Preheight: 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: System memory available for storage and retrieval of welding parameters.

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 condition will exist.

Setup Mode: The condition the control box must be in prior to adjusting parameters, quality windows, and/or any others settings except those contained within the Command Mode.

Squeeze Time: The amount of time after the ultrasonic tooling engages the component(s) and before delivery of ultrasonic energy. -- Adjustable from 0 - 0.5 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).

Weld Mode:

- **Weld In Energy:** System delivers ultrasonic energy until a predetermined amount of energy, in joules is dissipated. The system determines energy by calculating the area beneath the power curve -- Watts x Time = Joules (1 watt per second = 1 joule).
- **Weld In Height:** System delivers ultrasonic energy until the ultrasonic tooling reaches a predetermined position.
- **Weld In Time:** System delivers ultrasonic energy for a predetermined amount of time.
- **Welding Parameters:** (See: Parameters).

Chapter 3: Shipping and Handling

3.1 Unpacking, Handling & Installation

Unpack the Actuator and Touchscreen Controller. Remove the top cover of the power supply and check if any components became loose during shipment.

3.1.1 If damage has occurred

Notify the shipping company immediately. Retain packaging materials for inspection and possible re-use.

3.1.2 System Location

Locate the Touchscreen Controller in an area away from radiators or heating vents. Allow sufficient clearance in back of the controller to access the connectors. Observe the following:

- Do not block the exhaust or air intake areas. Proper air circulation is necessary to maintain a safe operating temperature
- Only operate the controller within an ambient temperature range of 41ºF to 122ºF (5ºC to 50ºC)
- Verify that neither dust nor dirt are allowed to restrict the flow of air exhaust or air intake. Clean the air ports as necessary

If the temperature of the power supply exceeds the recommended operating range, a thermal switch will stop ultrasonics and the power supply will display an Overload alarm. Ultrasonics will remain off until the power supply cools to a safe operating temperature and the RESET button is pressed.

If the environment is excessively dirty or oily, contact Branson for assistance. Special Touchscreen Controller enclosures, filters (i.e. filter/separator/regulator), and other equipment are available.

3.1.3 System Assembly

Connect the actuator system per the Hookup diagram contained in the Special Information Instruction Set. Verify that connections are complete and correct before proceeding. Plug the Controller into a proper power source. See the Touchscreen Controller Instruction Set for power specifications, plugs and receptacles used.

To prevent the possibility of an electrical shock, always plug the power supply into a grounded power source. Be sure the power switch is in the Off position before making any electrical connections.

Connect the system to a clean (5 micron air filter with 0.5 micron mist separator), dry, 80 psig (5.5 bar) minimum air supply. See the Actuator Instruction Set for information on the set up of application tooling and the use of this equipment for ultrasonic welding.

3.1.4 Crash Gap Adjustment

In most applications, adjustment of the gap between the ultrasonic Horn Tip and the Anvil is factory set to prevent these surfaces from contacting each other when no parts to be welded are present and the foot pedal is depressed. A poorly adjusted crash gap can cause serious damage to the tooling. See the Actuator Instruction Set for proper setup instructions.

3.1.5 Operating the System

With all proper connections made and with tooling properly set up, welding may be performed. In most instances it is likely that Branson has developed weld settings for your application and stored them as presets in the controller prior to shipping. See the Touchscreen Controller Instruction Set for information on retrieving presets. For other

weld parameter information pertaining to your system, see the parameter preset page included in the Special Information Instruction Set.

Chapter 4: Troubleshooting

4.1 Troubleshooting

This section shows how to fix some of the possible errors and problems which may occur in normal use of the MWX100/ Ultrasplice system.

4.2 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 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

4.3 Low Air Pressure

The control system and its components were designed to run with a clean air supply of from 90 to 120 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.

4.4 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 in to its connector

4.5 Troubleshooting Guide

Table 4.1 Troubleshooting Guide

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.
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. Press 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 thermo switch in power supply.

Table 4.1 Troubleshooting Guide

Problem	Solution
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.
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.

Table 4.1 Troubleshooting Guide

Problem	Solution
Squealing sound during welding or when test key is depressed.	Check plate screws and tighten or replace. Check cover plate screws and tighten. Reset gaps. Re-square horn/tip and reset gaps. Reset horn tip and gap.
Weld heights are inconsistent.	Re-calibrate encoders 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 arm moves sluggish.	Check air lines for contamination. **NOTE:** 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.
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.

Chapter 5: Maintenance

5.1 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.

Daily

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

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

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

5.1.1 FSR Assembly

Air Filter/Separator/Regulator (Optional Branson Part #207-020) should be serviced after 1 year or when a pressure drop of 15 psi is reached.

- Disconnect the air supply
- Remove and clean out filter bowl with a clean rag
- Replace the white filter element and re-assemble
- Remove and clean out separator bowl with a clean rag
- Replace brass-colored filter element and reassemble
- Reconnect air supply

Do not use solvent to clean filter bowls.

CAUTION	
	Clean the air filter bowl with a mild household soap only. The bowl is made from a polycarbonate material, which can rupture if exposed to synthetic lubricating oils solvents or harsh chemicals. The bowl is rated for a maximum line pressure of 140 psig (1043 kPa) and a maximum temperature of 120ºF (49ºC).

EMERSON

Original Instructions
DCM00052 - REV. 03

Ultraseal 20 EX

Actuator

Instruction Manual

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Table of Contents

List of Figures

List of Tables

Chapter 1: Ultraseal 20 EX Actuator

Chapter 1: Ultraseal 20 EX Actuator

1.1 Mechanical Actuator Specifications

The ULTRASEAL 20 EX system is comprised of a controller and mechanical actuator. The mechanical actuator is the subject of this Instruction Set. It rigidly holds the converter and horn assembly known as the ultrasonic stack (Figure 1.2 Ultrasonic Stack Assembly). A pneumatic cylinder drives the anvil towards the horn to apply precise pressure to the tube being sealed. The application tooling (i.e. anvil & replaceable tip) is designed for easy replacement.

Figure 1.1 Ultraseal 20 EX Actuator

Table 1.1 Specifications Ultraseal 20 EX

Specifications	ULTRASEAL 20
Actuator	G7A00000
Length	22.3” (566 mm)
Height	9.7” (246 mm)
Width	3.6” (91 mm)
Weight	26.5 lbs. (12 Kg)
Stroke	0.563” (143 mm)
Tooling Extension (½ wave)	5” (127 mm)

1.2 Ultrasonic Stack Assembly

The converter-booster-horn assembly, or ultrasonic stack, is supported by means of two diaphragm springs clamped between a spring retainer and a nut ring. The diaphragm springs are mounted at either end of the booster and are securely bolted to the nut ring and spring retainer.

The diaphragm shaped springs are made from titanium and are acoustically tuned at the 20 kHz operating frequency. This system permits very efficient transmission of ultrasonic vibration along the axis of the ultrasonic stack while providing an extremely rigid mounting.

Figure 1.2 Ultrasonic Stack Assembly

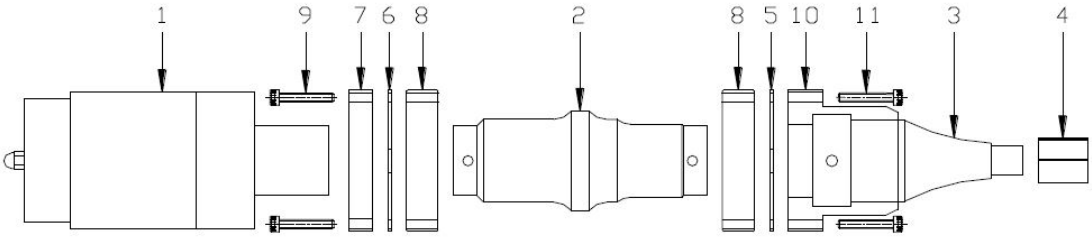


Table 1.2 Ultrasonic Stack Assembly

Item	Description	Item	Description
1	Converter	2	Booster
3	Horn	4	Tip
5	Front Diaphragm Spring	6	Rear Diaphragm Spring
7	Spring Retainer	8	Nut Ring
9	M5 x 20 mm SHCS	10	Nodal Support
11	M5 x 30 mm SHCS		

1.2.1 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 current expands and contracts.

The converter's efficiency of changing electrical energy to mechanical vibrations exceeds ninety-five percent.

1.2.2 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 and is designed to resonate at the same frequency as the converter with which it is to be used. A booster has two functions:

- As a rigid mounting for the converter/booster/horn stack and
- As an amplitude-of-vibration increaser 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

1.2.3 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 titanium and is designed to resonate at 20 kHz.

The acoustical efficiency of 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. The horn with a tip (Figure 1.3), can be rotated or replaced.

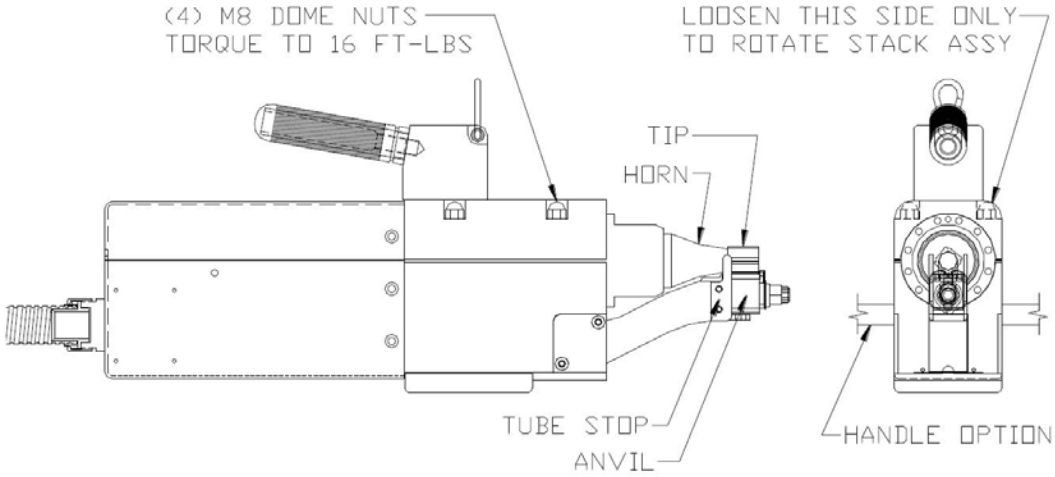
1.2.4 Welding Tip

The welding tip is designed to flatten (crimp) the tube and deliver the ultrasonic vibrations into the bonding area while cutting the tube off just past the sealing point. Replaceable welding tips are fabricated from high-grade tool steel and heat-treated to precise specifications to provide maximum life. The tip is coated to further enhance tool life and provide corrosion resistance.

1.2.5 Actuator

The ultrasonic stack is mounted into a cast aluminum housing. An air cylinder through a linkage to the anvil drives the anvil upwards towards the horn to apply a precise force to the tube being sealed and cut.

Figure 1.3 Horn with a Tip



1.2.6 Anvil

The anvil is made of high grade tool steel and coated for maximum wear and corrosion resistance.

1.2.7 Tube Stop

The tube stop is mounted just behind the anvil and provides a back-stop for positioning of the tube.

1.2.8 Operating Instructions

When properly set up the ULTRASEAL 20 EX System will produce quality seals by simply placing the appropriate tubing against both tube stops and actuating the start switch. Consistent quality tubing is important to maintaining a reliable process. The following material specification is recommended and will produce the most reliable results.

1.2.9 Tube Specifications

Preferred Copper Tube Properties:

Material: C12200.

Cu%: 99.9 (min).

P%: 0.015-0.040.

Total Bi, Pb, P content %: Not to exceed 0.10.

The material should conform to ASTM B 280-88 or 95A.

Temper:

"O" Soft annealed to 50-60.

Tensile strength 17,000 psi.

Yield Strength 11,000-13,000 psi.

% Elongation 40-50.

Grain size 0.1 micron max.

Hardness, Rockwell 15T scale 42-46.

The tube should be free from cracks or tears on the outer surface when bent 180º around a plate with thickness 1.5 times the I.D. of the tube.

The tube should be free from excessive porosity or grain boundary inherent to hydrogen embrittlement or physical structure indicating any segregation of grain boundary, when subject to the following:

Tubing shall be heated at 850 +/- 25º C for 30 minutes in a hydrogen environment. It may be etched with $FeCl_3$ if necessary.

The location of the weld should ideally be at least 3" (75mm) away from any brazed joint in the refrigeration system. This will minimize the effect of the heat hardening and oxidation which takes place during brazing.

1.2.10 Seal Parameters

To obtain quality seals each and every time, the correct combination of weld parameter settings must be developed. These parameters include:

- Height (mm)
- Trigger Pressure ("Force", psi/bar)
- Weld Pressure, Pressure During Sonics (psi/bar)
- Amplitude (Microns)
- Energy (Joules)
- Time (Seconds)

- Power (Watts)
- Seal Height (mm)

Table 1.3 Start point reference for various tube sizes

Tube Size	Wall Thickness	Seal Height	Weld = Trigger Pressure	Amplitude	Energy	Time Range	Power
Capillary	.028″ .70mm	.030″ - .038″. .75mm - .95mm	≈ 20 psi	45 – 55 microns	1500 joules	0.25 – 1.75 sec	≈ 600 watts
¼″ 6.4mm O.D.	.028″ .70mm	.030″ - .038″. .75mm - .95mm	≈ 50 psi	50 – 60 microns	2400 joules	0.25 - 1.75 sec	≈ 1500 watts
5/16″ 8.0mm O.D.	.028″ .70mm	.030″ - .038″. .75mm- .95mm	≈ 65 psi	50 – 60 microns	3200 joules	0.25 - 1.75 sec	≈ 2200 watts
3/8″ 9.5mm O.D.	.028″ .70mm	.030″ - .038″. .75mm - .95mm	≈ 75 psi	55 – 65 microns	4200 joules	0.25 - 1.75 sec	≈ 3200 watts
½″ 12.7mm O.D.	.028″ .70mm	.030″ - .038″. .75mm - .95mm	≈ 80 psi	60 – 70 microns	7000 joules	0.25 - 2.25 sec	≈ 4000 watts

For all tube sizes:

Squeeze Time: 0.25 sec

Hold Time: 0.30 sec

Pre Height min/max: 1.5mm – 15 mm

Height min/max: 0.5mm- 15mm

1.3 Explosion Proof Protection System

1.3.1 ”EX” Overview

When the air supply to the controller is open, a continual flow of air will purge the actuator.

The actuator is gasket sealed to minimize uncontrolled leakage from it and is designed to have controlled air flow and venting. The sealed actuator assembly allows purge air to pressurize it. This positive pressure does not allow intrusion of outside air or gases from the working environment to enter the actuator. An air pressure switch (self bleed/decay type) located in the controller is connected to feedback air line and continuously monitors air pressure in the actuator. An internal circuit in the controller verifies closure of the air pressure switch before the system power can be turned on. In addition, the circuit will shut system power if pressure inside the actuator falls below a set pressure point.

NOTICE	
	The removal, disabling or modification of the pressure monitoring system will void any “EX” certification.

1.3.2 Installation Requirements for the Ultraseal 20 EX

NOTICE	
	Be aware of any external effects and/or aggressive substances the equipment might be subjected to while in service.

- The controller must be located away from the “EX” environment in an area which is not considered a hazardous zone and is not therefore subject to “EX” regulations.
- The Branson supplied environmentally sealed electrical/air harness must be used to connect the actuator to the controller.
- Clean, dry air must be supplied to the controller at a minimum pressure of 80 psi and filtered to 5 microns or less.
- The air supply line must be equipped with a manual shut off valve which is located close to the controller.

1.3.3 Basic Start Up Procedure

- Turn air supply to the controller on. The actuator will immediately start to purge and pressurize with air supplied from the controller.

- After allowing the air supply to purge for at least 43 seconds, press the main power switch located on the front of the controller.
- Once the system power is on, close the main air supply. If the "EX" safety system is working properly, the system will power down within several seconds as the actuator purge pressure drops below the preset safety level.
- If the system does not power down once the air supply is turned off do not attempt to operate the actuator in an "EX" environment. Contact Branson service department immediately.
- If the system shuts down when the main air supply is closed the "EX" safety interlock is working properly. Open the air supply and restart the system.

1.3.4 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. Electronic circuits in the system will protect the power supply if this condition exists.

1.3.5 Air Purging of the Tooling

The actuator is equipped with a system to supply compressed air to the tube and the tooling during the weld, to expel any ambient gas and cool the tooling. The air is set to come on at the beginning of the weld cycle and remain on for 30 seconds after the weld is finished. Although the cooling parameters are adjustable through the touchscreen controller the above parameters should be maintained.

1.3.6 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 in addition to those found in the General Information Instruction Set under Periodic Maintenance.

1.3.7 Recommended Maintenance

Daily:

- Perform pressure switch safety test as outlined in 1.3.3 Basic Start Up Procedure.
- Check cut gap (Figure 1.5 Cutting Gap).
- Check crash gap (Figure 1.6 Crash Gap).
- Perform Height Encoder Zero Set. See 1.5.1 Height Encoder Zero Set.
- Check weld parameters energy, height, and time.
- Inspect and clean tooling. Look for excessive wear, chips, or cracking. If found, tooling should be rotated and the stack should be re-tuned. If the stack cannot be tuned, the tip should be replaced. This will prevent poor sealing in production.
- Measure the final weld thickness of sample parts to determine if they are within predetermined tolerance range. Adjust proximity switch as necessary to achieve final weld thickness. See 1.5 Setting Weld Height Proximity Switch.

Once a Month:

- Inspect all cables and connections for any twisting or stress on the connectors.

Every Three Months:

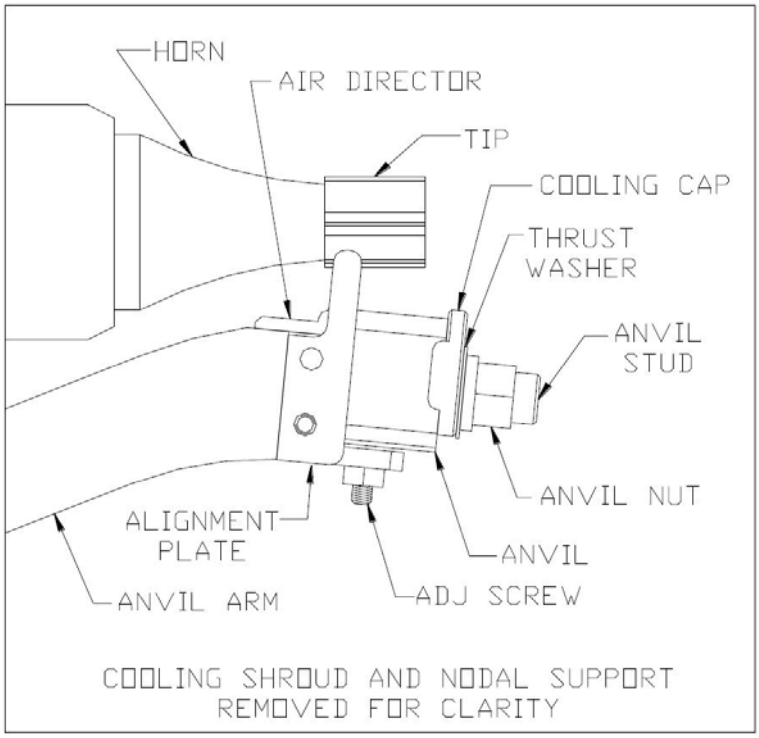
- Service stack. Disassemble, clean interfaces and re-assemble Tightening to the proper torque.

1.4 Tool Gap Requirements

Tooling includes the Horn, Tip, Anvil and all surfaces that contact the tube to be sealed during processing. The tooling should be inspected to confirm a proper gap. If the tooling is in contact during the application of ultrasonic energy, severe damage may result to the tooling and power supply.

NOTICE	
	Check the tool gap whenever tooling is changed or whenever tool contact is suspected.

Figure 1.4 Tooling Setup, Rotation and Replacement



1.4.1 Tooling Setup, Rotation and Replacement

See Figure 1.4.

For best performance, rotate tooling each 5,000 cycles.

NOTICE	
	Replace or Maintain Anvil First.

1.4.1.1 Anvil Replacement

- Power OFF.
- Remove anvil nut, thrust washers, cooling cap, and anvil.
- Remove air deflection plate and wipe off any excess copper dust, oil, etc.
- Replace deflection plate, new anvil, cooling cap, thrust washers and anvil nut.
- Set up anvil per “Anvil Rotation” below.

1.4.1.2 Anvil Rotation

- Remove anvil nut and thrust washers.
- Flip anvil over and orient the cutting edge to the desired side.
- Ensure that air deflection plate located behind anvil is down as far as possible.
- Replace thrust washers and anvil nut.
- Set cut and crash gap as described in 1.4.2 Horn Tip Rotation.
- Torque anvil nut to 60 ft. lbs.

1.4.1.3 Horn Tip Replacement

- Power OFF.
- Remove the sealing tip using the tip adapter wrench included in the tool kit.
- Clean the horn/tip interface removing any copper residue, oil, etc.
- Apply a small amount of anti-seize compound to the horn threads.
- Replace and torque the tip to 70 ft-lbs using the tip adapter wrench. Verify cutting edge orientation.
- Set cut and crash gap as described in 1.4.2 Horn Tip Rotation.

Figure 1.5 Cutting Gap

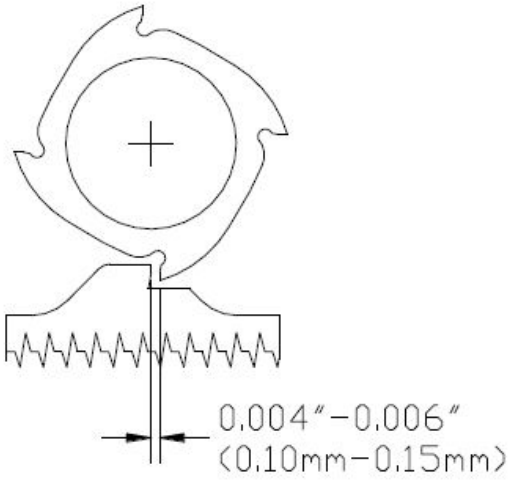
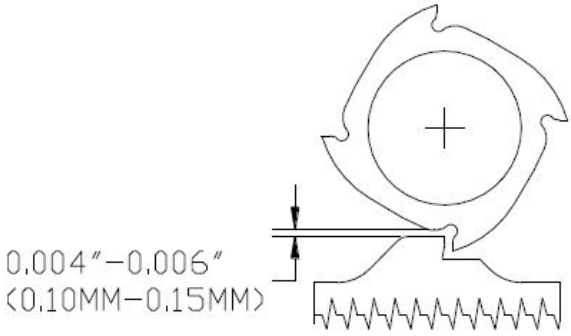


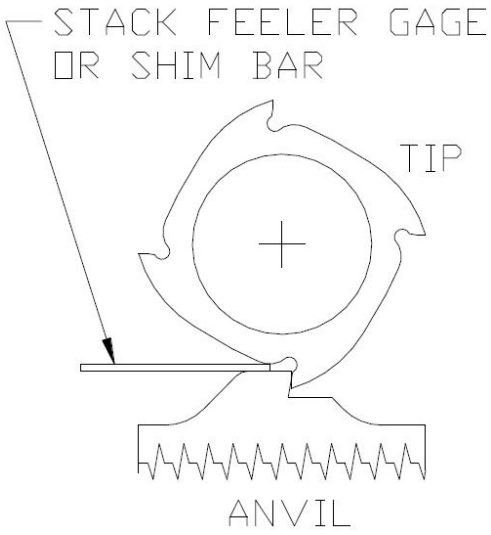
Figure 1.6 Crash Gap



1.4.2 Horn Tip Rotation

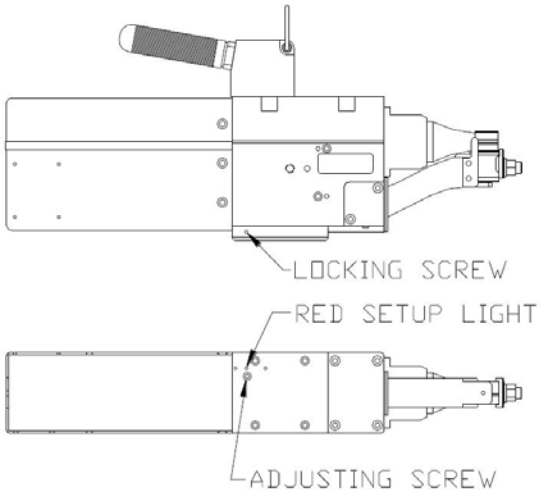
- Note tooling orientation before removing.
- Power ON.
- Loosen the anvil nut and 6mm jam nut. Turn the set screw counter-clockwise to lower the anvil.
- Loosen two 13mm jam nuts located on right side of handle assembly.
- Raise anvil (step reference Menu> Maintain> Anvil)
- Rotate horn tip to a new lobe and raise the anvil into position so that cut gap can be temporarily set to between .004” and .006” (.10mm - .15mm).
- Torque the two right 13mm dome nuts to 16 ft-lbs.
- Set the crash gap between .004” and .006” (.10mm - .15mm) and torque anvil nut to 60 ft-lbs.
- Loosen the two right 13 mm dome nuts and rotate the horn tip. Set a .004” to .006” (.10mm - .15mm) cut gap, and torque the loose dome nuts to 16 ft-lbs.
- Perform Height Encoder Zero Set. See 1.5.1 Height Encoder Zero Set.
- Verify weld height prox switch is set correctly and readjust if necessary. See 1.5 Setting Weld Height Proximity Switch.

Figure 1.7 Stack feeler gage positioning



1.5 Setting Weld Height Proximity Switch

Figure 1.8 Setting Weld Height Proximity Switch



Tools Required-2mm Allen wrench, 2.5mm Allen wrench, Feeler gauge set, Dial caliper Parameter Settings- System must be setup to run in the energy mode.

The preheight and height are used for quality monitoring. Refer to Touchscreen Controller Instruction Set portion of this manual for more information.

- Turn system on its right side (tooling facing toward you).
- Set/Stack feeler gage to final seal height target as required (recommended starting height target = 1.0-1.2 times tubing single wall thickness).
- Carefully position feeler gage stack into tooling (Figure 1.7).
- Raise the anvil (step reference- Menu> Maintain> Anvil) to contact feeler gage stack.
- Loosen lock set screw on side of bottom plate (Figure 1.8).
- Carefully adjust prox switch screw on bottom plate until height switch "Red Light" illuminates.
- Tighten prox switch lock set screw on side of bottom plate (Figure 1.8).
- Lower the anvil (step reference- Anvil).
- Verify that setting is correct via a GO/NO GO check.
- "GO" = Feeler gage height (1.0-1.2 times tubing single wall thickness) – (.05mm).
- "NO GO" = Feeler gage height (1.0-1.2 times tubing single wall thickness) + (.05mm).
- Carefully position "GO" gage in tooling (Figure 1.7).
- Raise the anvil (step reference- Anvil) to contact feeler gage stack.
- Height switch (Red light) should illuminate. If not, lower the anvil (step reference-Anvil), remove "GO" gage and repeat setting procedure.
- Lower the anvil (step reference- Anvil).
- Carefully position "NO GO" gage in tooling (Figure 1.7).
- Raise the anvil (step reference- Anvil) to contact feeler gage stack.
- Height switch (Red light) should not illuminate. If illuminated, lower the anvil (step reference-Anvil), remove "NO GO" gage and repeat setting procedure.
- Lower the anvil (step reference- Anvil).
- Store all gages.
- Turn system upright.
- Return to run mode (step reference- Exit> Exit).
- Produces samples, evaluate sealed tube final height and test as required. Repeat this procedure as necessary.

1.5.1 Height Encoder Zero Set

To be performed when horn or anvil tooling is removed, rotated, adjusted.

- Read all steps completely and exercise CAUTION as tooling moves during the calibration process.
- Position 1mm thick gage between the horn and anvil (Figure 1.7). Insure that fingers are not positioned within tooling zone.
- Raise anvil (step reference- Menu> Maintain> Height> Anvil)
- Visually insure that 1mm (.0395”) gage is parallel between tip and anvil. If not, lower the anvil (step reference- Anvil) and repeat procedure. If parallel, continue.
- Perform calibration (step reference- Calibration) System force will adjust and data will be processed for approx. 5 seconds. Upon completion horn returns to home, releasing the gage.
- Exit to Run Mode (step reference- Exit> Exit).

1.6 Ultrasonic Stack Disassembly

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

Remove the stack and check the interfaces after one million cycles or whenever a problem is suspected. The procedure is as follows:

- Be sure that power supply is off to prevent any possible electrical shock from the high voltage contact on the converter.
- Remove three screws from the back cover.
- Remove the four dome nuts on the handle/ main housing top.
- Clamp the ULTRASEAL 20 EX in a soft-jawed vise, and using the spanner wrench, unscrew the horn from the stack.
- Remove the remaining parts of the ultrasonic stack from the actuator body.
- Remove the two sets of M5 X 20 mm bolts from the two polar mount clamp rings and remove the polar mount clamp rings.
- The converter can now be removed from the booster by placing one spanner wrench on the converter and one on the booster and turning in opposite directions.
- The stack is now disassembled into three main components.
- The Ultrasonic Horn.
- The Booster.
- The Converter.
- The reassembly of the ultrasonic stack is the reverse of this procedure. A torque of 85 ft-lbs is required for the threaded connections between the horn and booster and 55 ft-lbs between the booster and converter.

1.7 Ultrasonic Stack Assembly

- Be sure that the mating surfaces of the horn, booster, and converter are clean and smooth. Any minor scratches or discolorations can be polished away using Scotch Bright or 600 grit emery or similar mild abrasive pads. Any gouges, scratches, or chips in any place on any of the stack components should be analyzed by Branson personnel.

NOTICE	
	Never use emery less than 600 grit, sandpaper, harsh abrasives, grinding equipment, engraving equipment, or debossing equipment on the stack components. This can cause severe damage to the machine.

- Spread an EXTREMELY thin film of silicone lubricant (Branson P/N 101-053-002) across the mating surfaces of the horn, booster, and the converter.
- Hand tighten the converter and horn to the booster. (Make sure that the front and rear diaphragm springs, the polar mount clamp rings and the nut rings are in place).
- If the ULTRASEAL 20 welder is not available to use as a polar mount clamp, then clamp the stack in a padded vise. (Clamping should be done on the back section of the horn which is approximately 2 inches (50.8mm) in diameter. A moderate clamping force is all that is necessary for this procedure).
- Insert the ½" drive torque wrench into the square hole in the spanner wrench, adapter (Branson P/N 48000-03-011).
- Set the torque of the wrench to 85 ft-lbs.
- Place the spanner wrench on the booster and apply torque until the wrench clicks once.
- The booster is now properly fastened to the horn.
- Set the torque of the wrench to 55 ft-lbs (75 Newton/Meters).
- Place the spanner wrench on the converter and apply torque until the wrench clicks once.
- Attach the clamp rings to the nut rings with the two sets of 12 (M5 X 20mm) socket head bolts. Torque these bolts to 110 inch pounds (12.4 Newton/Meters).
- The ultrasonic stack is now assembled.

1.7.1 Ultrasonics Testing

Ensure that nothing is touching the tip on all four sides. With the tooling disengaged and unloaded, test the sonics no longer than one second (step reference- Menu> Maintain> Sonic> 100% Test). If there is a loud squealing noise, the problem may be in the following areas:

- The Tip may not be secured properly.
- The Horn may not be secured properly.
- Tooling may be in contact with each other.

1.8 Ultraseal 20 Tool Kit BOM

Table 1.4 MTS-20 TOOLKIT BOM

PART NO	QTY	DESCRIPTION
106-088	2	WRENCH, SPANNER 201-118-019
101-053-002	1	LUBRICANT
211-111	1	WRENCH,10MM
211-218	1	SOCKET, 13MM DEEP
211-219	1	SOCKET, ADAPTER
211-247	1	WRENCH, ALLEN 3MM
211-248	1	WRENCH, ALLEN 4MM
211-636	1	CANVAS BAG W/BRANSON LOGO
11008-09-001	2	HANDLE, EXTENSION
11008-09-002	1	SOCKET, 5/8” MODIFIED
48000-03-011	1	WRENCH, SPANNER
G4A50A26	2	CUT-OFF CLEARANCE GAGE
G6A00A10-##	1	WRENCH, TIP ASSY
M1A50A45	1	SPACER, 1MM
X3A50325	1	SPACER, 6MM

1.9 Ultraseal 20 EX Actuator BOM

Table 1.5 G7A00000 ACTUATOR MTS-20 EX TOUCHSCREEN (BOM BY SUB ASSEMBLY)

ASSY	QTY	PART NO	QTY	DESCRIPTION
G7A00002	**1**			**HOUSING, MAIN BOTTOM ASSY.**
		203-128	4	STUD,SPECIAL M8 X 45 835 10
		204-005	2	BEARING, CUP, TIMKEN #L-215
		209-036	1	PLUG,PARKER 3/8 219P-6
		209-038	1	ELBOW, MALE PARKER #229-4-4
		209-091	1	FTG STR 1/4 NPT x 3/8 TUBE
		209-221	1	FTG UNION 1/4TUBE X 1/4TUBE EA
		G3A50A07	1	NUT,CYLINDER MOD. MTS
		G3A50A20	1	RACEWAY MTS
		G4A50A20	1	CYLINDER, AIR MODIFIED
		G6A50A14	1	PLATE,CYLINDER
		G6A50A93	1	MAIN HOUSING
G7A00005	**1**			**ASSY, HANDLE**
		102-106	1	BASE,OPERATOR
		102-111	2	COVER, DUST
		201-077	1	BUSHING,CARR LANE TYPE P
		210-032	1	CARIBINER,
		211-152	2	GRIP,RUBBER HAND,
		211-163	1	PLUG,MCMASTER
		G5A50A07	2	TUBE,GRIP
		G6A50A16	1	BASE,HANDLE
		J1A00043	1	WIRING DIAGRAM,START HANDLE
		J1A00227	1	CABLE,START MTS20 STD.AND E
		102-077R	1	PUSH BUTTON EAO 51-132.025
		102-078R	1	LENS,GREEN EAO 51-933.5
		102-105R	1	LENSE,AMBER
G7A00006	**1**			**ASSY,REAR COVER BOTTOM**
		203-228	4	STAND-OFF,M4X10MM MSC 00267
		207-031	2	FTG T FLOW CONTROL OD 1/4 T
		209-007	1	PLUG, PNEUMADYNE, SPG-10

Table 1.5 G7A00000 ACTUATOR MTS-20 EX TOUCHSCREEN (BOM BY SUB ASSEMBLY)

ASSY	QTY	PART NO	QTY	DESCRIPTION
		209-009	1	FITTING BARB PNEUMADYNE SBF
		G6A50A06	1	CAP,STRAIN RELIEF,CONVERTER
		G6A50A07	1	CAP,CONVERTER NON-ROTATING
		G6A50A08	2	SPRING,CONTACT
		G6A50A11	2	PIN,LOCATING CONVERTER CAP
		G7A50006	1	COVER,REAR BOTTOM,EX
		G7A50011-02	1	ASSY,HARNESS MTS-20STD&EX,1
		G7A50019	1	GASKET, BOTTOM
		J1A00053	1	CABLE, BUZZER
		104-256R	1	ALARM, FLOYD BELL XC-06-330
		000-127-027	1	SNAP BUTTON CJ410-5/8
		102-242-632R	1	ASSY AMTECH ACTUATOR INTF B
G7A00003	**1**			**ASSY,CAM BLOCK & ANVIL ARM**
		11003-01-043	1	NUT,ANVIL (MOD 5)
		203-467	1	SCREW,HEX HEAD,M4X6MM
		204-027	2	FOLLOWER,ROLLER
		209-070	1	FTG MALE ELB 1/8NPT X1/4TUB
		210-028	2	WASHER,THRUST
		G4A50A09	1	FRAME,HOUSING GUARD MTS
		G4A50A12	1	PIN,CAM BLOCK LOCK-ULTRA 20
		G4A50A21	2	SCREW,LOCK SHAFT
		G5A50019	1	PLATE WASHER MTS
		G5A50A06	1	BLOCK,CAM,15 Deg,Standard
		G6A50A17	1	ARM,ANVIL,STANDARD TOOLING
		G6A50A18	1	DIRECTOR,AIR COOLING
		G6A50A19	1	CAP,COOLING PURGE
		G6A50A40	1	ENCODER,TARGET
		G6A50A73	1	SET SCREW MODIFICATION
		G6A50A79	1	BEARING SHAFT
		G6A50A80	1	BEARING SPACER
		G6A50A81	2	THRUST WASHER, VESPEL
		G6A50A94	1	TARGET, PROXIMITY SWITCH

Table 1.5 G7A00000 ACTUATOR MTS-20 EX TOUCHSCREEN (BOM BY SUB ASSEMBLY)

ASSY	QTY	PART NO	QTY	DESCRIPTION
		203-923	1	BHCS with Through-Hole,M4x6
		210-092	2	WASHER, # 8 SPLIT LOCK
G7A00004	**1**			**ASSY,ACTUATOR**
		204-006	2	BEARING,CONE,
		G3A50A09	1	SHAFT,MTS
		G4A50A08	1	PLATE,BEARING COVER MTS RIG
		G4A50A29	1	COVER,BOTTOM FRONT REV 8
		G4A50A30	2	LOCKNUT,MOD. MTS-20
		G4A50A31	1	GUARD,HOUSING
		G4A50A59	1	PLATE,BEARING COVER LEFT
		G6A50A92	1	CLAMP,ENCODER
		101-236R	1	CONN HSG 3X1 100CL REC
		101-237R	3	CRIMP TERMINAL FEM 22-30 AW
		103-088	1	ENCODER,LINEAR,10mm TRAVEL
		G7A50084		SCHEMATIC,ENCODER ASSY WIRI
G7A00007	**1**			**ASSY,PROXIMITY SWITCH**
		102-117	1	SWT,Prox PEPPER&FUCHS
		202-033	3	SPRING,COMPRESSION
		203-094	1	SCREW SET, BRASS TIPPED,M4x
		203-129	2	RING RETAINING E 1/8" SST
		204-119	2	RING RETAINING E 3/32" SST
		G6A50A36	1	COVER,BOTTOM REAR
		G6A50A38	2	PLATE,RETAINING
		G6A50A41	2	SHAFT,SWITCH MOUNT
		G6A50A67	1	INSULATOR, PROX SWITCH
		G6A50A82	1	MOUNT,PROX. SWITCH,FINE THR
		G6A50A83	1	SCREW,PROX. ADJ.,FINE THREA
		J1A00054R	1	CABLE, PROX
G7A00008	**1**			**ASSY,FINAL**
		203-081	4	WASHER,ZINC PLATED M8
		203-127	4	NUT,M8 DOME
		G3A50A03	2	RING,NUT MTS

Table 1.5 G7A00000 ACTUATOR MTS-20 EX TOUCHSCREEN (BOM BY SUB ASSEMBLY)

ASSY	QTY	PART NO	QTY	DESCRIPTION
		G4A50A54	1	NODAL SUPPORT
		G6A50A04	1	GASKET, END, LOWER
		G6A50A04-01	1	GASKET, END, UPPER
		G6A50A09	1	COVER,REAR TOP
		G6A50A15	1	GASKET,REAR COVER
		G6A50A64	1	STACK, RING
		G7A50017	1	GASKET, SLOT
		G7A50022	1	GASKET,COVER,FRONT
		G7A50028	1	GASKET, STACK
		N5A50A46	1	SPRING,FRONT DIAPHRAGM
		N5A50A47	1	SPRING,REAR DIAPHRAGM
		N5A50A48	1	CLAMP,RING
G6A00A31				**ADJUSTMENT GUIDE ASSY**
		G6A50A61	2	GUIDE, ADJUSTABLE
		G6A50A62	2	ADJUSTABLE GUIDE,ADAPTER PL
		G6A50A63	2	ADJUSTING PLATE,WASHER PLAT
		G6A50A74	1	COOLING SHROUD,STAINLESS ST

1.10 File Attachments

Table 1.6 File Attachments

Description	File
Assembly Drawing MTS20	G7A00000
Purge Shut-Off Circuit	G7A00028
Barrier Circuit	G7A00029
Pressure Area	G7A50001
"EX" Certification	US20EX CERT
Actuator EX Label	G7A50013
Controller EX Label	G7A50014

BAS00ATEX3059X/5

Schedule Drawing

R. Patel

REVISIONS						
ZONE	REV	DESCRIPTION	DATE	ECN/ECO	DRAWN	APPR.
-	1	INITIAL RELEASE	09/29/2003	-	DDL	-
-	02	CONVERTED TO SOLID EDGE	05/27/2015	-	SB	MGD
A1	03	REMOVED "EX" FROM THE TITLE OF THE DRAWING	08/28/2015	21364	SB	V.DIAZ

Item #	Part #	Description	Qty
1	000 ANVIL	REFERENCE	1
2	000 BOOSTER	REFERENCE	1
3	000 HORN	REFERENCE	1
4	000 TIP	REFERENCE	1
5	102-117	SENSOR	1
6	104-256	ALARM	1
7	101-135-032E	CONVERTER	1
8	11003-01-043	TIP NUT	1
9	204-005	BEARING	2
10	204-006	BEARING CONE	2
11	204-027	BEARING	1
12	210-028	THRUST WASHER	2
13	210-032	CARIBINER	1
14	211-152	GRIP	1
15	G3A50A03	NUT RING	2
16	G3A50A07	CYL NUT MOD	1
17	G3A90A09	SHAFT	2
18	G3A50A17-1	ALIGNMENT GUIDES	2
19	G3A50A20	RACE WAY	1
20	G4A50A08	BRG COVER PLATE, RGT	1
21	G4A50A09	HOUSING GUARD FRAME	1
22	G4A50A12	CAM BLOCK LOCK PIN	1
23	G4A50A20	AIR CYL MOD	1
24	G4A50A21	SET SCREW ANVIL ARM	2
25	G4A50A29	COVER, BOTTOM FRONT	1
26	G4A50A30	LOCKNUT MOD	2
27	G4A50A31	HOUSING GUARD	1
28	G4A50A43	WASHER MOD, ANV ARM	2
29	G4A50A54	NODAL SUPPORT	1
30	G4A50A59	BRG COVER PLATE, LFT	1
31	G5A50019	WASHER PLATE	1
32	G5A50020	ENCODER MOD	1
33	G5A50A06	CAM BLOCK	1
34	G5A50A07	GRIP TUBE	1
35	G6A50A92	CLAMP, ENCODER	1
36	G5A50A21	MAIN HOUSING	1
37	G6A50A06	CAP STRAIN RELIEF	1
38	G6A50A07	CONVERTER CAP	1
39	G6A50A08	CONTACT SPRING	2
40	G6A50A09	COVER, REAR TOP	1
41	G6A50A10	COVER, REAR BOTTON	1
42	G6A50A11	PIN LOCATING	2
43	G6A50A14	CYLINDER PLATE	1
44	G6A50A16	HANDLE BASE	1
45	G6A50A17	ANVIL ARM	1
46	G6A50A18	AIR DIRECTOR, COOL	1
47	G6A50A19	CAP, COOLING PURGE	1
48	G6A50A26	DUST SHROUD, EXT	1
49	G6A50A35	TARGET, PROX SWITCH	1
50	G6A50A36	COVER, BOTTOM REAR	1
51	G6A50A37	MOUNT, PROX SWITCH	1
52	G6A50A38	RETAINING PLATE	1
53	G6A50A40	ENCODER TARGET	1
54	G6A50A41	SHAFT, SWITCH MOUNT	2
55	G6A50A51	STUD, M8	4
56	G6A50A58	SHOULDER SCR MOD	1
57	G6A50A64	STACK RING	1
58	G6A50A65	PROX ADJ SCREW	1
59	G6A50A67	PROX SWITCH INSUL	1
60	G6A50A73	SET SCREW MOD	1
61	N5A50A46	FR DIAPHRAGM SPRING	1
62	N5A50A47	RE DIAPHRAGM SPRING	1
63	N5A50A48	SPRING CLAMP	1
64	V1A00A11	ENCODER BOARD	1
65	G6A50100	ADJUSTING PLATE, WASHER PLATE	2
66	G6A50A62	ADJUSTABLE GUIDE,ADAPTER PLATE	2

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND TOLERANCES ARE:
2 PLACE DECIMALS ±.015
3 PLACE DECIMALS ±.005
ANGLES ±1° FRACTIONS ±1/32
SURFACE FINISH 125

SECONDARY DIMENSIONS ARE PROVIDED FOR REFERENCE ONLY

INCHES (MM)

3RD ANGLE PROJECTION

MATERIAL: None

Material Spec. None

FINISH: NONE

Finish Spec. N/A

EMERSON Industrial Automation

	NAME	DATE
DRAWN	DDL	09/29/03
CHECKED		
APPROVED		

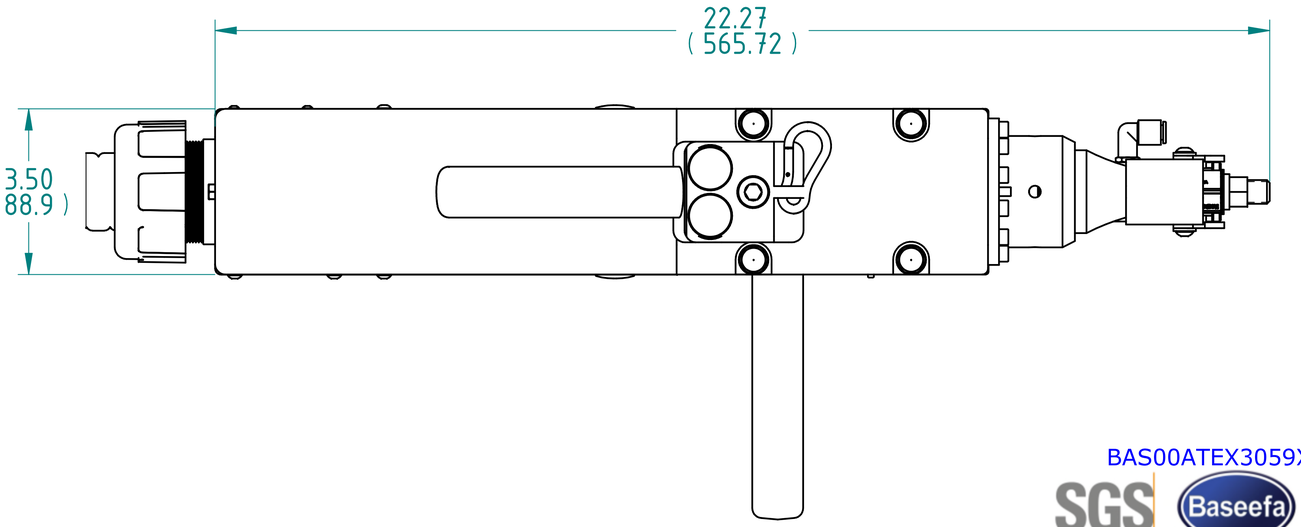
SCALE: 1:2 SHEET 1 OF 3

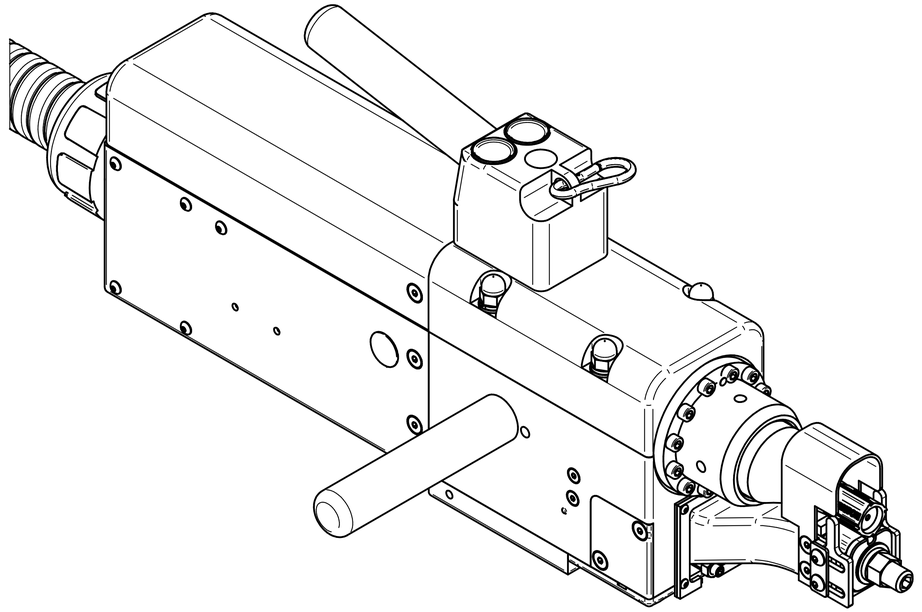
BRANSON

TITLE: ACTUATOR,MTS-20

SIZE D DWG NO G7A00000 REV 03

SOLID EDGE





BAS00ATEX3059X/5

SGS Baseefa Schedule Drawing

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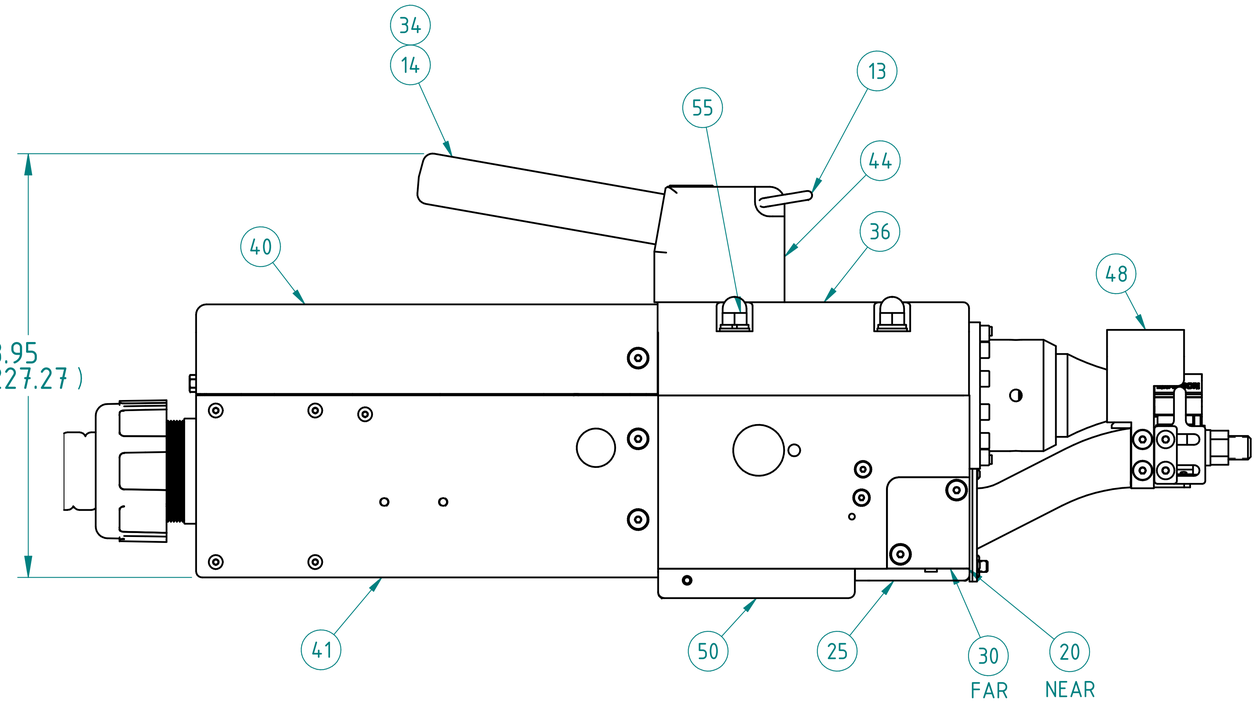

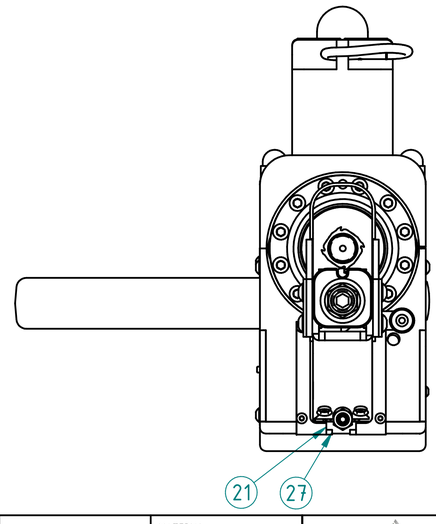

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND TOLERANCES ARE: 2 PLACE DECIMALS ±.015; 3 PLACE DECIMALS ±.005; ANGLES ±1° FRACTIONS ±1/32; SURFACE FINISH 125	This PROPRIETARY Document is property of Branson Ultrasonics Corp., Danbury, CT. It is confidential in nature, non-transferable, and issued with the clear understanding that it is not traced or copied without permission and is returnable upon demand. Article or material must comply with requirements stipulated by RoHS in its current version.	MATERIAL: None	EMERSON Industrial Automation	BRANSON
SECONDARY DIMENSIONS ARE PROVIDED FOR REFERENCE ONLY — INCHES (MM)		Material Spec. None	NAME / DATE	TITLE: ACTUATOR,MTS-20
3RD ANGLE PROJECTION		FINISH: NONE	DRAWN DDL 09/29/03	
			CHECKED	
			APPROVED	
		Finish Spec. N/A	SCALE: 1:1.6 SHEET 2 OF 3	SIZE D DWG NO G7A00000 REV 03

SOLID EDGE

BAS00ATEX3059X/5

Schedule Drawing

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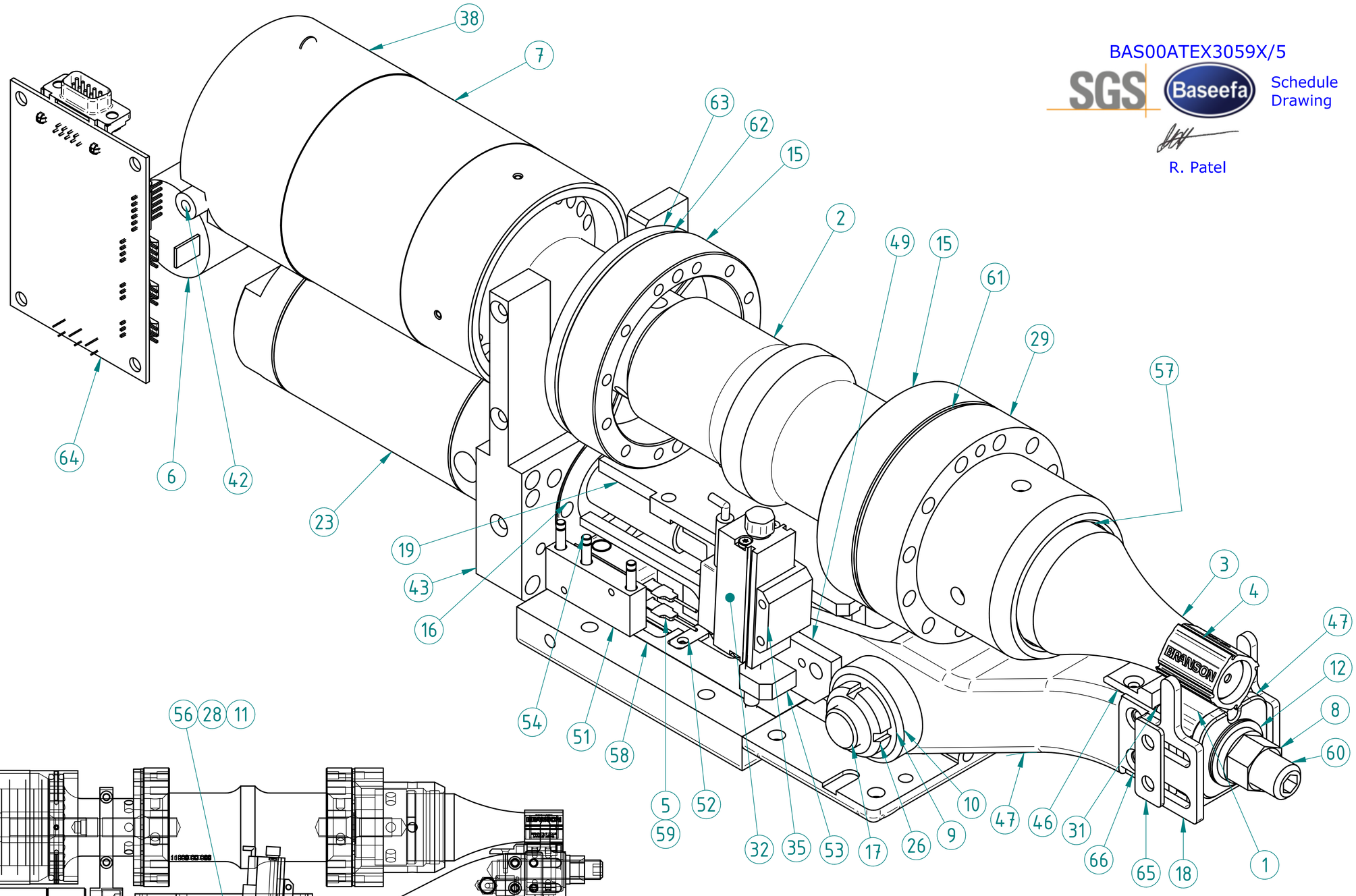

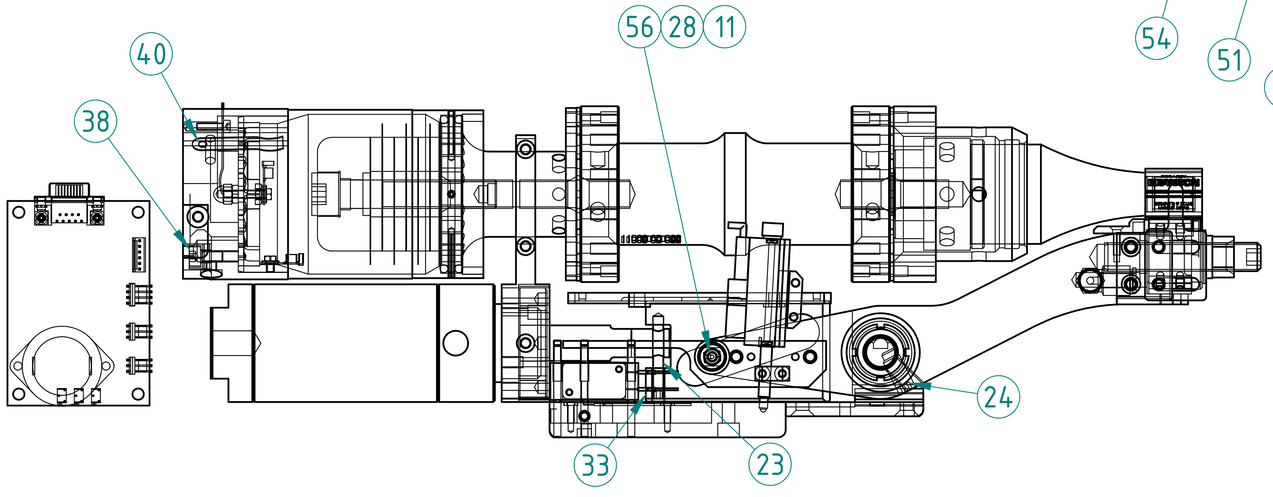

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND TOLERANCES ARE:
2 PLACE DECIMALS ±.015
3 PLACE DECIMALS ±.005
ANGLES ±1° FRACTIONS ±1/32
SURFACE FINISH 125

SECONDARY DIMENSIONS ARE PROVIDED FOR REFERENCE ONLY — INCHES (MM)

3RD ANGLE PROJECTION

MATERIAL: None

Material Spec. None

FINISH: NONE

Finish Spec. N/A

EMERSON Industrial Automation

	NAME	DATE
DRAWN	DDL	09/29/03
CHECKED		
APPROVED		

SCALE: 1.5:1 — SHEET 3 OF 3

BRANSON

TITLE: ACTUATOR,MTS-20

SIZE D — DWG NO G7A00000 — REV 03

SOLID EDGE

REVISIONS						
ZONE	REV	DESCRIPTION	DATE	ECN/ECO	DRAWN	APPR.
---	01	ORIGINAL	---	---	---	---
---	02	REMOVE CABLE J1A001126, RUN COMMON TO POWER SWITCH THROUGH RELAY. TERMINALS 5 & 9.	03-12-08	---	LAW	---
C1-D2	03	REMOVED 101-361M 101-632, 101-086 & 101-085; ADDED BALLOONS.	4-22-21	103053	VADV	LAW
ALL	04	REDRAWN IN SOLID EDGE; REMOVED "REF. EECS REPORT # 01(C)0286.	01/04/22	103729	VADV	FM

BAS00ATEX3059X/5

Schedule Drawing

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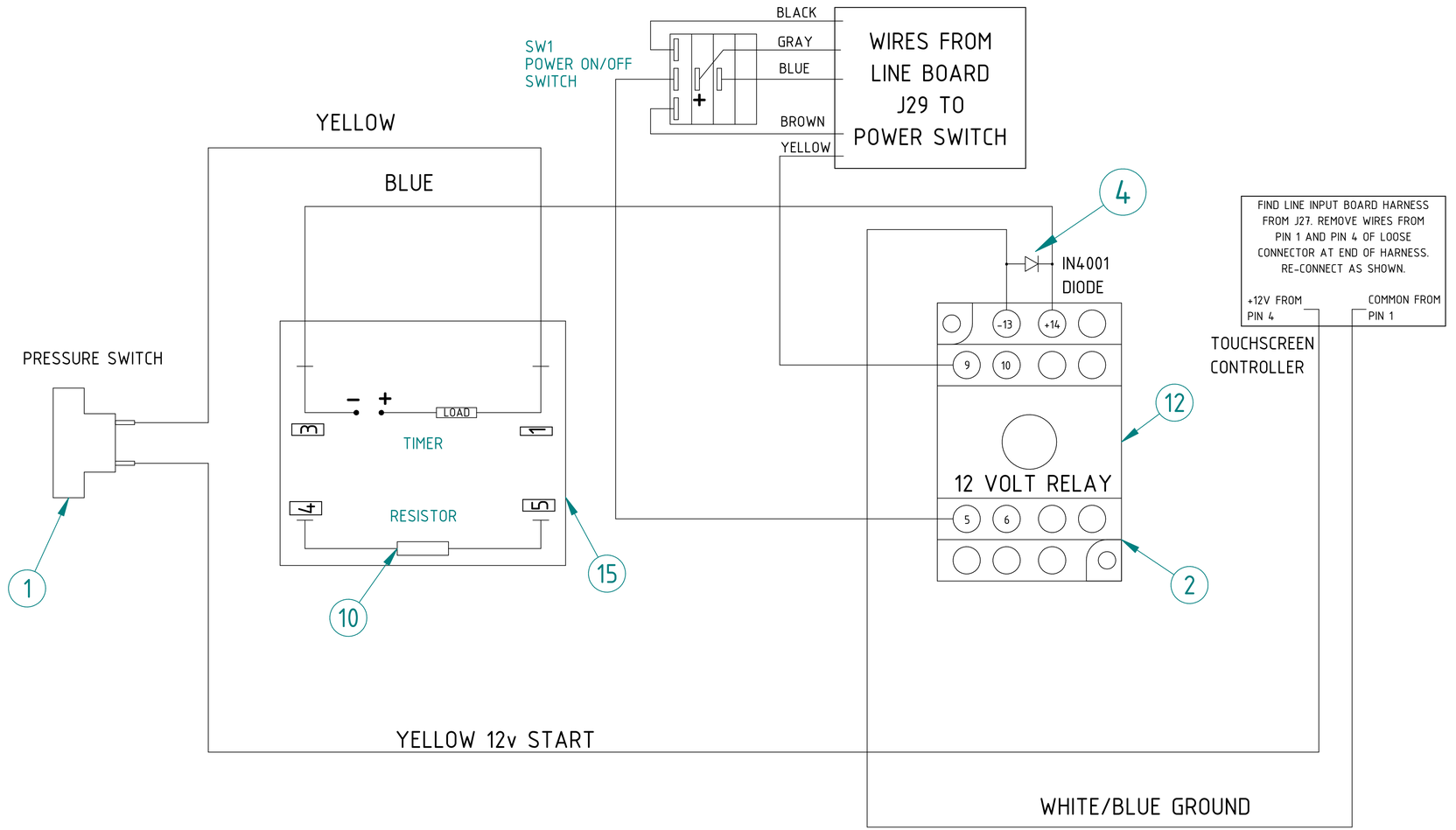


WARNING
CHANGES TO THIS PRINT MAY ENHANCE, BUT MUST NOT CONTRADICT INFORMATION ON CERTIFICATION DRAWING G7A00031.

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
AND TOLERANCES ARE:
2 PLACE DECIMALS ±.015
3 PLACE DECIMALS ±.005
4 PLACE DECIMALS ±.0005
ANGLES ±1° FRACTIONS ±1/32
SURFACE FINISH
GD & T Standard ASME Y 14.5
SECONDARY DIMENSIONS ARE PROVIDED FOR REFERENCE ONLY
INCHES [MM]
3RD ANGLE PROJECTION

MATERIAL: N/A
Material Spec. N/A
FINISH: N/A
Finish Spec. N/A

EMERSON

	NAME	DATE
DRAWN	J.W.	8/27/03
CHECKED	---	---
APPROVED	---	---

SCALE: 1:1 SHEET 1 OF 1

BRANSON

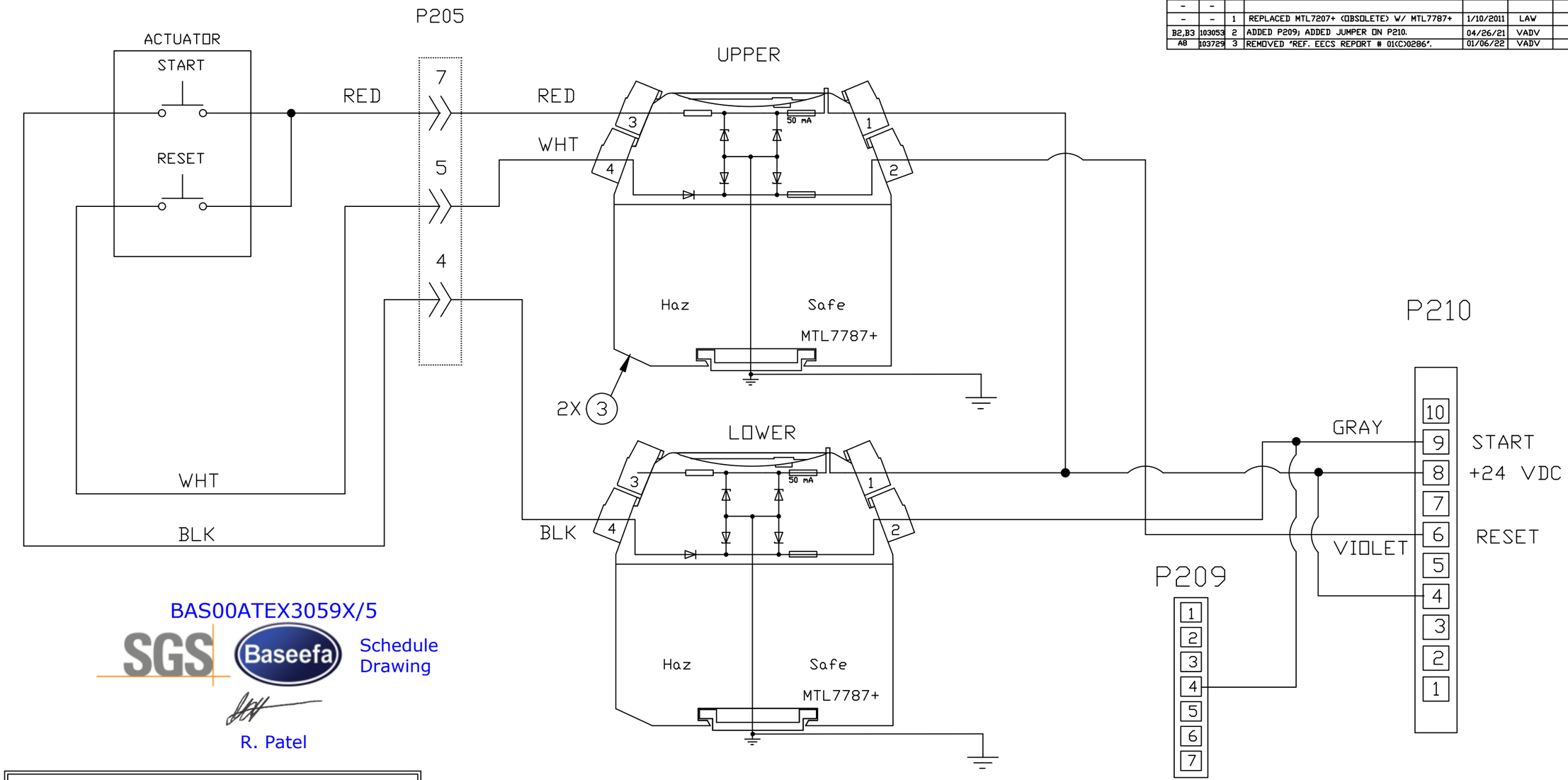
TITLE: MTS20 EX PURGE SHUTOFF CIRCUIT

AGENCY PART	NO
BUC CLASSIFICATION	3 Important
IP CLASSIFICATION	Error: No reference
WEIGHT	Error: No reference

SIZE D | DWG NO G7A00028 | REV 04

SOLID EDGE

REVISIONS						
ZONE	ECN#	REV	DESCRIPTION	DATE	REVISED	APPROVED
-	-					-
-	-	1	REPLACED MTL7207+ (OBSOLETE) W/ MTL7787+	1/10/2011	LAW	-
B2,B3	103053	2	ADDED P209; ADDED JUMPER ON P210.	04/26/21	VADV	LAW
A8	103729	3	REMOVED "REF. EECS REPORT # 01C)0286".	01/06/22	VADV	FM



BAS00ATEX3059X/5

Schedule Drawing

R. Patel

WARNING

CHANGES TO THIS PRINT MAY ENHANCE, BUT MUST NOT CONTRADICT INFORMATION ON CERTIFICATION DRAWING G7A00032

SHEET QTY: 1 of 1	SCALE: NONE	UNLESS OTHERWISE STATED, FOR ALL SPECIFICATIONS AND TOLERANCES, REFER TO:	EMERSON BRANSON
MATERIAL:	DATE: 8/27/03	ENGINEERING SPECIFICATION FOR MFG. FORM #ESFM-001	THIS PRINT IS THE PROPERTY OF AMERICAN TECHNOLOGY, Inc., AND REPRESENTS CONFIDENTIAL AND PROPRIETARY INFORMATION OF AMTECH, AND IT MAY NOT BE USED OR DISCLOSED IN ANY WAY WITHOUT THE EXPRESSED WRITTEN CONSENT OF AMTECH.
QTY/ASSY:	DRAWN BY: JW	DIMENSIONAL TOLERANCES	
HARDNESS:	APPROVED BY:	4 PLACE DECIMAL: ±.0005 3 PLACE DECIMAL: ±.005 2 PLACE DECIMAL: ±.010 FRACTIONAL DIM.: ±1/64 ANGULAR DIM.: ±1/2°	PART NAME: MTS 20 EX BARRIER CIRCUIT
FINISH:	3RD ANGLE PROJECTION		USED ON ASSEMBLY: TOUCHSCREEN / DRAWING NUMBER: G7A00029 / REV: 3
MODEL TYPE: ULTRASEAL 20 'EX'	DIMENSIONS ARE IN INCHES		
FILENAME: G7A00029.dwg	DO NOT SCALE DRAWINGS		
FORMAT: AUTOCAD RELEASE 2000			

Jan 06, 2022 - 8:09am
I:_ENGINEERING APPROVED DRAWINGS\G\G7A00029.dwg

REVISIONS						
ZONE	ECN#	REV	DESCRIPTION	DATE	REVISED	APPROVED
		1	INITIAL RELEASE	7/21/00	RRH	
		2	145 INCH³ WAS 122 INCH³	7/21/00	RRH	
B3	103729	3	UPDATED LABEL; UPDATED TEMPLATE.	01/06/22	VADV	FM

FASTEN
LABELS [G7A50014] &
[G7A50015] WITH
M3 BUTTON HEAD (4 ea.)

PRESSURE SWITCH LOCATED
IN CONTROL BOX
SET TO A MIN. OF
4.36 MBAR

SENSOR LINE TO
PRESSURE SWITCH IN
CONTROL BOX

POWER SUPPLY / CONTROLLER

PURGE AIR TO ACTUATOR

SAFE AREA

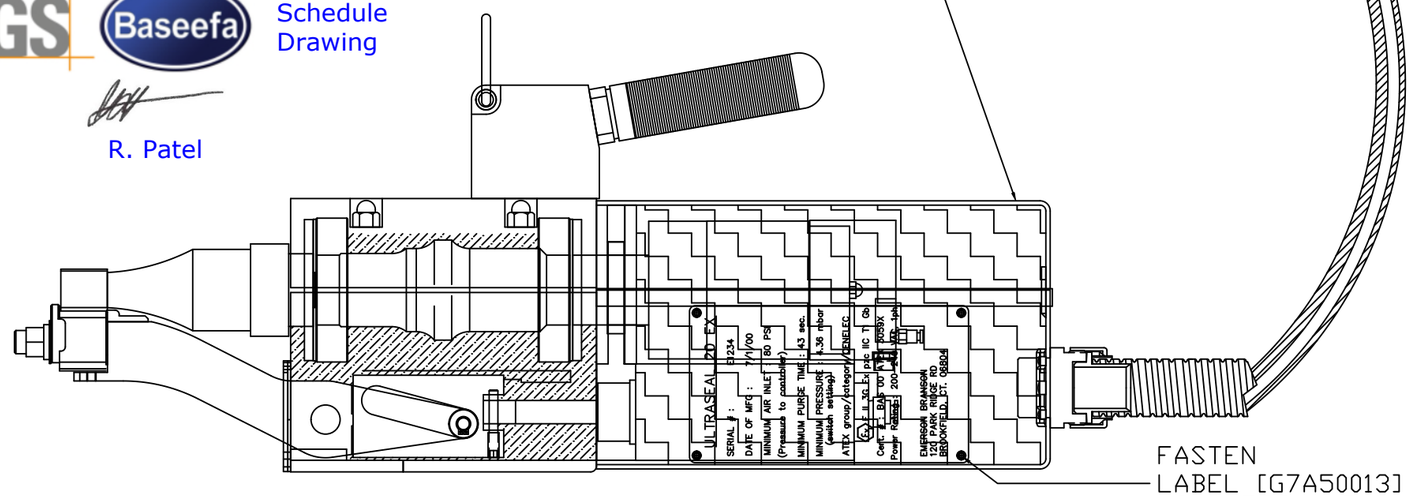
HAZARDOUS AREA

BAS00ATEX3059X/5

Schedule
Drawing

R. Patel

ACTUATOR



FASTEN
LABEL [G7A50013] WITH
M3 BUTTON HEAD (4)

WARNING
CHANGES TO THIS PRINT WILL
INVALIDATE 'EX' CERTIFICATION.

FREE VOLUME = APPROXIMATE 145 INCH^3

SHEET QTY: 1 of 1	SCALE: N. T. S.	UNLESS OTHERWISE STATED, FOR ALL SPECIFICATIONS AND TOLERANCES, REFER TO: ENGINEERING SPECIFICATION FOR MFG. FORM #ESFM-001	EMERSON BRANSON
MATERIAL:	DATE: 7-18-00		
QTY/ASSY:	DRAWN BY: R.R.H.		
HARDNESS:	APPROVED BY:		
FINISH:		3RD ANGLE PROJECTION	THIS PRINT IS THE PROPERTY OF AMERICAN TECHNOLOGY, Inc., AND REPRESENTS CONFIDENTIAL AND PROPRIETARY INFORMATION OF AMTECH, AND IT MAY NOT BE USED OR DISCLOSED IN ANY WAY WITHOUT THE EXPRESSED WRITTEN CONSENT OF AMTECH.
MODEL TYPE:		DIMENSIONS IN INCHES	PART NAME: PRESSURE AREA, ASSEMBLY [EX]
FILENAME:		DO NOT SCALE DRAWINGS	USED ON ASSEMBLY: G7A00010 / DRAWING NUMBER G7A50001 / REV 3
FORMAT: AUTOCAD RELEASE 2000			

1 # TYPE EXAMINATION CERTIFICATE

2 **Equipment or Protective System Intended for use in Potentially Explosive Atmospheres Directive 2014/34/EU**

3 Type Examination Certificate Number: **BAS00ATEX3059X – Issue 5**

3.1 In accordance with Article 41 of Directive 2014/34/EU, Type Examination Certificates referring to 94/9/EC that were in existence prior to the date of application of 2014/34/EU (20 April 2016) may be referenced as if they were issued in accordance with Directive 2014/34/EU. Supplementary Certificates to such Type Examination Certificates, and new issues of such certificates, may continue to bear the original certificate number issued prior to 20 April 2016.

4 Product: **Ultraseal-20Ex Tube Sealer**

5 Manufacturer: **Branson Ultrasonics Corporation**

6 Address: **120 Park Ridge Road, Brookfield, Connecticut, 06804 United States of America**

7 This re-issued certificate extends Type Examination Certificate No. **BAS00ATEX3059X** to apply to product designed and constructed in accordance with the specification set out in the Schedule of the said certificate but having any variations specified in the Schedule attached to this certificate and the documents therein referred to.

8 SGS Fimko Oy certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products of Category 3 intended for use in potentially explosive atmospheres given in Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014.

8.1 The original certificate was issued by SGS Baseefa Ltd (UK Notified Body 1180). It, and any supplements previously issued by SGS Baseefa Ltd have been transferred to the supervision of SGS Fimko Oy (EU Notified Body 0598). The original certificate number is retained.

The examination and test results are recorded in confidential Report No. – See Certificate History

9 Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN IEC 60079-0: 2018 **EN 60079-2: 2014**

except in respect of those requirements listed at item 18 of the Schedule.

10 If the sign "X" is placed after the certificate number, it indicates that the product is subject to the Specific Conditions of Use specified in the schedule to this certificate.

11 This TYPE EXAMINATION CERTIFICATE relates only to the design of the specified equipment and not to specific items of equipment subsequently manufactured.

12 The marking of the product shall include the following:

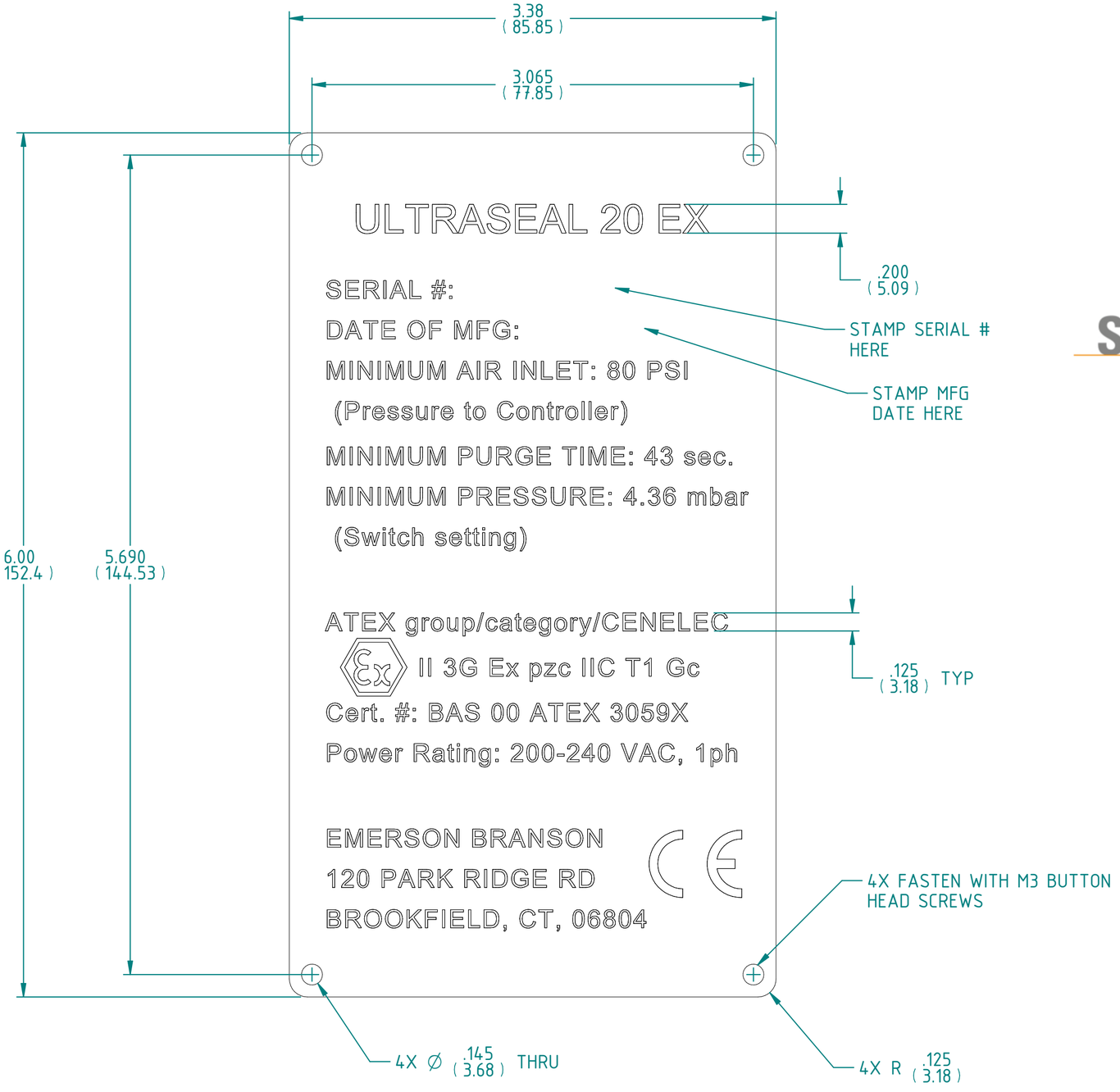
Ex II 3G Ex pzc IIC T1 Gc

SGS Fimko Oy Customer Reference No. **4295** Project File No. **21/0474**

SGS Fimko Oy
Takomotie 8
FI-00380 Helsinki, Finland
Telephone +358 (0)9 696 361
e-mail sgs.fimko@sgs.com
web site www.sgs.fi
Business ID 0978538-5 Member of the SGS Group (SGA SA)

Tuomas Hänninen
SGS Fimko Oy

REVISIONS						
ZONE	REV	DESCRIPTION	DATE	ECN/ECO	DRAWN	APPR.
---	1	INITIAL RELEASE	7/25/00	---	RRH	---
---	2	UPDATED ADDRESS ON LABEL	2/20/08	2603	RRH	---
---	3	UPDATED EX CODE AND CE MARK NUMBER	2/24/11	18846	LAW	---
ALL	04	REDRAWN ON SOLID EDGE; CHANGED FROM 80 lbs/in2 TO 80 PSI; CHANGED POWER RATING; UPDATED ADDRESS; REMOVED CURRENT CERTIFICATE NUMBER.	12/8/21	103445	OZG	VADV
D5	05	UPDATED CERTIFICATE NUMBER FROM "E II 3G Ex pzc IIC T1 Gb" TO "II 3G Ex pzc IIC T1 Gc".	03/21/22	103956	VADV	FM



BAS00ATEX3059X/5

SGS Baseefa

Schedule Drawing

R. Patel

WARNING
SIGNIFICANT
CHANGES TO THIS PRINT WILL
INVALIDATE "EX" CERTIFICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
AND TOLERANCES ARE:
2 PLACE DECMALS ±.015
3 PLACE DECMALS ±.005
4 PLACE DECMALS ±.0005
ANGLES ±1° FRACTIONS ±1/32
SURFACE FINISH 125

GD & T Standard ASME Y 14.5

SECONDARY DIMENSIONS ARE PROVIDED FOR REFERENCE ONLY

INCHES (MM)

3RD ANGLE PROJECTION

MATERIAL:
1/16" ALUMINUM 6061

Material Spec. N/A

FINISH:
LASER ENGRAVED-TEXT
W/ CLEAR ANODIZE

Finish Spec. N/A

EMERSON

	NAME	DATE
DRAWN	R.R.H	7/25/00
CHECKED		
APPROVED		

SCALE: 1.5:1 SHEET 1 OF 1

BRANSON

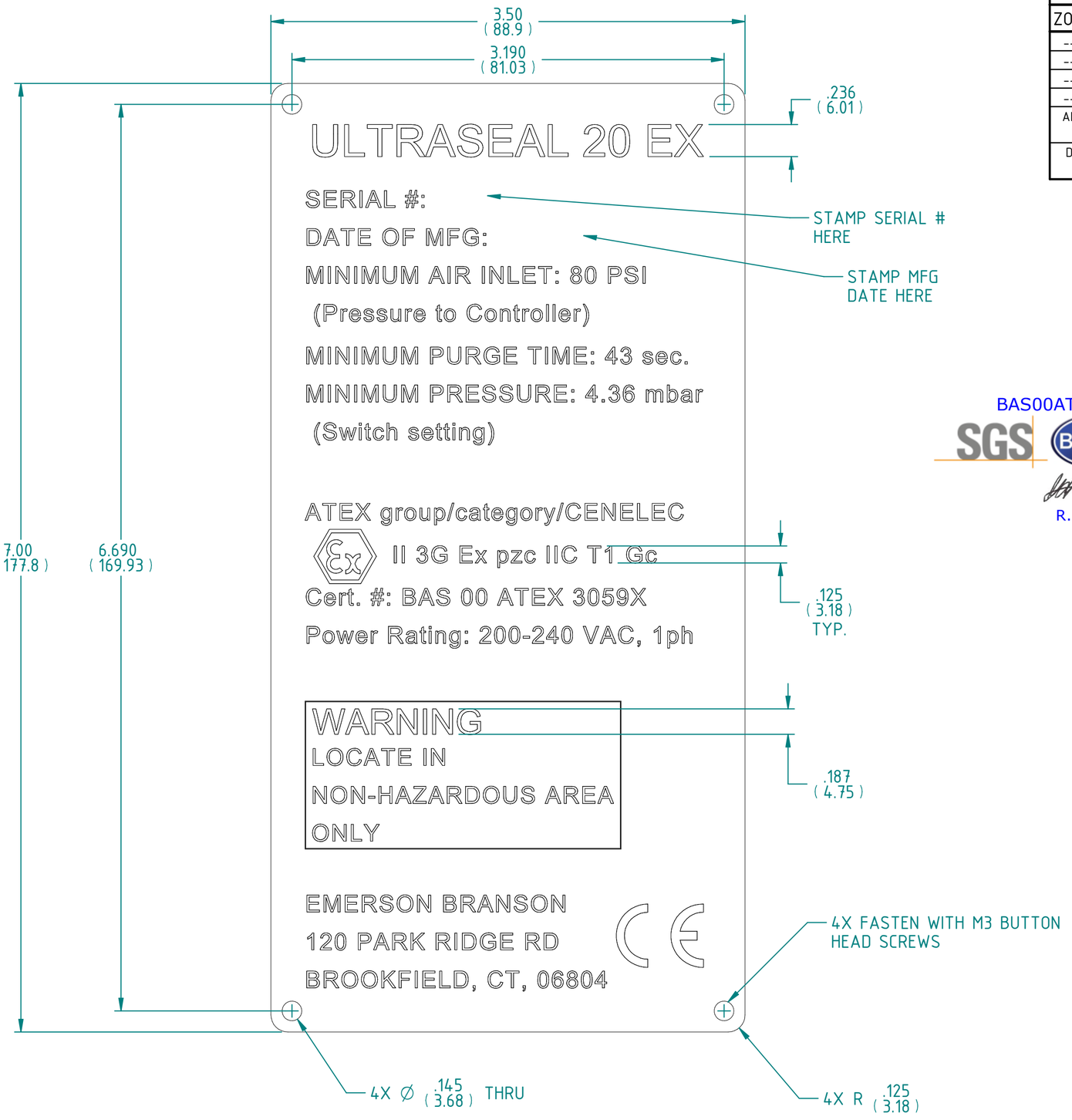
TITLE
LABEL "EX", ACTUATOR

AGENCY PART	NO
BUC CLASSIFICATION	3 Important
IP CLASSIFICATION	NO
WEIGHT	0.124 lbm

SIZE C | DWG NO G7A50013 | REV 05

SOLID EDGE

REVISIONS						
ZONE	REV	DESCRIPTION	DATE	ECN/ECO	DRAWN	APPR.
---	1	INITIAL RELEASE	7/25/00	---	RRH	---
---	2	UPDATED ADDRESS ON LABEL	2/20/08	2603	RRH	---
---	3	UPDATED EX CODE AND CE MARK NUMBER	2/24/11	18846	LAW	---
---	04	POWER RATING CHANGED FROM 200-245 TO 200-240 VAC.	08-09-21	103224	VADV	VADV
ALL	05	REDRAWN ON SOLID EDGE; CHANGED FROM 80 lbs/in2 TO 80 PSI; UPDATED ADDRESS; UPDATED CERTIFICATE NUMBER.	12/13/21	103681	VADV	VADV
D5	06	UPDATED CERTIFICATE NUMBER FROM "E II 3G Ex pzc IIC T1 Gb" TO "II 3G Ex pzc IIC T1 Gc".	03/21/22	103729	VADV	FM



BAS00ATEX3059X/5

Schedule Drawing

R. Patel

WARNING
SIGNIFICANT
CHANGES TO THIS PRINT WILL
INVALIDATE "EX" CERTIFICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
AND TOLERANCES ARE:
2 PLACE DECMALS ±.015
3 PLACE DECMALS ±.005
4 PLACE DECMALS ±.0005
ANGLES ±1° FRACTIONS ±1/32
SURFACE FINISH 125

GD & T Standard ASME Y 14.5

SECONDARY DIMENSIONS ARE PROVIDED FOR REFERENCE ONLY

INCHES (MM)

3RD ANGLE PROJECTION

MATERIAL:
1/16" ALUMINUM 6061

Material Spec. N/A

FINISH:
LASER ENGRAVED-TEXT
W/ CLEAR ANODIZE

Finish Spec. N/A

EMERSON

	NAME	DATE
DRAWN	R.R.H	7/25/00
CHECKED		
APPROVED		

SCALE: 1.5:1 SHEET 1 OF 1

BRANSON

TITLE
CONTROLLER, EX LABEL

AGENCY PART	NO
BUC CLASSIFICATION	3 Important
IP CLASSIFICATION	NO
WEIGHT	0.149 lbm

SIZE C | DWG NO G7A50014 | REV 06

SOLID EDGE

Original Instructions
DCM00002 - REV. 17

EMERSON

Welder
Touchscreen Controller

Operating Manual

Branson Ultrasonics Corp.
120 Park Ridge Road
Brookfield, CT 06804
(203) 796-0400
http://www.bransonultrasonics.com

BRANSON

Manual Change Information

At Branson, we strive to maintain our position as the leader in ultrasonics metal welding, plastics joining, ultrasonic 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 Touchscreen Controller system is a 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.

NOTICE	
	This document is intended for use with the following Branson products: Touchscreen Controller with a Welder.

This Instruction Set includes information for the Touchscreen Controller and actuator. Please refer to the Table Of Contents of this Instruction Set to find specific information.

Table Of Contents

List Of Figures

Chapter 1: Safety and Support

Chapter 2: Introduction

Chapter 3: Shipping and Handling

Chapter 4: Technical Specifications

Chapter 5: Operation

Chapter 6: Maintenance

List Of Tables

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 both in this manual and on the product itself 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	Indicates a possible danger
	If these risks are not avoided, death or severe injury might be the result.

CAUTION	Indicates a possible danger
	If these risks are not avoided, slight or minor injury might result.

NOTICE	Indicates a possible damaging situation
	If this situation is not avoided, the system or something in it's vicinity might get damaged. Application types and other important or useful information are emphasized.

1.1.2 Symbols found on the Product

The Touchscreen Controller has several warning labels on it to indicate the presence of hazardous voltages inside the unit.

Table 1.1 Symbols found on the product

Symbol	Description
	Warning. Ground the unit before operating.
	High Voltage. Risk of electric shock or burn. Do not remove cover. Refer service to qualified personnel only.

1.2 General Precautions

Take the following precautions before servicing the Touchscreen Controller:

- Be sure the power switch is in the Off position before making any electrical connections
- To prevent the possibility of an electrical shock, always plug the Touchscreen Controller into a grounded power source
- Power supplies produce high voltage. Before working on the Touchscreen Controller module, do the following:
  - Turn off the Touchscreen Controller;
  - Unplug main power; and
  - Allow at least 5 minutes for capacitors to discharge
- High voltage is present in the Touchscreen Controller. Do not operate with the cover removed
- High line voltages exist in the ultrasonic Touchscreen Controller 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 Touchscreen Controller before setting a DIP switch
- Keep hands away from the horn. Force (pressure) and ultrasonic vibrations can cause injury
- Do not cycle the welding system if either the RF cable or converter is disconnected

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.

NOTICE	
	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. 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.

1.2.1 Intended Use of the System

The Branson Touchscreen Controller and Actuator are components of an ultrasonic welding system. These are designed for a wide variety of welding or processing applications.

1.3 Regulatory Compliance

This product meets electrical safety requirements and EMC (Electromagnetic Compliance) requirements for North America 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.

- **Brookfield Main Number (all departments):** (203) 796-0400 (Eastern Time Zone)
- **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 6: 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

NOTICE	
	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, CT 06804, U.S.A.
Direct telephone number: (203) 796-0807
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.

1.6.1 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).

1.6.2 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?
   _____
   _____

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

_____

_____

4. What are the Weld Parameters?

   _____

   _____

   _____

5. What is your application? (Type of weld, metal material, etc.).

   _____

   _____

   _____

6. Name and phone number of the person most familiar with the problem:

   _____

   _____

   _____

7. Contact the Branson office prior to shipping the equipment.
8. 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.

1.6.3 Contact Information

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

1.6.4 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 the 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 6: 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: Introduction

2.1 Introduction

This manual provides detailed instructions for the setup, operation, and maintenance of the Branson Touchscreen Controller. For detailed information on operation and maintenance of other components connected to the Touchscreen Controller, refer to appropriate Actuator instruction manual.

The Touchscreen Controller contains a microprocessor-based controller that provides for control and monitoring of welding operations.

2.2 Model Covered

This document is intended for use with a Touchscreen Controller. This document is intended for use in conjunction with others to form a complete manual for your Branson system. Please refer to the Table Of Contents of this Instruction Set to find specific information.

2.3 Overview of this Model

Figure 2.1 Metal Welding Power Supply

The Branson welder generates ultrasonic electrical energy through an ultrasonic converter for welding metals. Several models are available, depending on the desired frequency (for example, 20 kHz) or the desired power range (for example, 2.2 kW). The Touchscreen Controller also contains a microprocessor-based controller module that provides for control and monitoring of welding operations.

Ultrasonic Power Supply Module

Generates ultrasonic energy at the resonant frequency of the Converter-Booster-Horn Stack. The Ultrasonic Power Supply Module contains five main circuits as follows:

- 320VDC Power Supply: Converts AC line voltage to +320VDC for the output power devices
- FET bridge: Switches the 320 VDC into ultrasonic pulses at the resonant frequency
- Output circuit: matches the impedance of the output power device to the Converter-Booster-Horn- Stack; and provides feedback to the Control circuit

Control circuits: Perform the following functions:

- Provide drive signal to output power device
- Determine true percentage of ultrasonic power used over a range of amplitudes
- Allows control of the resonant frequency
- Control starting amplitude

System Protection: Protects the Power Supply by providing five levels of protection:

- Voltage
- Current
- Phase
- Temperature
- Power

Line Board Module

Performs the dual function of providing RFI filtering for the line voltage input to the power supply, and controlling the electrical current surge to the ultrasonic Power Supply Module at power up until the inrush current limiter relay engages. The filtering also blocks ultrasonic signals from entering the AC main line. Additionally, the Line Board contains a soft start circuit module which limits the effects of current inrush.

DC Power Module- rectifies, filters, and regulates the AC voltages from the Line into DC voltages for the CPU Board. These two circuits are described below:

- 5VDC output: provides +5VDC for the analog and digital circuitry on the CPU Board
- 24VDC output: provides +24VDC for the CPU Board control signal and user I/O voltage

The DC Power Supply is mounted to the rear of the Power Supply case. It is mounted so it will swivel up to service the DC Power Supply, Line Board, and fuses.

Machine Controller Board

Provides a standard interface for automation and is accessed on the rear of the power supply. It gives the customer the ability to make their own interface for automation or special control and/or special reporting needs. It is mounted to the CPU Board on standoffs, and is connected to the rear of the controller case by its end panel.

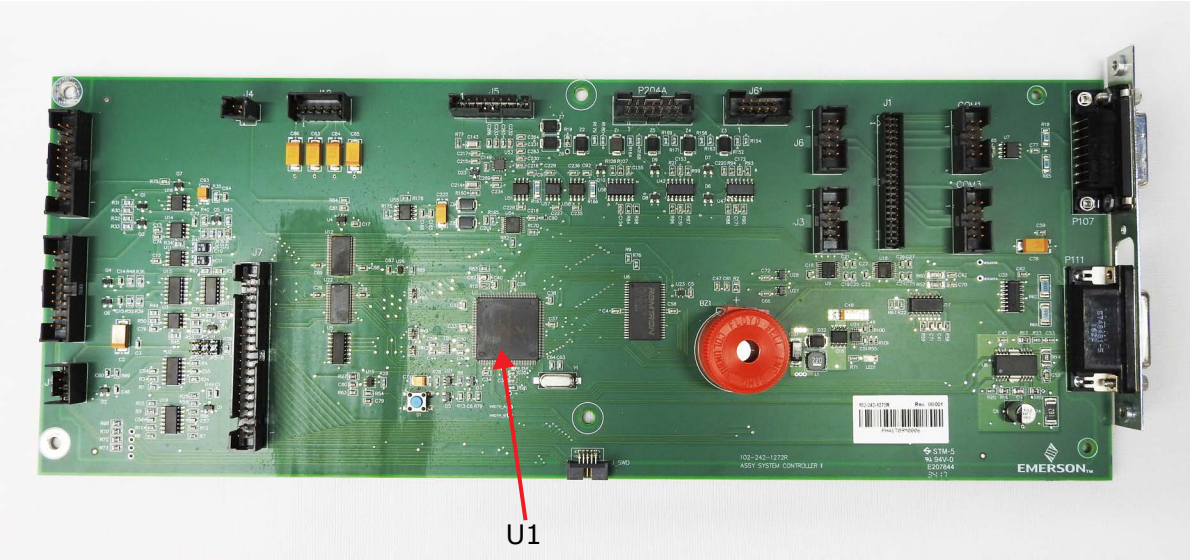
CPU Board

Controls the following functions of the Power Supply:

- Responding to start and stop signals
- Responding to alarm and reset signals
- Responding to user input from the front panel
- Activating and monitoring ultrasonics
- Provides information for Front Panel Displays
- Generate alarms
- Sending Weld data via RS232 serial communication
- Control communications

This board mounted to the bottom of the power supply box on standoffs and is connected to the rear of the controller case by its end panel. To access this board, removal of the Machine Controller Board is required. The system software resides in U1 as shown in Figure 2.2.

Figure 2.2 The CPU Board



Front Touchscreen Panel and Bezel Assembly

It is held by four upper screws which are accessible from inside the enclosure and four lower screws which are accessible from outside the enclosure through the ventilation slots in the bezel. Removal of the front bezel allows access to the following components which are housed inside it:

- **Touchpanel:** The sensing element which provides the user interface with the controller
- **LCD Screen:** The visual display through which instructions are communicated to the user. It is mounted directly behind the touchpanel
- **Display Board:** Contains the video control circuits for the LCD Screen. This board is mounted directly behind the LCD controller
- **Front Panel Board:** Houses the alarm beeper and the four diagnostic lights which are located to the right of the touchscreen on the front bezel
- **Power Switch:** Used to turn the Controller on and off

Motor Control Board

Contains the control circuit for controlling actuators which are equipped with a stepper motor driven gather mechanism.

Pneumatic Kit

Refer to the Special Information Instruction Set.

2.4 Compatibility with Branson Products

The Branson Touchscreen Controller is designed to be used with:

- Branson Metal Welding Actuators: Ultraweld 20, Ultraweld 40, MTS 20, Ultrasplice 40, ST 40, MWX100
- Branson Metal Welding Converters: See Table 2.1 below.

Table 2.1 Touchscreen Controller compatibility with Branson Metal Welding Converters

Branson Model	Converter
20 kHz/3300 W 20 kHz/4000 W	503, 105
30 kHz/1500 W	CR-30
40 kHz/800 W	4TJ, 4TR, 4TH

2.5 Ultrasonic Theory

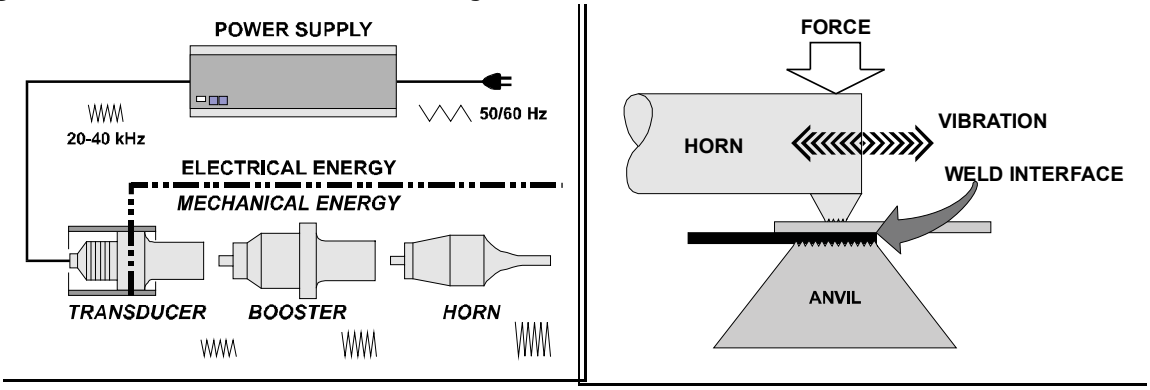
2.5.1 What Is An Ultrasonic Weld?

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 or 40,000 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 2.2 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 2.3 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.

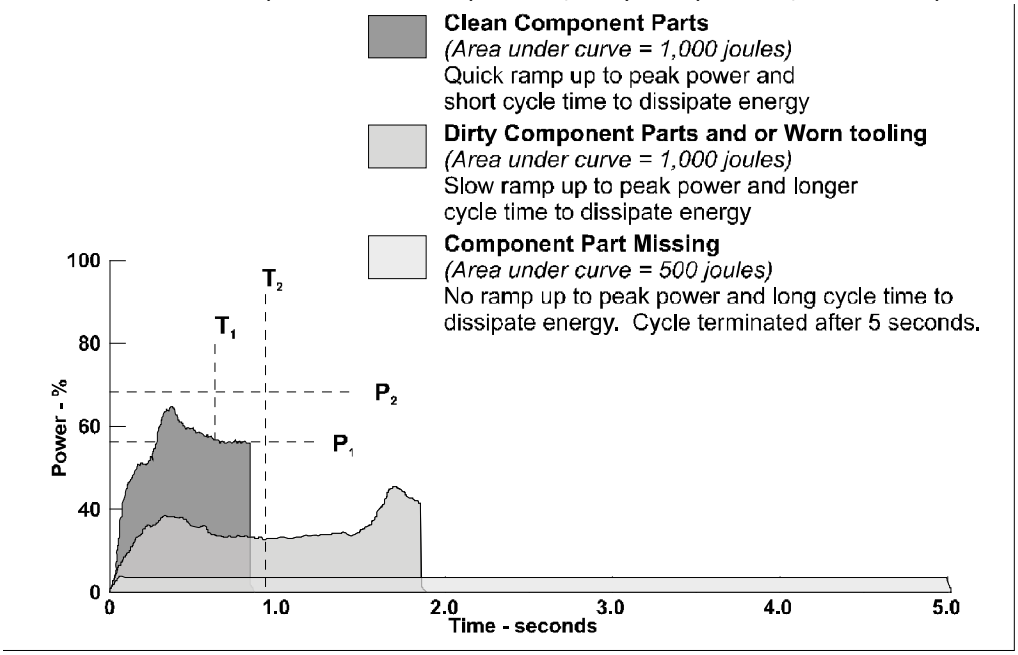
2.5.4 Welding To Energy - Why?

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 produce 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 Weld Power Graph for clean components, dirty components, and when part is missing) illustrates a weld produced. The weld 'power graph' is sometimes referred to as 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 components, dirty components, and when part is missing

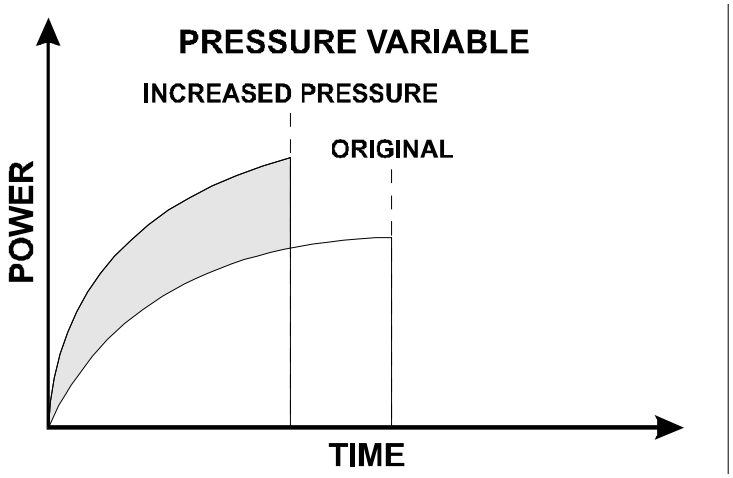


2.5.5 Power

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

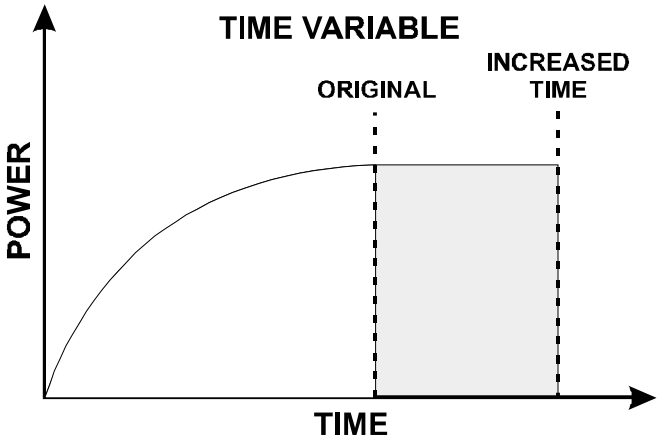


The difference in the appearance of each of the above weld graphs is the result of increased Power loading. Based upon an increase in Pressure, additional Power is required to maintain the motion of vibration. Thus, the same amount of energy is delivered in less time. This approach is typically used 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).

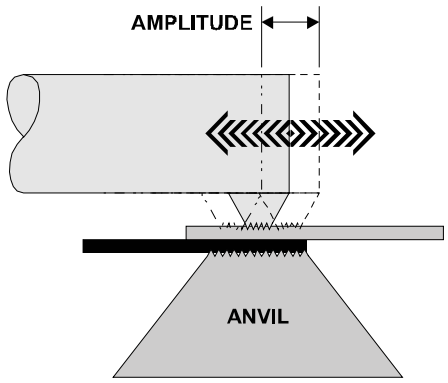
Figure 2.6 Pressure Variable with Increased Time



2.5.7 Amplitude

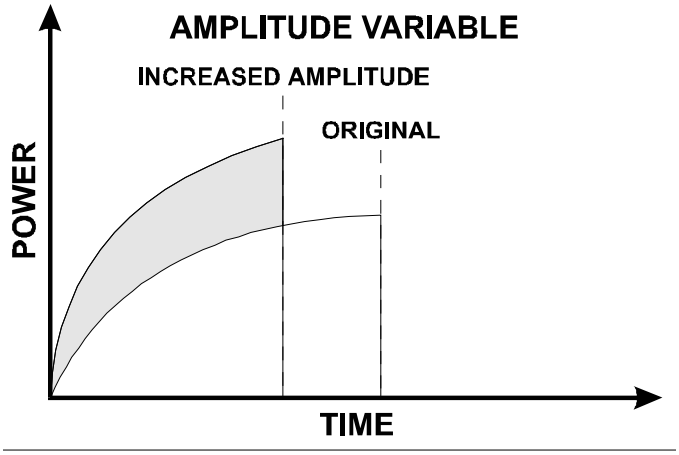
An ultrasonic tool is a resonant acoustical device. The term Amplitude is used to describe the amount of longitudinal expansion and contraction that the tooling endures as it vibrates (Figure 2.7). The amplitude correlates to the scrubbing action at the weld interface. This scrubbing action combined 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):

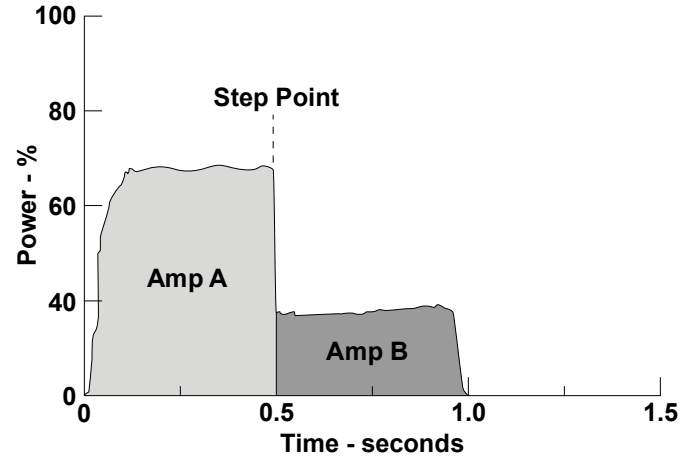
Figure 2.8 Amplitude's Influence on Weld Power and Time



2.5.8 Amplitude Stepping

In standard practice, the scrubbing amplitude at the weld interface is maintained constant during a weld cycle. Recent advances in technology have made it possible to change the amplitude of the horn face during the weld cycle. This is known as Amplitude Profiling. Figure 2.9 illustrates a typical profile where the amplitude is reduced during the cycle. This type of profile is used mostly with welding aluminum to increase weld strength and to help prevent sticking to the tooling.

Figure 2.9 Amplitude Stepping Profile



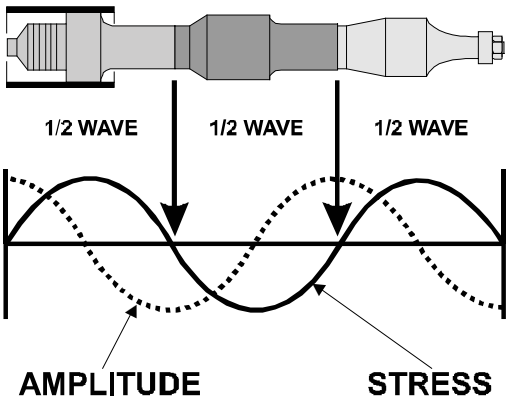
2.5.9 Resonant Frequency

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 2.10). 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 2.10 Harmonic Resonance on Ultrasonic Tooling.



2.5.10 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. Electronic circuits in the system will protect the power supply if this condition exists.

2.5.11 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

2.5.12 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 the weld is complete and at 1mm from the final height reading. Used when the splice nugget is sticking to the tooling.

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 .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.

Gathering Block: A specially designed mechanical device used to sweep across the face of the Tip to collect the wire strands, and to form the width of the compression chamber.

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 (also see 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 40 kHz, (40,000) or 20 kHz, (20,000) 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-Burst: A short duration (burst) of ultrasonic energy that begins after the Squeeze Time and before capturing the Pre-Height. Used when welding magnet wire. It helps to break up the insulation around the copper, and provide a small cooling period before the weld takes place.

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.

Quick After Burst: Once this option is enabled, the after burst needs to be implemented immediately after each weld cycle finished without any time delay or condition judgment.

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.

Width Encoder: A device utilized to monitor the position of the Gathering Block.

Chapter 3: Shipping and Handling

3.1 Shipping and Handling

CAUTION	High Voltage Hazard
	The Touchscreen Controller's internal components are sensitive to static discharge. Many components can be harmed if the unit is dropped, shipped under improper conditions or otherwise mishandled.

3.1.1 Environmental Specifications

The Touchscreen Controller is an electronic unit that converts line voltage to ultrasonic energy and controls user input for regulating the weld process. Its internal components are sensitive to static discharge, and many of its components can be harmed if the unit is dropped, shipped under improper conditions, or otherwise mishandled.

The following environmental guidelines should be respected when shipping the Touchscreen Controller:

Table 3.1 Environmental Requirements

Environment	Range
Storage / Shipping Temperature	-13º F to +131º F (-25º C to +55º C)
Humidity	30% to 95%* non condensing

*Above 40° C the humidity drops to 90%

3.2 Receiving

The Touchscreen Controller is a sensitive electronic device. Many of its components can be harmed if the unit is dropped or otherwise mishandled.

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

Scope of Delivery

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

To inspect the Touchscreen Controller when it is delivered, take the following steps:

Table 3.2 Inspection procedure after delivery

Step	Action
1	Verify that all parts are complete according to the packing slip.
2	Check the packing and the unit for damage (visual inspection).
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).

3.3 Unpacking

The Touchscreen Controller is fully assembled. It is shipped in a sturdy cardboard box. Some additional items are shipped in the box with the Touchscreen Controller.

When unpacking the Touchscreen Controller, take the following steps:

Table 3.3 Unpacking

Step	Action
1	Unpack the Touchscreen Controller as soon as it arrives. Save the packing material.
2	Inspect the unit for signs of damage.
3	Remove the cover of the Touchscreen Controller (see 6.2 Parts Replacement) to check if any components became loose during shipping.
4	Store or ship the Touchscreen Controller only within a temperature range of -13º F to +131º F (-25º C to +55º C).

NOTICE	
	If damage has occurred, notify the shipping company immediately. Retain packing materials for inspection.

3.4 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 Chapter 1: Safety and Support of this manual, for appropriate procedure.

Chapter 4: Technical Specifications

4.1 Environmental Requirements

The Touchscreen Controller has the following Environmental Requirements:

Table 4.1 Environmental Requirements

Environmental Concern	Controller/Power Supply
Ambient Operating Temperature	+41º F to +122º F (+5º C to +50º C)
Storage / Shipping Temperature	-13º F to +131º F (-25º C to +55º C*)
Humidity	30% to 95%**non condensing
Operating Altitude	1000 m (3280 ft)
IP Rating	2X

*70° C for 24 hours.
**Above 40° C the humidity drops to 90%.

4.2 Electrical Requirements

The following tables list input voltages, current requirements, and fuse requirements for the Touchscreen Controller Welding System, and includes power required when it is used with Branson Metal Welding Actuators.

Table 4.2 Electrical Input Operating Voltages

Power Supply Rating	Nominal Input Operating Voltage, +/-10%
40 kHz / 800W	200-230 V, 50/60 Hz, Single Phase
30 kHz / 1500 W	200-230 V, 50/60 Hz, Single Phase
20 kHz / 3300W	200-230 V, 50/60 Hz, Single Phase
20 kHz / 4000 W	200-230 V, 50/60 Hz, Single Phase

Table 4.3 Input Current and Fuse Requirements

Model	Power	Current Rating
For 20 kHz Models	3300 W 200V - 230V	21 Amp Max. @ 200V / 20 Amp fuse
	4000 W 200V - 230V	25 Amp Max. @ 200V / 25 Amp fuse
For 30 kHz Models	1500 W 200V - 230V	10 Amp Max. @ 200V / 10 Amp fuse
For 40 kHz Models	800 W 200V - 230V	5 Amp Max. @ 200V / 8 Amp fuse

4.3 Pneumatic Requirements

The factory compressed air supply must be "clean (to a 5 micron level), dry and unlubricated" air with a regulated maximum pressure of 80 psig (5.5 bar).

Chapter 5: Operation

5.1 Before Operating the Unit

Before attempting to operate the controller, make sure you have reviewed the entire manual and have an understanding of safety procedures. Check that connections between the controller and actuator are as shown in the Hookup Diagram provided in Special Information Instruction Set. The power button on the front of the system may then be used to turn the system on.

WARNING	High Voltage Hazard
	High voltage might be present in the Branson Touchscreen Controller (Touchscreen). When setting up and operating the welding system, observe the potential hazards listed below.

- Do not operate the Touchscreen Controller with the cover removed
- To prevent the possibility of electric shock, always plug the Touchscreen Controller into a grounded power source
- Do not cycle the welding system if either the RF cable or the converter is disconnected. High voltage could be present at open power connections
- Ensure power switch is in the OFF position before making or breaking any electrical or pneumatic connections to the Touchscreen Controller and/or Welder
- Do not touch Ultrasonic Horn during or immediately following the welding cycle. Vibrations and heat can burn skin
- When operating the controller keep clear of the actuator moving parts
- If power is removed from the system while the controller is on, it will be necessary to press the power button to its off position and then once again to its on position in order to restore power to the system

Interactive user screens supply a means of function selection and data entry for setting up the controller. The following pages provide illustrations, function descriptions and screen navigation instructions.

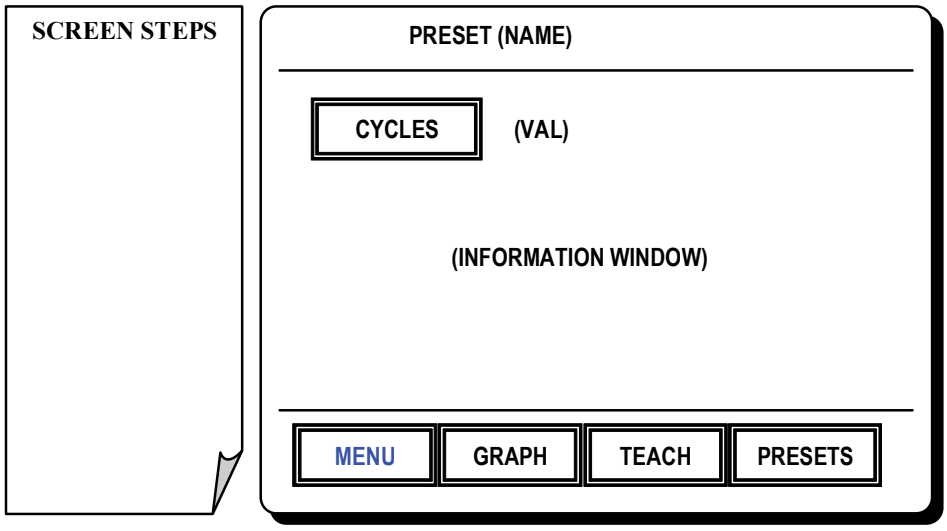
In the event of a system fault or an improper keyed entry, the controller will provide an instructional prompt screen in order to remedy the condition.

Controller User Screen Hierarchy

A drawing included in the Special information Instruction Set provides an overview of the controller user screens and functions shown in tree structure. It serves as a useful tool for navigating the command structure of the controller.

5.2 Run Screen

Figure 5.1 Run Screen



NOTICE	
	An image similar to the above will accompany the controller instructions in this section. The image on the right side resembles the controller touchscreen display. The left sidebar shows the screen steps required to arrive at the current display. If you are viewing the manual on a computer you may click on the blue links which will emulate many of the touchscreen operations.

Run Screen

This is the Run Screen. When you turn on your Controller it will start at this screen. Navigating from this menu will allow setup and configuration of the unit for your application.

Press one of the following options for this screen:

MENU

To go to the Menu Options which allows access to the settings and features of the controller. See 5.3 Menu Options Screen.

GRAPH/ DATA TOGGLE

To alternately display:

Power/ time graph of previous weld.

Current weld settings and feedback from previous weld.

TEACH TOGGLE

To accept teach samples when TEACH is shown highlighted. Used in standard mode the PRESET button will be replaced by an ACCEPT button which is pressed to add the previous weld data to the sample set. For more on Teach Mode see 5.23 Teach Mode Setup Screen.

PRESETS

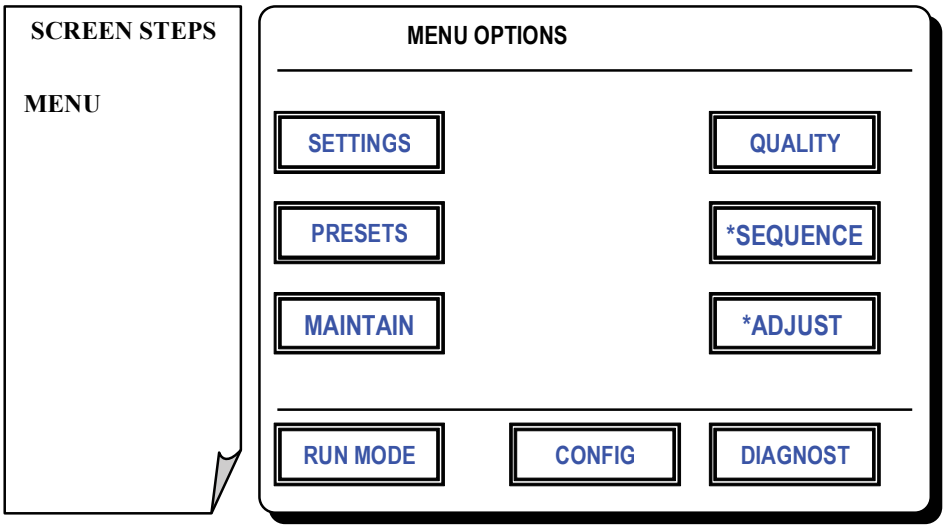
To retrieve a preset or save over an existing one stored in the controller preset library. For more on Presets see 5.7 Preset Menu Screen.

CYCLES

To reset the continuous cycle counter provided for user reference.

5.3 Menu Options Screen

Figure 5.2 Menu Options screen



Menu Options Screen

This screen allows access to the features of the controller. Features are divided in to related groups. Access to Configuration and Diagnostics are protected by a user changeable password. The password is initially set to 2677, the last four digits of Branson Metal Welding's phone number.

Press one of the following options for this screen:

SETTINGS

To change individual weld parameters which are the basic elements required to make a weld. See 5.4 Weld Settings Screen.

PRESETS

To name, save and recall specific weld parameter settings which may be stored in the controller's non volatile memory. See 5.7 Preset Menu Screen.

MAINTAIN

To allow adjustment and on demand control of the various motion devices in the weld actuator. Also allows access to maintenance counters which monitor tool life and sending data functions. See 5.10 Maintenance Menu Screen.

QUALITY

To allow setting min and max parameters for weld time, power, preheight and height. See 5.15 Weld Limits Screen.

SEQUENCE*

To name, save and recall sequences which may be stored in the controller's non volatile memory. A sequence is a series of grouped presets which are to be executed in a particular quantity and order. See 5.16 Sequence Menu Screen.

*Not available on Ultrasplice 40 & ST 40 actuators.

ADJUST*

To set weld height adjustment based on the measurements taken from the previous weld. See 5.20 Height Adjustment Screen.

*Available only on Ultraweld 20, Ultraweld 40, MTS 20, & ST 40 actuators equipped with a height encoder which is set to on.

CONFIGURATION

To access configuration features of the controller. These include units and language selection as well as various other operational settings. See 5.21 System Configuration Screen.

DIAGNOSTIC

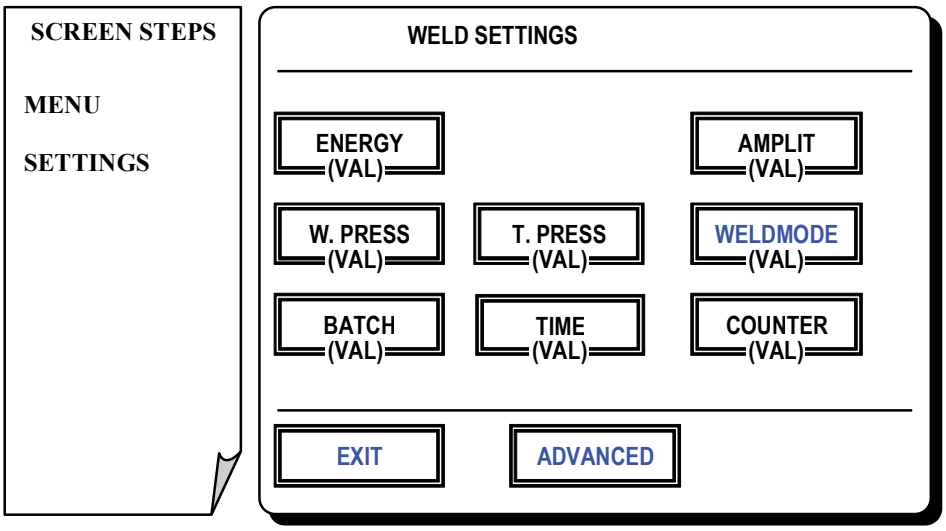
To make changes at the operating system level. These include initialization, serial port configuration and touch panel calibration. See 5.32 Diagnostic Screen.

RUN MODE

To return to Run Mode. See 5.2 Run Screen.

5.4 Weld Settings Screen

Figure 5.3 Weld Settings screen



Weld Settings Screen

From this screen you may change individual weld parameters which are the basic elements required to make a weld.

Press one of the following options for this screen:

ENERGY

To change the amount of energy (joules) delivered for each weld. See 5.35 Typical Keypad Entry Screen.

WELD PRESSURE

To change the clamping pressure delivered by the actuator while the weld is taking place. See 5.35 Typical Keypad Entry Screen.

BATCH

To set a batch count quantity which will display from the Run Screen in data mode. See 5.35 Typical Keypad Entry Screen.

TRIGGER PRESSURE

To change the pressure used to engage the knurl pattern into the component parts prior to initiation of ultrasonic energy. See 5.35 Typical Keypad Entry Screen.

TIME

To change the time duration of ultrasonic energy applied for each weld cycle. See 5.35 Typical Keypad Entry Screen.

Available only when Weld Mode is set to Time. See 5.5 Weld Mode Screen.

AMPLITUDE

To change amplitude which is measured in microns. If an amplitude stepping mode has been selected on the Weld Mode screen, you will be able to enter Amp-A, Amp-B, and a Step Point. Amplitude is the displacement of mechanical motion of the horn. See 5.35 Typical Keypad Entry Screen.

WELDMODE

To select the determining criteria for cut off of the ultrasonic energy. See 5.5 Weld Mode Screen.

COUNTER

To reset the batch counter.

ADVANCED

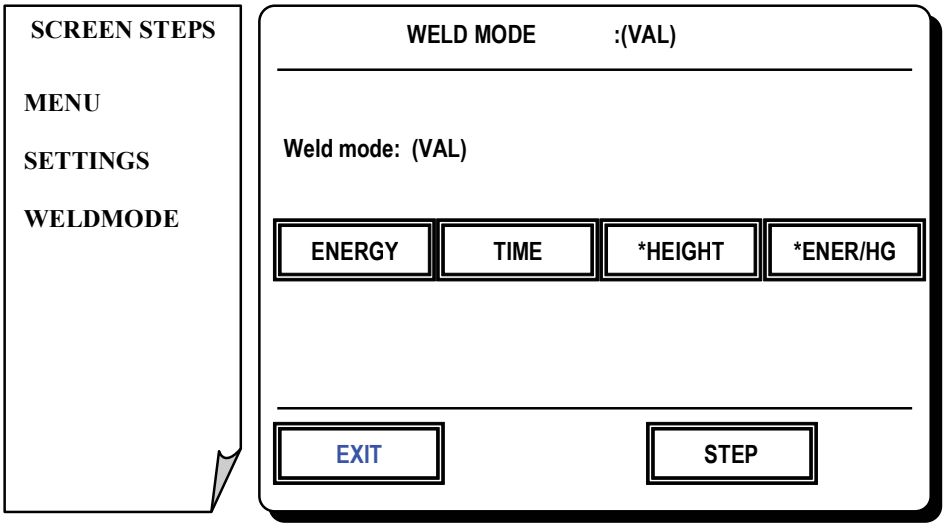
To enter selections pertaining to afterburst, squeeze and hold time. See 5.6 Advanced Weld Settings Screen.

EXIT

To return to Menu Options. See 5.3 Menu Options Screen.

5.5 Weld Mode Screen

Figure 5.4 Weld Mode screen



Weld Mode Screen

From this screen the weld mode may be selected. The weld mode dictates which weld setting variable will serve as the cutoff limit for the delivery of ultrasonic energy during each weld cycle.

Press one of the following options for this screen:

ENERGY

To weld in energy mode. The system delivers ultrasonic energy until a predetermined amount of energy (joules) is dissipated.

TIME

To weld in time mode. The system delivers ultrasonic energy for a predetermined amount of time (sec).

HEIGHT*

To weld in height mode. The system delivers ultrasonic energy until the tooling reaches a predetermined height (mm).

*Available only on Ultraweld 20, Ultraweld 40, MTS 20, & ST 40 actuators equipped with a height encoder which is set to on.

ENERGY W/HEIGHT COMPENSATION*

To weld in energy with height compensation mode. The system first delivers the predetermined amount of energy. If after the energy is delivered the welded part size does not fall within the height (mm) window, the system will deliver as required up to 300% more energy in order to achieve a mid window weld height.

*Available only on Ultraweld 20, Ultraweld 40, MTS 20, & ST 40 actuators equipped with a height encoder which is set to on.

STEP

To select the amplitude stepping mode. For information on entering the start amplitude, the step amplitude, and a stepping point see "Amplitude" under 5.4 Weld Settings Screen.

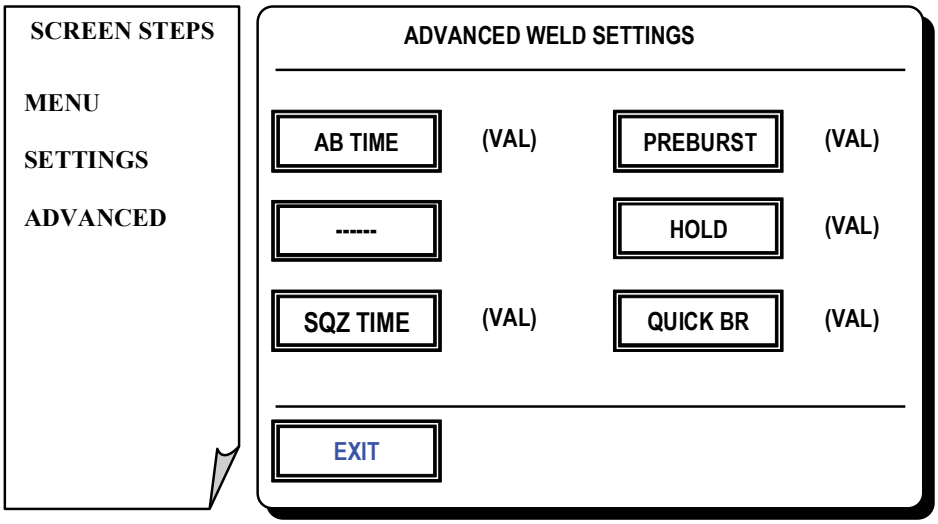
For information on Amplitude Stepping, see 2.5.8 Amplitude Stepping.

EXIT

To return to Weld Settings. See 5.4 Weld Settings Screen.

5.6 Advanced Weld Settings Screen

Figure 5.5 Advanced Weld Settings screen



Advanced Weld Settings

This screen allows access to the advanced options features defined below. These values will normally reflect the default settings made in Configuration mode. Values set from this screen will only effect the preset currently in use.

Press one of the following options for this screen:

AFTERBURST TIME

To change the amount of time (sec) of a short burst of ultrasonic energy that begins after the ultrasonic welding cycle. See 5.35 Typical Keypad Entry Screen.

AFTERBURST DELAY

To change the amount of time (sec) between the completion of the ultrasonic weld cycle and the start of the afterburst. See 5.35 Typical Keypad Entry Screen.

SQUEEZE TIME

To change the amount of time (sec) between when the horn engages the component(s) and when the delivery of ultrasonic energy occurs. See 5.35 Typical Keypad Entry Screen.

PREBURST

To change the amount of time (sec) of a short burst of ultrasonic energy that begins after the squeeze time and before capturing the Pre-Height. Used when welding magnet wire. It helps to break up the insulation around the copper, and provide a small cooling period before the weld takes place. See 5.35 Typical Keypad Entry Screen.

HOLD

To change the amount of time (sec) the components remain held under weld pressure after the delivery of ultrasonic energy. See 5.35 Typical Keypad Entry Screen.

QUICK AFTER BURST

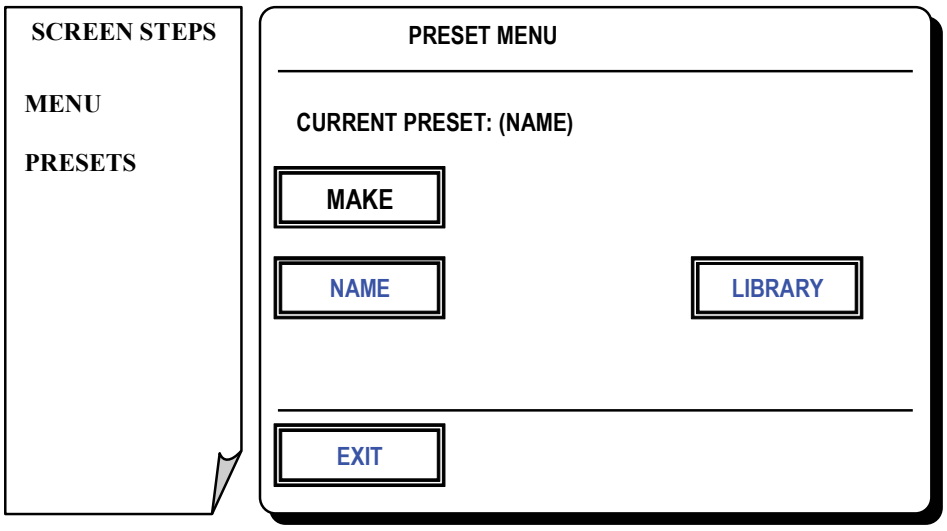
To enable/disable the Quick After Burst function.

EXIT

To return to Weld Settings. See 5.4 Weld Settings Screen.

5.7 Preset Menu Screen

Figure 5.6 Preset Menu screen



Preset Menu Screen

The controller allows for the storage of weld settings. The stored information is known as a preset. When a name is created and saved in the library, presets may then be saved under that name.

Press one of the following options for this screen:

MAKE NEW

To clear the current preset name in use. Advanced settings will default to those set under Configuration.

NAME

To create or edit a Preset Name. See 5.8 Preset Name Screen.

LIBRARY

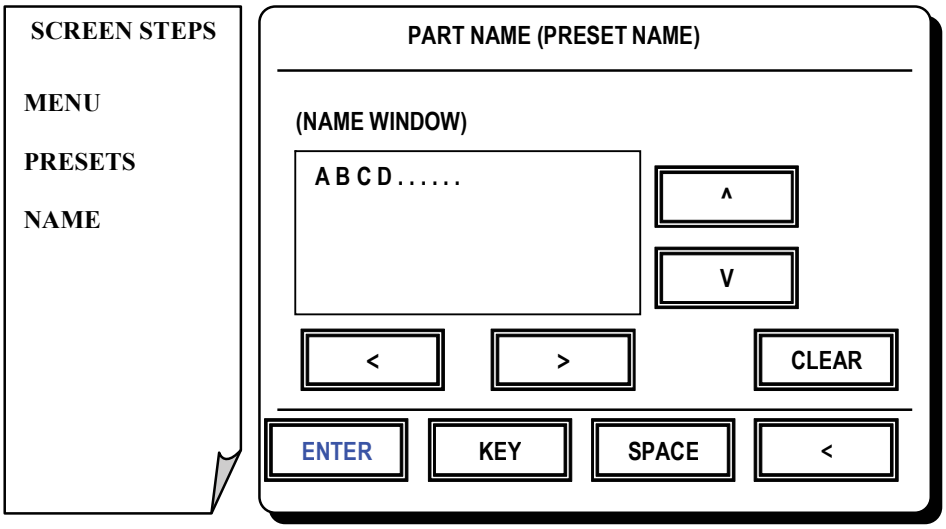
To save a preset by name for later recall. See 5.9 Preset Library Screen.

EXIT

To return to Menu Options. See 5.3 Menu Options Screen.

5.8 Preset Name Screen

Figure 5.7 Preset Name screen



Preset Name Screen

Names are created from this screen. The reason for creating a name is to associate it with particular group of weld settings and then store it in the controller library. A preset name may contain up to 20 characters.

Press one of the following options for this screen:

UP, DOWN, LEFT or RIGHT ARROWS

To navigate cursor over the desired character in the selection box.

KEY

To add the character in the name window.

SPACE

To add spaces in name window.

ARROW (lower right hand of screen)

To backspace one character.

CLEAR

To erase all characters in the name window.

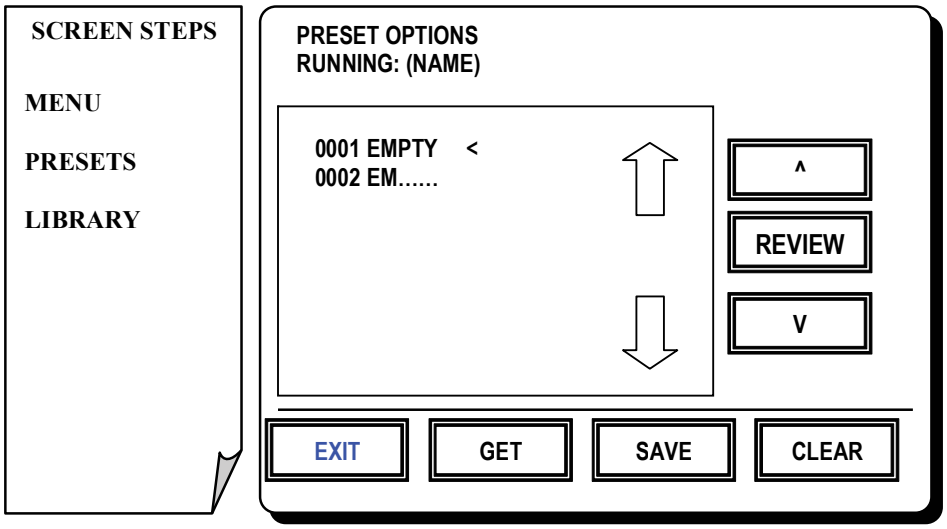
ENTER

To return to Preset Menu when you are satisfied with the name you have created. See 5.7 Preset Menu Screen.

NOTICE	
	The name will not be saved until it is stored in the library. See 5.9 Preset Library Screen.

5.9 Preset Library Screen

Figure 5.8 Preset Library screen



Preset Library Screen

When presets have been named and configured they must be stored in the library memory in order to retrieve them at a later date. Previously stored presets are also retrieved from this screen. The storage registers are shown mid screen starting with the number 0001 EMPTY. The preset that has been created or is in use is shown at the top of the screen. The library may store up to 1000 presets.

Press one of the following options for this screen:

UP or DOWN ARROWS

(Inside the storage register display window). To scan the library a page at a time.

UP or DOWN ARROWS

(Outside the storage register display window). To position the selection cursor next to the storage register you wish to fill, edit or retrieve from.

REVIEW

To view the weld settings associated with the register you have selected.

GET

To retrieve the preset into current memory.

SAVE

To retain the preset information in a selected register.

CLEAR

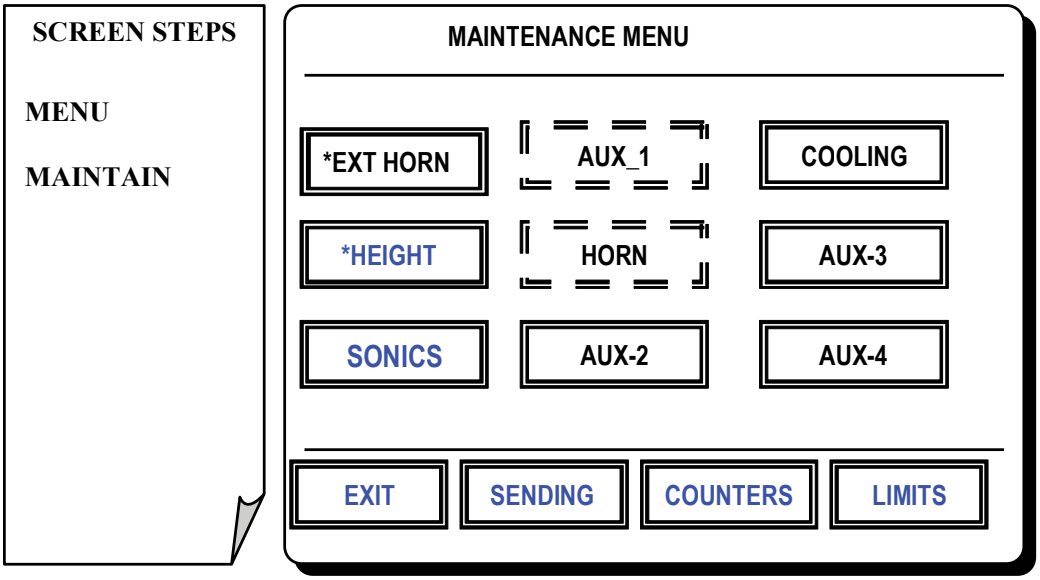
To erase information stored in a register.

EXIT

To return to the Preset Menu. See 5.7 Preset Menu Screen.

5.10 Maintenance Menu Screen

Figure 5.9 Maintenance Menu screen



Maintenance Menu Screen

The maintenance screen allows adjustment and on demand control of motion devices that are used in the weld actuator. This screen also allows access to sending data functions, maintenance counters and limit settings.

The level 2 password must be entered to access this menu. Default password is 2677.

Press one of the following options for this screen:

***EXT HORN**

To toggle the horn between up and down positions triggered by an external signal.

Use IN4 pin of the control cable for this function. When the EXT HORN signal is active, the HORN button will be highlighted.

*Make sure the L20 Actuator is selected to enable this function.

HEIGHT*

To calibrate the horn to anvil clearance. See 5.11 Height Calibration Screen.

*Available only on Ultraweld 20, Ultraweld 40, MTS 20, & ST 40 actuators equipped with a height encoder which is set to on.

SONICS

To allow on demand control of ultrasonic weld energy and calibrate amplitude. See 5.12 Sonic Generator Screen.

AUX_1 / GATHER

To toggle auxiliary actuator used on special systems (Ultraweld 20, Ultraweld 40, MTS 20, and ST 40).
To toggle the gather between open and closed positions (Gun 40 and MTS 20).

HORN / ANVIL

To toggle the horn between up and down positions. (Ultraweld 20, Ultraweld 40, and ST 40).
To toggle the anvil between up and down positions (Gun 40 and MTS 20).

AUX_2, AUX_3, AUX_4

To toggle auxiliary actuator used on special systems.

COOLING

To toggle the cooling air control solenoid on and off.

SENDING

To initialize and send the RS232 port used for recording weld information. See 5.13 Sending Screen.

COUNTERS

To set individual maintenance counters for critical parts on the actuator. See 5.14 Maintenance Counters and Limits Screen.

LIMITS

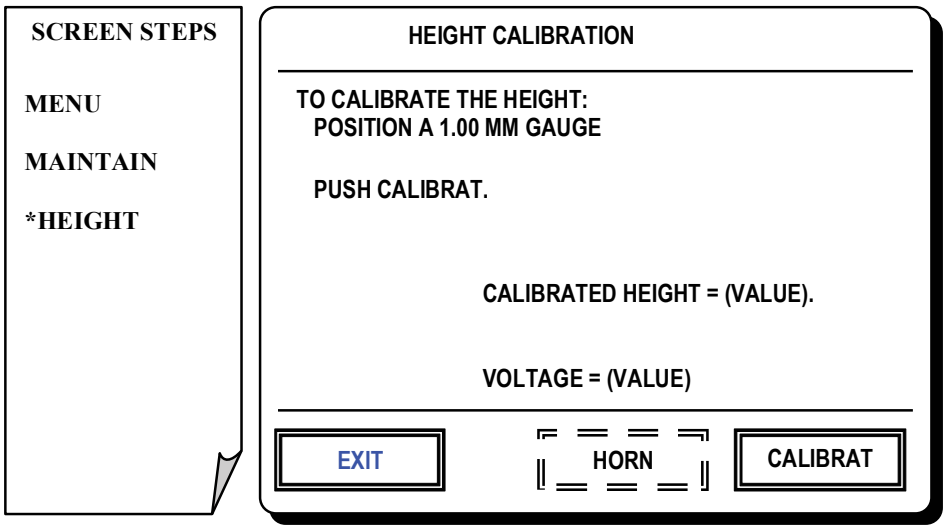
To set individual maintenance limits for critical parts on the actuator. See 5.14 Maintenance Counters and Limits Screen.

EXIT

To return to Menu Options. See 5.3 Menu Options Screen.

5.11 Height Calibration Screen

Figure 5.10 Height Calibration screen



Height Calibration Screen

This screen is for height (horn to anvil) calibration. The instructions on the screen explain the procedure for calibrating.

*Available only on Ultraweld 20, Ultraweld 40, MTS 20, & ST 40 actuators equipped with a height encoder which is set to on.

Press one of the following options for this screen:

HORN/ANVIL

To open and close horn against anvil.

CALIBRATE

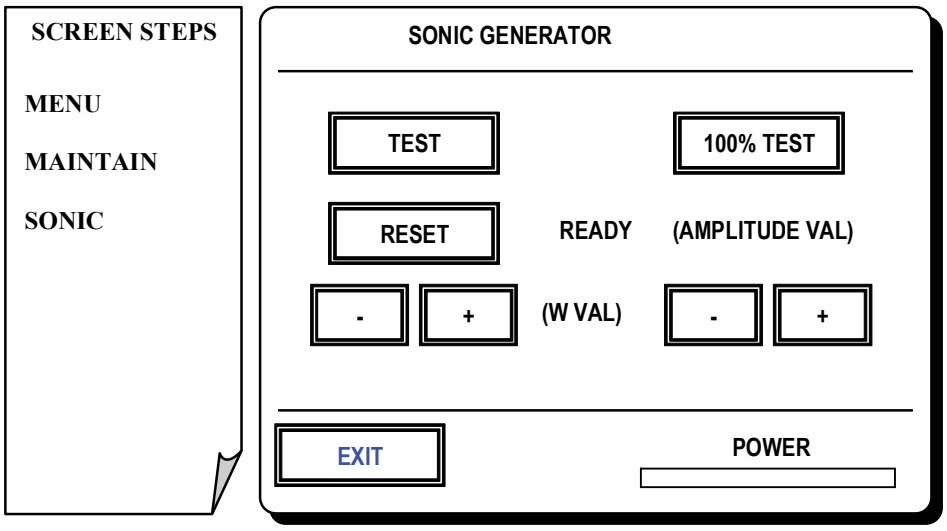
To calibrate height

EXIT

To return to Maintenance Menu. See 5.10 Maintenance Menu Screen.

5.12 Sonic Generator Screen

Figure 5.11 Sonic Generator screen



Sonic Generator Screen

This screen allows on demand control of ultrasonic weld energy and calibration of amplitude.

Amplitude calibration requires a dial indicator to be temporarily mounted in line with and in front of the horn usually on a magnetic base. The 100% test button is held and gage reading is viewed.

The gage reading x 2 = total amplitude, this is the value to be entered for the amplitude value when calibrating.

Press one of the following options for this screen:

TEST

To fire ultrasonic energy at the current amplitude setting.

RESET

To reset the controller if a weld overload should occur.

PLUS or MINUS (W)

Is set by Branson for a given actuator and is not changed. Generally the setting for 20 kHz actuators is 3300 W and the setting for 40 kHz actuators is 800W.

100% TEST

To fire ultrasonic energy at 100% amplitude. This is used when calibrating amplitude.

PLUS OR MINUS (MICRONS)

To set the amplitude value based on the indicator reading. See above.

POWER

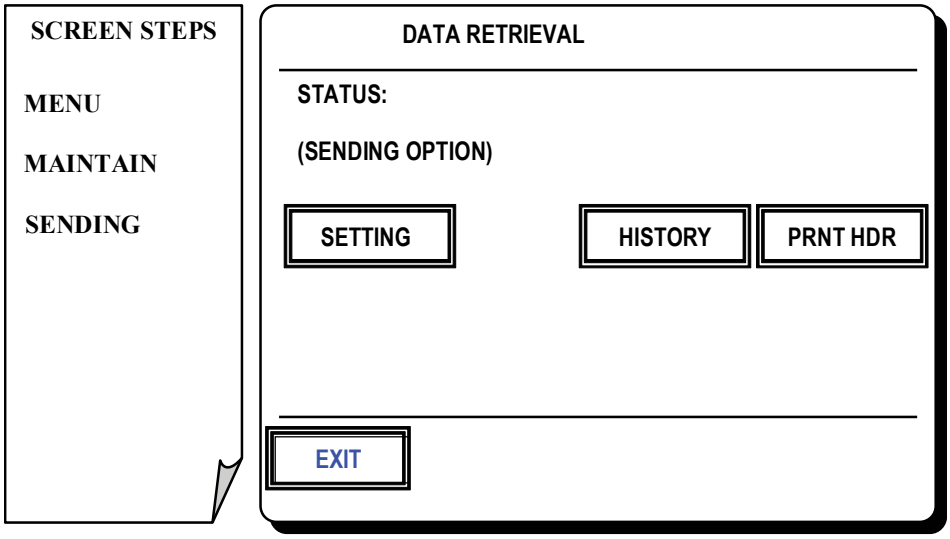
Power rate is displayed in real-time.

EXIT

To return to Maintenance Menu. See 5.10 Maintenance Menu Screen.

5.13 Sending Screen

Figure 5.12 Sending Screen



Sending Screen

This screen is for setup and test the RS232 port used for recording weld information.

Press one of the following options for this screen:

SETTING

To select the sending options which include:

- Sending off
- Send each weld
- Send on alarm

HISTORY

To send weld history information for previous welds. Send up to 128 welds.

PRNT HDR/NO HDR

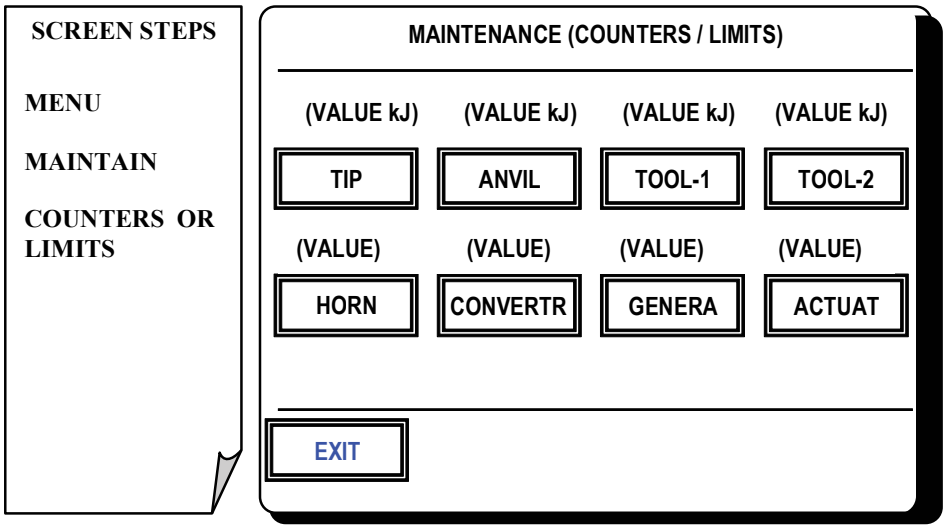
To toggle header on and off.

EXIT

To return to Maintenance Menu. See 5.10 Maintenance Menu Screen.

5.14 Maintenance Counters and Limits Screen

Figure 5.13 Maintenance Counters and Limits screen



Maintenance Counters and Limits Screen

Maintenance counters and limits are related. Both are set using the above screen. A maintenance counter will increment after each weld cycle up to the limit values set by the user. When a limit is exceeded the controller will issue a warning the next time it is turned on. Maintenance counters and limits may be reset at will. Any maintenance counter value which is less than its corresponding set limit value does not produce a warning on startup.

The top four values on the screen for tip, anvil, tool-1 and tool-2 are set in kilo joule units.

Example: if the energy weld setting in use is 1500 joules, a limit setting of 7500 kilo joules will produce about 5000 cycles before reaching its limit.

The tool-1 and tool-2 counters may be used to represent any special fixture tooling.

The bottom four values on the screen for horn, converter, generator (ultrasonic power supply), and actuator are set in number of cycles.

If a limit is set to 0 it will not yield a warning regardless of the maintenance count.

Press one of the following options for this screen:

ANY BUTTON

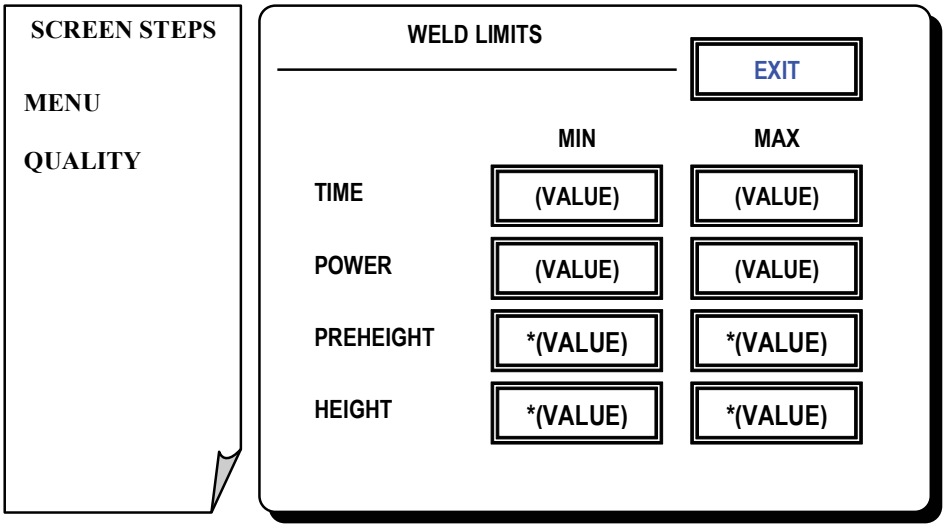
That you wish to set counter or limit values for. See 5.35 Typical Keypad Entry Screen.

EXIT

To return to Maintenance Menu. See 5.10 Maintenance Menu Screen.

5.15 Weld Limits Screen

Figure 5.14 Weld Limits screen



Weld Limits Screen

Weld limits assure that certain weld settings fall within a min/max range. This operating window assures the user of consistency between welds. If values fall outside these limits an alarm is given.

Press one of the following options for this screen:

TIME MIN or MAX

To set the min/max time (sec) that ultrasonic energy may be applied to a weld. See 5.35 Typical Keypad Entry Screen.

POWER MIN or MAX

To set the min/max power (watts) which may be applied to a weld. See 5.35 Typical Keypad Entry Screen.

PREHEIGHT MIN or MAX*

To set the min/max pre-height (mm). This is a pre sonic inspection reading from the height encoder prior to weld. See 5.35 Typical Keypad Entry Screen.

*Available only on Ultraweld 20, Ultraweld 40, MTS 20, & ST 40 actuators equipped with a height encoder which is set to on.

HEIGHT MIN or MAX*

To set the min/max height (mm). This is a post sonic inspection reading from the height encoder after welding. See 5.35 Typical Keypad Entry Screen.

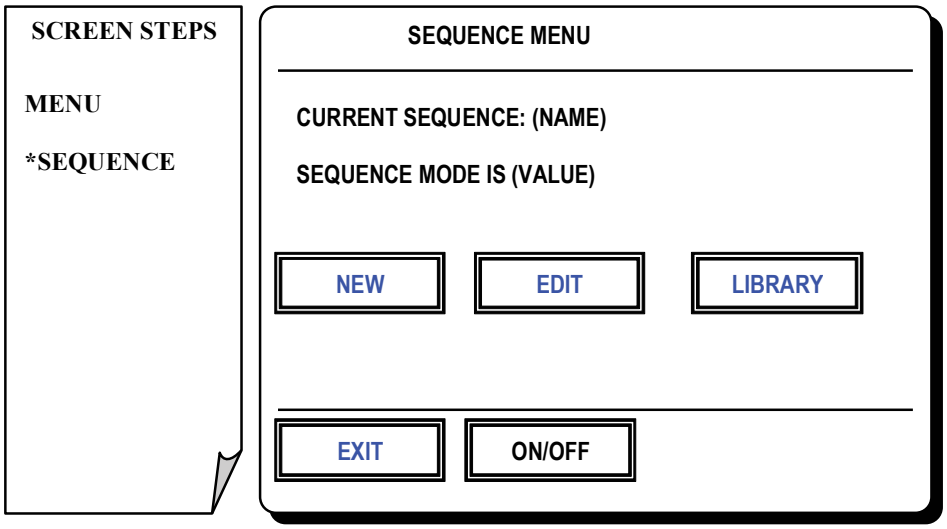
*Available only on Ultraweld 20, Ultraweld 40, MTS 20, & ST 40 actuators equipped with a height encoder which is set to on.

EXIT

To return to Menu Options. See 5.3 Menu Options Screen.

5.16 Sequence Menu Screen

Figure 5.15 Sequence Menu screen



Sequence Menu Screen

A sequence is a series of grouped presets which are to be executed in a particular quantity and order. Sequences are constructed using existing presets which have been previously stored in the preset library. When the combination of presets and their desired cycle quantities have been constructed they may be saved into the sequence library for future recall.

*Not available on Ultrasplice 40 & ST 40 actuators.

Press one of the following options for this screen:

NEW

To create a new sequence name. See Figure 5.16 Sequence Name and Edit screen.

EDIT

To edit an existing sequence name. See Figure 5.16 Sequence Name and Edit screen.

LIBRARY

To access the sequence library. See 5.19 Sequence Library Screen.

ON/OFF

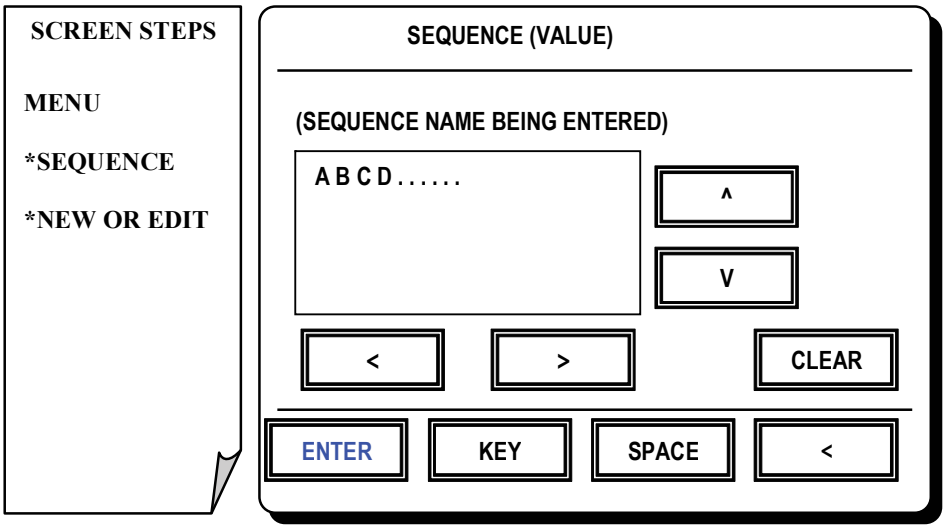
To toggle sequence mode on and off.

EXIT

To return to Menu Options. See 5.3 Menu Options Screen.

5.17 Sequence Name and Edit Screen

Figure 5.16 Sequence Name and Edit screen



Sequence Name & Edit Screen*

Sequence names are created and edited from this screen. Once the name is created the user may choose the presets which make up the sequence. Up to 50 sequences may be stored.

*Not available on Ultrasplice 40 & ST 40 actuators.

Press one of the following options for this screen:

UP, DOWN, LEFT or RIGHT ARROWS

To navigate cursor over the desired character in the selection box.

KEY

To add the character in the name window.

SPACE

To add spaces in name window.

ARROW (lower right hand of screen)

To backspace one character.

CLEAR

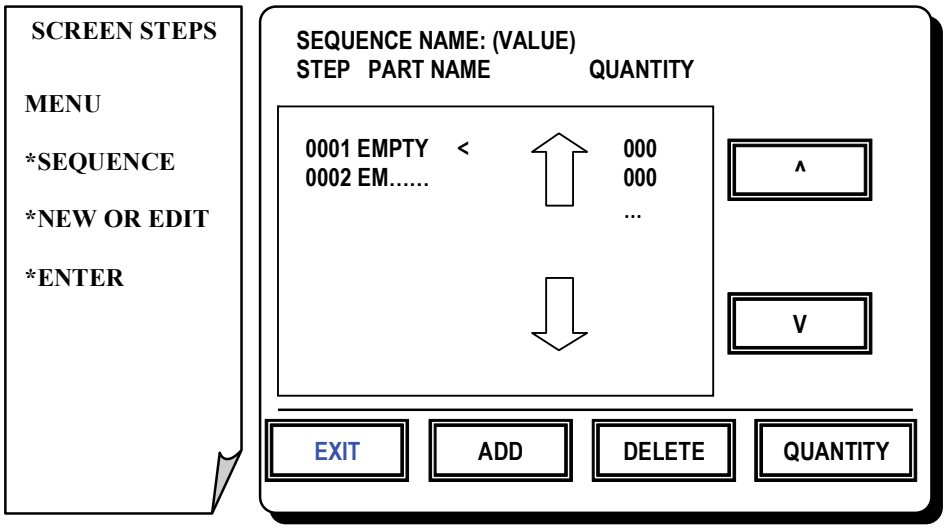
To erase all characters in the name window.

ENTER

When satisfied with the sequence name. The Sequence Steps screen will appear and presets used in the sequence may be selected. See 5.18 Sequence Steps Screen.

5.18 Sequence Steps Screen

Figure 5.17 Sequence Steps screen



Sequence Steps Screen*

A sequence consists of a series of presets, each of which is executed a designated number of times. This screen allows selection of presets and assignment of quantities.

*Not available on Ultrasplice 40 & ST 40 actuators.

Press one of the following options for this screen:

UP or DOWN ARROWS

(Inside the storage register display window). To scan sequence steps a page at a time.

UP or DOWN ARROWS

(Outside the storage register display window). To position the selection cursor next to the storage register you wish to fill, edit or retrieve from.

ADD

To add a preset to the sequence. A screen will appear which allows you to select a preset from the preset library.

DELETE

To delete the selected preset from the sequence.

QUANTITY

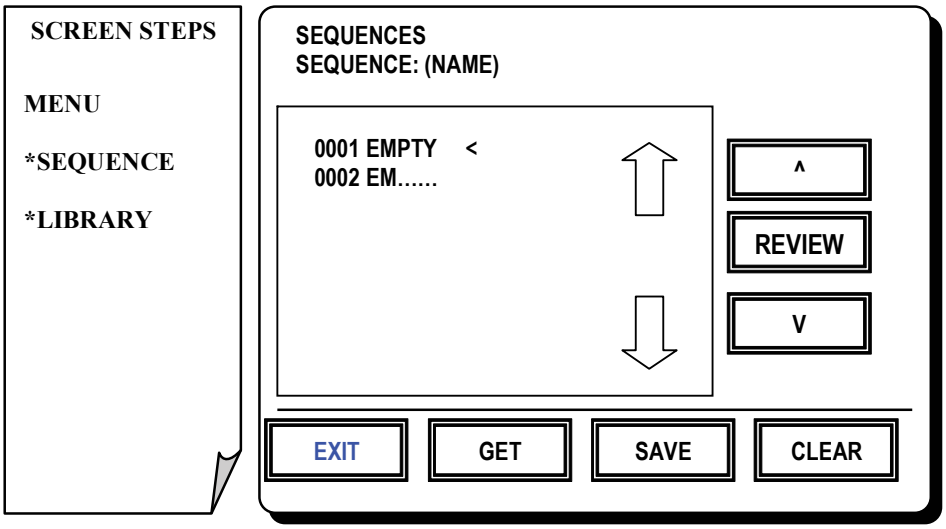
To specify the number of times to execute the selected preset in the sequence (250 times maximum).

EXIT

When satisfied with the sequence steps. If the sequence is new or has been changed, an option to try the sequence (return to the Run Screen, see 5.2 Run Screen) or exit (return to Sequence Menu, see 5.16 Sequence Menu Screen) is given.

5.19 Sequence Library Screen

Figure 5.18 Sequence Library screen



Sequence Library Screen

When a sequence has been named and configured it must be stored in the library memory in order to retrieve it at a later date. The sequence that has been created or is in use is shown at the top of the screen.

Not available on Ultrasplice 40 & ST 40 actuators.

Press one of the following options for this screen:

UP or DOWN ARROWS

(Inside the storage register display window). To scan the sequence library a page at a time.

UP or DOWN ARROWS

(Outside the storage register display window). To position the selection cursor next to the sequence storage register you wish to fill, edit or retrieve from.

REVIEW

To view the presets associated with the selected sequence.

GET

To retrieve the sequence into current memory.

SAVE

To retain the sequence information in a selected register.

CLEAR

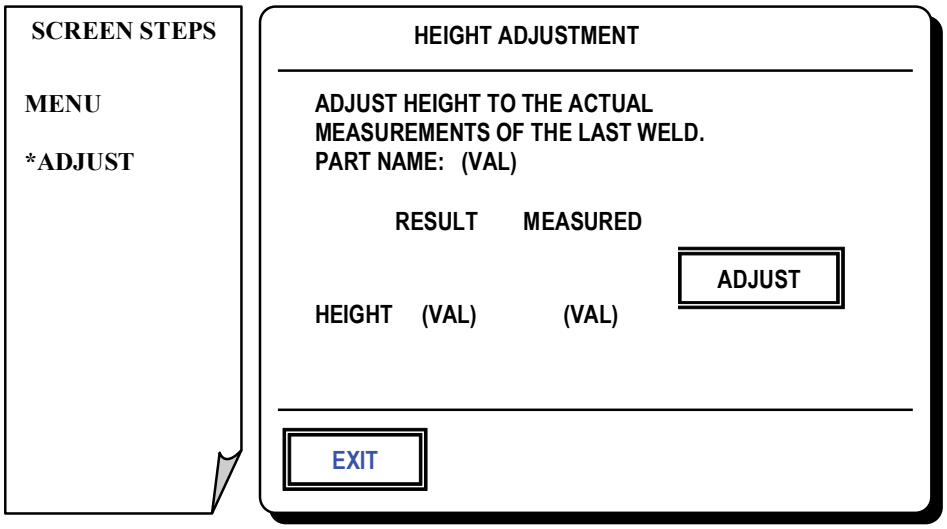
To clear a stored sequence from its storage register.

EXIT

To return to the Sequence Menu. See 5.16 Sequence Menu Screen.

5.20 Height Adjustment Screen

Figure 5.19 Height Adjustment screen



Height Adjustment Screen*

The actual measured value of a weld may vary from the height setting in the controller. The height setting does not include added height of component material which extrudes into the knurl patterns of the tooling. This screen allows an offset compensation to be entered so that the resultant weld matches the set value for height. The result value is set in the controller and represents the desired actual dimension of the weld. The measured value is taken from an actual sample and input using the adjust button. The controller will then create a compensation factor to produce the desired weld size.

*Available only on Ultraweld 20, Ultraweld 40, MTS 20, & ST 40 actuators equipped with a height encoder which is set to on.

Press one of the following options for this screen:

ADJUST

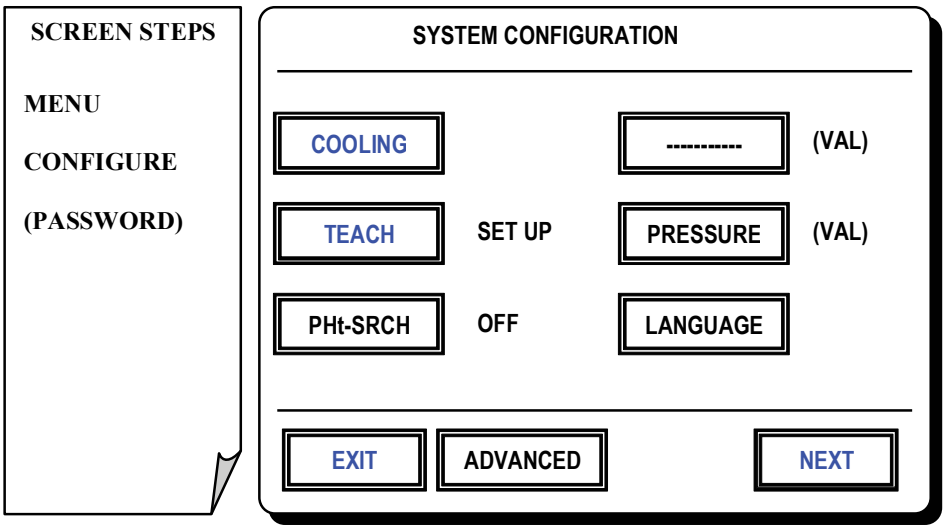
To enter a measured height (mm) value. See 5.35 Typical Keypad Entry Screen.

EXIT

To return to Menu Options. See 5.3 Menu Options Screen.

5.21 System Configuration Screen

Figure 5.20 System Configuration screen



System Configuration Screen

Features in this screen are global and remain unchanged regardless of other weld setting or presets that are currently in use. The exception is Advanced settings which serve as defaults and may be overridden on an individual preset basis. See 5.6 Advanced Weld Settings Screen for reference.

COOLING

To set timers that control post weld cooling air. See 5.22 Cooling Screen.

TEACH

To set mode and criteria for the teach function. The teach feature is a method for establishing weld limits. See 5.23 Teach Mode Setup Screen.

PHt-SRCH

To toggle Pre-Height Search function on and off.

ADVANCED (Default)

To set default values for advanced features. The screen and features are identical to those in Advanced Weld Settings. See 5.6 Advanced Weld Settings Screen for reference.

PRESSURE

To toggle pressure units between PSI and bar.

LANGUAGE

To select a controller display language in English, Spanish, Portuguese, French or German.

NEXT

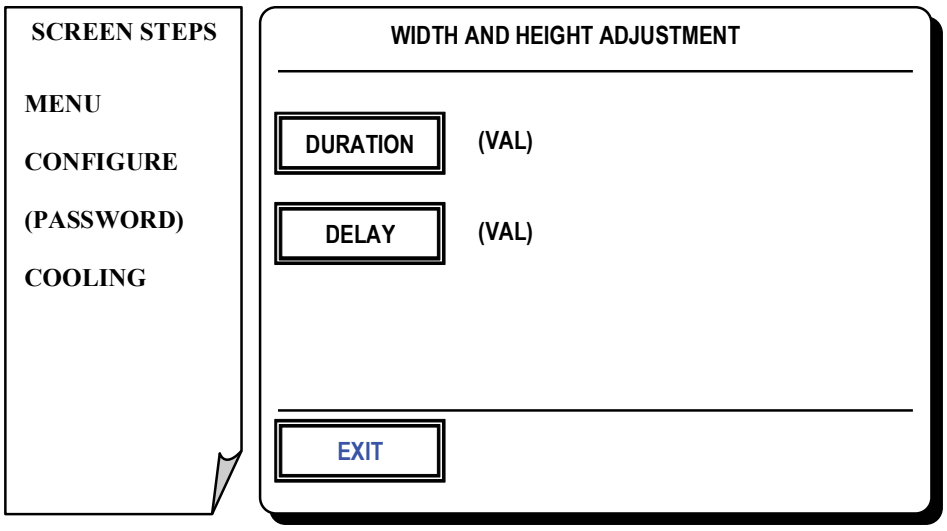
To view more configuration features. See 5.24 System Configuration Screen (Next).

EXIT

To return to Menu Options. See 5.3 Menu Options Screen.

5.22 Cooling Screen

Figure 5.21 Cooling screen



Cooling Screen

This screen allows access to timer settings which control post weld cooling air for tooling.

Press one of the following options for this screen:

DURATION

To change the length of time the cooling air is on after each weld cycle. See 5.35 Typical Keypad Entry Screen.

DELAY

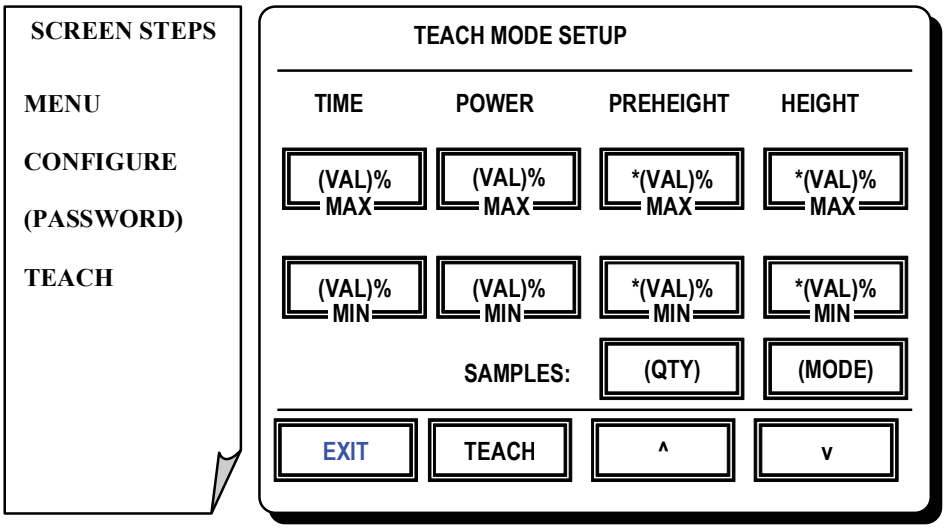
To change the delay period after weld and before cooling air is turned on. See 5.35 Typical Keypad Entry Screen.

EXIT

To return to System Configuration. See 5.21 System Configuration Screen.

5.23 Teach Mode Setup Screen

Figure 5.22 Teach Mode Setup screen



Teach Mode Setup Screen

The teach feature may be used to establish weld limits (see 5.15 Weld Limits Screen for reference) from a series of sample welds made by the user. Upon successful completion of the sample set the controller does the following:

- Calculates average values for Time, Power, Preheight and Height variables
- Factors the allowable min/max deviation percentages as entered in this screen
- Uses the resultant values to create the weld limits

There are two teach modes available as means to do sampling. The mode in use will be displayed at the top of this screen. These modes area as follows:

In the Standard Teach Mode the user may accept or reject each weld as part of the sample set. The button to accept the samples will appear to the right of the TEACH button on the Run Screen. Sample sets of 1 to 50 may be used.

In the Auto Teach Mode the user may not reject samples. Instead, the first five welds form a basis using the averaged values for Time, Power, Preheight and Height. A plus or minus ten percent tolerance is added to these averages which are used to evaluate the acceptability of the remaining samples. If a remaining sample falls outside of this range it is rejected and an alarm occurs. A teach session may encounter up to three errors in the first 15 welds made after which the sampling must be started over. Once completed the preset must be saved. When the preset is recalled again the controller will use the saved quality windows for the first five welds, after the first five welds are made, the controller will recalculate the windows to plus or minus ten percent and follow the same routine as stated above for the auto teach mode. Auto Teach mode will automatically reactivate when you change any of the weld parameters, quality windows or recall a new preset.

Once the teach mode sample size and variation criteria has been established, a sample run may be initiated by pressing the TEACH button on this screen or on the Run Screen.

Press one of the following options for this screen:

ANY MIN/MAX % VALUE*

To select an allowable deviation to be applied to the sample average. Availability of Preheight and Height settings is actuator dependent.

*Available only on Ultraweld 20, Ultraweld 40, MTS 20, & ST 40 actuators equipped with a height encoder which is set to on.

(MODE)

To toggle between Standard and Auto teach modes.

(QTY)

To enter a quantity for the sample set. The sample set may include up to fifty welds. In Auto mode the sample set has a fifteen weld minimum.

TEACH

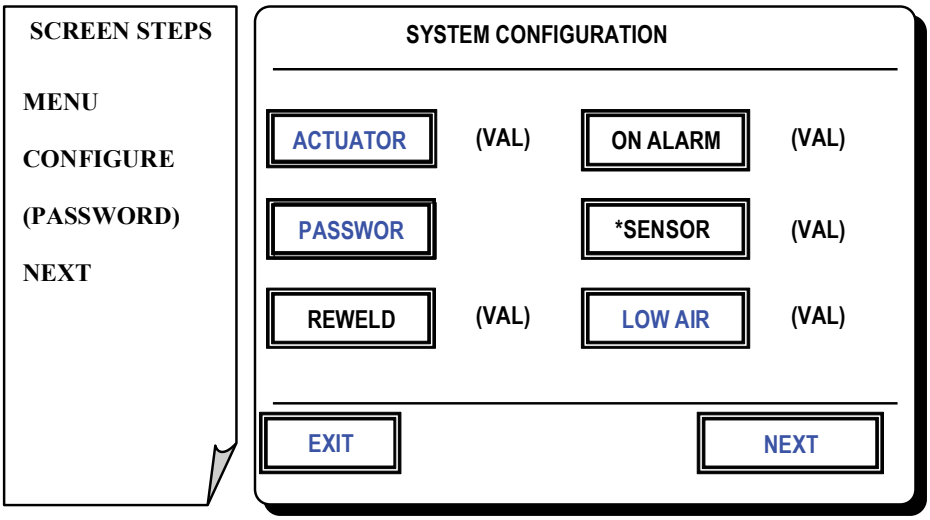
To put the controller in teach mode.

EXIT

To return to System Configuration. See 5.21 System Configuration Screen.

5.24 System Configuration Screen (Next)

Figure 5.23 System Configuration screen (Next)



System Configuration Screen (Next)

This screen allows access to other configuration settings.

Press one of the following options for this screen:

ACTUATOR

To configure the controller for the correct actuator. See 5.25 Actuator Selection Screen.

PASSWORD

To create passwords that control operator access to the touchscreen commands. See 5.26 Password Changing Screen.

REWELD

To toggle the reweld mode on/off. This provides an option when a weld limit alarm (see 5.15 Weld Limits Screen for reference) occurs. If the reweld setting is on the user may choose to reweld the same part again. Weld limits are turned off for one cycle while the reweld takes place.

ON ALARM

To toggle between lock or allow a weld to continue when an alarm condition exists. When set to lock the actuator will not release the part until a level 1 password is entered.

***SENSOR**

To toggle between Full/Half height encoder.

*Make sure the L20 Actuator is selected to enable this function.

LOW AIR

To set options and threshold for low line air pressure. See 5.28 System Configuration Screen (Next, Next).

NEXT

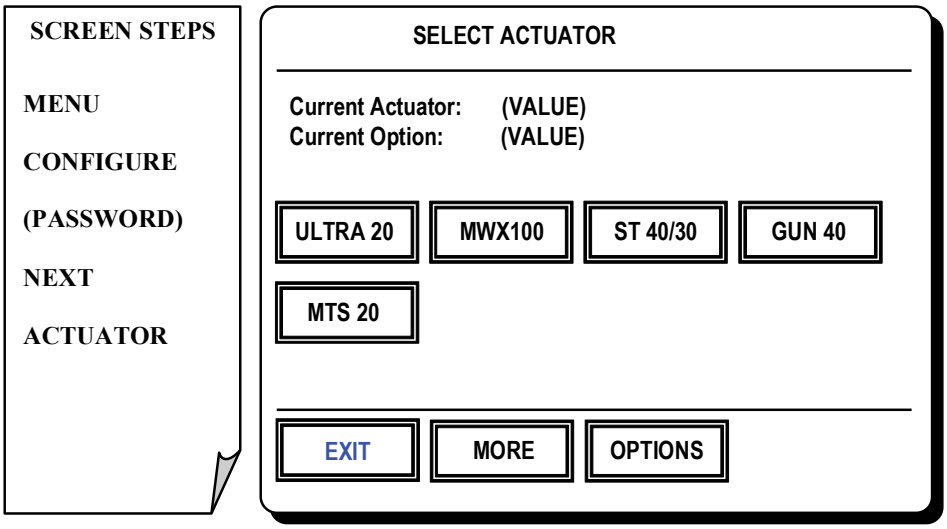
To view more configuration features. See 5.28 System Configuration Screen (Next, Next).

EXIT

To return to System Configuration. See 5.21 System Configuration Screen.

5.25 Actuator Selection Screen

Figure 5.24 Actuator Selection screen



Actuator Selection Screen

This screen is used to match the controller firmware to its attached actuator type.

Press one of the following options for this screen:

ULTRA 20

To configure the controller for the Ultraweld L20 actuator.

MWX100

To configure the controller for the MWX100 actuator.

ST 40/30

To configure the controller for the ST 30/40 actuator (plastic tube sealing).

GUN 40

To configure the controller for Gun 40 actuator.

MTS 20

To configure the controller for the Ultraseal 20 actuator (metal tube sealing).

OPTIONS (Ultraweld L20, MWX100, and Ultraseal 20 Only)

To select available options:

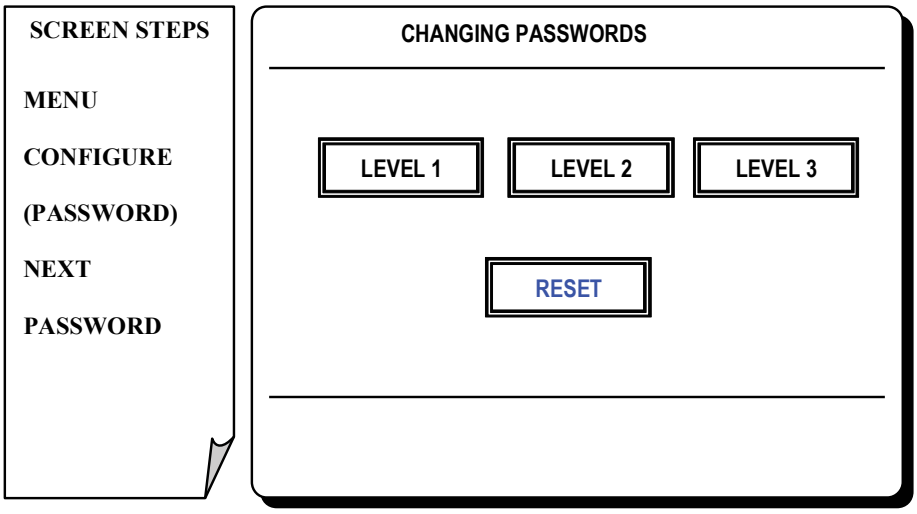
- Normal Mode/Double Hit Mode: To switch between normal mode and Double Hit mode (used for automation). Do not activate Double Hit Mode unless instructed by Branson (Ultraweld L20 and MWX100 only)
- Use FootSwitch/Use StartHandle: Used to select between using a foot switch or a start handle to begin the weld cycle (Ultraseal 20 Only)

EXIT

To return to System Configuration. See 5.24 System Configuration Screen (Next).

5.26 Password Changing Screen

Figure 5.25 Password Changing screen



Password Changing Screen

This screen is used to create passwords that control operator access to the touchscreen commands.

Level 1 passwords restrict access to the following screens:

Settings	Quality
Sequence	Splices
Teach	Adjust

Level 2 passwords restrict access to the Configuration. Maintain and Diagnostic screens. In order to use a Level 1 password a Level 2 password must be set.

Level 3 passwords restrict access to the following screens:

Quality limits key pads	Make a new splice	Teach Button
Weld setting key pads		

A Level 1, Level 2, or Level 3 password which is set to "0" turns password protection off. The factory settings for the controller are "0" for Level 1, 3 and "2677" for Level 2.

To change a password the user must first enter the current password. If password protection is off, enter "0" as the current password. A new password may then be entered.

A password may be up to 4 numbers Max.

Press one of the following options for this screen:

LEVEL 1

To change the Level 1 password setting.

LEVEL 2

To change the Level 2 password setting.

LEVEL 3

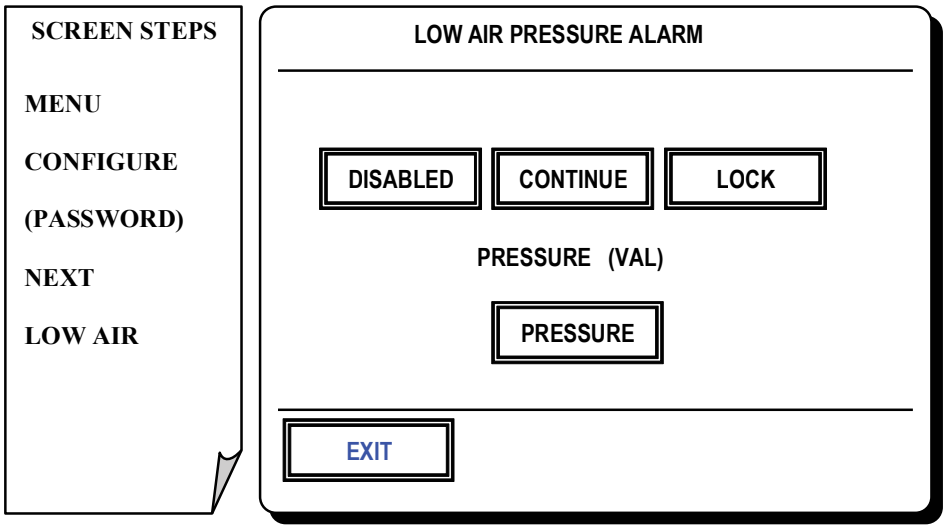
To change the Level 3 password setting.

RESET

To return to System Configuration. 5.24 System Configuration Screen (Next).

5.27 Low Air Alarm Screen

Figure 5.26 Low Air Alarm screen



Low Air Alarm Screen

This screen is for setting low air line pressure alarm options.

Press one of the following options for this screen:

DISABLED

To disable low pressure alarm. Select this setting if the system is not equipped with a pressure switch.

CONTINUE

To finish weld after sensing low pressure.

LOCK

To not allow weld after sensing low air pressure.

PRESSURE

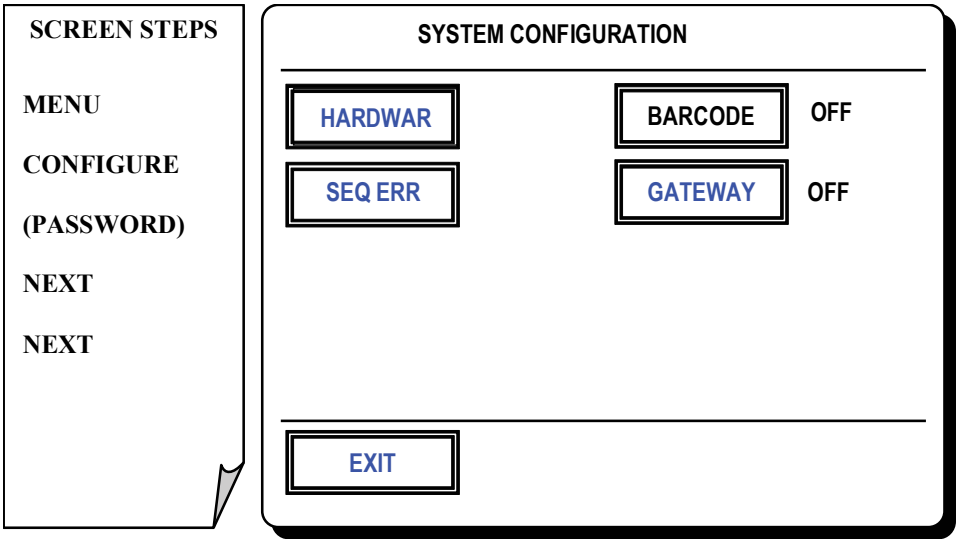
To set the alarm threshold for low line pressure. See 5.35 Typical Keypad Entry Screen.

EXIT

To return to System Configuration. See 5.24 System Configuration Screen (Next).

5.28 System Configuration Screen (Next, Next)

Figure 5.27 System Configuration screen (Next, Next)



System Configuration Screen (Next, Next)

This screen allows access to other configuration settings.

Press one of the following options for this screen:

HARDWARE

To set information feedback devices. See 5.29 Transducer Configuration Screen.

SEQUENCE ERROR

To set error handling options when running in Sequence mode. See 5.30 Sequence Error Screen.

BARCODE

To enable/disable barcode functionality.

GATEWAY*

To enable/disable Gateway functionality.

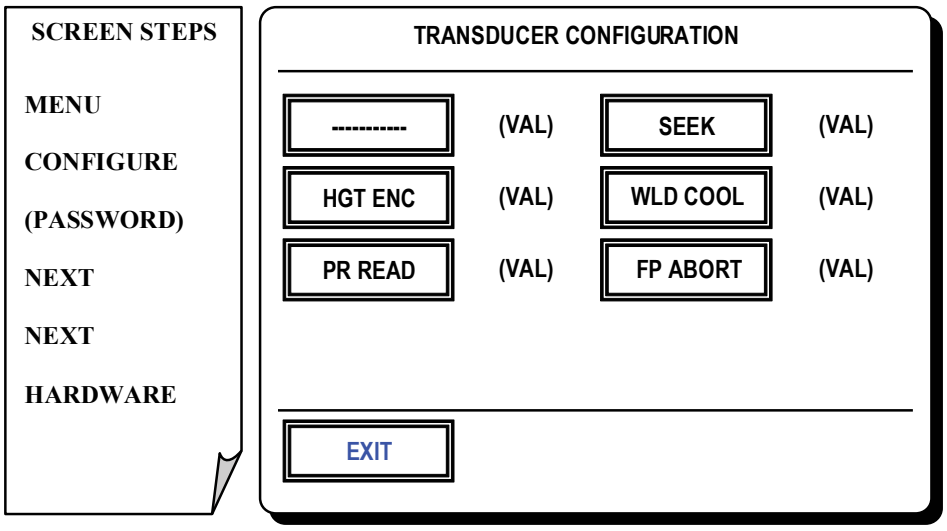
EXIT

To return to System Configuration. See 5.24 System Configuration Screen (Next).

*Available only on Ultraweld 20. Refer to Data Interface Gateway Manual 1026686 for setting up the Module RS232 to Ethernet.

5.29 Transducer Configuration Screen

Figure 5.28 Transducer Configuration screen



Transducer Configuration Screen

This screen allows control of information feedback devices on the actuator.

Press one of the following options for this screen:

HEIGHT ENCODER*

To toggle height encoder on/off

*Not available on Ultrasplice 40 & ST 40 actuators.

PRESSURE READING

To toggle pressure reading transducer on/off

SEEK

To toggle on/off seek function. This pulses ultrasonic energy to the stack prior to each weld in order to allow the system to tune to stack frequency.

WLD COOL

Enables the setting of a predetermined amount of time the cooling air will stay on after a weld.

FP ABORT

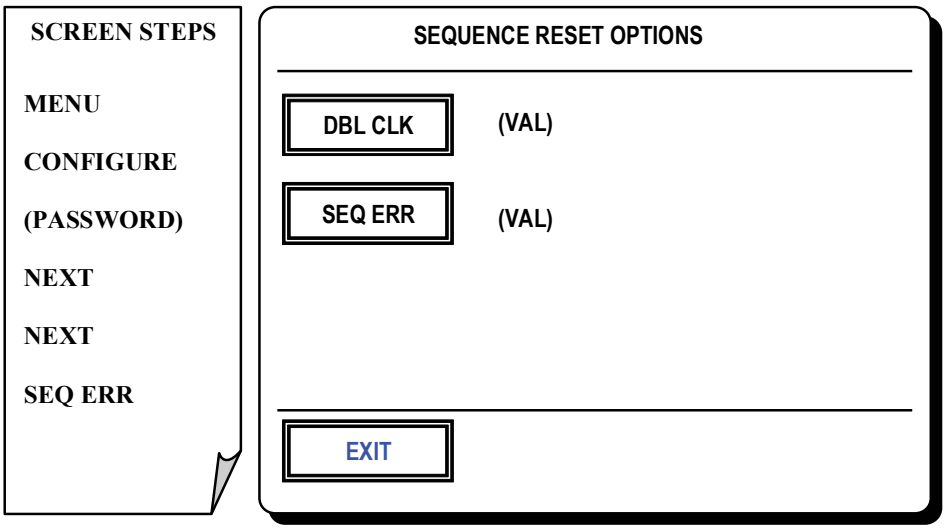
When enabled, foot pedal must be maintained until sonic starts or the weld cycle will be aborted.

EXIT

To return to System Configuration. See 5.28 System Configuration Screen (Next, Next).

5.30 Sequence Error Screen

Figure 5.29 Sequence Error screen



Sequence Error Screen

When a weld error occurs while running in Sequence mode, options are available for when the system is reset. This screen allows for setting these options.

The double click functions are applicable only when the controller is equipped with a remote reset button.

Press one of the following options for this screen (Display will toggle between options):

DOUBLE CLICK (To Next)

To move to the next step in the sequence.

DOUBLE CLICK (Not Allowed)

Turns Double Click option off.

DOUBLE CLICK (Restart)

Restart – to restart sequence from step 1.

SEQUENCE ERROR

To toggle between sequence options which apply after a weld error is cleared.

Restart: To restart the sequence from step 1.

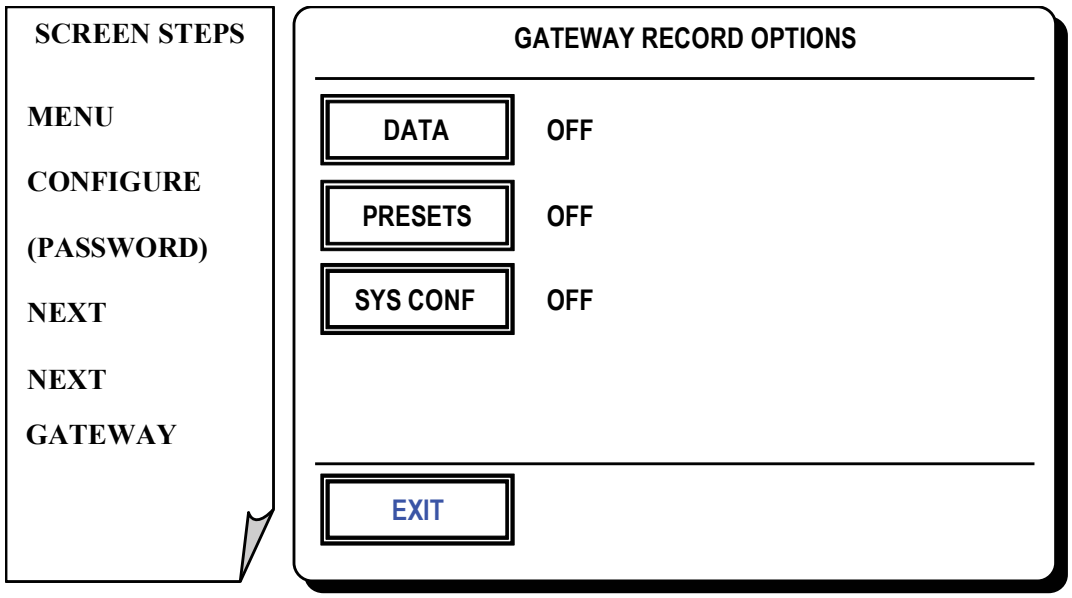
Reweld: To reweld the same step in the sequence.

EXIT

To return to System Configuration. See 5.28 System Configuration Screen (Next, Next).

5.31 Gateway Feature

Figure 5.30 Enabling the Gateway feature



Enable the data type that you want to send to the Gateway:

DATA

Enable Weld Data to be sent to the Gateway.

PRESETS

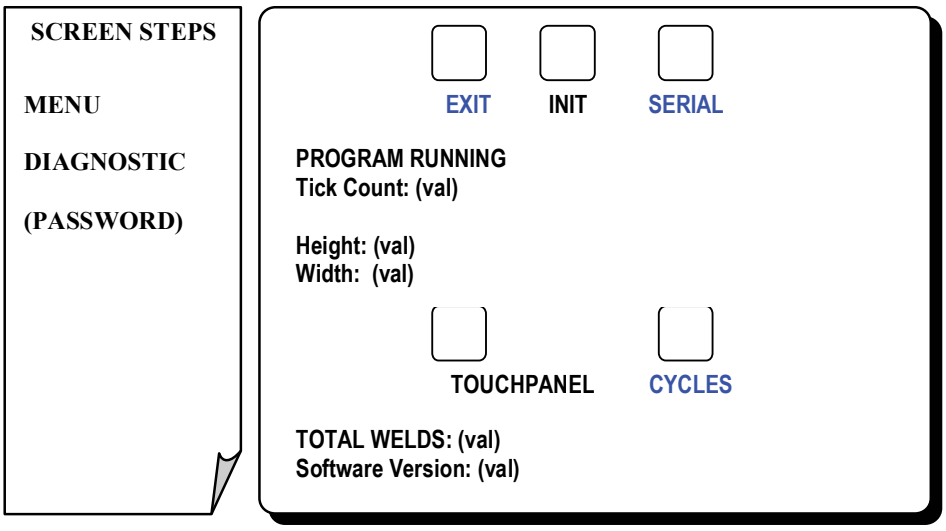
Enable Preset information to be sent to the Gateway.

SYS CONF

Enable System Configuration information to be sent to the Gateway.

5.32 Diagnostic Screen

Figure 5.31 Diagnostic screen



Diagnostic Screen

This screen allows access to operating system settings and information.

Press one of the following options for this screen:

INITIALIZE

To reinitialize the controller for software upgrades or in the unlikely event of a system failure. An option of partial or full initialization will be presented. A partial initialization will save all presets and sequences stored in the controller library.

NOTICE	
	A full initialization will not save all presets and sequences stored in the controller library.

SERIAL

To set baud rate and test serial communications. See 5.33 Serial Port Diagnostic Screen.

TOUCH PANEL

To go through a series of steps which recalibrate the touch panel. This is a factory set calibration that should not need adjustment.

CYCLES

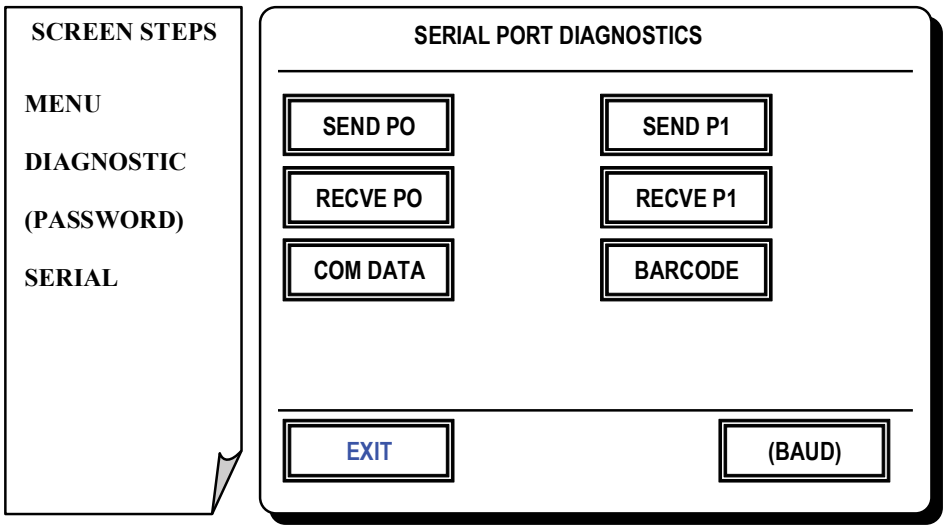
To set options for automatic actuator cycling used for testing. See 5.34 Cycles Screen.

EXIT

To return to Run Mode. See 5.2 Run Screen.

5.33 Serial Port Diagnostic Screen

Figure 5.32 Serial Port Diagnostic screen



Serial Port Diagnostics Screen

This screen is to setup test and move data between two controllers or a controller and a PC. The button functions are described below. For precise instructions on how to save/ transfer preset and sequence information see 5.37 Saving/Transferring Preset and Sequence Information.

Press one of the following options for this screen:

SEND PO

To send 10,000 "U" characters to Port 0 as test transmission

RECEIVE PO

Allows message typed on PC (hyperterminal) to be displayed on touchscreen.

COM DATA

Allows sending of stored Preset or Sequence information to Port 0.

SEND P1

To send 10,000 "U" characters to Port 1 as test transmission.

RECEIVE P1

Allows message typed on PC (hyperterminal) to be displayed on touchscreen.

BARCODE

To initialize Port 1 to receive barcode data.

BAUD

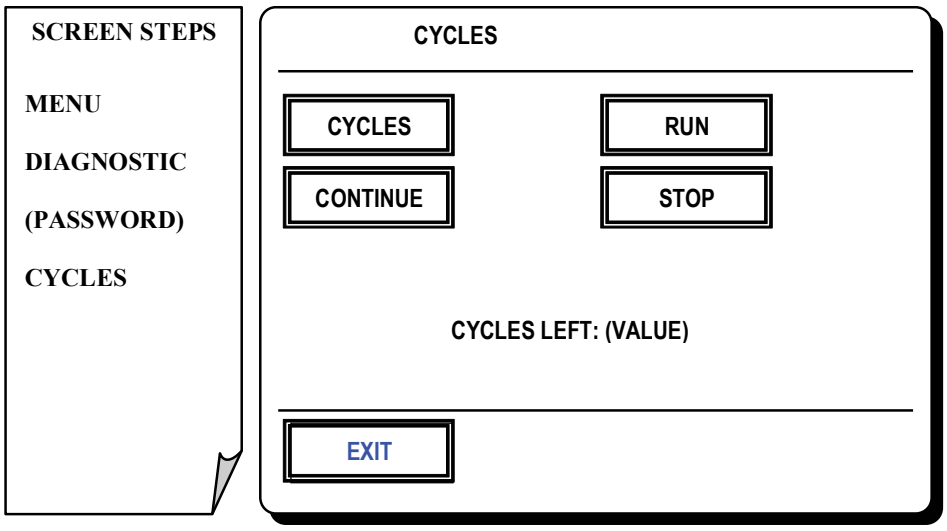
To set baud rate value for Port 0. (Port 1 baud is fixed at 9600).

EXIT

To return to Diagnostics. See 5.32 Diagnostic Screen.

5.34 Cycles Screen

Figure 5.33 Cycles screen



Cycles Screen

This screen allows automatic cycling of the weld actuator for a designated number of cycles. This feature is used for test purposes.

Press one of the following options for this screen:

CYCLES

To set the number of cycles to be completed. See 5.35 Typical Keypad Entry Screen.

CONTINUE

To continue the actuator cycling after initiating a stop command without resetting the counter.

RUN

To start actuator cycling.

STOP

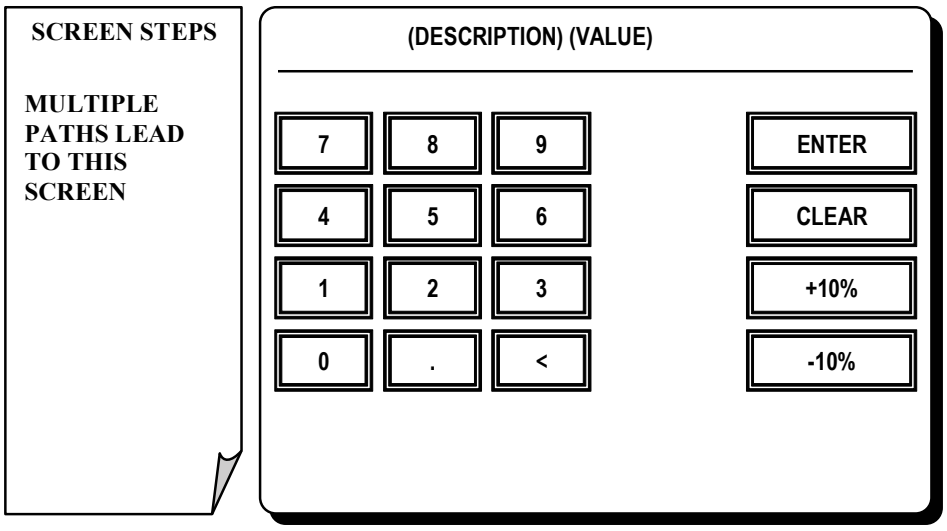
To stop actuator cycling

EXIT

To return to Diagnostics. See 5.32 Diagnostic Screen.

5.35 Typical Keypad Entry Screen

Figure 5.34 Typical Keypad Entry screen



Typical Keypad Entry Screen

A number of touchscreen menu paths lead to a numerical entry keypad screen similar to that shown above. Generally the current variable and its value are displayed at the top of the screen.

Note that some screens do not contain the 10% keys.

Press one of the following options for this screen:

NUMERIC KEYPAD

To enter a new value.

+10% or -10%.

To increment the current setting by plus or minus 10 percent.

CLEAR

To undo the value you entered.

CLEAR then ENTER

To return to settings and leave the previous value unchanged.

ENTER

To save the new value and return to previous screen.

5.36 Advanced Function Switch Select

Once you connect external controls to the power supply, you can set the following Advanced

Functions using the Switch Select block:

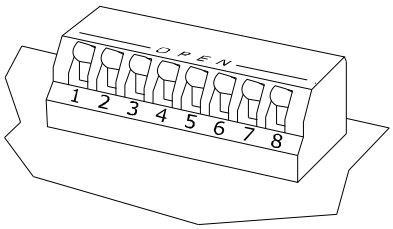
- **Seek:** Provides options for controlling, monitoring, and storing operating frequency
- **Amplitude Control:** Allows for varying amplitude (50% - 100%) via external controls or keeping the amplitude fixed
- **Select Start:** Provides four starting ranges. Select start allows the power supply to ramp amplitude to accommodate different converter and load requirements
- **Memory:** Stores horn frequency at end of each weld

See Figure 5.35 Advanced Functions Dip Switch for switch location. Refer to Table 5.1 Advanced Function Switch Select Table for switch settings.

Table 5.1 Advanced Function Switch Select Table

Function	Options	Set Toggles...
Seek	Seek on power up - Checks horn frequency upon power up and stores it in memory.	1 – Closed = OFF 1 – Open = ON (Default)
	Auto Seek - Checks horn frequency once each minute, timed from the last activation of ultrasonics.	2 – Closed = OFF 2 – Open = ON
	Auto Seek Duration - Indicates the length of time the Auto Seek function is active.	3 – Closed = 100 ms 3 – Open = 500 ms
	Store at End of Weld - Updates horn frequency memory at the end of each weld.	4 – Closed = OFF 4 – Open = ON
Amplitude Control	Variable - Front panel adjustment of amplitude (50% to 100%) **NOTICE** Pin 6 must be Open or Amplitude Control will not work.	6 – Closed = Fixed at 100% 6 – Open = Variable (Default)
Start	Short - Sets ramp time to 10 ms.	7 – Closed 8 – Closed
	Medium - Sets ramp time to 35 ms.	7 – Open 8 – Closed
	Standard - Sets ramp time to 80 ms.	7 – Closed 8 – Open (Default)
	Long - Sets ramp time to 105 ms.	7 – Open 8 – Open

Figure 5.35 Advanced Functions Dip Switch



5.37 Saving/Transferring Preset and Sequence Information

Equipment required:

- Standard IBM PC Null Modem cable
- A computer running Windows®* HyperTerminal and a standard RS232 serial port. Other computers may be configured to work but will require additional instructions
- A Branson Touchscreen Controller version 5.03.00 or later. It must be configured and ready to run

*Windows is a registered trademark of Microsoft Corporation.

Download Procedure:

- Connect the PC to the touchscreen controller (connection P105) with the Null Modem cable. Note the PC COM port because it will be required for setting HyperTerminal. Do not start the controller at this time
- From the PC, start HyperTerminal (Usually in the Accessories program menu folder)
- Setup a HyperTerminal connection (File, New Connection). Use the default settings with the following changes:

Table 5.2 HyperTerminal Connection

Set Phone Number	Direct to Com 1 (or Com 2 as available)

In Configure set:

Table 5.3 RS232 Serial Port Configuration

Bits per second	19200 (Default for TouchScreen)
Data bits	8
Parity	None
Stop bits	1
Flow control	None
In Settings Set Emulation	VT52

- Save and connect with the new connection
- Turn on touchscreen controller. HyperTerminal view window should show:

UUIA1

:020000030900F2

:02000000C740f7

:0100000100FE

This is the touchscreen's sign on to an attached serial port. It is always sent when the control starts to tell any waiting device that the COM port is active. If you do not see this sign on or the characters are unusual check the settings. The baud rate may have been changed or if there is no display check the Null Modem cable and COM port assignment.

- From the touchscreen controller go to the Serial Port Diagnostics Screen. (Menu> Diagnostic > Password> Serial)
- Check the BAUD rate at the lower right corner of the screen. It must match the Bits per second used in HyperTerminal

- From the PC HyperTerminal go to Transfer, Capture Text
- It is recommended that the data be stored on a floppy disk in the A: drive. A file name a:\tsdata.txt or similar can be used. Use a .txt extension
- From the touchscreen controller press COM DATA. When the next screen appears press PRESETS or SEQUENCE to upload the data to the PC HyperTerminal
- When all data has been sent to the PC go back to Transfer, Capture Text and Stop. This will close the file with data stored

Upload Procedure:

The captured text file contains all the information required to return the data back to any waiting touchscreen controller. Assuming the HyperTerminal setup was saved, load that setup to start the system. If you have not saved the setup you can use the above steps to setup a new HyperTerminal session.

NOTICE	
	Leave the controller at the RUN screen. From the PC, use the Send Text File (instead of Capture Text) to upload the file to the controller.

Controller to Controller

The PC is required only to store the data. If desired, two touchscreen controllers can be attached via the Null Modem cable and the data sent directly from one controller to another. The BAUD rate must be identical, there is no other setup.

5.38 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.

Chapter 6: Maintenance

6.1 Preventive Maintenance

The following preventive measures help assure long term operation of your Branson equipment.

WARNING	General Warning
	• 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 • Use LOTO (Lock Out Tag Out) lockable plug cover over line cord plug during any maintenance • Disconnect the air hose from the main air supply • Before you begin to disassemble any parts of the controller, ensure that it is turned off, and the main power is disconnected. Wait at least 5 minutes to allow capacitors to discharge • High voltage is present in the power supply. 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

6.1.1 Periodically Clean the Equipment

Air is continuously drawn into the Branson Touchscreen Controller. Periodically disconnect the unit from power, remove the cover and vacuum out any accumulated dust and debris. Remove material adhering to the fan blades and motor, transistors, heat sinks, transformers, circuit boards, cooling intake vents, and exhaust ports. Filters can be added to the Touchscreen Controller cooling fans for dusty environments. External covers may be cleaned with a damp sponge or cloth using a solution of mild soap and water. Do not allow cleaning solution to enter the unit. To prevent rust in areas of high humidity, exposed steel surfaces, such as handles, hardware, and the main column may require a very light film of oil, such as WD-40®*.

*WD-40 is a registered trademark of WD-40 Manufacturing Company Corporation.

NOTICE	
	When it is necessary to clean the touch screen, wipe gently with a soft cloth dampened with a mild detergent or a window glass commercial cleaner. Give a final wipe to the entire screen with the soft damp cloth. Under no circumstances should you use solvents or ammonia to clean the screen.

6.1.2 Routine Component Replacement

The lifetime of certain parts is based on the number of cycles the unit has completed, or on hours of operation, e.g., at 20,000 hours, cooling fans should be replaced.

6.2 Parts Replacement

WARNING	General Warning
	If a particular module has failed, it should be replaced or repaired at an Branson Depot Facility.

CAUTION	High Voltage Hazard
	The Branson Touchscreen Controller contains components that can be degraded or damaged by electrostatic discharge. Always use a Grounded Wriststrap and use a grounded work area when handling or servicing the Touchscreen Controller.

The Touchscreen Controller is designed for a long service life. In the event the system malfunctions, many of the internal components (Modules) are replaceable as a unit.

Power Supply Cover

The cover is held in place with seven screws, three on each side of the case and one on the rear. Lift the rear of the cover up to remove it. The cover must be in place when the system is operating due to fan-forced ventilation design.

Circuit Boards and Modules

Replaceable modules are shown in Figure 6.1 Touchscreen Controller - Top view with cover removed. Be sure to note ribbon cable and connector orientation prior to removing components for maintenance or replacement. The cooling fans use identical wiring harnesses, with one tying back the 'extra' lead length. Make note of any wiring paths if you are removing a module, before you disassemble. In some cases, there are several possible paths, but one preferred location. Be especially careful with harnesses and wires that go between the two portions of the case, as they can be pinched by the metal case if miss-routed.

6.3 Parts List

This section provides the list of replacement parts.

Table 6.1 Suggested spares

Item	Description	Part Number
1	Power Supply Module	100-244-043R (3300w) 159-244-069R (4000w)
2	Line Filter Module	100-242-1199R (100-242-1230R for 4KW units only)
3	DC Power Module	200-132-294R
4	Cooling Fans	100-126-015R
5	Touch Screen	1020969
6	LCD Display	200-220-040
7	Front Panel Board	100-242-1077R
8	Power Switch	1032510
9	Machine Controller Board	102-242-968
10	CPU Board	102-242-1272R
11	Motor Control Board (Splicer)	Call Branson
12	Ground Stud	200-098-870 203-144-089 200-073-231 200-114-170
13	Pneumatic Kit	See Special Info Instruction Set

Figure 6.1 Touchscreen Controller - Top view with cover removed