Model MW40 Press

INSTRUCTION MANUAL

SONICS®

Sonics & Materials, Inc.

WARNING

SAFETY PRECAUTIONS
READ BEFORE INSTALLING OR USING THE EQUIPMENT

Our systems have been designed to assure maximum operator safety. However, no design can completely protect against improper usage. For maximum safety and equipment protection, observe the following warnings at all times and read all applicable instruction manuals carefully before you attempt to operate any equipment.

- The equipment has safety devices that require both hands to be on the palm buttons until the horn contacts the work piece. Do not defeat or modify these safety devices.
- Do not use with foot switch or other means of actuation unless alternate means of pinch-point protection is provided.
- High voltage is present in the equipment. Disconnect plug before removing cover or servicing.
- Make sure equipment is properly grounded with a 3-prong plug. Before plugging in equipment, test outlet for proper earth grounding.
- High voltage potential may be present in the converter as a result of temperature changes. Do not touch the converter contact unless you first short both pins or the button to the converter case with an insulated tool.
- Never squeeze or grab a vibrating horn.
- Do not modify horn configurations.
- 20 kHz, 30 kHz and 40 kHz ultrasonic welders operate above normal audibility for most people. Ear protection is recommended.
- Do not affix any device to any portion of the horn.

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IMPORTANT SERVICE LITERATURE

NOTE: *Please read carefully before operating the equipment, then forward to your service department.*

The system supplied with this instruction manual is constructed of the finest material and the workmanship meets the highest manufacturing standards. It has been thoroughly tested and inspected before leaving the factory and when used in accordance with the procedures outlined in this manual, will provide you with many years of safe and dependable service.

MANUAL CHANGE INFORMATION

We continually strive to be at the forefront of the latest electronic developments by adding circuit and component improvements to our equipment as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we cannot incorporate these changes immediately into printed manuals. Hence, your manual may contain new change information. Change information, if any, is located in the Appendix.

We reserve the right to make any changes in the design or construction of our equipment at any time, without incurring any obligation to make any change whatsoever in units previously delivered.

The technical data and schematics in the manual are for informational purposes only and may not reflect the current configuration being shipped from our factory. Upon formal request, complete and up-to-date information can be provided from the factory free of charge.

UNPACKING AND INSPECTION

NOTE: *We recommend keeping all carton(s) and packing material in case it might be necessary to move the equipment, or to ship it for repair.*

Before unpacking the equipment, check the shipping carton for any visible damage. If you see any, be sure to follow the procedures described below under "Visible Loss or Damage." Otherwise, proceed to remove the equipment from the carton. Before disposing of any packing material, check it carefully for small parts. Then perform a visual inspection of the equipment to detect any evidence of damage which might have occurred during shipment. Check the following:

1. all components against the enclosed packing list,
2. all module plug-in units,
3. all wire plug-in connections.

The equipment was carefully packed and thoroughly inspected before leaving our factory. All units are tested and checked for problems prior to shipping. It is asked that when a problem does occur that all parts and components be inspected for damage (especially when the unit is not in working order when received). Responsibility for safe delivery was assumed by the carrier upon acceptance of the shipment. Claims for loss of damage sustained in transit must therefore be made upon the carrier, as follows:

VISIBLE LOSS OR DAMAGE

Any external evidence of loss or damage must be noted on the freight bill or express receipt, and signed by the carrier's agent. Failure to adequately describe such external evidence of loss or damage may result in the carrier's refusal to honor a damage claim. The form required to file such a claim will be supplied by the carrier.

CONCEALED LOSS OR DAMAGE

Concealed loss or damage means loss or damage which does not become apparent until the merchandise has been unpacked. The contents might have been damaged in transit due to rough handling even though the container may not show external damage. When the damage is discovered upon unpacking, make a written request for inspection by the carrier's agent within 48 hours of the delivery date. Then file a claim with the carrier since such damage is the carrier's responsibility. The form required to file such a claim will be supplied by the carrier. Do not destroy packing materials, or move material from one location to another before the carrier makes their inspection.

If the system or any unit is damaged, notify "Sonics." "Sonics" will arrange for repair or replacement of damaged equipment without waiting for the claim against the carrier to be settled, provided a new purchase order is issued to cover the repair or replacement costs. Should any damage, shortage or discrepancy exist, please notify us immediately.

INTRODUCTION

The MW40 press is a 40 kHz precision benchtop pneumatic press used for ultrasonic metal assembly. The press can be supplied with the following MX-Series power supplies:

- MX Series - standard keypad operation
- MSC Series - *SmartControl* touch screen operation

OVERVIEW OF ULTRASONIC METAL WELDING

PROCESS DESCRIPTION

Ultrasonic metal welds are produced when metals are rubbed together under pressure at a frequency of 15 kHz up to 40 kHz and amplitude of 30 to 70 microns. The intense scrubbing action at the interface causes surface films and oxides to be dispersed. The base metals are then mixed together to form a true metallurgical weld.

The temperature rise during welding is far below the melt temperature of the metals so that no intermetallics form and the weld does not degrade over time. Typical welds are produced in less than one second and require approximately one tenth of the power of a resistance weld. The welded parts are not annealed and can be handled immediately after welding.

MATERIALS

The ideal materials for the ultrasonic metal welding process include the softer metals such as copper, aluminum, gold, silver, nickel and brass. The metal that is vibrated is typically under 2mm in thickness to permit the vibrations to be transmitted to the weld interface. The stationary part may be any size and thickness.

Ultrasonic metal welding is most advantageous in welding materials that are dissimilar in composition and in thickness. An example is welding copper to aluminum for wire terminations and heat sinks.

TOOLING

Tool steels that are heat treated to Rockwell C 60-62 are excellent for metal welding and will produce 100,000 to 500,000 welds without any maintenance when applied correctly. Sonics has developed proprietary low cost replaceable tooling that can be easily changed in under one minute.

EQUIPMENT

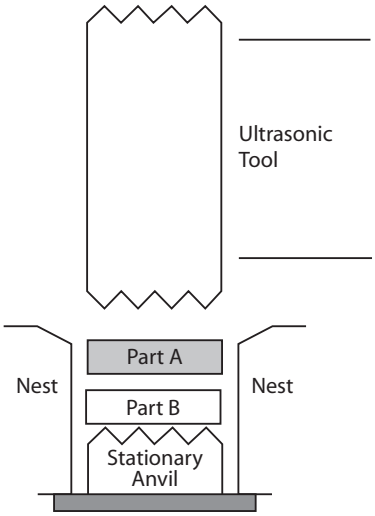
Sonics metal welding systems include:

- 20kHz and 40kHz universal spot welders
- 20kHz wire splicers
- 20kHz seam welders
- 20kHz metal tube sealers

APPLICATIONS

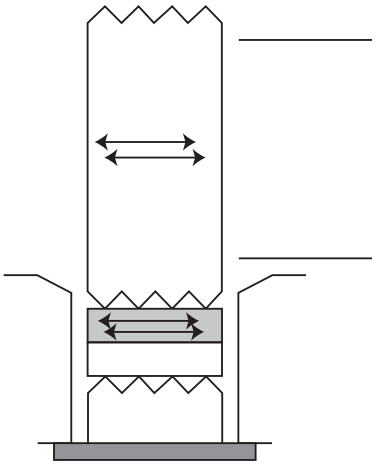
Typical ultrasonic metal welding applications include the following:

- Wire Terminations
- Wire Splicing
- Metal tube sealing for refrigerators and instruments
- Electrical switch gear
- Seam welding of solar water heaters and water pipe
- Battery terminations
- Heat sinks for high power electronic devices



The parts to be welded are placed into a locating nest.

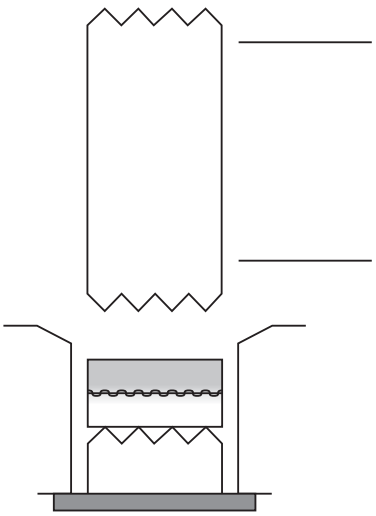
One component rests on a stationary anvil, that is serrated to grip the component and hold it still.



The ultrasonic tool descends to apply a clamping pressure between the weld parts.

The tool then vibrates at a frequency of twenty or forty kilohertz.

The weld parts are thus scrubbed together under pressure causing surface oils and oxides to be dispersed.



The base metals are then mechanically mixed causing a metallurgical bond between the parts.

The parts are immediately welded; there is no hold time or curing time.

GLOSSARY OF ULTRASONIC TERMS

POWER SUPPLY/GENERATOR – The solid state power supply converts standard 50/60 Hz electrical power to 15,000 Hz, 20,000 Hz, 30,000 Hz or 40,000 Hz (15/20/30/40 kHz) electrical energy (depending on frequency of model purchased).

ACTUATOR/PRESS – The pneumatic actuator provides compressive force and mounting for the converter and horn assembly. The benchtop press consists of a base assembly and linear actuator.

CONVERTER – The converter changes the high frequency electrical energy supplied by the power supply to high frequency mechanical vibrations.

BOOSTER – The booster is a tuned component of the system that transfers the vibration generated by the converter to the welding tip. The booster is designed to amplify the vibration and to provide an efficient mounting system for the ultrasonic stack.

WELDING TIP – The welding tip is a high grade steel tool that vibrates the metal parts to produce the weld. The tip is designed to provide long life and keyed for simple and precise set up.

HOLDING FIXTURE – The holding fixture or nest assures proper alignment and support of the parts being welded.

MODEL MW40

INSTALLATION

ELECTRICAL POWER

The press is powered by the power supply. Consult your power supply instruction manual to determine power specifications.

AIR SUPPLY

The press requires a source of dry, filtered (5 micron), oil-free, compressed air capable of supplying a constant line pressure of 85 psig. (625 kPa / 6 bar) at a minimum capacity of 2 CFM.

WARNING

Do not connect the press to an air source supplied by a compressor lubricated with synthetic oils or oils containing phosphate esters or chlorinated hydrocarbons. This type of lubricant may cause the air filter to malfunction, and the plastic bowl to rupture.

SETTING UP

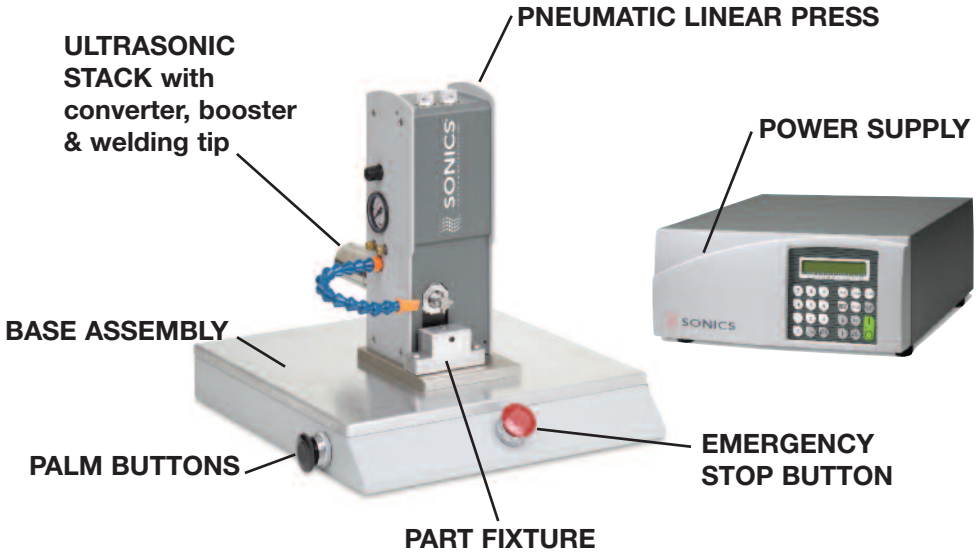
The press should be installed in a clear, uncluttered location that is free from excessive dirt, dust, corrosive fumes, and temperature and humidity extremes. The selected installation site should be near the electrical power and air supply sources and away from any equipment that generates abnormally high electrical transients. Observe the following additional instructions when installing the press:

a. The press should be placed on a sturdy, level table or bench capable of supporting a minimum of 100 pounds (45 kg).

b. Allow at least 6 inches (152.4mm) at the rear of the press for cable connections.

NOTE: *If the power supply is to be run continuously, air cooling of the converter and horn is required. Use clean, dry compressed air filtered down to 5 microns (supplied to converter fitting).*

KEY COMPONENTS



NOTE: *Do not strain or kink the cables. When going around corners, allow as wide a bend as possible. Do not run the cables parallel to any power line within a distance of less than 1 foot (304.8mm).*

CONNECTIONS

When making the initial connections, make sure all electrical power is disconnected.

1. Connect the air supply source to the press air connection located at the rear of the press head, using a hose having a minimum inside diameter of 1/8 inch (3 mm).

   A 1/4 NPT threaded female elbow connector is provided to attach your air line service. Connectors are typically an instant (push-to-connect) plastic tube fitting or a male sleeve lock type quick connect fitting.

2. Connect the RF and base (actuating) cables of the press to the power supply. (Consult your power supply instruction manual for details.)

3. Check with your electrician if you have any wiring questions.

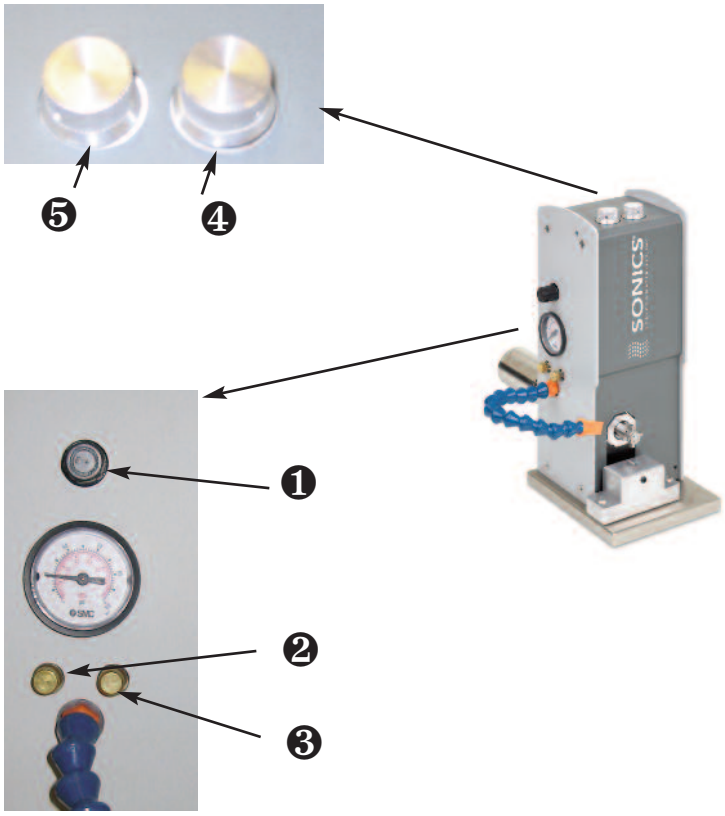
OPTIONS

A Linear Encoder is available as an option on Model MW40-GXL only. The Linear Encoder allows distance-controlled welding in incremental and absolute modes.

The Linear Encoder is supplied with a 9-pin male connector that connects to a matching 9-pin female connector on the GXL power supply (factory installed).

CONTROLS (MW40 PRESS)

Located at the top and side of the press are the following controls:



1. **PRESSURE REGULATOR** with corresponding gauge that allows regulation of the (air) pressure with which the horn contacts the part(s). Pull the knob to make adjustments, and then push in to lock setting when desired pressure is displayed on the gauge. Once pulled, turning the knob clockwise increases pressure, and turning it counterclockwise decreases pressure.
2. **CONVERTER COOLING** adjusts air flow for cooling the converter.
3. **HORN COOLING** adjusts air flow for cooling the welding tip.
4. **DOWN STOP** adjusts the lowest travel of the welding tip. The down stop should always be set to prevent contact between the welding tip and the anvil. The down stop lock is located on the front panel below the adjustment knob.
5. **UP STOP** adjusts the highest travel of the welding tip. It is typically set for ergonomics and productivity.

INITIAL EQUIPMENT SETUP

WARNING

Never tighten the tip nut to the horn using the housing as the wrench as this may cause damage to the horn alignment pin.

ASSEMBLING AND MOUNTING CONVERTER, HORN AND WELDING TIP

If the converter, horn and welding tip are not already assembled, follow these instructions:

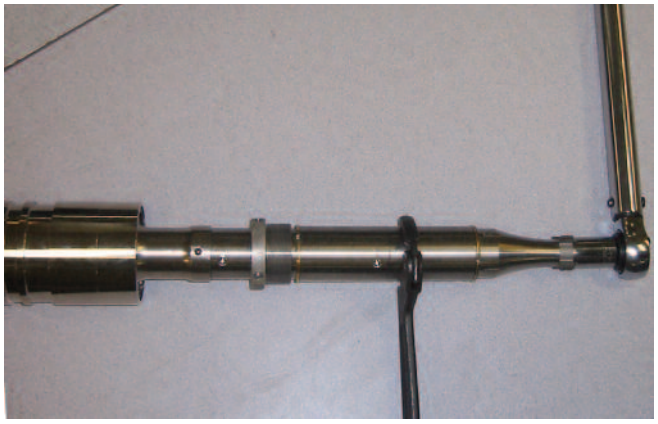
1. Clean the mating surfaces of the converter and horn, as well as the threaded stud and hole. Check that the stud is tight (see recommended torque requirements on page 12).
2. Place the stack locking ring over the converter. Hand assemble the converter and horn together. Using spanner wrenches as shown below, tighten until snug. Then, tighten to 15 foot-lbs. (20 newton-meters).
   Do not force or overtighten.

CONVERTER/ HORN

3. Clean the mating surfaces of the horn and welding tip, as well as the threaded stud and hole.
4. Hand assemble the tip, tip nut and horn. Using a spanner and a 10 mm socket on a torque wrench, tighten to 15 foot-lbs. (20 newton-meters).

   Do not overtighten.
5. Clean the taper rings and horn nodal rest. Place the taper ring onto the

CONVERTER/ HORN/ WELDING TIP

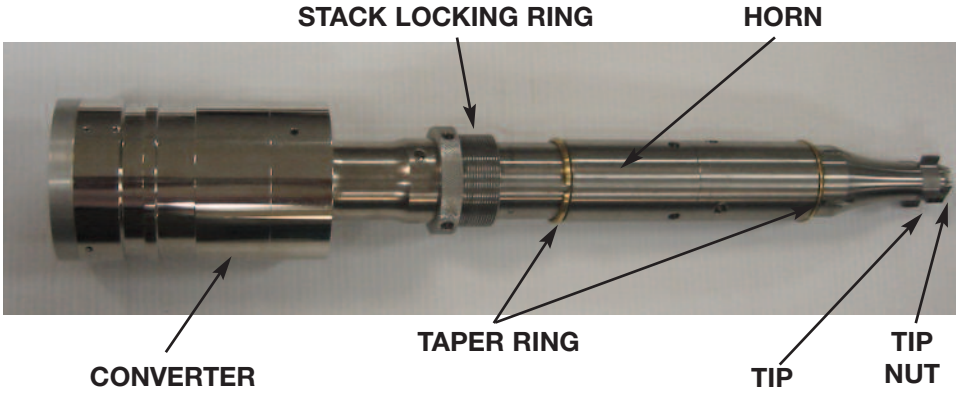


NOTE: *When performing any of the operations described on this page and page 11, DO NOT turn on the power supply.*

horn with the square corners against the nodal rest.

6. Place the assembled ultrasonic stack into the stack mount. Align the horn orienting key and seat the taper ring.
7. Screw in the stack locking ring and hand tighten to about 10 foot-lbs.

CONVERTER / BOOSTER / HORN ASSEMBLY



RECOMMENDED TORQUE REQUIREMENTS

Component	Foot-Lbs.	Newton-Meters
Converter / Horn	15	20
Horn / Welding Tip	15	20

HORN AND FIXTURE ALIGNMENT

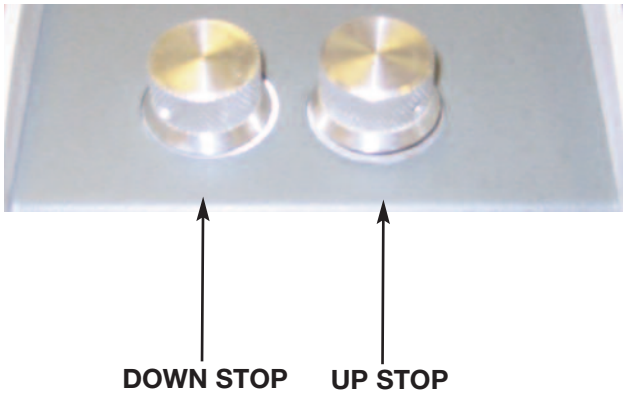
Up Stop Adjustment:

For maximum productivity, the clearance between the horn and the part should be at a minimum. However, adequate clearance should be provided to enable easy loading and unloading of the part from the holding fixture. The maximum stroke distance is 1" (25 mm).

Down Stop Adjustment:

Ensure that the welding tip does not contact the anvil at lowest point of travel. Otherwise the tooling can be damaged. With the set up switch on or with the air supply off, allow the stack to travel to its lowest point. Then adjust the down stop until a gap of .003" (.07 mm) minimum is set. Lock the down stop to prevent drifting of the adjustment.

NOTE: *Be sure not to set the down stop too high so that the welding tip cannot adequately engage into the parts to provide a good weld.*



OPERATION

WARNING

The equipment has safety devices that require both hands to be on the palm buttons until the horn is within 4 mm of the anvil. ***Do not defeat or modify these safety devices.***

NOTE: *Power supply cannot be shut off once the weld cycle has started. Termination of cycle can only be achieved by using the EMERGENCY STOP button.*

ACTUATION

Each MW40 press is equipped with two maintained anti-repeat (non-tie-down) palm buttons, one located on the left and one on the right side of the base of the press. Both palm buttons must be pressed simultaneously to activate the press to cycle the welder. To operate the press, follow these simple steps:

1. Depress both black palm buttons simultaneously.
2. Once the welding tip comes within 4 mm of the part, the switch closes and the ultrasonics are activated, release the palm buttons. If you release the buttons before contact is made, the head will immediately return to its “home” position.

EMERGENCY STOP

To abort the press during welding, simply press the red EMERGENCY STOP button located at the front center of the press base.

Once the EMERGENCY STOP button has been depressed, the head will retract and return to its “home” position. Simply rotate the EMERGENCY STOP button clockwise 1/4 turn to release the press for further operation.

FINE ADJUSTMENTS

WELD OPTIMIZATION

Sonics provides several methods to control the weld process and monitor weld quality. Depending upon the system purchased, the control modes can include time, energy, power and distance (optional).

Time is the duration of the weld cycle and may be adjusted from 00.00 to 99.99 seconds.

Energy is the integration of the power applied to produce the weld over the weld time, and thus compensates for variations in part oxidation and cleanliness.

Peak power is the power applied to the convertor to maintain vibrations at the operating frequency.

Distance is an optional feature used to measure the dimension of the weld nugget.

The process variables are weld pressure or force and amplitude.

PRESSURE

Provides the air pressure in the weld cylinder which applies the weld force at a mechanical advantage of approximately 1.8 times pressure. The pressure is typically set higher for larger area of welds as follows:

Area of Weld	Pressure
1 mm	20 psi
50 mm	85 psi

Higher pressures will increase power draw and produce deeper welds. Typically, we will increase the pressure setting in order to produce the desired weld strength in the least amount of weld time.

AMPLITUDE

Amplitude is the distance that the weld tool vibrates as a percentage. The amplitude of a system is determined by the physical properties of the converter and horn. We can reduce the amplitude electronically in order to optimize the weld results. Typically thinner and harder metals require less amplitude. Delicate parts also are more readily welded with lower amplitude.

As with pressure, amplitude should be increased to produce welds quickly without damaging the parts or causing an overload.

POSITIVE STOPS

Upper and lower positive stops are conveniently provided to adjust the upper and lower limits of travel of the welding tool. The “down” stop should always be adjusted to prevent the tip from contacting the anvil.

AIR COOLING

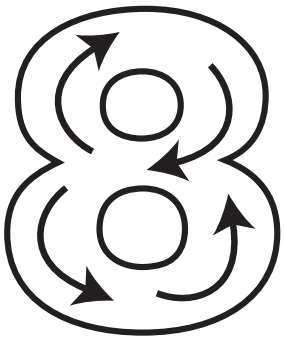
Air Cooling is sometimes required when larger welds are produced in a high duty cycle. Individual cooling controls are provided for the tip and the converter. These should be adjusted to satisfy the application.

RE-ESTABLISHING PROPER TIP / HORN INTERFACES

To re-establish proper interfaces, follow these instructions:

1. Using a socket wrench, separate the tip from the horn. Clean each item and then examine interfaces for irregularities (scoring).
2. If irregularities are present, you may polish the tip interface as follows:
3. Tape a sheet of 400 grit emery cloth to a smooth, flat surface. (Do not use coarser than 400 grit.)
4. Grasp the tip and move it across the emery cloth. To ensure proper lapping, a) hold the part straight, b) apply light downward pressure, and c) move in one direction only in a figure 8 pattern.

   Repeat the figure 8 pattern once more.



5. Then, rotate the tip 1/3 of a turn in a clockwise direction and then repeat step 4.
6. Repeat step 5.
7. Using wire brush, clean horn stud.
8. Install the tip onto the horn and torque the tip nut to 55 foot-lbs. with a socket and torque wrench.

NOTE: *Contact between the tip and horn should be parallel. When encountering symptoms such as loud noises or tuning difficulties, examine the booster / horn interfaces for parallelism, corrosion, galling or foreign deposits. Also check the integrity and tightness of the stud.*

WARNING

DO NOT use anything coarser than 400 grit emery cloth.

WARNING

Machining of tip / horn may alter the ability to tune the component to the system. System inoperation may occur.

MAINTENANCE

NOTE: *If packing unit for return shipment, DO NOT use styrofoam "peanuts."*

REPAIRS / SERVICE

If problems are encountered, contact our Service Department as follows:

Phone: 1-800-745-1105 • 1-203-270-4600 ext. 343 or 366

Fax: 1-203-270-4610

E-Mail: service@sonics.com

It is suggested that a system in need of repair be sent back to the factory, with a written description pertaining to the nature of the problem.

Always contact the factory for return authorization before shipping any instrument. Include date of purchase, model number, and serial number. For units not covered by the warranty, a purchase order should be forwarded to avoid unnecessary delay. Care should be exercised to provide adequate packing to insure against possible damage in shipment. The system must be sent with all transportation charges prepaid and return method of shipment indicated.

WARRANTY

Sonics & Materials, Inc., hereinafter referred to as "Sonics", warrants its products for a period of one year from the date of original shipment against defects in materials and workmanship under normal installation, use and maintenance as described in the operating instructions which accompany such equipment. During the warranty period, Sonics will, at its option, as the exclusive remedy, either repair or replace without charge for material and labor, the part(s) which prove upon our examination to be defective, provided the defective unit is returned to us properly packed with all transportation charges F.O.B. Sonics dock, Newtown, CT. Warranty period on equipment rentals that are converted to purchase are deemed to have commenced on the date of original rental equipment shipment.

Ultrasonic plastics welding horns constructed of titanium or aluminum are guaranteed against defects for a period of one year from date of shipment. Sonics will repair or replace a cracked or defective horn once without charge, if failure occurs within the warranty period.

Ultrasonic plastics welding horns constructed of steel are guaranteed against defects for a period of ninety days from date of shipment. Sonics will repair or replace a cracked or defective steel horn once at a charge of 50% of the original purchase price, if failure occurs within the warranty period.

Ultrasonic metal welding horns constructed of titanium or steel are guaranteed against defects for a period of one year from date of shipment. Sonics will repair or replace a cracked or defective horn once without charge, if failure occurs within the warranty period.

Sonics warrants its ultrasonic converters for a period of one year from date of shipment with a one-time replacement if a converter proves to be non-repairable.

When customer site service is required, all travel, living and related expenses will be billed at cost. In-warranty service labor time (including travel time) at the customers facility is provided Monday through Friday (excluding holidays) from 8:00 am to 5:00 pm. Any in-warranty service time requested outside of these days and hours will be billed at 150% of Sonics current rate per hour for such site service work.

LIMITATION OF WARRANTY

This warranty does not apply to items subject to normal wear and tear or, to equipment or tooling which has been subject to unauthorized repair, misuse, abuse, negligence or accident. Misuse includes operation of equipment with tooling that is not qualified for the equipment or tooling not properly installed on the equipment.

Equipment which, in our judgment, shows evidence of having been used in violation of operating instructions, or which has had the serial number altered or removed, will be ineligible for service under this warranty.

For components and parts not manufactured by Sonics but included in Sonics manufactured equipment, this warranty shall be limited to the warranty as given to Sonics by said original component or part manufacturer.

Ultrasonic horns supplied by Sonics are manufactured to exacting specifications and are tuned to vibrate at a specific frequency. Using an out-of-tune horn will cause damage to the equipment and may result in warranty nullification. Sonics assumes no responsibility for converters, horns or fixtures not supplied by Sonics or for consequential damages resulting from their usage

Ultrasonic converters showing signs excessive heat or contamination, such as but not limited to, oils and moisture, are not covered by this warranty.

Warranty does not apply to ultrasonic horns quoted as prototype, experimental or of unusual design which, in our judgment are more likely to fail in use.

Warranty does not apply to re-sharpening of ultrasonic blade type cutting or slitting horns.

Warranty does not apply to knurl pattern wear on ultrasonic plastics and metal welding horns and tips.

Warranty does not apply to ultrasonic horn or tip face wear when used with plastics that are molded with fillers, such as but not limited to, glass or talc.

This warranty does not apply to ultrasonic plastics welding equipment, horns or fixtures where metal-to-metal tooling contact time is in excess of 250 milliseconds.

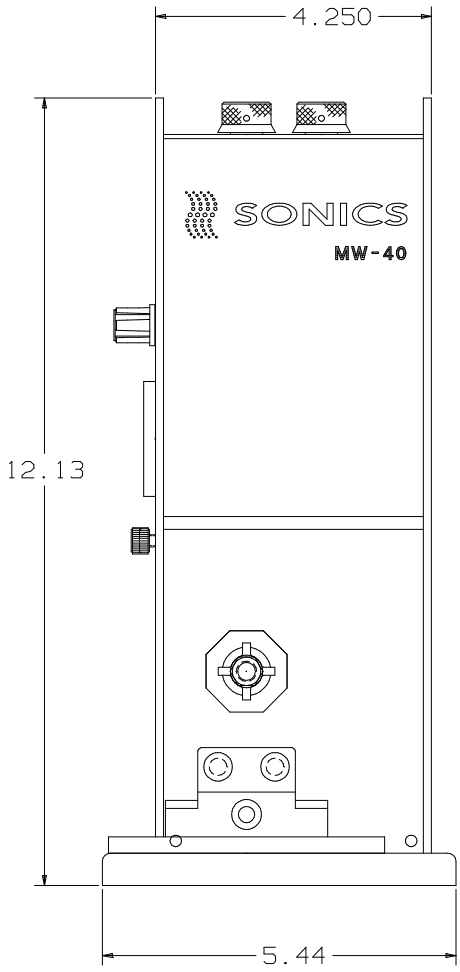
This warranty does not apply to used or re-built equipment. This warranty is non-transferable.

Data supplied in Sonics instruction manuals has been verified and validated and is believed adequate for the intended use of the equipment. If the equipment or procedures are used for purposes other than those specified herein, confirmation of their validity and suitability should be obtained in writing from Sonics. Otherwise Sonics does not guarantee results and assumes no obligation or liability.

This warranty is in lieu of any other warranties, either express, implied, or statutory. Sonics neither assumes nor authorizes any person to assume for it any other obligation or liability in connection with the sale of its products. Sonics hereby disclaims any warranty or merchantability or fitness for a particular purpose. No person or company is authorized to change, modify, or amend the terms of this warranty in any manner or fashion whatsoever. Under no circumstances shall Sonics be liable to the purchaser or to any other person for any incidental or consequential damages or loss of profit or product resulting from any malfunction or failure of this Sonics product.

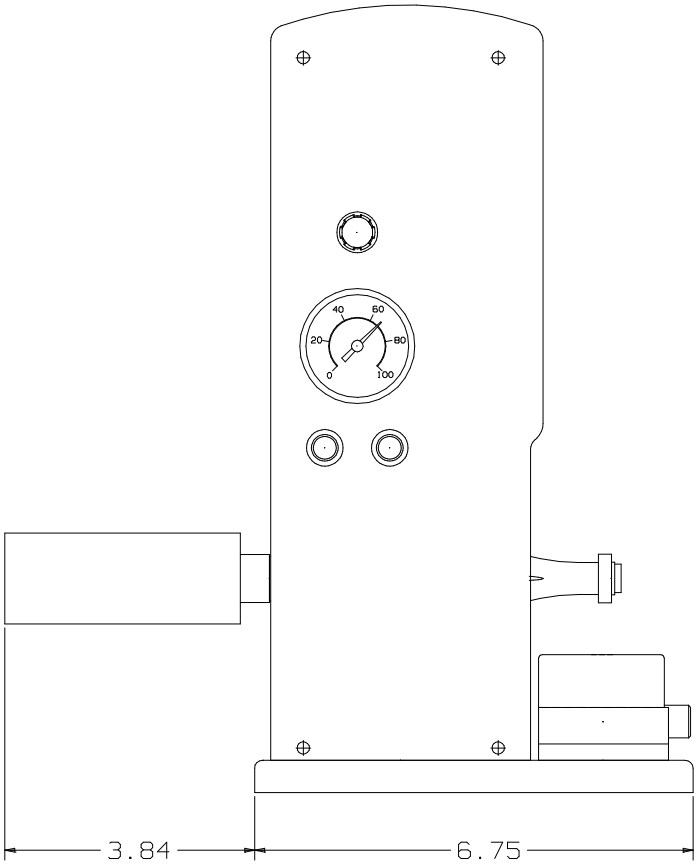
APPENDIX

MW40 LAYOUT FRONT VIEW



APPENDIX

MW40 LAYOUT SIDEVIEW



Dimensions are shown in inches and millimeters,
i.e., 1 1/2 (38.1) signifies 1 1/2" (38.1mm)