SONICS

Model
e-Press

INSTRUCTION MANUAL

哥威雅（香港）有限公司

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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 of 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.

WARNING
SAFETY PRECAUTIONS
READ BEFORE INSTALLING OR
USING THE EQUIPMENT

This system has 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 the instruction manual carefully before you attempt to operate the 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 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.

– Ultrasonic welders operate above normal audibility for most people. Ear protection is recommended.

- Do not affix any device to any portion of the horn.

SONICS®
world-wide leader in ultrasonic technology

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INSPECTION

Prior to installing the equipment, perform a visual inspection to detect any evidence of damage which might have occurred during shipment. Before disposing of any packing material, check it carefully for small items.

The equipment was carefully packed and thoroughly inspected before leaving our factory. Responsibility for its 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.

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.

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.

If the system or any unit is damaged, contact the Sales Department at Sonics & Materials, Inc. "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.

ELECTRICAL POWER

The E-Press motor controls require a fused, single phase, standard 3-terminal grounding type electrical receptacle capable of supplying 105-125 volts, 50/60 Hz, 10 amp service, or 200-240 volts, 50/60 Hz, 5 amp service, depending on the voltage option. See the Model Specification and Accessory List – section 3.0.

MODEL	@ 115 VAC	@ 230 VAC
20EP or 40EP	10 amps	5 amps

LOCATING THE EQUIPMENT

The system should be installed in proximity to the electrical source, and it is supplied with an 8 Ft power cord. The area should be free from excessive dust, dirt, corrosive fumes and extremes of temperature and humidity.

Allow at least 10 inches (25 cm) in back of each unit for cabling convenience.

All welding press models should be placed on a sturdy level bench capable of supporting a minimum of 500 pounds (227 kg).

The power supply and motor controller should be located so that the front panel controls are visible and accessible. Sufficient space should be allotted around the unit to ensure adequate ventilation. If the power supply and motor controller must be housed in a confined space, forced air-cooling may be necessary to keep the surrounding air within acceptable ambient temperature. Periodically check the ventilation grille and clean if necessary. The distance between the welding press and motor controls should not exceed 9 feet (3m).

PREPARATION FOR USE - CONNECTIONS

Connect the power supply and press in accordance with the following procedure. See section 4.0 starting on page 11 for additional information and a connection diagram.

1. Using cables provided, connect the power supply to the press. 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 (30 cm).

2. Plug the power supply line cords into the electrical outlets. To prevent the possibility of an electrical shock, ensure that the line cords are properly grounded.

IMPORTANT SERVICE LITERATURE

Please read carefully before operating the equipment

The plastics assembly system supplied with this instruction manual is constructed of the finest available components with workmanship that meets or exceeds our 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 INFORMATION

We continually strive to keep up with latest electronic developments by adding circuit and component improvements to our equipment as soon as they are developed and tested.

In order to move around the manual quickly, hyperlinks are provided in the following Table of Contents (TOC) for each major section. Click the hyperlink to move directly to the selected section. At the top of each linked heading you will find a TOC link to return to the Table of Contents. This should help to minimize continuous page up/down key-strokes to find a section of interest.

For the purposes of this manual, references to the "GX controller" or to the "ultrasonic power supply" will mean the associated ultrasonic supply and microprocessor controller. References to the "motor controls" or "stepper system" will mean the transport controls for velocity and distance. Certain ultrasonic control parameters can affect the stepper control performance. The GX Ultrasonic Power Supply manual must be considered an integral part of understanding the Stepper Welding System.

Basic Windows™ familiarity is assumed. The user must be familiar with Windows™ based file selection and mouse operations. Consult a Windows tutorial if these operations are unfamiliar. Manual descriptions will not address these basic concepts.

Internet familiarity is also assumed. URL addresses have been included in a few sections to assist with downloads for viewing this manual. If Internet access is not available these references may be ignored.

Manuals for all new Sonics & Materials products are provided on CD.

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.

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1.0 Introduction to Plastic Welding TOC **-** For an introduction to ultrasonic plastic assembly – Refer to the GX Power Supply Instruction Manual supplied with the ultrasonic power supply - pages 6 through 8. These sections discuss the basic principles of ultrasonic assembly and the major ultrasonic components – converter, booster and horn. The E-Press welding system is identical except that a solid mount booster is used that will not flex under applied pressure. To achieve the best desired assembly accuracy of the stepper system, a solid mount booster is required.

2.0 The Stepper Welding System TOC **-** The Stepper Welder System (E-Press Model) is designed for precision plastic welding applications with dimensional requirements beyond the capabilities offered with a standard air actuated ultrasonic press. The system will control the final weld position with a tolerance of ±0.0003 inches. Finished assemblies are produced with a weld repeatability that is not possible with any other plastic welding process. The advancing speed of the ultrasonic horn is controlled with a stepper motor drive, which exactly repeats the defined profile for position and velocity every time. The results are repeatable welds with exact final dimensions of the bonded components when compared with air driven actuators (material dependent). The system is offered as a transport option with standard Sonics & Materials 20 kHz and 40 kHz ultrasonic power supplies.

The E-Press actuator assembly is a completely rigid system. Solid booster technology is used to mount the stack assembly into the actuator head. These boosters do not contain O-rings, which are found in conventional ultrasonic boosters. O-rings can move and distort as pressure is applied resulting in horn movement on the parts and weld quality problems. With this rigid system the horn will not move and full capability of the stepper motion controls can be achieved.

Welding with an E-Press driven actuator is very unique, compared to a conventional pneumatic welder. With a pneumatic welder the applied force on a part is adjusted by changing the air pressure regulation to the cylinder which drives the horn assembly. Continuous pressure is applied to the parts during the welding process. Attempts to modify the applied pressure are only marginally successful due to the volume of air that is present. Pressure cannot be changed instantaneously as long as the air system has pressure. A notable lag will occur between changing the regulator settings and any actual pressure change. In most cases, the weld will be completed long before the pressure change could affect the weld in any appreciable way. With the stepper system, force can be controlled precisely through a digital velocity profile.

The E-Press system uses the programmed weld velocity to control the applied force directly. This applied force is also dependent on ultrasonic amplitude, which controls the level of heat available, and therefore the amount of molten plastic that will be produced between the parts. The resultant force will be a function of heat (ultrasonics) to melt the plastic and velocity to drive the parts together. The faster the horn moves into the parts the greater the force. The greater the heat that's available to melt the plastic, the lower the force, because the plastic will flow out from under the horn. Best application results will be provided by careful balance of velocity, distance and ultrasonic amplitude. With the velocity and distance precisely controlled, the actual weld cycle time will also be exactly repeatable because the velocity profile will be the same every time.

The E-Press controls are packaged in the same size chassis as the Sonics & Materials ultrasonic power supply so that they can be stacked together. This provides a standard ultrasonic supply whether the customer application requires velocity controls with the stepper transport or a standard air actuated system. Both units should be located so that they are accessible to the operator for initial setup and programming.

3.0 System Specifications

Application Types:

-The E-Press Model is best applied to applications that require precise dimensional control, repeatability or improved bonding strength. Special materials and delicate components will also benefit from the velocity profile offered by the EP System.

-Clean room applications that cannot allow the pressurized air systems required by conventional ultrasonic welders.

-Marginal conventional ultrasonic applications may be stabilized to improve weld quality and reduce production reject rates.

Press (All):

Transport System:	Stepper Motor positioning system w/ ball screw
Force Trigger Control:	10 – 150 lbs.; 1-lb. increments. (50 – 650 Newtons; 1 Newton increments).
Vertical Travel Velocity:	4 in/sec (102 mm/sec).
Weld Velocity 1 and 2:	0.001 –.500 in/sec (.025 – 12.7mm/sec)

Weld Distance (Ref Parts Contact Diagram Pg. 18):

Absolute	0.0500 – 3.500 in. (1.27 – 89 mm)
Incremental	0.0010 - 0.5000 in. (0.01 – 12.70mm)
Motor Position Accuracy:	$\pm$ 0.0003 in. ($\pm$ 0.007mm).

Parts search zone (Ref Parts Contact Diagram Pg. 18):

Upper Tolerance	0.0010 – 0.1000 in. (0.025 – 2.500mm).
Lower Tolerance	0.0010 – 0.1000 in. (0.025 – 2.500 mm)
Fixture Mounting Thread:	3/8 – 16 (10 mm).
Maximum Stroke:	3.5" (89 mm).
Motor Stall Force:	>500 Lbs. (2225 Newtons).

20 kHz e-Press Dimensions:

Press Height:	48" (1219.2 mm)
Weight:	210 Lbs. (95 Kgs)
Maximum opening for parts and fixture:	10" (254 mm)
Depth:	25" (635 mm)
Width:	14" (355.6 mm)

Motor Control:

AC Power: 115 VAC @ 10 amp fuse rating.
230 VAC @ 5 amp fuse rating.

Package size: 15.25" W x 6.5" H x 18.75" D.
(387.3 x 165.1 x 476.25 mm.)

Weight: 21 Lbs. (9.5 Kgs).

Humidity: 20 – 90% non-condensing.
Operating Temperature Range: 50°– 90° F (17° – 40° C)

Programming: Pentium Class PC required. See section 6

Stepper Motor Resolution: 42666 counts/inch. (0.0000234 in./count).

Maximum Motor Case Temperature: 125°C

Display: Two-line LCD reports final weld distance.

EMC: e-Press controller is not CE approved.

4.0 Physical System and Connections <u>TOC</u> – Physically the system is contained in three separate packages – The stepper controller, the ultrasonic power supply and the motor press assembly. Several cables are required to connect the various pieces together – see cable diagrams on the following pages. The ultrasonic supply and the motor controller are packaged in similar size chassis and should be positioned for easy programming access and cabling. The press assembly contains the motor, motor position encoder, force sensor, linear positioning actuator and ultrasonic converter with a solid mount booster. Additionally, a standard computer with Windows operating system is required for programming the stepper system.

The press assembly has five cables, two connect to the ultrasonic power supply (GX) and three connect to the stepper control box. The round cables cannot be interchanged and will only match the appropriate connector shell type on the back panels of the control units.

A termination connector is supplied and must be used on the stepper system if a computer will not be used to monitor the stepper controls. This connector terminates the hardware handshake lines. Drawings for some of these cables are contained in the Maintenance section of this manual.

Cable Connections for Stepper Controller and Ultrasonic Power Supply

The drawings below and on the next page show the back connections of the Stepper and Ultrasonic controls. Match the cables from the press to the appropriate connections noted below. (The interconnecting cables will be supplied with your system.)

Stepper Controller
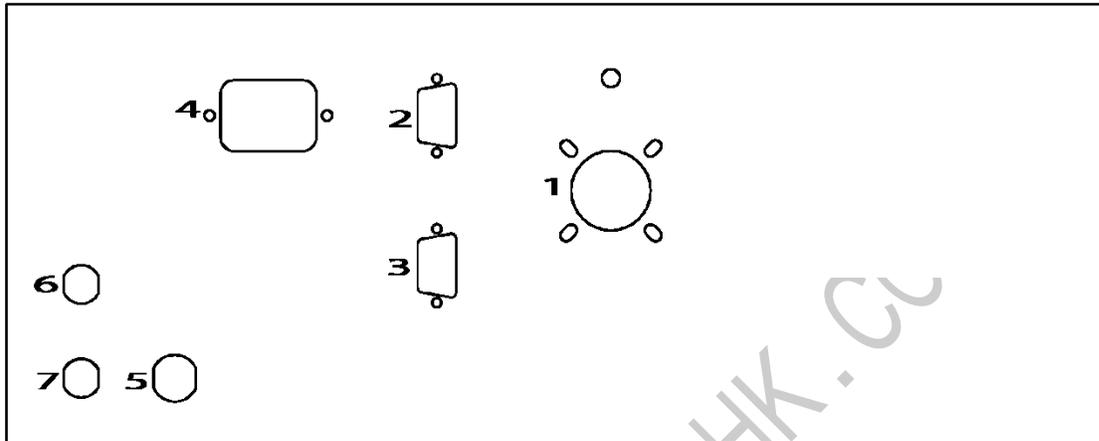
1.   J1 - Control cable from press to Stepper Control
2.   J2 – 9 Pin base cable from base to stepper control
3.   J3 - RS232 Communication to PC***
4.   J4 - Power outlet to the press head for motor drive
5.   Power line cord that plugs into the appropriate electrical outlet
6.   Line fuse
7.   Additional fuse for 220v configuration

***NOTE: The RS-232 cable connected between the PC and Controller must be a straight one-to-one cable (Do not use a null modem cable.)

GX Power Supply
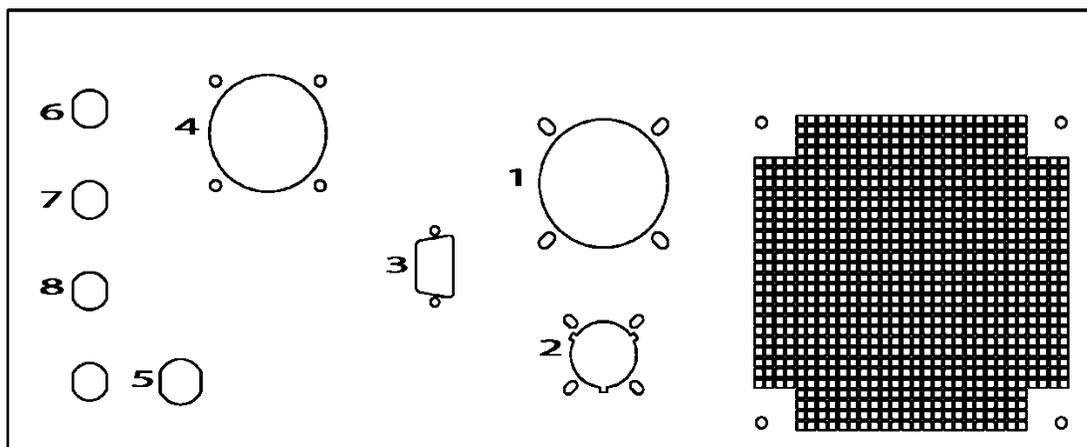
1. J1, a round, 12-pin RF cable that connects the welding press to the power supply.
2. J2, an actuation cable that connects the power supply to a trigger source (press cable or external trigger source.) Refer to wiring diagrams at the back of this manual.
3. J4 Serial Output***
4. J5 External I/O
5. The power line cord that plugs into the appropriate electrical outlet.
6. Fuse (0.5 amp - internal low voltage)
7. Line fuse
8. Line fuse

***NOTE: The RS-232 cable connected between the GX Power Supply and the PC must be a null modem cable (crossover).

5.0 PC Software Installation [TOC](#) – A Pentium class PC is the minimum required as the programming and monitoring interface to the stepper welder system. The computer is used to program the stepper distance and velocity controls. Once the application is setup and running properly, the computer may be removed. The system will run the programmed profile without further commands from the computer. A termination jumper must be connected to the stepper controls in order to terminate the communication signals.

The following computer requirements should be considered when selecting a PC for the Stepper Utility Program.

Recommended minimum computer requirements for the E-Press welder:

1. Minimum Computer: Pentium 200 Mhz.; 32 Meg Ram; 2 Gig Drive; Windows98 or WindowsXP

2. The system must have two (2) Comm ports available: COMM1, 2, 3, 4, etc.

3. Program space required: Less than 20 Meg for the Stepper Program.

4. Data Space: Consider Storage space for accumulated Data. If you intend to open a disk file to save the Welding Status line after each weld then get the largest Disk drive possible. Each line will be about 90 text characters in length.

5. Software: Windows98/XP; Microsoft Office 97 or later.

The Stepper control programs are provided on CD.   Select the appropriate directory and run the setup program from that directory. For the Stepper Control Utility, run the .exe file entitled G-Series EP Utility from the c:|EP Utility directory. A Sonics Directory will be created and the files will be installed in the standard installation technique. See section 10.0 to run the E-Press utility program.

6.0 Stepper Welding Operation [TOC] **–** The stepper welding process is similar to the conventional ultrasonic process. The application parts are positioned in the fixture and dual palm buttons are pressed simultaneously to initiate a weld. A cycle begins by advancing the horn to the parts at a fixed approach velocity. The approach velocity has been selected based on the mass of the head mechanism and the maximum acceleration that can be used without stalling the stepper motor.

Just above the parts, the velocity is reduced to a search speed in order to locate the parts for assembly. This protects the parts from impact damage that could result from a higher speed contact. The parts search will continue for a distance equal to the width of the programmed tolerance window or until the parts are found.

When the ultrasonic horn contacts the assembly, pressure will increase quickly. The applied force is measured and monitored until the trigger set-point is reached defining the parts' location and positively seating the plastic interface joints. The trigger is satisfied and ultrasonics will be turned on to begin the plastic weld. The defined weld motion profile will continue as the ultrasonic energy melts the plastic joints.

When the weld velocity and distance profiles have been executed, the weld is complete and ultrasonics will be turned off. If a hold time has been programmed, the motion will be stopped and the system will wait for the specified time period. Hold time is normally used to allow the plastic joint to solidify while the parts are held in position to complete the bonding process.

The system will retract to the home position to end the weld cycle. The final weld distance will be reported on the stepper controller display and the system will be ready for another weld operation.

The following sequence of events defines the "typical" weld cycle. See section 12.0 for the details of programming the stepper settings.

Typical Weld cycle:

1. The weld cycle is initiated by simultaneous palm button commands.

2. The stepper drive head assembly will descend at a high speed to the parts position taught by the "Teach Command", less the upper tolerance setting.

3. The system searches for the parts at a slower search speed. The parts are detected when the force builds to the programmed Force Trigger set-point. If the parts are not found by the time the system has traveled to the lower tolerance setting, the cycle is aborted and the head retracts automatically. Parts may not be positioned in the fixture.

4. When the parts are found, the specified incremental or absolute weld will begin. The ultrasonics is turned on and the motor continues to travel at the programmed Velocity #1 until the programmed Distance #1 is reached.

5. If a second weld distance has been entered (anything but a zero value) then the weld will continue after the first distance using the parameters for the second distance settings. The travel motion proceeds using welding Velocity #2 until Distance #2 is reached. Ultrasonics will be on or off during this period controlled by the Weld indicator associated with the Travel #2 parameters. If "Off" has been selected for ultrasonics during this period then the ultrasonic hold time must be set long enough to allow for the movement plus any additional Hold time is required by the application after the move is complete. See section 12.10.

6. When the distance has been satisfied, the ultrasonics will be turned off by a cutoff command issued to the GX power supply.

7. The system waits for the hold time specified for the welder controls.

8. When the weld cycle is complete, the system ascends to the home position (up).

9. The stepper controller transmits the final distance report and the GX ultrasonic controller transmits the weld status information.

Power Up – The stepper system has two separate power switches - a green membrane key on the GX power supply and an identical green key on the E-Press Motor Control box. Both units should be powered up before the computer system is turned on. The order is not critical.

Safety Note – The stepper welding system will retract to the head up position whenever the Red Emergency Stop button on the front of the press is engaged. The Stepper Controller will remain powered during an emergency stop condition in order to step the mechanism in the reverse direction. It does not power down with engagement of the Emergency Stop button. This action is necessary due to the force that can be applied by the screw mechanism! Just stopping all movement is not an acceptable action because the applied pressure will not be removed. The pitch of the screw mechanism is very small, it may not be easy to release the pressure by human intervention. It could be difficult for the operator to manually lift the press assembly. Depending on the customer application, additional protection may be required by local laws or the European community. In some applications where operators may be directly exposed to danger areas additional guarding may be required. The ultrasonic power supply section is CE marked and has been tested in standard air actuated ultrasonic systems. The motor controls are not CE marked.

Position Accuracy – The system uses a stepper motor drive and ball screw which is controlled to 42666 counts per inch and a feedback encoder which reads to 6660 counts per inch (1679 counts per millimeter and 262 counts per millimeter respectively). Allowing for lower encoder resolution and a small backlash within the system, the position accuracy will be $\pm$ 0.0003 inch ($\pm$ 0.007 mm). The indicated position numbers on the stepper and logger screens represent the measured motor movement. Any mechanical deflection caused by large pressures applied to the "Parts to be Welded" will degrade the accuracy numbers (with respect to the parts dimensions). Typical deflection measurements for each type of press are provided in the Maintenance section at the end of the manual. The operator should be aware that large pressures approaching 500 LBS can be applied very quickly. If the ultrasonic amplitude is too low and the plastic is not hot enough to melt, then large pressures can be applied with only a few steps of the motor system. If pressures exceeding 500 LBS are applied, the motor system may stall. The system must be reset with the RESET button on the back of the controller panel.

Applications – A stepper application project involves careful setting of the stepper and ultrasonic controls. Distance and velocity controls are set using the stepper setup utility program in combination with the Stepper Control panel switches and display. The ultrasonic controls are adjusted with the GX power supply control panel.

7.0 Quick Start Setup Procedure for a Typical Application **–** This section is intended to be a quick startup checklist for an operator who is familiar with the E-Press welding system. Users who are unfamiliar with the system should read this manual and the GX power supply manual, prior to welding any parts. After reading those manuals, return to this section with a full understanding of the system interactions between distance, speed and ultrasonic controls.

Setting up the system to weld a typical part is really very easy but can seem involved due to the movement and ultrasonic controls required. In order to make full use of the precise distance and velocity welding functions, the ultrasonic power supply will be set so that the time or energy settings are beyond the expected weld requirements. The stepper movement should reach the programmed position before either time or energy settings are reached. Steps to prepare a typical part for welding are identified below. The computer interface must be connected and running properly to set up a part for welding. Once the machine is set up, the computer can be disconnected without effecting the welding process provided that the termination jumper supplied is installed on the back Stepper Controller chassis. Details of the settings are further described below, but the quick start directions can help the proficient user.
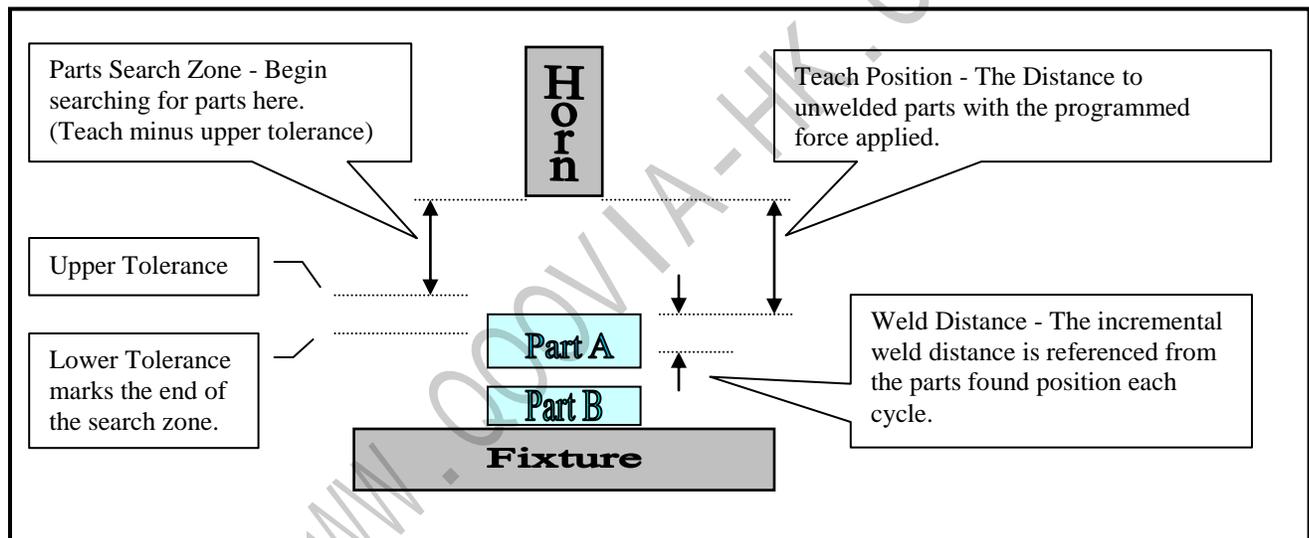
1. Install the horn and fixture on the machine.
2. Release the column locking clamps, raise the Ultrasonic head to provide clearance of at least 4 inches (101.6 mm) above the parts and fixture. Secure the clamps.
3. Set the unwelded parts into the fixture with proper orientation.
4. Set the desired travel and welding parameters using the stepper utility software program. (click SET function to transfer values). See section 9.0 for the stepper controls description. Set the travel distance value large enough to place and remove the parts. Enter the upper and lower tolerances expected. These numbers should account for the variation in the molded parts. Set the upper tolerance to 0.0100 in (0.300 mm); Set the lower tolerance to the thickness of the top part (0.100 inches max). This prevents the horn from contacting the fixture while looking for the parts. Enter the force trigger level desired before sonics starts. This is the force applied to the parts before the weld begins. Again use the **SET** function to send these values to the machine.
5. Extend the ultrasonic horn using the Align function on the stepper controls front panel. Press the Align button and then the system palm buttons. The system will extend the horn to the programmed Travel Distance. Maintain the button command until "Head is Down" is displayed on the LCD screen.
6. Again release the locking clamps and lower the head assembly so that the horn contacts the top of the unwelded parts. Now position and align the horn, parts and fixture. Lock the column clamps and secure the fixture.
7. Return the Head to the Home position by pressing the HOME button.
8. Teach the system where the parts are located: Press the TEACH button. Per screen instructions, press the palm buttons and keep depressed until the distance to the part is displayed on the LCD screen. The system will move the horn to the unwelded parts and apply the programmed pressure. This contact distance will be remembered for the welding function.
9. Press the HOME button to return the press head to the home position.
10. Set the Weld mode for Incremental, the Weld Velocity #1 to .02 in/sec and Weld Distance #1 to 0.0100 inches (let's go slow for the first weld). Set Weld Distance #2 to 0. Again use the **SET** function to send these values to the machine.
11. Set the ultrasonics on the GX power supply for a longer weld time than necessary to complete the weld. Force Trigger must be disabled. The Delay Time must be set to 0.01 seconds (stepper controller needs this delay); Hold time to 1 second (or desired); Afterburst to 0.00 and the Time Limit High to 9.99 seconds. Set the amplitude to approximately 80% to assure sufficient melt. These parameters are programmed from the GX power supply. See the GX manual for further assistance.
12. If using a GXE power supply with energy welding controls, set the Energy parameters for a higher Energy number than will be delivered during the weld time. The distance should control the weld in most cases when using the Stepper system. If the ultrasonics times out or reaches the energy limit before the programmed distances are achieved, then the cycle will not be complete. The control parameter (distance, energy or time) which wins the race to its programmed setting will end the present weld cycle. If a distance is not achieved, check the time or energy settings to see that the

programmed velocities can reach the desired position within the timer/energy settings. Velocity settings and distances, timers, limits and amplitude settings are all interactive and must be considered when setting up a stepper application.

13. The system should be ready to try a weld, be sure that parts are installed prior to initiating a weld cycle. Don't damage the fixture or horn.
14. Simultaneously press the left and right palm buttons (black buttons) on the press base to begin a weld cycle.

Further adjust the settings as necessary to produce the optimum weld cycle time by using the shortest practical travel distance. If the Upper Tolerance number can be made smaller, the parts will be found faster which also improves the cycle time. The Lower Tolerance number should be adjusted so that when no parts are installed, the system will not hit the lower fixture! This is the end of the parts search zone which will cause the system to retract if no parts are found! **Do not allow the horn to contact the fixture.**

Parts Contact Diagram

Parts Search Zone - Begin searching for parts here. (Teach minus upper tolerance)

Horn

Teach Position - The Distance to unwelded parts with the programmed force applied.

Upper Tolerance

Lower Tolerance marks the end of the search zone.

Part A

Part B

Fixture

Weld Distance - The incremental weld distance is referenced from the parts found position each cycle.

8.0 Overview of the Stepper Controls <u>TOC</u> – The stepper front panel is shown below. It contains several switches and an LCD display necessary to initiate setup functions that are used to align the parts and fixture and to teach the system where the parts are located (the distance to the unwelded parts).

The "Align" button is used first to extend the ultrasonic horn by the programmed travel distance toward the parts. Adjust the ultrasonic horn for proper fit against the unwelded parts and lock the head assembly into position using the column lock handle. Apply enough pressure to the lock handle so the head will not be able to move under normal welding pressures. Then use the "Home" button to return the head to the home or full up position.

The operator must then use the "Teach" button to execute the Teach Function. This function must be used one time after initial alignment or whenever the column, fixture or parts are changed or adjusted. The system will learn where to find the parts by extending the head assembly until force is detected on the parts. This position will be remembered for subsequent weld cycles or until the teach function is repeated at a later time. The settings are preserved in permanent memory and will be saved during any non powered interval.

Once the system knows where the parts are located and the expected variation in their vertical dimension (upper and lower tolerance settings) the production welding process will be accurately repeated for every weld cycle.

The Stepper Controls Front Panel

8.1 On/Off Button – The On/Off button turns the unit on and off.

8.2 LCD Display – The LCD display will show the weld distance report after every cycle. In addition, the display shows instructions and feedback in accordance with the operations in progress. It is also used to examine the presently programmed weld parameters so that a computer is not required once a system has been setup for production operations.

   8.3 Align Button - The Align button is used to initiate the Align function (when used in coordination with the palm buttons) or to examine weld setting parameters.

   View settings -To view settings, as instructed on the display, press and hold the Align button for 2 seconds, then release. The LCD screen will then display a weld parameter, such as Force Trigger. Then press the Align button to scroll through the present settings. Press the Home button to leave

the parameter display mode, or the Align button to continue viewing current settings. The system must be returned to the ready screen prior to initiating the next weld cycle.

Align Function – To use the Align function, simply depress the Align button, but do not hold it down as above. The LCD screen will display the Align Mode screen with a message indicating "Home to Abort, Palm Buttons to Start."   Press and hold the palm buttons until the display reads: "Head is in Position. Press Home when Done."

If the palm buttons are released too early, the LCD screen will display the message "Head is not Down. Press Home and Try Again."

8.4 Home Button – The Home button is used to return the assembly to the up or home position after the teach or align function. It is also used to exit the Align parameter display mode as described and/or to abort the teach or align function.

8.5 Teach Button - The Teach button is used to initiate the Teach function when used in coordination with the palm buttons.

Teach Function – Press the Teach button to enter the Teach mode. As instructed on the LCD screen, press both palm buttons and hold them to extend the horn to an unwelded part. The horn will apply the programmed force on the part and stop. Continue to hold the buttons until the distance to the part is displayed on the LCD screen, i.e., "2.9990 in. to Part. Press Home when Done."

At this point, the position has been "taught" and it is OK to press the Home button to return the head to the Home position. If the palm buttons are released before the horn contacts the parts, the display will read "Position has not been Taught. Press Home and Try Again."

8.6 Reset Button – There is a Reset button located at the back of the controller. Press the reset button to restart the motion controller after a motor stall, usually caused by excessive applied force or if the distances or speeds have been set outside the practical application. Check the program settings and re-teach the system.

9.0 GX Power Supply Settings

Be sure to consult the GX Power Supply manual for a complete explanation of the various available weld parameters and how to enter or change applicable settings.

1. Do not select Force/Pressure as the Trigger method. Instead select the Delay Timer option, so that the ultrasonics will be triggered when the Delay Time specified in the Time menu is reached (per #2 below).

2. The Delay time value must be 0.01 seconds

3. The Weld time value must be long enough so that the distance profile and velocity controls are in command of the cycle. If Weld time is programmed too short, the weld cycle may be cut off before the travel profile is complete.

4. The same comment is true for the energy mode settings if you are using a GXE power supply. The energy limit must be set large enough so that the motor and velocity controls will have sufficient time to complete the weld. If energy limits are reached before the weld distance, the cycle may be cut short and the system may not reach the programmed distance.

5. The Hold timer must be set long enough to allow the second distance movement to take place. If ultrasonics is programmed to be "OFF" during the second move (Velocity #2 and Distance #2) then the hold must be set long enough to complete the movement and provide for additional hold time. If ultrasonics is programmed "ON" during the second move then the ultrasonic hold time will not need to consider the time required for the second move. Hold timer begins when the ultrasonic pulse is terminated.

6. Afterpulse and Abort timers will function as necessary.

10.0 Running the Stepper Utility Program <u>TOC</u> - Both controllers, the Stepper Motor Controller and the Ultrasonic Power Supply, should be powered and connected before starting the Stepper Utility Program. The stepper utility program will be an .exe file called G-Series EP_Utility located on the hard drive in the c:\EP UTILITY directory.   If the computer system has been supplied by Sonics & Materials, then the stepper software will have been preinstalled and a short cut icon created on the computer desktop.   A standard stepper icon file is provided for that purpose.

Run the Stepper Utility Program by double clicking the E-Press icon on the desktop or by running the EP Utility .exe file using the Windows™ START button. A typical startup splash screen will first be displayed for a few seconds followed by the stepper programming form once the system has been identified. When the stepper form is displayed, make sure that the power supply is also on.

NOTE: The GX power supply does not need to be connected for the system to function.

Two communications ports are required in the users computer system as previously described. Select w COMM ports, from COMM1 through COMM 12. One port must be connected to the Stepper controller and a second to the GX ultrasonic power supply. When the program is run for the first time, an identification screen will prompt the operator to identify which ports are connected to each controller. Once the system has been identified and the ports exist within the computer, the configuration is stored in a small file that will be used the next time the welding system is powered up. The identification screen will not be displayed again provided that the control systems and computer ports are found and verified the next time the program is run. If the ports and controllers cannot be found, the identification screen will prompt the user to assign Comm ports again. If the identification screen is shown but the configuration has not changed the controllers may not be responding. Check the power and connections, terminate the program and start it again (see below). If the system is found and identified normally, it will take approximately 7 seconds to retrieve the presently programmed values from the stepper controller. The proper assigned ports and controllers must be found in order to continue beyond this identification screen. The system will continue to return to this screen until the proper conditions exist.

The COMM Port Identification Screen

Use the drop down arrows to specify the Comm port connections for the E-Press controller and ultrasonic power supply. The system will not allow the same selection for both ports or the specification of ports which do not exist in the users PC system. When the proper selections have been made, click OK to proceed with system communication.

Note – Several printing options are provided by selections on the following control forms. Print driver compatibilities have not been explored beyond noting the potential problem. (Note: Laser printers have not been tested. Text only printouts have worked correctly in most cases).

The proper type of printer should be used depending on production record keeping or setup and checkout. A more appropriate tractor feed printer should probably be used for production monitoring or quality records. In either case, the installed printer may operate differently than the user intended! For instance, ink jet printers will wait for the page buffer to be filled or the print job to be closed before the physical print is started. This could cause some confusion in the printed logging output. The information is actually in the print buffer but may not be printed until printer logging is turned off, the page is full or the program is terminated. All three events cause the print buffer to print.

English or Metric – The system may be programmed in either system of Engineering Units. When the E-Press program begins, it will read the presently programmed entries and units from the machine. This data will be displayed on the stepper programming form when the system is identified. See section 12.0 below for E-Press form details.

Control Forms - Two Control Forms are available for programming and monitoring the E-Press system – the Stepper Setup Form and the Data Logger Form. Only the presently visible screen receives or sends data to the communications ports so be sure to have the desired form displayed prior to executing a weld cycle. Forms cannot be switched once a weld cycle has been completed or any data is being transmitted. When data transmission is complete, form switching is allowed again.

The Stepper setup screen is the startup default screen and will normally be the first user screen displayed after initiating the stepper utility program.

The following two sections present each of the major forms separately. A graphic of each form precedes a discussion of each item on the form and its associated relevance to stepper welding. The order is generally from the top left side of the form proceeding left to right and top to bottom. The menu items are addressed last in each section.

11.0 The Stepper Setup Screen **-** The E-Press motion settings are selected and programmed on the E-Press setup screen. These include several motion and speed controls as well as setup information to describe the welding application. The purpose for this screen is to type, slide or increment the control parameter values until the desired settings are obtained in each text box on the left side of the screen. Select the Units and Weld mode by clicking on the appropriate buttons. When the desired settings have been entered, they can be transferred to the machine for use during the next weld cycle using the SET button. This operation will take a few seconds to transfer and confirm. A progress bar will indicate a busy condition at the bottom of the screen during this transfer. *Note:* Welding should not be initiated until the bar has stopped. Upon completion of the SET function, the right hand side of the screen (Machine Values) will be identical to the left hand side (desired settings). This approach minimizes the required communications between controllers and preserves the non-volatile memory in the Stepper control system.

A typical setup screen is shown below and illustrates how the motion parameters are set and displayed. Each item on the setup screen will be discussed in the following sections as it pertains to the motion control and welding process. References to the GX ultrasonic power supply manual will help guide the user in setting the associated ultrasonic controls. Several menu items are also available from the top toolbar for switching screens and maintaining the application. The programming and control items will be addressed first followed by the menu selections.

Stepper Setup Screen
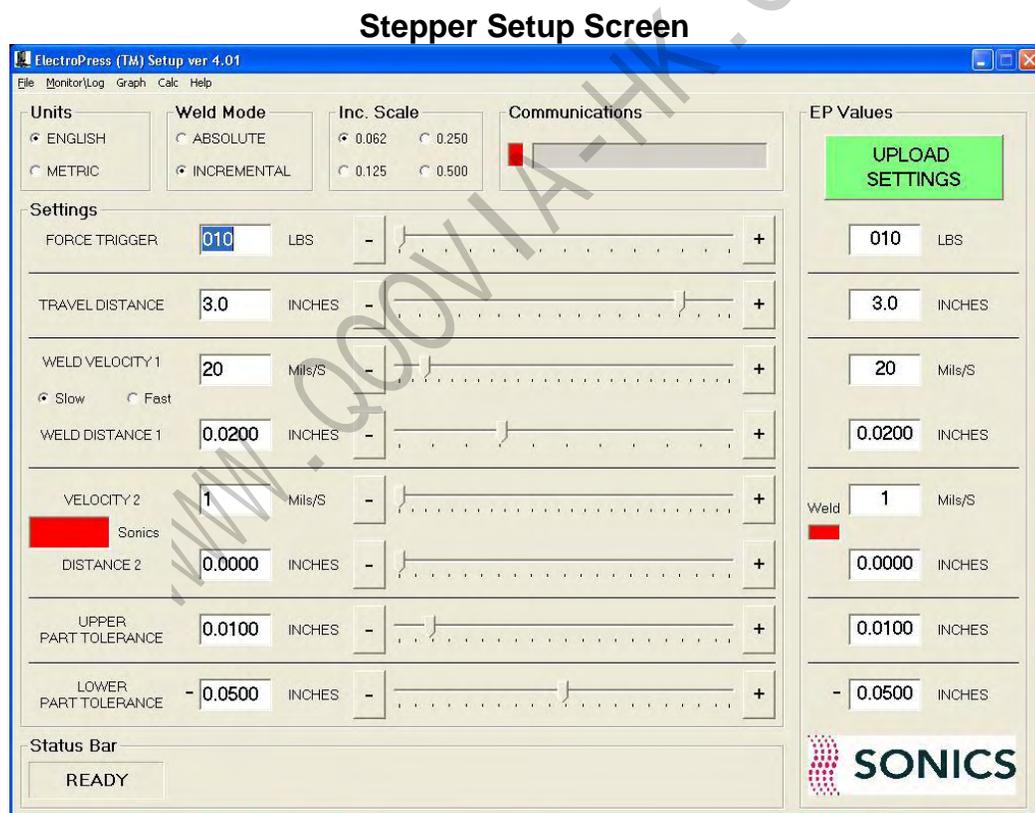
Motion controls for Force, Weld Velocity and Weld Distance are settable using this screen. Numerical settings may be adjusted in several ways. They may be typed into text boxes for exact selection or they may be adjusted using the corresponding slide bar. These are standard controls that use the mouse to drag and drop the settings or to increment or decrement the adjustment by one least significant count. Once the appropriate selections have been made the settings are transferred to the motor controls using the SET button as previously described.

11.1 Units – Select the English or Metric system of units by clicking the appropriate indicator. This should be the first option selected when beginning an application because switching units will automatically default the associated parameters. If the programming units are changed by the operator, the weld parameters will be set to the minimum settings for the new Units selection. If the operator changes back to the original units prior to a SET button command, the displayed values will again be set to match the original machine values. The allowed programming limits provide different resolutions for Metric or English selection so that whole decimal positions can be used. This will avoid incrementing entries by 2.54 etc.

The programmer must provide all weld values. The system does not automatically convert from Metric to English or the reverse. The selection for Units and Weld Mode will determine the range of values allowed for welding and speed settings. See Table 12.1. Note: Reference calculator function.

11.2 Weld Mode – Select Absolute or Incremental Welding by clicking the appropriate circular indicator. Absolute welding is referenced from the encoder home position. Selecting absolute welding means that the reference weld distance is measured from home. Absolute distances must be coordinated when using the second weld distance control. This means that Weld Distance 2 must be greater than Weld Distance 1 etc. Ex: It would not be possible to weld first to 2.25 inches and then to 2.00 inches. Absolute welding would be used when the final dimension of a welded part is to be controlled.

Incremental Welding is referenced from the location where the parts are compressed by the horn and the applied force is equal to the Force Trigger setting. An incremental weld will first travel to Weld Distance 1 using Weld Velocity 1 and then continue for and additional Weld Distance 2 using Weld Velocity 2 (if Weld Distance 2 is set to a non-zero value).

11.3 Communications – The communications window does not contain any programmable parameters. This is an indicator box used to identify communications activity. It will turn green during communications activity and return to red when the data has terminated. It will normally flash after each weld to indicate that the weld data has been sent. Next to the communications indicator, a small text box shows the last message received from the stepper system. This allows the programmer to see the weld distance report during setup and adjustment of a welding application without switching back and forth to monitoring screens.

11.4 Machine Values – These are the present programmed parameters that have been sent to the motor controllor. The Green SET button is the only operator interaction on the right side of the screen as described above. When the SET button is clicked, the parameters that have been set by the programmer are transferred to the motor controllor. To recall the settings from the machine refer to the File Recall section below. The SET function will also attempt to qualify entries as much as possible. Appropriate messages will be displayed to help the operator select values that not would create operational errors.

11.5 Force Trigger – The force trigger value is the amount of force which will be applied before the ultrasonics is turned on and the weld begins. This is also the force applied during the teach mode described in 9.5. Force is measured by a load cell located between the actuator and the moving head assembly. The conditioned force signal is wired to the motion controller which moves the motor and monitors the force.

11.6 Travel Distance – This programmed distance is used for the Align function and will be the travel distance to unwelded parts during the welding cycle. The Align Function is initiated by simultaneous activation of the front panel Keyswitch and the Align switch (see Align Function). It extends the carriage by the programmed travel distance to allow for fixture alignment and adjustment. During a "Teach" operation, the system will find the actual distance to the parts.

11.7 Weld Velocity 1 – The weld velocities are entered as RPS (motor revolutions per second) values because actual weld velocity numbers would be too small to comprehend. The programmer would have to enter too many decimal digits to change a setting. Weld velocity 1 represents the speed which will be

used during the first weld period. This weld begins after the force trigger has been satisfied and continues until Weld Distance 1 has been reached.

11.8 Weld Distance 1 – Weld distance 1 is the distance which ends the first weld period. When the system has advanced to Weld Distance 1, the velocity and distance set-points will be adjusted for the second weld parameters (Weld Velocity 2 and Weld Distance 2). The system does not stop between the distance 1 and 2 settings unless distance 2 is set to zero. A zero (0) setting for distance 2 means that it is OFF and will not be used. If Weld Distance 2 has a nonzero setting the system will accelerate/decelerate to the new velocity.

11.9 Weld Velocity 2 – Weld Velocity 2 is set the same way as weld velocity 1. The system switches to velocity 2 when distance 1 has been met and distance 2 is non-zero.

11.10 Weld Indicator (Green/Red Selection Box) – Ultrasonic vibration can be turned on or off for the second distance control. Clicking on the colored portion of the Indicator Box will toggle the color between Red and Green. Red is used to turn ultrasonics off and green is used for ultrasonics on. This control box is located at the extreme left edge of the form next to the Weld Velocity 2 and Weld Distance 2 settings. The operation is the same as all weld settings, select the desired condition and click the SET button to transfer the selections to the controller. If Weld distance 2 is equal to zero, then the distance 2 settings are not used (it's off) so the state of this Weld control does not matter. Ultrasonics cannot be turned off during weld distance 1.

The hold timer, set on the GX power supply, must be long enough to allow the second distance movement. If ultrasonics is programmed to be "OFF" during the second move (Velocity 2 and Distance 2) then the hold must be set long enough to complete the movement and provide for additional hold time. If sonics is programmed "ON" during the second move then hold time will not need to consider the time required for the second move. The hold timer begins when the ultrasonic pulse is terminated even if the head assembly is still in motion. (Refer to power supply instruction manual for more information.)

11.11 Distance 2 – Distance 2 is set the same way as weld distance 1 except that distance 2 is allowed to equal zero. When distance 1 has been met, the system will switch to velocity 2 until distance 2 is reached.

11.12 Upper Part Tolerance – The Upper Part Tolerance is set to allow for the variation in plastic part dimension. Its purpose is to provide a reference location above the teach position that will allow the motor controls to slow the head assembly and begin the search for the parts. This value should be large enough to cover the widest variation expected so that the parts do not get crushed by the advancing head assembly prior to the slow down point. This entry is always referenced from the "Teach Position". EX: An entry of 0.050 inches would tell the controller to slow down when the system reaches 0.050 inches above the normal unwelded parts dimension. The requirement is that the parts variation is expected to be less than 0.050 inches above the taught position.

11.13 Lower Part Tolerance – The Lower Part Tolerance is the same type of entry as the upper part tolerance but on the lower side of the taught position. i.e. An entry of 0.070 inches would tell the controller that the part should have been found prior to the taught location plus the lower part tolerance value. If the part has not been found between the Upper and Lower Part Tolerance entries then maybe it hasn't been loaded or is missing. When the parts are not found in the defined window, the weld cycle is terminated and the head assembly returns to the home position. Note that a permanent minus sign ("-") is placed in front of the Lower Part Tolerance entry and setting to help indicate that the reference means below the taught position. The values are always entered as positive numbers.

11.14 Ready Indication – This indicator displays the present status of save or recall operations. It will indicate any activity along with a progress bar which will appear along the bottom edge of the screen

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when file operation or communications are in process. This indicator does not have any associated operator interaction.

11.15 Scales and Limits –The following table shows the allowed ranges for programmed entries on the stepper controls screen. When switching from Metric to English (or the reverse), the entries are set to default conditions. The operator must select appropriate entries for the welding application. Scales are selected for closest whole digit resolution and presentation).

Table 12.1

Parameter	English-ABS	English-INC	Metric-ABS	Metric-INC
Force Trigger (FT)	010 – 150 LBS	010 – 150 LBS	50-650 Newtons	50-650 Newtons
Travel Distance (T1)	0.2 –2.7 In	0.2 –2.7 In	05– 70 mm	05– 70 mm
Weld Velocity 1 (R1)	0.01-10.00 RPS	0.01-10.00 RPS	0.01-10.00 RPS	0.01-10.00 RPS
Weld Distance 1 (WD)	0.0500 – 2.7500 In	0.0010 – 0.5000 In	1.000 – 70.000 mm	0.01 – 12.70 mm
Weld Velocity 2 (R2)	0.01-10.00 RPS	0.01-10.00 RPS	0.01-10.00 RPS	0.01-10.00 RPS
Weld Distance 2 (WD)	0.0000 – 2.7500 In	0.0000 – 0.5000 In	0.000 – 70.000 mm	0.000 – 12.700 mm
Upper Tolerance (P1)	0.0010 – 0.1000 In	0.0010 – 0.1000 In	0.025 – 2.500 mm	0.025 – 2.500 mm
Lower Tolerance (P2)	0.0010 – 0.1000 In	0.0010 – 0.1000 In	0.025 – 2.500 mm	0.025 – 2.500 mm

11.16 Menu Items - The top line of the stepper setup form contains drop down menus for file functions, screen switching, initiating the Windows calculator and a basic help utility.

1. File Job Open or Save – The File\ Job\ Open and Save functions allow the presently programmed values for the motor controls to be saved and recalled to or from a specified file. The file selection is handled in the standard windows style. When the user has selected a file for the open function, the data will automatically be retrieved from the computer file and loaded into the motor controls. The save function will capture the present motor control settings and save this data to the specified file for future recall using the Open menu selection. For either case the progress bar will indicate the activity and the Ready Text box will identify the operation.

2. File Print Settings – The Print Settings selection under the File menu will initiate a print operation. The present motor control settings will be sent to the printer along with a time and date stamp.

3. Recall Machine Settings – The present machine settings may be recalled from the stepper control process at any time by selecting the Recall Machine Settings option under the File menu. When the operation is complete, the selection side of the setup form will be set to match the present machine values. This action will retrieve the values from the controller and verify all display settings.

4. Monitor\Log – The Monitor\Log menu selection will unload the stepper setup form and display the Monitor\Logging form. The Monitor\Log form is intended to capture weld and distance data and present one status line after each weld. This data may be logged to a text data file and\or sent to the system print buffer.

5. Calc – The Calc selection will launch the windows system calculator intended to assist the operator with application setup. If the windows Calculator program cannot be found, a message box will indicate the condition.

6. Help\ About Stepper Controls – This selection will display a message box to identify the present revision level of the stepper utility software.

11.17 Incremental Total Distance Window – When the incremental welding mode has been selected, a special Total Distance Window will be displayed when the Distance 1 or Distance 2 setting receives the focus. That means the Total Distance Window will appear when the cursor is clicked in either text window for Distance to highlight or change the numerical values. This window will display the sum of Weld Distance 1 and Weld Distance 2. When either distance is changed the Total Distance Window will automatically update and always show the total weld distance.

Total Distance Window

The section to the left shows the window as it would be displayed for a typical setting. It will only be displayed if Distance 2 has a non-zero value, incremental weld mode is selected and one of the distances has been given the focus as described above.

The window can be removed by clicking the mouse on any portion of the Total Distance Window. The underlying tolerance settings will be returned.

The Total Distance Window will not be displayed for the absolute welding mode because the weld numbers are referenced from home and do not effect each other as they would for an incremental setup.

12.0 The Data Logging Form <u>TOC</u> **-** The Monitor/Logging Form is provided to monitor a production operation. When a weld has been completed, a status line is sent from the ultrasonic welder and a final distance report is sent from the stepper motor controller. This presentation combines the status line from each unit and displays one line after each weld.

Up to 100 lines will be retained on the form. They may be reviewed using the vertical slide bar on the right side of the text area. The slide bar will automatically be enabled when the viewable text area has been filled. Beyond 100 lines of history, the data will roll off the form and be lost to the active text area. To save all data lines see the File Logging option below. File logging allows all data to be logged to a file for later examination using any word processor or text editor.

A line number reference plus a time and date stamp are appended to the beginning of each line. The line number reference begins at one (1) each time the program begins, it cannot be set by the operator. The time and date stamp is taken from the computer system information.

Monitor \ Logging Form

The simulated indicator lights along the lower edge of this form show the present status for file logging, printing and communication activity. When the indicators are green, the adjacent function is active. When they are red, the condition is turned off or waiting for data. These indicators are not used for operator selection, all selections for this form are made using the menu system along the top line of the form.

NOTE: Line 2 shows "No Weld Data." This message will display if the GX power supply is not connected to the PC.

12.1 Content of A typical status line (as displayed on the previous page) – The content of a typical status line is displayed below with a brief description of each element.

```
00008 10:48:49 AM  3/10/2009  000391 00.00 sec 0.000 in 000000 j 000 %Pmax  Alarms T:– D:– E:L-J–––   DIST: 0.0000 IN.
         1                 2       3      4       5     6            7           8            9
```

1. "00008 10:48:49 PM 2/1/99" - This is the standard Reference # plus the time and date stamp of this weld.
2. "00391" - A reference number from the ultrasonic welder indicating the total ultrasonic cycles
3. "00.00 sec" - Weld time
4. "0.000 in" – Not applicable for e-Press, so data will be zero
5. "000000 j" – Weld energy in joules (applicable for GXE power supply models only)
6. "000% Pmax" - Indicates the maximum percent power (peak) delivered during the weld.
7. "Alarms: T_D:_E:L" – Any alarm violations (Time, Distance, Energy)
8. "J- -" – Job number
9. "DIST: 0.0000 in." - The total weld distance. It should be very close to the programmed setpoint values.

If the communications is lost from either the motor controls or the ultrasonic supply after a weld has been completed, the system will wait for the other unit to respond for about 0.4 seconds. At the end of that time whatever information has been received will be added to the status line (one of the units has not responded for some reason). This will result in a shortened line of information until the condition is corrected. The most likely cause for this condition is that the GX print line ON switch is not in the "on" position, resulting in the absence of ultrasonic information.

12.2 Menu Items - The menu items are used to select File Logging, Printing, screen switching and can also be used to initiate the standard windows notepad program.

1. Open Log File – The "Open Log File" option under the File menu selection allows the user to specify a data file to receive the status line described above. File specification is handled in the familiar windows manner. Once a file has been selected, every status line that follows will be also written to the specified file as well as to the displayed text window.

If the selected file already exists the operator will be provided the option of appending to the end of the existing file or replacing the entire file. While the file logging option is active the File Logging indicator at the lower left edge of this form will turn green. The file will remain open and in use by this function until file logging is turned off or the stepper utility program is closed. It will be available for any other program to use once it has been closed.

The status line is written as text characters and therefore may be read by any processor or text editor program. A normal line will be approximately 85 characters long. Be aware that a fast duty cycle operation could build very large data files!

2. Close Log File – The "Close Log File" option under the File menu will terminate the logging operation and close any open file. The File Logging indicator will turn red.

3. Printer - The "Print On" and "Print Off" options are available under the Printer menu selection. The same file logging status line will be sent to the system printer after each weld if the "Print On" option has been selected. Note that the system printer may not print a physical line on the page until the print buffer has at least a page of characters in the queue. Printer options and buffer settings are available under the windows control panel settings. Some print characteristics will be a function of the users installed printer.

Any characters that have not been printed will automatically print when the option this turned off or the stepper utility program is closed. The Printer indicator at the lower left center of this form will turn green while the printer option is ON. It will be red when the selection is OFF.

4. Set-Stepper – The Set-Stepper menu selection will unload the monitor \ logging form and display the Stepper Setup form.   The Set-Stepper form is used to program the motor controls as previously described.

5. Notepad– The Notepad selection is an easy way to launch the windows system Notepad program. Notepad can be used to view the data file created by the file logging operation. If the windows Notepad program cannot be found, a message box will indicate the condition.

MAINTENANCE

Stepper Trouble-Shooting Guide :

The following list contains the most common problems associated with the stepper welding system and the most probable cause. The potential problem is in **Bold Red** and the associated discussion should help lead to a solution.

1. The **Weld seems to be cut short** and does not achieve the distance setpoint. Check the GX power supply weld time settings, they must be programmed long enough for the E-Press system to complete all programmed moves. If sonics is programmed OFF during the second move (Distance #2 and Velocity #2) then the GX hold time must be long enough for the second move plus any desired Hold time. The ultrasonic welder will be in HOLD when sonics shuts OFF.

2. The motor **starts to weld but there is a grinding sound**. Then it stops and stays in position. The system has stalled for any one of several reasons causing the stepper motor to slip. This slipping makes clicking noises but does not harm the motor. Use the RESET button on the E-Press front panel to reset the motor system. The head assembly will move up to the home position. This condition could be caused by excessive velocity settings or low ultrasonic amplitude. Check the velocity settings on the Stepper Screen and verify that the ultrasonic amplitude is sufficient to melt plastic.

3. The **computer does not find the Stepper or GX controller**. These devices must be connected to the two COMM Ports. They must be standard PC ports as COMM1 through COMM4 and each unit must be wired with the proper cables. The stepper system must be in the ready screen: "**SONICS & MATERIALS**" Press HOME or RESET to return to the ready screen. "**SYSTEM READY**"

4. The **head assembly does not find the home position** and keeps trying to run into the upper stop. This could happen at initial startup or after a stall has taken place. The system has missed the upper limit home signal and is trying to run until it finds it. Press the Emergency Stop button and physically move the carriage down from the stop, approximately one inch. Restart or RESET the system and the HOME position should be detected.

5. The System seems to find the parts but then **welds in the upward direction.** This can happen if Absolute Welding mode has been selected and the parts tolerance settings are large. If the parts are found near the end of the specified tolerance window (the sum of the upper and lower tolerance settings) and the absolute weld setting is before that point, the system will weld in the reverse direction or up to the setting. This would obviously be an incorrect application setup but it can be confusing. The part tolerances could not meet the final desired depth after welding if they are already too short to be welded!

6. The machine seems to weld 10 or 15 pieces and then **stops in the middle of the weld while down on the parts.** If the PC port is not connected with the stepper utility program running or the cable has been disconnected without installing the terminator plug, the stepper controller can get into an internal buffer full condition. Install the terminator connector or check the cables and run the utility program.

Glossary of Terms

Align – The horn moves to the travel distance in order to position the unwelded parts and fixture.

Creep Speed - A very slow final approach speed used to find the plastic parts. It is used to avoid impact damage to the parts that would occur if the travel speed were to be used all the way to the parts.

Deflection – A measurement taken at the parts position which indicates the expected bending of the ultrasonic press with applied pressure. Deflection will degrade the position accuracy of the system.

Delay Time – The programmed duration which the horn is on the part before the weld begins.

GX – The Ultrasonic Power Supply with microprocessor.

Encoder – Provides optical position feedback of the motor position. This is the number presented in the position data screens.

Force Trigger – The amount of force applied before the weld begins. Foce is measured with a load cell mounted in-line to the stack assembly and the screw actuator.

Hold Time – The programmed duration which the horn is held on the part after the weld ends and before the horn travels home.

Home Position – The full upward start position.

Logger Form – Programming form which prints a status line after every weld. Data may also be sent to a file for later examination or simultaneously to a printer.

Lower Tolerance – The search window position below the taught position which is the expected minimum limit where the parts will be found. If parts are not found before the lower limit position, the cycle will be aborted.

Press – The mechanical assembly which holds the ultrasonic stack and provides a rigid platform to hold the parts and fixtures.

Status Line – The Printed line on the logger form. Also the distance report on the LCD display.

Stall/Slip – When the stepper motor cannot maintain phase lock with the rotating magnetic fields within the motor. Caused by too much applied force or a field velocity too high to maintain physical alignment.

Stepper Motor – A special type of rotary positioning motor. Alternately energized phase coils will magnetically move the rotor in order to control its final position.

Stepper Setup Form – Programming form used to input the control settings for velocity and position.

Teach – The method used to define the precise position of the parts to be welded. The system moves downward at slow speed until force is detected by the load cell. This defines the top of the parts!

Travel Velocity – Initial velocity used to approach the parts. The system will switch to a creep speed just above the parts and slowly find the parts.

Upper Tolerance – The search window position above the taught position which is the expected maximum limit where the parts will be found.   This position is used to end the travel approach speed and defines the start of the creep speed zone used to detect the parts.

Ultrasonic controls – The GX ultrasonic controller.

Weld Time – The programmed ultrasonic time in the GX Controller.

Weld Velocity – The programmed speed used to advance the head assembly during the weld time. Two speed changes can be programmed during the weld and/or hold times.
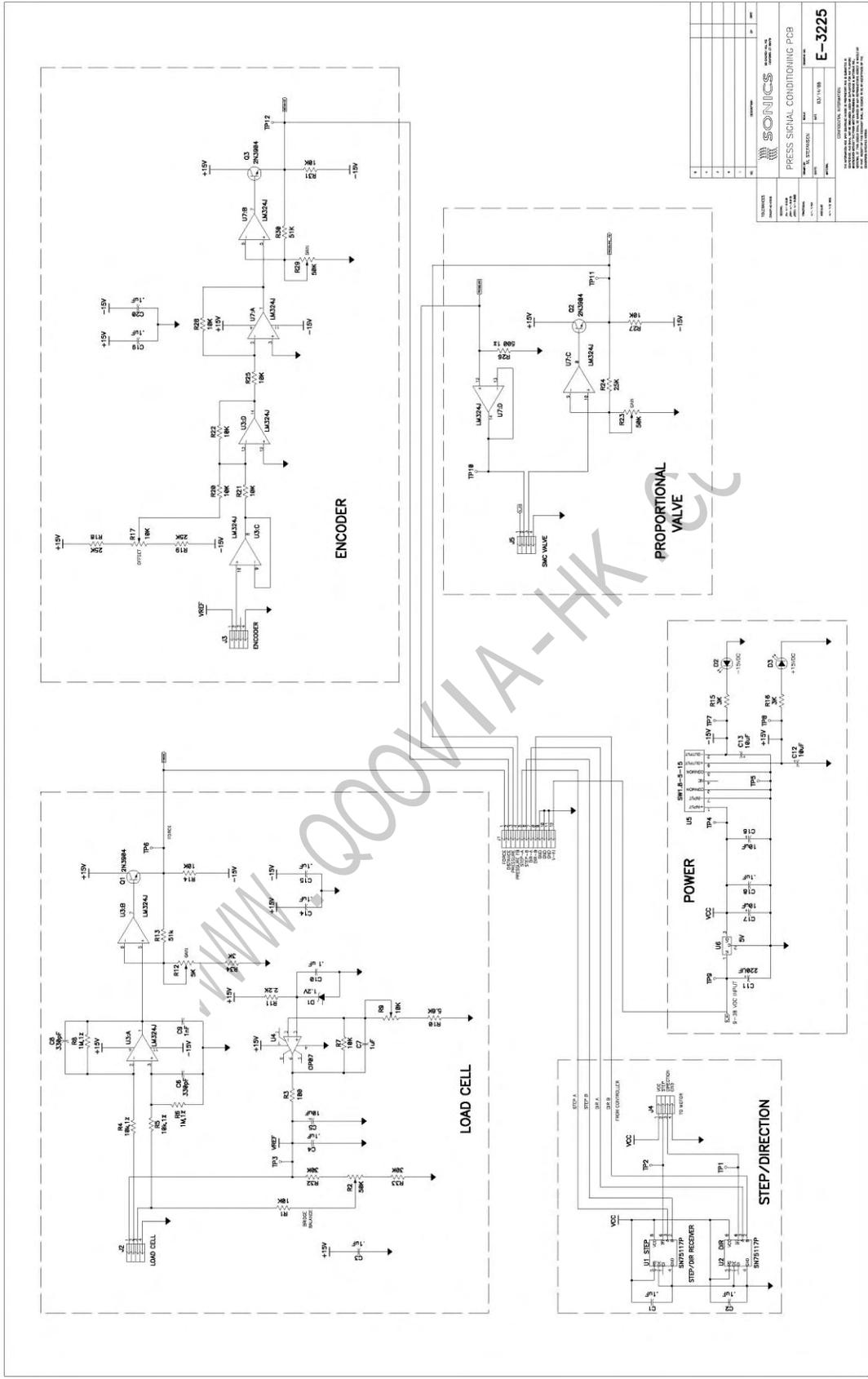
Weld Distance – The distance to travel during the weld. Two weld distance steps can be programmed during the weld time.

Drawing List – The following drawings are contained in this document for user reference and maintenance purposes. In certain cases, if details are difficult to read because these drawings have been reduced to fit on one page, simply enlarge (zoom) your current on-screen view.
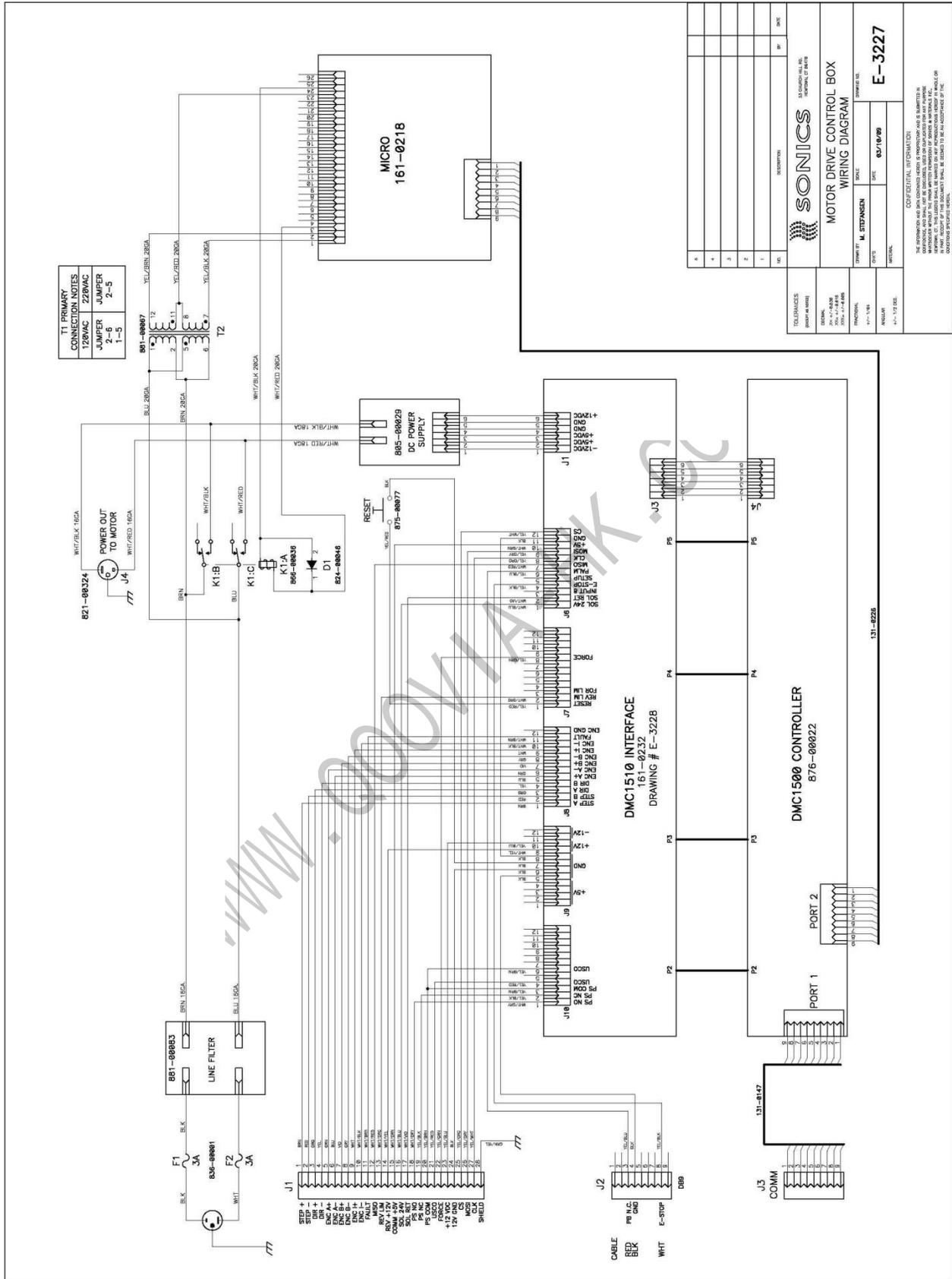
1. E-3225   Press Signal Conditioning PCB
2. E-3227   Motor Drive Control Box Wiring
3. E-3228   DMC-151- IO Interface
4. E-3229   Electric Press Wiring
5. E-3092   Stepper Line Terminator
6. Schematic   Layout Side View
7. Schematic   Base Layout
8. Schematic   Optional Stand-alone Mounting Hub Layout
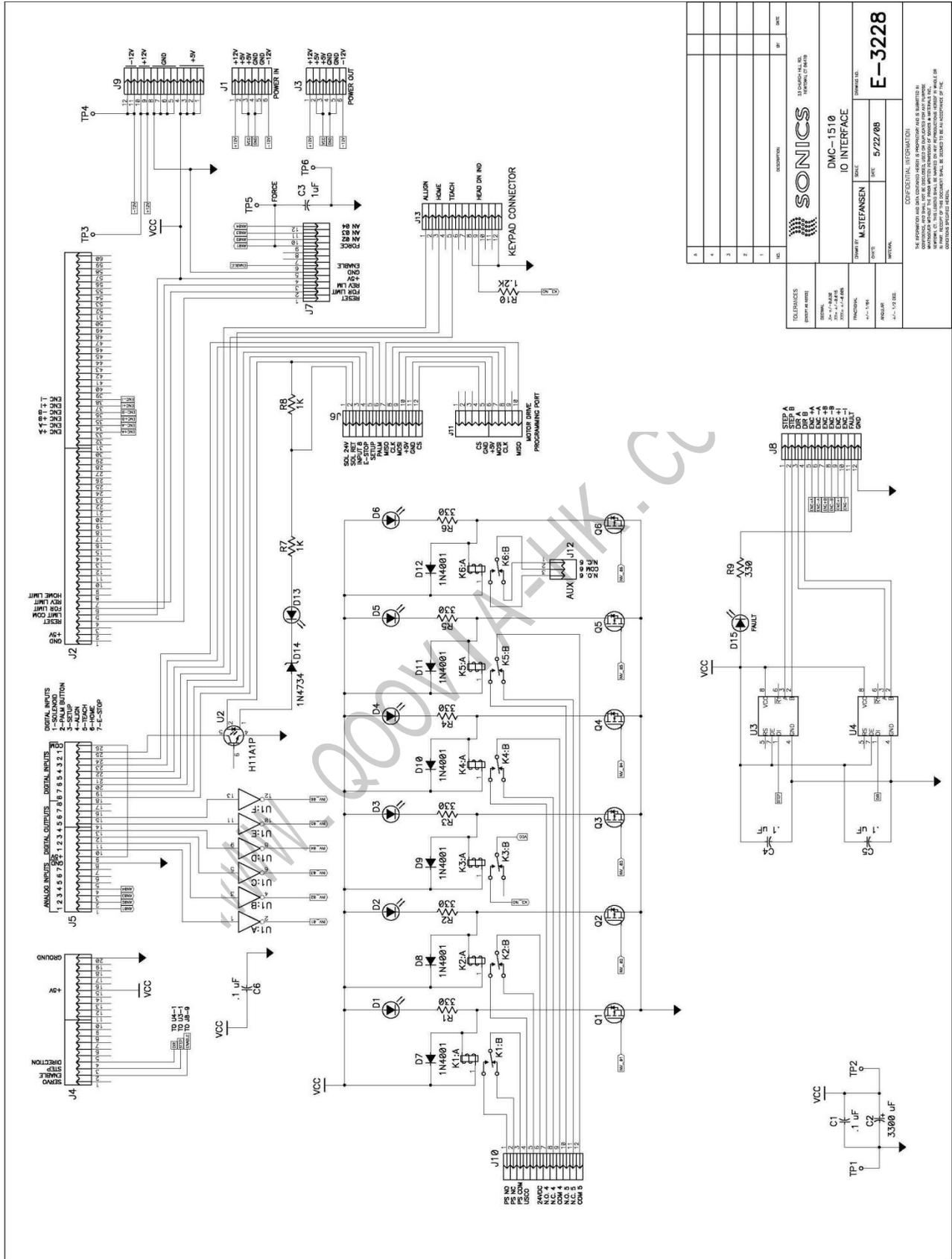9. Schematic   Exploded Assembly Drawing

CABLE TO POWER SUPPLY

HEAD SOLENOID — A +
US—STOP — B −
HEAD DOWN — E
FORCE SENSOR — K
— H
— J
— L
N.O. — C
PRESSURE SWITCH COM. — F
N.C. — G
High Voltage Coax — D
— M

WHT
BLK
BRN
ORG
BLU
RED

CONVERTER

TB1

GRN
WHT
BLK
ORG
BLU
RED
BRN

LOAD CELL
805-00018

RED
BLK
WHT
GRN

TOP VIEW
GRN
BLK
RED
WHT

161-0234

WHT/BLU
WHT/VIO
WHT/GRY
YEL/BRN
YEL/BLK
YEL/GRN

875-00145
REVERSE LIMIT PRXM
BLK
BRN
BLU

PRESS SIGNAL CONDITIONING PCB
161-0233

VCC
STEP
DIR
GND

FORCE
STEP-A
STEP-B
DIR-A
DIR-B
GND
GND
GND
V-IN

VIO
GRY/BRN
YEL/BRN

BLK
GRN
WHT
RED

IMS MOTOR
805-00055

OPTO
ENABLE
ENC I+
ENC B−
ENC B+
ENC A+
MOSI
CS
+5VDC
GND
DIR
NC
ENC I−
ENC A−
CLOCK
MISO
STEP
FAULT

VIO
GRY
RED/BLU
GRN
ORG
GRY/PNK
WHT/YEL
WHT/GRY
BLK
BRN/GRN
WHT
BRN/GRN
YEL
PNK
GRY/BRN
BRN

J1

STEP +
STEP −
DIR +
DIR −
ENC A+
ENC A−
ENC B+
ENC B−
ENC I+
ENC I−
FAULT
MISO
REV LIM
COM +5V
SOL 24V
SOL RET
PS NO
PS NC
PS COM
USCO
FORCE
+12 VDC
12V GND
CS
MOSI
CLK
N/C

BRN
RED
ORG
YEL
GRY/PNK (MOTOR)
WHT (MOTOR)
RED/BLU (MOTOR)
GRN (MOTOR)
BRN/GRN (MOTOR)
BRN/GRN (MOTOR)
BLK(PROM)
PNK (MOTOR)
BRN(PROM)
WHT/GRY (MOTOR)
WHT/VIO
WHT/GRY
YEL/RED
YEL/GRN
YEL/BLU
BLK
WHT/YEL (MOTOR)
WHT/GRN (MOTOR)
YEL (MOTOR)

SONICS
53 CHURCH HILL RD.
NEWTOWN, CT 06470

ELECTRIC PRESS WIRING

DRAWING NO.
E-3229

DRAWN BY
M. STEFANSEN

DATE
03/10/09

SCALE

DESCRIPTION

TOLERANCES

CONFIDENTIAL INFORMATION

THE INFORMATION AND DATA CONTAINED HEREIN IS PROPRIETARY AND IS SUBMITTED IN CONFIDENCE AND SHALL NOT BE PRIOR WRITTEN PERMISSION OF SONICS & MATERIALS INC.

TYE-WRAP(690-08002)

Stepper Controls Line Terminator

Must be installed when a computer is not connected on the Com port is not available.
(Yellow Dot on back of the stepper Controls)

TAG (890-09052)

HOOD
821-00138

YELLOW PAINT
BOTH SIDES
(USE MARKERS)

(FEMALE)

18 AWG BUSS WIRE
(816-01800)

REAR VIEW
CONNECTOR
821-00133
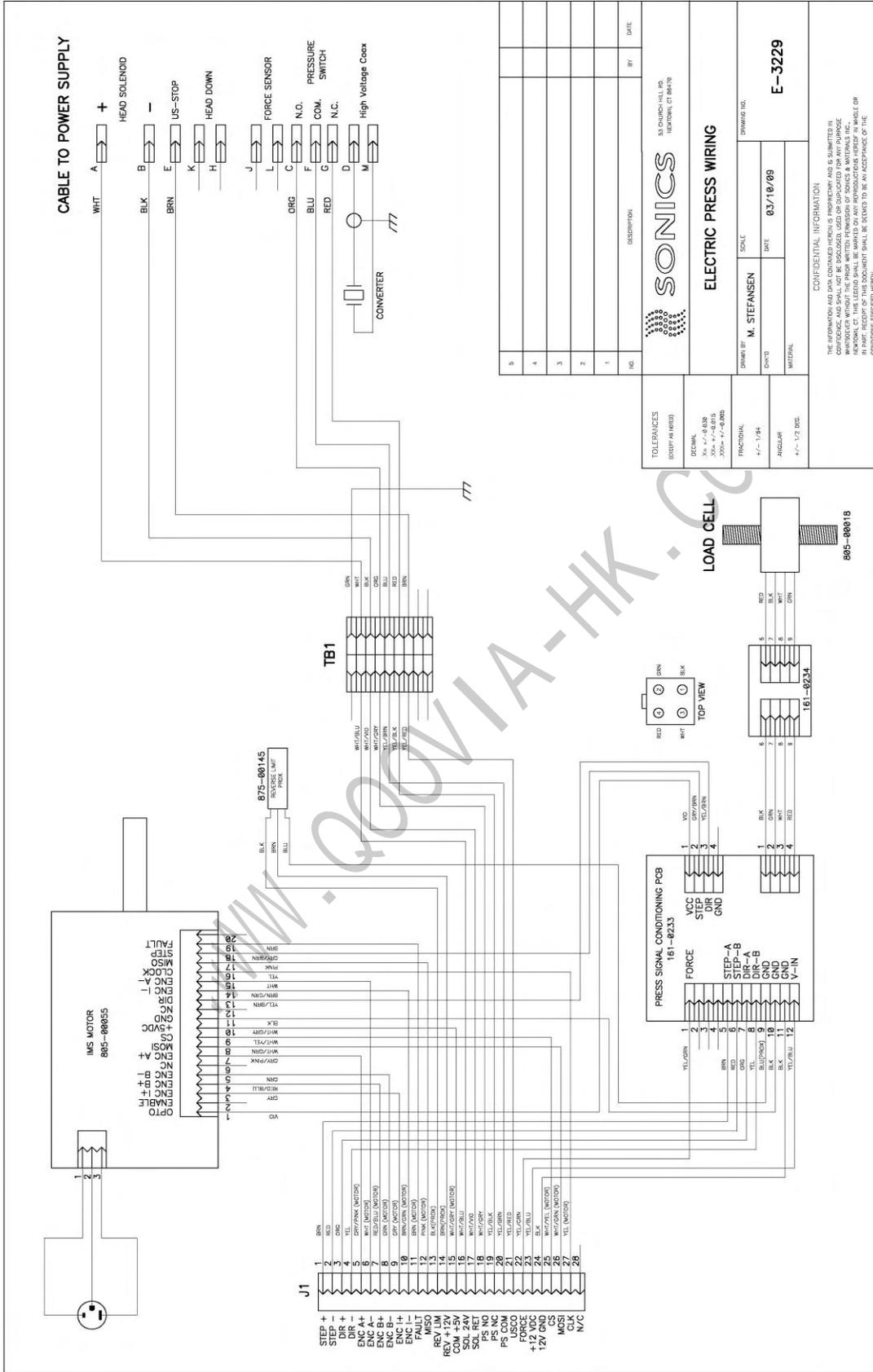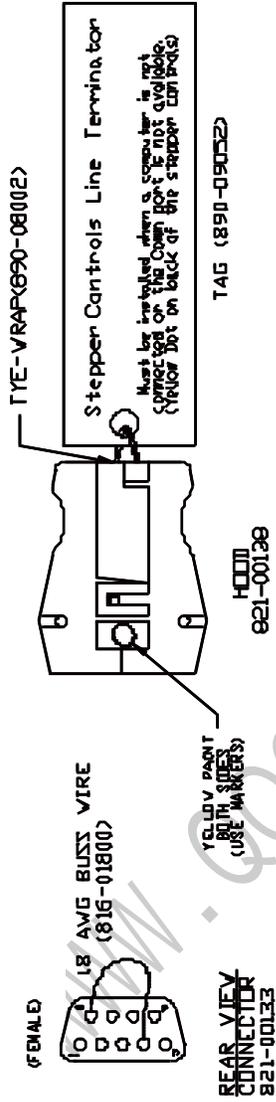
NOTES:
1. MAKE LOOP ON BUSS WIRE LARGE ENOUGH FOR TYE-WRAP
2. MAKE SURE TYE-WRAP END IS NOT EXSPOSED(AS SHOWN)

STEPPER LINE TERMINATOR

DRAWING NO
E-3092

DRAWN BY   JAC
THIRD
DATE 3-18-98

201-0237

LAYOUT SIDEVIEW

42 (1066.8)

$5^{1}/_{4}$ (133.4) TYP

10 (254.0) MAX

$4^{1}/_{4}$ (108.0)

25 (635.0)

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

BASE LAYOUT

3³/₄ (95.2)

³/₈ (16) TYP

12¹/₂ (317.5)

14³/₄ (374.7)

7 (177.8) TYP

12 (304.8) TYP

13¹/₂ (342.9)
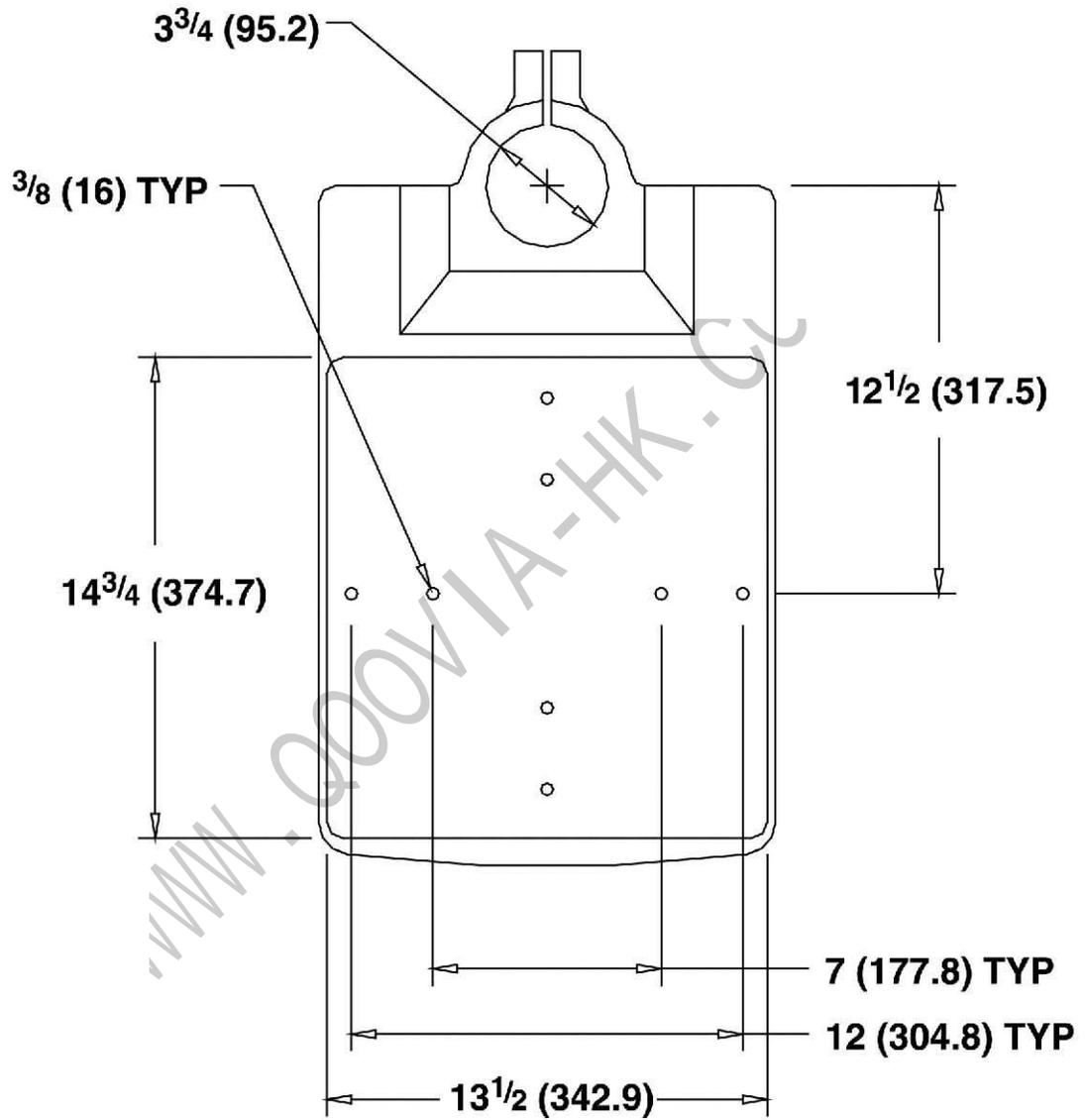
Dimensions are shown in inches and millimeters,
i.e., 1¹/₂ (38.1) signifies 1¹/₂" (38.1mm)

OPTIONAL STAND-ALONE
MOUNTING HUB LAYOUT

$3^3/4$ (95.3)

$^{17}/_{32}$ (13.5) TYP
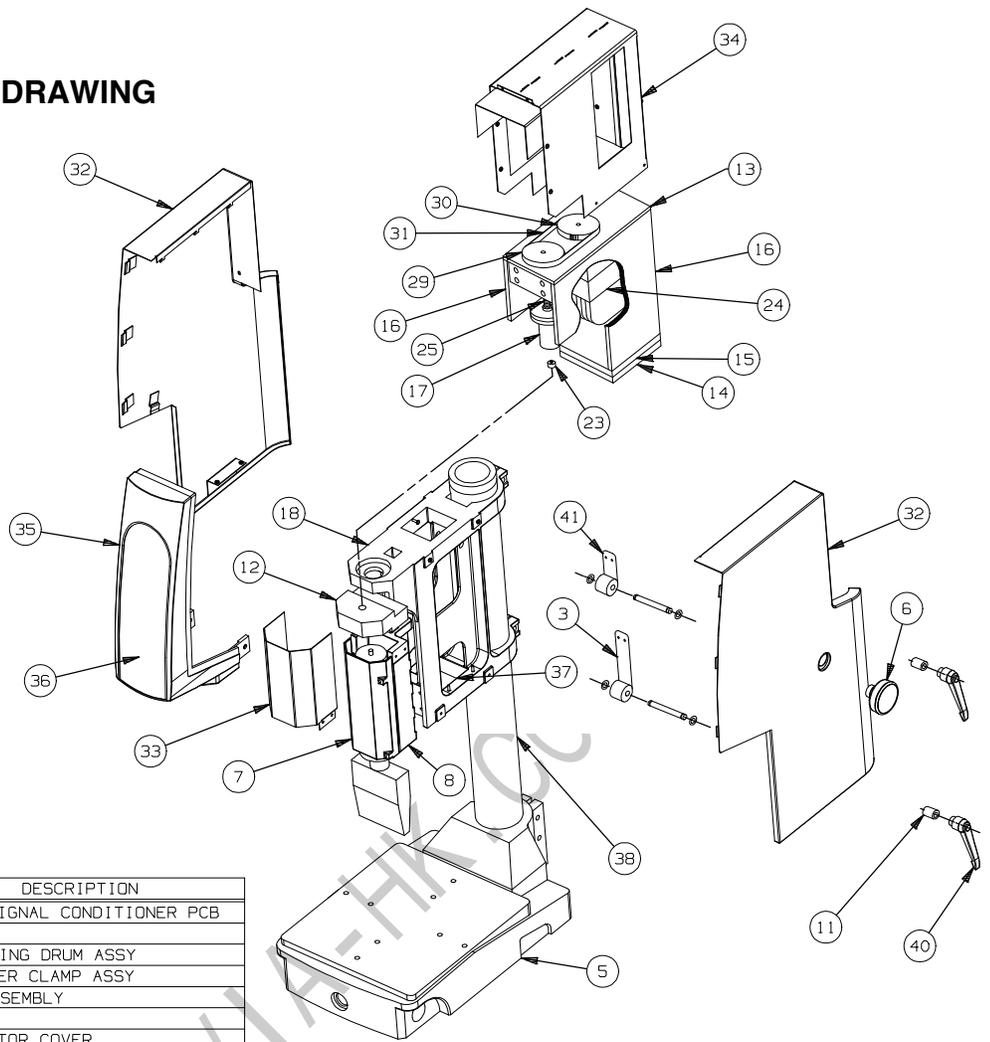
$7^1/2$ (190.5)

9 (228.6)

$2^1/8$ (54.0)

$5^1/2$ (139.7)

7 (177.8)

1 (25.4)

10 (254.0)
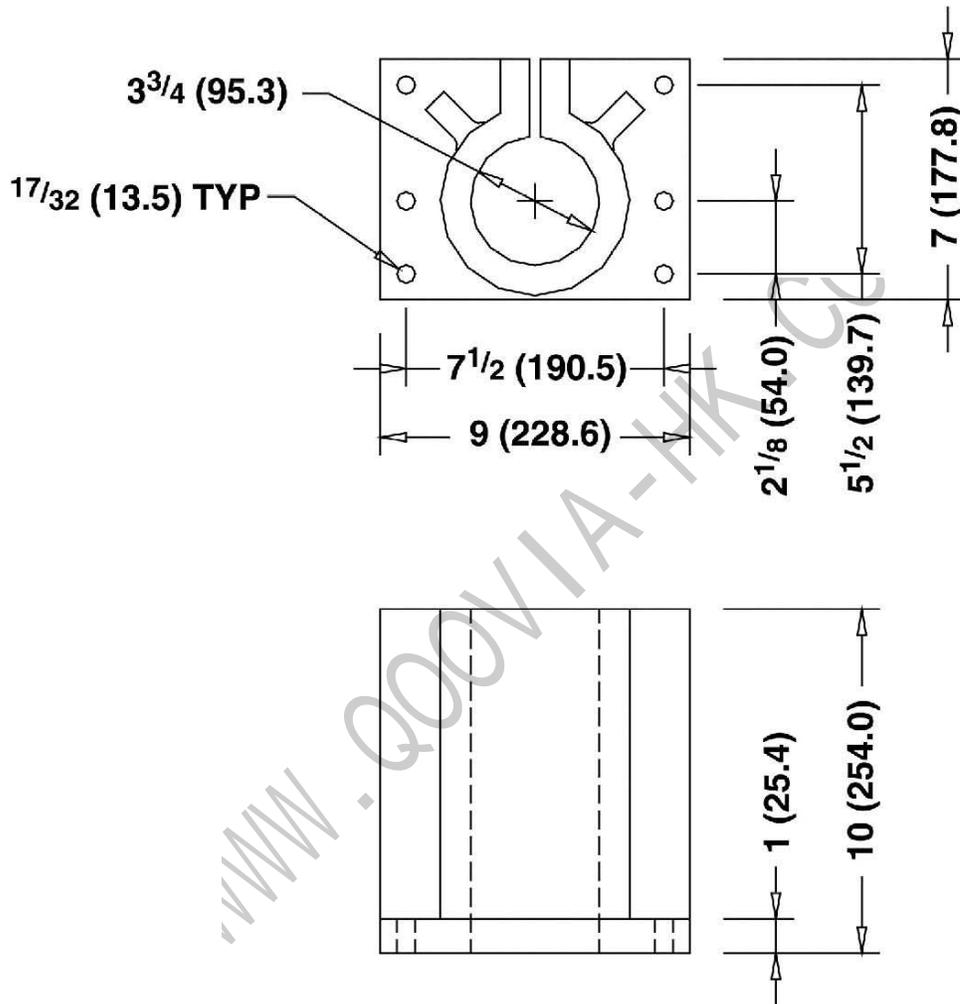
Dimensions are shown in inches and millimeters,
i.e., $1^1/2$ (38.1) signifies $1^1/2$" (38.1mm)

EXPLODED ASSEMBLY DRAWING

PART NO.	ITEM	QTY.	DRAWING NO.	DESCRIPTION
161-0233	1	1		PRESS SIGNAL CONDITIONER PCB
	2			
301-0108	3	1	SMI-2086-7	DUAL SPING DRUM ASSY
301-0218	4	1	SMI-2082-15	CONVERTER CLAMP ASSY
301-0224	5	1	SMI-2079-3B	BASE ASSEMBLY
515-0022	6	1	SMI-1053-27	KNOB
516-0002GY	7	1	SMI-1053-38D	CONVERTOR COVER
516-0114GY	8	1	SMI-2070-2	CONVERTOR HOUSING
516-0117GY	9	1	SMI-2079-5	COLUMN CAP
516-0119	10	2	SMI-2079-17	SPLINED SHAFT
516-0126	11	2	SMI-2079-18	CLAMP HANDLE EXTENSION
516-0137GY	12	1	SMI-2086-10	TOP MOUNTING PLT
516-0138	13	1	SMI-2086-1	MTG PLATE ELECTRO-PRESS
516-0139	14	1	SMI-2086-2	BASE PLATE
516-0140	15	1	SMI-2086-3	CENTER FRAME BASE PLT
516-0141	16	2	SMI-2086-4	SIDE PLATE
516-0142	17	1	SMI-2086-5	COUPLE
516-0143	18	1	SMI-2086-11	CENTER FRAME
516-0144	19	1	SMI-2086-15	POSITIVE STOP
701-0185	20	1	SMI-2086-12	PROX MOUNTING PLT
701-0186	21	2	SMI-2086-13	STOP BLOCK
701-0187	22	OPT	SMI-2086-14	FAN MOUNTING PLT
805-00018	23	1	PURCHASED	LOAD CELL (500LB)
805-00055	24	1	PURCHASED	IMS MOTOR
805-00056	25	1	PURCHASED	BALL SCREW
810-00022	26	2	PURCHASED	RETAINING RINGS
810-00130	27	1	PURCHASED	LINEAR BEARING
810-00131	28	2	PURCHASED	LINEAR SLIDE
810-00139	29	1	SMI-2086-16	PULLEY (32T)
810-00140	30	1	SMI-2086-17	PULLEY (48T)
810-00141	31	1	PURCHASED	TIMING BELT
818-0309	32	1	SMI-2079-11	PANEL COVER LEFT & RIGHT 2050
818-00315	33	1	SMI-2079-9	CONVERTER SHIELD 2050
818-00318	34	1	SMI-2079-13	COVER FRAME 2050
818-00386	35	1	SMI-2086-6	BEZEL
818-00391	36	1	SMI-2086-8	EP OVER LAY
818-00393	37	1	SMI-2086-9	CONNECTOR MTG PLT
820-00011	38	1	SMI-2079-11	COLUMN 3 3/4 DIA
831-00012	39	OPT	PURCHASED	FAN
841-00007	40	1	PURCHASED	HANDLE
872-00034	41	1	SMI-2079-27	SPRING TRIPLE DRUM ASSY

RETURN/REPAIR NOTES

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 before returning 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 should be sent with all transportation charges prepaid and return method of shipment indicated.

SHIPPING

Because of the problems in the handling of our equipment during shipment, it is asked that all customers check the following:

1. All module plug in units.

2. All wire plug in connections.

3. All I. C.

4. Sonics & Materials makes every effort to ship our units in proper working order. 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).