SmartControl Ultrasonic Power Supply

INSTRUCTION MANUAL

SONICS

Sonics & Materials, Inc.

INSTRUCTION MANUAL • ***SmartControl*** POWER SUPPLY

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.

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

Sonics & Materials, Inc.
53 Church Hill Road • Newtown, CT 06470 USA
203.270.4600 • 800.745.1105 • 203.270.4610 fax
www.sonics.com • info@sonics.com

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

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 storing 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 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 SmartControl power supply is an ultrasonic generator with automatic frequency tuning and a built-in Microprocessor that features time, energy and height based weld mode controls. The Microprocessor is programmed with a touch panel color operator interface and weld data information displayed on either the system's alpha/numeric data Screen or weld power graph Screen.

FREQUENCY SPECIFICATIONS

	40 kHz	20 kHz	15 kHz
Nominal Horn Amplitude (Microns)	20μm	60μm	100μm
Horn Amplitude Range (Microns)	5μm to 30μm	14μm to 72μm	70μm to 130μm
Horn Frequency Range	39.900 to 40.100	19.900 to 20.100	14.900 to 15.100
110 VAC Incoming Line Voltage Range	95 to 130 VAC	95 to 130 VAC	95 to 130 VAC
220 VAC Incoming Line Voltage Range	190 to 265 VAC	190 to 265 VAC	190 to 265 VAC

OVERVIEW OF ULTRASONIC METAL ASSEMBLY

WHAT IS ULTRASONICS?

Ultrasonics refers to vibrational waves with a frequency above the human audible range which is usually above 18,000 cycles per second (Hz).

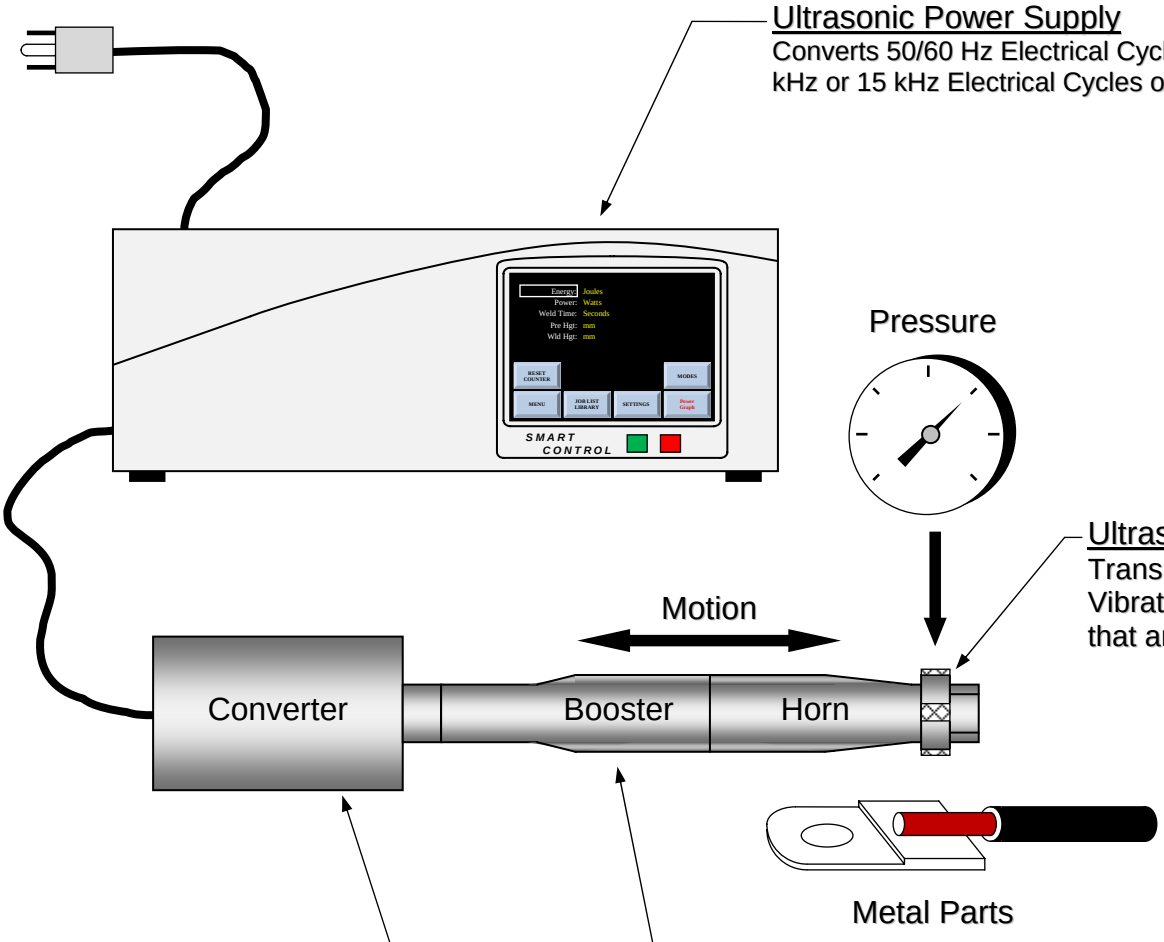
PRINCIPLE OF ULTRASONIC METAL ASSEMBLY

The basic principle of ultrasonic assembly involves conversion of high frequency electrical energy to high frequency ultrasonic energy in the form of reciprocating mechanical motion which, when applied to metal assemblies or parts, generates frictional gawling at the metal-to-metal interface. Under applied pressure and force, the metal parts are scrubbed against one-another causing surface oils and oxides to be dispersed. The base metals are then mechanically mixed causing a metallurgical bond between the parts.

ULTRASONIC ASSEMBLY SYSTEMS

Ultrasonic assembly systems are generally composed of the following major elements: a power supply, converter, booster, horn, pneumatic press and holding fixture, as detailed in the diagram on the next page. A review of this diagram will help you understand the basic elements involved in the assembly process and their relation to each other.

ULTRASONIC COMPONENTS DIAGRAM



NOTES

The converter, booster and horn assembly are also commonly referred to as the ultrasonic "stack."

Hz = Cycles per Second

kHz = Thousand Cycles per Second

The line cord of the controller/power supply is equipped with a 3-prong, grounding plug. Do not, under any circumstances, remove the ground prong. The plug must be plugged into a mating 3-prong, grounding type outlet.

ELECTRICAL POWER REQUIREMENTS

The power supply requires a fused, single-phase, standard 3-terminal grounding type receptacle capable of supplying the requisite voltage and current. Refer to the table below for power specification.

POWER SPECIFICATIONS

Model	Power Rating/ Frequency	115 vac	230 vac
SC400-40	400w - 40 kHz	15 amps	10 amps
SC800-40	800w - 40 kHz	15 amps	10 amps
SC1500-20	1500w - 20 kHz	N/A	20 amps
SC2500-20	2500w - 20 kHz	N/A	20 amps
SC4000-20	4000w - 20 kHz	N/A	30 amps
SC3000-15	3000w - 15 kHz	N/A	30 amps
SC6000-15	6000w - 15 kHz	N/A	30 amps

Model Prefix MSC - Spot Welding and Tube Sealing Systems
Model Prefix WSC - Wire Splicing Systems

SETTING UP

The power supply is a free-standing assembly. It 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 source and away from equipment that generates abnormally high electrical transients. Observe the following additional instructions when installing the equipment:

a. Allow at least 6 inches (152mm) at the rear of the power supply for cable connections.

b. Position the power supply so that the front panel controls are visible and readily accessible.

c. The power supply is air cooled; allow sufficient space around the assembly to ensure adequate ventilation. If the power supply must be housed in a confined space, forced air cooling may be necessary to keep surrounding air within acceptable ambient temperature limits. Periodically check the ventilation grille and clean as necessary.

ELECTRICAL CONNECTIONS

NOTE: *Do not plug the power supply into an electrical outlet until all other connections have been made.*

The standard cable supplied with a Sonics press is 10 feet. Optional extension cables are available up to 15 feet without modification.

When making the initial electrical connections, make sure the power is disconnected and follow these precautions.

1. 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 (305mm).

2. To prevent the possibility of an electrical shock, ensure that the power supply line cord is properly grounded. Also make sure that the voltage rating of the electrical power source matches the power supply requirement (refer to the "Power Specifications" table on preceding page).

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

CHASSIS PROFILES AND SPECIFICATIONS

LOW PROFILE CHASSIS

40 kHz @ 400 Watts Power
40 kHz @ 800 Watts Power
20 kHz @ 2500 Watts Power

Height: 7.00" (178mm)
Width: 15.25" (387mm)
Depth: 18.25" (464mm)

Weight: 21 Lbs. (9.5kg)

HIGH PROFILE CHASSIS

20 kHz @ 4000 Watts Power
15 kHz @ 3000 Watts Power
15 kHz @ 6000 Watts Power

Height: 10.75" (273mm)
Width: 17.62" (448mm)
Depth: 22.50" (572mm)

Weight: 70 Lbs. (31.7kg)

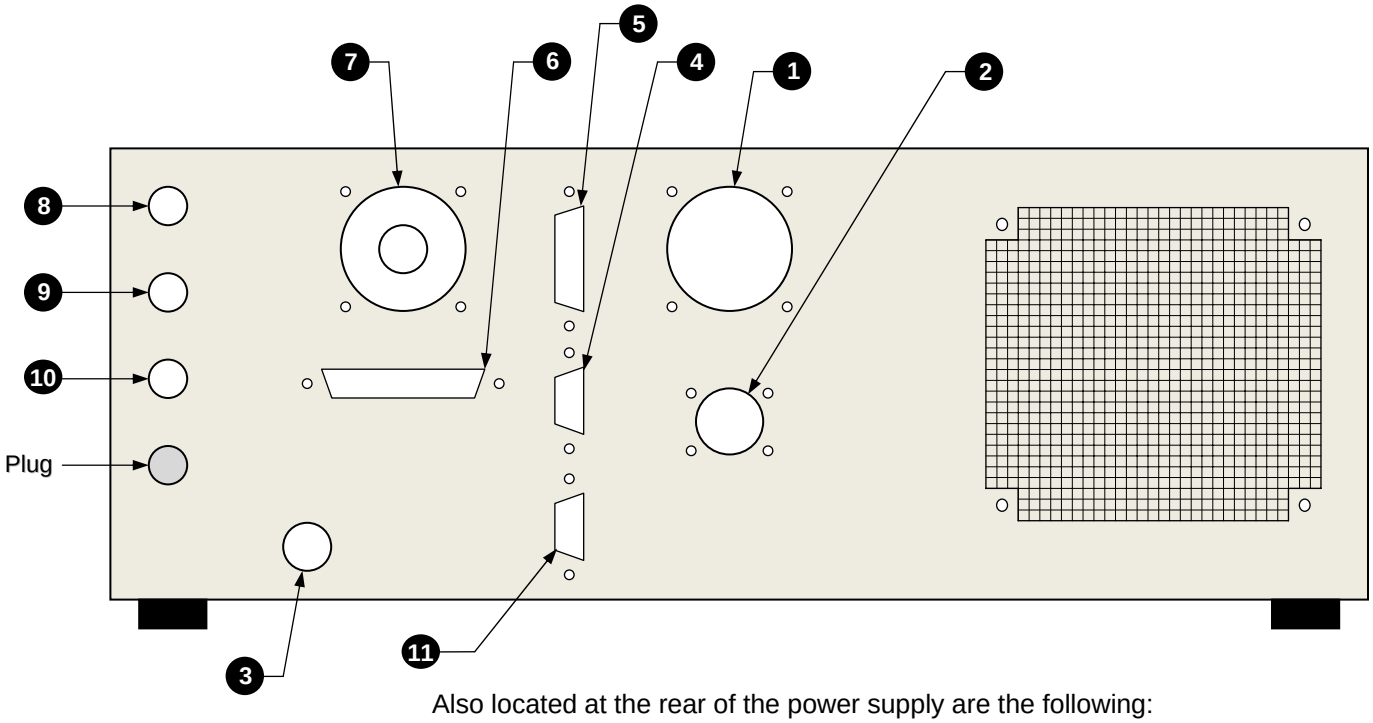
CABLE CONNECTIONS - Low Profile Chassis

Located at the rear of the power supply are the cable connections as illustrated below. (The interconnecting cables will be supplied with your system.)

NOTE: *Detailed wiring diagrams are supplied in the Appendix at the back of this manual.*

1. J1 combination RF and control circuit cable that connects the welding press to the power supply.
2. J2 actuation cable that connects the welding press or, an alternative external trigger source, to the power supply.
3. Power line cord that plugs into the appropriate electrical service outlet.

Once these three connections have been made, the power supply is ready for operation. If applicable, be sure to consult your welding press instruction manual to insure that all connections on the press side are correct, and that the press is ready for operation.



Also located at the rear of the power supply are the following:

4. 9 Pin (DB9) RS232 PC interface connection
5. 15 Pin (Serial) connection for linear encoder and digital pressure control
6. 25 Pin (D-Connector) plc interface connection
7. OPTIONAL - Electric motor interface cable (Wire Splicer)
8. Fuse (internal low voltage)
9. Line fuse (based on requirements listed in “Power Specifications” table)
10. Line fuse (based on requirements listed in “Power Specifications” table)
11. 9 Pin (DB9) RS232 Barcode Scanner Connection

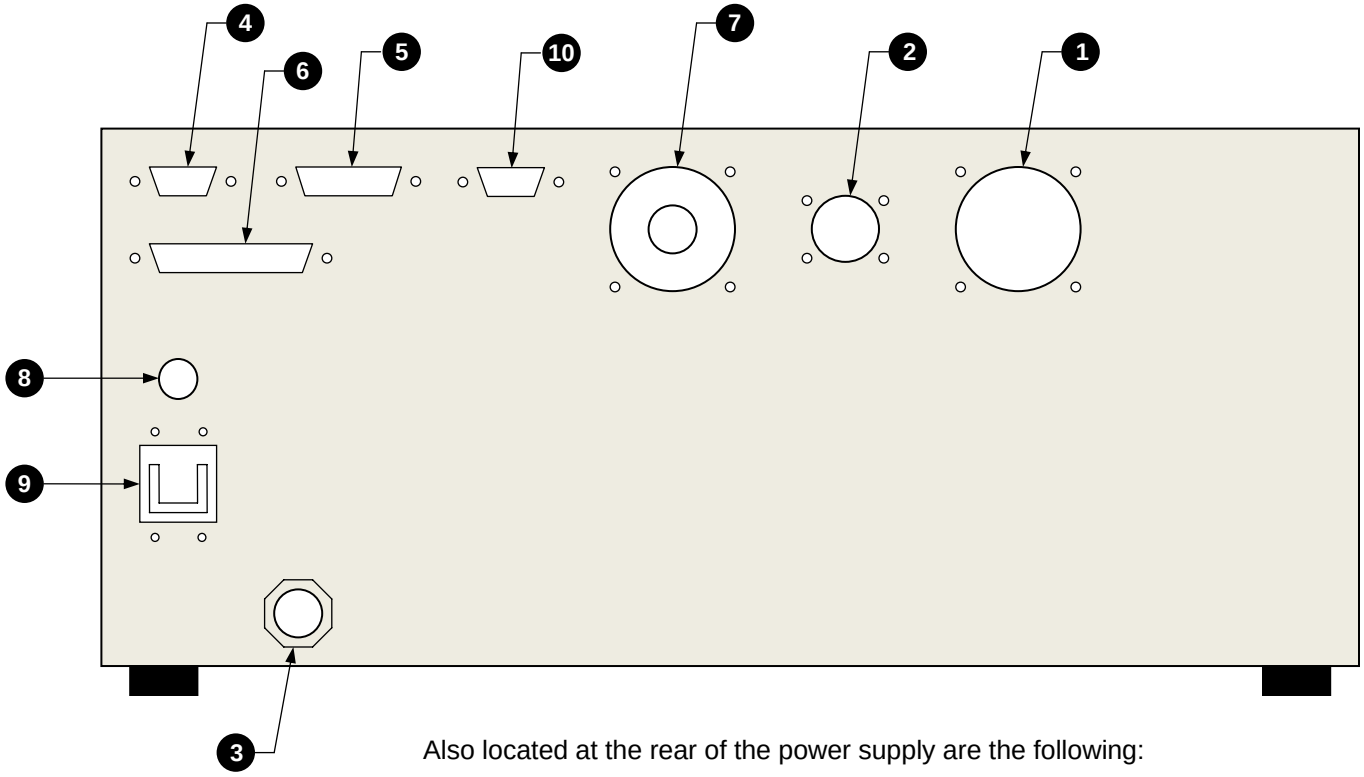
CABLE CONNECTIONS - High Profile Chassis

Located at the rear of the power supply are the cable connections as illustrated below. (The interconnecting cables will be supplied with your system.)

NOTE: *Detailed wiring diagrams are supplied in the Appendix at the back of this manual.*

1. J1 combination RF and control circuit cable that connects the welding press to the power supply.
2. J2 actuation cable that connects the welding press or, an alternative external trigger source, to the power supply.
3. Power line cord that plugs into the appropriate electrical service outlet.

Once these connections have been made, the power supply is ready for operation. If applicable, be sure to consult your welding press instruction manual to insure that all connections on the press side are correct, and that the press is ready for operation.



Also located at the rear of the power supply are the following:

4. 9 Pin (DB9) RS232 PC interface connection
5. 15 Pin (serial) connection for linear encoder and digital pressure control
6. 25 Pin (D-Connector) PLC interface connection
7. OPTIONAL - Electric motor interface cable (Wire Splicer)
8. Fuse (internal low voltage)
9. Circuit breaker
10. 9 Pin (DB9) RS232 Barcode Scanner Connection

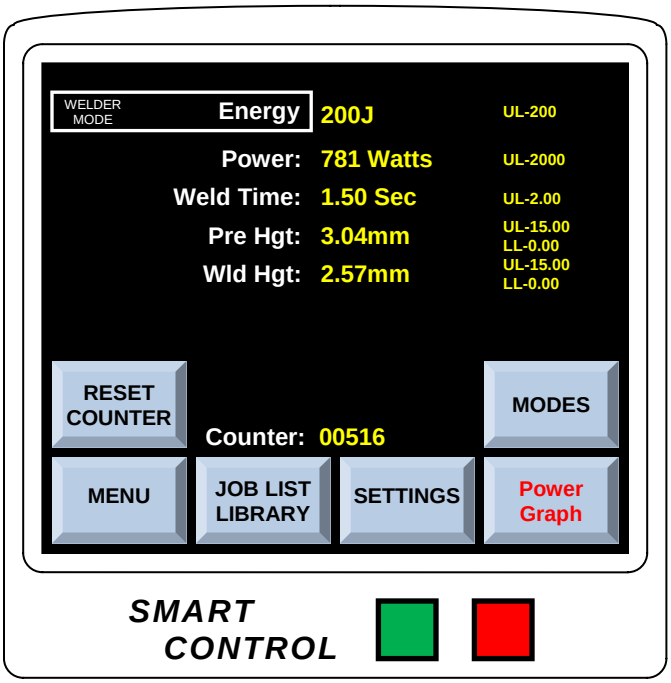
OVERVIEW

The graphic user interface of the SmartControl allows the operator the ability to easily set parameters and view weld data empirically and graphically. Parameters are set in the Weld Settings Screen. Weld data is generated and displayed in the Weld Data Screen or Weld Power Graph Screen. This data may be used to optimize the weld process and be collected for data logging purposes. The Weld Power Graph Screen plots Power over Time depicting changes that might not be apparent when only looking at the absolute weld data values.

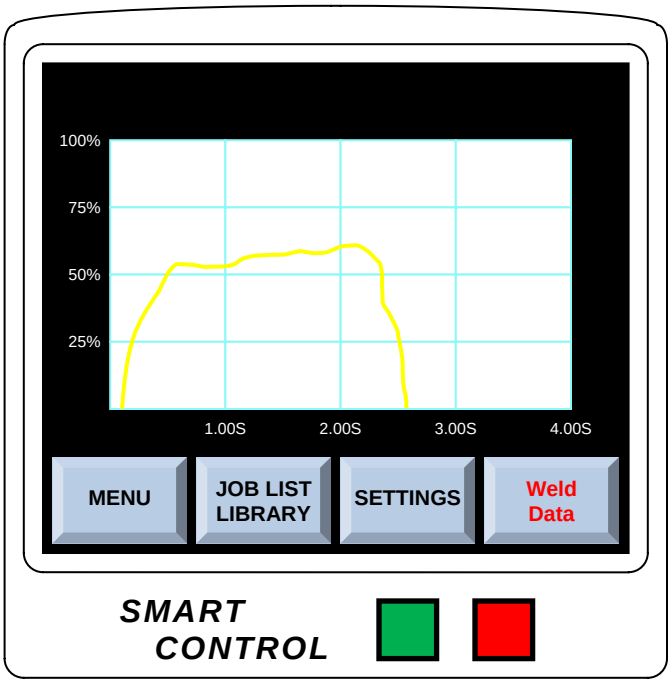
This Power Supply / Controller can be programmed to be utilized with different Sonics & Materials metal welding systems. Some Screen features may not apply to the particular welder in use. The SmartControl is programmed from the factory to be used with the welder it is purchased with.

FRONT PANEL AND WELD MODE SCREENS

From either of these two Screens, the system is ready to cycle and weld application parts.



WELD DATA SCREEN



WELD POWER GRAPH SCREEN

ON/OFF buttons which turn the unit on (green) and off (red).

NOTE - On power up, either the Weld Data Screen or Weld Power Graph Screen will boot, depending on which Screen was displayed at prior session shutdown.

WELD DATA SCREEN displays previous weld data.

WELD POWER GRAPH SCREEN displays previous Weld Graph Chart in Power and Time. Wave shapes associated with acceptable welds can be used as a benchmark to predict quality.

WELD SETTINGS

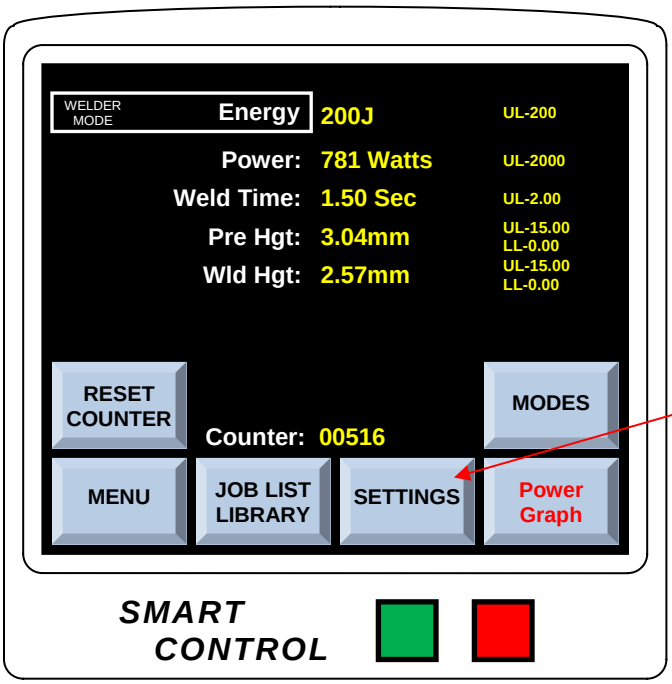
Weld Modes

The SmartControl power supply offers the following weld modes.

TIME BASED MODE turns ultrasonics on and ultrasonics remain on for a preset period of time in seconds.

ENERGY BASED MODE turns ultrasonics on and ultrasonics remain on until a certain amount of preset Energy in Joules (watt seconds) is attained. As the Energy mode compensates for variables such as air pressure and line voltage fluctuations, the amount of time ultrasonics remains on from cycle-to-cycle will vary.

HEIGHT BASED MODE turns ultrasonics on and ultrasonics will remain on until a preset melt down distance is achieved.



WELD DATA SCREEN

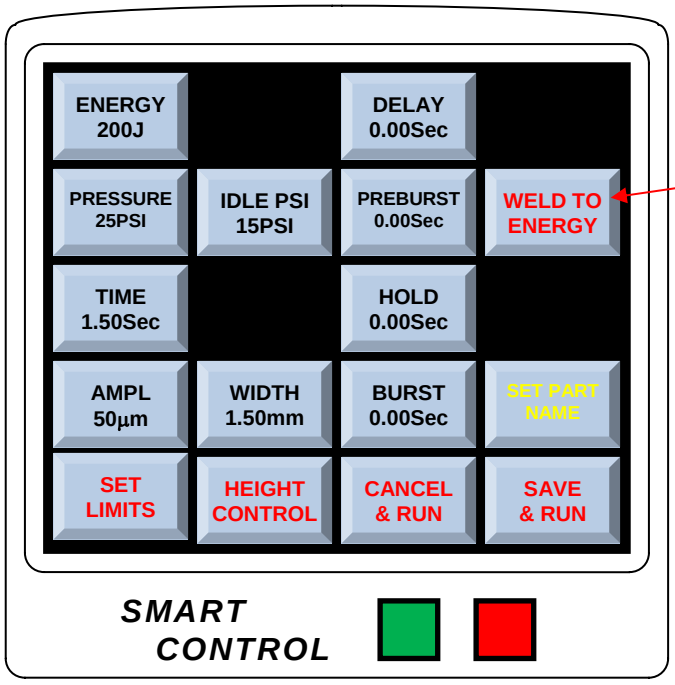
NOTE

When welding by Energy or Height, the system will still require that a time setting be entered. The time setting must be greater than the minimum time required for the preset Energy or Height setting to be achieved.

To set weld mode and then input weld data for that respective weld mode, touch the Settings Key on the Weld Data Screen or Weld Power Graph Screen. Touching this Key will take you to the Weld Settings Screen on the next page.

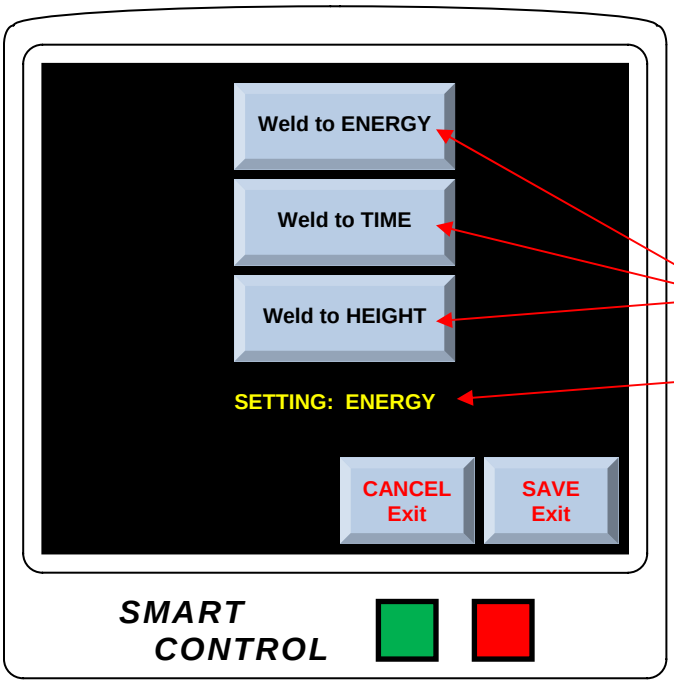
Weld Mode Selection

The weld cycle may be ended by **Time, Energy** or **Height** based mode. From the Weld Settings Screen, touch the Weld Mode Key to open the Weld Mode Selection Screen below.



Weld Mode Key
(Displays the Current Weld Mode)

WELD SETTINGS SCREEN



Touch any one of the Energy, Time or Height Weld Mode Selection Keys to set the desired weld mode.

The selected weld mode will then appear and you can then touch Save Exit to return to the Weld Settings Screen.

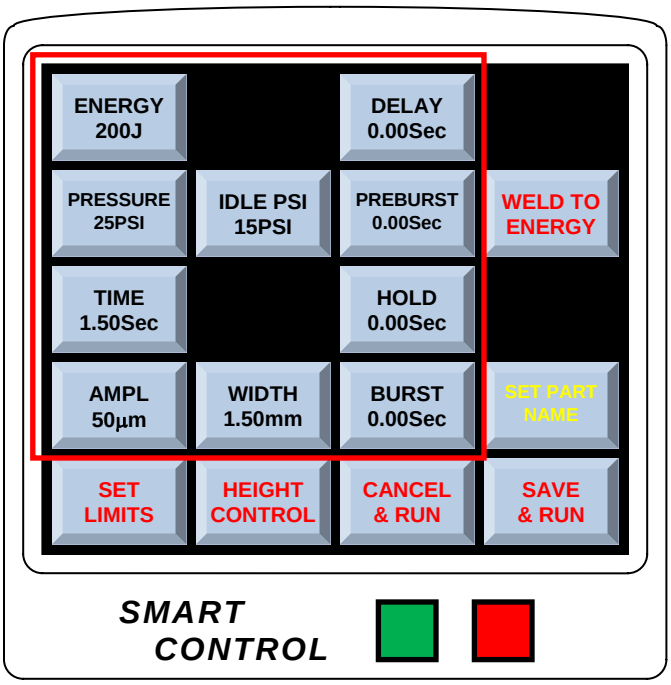
Weld Mode Selection Keys

Current Selection

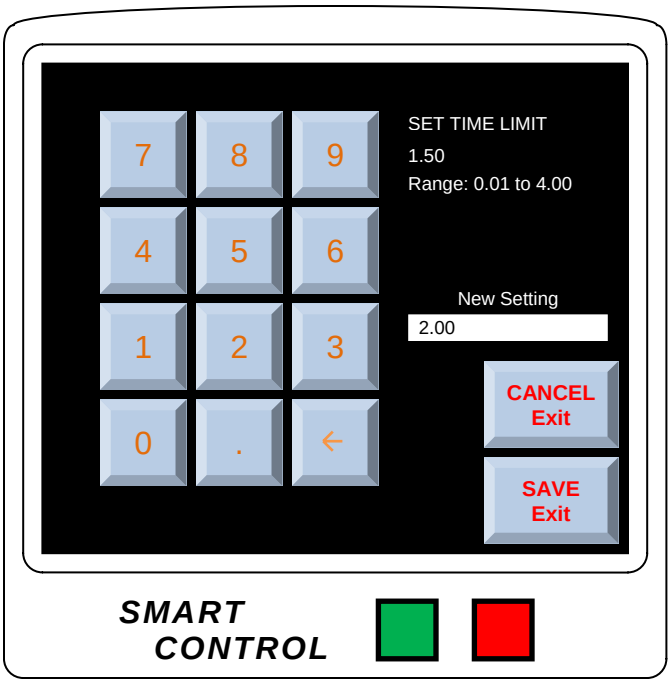
WELD MODE SELECTION SCREEN

Weld Data Settings

Once you have selected the desired weld mode, the Weld Settings Screen Keys are used to open various Data Input Keypads to enter weld data. As an example, the Time Data Input Keypad Screen is shown below.



WELD SETTINGS SCREEN



TIME DATA INPUT KEYPAD

Display Key Functions

Energy – 1 to 20,000 Joules

Weld cycle terminates after a preset amount of energy in Joules is achieved.

Pressure – 15 to 100 PSIG (0.103 to 0.690 MPa)

Increasing pressure increases the force applied by the horn to the assembly during the weld cycle. Increased pressure results in increased the power usage.

Time – .01 to 4.00 Seconds

Weld cycle terminates after a preset amount of time in seconds is achieved.

Amplitude *(20 kHz Example)* – 14 to 72 µm (Microns)

The amplitude of the ultrasonic vibrations are adjusted electronically. Use of a mechanical booster in the machines stack can also be used to increase or decrease amplitude. Increasing Amplitude results in increased power usage.

Idle PSI - 15 to 100 PSI

Idle PSI or pressure, is the systems pressure setting in its home or start position. Upon system start, pressure increases to the required weld pressure setting.

Width – 0 to 15mm (.590")

Weld width can be set on ultrasonic wire splicing systems which include an automatic wire "gathering" device.

Delay – 0 to 1.00 Second

After horn contact with the assembly, ultrasonic start can be delayed for a period of time

Preburst – 0 to 1.00 Second

After pressure is applied, but before the welding process begins, a burst of ultrasonic energy is applied.

Hold – 0 to 4.00 Seconds

After the weld cycle is complete, hold applies pressure to the welded assembly.

Burst – 0 to 1.00 Second

Provides a short burst of ultrasonic energy after the weld is complete. Typically it is used to release a welded assembly that might stick to the welding horn or tip.

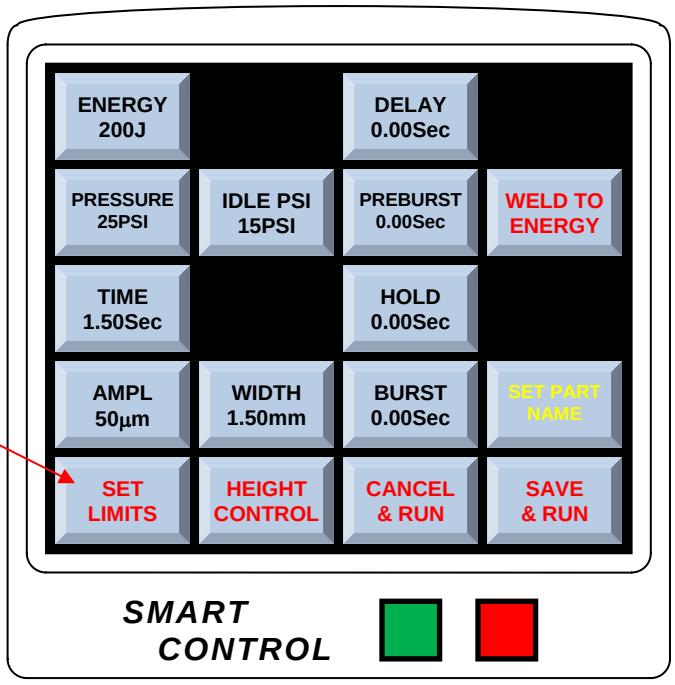
Weld Limit Settings - Time, Energy and Power

The SmartControl system allows the user to set upper and lower weld mode limits in Time, Energy or Power.

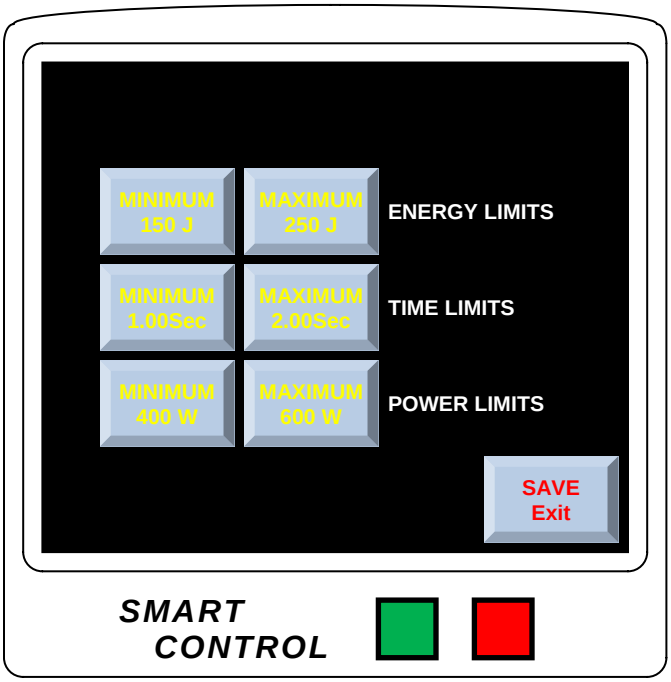
These minimum and maximum weld mode limits allow the user to set an acceptable weld "window."

In order to set upper and lower weld limits, in Time, Energy or Power, touch the Set Limits Key and the Weld Limits Screen below will appear.

Set Limits Key



WELD SETTINGS SCREEN



WELD LIMITS SCREEN

Touching the minimum and maximum Keys will open Data Input Keypads where you can enter respective minimum and maximum weld limit settings.

Examples

ENERGY: The Screen to the left illustrates that a minimum of 150 joules and a maximum of 250 joules of energy have been entered.

TIME: The Screen to the left illustrates that a minimum of 1.00 seconds and a maximum of 2.00 seconds of weld time have been entered.

POWER: The Screen to the left illustrates that a minimum of 400 watts power and a maximum of 600 watts power have been entered.

If desired, minimum and maximum limit settings can be entered in one, two or all three (Energy, Time and Power) limit categories.

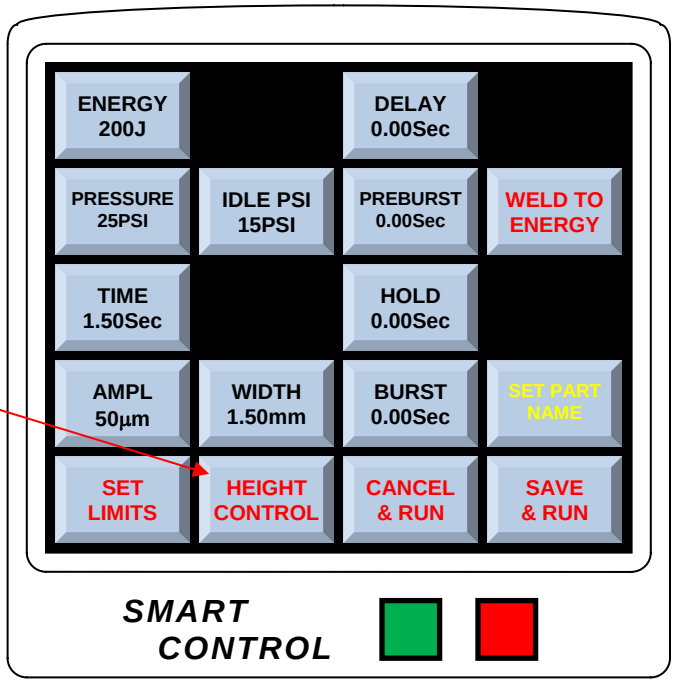
NOTE - Should a weld cycle violate any of these minimum or maximum limit settings, a weld violation fault will display on the Weld Data Screen.

Weld Limit Setting - Height

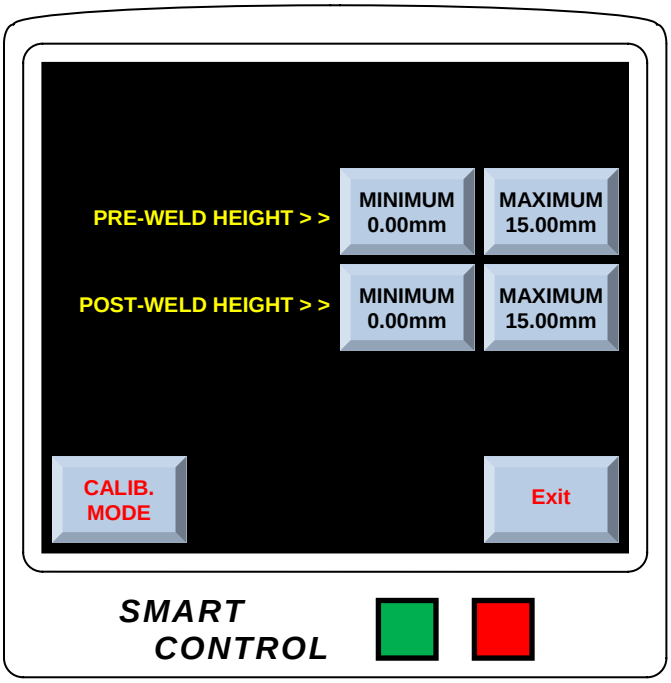
The SmartControl system allows the user to set acceptable un-welded part Heights and, to set acceptable post-weld part assembly Heights.

In order to set upper and lower weld Height limits, touch the Height Control Key and the Height Control Screen below will appear.

Height Control Screen



WELD SETTINGS SCREEN



HEIGHT CONTROL SCREEN

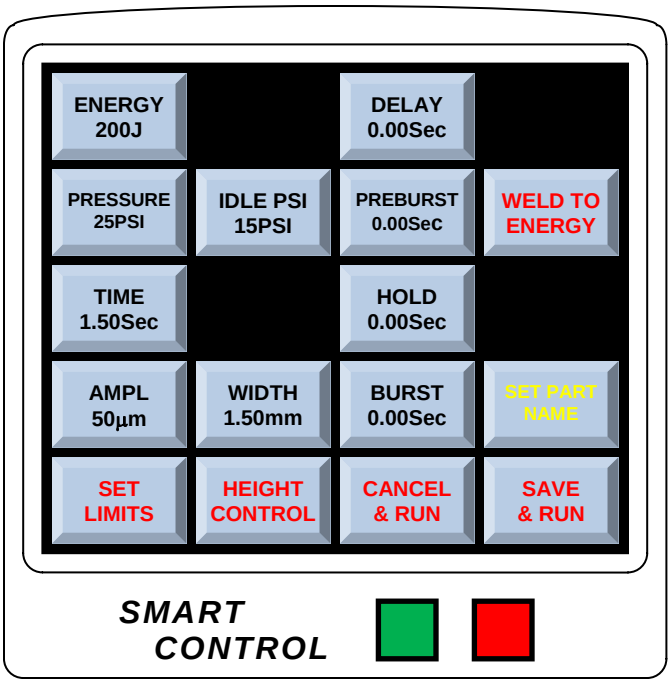
Touching the minimum and maximum Keys will open Data Input Keypads where you can enter respective minimum and maximum weld height limit settings.

PRE-WELD HEIGHT is the minimum and maximum permitted height of **un-welded application parts** when ready for weld cycle. Upon cycle, light pressure is first applied to the metals to be welded and if a measured height value is outside of set limits, the weld cycle will terminate and the head will return up and to its start position.

POST-WELD HEIGHT is the minimum and maximum permitted height of **application parts after completion of the weld cycle.** Should a weld cycle violate either a minimum or maximum, an error message will appear.

The **CALIBRATION MODE KEY** is a second Screen, or alternative, navigation route to the Height Calibration Screen.

Weld Mode Conflicts



WELD SETTINGS SCREEN

Once weld parameters and limits are set through the Weld Settings Screen, touch the SAVE & RUN button to save your data and return to the Weld Data Screen or Weld Power Graph Screen.

NOTE

Weld Mode Conflicts

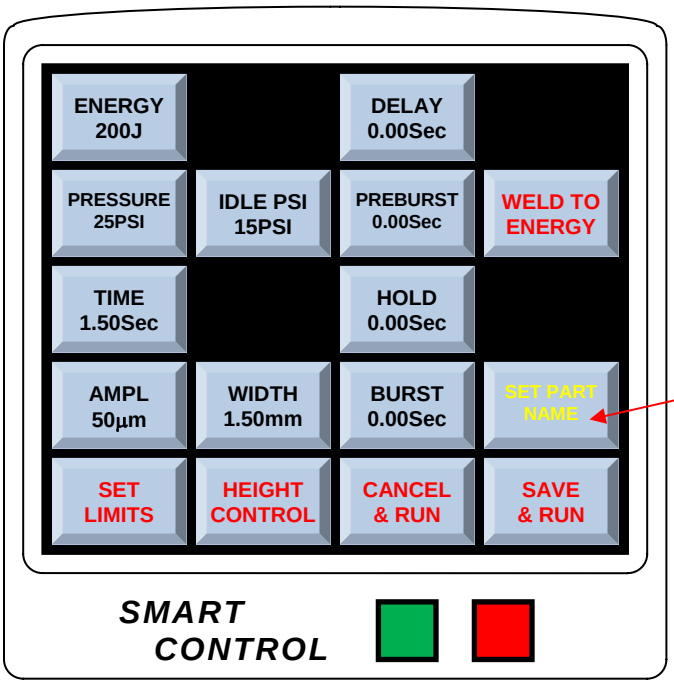
The settings in these menus should be taken into account when setting up a job since they do not function independently of each other. A parameter change in one menu can impact the net effect of a parameter in another menu.

For example, if you specify a weld Time of 2 seconds and an Energy setting of 2,000 joules, the weld cycle will be terminated by whichever of the two settings (Weld Time or Energy Setting) is reached first – that is, either when ultrasonics have been applied for 2 seconds or when Energy equivalent to 2,000 joules has been delivered to the parts being assembled. If 2 seconds is reached before 2,000 joules have been delivered, the weld cycle will terminate regardless of the amount of Energy delivered, and vice versa.

The ability to specify Time and Energy affords more control of the weld process. However, when entering your specifications in the various menus described above, keep in mind that the settings from previous use remain in effect until you make a change and register a new value.

As an example, if you want to achieve a weld time of 2 seconds, you will need to ensure that entries in the Energy menu will allow a 2-second weld time to be achieved before an Energy setting is reached and ultrasonics are terminated.

Job Names



WELD SETTINGS SCREEN

Once all job settings and data have been entered, you can name the job by touching the Set Part Name Key on the Parameter Input Screen.

This will open the Qwerty style Keyboard below.

Set Part Name Key

Once the Keyboard is open, you can name the job such as "My Job 1."

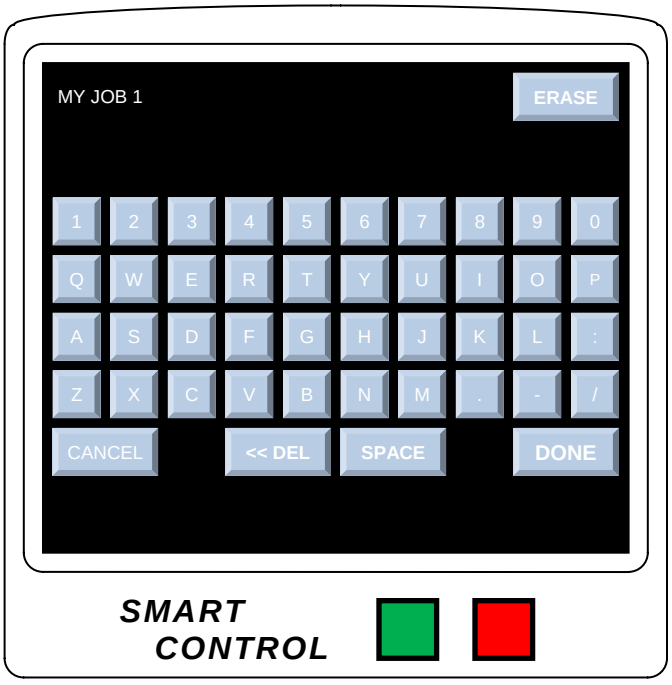
When naming your job, you can use any alpha-numeric combination of up to 30 characters.

When finished entering your job name, touch "Done" to save and exit back to the Weld Settings Screen.

From the Weld Settings Screen, touch the Save & Run Key to return to the Weld Data or Power Graph Screen.

NOTE

Proceed to the next section of this manual to save your named job to the Job Library.

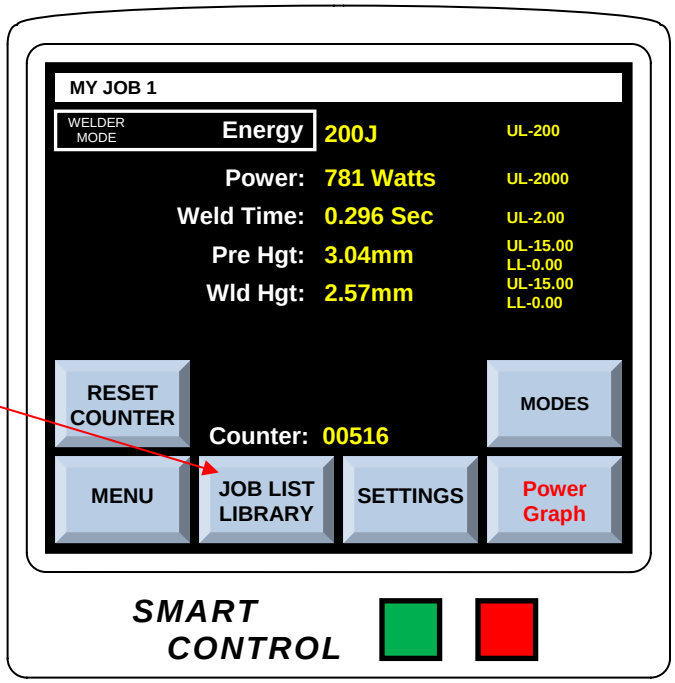


KEYBOARD

Job Library

Once a job has been named and you have returned to the Weld Data Screen, the job name, "My Job 1" is displayed at the top of the Screen.

To save the named job to the Job Library, touch the Job List Library Key.

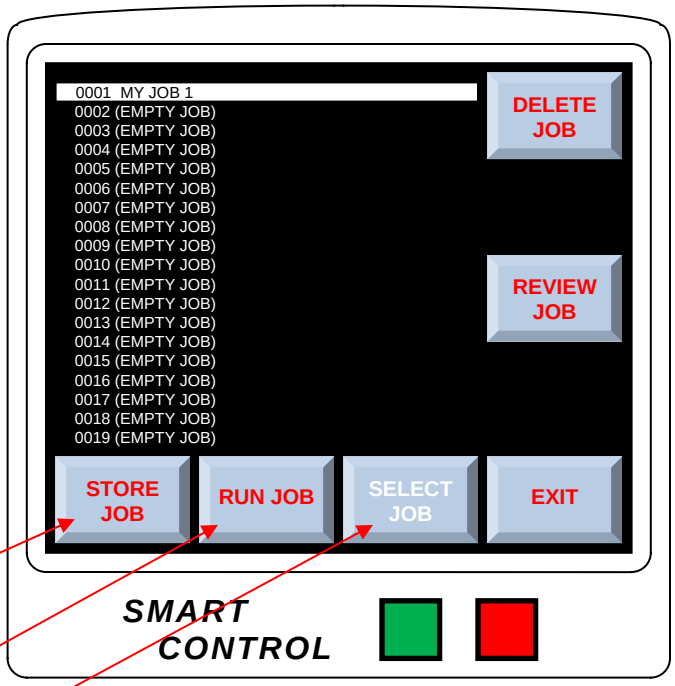


WELD DATA SCREEN

From the Job List Library Screen, touch the Select Job Key to select which job number you want your job saved under. In this example, we are saving the job to 0001

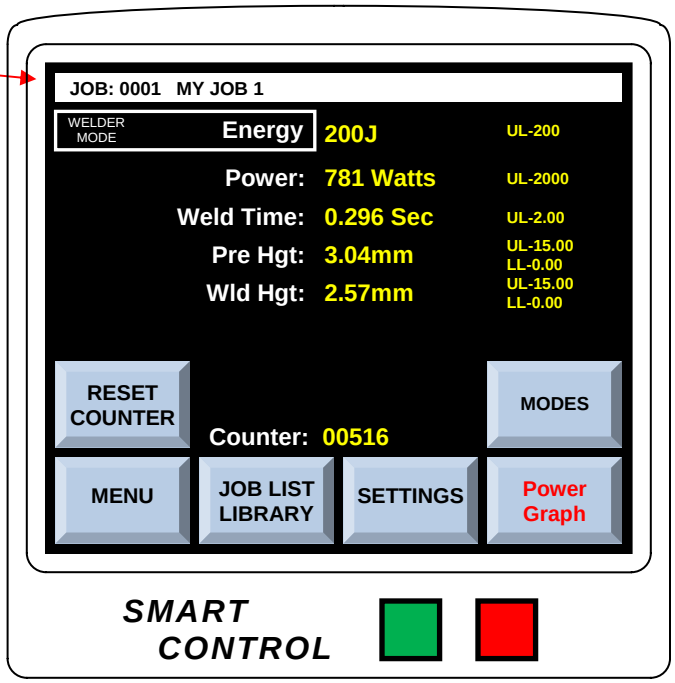
After selecting the job number, touch the Store Job Key and the named job, "My Job 1" will store and appear next to job 0001.

Now touch the Run Job Key to return to the Weld Data Screen in which the Weld Data Screen will now illustrate the loaded job number and corresponding job name. (See next page.)

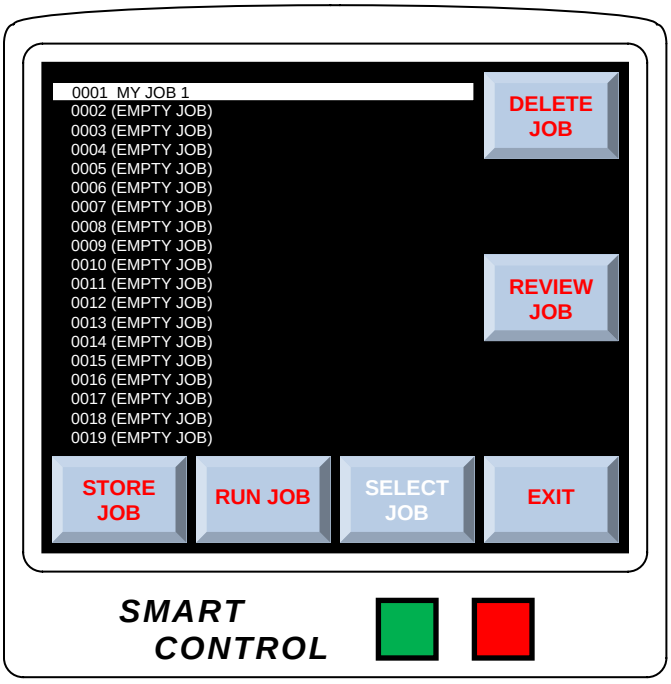


JOB LIST LIBRARY SCREEN

Job Library Keys



WELD DATA SCREEN



JOB LIST LIBRARY SCREEN

Display Key Functions

DELETE JOB: Deletes current selected job and all job weld data with confirm or cancel prompt.

REVIEW JOB: Opens a Screen to display basic weld data of the selected job.

STORE JOB: Saves and stores new job settings and job names.

RUN JOB: Saves any changes and returns user to the Weld Data or Weld Power Graph Screen.

SELECT JOB: Opens a numeric Keypad to select and load job 1 through 1008.

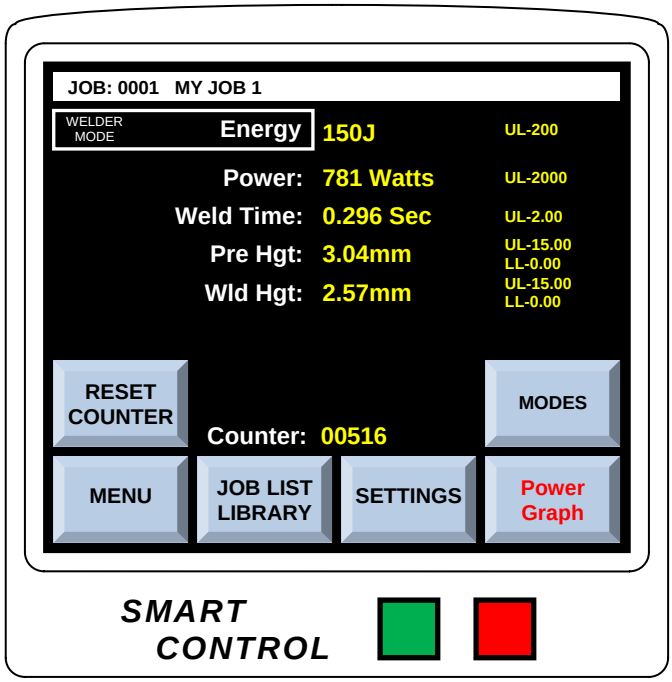
EXIT: Saves any changes and returns user to the Weld Data or Weld Power Graph Screen.

POWER AND FREQUENCY CHECK

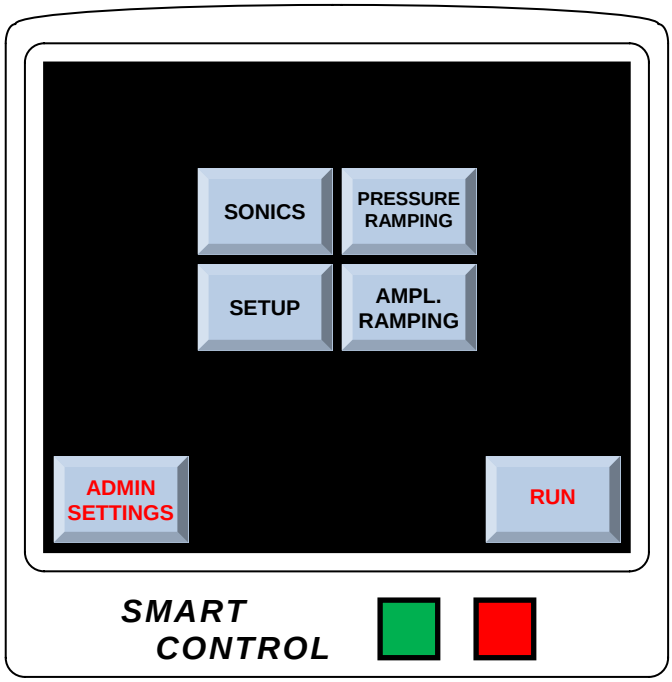
The SmartControl power supply provides the user the ability to check power draw and ultrasonic stack frequency.

From the Weld Data or Weld Power Graph Screen, touch the MENU Key to open the Menu Screen.

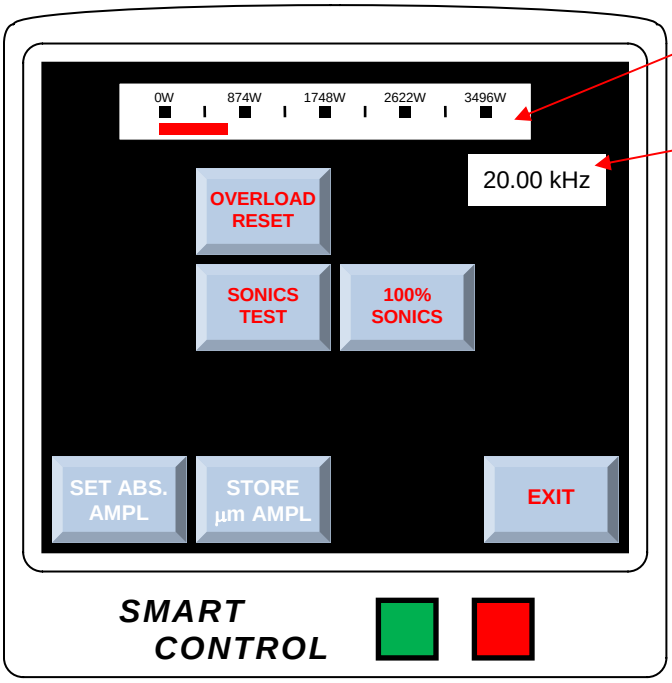
After opening the Menu Screen, touch the SONICS Key to open the Sonics Screen.



WELD DATA SCREEN



MENU SCREEN



SONICS SCREEN

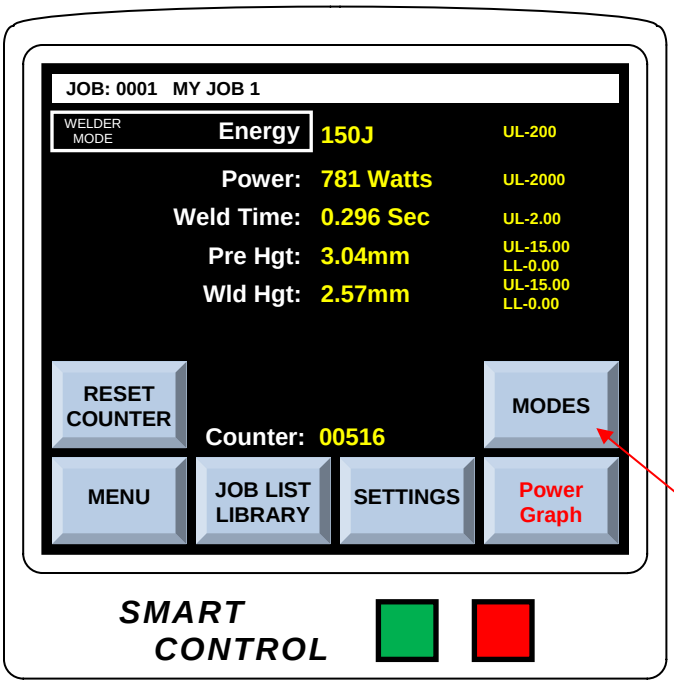
Power Output Meter

Output Frequency

SONICS TEST — Press and hold the Sonics Test Key to display the Power Output Meter.

100% SONICS — Press and hold the 100% Sonics Key to display the Output Frequency.

Sequence and Teach Modes



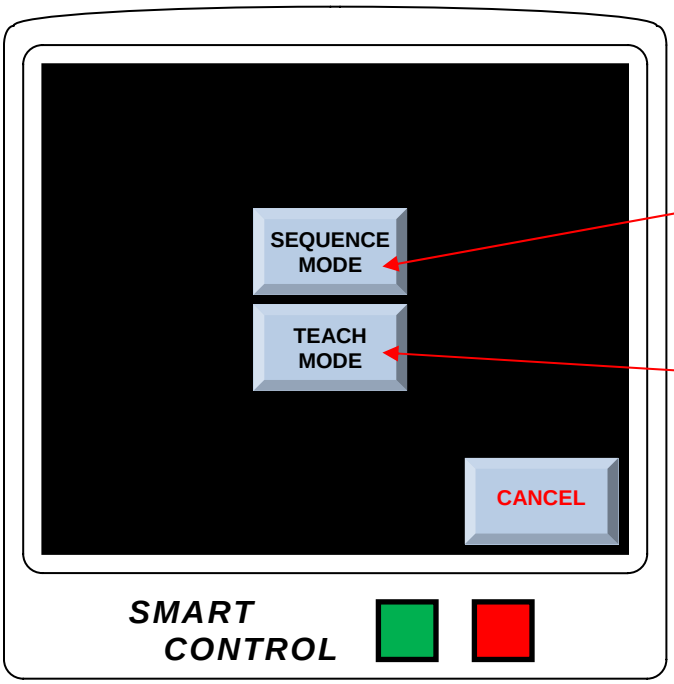
WELD DATA SCREEN

The SmartControl power supply features two distinct features to enhance process quality and productivity.

The **SEQUENCE MODE** allows the user the ability to sequentially change job settings during the course each machine cycle.

The **TEACH MODE** allows the user the ability to weld a series of parts and then after a chosen weld count, "Teach" the system to create upper and lower weld window limit settings based on the weld data collected from the previous weld cycle count.

To access either the Sequence or Teach mode features, touch the Modes Key on the Weld Data Screen.



MODE SCREEN

Once in the Modes Screen, touch the Sequence Mode Key to access the Sequence Mode Screen or, touch the Teach Mode Key to access the Teach Mode Screen.

Sequence Mode - Overview

As shown below, an Assembly or "End Product" might require that multiple wire splices be welded in sequence. All three splice configurations are then moved to the next operator station for final assembly to the End Product.

After completion of the third splice sequence step, the next machine cycle will start at Weld Splice Sequence Step 1.

Weld Splice Sequence Step 1

Two LH Wires are Spliced

Weld Time: 0.25 Seconds
Weld Energy: 200 Joules
Weld Pressure: 30 PSIG

Weld Splice Sequence Step 2

Two LH Wires and One RH Wire are Spliced

Weld Energy: 250 Joules
Weld Pressure: 35 PSIG

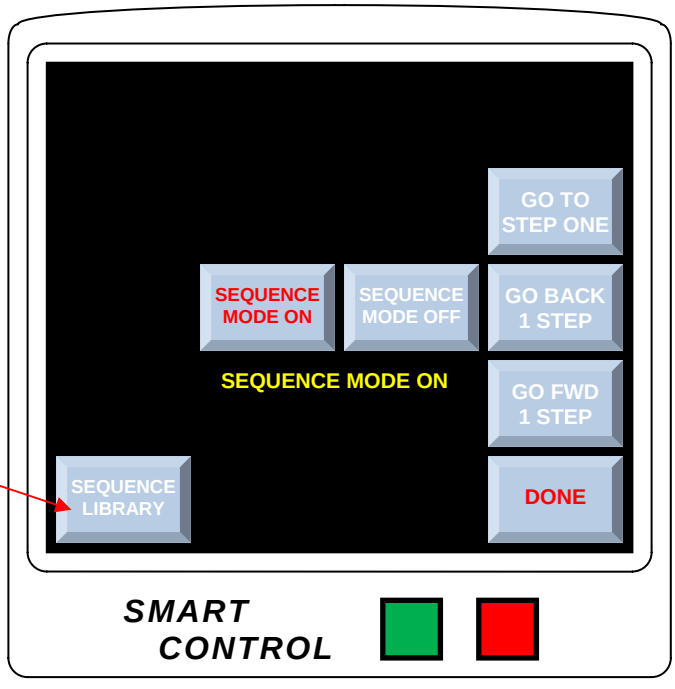
Weld Splice Sequence Step 3

Two LH Wires and Two RH Wires are Spliced

Weld Time: 0.65 Seconds
Weld Energy: 300 Joules
Weld Pressure: 50 PSIG

The SmartControl power supply can store up to 100 saved sequences or jobs and within each selected sequence or job, up to 16 sequential weld parameter steps can be programmed and stored.

Once in the Sequence Mode Screen, touch the Sequence Library Key to access your library of stored sequences or jobs.



SEQUENCE MODE SCREEN

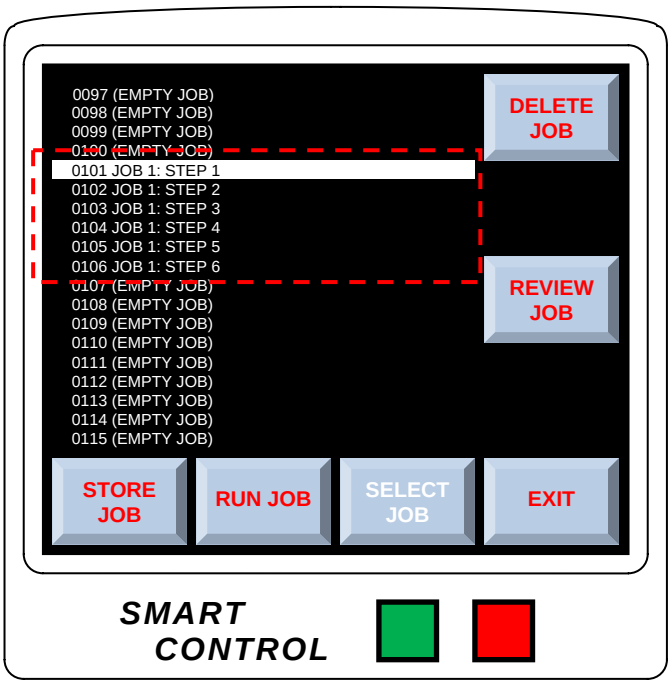
Sequence Mode - Ladder Diagram

From the Job Library, each particular sequence, or job, starts at 101, 201, 301 etc. The ladder diagram below is intended to illustrate how the sequenced jobs are named and stored in sequential steps.

Sequence Job #1 - The first step in the sequence starts at 101 with each individual step in the sequence having its own weld parameters.

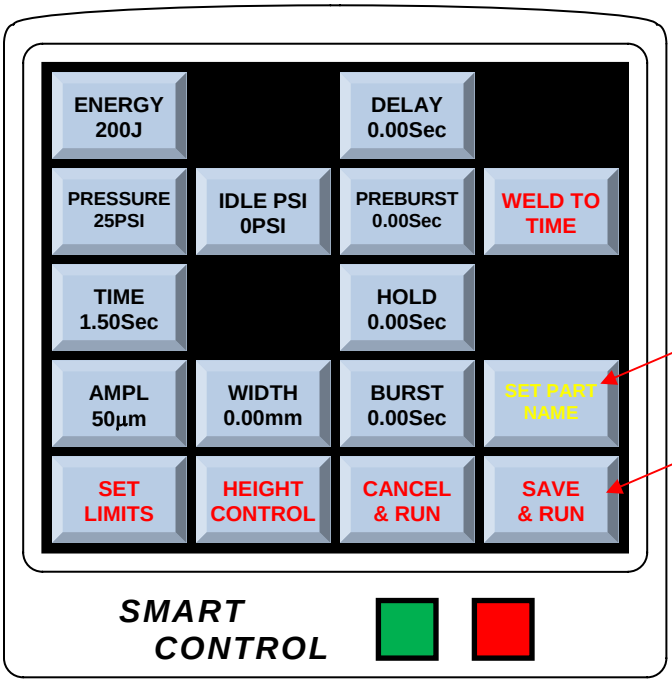
0101 JOB 1: STEP 1
- 0102 JOB 1: STEP 2
  - 0103 JOB 1: STEP 3
    - 0104 JOB 1: STEP 4
      - 0105 JOB 1: STEP 5
        - 0106 JOB 1: STEP 6

The Screen below illustrates how the above sequenced job would appear in the Job List Library Screen.



JOB LIST LIBRARY SCREEN

Sequence Mode - Job Creation and Save



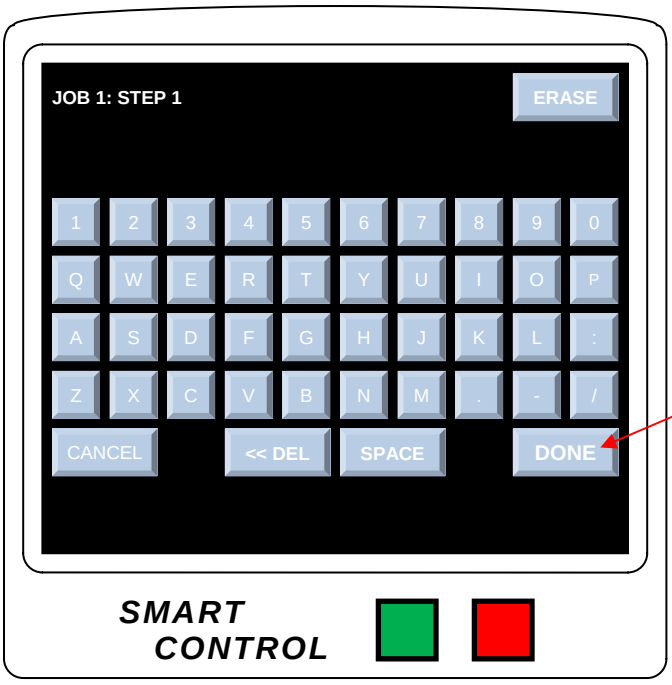
WELD SETTINGS SCREEN

To create your specific job sequence weld settings, return to the weld Settings Screen and enter weld parameters for the first sequence step. The sample Screen left shows Energy (200J), Pressure (25PSI) and Time (1.50Sec) have been entered with a Time based weld mode.

After weld settings have been entered for step 1, touch the Set Part Name Key.

Set Part Name Key

Save & Run Key



KEYBOARD

Using the previous page ladder diagram as an example, name the first job sequence step -

JOB 1: STEP 1

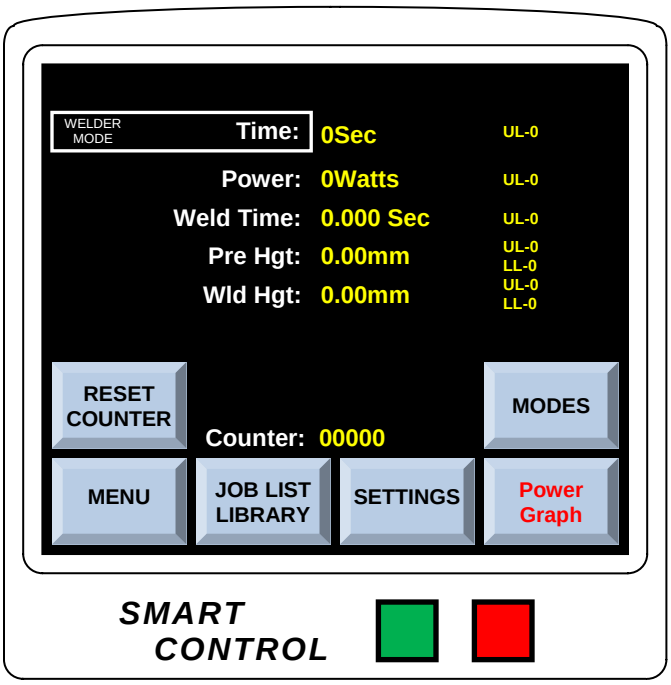
Touch the Done Key to save and exit.

From the Weld Settings Screen above, touch the Save & Run Key to return to the Weld Data Screen.

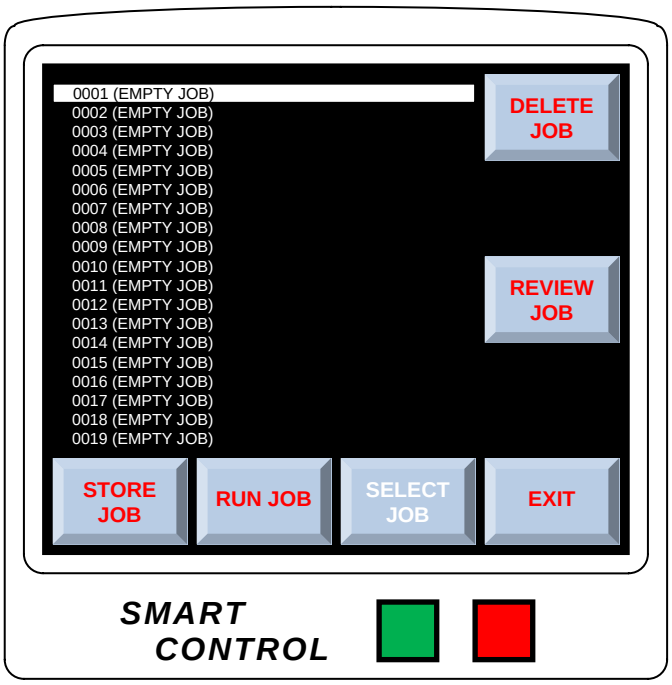
Done Key

After touching the Done Key and returning to the Parameter Input Screen, press the Save & Run Key (above) to return to the Weld Data Screen.

Sequence Mode - Job Creation and Save



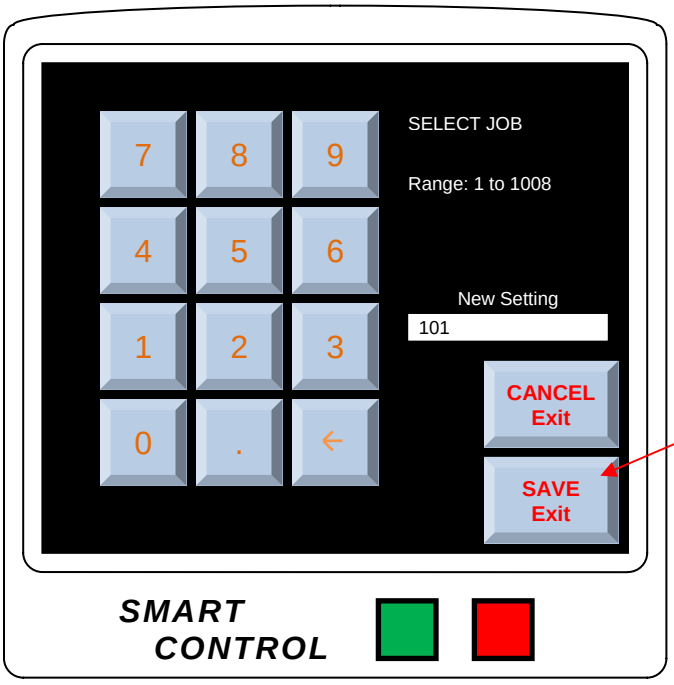
WELD DATA SCREEN



JOB LIST LIBRARY SCREEN

Once you have returned to the Weld Data Screen, touch the JOB LIST LIBRARY Key to enter the Job List Library Screen.

From the Job List Library Screen, touch the SELECT JOB Key to enter the numerical data entry keypad.



DATA ENTRY KEYPAD

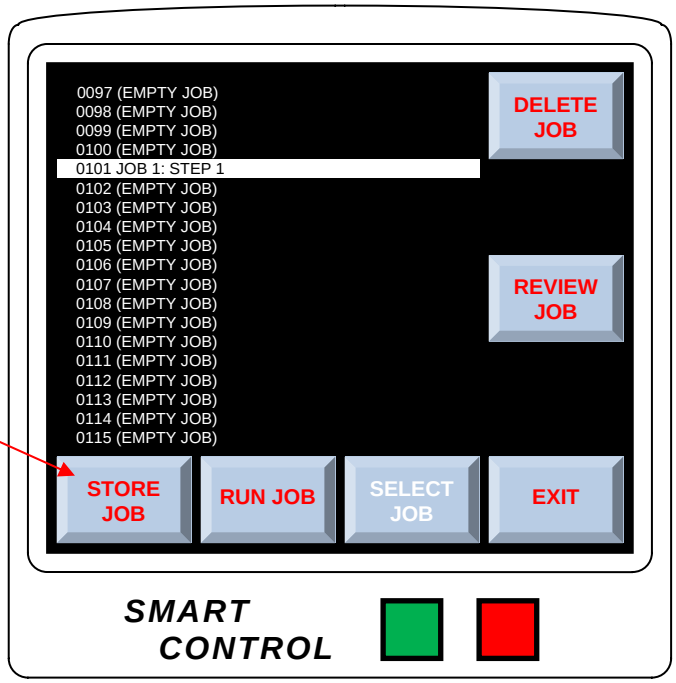
From the data entry keypad, enter 101 and then touch the Save Exit Key.

Save Exit Key

Sequence Mode - Job Creation and Save

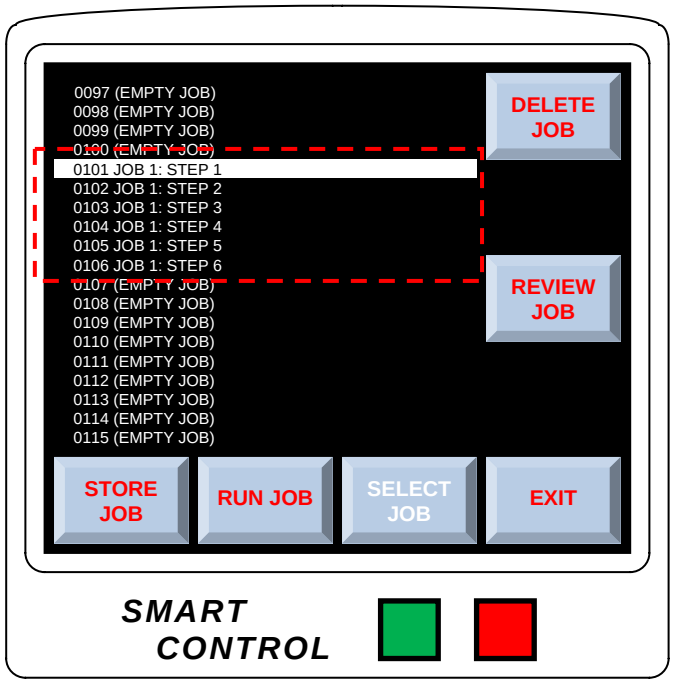
Once you have returned to the Job List Library Screen, touch the Store Job Key to store step 101's job settings in the library.

As illustrated to the right, you will see that Job 1:Step 1 settings are now stored in job number 101.



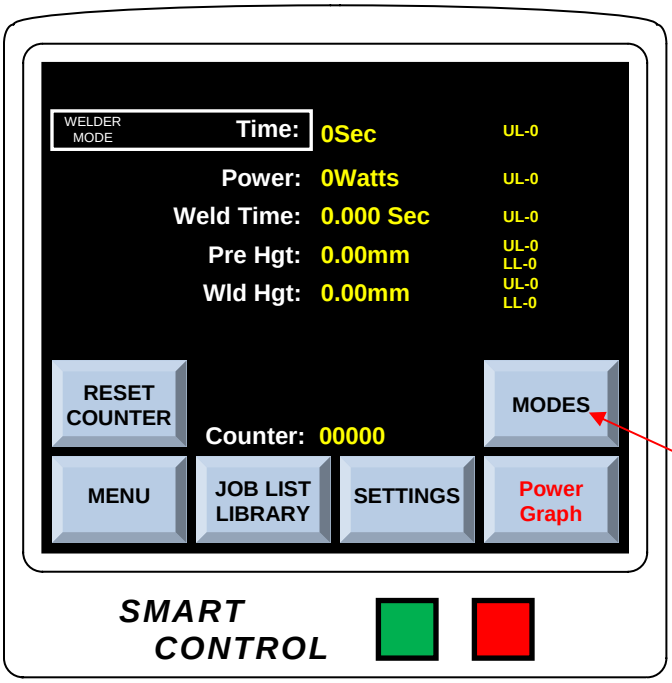
JOB LIST LIBRARY SCREEN

Repeat procedures on pages 25 through 29 to set desired weld parameters for each required step in the example sequence as shown to the right.



JOB LIST LIBRARY SCREEN

Sequence Mode - Sequence Job Load



WELD DATA SCREEN

Once all weld step parameters for your particular job sequence have been entered into the Job List Library, your job sequence needs to be up-loaded from the Sequence Library.

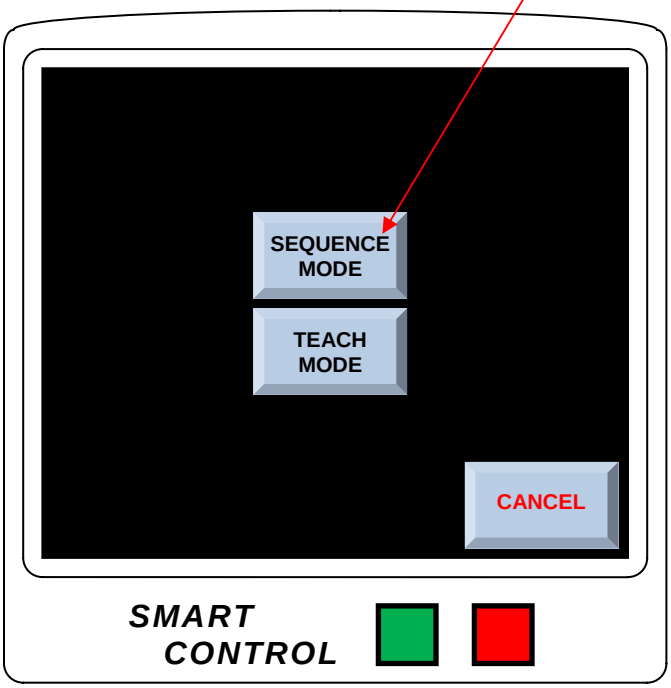
1. Exit the Job List Library Screen to return to the Weld Data Screen left.

2. From the Weld Data Screen, touch the Modes Key to enter the Mode Screen.

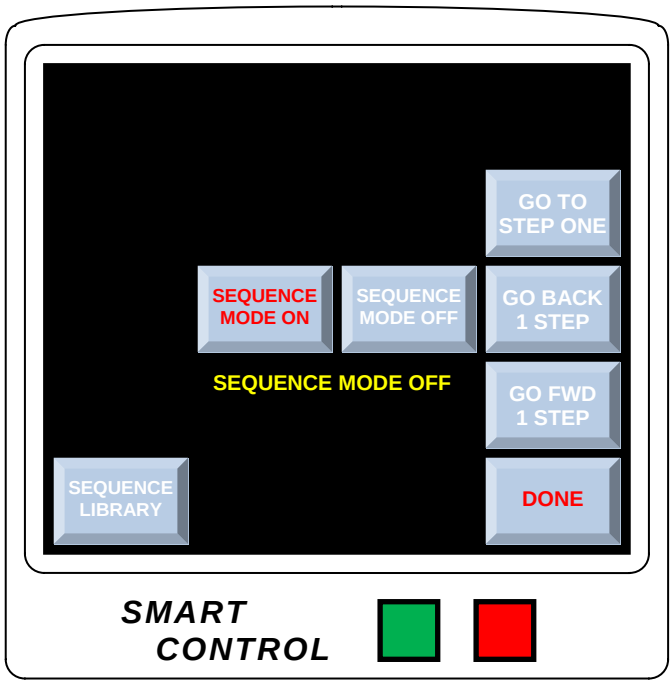
3. From the Mode Screen, touch the Sequence Mode Key to access the Sequence Mode Screen below.

Modes Key

Sequence Mode Key

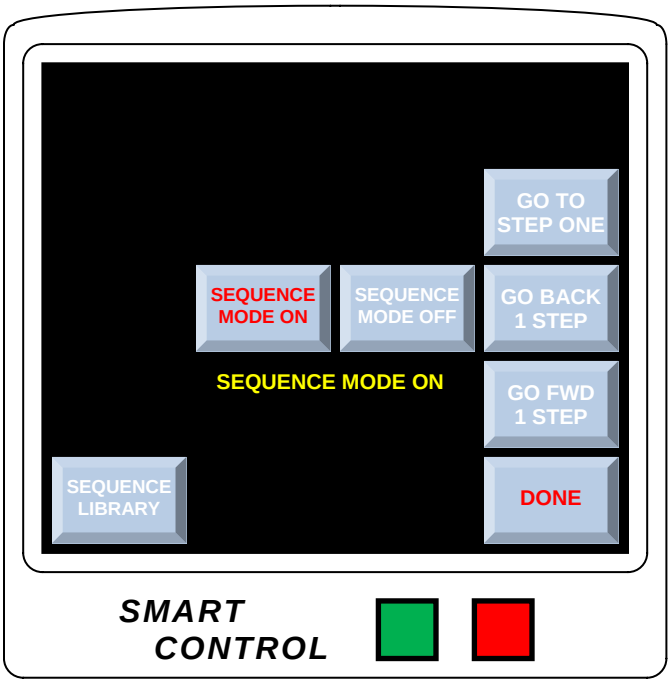


MODE SCREEN

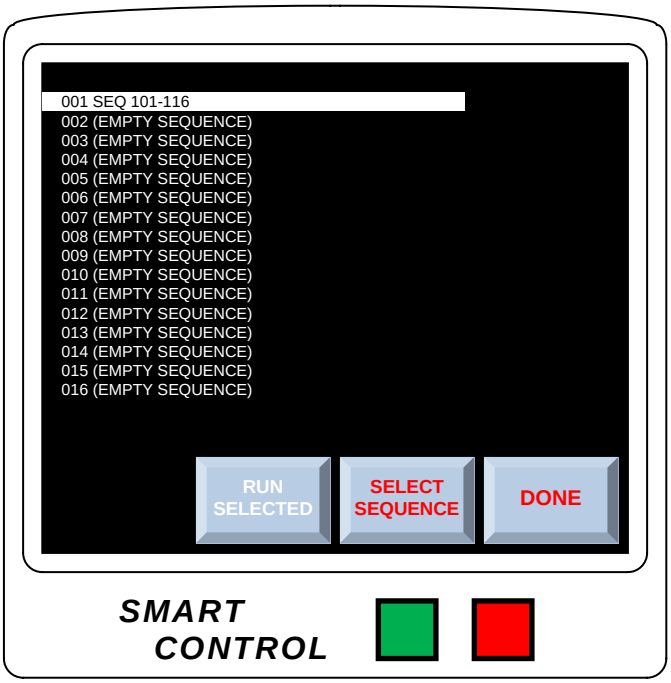


SEQUENCE MODE SCREEN

Sequence Mode - Sequence Job Load



SEQUENCE MODE SCREEN



SEQUENCE LIBRARY SCREEN

Touch the SEQUENCE MODE ON Key to activate (turn on) the sequence mode.

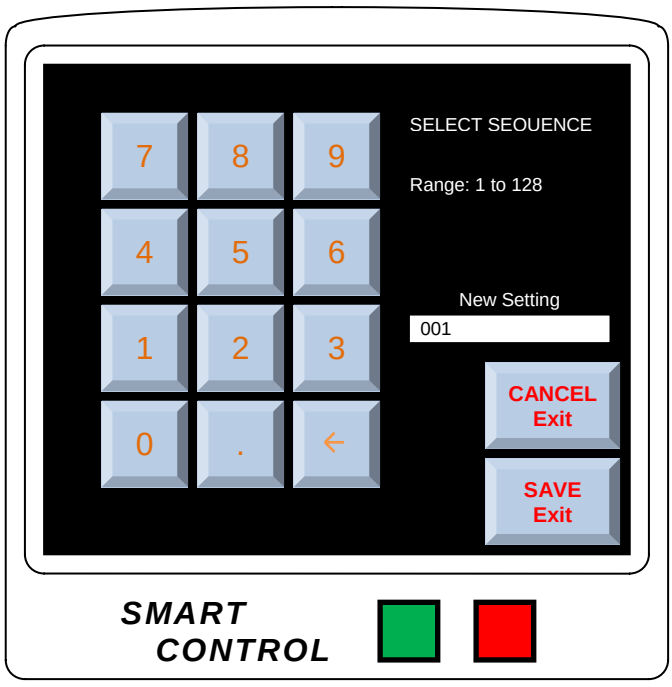
Touch the SEQUENCE LIBRARY Key to access the Sequence Library.

Touch the SELECT SEQUENCE Key to open a data entry Keypad.

After selecting the job sequence, touch the SAVE Exit Key to exit the Data Entry Keypad.

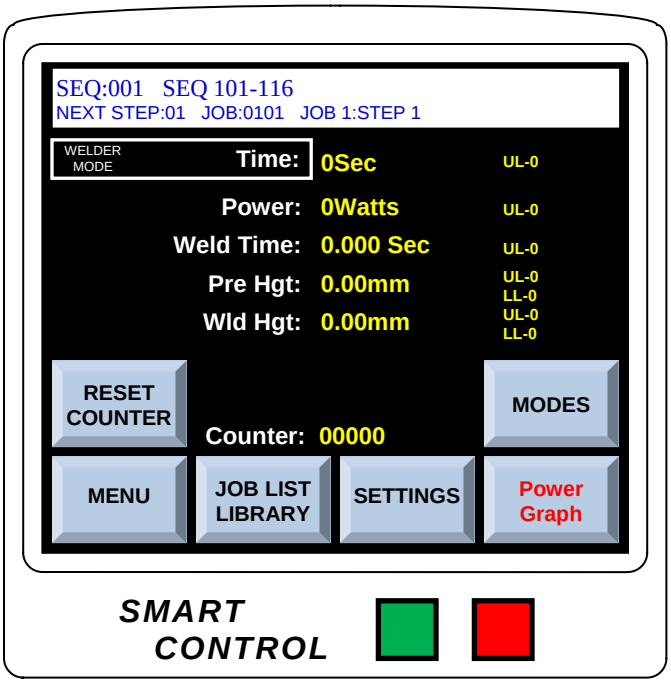
Note that on the above Sequence Library Screen, sequence 101 is now highlighted.

Touch the RUN SELECTED Key to return to the Weld Data Screen.



DATA ENTRY KEYPAD

Sequence Mode - Sequence Job Load

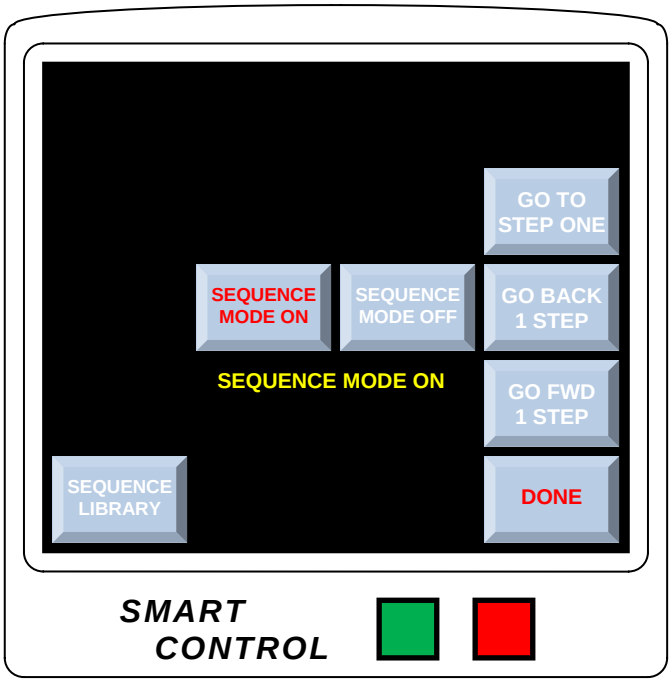


WELD DATA SCREEN

Now back to the Weld Data Screen, you will see your selected sequence highlighted at the top of the Screen.

From this point, you are now ready to sequentially weld your applications.

Sequence Mode - Additional Key Functions



SEQUENCE MODE SCREEN

Once you have selected and recalled the sequence or job from the sequence library and go back to the Sequence Mode Screen for other sequence mode key functions.

SEQUENCE MODE ON / SEQUENCE MODE OFF — Turns the selected sequence or job on or off.

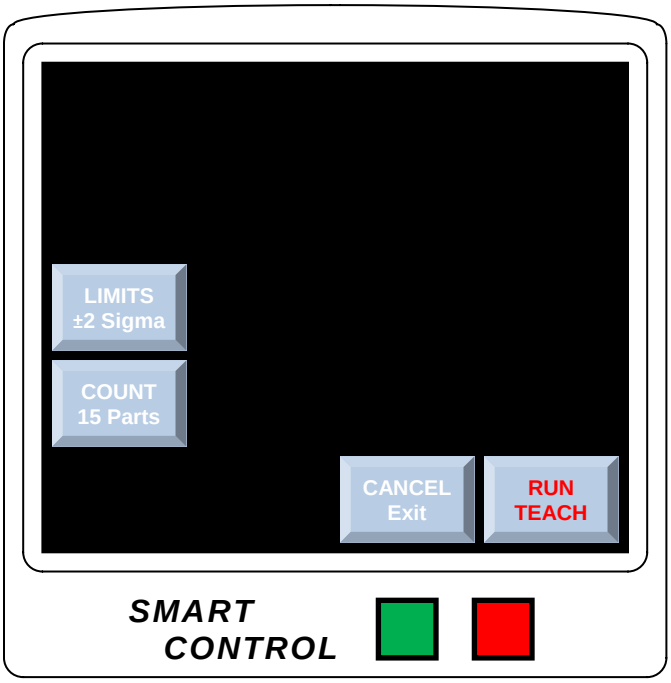
GO TO STEP ONE — If required, restarts the sequence to the first step in the sequence.

GO BACK 1 STEP — Goes back one step in the current sequence. If current step is 1, will go to the last step in the sequence.

GO FWD 1 STEP — Goes forward one step in the current sequence. If current step is last step, will go to the first step in the sequence.

DONE — Takes the user to the Weld Data Screen for sequence cycle start.

Teach Mode - Overview



TEACH MODE SCREEN

The **TEACH MODE** allows the user the ability to weld a series of parts (between a cycle count of 1 to 30) and then after the chosen cycle count has been reached, "Teach" the system to create upper and lower weld window limit settings based on the weld data collected from the previous weld cycle count.

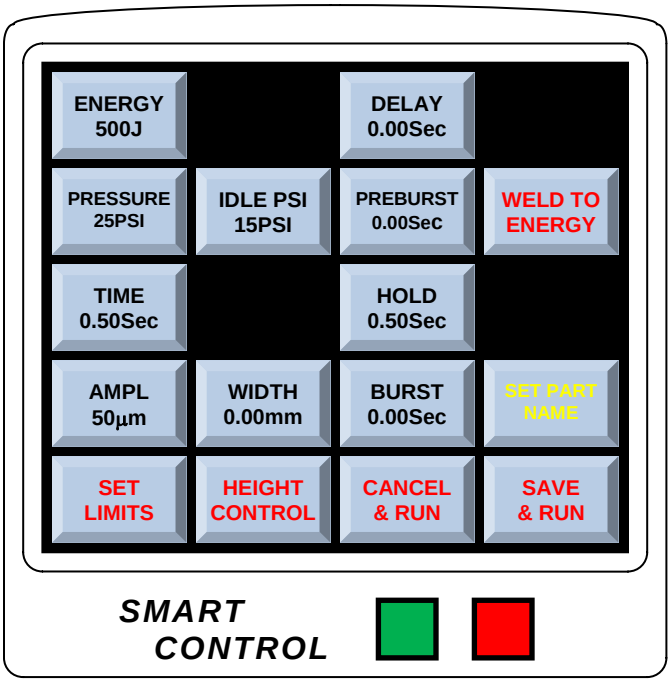
Prior to "Teaching" the system, you must first set your job weld parameters as covered in the Weld Settings section of this manual starting on page 14.

For convenience, the Weld Settings and Weld Limit Screens of the Weld Settings section are shown below.

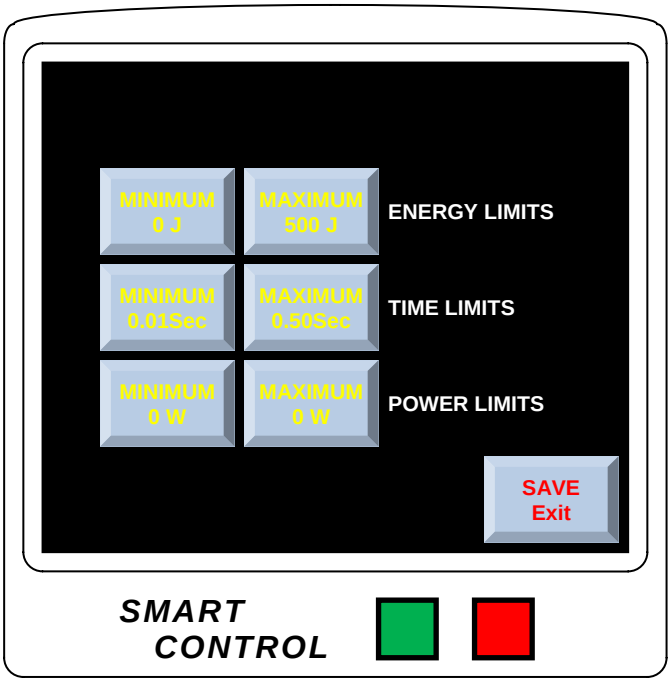
On the weld settings Screen below, example weld setting values of 500 Weld Energy Joules and 0.50 Weld Time in Seconds have been entered.

After entering your weld settings in the Parameter Input Screen, touch the Set Limits Key and you will see that the 500 Joules of Weld Energy are in the Maximum Energy box and the .50 Weld Time in Seconds are in the Maximum Time Limits box.

After setting your weld parameters, return to the Teach Mode Screen.

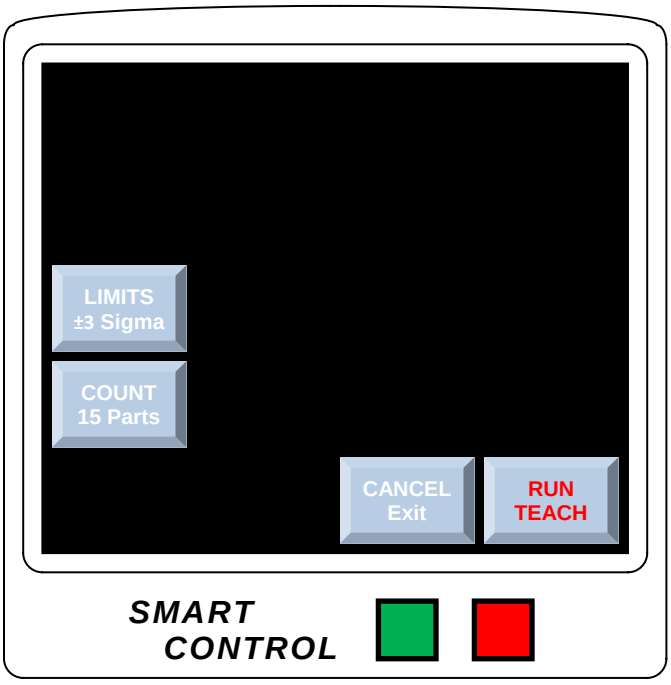


WELD SETTINGS SCREEN



WELD LIMITS SCREEN

Teach Mode - Setup



TEACH MODE SCREEN

LIMITS ±3 Sigma

Sigma is the Greek alphabet letter σ and is used to describe variability and quality level.

The higher the Sigma level the less likely a chance for defect.

In Six Sigma the common measurement index is DPMO or, Defects Per Million Operations.

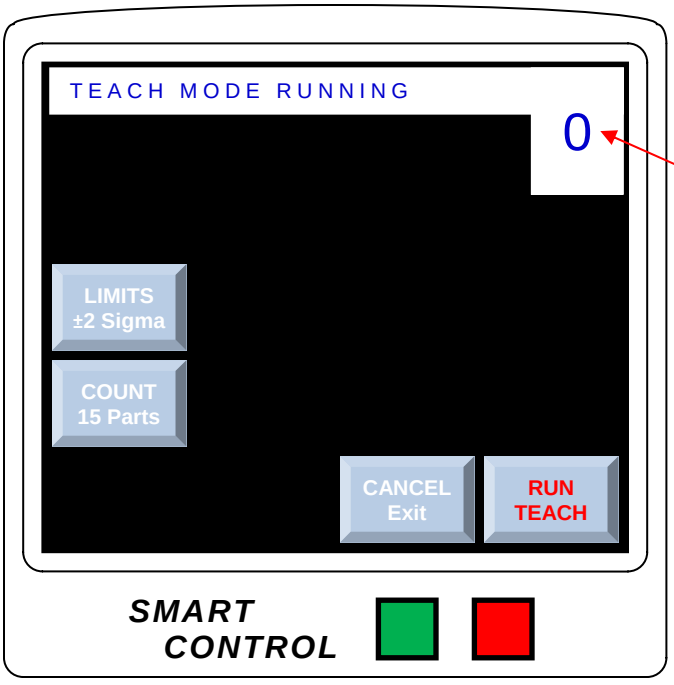
Sigma Level	% Good	DPMO
2	95.45	45,500
3	99.73	2,700
4	99.9937	63
5	99.999943	.57
6	99.9999998	0.002

COUNT 15 Parts

Touch the Count Key to enter the desired number cycles (between 1 and 30) the machine is to run in order to establish teach qualification. For this example, we have set the Teach Mode Count to 15.

RUN TEACH

After setting desired Sigma Limits and Part Counts, touch the Run Teach Key to ready the machine for Teach Count Cycle.



TEACH MODE SCREEN

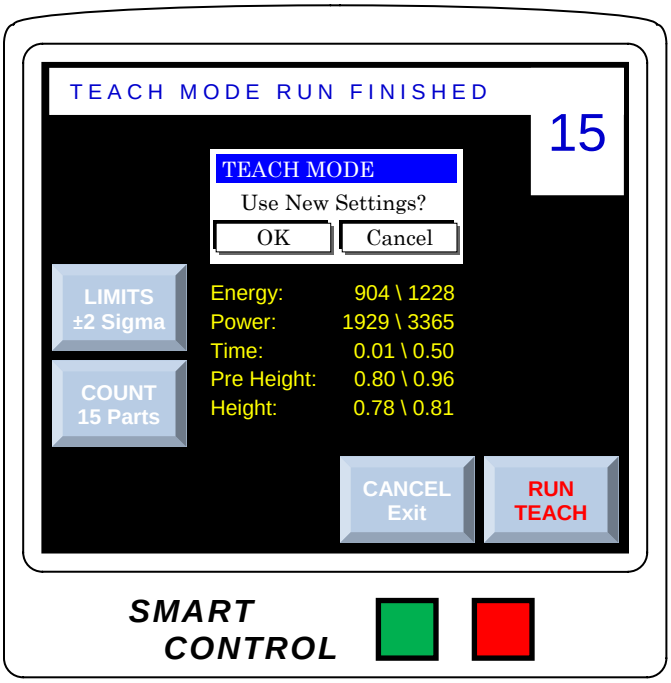
Once you have touched the Run Teach Key, the Screen as shown left, will indicate the Teach Mode is running and ready to count to the preset number of cycles.

Active Teach Cycle Count

NOTE - **<u>DO NOT CANCEL EXIT</u>** the Teach Mode Screen.

You are now ready to load application parts into the machine and initiate weld cycles while remaining in the Teach Mode Screen.

Teach Mode - Complete

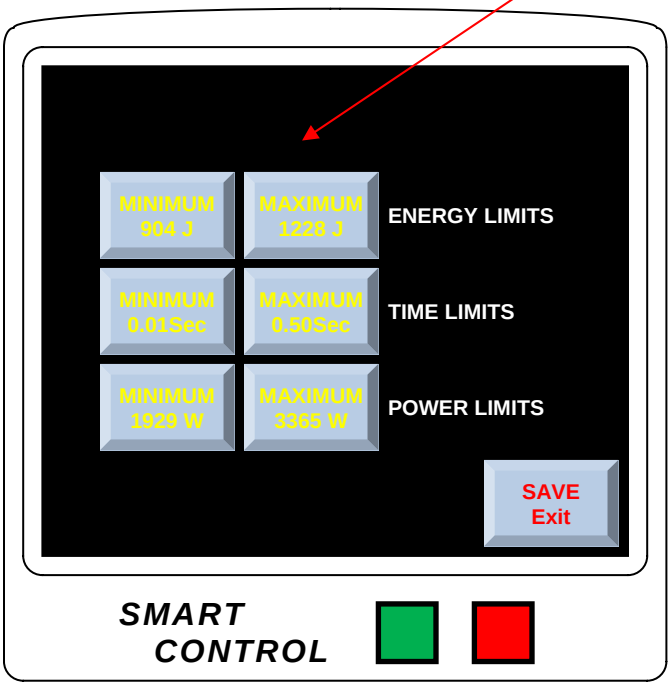


TEACH MODE SCREEN

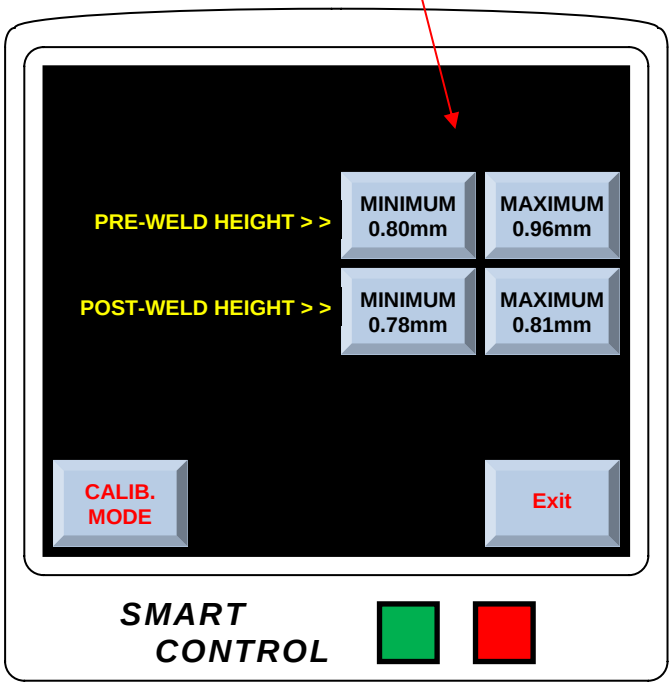
Once you have finished the welding of your 15 parts, the Teach Mode Screens illustrates various upper and lower limit settings with prompt to either Use New Settings or Cancel.

By pressing OK to keep the new settings, the settings will automatically store in the minimum and maximum windows of the Weld Limits Screen and Height Control Screen as illustrated below.

Minimum and Maximum Weld Limits



WELD LIMITS SCREEN

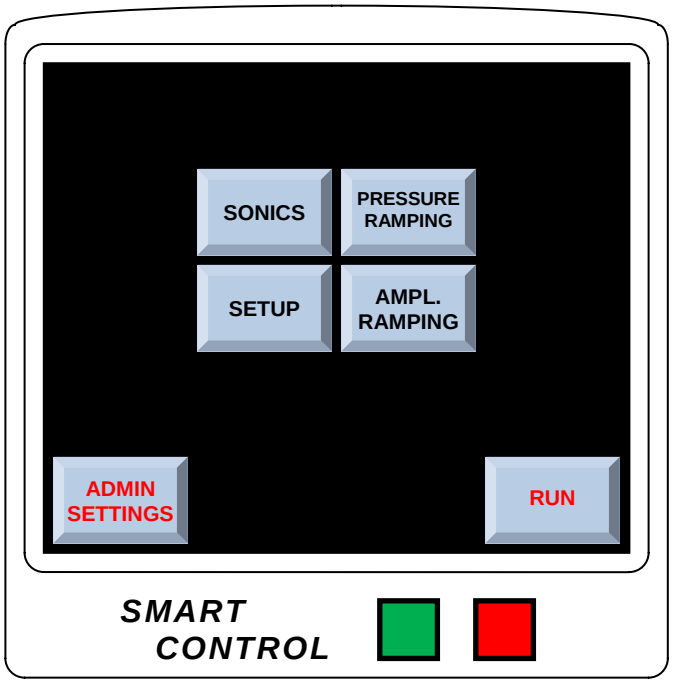


HEIGHT CONTROL SCREEN

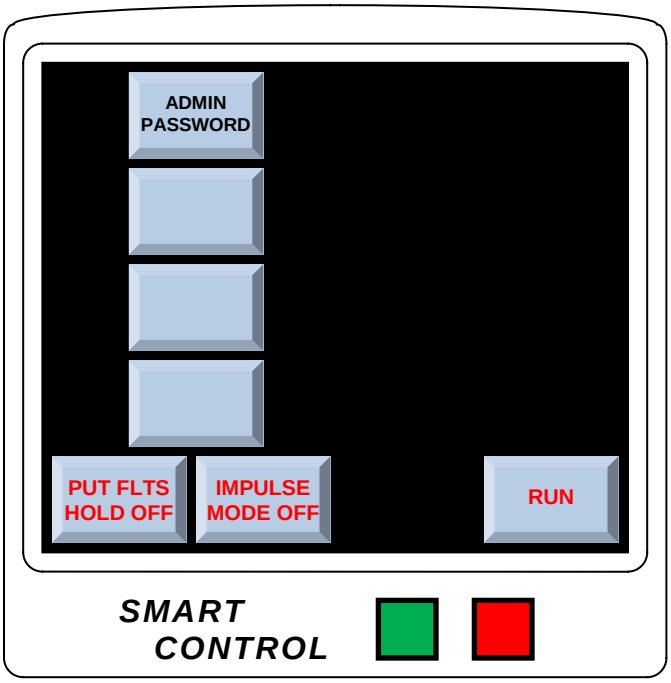
Passwords

To access the Passwords Screen, touch the Menu button on the Weld Data Screen and the Menu Screen shown to the right will appear.

From the Menu Screen, touch the ADMIN SETTINGS button to access the Passwords Screen.



MENU SCREEN



ADMINISTRATIVE SETTINGS SCREEN

The SmartControl system has a 4 level password structure for various Screen access.

The 4 levels are -

- Administrator
- Supervisor
- Technician
- Operator

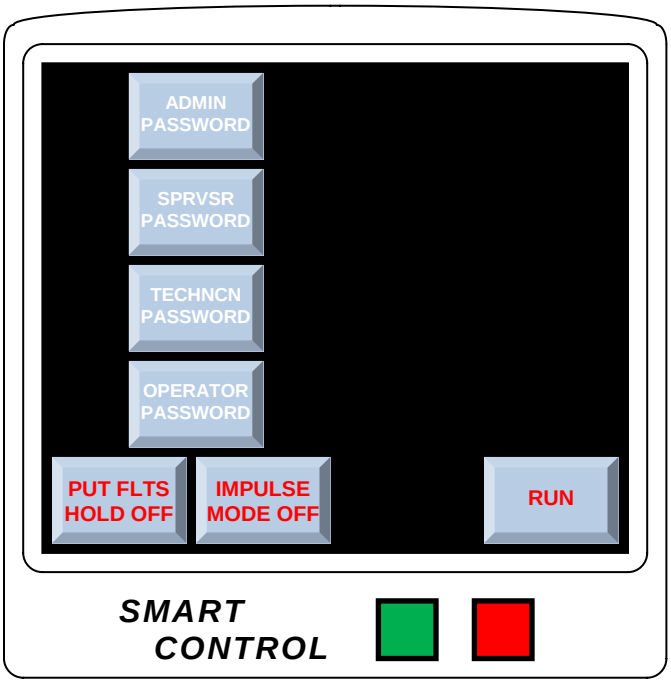
The Administrator has complete control over all passwords and complete access to all Screens. No other user can enter or change passwords.

If the Administrator's password is cleared it automatically clears all other sub-level passwords and, all Screens are accessible.

Touch the ADMIN PASSWORD button to access the alpha-numeric password Keypad and then enter the Administrators password.

All password levels are a minimum of 6 to maximum of 30 characters either alpha only, numeric only or an alpha numeric combination.

Password Screen Access and Utility Settings



ADMINISTRATIVE SETTINGS SCREEN

Once the Administrators password has been set, the Supervisor, Technician and Operator password buttons are now available for individual level password settings.

NOTES

- If any level password is cleared, access to that levels Screens and all Screens under are accessible.
- If two passwords are the same, Screen access is granted to the next higher password level.

Screen Access Password Levels

ADMIN PASSWORD — **Administrator:** All system Screens.

SPRVSR PASSWORD — **Supervisor:** All Operator and Technician Screens and all Screens related machine faults, errors and emergency (e-stop) conditions.

TECHNCN PASSWORD — **Technician:** All Operator Screens and Screens related to setup and job library save and recall.

OPERATOR PASSWORD — **Operator:** Weld Data Screen and Weld Power Graph Screen.

Additional Administrator Utilities

PUT FLTS HOLD OFF — This key toggles a weld fault on and off. When faults are "ON," the ultrasonic horn will stay down if a maximum or minimum weld limit setting has been violated. A violation notice will appear on the Weld Data or Weld Graph Screen and a Supervisor password will be required to reset the machine for continued weld cycles.

IMPULSE MODE OFF — Turning this mode "ON" allows the operator to release both palm start switches immediately after cycle start and before the horn makes contact with the application parts to be welded.

To prevent injury, this should only be turned "ON" when adequate alternative means of pinch point protection have been added to the machine.

Amplitude and Pressure Ramping

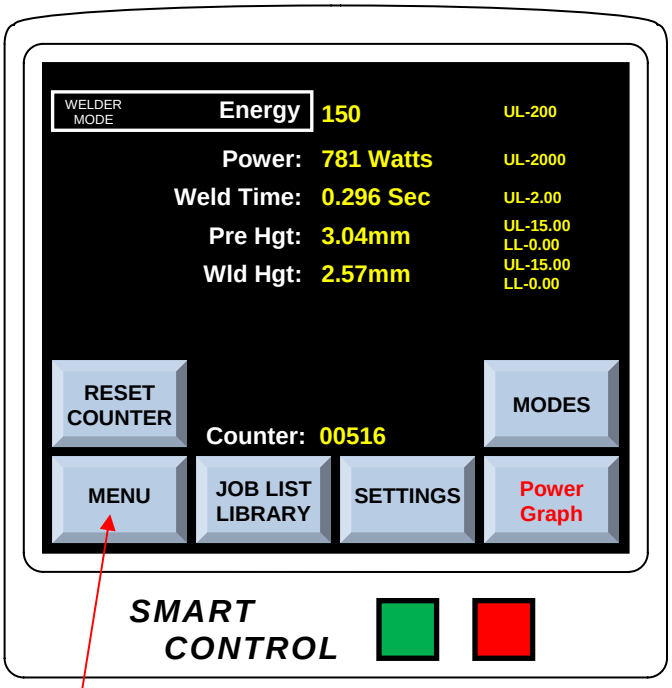
Amplitude Ramping allows the user to start the weld cycle at a low amplitude and then increase or "ramp" the amplitude during the course of the weld cycle.

Amplitude ramping serves two purposes, first being to prevent full (100%) amplitude "shock" to the ultrasonic horn at cycle start and second, to offer additional weld cycle process control.

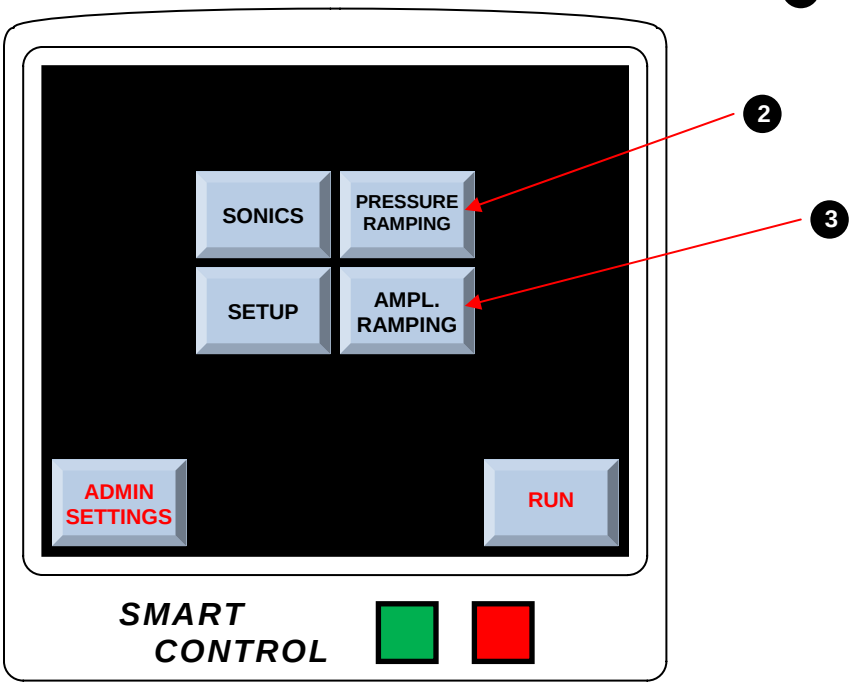
Pressure Ramping, like amplitude ramping, pressure increase ramping offers additional weld cycle process control.

To access the Amplitude Ramping and Pressure Ramping Screens -

1. From the Weld Data Screen, touch the Menu Key which will take you to the Menu Screen below.
2. Once in the Menu Screen, touch the Pressure Ramping Key to access the Pressure Ramping Screen or;
3. Touch the Amplitude Ramping Key to access the Amplitude Ramping Screen.



WELD DATA SCREEN



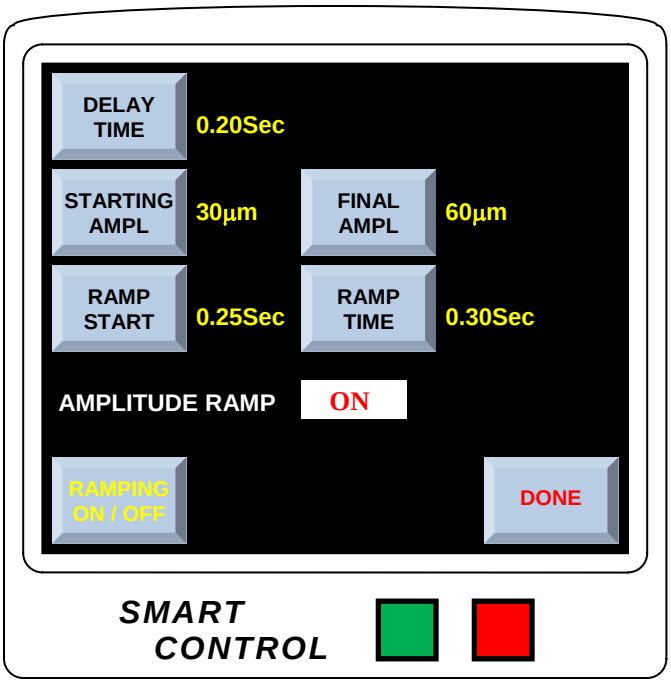
MENU SCREEN

NOTE

If Amplitude and/or Pressure ramping is turned on, they will apply to all job settings.

Ramp settings are system default settings and are not independently stored in any specific or individual job setting.

Amplitude Ramp Settings



AMPLITUDE RAMPING SCREEN

Display Key Functions

Delay Time - 0 to 4.00 Seconds

Amplitude Delay Time is the time to go from the 14µm root default amplitude to Starting Amplitude. The chart below illustrates a Delay Time setting of 0.20 seconds.

Starting Amplitude *(20 kHz Example)* - 14 to 72 µm (Microns)

Starting Amplitude is the initial ramp increase of weld amplitude. The chart below illustrates an increase from the 14µm root amplitude to a 30µm weld amplitude.

Ramp Start - 0 to 4.00 Seconds

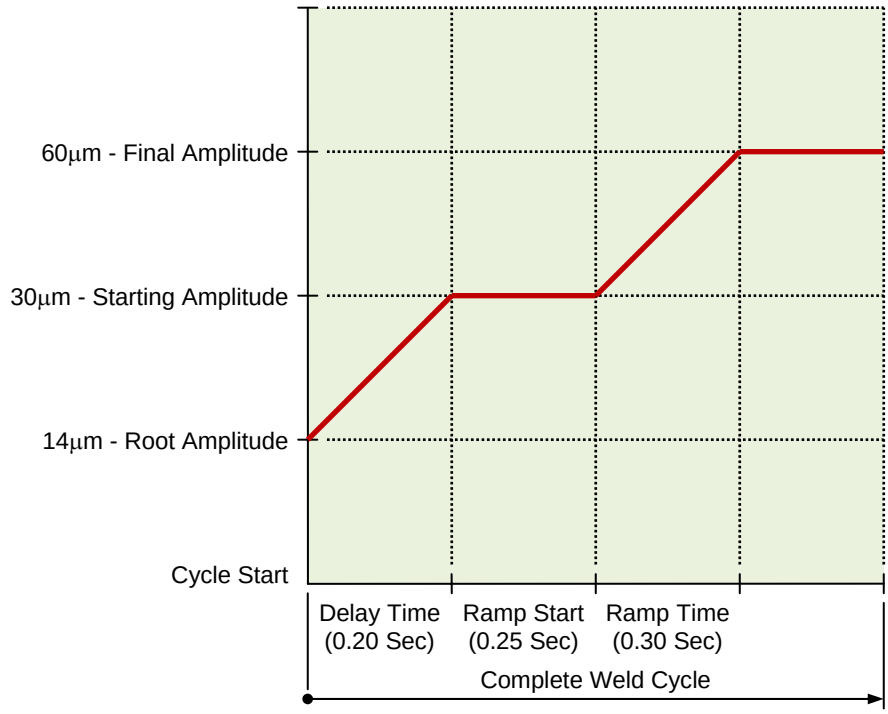
Ramp Start is the amount of time that Starting Amplitude is maintained. The chart below illustrates a Ramp Start time of 0.25 seconds.

Final Amplitude *(20 kHz Example)* - 14 to 72 µm (Microns)

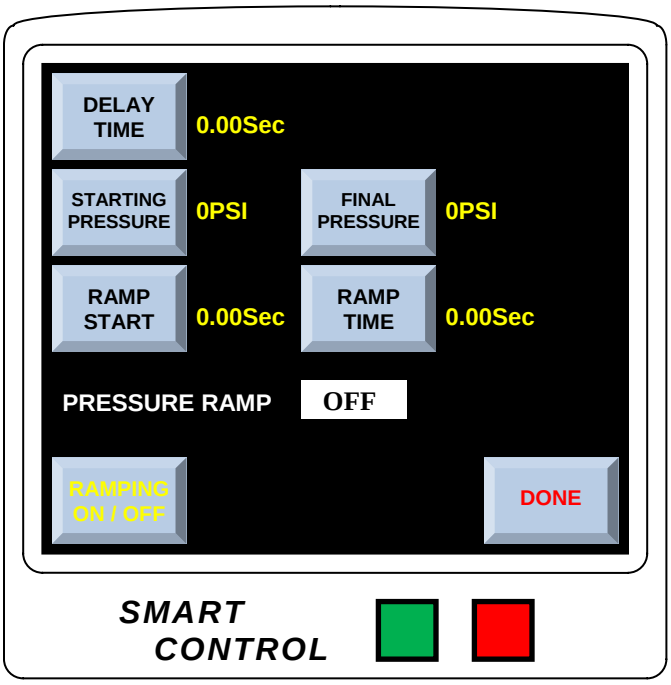
Final Amplitude is the desired peak amplitude setting. The chart below illustrates an increase from the 30µm starting amplitude to a 60µm peak weld amplitude.

Ramp Time - 0 to 4.00 Seconds

Ramp Time is the amount of time to go from the Starting Amplitude to Final Amplitude. The chart below illustrates a Ramp Time of 0.20 seconds.



Pressure Ramp Settings



PRESSURE RAMPING SCREEN

Display Key Functions

Delay Time - 0 to 4.00 Seconds

Pressure Delay Time is the time to go from Idle Pressure (15 PSI minimum) to Starting Pressure.

Starting Pressure - 15 PSI to 100 PSI

Pressure setting at cycle start.

Ramp Start - 0 to 4.00 Seconds

Ramp Start is the amount of time at Starting Pressure. Add Delay Time to Ramp Start to find the ramp start time.

Final Pressure - 15 to 100 PSI

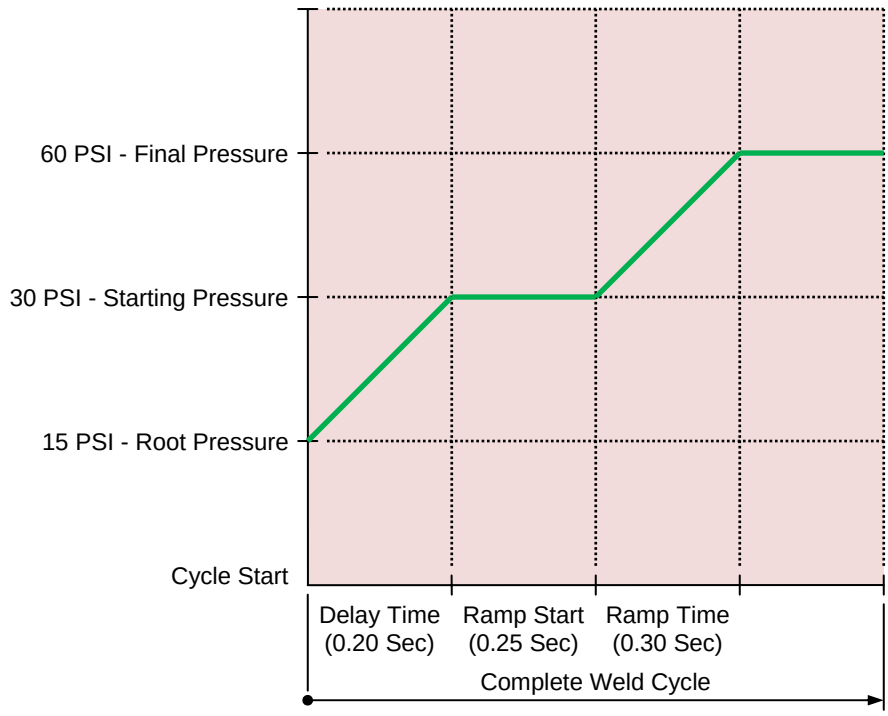
Pressure setting during weld cycle.

Ramp Time - 0 to 4.00 Seconds

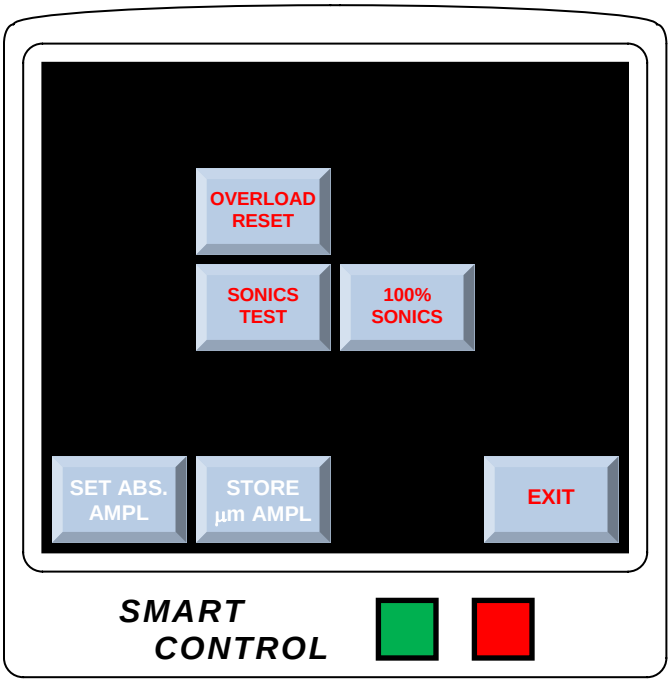
Ramp Time is the amount of time to go from the Ramp Start setting to the final setting.

Note 1 - Add Delay Time, Ramp Start, and Ramp Time to get ramp finish time.

Note 2 - After Ramp Time, the weld continues to the final pressure setting.



Amplitude Calibration



SONICS SCREEN

Depending on system frequency, each SmartControl power supply is factory pre-set with a maximum amplitude, in microns, that is adjustable from 20% to 100%

Based on an individual ultrasonic horn or stack configuration, the user may verify actual amplitude of the horn or tip and then calibrate the system to match that tools specific maximum amplitude.

Follow the instructions below to calibrate amplitude.

From the Menu Screen, touch the SONICS Key to enter the Sonics Screen.

From the Sonics Screen, touch the SET ABS. AMPL Key to open a data entry Keypad. From the data entry Keypad, enter 100% for maximum amplitude.

Using a height gauge (customer supplied) that will display settings in microns, set the gauge to zero against your horn or tip.

Press and hold the SONICS TEST Key to activate (turn on) ultrasonics and verify amplitude in microns on the gauge.

After verifying 100% horn amplitude from the gauge, touch the STORE µm AMPL Key to open a data entry Keypad. From the data entry Keypad, enter the amplitude in microns.

Upon exiting the Sonics Screen, that horn or tips maximum amplitude has been set. 20% to 100% adjustments in amplitude will now be based on that horn or tips maximum amplitude.

SMART PROGRAM

The ***SmartProgram*** is an optional Windows™ based computer program specifically created by Sonics & Materials to interface with Sonics ***SmartControl Ultrasonic Wire Splicing Systems.***

Some of the features and benefits of the SmartProgram include -

- *Quick Wire Bundle Count Selection*
- *Quick Wire Gauge Selection*
- *Quick Wire Insulation and Stripe Color Identification*
- *Time, Energy or Height Based Weld Mode Selection*
- *Prior Weld Power Graph Screen*
- *Prior Weld Data Results Screen*
- *Weld History Excel Spreadsheet Download Capability*
- *Suggested Weld Setting Guidelines*

In order to use the SmartProgram, it is assumed that the user has basic Windows™ operating system familiarity. The user must be familiar with Windows™ program load, file selection and mouse operations. If unfamiliar with these Windows™ operating system functions, consult a Windows™ tutorial as these functions are not covered in this manual.

The SmartProgram is supplied as a Windows™ based program only and the manufacturer, Sonics & Materials, Inc., does not supply, nor does the purchase price of the program include, actual computer, Windows™ based computer operating system software or peripheral computer accessories such as communications cables, monitor, Keyboard or mouse.

Computer System Requirements

- *Windows™ XP and up to Windows™ 7 Operating System*
- *2 MB Minimum Hard Drive Space*
- *1 Available USB Communications (COMM) Port*
- *Compatible USB to RS232 Conversion and Interface Cable -* ***See Note***

NOTE

As of this manuals printing, it is recommended that the following USB to RS232 Conversion and Interface Cable be used for communications between the computer and the SmartControl ultrasonic power supply.

IOGEAR #GUC232A
USB to RS232 Cable

Manufacturer: IOGEAR (www.iogear.com)
Model Number: GUC232A
Package: 1 USB to RS232 Serial Adapter Cable with Software Installation CD

Installation

To install Sonics SmartProgram on Windows™ XP or 7

1. Insert the compact disc into your computers CD-ROM drive.
2. Click the button labeled "Install SmartProgram."
3. Follow setup instructions on your Screen.

NOTE

With the often and unexpected changes in computer operating system software and computer manufacturer hardware configurations, occasional conflicts may occur. Should a computer software or hardware conflict occur that prevents the SmartProgram from properly interfacing with the SmartControl, contact Sonics' service department.

4. Connect the RS232 end of the interface cable to the DB9m (RS232) 9-pin socket on the back of the SmartControl ultrasonic power supply. (Depending on power supply chassis profile, see page 11 or 12, connection number 4.)

5. Connect the USB end of the interface cable to the USB communications port on your computer.

6. Once the SmartProgram has been loaded and the computer to SmartControl power supply interface cable connections have been made, click the Sonics SmartProgram link from your computer systems programs menu list to open the program.

Communications

Once the programs main window is opened, click the Energy, Time or Height circle from the Select Weld Mode prompt to select the desired weld mode to close the Select Weld Mode prompt. (This is only an initial program load formality and if desired, weld mode can be changed during job settings setup.)

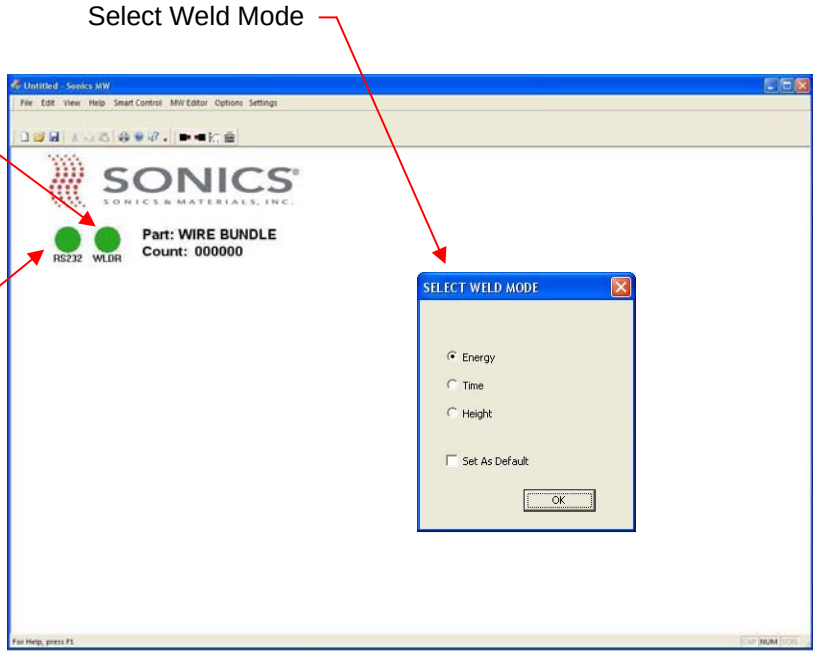
Both the **RS232** and **WLDR** circles should be green indicating good communications.

WLDR - Green circle indicates a good connection between the SmartControl power supply and SmartProgram.

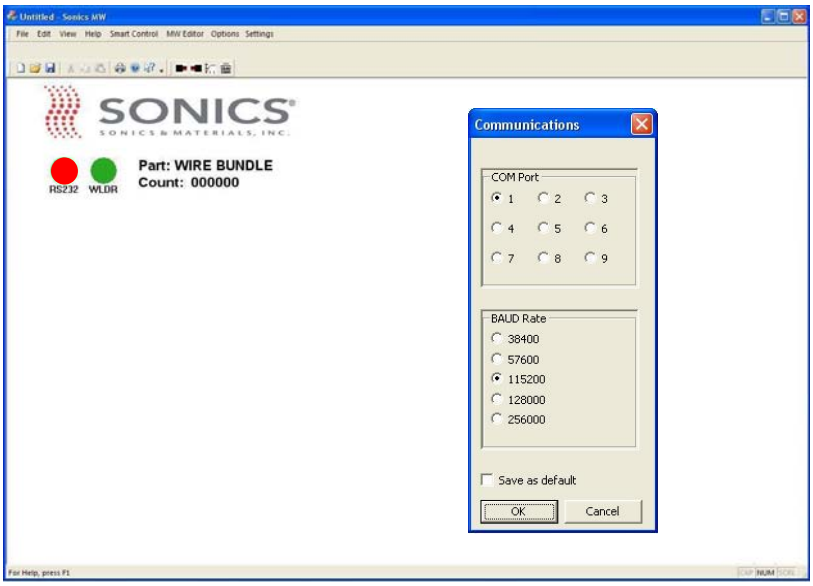
If the circle is red, check that the RS232 cable connections and communication settings are correct.

RS232 - Green circle indicates the SmartProgram has found an acceptable port on the computer.

If the circle is red, check the RS232 to USB interface cable connections between the computer and the SmartControl power supply.



MAIN WINDOW



MAIN WINDOW

If the **RS232** circle remains red after verifying that the RS232 to USB interface cable connections are correct, you may need to verify correct COM Port and communications BAUD Rate speed between the computer and the SmartControl power supply.

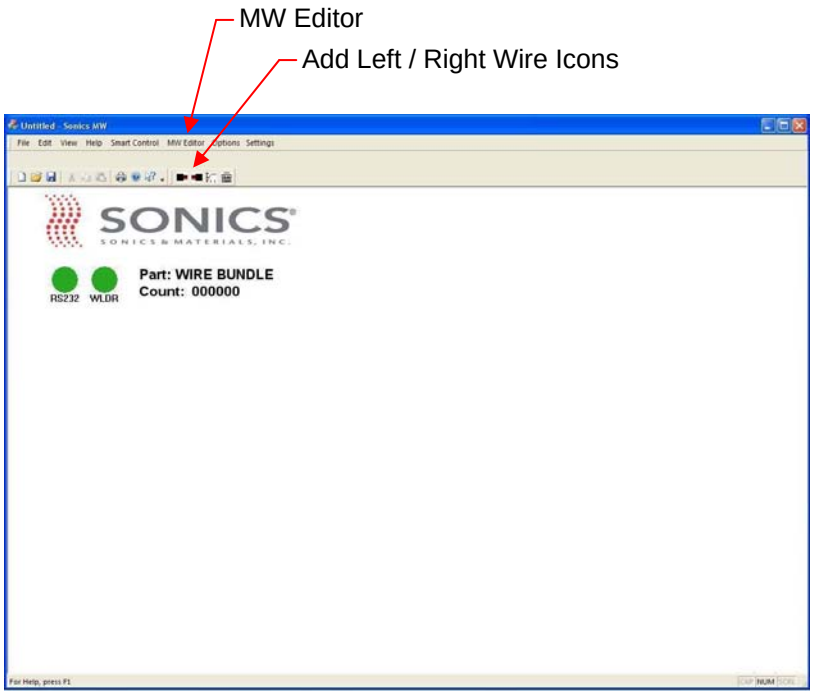
To change COM Port and/or communication BAUD settings, click SmartControl from the program command line to open the Communications window.

You can now select appropriate COM Port and BAUD Rate speed between your computer and the power supply.

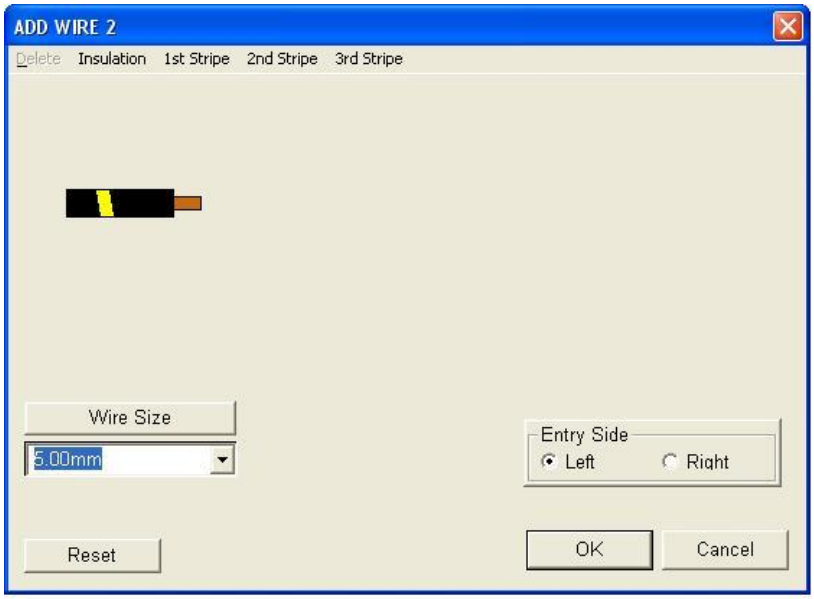
Wire Selection

Once both the **RS232** and **WLDR** show green, you are now ready to set your wire splice bundle configuration by adding wire bundles to the left side, right side or both left and right sides.

To configure your wire splice bundles, click the MW Editor from the program command line or, from the add left or add right wire icons just below the program command line.



MAIN WINDOW



WIRE SELECTION WINDOW

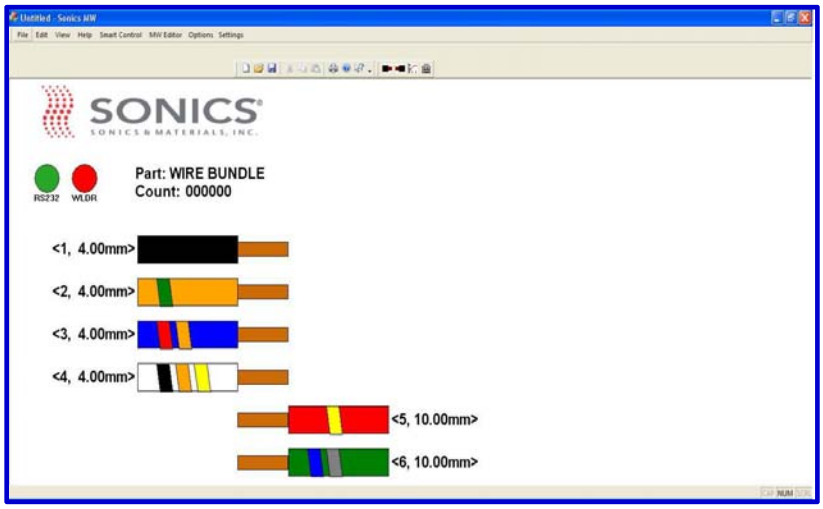
With the add left or right wire selection window now open, you can identify and add specific wire sizes to your wire splice bundle.

Insulation - Allows the user the ability to change the color identity of a specific wires outer insulation or jacket.

Stripe 1 - Allows the user the ability to change a specific wires outer insulation stripe color. The example left illustrates a yellow stripe. (Up to three different color stripes can be added to a specific wire.)

Wire Size - The arrow down opens a drop down list of standard wire sizes (metric and AWG) for the specific wire size to be welded.

Entry Side - Allows the user to switch from a left side or right wire load or Entry Side.



After all wires for the wire splice bundle have been selected, the Main Screen illustrates the selections.

NOTE

If you need to change a wire insulation color or stripe, double click the specific wire and a wire edit window will open to make the desired change.

Left Side Wire Entry (4 Wires Total)

Wire #1
Wire Size: 4.00 mm
Wire ID: Black Jacket, No Stripe

Wire #2
Wire Size: 4.00 mm
Wire ID: Orange Jacket, Green Stripe

Wire #3
Wire Size: 4.00 mm
Wire ID: Blue Jacket, Red/Orange Stripes

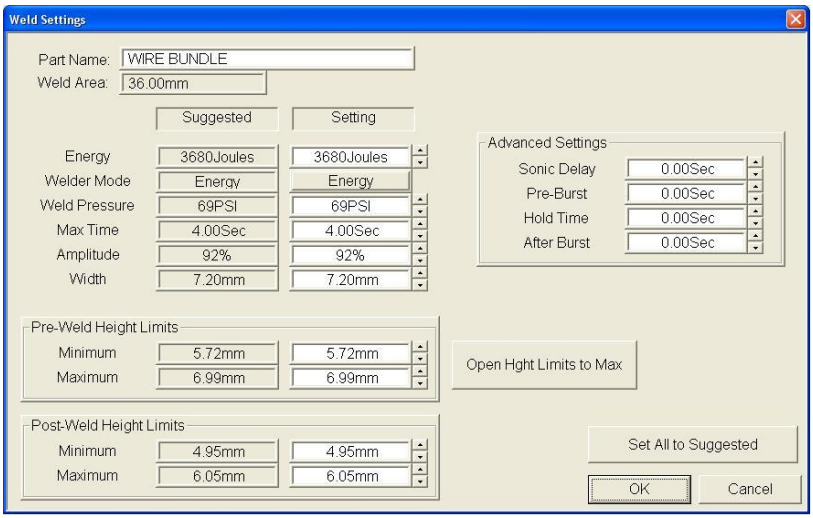
Wire #4
Wire Size: 4.00 mm
Wire ID: White Jacket, Black/Orange/Yellow Stripes

Right Side Wire Entry (2 Wires Total)

Wire #5
Entry: Right Side
Wire Size: 10.00 mm
Wire ID: Red Jacket, Yellow Stripe

Wire #6
Entry: Right Side
Wire Size: 10.00 mm
Wire ID: Green Jacket, Blue/Grey Stripes

Weld Settings



Once you have built your wire splice bundle, click Settings on the Main Screen program command line to open the Weld Settings window to the left.

A unique feature of the SmartProgram is that based on the total weld area, which in this example is 36mm, (the cumulative total of all wire sizes being spliced) the program automatically offers suggested weld settings.

You now have the option to accept the programs suggested weld settings or, use the individual up/down arrow Keys under the Setting column to change individual weld settings.

NOTES

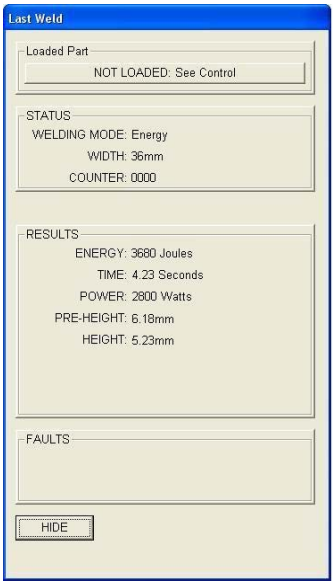
1. **WELD SETTINGS:** For information and explanation of individual weld settings, please see the Weld Settings section of this manual starting on page 14.

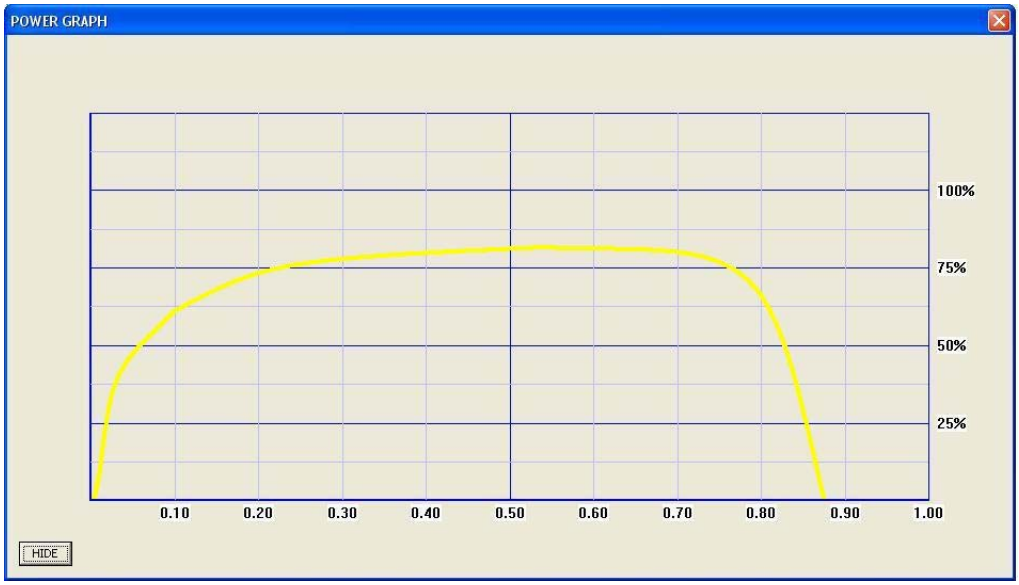
2. **PART NAME:** From the weld settings Screen, you can name your particular job.

3. **WELD MODE:** If you previously set Energy, Time or Height as the default weld mode setting, you can change the weld mode by clicking Welder Mode under the settings column.

Additional Features

From the Main Screen program command line, click View to open either of the two windows below.



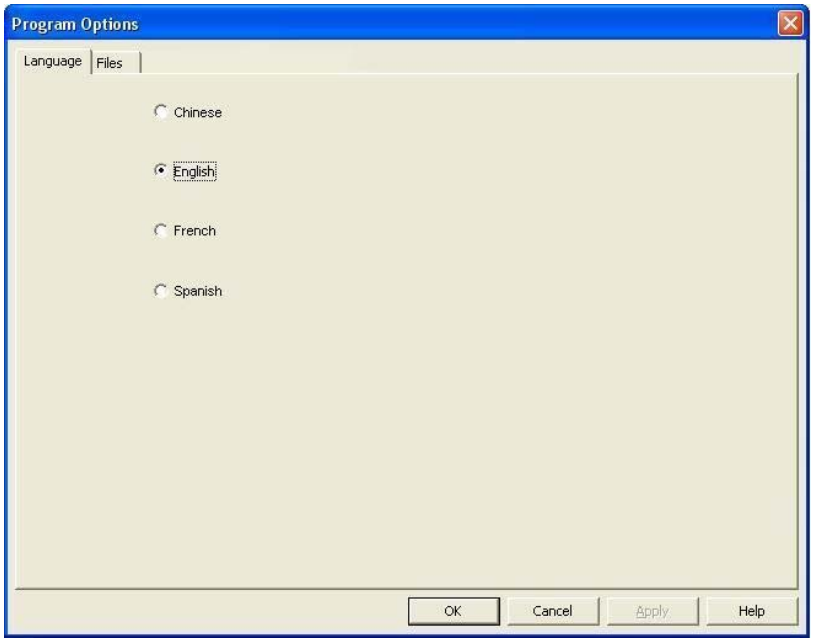


Last Weld Window - Displays previous weld/splice data results.

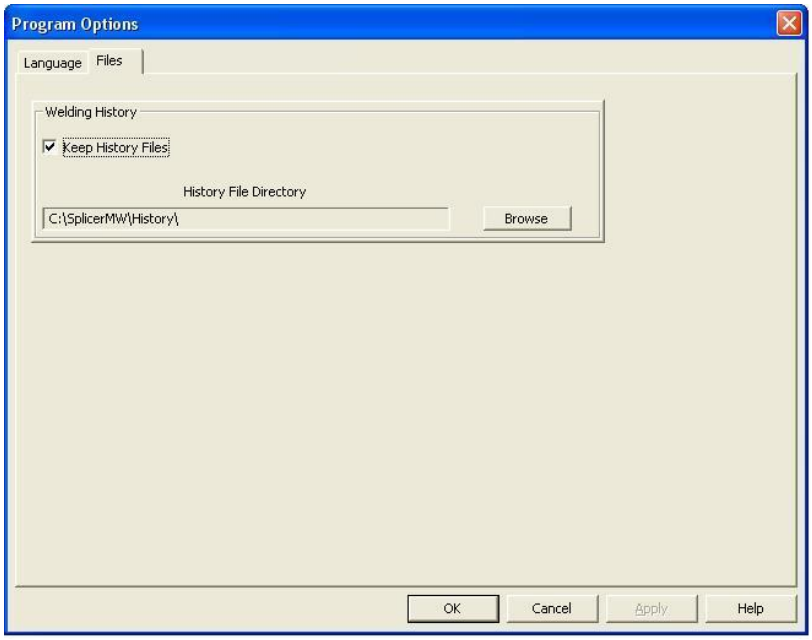
Power Graph Window - Displays previous weld/splice graph results in power and time. Wave shapes associated with acceptable welds can be used as a benchmark to predict quality.

Program Options

From the Main Screen program command line, click Options to open the Program Options window below.



Language - The Language tab in the Program Options window allows the user to set and view the program Screens in the Chinese, English, French or Spanish language.



Files - The Files tab in the Program Options window allows the user to save and export weld data history in an Excel file format.

NOTES

Due to potential RS232 communication conflicts, you cannot have both the SmartProgram computer interface and the Barcode Scanner connected at the same time.

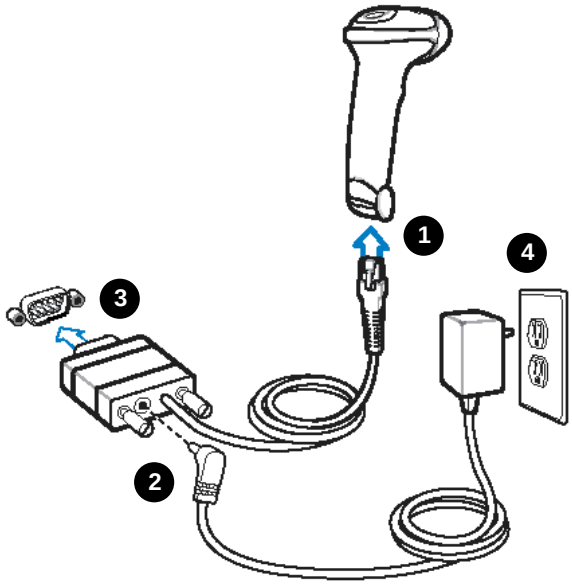
BARCODE SCANNER

The Barcode Scanner is an optional hardware package which allows the user the ability to barcode scan a label which is related to a set of parts that are to be welded. Once the barcode label is scanned, the SmartControl power supply matches the scanned label to its respective named job in the power supply library, and that jobs weld parameters are then loaded into the system for weld cycle.

The feature of the scanner interface allows for random groups of parts to be brought to the welder, barcode scanned, and the welder then automatically sets the pre-programmed weld parameters for that particular group of parts.

Scanner Hardware Connections

Motorola "Symbol" Model LS2208
Barcode Scanner



1. Connect Interface Cable to Scanner
2. Connect 120 VAC Power Supply Cable to the back of the DB9 (RS232) Connector
3. Connect the DB9 Connector to DB9 (9 Pin Male) Rear Power Supply Port (See Pages 11 and 12 for Diagram)
4. Plug Power Supply into 120 VAC 50/60 Hz Electrical Source (Connection will be confirmed by three audible beeps.)

NOTE

As of this manuals printing, only the above Motorola Model LS2208 has been proven as compatible with the SmartControl power supply microprocessor. Use of other scanners brands or models may not operate correctly.

Scanner Setup

Once the scanner hardware connections have been made, you are ready to set the scanner for communication with the SmartControl power supply.

To test the scanner after setup, first create a sample barcode and name it MYBARCODE. After creating the barcode, set up a job in the job library and name the job MYBARCODE. (See pages 20 and 21 for Job Library storage.)

After you have created your test barcode (MYBARCODE), scan the following barcodes in numerical order.

1

SET DEFAULTS

2

STANDARD RS-232

3

SCAN OPTIONS

4

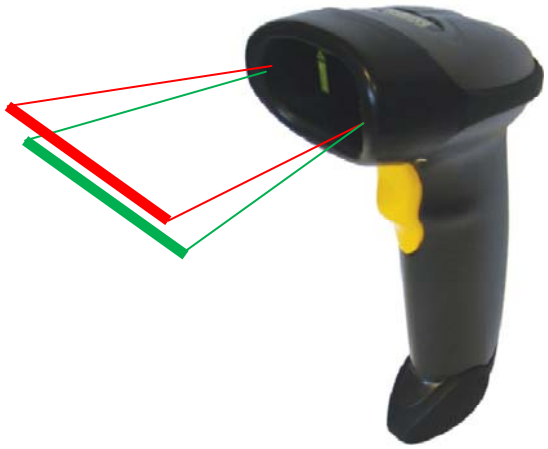
<DATA><SUFFIX>

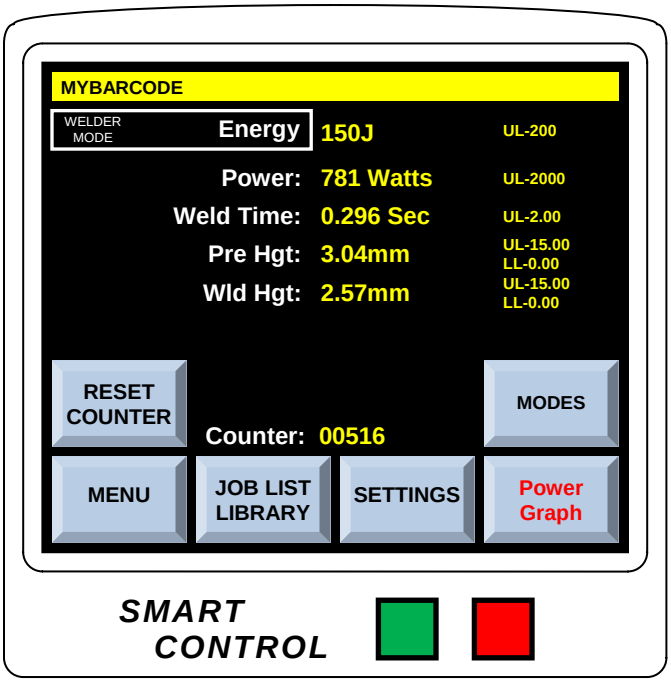
5

ENTER

6

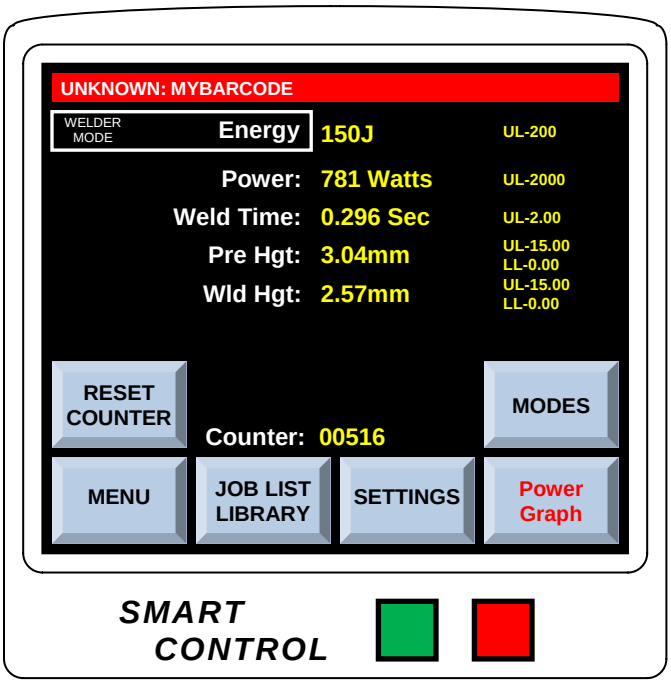
M Y B A R C O D E





WELD DATA SCREEN

If communications are correct, the run Screen status line will display MYBARCODE. This indicates that the scanner correctly read your test barcode and loaded that jobs settings from the Job Library.



WELD DATA SCREEN

If the run Screen status line reads UNKNOWN: MYBARCODE this indicates a failed communication.

Re-attempt to establish communications from the scanner to the SmartControl power supply by repeating steps 1 through 6 on the previous page.

NOTE

Due to potential RS232 communication conflicts, you cannot have both the SmartProgram computer interface and the Barcode Scanner connected at the same time.

GENERAL

1. Always make sure the power supply has adequate ventilation by keeping sufficient space around the assembly.

2. Periodically check the ventilation grilles and clean as necessary.

REPAIRS / SERVICE

If problems are encountered, contact our service department at 1-800-745-1105.

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 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 a return method of shipment indicated.

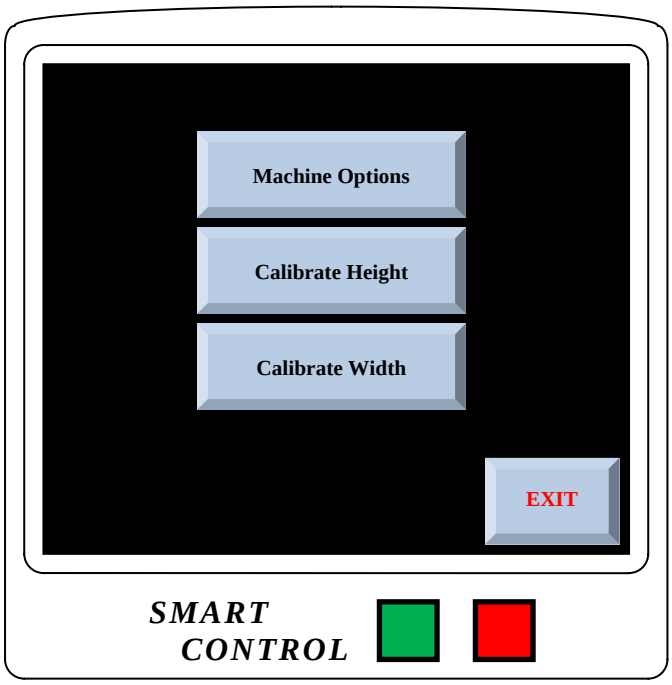
NOTE: *If packaging unit for return shipment,* ***DO NOT*** *use Styrofoam "peanuts."*

Setup Screen

Within the Menu Screen is a Touch Key labeled Setup which will bring the user to the Setup Screen below.

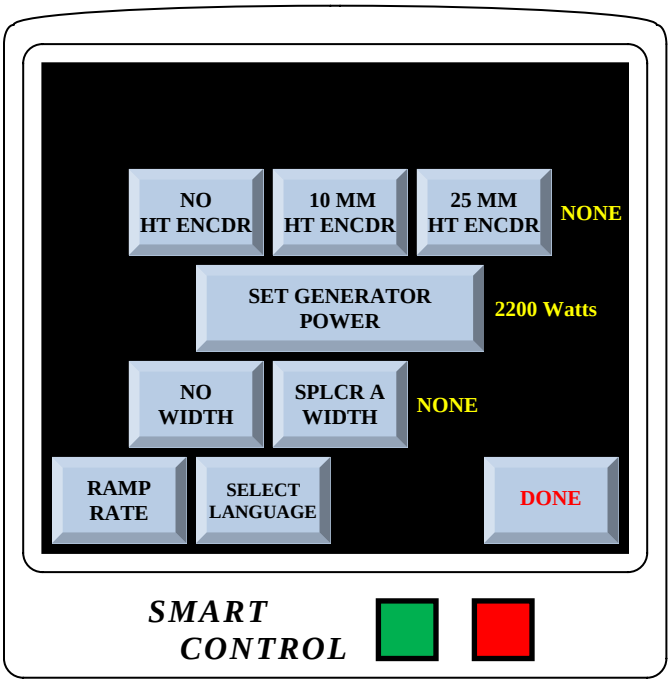
NOTE

CAUTION - The various functions and settings within this screen are primarily factory default system settings and **these screens should only be accessed by a qualified technician** if factory settings need to be changed, adjusted or re-calibrated.



SETUP SCREEN

Machine Options



MACHINE OPTIONS SCREEN

NO HT ENCDR - Touching this key indicates that the welding press has no optional height encoder. If the welding press was supplied with a height encoder, touching this key will disable the encoder.

10MM HT ENCDR - Touching this key activates a 10mm distance height encoder for a 40 kHz (MWA40) actuator.

25MM HT ENCDR - Touching this key activates a 25mm distance height encoder for a 20 kHz (MWA20) or 15 kHz MWA15 actuator.

SET GENERATOR POWER - This key is set to match the factory set output power of the ultrasonic power supply/generator. **Changing this setting will not increase or decrease the systems output power and will cause energy setting conflicts.**

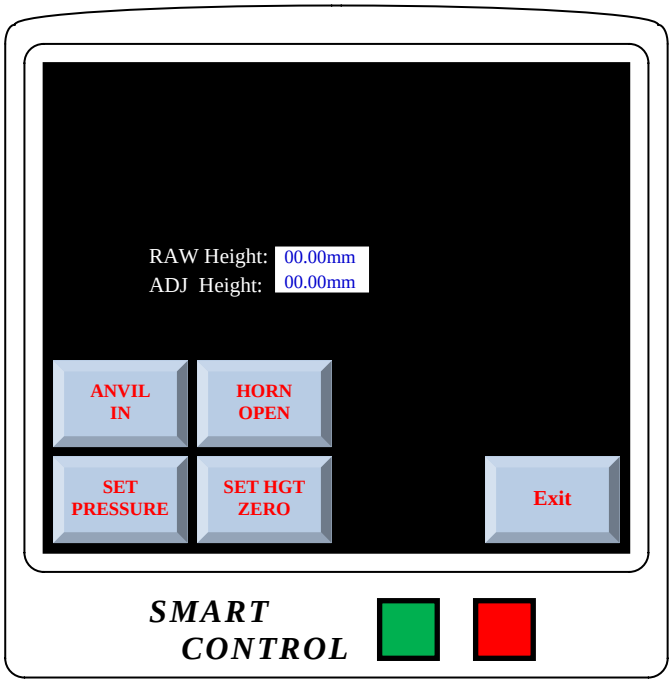
NO WIDTH - Touching this key disables the ultrasonic wire splice system (MWS20) width control.

SPLCR 1 WIDTH - Touching this key enables the ultrasonic wire splice system (MWS20) width control.

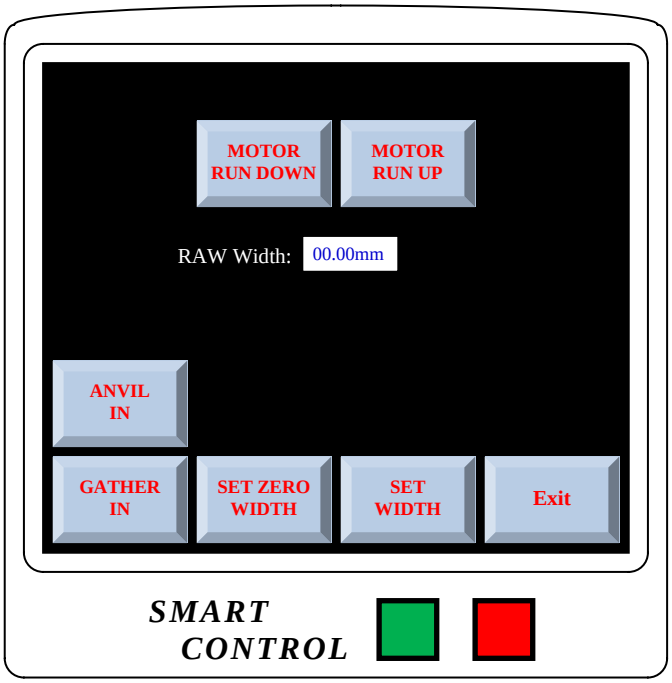
RAMP RATE - Touching this key changes the factory default amplitude ramp rate. A high or excessive ramp rate can damage ultrasonic stack components. (Factory default setting is 50%)

LANGUAGE - Touching this key enables the user to change the systems language to English, Chinese or Spanish.

Height and Width Calibration



CALIBRATE HEIGHT SCREEN



CALIBRATE WIDTH SCREEN

NOTE

CAUTION - These screens are factory preset to the encoder supplied with the welding press at the time of shipment.

Adjustments and calibrations through these screens are only required if -

1. A new encoder is installed on an ultrasonic actuator or wire splicer.
2. Customer requires annual equipment calibration certification.

Contact the factory service department for encoder replacement procedures, instructions or, to setup factory or site calibration service.

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 customer's 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.

SmartControl Compatible Ultrasonic Metal Welding Machines

NOTE: *Please contact the factory for specific metal welding machine manuals.*

MWA40, MWA20 and MWA15 Ultrasonic Actuators

- ✓ 40 kHz, 20 kHz and 15 kHz Frequencies

MWB40, MWB20 and MWB15 Ultrasonic Presses

- ✓ 40 kHz, 20 kHz and 15 kHz Frequencies
- ✓ Shown with Optional Tabletop Base

MWS20 Ultrasonic Wire Splicer

- ✓ 20 kHz Frequency

MWT20 Ultrasonic Tube Sealer

- ✓ 20 kHz Frequency

APPENDIX

PLC I/O Interface Connection Table

See pages 11 and 12 for low profile and high profile power supply chassis 25 pin D-Connector positions.

PIN	DESCRIPTION
1	Ground
2	Ready - OUT
3	Auxiliary #1 - IN
4	No Connection
5	Auxiliary #2 - IN
6	Height Error - OUT
7	Auxiliary #3 - IN
8	Palm Button #1
9	Auxiliary #4 - IN
10	Palm Button #2
11	Emergency Stop - IN
12	Ground
13	Ground
14	Auxiliary #1 - OUT
15	Emergency Stop - OUT
16	Auxiliary #2 - OUT
17	Auxiliary #5 - IN
18	Auxiliary #3 - OUT
19	Auxiliary #6 - IN
20	Auxiliary #4 - OUT
21	Auxiliary #7 - IN
22	Keyed
23	External Reset - IN
24	Ground