Original Instructions
1020978 - REV. 00

EMERSON

GCX
Ultrasonic Generator

Instruction Manual

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BRANSON

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1.1 Manual Change Information

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

Information concerning any improvements will be added to the appropriate manual section(s) at the next printing. Therefore, when requesting service assistance for specific units, refer to the revision level of this manual.

1.2 Warranty

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

1.3 Regulatory Compliance

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

This product meets RoHS2.

1.4 Warnings

WARNING	
	Ultrasonic Power supplies produce high voltage. Before working on an ultrasonic power supply, do the following: 1. Turn off the ultrasonic power supply and unplug AC voltage; and 2. Remove the cover and allow at least 1 minute for capacitors to discharge.

WARNING	
	Transducer (elements) can hold a high voltage charge. Before troubleshooting or making repairs, discharge voltage by momentarily shorting pins A and B of the RF connector that plugs into the ultrasonic power supply.

1.5 About This Manual

This manual contains instructions for installing, operating and maintaining GCX Ultrasonic Power Supply.

At the back of the manual you will find Appendices containing documentation including wiring schematics, plumbing schematics and assembly drawings.

The following definitions apply in this manual:

WARNING	
	If these risks are nor avoided, death or severe injury might result.

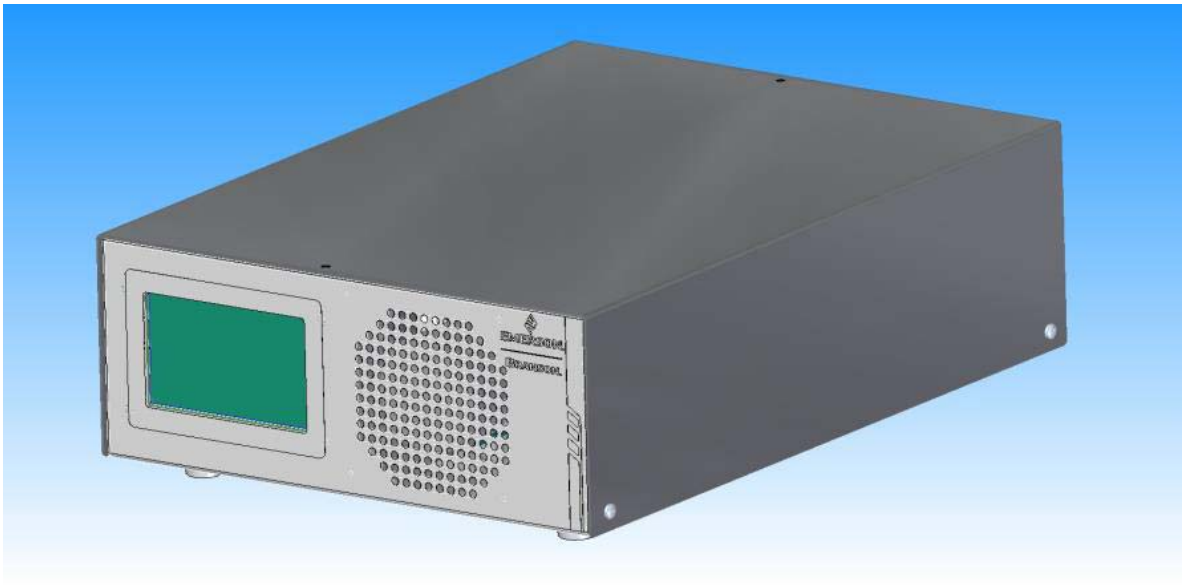
CAUTION	
	If these risks are not avoided, slight or minor injury might result.

NOTICE	
	If this situation is not avoided, the system or something in its vicinity might get damaged. Application types and other important or useful information are emphasized.

PN indicates Part Number.

Part(s) indicates your workpiece or component to be cleaned.

Figure 1.1 GCX Ultrasonic Power Supply



1.6 General System Description

GCX Ultrasonic Power Supplies deliver ultrasonic electrical energy at 25 kHz, 40 kHz, 80 kHz, 120 kHz or 170 kHz (depending on the model) to an ultrasonic cleaning system. A typical system consists of an ultrasonic power supply and a cleaning tank or immersible. Optional full feature or OEM feature allow the generator to be configured and operated remotely.

NOTICE	
	GCX ultrasonic power supplies only work with Branson ultrasonic equipment (tanks and immersible transducers).

1.6.1 Ultrasonic Power Supply Models

Table 1.1 Ultrasonic Power Supply Models

Part Number	Model	Voltage	Nominal Power level	Number of elements	Standard Groupings
1021313	GCX-25-12	208V~230 VOLT	500W	12	1x12 or 2x6
1021314	GCX-25-18	208V~230 VOLT	750W	18	1x12&1x6 or 3x6
1021315	GCX-25-24	208V~230 VOLT	1000W	24	2x12 or 4x6
1021316	GCX-25-36	208V~230 VOLT	1500W	36	3x12 or 6x6
1021317	GCX-25-48	208V~230 VOLT	2000W	48	4x12 or 8x6
1021318	GCX-40-6	208V~230 VOLT	250W	6	1x6
1021319	GCX-40-12	208V~230 VOLT	500W	12	1x12 or 2x6
1021320	GCX-40-18	208V~230 VOLT	750W	18	1x12&1x6 or 3x6
1021321	GCX-40-24	208V~230 VOLT	1000W	24	2x12 or 4x6
1021322	GCX-40-36	208V~230 VOLT	1500W	36	3x12 or 6x6
1021323	GCX-40-48	208V~230 VOLT	2000W	48	4x12 or 8x6
1021324	GCX-80-12	208V~230 VOLT	500W	12	1x12 or 2x6
1021325	GCX-80-18	208V~230 VOLT	750W	18	1x12&1x6 or 3x6
1021326	GCX-80-24	208V~230 VOLT	1000W	24	2x12 or 4x6
1021327	GCX-120-12	208V~230 VOLT	500W	12	1x12 or 2x6

Table 1.1 Ultrasonic Power Supply Models

Part Number	Model	Voltage	Nominal Power level	Number of elements	Standard Groupings
1021328	GCX-120-18	208V~230 VOLT	750W	18	1x12&1x6 or 3x6
1021329	GCX-120-24	208V~230 VOLT	1000W	24	2x12 or 4x6
1021330	GCX-170-12	208V~230 VOLT	500W	12	1x12 or 2x6
1027407	GCX-25-12	110V~120 VOLT	500W	12	1x12 or 2x6
1027408	GCX-40-12	110V~120 VOLT	500W	12	1x12 or 2x6

1.6.2 Options

Table 1.2 Power Supply Options

Part Number	Type	Description
1020220	Power Line	POWER LINE UL GCX
1020217	Power Line	POWER LINE 3C GCX
1020218	Power Line	POWER LINE PSE GCX
1020219	Power Line	POWER LINE VDE GCX
1021210	FULL I/O	KIT FULL I/O GCX
1027536	OEM I/O	KIT OEM I/O GCX

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2.1 Introduction

Operating the ultrasonic power supply requires that you become familiar with the power supply touchscreen setting and peripheral port function.

2.2 Front Panel

Figure 2.1 GCX Front Panel

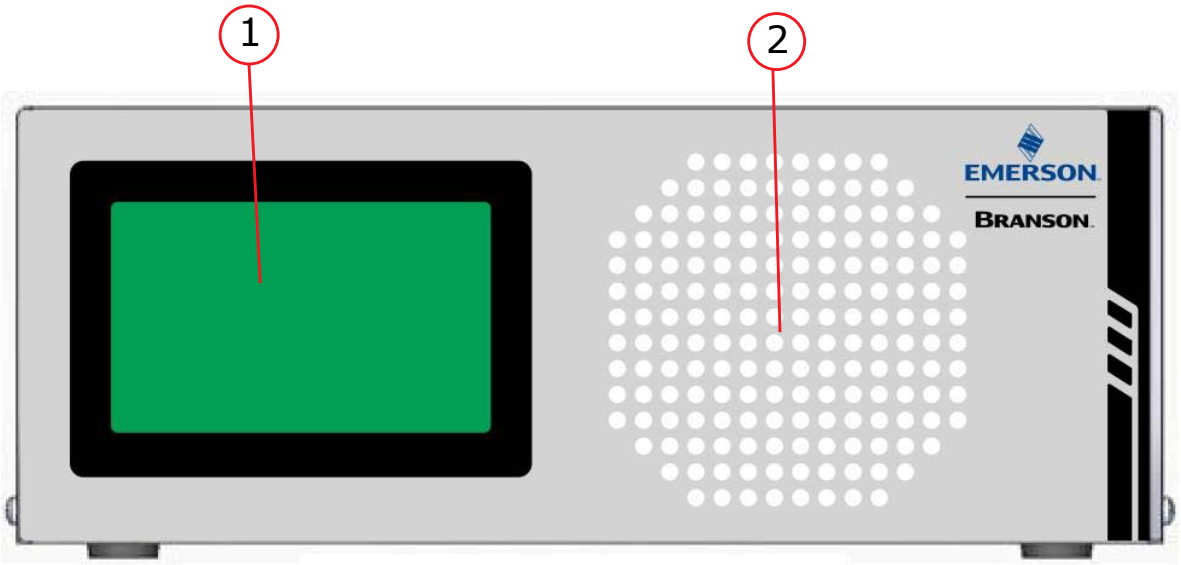

Table 2.1 GCX Front Panel

Item No.	Description	Function
1	Touch screen	Operates the system.
2	Vent	System ventilation and heat dissipation.

2.3 Back Panel

Figure 2.2 GCX Back Panel – Full I/O

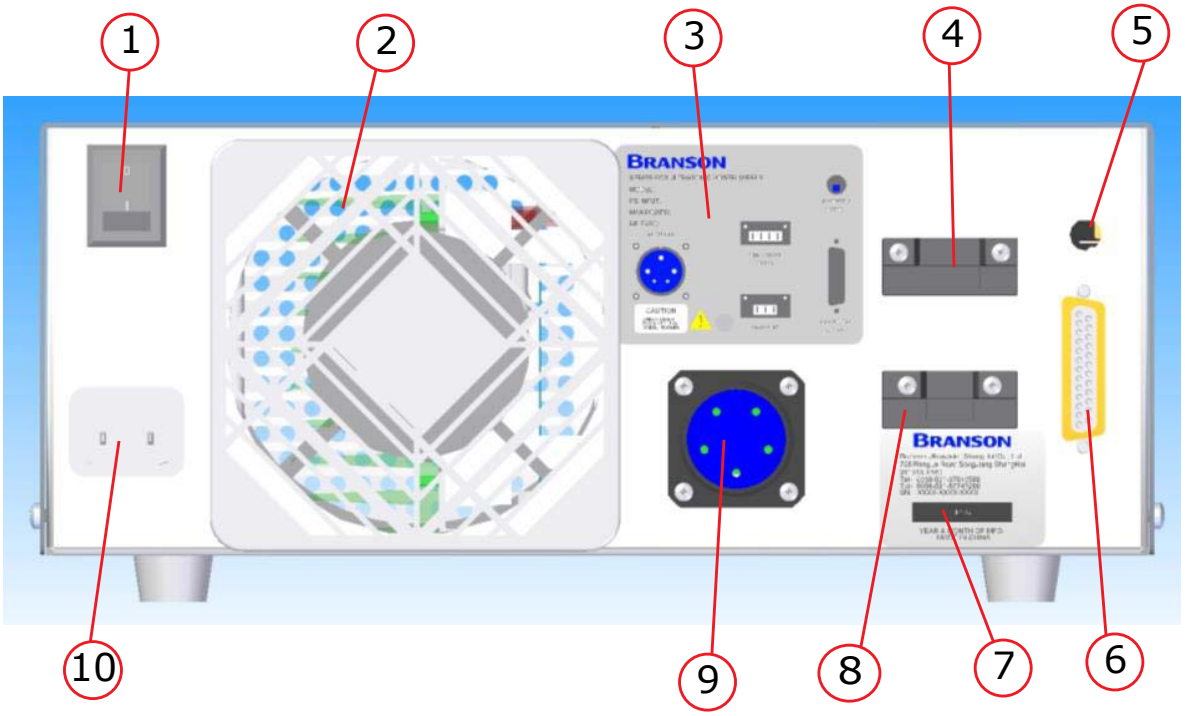

Table 2.2 GCX Back Panel – Full I/O

Item	Description	Function
1	Main On/Off Switch	Switches on AC power to the ultrasonic power supply.
2	Fan	Cools the ultrasonic power supply by exhausting hot air.
3	Product Label	Displays product information, such as power level, frequency, and serial no.
4	OEM Communication (N/A)	External control ultrasonic ON/OFF and external Lock (Unavailable).
5	Local/Remote switch SW1	Allows switching between local and remote operation.
6	I/O 25-pin D-shell connector (I/O option only).	Provides connection of cable from ultrasonic power supply to external controller.
7	Branson Label	Displays Branson China company information.
8	RS485 Communication	Display the current time and power.
9	RF Connector	For connecting the RF cable to the ultrasonic power supply from a tank or immersible transducers.
10	Input AC Connector	Connects ultrasonic power supply to AC power.

Figure 2.3 GCX Back Panel – OEM I/O

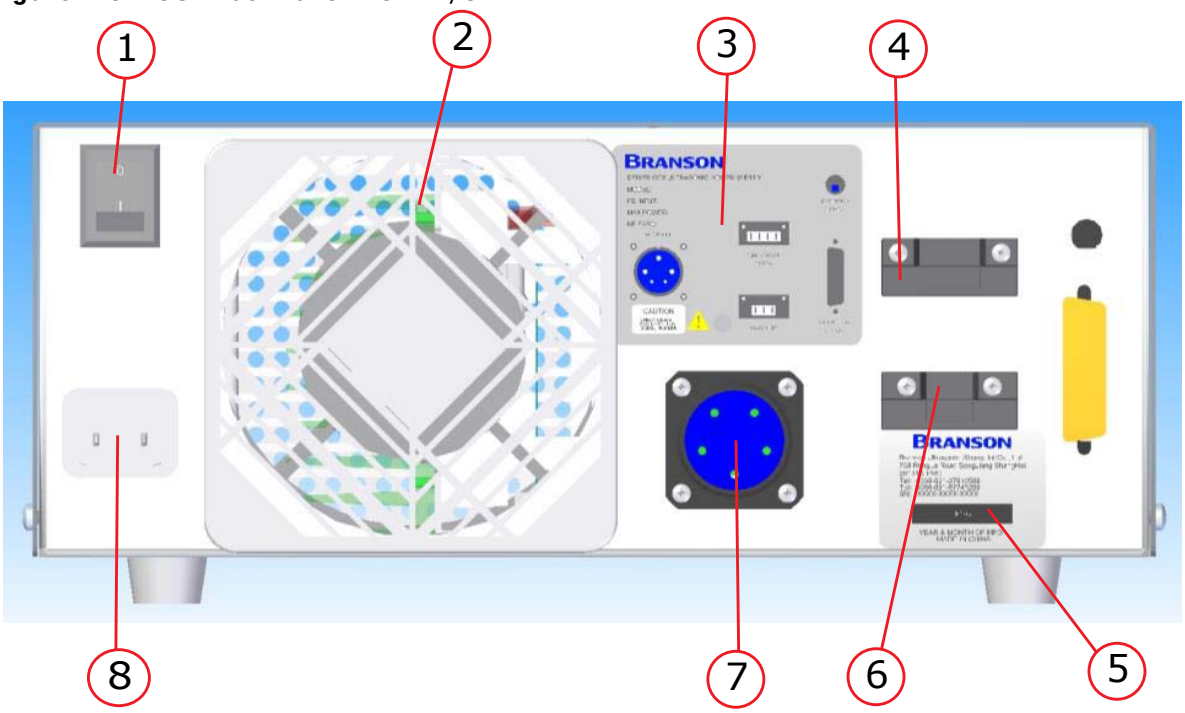

Table 2.3 GCX Back Panel – OEM I/O

Item	Description	Function
1	Main On/Off Switch	Switches on AC power to the ultrasonic power supply.
2	Fan	Cools the ultrasonic power supply by exhausting hot air.
3	Product Label	Displays product information, such as power level, frequency, and serial no.
4	OEM Communication	External control ultrasonic ON/OFF and external Lock.
5	Branson Label	Displays Branson China company information.
6	RS485 Communication	Display the current time and power.
7	RF Connector	For connecting the RF cable to the ultrasonic power supply from a tank or immersible transducers.
8	Input AC Connector	Connects ultrasonic power supply to AC power.

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3.1 Installation Overview

This section contains a sequence of tasks you must follow to ensure proper installation of your ultrasonic power supply and ultrasonic tank. These tasks include:

1. Unpacking the ultrasonic power supply.
2. Choosing a suitable location for the ultrasonic power supply.
3. Matching ultrasonic equipment (ultrasonic power supply to tanks and immersible transducers).
4. Connecting the ultrasonic power supply.
5. Installing an ultrasonic tank.

3.2 Unpacking the Ultrasonic Power Supply

Unpack the ultrasonic power supply as follows:

Table 3.1 Unpacking the Ultrasonic Power Supply

Step	Action
1	Unpack the ultrasonic power supply as soon as it arrives, using normal precautions to prevent damage.
2	Inspect the controls, indicators, and surface for damage.
3	Make sure that all switches are off.

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

3.3 Electrical Requirements

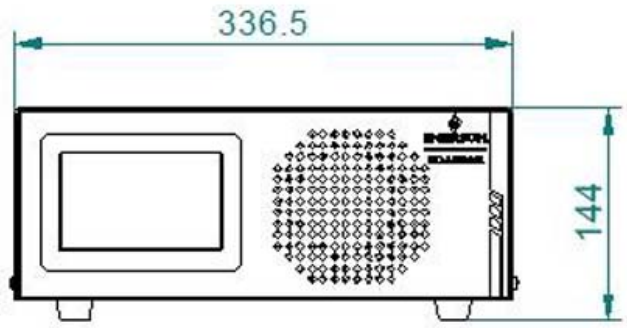
Standard line voltage: 187-253 VAC 50/60 Hz.

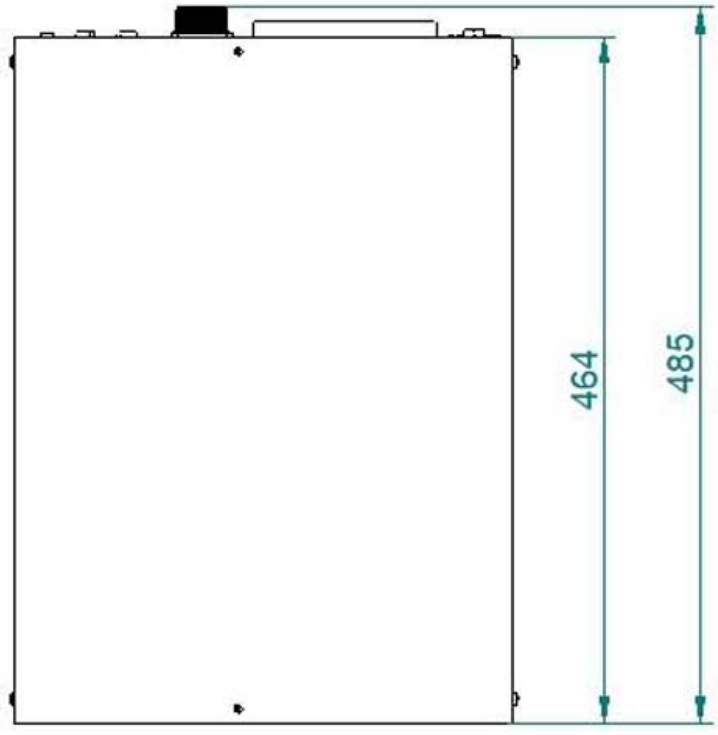
3.4 Locating the Ultrasonic Power Supply

Locate the ultrasonic power supply according to the following guidelines:

- Make sure the ambient air temperature where you locate and operate the ultrasonic power supply does not exceed 45°C (113°F)
- Make sure air flow to the fan is not obstructed
- Locate the ultrasonic power supply in an electrically non-conductive atmosphere
- Make sure to locate the ultrasonic power supply in an area free from water spray, splashing, and dripping
- Ground the ultrasonic power supply receptacle in accordance with local building codes
- Allow sufficient clearance to access connectors on back of the ultrasonic power supply (7 in. minimum)
- Place the ultrasonic power supply on a horizontal, flat surface top near the tank or transducer in an area away from any heat sources

Figure 3.1 Ultrasonic Power supply Dimensions

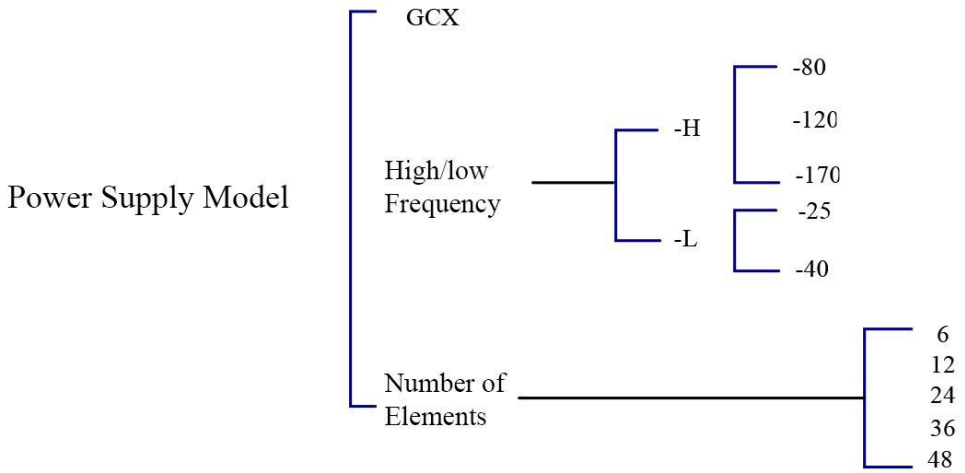




3.5 Matching Ultrasonic Equipment

Make sure to match the elements of the cleaning tank or immersible connected to the GCX generator.

Figure 3.2 Translating Model Numbers



Examples： GCX-L-2524
GCX-H-17012

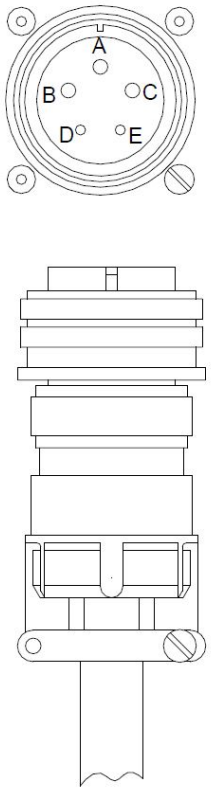
3.6 Connecting the Ultrasonic Power Supply

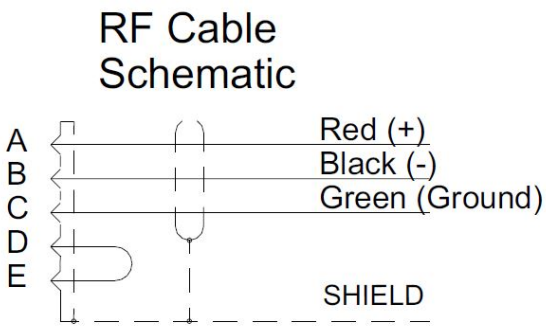
Connect the ultrasonic power supply as follows:

Table 3.2 Connecting the Ultrasonic Power Supply

Step	Action
1	Make sure that the ultrasonic power supply is unplugged from the AC voltage source.
2	Make sure the Main On/Off switch (located on the back panel) is off.
3	Align the notch of the RF cable and the slot of RF connector on the back panel (Figure 3.3 shows the alignment).
4	Plug the RF plug into the RF socket; secure the RF plug by threading the knurled ring and turning until the end of travel.

Figure 3.3 Alignment of RF Plug





Pin	Wire In
A	Red
B	Black
C	Green
D	Interlock
E	Interlock

NOTICE	
	If the RF connector is not fully engaged by the knurl ring, the External Lock alarm will light.

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4.1 Overview

This section contains instructions for starting and operating the ultrasonic power supply and covers the following:

- Using the U/S switch to activate ultrasonics
- Setting the power level
- Using Power modulation mode to remove dissolved gases from the tank liquid
- Using Sweep mode to select the sweep speed and bandwidth
- Using the Rate switch to set sweep speed
- Using the Reset switch when tuning and when clearing a fault condition

The order of the topics above is the most common sequence used to operate the ultrasonic power supply.

4.2 Key Concepts

The following defines key concepts used when operating the ultrasonic power supply:

Line/load regulation – compensates for the tank liquid level and temperature changes as well as line and load variations. This maintains power to less than 3 percent change for consistent cleaning.

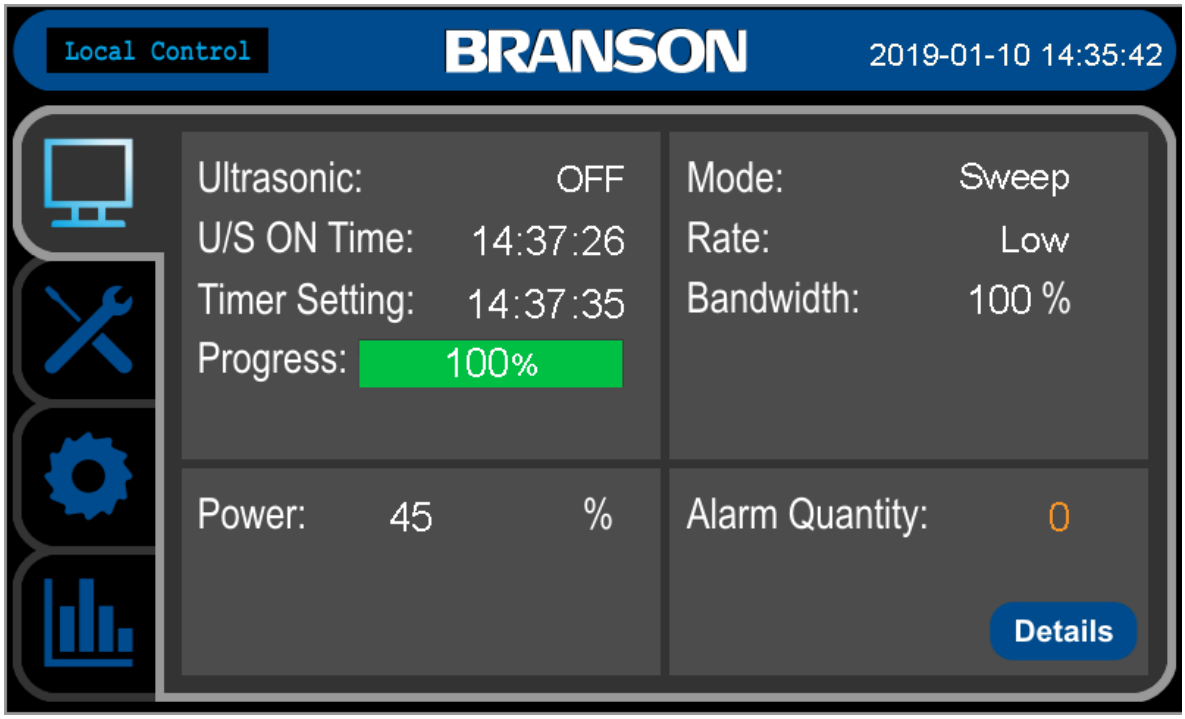
Auto frequency tracking – maintains optimum operating frequency around your application. Dynamically adjusts to your preset conditions regardless of changes in your operating environment.

Sweep mode – modulates the operating frequency above and below the ultrasonic power supply's tuned frequency by approximately 1000 Hz. This feature products a random wave-length pattern in the tank to improve energy distribution and cleaning effectiveness.

Power modulation – Changes the ultrasonic waveform to provide high amplitude to assist in cavitating viscous or difficult to cavitate liquids. The average power level is unchanged. Power modulation may be used to improve degassing in difficult to degas liquids.

4.3 Dashboard Screen

Figure 4.1 Dashboard Screen



This feature provides capability to have an overview of Current System Status as follow.

- Ultrasonic On/Off Indicator: On/Off
- Ultrasonic On Lasting Time Indicator: HH:MM:SS
- Timer Setting Display: HH:MM:SS
- Progress Bar: XX% (U/S on lasting time/Timer Setting)
- Current U/S mode: Normal/Sweep/Power Modulation
- Sweep Rate: Low / High
- Sweep Bandwidth setting: 1 - 100 %
- Power Percentage Display: 20 - 100 %
- Alarm Quantity Display: 0~6
- Detail Alarm Information Entry: “Details” button
- Setting Screen

4.4 Ultrasonic Switch

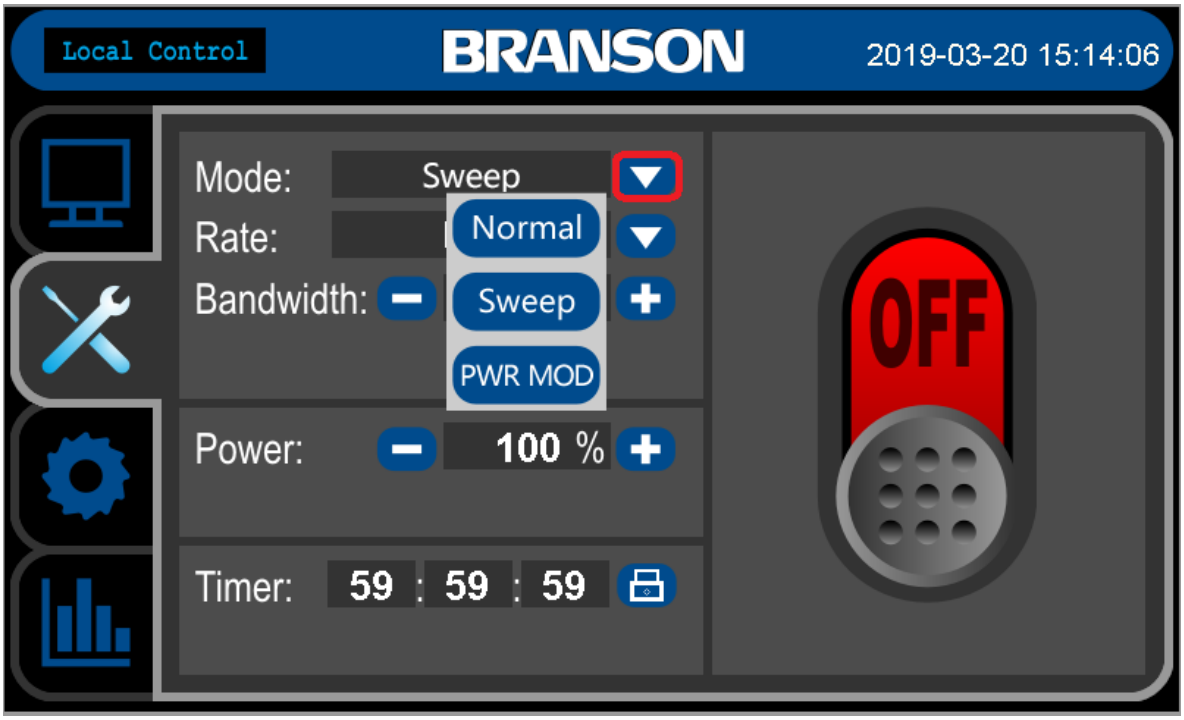
There is a switch on the right of the Setting screen to turn on/off the ultrasonic generation.

Figure 4.2 Setting Screen-Ultrasonic Switch

4.4.1 Mode

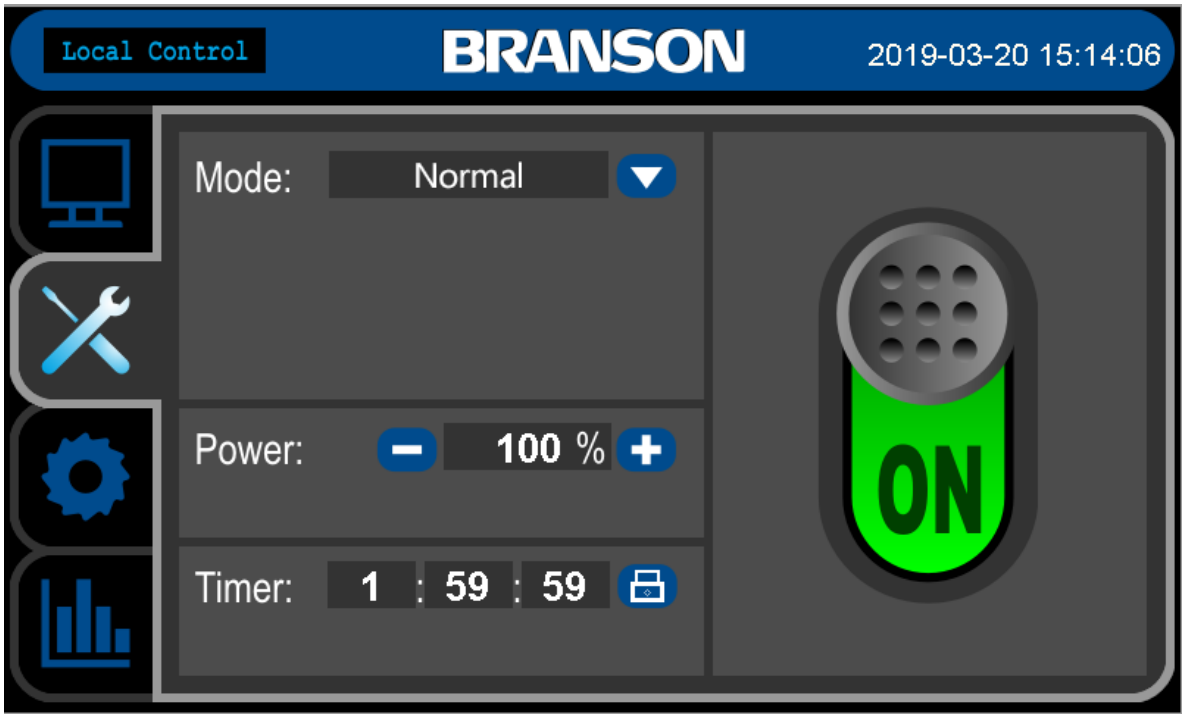
There are three modes to be selected: Normal, Sweep and PWR MOD. Touch button on the right of "Mode" to list three modes and select. The generator must be off to enter the Mode Selection.

Figure 4.3 Setting Screen-Mode

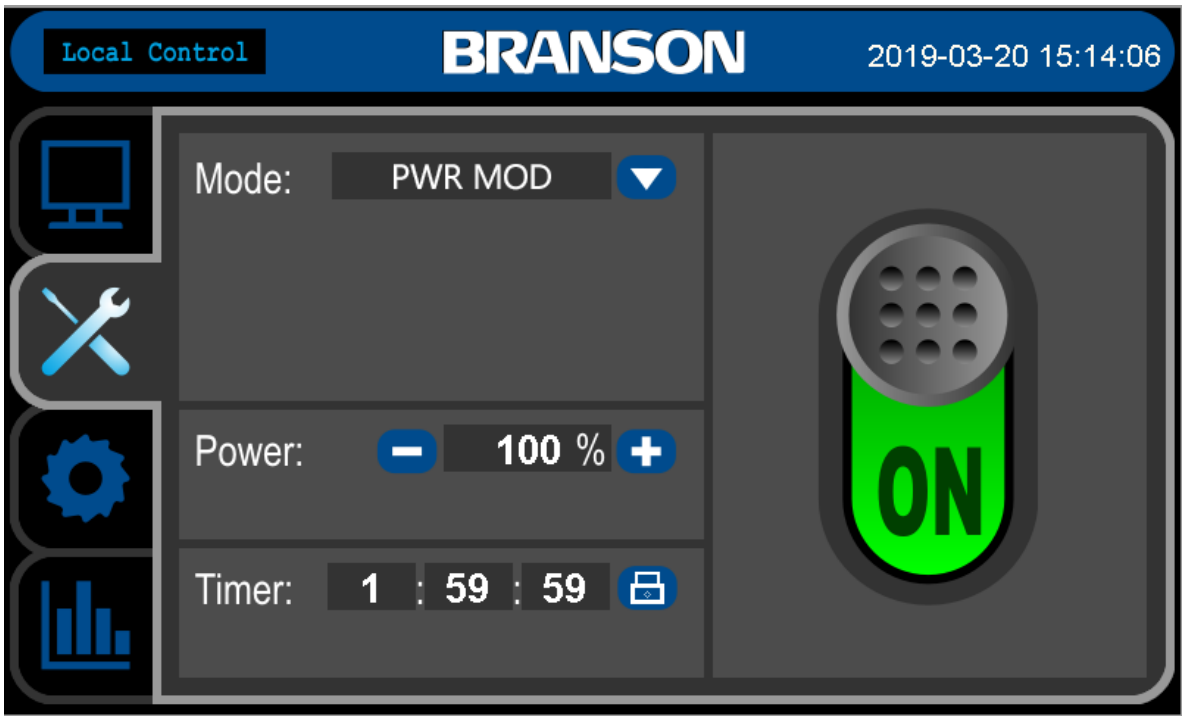


1. Normal Mode

This mode is used when you need to fix the system frequency.



2. Power Modulation Mode

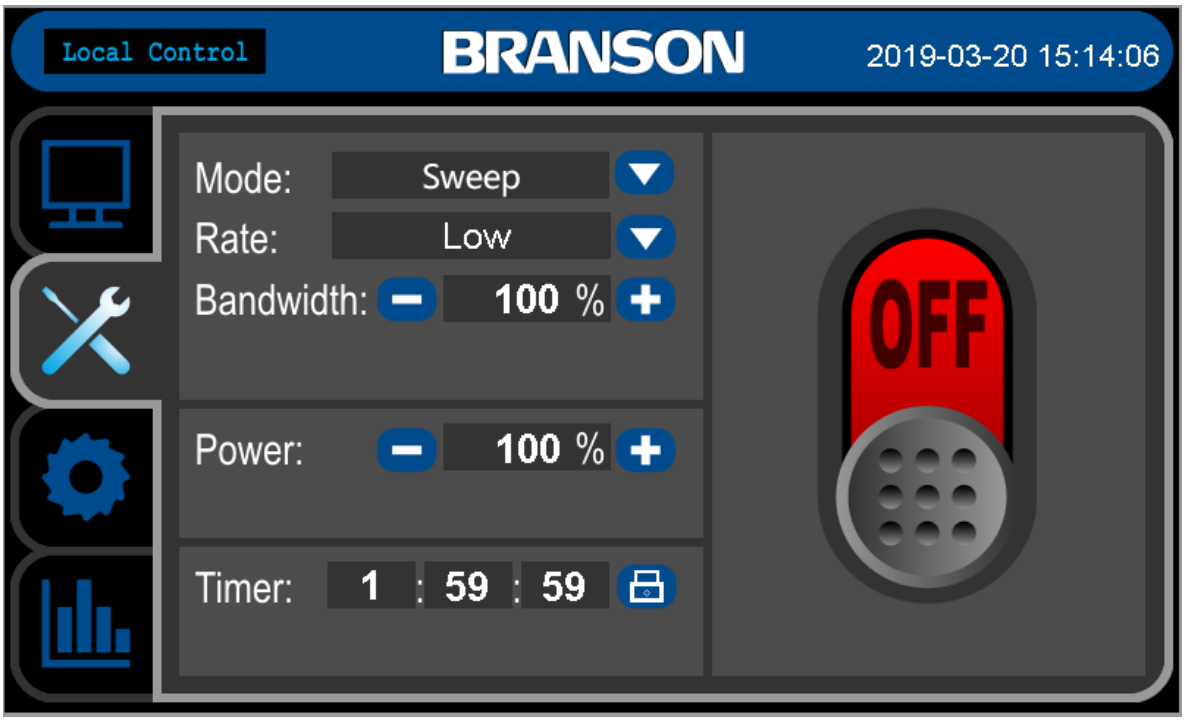


Power modulation creates power bursts at a 4 : 1 ratio between peak power and the average power. When not in power modulation, the ratio between the peak and average

power is 2:1. This feature is helpful when working with liquids that are normally difficult to cavitate such as semi-aqueous solutions.

- The generator must be off to enter the power modulation mode
- Sweep will be inactive in the power modulation mode

3. Sweep Mode

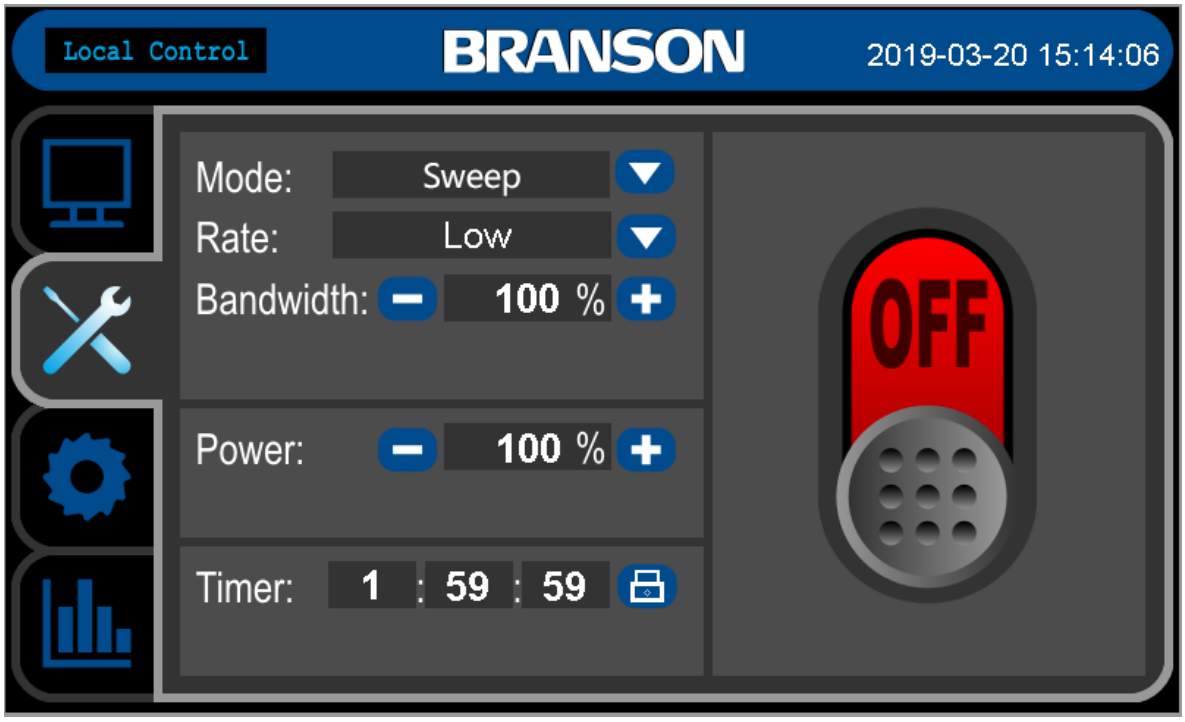


Sweep Mode allows the ultrasonic power supply to operate above and below the operating frequency. In Sweep mode, the operating frequency constantly changes, sweeping from 1000 Hz below to 1000 Hz above the operating frequency. This helps cleaning activity in the tank.

When Sweep mode is selected, Sweep Rate and Sweep Bandwidth could be set as below:

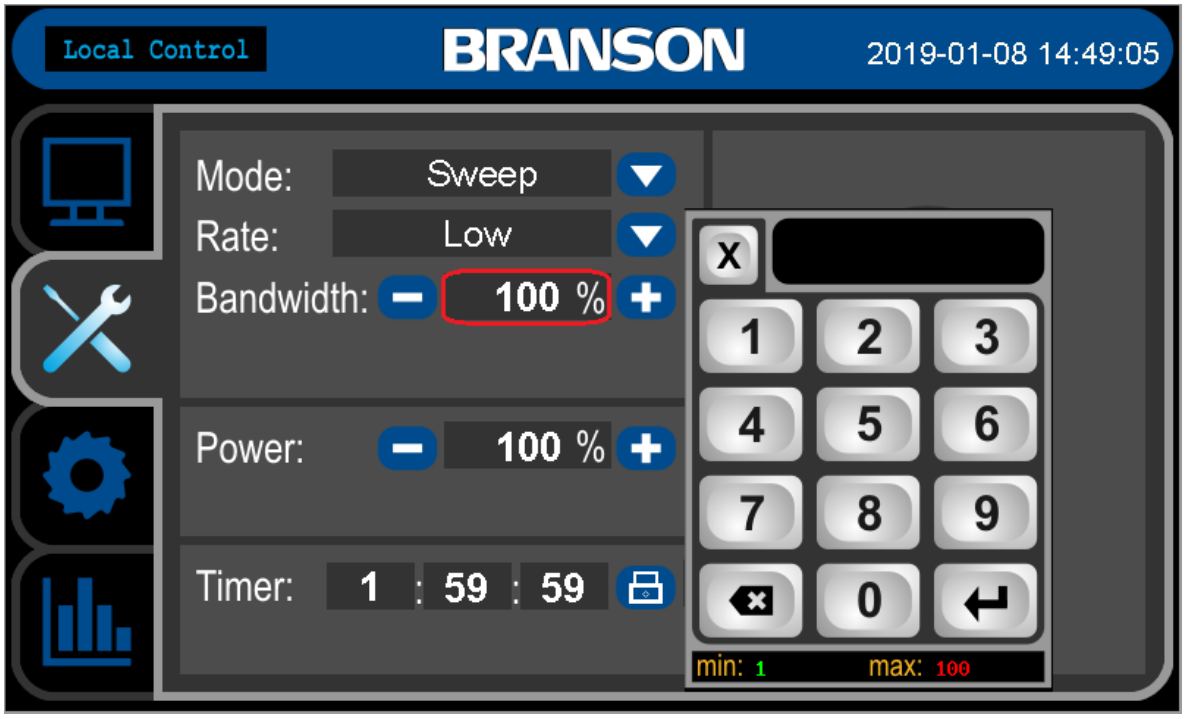
4. Sweep Rate

Sweep rate could be set as low or high. Touch button on the right of "Rate" to select the desired rate:



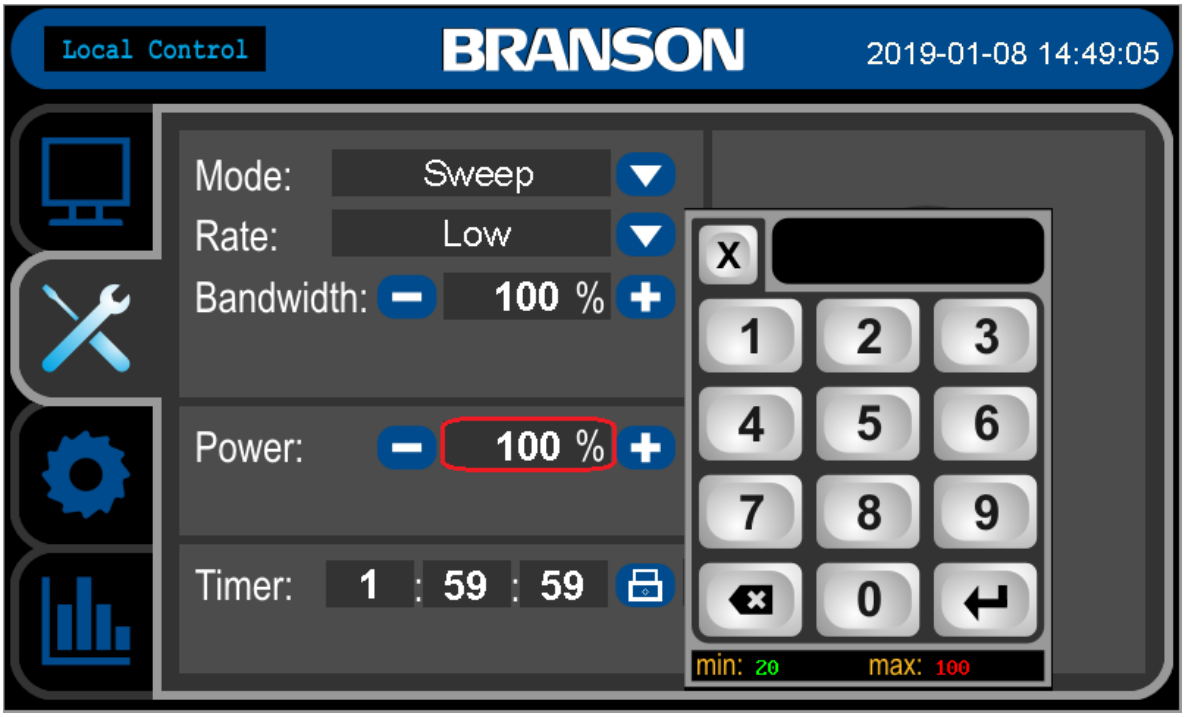
5. Sweep Bandwidth

Touch the value area, a keyboard will pop up. Input the range of power percentage setting from 1to 100 and press or adjust the range by and buttons beside the "Bandwidth".



4.5 Ultrasonic Power Setting

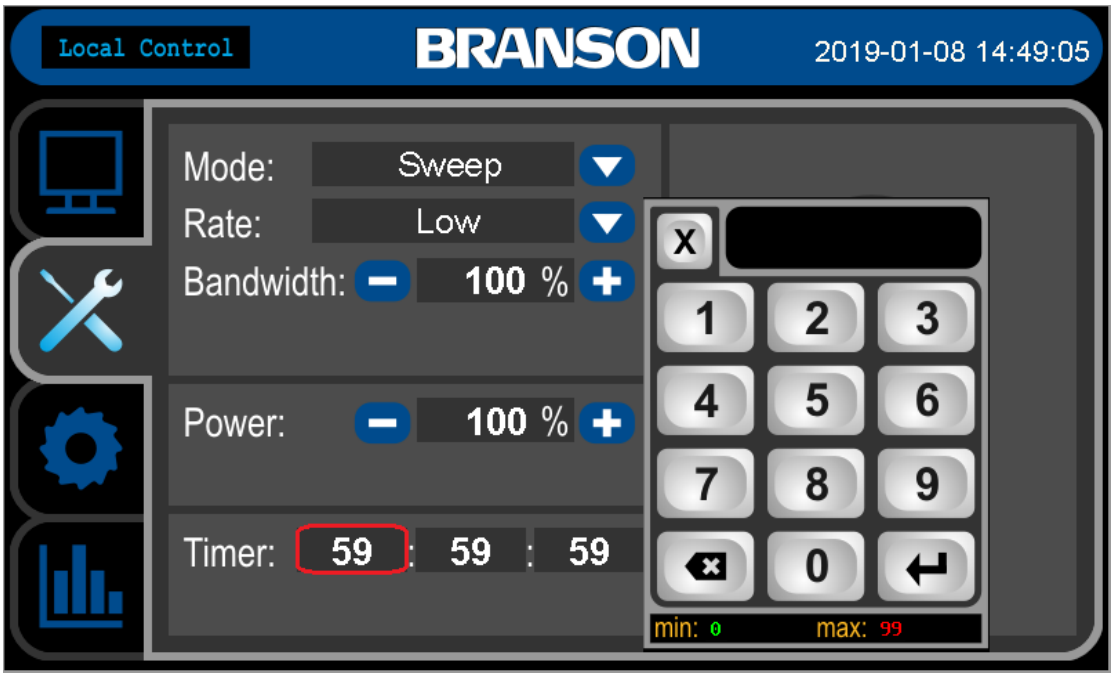
Touch the value area, a keyboard will pop up. Input the range of power percentage setting from 20 to 100 and press or adjust the range by and buttons beside the “Power”.



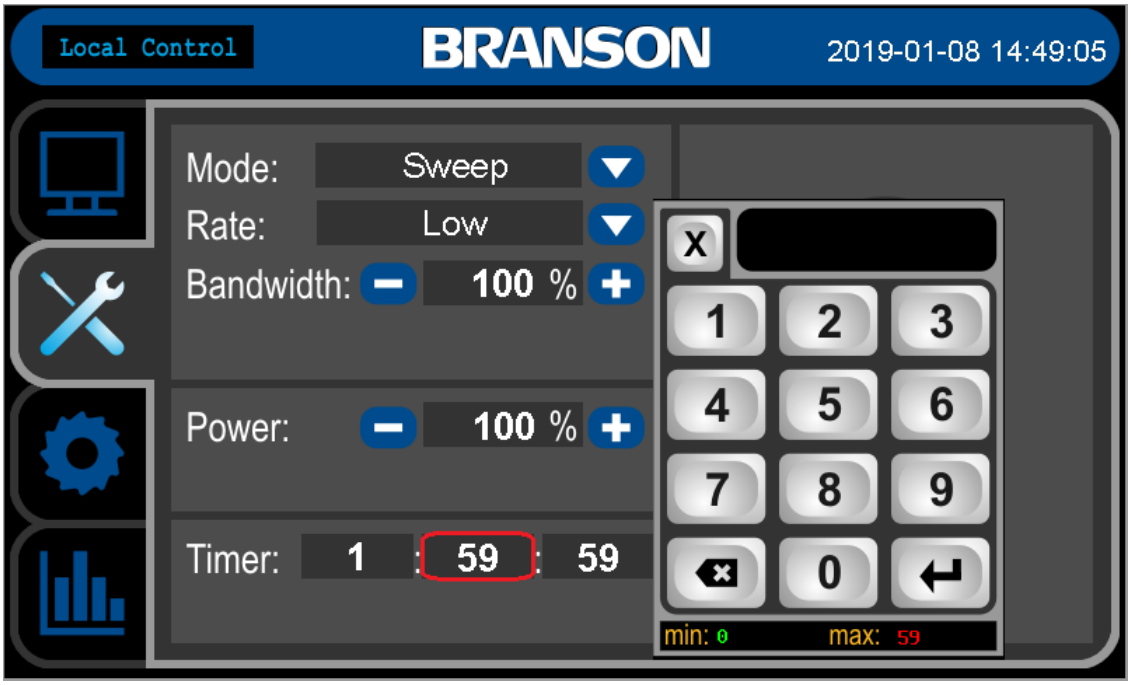
4.6 Timer

4.6.1 Timer Setting

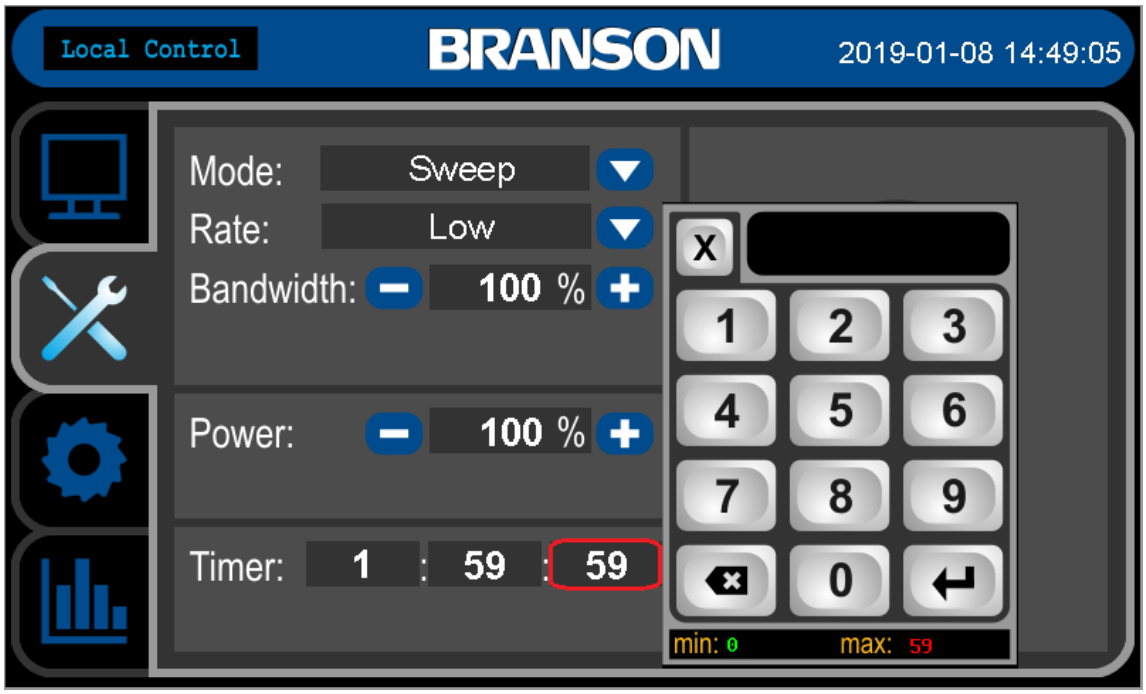
Touch the hour value area, a keyboard will pop up. Input the range of hour from 0 to 99.



Touch the minute value area, a keyboard will pop up. Input the range of minute from 0 to 59.

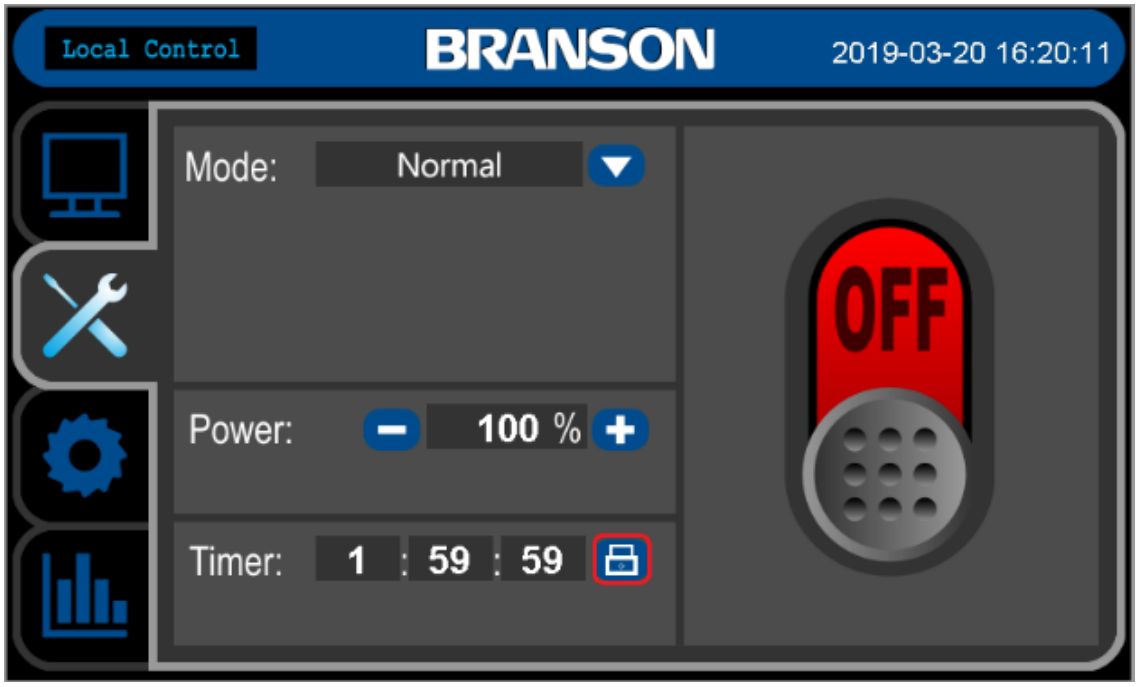


Touch the second value area, a keyboard will pop up. Input the range of second from 0 to 59.

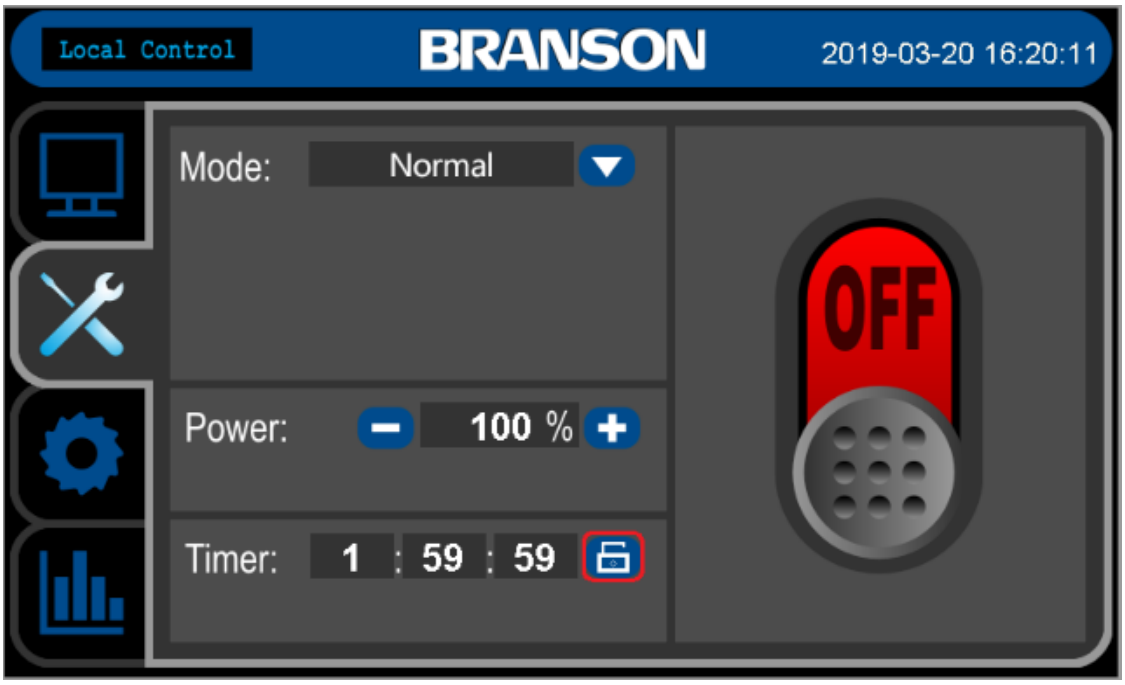


4.6.2 Timer Enable Switch

There is a switch on the right of the timer setting area as below:



Timer Disabled

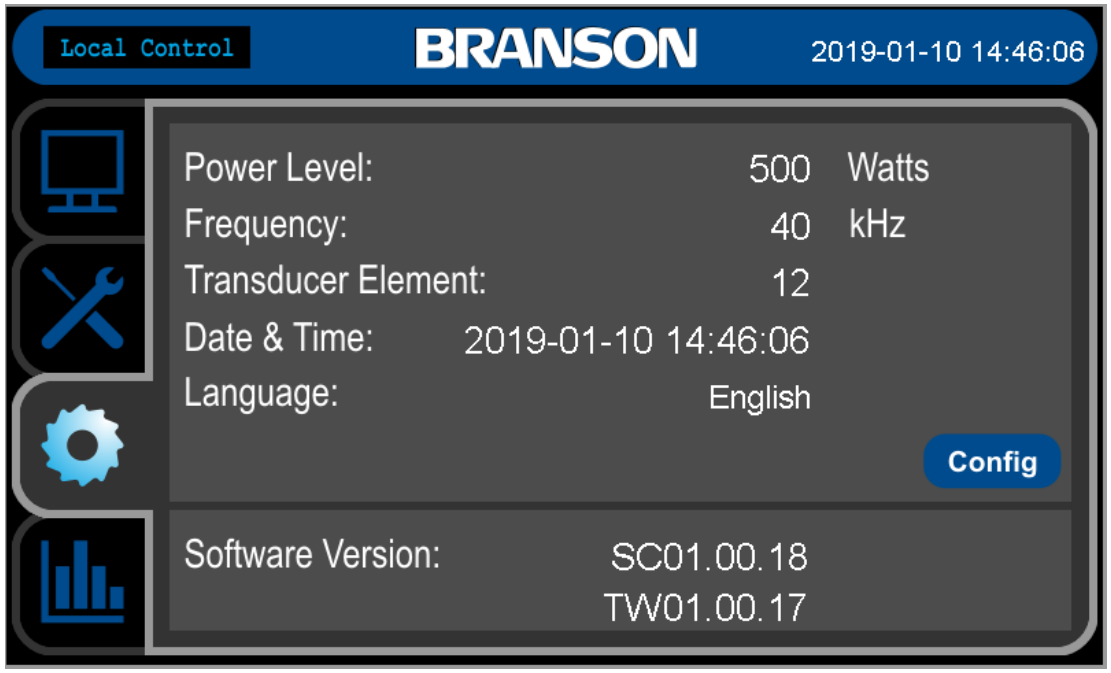


Timer Enabled

4.7 System

4.7.1 System Information

From this screen, below information could be seen:

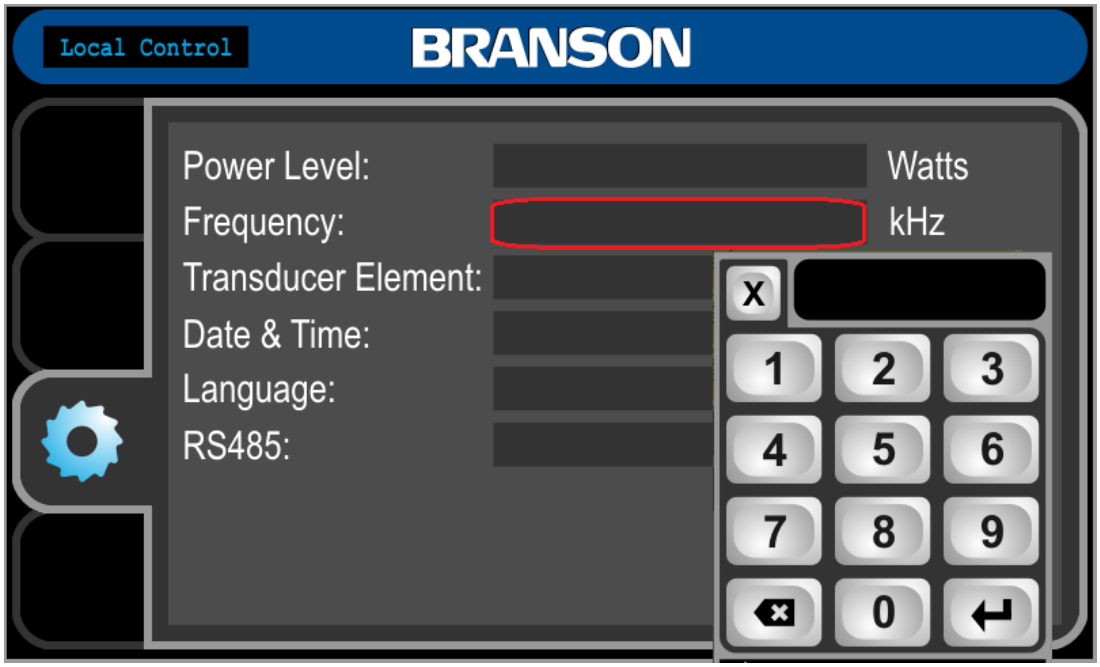


4.7.2 System Configuration

For system configuration, please contact Branson Service.

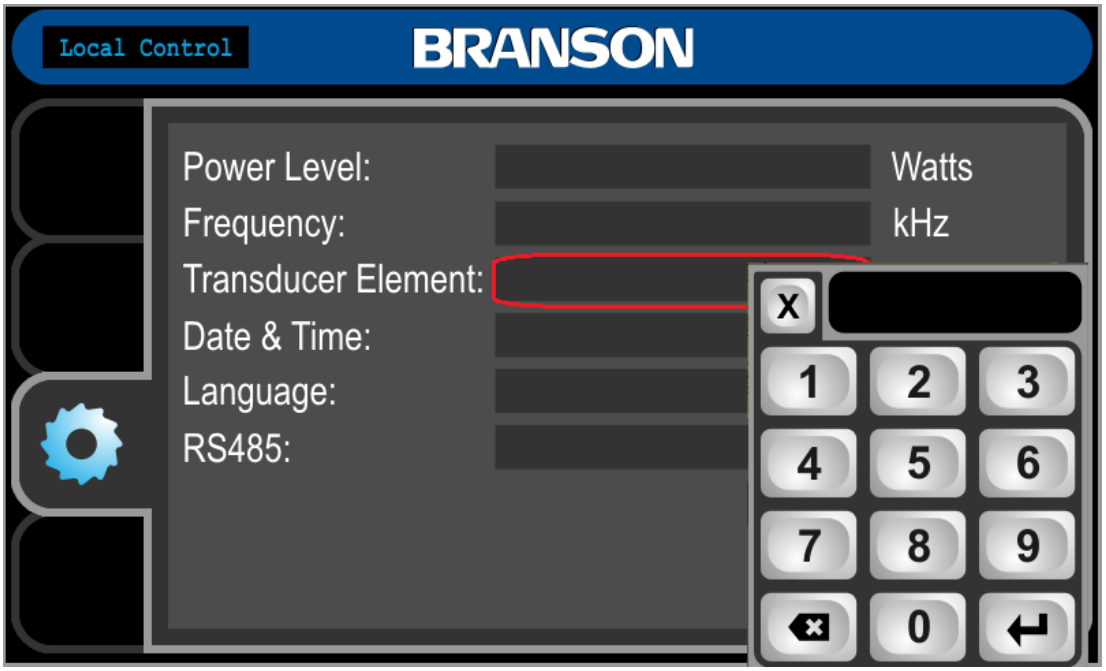
4.7.3 Frequency Setting

Touching below area in red frame could set the Frequency by kHz, such as 25, 40, 80…



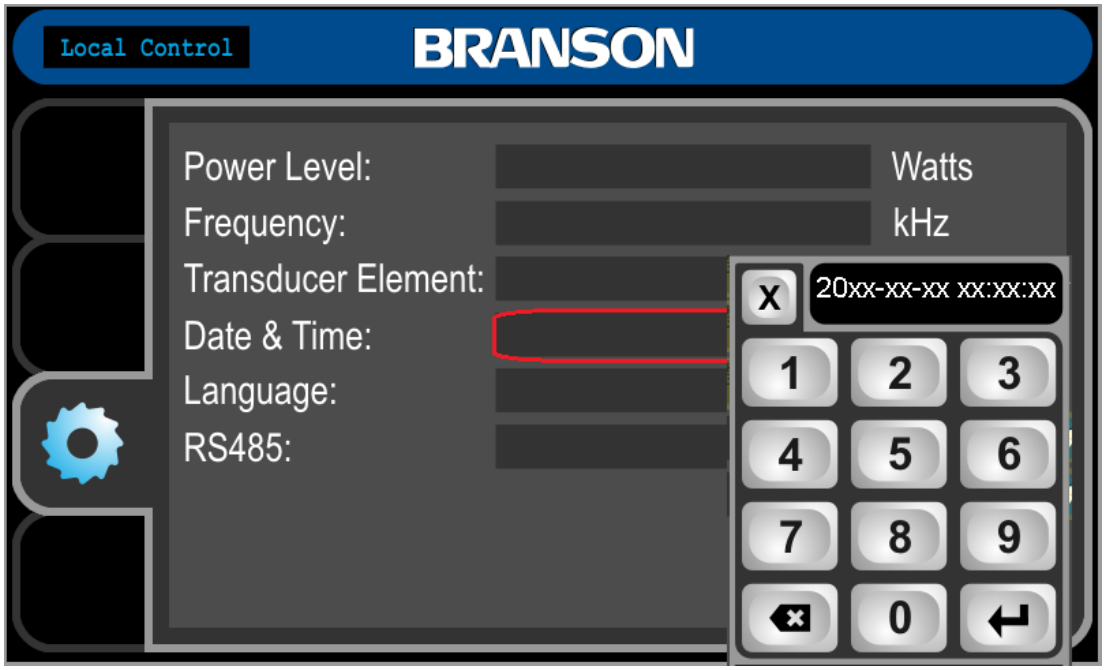
4.7.4 Transducer Element Setting

Touching below area in red frame could set the Transducer Element number, such as 12, 24…



4.7.5 Date and Time Setting

Touching below area in red frame could set the Date and Time.

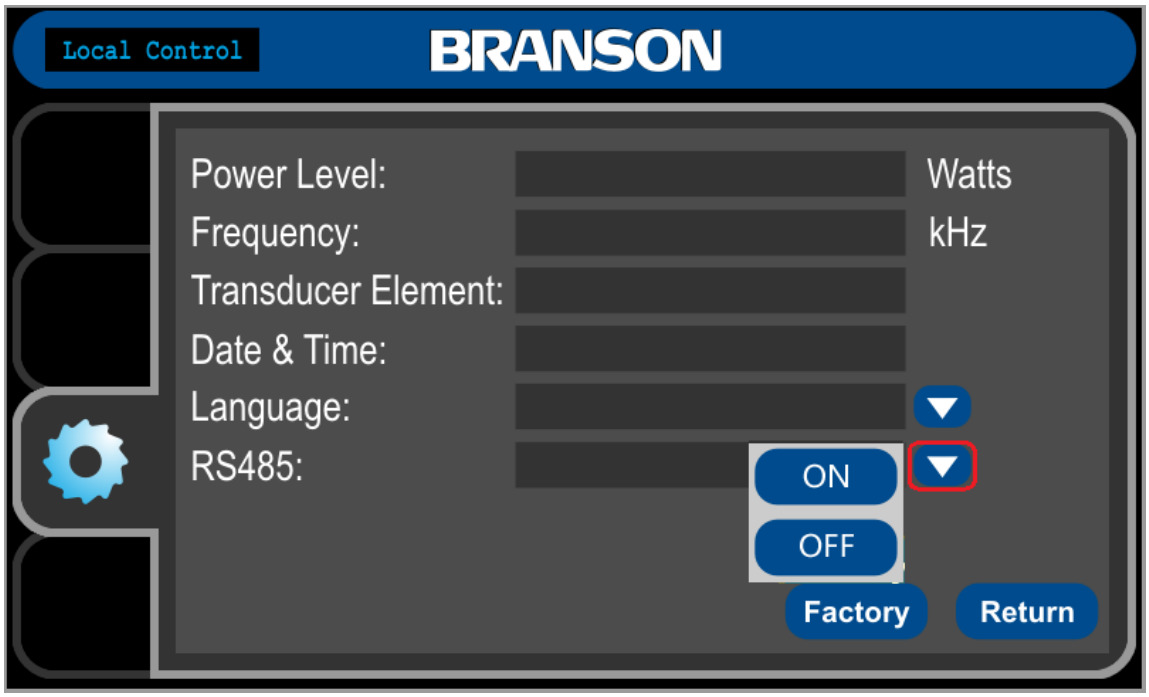


4.7.6 Language Selecting

Current system Language could be set as Chinese, English or Japanese. Touch button on the right of "Language" to select the desired language.

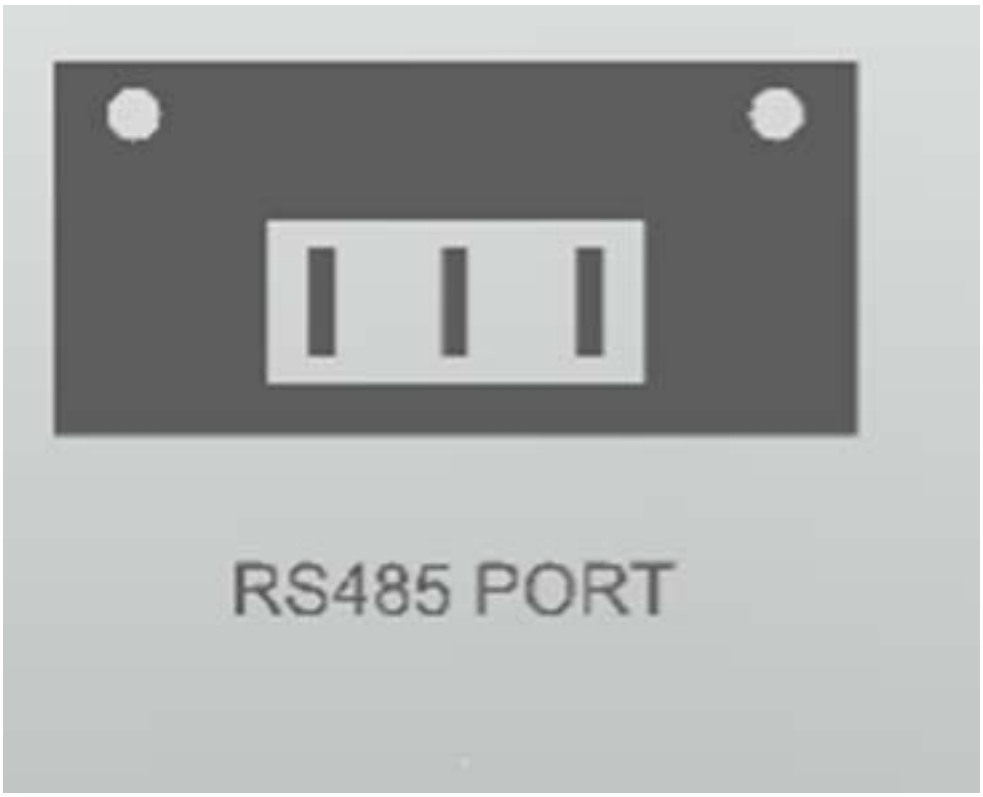
4.7.7 RS485 Output Switch

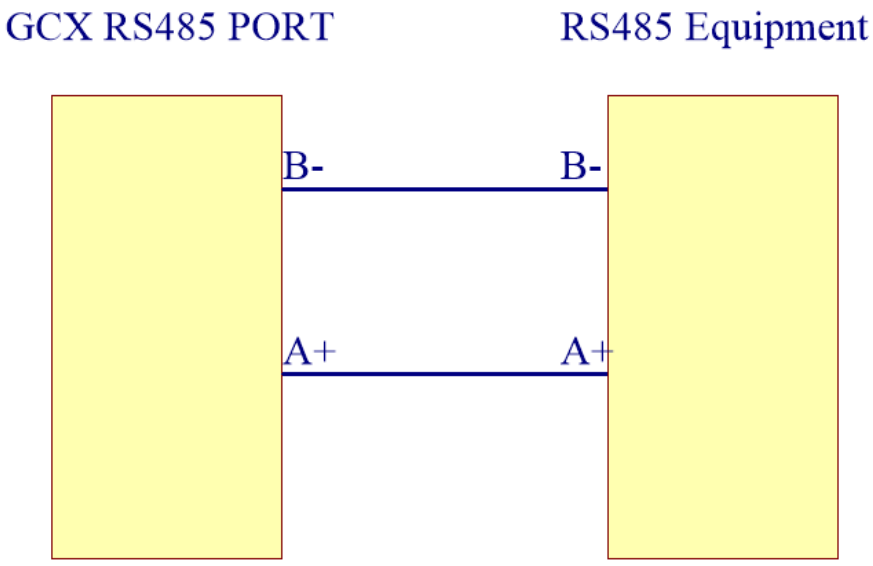
Power percentage and alarm information could be outputted through RS485. That function could be enabled/disabled by button on the right of RS485.



RS485 Communication

RS485 can output communication signal when its function is enabled in the front touch screen.



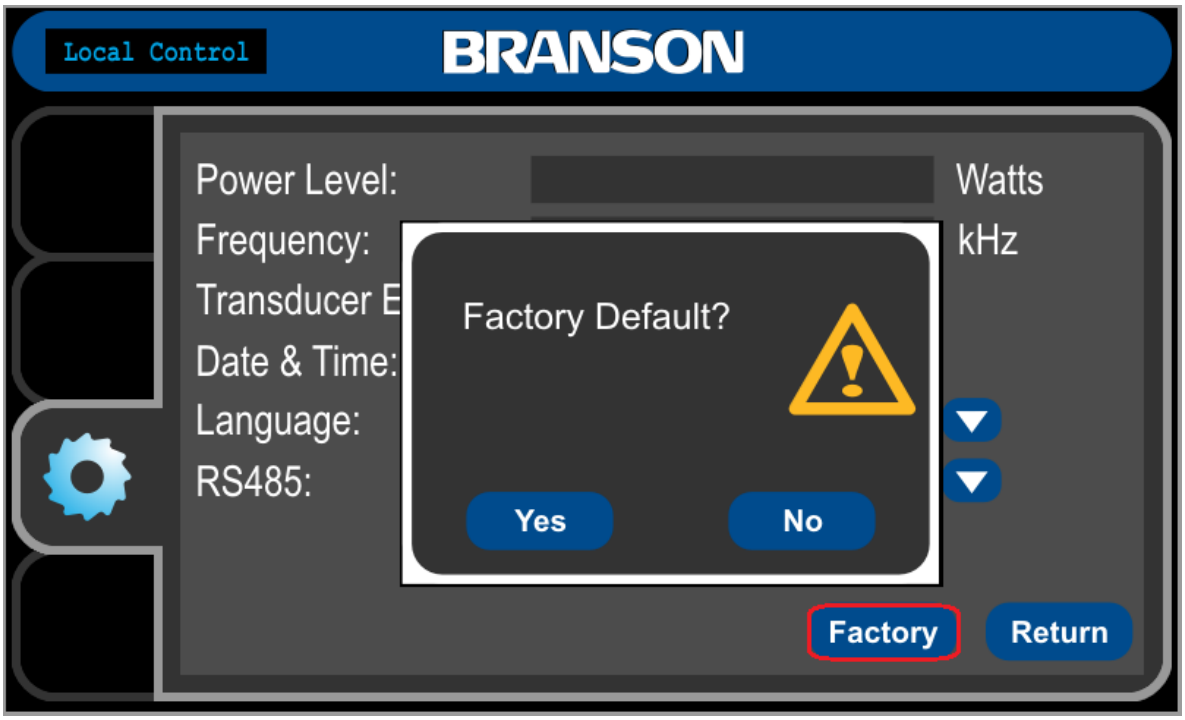


The communication baud rate of RS485 is 38400, 8 data bits, no check bit and the stop bit is 1.

What is communicated is time and power value.

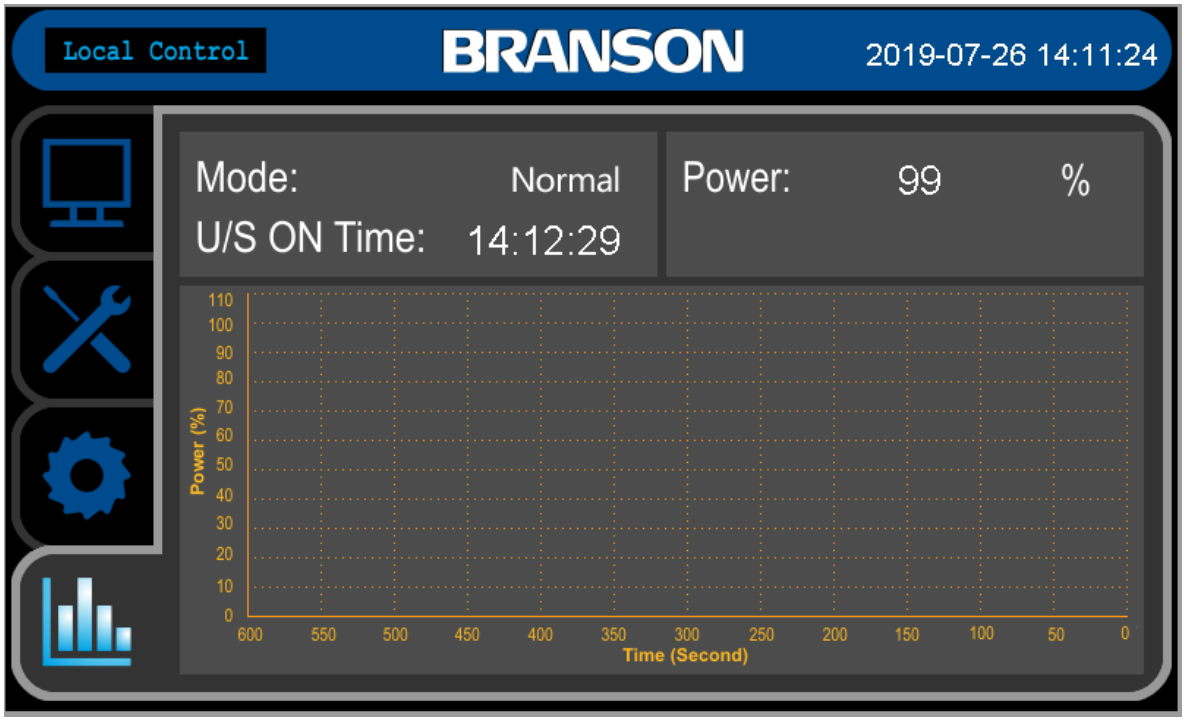
4.7.8 Factory Default

All system configuration could be reset to factory default value by below “Factory” button. Clicking “Yes” to confirm, or “No” to cancel.



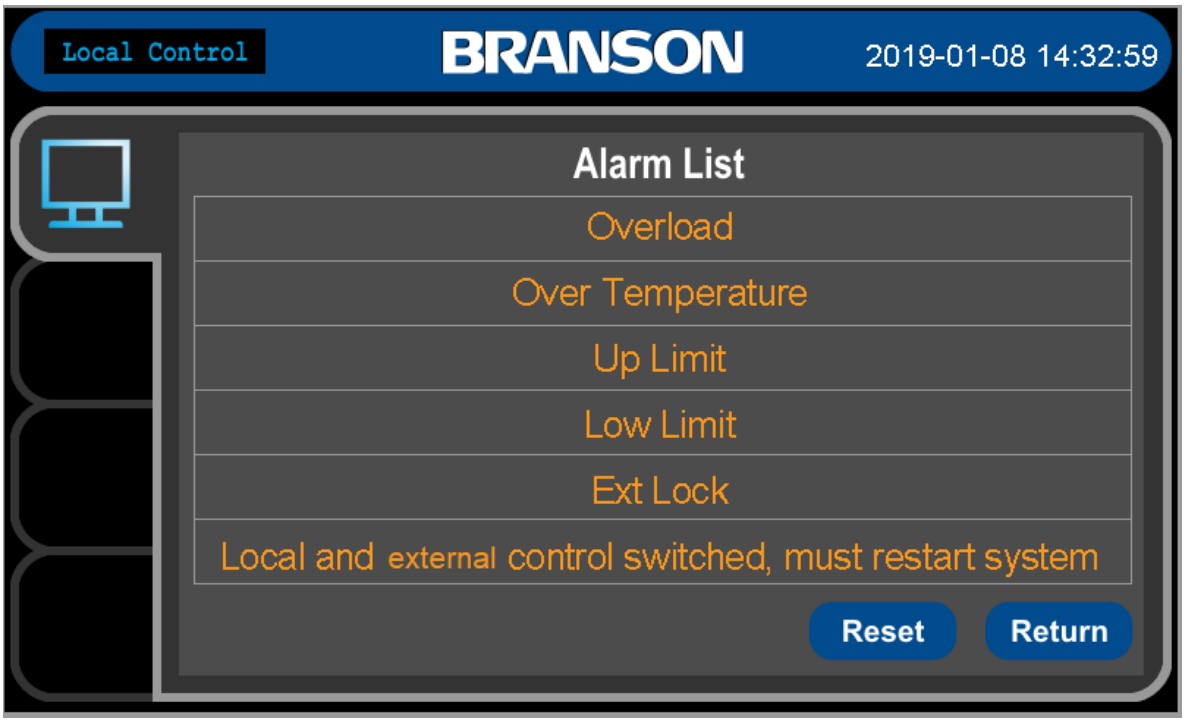
4.8 Power Graph

The graph is refreshed every 1 second. From this screen, user could see the power percentage history of the last 600 seconds.



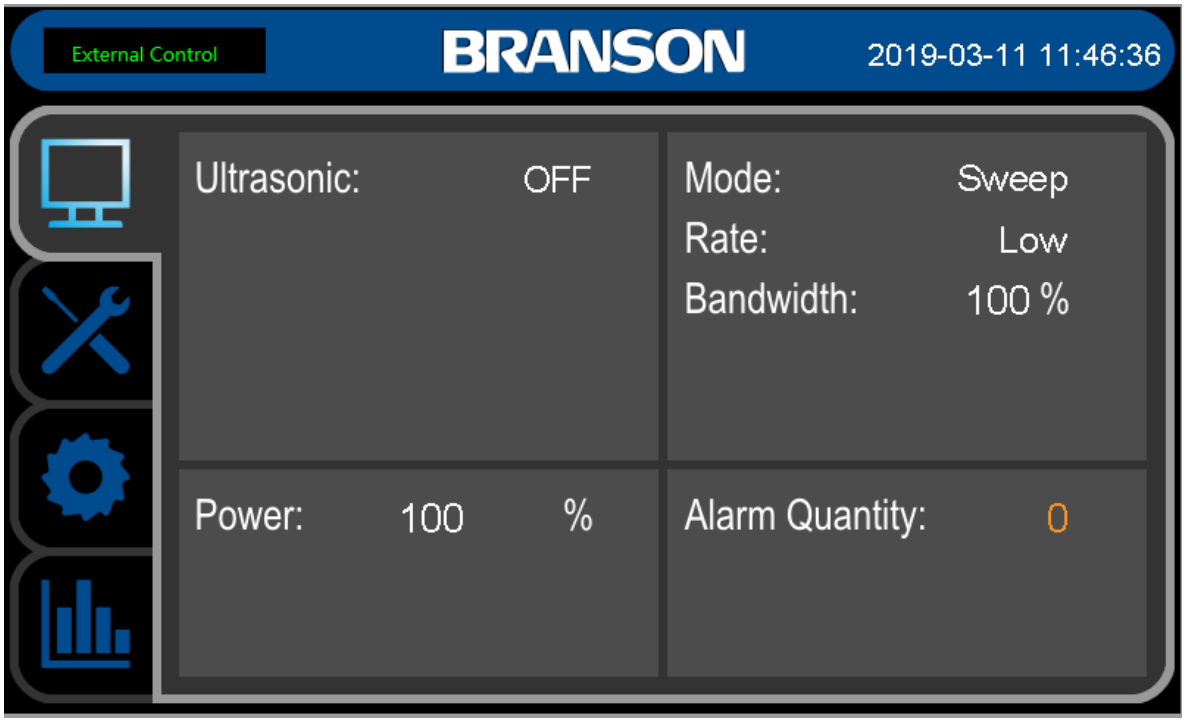
4.9 Alarm List

Touch "Details" button on the lower right of the Dashboard to enter Alarm List Screen. From this screen, all current active alarms could be seen. If the cause of alarm has already been fixed, clicking the "Reset" button could remove the alarm from this screen. After that, touch "Return" button to go back dashboard screen.



4.10 External Control Screen

If the external control switch is turned on, the machine is controlled by the User I/O and below information could be seen and the touch screen is not available:



Chapter 5: Troubleshooting

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5.2 Troubleshooting Charts 47
5.3 Troubleshooting the Load. 48
5.4 Resistance Charts. 50
5.5 Cavitation Erosion 52
5.6 Parts List 53

Overview

This section contains information for troubleshooting the ultrasonic power supply and includes the following:

- Periodic maintenance – steps for maintaining tanks and immersible transducers.
- Troubleshooting charts – common problems and possible solutions.
- Resistance charts – for isolating defects in the Driver Board.
- Parts list – contains part numbers for replaceable components.

WARNING	
	Ultrasonic Power supplies produce high voltage. Before working on an ultrasonic power supply, do the following (1) turn off the ultrasonic power supply and unplug AC voltage; and (2) remove the cover and allow at least 1 minute for capacitors to discharge.

5.1 Periodic Maintenance

Ultrasonic power supplies, ultrasonic tanks, and immersible transducers require periodic maintenance every 3 months or sooner.

5.1.1 Ultrasonic Power Supplies

Table 5.1 Ultrasonic Power Supplies

Step	Action
1	Unplug the Ultrasonic power supply from the AC voltage source.
2	Remove the cover.
3	Remove any dirt and dust. (You can use forced dry air, filtered to 5 microns).
4	Replace the cover.
5	Inspect RF cable and line cord for damage or wear. Replace if damaged.

5.1.2 Tanks and Immersible Transducers

Table 5.2 Tanks and Immersible Transducers

Step	Action
1	Drain the tank as required by your application.
2	Use a non-abrasive cloth to remove contamination from cleaning surfaces or an ultrasonic tank or an immersible transducer. **CAUTION** Take care never to mar or scratch a radiating surface. Doing so can accelerate cavitation erosion.
3	For a tank with the pump and filter option, inspect the filter cartridges and replace when necessary.
4	Inspect the RF cable and line cord (heated units only) for damage. Replace a damaged cable, and damaged line cord, or both.
5	Refill the tank.

5.2 Troubleshooting Charts

Table 5.3 Trouble-shooting Charts

Problem	Cause	Solution
Over temp	Ambient air temp exceeds 105ºF. Air flow to the cooling chamber obstructed.	Move ultrasonic power supply to cooler location. Remove all obstructions from back of ultrasonic power supply.
Overload	Incompatible load, power, or frequency connected to ultrasonic power supply. Faulty connection between ultrasonic power supply and load. Faulty component connected to ultrasonic power supply. Low line voltage.	Check model numbers of tanks or immersible transducers connected to ultrasonic power supply. Refer to Chapter 3: Installation of the manual for more information. Check RF cable and all connecting cables for open or short circuits. Refer to 5.3 Troubleshooting the Load. Check that the line voltage is above 187VAC.
Power exceeds upper limit or lower limit alarm	A component connected to the ultrasonic power supply does not have the same power or frequency rating. Faulty component connected to the ultrasonic power supply.	Check model numbers among ultrasonic power supply and all connected components. Refer to Chapter 3: Installation of the manual. Troubleshoot/test tank or immersible transducers, replace if faulty.
Abnormal load connection	RF cable not connected to ultrasonic power supply. Ext. Lock switch closed through I/O connector.	Connect RF cable to ultrasonic power supply. Open Ext. Lock switch.

5.3 Troubleshooting the Load

Troubleshooting the load involves inspecting and testing ultrasonic equipment connected to the ultrasonic power supply. Instructions follow for testing RF connections and transducers connected to the ultrasonic power supply.

WARNING	
	Transducer (elements) can hold a high voltage charge. Before troubleshooting or making repairs, discharge voltage by momentarily shorting pins A and B of the RF connector that plugs into the ultrasonic power supply.

NOTICE	
	Take capacitance measurements at room temperature.

Table 5.4 Testing RF connections and transducers

Step	Action
1	Turn off AC voltage to ultrasonic power supply.
2	Disconnect RF cable to tank or immersible transducer.
3	Inspect tank and immersible transducers for cracks, discolorations, or charred spots.
4	Short pin A (red) and pin B (black) of the RF cable connector to remove any electrical charge.
5	Connect an ohmmeter – set to resistance scale R x 10K – to pins A and B of the RF connector. If the meter indicates a short circuit, follow the steps below.
6	Troubleshoot as follows: 1. For ultrasonic tanks: (a) drain tank; (b) remove bottom cover; and (c) inspect transducers and RF cable for a short circuit. 2. For immersible transducers: check fittings and junction boxes for a short circuit. 3. If you cannot find a short circuit, test transducers as follows:

Table 5.4 Testing RF connections and transducers

Step	Action
7	Do a DC Hi Pot test: 1. Connect DC Hi Pot positive red lead to pin A; connect black negative lead to pin B. 2. Apply 2500 VDC to the load. If the test indicates leakage over 400µA, repair or replace the faulty component. If the meter does not indicate leakage, check capacitance of transducers.
8	Shake an immersible to check immersible transducers for debonding,. One or more element has debonded if the transducer rattles

WARNING	
	Transducer (elements) can hold a high voltage charge. Before troubleshooting or making repairs, discharge voltage by momentarily shorting pins A and B of the RF connector that plugs into the ultrasonic power supply.

NOTICE	
	1. Take capacitance measurements at room temperature. 2. Capacitance values: 25 kHz = 0.0040 uF (±7%); 40 kHz = 0.0044 uF (±7%).

Table 5.5 Taking capacitance measurements

Step	Action
9	Take capacitance measurements as follows: 1. Determine capacitance values in µF: • 25 kHz – 0.0040 x # of transducers (±7%) • 40 kHz – 0.0044 x # if transducers (±7%) 2. Use a capacitance meter to test each set of transducers. 3. If the capacitance meter displays a value varying by more than 7% replace the set of transducers.

5.4 Resistance Charts

5.4.1 Overview

Doing point-to-point resistance checks can help isolate circuit defects which produce a significant change in resistance readings. The following resistance charts list specific circuit points on the modules, expected resistance values between these points, and steps to take if expected and actual resistance measurements do not match.

WARNING	
	Ultrasonic Power supplies produce high voltage. Before working on an ultrasonic power supply, do the following: (1) turn off the ultrasonic power supply and unplug AC voltage; and (2) remove the cover and allow at least 1 minute for capacitors to discharge.

5.4.2 Using Resistance Charts

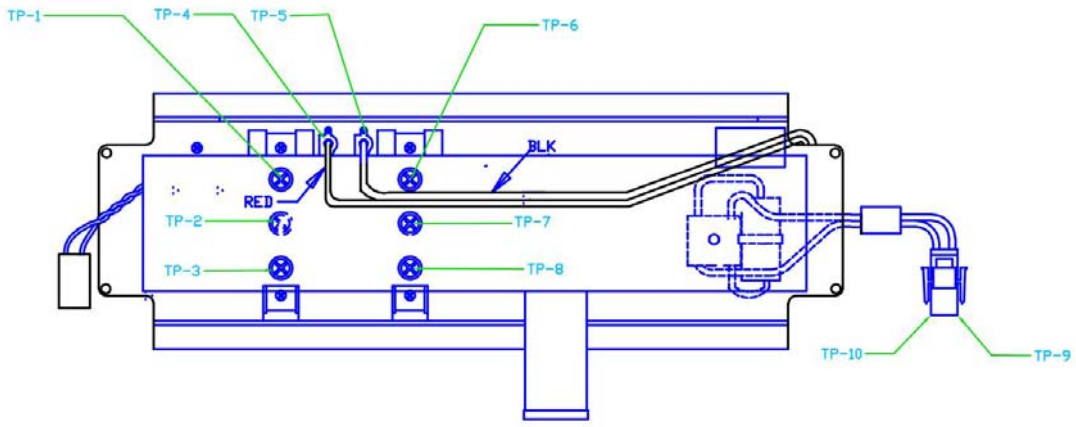
To use the resistance charts:

1. Set your ohmmeter to diode test.
2. Measure the diode resistance at the circuit test points listed in columns 1 and 2. (Refer to Figure 5.1, which contain drawings showing the test points.)
3. Compare resistance values on your ohmmeter with the resistance values listed in Column 3.
4. If the two values differ, the driver board assembly is bad. Check the assembly part number before calling for replacements.

Table 5.6 Diode Resistances

Diode meter test leads		Reading
+	-	
TP-1	TP-2	OPEN-CIRCUIT
TP-2	TP-3	0.35-0.55
TP-3	TP-1	0.35-0.55
TP-6	TP-7	OPEN-CIRCUIT
TP-7	TP-8	0.35-0.55
TP-8	TP-6	0.35-0.55
TP-5	TP-4	0.7-1.0
TP-9	TP-10	OPEN-CIRCUIT
TP-10	TP-9	OPEN-CIRCUIT

Figure 5.1 Driver Board Test Points



5.5 Cavitation Erosion

Cavitation erosion is a natural consequence of operating ultrasonics. It appears initially as a dulling of the radiating surface and proceeds to pitting and eventually may penetrate the metal so that the tank or transducer becomes unusable. The rate of erosion depends upon the ultrasonic frequency, the temperature of the liquid, the chemistry in the tank, the hardness of the tank, the power setting of the generator and many other factors.

5.5.1 Repairing Cavitation Erosion Marks

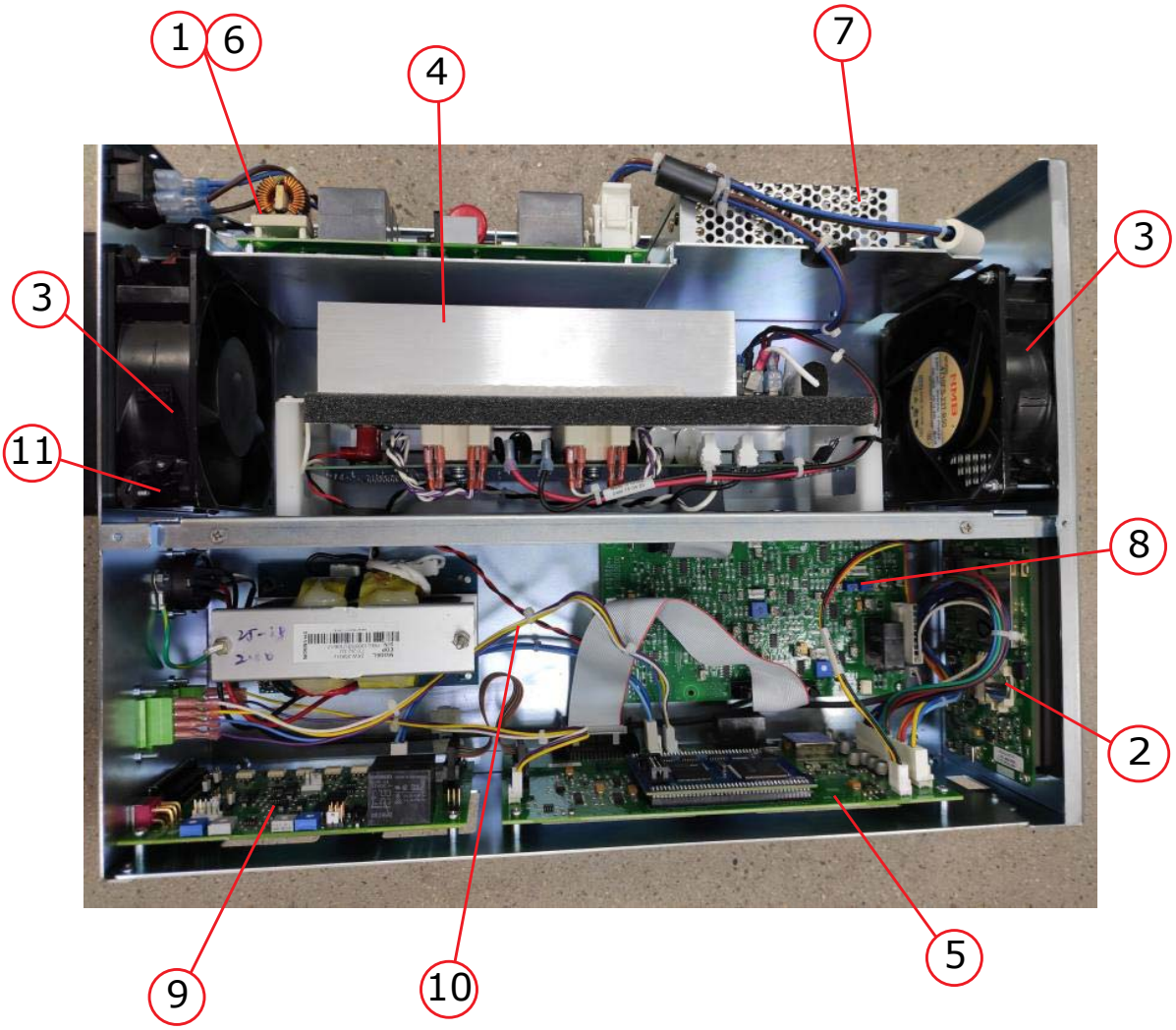
There is no reliable method of repairing cavitation erosion.

5.5.2 Minimizing Cavitation Erosion

To reduce cavitation erosion:

- Operate the ultrasonics only when actually cleaning parts
- Set the power level to the minimum setting that will produce clean parts

Figure 5.2 Ultrasonic Power Supply Top View



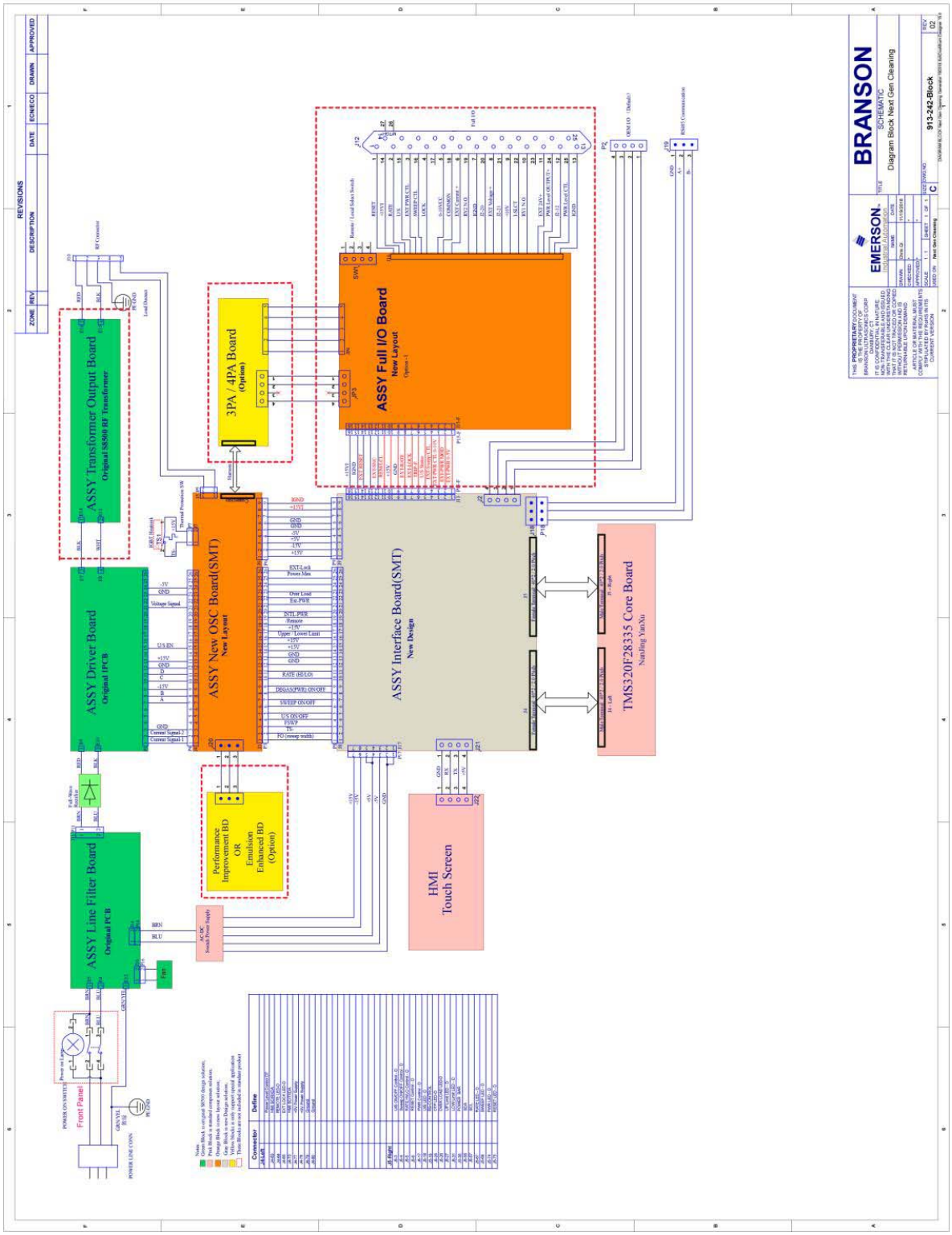
5.6 Parts List

Table 5.7 Spare Parts List

No.	Part	Part Number
1	Fuse 16A, 250VAC	200-049-116R
2	TOUCH SCREN GCX	1016936
3	FAN	200-126-012
4	PCB ASSY HIGH F DRIVER BOARD GCX	1018103
	PCB ASSY LOW F DRIVER BOARD GCX	1016993
5	PCB ASSY INTERFACE GCX	1016921
6	LINE FILTER PC GCX	1019578
7	SWITCH P/S RQ-065 GCX	1017066
8	ASSY PCB OSC GCX	1016928
9	PCB ASSY GCX FULL I/O	1016925
10	KIT OEM I/O GCX	1020215
11	FAN, FILTER,105X105, FL-120H(B)-A(SHJY), L20*	890-117-102

*Replace the filter in time if the system is used in high dust or high pollution environment.

Figure 5.3 Interconnection Diagram



Chapter 6: Options

6.1 Full Feature Input/Output Board (1016925) 56
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6.1 Full Feature Input/Output Board (1016925)

The Input/Output (I/O) board kit is an accessory that allows you to operate the power supply remotely. The I/O board includes two ports on the back panel of the power supply: (a) a 2-position switch for selecting remote (I/O) or local (power supply) controls; and (b) a 25-pin D-shell connector that you connect to your controls.

6.1.1 Removing the Cover

WARNING	
	Ultrasonic Power supplies produce high voltage. Before working on an ultrasonic power supply, do the following (1) turn off the ultrasonic power supply and unplug AC voltage; and (2) before removing the cover, allow at least 1 minute for capacitors to discharge.

Figure 6.1 Removing The Cover

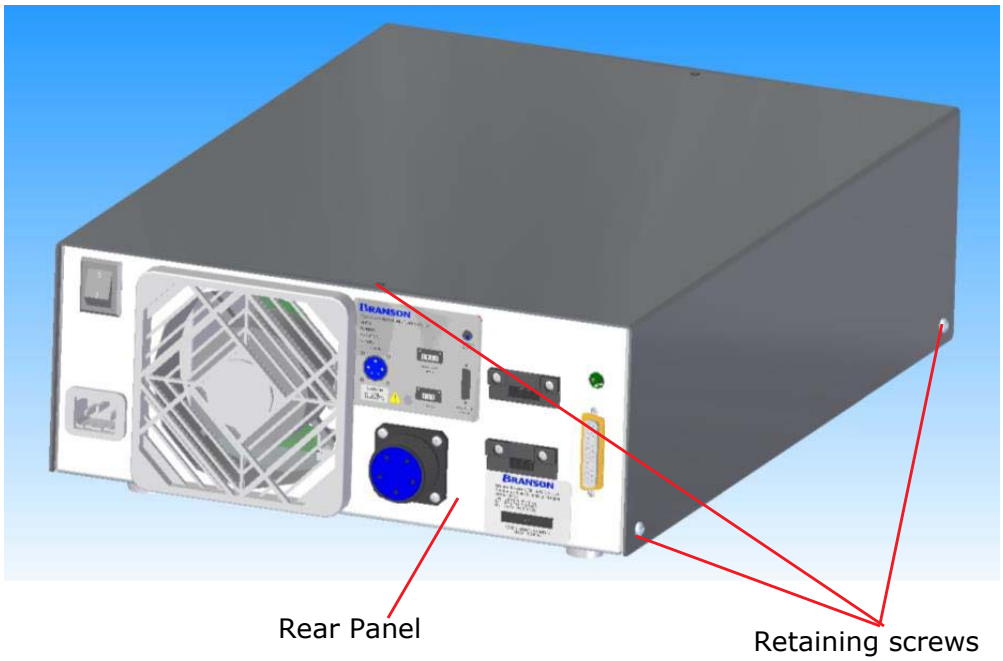


Table 6.1 Removing The Cover

Step	Action
1	Turn the power supply to Off; unplug main AC power.
2	Remove the six retaining screws (Figure 6.1).
3	Lift the cover off.
4	Place the cover out of the way.

6.1.2 Installing the Full I/O Board

Figure 6.2 and Figure 6.3 contain illustrations showing how to install the Full I/O board in the power supply. Study the illustrations, then follow the instructions below.

Figure 6.2 Installing Standoffs

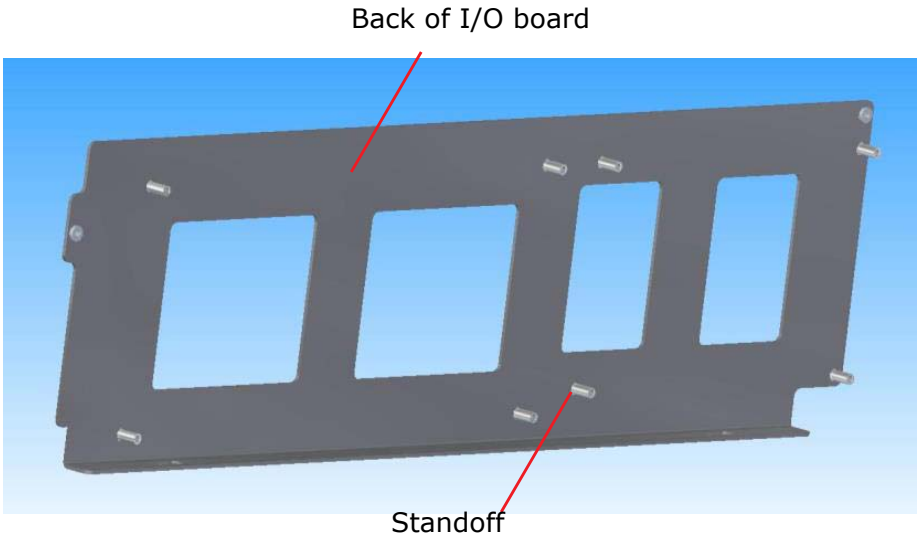


Figure 6.3 Installing I/O Board

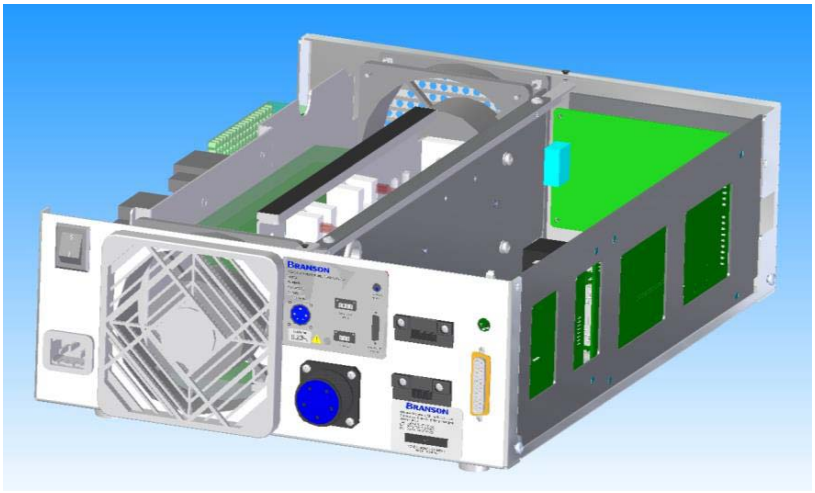
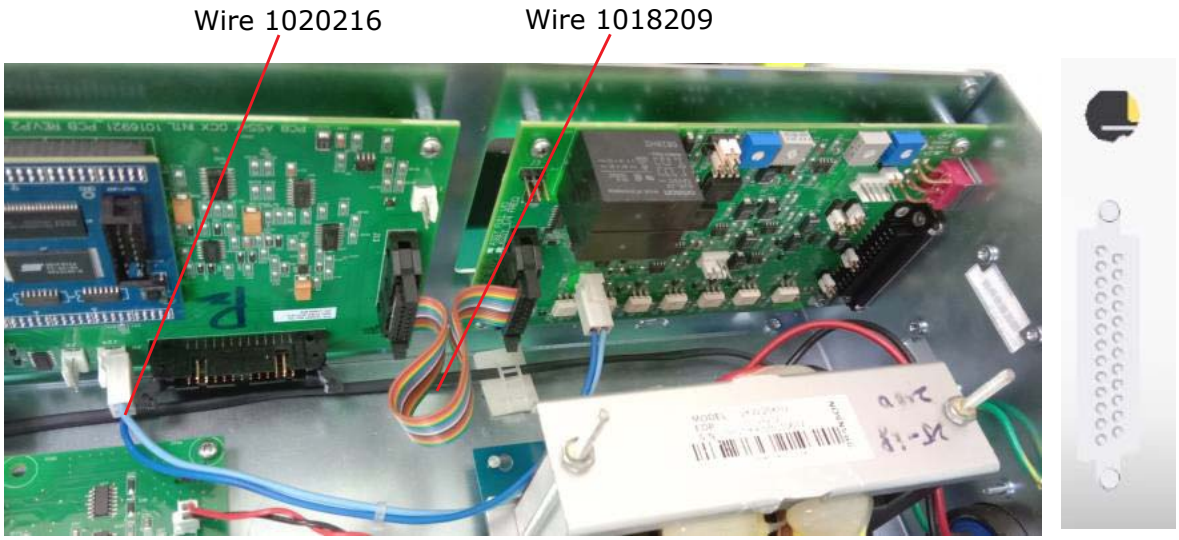


Table 6.2 Full I/O installation steps

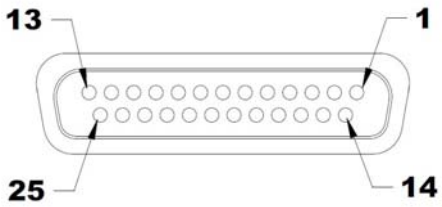
Step	Action
1	Remove the cover.
2	Install the Full I/O board on the side and fixed by four screws. Use tow screen to fix the rear panel.
3	Connect one end of the wire 1018209 to the J13 of the interface board and connect the other end to the J13 of Full I/O board.
4	Connect one end of the wire 1020216 to the J22 of the interface board and connect the other end to the J23 of the Full I/O board.

Figure 6.4 Connecting the wires



6.1.3 I/O Board Input Signals

Figure 6.5 Connector J2



The I/O board is capable for controlling ultrasonic power using either a voltage input (0-10VDC) or a current input (0-20ma or 4-20ma). This selection is made by the state of pin 25. If pin 25 is connected to common, current control is selected. If open, voltage control is selected. If current mode is selected, the state of pin 22 controls which current range is used. If pin 22 is open, the 4-20ma range is selected. If pin 22 is closed, the 0-20ma range is selected. If voltage mode is selected, a 0-10VDC signal is applied between pins 8(+) and 7(-). To activate a function, you connect the corresponding (Figure 6.5) function pin and the common pin.

Table 6.3 I/O Board Input Functions

Pin No.	Function	Pin No.	Function
1	Reset	13	Common
2	Rate	15	Ultrasonics (U/S) ON/OFF
3	Power Modulation	16	Sweep
4	Interlock	17	Not Used
6	Current Mode Control Input	19	U/S Status
7	Input Common	22	Current Control Select 0-20ma – 4-20ma
8	0-10 VDC power control	25	Current or Voltage Control Select

6.1.4 I/O Board Output Functions

The I/O board outputs two status signals through isolated relay contacts.

- A "FAULT OUTPUT" contact closure occurs between pins 10 and 18 when a generator fault condition exists.
- An "U/S output" contact closure occurs between pins 19 and 18 when U/S is on.

If the current control mode is selected, a current proportional to power is output on pin 24.

If the voltage control mode is selected, a voltage proportional to power is output between pins 5 and common (7) or (13).

A +10.0VDC reference voltage is output on pin 9 (1ma max load).

A +15VDC supply (10ma max load) is output on pin 14.

Table 6.4 I/O Board Output Functions

Pin No.	Function	Pin No.	Function
5	0-10 VDC power meter	14	+15VDC Supply (10ma max.)
7	Common	18	Relay Output Common
9	+10VDC Reference (1ma max.)	20	Do Not Use
10	Fault Relay N.O. Contact	21	Do Not Use
11	Not Used	23	Not Used
12	Do Not Use	24	Power Level Current Output

6.1.5 Full Feature I/O Board Circuits

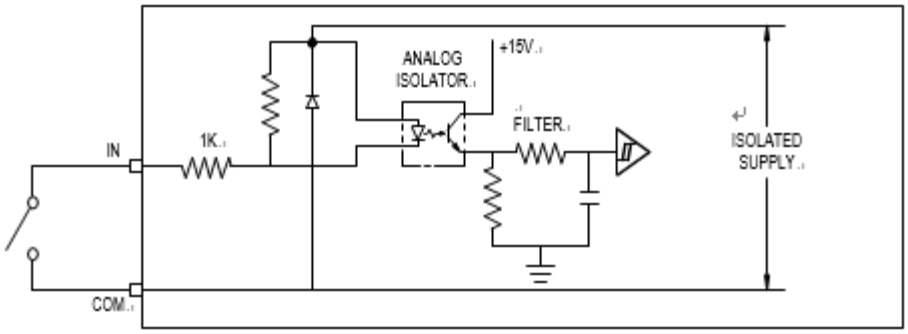
I/O Board Analog Functions

The I/O Board also carries four analog signals:

1. Power Adjustment (input) - an external 0-10 VDC source controls the power level of the ultrasonic power supply.
2. Power Level (voltage) - outputs the power level of the ultrasonic power supply via a 0-10 VDC signal. Figures 6-5, 6-6, 6-7, and 6-8 contain circuit diagrams for circuits that handle the input and output functions of the I/O board.
3. Current Adjustment (input) - an external 4 to 20ma or selectable (0-20ma) current source, controls the power level of the ultrasonic power supply.
4. Power Level (current output) - outputs the power level of the ultrasonic power supply by a current output, (either 0-20ma or 4-20ma selectable).

NOTICE	
	The I/O board contains a set pot labeled R86 that can be used to control ultrasonic power when using external control (i.e., PLC). To enable this feature, jumper JP2 pins 1+2. While the jumper is in place you can no longer control power using J2 Pin 8.

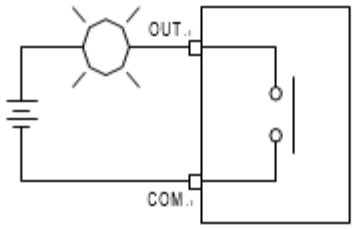
Figure 6.6 Discrete Input - Sinking Input Type



INPUT SPECIFICATIONS

TYPE OF DEVICE	NON-VOLTAGE CONTACTS OR NPN OPEN COLLECTOR
ISOLATION	ANALOG ISOLATION
INPUT IMPEDANCE	1K OHM

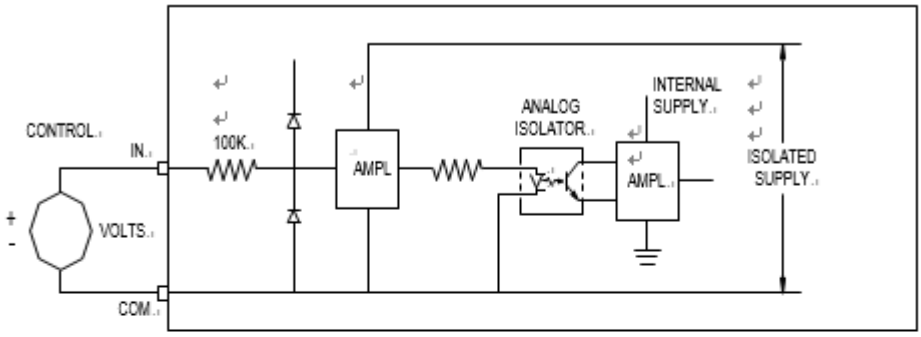
Figure 6.7 Discrete Outputs – Normally Open Contacts



OUTPUT SPECIFICATIONS

TYPE OF DEVICE	RELAY CONTACT N.O.
ISOLATION	RELAY ISOLATION 5000VAC ISOLATION
OUTPUT IMPEDANCE	30 mOHMS
CONTACT RATING	24VAC OR VDC 5.0A

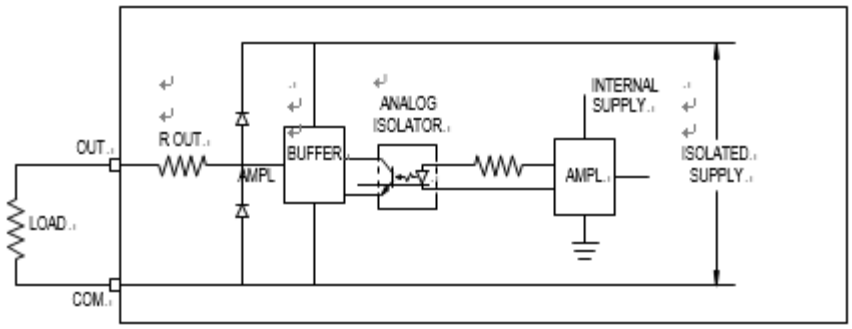
Figure 6.8 Analog Input



INPUT SPECIFICATIONS

TYPE OF DEVICE	0-10VDC VOLTAGE SOURCE
ISOLATION	ANALOG ISOLATION
INPUT IMPEDANCE	100K OHM - VOLTAGE INPUT

Figure 6.9 Analog Output



OUTPUT SPECIFICATIONS

TYPE OF DEVICE	0-10VDC VOLTAGE SOURCE/ (0-20mA) OR (4-20mA) CURRENT SOURCE
ISOLATION	ANALOG ISOLATION
OUTPUT IMPEDANCE	100 OHM - VOLTAGE OUTPUT 250 OHM - CURRENT OUTPUT
MAX.OUTPUT SOURCE	5mA - VOLTAGE 20mA - CURRENT

6.2 OEM-I/O Kit

6.2.1 General

The OEM I/O kit enables the ultrasonics to be turned on remotely by means of a switch, plc or relay. It also provides a signal that indicates that the ultrasonics are operating.

6.2.2 Kit Components

OEM I/O harness (1020215).

6.2.3 Installation

WARNING	
	Be certain power is off and the power supply is unplugged before beginning the installation. The installation should only be performed by qualified personnel.

Remove the power supply's top cover.

Connect one end of the OEM I/O harness (1020215) to the J2 of the interface board and the other end to the OEM I/O port on the rear panel.

Place the cover back on the power supply and secure to the sides with screws.

6.2.4 OEM I/O Operation

The OEM I/O is functionally in parallel with the front panel US switch on the touch screen. Two external functions are provided with the interface board, ultrasonics ON/OFF and ultrasonics ON/OFF status. Both functions are accessed through a 4 position terminal block located on rear panel. Ultrasonics can be toggled on or off from a dry switch closure or a 24VAC or 24VDC source, depending on how the interface board is configured. The factory setting is for dry switch closure. Ultrasonic ON/OFF status is read from a normally open output relay contact on terminals 3 and 4 of the terminal block. Ultrasonic ON/OFF control is activated from terminals 1 and 2 of the terminal block.

6.2.5 Specifications

Table 6.5 Specifications

	Isolation Type	Voltage Range	Maximum Current
Input	Optical	12-30 VDC 10-27 VAC	N/A
Output	Relay	0-30 VDC 0-48 VAC	N/A

The interface board can be configured to activate ultrasonics with an external switch closure or an external 24 VAC or 24 VDC voltage source.

Figure 6.10 OEM I/O Configuration

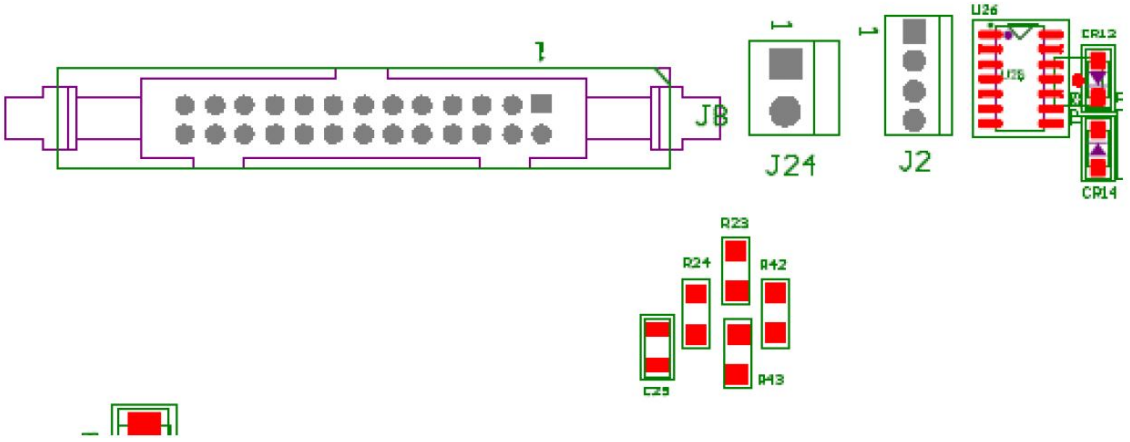


Table 6.6 OEM I/O Configuration

Input Control Type	Jumper Settings	Terminal Connections
Dry switch closure (Factory setting)	JP1 on pins 1 and 2 JP2 on pins 1 and 2	U/S on: Close switch across terminals 1 and 2
24VAC source	JP1 on pins 2 and 3 JP2 on pins 2 and 3	U/S on: Connect 24VAC source across terminals 1 and 2
24VDC source	JP1 on pins 2 and 3 JP2 on pins 2 and 3	U/S on: Connect +24VDC to terminal 1, connect +24VDC common to terminal 2

Figure 6.11 External Wiring Diagrams