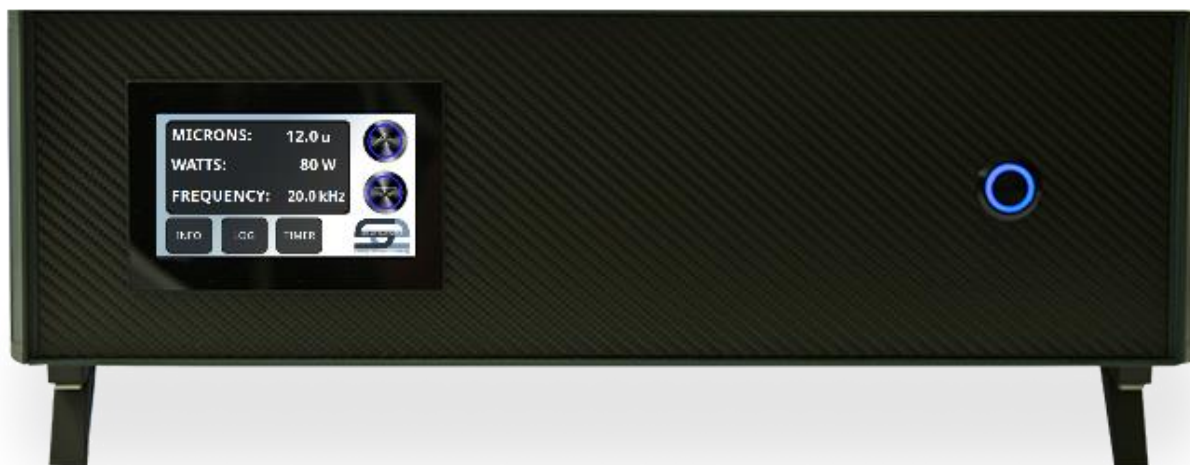


INSTRUCTION MANUAL

A High Intensity Ultrasonic Process System

Model L500/8-20



www.sonicsystems.co.uk

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EC DECLARATION OF CONFORMITY

In accordance with EN ISO 17050-1:2004

Manufacturer's Name Sonic Systems Limited

Manufacturer's Address Bakers Farm Barns
Puckington
Ilminster
Somerset TA19 9JA
United Kingdom

In accordance with the following Directives:-

- 2006/95/EC The Low Voltage Directive
- 2004/108/EC The Electromagnetic Compatibility Directive

Hereby declare that the product detailed below:

Product Name: Ultrasonic Process System
Model Number: L500/8-20

Is in conformity with the applicable requirements of the following documents:

Ref. No.	Title	Edition/Date
BSEN6100-6-4	Electromagnetic compatibility (EMC). Generic standards. Emission standard for industrial environments	2019
BSEN6100-6-2	Electromagnetic compatibility (EMC). Generic standards. Immunity for industrial environments	2019
BSEN61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use.	2010

Signed:

Name: M J Draper
Position: Managing Director



Puckington, United Kingdom. 1st April 2019

2.0 HEALTH & SAFETY.

- ◆ The equipment must be operated in an acoustic attenuating booth, or suitable ear protection worn if the audible noise level exceeds 85dB(A), refer to the 1989 Noise at Work Regulations
- ◆ The equipment may only be operated after reading completely, the supplied instruction manual.
- ◆ The equipment may only be connected to a mains supply with protective earthing, by means of the power connector provided.
- ◆ Before connecting or disconnecting cables, the equipment shall always be switched off, and the mains plug removed from its socket. Ensure that your hands are dry and only grasp cables by the plug.
- ◆ The generator shall be protected against ingress of moisture and corrosive dust. No liquid may be permitted to enter the housing.
- ◆ This equipment must not be used for the treatment of flammable or explosive substances without consultation with the manufacturer.
- ◆ Do not touch vibrating acoustic sections or horns.
- ◆ Do not immerse fingers or hands in solution being sonicated

3.0. GENERAL DESCRIPTION

The high intensity ultrasonic processing system has been specifically designed for research and production work in the treatment of liquids, gases and solids by ultrasound. The system offers the advantage that acoustic as well as electrical parameters may be monitored, thereby giving the user full process information.

The system has a "power by demand" characteristic. That is to say, that when the required operational transducer amplitude has been selected, the power transmitted will depend on the acoustic parameters of that load. The vibrational amplitude will be held at the pre-set level regardless of the loaded conditions, when the system is used within its rated characteristics.

Acoustic energy is coupled to the treatment sample by means of process horns and can be controlled by an adjustment of vibrational amplitude (electrical power), to the transducer and/or by selecting a particular horn geometry.

The transducer vibrational amplitude, acoustic power transmitted to the test sample and the operational frequency are all continually monitored.

Transducer resonance is maintained by means of a true motional feedback network and the transducer motion is displayed on a micron meter situated on the front panel. The operational frequency is also monitored and displayed.

A true reading wattmeter measures the ultrasonic power to the transducer and can be used to measure the acoustic power transmitted to the treatment sample. This is displayed on the screen.

4.0 OPERATING INSTRUCTIONS.

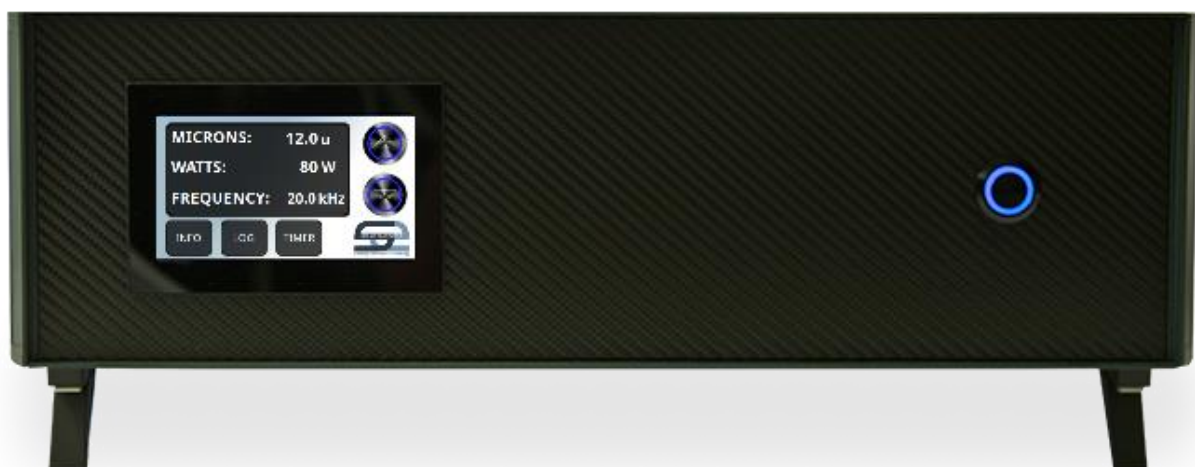


Fig 1 L500/8-20 Ultrasonic Generator Front Elevation

4.1 Generator Controls & Indicators

4.1.1 Standby/Run

The illuminated push button switch is used to locally switch on/off the ultrasonic drive to the transducer, selected mode is indicated by the respective LED's:

The '**BLUE LED**' indicates that the generator is in a '**STANDBY**' condition
The '**GREEN LED**' indicates that the generator is in a '**RUN**' condition

4.1.2 TFT Panel

A touch screen display is used in conjunction with the illuminated push button to control and indicate the operating parameters:

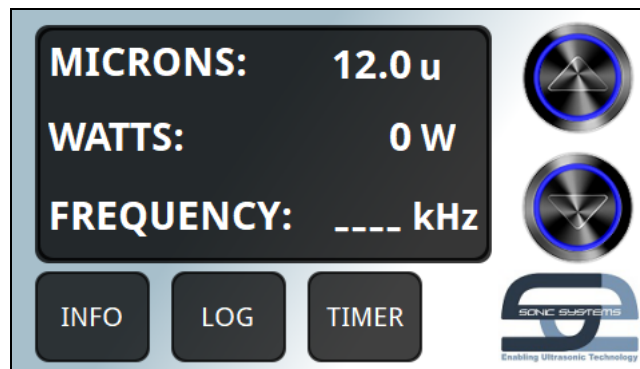


Fig 2 HOME Page - System in Standby

4.1.2.1 Transducer Amplitude (MICRONS):

Indicates the level of vibrational amplitude present at the front face of the transducer, this is displayed in microns peak to peak (pk-pk). The Amplitude can be set to a maximum of 12.0 microns pk-pk.

4.1.2.2 Acoustic Power (WATTS):

Indicates RMS acoustic power delivered to the acoustic load (transducer/horn assembly), this is displayed in Watts.

4.1.2.3 Frequency:

Displays the operational frequency of the Transducer/Horn assembly in the 'run' condition only. The frequency is given in kHz.

4.1.3 Fault Detection

If the generator detects a fault condition. The illuminated push button switch will 'Flash Red'.

The most common occurrence of this is caused by an open circuit transducer lead .Please ensure the connector is fully mated at both ends.

4.2 Generator Connections

The following connections are to be found on the rear panel of the generator unit

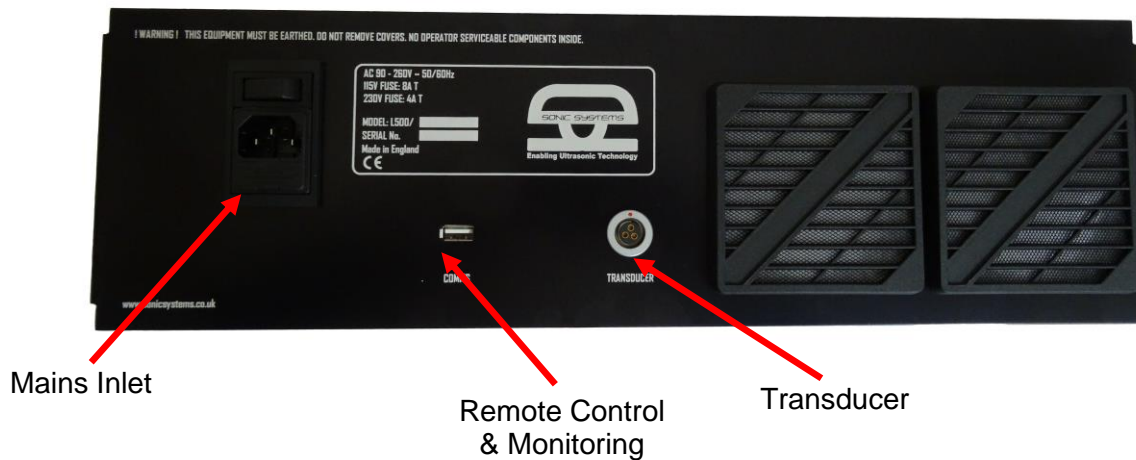


Fig 3 L500/8-20 Ultrasonic Generator Rear Elevation

4.2.1. Mains Inlet

Connect the supplied IEC mains inlet cord to this socket. An integral rocker switch is used to switch on/off the mains supply. The inlet also houses two 20mm mains fuses (one is a spare).

4.2.2. Transducer

The three-way Fischer socket provides connection of the transducer using the supplied transducer lead assembly (A98844/3).

4.2.2. Comms

Type 'A' USB socket is provided to enable connection of remote control & monitoring signals. This provides RS232 level serial UART interface to USB.

4.3 Local Operation

Switch the generator mains supply on at the mains inlet switch System is now in standby condition. The internal heatsink fan will start and the display will illuminate after a short delay

Use the TFT display 'UP' and 'DOWN' control to set the desired Amplitude level in microns.

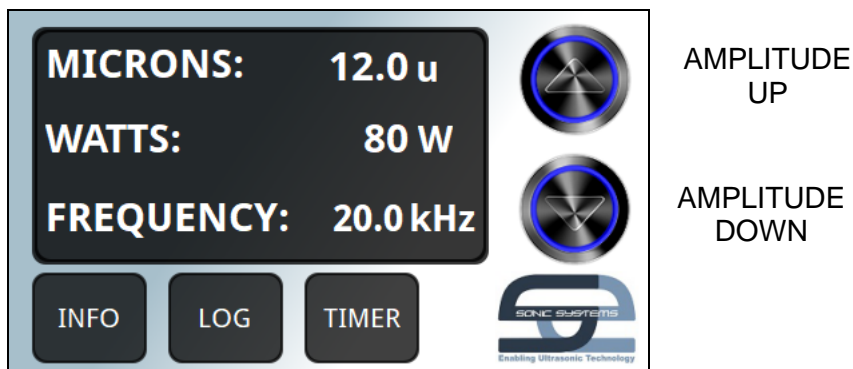


Fig 4 Home Screen - System Running

Use the Illuminated push button switch to start/stop the ultrasonic output (as 4.1.1 Standby/Run). The acoustic power generated and frequency is now displayed on the wattmeter.

Note: If the acoustic losses of the transducer and horn are established for a given level of amplitude, that is to say that the losses are noted when the system is run free in air – the acoustic power developed when loaded is equal to the acoustic power indicated on the meter less the noted acoustic losses of the transducer/horn assembly free in air .

4.4 Additional TFT Functions

4.4.1 System Information

Use the 'INFO' button to display system information



Fig 5 System Information Screen

The 'BACK' button will return to the "Home Screen"

4.4.2 Power Logging (Beta Version)

Use the 'LOG' button to display the log graph.

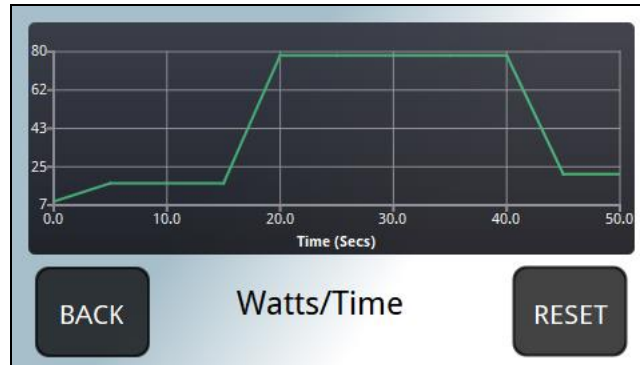


Fig 6 Log Screen

The Log graph will display power(Watts) vs time. The log will run continuously when the generator is on. The time can be reset to '0' seconds with the reset button.

The scale of both the Watts and Time (i.e. Secs, Mins, Hrs etc)axis will auto-scale to best suit logging period

The 'BACK' button will return to the "Home Screen"

4.4.2 Timer Function

From the Home screen use the 'TIMER' button to display the timer function

To set a timed operating period use the 'SET' buttons to increase (▶) or decrease (◀) the desired time in minutes.

Use the 'RUN TIMER' button to commence operation.

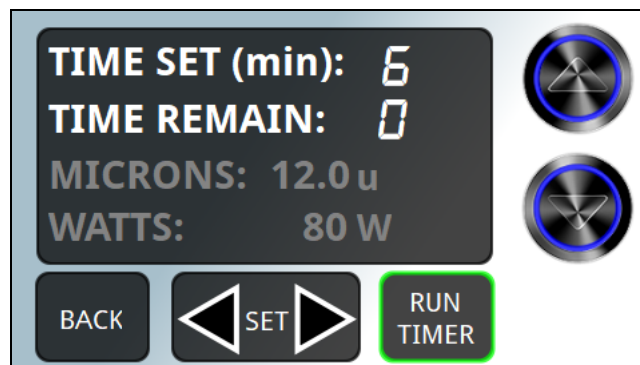


Fig 6 TIMER Screen -Set Time and RUN

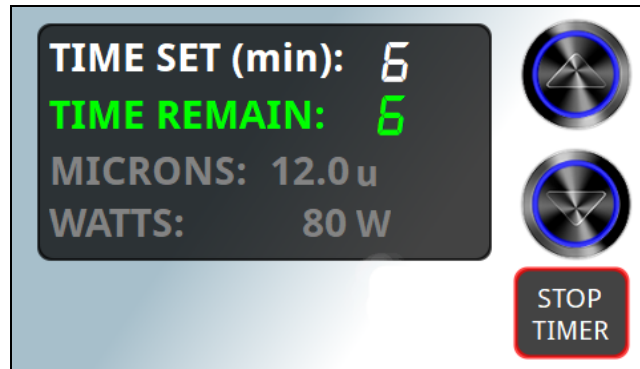


Fig 7 TIMER Screen -Stop TIMER

Use the 'STOP TIMER' button to cancel the TIMER operation.

Note: The amplitude level can still be adjusted using the up & down controls under timer control

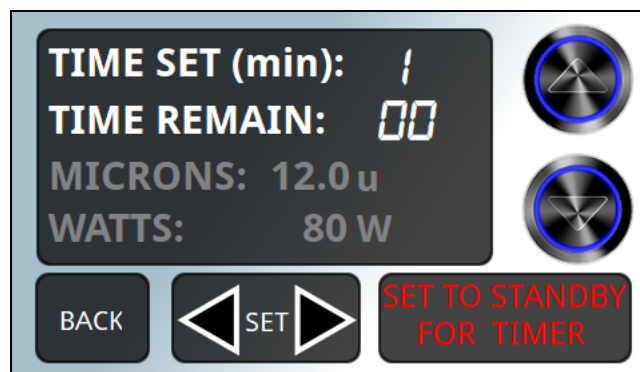


Fig 7 Timer Screen – when Ultrasonics running in Continuous Mode

To enable the TIMER function the Ultrasonics must be in the Standby condition

4.5 Remote Operation

4.5.1 Controls & monitoring

The system has been configured so that the generator can be independently operated and monitored from a remote station.

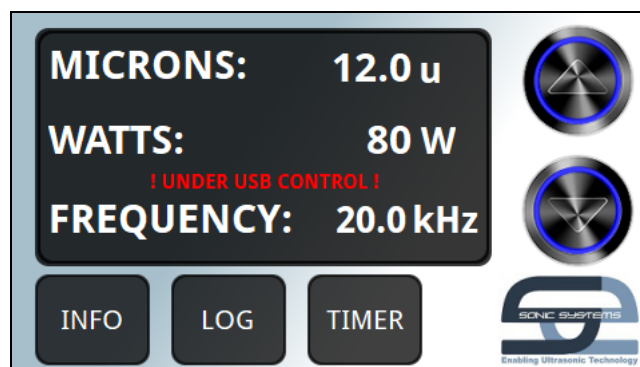


fig 8 Remote Mode (note **USB Control** Indicated)

Remote commands detailed below in *Table 1*

The following instructions are implemented using a communications and terminal emulation program such as Hyper Terminal (CR denotes Carriage Return).

Ensure that a suitable USB data cable (1/OFF is supplied) is connected between the PC and the L500/8-20.

On the front panel ensure that the generator is set to 'standby' (BLUE LED)

Type REM (CR)	System is now in remote mode. (Note: front panel control standby/run is now locked out) refer to fig 4.5
Type ON (CR)	The front panel 'GREEN Run' LED should now be lit
Type SAnn.n (CR)	The ultrasonic drive should be driving at an amplitude of nn.n where nn.n is any number between 1 and 12.0.

Note : If a value greater than 12.0 is entered a #OVR error will be returned

The amplitude and resulting acoustic power can be monitored at any time by requesting the information using the following commands:

Type GA (CR)	The amplitude is returned in microns
Type GP (CR)	The power is returned in Watts

To switch off the ultrasonic drive:

Type OFF (CR)	The front panel 'BLUE Standby' LED should now be lit
Type LOC (CR)	System local control mode. Front panel controls active.

L500/8-20 RS232 COMMANDS		
Command (followed by Carriage Return)	Description	Comment
REM	Switch to remote operation	
LOC	Switch to local operation	
ON	Switch on ultrasound	
OFF	Switch off ultrasound	
<i>SAnn.n</i>	Set amplitude	<i>nn.n</i> is value in microns (maximum value 12 microns)
GA	Get Amplitude – returns amplitude value in microns	
GP	Get Power – returns the acoustic power in Watts	
MM	Lists all commands	

Table 1

5.0 EQUIPMENT SPECIFICATION.

5.1 Electrical

- | | |
|---------------------------------|---|
| 5.1.1 Mains Supply | AC 90-260V ~ 50 - 60 Hz Single Phase |
| 5.1.2. Classification | Class 1. Must be earthed. |
| 5.1.3. Power Consumption | 600VA Maximum |
| 5.1.4. Mains connector | IEC Plug mounted on rear panel. Contains integral Single-pole rocker switch with a 20mm fuse. |
| 5.1.5. Fuse Rating | 115V: 8A T
230V: 4A T |

5.1.6. Operational Frequency 20kHz nominal with a 1kHz bandwidth

5.1.7. Frequency Control

Automatic. A feedback network senses the motion of the transducer/acoustic system and maintains the system at its optimum operating frequency.

5.1.8. Power Output

The generators are designed for a potential maximum output of 500 Watts. This is a power by demand system where the required transducer displacement can be pre-set and the generator automatically delivers the necessary power to maintain this displacement under varying conditions of load. Power transferred to the load may be controlled by selection of Horn design.

5.1.9. Duty cycle

Capable of a continuous 24 hour operation.

5.2 MECHANICAL

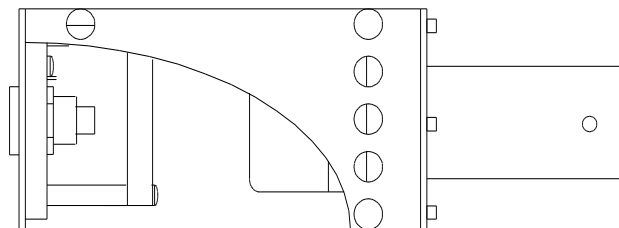
The electronics are mounted into a free-standing case which can be easily adapted for 19" rack mounting if required.

5.2.1. Overall Dimensions

5.2.1.1 Generator Width 450mm
 Depth 375mm
 Height 135mm

5.2.1.2 Transducer Assembly

Length :	nominal 195mm
Max Dia:	65mm
Transducer radiating face Dia :	35mm



5.2.1.3 Process Horns and Interstages

Any process horns supplied by Sonic Systems for use with this L500 would generally be a ½ wavelength @ 20kHz. The nominal length of these would be 125 mm (this can vary by a few mm depending on tuning)

For example, adding an interstage and a process horn would increase the length of the Transducer assembly above by a nominal 250 mm.

The complete assembly length would then be 445mm without the connector

The connector adds another 60mm to the overall length

5.2.2 Weight	Generator Assembly:	6.5kg
	Transducer Assembly:	0.5kg

5.2.3. Colour	Frame	RAL 7016 Grey
	Cover	RAL 9006 Light Grey

5.3 ENVIRONMENTAL

5.3.1. Operating Temperature	Min.	5° C
	Max.	35° C

5.3.2. Storage and Transport	Min.	-40° C
	Max.	+70° C

5.4. ACOUSTIC SYSTEM

5.4.1. Transducer	Model	GA98832
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These are a high efficiency pre-stressed piezoelectric design. The main body of the transducer is constructed from Titanium alloy. This is mounted in an aluminium housing and fan cooled, which permits continuous operation.

5.4.2. Frequency

The transducer is designed to operate at 20kHz

5.4.3. Process Horns

Acoustic horns can be supplied for use with each system, giving a variety of displacements and total power output characteristics. However, coupling high powers into liquid loads can be complex, and an understanding of the acoustic parameters of the load will enable the system performance to be maximised.

Couple the horn to the transducer using the M10 x 25mm stud provided. Ensure that the coupling faces are clean and tighten the two parts using the wrenches provided. If a torque spanner is used it should be set at 30 to 35 Nm.

5.4.4. Transducer Displacement

The maximum vibrational amplitude at the transducer radiating face is $12\mu\text{m} \pm 1\mu\text{m}$ pk-pk

6.0 GUARANTEE

Sonic Systems guarantee to replace any component which on inspection by them proves to be defective in material or through workmanship, provided that written notice of any such defect is given within twelve months of the date of sale to the original purchaser and the instrument or components alleged to be defective are returned carriage paid as soon as may be possible after such notice and subject to the following further conditions:

- 1 Components repaired or replaced will carry a further 12 month guarantee limited to those items repaired and/or replaced.
- 2 Carriage and packing charges for the return of the instruments or components shall be for the account of their owner.
- 3 Where instruments or components are required to be repaired in situ or where the forwarding of replacement parts is required, then Sonic Systems reserves the right to levy such charges to cover service, labour or incurred travelling expenses as may be appropriate.
- 4 This guarantee does not apply to any equipment which may have been repaired or altered other than by Sonic Systems or which has been subject to misuse or accident or negligence.

Please Note:

The contents of this instruction manual are believed to be correct at the time of printing. The manufacturers, however, reserve the right to change the content, product specification, and performance criteria, without notice.