



MASTERSONIC[®]
MSG.X00.YY
ULTRASONIC POWER SUPPLY
MMM, Wideband Multifrequency Technology

SYSTEM OPERATION
MANUAL

CONTENTS

1. INTRODUCTION	3
1.1. FEATURES	3
1.2. SYSTEM SAFETY	3
2. SYSTEM SET-UP	5
2.1. CONTROL TERMINAL BLOCK	5
2.2. POWER TERMINAL BLOCK	6
2.3. EXTERNAL ON/OFF POWER CONTROL	6
2.4. ANALOG INPUT POWER CONTROL	7
2.5. TRANSDUCER POWER CONNECTION	7
2.6. WAVE GUIDE AND ACCESSORIES MOUNTING	7
2.7. TRANSDUCERS	8
2.8. INDUCTIVE COMPENSATION	8
3. FRONT PANEL	9
3.1. GREEN INDICATOR LIGHT	9
3.2. RED INDICATOR LIGHT	9
3.3. INDUCTIVE COMPENSATION REGULATOR	9
4. REMOTE CONTROL PANEL	10
4.1. REMOTE CONTROL PANEL DESCRIPTION	10
4.2. REMOTE CONTROL PANEL CONNECTION	10
4.3. REMOTE CONTROL PANEL OPERATION	10
5. PC SOFTWARE CONTROL OPTION	13
5.1. PC AND CUSTOM SOFTWARE CONTROL DESCRIPTION	13
5.2. PC GRAPHICAL USER INTERFACE WINDOW	13
5.3. CUSTOM CONTROLLER OR SPECIAL PC COMMAND OPTIONS	14
6. LIMITATION OF WARRANTY	17
8. SERVICE	18

1. INTRODUCTION

1.1. Features:

The ultrasonic modular generators MSG X00.YYOF/AL are designed according to MMM Technology for building-into Ultrasonic Technological Systems . Presently available modules are made for driving 300W and 600W piezoelectric loads.

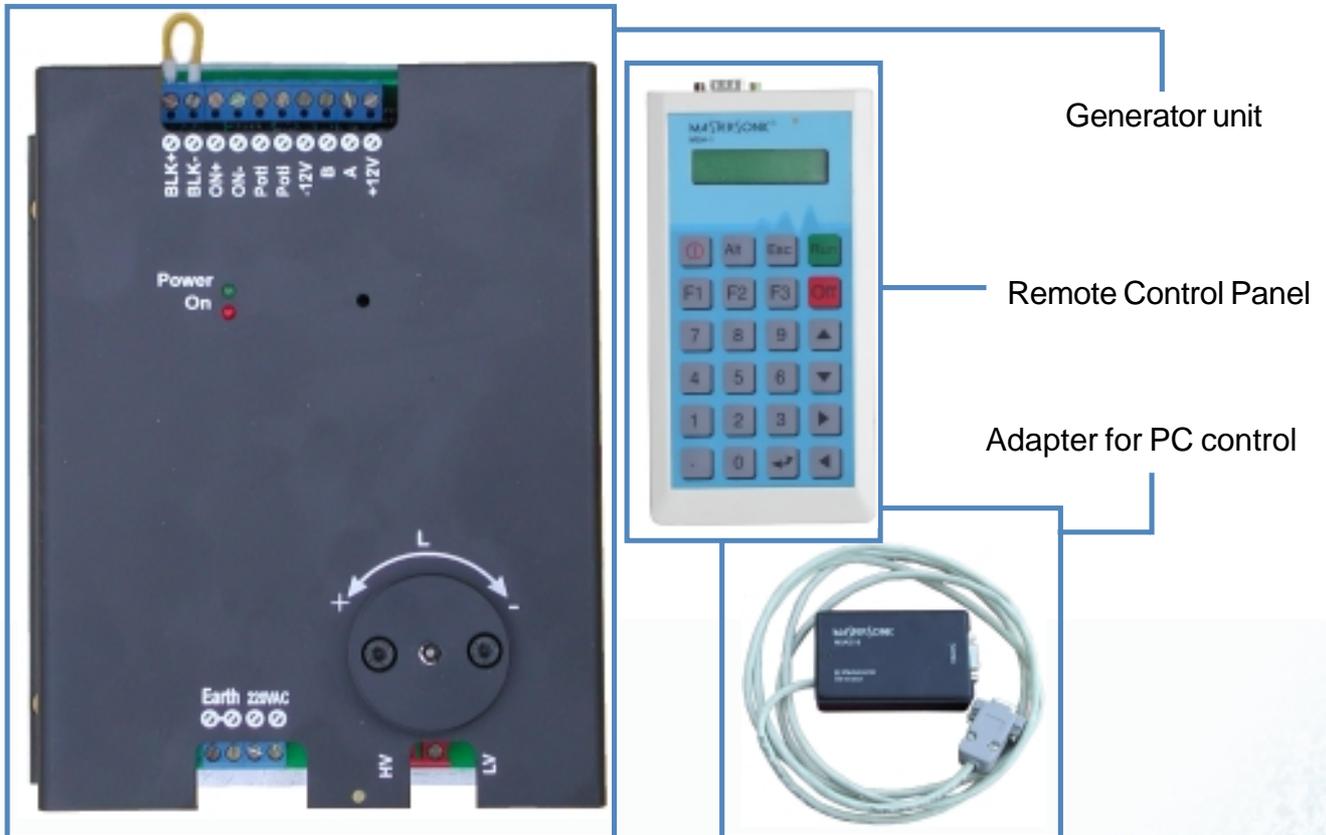


Fig. 1.1. MSG X00.YYOF/AL complex system

The appearance of the complex system is shown on fig. 1.1. It consists of:

- Generator unit
- Remote Control Panel for parametrization.
- As an option, the Rremote Control Panel can be replaced with an adapter for direct PC control

The generator is a separate device, which can operate independently or as a part of a system.

1.2. System safety:

Read this manual thoroughly and follow all directions to assure maximum safety during operation.

- Installation of the MasterSonic (generator/power supply) and associated transducers, the “Mastersonic System”, is to be performed by qualified technical personnel only.
- The Mastersonic System is an electro-mechanical device that under certain circumstances could present an electrical shock hazard to the operator.

1. INTRODUCTION

- The MasterSonic System should only be used and operated by properly trained and qualified technicians.
- Qualified technicians licensed by the manufacturer should only perform servicing of the MasterSonic System.
- Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous exposure to ultrasonic energy.
- To avoid electric shock, do not remove the case covers from the MasterSonic System. There are no user-serviceable parts inside any of these devices.
- Connecting the Generator unit to mains that supplies improper voltage may cause the Generator to malfunction or create a shock or fire hazard.
- Proper system grounding cannot be insured unless unit is connected to properly wired three prong 220 - 230 VAC single-phase outlet with a sufficient current rating.
- Do not remove the grounding prong on the line cord plug.
- The Generator Electrical Supply cord should not be plugged into a device (e.g. "power strips", "gang plugs", etc.) other than an industrial grade wall socket. Such other use could cause significant changes in voltage that could result in an electrical fault indication. This condition may occur even though other equipment plugged into multi-outlet sockets continues to operate.
- Do not restrict airflow to the MasterSonic System by covering or enclosing in a sealed housing while in operation. Airflow must circulate through the unit during operation to facilitate proper cooling of electronic components.
- Do not place Generator on towel, foam or other soft surface since the material may block air vents. Blocking vents may cause Generator to overheat and malfunction or create a shock hazard.
- Do not expose or immerse the MasterSonic System or the transducer in water or liquids. The system is not sealed against liquids and exposure may result in damage to the equipment, create a shock hazard, or fire hazard.
- Due to the general operating principles of the MasterSonic System and ultrasonics, this equipment is not suitable for use in environments where danger of explosion exists.
- The Generator should not be turned on until the Transducer Cable has been connected to both the Generator and Transducer. Otherwise, damage to the Generator may result.
- When ultrasound output power is on, do not touch the transducer, booster, sonotrode, waveguide, or any device directly connected to these components; doing so may result in injury.
- Ear protection during operation of the system is highly recommended. Do not position the transducer, booster, sonotrode, waveguide, or any device directly connected to these components near the technician or operators ears. The operating frequency of the MasterSonic System is below, within, and above the range of human hearing, and emits acoustic energy. Do not activate the system if system components are within 4 feet (122 cm) of the ears of technician or operators.

2. SYSTEM SET-UP

CAUTION: Do not place Generator on towel, foam or other soft surface that may block generator air vents. Blocking any vents may cause the Generator to overheat, malfunction, or create a shock hazard.

CAUTION: Connecting the Generator unit to mains which supplies improper voltage may cause the Generator to malfunction or create a shock or fire hazard.

CAUTION: The Generator should not be turned on until the Transducer Cable has been connected to both the Generator and Transducer. Otherwise, damage to the Generator may result.

CAUTION: The Generator Electrical Supply cord should not be plugged into a device (e.g. “power strips”, “gang plugs”, etc.) other than an industrial grade wall socket. Such other use could cause significant changes in voltage that could result in an electrical fault indication. This condition may occur even though other equipment plugged into multi-outlet sockets continues to operate.

2.1. Control Terminal Block:

The control Terminal Block (fig. 2.1.) is placed on the upper side of the generator and implements the following functions:

- Terminals 1, 2, 3, 4, - ON/OFF Power Control; Protection Control;
- Terminals 5 and 6 - Analog setting of the power;
- Terminals 7, 8, 9, 10 - Remote Control Panel/PLC connection.

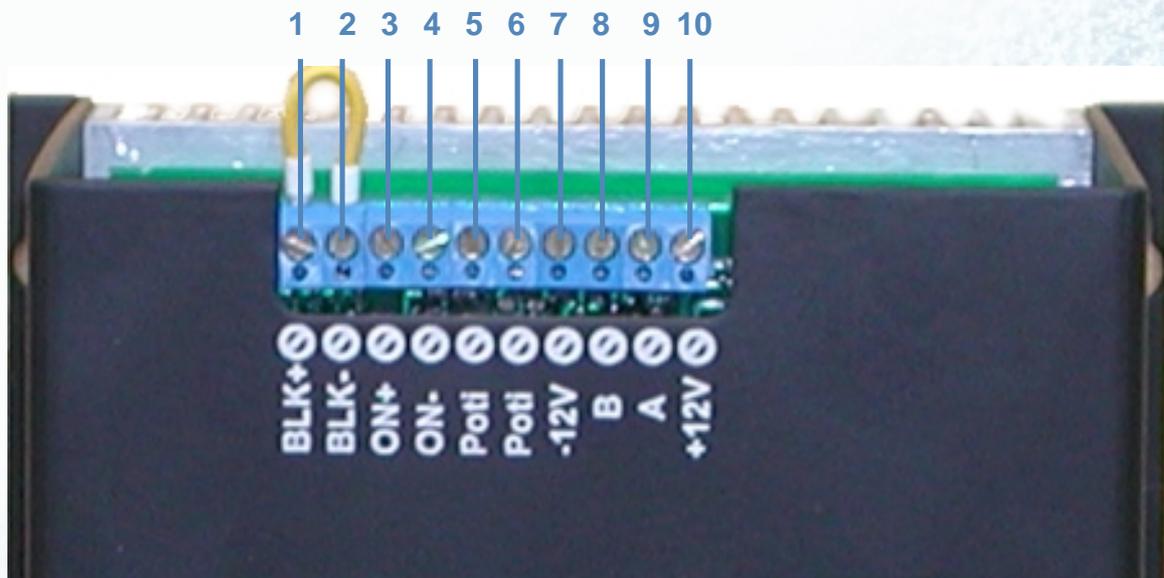


Fig. 2.1. Control Terminal Block

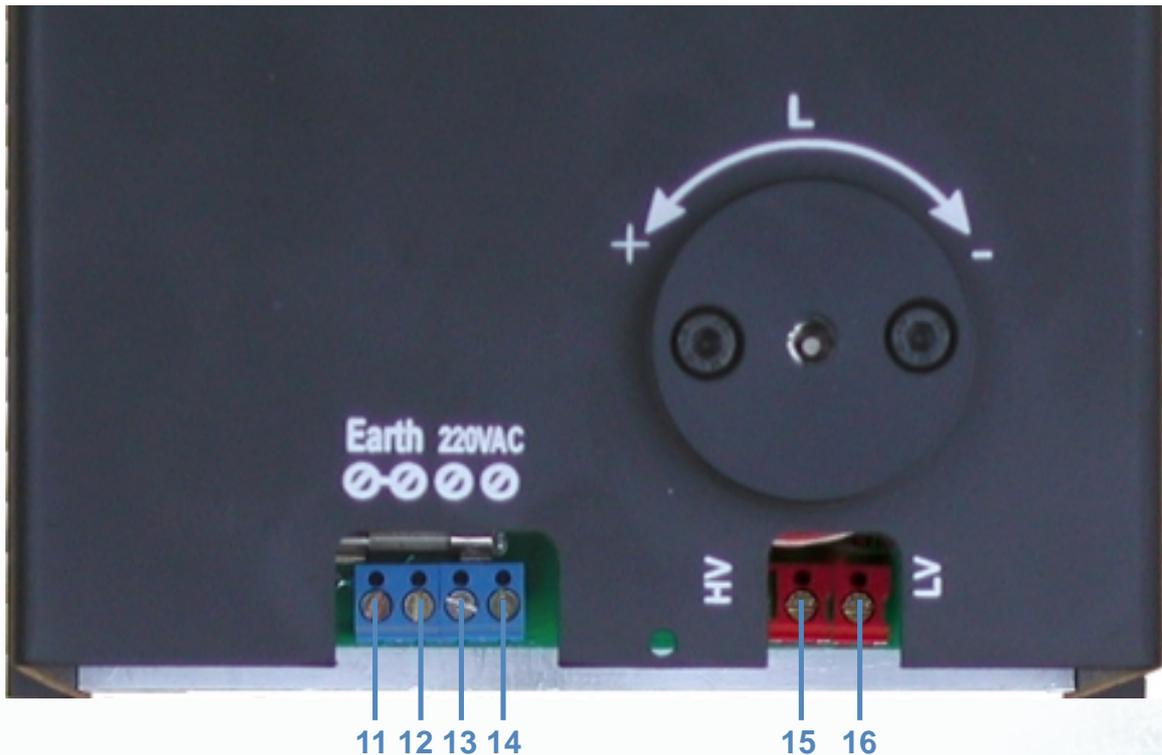
2. SYSTEM SET-UP

2.2. Power Terminal Block:

The Power Terminal Block (fig. 2.2.) is placed on the lower side of the generator and implements the following functions:

- Terminals 11, 12, 13, 14 - Power Supply Voltage and Grounding;
- Terminals 15 and 16 - High Frequency/Ultrasonic output;

Fig. 2.2. Power Terminal Block



2.3. External On/Off Power Control:

The external control of the generator is done through terminals on pins 1, 2, 3, 4 (fig. 2.1.). The way of connecting is shown on the drawing. Through pins 3, 4 the generator is switched ON or OFF. When the terminals are closed the generator is switched on and when the terminals are open, the generator is switched off.

NOTE: If the generator has been switched off because of activation of some internal block-

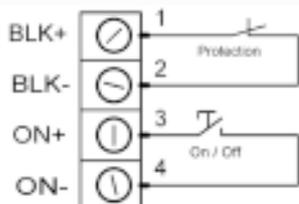


Fig. 2.3. External On/Off Power Control

ing or external protection the terminals remain closed. Next starting of the machine should be done by opening and closing the terminals again.

NOTE: Terminals on pins 1 and 2 are protection inputs and they should be connected through short circuit enabling the generator to operate. If this circuit is open, the generator will stop operating.

2. SYSTEM SET-UP

2.4. Analog Input Power Control:

The power of the generator can be controlled in the following three ways:

- The power can be set during the parameter setting of the generator.
- The power can be set through the serial interface by the changing power command of the Remote Control Panel or PLC.
- The power can be set through the analog input - terminals 5 and 6. When a 2.5kOhm potentiometer is connected to terminals 5 and 6, as shown on picture 2.4., the power is set from 0 to 100%.

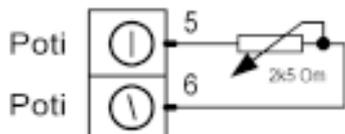


Fig. 2.4. Analog Input Power Control

2.5. Transducer Power Connection:

The 2-Pin terminal connector in the lower right side (terminals 15 and 16) is used to supply ultrasonic power to the system transducer.

CAUTION: The MasterSonic System should only be operated with the supplied transducer and cable.

The ultrasonic power cables are fixed to the terminals according to picture 2.2. and the description to it. The other end of the cable should be connected to the transducer.

NOTE: Terminal 15 (High Voltage) is an output to the power transformer of the generator. Terminal 16 (Low Voltage) should be connected to the inductive compensation of the transducer and to the system grounding.

NOTE: If the transducer should be grounded through the power supply cable this could be done by connecting terminal 16LV (Low Voltage) to terminal 11 or 12 of the power supply cable.

ATTENTION! Do not connect the High Voltage (pin. 15) to grounding. This will damage the machine.

2.6. Waveguide and Accessories Mounting:

CAUTION: Ensure all connections and mating surfaces are clean and dry before assembly.

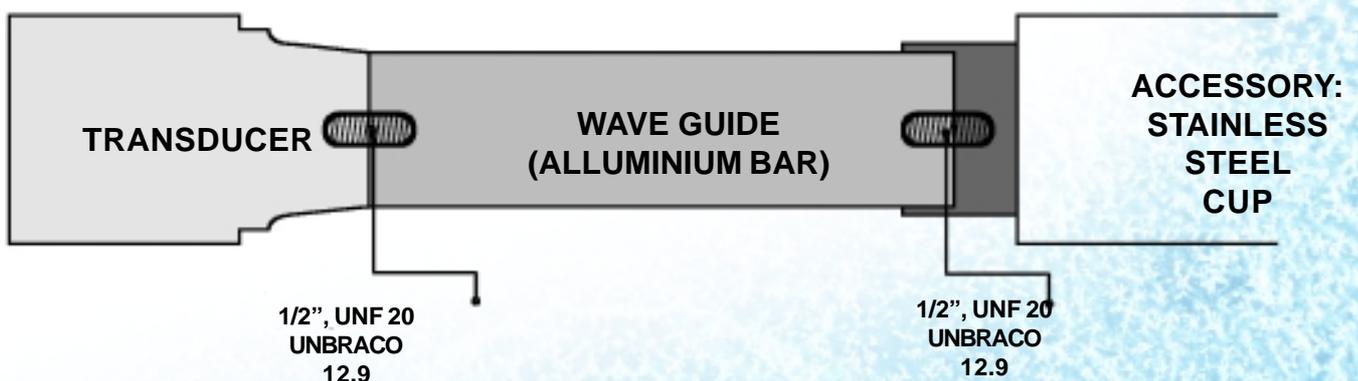


Figure 2.6. System Assembly

2. SYSTEM SET-UP

Use the supplied studs to interconnect the mechanical components. All components should be threaded by hand until snug, DO NOT force the threads, they must turn in smoothly all the way until the mating faces touch. Use two open end pin wrenches and make final tightening.

As depicted in Figure 4 the Wave Guide or Booster should be connected to the transducer tip. Accessories such as the stainless steel cup are connected to the opposite end of the waveguide_or Booster.

2.7. Transducers

Due to their unique controllable compensative inductivity, the MSG X00.YYOF/AL devices enable power supply of a large range of ultrasonic mechanical systems with different number of ultrasonic transducers. Load electrical parameters are the following:

- Average Operating frequency: 22 - 43 kHz.
- Static capacity of the complex ultrasonic transducer: 3nF - 30nF.

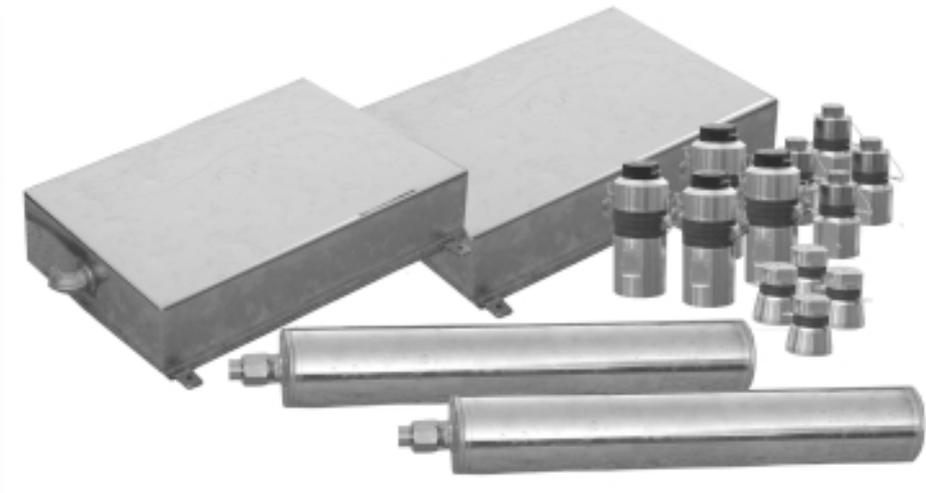


Fig. 2.7. MasterSonic Transducers

2.8. Inductive compensation.

The ultrasonic modular generators MSG X00.YYOF/AL are designed to supply with power load of 300w or 600W at the frequency of 21kHz - 44kHz. The resonant frequency should be chosen during parameter setting with the help of the Remote Control Panel (4.) After setting of the resonant frequency, the inductivity should be set. It is done by means of (inbus key S4 as the ferrite core is opened or closed).

The inductive compensation depends on the frequency, the static capacity of transducers and their operating mode.

3. FRONT PANEL

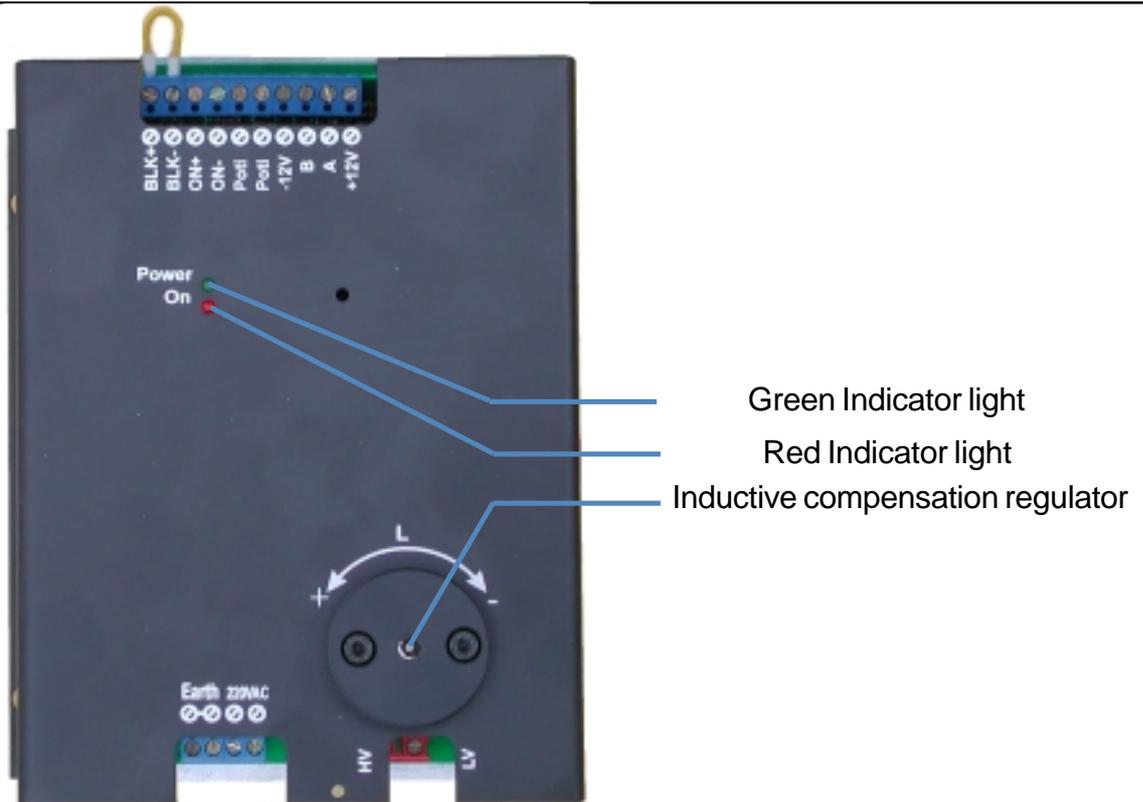


Fig. 3. Generator Front Panel

3.1. Green Indicator light:

The green indicator lights on when the generator is connected to the mains.

3.2. Red Indicator light:

The red light is illuminated (on) when the generator is turned ON and producing ultrasonic power output to the transducer. When the generator output power is turned OFF this light is not illuminated.

The red indicator is also connected to the generator protection circuits. If the generator is experiencing an internal problem or detecting a problem with the mechanical ultrasonic components it will automatically stop ultrasonic power generation. Then the red light is not illuminated.

3.3. Inductive compensation regulator.

The inductive compensation regulator controls the inductivity by regulating the airgap of the ferrite core.

Turning the regulator to “-” opens the airgap of the ferrite core and the inductivity decreases.

Turning the regulator to “+” closes the airgap of the ferrite core and the inductivity increases.

- When the ferrite core is closed the inductivity is approx. 2mH
- When the Ferrite core is max. opened the inductivity is approx. 1mH.

ATTENTION: The inductivity is set to max. during transportation.

4. REMOTE CONTROL PANEL

4.1. Remote Control Panel Description:

The remote control panel is designed for rapid parameter setting and tuning of the ultrasonic generator while connected to the oscillating mechanical system.

4.2. Remote Control Panel Connection:

Connection of the remote control panel to the generator is made by a special cable, which is connected to terminals 7, 8, 9 and 10. The remote control connection should be made as shown on picture 2.2.:

Terminal No	Cable Colour	Signal Name
7	Blue	-12V
8	White	B
9	Black	A
10	Brown	+12V

4.3. Remote Control Panel Operation:

The remote control panel has an LCD display with 2 rows of 16 symbols and keyboard with 24 buttons that have the following functions:

Numeric keyboard from 0 to 9 and decimal point for entering new parameters.

Enter button to input parameters or initiate a Function.

“esc” button to escape or cancel current operation.

Up and **Down Arrow** buttons for increasing and decreasing display values.

Left and **Right Arrow** buttons for reading the LCD menu.

Functions buttons:

F1 - reads parameter data stored in the controller memory. Press F1 then select a memory position (0 to 20) to view stored parameters.

F2 - stores new parameter data from the buffer to a selected memory position (0 to 20) in the controller.

F3 - downloads parameter data from the buffer to the MasterSonic generator memory.



Power On Button - switches the Power Supply of the Remote Control Panel.



Button for extending the functions of the Remote Control Panel. Intended for future applications.



Starts the generator. The RUN Button ensures that the generator is completely controlled by the Remote Control Panel during the parameterization.
Stops the generator.

4. REMOTE CONTROL PANEL

NOTE: If the Mastersonic generator is in operation (ultrasonic power is ON) when downloading data from the remote control panel the generator will automatically turn OFF the ultrasonic power for system safety. The generator may be restarted manually by switching the ON/OFF switch, connected to terminals 1 and 2, or by pressing the RUN button of the Remote Control Panel.

4.3.1. When the remote control panel is connected to the MasterSonic generator, the active set of generator parameters that are in its memory are automatically transferred to the buffer of the control panel.

4.3.2. To set Operating Frequency – select desired parameter with LEFT and RIGHT ARROW buttons. Select parameter value with UP and DOWN ARROW buttons, or with numeric keyboard. The ENTER button downloads the current parameter value in the generator.

4.3.3. To set Ultrasonic Output Power – select desired parameter with LEFT and RIGHT ARROW buttons. Select parameter value with UP and DOWN ARROW buttons, or with numeric keyboard. The ENTER button downloads the current parameter value in the generator.

4.3.4. To set PWM Period– select desired parameter with LEFT and RIGHT ARROW buttons. Select parameter value with UP and DOWN ARROW buttons, or with numeric keyboard. The ENTER button downloads the current parameter value in the generator.

4.3.5. To set PWM Ratio– select desired parameter with LEFT and RIGHT ARROW buttons. Select parameter value with UP and DOWN ARROW buttons, or with numeric keyboard. The ENTER button downloads the current parameter value in the generator.

4.3.6. To set Fast Sweeping select desired parameter with LEFT and RIGHT ARROW buttons. Select parameter value with UP and DOWN ARROW buttons, or with numeric keyboard. The ENTER button downloads the current parameter value in the generator.

4.3.7. To set Sweeping select desired parameter with LEFT and RIGHT ARROW buttons. Select parameter value with UP and DOWN ARROW buttons, or with numeric keyboard. The ENTER button downloads the current parameter value in the generator.

4. REMOTE CONTROL PANEL

Function	LCD Display Pictures	LCD Displays	Description of Action
Reading Data		<<<<<<<<	Uploading parameters from the generator memory to the remote control panel buffer.
Sending Data		>>>>>>>	Downloading parameters from the remote control panel buffer to the generator memory.
Read Memory		Location xx	Reading parameters from a remote control panel memory location (1 to 20) to the remote control panel buffer.
Write Memory		Location xx	Writing parameters from the remote control panel buffer to a remote control panel memory location (1to20).
Frequency		xx.xxx kHz(example: 21.940 kHz)	The average frequency of the ultrasonic transducers (first, natural resonant mode).
Fast Sweeping		xx stp (example: 25 stp)	Depth of the Fast Sweeping (0-255 stp)
Sweeping		x (example: 3)	Depth of the Sweeping (0-7)
Power		xxx %(example: 50%)	The current power as a percent of nominal power of ultrasonic generator.
PWM Period		x.xxx s (example: 1.190 s)	Period of Pulse Width Modulation (PWM in seconds).
PWM Ratio		xx% (example: 65%)	Ratio of Pulse Width Modulation (PWM percent)

5. PC SOFTWARE CONTROL OPTION

5.1. PC and Custom Software Control Description:

MasterSonic generator parameters may be automatically controlled through a PC or other custom controller connected to the front panel 9-Pin interface connector via the optional adaptor box.

NOTE: Only one device may be connected to the MasterSonic 9-Pin controller interface connector. The optional PC control adaptor box and the remote control panel may not be used at the same time.

5.2. PC Graphical User Interface Window:

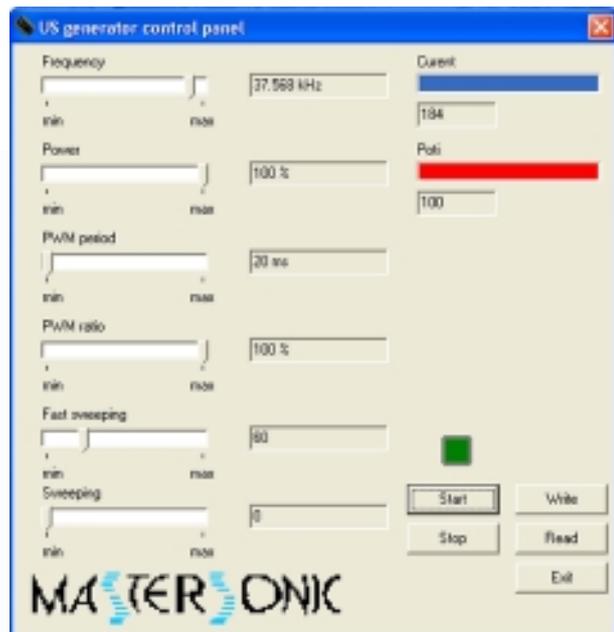
The optional PC software control accessory is used to control generator parameters through a PC connected via the special interface adaptor box to the MasterSonic front panel 9-pin interface connector.

5.2.1. Installation Instructions for the MasterSonic Control Panel Window: (Windows 98 compatible)

a) Create a new file folder on your PC in a location where you prefer to store the executable software file.

b) Copy the file “mastersonic.exe” from the MasterSonic CD and paste to your new file folder.

c) Right click the copied file “mastersonic.exe” and left click the “make a shortcut” option. Drag the shortcut to your PC desktop or another convenient location.



5.2.2. To run the MasterSonic PC Control Panel Window:

a) Double click the “mastersonic.exe” shortcut icon.

b) The MasterSonic Generator Control Panel window will appear. If the PC serial port is properly connected to the MasterSonic Generator the active set of generator parameters that are in its memory are automatically uploaded and displayed in the Control Panel window.

Figure 7. PC Windows Control Panel

5.2.3. To READ Currently loaded Parameters in the MasterSonic Generator memory:

a) Click the PC control panel “Read” button.

b) Parameters are uploaded from the MasterSonic generator memory and displayed on the PC Control Panel window.

5.2.4. To Set New Parameters and WRITE them to the MasterSonic Generator:

5. PC SOFTWARE CONTROL OPTION

- a) Each parameter may be set by either the sliding graphic bar or by typing specific numerical values. (Parameter setting limitations are as described for the control panel above.)
- b) When all parameters are set to the desired value Click the PC control panel “Write” button.
- c) All parameters will be downloaded from the PC Control software to the MasterSonic generator.

NOTE: If the Mastersonic generator is in operation (ultrasonic power is ON) when downloading data from the PC control panel the generator will automatically turn OFF the ultrasonic power for system safety. After the download is completed the generator may be restarted manually by pressing the front panel Green ON button or via the control panel start button.

5.2.5. To Start or Stop the ultrasonic power generation from the MasterSonic Generator:

- a) After desired parameters have been set Click the “START” button.
- b) Press the “STOP” button to stop ultrasonic power generation.

5.2.6. To Quit or Exit from the PC Control Window:

- Click the “EXIT” button.

5.3. Custom Controller or Special PC Command Options:

Using MasterSonic MSA2218 Adapter RS485 / RS232C interface users may develop or use industry standard controllers and PCs for programming and controlling the MasterSonic generator via the optional interface adaptor box.

NOTE: Only one device may be connected to the MSG interface connector - terminals 7, 8, 9 and 10. A Custom Controller and the remote control panel may not be used at the same time.

NOTE: This option is not part of standard support. Assistance for hardware interface and programming are quoted by the manufacturer or distributor on a case by case basis.

5.3.1. The RS232C transfer protocol is semi-duplex and data transfer (reading/writing) is controlled by RTS signaling.



5.3.2. MasterSonic Generator Commands.

NOTE: Each command is terminated with carriage return (CR) ASCII code HEX = "0D " or decimal = 13

Inquiry Commands:	
%04f(CR)	inquire for Current Frequency of the generator
%04s(CR)	inquire for Current Fast Sweeping of the generator
%04d(CR)	inquire for Current Sweeping of the generator
%04w(CR)	inquire for Current PWM Period of the generator
%04m(CR)	inquire for Current PWM coefficient of the generator
%04t(CR)	inquire for Current potentiometer value
%04c(CR)	inquire for Current Electricity value of the generator
%04p(CR)	inquire for Current Power of the generator

Inquiry Reply Formats:	
#02fxxx(CR)	Current Frequency reply. (xxx is frequency in kHz) o (0-255kHz)
#02sxxx(CR)	Current Fast Sweeping reply. o (0-255stp)
#02dxxx(CR)	Current Sweeping reply. o (0-7)
#02wxxx(CR)	Current PWM Period reply. o (1-100) - (10ms-1000ms)
#02mxxx(CR)	Current PWM coefficient reply. o (0 - 100%)
#02txxx(CR)	Current position of power potentiometer. o (0-100%)
#02cxxx(CR)	Current Electricity value reply. o (0-400) (0-4A)
#02pxxx(CR)	Current Power reply. o (0-100%)

5. PC SOFTWARE CONTROL OPTION

@04start(CR)	Start command
@04stop(CR)	Stop command
@04wr(CR)	Write command

Set New Parameter Value Commands:

#04fxxx(CR)	Sets a new Operating Frequency for the generator (0-255)
#04sxxx(CR)	Sets a new Fast Sweeping Frequency (0-255)
#04dxxx(CR)	Sets a new Sweeping Frequency (0-7)
#04wxxx(CR)	Sets a new PWM Period 1-100 (10-1000ms)
#04mxxx(CR)	Sets a new PWM Coefficient (0-100%)
#04pxxx(CR)	Sets new Power (0-100%)

NOTE: The generator replies with a character ">(CR)" after receiving the setting parameters. The reply is not controlled.

Data transfer: According to RS232 / RS485 Protokol.

Note: The manufacturer recommends that only original MasterSonic MSA2218 Adapter is used with the MasterSonic generator.

Comments:

MODE: Asynchronous
 DATA: 8 data bits
 Stop: 1
 Baud rate: 19200
 Parity: No
 Txd - 1 = Send
 Rxd - 0 = Receive

6. LIMITATION OF WARRANTY

The product warranty is detailed in the general conditions of sale or as part of a special sale agreement.

The warranty does not apply and may be voided for equipment subject to unauthorized modifications, repair, misuse, abuse, negligence or accident.

Equipment that, in our judgment, shows evidence of having been used in violation of operating instructions will be ineligible for service under this warranty.

The MasterSonic equipment is designed for maximum operator safety and incorporates built-in safety devices. Any modifications to these safety features will void the warranty. The Manufacturer assumes no responsibilities for consequential damages incurred due to modifications to the said equipment.

Under no circumstances shall the Manufacturer 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 MasterSonic product.

No liability is assumed for expenses or damages resulting from interruptions in operation of the product or damages to material in process.

The Manufacturer reserves the rights not to warrant horns, sonotrodes, and waveguides of unusual or experimental design that in our judgment are more likely to fail in use.

Within the period guaranteed, we will repair or replace free of charge, at our sole discretion, all parts that are defective because of material or workmanship, not including costs for removing or installing parts.

Liability, whether based on warranty, negligence or other cause, arising out of and/or incidental to sale, use or operation of the transducer elements, or any part thereof, shall not in any case exceed the cost of repair or replacement of the defective equipment, and such repair or replacement shall be the exclusive remedy of the purchaser, and in no case will we be responsible for any and/or all consequential or incidental damages including without limitation, and/or all consequential damages arising out of commercial losses.

7. SERVICE

WARNING: To avoid electric shock, do not remove the case cover from the Generator or Transducer. There are no user-serviceable parts inside any of these components.

IMPORTANT NOTICE: For the protection of employees, shippers, receivers, various personnel, and to remain in compliance with Transit Laws, material returned to the Manufacturer or its designated representatives must be rendered free of any hazardous, noxious or radioactive contamination.

Should the user of this device have any questions or comments as to its specifications, use, limitations, or maintenance, the Manufacturers Service Representative can be contacted as follows:

**By Post/Mail: MP Interconsulting
Attn: MasterSonic Service
Marais 36
2400 Le Locle, Switzerland**

**Telephone/Fax: +41 32 9314045
E-mail: mastersonic@mpi-ultrasonics.com;
www.mpi-ultrasonics.com**