ULTRASONIC GENERATOR

(JYD-760 SERIES)

User Manual

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01. Overview

The newly ultrasonic generator was officially launched to the ultrasonic cleaning industry in 2007. The Company established R&D team in the development center of Hunan University in 2006, invested abundant human resources and materials to make the revolutionary modification to old ultrasonic cleaner and it has successfully developed the latest ultrasonic control technology, which has achieved ideal effects after related tests were conducted in relevant manufacturers with a year of R&D and experiment.

The main feature of this generator is the use of full-bridge digital pulse drive. Compared to the half-bridge drive control circuit, it has the advantages of small size, simple peripheral circuits, stable ultrasonic effects, and high conversion efficiency. And comes with frequency tuning function, to ensure that the machine is in the best working condition from beginning to end, can maximize the potential of ultrasonic transducer, but also has a perfect over-current protection, output short circuit protection.

Integrated digital display ampere meter, frequency, time control and PLC remote control, light bar indicating power and other functions. Based on the above functions, new functions such as frequency lock, current lock, frequency sweep mode selection, automatic frequency follow-up, 485 communication (optional), and one-key degassing (optional) are added.

02. Main Parameters

Product model	JYD-760-I	JYD-760-II	JYD-760-EG
Driving power	600W-1500W	1500W-2400W	600W-1200W
Power control	10-100%	10-100%	10-100%
Working frequency	20KHz-40KHz	20KHz-40KHz	50KHZ-136KHZ
Working voltage	220V±10% 50Hz/60Hz	220V±10% 50Hz/60Hz	220V±10% 50Hz/60Hz
Maximum output current	**5A**	**7.5A**	**3.5A**
Ambient temperature	0-40℃	0-40℃	0-40℃
Net weight of pro	6.5KG	8.2KG	6.5KG
External dimensi	365*300*145mm	365*300*145mm	365*300*145mm

03. Specification on Panel Functions and Operation

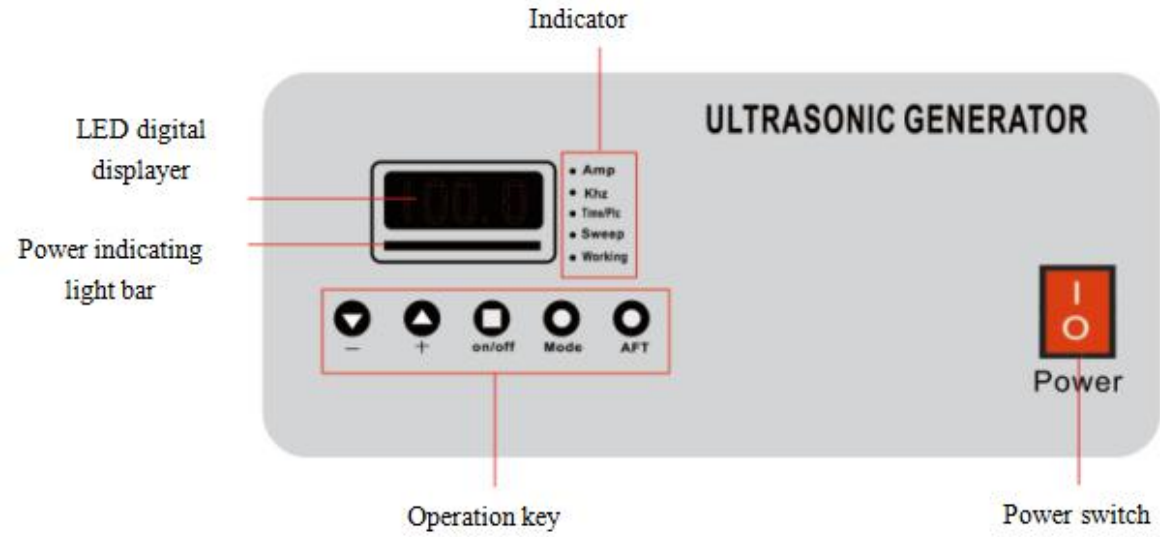


Figure 3.1

Name	Function specifications
Power switch	Power switch is general power switch for the whole machine, which is on and off when it is pushed and pressed respectively.
Indicator	It refers to state indicator for current operation of the generator. There are 5 indicators including current display, frequency display, time/PLC display, display of mode of sweep display and display of working state.
Operation key	The icon Mode button, in order to switch the LED digital display mode, can display the whole working current, ultrasonic working frequency, timing time/PLC, or sweep mode. The icon ON/OFF button is the ultrasonic start/stop switch that can turn on or off the ultrasound. Icon + button, you can add current or time, when the LED digital display for the current mode, ultrasonic work on, you can add current, this time the light bar will increase with the current increase, plus a current mode a total of 16 files; when the LED The digital display is time mode, which can increase the time of the ultrasonic work. The ultrasonic time is 0-59min59s. The icon - button, you can reduce the current or time. When the LED digital display is in current mode, when the ultrasonic work is on, the current can be reduced. At this time, the light bar will decrease with the current, and the current reduction mode will decrease by 0.1A per time. When the LED digital display is in time mode, the ultrasonic operation timing can be reduced. The icon AFT button can automatically track the frequency. When this button is pressed for 2 seconds, the generator enters the auto-frequency tuning mode.

After booting, press the Mode key for control on LED digital display modes which are able to display overall

working current and ultrasonic working frequency respectively, it is for mode of time/PLC or sweep.

Mode of current display

Figure 3.2

Mode of working frequency display

Figure 3.3

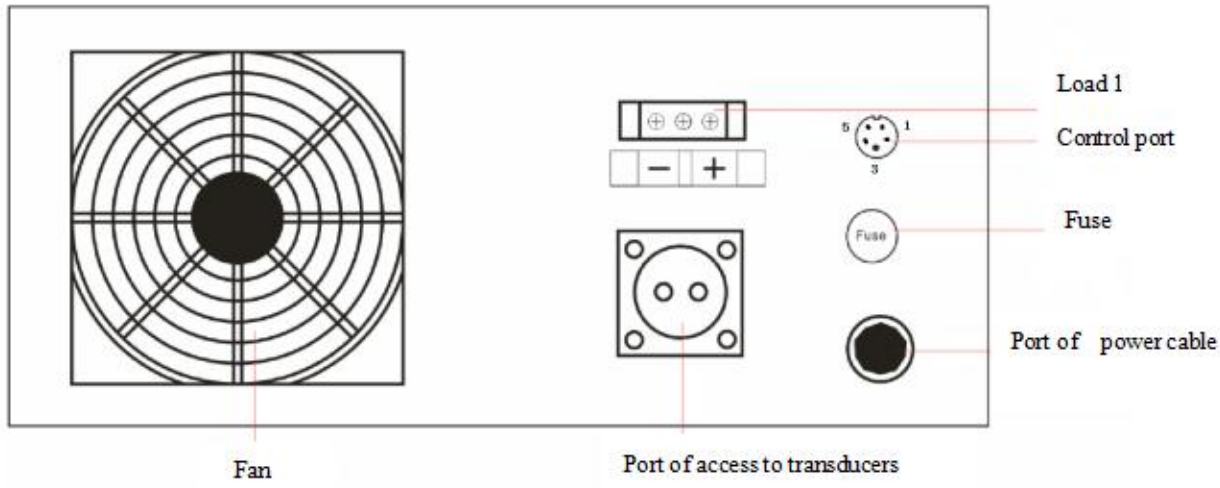
Mode of time/PLC display
Figure 3.4

Mode of sweep display
Figure 3.5

Lighting position	Display mode on LED digital displayer	Panel function specification
●Amp	Mode of current display	LED digital tube will display working current of the whole machine (unit: Am (Ampere)) as shown in Figure 3.2.
●KHz	Mode of working frequency display	LED digital tube will display working currency of the ultrasonic generator a shown in Figure 3.3.
●Time/PLC	Time/PLC display mode	LED digital tube will display the set time of the ultrasonic generator while Time/PLC indicator will be on as shown in Figure 3.4. In the Time/PLC display mode, keys of ▼, ▲ and ■ will work. In other display modes, the three keys will not work. The maximum time of the timer is 59 minutes 59 seconds. If not intending to set time, it will be advised to set it to be ON. Press the ■ ON/OFF key and it will stop working. Press the ▼ key and the time set will decrease to OFF at minimum. Press it once and it will decrease 1 second. Long press it and the time set will decrease continuously. Press the ▲ key and the time set will increase to ON at maximum (mode of boot and continuous working). Press it once and it will increase 1 second. Long press it and the time set will continuously increase. After setting the time, press the ■ ON/OFF key and the timer will start timing. When it is time set, the machine will turn off the ultrasonic and call in originally set ultrasonic time. After booting, access the Ultrasonic Generator through PLC control. If it is Time/PLC display mode after pressing the Mode key, LED digital tube will display PLC when the timing function will not be effective. Whether the ultrasonic of the whole machine will be fully controlled by PLC. Note: if the timing function is not used, please turn the time display to the state of time display!

●Sweep	Mode of sweep display	There are four modes of sweep display of SP01, SP02, SP03 and SP04 as shown in Figure 3.5. Each mode of sweep display is different in width of sweep display, which is applied to different cleaning objects, making the ultrasonic generator reach the best cleaning effects.
●Working	Working state	It indicates that the generator is in working state.

04. Specification on Connection Port



Note: control port (optional RS485 control port 1：A, 2：B, 3：GND, 4-5:PLC), PLC control: 4 and 5 pin get short circuit ultrasonic work, open ultrasonic stop.

Figure 4

05. Debug Methods and Steps

Figure 5.1

1. Connect load (transducer) to output port of the generator (Figure 4). Note: please make correct connection as per ＋and－.

2. Frequency debugging: Connect the generator to the power supply, turn on the power switch, and open the case, press the AFT button on the display panel. At this time, the display shows the frequency of the flashing, this frequency is the center frequency of the automatic frequency-sweeping, release After the key is pressed, the best resonance frequency of the generator and the load will be automatically tracked with this frequency as the center +/-1KHZ. If the difference between the center frequency and the load frequency is too large, please adjust the frequency adjustment potentiometer in Fig.5.1 with the frequency flicker. The frequency tracking is completed in about 20S. After the machine completes the automatic frequency sweep, the best resonant frequency to be tracked will be saved and the work will begin.

3. Current correction: After the frequency is adjusted, press the generator to increase the power to the maximum power. At this time, the current displayed on the generator and the actual current of the generator will be corrected by the current correction potentiometer shown in Figure 5.1. The generator current is consistent with the actual current and this step can be skipped.

4. Current debugging (adaptive inductor debugging): If the current is less than the required current (corrected) after correcting the current, adjusting the matching inductor on the generator and increasing or decreasing the gap of the matching inductor core can change the matching inductance. Inductance, when the inductance of the matching inductor and the load achieve the best LC resonance, the current at this time is the maximum state.

5. Current debugging (high-frequency transformer debugging): When the matching inductance is adjusted to the best state, the current can not meet the requirements, you can change the gear of the high-frequency transformer, the transformer gear has three gears, 1 gear minimum current, 2 gears The highest 3rd gear.

6. After the above steps are completed, switch the power again, press the ON/OFF button or connect to the PLC control port to turn on the ultrasound. Press the plus button in current mode to increase the current to the required current.

7. In debugging, rated current shall be calculated as per 0.13A for each transducer. Current can be reduced to 0.12A in calculation in a proper way in case of substantial transducers.

8. Mode of sweep display (those who are not debugging personnel are prohibited): SP01 sweep display; SP02 sweep display; SP03 sweep display; SP04 sweep display. Please select appropriate mode of sweep display based on different cleaning objects.

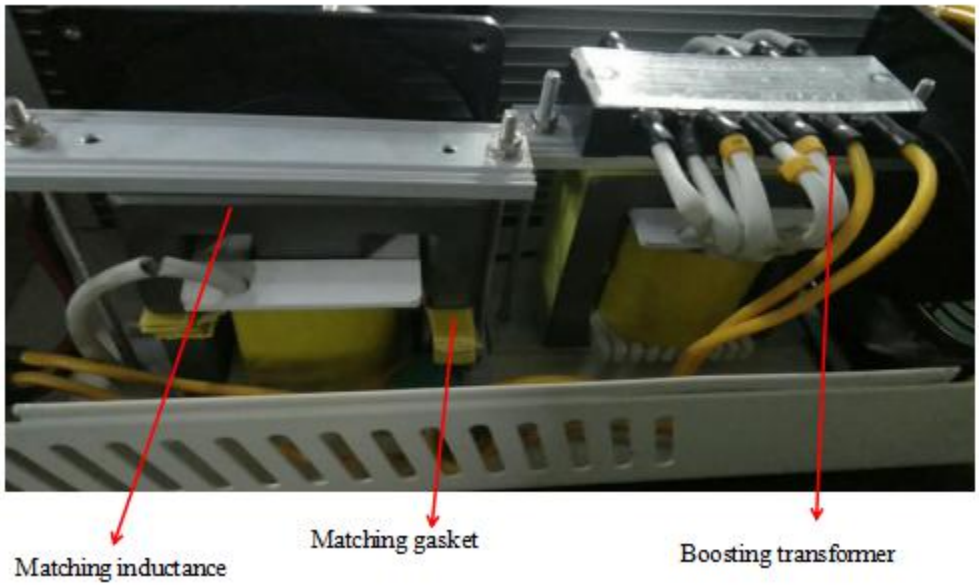


Figure 5.2

06. Common Faults and Maintenance Methods

Fault specification	Maintenance method
There is no ultrasonic and fuse is burnt	Open the machine cover to check whether there is damage on power switch. Check whether there is burning trace on the main board and check whether bridge rectifier, power tube and power resistance are damaged. Replace them if they are damaged.
There is no ultrasonic, fan runs and indicator on driving board is on, and there is frequency display	Check whether each connector on the generator is loosened or disconnected. If yes, weld; if not, return to the manufacturer for repair.
There is no ultrasonic, fan runs and indicator on driving board is off.	Check whether 12V power supply, stabilivolt IC, driving audion and diode are damaged. If yes, please replace them one by one.
There is ultrasonic and there is overcurrent, which is abnormal.	Check whether there are problems in load, if not, please return to the manufacturer for repair.
There is ultrasonic, ultrasonic sound is abnormal and poor in strength.	(1) Check whether output frequency is within working frequency range of transducer by frequency meter (in terms of frequency, 28KHZ transducer and 40KHZ transducer shall be 26KHZ-31KHZ and 36KHZ-41KHZ respectively). In case of too big difference, return to normal working frequency by modulating frequency potentiometer. (2) Observe the current in ampere meter. If current is overly smaller than rated current, first of all, check whether there is damage on ultrasonic transducer, such as transducer shedding, transducer wafer cracking, bonding glue fracture and whether there is short circuit in connection guide wire.

	Generally, if current fall is slight or there is no fall at all, sound is normal while ultrasonic strength declines in a fierce way, it will be likely that transducer bonding glue cracks. Its way of judgment is: observe the glue coating of the joint between transducer and steel plate, which shall be smooth surface in normal situation. In case of tiny crack, it will be likely that glue has cracked and it is necessary to disassemble the transducer to re-bond. If current declines in a fierce way, mainly check whether there is open circuit in guide wire or transducer wafer fracture. (3) Generally working voltage, cleaning object, water temperature and type of cleaning solution etc. will have impact on ultrasonic strength. In fierce stirring in particular, ultrasonic will weaken and it will not return to normal until tens of seconds later. Please pay attention to methods of usage.

07. Precaution

Please place the machine in where it is dry and airy. Distance between the rear of the machine and screen shall be longer than 35mm for convenience in heat dissipation. Please contact maintenance personnel in case of abnormal operation. Please do not uncover arbitrarily so as to prevent injury.

08. RS-485 description

Description of 760 Generator Communication Protocol V2.0

The ultrasonic generator produced by our Company 760 series can be set with RS-485 communication function as an option to realize that one mainframe can control several ultrasonic generators in remote, even can be connected into 32pieces ultrasonic generator by single RS-485 communication port. Thus making clients monitor and control work parameters (frequency and current) of each ultrasonic generator, control working & stopping and power plus & minus of each ultrasonic generator on remote mainframe.

Range of generator address: 01-192, it can be set on generator freely, and communication address of ultrasonic generator can also be changed randomly on the site for ease of clients to debug communication function and replace ultrasonic generator. In the case that the “MODE” button on generator has been pressed, switch on ultrasonic generator and wait for 3seconds, there will be A XXX on display, wherein, A means the address of this generator, XXX is any value in range of 1-192. It is possible to plus or minus value by pressing +/- button on generator panel. Keeping for 3s-5s after the value setting, it can be restarted after the address is written inside the ultrasonic generator. If clients would like to modify communication address of ultrasonic generator, they can do it according to the methods said above again.

Generator communication rate setting: With the long press of the - button, turn on the power switch and the ultrasonic generator enters the communication rate setting mode.

Press +/- button respectively, the display shows b 9.6/b 19.2/b 38.4/b 115, respectively, representing the communication rate of 9600bps/19200bps/38400bps/115200pbs. After the setting is completed, wait 3-5 seconds, save the data to the inside of the ultrasonic generator, and restart it.

When at slave mode, the ultrasonic generator can respond to all effective commands sent from mainframe (computer, PLC, etc.). In order to facilitate the communication and realize reliable connection, communication protocol of ultrasonic generator can be described as follows:

1. Ultrasonic generator adopts half-duplex communication mode with 9 bits UART and fixed Baud rate at 9600/19200/38400/115200bps. One frame of data contains a start bit (0), 8 data bits, two stop bits (1), and no parity bit. (or select a frame of data containing a start bit (0), 8 data bits, 1 parity bit, a stop bit (1)).
2. Read a single holding register code 0x03; write a single holding register 0x06. (Note: Supporting reading of multiple holding register codes is 0x03 at the same time, but it supports up to 16 holding registers at a time. If this is exceeded, an error occurs. The HMI can be directly connected.)
3. Detailed communication protocol, please check the MODBUS RTU communication manual.
4. When communicating with the PLC, the register address starts from 40000; when communicating with the HMI, the register address starts from 40001. When communicating with the HMI, the register address starts from 40001. (When the PLC engineer writes the software, it is determined according to the actual situation; if the 40000 address is occupied, other addresses can be set, and the maximum address offset is 16.)

Appendix1 Description Table

Register address	Name	Description	Read/write
（40001）0x00	Generator status	Bit0: 1----------equipment is working 0----------equipment stops	read
（40002）0x01	Control generator working and stopping	Bit0: 1----------External host control generator to work 0----------External host control generator to stop	write
（40003）0x02	Preset current	The unit is A. The current preset current is 4.0A, the data in the register is 0x28; the current preset current is 4.2A, the data in the register is 0x2A. (When the machine uses the preset current function, and the preset current is not 0, the power level holding register (0x04) can only be read and cannot be written; when the preset current is 0, the power level function is automatically enabled, and the power level is maintained. The register (0x04) can be written. The PLC or HMI needs to send the preset current value to the ultrasonic generator every time it is turned on; otherwise, the ultrasonic generator generates the last preset current value saved internally each time it is started.) (Setting The operating current cannot be greater than the maximum operating current of the generator)	write

（40004）0x03	Working current(Real-time current)	The current generator's operating current, in units of A. The current operating current is 4.0A, the data in the register is 0x28; the current working current is 4.2A, then the data in the register is 0x2A.	read
（40005）0x04	Power level	The current equipment output power level, the value is 0-100, the register data is 0-100. **(The actual power output is only about 5-100. When the preset current function is enabled, the power level holding register (0x04) is invalid, and the read back value is 0)**	Read/write
（40006）0x05	Working frequency of generator	The current operating frequency of the generator, when the register is 2860, it represents 28.60KHz	read
（40007）0x06	Generator communication rate	When the value is 0x00, 9600bps; when the value is 0x01, 19200bps; When the value is 0x02, 38400bps; when the value is 0x03, 115200bps; when it is other values, the default is 9600bps. (Note: After the generator data is returned, the generator will change the rate to the set rate)	read/write
（40008）0x07	Ultrasonic generator degas control	Bit0: 1----------equipment starts degassing 0----------equipemnt stops degassing	write
（40009）0x08	Communication address	1-192	read
（40016）0x0f	data storage	If Bit0:1 is written, the data will save the baud rate, or the preset current value (or set the function level) to the generator. After the generator saves the data, Bit0: 1will return to 0.	write/read

Appendix II Description

1. After the command to increase or reduce power being sent, mainframe shall read current only after extending 3s-5s, because it is impossible for power to hop in a flash when ultrasonic generator is working.
2. After working, mainframe shall read current only after extending 3s-5s, because it is impossible for power to hop in a flash when ultrasonic generator is working.
3. According to actual quantity of parallel ultrasonic generators, choose appropriate terminal matched resistance.
4. A 485 communication port is recommended with a maximum of 32 connection generators。
5. **Please select STP (Shielded twisted pair) in strict accordance with requirements in RS-485 Norm and select appropriate connection manner.**
6. **The communication port behind 700F machine is 3PIN aviation socket--the first PIN is A, the second PIN is B and the third PIN is shielded line, if there is no shielding layer for communication line, then don't connect!**
7. **If the customer's electromagnetic environment is relatively poor, it is recommended that customers do not use too high communication speed!**
8. **The waiting time between two instructions sent by PLC or HMI should reach 50ms or more (9600bps)!**
9. **This version of the generator software is compatible with V1.0 software.**