IMTEC®

ACCUMEG™

Megasonic System Operating Manual

For Accumeg Systems with UO1000PMCA RF Generators

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Pub. No.: 15-A357-0307

CE UL REGISTERED FIRM ISO 9001 A4203

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1. Unpacking Procedures

1.1. Description

This section describes the procedures required for unpacking the IMTEC Megasonic System. The information is presented in these parts:

- Inspecting the Packaging
- Checking the Contents
- Unpacking Procedures

1.2. Inspecting the Shipping Container

Before opening the shipping container, please look for evidence of transportation damage. It is your responsibility to notify the shipper promptly of any claims of freight damage. Although IMTEC takes no responsibility for components damaged in transit, we ask that we be notified as soon as possible of any damaged components so that we may help with the damage claim and with an expeditious repair or replacement of the damaged parts.

IMPORTANT:

Keep the shipping container and packaging in which the system components where shipped. If any system component should ever need to be returned to IMTEC, it ***must*** be returned in an appropriate container to minimize risk of shipping damage. If the original container is not available, a packaging kit may be purchased from IMTEC for a nominal fee.

1.3. Checking the Contents

Review the equipment list for completeness. The following components should be present:

- Tank
- Tank Frame (including coupling tray for indirect systems)
- Transducer(s) Assembly (Mounted to Tank for Direct systems, mounted to coupling tray for Indirect systems)
- Generator(s)
- Cables (one per Generator output)
- This document (Operation Manual)
- Warranty card
- Any other options or components shown on the receiving documents and/or additional manuals

NOTE: If any of the above items are missing, contact IMTEC immediately.

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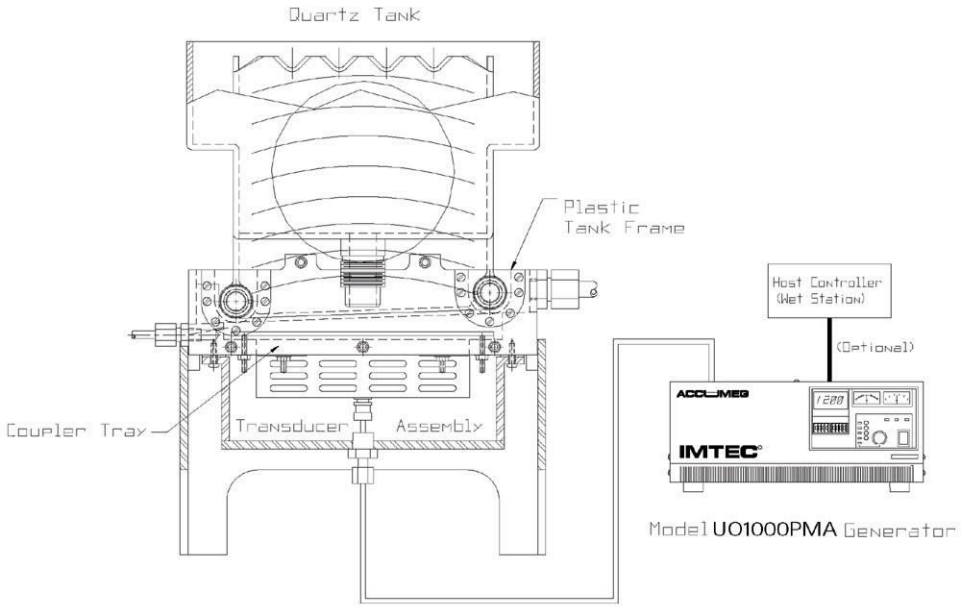
Figure 1-1: Megasonic Components



1.4. Unpacking Procedure

The unpacking of the components requires careful handling of the quartz tank to prevent breakage and to prevent “kinking” or crushing of the RF cables. All RF cables must be in excellent condition, free of creases, sharp bends, or crushing. A defective cable will not transmit maximum energy (wattage) from generator to transducer. If it is necessary to move or replace any RF cabling, great care must be taken to avoid the any damage.

Remember that quartz — **is fragile**. Place all quartz components on a level, padded surface with ample space at all times. Always wear protective gloves when handling Quartz components to Insure cleanliness.

This concludes Section 1., Unpacking Procedures.

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2. Introduction

2.1. Description

This section describes the IMTEC Megasonic System in general terms and what information about it is contained within this manual. The information is presented in these parts:

- The Megasonic Cleaning System
- What this Manual Contains
- System Configurations

2.2. The Megasonic Cleaning System

The IMTEC Megasonic System is a non-contact, sonic cleaning system, which removes micron- and submicron-sized particles from wafers and other substrates. Megasonic systems can be used in a number of applications including SC1, Solvent strip, post sulfuric and phosphoric rinse, and final rinse.

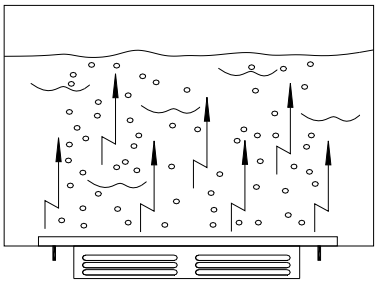
The IMTEC Megasonic System cleans wafers by transmitting sonic waves at a frequency of approximately 1 MHz through a liquid medium to augment the particle removal efficiency of a wet-cleaning process step. The force of the acoustic sound waves reduces the boundary layer on the surface of a wafer substrate to effectively lift more and smaller particles from the product surface. Particles are removed from the wafer surface and carried away via internal tank flow dynamics.

2.3. What this Manual Contains

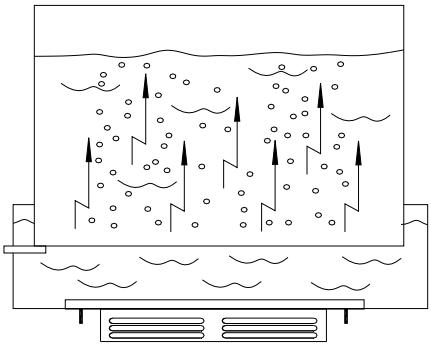
This document is meant to inform and instruct the reader about the procedures required for installing and operating the IMTEC Megasonic System. IMTEC recommends that it be read completely before any procedures are attempted.

2.4. System Configurations

This manual covers the Direct and Indirect Megasonic Cleaning Systems and should be read in conjunction with either the Model UO1000PMA (1000 Watt Digital Generator) Operating Manual or the Model UO1200PMQA (1200 Watt Digital Generator) Instruction Manual.



Direct



Indirect

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3. Safety Recommendations and Requirements

3.1. Description

This section describes the safety procedures recommended when using the Megasonic System. The information is presented in these parts:

- Regulations Check
- Electrical/Electromagnetic Safeguard Requirements
- In-Use Recommendations

NOTE: These recommendations are included for the Operator's safety and the protection of the Megasonic System. Please read through the recommendations completely before installing or operating the Megasonic System.

NOTE: These recommendations are advisory in scope; *IMTEC assumes no liability for the correct installation or use of this equipment.* It is the user's responsibility to ensure that facility preparation, system installation and operation are performed by properly licensed and trained personnel of the user's choosing.

3.2. Regulations Check

Prior to installation, IMTEC recommends a check of your company wet station Safety Regulations and Specifications, the local fire marshal codes and applicable electrical code requirements to be sure of compliance.

3.3. Electrical/Electromagnetic Safeguard Recommendations

The United States Department of Labor, through the provisions of the Occupations Safety and Health Act of 1970 (OSHA), has established an electromagnetic energy safety standard, which applies to the use of this equipment. Proper use of this RF source results in exposure below the OSHA limit. The following precautions are recommended:

3.3.1. Observe common sense rules that apply when dealing with electricity.

3.3.2. Do not operate the RF Power Source unless all RF connectors are secure and any open connectors are properly terminated.

3.3.3. Ensure that all equipment is properly grounded.

3.4. In Use Requirements

3.4.1. For direct systems, make sure there is at least 50mm (2 inches) of fluid above the transducer before it is energized.

3.4.2. For indirect systems, never turn on the transducer without first ensuring that the boundary layer is full and the DI water flow (10-15 GPH) is functioning properly.

3.4.3 **Under no circumstances should a person put any part of his or her body into a bath while the Megasonic generator is turned on**. The RF energy, while apparently not harmful to skin, can severely damage bones and internal tissue.

NOTE: Additional safety information is located in pertinent sections of this manual.

This concludes Section 3., Safety Recommendations and Requirements.

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4. System Components and Specifications

4.1. Description

This section describes the components making up the Megasonic System and their respective specifications. The information is presented in these parts:

- The Tank
- Transducer Assembly
- Generator

4.2. Tank (Indirect)

4.2.1. All tanks used in the IMTEC Indirect Megasonic System are sloped bottom quartz tanks with a scalloped process chamber. Process chemistry is pumped through sparger tubes in the base of the tank.

4.2.2. The tank sits in a coupler tray supported by a plastic frame. The transducer arrays mount to the bottom of the coupler tray. The frame is designed to create a cavity between the bottom of the quartz tank and the top of the transducer array(s). DI water is circulated through this coupler tray to create a liquid medium for the transmission of energy from the transducers to the tank, and for cooling the transducers.

4.2.3. DI water feeds into the coupler tray through holes in the side or bottom of the coupler tray. To further remove any bubbles that form in the coupling tray, the flat bottom of the quartz tank is angled from side to side. This creates shallow and deep sides to the coupling water layer. Any bubbles that do form in the DI water migrate to the top of the deep side and escape to the atmosphere.

4.2.4. Strips of Teflon are used to cushion the quartz tank from the coupler tray to the bottom of the quartz tank.

4.3. Tank (Direct)

4.3.1 All tanks used in Direct Systems have the transducer assemblies mounted directly into the bottom of the tank.

4.4. Transducer Assemblies (a.k.a. Vibration plate or Oscillating Plate)

4.4.1 Either one or two transducer assemblies mount to the bottom of the systems. A gasket forms a seal between the fluid and the transducer assembly. The top of the transducer assembly may be specially coated — care should be taken not to scratch the transducer surface; **damage will result**.

4.4.2. Each transducer array contains a grid of piezoelectric crystals. The piezoelectric crystals are the oscillating devices of the system. When the power at the desired frequency is applied to the piezoelectric crystals, they vibrate at that frequency. This energy is transferred through the liquid medium.

4.4.3. Each set of piezoelectric crystals is matched to the Generator to provide maximum transmission electrical efficiency. The serial number of the matched transducer is noted on the generator.

4.4.4 A regulated flow of nitrogen gas or CDA of 10 PSI (3.4 kg/cm^2) delivered to the transducer housing orifice creates. .75 in H^{2}0 (1.9 cm H^{2}0) internal to the housing. This purge

creates a positive pressure inside the housing to prevent corrosive gases or liquids from entering.

4.4.5 Special coaxial cables connect the transducer(s) to the RF Generator.

4.5 Generator

The Generator is specifically designed for driving the piezoelectric transducers for Megasonic Cleaning applications. (See Generator Model UO1000PMA or UO1200PMQA Manual for details).

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5. Facility Requirements

5.1. Description

This section describes the facilities required for successfully installing and operating the IMTEC Megasonic Cleaning System. The information is presented in these parts:

- Electrical Requirements
- Cooling Requirements
- Mounting Requirements
- Plumbing Requirements

5.2. Electrical Requirements

5.2.1. The Generator for the IMTEC Megasonic Cleaning System is wired for 200V+-4%, 208V ± 10% 10 amp (1000 W) or 12 amp (1200 W) operation. Contact IMTEC Technical Support before attempting any changes.

5.3. Cooling Requirements

5.3.1. To adequately cool the Generator, sufficient space must be allowed for air circulation. The air-intake is through the front of the unit and the exhaust at the rear. The area around intake and outlet openings must not be blocked.

5.3.2. *If the Generator is to be placed in a cabinet:* The ambient temperature within the cabinet must be no higher than 40°C. Cooling air must move continuously in and out of the cabinet. If ventilation is inadequate, temperatures may exceed safe limits.

5.4. Mounting Requirements

5.4.1. Place the generator where the front panel can be easily read and accessible for operation. The generator location must be free of corrosive liquid and fumes.

5.4.2. Ensure adequate access to the generator rear panel and cables.

5.4.3. Multiple generators should not be stacked higher than two. Place side by side with appropriate spacing.

5.5. Plumbing Requirements

In addition to plumbing for the tank, the following are also required:

5.5.1. DI Water for Boundary Layer (Indirect systems only): ¼" Compression fitting, (10-15 GHP) (38-57 LPH).

5.5.2. N_2: ¼"Compression fitting 10 PSI (3.4 kg / cm^2) (for transducer housing).

5.5.3. N_2: 1/8" NPT, 60 PSI (20.5 kg 1 cm^2) with regulation (plastics) (QDR systems only – for actuating dump doors).

5.5.4. Tank inlet, ¾" flared tube fitting, 15-25 liters/min.

5.5.5. Tank sump 1.0 " QUARTZ flared stem, process chamber drains ¾" flared tube fitting.

5.5.6. Boundary layer outlet (indirect systems only), ½" Compression fitting.

This concludes Section 5., Facility Requirements.

6. Installing the System

6.1. Description

NOTE: Please read through all of the procedures before beginning installation.

This section describes the procedures required for installing the Megasonic System. The information is presented in these parts:

- Attaching the Transducers
- Mounting the Tank Frame in the Wet bench
- Routing the RF Cables
- Installing the Tank
- Mounting the Generator
- Installing the Interconnects

6.2. Attaching the Transducers

6.2.1. The system is shipped with the transducers already mounted to the coupler tray (indirect) of the tank frame or the tank itself (direct). If this is not the case, please contact IMTEC Technical Support.

6.3. Mounting the Tank Frame in the Wet bench

6.3.1. The tank frame is designed to be supported by either the upper flange or the frame legs. Place the tank frame into the wet bench cradle or rails so that the flange is well supported and the leveling screws can adjust the height of the frame without binding.

6.3.2. Ensure that there is sufficient clearance for the frame, transducers and cables.

6.4. Routing the RF Cables

6.4.1. Make sure all cables are labeled at both ends.

6.4.2. Drill and tap 3/8” NPT holes in the inside of bulkhead of the headcase or rear plenum to match the threaded fitting attached to the end of the cable.

6.4.3. Loosen the nut on the fitting so that the cable slides easily through the fitting and route the cable through the headcase or rear plenum holes, ensuring that no tension is applied to the transducer connection.

6.4.4. Tighten the fitting in the threaded hole at the pass-through, then tighten the nut on the fitting to seal around cable. **Do not use pliers to tighten!**

IMPORTANT: Handle cables carefully to avoid crimping or kinking them.

6.5. Installing the tank

6.5.1. Carefully place the tank into the previously installed tank frame so that the weight of the tank is resting on the Teflon™ gasket (Indirect Systems only)

6.5.2. Attach ¼” O.D. DI water feed line to the male connector located underneath the coupler tray. (Indirect systems only)

6.5.3. Make sure the tank is positioned correctly and tighten the adjustment screws on the end of the tank frame to take up free play between quartz tank and the frame. *Do not over tighten. (Indirect systems only)*

6.5.4. Turn on the DI water to a flow rate of (10-15 GPH) (38-57 LPH). The boundary layer between the tank and the transducer should fill with water. (Indirect systems only)

IMPORTANT: The boundary layer must be completely filled with DI water and the DI water feed must continue to replenish that water at the prescribed flow rate during operation of the system. Without continuous water flow in the boundary layer(s), proper coupling cannot be achieved and the transducers will overheat!

6.5.5. Attach ¼" O.D. tubing for $N_{2\ or}$ CDA input to the bottom center of each transducer and turn on the N_2 feed to a pressure of (10 psi) (3.4 KG/CMZ) regulated.

6.5.6. Attach the balance of the plumbing for working fluid in-flow, drain, boundary layer trough (dry plenum only), and QDR spray bars (QDR systems only), working carefully around the RF cables (see Section 5.5).

6.6. Mounting the Generator

6.6.1. The Generator is a high powered electronic device and, as such, should be located in a dry, well-ventilated area free of corrosive fumes with an operating temperature of $0\text{-}40^0$ c.

6.6.2. The generator is wired for (208V ±10%) (208V ±10%). Contact IMTEC Technical Support about operating the generator at other voltages.

6.6.3. Ensure the front panel power switch is in the OFF (out) position.

6.6.4. Attach cables to the appropriate outputs on the back of the Generator according to the cable tags labeled earlier (see Section 6.4.1), being careful not to crimp or kink the cables.

6.6.5 Plug in power cord to the Generator and the appropriate power receptacle

6.7 Installing the Interlocks

6.7.1. All Imtec Indirectly Coupled Megasonic Cleaning Systems are shipped with a boundary layer sensor that will open if the boundary layer level is too low or the water temperature exceeds 70°C.

6.7.2. All systems include an N2 pressure switch to monitor the transducer housing N2 Purge.

6.7.3. **IMPORTANT NOTE:** At least one normally closed switch (i.e. closed in a safe condition) must be connected to the generator parallel port in order for the system to function.

6.7.4. For directly coupled systems (i.e. tanks that have transducers in the process vessel) it is the user's responsibility to provide a means of monitoring liquid level to ensure that the transducer cannot be run without being covered by at least 0.5 inches of liquid.

6.7.5. All customer supplied sensing devices should be of a dry contact type.

6.7.6. Refer to the Generator Manual section for proper connection of sensors.

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IMTEC MEGASONIC CLEANING SYSTEM LIMITED WARRANTY

(NON-WARRANTY OF MERCHANTABLILITY, FITNESS AND LIMITATION OF LIABILITY)

7.0 IMTEC warrants the Imtec Megasonic Cleaning System to be free from manufacturing defects in materials and workmanship for a period of *36 months* **from the date of original shipment from our factory with the following exceptions:**

1. IMTEC quartz ware is guaranteed to remain sound and whole in normal usage for a period of 45 days from the date of initial shipment.

2. Any Teflon®or other coating of the transducer shall be warranted for a period of (1) ONE YEAR.

Such warranty of IMTEC is limited as follows: In the event of such defect, IMTEC agrees at its option, to either repair or replace the defective unit or to refund the purchase price and IMTEC's liability is limited thereto. Units repaired or replaced under warranty will bear the remainder of the original equipment warranty.

All repairs will be made at IMTEC's place of business. Buyer shall pay the cost of returning the product to IMTEC's factory. Any such return must be pre-authorized by IMTEC, through issuance of an IMTEC RGA number. That number must be shown on the returned merchandise.

IT IS THE BUYER'S RESPONSIBILITY TO CAREFULLY INSPECT ALL PRODUCTS OR DAMAGE UPON RECEIPT. CLAIMS FOR DAMAGE IN SHIPMENT SHOULD BE SUBMITTED TO YOUR CARRIER. RETAIN ALL OF ORIGINAL PACKAGING AS THE CLAIMS ADJUSTOR WILL NEED TO INSPECT. IT ISS RECOMMENDED THAT ALL CLAIMS BE SUBMITTED WITHIN 5 DAYS OF RECEIPT OF SHIPMENT.

A. WHAT IS INCLUDED IN THE WARRANTY

IMTEC guarantees its equipment only if used with compatible chemistries, within proper temperature ranges for these chemistries, in proper environments, temperature, and voltage ranges for the equipment. With these conditions met, IMTEC guarantees:

1. Megasonic generator
2. Transducer
3. Built-in sensors
4. General workmanship

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B. WARRANTY EXCLUSIONS

While other exclusions may apply, IMTEC specifically does not guarantee and accepts no responsibility for:

1. Penetration or chemical attack of any material by unauthorized or non-approved user chemistries.
2. Chemical attack on quartz components.
3. Breakage of quartz or other product by impact, improper facility/wet-station installation, handling or other abusive treatment, or damage related to such impact-related or physically induced damage, such as internal corrosion.
4. Damage to the transducer or coating due to operating the transducer without fluid above it.
5. Damage to the transducer or coating due to operation above 70°C. (Max Chemical temperature in direct systems). (Max boundary layer water temperature in " in-direct" systems).
6. Damage to the transducer or coating due to operation without specified nitrogen or CDA.
7. Damage to the transducer or coating from physical contact.
8. Unauthorized customer modifications to any portion of the system (this may disqualify all warranties).
9. Generator or hardware failures caused by installation directly within the process-sink hood or other fume areas where it is subjected to corrosive environments in violation of normally accepted industry practice in appropriate sink control areas.
10. External temperature sensors where the protective outer coating has been torn, cut or abraded.
11. Where failure is due to negligence, abuse or vandalism.
12. Submersion of the unit or other non-standard practices.
13. Damage to the cables due to excessive bending.

IMTEC DOES NOT WARRANT MERCHANTABILITY OR FITNESS FOR ANY PURPOSE AND THERE ARE NO WARRANTIES, EXPRESSED OR IMPLIED, OTHER THAN THOSE EXPRESSLY STATED HEREIN. IMTEC IS NOT RESPONSIBLE FOR ANY CONSEQUENTIAL, INCIDENTAL OR OTHER DAMAGES WHATSOEVER. IMTEC'S LIABILITY IS LIMITED TO THE REPAIR OR REPLACEMENT OF SUCH DEFECTIVE PRODUCT OR REFUND OR PURCHASE PROCE AT IMTEC'S SOLE OPTION, AS STATED ABOVE. ALL CLAIMS MUST BE MADE TIMELY AND WITHIN THE WARRANTY PERIOD.

IMTEC®

ACCUMEG™

Megasonic Generator Manual
Model # UO1000PMCA

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Pub. No.: 15-A357-0307
CT98-011 Rev5

Safety Precautions

1. The Megasonic generator is a main component of the Megasonic cleaning system, and is designed and manufactured to meet the required standards of the Low Voltage Directive and the EMC Directive of Europe.

   lMTEC puts a CE marking on the UO1000PMCA Megasonic generators to declare that they conform to these standards.
   lMTEC asks customers to familiarize themselves with the manual's contents to maintain conformity, thereby ensuring their safety and protecting their property.

2. Please keep this manual handy, for example, near the Megasonic cleaning system.

3. This manual is essential for using the Megasonic generator. Please treat it as an integral component of the generator, so that all future users can reference it.

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Table of Contents

1. Product outline, Components and Major Specifications

1.1. Product Outline

The UO1000PMCA Megasonic generator is a main component of the “ACCUMEG” Megasonic cleaning system. The generator combining with the IMTEC provided transducer develops a maximum output of 1000W nearly at 1000kHz. The generator is powerful enough to provide a wide cleaning area through a proper cleaning bath layout.
The UO1000PMCA Megasonic generator is a CE marked product which conforms to the Low Voltage Directive and the EMC Directive of the European Community. The UO1000PMCA can be safely used in the European countries.

1.2. Components

1.2.1.	Megasonic generator	Qty
	- UO1000PMCA	1
1.2.2	Standard accessory	
	- Power supply cable (AC cable) , assembled to generator unit	1

1.3. Major Specifications

1.3.1.	Source requirements:	208V±10%AC, 10A, single phase, 50Hz or 60Hz
	Consumption:	2.08kVA or less
	Rush current:	50A max.
	Output Power:	1000W
	Output Range:	20 – 1000W
	Output frequency:	950.0kHz to 999.9kHz
	Weight:	25kg max.
	Dimensions:	380mm(W) x 550mm(D) x 175mm(H) outside dimensions of generator unit excluding protrusions
1.3.2	Applicable transducer:	IMTEC manufactured and specified

2. Safety Precautions - Be sure to follow these instructions

2.1. General

2.1.1. Ensuring safety

To ensure safety means to protect people and their possessions from exposure to danger. For that purpose, it is necessary to predict all possible dangers and implement measures to prevent them from occurring. The safety precautions presented in this section should be considered as supplements to important overall actions taken to ensure safety. The customers are requested to familiarize themselves with the safety precautions, consider the specific operating conditions, and establish safety implementations for the installation and operation of the generator according to applicable private and public standards and regulations.

2.1.2. Warning marks

This section explains the meaning of the warning marks attached to the system and used in this instruction manual.

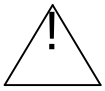
Warning marks

Warning mark	Meaning
⚠ WARNING	- Follow the descriptions in the Instruction Manual. - Ignoring this mark and performing improper handling may result in death or serious injury.
⚠ CAUTION	- Follow the descriptions in the Instruction Manual. - Ignoring this mark and performing improper handling may result in injury and/ or physical damage.
Warning	- Observe the descriptions. - Radio disturbances are expected.
Caution	- Follow the descriptions in the Instruction Manual. - Physical damage is expected.

Symbols

Symbol	Meaning
	- General caution, warning, risk of danger - Refer to the Instruction Manual.
	- Electric shock - Refer to the Instruction Manual.
	- Requirement of protective ground system

2.1.3. Dangers due to unintended use



WARNING - Electric shock, skin burn, disturbance to other system

This product is *intended only to perform Megasonic cleaning*, with the specified Megasonic transducer connected and the specified cleaning bath used.

Other forms of use may result in danger.

Examples of expected dangers:

1) Skin burn due to high frequency and high voltage
2) Megasonic generator burnout
3) Communications line disturbance
4) Computer system disturbance
5) Other industrial equipment disturbance (In the worst case, human injury due to the malfunction of an industrial robot is expected.)

2.1.4. Danger due to disassembly and/or modification

WARNING - Electric shock, skin burn, failure, hazardous radio disturbance

Disassembly and/or modification of the generator must be done by IMTEC authorized personnel only. Removing a panel and/or a cover to access internal electronic circuits is extremely dangerous. High voltage is used internally, and there is a risk of electric shock.
Any repair and/or modification by a person other than IMTEC authorized personnel breaks the system standards indicated by the CE marking, thereby resulting in risk of the dangers described in Item (3), "Dangers due to unintended use."

2.1.5. Cautions on starting the generator

CAUTION - Failure of, smoke from, and/or fire from generator and/or transducer

1) Do not start the generator without the transducer cables connected.

2) Before starting the generator, check that the cleaning bath contains a sufficient amount of solution. Starting with an insufficient amount of solution causes the failure of the Megasonic generator and/or transducer. Smoke and/or fire may also occur.

2.1.6. Caution on the transducer cables (the cables to interconnect the ultrasonic generator and transducer)

CAUTION - Skin burn and/or ultrasonic generator failure due to high frequency voltage

Do not unplug the Megasonic power cable (transducer cable) during operation. Otherwise, high-frequency high voltage may cause skin burn and/or ultrasonic generator failure.

2.1.7. Caution for handling the generator

CAUTION - Harm to your body due to excess weight

The generator weights nearly 25 kilograms.

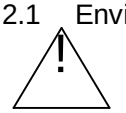
1) Do not lift the generator up by oneself.

2) Use suitable carrying means for transportation.

This work shall be performed by a person on handling assignment.

2.2 Installation

2.2.1 Environmental conditions



WARNING - Electric shock, fire, smoke, failure

This product is designed to safely operate in the environmental conditions described below. Use in other conditions may result in damage to personnel including death or serious injury due to electric shock, physical damage including fire or failures, or any combinations of these.

Always use this product under the environmental conditions described below. Control the environmental conditions properly as necessary.

Environmental conditions

1) Indoor use : Operate and store the product indoors.

2) Maximum altitude : 2,000 m (1000 meters max. under the Machinery Directive)

3) Temperature : 5°C to 40°C

4) Maximum relative humidity : 80% up to 31°C, decreasing linearly to 50% at 40°C. No condensation is allowed.

5) Supply voltage : 208 VAC ±10%, 50 or 60Hz

6) Supply line transient over voltages: specified voltages according to Installation Category II in the EN61010-1 : 1993/A2 : 1995

7) Pollution degree : ① No corrosive gas is allowed.

② The system must not be exposed to foreign materials that would cause degradation in electrical insulation, including dust, steam, water drops, and/or oil mist. (The pollution degree must be no worse than an ordinary office environment.)

2.2.2 Operating environment

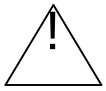
This product (the Megasonic generator) is intended for use in an industrial environment. It is classified as Class A, Group 1 of the relevant standards of radio disturbance characteristics (EN 55011/3.1991), and meets the applicable requirements.

① Warning : Radio disturbance in residential, commercial, and light-industrial environments

Do not use the Megasonic generator in a residential, commercial, or light-industrial environment. This product may cause disturbances to radios, television sets, computer systems, and/or light-industrial equipment.

In special cases, the generator may not be able to completely avoid disturbance to other systems. This may occur, for instance, when a highly susceptible apparatus is being used in proximity or when a apparatus presumed to conform with the relevant requirements for use in industrial environments is used in extreme proximity.

In these cases, this product may cause failure of the products being processed and/or damage to personnel.

②  WARNING - Dangerous malfunction of other systems

1) To mitigate electromagnetic interference with other systems in the same industrial environment, consider the following points before installation:

- Keep the maximum possible distance to other systems.
- Keep the distances between the Megasonic generator, remote controller, and distribution board (source power switch board) as short as possible.
- Separate the connecting lines and cables for this product from those for others, and keep the maximum possible distance.

2) Confirm the following points during trial operation:

- Run the generator, maximize the output, and confirm that operation of other systems is not affected.

③ Mitigation measures against radio disturbance and electromagnetic interference

If radio disturbance and/or electromagnetic interference must be mitigated further after implementing the measures described in Item (2), measures that meet the specific situations must be taken. IMTEC is ready to assist the customers in implementing these measures for solution.
The steps are as follows. IMTEC requests the customer to provide specific information to identify the actual conditions, and plans and presents solutions.
IMTEC then sends the components and materials required for the solutions, and the customer implements the solutions. Or, IMTEC dispatches engineers to implement the solutions and confirm the results.
The cost of components, materials, and engineer dispatch must be born by the customer. Due to the nature of the work, a considerably long period may be required to complete the solutions.

2.2.3 Personnel for installation

WARNING – Harm to human body, fires etc.

Activities from the installation planning to the completions of the trial operation shall be implemented under engineers who have sufficient knowledge of electric hazards and were trained according to your safety standard and construction standard.

2.2.4 Installation location

① Cautions for flammable or explosive gases

WARNING – Explosion and fire

This product does not have an explosion-proof design. To prevent harms due to explosion and/or fire, strictly follow the following regulations in addition to those described in Section 2.2.1, "Environmental conditions":

1) The environment must contain no flammable and/or no explosive gas.
2) The environment must contain no flammable solvent steam or no flammable dust.

② To prevent the generator falling

CAUTION – Harm and damage due to falling

To prevent harms and/or damage due to falling in the event of an earthquake or a contact by a person, follow the regulations below.

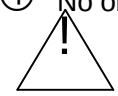
1) Install the generator horizontally on a stable, flat surface, and fasten it using supplied fixing legs (supplied optionally).
2) Do not pile up the generator to two or more.

③ Not to overlook warnings

WARNING – Danger due to overlooking the label

To prevent danger due to overlooking the label, install the system so that the operator can easily see the label from a working position. Also, make sure that there is enough lighting to read the label.

④ No obstacles to protector operation



CAUTION – Spread of fire, smoke, and/or malfunction

On the rear panel of the ultrasonic generator, there is a power switch with a circuit protector function. The switch is automatically flipped to the OFF position when an over-current is detected.
Install the generator so that no structure, cable, and/or wire would hinder the mechanical operation of the switch.

⑤ Routing of cables and wires

WARNING – Electric shock and/or fire

Prevent disconnection, shorting, and/or insulation degradation from occurring on the protective ground wire or other cables. For that purpose, select a path that minimizes the possibility of wear and damage due to external forces, deformation by heat, and/or corrosion and/or deterioration due to water or chemicals. If such a path cannot be found, take sufficient protective measures.

2.2.5 Connection

2.2.5.1. Connecting the Megasonic generator and the transducer cable

CAUTION – Burnout, smoke, and increased electromagnetic interference

1) Each Megasonic generator corresponds to a specific transducer, and is given matching numbers when delivered from the factory. Confirm the matching numbers and make sure that the Megasonic generator is connected to the correct transducer.
2) Do not cut and shorten the transducer cables, and also not extend them.

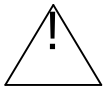
2.2.5.2. Connecting the power supply cable (AC cable) to a protective ground system and power lines

CAUTION – Electric shock

To prevent risk of electric shock, follow the steps below:

1) Turn off the power switch of the ultrasonic generator.
2) Turn off the switch on the distribution board (customer's switchboard).
3) Connect the power supply cable's protective ground line to the protective ground terminal of the distribution board.
4) Connect the power supply cable's power lines to the relevant power supply terminals of the distribution board.

2.2.6. Cautions on trial operation



WARNING – Harm to human body, losses due to fire etc.

On trial operation, observe the precautions described in Section 2.3 "Operation"

Caution : Before starting the Megasonic generator, especially when trial operation, ensure that the cleaning bath is filled with sufficient solution.

Starting with an insufficient amount of solution may cause the failure of the transducer and the generator.

The customers are recommended to maintain foolproof measures for preventing damages from possible mis-operation.

2.2.7. Routine check

Periodically check that the initial state is maintained for the following items described in Section 2.2, "Installation." Clarify any item that needs to be rectified, and take necessary measures.

2.2.7.1. Environmental conditions	:	Check that all necessary conditions are met
2.2.7.2. Operating environment	:	Check that no trouble occurs due to radio disturbance or electromagnetic interference.
2.2.7.3. Installation location	:	1) Check that the necessary conditions and states are maintained. 2) Check that the routed cables and/or wires are free from damage, corrosion, and/or

deteriorated insulation.

2.3. Operation

2.3.1. Notes on cleaning solution

WARNING – Harm, and damage due to explosion and/or fire, and health hazards

This product does not have an explosion-proof design. The electric energy used in the system may trigger fire in a flammable environment. Furthermore, the Megasonic energy promotes evaporation and splashing of the cleaning solution.

To prevent explosion, fire, and/or health hazards, follow the instructions below.

1) Do not use a flammable cleaning solution.
2) When using a cleaning solution that is hazardous to health, take special measures, for example, prevent direct contact with the cleaning solution and/or ensure proper ventilation.
3) Specify proper handling procedures according to relevant public regulations on hazardous materials.

2.3.2. Notes on starting operation

WARNING – Burnout of transducer, failure of the generator

Before starting the Megasonic generator, ensure that the cleaning baths (inner bath and outer bath) are filled with specified amount of solution.

Do not start the generator when the baths contain no or low solution.

2.3.3. Abnormalities during operation

CAUTION – Spread of fire and/or smoke

If a smell, smoke, or abnormal heating occurs during operation, immediately stop the Megasonic generator and turn off the power switch.

3. Names and Functions of Component Parts

FRONT VIEW

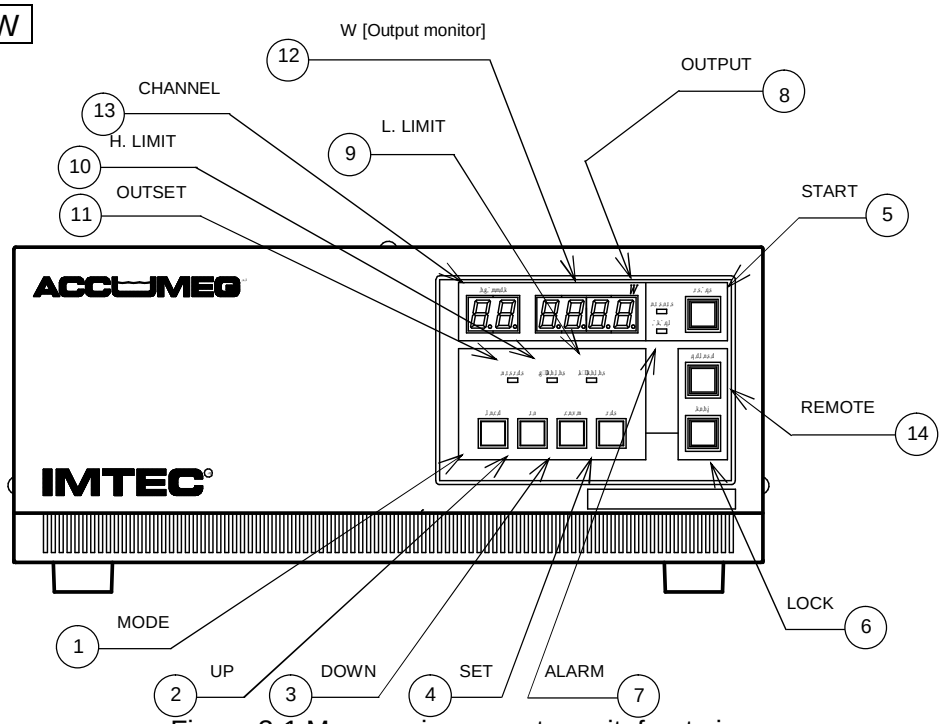


Figure 3-1 Megasonic generator unit, front view

① MODE switch
changes over between the setting mode (preset output power value setting, upper limit power value setting, lower power value setting) and the local mode. Pressing the switch once changes over between the setting mode and the local mode. When the user starts in local mode, the target power value of the channel is the power value of the channel set in setting mode.

* The user may press the MODE switch while the LOCK lamp is off in local mode.

② UP switch
increases the channel number and the power level in setting mode (preset output value setting, upper limit power value setting, lower limit power value setting). The UP switch allows you to increase the preset channel number while the generator is in wait mode.

* The user may press the UP switch while the LOCK lamp is off in local mode.

③ DOWN switch
Reduces the channel number and the power level in setting mode (preset output power value setting, upper limit power value setting, lower limit power value setting). The DOWN switch allows you to reduce the channel number in wait mode.

* The user may press the DOWN switch while the LOCK lamp is off in local mode.

④ SET switch
Confirms the channel number of the preset channel in setting mode (preset output power value setting, upper limit power value setting, lower limit power value setting) and in wait mode.

* The user may press the SET switch while the LOCK lamp is off in local mode.

⑤ START switch (with a lamp)
Turns ON/OFF the ultrasonic generator.

Pressing the START switch when the switch is off turns ON ultrasonic output. Likewise, pressing the START switch when the switch is ON turns OFF ultrasonic output.

* The START switch is disabled in REMOTE mode.

⑥ LOCK switch (with a lamp)
Disables the REMOTE switch, MODE switch, UP switch, DOWN switch, SET switch, and START swith in local mode. While the LOCK switch lamp is lit, the four switches from the MODE switch to the SET switch, and the REMOTE switch are disabled. Pressing the REMOTE switch when the LOCK lamp is off turns to REMOTE mode, making the lamp on. In REMOTE mode, the LOCK switch remains locked even when the switch is pressed.

⑦ ALARM lamp
Turns ON when the generator becomes abnormal.

The abnormal conditions mean when:

- The control box hardware becomes abnormal;
- The inside of the generator is overheated;
- Abnormal current conducts on the high voltage unit of the generator;
- Alignment with load becomes extremely abnormal;
- The FAN has stopped;
- The configuration is incorrect (example: single generation has been set despite two generators);
- SLAVE becomes abnormal in the MASTER/SLAVE configuration;
- The power value measured has exceeded the upper limit setting value for the target power value of the preset channel being output;
- The power value measured has gone lower than the lower limit setting value for the target power value of the preset channel being output.

In these case, the lamp turns ON and breaks ultrasonic output.

⑧ OUTPUT lamp
Turns ON while a power level appears in the level display, and remains OFF while an error code, due to, for example, alarm, appears in the display.

⑨ L.LIMIT lamp
turns ON in lower limit power setting mode, and remains OFF in other mode.

⑩ H.LIMIT lamp
turns ON in upper limit power setting mode, and remains OFF in other mode.

⑪ OUTSET lamp
Turns ON in preset output power value setting mode, and remains OFF in other mode.

⑫ OUTPUT level display
Indicates the preset output power value, upper limit power value, and lower limit power value in setting mode.

The OUTPUT level display indicates the measurement value of the power being output while oscillation output does not starts in local mode or remote mode ("0" appears usually), whereas the display indicates the measurement value of the power being output while oscillation output has started. The display indicates the code of the alarm when it occurs.

⑬ Channel display
Indicates a channel number corresponding to the setting item in setting mode, whereas indicates the preset channel number being set in local mode. In remote mode, the channel display indicates a channel number directed by the upper interface.

⑭ REMOTE switch (with a lamp)
Enables the system to operate in remote mode. While the REMOTE switch lamp remains ON, the four switches from the MODE switch to SET switch, and the START switch are disabled. The LOCK switch lamp automatically turns ON and remains locked. In remote mode, the system follows the preset channel specified by the upper interface and the states of output enable signal and of output power selection signal. The user may press the REMOTE switch while the LOCK lamp remains OFF in local mode.

REAR VIEW

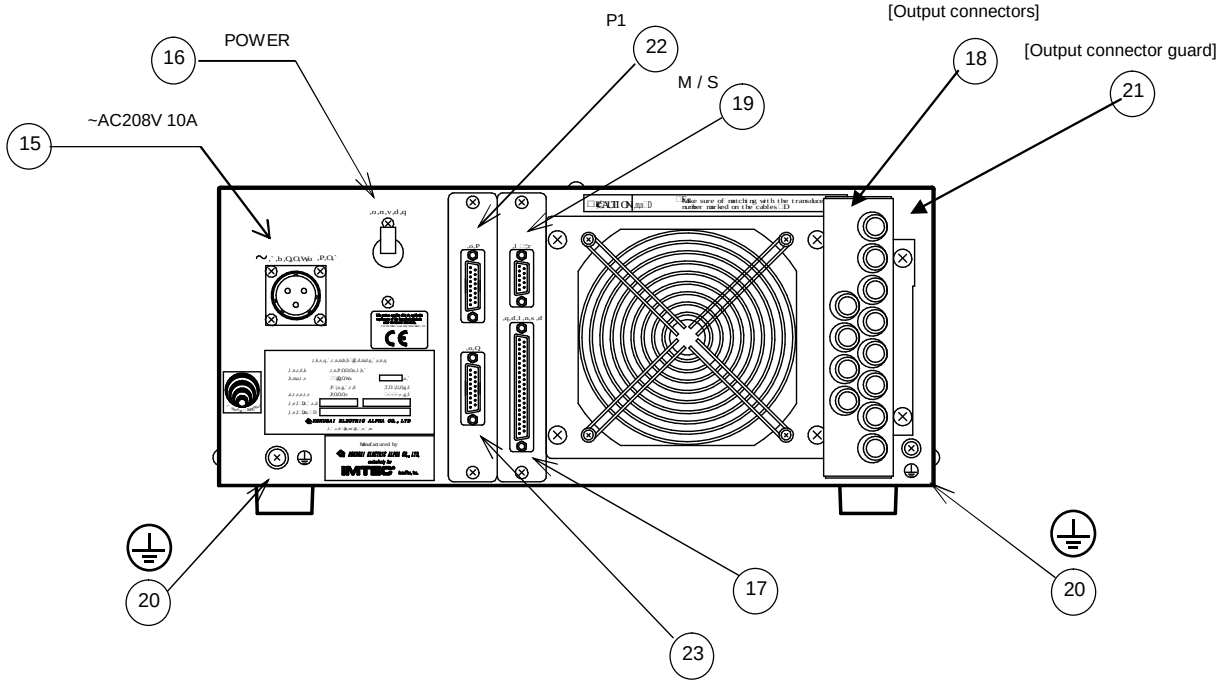


Figure 3-2 Ultrasonic generator unit, rear view

⑮ **Power connector** Is for the power cable attached. Firmly connect the connector with the power cable.

⑯ **POWER switch t**urns ON/OFF the power of the ultrasonic generator. The POWER switch has an overcurrent protection function.

⑰ **Control signal connector** Is used for selecting OUTPUT CONTROL and preset on the front panel, and for outputting the START control signal and error data of the generator. Connect the attached DSUB37pin connector cable to the connector.

⑱ **Output connector** Is used for connecting the cable from the transducer.

⑲ **Master/Slave connector** Is used for connecting the Master generator and the Slave generator. Use the dedicated cable to connect the generators.

⑳ **Protective ground terminal** Is connected with the PE ⏚ of the power input connector inside. Connect the terminal of the output connector to the protective ground line of the transducer. Use the terminal of the power connector as a supplementary terminal of the protective ground line (supplementary protective ground) of the power cable.

㉑ **Output connector guard** prevents the user from accidentally removing/connecting the output connector during the operation of the generator. Without the connector guard fixed, no ultrasonic is output.

㉒ **RS485 upper side connector** Is used for connecting a cable near the upper side. The connector enables the generator to perform remote control via RS485 interface in remote mode.

㉓ **RS485 lower side connector** Is used for connecting a cable on the lower side equipment or the end connector. The connector enables the generator to perform remote control via RS485 interface in remote mode

4. Precautions for Installation

⚠ WARNING, CAUTION – Harms to person, damage to possessions

Observe safety precautions described in Section 2.2 “Installation” including instructions hereinafter.

4.1 Generator Unit

- Do not place the generator unit in direct sunlight or near a heater.
- Do not place the generator in a humid or dusty environment.
- The generator generates heat and raises the ambient temperature. Install it at least 10 cm away from walls or similar surfaces. Install two or more generators at least 1 cm away from each other.
- Place the generator horizontally on a stable platform and fasten it securely with fixing legs supplied optionally.
- Do not stack up to two or more generator units.
- The generator has an air intake at the bottom of the front panel and an air outlet on the rear panel. Make sure that the air intake and outlet are not blocked. Also, make sure that the temperature at the air intake is not more than 40°C.
- Do not put anything on the generator unit.

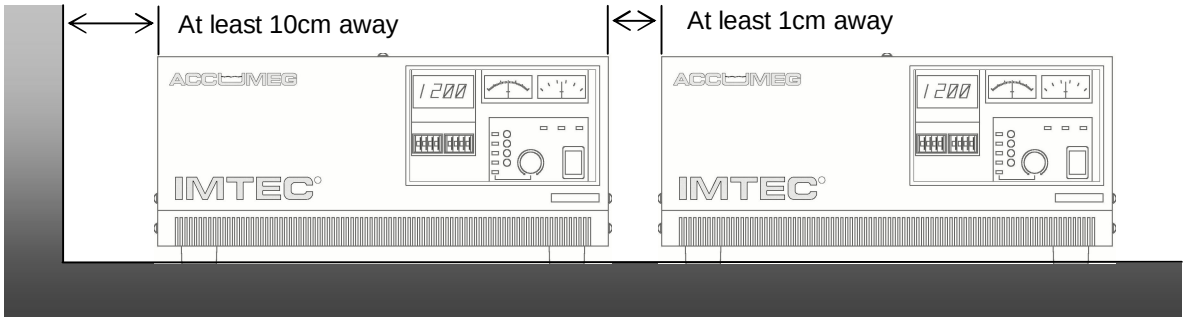


Figure 4-1 Installation

4. The lower part of the front panel absorbs air and the rear part discharge air from inside. For air flow, secure a distance of 10 cm or more for the front side and 20 cm or more for the rear side of the generator. Arrange the generator so that the temperature at the air intake is 40°C or less.

5. Do not leave or stack anything on the top of the generator.

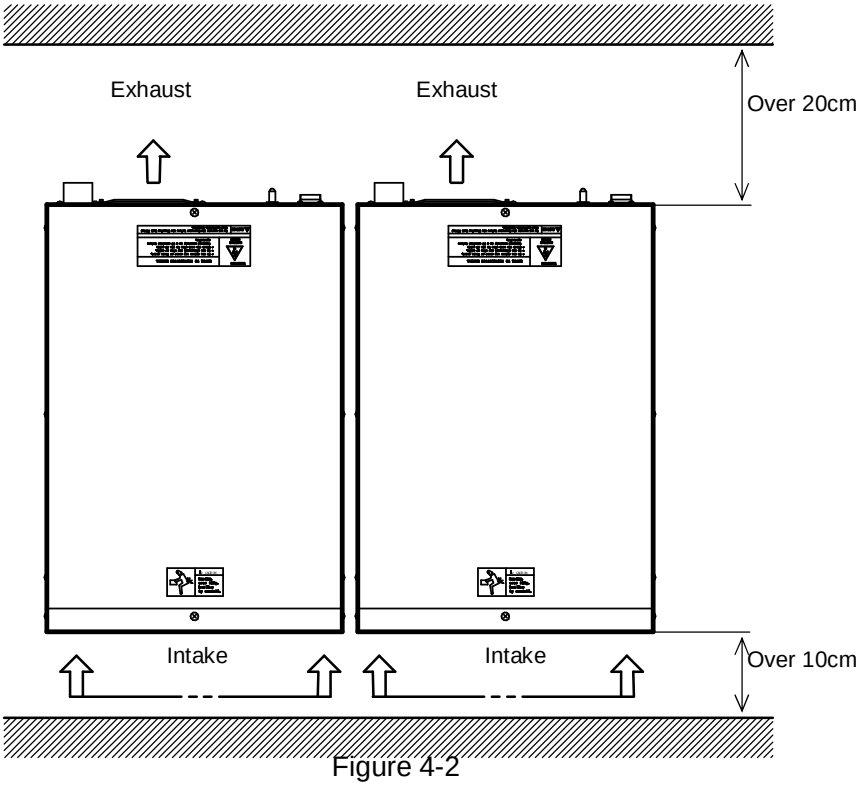


Figure 4-2

5. Connecting the Components

⚠ WARNING, CAUTION – Electric shock, damage to possessions

Observe safety precautions described in Section 2.2.5 “Connection” including followings.

5.1 Connecting Output -: See Figure 5-1.

1. Remove the output connector guard on the output connector on the rear panel of the generator.
2. Connect the transducer cables (ultrasonic power cable) coming out of the ultrasonic generator through the hole of the connector guard with the output connectors . Rotate the connector clockwise and firmly lock it.
3. Be sure to match the cable numbers of the cables with the numbers on the rear panel of the generator before connecting them.
4. Firmly connect the output connector guard.

Note

1. The individual transducer cables of the coaxial cable have minimum bend radius R of 40 mm.
2. Ultrasonic is not output when the output connector guard is not fixed.

5.2 Connecting the Protective Ground Line - See Figures 5-1 and 5-2.

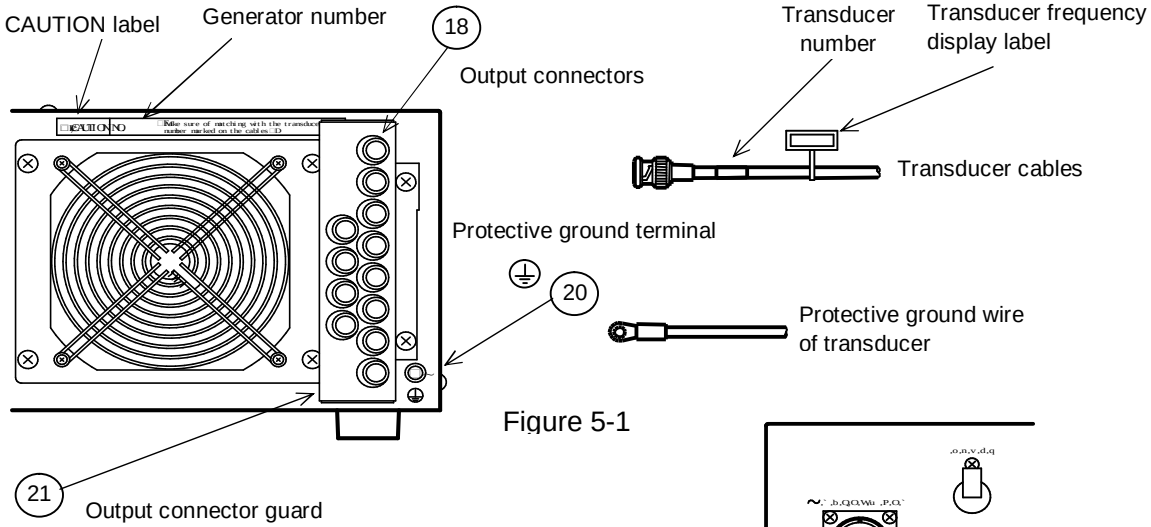


Figure 5-1

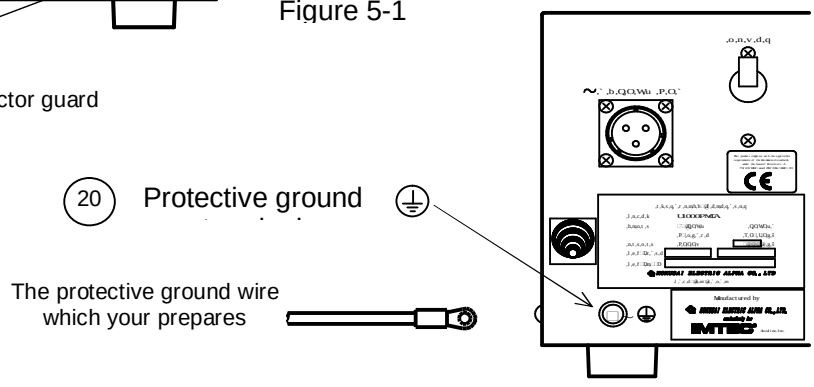


Figure 5-2

5.3 **Connecting the Power Supply Cable** (power lines and protective ground line)

Connect the power cables (black-1, black-2) with the power distribution panel in your plant, and the protective ground wire (green/yellow) with the protective ground. Refer to Figure 5-2 for discriminating the power supply line and the protective ground wire of the power cable.

⚠ WARNING Electric shock

- Be sure to check that the LED of the START switch on the front panel of the generator is not lit, namely in STOP state.
- Turn the POWER switch to OFF on the rear panel by pressing down the lever.
- Leave wiring and connecting cables to an authorized engineer stated in Section 2.2.3, Installing Personnel.

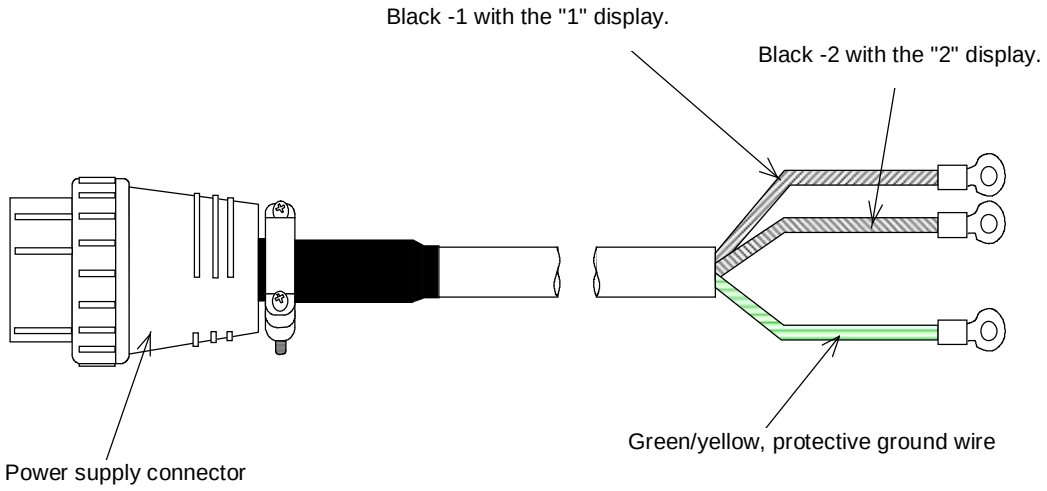


Figure 5-3 Discriminating Core Wires of the Power Cable

Black-1: Load wire
Black-2: Neutral wire
Green/Yellow: Protective ground wire

Connection: Process the end of the power cable and connect the cable to the power distribution panel in your plant in accordance with your engineering work standard.

5.4 Control Signal Connector

Note Refer to Chapter 7, How to Use the Control Signal Connector, besides precautions for use.

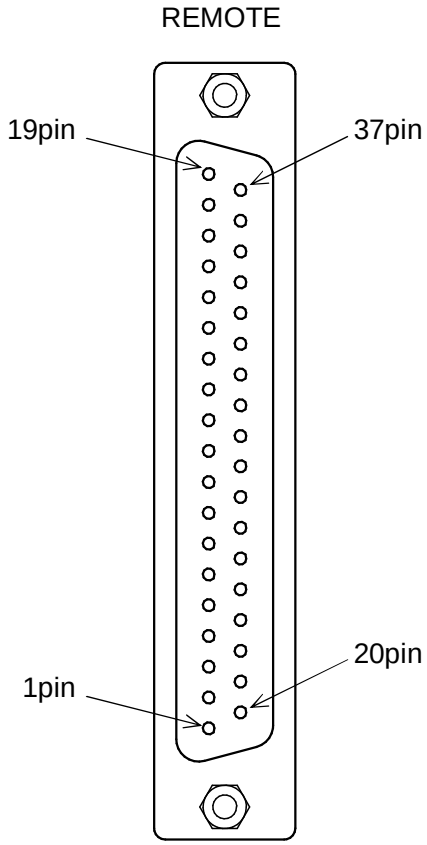


Figure 5-4

1. REMOTE connector

It is used in REMOTE(Parallel) control configuration.

Is used for controlling the upper controller and for connecting status signals in parallel.

Use the attached DSUB37 pin connector cable to connect with the upper controller. See Chapter 7 for details.

2. The control from Remote Controller is not possible, because the setting of generator is RS485 control. But, the status of generator can be timely watched by Remote Controller.

Please refer to APPENDIX-3 and APPENDIX-4.

Note

1. The contact capacity of an output relay is 24VDC, 0.2A.

Don't apply a voltage exceeding 42V between a terminal and the earth.

5.5 Master/Slave Connector

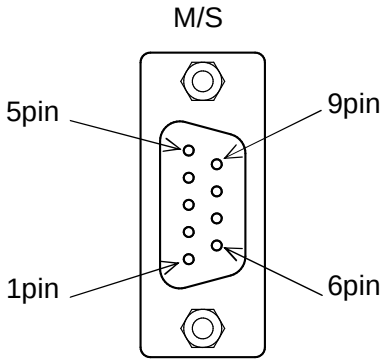


Figure 5-5

1. Master/Slave connector
   It is used in MASTER/SLAVE operate configuration.

   Is a pin connector that connects between the MASTER generator and the SLAVE generator.

   Use the dedicated cable, described in Chapter 8, Connector Specification for the Master/Slave Connection.

   Please refer to APPENDIX-2 and APPENDIX-4.

5.6 RS485 Connector (P1,P2)

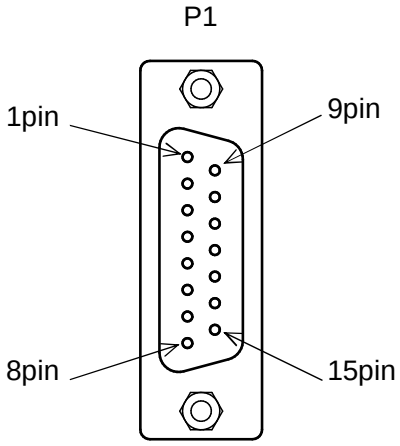


Figure 5-6

2. RS485 connector
   It is used in RS485 control configuration.

   Is a pin connector used for connecting between the RS485 interface and the upper control device.

   Use the dedicated cable, described in Chapter9.

   Please refer to APPENDIX-1 and APPENDIX-2.

6. Operating the Generator

WARNING, CAUTION – Harm and/or damage due to explosion and/or fire

Observe safety precautions described in Section 2.3 “Operation”.

6.1. Preparation

1. Pour the cleaning solution into the Megasonic bath (outer bath) and cleaning bath (inner bath). Do not start operation until the transducer is covered with sufficient solution, or the transducer will be damaged.
2. Confirm that the generator and the transducer are firmly connected. (refer to Section 2.2.5, Connection, for details.)
3. Turn OFF the POWER switch on the rear panel of the generator (downward).
4. Check that the protective ground line is firmly connected.
5. Turn ON the power switch of the power distribution panel.

6.2. Local Operation

[Operation]

1) Turn ON the POWER switch (upward) on the rear panel of the generator. The exhaust fan starts rotating and the channel number "01" appears in the channel display on the front panel. The initial set power value "0200" of preset channel 1 appears blinking in the OUTPUT level display for three seconds, before "0" appears in the level display as the current output power value (START switch lamp is not lit).
2) Once press the START switch on the front panel to turn ON the switch. The START lamp turns ON.
3) Change the value in the OUTPUT level display so that the value gradually approaches the set power value of preset channel 1.
4) In a few seconds, the generator performs stable output at near the set power value, and continues oscillation.

6.3. Setting a Preset Output Power Value

The preset output power value is set at factory delivery. However, when the user wants to use another power value, the power value must be entered for the preset channel. (See to the inspection certificate to know the output power value at factory delivery.)

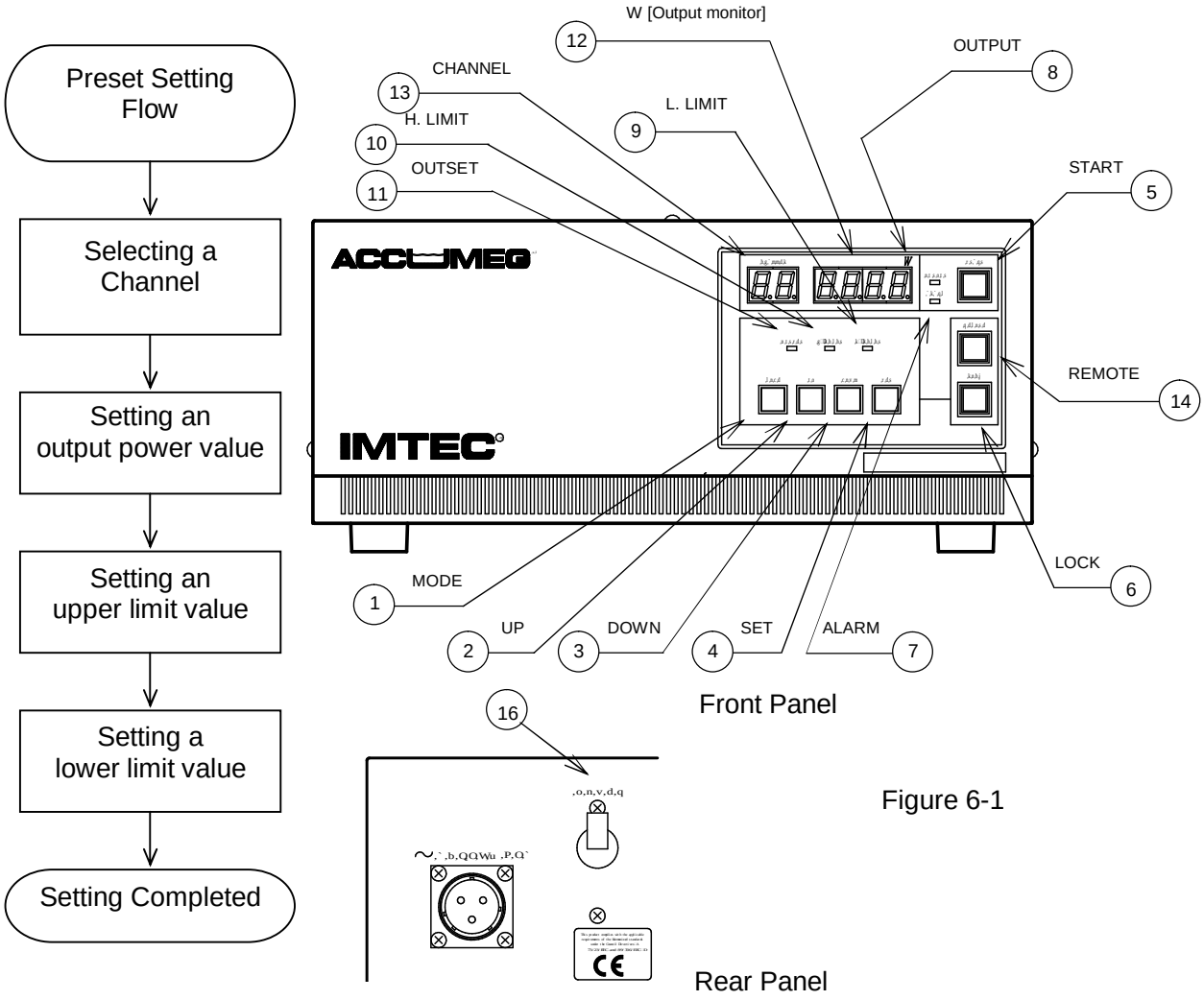


Figure 6-1

(Preparation)

(1) Turn ON the POWER switch on the front panel (upward).
(2) Confirm that the START lamp on the front panel is off.
(3) Confirm that the LOCK lamp on the front panel is off.

(Operation)

(1) Once press the MODE switch on the front panel.
(2) channel display on the front panel starts blinking.
(3) To select the preset output channel that performs settings, use the UP switch and the DOWN switch to match the channel number.

(4) Press the SET switch to confirm the preset output channel.

(5) The channel display stops blinking, and the OUTPUT level display starts blinking.

(6) Use the UP switch and the DOWN switch to match the power value to be set for this channel.

(7) Press the SET switch to confirm the power value.

(8) The power value in the OUTPUT level display stops blinking for 0.5 second before proceeding to the next setting.

(9) The OUTSET lamp goes off, and the H.LIMIT lamp turns ON.

(10) MAX of the upper limit value for the power value set for this channel appears blinking in the OUTPUT level display.

(11) Use the UP switch and the DOWN switch to match the upper limit value to be set for this channel.

(12) Press the SET switch to confirm the upper limit value.

(13) The upper limit value in the OUTPUT level display stops blinking for 0.5 second before proceeding to the next setting.

(14) The H.LIMIT lamp goes off and the L.LIMIT lamp turns on.

(15) MIN of the lower limit value for the power value set for this channel appears blinking in the OUTPUT level display.

(16) Use the UP switch and the DOWN switch to match the lower limit value to be set for this channel.

(17) Press the SET switch to confirm the lower limit value.

(18) The lower limit value in the OUTPUT level display stops blinking for 0.5 second before proceeding to the next setting.

(19) Use the UP switch and the DOWN switch to select an output channel.

(20) Press the SET switch to confirm the preset channel for output.

(21) The above settings have completed the preset power value setting, which are stored on the internal memory. When the user turns ON the switch next time, the system starts operation with the current settings.

(22) Pressing the START switch with a lamp starts oscillation.

Note The ALARM lamp may turn on when your upper limit power value or lower limit power value is too close to the output setting value. This we recommend that your upper and lower limit power values should be lower than the power setting value by ±5%.

6.4 Initial Preset Values

	1200W			1000W		
Preset No.	Output Power	Upper Limit	Lower Limit	Output Power	Upper Limit	Lower Limit
1	200	230	100	100	115	50
2	400	440	200	200	230	100
3	600	660	300	300	330	150
4	800	880	400	400	440	200
5	1000	1100	500	500	550	250
6	1200	1320	600	600	660	300
7	50	65	12	700	770	350
8	75	98	18	800	880	400
9	100	115	50	900	990	450
10	125	144	62	1000	1100	500
11	150	173	75	50	65	12
12	200	230	100	75	98	18
13	250	288	125	100	115	50
14	300	330	150	125	144	62
15	350	385	175	150	173	75
16	400	440	200	200	230	100
17	450	495	225	250	288	125
18	500	550	250	300	330	150
19	550	605	275	350	385	175
20	600	660	300	400	440	200
21	650	715	325	450	495	225
22	700	770	350	500	550	250
23	750	825	375	550	605	275
24	800	880	400	600	660	300
25	850	935	425	650	715	325
26	900	990	450	700	770	350
27	950	1045	475	750	825	375
28	1000	1100	500	800	880	400
29	1050	1155	525	850	935	425
30	1100	1210	550	900	990	450
31	1150	1265	575	950	1045	475
32	1200	1320	600	1000	1100	500

6.5 Setting the Range of the Preset Values

Maximum output power.	1200W Model		1000W Model	
Setting range of the output power.	20W to 1200W		20W to 1000W	
Setting range of the lower limit.	Output power set value.	Possible setting range.	Output power set value.	Possible setting range.
	20W to 99W	□75□ to Output power set value□10W	20W to 99W	□75□ to Output power set value□10W
	100W to 1200W	20W to Output power set value□10W	100W to 1000W	20W to Output power set value□10W
Setting range of the upper limit.	Output power set value.	Possible setting range.	Output power set value.	Possible setting range.
	20W to 49W	□75□ to Output power set value□10W	20W to 49W	□75□ to Output power set value□10W
	50W to 99W	□30□ to Output power set value□10W	50W to 99W	□30□ to Output power set value□10W
	100W to 299W	□15□ to Output power set value□10W	100W to 299W	□15□ to Output power set value□10W
	300W to 1200W	□10□ to Output power set value□10W	300W to 1000W	□10□ to Output power set value□10W

6.6 Setting an ID Number and a Baud Rate for RS485

6.6.1 Setting an Device ID

To move to device ID setting mode, keep pressing the MODE switch for two seconds in normal state (non-oscillation, non-preset setting).

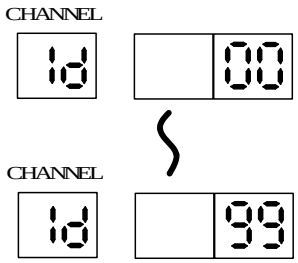
(1) Keep pressing the MODE switch for two seconds in non-oscillation and non-preset setting mode.

(2) "1d" appears in the CH 7SEG LED, and the current device ID appears in the power 7SEG LED (2 digits at right).

(3) Use the UP/DOWN switches to select an ID number within 00 to 99.

(4) Press the SET switch to store the set data on flash memory before exiting from device IDS setting mode.

The 7SEG LED shows the following:



6.6.2 Setting a Baud Rate

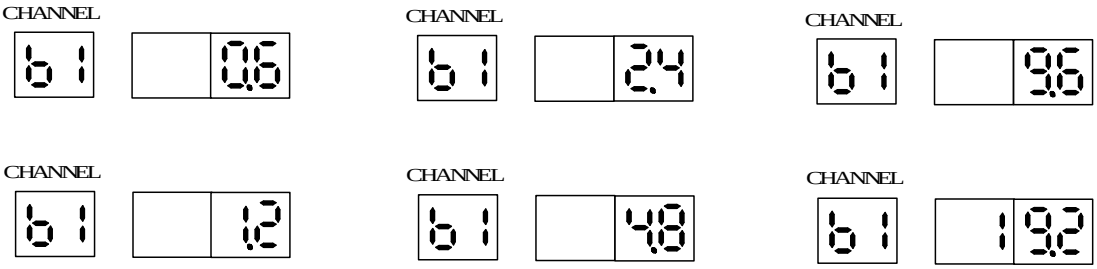
After exiting from device ID setting mode, move to baud rate setting mode.

(1) "b1" appears in the CH 7SEG LED, and the current baud rate appears in the power 7SEG LED (3 digits at right).

(2) Use the UP/DOWN switches to select a the baud rate (0.6k, 1.2k, 2.4k, 4.8k, 9.6k, 19.2k).

(3) Press the SET switch to store the set data on flash memory before exiting from baud rate setting mode to normal mode.

The 7SEG LED displays the following:



6.7 Remote Operation 1 (connecting parallel signals)

(Preparation)

(1) Connect the attached control cable with the control signal connection connector on the rear panel of the generator.

(2) Connect the control cable with your device. (refer to Chapter 7, How to Use the Control Signal Connector.)

(3) Turn ON the POWER switch of the generator (upward).

(4) Confirm that the START switch lamp on the front panel is off.

(Operation)

□□□ Press the REMOTE switch on the front panel.
□□□ Confirm that the REMOTE lamp is lit.
□□□ Your remote device enables to control the generator.

6.8 Remote Operation 2 (connecting serial signals)

(Preparation)

□□□ Connect the attached control cable with the RS485 upper connector on the rear panel of the generator.
□□□ Connect the control cable with your device.
□□□ Connect the attached terminator with the RS485 lower connector on the rear panel of the generator.
□□□ Turn ON the POWER switch of the generator (upward).
□□□ Confirm that the START lamp is off on the front panel.

6.9 Stop

□□□ In remote control, turn OFF the START control of the remote control terminal.
□□□ In local control, turn OFF the START switch on the front panel of the generator. (Turn OFF the START switch lamp.)
□□□ Turn OFF the POWER switch on the front panel of the generator.

Note

□ To turn ON/OFF ultrasonic output, turn OFF the START switch on the front panel in local control, and with the contact connected with the START terminal of the control signal connection connector in remote control.

- Ultrasonic output will be unstable for 30 seconds right after operation. This does not mean the generator is abnormal.
- The value 1080 to 1320 appears as power control MAX in the OUTPUT level display. In this case, the conditions are:

□□□ The temperature of the fluid in the ultrasonic tank (city water) must be as specified.
□□□ No stuff except water (beaker, work, etc. that reflects ultrasonic) must be in the tank.
□□□ The atmosphere temperature must be 20 to 40□.
□□□ Power supply must be rated voltage.

In case where any one of your operating conditions are different from the above conditions, output power can vary, and any of your operating conditions may exceed the above values.

6.10 Precautions for Operation

CAUTION

· Be sure to match ID numbers of your generator and transducer.

· Don't start your generator when no fluid is found in the ultrasonic tank (outer tank). Otherwise, the generator will fail. Furnish a safety mechanism so that the generator is disabled when no fluid is found in the outer tank. You need to check the mechanism from time to time.

7.0 How to Use the Control Signal Connection Connector

Note

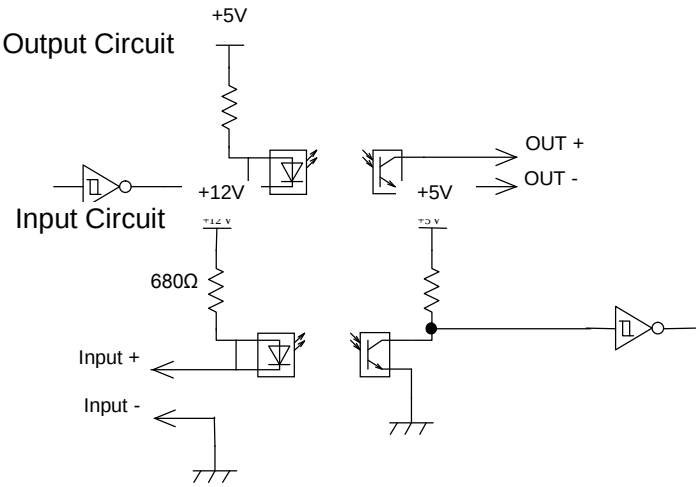
Connect the control signal connection connector to the master generator when a composition of MASTER/SLAVE operate.

7.1 Pin Assignment of the Control Signal Connector

Pin No.	Signal name	Input/Output	Description	Operation in RS485
1	PRS0	IN	Output preset input bit0	Disable
2	PRS2	IN	Output preset input bit2	Disable
3	PRS4	IN	Output preset input bit4	Disable
4	OE	IN	Output enable input	Disable
5	OPSEL	IN	Output power select (master/slave)	Disable
6	WATT4	OUT	Output power display bit4	Disable
7	WATT6	OUT	Output power display bit6	Disable
8	WATT8	OUT	Output power display bit8	Disable
9	WATT10	OUT	Output power display bit10	Disable
10	WATT12	OUT	Output power display bit12	Disable
11	Output monitor (+)	OUT	Analog output monitor(4□20mA)(+)	Active
12	STBY	OUT	Standby output	Active
13	COM	OUT	Standby signal, OSCOUT signal COMMON	Active
14	LLDS	IN	Liquid Level Detection Sensor	Active
15	Lower limit A	OUT	Lower limit alarm A	Active
16	Lower limit COM	OUT	Lower limit ALARM signal COMMON	Active
17	Alarm B	OUT	Alarm B	Active
18	NFB trip A	OUT	AC input overcurrent A	Active
19	Trip COM	OUT	AC input overcurrent COMMON	Active
20	PRS1	IN	Output preset input bit1	Disable
21	PRS3	IN	Output preset input bit3	Disable
22	COMPRS	IN	Preset signal COMMON	Disable
23	COMOE	IN	Output enable signal COMMON	Disable
24	COMOPSEL	IN	Output select signal COMMON	Disable
25	WATT5	OUT	Output power display bit5	Disable
26	WATT7	OUT	Output power display bit7	Disable
27	WATT9	OUT	Output power display bit9	Disable
28	WATT11	OUT	Output power display bit11	Disable
29	COMWATT	OUT	Output power display signal COMMON	Disable
30	Output monitor(-)	OUT	Analog output monitor(4□20mA)(-)	Active
31	OSCOUT	OUT	Outgoing output status	Active
32	Upper limit A	OUT	Upper limit alarm A	Active
33	Upper limit COM	OUT	Upper limit ALARM signal COMMON	Active
34	LLDS COM	IN	Liquid Level Detection Sensor COMMON	Active
35	Alarm A	OUT	Alarm A	Active
36	Alarm COM	OUT	Alarm signal COMMON	Active
37	NFB trip B	OUT	AC input overcurrent B	Active

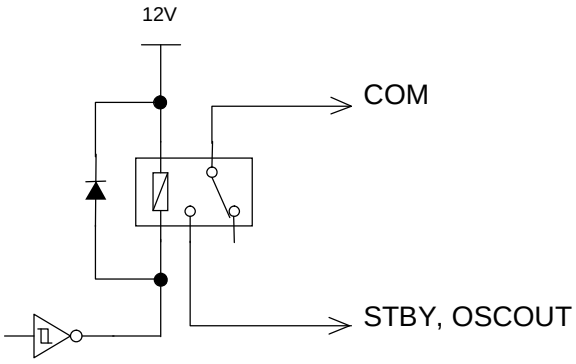
7.2 Hardware Connection of Control Signals

Signal Name: PRS0, PRS1, PRS2, PRS3, PRS4, OE, OPSEL, WATT4, WATT5, WATT6, WATT7, WATT8, WATT9, WATT10, WATT11, WATT12,LLDS internal Input/Output Circuit



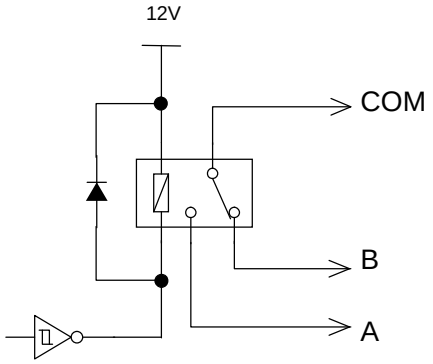
Current capacity of output circuit	:	MAX300mA
□□ resistance of output circuit	:	2Ω
Maximum Voltage of output circuit	:	42V

Signal Name: STBY,OSCOUT,Upper ALARM,Lower ALARM internal Output Circuit



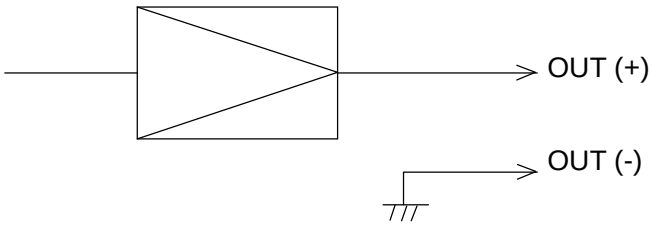
Current capacity of output circuit	:	Max. 0.3A Min. 100μA
Maximum Voltage of output circuit	:	42V

Signal Name: ALARM,NFB Trip internal Output Circuit



Current capacity of output circuit : Max. 0.3A Min. 100µA
Maximum Voltage of output circuit : 42V

Signal Name: OUTPUT MONITOR internal Output Circuit



Current of output circuit : 4mA to 20mA
Voltage of output circuit : MAX 15V(When OPEN)
Connection resistance : 600Ω or less

7.3 Description of Control Connection Signals

The contact point to be connected must have no voltage.
Use a gold contact point that weak current can conduct.
Use the dedicated cable attached.
On the connection attached cable, please refer to chapter 7-(4)
”REMOTE CABLE CIRCUIT DIAGRAM (3CD02147)”.

NOTE Use the dedicated cable to connection to the CE standard.

□□□OE terminal
Use an OE terminal when turning ON/OFF ultrasonic output from a remote place.
NOTE a circle means closed and x means opened.

OE terminal --COMOE terminal	Ultrasonic output
o	Yes
×	No

□□□LLDS terminal
Connect Liquid Level Detection Sensor.
(Note) a circle means closed and x means opened.

LLDS terminal --LLDS COM terminal	Liquid in the transducer
o	Yes
×	No

□□□Selecting an output channel (PRS0 to 4)
Use this channel when changing over ultrasonic output channels.
The PRS terminals in the following table indicates the channel with the COMPRS terminal is closed or open.
NOTE A circle indicates the channel is closed and x indicates the channel is open.

PRS4	PRS3	PRS2	PRS1	PRS0	Ultrasonic output channel
×	×	×	×	×	1
×	×	×	×	o	2
×	×	×	o	×	3
×	×	×	o	o	4
×	×	o	×	×	5
×	×	o	×	○	6
×	×	o	o	×	7
×	×	o	o	o	8
×	o	×	×	×	9
×	o	×	×	o	10
×	o	×	o	×	11
×	o	×	o	o	12
×	o	o	×	×	13
×	o	o	×	○	14
×	o	o	o	×	15
×	o	o	o	o	16
o	×	×	×	×	17
o	×	×	×	o	18
o	×	×	o	×	19
o	×	×	o	o	20
o	×	o	×	×	21
o	×	o	×	o	22
o	×	o	o	×	23
o	×	o	o	o	24
o	o	×	×	×	25
o	o	×	×	o	26
o	o	×	o	×	27
o	o	×	o	o	28
o	o	o	×	×	29
o	o	o	×	o	30
o	o	o	o	×	31
o	o	o	o	o	32

NOTE

Connect a changeover switch to the control signal connection connector to output up to 32 types of signals from a remote place.

□□□OPSEL terminal

Use this OPSEL terminal to specify power values on the master and slave generators to monitor the ultrasonic output power from a remote place.

NOTE Circles in the table indicate closed, and x, open.

OPSEL terminal--COMOPSEL terminal	Ultrasonic output monitor power value
o	Slave side
×	Master side

□□□WATT terminal (WATT4 to 12)

When monitoring ultrasonic output power from a remote place, the most significant 3 bits of the power value is output in decimal. Use the terminal when monitoring output power.

The WATT terminals in the following table indicate closed or open with the COMWATT terminal.

NOTE A circle in the table indicates the contact point is closed, and X, open.

WATT terminal number									Value in BCD	Output power value (W)
12	11	10	9	8	7	6	5	4		
×	×	×	×	×	×	×	×	×	000	0~4
×	×	×	×	×	×	×	×	o	001	5~14
				~					~	~
o	×	×	×	o	o	×	×	o	119	1,185~1,194
o	×	×	o	×	×	×	×	×	120	1,195~1,204
o	×	×	o	×	×	×	×	o	121	1,205~1,214
o	×	×	o	×	×	×	o	×	122	1,215~1,224
				~					~	~
o	×	×	o	o	×	×	×	o	131	1,305~1,314
o	×	×	o	o	×	×	o	×	132	1,315~1,324

NOTE The setting range for power displays up to 1000W. However, a value over 1000W may be displayed.

□□□STBY terminal

Use this terminal for monitoring whether the ultrasonic generator is workable or not from a remote place.

NOTE The circles in the following table indicate that the contact point is closed, and that x, open.

STBY terminal--COM terminal	Ultrasonic generator's state
o	Oscillation is enabled
×	Oscillation is disabled.

□□□OSCOUT terminal

Use this terminal for monitoring whether the ultrasonic generator is workable or not from a remote place.

NOTE The circles in the following table indicate that the contact point is closed, and that x, open.

OSCOUT terminal--COM terminal	Ultrasonic generator's state
o	Oscillation has started
×	Oscillation has stopped

□□□Upper limit alarm terminal

Use this terminal for monitoring whether an upper limit alarm is generated or not from a remote place.

NOTE The circles in the following table indicate that the contact point is closed, and that x, open.

Upper limit A terminal-- Upper limit COM terminal	Upper limit B terminal-- Upper limit COM terminal	Occurrence of upper limit alarms
o	×	Yes
×	o	No

□□□Lower limit alarm terminal

Use this terminal for monitoring whether an lower limit alarm is generated or not from a remote place.

NOTE The circles in the following table indicate that the contact point is closed, and that x, open.

Lower limit A terminal-- Lower limit COM terminal	Lower limit B terminal-- Lower limit COM terminal	Occurrence of lower limit alarms
o	×	Yes
×	o	No

□□□□ Alarm terminal

Use this terminal for monitoring whether an alarm occurs or not from a remote place.

NOTE The circles in the following table indicate that the contact point is closed, and that x, open.

Alarm A terminal-- Alarm COM terminal	Alarm B terminal-- Alarm COM terminal	Occurrence of alarms
o	×	Yes
×	o	No

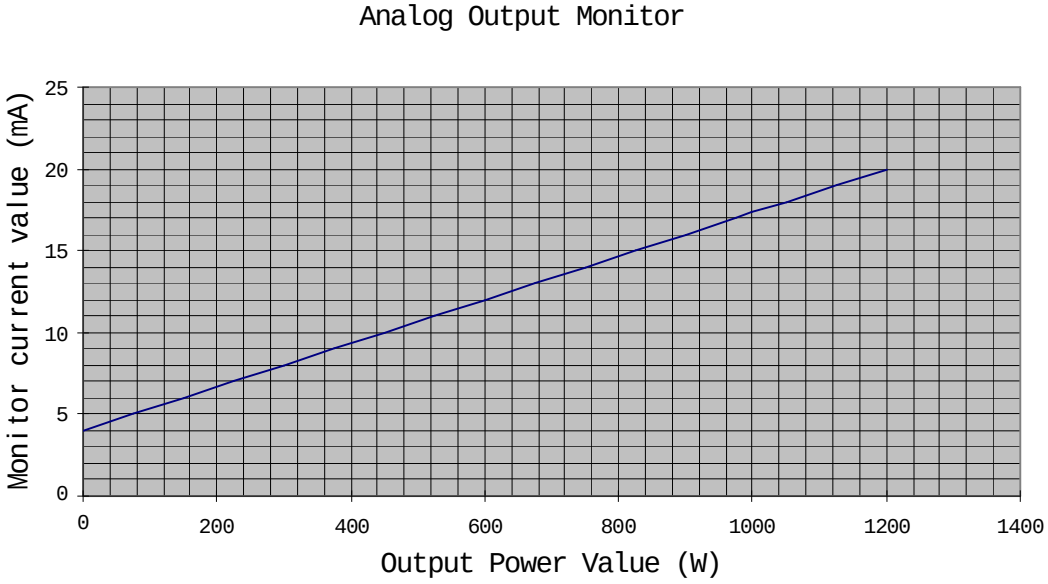
□□□□ NFB trip terminal

Use this terminal for monitoring whether an NFB trip occurs or not from a remote place.

NOTE The circles in the following table indicate that the contact point is closed, and that x, open.

NFB trip A terminal-- Trip COM terminal	NFB trip B terminal-- TRIP COM terminal	Occurrence of NFB trip
o	×	Yes
×	o	No

□□□□ Analog output monitor terminal

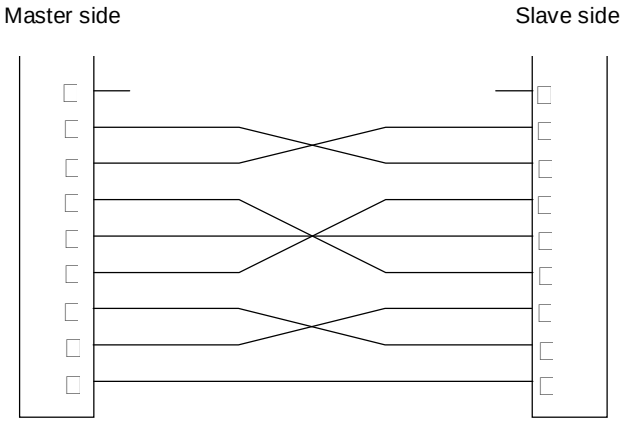


Note In the operation of MASTER/SLAVE control, it can be watched from MASTER generator. But,it can not be watched from SLAVE generator.

8.0 Connector Specification for Master/Slave Connection

Pin No.	Signal name	Input/Output	Description
1	CD	NC	Carrier Detect
2	RXD	IN	Received Data
3	TXD	OUT	Transmitted data
4	DTR	IN	Data Terminal Ready
5	SG	-	Signal Ground
6	DSR	OUT	Data Set Ready
7	RTS	NC	Request to Send
8	CTS	NC	Clear to Send
9	NC	NC	NC

Use the dedicated cable attached.



(Cable length: 2m)

NOTE Use the dedicated cable to conform to the CE standard.

9. Connector Specification for RS485 Connection (for upper and lower sides)

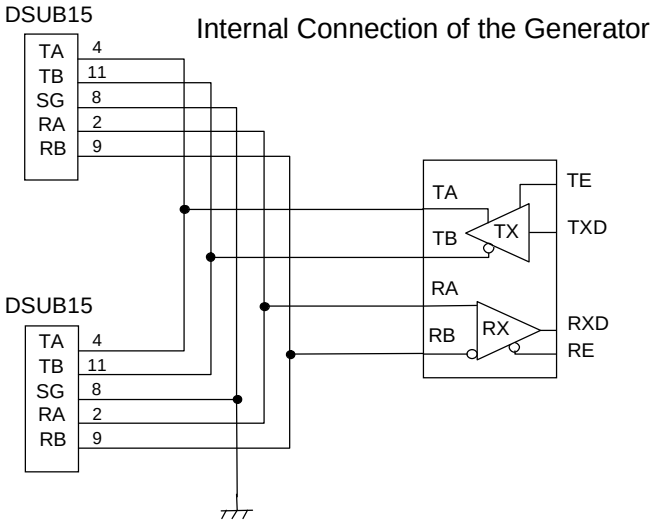
Pin No.	Signal name	Input/Output	Description
1	FG	□	Frame Ground
2	RA	IN	Receive A(+)
3			
4	TA	OUT	Transmission A(+)
5			
6			
7			
8	SG	-	Signal Ground
9	RB	IN	Receive B(-)
10			
11	TB	OUT	Transmission B(-)
12			
13			
14			
15	FG	-	Fame Ground

Use the dedicated cable.

NOTE Use the dedicated cable to conform to the CE standard.

(Cable length: 5 m)

The internal connections of the connector are as follows:



10. Countermeasures When the Protective Circuit Is Working or When an Error Is Displayed

Break ultrasonic output when the protective circuit is working.

Table 10-1

	Display	Cause	Protecting work	Control signal connection connector	Recovery operation
1	ALARM is lit. "E01" appears in the level display.	System RAM error	keystroking is disabled. Ultrasonic output is broken.	The ALARM A terminal (between 35-36) is closed. The ALARM B terminal (between 17-36) is open.	An error has taken in the circuitry of the CPU. The CPU must be replaced with a new one.
2	ALARM is lit. "E02" appears in the level display.	The fan stopped.			The fan has stopped because of failure. Please confirm the fan in rear panel. The cause is a trouble of the fan, if there is no. It must be replaced with a new one.
3	ALARM is lit. "E03" appears in the level display.	The output protective circuit worked.			The protective function for ultrasonic output worked. Turn OFF the POWER switch and check the connection with the transducer unit. After confirming the connection, turn ON the POWER switch.
4	ALARM is lit. "E04" appears in the level display.	The radiator plate of the output unit has been heated abnormally.			The temperature has abnormally risen with the ultrasonic output unit. Turn OFF the POWER switch and wait until the temperature of the output unit cools down before turning ON the POWER switch.
5	ALARM is lit. "E05" appears in the level display.	High voltage power output shorted.			The high voltage power output unit has shorted. Contact the maker of the cleaning system.
6	ALARM is lit. "E07" appears in the level display.	Interlock error			Turn OFF the POWER switch if no front panel or output connector cover is fixed. Fix the front panel or the output connector cover before turning ON the POWER switch.

	Display	Cause	Protecting work	Control signal connection connector	Recovery operation
7	ALARM is lit. "E08" appears in the level display.	Switch error	Key stroking is disabled. Ultrasonic output is broken.	The ALARM A terminal (between 35-36) is closed. The ALARM B terminal (between 17-36) is open.	Turn OFF the POWER switch . And After, turn ON the POWER it one. The error immediately arose, and it is a trouble of the control unit. The control unit must be replaced.
8	ALARM is lit on the salve side only. "E09" appears in the level display.	Master/Salve connection error		The ALARM A terminal (between 35-36) on the master side is closed. The ALARM B terminal (between 17-36) on the master side is open.	Check for the power supply on the master side. After turning OFF the POWER switch, connect the master/slave cable between the two generators before turning ON the POWER switch.
9	ALARM is lit on the master side only. "E10" appears in the level display.	Master/Salve connection error		The ALARM A terminal (between 35-36) is closed. The ALARM B terminal (between 17-36) is open.	Check for the power supply on the master side. After turning OFF the POWER switch, connect the master/slave cable between the two generators before turning ON the POWER switch.
10	ALARM is lit. "E11" appears in the level display.	Single mode error			Turn OFF the POWER switch and remove the master/slave cable from the generators. Turn ON the POWER switch.
11	ALARM is lit. "E12" appears in the level display.	Slave error			The alarm has occurred on the slave side. Remove the cause of the alarm before turning ON the POWER switch.
12	ALARM is lit. "E13" appears in the level display.	Upper limit error		The ALARM A terminal (between 35-36) is closed. The ALARM B terminal (between 17-36) is open. The Upper limit A terminal (between 15-16) is closed. The lower limit B terminal (between 34-16) is open.	Ultrasonic output power has exceeded the preset upper limit value. Turn OFF the POWER switch and check for the cleaning fluid in the cleaning tank, the connection with the transducer unit, and the upper limit value (whether it is reasonable). After confirming these conditions, turn ON the POWER switch.

	Display	Cause	Protecting work	Control signal connection connector	Recovery operation
13	ALARM is lit. "E14" appears in the level display.	Lower limit error	Key stroking is disabled. Ultrasonic output is broken.	The ALARM A terminal (between 35-36) is closed. The ALARM B terminal (between 17-36) is open. The lower limit A terminal (between 15-16) is closed. The lower limit B terminal (between 34-16) is open.	Ultrasonic output power has lowered the preset lower limit value. Turn OFF the POWER switch and check for the cleaning fluid in the cleaning tank, the connection with the transducer unit, and the lower limit value (whether it is reasonable). After confirming these conditions, turn ON the POWER switch.
14	ALARM is lit. "E15" appears in the level display.	Power detection error	Key stroking is disabled. Ultrasonic output is broken.	The ALARM A terminal (between 35-36) is closed. The ALARM B terminal (between 17-36) is open.	Output from the power detection unit is abnormal. Contact the maker of the cleaning system.
15	Nothing is displayed. The POWER switch automatically turns OFF.	Power (AC) input overcurrent	AC power failure	The NFB trip A terminal (between 18-19) is closed. The NFB trip B terminal (between 37-19) is open.	Overcurrent has been detected with the AC power input unit. Check for the connection with the AC power input wiring. After confirming it, turn ON the POWER switch.
16	The POWER switch remains ON and nothing is displayed.	Internal power error	Ultrasonic output is broken.	No terminal outputting	The internal power supply has malfunctioned. Turn OFF the POWER switch and contact the maker of the cleaning system.
17	ALARM is lit. "E06" appears in the level display.	Liquid Level Detection Error	keystroking is disabled. Ultrasonic output is broken.	The ALARM A terminal (between 35-36) is closed. The ALARM B terminal (between 17-36) is open.	If there is no liquid in the transducer, you must put liquid into the transducer. If there is liquid in the transducer the liquid level detection sensor has malfunctioned.
18	ALARM is lit "E16" appears in the level display.	Internal switch setting error.	Keystroking is disabled. Ultrasonic output is shutdown.	The ALARM A terminal (between 35-36) is closed. The ALARM B terminal (between 17-36) is open.	Internal switch has malfunctioned. An error has taken in the circuitry of the CPU unit. The control unit must be replaced.

NOTE When the same error occurs after taking the above recovery measure, the generator or the cleaning system has failed. Immediately turn OFF the power switch and contact the maker of the cleaning system.

11. Specification

11.1 Megasonic Generator

MODEL		UO1000PMCA	
Rated output Power		1000W	
Output arranging range		50~1000W	
Oscillation frequency		710.0kHz~750.0kHz 0.1kHz step	950.0kHz~999.9kHz 0.1kHz step
Oscillation system		Crystal controlled synthesizer	
Output circuit		FET class D P.P system	
Rating power supply		208VAC±10%, 10A, single phase 50 or 60Hz	
Rush current		50A or less	
Rating power consumption		208 VAC*	
Control	Front panel	Output (ON/OFF), Output setting (7 push buttons)	
	Remote control	Output (ON/OFF), changeover of output settings on the front panel	
Display	Front panel	Output level display (7 segment LED, 2 digits)	
		Output channel display (7 segment LED, 2 digits)	
		Output start display, alarm display, remote display	
		key lock display, setting mode display	
	External output	Output level data, Operating, Alarm	
		Ultrasonic upper and lower alarms	
External dimensions		380 mm (W) x 550 mm (D) x 175 mm (H)	
Mass		Less than 25kg	
Operating ambient condition		See Section 2.2.1, Environmental Conditions.	
Applied ultrasonic transducer	Connection	Limited for our UO1000PMCA	
	transducer	Specified by KOKUSAI ELECTRIC ALPHA	
	Allowable	1000W or more	
	Frequency	710kHz~750kHz	950kHz~1000kHz
	Transducer	PZT	

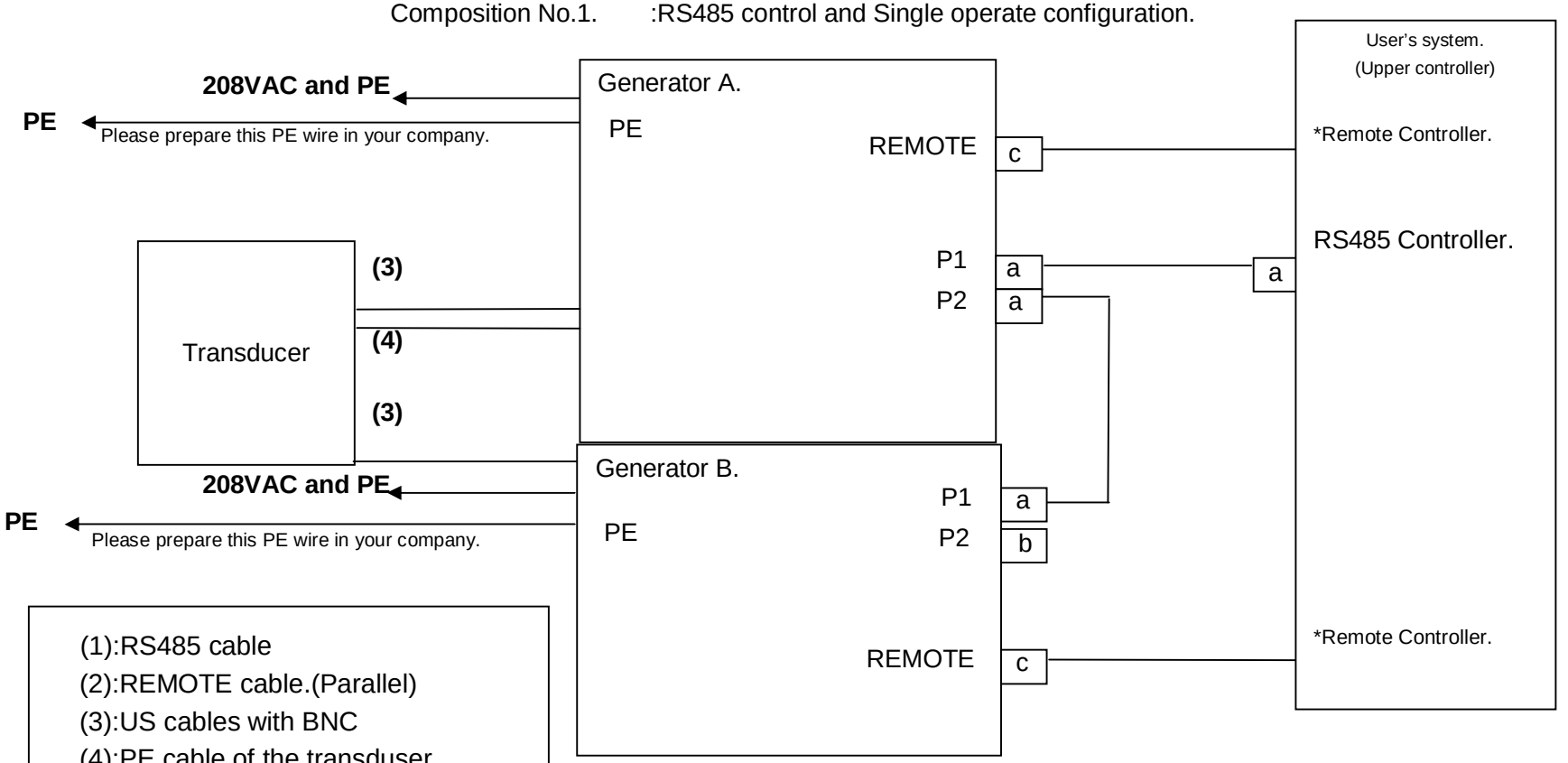
- It sometimes reaches the maximum of the +10% by an actual use state.
- (Alteration of power supply, alteration of liquid temperature)

11.2 Applicable Megasonic transducer

1	The adaptation:	Limited for the IMTEC manufactured and for UO1000PMA.
2	Model:	IMTEC manufactured and specified
3	Allowable input:	Over 1000W.
4	Frequency range:	950kHz to 999kHz
5	Transducer element:	laminar PZT

12. Appendix drawing

Composition No.1. :RS485 control and Single operate configuration.

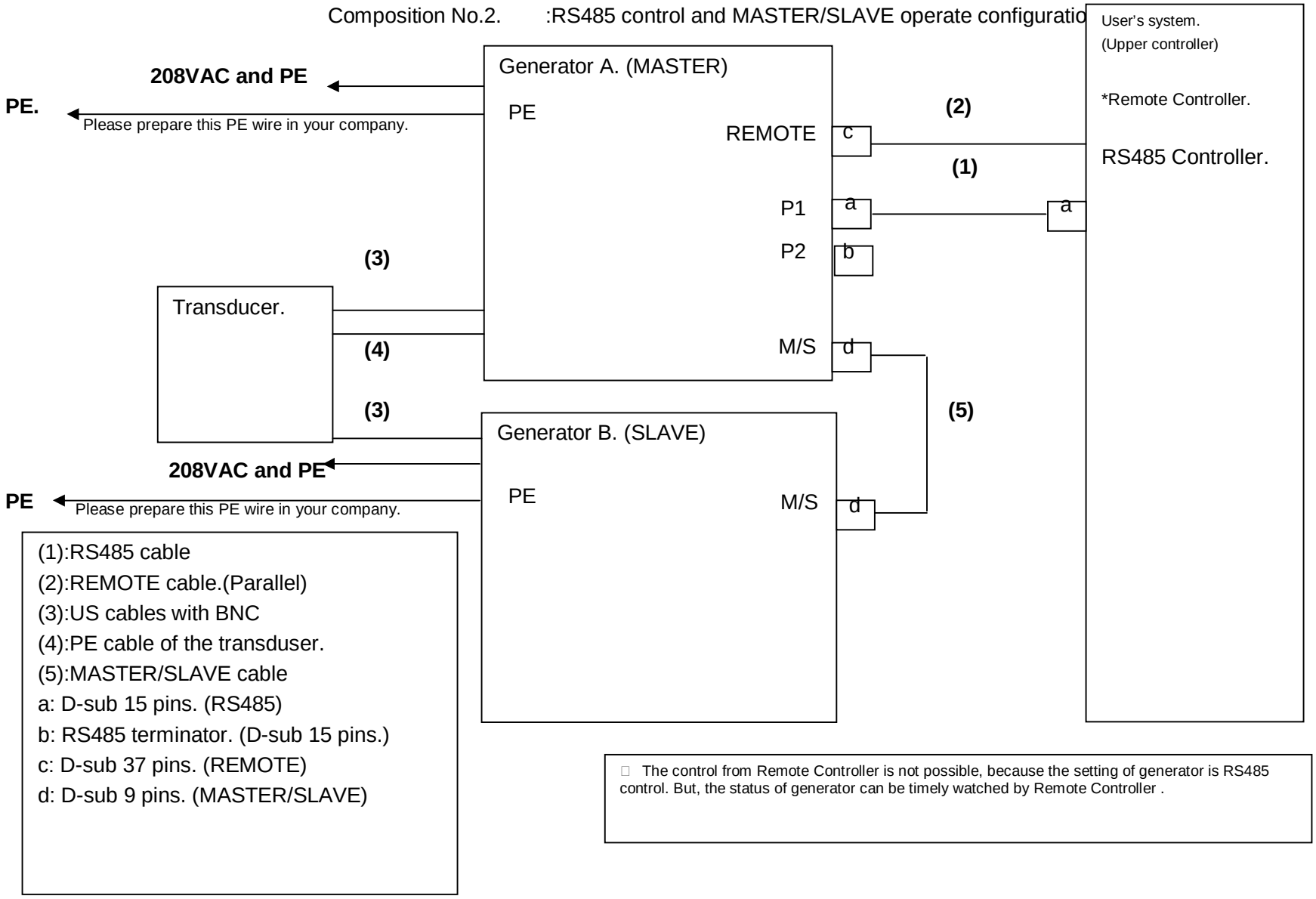


(1):RS485 cable
(2):REMOTE cable.(Parallel)
(3):US cables with BNC
(4):PE cable of the transduser.
a: D-sub 15 pins. (RS485)
b: RS485 terminator. (D-sub 15 pins.)
c: D-sub 37 pins. (REMOTE)

The control from Remote Controller is not possible, because the setting of generator is RS485 control. But, the status of generator can be timely watched by Remote Controller .

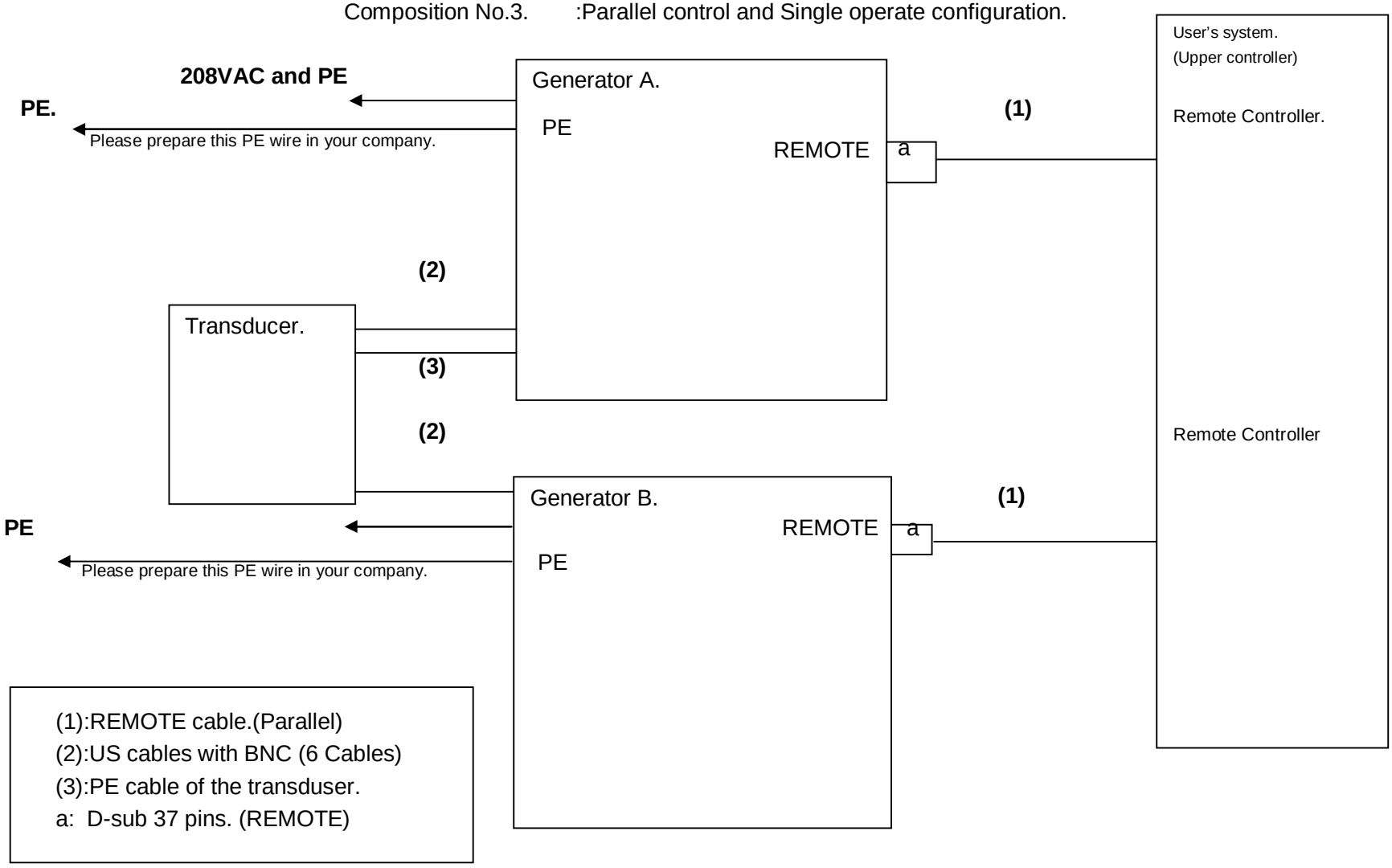
APPENDIX-1

Composition No.2. :RS485 control and MASTER/SLAVE operate configuratio



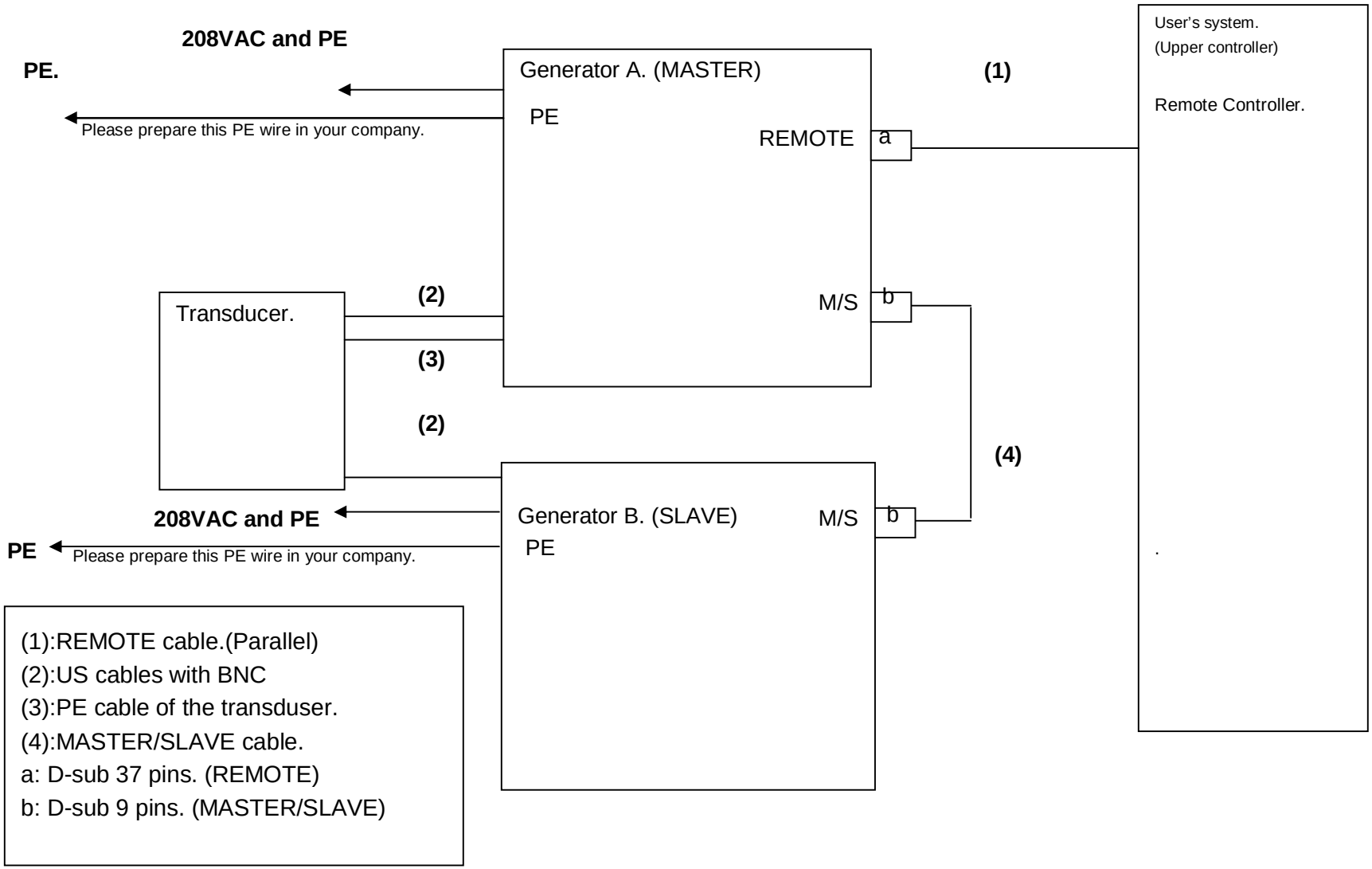
APPENDIX-2

Composition No.3. :Parallel control and Single operate configuration.



APPENDIX-3

Composition No.4. :Parallel control and MASTER/SLAVE operate configuration.



APPENDIX-4

13. Drawings

UO1000PMCA GENERAL VIEW	3CK14402
UO1000PMCA BLOCK DIAGRAM	4CD01248
UO1000PMCA LABELING DIAGRAM	3CK14304