

Instruction Manual

Ultrasonic Generator

Gen II



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Dear customer,

We thank you for buying GEN II[®] – series ultrasonic generators.

The product you acquired is part of the most innovative class of devices in the field of ultrasonic technology and provides a maximum in performance and comfort.

The GEN II[®] – series ultrasonic generator is based on the worldwide established, which performance was expanded by a digital control.

With the digital control in combination with real text display and interfaces for data communication extensive functions for ultrasonic operation and monitoring for data acquisition were implemented.

The modular concept which ensures flexibility and reliability as well as constant power regulation which entails high level of design integration.

This documentation was created to give all information for installation, control and operation of the ultrasonic systems to the user.

To insure proper operation, it is necessary to follow all information and instructions in this manual.

This documentation responds to the publishing date and is not subject to any revision service.

Information in this document can be changed, improved or supplemented without further notice.

Third parties document if enclosed are for information only. We do not take any responsibilities for correctness or completeness of its contents.

If you require further information not contained in this guide please call our technical assistance at any time.

Advanced Ceramics Technology (M) Sdn. Bhd.

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GEN II[®]

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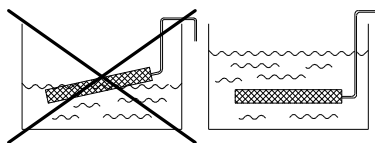
1. Safety Information

1.1 Safety Information

CAUTION 	Danger of fire or explosion!
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Please read the following safety information carefully before operating the ultrasonic components.

- The correct use and Technical Specification of the ultrasonic components are described in this document and must be followed.
- Installation of the ultrasonic generator must be carried out by a skilled and qualified personnel. You have to comply with the relevant national standards on safety for mechanical and electrical installation.
- Operation of the ultrasonic generator must be done by trained staff. Improper operation can result in fatal damage to the equipment or injury to the user.
- The technical details of the ultrasonic components must be adhered to.
- Adequate ventilation of the ultrasonic generator has to be guaranteed.
- The ultrasonic power supplied to the bath is transformed into heat. Without sufficient heat dissipation, it can results in hot steam or ignition, depending on the cleaning medium!
- Never operate the ultrasonic generator and the transducer without bath liquid. The transducer must be completely immersed in liquid which must be able to absorb and dissipate the power (heat).



- Use only bath liquid permitted for use with ultrasonic cleaning applications, particularly the possibility of environmental effects and their inflammability.
- Unplug or disconnect the system properly before maintenance or repair of the system. Vibration to the ultrasonic transducer can generate static voltage if not connected (>1000V). Before handling, short terminals.

2. Warranty

2.1 Warranty

The validity of the warranty are written in the Terms of Delivery or in the sales contract (Confirmation of Order).

The version for warranty terms and conditions is ultimate during delivery. Warranty void if one of the following reasons is applied:

- Improper operating.
- Improper use, not corresponding to its purpose.
- Improper changes, repairs, or modifications or changes, repairs, or modifications without prior consent of the producer.
- Extreme external effects (e.g. impact, fall, humidity, dirt and corrosive environment etc.).
- Insufficient trained and non-qualified operating or service staff.
- Not complying to the respective safety regulations.
- The generators in 63TE-3 and 84TE-5 housings (**3-Phase mains supply**), a loadable Neutral line is a must, otherwise fatal damage to the generators.

3. General Information

3.1 Purpose

The GEN II[®] – series ultrasonic components have been developed specially for industrial cleaning applications.

Along with the use in cleaning, special applications in the field of mixing and separating are possible (e.g. emulsifying, dispersing, and disintegrating).

For special applications, it is necessary to consult the system builder!

This unit is intended for applications in an industrial environment. Due to potential conducted and radiated noise, the electromagnetic compatibility cannot be guaranteed in other environments.

The ultrasonic generator is specially matched to a specific transducer load hence generators and transducers are to be replaced only with the same types.

3.2 Function

The ultrasonic system is generally consisting of an ultrasonic generator, a transducer and a cleaning bath with the cleaning liquid intended for a desired cleaning application.

The ultrasonic generator transforms the mains voltage to a voltage and frequency matched to the electromechanical sonic system (transducer).

The transducer transforms the electrical oscillation into mechanical oscillation which is dissipated into the cleaning liquid. Depending on frequency and sonic power the pressure waves will generate cavitation and so-called micro streams on the surface of the device under cleaning. The effect are remove the dirt and contaminations from the surface of the device.

3.3 Cleaning Liquid

CAUTION 	You must not use flammable or explosive cleaning liquid. In any use of harmful cleaning agent, first consult the corresponding safety instructions. Pay attention to the standards and consult your application supplier.
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The cleaning liquid type use depends on the material of the device under clean and the type of contamination. Please contact your application supplier or cleaning agent supplier.

4. Installation

4.1 Placing and Mounting

The ultrasonic generator has to be installed on a flat surface and in an area of not exposing to high humidity, dirt and corrosive vapors.

In order to ensure sufficient ventilation, unrestricted airflow has to be maintained to the air inlet at the bottom front of the generator case as well as to the air outlet at the rear. There must be a clearance of minimum 150 mm at the rear side of the generator housing.

For an inconducive environment, the generator can be housed in a cabinet, conditioned with an air condition unit (option).

4.2 Transducer Connection

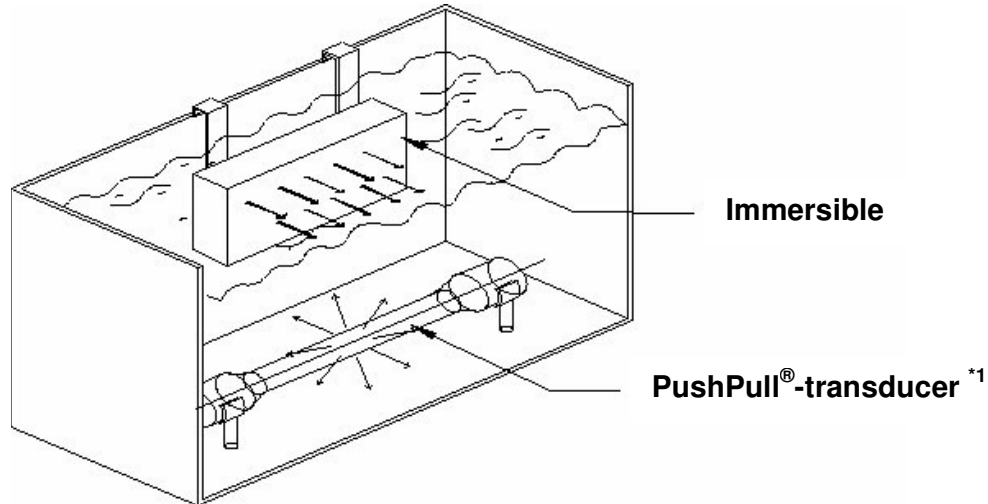
Each generator module is driving one transducer load and is factory preset to the type and operating frequency. For higher power applications or multifrequency transducers, several generator modules are driving the transducer load. In this case the transducer load has several connections. Generally the transducer load outputs have to match to the generator modules.

For the electrical connection of the transducer load to the generators, only shielded cables(Co-axial) with proper connections must be used.

4.3 Information about Transducer Installation (Examples)

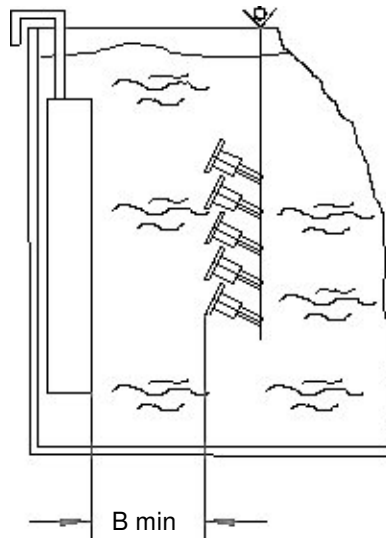
4.3.1 Direction of Power Dissipation

Immersible- and plate type transducers are dissipating the ultrasonic power vertically to the surface, PushPull® transducers are dissipating the ultrasonic power radial from resonator rod.



*1 : Not Applicable

Immersible- and Plate Type Transducers



Minimum distance to parts under clean :

25 kHz – transducer : $B_{min} = 200 \text{ mm}$

40 kHz – transducer : $B_{min} = 200 \text{ mm}$

68 kHz – transducer : $B_{min} = 200 \text{ mm}$

5. Maintenance

5.1 Introduction

WARNING 	High voltage hazardous!
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Before performing any maintenance or repair, unplug and disconnect from the mains supply.

5.2 Generator Modules

The generator modules are maintenance free.

Check power cord and transducer connections regularly for breaks or loose connections. To ensure sufficient cooling for the generators, air inlet of the housing must be checked regularly for dirt accumulation. Clean when necessary.

5.3 Transducers

The transducers are exposed to extreme dynamic load and have therefore to be checked regularly (at least every month) for damage or loose parts. Additional to this, remove dirt from the surfaces regularly.

Possible damages due to strain:

- cracks in transducer electrodes
- chip off *)
- loose bolt

**) Due to constant vibration, material of the transducer can be chipped off its surface. This is a physical process and not a malfunction of the transducer.*

5.4 Cleaning Liquid

The cleaning bath is to be checked, purified or replaced according to the manufacturer's recommendations.

6. Operation

6.1 Features

Besides the constant output power irregardless of load conditions, the generator module has the following features:

- microprocessor based control with interactive settings
- high reliability, regulations at different operating conditions
- real output power of up to 1000 Watts
- integrated data control for application specific data
- setup of operation parameters via user menu with keypad and LCD text display, real text display of operation data during operation
- remote control and monitoring of operation data via analog or serial interfaces (RS485/RS232), easy to connect to PLC, PC, etc.
- bus capable RS485-interface, up to 247 units (32 units without repeater)
- connection to common interfaces used in industry (Profibus, Modbus, etc.) via protocol converter
- front operating panel available (with keypads and display)
- Compatible to GENESIS[®] and GTI-series generators

6.2 Description of Operation

Power regulation:

Output power regulation with PWM (Pulse Width Modulation) methodology and/or VCO (Voltage Controlled Oscillator) methodology depending on operation and the characteristic of the load's impedance curve.

6.3 Configuration

Operation range:

- The start frequency and scan range (operation range) can be adjusted in a predefined limits.

Power settings:

- Internally by keypads or software command (default)
- Remotely by applying a control voltage at the D-SUB connector

Remote signal:

- ultrasonic 'on' with signal 'low' (default)
- ultrasonic 'on' with signal 'high' or 'open'
- disabled

Error output relay:

- At error condition contact closed (default)
- At error condition contact open

Button Lock:

- I/O-button unlocked/free (default)
- locked,
Button lock to avoid unauthorized operation of generator or by mistake. With I/O-button locked, the ultrasonic output of the generator module can be enabled by remote input signal or software command only. Additionally, the I/O-button can be locked with a signal input, too (see Technical Data in Appendix). So the manual operation of the generator module can be controlled by a host system (PLC).

Error handling:

- IdlePwr (idle power error) enabled/disabled. Idle Power Error occurs, if HF-power at start condition is higher than set value
- WobbErr (wobble error) enabled / disabled
- Wobble-Error occurs, if generator does not find an operation point within the scan-range

- HighPwr (highpower error) enabled / disabled
- High-Power Error occurs, if output power is higher than 108% of nominal power
- NoLoad (no load error) enabled / disabled

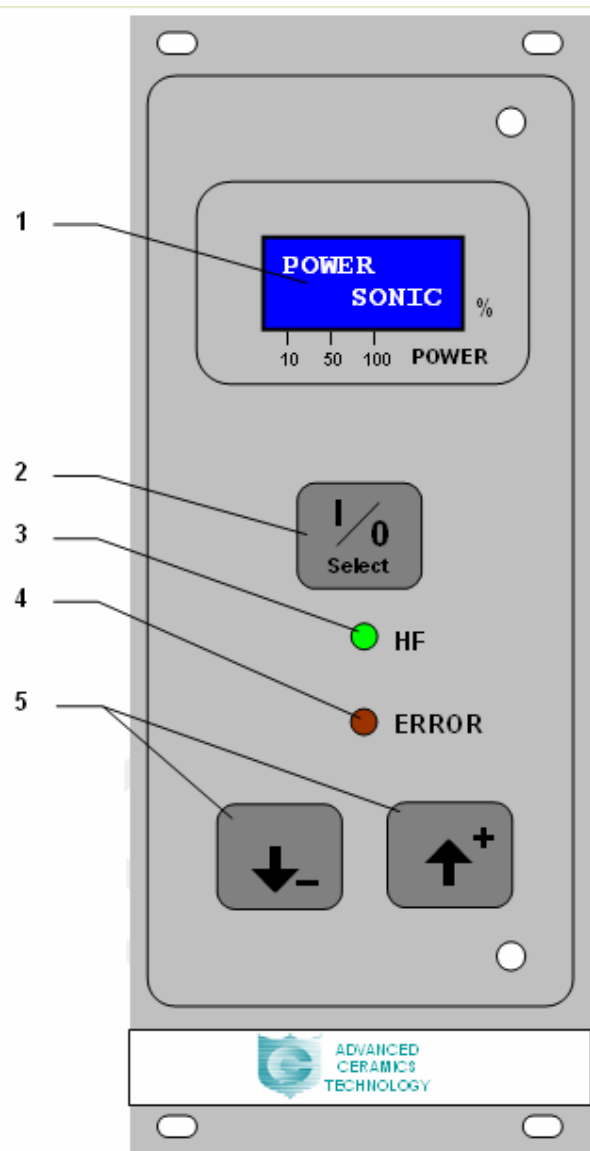
Level sensor:

- disabled (default)
- enabled,
With connection of an external level sensor, the liquid level of a cleaning bath can be monitored. With low liquid, the generator module will disable ultrasonic operating and an error signal occurs.

Interface:

- RS485, bus compatible (default)
- RS232 (option, 28TE-1 and 42TE-2 housing only),
no bus operation possible, each generator module needs an own interface at the host

6.4 Controls and Indicators



Pos.	Name	Description
1	Display	Illuminated LCD display
2	'I/O-Select' - button	Ultrasonic enable/disable, Selection button (depending on menu function)
3	HF indicator (green)	HF-output active
4	Error indicator (red)	Error at sonic system
5	Buttons 'up' and 'down'	Settings/adjustment of menu parameters

6.5 Setting-Up Operation

All generator modules have to be inserted and fixed prior to operation and connected properly to the sonic system.

Before system operation, the proper connection of the generators and the transducers to protective earth (PE) must be provided.

After turning on mains supply, the generators are ready to use.

6.5.1 28TE-1 and 42TE-2 housings

Switch on module with the green rocker switch. If the green operating light is on, the module is in stand-by mode. The fan(s) have to operate.

6.5.2 63TE-3 und 84TE-5 Housing

	CAUTION To operate the generators in 63TE-3 and 84TE-5 housings, a loadable Neutral line is a must
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Switch on modules with the rotary switch turn to '1'. If all three phase operating lights are on, the modules are in stand-by mode. The fans have to operate.

6.5.3 Special Characteristics

Selection of Generator Address:

When interfacing the generators in RS485 protocol, all generator has to be addressed individually. This can be done in the service menu or by software command. The factory set address counts up starting with '049', depending on number of modules of current order.

Over Temperature Shut-off:

If the temperature of generator module rises up during operation caused by high ambient, insufficient cooling or exceeding power loss by a faulty system, the ultrasonic operation will be stopped automatically. After cooling down, the ultrasonic operation will be started automatically again.

Direct Access to Service Menu:

Pressing the 'I/O/Select'-button during powering up the generator module:

The service-menu will be accessed immediately after booting. This is useful with configuration of the remote input signal to 'active high'. With this, ultrasonic operation will be enabled after powering up while the remote signal is left open or connected to 'high'. So, the remote signal will be ignored and it is possible to access the service-menu to change the configuration setting.

6.6 Error Fixing

If errors occur, generally the following items should be checked first :

- Is the mains power supply available and are the voltages according to specification?
- Is the power line sufficient when loaded?
- Is the transducer connected correctly, are the generator and transducer matched properly (frequency, power) ?
- Is the HF-cable wired correctly and not damaged?
- Is there any condensation inside transducer or HF-cable?
- Is the generator cooled sufficiently? Do the fans operate properly?
- Is the ambient temperature according to the specified range?
- Is the bath temperature according the specified range?
Due to some physical reasons, the transformation behavior of PZT-stack from electrical energy to mechanical energy will change completely with rising temperature. Above the limit, the PZT-stacks might be destroyed.
- Is the cleaning bath condition good for ultrasonic operation?
Heavy bath turbulences, high flow rate or vacuum may cut the sonic waves. For these reasons the transducers are not able to dissipate the ultrasonic energy completely.
Also reflections may be generated from cross-talk in the transducers or by the device under clean, which reflect the electrical energy back to the generator modules. With this, the generator module may stop the ultrasonic operation due to over load condition detected.
- Is the failure intermittent or consistent through out the operation ?
- Is it a new application and the application before operate fine ?

Because of the complexities of the ultrasonic systems and for the product responsibility, therefore only the manufacturer should do the repair of the failed components.

6.6.1 Quick steps to find out the generator-tank system condition

Please disconnect transducer from generator and turn on the ultrasounic. If green HF-LED lights up for some seconds, the generator is probably not the failure reason.

- Follow these steps :
connect second transducer of the same type
if generator does not operate properly, the generator is probably the reason of the failure or generator and transducer are mismatched;
operating conditions can be the failure reason as well
- shake transducer
if you can hear clacking noise, the PZT's could be broken, the transducer must be repaired at factory
- measure capacitance and resistance of transducer
unstable values or high variance possible due to moisture invasion,
broken wiring or broken PZT's.
- perform a high voltage test
disconnect transducer and perform high voltage test at transducer
(connection box or plug, between transducer wires AC1000V/50Hz)
Caution: transducer housing is connected to the -ve terminal (blue resp. brown wire) If arcing happens, moisture invaded or PZT's failed; further the wiring can be lazy, too. This can be checked by disconnecting the wire and repeat the high voltage test.

6.6.2 Capacitance and resistance of transducers (approx. values)

For measuring real capacitance values, a capacitance meter with built-in AC-source is required. A standard DVM may not show proper result because it is not dedicated for capacitance measurement.

Immersible- and plate-type transducers				
Module	GEN II 250	GEN II 500	GEN II 1000	Resistance
25 kHz	?	--	84nF	560k
40 kHz	--	--	60nF	560k
68 kHz				560k
58 kHz	--	18nF	--	560k
132 kHz	--	24nF	--	560k
192 kHz	--	18nF	--	560k

Table 6-1: Capacitance and resistance of transducers (approx. values).

6.7 Error Messages of the Modules

Error Code	Description	Possible Reason, Corrective
E 01 low line	low line voltage	check mains supply
E 02 hi line	high line voltage	check mains supply
E 03 no hf	HF-voltage fail	module failed, repair by manufacturer
		short at transducer/HF-cable, occurring temporarily: aftereffect of further errors or overload, improper operation conditions
E 04 ovr curr	Over current shut-off	temporarily over load, improper operation conditions
		transducer or HF-cable failed
E 05 I2C-Bus	Internal error	failure of internal control, module failed
E 06 comm 1	interface error com1	safety shut-off enabled: at ultrasonic 'on' by software command, the host has to communicate regularly with the module (e.g. request status), see programmers manual
E 08 idle pwr	idle power: power above set value (can be disabled by configuration)	improper operation conditions: at new installation, change start frequency after consulting
		transducer or HF-cable failed
E 09 no OP	scan-error: system cannot find a proper operating point	at new installation: change start frequency after consulting
		wrong transducer connected
		transducer or HF-cable failed
E 10 NTC open	temperature sensor break	module failed, repair by manufacturer
E 11 NTC shrt	temperature sensor short	module failed, repair by manufacturer
E 12 high pwr	highpower: high output power (can be disabled by configuration)	improper operation conditions
		wrong transducer connected
		transducer or HF-cable failed
E 13 no load	no load error: the generator is not able to source HF-power to the system (can be disabled by configuration). Normally disabled for PushPull®- and SinglePush-transducers, because of dry operation ability.	improper operation conditions
		transducer or HF-cable failed
E 14 high cur	over current shut-off	improper operation conditions, over load
		transducer or HF-cable failed

Error Code	Description	Possible Reason, Corrective
E 15 cur mode	current regulation mode, disable ultrasonic after 30sec., amplitude limiting (for PushPull [®] - and SinglePush-transducers only)	no error, sonic system cannot source set power to the cleaning liquid (e.g. vacuum operation or no load condition)

6.8 More Failure Reasons

Failure	Possible reason	Corrective
Reduction of output power without disabling ultrasonic (amplitude regulation mode, PMI/SMI only)	transducer not immersed completely	immerse transducer completely
	vacuum ambient	no error
shut-off with error message 'temperature'	max. ambient temperature exceeded	move generator to air-conditioned area
	inadequate cooling	improve cooling, clean air inlet
	fan failed	repair by manufacturer
shut-off with warning message 'level sensor'	low level detected	check liquid level
shut-off with error message	operation with badly matched sonic system, wrong transducer connected	connect proper transducer, watch for correct type and frequency
	improper operation conditions (liquid temperature, cleaning agent, concentration, etc.)	if possible change conditions, small changes (e.g. change liquid temperature by 5K) can change operation conditions substantial
	cleaning liquid not degassed	degas cleaning liquid
	heavy turbulences in cleaning tank	reduce turbulences, disable ultrasonic during pumping procedure
	transducer not immersed completely	immerse transducer completely
	transducer not properly connected	check connections
	HF-cable short	check/repair cable
	transducer short	check transducer, repair by manufacturer
	failed power stage of generator	repair generator by manufacturer
application does not clean properly generator doesn't operate at full power	cleaning liquid not degassed	degas cleaning liquid
	heavy turbulences in cleaning tank	reduce turbulences
loud screaming noise during operation	noise radiation of cleaning tank caused by interferences	quick fix: reduce output power, change liquid temperature, change solvent concentration, add noise absorbers at outside tank walls (min. 3cm foam, e.g. Armaflex), reinforce sidewalls of tank
	cleaning liquid not degassed	degas cleaning liquid

7. Appendix

7.1 General

The Technical Data are valid for a single module. Connecting to the power supply, the total power consumption per housing has to be considered.

Application Ultrasonic cleaning, mixing and separating applications
for industrial use, special applications

Design Module 14TE resp. 28TE / 4HE
for mounting in corresponding 19"- housings

Module type	Transducer
GEN II	Immersible- or plate type transducers
PMI *1	PushPull® transducers
SMI *1	SinglePush transducers
HMI *1	High frequency transducers

*1: Not applicable

7.1.1 Output

HF-voltage for operation of matched ultrasonic transducers

Frequency approx.: 25 kHz, 40kHz, 58KHz*², 68kHz, 132KHz*² and 192KHz*²

Module type	Output power max.	Power consumption max.
GEN II W250	250 W	350 VA
GEN II W500	500 W	750 VA
GEN II W1000	1000 W	1400 VA

*²: Not available yet

VOLTAGE	SONIC POWER	CURRENT LOAD	FUSE
115 Vac	250W	3A	4A
	500W	6A	10A
	1000W	12A	15A
230 Vac	250W	1.5A	2.5A
	500W	3A	4A
	1000W	6A	10A

Power regulation: $\pm 5\%$

Duty cycle: variable (continuous)

Power Supply / Max. Wattage / Max. Line Current:

28TE-1 housing: AC 230V $\pm 10\%$, 47...63Hz, 1~, N, PE / 2200VA / 16A

42TE-2 housing: AC 230V $\pm 10\%$, 47...63Hz, 1~, N, PE / 3300VA / 16A

63TE-3 housing: AC 230V/400V $\pm 10\%$, 47...63Hz; 3~, N, PE / 6600VA / 3x 16A

63TE-3 housing: AC 230V/400V $\pm 10\%$, 47...63Hz; 3~, N, PE / 8800VA / 3x 16A

84TE-5 housing: AC 230V/400V $\pm 10\%$, 47...63Hz; 3~, N, PE / 11000VA / 3x 32A

7.1.2 Front Panel Controls

	Operation mode	Setup mode
'I/O-Select'-button	ultrasonic operation on/off	Display selection, confirmation of selection
'+' / '-' -Buttons	Display of actual operation parameters	Function selection, adjustment of parameters
HF-LED (green)	HF-voltage present	--
ERROR-LED (red)	Error indicator	--

7.1.3 Interface analog/binary (Interface)

(see page 7-8 for signals location on 25P DSUB socket at Casing)

Control input:	Ultrasonic enable connect to GND with potential free contact, approx. 5V / 2mA Option 0: disabled Option 1: ultrasonic 'on', if connected to GND (default) Option 2: ultrasonic 'on', if signal floating or 'high'
Control input:	Button lock of 'I/O/Select'-button connect to GND with potential free contact, approx. 5V / 2mA button locked, if connected to GND
Control input:	external level sensor connect to GND with potential free contact, approx. 5V / 2mA Option 0: disabled (default) Option 1: low level, if signal floating or 'high'
Control signal analog:	Set value power Analog voltage 4V ... 10V → 40% ... 100%, referred to GND, input impedance $R_i \geq 10k\Omega$ Option 0: internal adjustable with menu (default) Option 1: external adjustable with control signal Information: the minimum power is given by sonic system and start frequency

Error output:	Error relay potential free contact, max. 30V, 0,1A Option 0: contact closed at error condition (default) Option 1: contact open at error condition
Signal output:	Actual value output power analog voltage 0% ... 100% → 0V ... 10V, referred to GND, max. 5mA
Signal output:	Auxiliary voltage +15V, max. 50mA

All connections of analog/binary interface are protected up to max. DC 32V

7.1.4 Interface for Connection to Host System (SPS, PLC, etc.)

RS485 (default):	Parameter:	19200,N,8,1
	Protocol:	GEN II -internal
	Cable length:	approx. max. 1200m (with shielded cable and proper bus termination)
	Mode:	half duplex
RS232 (option, instead RS485)	No. of units:	247 units per bus 32 per bus segment, can be extended with off-the-shelf repeaters
	Parameter:	19200,N,8,1
	Protocol:	GEN II -internal
	Cable length:	approx. max. 15m (with shielded cable)
Available with 28TE-1 and 42TE-2 housing only, no bus operation possible, each module needs an own interface		

Information:

The names of the interface lines 'A' and 'B' of the RS485 are not standardized, it is possible, that these names were interchanged or named differently at other RS485-components depending on manufacturer. If a communication does not

work between the units, the wires 'A' and 'B' should be interchanged. This is applicable only, if all generator modules have RS485 option installed. A bus termination should also be added generally.

7.1.5 Identification of Circuits / Isolation

Identification of Circuits / Isolation

Power supply:	primary circuit
Output:	secondary circuit
Interfaces:	ELV-circuits

Galvanic isolation between

- | | |
|--------------------------------|---------------------------|
| - Power supply and output, | isolation voltage AC1000V |
| - Interfaces and output, | isolation voltage AC250V |
| - Power supply and interfaces, | isolation voltage AC250V |

Moisture degree:	2
Over voltage category:	III

Information:

The minus-pin of output and GND of interfaces are connected to protection earth (PE).

7.1.6 Environment Conditions Generator / HF-cables

Max. ambient temperature:	+10°C ... +40°C	(50F ... 104F)
max. storage temperature:	- 20°C ... +85°C	(- 4F ... 185F)
Humidity:	max. 70%, non condensing	
IP-class according IEC 529 / IP:	module without housing: IP00	
module installed in housing:	IP20	

7.1.7 Connections

Power supply 28TE-1 and 42TE-2 housing:

EU-plug DIN 49441, cable length approx. 1,5m

Power supply 63TE-3 housing:

power plug CEE-standard 7 / VII, 16A, cable length approx. 2,0m

Power supply 84TE-5 housing:

power plug CEE-standard 7 / VII, 32A, cable length approx. 2,0m

power plug CEE-standard 7 / VII, 16A, cable length approx. 2,0m
(option)

HF-connection	GEN II	BNC-HV
	PMI/SMI*1	Amphenol C16
	HMI*1	BNC-HV

Interfaces	analog/binary:	DSUB 15pole, socket
	RS485:	DSUB 9pole, socket (2x)
	RS232:	DSUB 9pole, plug (option)

*1: Not applicable

7.1.8 HF-Cable Length / Cable Width:

Module Type	Frequency	Cable Width	Max. Cable Length
GEN II W250-1000	25kHz	RG58	10m
GEN II W250-1000	40kHz	RG58	10m
GEN II W250-1000	68kHz	RG58	10m

7.2 Dimensions And Weights

Module type	Height	Width	Weight
MW 300-2000 GEN II /PMI/SMI/HMI	4 HE	14 TE	4,0 kg

Housing (empty housing)	Height	Width	Depth	Weight (w/o modules)
28 TE	194 mm	184 mm	397 mm	1,5 kg
42 TE	222 mm	236 mm	411 mm	2,0 kg
42 TE with MB *)	222 mm	271 mm	411 mm	2,1 kg
63 TE	222 mm	400 mm	411 mm	2,3 kg
63 TE with MB *)	222 mm	435 mm	411 mm	2,4 kg
84 TE	222 mm	449 mm	411 mm	2,6 kg
84 TE with MB *)	222 mm	484 mm	411 mm	2,9 kg

*) MB: mounting brackets for 19"- rack installation

Information:

To insure proper cooling of generators, there must be a clearance of min. 150mm behind the housing (air outlet).

7.2.1 Housing Assembly

Housing			
28TE	42TE	63TE	84TE
One module 14TE	Two modules 14TE or one module 28TE	Three modules 14TE	Five modules 14TE or two modules 28TE

Information:

The max. installed power of each housing must be followed.

7.3 Connection Tables

7.3.1 Interface analog / binary (25-Pole DSUB socket)

Pin 14TE*	Pin Name	Function	Description
1	FS_M1	remote module 1	input control: ultrasonic enable / disable connect potential free switch to GND, approx. 5V/2mA
2	FS_M2	remote module 2	
3	FS_M3	remote module 3	
4	FS_M4	remote module 4	
5	FS_M5	remote module 5	
6	AN_IN_M1	power control module 1	input control: desired output power (option) voltage 4V...10V → 40%...100% output power input resistance $R_i \geq 10 \text{ k}\Omega$, max. 30V
7	AN_IN_M2	power control module 2	
8	AN_IN_M3	power control module 3	
9	AN_IN_M4	power control module 4	
10	AN_IN_M5	power control module 5	
11	LUE2	error relay common	alarm signal: 'ERROR' relay potential free, max. AC24V/DC30V, 0,1A
12	LUE1_M1	error relay module 1	
13	LUE1_M2	error relay module 2	
14	LUE1_M3	error relay module 3	
15	LUE1_M4	error relay module 4	
16	LUE1_M5	error relay module 5	
17	P_OUT_M1	output signal module 1	output signal: actual value of output power 0%...100% output power → voltage 0V...10V, max. 5mA
18	P_OUT_M2	output signal module 2	
19	P_OUT_M3	output signal module 3	
20	P_OUT_M4	output signal module 4	
21	P_OUT_M5	output signal module 5	
22	EXT_T	external level sensor	control input: liquid level control connect potential free switch to GND, approx. 5V/2mA
23	REM_LOC	on/off-button lock	control input: on/off-button lock (front panel) connect potential free switch to GND, approx. 5V/2mA
24	GND		Ground
25	GND		Ground

Pin 14TE *: pin no. at assembly of the 28TE, 42TE and 84TE cases
with generators series GEN II W250-1000/ MW 600-2000 PMI / SMI /
HMI (module width 14TE)

- all inputs and outputs are protected up to DC 30V
- non-listed connections resp. the connections of non-assembled modules are not connected
- ground potential 'GND' is connected to protective earth (PE)

7.3.2 Interface RS485 (9-Pole DSUB socket)

Pin	Designator	Description
1	GND-PE	functional earth (connected to PE)
2	B	communication signal 'B'
3	GND485	bus termination RS485 (see below)
4	GND	reference signal
5	+5V	+5V auxiliary voltage for bus termination
6	GND485	bus termination RS485 (see below)
7	A	communication signal 'A'
8	GND	reference signal
9	+15V	+15V auxiliary voltage

Information:

For connecting several housings and PLC, only the lines 'A', 'B' and 'GND' have to be used. The auxiliary voltages are intended for bus termination and to supply optional accessories.

The naming of the lines 'A' and 'B' are not standardized. Therefore it is possible, that these markings of RS485-components of third party suppliers are interchanged or completely different. If you cannot get connection at operation setup, first interchange lines 'A' and 'B'.

7.3.3 Interface RS232 (9-pole DSUB plug)

Pin	Designator	Description
1	--	n.c.
2	TxD	transmit line (output)
3	RxD	receive line (input)
4	--	n.c.
5	GND	reference signal
6	--	n.c.
7	--	n.c.
8	--	n.c.
9	--	n.c.

Information:

For connection to a standard RS232 PC-interface a direct cable 1:1 socket/socket can be used.

Recommended Circuit of RS485-Interface

(according recommendation of ModBus-Organisation, Aug-2004)

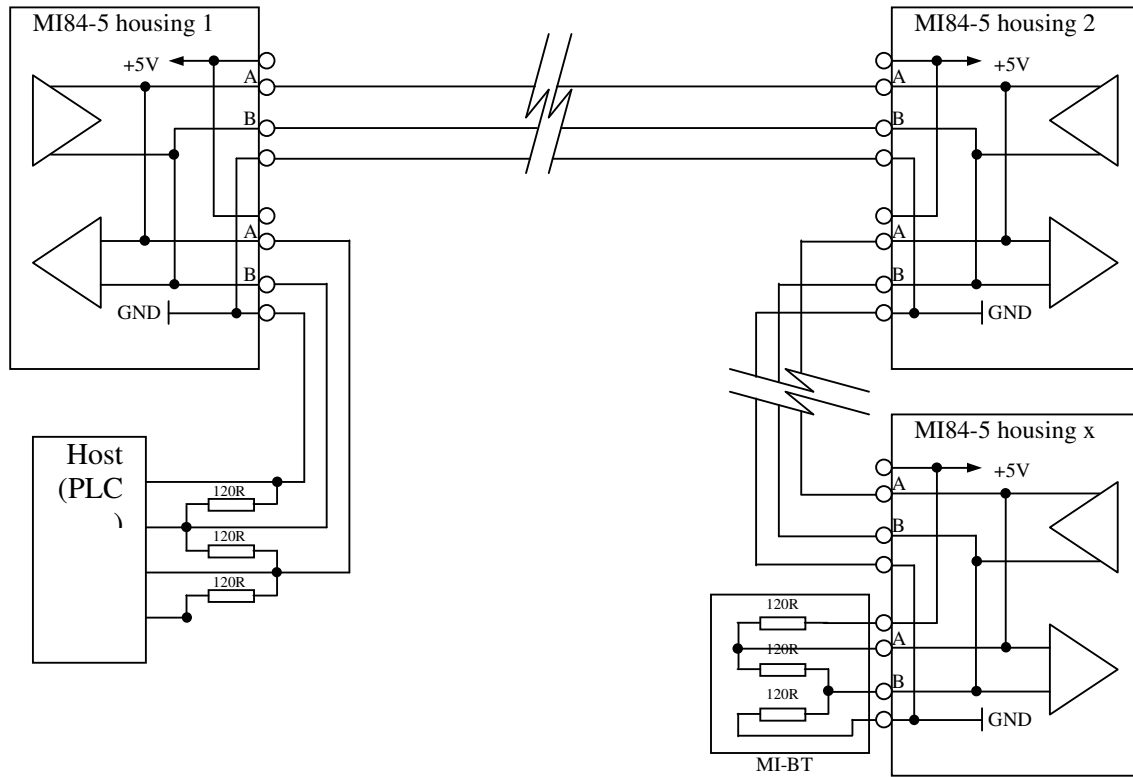
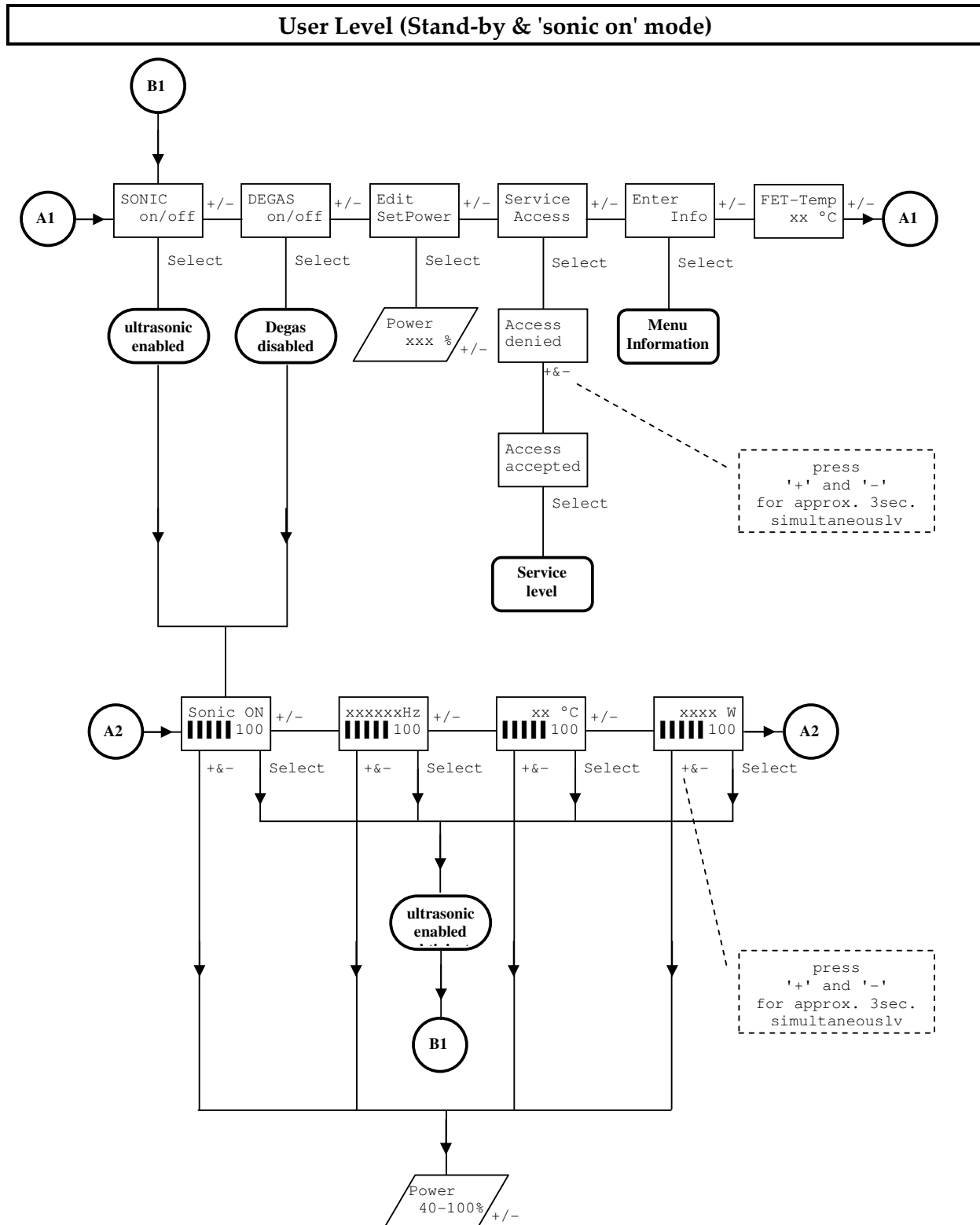
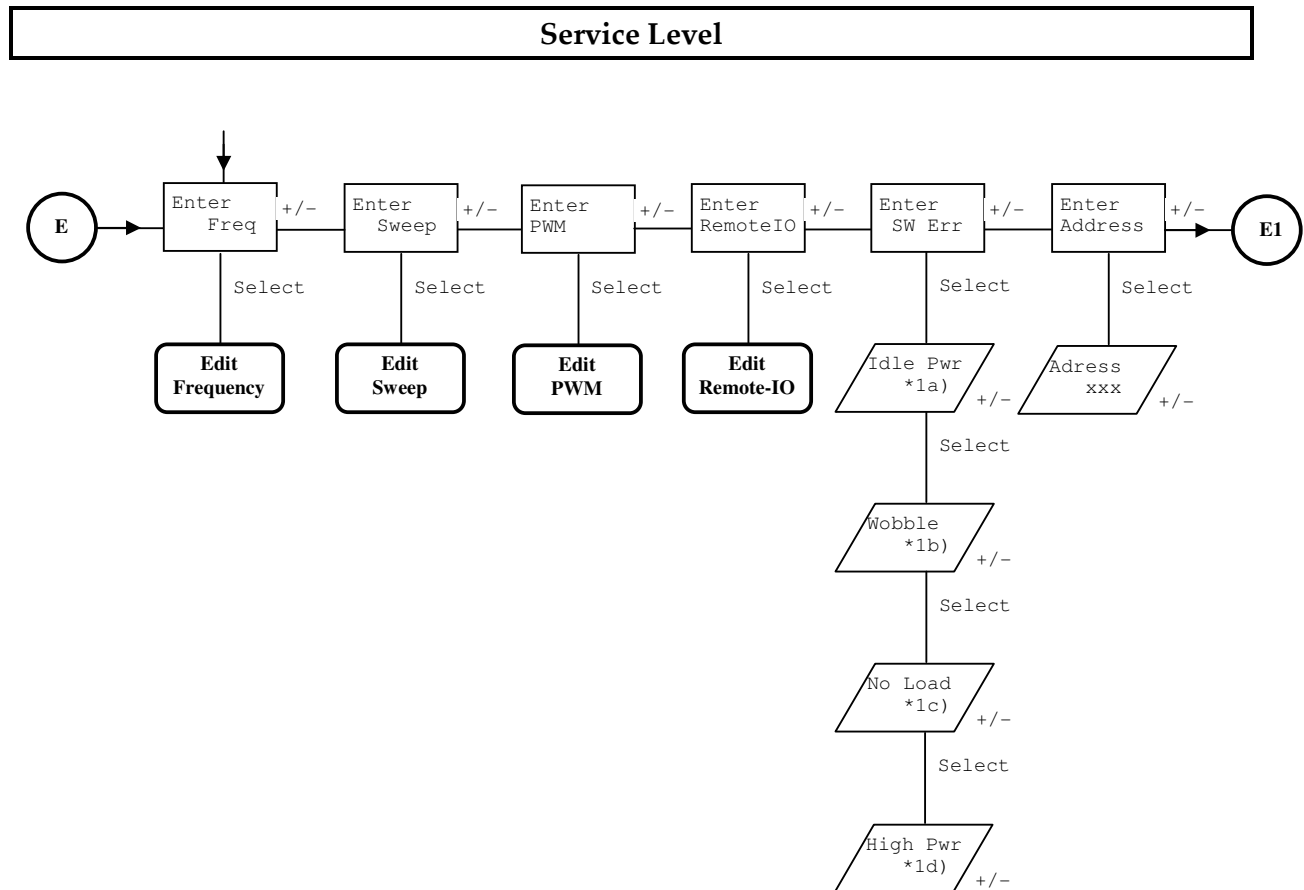
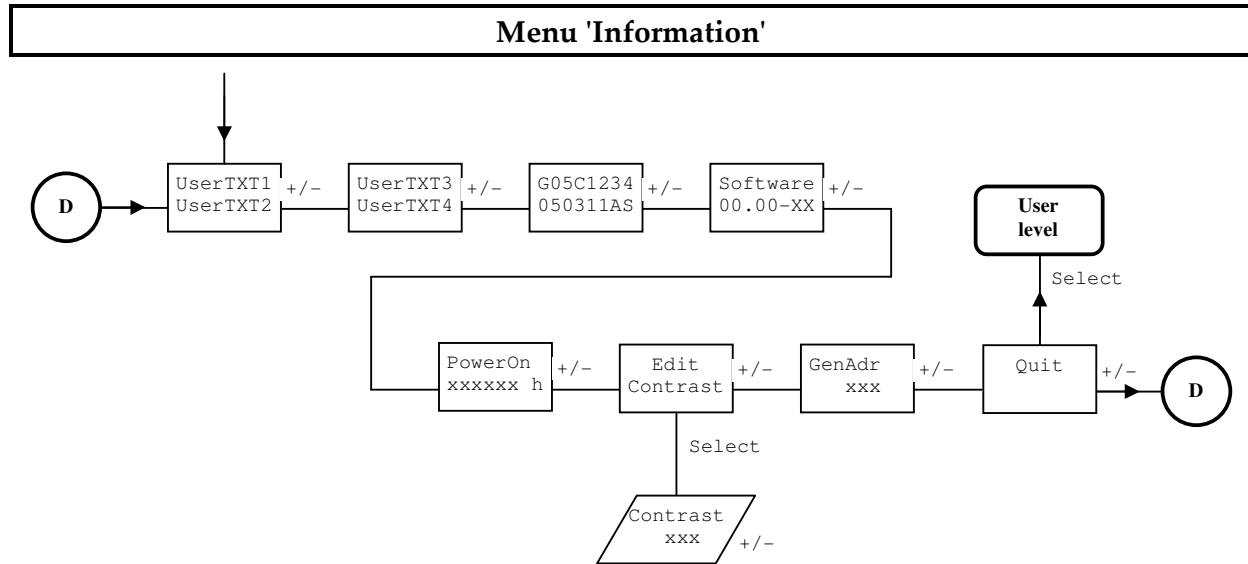


Figure 7-1: Recommended Circuit of RS485-Interface.

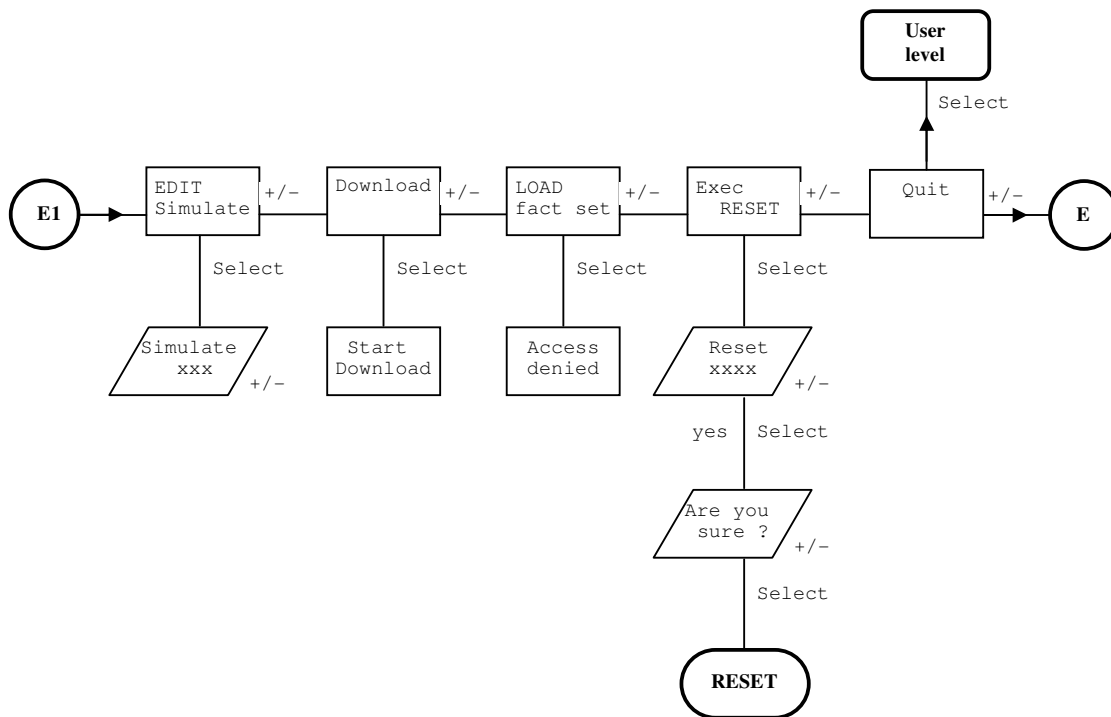
7.4 Menu Structure



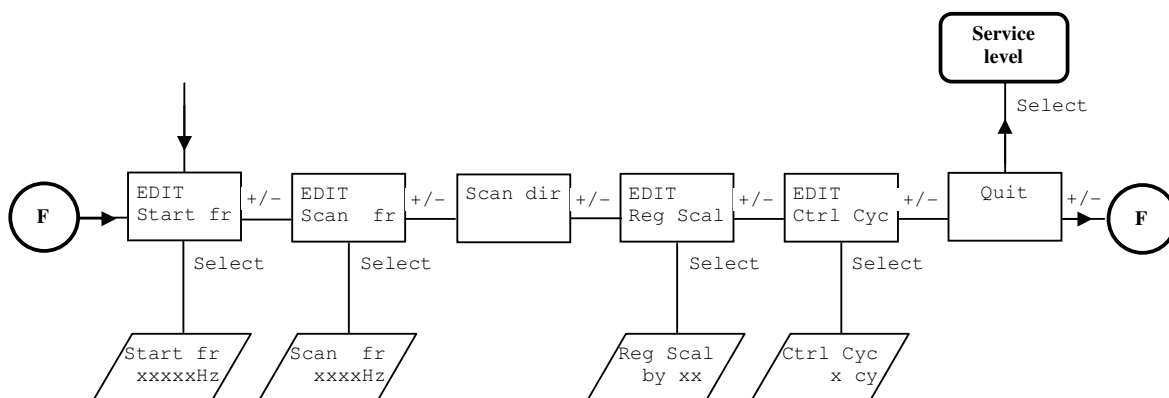


Menu item		Selection	Description
IdlePwr	*1a)	enabled / disabled	Idle error detection enabled / disabled
Wobble	*1b)	enabled / disabled	Wobble error detection enabled / disabled
NoLoad	*1c)	enabled / disabled	No load error detection enabled / disabled
HighPwr	*1d)	enabled / disabled	High power error detection enabled / disabled

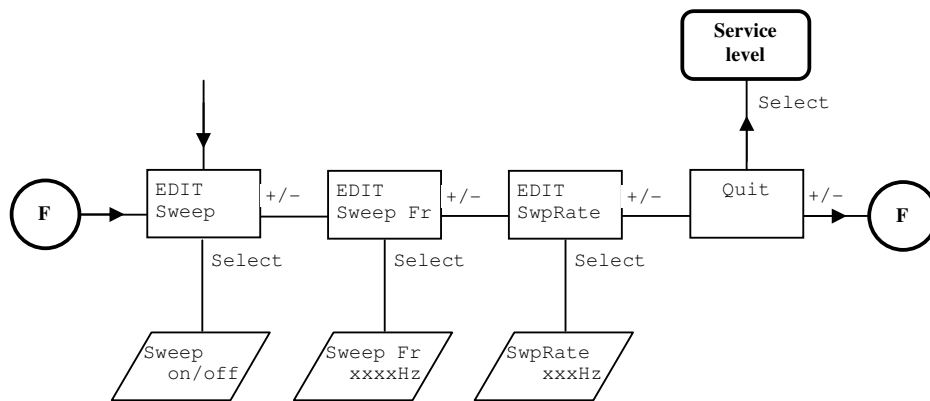
Service Level (continued)



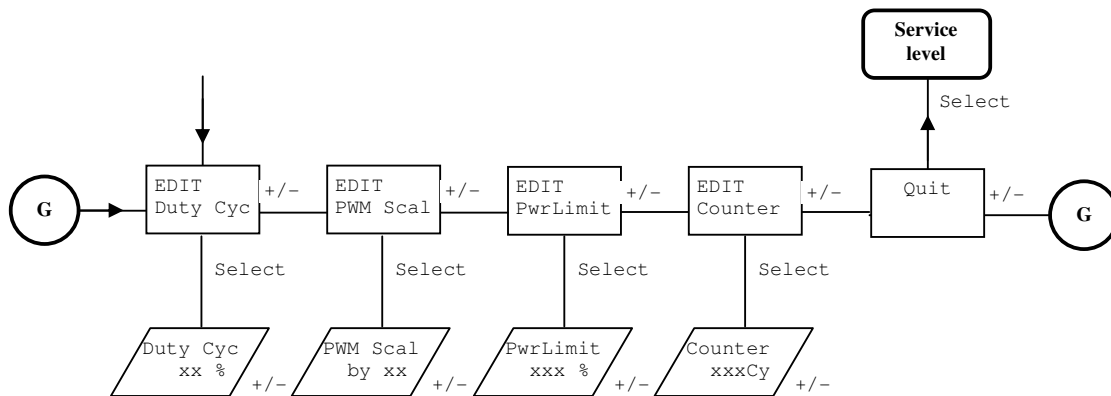
Service Level: Menu 'Edit Frequency'



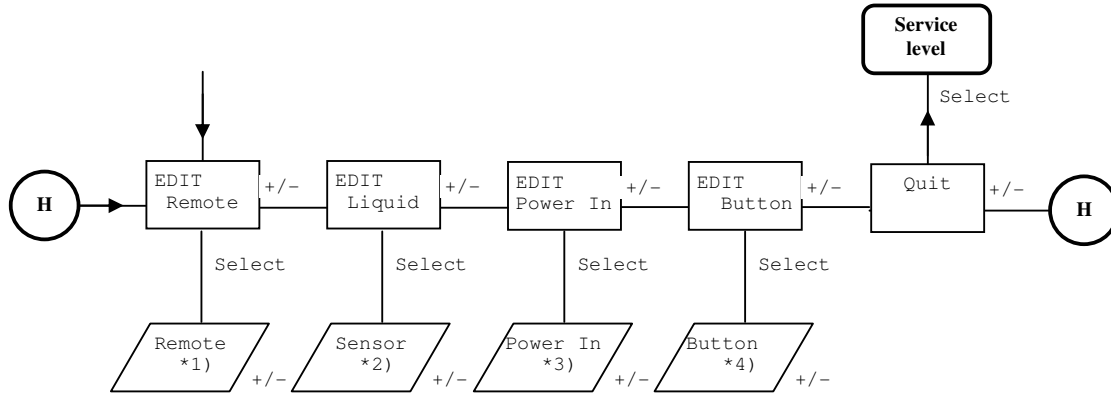
Service Level: Menu 'Edit Sweep'



Service Level: Menu 'Edit PWM'



Service Level: Menu 'Edit Remote-IO'



Menu item	Selection	Description
Remote *1)	low act	signal input 'REMOTE' activ low
	high act	signal input 'REMOTE' activ high
	off	signal input 'REMOTE' disabled
Sensor *2)	low act	signal input level sensor activ low
	high act	signal input level sensor activ high
	off	signal input level sensor disabled
Power In *3)	button	power setting by buttons/menu or software command
	analog	power setting by analog signal input 4-10V
Button *4)	free	I/O-button enabled for ultrasonic 'on'
	locked	I/O- button disabled for ultrasonic 'on'

7.5 Command Overview

OPERATION (operation commands)

start sonic enable ultrasonic

stop sonic disable ultrasonic

set power • set output power 10-100%, only for GEN II (internal setting only)
 • set output power 40-100%, for others model (internal setting only)

Request sonic data

- set power
- HF-output power (0-100%)
- HF-output current (0-100%, PMI/SMI only)
- current temperature of generator module (in degC)

Request generator status - request operation status and error status

- ultrasonic 'enable'/'disable'
- generator temperature ok/over range
- generator temperature warning level ok/warning
- generator status ok/error
- variable parameter set (user set) unchanged/changed
- variable parameter set (user set) valid/void
- fixed parameter set (factory set) available/not available
- amplitude control operation/power limiting operation (PMI/SMI only)
- continuous mode / degas mode
- supply voltage ok/over- or under range
- HF-voltage ok/missing
- HF-current ok/over range (hardware detection)
- internal memory ok/error
- interface 1 ok/error
- interface 2 ok/error
- idle power error ok/error
- wobble error ok/error
- temperature sensor ok/failed
- HF-power ok/over load
- HF-current ok/over range (software detection)
- sweep lock enabled / unlocked
- line sync present / missing
- level sensor ok / low level
- load detected / load missing, no output power

INFORMATION

request version & date	request software version and date
request line frequency	request line frequency (50Hz / 60Hz)
request total sonic time	request operation time counter (ultrasonic 'on'-time, max 65535 hours)
request front panel	request execution of operation controls

GEN II DATA (manufacturer data)

Request GEN II -Data

- serial number
- manufacturing date / test person
- unit type

PARAMETER 1 (internal operating parameters, fixed)

request parameter 1

- start frequency
- scan range
- sweep enable/disable
- sweep frequency range (with sweep enabled only)
- sweep rate (with sweep enabled only)
- PWM scale
- PWM power limit
- PWM Counter

PARAMETER 2 (internal regulation parameters, fixed by manufacturer)

request parameter 2

- gate time
- amplitude limit (upper value)
- amplitude limit (lower value)
- regulation scale (regulation speed)
- control cycle (regulation sensitivity)

PARAMETER 3 (unit settings)

set user text 1-4

- set user defined text (2x2 rows, each 8 characters) free text, machine number, application name, etc.

set misc. options

- remote signal active low/active high/disabled
- level sensor active low/active high/disabled
- power control internal/external (analog input 4-10V)
- button lock

set software error detection

- idle error enabled/disabled
- wobble error enabled/disabled
- no load error enabled/disabled
- high power error enabled/disabled

request parameter 3

- nominal output power of generator
- user text 1-4 setting
- misc. options setting
- software error detection setting

SYSTEM DATA (system commands)

reset generator generator module reset to on-position

set address set generator module address, range '001'-'247'
(RS485 and RS232)

clear error flags **Information:**

The error condition will be shown at front display and the error LED, setting of corresponding status flags and blinking of display back light.

With this command, the generator will be reset to error free standby-condition.

RETURN

return: OK

return: command error

Note:

[illegible]