



DST4400

Operating

Manual

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J1939
interface

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for
DST4400 and derived products

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as manufacturer of the listed products,
declares that they comply with the requirements of the
EMC Directive 89/336/CEE
and of the
Low Voltage Directive 73/23/CEE

Reference Standard Specification

EN61326-1 (1998-04) Electrical equipment for measurement, control and laboratory use. EMC Requirements. Part 1: General requirements.

EN61326/A1 (1999-05) Electrical equipment for measurement, control and laboratory use. EMC Requirements.

EN61010-1 (2001-11) Safety requirements for electrical equipment for measurement, control and laboratory use. Part 1: General requirements



Conformity is applicable for not damaged products that are properly installed and used.

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1. General information

NOTE: Before installing the device, carefully read par. 7.

NOTA: Before using the device, carefully read this operating manual.

DST4400 board, operating in an electric switchboard, is able to control the automatic operation of a generator set and to monitor and control it during the operation. It works with both three- and single-phase systems.

The built in MAINS three-phase sensor makes DST4400 a full AMF control device

Please refer to SICES document EAAM010202 (or following versions) for programming and default values.

1.1 Definition

Throughout this document the word BLOCK is used to indicate an alarm that makes generation function impossible and causes immediate generator shutdown.

The word DISABLE is used to indicate an alarm that makes generation function impossible and causes the automatic generator shutdown after a proper cooling down cycle.

The word WARNING is used to indicate a warning that requires an operator action but doesn't require the automatic generator shutdown.

Throughout this document, the words SOFTWARE and FIRMWARE are used as synonymous if they are referred to the board firmware.

Software code version is reported in a format like: EB0220064xxyy, where xx is the major version number and yy is the minor version number. Thus, code EB02200640001 refers to 00.01 software release.

In DST4400 can be embedded two different software version depending on board configuration:

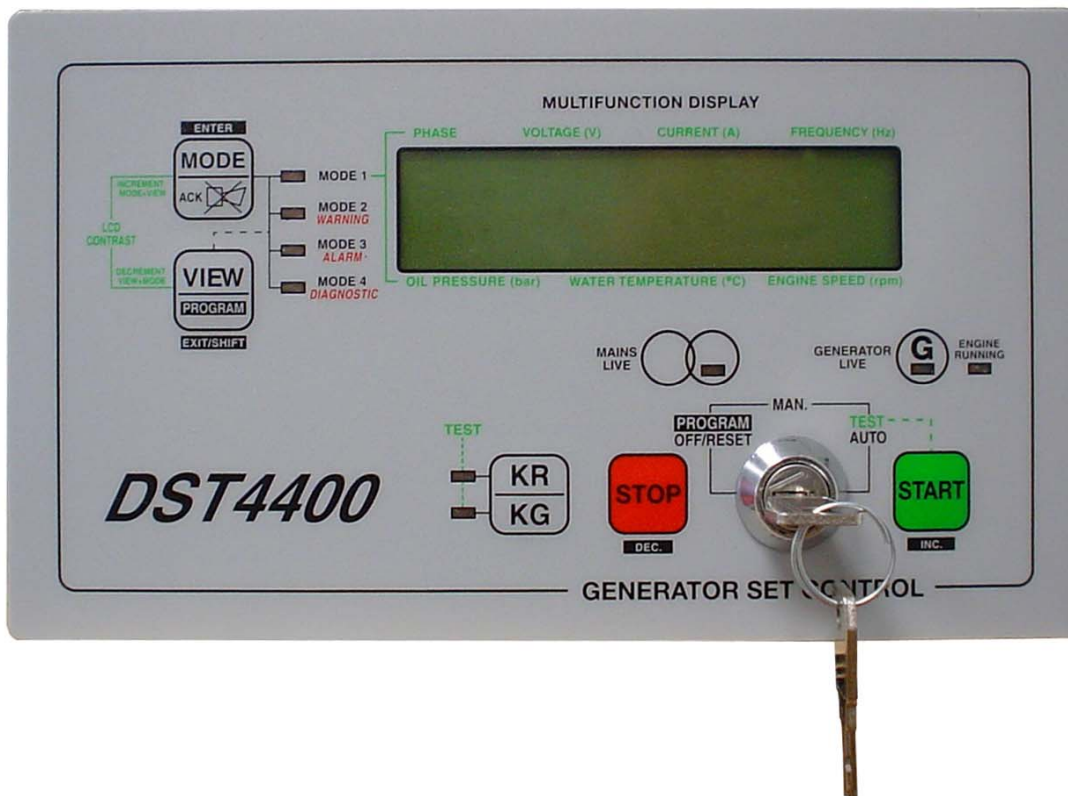
- EB0220064xxyy: for standard board
- EB0220078xxyy: for board equipped with CANBUS option

1.2 Symbols

In this document a vertical bar on the right margin indicates that the chapter or the paragraph has been emended respect to the last document's version.

A grey background highlights changes in table's fields.

2. Front Panel



2.1 Commands

Command operations are carried out by means a key-lock switch and five pushbuttons.

2.1.1 Key-lock selector

Key position	Function
OFF/RESET PROGRAM	The gen-set is disabled. Warnings and blocks are reset. It is possible to gain access to programming function.
MAN	Gen-set is in manual mode. The START pushbutton allows the board to start the engine. STOP allows stopping the engine. KR/KG allows to changeover the load between MAINS and GENSET.
AUTO	Gen-set is in automatic mode. Pressing START button activates the mode TEST.

2.1.2 Pushbuttons

Pushbutton	Function
MODE/ACK ENTER	It is used to acknowledge a warning and/or to silent the HORN. If no anomalies are pending, it is usable to select the page to show on the display device. In programming mode, it is used for entering the menu, and also to begin and to confirm the change of a parameter. Used in combination with the key VIEW it allows modifying the contrast of the display device.
VIEW PROGRAM EXIT/SHIFT	It is used to select measures to show on the display in the selected mode. It is used to enter/exit the programming mode and to abort the parameter changing. Used in combination with the key MODE it allows modifying the contrast of the display device. While changing a parameter value, if pressed at the same time with START or STOP, it allows increasing the changing rate of the value.
START INC	In MAN mode, it allows to start the engine. In AUTO mode, it allows to enter the TEST mode starting the engine. In Program mode, it scrolls up the menu and increases the parameter value while in changing mode.
STOP DEC	It is used to halt the engine. If in TEST mode, it exits the mode returning to AUTO mode. In programming mode, it is used to scroll down the menu list and to decrease the parameter value while in changing mode.
KR/KG	In MAN and in TEST it is used to toggle the changeover status. The gen-set loading is allowed only if voltage and frequency value are within the working range. While changing a string parameter (in PROGRAM mode), it allows to move the cursor.

2.2 Display

2.2.1 Multifunction display

The multifunction display works in four different modes that can be selected by means MODE button. MODEs are highlighted by signal LEDs ("MODE1".."MODE4").

If the selected MODE has more than one page, it can be selected by the VIEW key.

The control unit manages the backlight lamp of the LCD display, switching it OFF if no operation is carried on the board for a time which value can be programmed. To activate the lamp, it is sufficient to press a key.

The variable used to set this value is **P.492 – SCREEN SAVER DELAY** located in the sub menu **OTHER AUX** of the menu **AUX FUNC**.

2.2.1.1 MODE 1

This mode allows to show the more useful measures of the generator (voltage, current, frequency and phase rotation) and of the engine (oil pressure, coolant temperature and engine speeds).

It shows also anomalies, if active, and the engine statuses during the start, cooling down and stop phases.

It has only one page and the VIEW key is used only to show the measures if they are hidden by some messages regarding anomalies.

2.2.1.2 MODE 2

MODE 2 allows to get, by means some different view pages, information about power and energy supplied from the gen-set. MAINS voltages can be shown in this mode too.

The different pages can be selected by means the VIEW key.

If the mode is changed and then is re-entered again, the last selected page will be displayed.

2.2.1.3 MODE 3

MODE 3 is mainly used to show counters: start counter, working hour and time to maintenance. It also shows the fuel level (if used).

If the CANBUS interface is installed, MODE 3 will show the measures obtained by means the J1939 interface in additional pages.

The different pages can be selected by means the VIEW key.

If the mode is changed and then is re-entered again, the last selected page will be displayed.

2.2.1.4 MODE 4

In this mode are shown, by means some different view pages, some information regarding the board such as: real time clock/calendar, internal temperature and working hour counter of the board.

A dedicated page shows the serial communication port status, especially useful when connected to a modem.

If the CANBUS interface is installed, the engine diagnostic information, obtained by means of J1939 interface, are shown in additional pages.

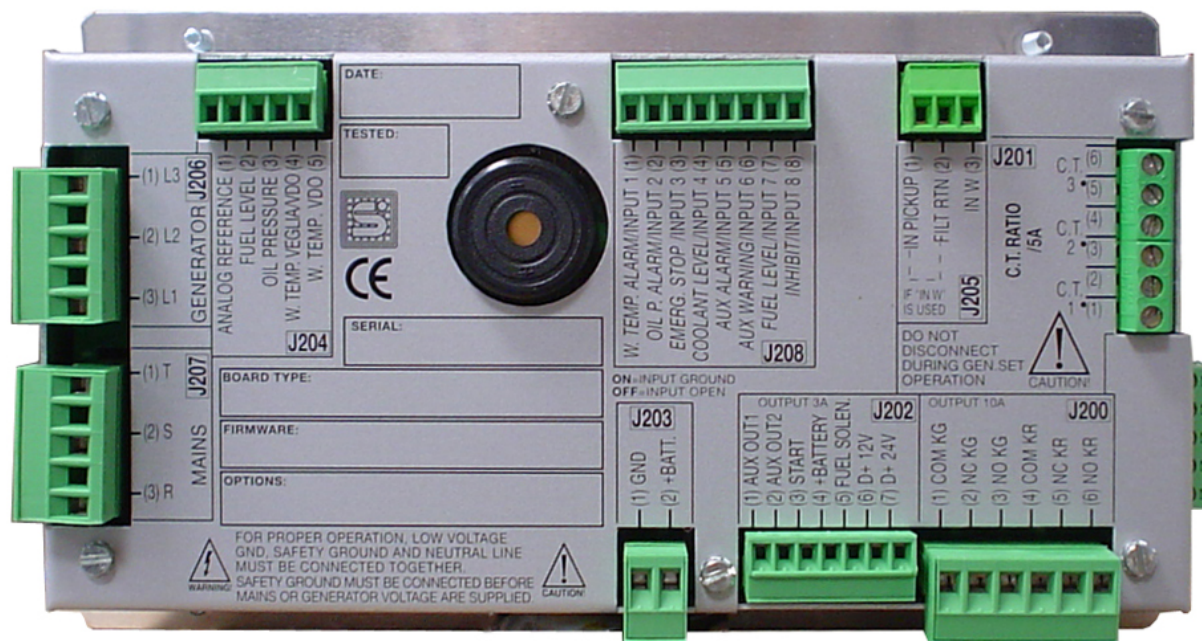
The different pages can be selected by means the VIEW key.

If the mode is changed and then is re-entered again, the last selected page will be displayed.

2.3 Signals

Signals	Function
MODE 1	Signals that the multifunction display is showing the single available page in MODE 1
MODE 2 / WARNING	Fixed ON, it signals that the multifunction display is showing one of the available pages of MODE 2. If flashing, it signals that at least one warning is active. If both MODE 2 is selected and a warning is active, it flashes with a duty cycle of 75%
MODE 3 / ALARM	Fixed ON, it signals that the multifunction display is showing one of the available pages of MODE 3. If flashing, it signals that at least one block or disabling is active. If both MODE 3 is selected and an alarm is active, it flashes with a duty cycle of 75%
MODE 4/DIAGNOSTIC	Fixed ON, it signals that the multifunction display is showing one of the available pages of MODE 4. If flashing, it signals that at least one engine diagnostic code is available (only J1939 interface). If both MODE 4 is selected and a diagnostic code is available, it flashes with a duty cycle of 75%
KR	It is OFF if KR is deactivated, ON if activated. It flashes with 25% duty if deactivated while activation is command. It flashed with 75% duty if activated while deactivation is command. If in TEST mode, it flashes alongside the KG signal with a duty of 50% (if changeover is driven in TEST, no signalling is done). Warning: relays KR is not driven when activated, then N.C. contact should be used.
KG	It is OFF if KG is deactivated, ON if activated. It flashes with 25% duty if deactivated while activation is command. It flashed with 75% duty if activated while deactivation is command. If in TEST mode, it flashes alongside the KR signal with a duty of 50% (if changeover is driven in TEST, no signalling is done).
MAINS LIVE	OFF if the mains voltages are not present, fixed ON if present and steady in operating range. It flashes (50% duty) during transition status. If inhibition is active, It flashes at 25% duty if MAINS is not present, otherwise it flashes at 75% duty.
GENERATOR LIVE	It is OFF if both generator voltages and frequency are not present; it is fixed ON if both voltages and frequency are steady present and in operating range. It flashes (50% duty) during transition status.
ENGINE RUNNING	OFF if engine is dead; ON if engine is running and flashing while in cooling down

3. Rear Panel



3.1 Digital inputs

J208 connector is used to connect all the digital input of the board. They are active when connected to ground.

All the digital input function can be programmed and can be modified by means the programming menu. In the following table, the column Function reports the factory configuration of the input.

Terminal	Function
J208.01	W. TEMP. ALARM / INPUT 1. Programmable input presets as a block for max. Coolant temperature function.
J208.02	OIL P: ALARM / INPUT 2. Programmable input presets as a block for min. oil pressure function
J208.03	EMERG. STOP / INPUT 3. Programmable input presets as block for emergency stop activation.
J208.04	COOLANT LEVEL / INPUT 4. Programmable input presets as block for low coolant level function.
J208.05	AUX ALARM / INPUT 5. Programmable input presets as auxiliary block function
J208.06	AUX WARNING / INPUT 6. Programmable input presets as auxiliary warning function.
J208.07	FUEL LEVEL / INPUT 7. Programmable input presets as warning for fuel low level function.
J208.08	INHIBIT / INPUT 8. Programmable input presets as function inhibition for AUTO mode.

To the programmable inputs can be assigned the following functions:

Code	Description
0	Input not used
1	External (auxiliary) warning
2	External (auxiliary) disable
3	External (auxiliary) block
4	External (auxiliary) block enabled after oil time mask
5	Reset command
6	KR status
7	KG status
8	Minimum fuel level
9	Low fuel level
12	High fuel level
13	Minimum oil pressure
14	Low oil pressure
15	High coolant (water) temperature
16	Max coolant (water) temperature
17	Overload
18	Overspeed
19	External (auxiliary) warning enabled after oil time mask
21	External (auxiliary) warning enabled after gas valve activation
22	External (auxiliary) block enabled after gas valve activation
23	External (auxiliary) warning enabled after fuel solenoid activation
24	External (auxiliary) block enabled after fuel solenoid activation
25	Inhibit
26	Remote Test
27	Remote start request
28	Emergency stop

3.2 Measure inputs

Terminal	Function
J202.1/2	TA input, L1 phase
J202.3/4	TA input, L2 phase
J202.5/6	TA input, L3 phase
J206.03	Generator Voltage phase L1
J206.02	Generator Voltage phase L2
J207.01	Generator Voltage phase L3
J207.03	Mains Voltage phase L1
J207.02	Mains Voltage phase L2
J207.01	Mains Voltage phase L3

3.3 Digital outputs

The following table lists the output that uses J202.04 as common voltage source. If an output is activated, the voltage output will be the voltage applied to the common terminal.

Terminal	Type	Function
J202.01	Relays 3 A, N.O.	AUX OUT 1. Auxiliary and configurable output. It is preset to STOP SOLENOID function.
J202.02	Relays 3 A, N.O.	AUX OUT 2. Auxiliary and configurable output. It is preset to EXTERNAL HORN function.
J202.03	Relays 3 A, N.O.	START. Command for engine's starting motor.

Terminal	Type	Function
J202.05	Relays 3 A, N.O.	FUEL SOLENOID. Fuel solenoid command for engines having drop-down shutdown system.

The following table lists the functions that can be assigned to the programmable outputs:

Code	Description
0	Not used
1	Output reset pulse
2	Glow-plugs preheater
4	Load (power) level status
5	Remote signal test running
6	Remote signal mains OK
8	Remote signal engine running
9	Remote signal generator alarm
10	Remote signal engine alarm
11	Remote signal speed alarm
12	Remote signal fuel alarm
13	Remote signal contactors alarm
14	Gas valve
16	Stop solenoid
17	Remote signal or warnings
18	Remote signal or alarms
19	Remote signal MAN-AUTO-TEST
20	Remote signal AUTO-TEST
21	External horn
22	Remote signal configured by bits
23	Engine idle speed command

The following table lists outputs having free potential contacts.

Terminal	Output type	Function
J200.01	Relay, 10A	KG – COM. Genset contactor command. Common terminal.
J200.02	Relay, 10A	KG – N.C. Genset contactor command. Closed at rest.
J200.03	Relay, 10A	KG – N.O. Genset contactor command. Open at rest.
J200.04	Relay, 10A	KR – COM. Mains contactor command. Common terminal.
J200.05	Relay, 10A	KR – N.C. Mains contactor command. Closed at rest.
J200.06	Relay, 10A	KR – N.O. Mains contactor command. Open at rest.

Notice: KG relay is driven to load the genset; KR relay is driven to disconnect the load from the mains.

3.4 Engine inputs/outputs

Terminal	Type	Function
J202.06	Internal limited at 280mA @13Vdc	EXC D+ 12V. Excitation output for 12V battery charger alternator.
J202.07	Internal limited at 130mA @25Vdc	EXC D+ 24V. Excitation output for 24V battery charger alternator.

Terminal	Type	Function
J204.01	Measurement input	ANALOG REF. Input for engine reference ground measurement.
J204.02	Measure input	FUEL LEVEL. Input for floater fuel level sensor.
J204.03	Measure input	OIL PRESSURE. Input for oil pressure sensor VDO, VEGLIA.
J204.04	Measure input	W. TEMPERATURE. Input for coolant temperature sensor VDO, VEGLIA
J204.05	Measure input	W. TEMPERATURE. In case of a VDO sensor is used <u>connect this terminal to terminal J204.4</u>

Terminal	Type	Function
J205.01	Measurement input	IN PICK-UP. Pick-up input signal. Note: the signal return must be connected to battery negative. If a W signal is used instead, this terminal should be connected to terminal J205.02.
J205.02	Measure input	FILT RTN. To be connected to terminal J205.01 if a W signal is used, otherwise it should let unconnected.
J205.03	Measure input	IN W. W input signal. Note: the signal return must be connected to negative battery.

3.5 Other connectors

3.5.1 J203 (Power supply)

J203 connector is the power supply connector of the device. Connect a DC source having a voltage value between 7 and 32 Vdc. The negative terminal (GND) should be connected to the protective ground. For application that requires isolation between GND and protection ground, ask SICES for the rated condition.

3.5.2 J209 (RS232)

J209 connector is used to interface an external device equipped by a RS232 interface for data communication. A PSTN or GSM modem can be directly connected to this terminal.

For more information about related functions and protocols, please refer to the EAAS0108xx document.

3.5.3 J210 (CAN BUS)

This connector is available only if the CANBUS option is installed.

Terminal	Function
J210.01	CAN_GND. Common ground
J210.02	CAN_L bus line (dominant low)
J210.03	CAN shield
J210.04	CAN_H bus line (dominant high)
J210.05	CAN_V+. For insulated interface, connect positive supply voltage (battery voltage)

4. Programming remarks

The board programming is a special function that can be carried out only when the engine is dead. To gain access to these functions, it is required to press the VIEW key while the key-lock selector is in OFF/RESET-PROGRAM position.

Once in programming mode, it is no possible to control the engine and the generator.

If a menu list is show, using START and STOP keys, it will be possible to scroll the list to select the required menu item. Press MODE to enter the selected menu.

If a parameter is show, using START and STOP keys, it will be possible to scroll the parameter list to select the required one. To go back up to the menu list, press the VIEW key.

The parameter value is enclosed in square brackets such as:

[400]

To modify the value, press MODE key, brackets will start to flash: using START and STOP keys will be possible to change the value. Then press MODE to confirm the changing or VIEW to abort it.

Each parameter page is identified by means a three digit code that is consistent in all the configured language.

4.1 Access codes

Program access can be restricted by means a password. There are 3 different access levels and passwords:

1. Maker
2. System (installer)
3. User.

First page of **SYSTEM** menu (**000-Access code**) let the user input password, if at least one of the three passwords is different from 0.

If any password is set to 0, it is not assigned and not required.

As **USER** it is possible to modify only the User Password.

As **INSTALLER** it is possible to modify the User and the System Password.

As **MAKER** it is possible to modify all the three passwords.

Only enabled pages, for the access level the operator has gained access to, are shown in the menu, included the password modify pages.

It's possible that, after password input, menu doesn't show all the allowed pages. In this case press VIEW (to go to previous menu) and access again the menu, allowing the board to reload again the menu.

The keyed access code is kept alive for a time of about 10 minute after the programming function is ended. After this time, the code should be keyed again, if requested, to gain access to the same level.

In case of forgotten password, only knowing password of greater level is possible to rescue the access level. Otherwise and in case of lost MAKER password the board should be returned to the factory to reset password level.

4.2 How to modify string parameters

Some parameters require text input or modify.

In these cases, pressing MODE to activate the modify function on the selected variable, besides the square brackets flashing, it is activated an underline cursor at the first character string position. Using KR/KG key, it is possible to select the character to be changed. Then use the START and STOP keys to scroll allowable values and select the needed one. Repeat the operation for all the characters that must be modified.

If the string has more than 14 characters, left or right (or both) arrows will be displayed. In this case, if the cursor selects the last character before the arrow, pressing KR/KG will scroll the text of one character to show the next one.

MODE confirms the changes and VIEW aborts.

4.3 Direct access to the last used programming page

It is possible to directly access the last used page. If the VIEW key is pressed for about 4 seconds, programming function is left and the displayed page is stored. When programming is again entered, this page is shown at first (then, if required, pressing VIEW it is possible to go up through menus).

The same feature is obtained when programming is automatically aborted. Programming is aborted if for about 60 seconds no operation is carried out on programming functions or if the key switch is move in MAN or AUTO position.

4.4 Protection and alarm parameters

Protections and alarms are normally configurable by means dedicated variables. For quite all these protections can be specified the delay time. Setting to 0 the delay time of a protection or alarm function, that function is disabled.

5. Other functions

5.1 Peak archive

This archive store the highest value measured of the following quantities:

1. Total active power and relative engine temperature
2. Phase current L1 and relative power factor
3. Phase current L2 and relative power factor
4. Phase current L3 and relative power factor
5. Maximum engine temperature
6. Minimum board internal temperature
7. Maximum board internal temperature

Each record is filled with timestamp.

It can be cleared only by serial port.

When the archive is cleared, it records the first measures until greater values are obtained.

5.2 Real time clock

The device has an internal real time clock calendar.

There are two different type of RTCs; the board can be equipped either with one or the other.

- Software RTC
- Hardware RTC

The first type is supplied as standard for all the DST4400 boards. It lacks of backup supply, thus every time the supply is disconnected, it will stop and it will lost the date and time.

The second type is supplied as option and has an internal rechargeable backup supply source that let the RTC work for more than 2 days.

If the key-lock is in OFF/RESET position, the display shows the date and time. At the top right of the display the message `SW` identifies the standard supplied RTC. The message `HW` identifies the installed hardware RTC option.

6. Special settings

6.1 Language selection

DST4400 board can shows text strings in different languages.

To select a different language, supply the board while pressing (at the same time) the pushbuttons START and STOP. Keep them pressed until the following screen is shown:

```
Special Function  
Func: [LANGUAGE]
```

Press MODE and use scroll keys, if needed, to select LANGUAGE. Press MODE once again. If [LANGUAGE] is already shown, press MODE twice.

At this point board will require the password.

If the keyed password is correct, a page that allows selecting the operating language will be shown. To make effective the new language switch off and on the board.

The value required for this password is **1**.

6.2 Fuel level sensor calibration

Before start the calibration procedure, connect the sensor that must be mounted in a way that let the floater be manually operated.

Supply the board while pressing (at the same time) the pushbuttons START and STOP. Keep them pressed until the following screen is shown:

```
Special Function  
Func: [LANGUAGE]
```

Press MODE and use scroll keys, if needed, to select [FUEL LEV]. Press MODE once again.

At this point board will require the password.

If the keyed password is correct, a page that shows the current measured fuel level will be shown. To calibrate the sensor, follow displayed instructions.

The value required for this password is **135**.

Follow the instruction that display will shown.

6.3 Counter clearing

By this procedure, it is possible to clear the following counter:

- Active and reactive counter
- Start counter
- Clearable engine hour counter

Supply the board while pressing (at the same time) the pushbuttons START and STOP. Keep them pressed until the following screen is shown:

Special Function
Func: [LANGUAGE]

Press MODE and use scroll keys, if needed, to select [COUNTERS]. Press MODE once again.

At this point board will ask for the password.
If the keyed password is correct, all the counters will be cleared and a message reporting that the function is executed will be shown.

The value required for this password is **274**.

6.4 LCD contrast changing

The LCD display contrast can be adjusted in order to obtain improve the readability.
To increase the contrast, press the MODE key and then, while the MODE key is kept pressed, press the VIEW key the numbers of time you need: for each key action the contrast is increased of a step.

To decrease the contrast, press the VIEW key and then, while the VIEW key is kept pressed, press the MODE key the numbers of time you need: for each key action the contrast is decreased of a step.

When changing the contrast, the display shows on the second row the message "CONTRAST" followed by a two-digit number that reports the contrast value.
This value can range from 0 to 63; higher is the number higher is the contrast.

If turning on the board the display is blank or black, try to increase or decrease the contrast.

The pushbuttons used to change the contrast have the "auto repeat" function.

7. Installations

DUE TO THE HIGH VOLTAGE CONNECTED TO THE MEASURE INPUTS, THE DEVICE ENCLOSURE MUST BE CONNECTED TO SAFETY GROUND.

For a proper use of the device, it must be mounted in a fixed way onto a panel or cabinet. The rear panel of the device must not be accessible without the use of tools or keys. The device must not be removable without tools.

Safety EARTH connection must be made in a fixed way by means at least one of the dedicated terminals.

The generator and mains voltage lines connected to the measure inputs of DST4400 Controller must have an over current protection (such as fuse). The input load of the board is greater than 1Mohm. A 1A protection threshold is suitable.

The safety heart connection wire must be at least equal in section as wires used to cable mains and generator voltage lines to the board. Wire section must be conforming to the over current protection used.

For CAT.IV operation, the negative pole of low voltage supply (GND at J203-01) must be connected to the SAFETY EARTH. If required operation with GND isolated from SAFETY EARTH, please ask to S.I.C.E.S. for the allowable operation condition.

For CAT.IV operation the maximum allowable phase to neutral voltage is 300Vac (520 Vac phase to phase). Maximum allowable input voltage toward SAFETY EARTH is 300Vac.

For CAT.III operation, the maximum allowable phase to neutral voltage is 345Vac (600 Vac phase to phase). Maximum allowable input voltage toward SAFETY EARTH is 600Vac.

For CAT.IV operation, low value voltage should be used for contactor supply (KG and KR terminal).

7.1 Dimensions and panel cut for mounting

