Be 2000 OEM's Manual

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This equipment complies with the EMC protection requirements CE

WARNING High voltage is present inside the instrument. To avoid electric-shock hazard, operating personnel must not remove the protective cover. Do not defeat the grounding connection. Any interruption of the grounding connection can create an electric-shock hazard. Before making external connections always ground the Be2000 first by connecting the blade-male terminal to a proper ground.

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1.0 First Time Operation and Safety recommendation

These proceedings are reserved to qualified personnel only and provide an initial check to verify the Be2000 operation. After these initial steps, the unit is ready for use.

DANGER : *THE BE2000 DOES NOT GENERATE A WARNING OR AUDIBLE SIGNAL PRIOR TO INITIATING THE STARTING PROCEEDINGS. DO NOT WORK ON EQUIPMENT, WHICH IS CONTROLLED BY THE BE2000 UNIT. IT IS RECOMMENDED TO PLACE WARNING SIGNS ON THE MAIN PARTS OF THE GENERATING-SET.*

1.1 Initial Settings

WARNING: TO AVOID PERSONAL INJURY, THE FOLLOWING INSTRUCTIONS ARE FOR QUALIFIED PERSONNEL ONLY

A. Before connecting the supply, check the voltage on the JI plug:
#JI-1 to the Battery plus and #JI-2 to the Battery minus. The voltage to operate the Be2000 is 7 Vdc up to 36 Vdc. The battery minus must be grounded only at the engine side. Different potentials in ground path may damage the Be2000. A ground connection is mandatory for the panel frame and switchboard. The Be2000 features a ¼" blade terminal for ground connection. Do not use the supply minus wire as ground carrying cable.

B. Connect the supply plug to the Be2000: the internal check will take place automatically. If no errors are detected, the Be2000 will display the software version and the **[MEM OK]** message. Finally, the green LED 'KM' will be turned on to indicate that the Load is transferred to the Mains. The list of the power-on messages follows.

[MEM OK]..... This message appears momentarily after the power-on sequence if the memory works properly.

[MEM ERR.] ..... This message is displayed if an internal memory failure occurs. The Be2000 must be returned for repair. To skip the alarm push the 'ACK' pushbutton. The integrity of the parameters cannot be guaranteed. (see Sections 7.7 and 13.0)

[V X.XXX] ..... Code number of the software version; this message is displayed momentarily after the power-on cycle.

[CLK ERR] ..... CLOCK ERROR: push the [ACK] pushbutton and follow the instruction in the section 7.4.4.

C. Before using the Be2000, check that programmed parameters (see Section 7.2 and 7.6) meet the characteristics of the Generating-Set.

1.2 Test the Wiring Connections

☞*WARNING: TO AVOID PERSONAL INJURY THE FOLLOWING INSTRUCTIONS ARE FOR QUALIFIED PERSONNEL ONLY.*

A. Unplug the supply connector 'JI'.

B. Before connecting the input wires check the polarity of the switches (n.o. / n.c.) according to the programmed setting (see Section 7.6 - 7.6.6). The opposite side of the switches must be connected to the battery minus.

C. Before connecting the output terminals, it is recommended to test each output Load with a suitable instrument: the Load must be compatible with the Output characteristics (see Section 10.6-10.7). Some outputs are active HIGH (RELAY delivers a positive polarity) and some others are active LOW (STATIC OUTPUT delivers a negative polarity).

D. Check, with an Ohmmeter, that the sender resistance matches the programmed relationship.

E. To avoid reading errors, it is recommended to connect the ground sense terminal (#JM9) as near as possible to the sender placement. To simplify the wiring, for distance less than 4 meters, it is possible to connect #JM-5 and #JM-9 together (local reference).

F. Connect the 'Alternator Control' terminal #JM1-2 to the Charging Alternator.

G. Connect the Current Transformers (CTs) to the terminals #JL-1-2-3-4-5-6. The S1 terminal of each CT must be grounded on CTs side.

H. Connect the Mains and Generator wires. External fuses are highly recommended.

I. To operate the Be2000, connect the supply plug.

1.3 Front Panel Description

The front panel (section 16.0) features:

- One Alphanumeric green Display made of 8 digits (section 7.0)
- Three Displays made of 4 digits (section 6.0)
- Six red LEDs for alarm indication
- One yellow LED for 'Fuel Level' warning and One green LED for 'Engine Running' indication
- Four yellow LEDs to indicate the menu
- One red LED to indicate the 'Warning' menu of the display
- Two yellow LEDs for 'Mode Display' selection
- One green LED for automatic operating mode indication (A.M.F.)
- Two green LEDs to indicate the status of the contactor

The pushbuttons are made of Membrane Switches and have the functions described below.

[^][v] (Up/Down pushbuttons): select the Menus and allows programming (section 7.2 and 7.6)

[<][>] (Left/Right pushbuttons): select Parameters and save data (sections 7,2 and 7.6)

[START]: it starts the engine (it must be used simultaneously to the [ENABLE] pushbutton)

[STOP]: it stops the engine (section 2.02)

[I]: closes the contactor of the Generator (section 2.03)

[O]: opens the contactor of the Generator (section 2.03)

[AUTO/MAN]: Auto or Manual control (to use simultaneously with [ENABLE] pushbutton)

[ENABLE]: Enables the use of [START], [**I**] and [AUTO/MAN] pushbuttons

[OFF]: it allows Alarm Clear and Panel shut down

[ACK] : features Alarms acknowledge, Horn silence, Parameter reading control and Programming

[MODE-SAVE] features: Mode Display control, Save control, Programming Quit.

2.0 'Manual' Operating Instructions

Let us assume the Be2000 is ready for use and fitted with electrical connections as described in Sections 1.1 and 1.2.

Push [ENABLE] and [AUTO/MAN] simultaneously until the green display indicates the message 'MANUAL' in the 'Data/h' menu (***NOTE****: if an external Key Switch is used as described in the section 20B, the BE2000 enters directly in 'MAN' operating mode).* The 'KM' green LED will be turned on to indicate 'Load transferred to the Mains'. Now, the user can either select:

- To turn the Be2000 in 'OFF' operating mode by pushing the [OFF] pushbutton as described in Section 2.04 or.
- To turn the Be2000 in 'AUTO' operating mode using the [ENABLE] and [AUTO/MAN] pushbuttons as described in Section 3.02 or
- To START and STOP the set by using [START][STOP] pushbuttons as described in Section 2.01 and 2.02 or
- To select a menu for the Alphanumeric Display by using the [^] and [v] pushbuttons as described in Section 7.

2.01 Manual Start

A) - Cancel all alarms by using [ACK] and [OFF] pushbuttons.

B) - If a 'STOP cycle' is energised, wait for the end of the 'STOP SOLENOID' timing or, if the engine has already stopped, push the [STOP] pushbutton to cancel timing.

C) - Press the [ENABLE] and [START] pushbuttons simultaneously until engine starts, the green 'ENGINE RUNNING' LED will illuminate. If the 'PREGLOW' is used in the Be2000 settings, a message **[PREGLOW]** will appear before the start attempt.

During the cranking, the LEDs and Displays are turned off. The Be2000 monitors the 'Under Frequency', 'Under Speed', and 'Under Voltage' protections only if the Contactor of the Generator is closed (see section 2.03).

2.02 Manual Stop

Press the [STOP] pushbutton until the message **[STOPPING]** appears. At the end of the 'STOP' cycle (section 7.6.2), by pushing the [OFF] pushbutton, the Be2000 enters the 'OFF' operating mode. If the engine is not running, it is possible to disable the 'STOP SOLENOID' cycle by pushing the [STOP] pushbutton.

2.03 Manual Load Control

In Manual operating mode, the load is automatically transferred to the Mains independently of the status of the Mains (the green 'KM' LED energises). In order to transfer the load to the Generating-Set press the [**I**] pushbutton simultaneously with the [ENABLE] pushbutton. The 'KM' contactor opens and then, after a 2 second delay, if all parameters of the Generator are met, the 'KG' will energise. Anytime the contactor can be opened by the [**O**] pushbutton and the load is transferred back to the Mains.

2.04 OFF Operating mode

To enter the 'OFF' operating mode push the [OFF] pushbutton for a few seconds. This mode is a low power consumption condition in which the Load is transferred to the Mains and the engine is stopped. Only the green 'KM' LED stays illuminated.

3.0 'Auto' Operating Instruction

Let us assume Be2000 is ready for use and fitted with all electrical connections as described in Sections 1.1 and 1.2.
If the Be2000 is already in 'MANUAL' operating mode follow the instruction of Section 3.02 otherwise proceed to Section 3.01.

3.01 'Manual' operating mode Set Up

a)- push the [ENABLE] and [AUTO/MAN] pushbuttons simultaneously until the message [MANUAL] appear. The green LED 'KM' will be turned on as indication of 'Load transferred to the Mains'.

3.02 'Auto' operating mode Set Up

b)- push the [ENABLE] and [AUTO/MAN] pushbuttons simultaneously until the green '**A**utomatic **M**ains **F**ailure.' LED illuminates. (***NOTE****: if an external Key Switch is used as described in the section 20B, the BE2000 enters directly in 'AUTO' operating mode)*

If the Mains fails, the Be2000 starts the engine after a programmable delay and transfers the load to the Generating-Set after the warm-up time. To open the contactor of the generator select the 'MAN' operating mode and push the **[0]** pushbutton. If the button is pushed in 'AUTO' operating mode the GEN-SET stops and the alarm 'EMERGENCY' energises (section 8.1.8). If the Mains restores, the load is connected back to the Mains after a programmable delay and the Generating-Set stops after a Cooling down time. Further details are explained in Section 3.07.

3.03 Remote Controls and Automatic Periodic Test (A.P.T.)

The GEN-SET TEST and ENGINE TEST functions are enabled in AUTO operating mode. The 'ENGINE TEST' starts the engine and does not transfer the load to the Generator.

The 'GEN-SET TEST' starts the engine and transfers the load to the Generator.
A Cooling down time is executed before stopping the engine. The 'GEN-SET TEST' function overrides the ' ENGINE TEST' function. Further details are explained in Section 3.07. BE2000 allows automatic periodic test (A.P.T) with real time clock control. The section 7.6.3A describes the details. The A.P.T. works only in AUTO operating mode. The Automatic Periodic Test can be cancelled by alarm events. After an A.P.T. the BE2000 updates the display in order to inform the user about the next A.P.T. cycle (see section 7.2 parameters [SCH.DATE] and [SCH.TIME])

3.04 Mains Simulation

To simulate the Mains presence, the '#JC10 MAINS SIMULATION' is provided. The input simulates the Mains as follows: if the '#JC10' terminal is opened the Generating-Set starts (if the Mains is absent) and, if grounded, it stops (Mains presence is simulated). The status of the 'Mains simulation input' is displayed in the 'Power' menu with the messages **[EXT.ON]** and **[EXT.OFF]**. The Generating-Set will operate with the same timings of AUTOMATIC MAINS FAILURE. The BE2000 features n.c. or n.o. programming (section 7.6.6). A truth table shows the possibilities (let us assume n.o. contact):

Display Message	*MAINS STATUS*	*#JC10 INPUT*	*GENERATING-*

			SET
[EXT. ON]	Normal	Closed to ground	Stand by mode
[EXT. OFF]	Normal	Open	Stand by mode
[EXT. ON]	Failure	Closed to ground	Stand by mode
[EXT. OFF]	Failure	Open	Starting mode

3.05 Alarms monitoring

In the 'AUTO' operating mode some alarms stop the engine immediately and some others after a Cooling down time. These details are explained in Section 8.1.
If during the Cooling Down time the user puts the Be2000 in 'MANUAL' operating mode, the engine will continue to run. The Be2000 monitors the Under Frequency, Under Voltage and Under Speed only if the Contactor of the Generator is closed. It is always recommended to use a Contactor to transfer the Load to the Generator.

3.06 'Auto' operating mode: Stop

The Generating-Set stops automatically if the Mains restores or if the remote controls return in stand by. The user can stop the Generating-Set in 'MANUAL' operating mode by pushing the [STOP] pushbutton. The user may press the [STOP] or [0] pushbutton in automatic operating mode but, in this case, the red 'EMERGENCY' LED alarm will energise and the Load will be transferred to the Mains. The use of the [OFF] pushbutton stops the engine and turns the BE2000 in 'OFF' operating mode.

3.07 'Auto' operating mode: Timings and Parameters

The *Automatic Sequences* include the [FAILURE], [BREAKER], [RESTORE], [WARM UP] and [COOLING] parameters. The details are explained in the sections 7.2 and 7.6. In case of Mains failure, the Mains Contactor opens after the [BREAKER] time-out. The [FAILURE] timing takes place if the Mains Failure persists. After this time-out, the BE2000 starts the engine. The [WARM UP] allows the engine to warm up.
After the [WARM UP], if all electrical parameters are met, the Contactor of the generator will close. If the Mains restores the [RESTORE] timer starts to count and the load will be transferred to the Mains. The engine will stop after the [COOLING] time.
The *Engine Starting Parameters* are controlled by the [CR.DELAY], [IDLE], [PREGLOW], [CRANK], [REST], [ATTEMPTS] and [CRANKOFF] parameters. The [PREGLOW] energises the *Pre-GLOW Output* before the starting attempts. Between the starting attempts ([REST]) the *PreGlow Output* remains energised. If preGlow function is used, it is recommended to program the [REST] time properly (see [PREGLOW] in Section 7.6.2)

3.08 Crank Termination

The Be2000 monitors many sources to detect the *Crank Termination*. The green 'ENGINE RUNNING' LED will light if one of the sources is recognized to be true. Further details are explained in Section 4.0.

3.09 'Auto' and 'Manual' selection

a)- press the 'AUTO-MAN' and 'ENABLE CONTROL' pushbuttons simultaneously: the 'AUTO' and 'MANUAL' operating modes will toggle the green A.M.F. LED status.
b)- the automatic operating mode is indicated by the green 'A.M.F' LED.
NOTE : the Be2000 stores the AUTO operating mode in the memory. If the supply fails and then restores, the Be2000 enters the AUTO operating mode automatically.

4.0 Engine Running Status

Be2000 monitors conditions to terminate the *Crank as follows*:

- one of the 3-Phase L1-N, L2-N, L1-N is rises above 90Vac
- the Charger Alternator voltage (#JM1-2) rises above [D+/WL] V (see section 7.6.2)
- the Generator Frequency rises over 20Hz
- the Engine Speed rises above the **[CRANKOFF] [--- RPM]** setting (Section 7.6.2)

The presence of one of the above conditions will illuminate the green 'ENGINE RUNNING' LED and the 'Engine Running' Static Output (#JB1) will energise.

5.0 Phase Sequence Monitoring (PSM)

The Be2000 compares the Phase Sequence of the Mains and Generator to an internal reference, clockwise. If the Mains Phase Sequence is counter clockwise, the 'Power' menu shows the message **[M-PH ERR]**. This is a *Mains Failure* condition and, according to the programmed timers, the Generating-Set will start. If the Phase Sequence of the Mains returns clockwise ,and the Voltage /Frequency are within the settings, the BE2000 will transfer the load to the MAINS . If the Phase Sequence of the Generator is counter clockwise, the engine will shut down and the 'Warn.' menu will indicate the message **[G-PHASES]**. The PSM is inhibited by the code [SINGLE] or [3-PH N/R] in the parameter [PHASES] (see section 7.6.7).

6.0 Display Features, Lamp test

The Be2000 has 4 displays: one *Alphanumeric Display* made of 8 green characters and three 7-segment red *LED Display* made of 4 digits each (total of 12 digits). During starting attempts, all displays are turned off to save energy for the microprocessor. After 2 minutes without operating the [<][>][v][^] pushbuttons, the Alphanumeric Display will reduce the luminosity. The display turns in a normal operating mode by pressing one of the [<][>][v][^] pushbuttons.

The Alphanumeric Display can show five menus: **'Warning'-'Program'-'Power'-'Data/h'** and **'Engine'** (see section 7.0). The three 4-Digit Displays indicate electrical measurements of the Generator according to the selection done using the [MODE-SAVE] pushbutton. The yellow 'Mode' LEDs indicates 4 display-operating modes (section 7.6.7).

The ***'LAMP-TEST' (Test LED)*** is obtained by pushing [^] and [v] simultaneously.

7.0 Alphanumeric Display and menu facilities

The display has five menus: 'Warning'-'Program'-'Power'-'Data/h' and 'Engine'. The selection is done using the [^], [v], [<], [>] and [ACK] pushbuttons:

[^][v] (*Up/Down Cursors)* select the menu
[<][>] (Left/*Right Cursor)* browse the menu
[ACK] (*Acknowledge)* updates the value of the parameter
NOTE: (see sections 7.6, 7.6.8 and 7.7 to find out more).

7.1 'WARN.' menu

The alarms not indicated by LEDs are displayed by Messages in the 'Warning' menu. In this case the red LED 'Warning' will blink. To read the message select the 'Warning' menu by using [^] or [v] pushbuttons. To clear the message follow the instruction:

a) - push [ACK] to silences the Horn
b) - remove the cause of the alarm
c) - push [ACK] to cancel the message

Message Description ***Display [MESSAGE]***

7.1.1 **SPEED Alarm Messages**

- Under Speed shut down: ..... **[U/SPEED]** (see section 8.1.15)
- Pick Up Failure shut down: ..... **[FAULT 05] " "**
- Pick Up Failure calibration error: ..... **[FAULT 07] " "**
-

7.1.2 GENERATOR Alarm Messages

- Under Frequency shut down: ..... **[UNDER Hz]** (see section 8.1.10)
- Over Frequency shut down: ..... **[OVER Hz]** (see section 8.1.9)
- Over Current shut down: ..... **[OVER Aac]** (see section 8.1.13)
- Over Current warning: ..... **[WARN Aac]** (see section 8.1.13)

- '#JF4 input' Overload shut down ..... **[OVERLOAD]** (see section 8.1.13)
- Generator Phase Sequence error ..... **[G-PHASES]** (see section 8.1.14)
- Over Voltage shut down: ..... **[OVER V] " "**
- Under Voltage shut down:..... **[UNDER V] " "**
- Alternator Failure shut down: ..... **[GEN.FAIL] " "**
- Over Active Power shut down: ..... **[OVER KW]** (see section 8.1.12)
- Over Apparent Power shut down: ..... **[OVER KVA] " "**

7.1.3 OIL PRESSURE Alarm Messages

- Low Oil Pressure' warning:..... **[WARN OIL]** (see section 8.1.2)
- Oil Sensor Failure warning: ..... **[FAULT 02]** (see section 8.1.2)

7.1.4 TEMPERATURE Alarm Messages

- High Temperature' warning: ..... **[HI TEMP]** (see 8.1.5)
- Low Temperature' warning: ..... **[LO TEMP]** (see 8.1.5)
- Temperature' Sender failure warning**:** ..... **[FAULT 03] " "**
- Temperature 2' shut down ..... **[TEMPER 2]** (see 8.1.4)

7.1.5 BATTERY and FUEL Alarm Messages

- Low Battery Voltage warning ..... **[LO BATT]** (see section 8.1.17)
- High Battery Voltage warning..... **[HI BATT] " "**
- Low FUEL level' warning..... **[LO FUEL]** (see section 8.1.11)
- FUEL Level' Sender failure warning..... **[FAULT 04] " "**
- Maximum Level Fuel' warning..... **[HI FUEL]** (see section 8.1.11)
- Maximum Level Fuel' warning..... **[HI FUEL]** (see section 8.1.11)
- PUMP ERROR ..... **[PRG PUMP]**

7.1.6 MISCELLANEOUS Alarm Messages

- Be2000 internal failure alarm: ..... **[FAULT 01]** (see section 13)
- Service Schedule Time out prompt: ..... **[SERVICE]** (see section 7.4.3)
- '#JF1 Alarm 1' shut down: ..... **[ALARM 1]** (see section 8.1.16)
- '#JF8 Alarm 2' shut down: ..... **[ALARM 2]** (see section 8.1.16)
- '#JH1 Aux 1' alarm: ..... **[AUX 1]** (see section 8.1.19)
- '#JH2 Aux 2' alarm: ..... **[AUX 2]** (see section 8.1.19)
- '#JH3 Aux 3' alarm : ..... **[AUX 3]** (see section 8.1.19)
- Clock failure alarm : ..... **[CLK ERR]** (see section 7.4.4)
- Cyclic Test alarm : ..... **[CYC ERR]** (see section 7.6.3A)
- Belt break : ..... **[BELT BRK]** (see section 8.1.7)

7.2 'PROGRAM' menu: [VIEW>] Display Mode

The 'Program' menu is indicated by the yellow 'Program' LED. To select the menu push the [^] or [v] pushbuttons. The [VIEW>] mode is available if the BE2000 is not in program mode (see section 7.6). It displays the list and setting of the programmable parameters.
To select a parameter push the [>] pushbutton. To display the setting push the [ACK] pushbutton. The list of the parameters with a short description follows.

[STATUS] [OFF] ..... Automatic Periodic TEST enable/disable (section 7.6.3A)

[INTERVAL] [1 DAY] ..... Interval day(s) between Automatic Periodic TESTS (section 7.6.3A)

[DURATION] [5 min] ..... Duration of the Automatic Periodic TEST (section 7.6.3A)

[SCH. DATE] [00/00/00] ..... Automatic Periodic TEST date (section 7.6.3A)

[SCH. TIME] [00:00] ..... Automatic Periodic TEST starting moment (section 7.6.3A)

[DATE FRM] [DD/MM/YY] .. Display mode of the date (section 7.6.7)

[FAILURE] [5 sec]..... GEN-SET start delay: 0-59 seconds or 1-30 minutes (section 7.6.1).

[RESTORE] [5 sec]..... Mains Restore Time: 0-59 seconds or 1-30minutes.

[BREAKER] [5 sec] ..... Mains Contactor Delay: 0-59 seconds or 1-30 minutes (7.6.1).

[M OVERV] [500 V] ..... Mains Over Voltage Threshold: 80-999 Vac or [INHIBIT].

[M UNDERV] [320 V] ..... Mains Under Voltage Threshold: [INHIBIT] or 70-990 Vac.

[M OVERHz] [55.0 Hz] ..... Mains Over Frequency Setting: 20-70 Hz or [INHIBIT].

[M UND/Hz] [48.0 Hz] ..... Mains Under Frequency Threshold: [INHIBIT] or 20-70Hz.

[G OVERV] [500 V] ..... Generator Over Voltage Shut Down: 80-999 Vac or [INHIBIT].

[T OVERV] [1 sec] ..... Over Voltage bypass timing: 1-15 seconds

[G UNDERV] [320 V] ..... Generator Under Voltage Setting: [INHIBIT] or 70-990 Vac.

[T UNDERV] [5 sec]..... Under Voltage bypass timing: 1-15 seconds

[G OVERHz] [55 Hz] ..... Generator Over Frequency Threshold: 20-70 Hz or [INHIBIT].

[T OVERHz] [1 sec] ..... Over Frequency bypass timing: 1-15 seconds

[G UNDRHz] [48 Hz] ..... Generator Under Frequency Setting: [INHIBIT] or 20-70Hz.

[T UND/Hz] [6 sec] ..... Under Frequency bypass timing: 1-15 seconds

[OVER KW] [INHIBIT]..... Over Power kW Trip Setting: 10-5000 kW or [INHIBIT] (sections 8.1.12 and 7.6.3).

[OVER KVA] [INHIBIT] ..... Over Power kVA Trip Setting: 10-5000 kVA or [INHIBIT] (Sections 8.1.12 and 7.6.3).

[OVER Aac] [INHIBIT] ..... Over Current Shut Down Setting: 10-9990Aac or [INHIBIT] (Section 8.1.13 and 7.6.3).

[T OVER A] [6 sec] ..... Over Current Shut Down bypass Timing: 1-59 secs/1-15 minutes.

[WARN Aac] [INHIBIT] ..... Over Current Warning Setting:10-9990Aac or [INHIBIT] (Section 8.1.13 and 7.6.3).

[T WARN A] [6 sec] ..... Over Current Warning timing: 1-59 secs or 1-15 minutes

[ATTEMPTS] [3]..... Number of Crank attempts : 3-15

[CR. DELAY] [0 sec]..... Crank delay Time: 0-15 secs.

[CRANK] [5 sec] ..... Crank timing: 3-15 seconds.

[REST] [5 sec]..... Rest timing: 3-15 seconds. Timing between the crank attempts.

[IDLE] [0 sec] ..... Engine running trigger: 0-59secs, 1-15 mins

[PREGLOW] [0 sec] ..... Engine Glow PREGLOW Time: [INHIBIT] or 1-59secs.

[WARM UP] [5 sec] ..... Off Load Generating-Set Running: 0-59 seconds or 1-15 minutes.

[COOLING] [15 sec] ..... Cooling Down Time: 0-59 seconds or 1-15 minutes.

[STOPPING] [20 sec] ..... Stop Cycle: 1-99 secs.

[OV/SPEED] [INHIBIT] ..... Over Speed Setting:100-4000 rpm or [INHIBIT].

[T OV/SPD] [1 sec] ..... Over Speed bypass delay: 1-10 secs.

[UNDSPEED] [INHIBIT] .... Under Speed Setting: [INHIBIT] or 100-4000 rpm.

[T UN/SPD] [6 sec] ..... Under Speed bypass delay: 1-10 secs.

[CRANKOFF] [300 RPM].... Crank Termination setting: 100-800 r.p.m.

[TEETH N.] [INHIBIT] ..... Number of Teeth of the Flywheel: [INHIBIT] or 1-500 teeth.

[WARN OIL] [INHIBIT] ..... Low Oil Pressure Warning Threshold: [INHIBIT] or 0.1-20.0BAR

[HI TEMP.] [INHIBIT] ..... High Temperature Warning Threshold: 40-250°C or [INHIBIT]

[LO TEMP.] [INHIBIT] ..... Low Temperature Warning threshold: [INHIBIT] or 1-80°C.

[HORN] [1 min] ..... Alarm Horn Time-out: 5-59 seconds,1-15 minutes or [NO STOP].

[LO FUEL] [INHIBIT]..... Minimum Fuel Level Warning Setting. [INHIBIT] or1-99%.

[HI FUEL] [INHIBIT] ..... Maximum Fuel Level Warning Setting. [INHIBIT] or 1-99%.

[PUMP ON] [INHIBIT] ..... Minimum Fuel Level Warning setting: [INHIBIT] or 1-99%.

[PUMP OFF] [INHIBIT]..... Maximum Fuel Level Warning setting: [INHIBIT] or 1-99%.

[OUTPUT 1] [--] ..... Programmable Output 1 terminal #JB7

[OUTPUT 2] [--] ..... Programmable Output 2 terminal #JB8

[OUTPUT 3] [--]..... Programmable Output 3 terminal #JB9.

[INP. JH1] [n.o.] ..... AUX INPUT1 (#JH1) POLARITY: normally open or closed **([n.c.])**

[INP. JH2] [n.o.] ..... AUX INPUT2 (#JH2) POLARITY: normally open or closed **([n.c.])**

[INP. JH3] [n.o.] ..... AUX INPUT3 (#JH3) POLARITY: normally open or closed **([n.c.])**

[JH1 MODE] [WARNING] ... Programmable options for AUXILIARY INPUT1.

[JH2 MODE] [WARNING] ... Programmable options for AUXILIARY INPUT2.

[JH3 MODE] [WARNING] ... Programmable options for AUXILIARY INPUT3.

[ALARM 2] [n.o]..... Alarm 2 Switch (input #JF8): normally Open or Closed (**[n.c]**).

[TEMPER.2] [n.o] ..... Temper. 2 Switch (input #JF6):normally Open or Closed (**[n.c]**).

[SIMULAT.] [n.o] ..... Temper. 2 Switch (input #JF6):normally Open or Closed (**[n.c]**).

[PHASES] [3-PHASE]..... 3-Phase or single Phase Mode.

[C.T.SIZE] [500/5A]..... Current Transformer size: 50A/5-9900Aac/5Aac

[Vac RATIO] [X1] ..... Reading ratio. The X1 or X2.

[D+/WL] [8.0 Vdc] ..... Engine running trigger: 3-20Vdc, [INHIBIT]

[BY PASS] [5 sec] ..... Oil Pressure Switch, Alarm 1 and TEMPERATURE 1 shut down bypass: 2-90 secs.

[SLAVE N.] [1]..... Node Address: 1-9

7.3 'POWER' menu

This menu shows electrical measurements, Mains Simulated Status and Phase Sequence Status. The code 'XX.X' or 'XXXX', indicate a numeric field up to 4 digits. Push the [<] and [>] pushbuttons to select a measurement. To display the parameters indicated with (°°°) push the [ACK] pushbutton.

Generator Voltage VL1 to Neutral **(°)** ..... **[L1N XXXV]**
Generator Voltage VL2 to Neutral **(°)**..... **[L2N XXXV]**
Generator Voltage VL3 to Neutral **(°)**..... **[L3N XXXV]**

Generator, Phase L1 Reactive Power kVAr: (°°°)..... **[kVAR 1] [XXXX]**
Generator, Phase L2 Reactive Power kVAr: (°°°)..... **[kVAR 2] [XXXX]**
Generator, Phase L3 Reactive Power kVAr: (°°°)..... **[kVAR 3] [XXXX]**
Total Reactive Power kVAr..... **[XXXX kVAR]**
Total Apparent Power kVA ..... **[XXXX kVA]**
Total Active Power kW ..... **[XXXXkW]**

Generator Power Factor **(°°)**..... **[PF X.XX]**

Generator Frequency..... **[G XX.XHz]**
Generator Rotation Phase clockwise **(*)**..... **[G.PH OK]**
Generator Rotation Phase counter clockwise **(*)**..... **[G.PH ERR]**
Generator Rotation Phase not available (e.g. Single Phase Mode) **(*)**..... **[G.PH --]**

Mains Simulation Disabled **(**)** ..... **[EXT.OFF]**
Mains Simulation Enabled **(**)** ..... **[EXT. ON]**

Mains Voltage Vr to Vs ..... **[Vrs XXXV]**
Mains Voltage Vs to Vt ..... **[Vst XXXV]**
Mains Voltage Vr to Vt ..... **[Vrt XXXV]**

Mains Frequency ..... **[M XX.XHz]**
Mains Phase Rotation counter clockwise **(***)**..... **[M.PH OK]**
Mains Phase Rotation clockwise **(***)**..... **[M.PH ERR]**
Mains Phase Rotation not available (e.g. Single Phase Mode) **(***)** ..... **[M.PH --]**

(*)(**)(***) Note: only one message is displayed according to the real internal status flag.
(°) The Phase to Phase voltage is indicated by the 4-Digit display (section 7.6.7)
(°°) the PF reading is factory inhibited (see section 7.6.3 parameter [OVER KW])

7.4 'DATA/h' menu

This menu displayes, by using the **[<]** or **[>]** pushbuttons, the following additional sub-menus:

- Operating Messages (section **7.4.1)**
- Hour Counter (section **7.4.1)**
- Service Scheduled Alarm (section **7.4.1)**
- Clock (section **7.4.1)**

- Events Memory (section **7.4.5)**

7.4.1 Operating Message

The message is automatically displayed and removed according to the internal status.
The list of the messages follows.

[SHUTDOWN]..... An alarm shuts down the engine
[COOLING]..... 'Cooling Down' timing cycle (section 7.6.2)
[ENG.TEST]..... Indication of a 'Engine Test' cycle (Input JM-10).
[LOAD] ..... The Generating-Set is running on load.

[MANUAL] ..... The Be2000 is in Manual operating mode (section 2.0)
[M FAULT]..... Indicates 'Mains Failure' or 'Breaker' timing cycle (section 7.6.1).
[PREGLOW] ..... Preglow cycle in progress (section 7.6.2).
[RESTORE] ..... Indication of a 'Mains Restore' cycle. The Be2000 counts the programmed 'Mains Restore' time before to open the Generator Contactor (section 7.6.1).
[STARTING] ..... Crank cycle in progress. The message is displayed one second before the crank attempt. The display is turned off during cranking.
[STOPPING] ..... 'Stop Solenoid' timing cycle (section 7.6.2)
[SET-TEST] ..... Indication of 'Generating-Set Test' cycle (Input JF-7).
[STANDBY]..... The Be2000 is waiting for a Mains Failure or for the Remote/Automatic periodic Test. The message appears only in 'AUTO' operating mode,
[WAIT GEN]…….. The Be2000 is waiting for the stabilization of the electrical parameters of the generator. When the Voltage and Frequency meet the programmed settings the [WARM-UP] timing takes place and the 'Generator Available' static output energises (JB3 section 9.0).
[WARM UP] ..... 'Off Load Running' timing cycle. The unit is waiting for the Warm-Up time-out before closing the Contactor of the Generator (section 7.6.2).
[CYC-TEST]..... Automatic periodic test cycle (Real time clock tagged). This message energises according to the settings of the parameters [STATUS], [DURATION], [SCH.DATE] and [SCH.TIME] (section 7.6.3A)

7.4.2 Hour Counter

The Hour Counter can record up to **[9999h]**.
The procedure to cancel the counter is described in section 7.7.

7.4.3 Service Schedule Prompt

The display indicates, in the form **[SERV XXX] (*),** the remaining number of hours to energise the Service Prompt Alarm. By pushing the [ACK] pushbutton the **[SET XXX]** message will appear to indicate the *Scheduled Timing* setting. The timer counts down if the engine is running. When the counter reaches the zero count, the Common Alarm (#JC2) energises and the message **[SERVICE]** remains in the 'Warn.' menu. To associate the alarm to an output follows the instruction on the section 7.6.6.

***7.4.3a To set the Scheduled Timing follows this procedure*:**

A - Connect the 'Programming Enable' input (#JB10) to the battery minus.
B - Select the 'DATA/h' menu by using [^] and [v].
C - Select the Service message by using [<] and [>].
D - The hour-count of the Service time appears ([SERV XXX] message).
E - Push the [ACK] pushbutton: the numerical field will blink slowly to indicate the previous setting.
F - To adjust the Service setting ([SET XXX]) push [ACK] and [^] (or [v]) simultaneously.
G - Release the pushbuttons to save the *Scheduled Timing* into the memory.
H - Remove the 'Programming Enable' connection to avoid unwanted programming attempts.

***7.4.3b To clear the Scheduled Service prompt follows this procedure*:**

A - Connect the 'Programming Enable' input (#JB10) to the battery minus.
B - Select the 'DATA/h' menu by using [^] and [v].
C - Select the [SERV 0] message using [<] and [>].

D - Push the [OFF] pushbutton for a short time: a new cycle of counting will take place

(*) Note: XXX means a 3-Digit numerical field (up to 999h)

7.4.4 Clock

This menu displayes the clock. The information are displayed in two screens: [Day/Month/Year] and [hours:minutes:seconds]. Using the [<] and [>] pushbuttons the display toggles the information. According to the parameter **[DATE FRM]** (see section 7.6.7) the [DD/MM/YY] menu can be transformed into the [MM/DD/YY] mode.

To set the clock follow these simple instructions:

a) - Disconnect the power supply plug (JI)
b) - Connect the terminal JB10 to the battery minus (Programming enable)
c) - Connect the supply plug (JI) and wait at least 1 minute
d) - Push the [ENABLE] and [AUTO-MAN] buttons simultaneously
e) - The BE2000 enters automatically the 'Data/h' menu. If an alarm toggles the menu into 'Warning', push the [v] pushbutton in order to return to the 'Data/h' menu
f) - Push the [>] pushbutton for 3 times to select the data display [DD/MM/YY]
g) - Push+hold the [ACK] pushbutton: the YY flashes; push [^] or [v] to set the year.
h) - Push+hold the [ACK] pushbutton and push the [<] to select MM. Use [^] or [v] pushbutton to set a value
i) - Push+hold the [ACK] pushbutton and push the [<] to select DD. Use [^] or [v] pushbutton to set a value
l) - Release the [ACK] pushbutton
m) - Push the [>] pushbuttons: the display will show [hh:mm:ss]
n) - Repeat the steps g)- h)- i)- l) to set the time hours:minutes:seconds
o) - Release the [ACK] pushbutton according to your reference clock and BE2000 will run the clock

NOTE: BE2000 can run the clock for a 2 days without power supply. When the clock does not work the BE2000 displays the message [CLK ERR] (section1.1). In this case push the [ACK] pushbutton and follow the instruction to set the clock.

7.4.5 LOG Events

The BE2000 can record 20 events. Each event includes the clock information in the form **[EVENTXX] [Message] [DD/MM/YY]** and **[hh:mm:ss]**. To read an event:
- Push [<] or [>] pushbuttons to select the event.
- Push [ACK] to display the name of the event (the table describes all possibilities).
- Push [ACK]+[>] to show [DD/MM/YY]
- Push [ACK]+[>] to show [hh:mm:ss]

NOTE: to cancel the LOG Events follow the instruction on section 7.7 ([LOG CLR])

The events are listed in the following table:

MEMORY EVENTS TABLE

[Message]	Description	Section	Input
-**[ALARM 1]**	Alarm 1 shut down	8.1.16	JF1
-**[ALARM 2]**	Alarm 2 shut down	8.1.16	JF8
-**[AUTO]**	The BE2000 is turned in AUTO	3.0	-
-**[AUX 1]**	Auxiliary alarm 1	8.1.19	JH1
-**[AUX 2]**	Auxiliary alarm 2	8.1.19	JH2

-**[AUX 3]**	Auxiliary alarm 3	8.1.19	JH3
-**[BELT BRK]**	Engine Belt break/Charger Failure	8.1.7	JM1-2
-**[CYC- TEST]**	Automatic Periodic Test	7.6.3A	-
-**[CYC- ERR]**	Automatic Periodic Test Fault	7.6.3A	-
-**[CLK- ERR]**	Real time clock failure	7.4.4	-
-**[EXT. STOP]**	Emergency Stop Shut Down	8.1.8	JF10
-**[FAULT 01]**	Be2000 internal failure alarm	13.0	-
-**[FAULT 02]**	Oil Sender Failure warning	8.1.2	JM7
-**[FAULT 03]**	Temperature Sender failure warning	8.1.5	JM6
-**[FAULT 04]**	Fuel Level Sender failure warning	8.1.11	JM8
-**[FAULT 05]**	Pick Up Failure shut down	8.1.15	JM3-4
-**[FAULT 07]**	Pick Up Failure calibration error	8.1.15	JM3-4
-**[FUEL END]**	Fuel, Level Switch shut down	8.1.11	JF2
-[G-PHASES]	Generator Phase Sequence error	8.1.14	Generator
-[GEN.FAIL]	Alternator Failure shut down	8.1.14	Generator
-**[HI BATT]**	High Battery Voltage warning	8.1.17	Battery
-**[HI FUEL]**	Maximum Level Fuel warning	8.1.11	JM8
-**[HI TEMP]**	High Temperature warning	8.1.5	JM6
-**[KM ON]**	The contactor of the Mains closes	3.0,7.6.1	Mains
-**[KM OFF]**	The contactor of the Mains opens	3.0,7.6.1	Mains
-**[KG ON]**	The contactor of the Generator closes	3.0,7.6.3	Generator
-**[KG OFF]**	The contactor of the Generator opens	3.0	Generator
-**[LO TEMP]**	Low Temperature warning	8.1.5	JM6
-**[LO BATT]**	Low Battery Voltage warning	8.1.17	Battery
-**[LO FUEL]**	Low Level Fuel warning	8.1.11	JM8
-**[MANUAL]**	The BE2000 is turned in MANUAL	2.03	Oper. MODE
-**[MODE OFF]**	The BE2000 is turned in OFF	2.04	Oper. MODE
-**[M FAULT]**	The Mains failed	3.0,7.6.1	Mains
-**[NO START]**	Starting Failure	8.1.6	-------
-**[OIL]**	Low Oil Pressure shut down	8.1.1	JF9
-**[OVER Hz]**	Over Frequency shut down	8.1.9	Generator
-**[OVER Aac]**	Over Current shut down	8.1.13	Generator
-**[OVERLOAD]**	Overload shut down	8.1.13	JF4
-**[OVER V]**	Over Voltage shut down	8.1.14	Generator
-**[OVER SP]**	Engine Overspeed shut down	8.1.15	Pick Up
-**[OVER KW]**	Over Active Power shut down	8.1.12	Generator
-**[OVER KVA]**	Over Apparent Power shut down	8.1.12	Generator
-**[POWER ON]**	The supply is applied to the BE2000	2.0,3.0	Supply
-**[RESTORE]**	The Mains restores	3.0,7.6.1	Mains
-**[RESERVE]**	Low Level Fuel switch	8.1.11	Fuel level
-**[RUNNING]**	The engine is running	4.0	Engine
-**[STOPPED]**	The engine has been stopped	2.02,3.06	Engine
-**[SERVICE]**	Service Schedule Time out prompt	7.4.3	-
-**[TEMPER 1]**	Temperature 1' shut down	8.1.3	JF3
-**[TEMPER 2]**	Temperature 2' shut down	8.1.4	JF6
-**[UNDER Hz]**	Under Frequency shut down	8.1.10	Generator
-**[U/SPEED]**	Under Speed shut down	8.1.15	Pick up
-**[UNDER V]**	Under Voltage shut down	8.1.14	Generator
-**[WARN OIL]**	Low Oil Pressure Warning	8.1.2	JM7
-**[WARN Aac]**	Over Current warning	8.1.13	Generator

7.5 'ENGINE' menu

The display shows the following measurements:

- Engine Speed up to 4000 R.P.M.: **[XXXX RPM] (*)**
- Oil Pressure up to 20.0 Bar: **[XX.X BAR] (**)**
- Engine Temperature up to 250 °C: **[XXX °C] (**)**
- Battery Voltage measurement up to 33.0Vdc: **[XX.X Vdc]**
- Tank Fuel Level indication up to 99%: **[FUEL XX%] (**)**
- Charging Alternator Voltage up to 33.0Vdc:**[D+XX.XV]**
-

Note: the symbol 'X' means one Digit of numerical value.
(*): if the TEETH number is in INHIBIT mode the display indicates [---- RPM].
(**): if the warning setting is in 'INHIBIT' mode the display indicates dashes.

7.6 Be2000 Programming Guide (to modify defaults....)

Be2000 has *Local* and *Remote* programming. The *Remote* programming is done using an external computer connected to a RS232C serial plug. The parameters are divided into menus: **[MAINS >], [ENGINE >], [GENSET >], [TEST >], [FUEL >], [SENSORS>], [I/O >]**, **[SETTING>]** and **[CALIBR>].** To program follow the instruction:

a) - Turn the Be2000 in 'OFF' operating mode (Section 2.04) and connect the '#JB10 Programming Enable' to the battery minus.
b) - Push the [ACK] and [>] pushbuttons simultaneously until the message **[SET-UP]** appears.
c) - Release the buttons; the display will indicate the **[MAINS>]** menu..
d) - Push the [^] or [v] pushbuttons to select a different menu. The parameter selection is done by using the [<] and [>] pushbuttons.
e) - To change the value of a parameter or to change the options, push the [ACK] and [v] (or [^]) pushbuttons simultaneously.
f) - To save, push the [MODE-SAVE] pushbutton . The **[SAVE?]** message will appear for a second and then, the **[YES NO]** message will guide you to save or not. The message '**YES'** is above the [<] pushbutton and the message '**NO'** is above the [>] pushbutton.
g) - Push the [<] or the [>] pushbutton to complete the task.
h) - The message **[WRITE OK]** confirms the memorization (otherwise, if the [>] pushbutton is pressed, the [NO SAVED] message appears for a second and the BE2000 will turn off automatically).
i) - If an error is detected the message **[ERROR]** appears and the user must repeat the '**f) -**' proceedings (see NOTE1).
j) - To return to a normal operating mode disconnect the supply for a few seconds.
k) - It is recommended to check all modifications by using the VIEW mode (see section 7.2). We recommend recording on paper all modifications.

NOTE 1 *If the* **[ERROR]** *message persists even for 2 or 3 times, the BE2000 has an internal memory failure. It is possible to use the BE2000 but the* **[FAULT 01]** *message will persist in the 'Warn' menu to inform about the memory failure. Try to recover the memory manually as indicated in the section 7.7.*

7.6.1 [MAINS >] Parameters List. The name of the parameter is indicated in the left side of the page followed by its own default. The right side describes the parameter with the available options. For programming see section 7.6a/b----/k.

[FAILURE] [5 sec]..... **GEN-SET start delay:** 0-59 secs, 1-30 mins. The Be2000 will start the engine if the Mains Failure (Voltage, Frequency or Phase Sequence) persists for the [FAILURE] time. This timer energises after the [BREAKER] timing.

[RESTORE] [5 sec]..... **GEN-SET ON-LOAD delay:** 0-59 secs , 1-30 mins. The BE2000 transfers the Load to the Mains after a programmable period of Mains presence ([RESTORE]). During this time the GEN-SET runs ON-LOAD. After the [RESTORE] timing the BE2000 transfers the load to the Mains and starts the [COOLING] timer to allow OFF-LOAD running.

[BREAKER] [5 sec] ..... MAINS Contactor Delay: 0-59 secs or 1-30 mins. If the Mains Failure persists for more than [BREAKER] time, the Mains contactor will open and the [FAILURE] timer starts to count. The Mains contactor will close only after the [RESTORE] timing.

[M OVERV] [500 V] ..... MAINS Over Voltage: 60-998Vac or [INHIBIT]. If the Phase-to-Phase voltage rises above this setting, the [BREAKER] timer energises. The [INHIBIT] setting (> 998V) disables the Mains Over Voltage control.

[M UNDERV] [320 V] ..... MAINS Under Voltage: [INHIBIT] or 60-998Vac. If the Phase-to-Phase Mains voltage drops below this setting, the [BREAKER] timer energises (see above). The [INHIBIT] setting (<60Vac) disables the Mains Under Voltage control.

[M OVERHz] [55 Hz] ..... MAINS Over Frequency: 20-70Hz or [INHIBIT]. The Over-Frequency energises the [BREAKER] timer. The [INHIBIT] setting (>70Hz) disables the Mains Over Frequency control.

[M UND/Hz] [48 Hz] ..... MAINS Under Frequency: [INHIBIT] or 20-70Hz. The Under-Frequency energises the [BREAKER] timer. The [INHIBIT] setting (<20Hz) disables the Mains Under Frequency control.

7.6.2 [ENGINE>] Parameters List. The name of the parameter is indicated in the left side of the page followed by its own default. The right side describes the parameter with the available options. For programming see section 7.6a/b----/k .

[PREGLOW] [0 sec] ..... Pre Glow Timing: 0-59secs. The timer energises the #JC1 output before to crank the engine. The [INHIBIT] code (<1 sec) disables the PreGlow. ***NOTE:*** the PreGlow output will be activated during the [REST] timing.

[ATTEMPTS] [3]..... Number of Attempts: 3-15 attempts (output. #JC6). The BE2000 will energise the starting failure alarm if the engine does not start after the programmed number of attempts.

[CR. DELAY] [0 sec]..... Crank delay Time: 0-15 secs. This delay allows external electronic equipment (governor or electronic controller) to set up.

[CRANK] [5 sec] ..... Cranking Time: 3-15 secs. Maximum insertion time of the starter motor. The time count is cleared if the engine starts to run.

[REST] [5 sec]..... Rest Time: 3-15 secs. Timing between the crank attempts. If the [PREGLOW] is selected, the #JC1 output will energise during the Rest Time.

[WARM UP] [5 sec] ..... Engine warm-up time: 0-59 secs or 1-15 mins. The Warm-Up timer energises before closing the Contactor of the Generator. This will allow critical parts to reach the recommended operating temperature.

[COOLING] [15 sec] ..... Cooling Down Time: 0-59 secs or 1-15 mins. This timer cools the Alternator. The Contactor opens and the engine runs OFF-Load.

[STOP] [20 sec] ..... Stop Cycle: 1-59 secs or 1-15 minutes. This timer controls the output #JC4 and display the [STOPPING] message.

[OIL MASK] [5 sec] ..... Engine Shut down Bypass: 2-90 secs. This timer disables the OIL pressure and ALARM 1 alarms during the start sequence.

[OV/SPEED] [INHIBIT] ..... Over Speed setting: 100-4000 rpm or [INHIBIT]. The engine shuts down if the speed rises over the limit for [T OV/SPD] seconds. The [INHIBIT] code (>4000 r.p.m.) disables the Over Speed control.

[T OV/SPD] [1 sec] ..... Over Speed bypass delay: 1-10 secs. It bypasses the Over Speed [OV/SPEED] shut down.

[UNDSPEED] [INHIBIT] .... Under Speed setting: [INHIBIT] or 100-4000 r.p.m.. The protection is bypassed for [T UN/SPD] seconds (Section 8.1.15). It is enabled only if the Contactor of the Generator is closed. The [INHIBIT] code (setting <100 r.p.m.) disables the Under Speed control.

[T UN/SPD] [6 sec] ..... Under Speed bypass delay: 1-10 secs. It bypasses the Under Speed shut down.

[CRANKOFF] [300 RPM] .... Crank Termination setting: 100-800 r.p.m.. This speed threshold terminates the crank.

[TEETH N.] [INHIBIT] ..... Number of Teeth of the Flywheel: [INHIBIT] or 1-500 teeth. The [INHIBIT] code (setting <1) disables the display reading and control of the Speed (section 7.5).

[WARN OIL] [INHIBIT] ..... Low Oil Pressure Warning threshold: [INHIBIT] or 0,1-20.0BAR. If the Oil Pressure drops below the setting for 15 seconds (continuously) the warning alarm will energise (section 8.1.2). The setting [INHIBIT] (<0.1BAR) disables the display reading (section 7.5) and inhibits the warning.

[HI TEM] [INHIBIT] ..... High Temperature Warning threshold: 40-250°C or [INHIBIT]. If the Temperature rises above the setting for 15 seconds (continuously) the warning alarm will energise (section 8.1.5). The setting [INHIBIT] (>250°C) disables the display reading (section 7.5) and inhibits the warning.

[LO TEM] [INHIBIT] ..... Low Temperature Warning threshold: [INHIBIT] or 1-80°C. If the Temperature drops below the setting for 15 seconds (continuously) the warning alarm will energise (section 8.1.5). The setting [INHIBIT] (<1°C) disables the Low Temperature warning.

[D+/WL] [8.0 Vdc] ..... Engine running trigger: 3-20Vdc, [INHIBIT] . If the voltage of the Charger Alternator rises above this threshold, the starter is inhibited and the green LED 'ENGINE RUNNING 'energises (section 4.0). The [INHIBIT] code (> 20Vdc)disables the charger alternator alarm (see section 8.1.7)

[IDLE] [0 sec] ..... IDLE speed control: 0-59secs, 1-15 mins, [NO STOP]. The output energises in order to maintain the IDLE speed of the engine. The output shuts down automatically after the timer timeout. The output should be connected to a relay able to control the governor of the engine.

7.6.3 [GENSET >] Parameters List. The name of the parameters and defaults are indicated below on the left side. The right side describes the parameter. For programming see section 7.6a/b----/k.

[G OVERV] [500 V] ..... Generator Over Voltage setting: 60-998 Vac or [INHIBIT]. The Generating-Set shuts down If the [G OVERV] voltage rises above the setting for the [T OVERV] time. The setting [INHIBIT] (>998V) disables the Over Voltage alarm (section 8.1.14).

[T OVERV] [1 sec] ..... Over Voltage bypass timing: 1-15 seconds (see above).

[G UNDERV] [320 V] ..... Generator Under Voltage setting: 60-998 Vac or [INHIBIT]. The Be2000 shuts down the engine if the voltage drops below the [G UNDERV] setting for the [T UNDERV] time. The [INHIBIT] code (<60V) disables the alarm. The BE2000 monitors the Under Voltage only if the Contactor of the generator is closed (section 8.1.14).

[T UNDERV] [5 sec]..... Under Voltage bypass timing: 1-15 seconds (see above)

[G OVERHz] [55 Hz] ..... Generator Over Frequency setting: 20.0-70.0 Hz or [INHIBIT]. The Gen-Set shuts down if the Over Frequency persists for at least [T OVERHz] seconds. The [INHIBIT] (>70Hz) disables the Over Frequency alarm (section 8.1.9).

[T OVERHz] [1 sec] ..... Over Frequency bypass timing: 1-15 seconds (see above)

[G UND/Hz] [48 Hz] ..... Generator Under Frequency setting: [INHIBIT] or 20.0-70.0Hz. The Gen Set shuts down if the Under Frequency persists for at least [T UND/Hz] seconds. The [INHIBIT] disables the alarm. The BE2000 monitors Under Frequency only if the Contactor of the generator is closed (section 8.1.10).

[T UND/Hz] [6 sec] ..... Under Frequency bypass timing: 1-15 seconds (see above)

[OVER KW] [INHIBIT]..... Over Power kW setting: 10-5000 kW or [INHIBIT]. The BE2000 opens the contactor and shuts down the engine if the power rises above the [OVER KW] setting for at least 30 seconds (Section 8.1.12). The [INHIBIT] setting (>5000kW) disables the alarm and inhibits the PF reading also.

[OVER KVA] [INHIBIT] ..... Over Power kVA setting: 10-5000 kVA or [INHIBIT]. See the description of [OVER KW] (see above) and section 8.1.12. The [INHIBIT] code disables the Over kVA alarm.

[OVER Aac] [INHIBIT] ..... Over Current Shut Down setting: 10-9900Aac or [INHIBIT]. If the Current rises above the [OVER Aac] setting for at least [T OVER A] seconds, the genset shuts down (Section 8.1.13). The [INHIBIT] setting (>9900A) disables the alarm.

[T OVER A] [6 sec] ..... Over Current Shut Down bypass Timing: 1-59 secs/1-15 minutes.

[WARN Aac] [INHIBIT] ..... Over Current Warning setting:10-9900Aac or [INHIBIT]. If the Current rises above this setting for at least [T OVER A] seconds, the warning alarm energises (Section 8.1.13). The [INHIBIT] setting (>9900A) disables the warning.

[T WARN A] [6 sec] ..... Over Current Warning timing: 1-59 secs or 1-15 minutes (see above).

[HORN] [1 min] ..... Alarm Horn control time out: 5-59secs, 1-15minutes or [NO STOP]. The alarm output de-energise automatically after time out. The setting [NO STOP] turns on the continuous operation. The user must silence the horn by using the ‘ACK’ pushbutton. Further details are explained in Section 8.

7.6.3A [TEST >] Parameters List. The name of the parameter is indicated in the left side of the page followed by its own default. The right side describes the parameters and options. For programming see section 7.6a/b----/k.

[STATUS] [OFF]..... Automatic periodic TEST: [ON] or **[OFF]**. The selection '[ON]' enables the Automatic Periodic Test. The selection '[OFF]' disables the

Automatic Periodic Test. The settings of the [INTERVAL], [DURATION] [SCH.DATE] and [SCH.TIME] parameters are required.

[INTERVAL] [1 DAYS] ..... Period of time between Automatic periodic TEST:1-30 days.

[DURATION] [5 min] ..... Duration of the Automatic periodic TEST:1-99 minutes.

[SCH.DATE] [01/01/00] ..... Automatic periodic TEST: scheduled DATA of the Automatic test. The data is programmed [day/month/year] or [month/day/year] according to the parameter [DATE FRM] (see section 7.6.7). The parameter is automatically updated (see section 7.2) to inform about the date of the next TEST cycle. If the setting of the [SCH.DATE] is not consistent with actual real time clock the [CYC-ERR] alarm energises.

[SCH. TIME] [00:00] ..... Automatic periodic TEST: scheduled time ([hour:minute]) of the first automatic TEST cycle. The display updates after each test cycle (see parameter list in the section 7.2).

7.6.4 [FUEL >] Fuel Level Warning Setting. The name of the parameter is indicated in the left side of the page followed by its own default. The right side describes the parameter and the available options. For programming see section 7.6a/b----/k.

[LO FUEL] [INHIBIT]..... Minimum Fuel Level Warning setting: [INHIBIT] or 1-99%. A 15 seconds delay is provided to filter out noise on the level measurement. The [INHIBIT] setting (<1%) disables the warning.

[HI FUEL] [INHIBIT] ..... Maximum Fuel Level Warning setting: 1-99% or [INHIBIT]. A 15 second delay is provided to filter out noise on the measurement level. The [INHIBIT] setting (>99%) disables the warning.

[PUMP ON] [INHIBIT] ..... Pump start setting: [INHIBIT] or 1-99%. The Fuel Transfer Pump starts if the level falls under the [PUMP ON] setting. The [INHIBIT] setting (<1%) disables the PUMP.

[PUMP OFF] [INHIBIT]..... Pump stop setting: [INHIBIT] or 1-99%. The Fuel Transfer Pump stops if the level rises above the [PUMP ON] setting. The [INHIBIT] setting (>99%) disables the PUMP.

7.6.5 [SENSORS >]..... Sensor settings. The first column indicates the name and the value of the physical parameter. The range is 0-20.0 Bar (Pressure), 0-250°C (Temperature) and 0%-99% (Fuel Level). The second column indicates the OHM settings (0-999). To modify the parameter push the [^] or [v] pushbuttons. To modify the Ohm value push the [ACK] and [^] (or [v]) pushbuttons simultaneously. A resistance of the sensor over 2000 Ohm triggers the Sensor warning alarm (See section 13.0). The following table indicates the defaults:

.....Oil Sender
[P1 0.0] [010 Ohm] ..... Relationship Bar to Ohm point #1
[P2 2.0] [051 Ohm] ..... Relationship Bar to Ohm point #2
[P3 4.0] [086 Ohm] ..... Relationship Bar to Ohm point #3
[P4 6.0] [122 Ohm] ..... Relationship Bar to Ohm point #4
[P5 8.0] [152 Ohm] ..... Relationship Bar to Ohm point #5
[P6 10.0] [180 Ohm] ..... Relationship Bar to Ohm point #6

.....Temperature Sender
[T1 128] [019 Ohm]..... Relationship °C to Ohm point #1
[T2 115] [026 Ohm]..... Relationship °C to Ohm point #2
[T3 090] [046 Ohm]..... Relationship °C to Ohm point #3
[T4 080] [067 Ohm]..... Relationship °C to Ohm point #4
[T5 070] [095 Ohm]..... Relationship °C to Ohm point #5

[T6 040] [287 Ohm]..... Relationship °C to Ohm point #6
.....Fuel Sender
[F1 00%] [10 Ohm] ..... Relationship Level 00 % to Ohm
[F2 20%] [50 Ohm]..... Relationship Level 20% to Ohm
[F3 50%] [100Ohm]..... Relationship Level 40% to Ohm
[F4 80%] [150Ohm] ..... Relationship Level 60% to Ohm
[F5 90%] [200Ohm]..... Relationship Level 80% to Ohm
[F6 99%] [250Ohm]..... Relationship Level 100% to Ohm

7.6.6 [I/O >] Programmable I/O and n.c/n.o. Control. The name of the parameter is indicated in the left side of the page followed by its own default. The right side describes the parameters and options. For programming see section 7.6a/b----/k.
[OUTPUT 1] [--] ..... Programmable Output 1 terminal #JB7 (see below)
[OUTPUT 2] [--] ..... Programmable Output 2 terminal #JB8 (see below)
[OUTPUT 3] [--]..... **Programmable Output 3 terminal #JB9.** It is possible to transfer to the programmable outputs Flags or Alarms as below indicated.

Message	Operating Meaning
[--]	Output not used
[AUTO]	The BE2000 operates in AUTO operating mode
[OIL]	Energises in case of low Oil Pressure (from sensor only)
[TEMPERAT]	Energises in case of Temperature Alarm (from sensor only)
[ALTERNAT]	Energises in case of: Over/Under Voltage, Overload, Over Aac, Over/Under Frequency, Generator Failure, Over kW/kVA and Over/Under Speed.
[GEN-SET]	Energises if the genset shuts down because of Engine failure or Alternator failure.
[ALARMS]	Energises in case of [ALARM 1], [ALARM 2], [AUX 1]/2]/3] or [EMERGENCY]
[SERVICE]	Indicates the time-out for the Generating Set SERVICE maintenance
[M FAIL.]	Indicates a MAINS failure
[KG-CLOSE]	Indicates that the contactor of the generator is closed
[SHUTDOW]	Energises in case of shut down. It comprehends all shuts downs: engine, generator and external alarms

[INP JH1] [n.o.] ..... INPUT1 (#JH1) POLARITY: normally open or closed **([n.c.])**

[INP JH2] [n.o.] ..... INPUT2 (#JH2) POLARITY: normally open or closed **([n.c.])**

[INP JH3] [n.o.] ..... INPUT3 (#JH3) POLARITY: normally open or closed **([n.c.])**

[JH1 MODE] [WARNING] ... Programmable options for AUXILIARY INPUT1. The **[STOP]** selection shuts down the engine immediately. The **[COOLING]** selection stops the engine after the cooling down time. The **[WARNING]** selection provides warning only (see section 8.1.19).
[JH2 MODE] [WARNING] ... Programmable options for AUXILIARY INPUT2. In addition to the options available for AUX1, the JH2 provides input to connect an external KEY SWITCH for MANUAL operating mode (**[KEY MAN]** see section 20B).

[JH3 MODE] [WARNING] ... Programmable options for AUXILIARY INPUT3. In addition to the options available for AUX1, the JH3 provides input to connect an external KEY SWITCH for 'AUTO' operating mode (**[KEY AUTO]** see section 20B).

[ALARM 2] [n.o]..... Alarm 2 Switch (input #JF8):normally Open or Closed (**[n.c]**).

[TEMPER.2] [n.o] ..... Temper. 2 Switch (input #JF6):normally Open or Closed (**[n.c]**).

[SIMULAT.] [n.o] ..... Mains Simulation Input polarity: normally Open or Closed (**[n.c]**).

7.6.7 [SETTING>] Miscellaneous parameters. The name of the parameter is indicated in the left side of the page followed by the default. The right side describes the parameter and the available options. For programming see section 7.6a/b----/k.

[PHASES] [3-PHASE]..... 3-Phase or single Phase Mode. In 3-phase mode (**[3-PHASES]**) the connection to the Generating Set is via 4-wire: L1-L2-L3-N and the Mains is via 3-wire: R-S-T. The option (**[3-PH N/R]**) inhibits the Phase-Sequence alarm. The option (**[SINGLE]**) features single phase connections: L1 and N (L2-L3 left open) / R (Line) and T (Neutral) . Terminal S is left open.

[C.T.SIZE] [500/5A]..... Current Transformer size: 50A/5-9900Aac/5Aac

.

[Vac RATIO] [X1] ..... Reading ratio. The X1 mode is the normal operating mode. The display range is up to 600Vac Phase to Phase. The **[X2]** operating mode requires an external adapter (/2 divider) to extend the reading up to 1000Vac Phase to Phase

.

[DISPLAY] [MODE 4]..... It is not possible to change this setting. The [MODE-SAVE] pushbutton browses the 4 menus as follows:

DISPLAY	**Menu 1**	**Menu 2**	**Menu 3**	**Menu 4**
Top **>**	(*)**[**Voltage L1-2/L2-3/L1-3**]**	(*)**[**Voltage L1-2/L2-3/L1-3**]**	**[**Voltage L1-L2**]**	**[**Aac1**]**
Middle **>**	(*)**[**Current L1/L2/L3**]**	(*)**[**Current L1/L2/L3**]**	**[**Voltage L2-L3**]**	**[**Aac2**]**
Bottom **>**	(#)**[**Frequency**]**	(#)**(°°)[**Power Factor**]**	**[**Voltage L1-L3**]**	**[**Aac3**]**

(*) each phase is displayed for 3 seconds.
(#) Right-Top dash indicates phase L1, middle-dash/Phase L2 and bottom-dash Phase L3
(°°) the PF reading is inhibited by default (see section 7.6.3 parameter [OVER KW])

[SLAVE N.] [1]..... Node Address. To allow multi-communication it is possible to connect on the same link up to 9 units (slave number [1] up to [9]).

[DATE FRM] [DD/MM/YY]... Clock setting mode. The selection **[MM/DD/YY]** allows setting and display the clock in the form Month/Day/Year. The default programming set the form DAY/MONTH/YEAR.

7.6.8 [CALIBR >] Calibration procedure. (to enter this procedure see Section 7.6)
To calibrate a measurement, a stable reference signal should be provided (column D) by stable laboratory source or by the Generator (see NOTE at the end of this section). The measurement selection is done by using the [<] and [>] pushbuttons (column A). The red display on the top indicates the measurement (Column D). The display on the middle indicates OHM (Column E). The display on the bottom (Column F) indicates the internal correction factor. To correct the measurement push simultaneously the [ACK] and [v] (or [^]) pushbuttons: the internal correction factor updates. It is possible to modify the displayed value in a +/-10% range. To save the calibration follow the instruction of the section **7.6.f**.

The list of the measurements follows.

Column A	Column B	Column C	Column D	Column E	Column F
Alphanumeric message	Description	Recommended reference range	Top display	Middle display	Bottom display
[V L1-N]	L1-N Generator Vac	200-250 V	[XXX] Vac	blank	1016
[V L2-N]	L2-N Generator Vac	200-250 V	[XXX] Vac	blank	1000

[V L3-N]	L3-N Generator Vac	200-250 V	[XXX] Vac	blank	1000
[MAINS R]	R-S Mains Voltage	350-400 V	[XXX] Vac	blank	1012
[MAINS S]	S-T Mains Voltage	350-400 V	[XXX] Vac	blank	1000
[MAINS T]	R-T Mains Voltage	350-400 V	[XXX] Vac	blank	980
[CURR 1]	L1 Generator Current	3.0-4.0 A	[XXX] Aac	blank	1000
[CURR 2]	L2 Generator Current	3.0-4.0 A	[XXX] Aac	blank	1000
[CURR 3]	L3 Generator Current	3.0-4.0 A	[XXX] Aac	blank	1000
[TEMPERAT]	Engine Temperature	90-100	[XXX] °C	[xxx]Ohm	1010
[OIL]	Oil Pressure	2-6 BAR	[XXX] BAR	[xxx]Ohm	1010
[FUEL]	Fuel Level	50%	[XXX] %	[xxx]Ohm	1010
[BATTERY]	Battery Voltage	12-14V/22-26V	[XXX] Vdc	blank	1000
[SPPED]	Oil Pressure	1300-1500 RPM	[XXX] RPM	blank	1200

NOTE: the calibration can easily be carried as follows:
a) start the engine in MANUAL operating mode.
b) wait for the generator to stabilize
c) push the [ENABLE] button until the message [CALIBR>] appears
d) push the [>] button in order to select the first parameter
e) follow the instruction on the top of this section
f) to exit the CALIBRATION push [Mode/Save] and choice the options on the display

7.7 System Utilities

To enter the System Utility follow the instruction:
a)- Disconnect the battery supply, connect the #JB10 terminal to battery minus.
b)- Push and hold the [ACK] pushbutton.
c)- Apply the battery supply.
d)- Wait until the **[SYSTEM >]** message appears.
e)- Push [>] the pushbutton until the message **[HOUR CLR]** appears.
f)- Push [v] the pushbutton to select a menu: [LOG CLR], [DEFAULT], [EE RESET] or [TEST I/O] .

NOTE: to exit the System Utilities remove the power supply. If the display indicates [CLEAR...], [CLEARING], [LOADING] or [MEM INIT] message do not interrupt the power supply. Wait the [OK] final message. This procedure avoids corruption of the memory DATA.

7.7.1 System Utilities description

[HOUR CLR] Push the [ACK] pushbutton to clear the Hour counter. The messages [CLEARING] and [OK] confirm the operation. Finally the display will show the [HOUR CLR] message.

[LOG CLR] Push the [ACK] pushbutton to clear the Memory Events (section 7.4.5). The messages [CLEAR....] and [OK] confirm that the internal LOG counter has been cleared. The display will return to show the [LOG CLR] message**.**

[DEFAULT] Push the [ACK] pushbutton to restore the factory defaults parameters. The messages [LOADING] and [OK] will confirm the operation. Finally the display will show the [DEFAULT] message.

[EE RESET] Push the [ACK] pushbutton to cancel the memory. The message [MEM INIT] and [MEM OK] will appear to inform that all programmable parameters and calibration constant are substituted with the factory set defaults. The Hour Count and Memory Event are cleared. Finally the display will show the [EE RESET] message.

[TEST I/O] This function is protected by a factory secret code. The user has not access to this procedure**.**

(*) *It is recommended the [DEFAULT] loading. If the [FAULT 01] message persists, try the [EE RESET] procedure. Be careful in using these proceedings: the programmable parameters are subjected to change. If these proceedings do not solve the problem, the Be2000 unit must be returned for repair.*

8.0 Alarm Management

The Be20000 features Shutdowns (the engine stops) or Warnings (only optical and acoustical information). The Be2000 provides:

1 - red or yellow LEDs on the front facia,
2 - a red LED 'Warning' to indicate the presence of a message on the display
3 - a 'COMMON ALARM' output relay (#JC2 output terminal),
4 - a programmable #JB7/8/9 static outputs (according to the setting, section 7.6.6),
5 - the #JB2, #JB4, #JB5 and #JB6 alarm static outputs

The 'COMMON ALARM' relay drives an external HORN. To silence the HORN push the 'ACK' pushbutton or wait for the **[HORN]** timeout (see section 7.6.3). If the **[HORN]** is set in **[NO STOP]** (continuous) mode, the timeout is inhibited; the use of the [ACK] pushbutton, in this case, is required. After the alarm acknowledge, the LED will stay continuously illuminated. To clear an alarm, remove the alarm source and then press the [OFF] pushbutton.

8.1 Alarm Description

A detailed list of the alarms follows. Every alarm energises the common alarm output #JC2. Specific alarm outputs are described below.

8.1.1 Low Oil Pressure shut down (Pressure Switch)

- Oil Pressure Switch Input: normally closed contact connected to the terminal #JF9.
- A red LED on the front panel indicates 'OIL PRESSURE' shut down.
- Bypass timing: **[MASK OIL]** (section 7.6.2).
- Static outputs: #JB7/8/9 (section 7.6.6).
- Memory Event Message: **[OIL]** (section 7.4.5).

8.1.2 Low Oil Pressure warning

- Oil Sensor connections: #JM7/#JM9
- Warning setting: **[WARN OIL]** (Section 7.6.2).
- Pressure-Ohm programming: 6 points (see Section 7.6.5).
- Static outputs: #JB7/8/9 (parameter **[OIL]** section 7.6.6).
- Bypass delay: 15 seconds.
- 'Open Sensor' failure message: **[FAULT 02]** (>2000 Ohm, section 7.1.3)
- Oil Pressure warning message: **[WARN OIL]** (Section 7.1.3)
- History Event messages: **[WARN OIL] [FAULT 02]** (see section 7.4.5)

8.1.3 High Engine 'Temperature 1' shut down

- A red LED on the front panel indicating 'TEMPERATURE' shut down is provided.
- Terminal input: #JF3
- Alarm static outputs: #JB7/8/9 (parameter **[GEN-SET]** section 7.6.6).
- The engine shuts down after a programmable Cooling Down Time.
- Memory Event Message: **[TEMPER 1]** (see section 7.4.5)

8.1.4 High Engine 'Temperature 2' shut down (Temperature Switch 2/#JF6)

- Temperature 2 Input Switch terminal: (#JF6). The switch can operate as: (Section 7.6.6)
  1)-[TEMPER.2] [n.o.] The engine shuts down if the contact closes to ground.
  2)-[TEMPER.2] [n.c.] The engine shuts down if the contact opens.
- Shut Down message in the 'Warning' menu: **[TEMPER 2]** (Section 7.1.4)
- Alarm static outputs: #JB7/8/9 (parameter **[GEN-SET]** section 7.6.6).
- Memory Event Message: **[TEMPER 2]** (see section 7.4.5)
-

8.1.5 High/Low Temperature warning

- Sensor inputs: #JM6,#JM9 (0 Ohm up to 999 Ohm).
- °C to Ohm programming: see section 7.6.5.
- Warning messages (see Section 7.6.2): **[HI TEMP]/[LO TEMP]**
- Alarm static outputs: #JB7/8/9 (parameter **[TEMPERAT]** section 7.6.6).
- Bypass delay: 15 seconds
- 'Open-Sensor' message: **[FAULT 03]** (>2000 Ohm, section 7.1.4)
- 'High/Low Temperature'message: **[HI TEMP] and [LO TEMP]** (Section 7.1.4)
- Memory Event Messages: **[HI TEMP]/[LO TEMP]/[FAULT 03]** (see section 7.4.5)

8.1.6 Fail to Start shut down

- The alarm energises if Be2000 fails to fire the engine.
- Number of attempts (Section 7.6.2): **[ATTEMPTS]**
- Maximum crank time (Section 7.6.2): **[CRANK]**
- Interval time between Crank attempts (Section 7.6.2): **[REST]**
- Alarm static outputs #JB7/8/9 (parameter **[GEN-SET]** section 7.6.6).
- Specificc'Fail to Start' alarm output: #JB5
- A red LED, on front panel, indicates 'FAIL TO START' shut down.
- Memory Event Message: **[NO START]** (see section 7.4.5)

8.1.7 Charger Failure shut down

- The Be2000 monitors the terminal D+/W.L of the charger alternator
- Setting: **[D+/W.L.]** (section 7.6.2)
- Bypass timing: 20 seconds.
- Alarm static outputs: #JB7/8/9 (parameter **[GEN SET]** section 7.6.6).
- A red LED on the front panel indicates 'CHARGER FAILURE'.
- Memory Event Message and Warning message: **[BELT BRK]** (see 7.4.5 and 7.1.6)

8.1.8 External Stop shut down (EMERGENCY)

- The BE2000 monitors the input terminal #JF10 connected to an emergency switch.
- Alarm static outputs: #JB7/8/9 (parameter **[ALARMS]** section 7.6.6).
- A red LED on front panel indicates 'EMERGENCY'.
- This alarm is energised, also, by the [STOP]/[0] pushbuttons in 'AUTO' operating mode.
- Memory Event Message: **[EXT. STOP]** (see section 7.4.5)

8.1.9 Over Frequency shut down

- Setting (Section 7.6.3): **[G OVER Hz]**
- Bypass timing: **[T OVER Hz]**
- Alarm static outputs: #JB7/8/9 (options **[GEN-SET]/[ALTERN]** section 7.6.6).
- Alarm message in the 'Warning' menu: **[OVER Hz]** (Section 7.1.2)
- Memory Event Message: **[OVER Hz]** (see section 7.4.5)

8.1.10 Under Frequency shut down

- Setting (Section 7.6.3): **[G UND/Hz]**
- Bypass timing: **[T UND/Hz]**
- Alarm static outputs: #JB7/8/9 (options **[GEN SET]/[ALTERN]** section 7.6.6).
- Under frequency monitoring: only in 'AUTO'.
- Alarm message in the 'Warning' menu: **[UNDER Hz]** (Section 7.1.2)
- Memory Event Message: **[UNDER Hz]** (see section 7.4.5)

8.1.11 Fuel Level alarms (Specific Alarm outputs: #JB6)

- The Low Level Fuel Warning **(Level switch)** features:
  - the input #JF5 (15 seconds 'bypass' delay)
  - a yellow 'FUEL' LED on the front panel
  - a Memory Event Message: **[RESERVE]** (see section 7.4.5)

- The No Fuel in the Tank Shut Down **(Level Switch)** features:
  - the input #JF2 (15 seconds bypass time)
  - an alarm message in the 'Warning' menu: **[FUEL END]** (Section 7.1.5)
  - a Memory Event Message: **[FUEL END]** (see section 7.4.5)

- The Low Level Fuel in the Tank Warning **(Level Sender)** features:
  - the input #JM8, 15 seconds' 'bypass' timing
  - a low level setting (Section 7.6.4): **[LO FUEL]**
  - an alarm message in the 'Warning' menu: **[LO FUEL]** (Section 7.1.5)
  - a Memory Event Message: **[LO FUEL]** (see section 7.4.5)

- The Max Level Fuel in the Tank Warning **(Level Sender)** features:
  - the input #JM8 (15 seconds 'bypass' timing)
  - a low level setting (Section 7.6.4): **[HI FUEL]**
  - an alarm message in the 'Warning' menu: **[HI FUEL]** (Section 7.1.5)
  - Memory Event Message: **[HI FUEL]** (see section 7.4.5)

- The Fuel Sensor Failure Warning features:
  - >2000 Ohm open circuit detection
  - alarm message in the 'Warn.' menu: **[FAULT 04]** (Section 7.1.5)
  - Memory Event Message: **[FAULT 04]** (see section 7.4.5)

8.1.12 Over 'kW' and 'kVA' shut downs

- 'kW' setting (Section 7.6.3): **[OVER kW]** (bypass delay: 30 seconds).
- 'kVA' setting (Section 7.6.3): **[OVER KVA]** (bypass delay: 30 seconds).
- Cooling Down Time (Section 7.6.2): **[COOLING]**
- Alarm static outputs #JB7/8/9 (parameter **[GEN SET]** section 7.6.6).
- Alarm message in the 'Warning' menu: **[OVER kW] /[OVER kVA]** (Section 7.1.2)
- History Event Message: **[OVER kW]/[OVER kVA]** (see section 7.4.5)

8.1.13 Over Current and Overload shut downs

- Overload message: **[OVERLOAD]** (#JF4 input)
- The engine shuts down after a Cooling Down Time: **[COOLING]**
- Alarm static outputs: #JB7/8/9 (parameter **[GEN SET]** section 7.6.6).
- Over Current Shut Down/Timing settings (section 7.6.3): **[OVER Aac]/ [T OVER A]**
- Over Current Shut Down message in the 'Warning' menu: **[OVER Aac]** (Section 7.1.2)
- Over Current Warning settings (section 7.6.3): **[WARN Aac]/ [T WARN A]**
- Over Current Warning message in the 'Warn.' menu: **[WARN Aac]** (Section 7.1.2)
- Specific alarm output for Current Warning: Output # JB4
- History Event Messages: **[OVER Aac]/[WARN Aac]/[OVERLOAD]** (see section 7.4.5)

8.1.14 Over/Under Voltage and Generator Failure shut downs

- Over Voltage/Timing settings (Section 7.6.3): **[G OVER V] /[T OVER V]**
- Over Voltage alarm message in 'Warning' menu: **[OVER V]** (Section 7.1.2)
- Under Voltage/Timing settings (Section7.6.3): **[G UNDERV]/ [T UNDER V]**
- Be2000 monitors the Under Voltage only if the contactor is closed
- Be2000 shuts down the engine after a cooling down time: **[COOLING]**
- Message to indicate Phase Sequence Error: **[G-PHASES]**
- Generator failure message: **[GEN.FAIL]** (150 secs delay)
- Alarm static outputs: #JB7/8/9 (parameters: **[GEN SET], [ALTERNAT] -**see section 7.6.6).
- History Event Messages: **[GEN.FAIL]/[G-PHASES]/[UNDER V]/[OVER V]** (section 7.4.5)

8.1.15 Speed shut downs

- Number of teeth of the Pick-up (Section 7.6.2): **[TEET N.]**
- Setting: **[OV/SPEED]** (Section 7.6.2)
- Bypass delay setting: **[T OV/SPD]**
- Over Speed indication: a red 'OVERSPEED' LED is provided.
- Under Speed setting (Section 7.6.2): **[UNDSPEED]**
- Under Speed message in the 'Warning' menu: **[U/SPEED]** (Section 7.1.1)
- Bypass delay (Section 7.6.2): **[T UN/SPD]**
- Pick Up failure indication: **[FAULT 05]**
- Pick Up un-calibrated error Shutdown message: **[FAULT 07]**
- Alarm static outputs: #JB7/8/9 (parameter **[GEN SET]** section 7.6.6).
- History Messages: **[FAULT 05]/[FAULT 07]/[U/SPEED]/[OVER SP]** (see section 7.4.5)

8.1.16 'Alarm 1'and 'Alarm 2' shut downs

- 'Alarm 1' input: #JF1 terminal.
- 'Alarm 1' message in the 'Warning' menu: **[ALARM 1]** (section 7.1.6)
- 'Alarm 1' is by-passed by the **[MASK OIL]** delay (section7.6.2)
- 'Alarm 2' switch input: #JF8 terminal

- 'Alarm 2' display message in the 'Warn.' menu: **[ALARM 2]** (section 7.1.6)
- 'ALARM 2' switch selection (Section 7.6.6): **[ALARM 2] [n.o.] [n.c.]**
- Alarm 2 bypass timing: 1 second.
- Alarm static outputs: #JB7/8/9 (parameter **[ALARM]** section 7.6.6).
- History Event Messages: **[ALARM 1]/[ALARM 2]** (section 7.4.5)

8.1.17 Battery Voltage warning

- Alarm settings for 12V battery: High V=15Vdc, Low V=11.8Vdc
- Alarm settings for 24V battery: High V=30Vdc, Low V=23,6Vdc)
- Warning message in the 'Warn.' menu: **[LO BATT] [HI BATT]** (section 7.1.5).
- Bypass delay: 60 seconds
- Specific Alarm outputs: #JB2
- Memory Event Message: **[LO BATT]/[HI BATT]** (see section 7.4.5)

8.1.18 Service Prompt alarm (*See the section 7.4.3 for details and description)*

- Memory Alarm Message: **[SERVICE]** (see section 7.4.3 and 7.4.5)

8.1.19 Auxiliary Alarms (see Section 7.6.6 for programming)

'Auxiliary Alarm 1' switch input: #JH1

- Contact polarity: **[INP JH1]** normally open or closed (**[n.o.]** or **[n.c.]**)
- Options: **[STOP]** (it shuts down immediately),**[COOLING]** (it shuts down after cooling down time), **[WARNING]** (it only warns).
- Message in the 'Warn.' menu: **[AUX 1]** (see section 7.1.6)
- Memory Event Message: **[AUX 1]** (see section 7.4.5)

'Auxiliary Alarm 2' switch input: #JH2

- Contact polarity: **[INP JH2]** normally open or closed (**[n.o.]** or **[n.c.]**)
- Options: **[STOP]** (it shuts down immediately), **[COOLING]** (it shuts down after cooling down time), **[WARNING]** (it does not shut down but only warns).
- Message in the 'Warn.' menu: **[AUX 2]** (see section 7.1.6)
- Memory Event Message: **[AUX 2]** (see section 7.4.5)

'Auxiliary Alarm 3' switch input: #JH3

- Programmable Contact polarity: **[INP JH3]** normally open or closed (**[n.o.]** or **[n.c.]**)
- Programmable actions: **[STOP]** (it shuts down immediately), **[COOLING]** (it shuts down after cooling down time), **[WARNING]** (it does not shut down but only warns).
- Message in the 'Warn.' menu: **[AUX 3]** (see section 7.1.6).
- Memory Event Message: **[AUX 3]** (see section 7.4.5)

9.0 Terminal description

Terminal connection	Description	Note	See Section…
#JI-1	+12 or +24V Battery to the Be2000 Vdc supply.	Internal Electronic 500mA Thermal Protection.	8.1.17 – 1.1 – 10.1
#JI-2	Battery minus connection to the Be2000 supply	Connet to ground the minus only on the Engine side.	8.1.17 – 1.1 - 10.1
#JH-1	Auxiliary INPUT1 AUX1	Programmable input	7.6.6 - 8.1.19
#JH-2	Auxiliary INPUT2 AUX2	Programmable input	7.6.6 - 8.1.19
#JH-3	Auxiliary INPUT3 AUX3	Programmable input	7.6.6 - 8.1.19
#JL-1	Current Transformer 'L1' S1 input	5Aac rated (S1 must be grounded on CT side)	7.6.7 - 10.3 – 8.1.13
#JL-2	Current Transformer 'L1' S2 input	5Aac rated, S2 signal	7.6.7 - 10.3 - 8.1.13
#JL-3	Current Transformer 'L 2' S1 input	5Aac rated (S1 must be grounded on CT side)	7.6.7 - 10.3 - 8.1.13
#JL-4	Current Transformer 'L2' S2 input	5Aac rated, S2 signal	7.6.7 - 10.3 - 8.1.13
#JL-5	Current Transformer 'L3' S1 input	5Aac rated (S1 must be grounded on CT side)	7.6.7 - 10.3 - 8.1.13

#JL-6	Current Transformer 'L3' S2 input	5Aac rated, S2 signal	7.6.7 - 10.3 - 8.1.13
#JE-1	Generator Contactor output relay	Normally open	10.7 – 2.03 – 3.07
#JE-2	Generator Contactor output relay	Common	10.7 - 2.03 – 3.07
#JE-3	Generator Contactor output relay	Normally closed	10.7 - 2.03 – 3.07
#JD-4	Mains Contactor output relay	Normally open	10.7 - 2.03 – 3.07
#JD-5	Mains Contactor output relay	Common	10.7 - 2.03 – 3.07
#JD-6	Mains Contactor output relay	Normally closed	10.7 - 2.03 – 3.07
#JA-1	Generator Voltage' Phase L1' input	600Vac rated	10.4 - 7.6.3
#JA-3	Generator Voltage 'Phase L2' input	600Vac rated	10.4 - 7.6.3
#JA-5	Generator Voltage 'Phase L3' input	600Vac rated	10.4 - 7.6.3
#JA-6	Generator Voltage ,'Neutral'	As above	10.4 - 7.6.3
#JA-8	Mains Voltage' Phase R' input	600Vac rated	10.2 - 7.6.1
#JA-10	Mains Voltage 'Phase S' input	600Vac rated	10.2 - 7.6.1
#JA-12	Mains Voltage 'Phase T' input	600Vac rated	10.2 - 7.6.1
#JF-1	'Alarm 1' switch input	Engine shuts down	10.5 - 8.1.16
#JF-2	No Fuel in the Tank Switch input	Energised to ground, engine shuts down	10.5 - 8.1.11
#JF-3	'Temperature 1' Switch input	Engine shuts down	10.5 - 8.1.3
#JF-4	Overload Switch input	Energised to ground, engine shuts down	10.5 - 8.1.13
#JF-5	Low Level Fuel Switch input	Energised to ground, only warning	10.5 - 8.1.11
#JF-6	'Temperature 2' Switch input	Programmable n.o./n.c.	10.5 - 7.6.6 - 8.1.4
#JF-7	Generating-Set Remote Test switch input, energised to ground	Starts and transfers the load to Generating-Set	10.5 - 3.03
#JF-8	'Alarm 2' Switch input	Programmable as n.o./n.c.	10.5 - 7.6.6 – 8.1.16
#JF-9	Low Oil Pressure Switch input	Engine shuts down if the contact closes	10.5 - 8.1.1
#JF-10	External Stop Switch input	Energised to ground, engine shuts down	10.5 - 8.1.8
#JC-1	PREGLOW output relay Positive output logic	[PREGLOW]programmable timing	7.6.2 - 10.7
#JC-2	Common Alarms output relay	[Horn] programmable time	10.7 - 7.6.3
#JC-3	Idle Speed, Relay output (Programmable OUTPUT #4)	Be2000 runs the engine at idle speed	7.6.2
#JC-4	Stop Solenoid output relay Positive output logic	[STOP] programmable time	10.7 – 7.6.2.
#JC-5	Not used		
#JC-6	Crank Pilot relay driver Positive relay output	[CRANK] programmable time	10.7 – 7.6.2
#JC-7	+V Battery input connection	Common Plus to the relay output contacts	Internal electronic 4 Adc Fuse
#JC-8	Fuel Solenoid output relay Positive output logic	Energised to run, 20 secs timeout shut down	10.7
#JC-9	Fuel Transfer Pump output (Programmable OUTPUT #6)	Static Output (active low)	7.6.4
#JC-10	Mains Simulation Switch input	If grounded, simulates the Mains presence	10.5 - 3.04
#JB-1	Engine Running static output Flag	Active 'low' static output	10.6 – 4 - 10.11
#JB-2	Battery Voltage static output alarm	Active 'low' static output	10.6 - 8.1.17
#JB-3	'Generator Available' output Flag	Active 'low' static output	10.6 - 7.4.1
#JB-4	Overload Warning static output	Active 'low' static output	10.6 – 8.1.13
#JB-5	Fail to Start static alarm output	Active 'low' static output	10.6 – 7.6.2 – 8.1.6
#JB-6	Common Fuel Alarm static output	Active 'low' static output	10.6 – 7.6.5 – 8.1.11
#JB-7	Programmable static output '1'	Active 'low' static output	10.6 - 7.6.6

#JB-8	Programmable static output '2'	Active 'low' static output	10.6 - 7.6.6
#JB-9	Programmable static output '3'	Active 'low' static output	10.6 - 7.6.6
#JB-10	Programming Enable input (allow the use of external key-switch)	Enables the programming of the Be2000.	10.5 - 7.6
#JM-1	Alternator Excitement 12V and 24V, 3W, Positive output	D+ /W.L. connection	4 – 8.1.7 – 10.11
#JM-2	D+ /W.L. input active high	Normally connected to the JM-1 terminal and D+/W.L. of the Charging Alternator	4 – 8.1.7 – 10.11
#JM-3	Pick-Up signal 'high' input	Pick up input	7.6.2 - 8.1.15 - 10.12
#JM-4	Pick-Up signal 'low' input	Pick up input	7.6.2 - 8.1.15 - 10.12
#JM-5	Ground connection	Pick up shield	7.6.2 - 8.1.15 - 10.12
#JM-6	Temperature Sender input	Resistive Sender	7.6.5 - 8.1.5 - 10.9
#JM-7	Oil Pressure Sender input	Resistive Sender	7.6.5 - 8.1.2 - 10.8
#JM-8	Fuel Level Sender input	Resistive Sender	7.6.5 - 8.1.11 - 10.10
#JM-9	Common Sender ground sense	Remote ground sense	
#JM-10	Remote Engine Test Switch input	Engine test	3.03 – 10.5
#JG-1-8-9	Not used		
#JG-2	RX Line (Input)	RS232C Interface	11.0
#JG-3	TX Line (Output)	RS232C Interface	11.0
#JG-4	DTR (Output)	RS232C Interface	11.0
#JG-5	Common Ground	RS232C Interface	11.0
#JG-6	DSR (Input)	RS232C Interface	11.0
#JG-7	Internal 4K7 Pull-Up	RS232C Interface	11.0

10.0 General Specifications

10.1 Power Supply

Terminal description and connection: .....Section 9, #JI1-2
Supply voltage: .....7Vdc to 36Vdc
Reverse polarity: .....Permitted continuously
Supply ripple: .....15% up 65 Hz
Supply protection: .....internal 500mA electronic fuse
Supply source: .....Plant Battery with minus grounded
Power consumption: .....100 mA up to 300mA
Supply voltage threshold to reset the system: .....6,5V for 5 seconds

10.2 Mains Voltage Input

Terminal description: .....Section 9
Mains connections: .....#JA8-10-12
Mains input voltage: .....80 up to 500Vac
Maximum allowed voltage:.....600Vac continuously
Frequency Reading range: .....20,0Hz up to 70,0Hz
Over voltage:.....4KVac phase to phase
Insulation to ground: .....2KVac / 300 seconds
Input impedance: .....2 M Ohm
Factory Accuracy: .....+/- 3%
Calibration range:.....+/-10%

10.3 Current Transformer Input

Terminal description:.....Section 9
Current transformer L1-L2-L3 connection:.....#JL 1-2-3-4-5-6
Programmable CT size: .....50/5 up to 9900/5
Rated input current: 5Aac

Power consumption at 5Aac (each CT's):.....1,25W
Maximum continuously current: 6Aac
Ground connection:.....terminal S1
Factory Accuracy: .....+/- 3%
Calibration range:.....+/-10%

10.4 Generator Voltage Input

Terminal description:.....Section 9
Generator connection: .....#JA-1-3-5-6
Generator input voltage: .....80 up to 500Vac (generator and neutral)
Maximum allowed voltage:.....600Vac continuously
Frequency Reading range: .....20,0Hz up to 70,0Hz
Over Voltage:.....4KVac phase to phase, phase to neutral
Insulation to ground: .....2KVac / 300 seconds
Input impedance: .....4 M Ohm
Factory Accuracy: .....+/- 3%
Calibration range:.....+/-10%

10.5 Digital Inputs

Terminal description:.....Section 9
Connections:.....#JF1 to #JF10,#JB10,#JC10 and #JM10
Open circuit voltage: .....V battery minus 2V
Closed circuit current (switch closed to ground): .....15mAdc maximum
Over voltage:.....100V/10ms
Cable length:.....20m max. (1,0 mm^2) max.20 OHM

10.6 Static Outputs

Terminal description:.....Section 9
Connections:.....#JB1 to #JB9 and #JC5,#JC9
Output current (sink current):.....+200mA short circuit proof
Output voltage: .....1.2 V at 150mA
Output rating (internal electronic 400mA fuse): .....100V/3A 1,000 operations
Logic: .....negative

10.7 Output Relay Ratings

Contactor Driver Relays
Generator output relay:.....#JE1-2-3
Mains output relay:.....#JD4-5-6
Contact ratings:.....8A/250V changeover contacts
Insulation to panel:.....2000Vac 60 seconds
Terminal description:.....Section 9
Fuse protection: .....must be externally provided 2A/250V
Engine Automation Relays
Terminal connection:.....#JC1-2-3-4-6-8
Output relay contact rating:.....8A-250V
Maximum total output current (*NOTE):.....4Adc
Output Voltage:.....Vdc of the Plant Battery
Short Circuit Thermal protection: 7Adc

(*NOTE) the sum of all output current must not be higher than 4 Amps.

10.8 Oil Pressure Measurement

Connection terminal:.....#JM7-#JM9 (Section 9)
Resistance range: .....0 Ohm to 999 Ohm
Open circuit Voltage: 10V

Short circuit current:.....1mA
Cable shielding: .....over 4 meters required
Relationship: .....6 point (programmable, Section 7.6.5)
Sensor Failure Threshold:.....over 2000 Ohm

10.9 Analogue Temperature Measurement
Terminal description:.....Section 9
Connection terminal:.....#JM6-#JM9
Resistance range:.....0 to 999 Ohm
Open circuit voltage: 10V
Short circuit current:.....10mA
Over voltage protection:.....100V /20ms
Cable resistance: .....1 Ohm max.
Cable shielding: .....over 4 meters required
Relationship: .....6 point (programmable, Section 7.6.5)
Sensor Failure Threshold:.....over 2000 Ohm

10.10 Fuel Level Measurement
Terminal description:.....Section 9
Connection terminal:.....#JM8-#JM9
Resistance range:.....0 to 999 Ohm
Open circuit voltage: 10V
Short circuit current:.....10mA
Over voltage protection:.....100V /20ms
Cable resistance: .....1 Ohm max.
Cable shielding: .....over 4 meters required
Relationship: .....6 point (programmable, Section 7.6.5).
Sensor Failure Threshold:.....over 2000 Ohm

10.11 Battery Charger Alternator Monitoring
Terminal description:.....Section 9
Connection terminal:.....#JM1-#JM2
Operating voltage:.....max 40V
Reverse polarity: .....Permitted
Engine Running Threshold: .....programmable
Excitation Power output: .....Max 3W
Input terminal impedance:.....2200 Ohm

10.12 PICK-UP Characteristics
Terminal description:.....Section 9
Connection terminal:.....#JM3-#JM4-#JM5
Magnetic Pick-up input voltage range:.....0.7Vac up to 50Vac
Magnetic Pick-up Frequency: .....0Hz up to 10kHz
Input terminal impedance:.....2200 Ohm

10.13 Microprocessor
Microprocessor: .....Mitsubishi M30624FGFP (16MHz)
Safety control:.....Fully hardware WATCHDOG
Data retention: .....EEPROM 16KBit

10.14 Environmental
Operating temperature range:.....-30 °C to +70 °C
Vibration: 40mm/sec
Operating Environment:.....indoors-outdoor

10.15 Safety Standards

General design:.....89/336 EEC, 89/392 EEC, 73/23 EEC, 93/68 EEC, and IEC 68-2-6
European Norms: .....EN 60950
Certification: .....CE

10.16 Dimensions and Weight

Overall dimensions: .....250mm X 185mm X 67mm.
Panel cut-out: .....239mm X 171mm
Fixing: .....4 fixing clips
Weight: .....1350 grams

10.17 Serial Interface

Serial interface: .....Standard Rs232C plug in module.
All parameters can be monitored and a full communication is provided to transfer alarms and measurements to your PC. The software runs under WIN/98/2000/me/XP operating systems. The optional module BE15 includes MODBUS protocol, RS485, and drivers all kind of Analog/GSM/GPRS modem.

10.18 Connectors and Terminal Block

Be2000 includes MALE and FEMALE connectors. The connector for serial interface is not included.

11.0 SOFTWARE DESCRIPTION

All details are explained in a 'README.TXT' file available on internet (http://www.bernini-design.com)

12.0 Troubleshooting

☞WARNING: THE FOLLOWING INSTRUCTION IS FOR QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY ACTION NOT SPECIFIED IN THIS SECTION.

a) The LEDs on the front panel does not illuminate
- Check for the presence and the polarity of the supply.
- The supply plug is not properly connected.

b) The reading of the voltage battery is not stable
- The battery minus is not properly grounded.
- The battery charger shares the BE2000 supply wires.

c) Amp reading is not consistent with actual load or Amps read without any load connected.
- The Current Transformers are not grounded, check the wiring (section15.0)
- Check the CT's size.

d) The Generator voltage or frequency is unstable
- Check the connections.
- The voltage of the neutral must be within 30 Vac to ground.
- Check the waveform distortion of the Voltage.

e) The measurements of the 'POWER' and the 'PF' are incorrect
- Check the phase connections of the current transformers.
- Check the grounding connections of the current transformer.
- The [OVER KW] is set to '[INHIBIT]' (section 7.6.3).

f) The Be2000 does not START or STOP the engine
- Check the voltage of the #JC4-6-8 outputs; the voltage required to energise the external relay should be (Vbattery) Vdc minus 1.5Vdc. If the voltage is lower than 10V (or 20V for 24V battery system), check the source of overloading.
- Disconnect the suspected output terminal and try to find out more by using a Ohm-Meter
- The total maximum output current of 4A is exceeded
- The power supply voltage drops under 10 Vdc (20Vdc).

g) The Engine stops without reason after few seconds or minutes

- Verify the presence of alarms on the front panel.
- Test the voltage of the fuel solenoid output #JC8.
- The power supply voltage drops under 12 Vdc (or 24Vdc).

h) The Be2000 does not monitor the inputs

- Check the switch connections.
- Try to connect to ground, directly using a jumper, the suspected input.
- The power supply voltage drops under 7 Vdc.

i) The display shows the [FAULT XX] messages or the reading(s) of the sensors are unstable

- Check the connection to ground of the #JM9 terminal.
- Compare the 6 Points relationship with the Sensor characteristics.
- Check, by using an Ohmmeter, the wiring connection of the sender(s).
- For the Pick-Up check the programmed number of teeth and verify the cable shielding.
- The power supply voltage drops below 7 Vdc.
- The Battery is not properly grounded.

l) The Mains fails but the BE2000 does not start the engine

- Check if the Be2000 is placed in the AUTO operating mode (A.M.F. LED).
- The timers [FAILURE] and [BREAKER] are counting: wait for the time-out.
- If the green 'KM' LED is illuminated and the operating message indicates '[STANDBY]' a failure of the Mains Contactor or abnormal setting in Mains parameters may be expected.
- Check the setting of the Mains Failure parameters : Over/Under Voltage and Frequency.
- Check the setting of the [FAILURE], [RESTORE] and [BREAKER] timers.
- The MAINS SIMULATION feature is used: check the message [EXT ON] and [EXT OFF] as described in section 3.04.
- There is an Alarm on the front panel: verify the status of the red LEDs on the panel.
- The green 'ENGINE RUNNING' LED is lit. An abnormal situation triggers the Engine Running status

m) The engine starts but the BE2000 does not close the Contactor (KG)

- If the display indicates [WARM UP]: wait for the end of warm up time out.
- If the display indicates [WAIT GEN]: an electrical parameter of the generator is out of the limit.
- The Be2000 is not in automatic operating mode.
- The green KG LED is illuminated: a failure of the contactor may be expected.

n) The BE2000 opens the Contactor (KG)

- The electrical parameters, due to external conditions, are outside limits (section 7.6.3.).
- The Mains restores or Mains Simulation energises.
- Be2000 is not in Automatic operating mode

o) The BE2000 opens the Contactor (KG) and the engine does not stop

- The Be2000 is counting the cooling down time (message [COOLING] on the display).
- The ENGINE TEST remote control has been energised.
- The Be2000 is not in Automatic operating mode.
- A new cycle of MAINS FAILURE has been initiated.

p) The BE2000 does not display Speed, Oil pressure, Temperature.....

- to display 'Oil pressure' it is necessary to set an alarm in the parameter [WARN OIL]
- to display 'Temperature' it is necessary to set an alarm in the parameter [WARN TEM]
- to display 'Fuel Level' it is necessary to set an alarm in the parameter [LO FUEL]
- to display 'Speed' it is necessary to set a number in the parameter [TEETH N.]

NOTE: see section 7.6 for programming

13.0 [FAULTXX] Messages

The 'Warn.' menu can display the following messages (see also Section 7.1).

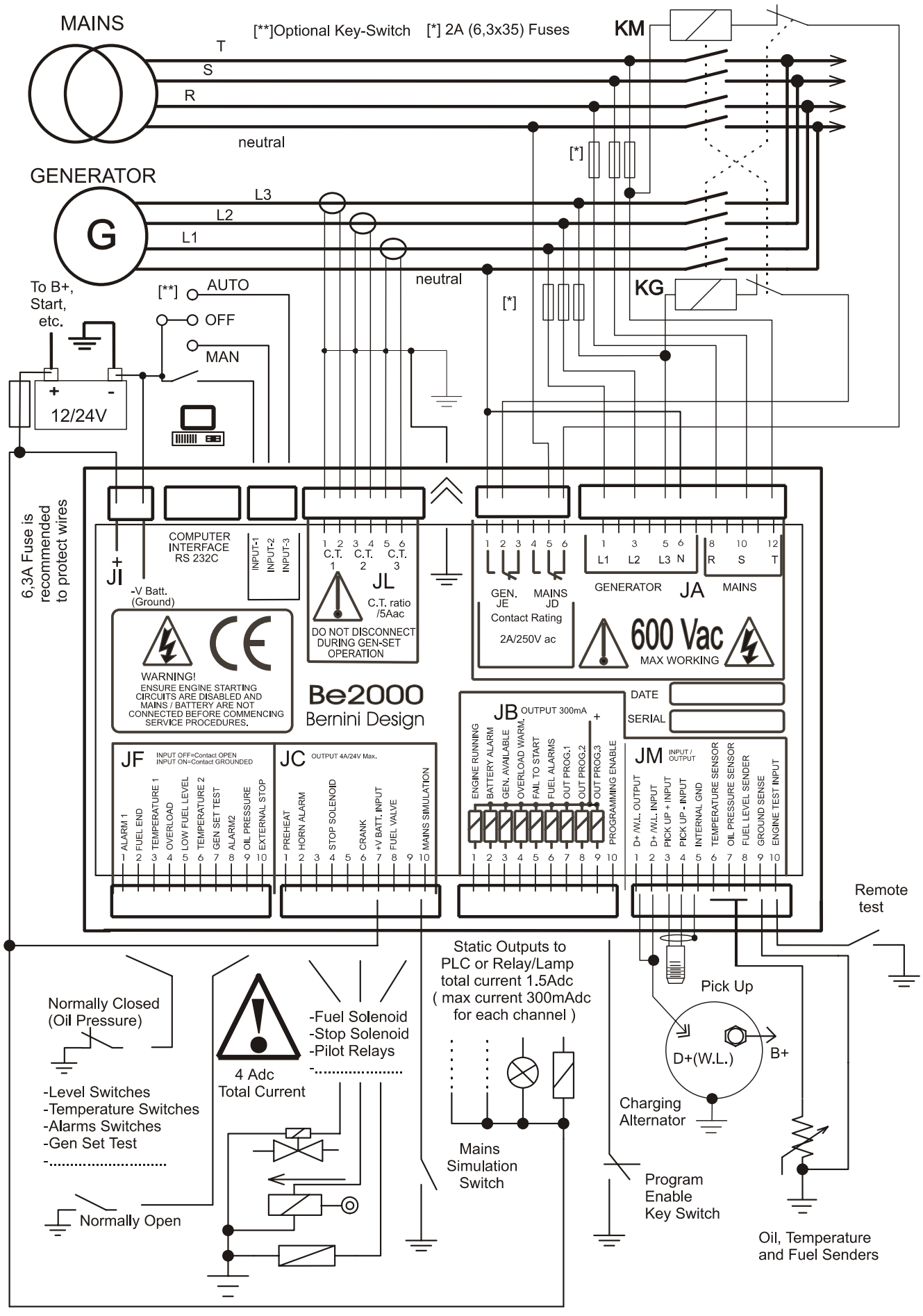
[FAULT 01]/[MEM ERR.]: the Be2000 has an internal memory failure. It is possible to recover the normal operating mode of the Memory by using the System Utility as described in the Section 7.7.
[FAULT 02]: Oil Sender Failure or Open Circuit detection (see Section 12 and 8.1.2)
[FAULT 03]: Temperature Sender Failure or Open Circuit detection (see Section 12 and 8.1.5)
[FAULT 04]: Fuel Level Sender Failure or Open Circuit detection (see Section 12 and 8.1.11)
[FAULT 05]: Pick-Up Failure or Open Circuit detection (see Section 12 and 8.1.15)
[FAULT 06]: Not used

[FAULT 07]: The BE2000 is not receiving the expected input from Pick-Up or the detected speed is below the Under Speed setting for 150 seconds continuously (section 8.1.15).

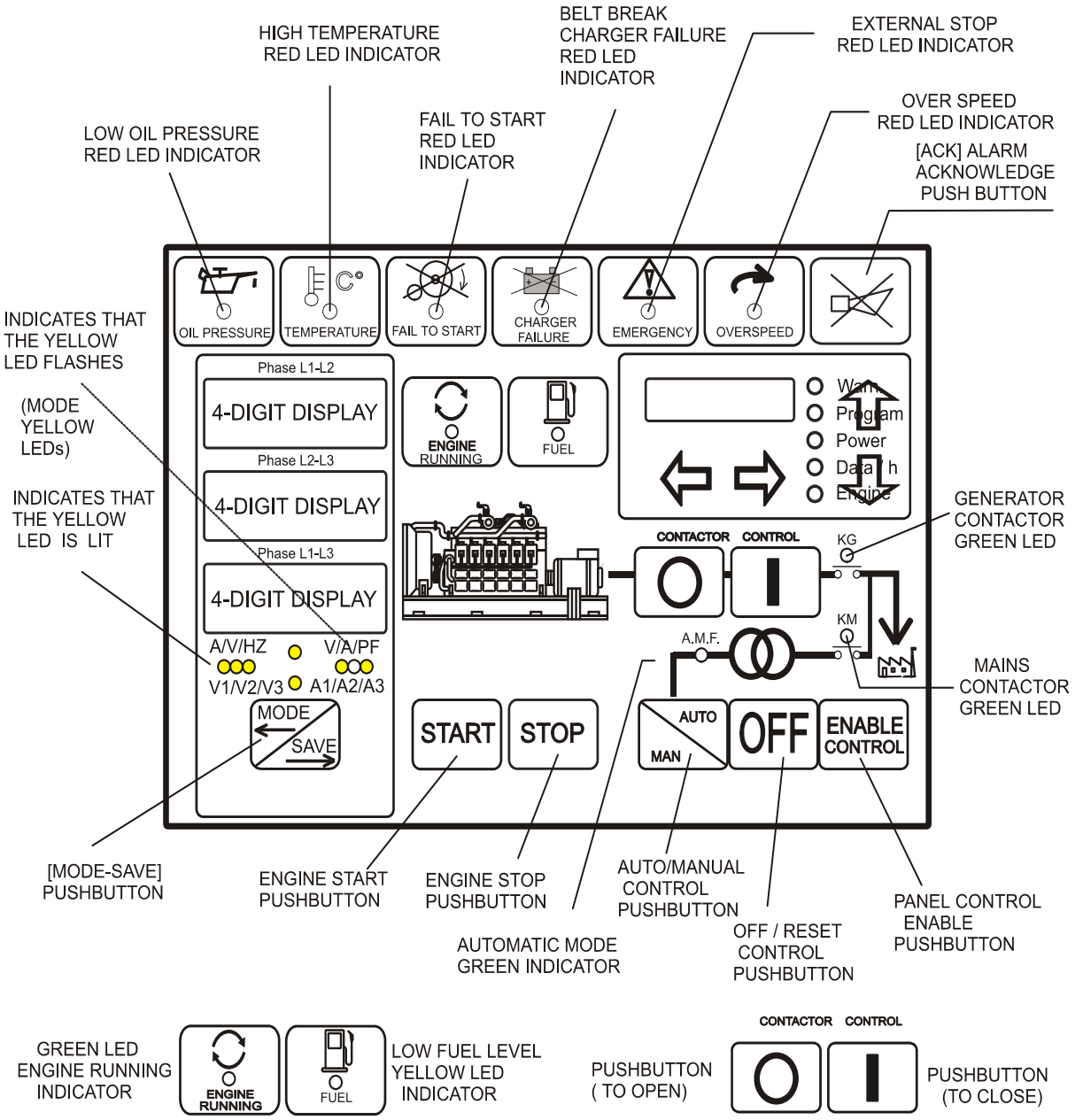
14.0 Definition of Terms

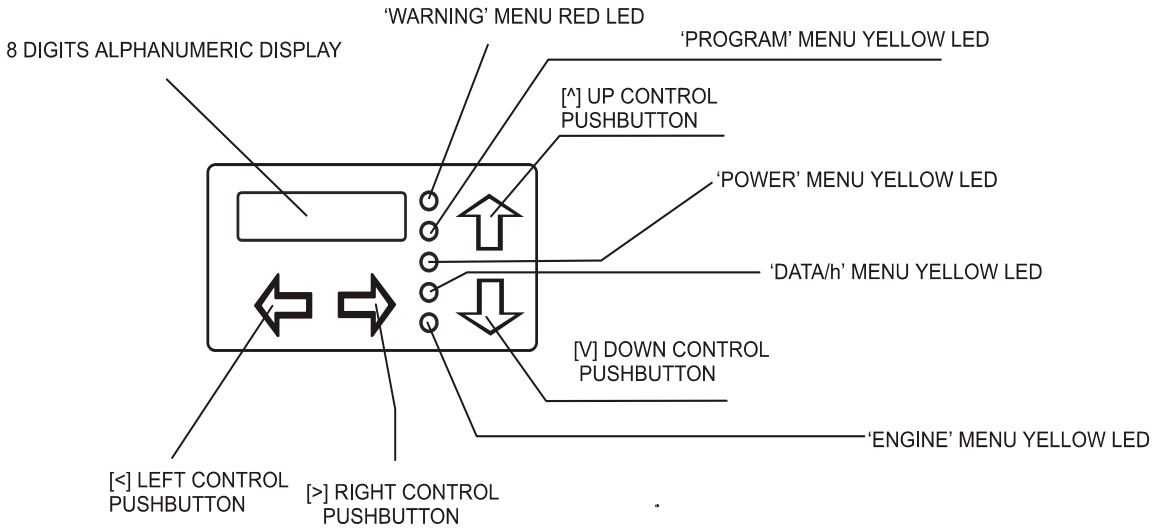
CHARGING ALTERNATOR: ..... the belt-driven alternator used to charge the starting battery set.
ALTERNATOR (Generator): ..... the rotating machine able to supply the Vac alternating voltage/current to the user load.
SENSOR: ..... any variable resistor proportional to the physical phenomena.
BATTERY: ..... if not otherwise stated this is the battery of the engine plant (12V or 24V).
SET, GENERATING-SET, GEN-SET ..... is the assembly of an engine and one alternator.
FUEL SOLENOID: ..... electric valve energised to open the fuel.
Be2000: ..... is the control unit.
BELT BREAK: ..... transmission belt failure.
XXXXXX : ..... 6 digit alphanumeric data on display.
XX.X:..... 3-digit number with a decimal point.
XXXX: ..... 4 digit alphanumeric data on display.
LED, LEDs: ..... solid-state lamp.
LOAD: ..... all electrical equipment able to absorb energy from the Generating Set.
MENU: ..... a list of parameters on the alphanumeric display.
PUSHBUTTON: ..... touch type pushbutton on the Be2000 front panel.
SERIAL INTERFACE: ..... if not otherwise stated the serial interface is RS232C.
STATIC OUTPUT: ..... output of the Be2000 able to absorb 300 mA of current at the near-zero voltage level of the battery.
STOP SOLENOID: ..... electromagnet energised to stop the engine.
JA1JA2, JB etc.: ..... name of the Be2000 input or output terminal

Section 15.0: Be2000 Typical Wiring Diagram

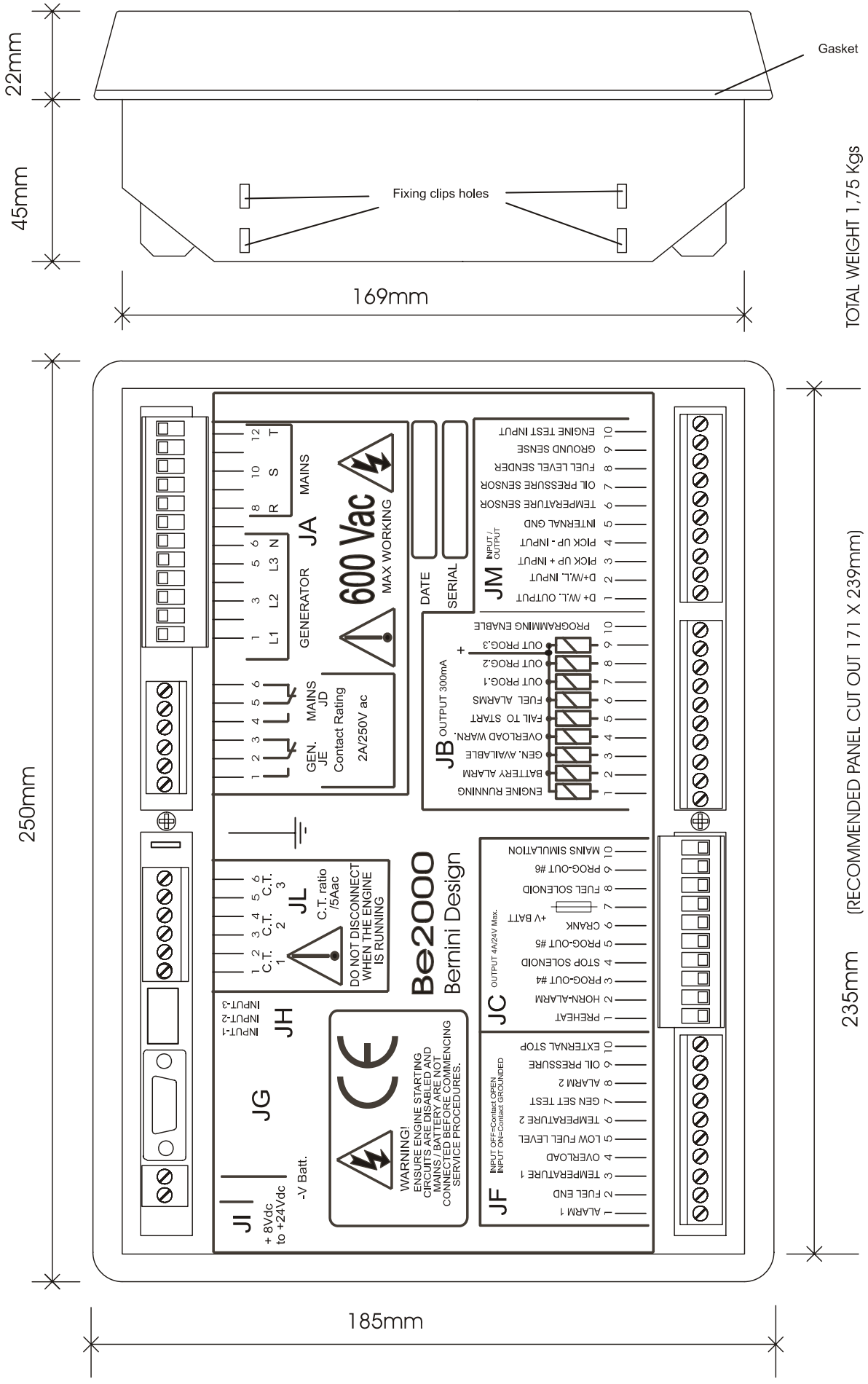


Section 16.0: Be2000 Front Panel

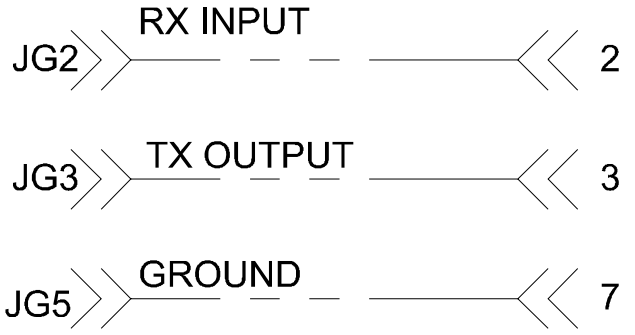




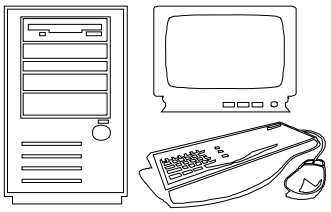
Section 17.0: Be 2000 Rear view and dimensions

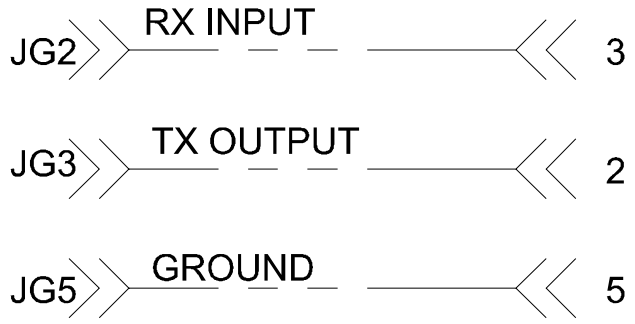


Section 18: RS232 Serial Interface Connection

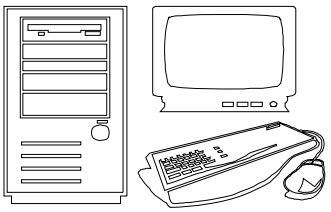


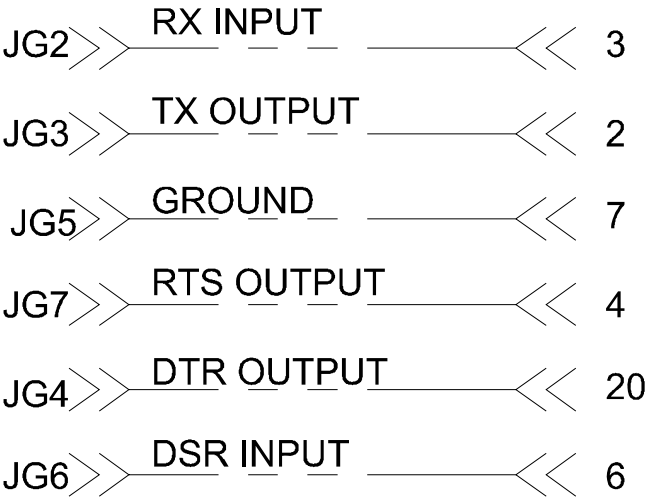
Computer Interface Connector:
D-SUB 25 Poles Male



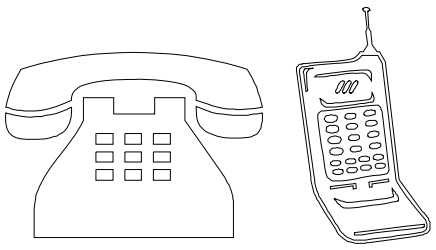


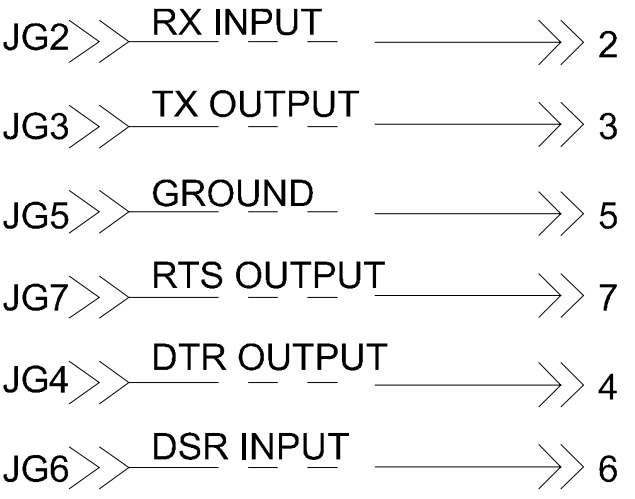
Computer Interface Connector:
D-SUB 9 Poles Male



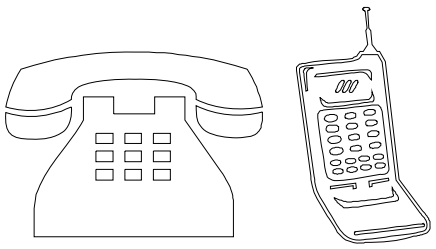


Modem Interface Connector:
D-SUB 25 Poles Male





Modem Interface Connector:
D-Sub 9 Poles Female



19.0 Installation and Plant Information

We recommend writing down. To help Your customer please fill the following form.

PANEL Serial N°	**PANEL Model/Rating**
GEN-SET Serial N°	**GEN-SET Model/KVA**
BE2000 Serial N°	**SOFTWARE Version:**
MANUFACTURER NAME	**TELEPHONE / FAX**
DATE	**SIGNATURE**

19.1 SOFTWARE UPGRADES

Visit the web site http://www.bernini-design.com to download all information about the firmware and software upgrade.

20.0 Application note

20A-Oil Pressure/Temperature Sensor If the Oil Pressure or Temperature sensor is used without the Fuel sender, a degradation of accuracy may be seen in the measurements (+/- 2%). To avoid errors in the reading of Oil Pressure or Temperature it is recommended to connect together JM8 and JM9 if the fuel sender is not provided.

20B-Use of an External KEY-SWITCH

By means of an external 3-position key switch it is possible to select the operating modes of the BE2000. The [AUTO-MAN] push button on the front panel will be disabled.
Be2000 can operate in 2 modes : MAN-OFF-AUTO or RUN-OFF-AUTO.

MAN-OFF-AUTO:

A- Program the [OPT AUX2] for MANUAL operating mode ([KEY MAN] see section 7.6.6) and the [OPT AUX3] for AUTO operating mode ([KEY AUTO] see section 7.6.6).
B- Connect the 'MAN' key switch section to the input #JH2 (AUX2). Connect the other side of the switch to battery minus.
C- Connect the 'AUTO' key switch section to the input #JH3 (AUX3). Connect the other side of the switch to battery minus.
D- Leave the key switch section 'OFF' open (available for other function).
E- The AUX1 (#JH1 input) remains available for other use
F- The key switch allows entering the operating modes directly. The 'OFF' operating mode clears alarms and shuts down the engine.

RUN-OFF-AUTO (NFPA110 level 1 and 2)

This special application requires a double section on the 'RUN' key switch position as below described:
A- Program the [OPT AUX3] for AUTO operating mode ([KEY AUTO] see section 7.6.6)
B- Connect the 'RUN' key switch (first section) to the input #JH3 (AUX3). Connect the other side of the switch to battery minus.
C- Connect the 'RUN' key switch (second section) to the input JM10 (REMOTE TEST). Connect the other side of the switch to battery minus.
D- Connect the 'AUTO' key switch section to the input #JH3 (AUX3). Connect the other side of the switch to battery minus.
E- Leave the key switch section 'OFF' open.
F-AUX1 (#JH1 input) and AUX2 (#JH2 input) remain available for other use.
The key switch allows entering the operating modes directly. The 'OFF' operating mode clears alarms and shuts down the engine.

NOTE:

A) Anytime it is possible to use the [OFF] pushbutton on the front panel to enter the OFF operating mode. In this case, it is necessary to move the KEY-SWITCH to OFF and then to AUTO (or MAN) in order to restore an operating mode.
B) Anytime the battery supply is applied, the BE2000 enters directly the operating mode according to the key-switch position. C) BE2000 features programmable outputs (section 7.6.6, option '[AUTO]) to send remotely the AUTO operating mode status.