

BM80B2 OEM's Manual

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Warranty

Bernini Design SRL (hereinafter "BD") warrants that BM80B2 shall be free from defect in material or workmanship for a period of 3 years from the BD delivery date. BD shall, at its option, repair or replace the product without charge. BD shall return the BM80B2 to the buyer with the Default parameters at no extra charge. The buyer shall furnish sufficient information on any alleged defects in the product, so as to enable BD to determine their cause and existence. If the BM80B2 is not defective, or the product is defective for reason other than covered by this warranty, the buyer will be charged accordingly. This warranty shall not apply if the BM80B2 has not been used in accordance with the User Manual and other operating instructions, particularly if any defects are caused by misuse, improper repair attempts, or negligence in use or handling.

This purchase is non-refundable.

This equipment complies with the EMC requirements



WARNING!! High voltage is present inside the BM80B2. To avoid electric-shock hazard, operating personnel must not remove the protective cover. Do not disconnect the grounding connection. The BM80B2 can start the engine at anytime. Do not work on equipment which is controlled by the BM80B2. When servicing the engine, disconnect the battery and battery charger. We recommend that you place warning signs on the equipment indicating the above.

!! W A R N I N G !! Relays and solenoids connected to the BM80B2 must be suppressed using flywell diodes or suppression devices (e.g. RC networks), see wiring diagram in section 15.0.

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1.0 DESCRIPTION

The BM80B2 is a control system for a stand-by generators. It monitors the following: LOW OIL PRESSURE, HIGH TEMPERATURE, MAINS SIMULATION, EMERGENCY STOP, LOW FUEL LEVEL, MAINS VOLTAGE (3-Phase), GENERATOR VOLTAGE (Phase to Neutral), GENERATOR CURRENT (Phase L1) , GENERATOR FREQUENCY, BATTERY VOLTAGE and BATTERY CHARGER ALTERNATOR. The BM80B2 controls the following outputs: START, CHOKE/PREHEAT, ALARM HORN, FUEL SOLENOID, MAINS and GENERATOR CONTACTOR. The BM80B2 has an internal electronic Battery Charger (12V/2A and 24V/1A) to charge the battery of the engine.

2.0 Operating Modes

The BM80B2 features two push-buttons, [MODE-UP] and [MODE-DOWN], to select 4 operating modes: TEST-AUTO-MAN-RESET (see section 17.0).

3.0 TEST operating mode

The TEST operating mode tests the engine. The load is transferred to the generator only if the Mains fail. The Load will remain connected to the generator until you select the AUTO operating mode. If the Mains restores the LOAD is connected back to the Mains; the engine will stop after the cooling down time. You can also turn the BM80B2 into 'MAN' and stop the engine manually. The BM80B2 will transfer the Load to the Mains and, after 30 seconds of cooling down, the engine will stop. If you push the [STOP] push-button in 'AUTO' or 'TEST' operating modes, the alarm [E08] will energize; the engine will stop immediately. Select the 'RESET' operating mode to clear the [E08] alarm.

4.0 AUTO operating mode

The timers inside the BM80B2 are controlled by means of potentiometers (R2-3-4-8) on the top side of the rear cover (see section 14.0). The timers are activated when the voltage parameter falls under (or rises above) the setting of R4. The starting characteristics are indicated in section 13.0. The Mains Failure and Mains Restore timing is determined by R2. R3 controls the warm-Up (the engine will run Off-Load). The Cooling Down time is fixed at 30 seconds (the engine will run Off-Load to cool the Generator). To set the potentiometers, see section 12.0.

5.0 MANUAL operating mode

In manual operating mode, the [START] and [STOP] pushbuttons are used to control the engine. The BM80B2 transfers the load only in 'AUTO' operating mode when the MAINS fails.

6.0 RESET operating mode

The Reset operating mode clears the fault alarms and stops the engine. The BM80B2 monitors the MAINS, but, in case of Mains failure, the engine will not start. If you leave the panel in 'RESET' for more than 5 minutes, the BM80B2 will enter low power consumption mode, and the display will turn off. To energize the display, select an operating mode or push the [MODE-DISPLAY] pushbutton.

7.0 START - STOP pushbuttons

These are the push-buttons for Manual control of the engine (see section 17.0). In 'AUTO' or 'TEST' modes, the activation of the [STOP] push button will energize the emergency stop. The [E08] message will appear on the display.

8.0 DISPLAY FEATURES

The BM80B2 features a 3 Digit Display to indicate messages and measurements. The [MODE-DISPLAY] push button selects the following:

Voltage: Voltage of the MAINS or GENERATOR. The display indicates the generator voltage only when the Fuel Solenoid output is energized. Otherwise the display indicates the Mains voltage.

Frequency: Frequency of the generator. The resolution is 0.1Hz. The reading is updated every 2 seconds

V Battery: Battery voltage measurement.

Hour Count. To obtain the running hours push [MODE-DISPLAY] pushbutton for 5 seconds. The 3-Digit display counts up to 999h. A right decimal point will appear over 1000 hours. For example, 562. will indicate 5620 hours.

To clear the Hour count, follow the instructions:

- select the OFF operating mode
- push the [STOP] and [MODE-DISPLAY] pushbuttons simultaneously, until the display blinks (approximately 10 seconds).

Ampere: measurement of the generator current up 400A (see the sizes of the Current Transformers in section 12.0).

9.0 ERROR MESSAGES

Some alarms are displayed by [EXX] messages. 'E' indicates Error and 'XX' indicates a code '00' up to '09'. The engine stops and BM80B2 transfer the load to MAINS. The list of the messages follows:

[E01] OVER-SPEED: the alarm energizes if the Frequency of the generator rises above the setting (53 Hz, for 50 Hz system, or 64Hz, for 60 Hz system). The protection is delayed by 2 seconds.

[E02] BELT FAILURE: this alarm energizes in case of the Battery-Charging Alternator failure (a 20 seconds delay prevents false alarms).

[E03] EMERGENCY STOP: When the input JA-5 is grounded, the engine stops immediately and the load is transferred to the mains.

[E04] ALTERNATOR FAILURE: this message will be displayed if there is no Voltage or Frequency to the generator for 150 seconds from the starting of the engine. The alarm works only in AUTO and MANUAL operating mode.

[E05] GENSET OVERLOAD: The R8 sets the overload threshold (see section 12.0). The range is 1A to 5A (secondary output of the C.T). The protection is delayed 4 seconds.

[E06] UNDER SPEED: the settings are 47Hz (50Hz system) and 57Hz (60Hz system). The protection is delayed 4 seconds (see section 12.0).

[E07] ENGINE STOP: this message appears if the engine stops for unknown reasons.

[E08] STOP: this message appears if the user pushes the Stop pushbutton in AUTO or TEST operating mode.

[E09] UNDER VOLTAGE: if the Alternator voltage falls under the setting of R4 (section 12.0) for at least 6 seconds, the alarm energizes. The contactor of the generator is opened, and the engine will stop after a cooling down time.

10.0 LED indicators

FAILURE: this is an indication for Low Oil Pressure (JA3 input) or High Temperature (JA4 input) alarms. The alarms are ignored for 15 seconds during the starting sequence of the engine. The engine stops immediately and BM80B2 transfer the load to MAINS.

STARTING FAILURE: this alarm is activated if the engine does not start after 3 starting attempts.

BATTERY: Low/High Battery voltage warning. The threshold are automatically set to 11,8Vdc /15.0 or 23,6/30.0 Vdc (the alarm is delayed 60 seconds).

ENGINE RUN: this Led illuminates when the voltage of the charger alternator (terminals JA7-8) rises above the setting of R19 (adjustable from 3 V to 15V, see section 15.0)

FUEL LEVEL: this alarm warns against low fuel. The engine will stop if the level switch remains closed for more than 15 minutes.

KR: this green LED illuminates when the load is transferred to the Mains .

KG: this green LED illuminates when the load is transferred to the Generator .

11.0 Remote Control and Periodic Test

[-on] mode: when terminal #28 is grounded, the BM80B2 simulates the presence of the Mains supply. The display will show the message **[-on]** if the 'Voltage' indication is selected. This terminal is used in applications where MAINS supply is not available. You can start and stop the engine using a switch (level switch, timer or other) connected to terminal #28.

Automatic Periodic Test (A.P.T.)

To select the periodic test, switch on the SW4 (section 14.0) The BM80B2 does not use a clock to count the days. The maximum error and drift of the counter is +/-1%. The user could experiment with shifting the periodic tests. To avoid error accumulation, we recommend the following procedures:

- **disconnect the power supply (battery) of the BM80B2**
- **wait for the desired start time (watching the clock)**
- **connect the power supply to BM80B2**
- **select the 'AUTO' operating mode**

The BM80B2 will start the engine after 7 days. The engine will run OFF-LOAD for 5 minutes. If the Mains fails during the A.P.T., the BM80B2 will transfer the load to the generator until the Mains will restore.

IMPORTANT NOTICE

If the supply (battery voltage) is removed, the BM80B2 loses the accumulated count of the days. If the supply restores, the BM80B2 starts to count the days from zero. It is important, in case you use the **A.P.T.** to synchronize the power on according to your needs.!

12.0 PROGRAMMING

The programming is done by setting R2, R3, R4,R8 and DIP-Switches 1-6 (see sections 14.0 and 17.0). To enter programming follow the instructions:

- A)-** Push the [MODE-UP] pushbutton to select the OFF operating mode
- B)-** Push and hold the [MODE-UP] pushbutton until the RESET yellow LED start to blink (approximately 6 seconds).
- C)-** Push the [MODE-UP] or [MODE-DOWN] pushbuttons to select a programmable Parameters (see later in this section).
- D)-** Push the [MODE-DISPLAY] pushbutton to display the parameter setting.
- E)-** To modify a setting of a potentiometer, use a 2mm screwdriver and rotate slowly C.C.W. or C.W.. Push the [MODE-DISPLAY] pushbutton to display the setting.
- F)-** To modify the status of a DIP-Switch, toggle the switch. Push [MODE-DISPLAY] to display the status of the switch ([On] or [OFF]).
- G)-** To exit programming, remove the supply or push the [MODE DOWN] pushbutton

The list of the programmable parameters follows.

[r. 2] Mains failure or Restore time range: 1"- 99" (seconds)

Seconds or minutes of continuous Mains failure (or continuous Mains restore) needed to initiate the automatic engine start (or to initiate the Stop sequence).

[r. 3] Warm up time: 1"- 99" (seconds)

This delay allows the engine to Warm Up. After the delay, the BM80 will enable the contactor of the Generator.

[r. 4] Mains and Generator Under Voltage: 150-200Vac

Once the BM80 has enabled the contactor, if the voltage drops under the [setting] for at least 6 seconds, the Under-Voltage protection [E09] will energize (see section 9.0).

[r. 8] Overload setting (*): 10-48A, 20-96A, 40-190A, 80-390A, [INH.]

If the current rises above the setting by 6 seconds, the BM80B2 opens the contactor and shows the message [E05]. The [INH.] settings will disable the alarm.

(* see the Current Transformer sizes (section14.0)

[S. 1] Stop Solenoid or Pre-Glow option

[OFF]: the BM80B2 enables the Stop Solenoid Output (#26)

[On]: the BM80B2 enables the Pre-Glow Output (#26)

[S. 2] [S. 3] Current Transformer Size selection:

SWITCH 2	SWITCH 3	C.T. Size
OFF	OFF	50/5
OFF	ON	200/5
ON	OFF	100/5
ON	ON	400/5

[S. 4] Automatic Periodic Test:

[OFF]: no test

[On]: test on (the engine will start every 7 days and will run OFF-LOAD for 5 minutes)

[S 5] Nominal Frequency selection

[OFF]: 50 Hz (Under-frequency: 46Hz ,Over-frequency: 53Hz)

[On]: 60 Hz (Under-frequency: 56Hz ,Over-frequency: 64Hz)

[S 6] Belt Failure

[OFF]: belt failure enabled (the alarm is delayed 20 seconds)

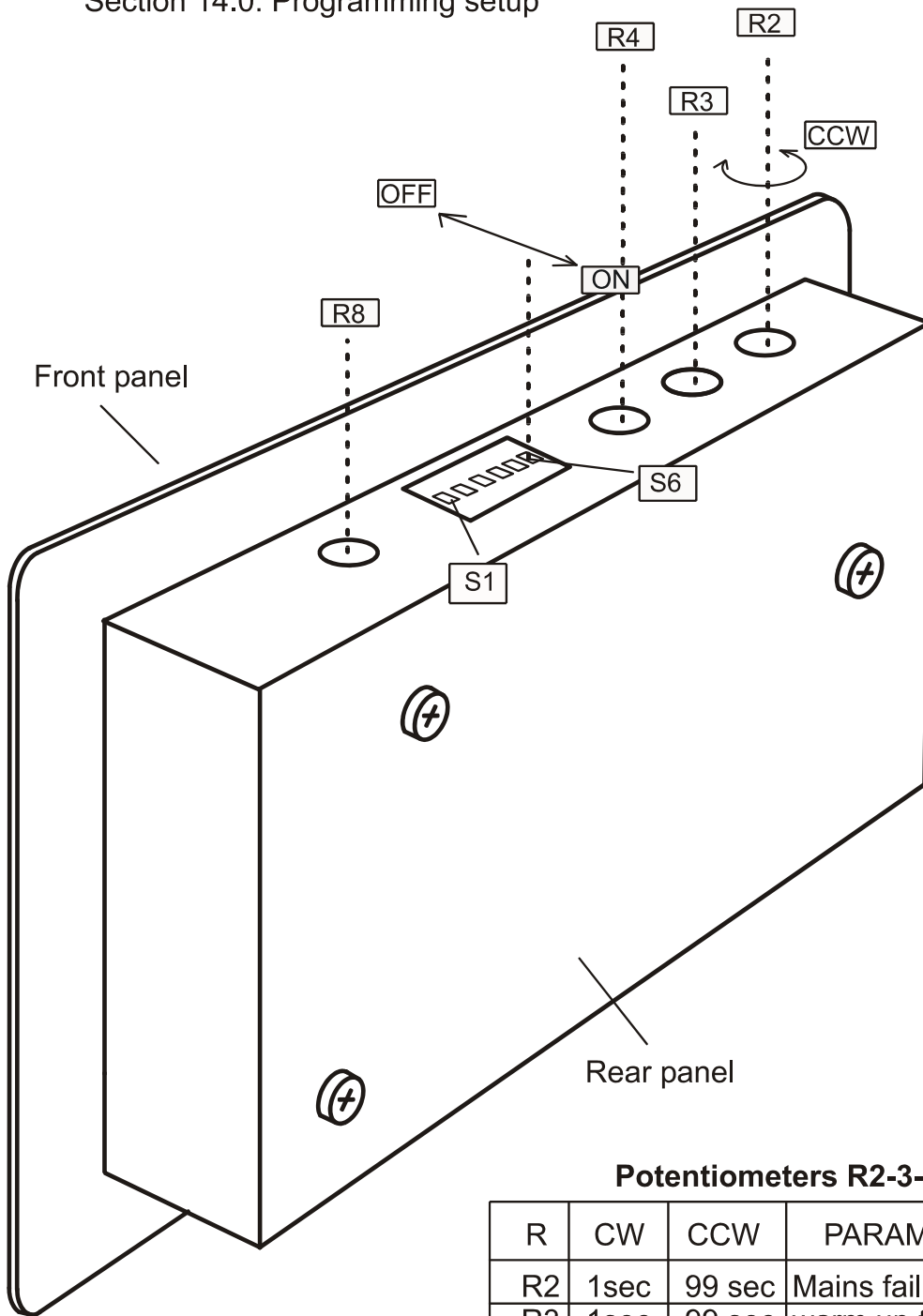
[On]: belt failure disabled

The following parameters are fixed in factory:

Start attempts	3
Crank time	5 seconds
Rest time	5 seconds
Cooling down time	30 seconds
Pre-glow time	10 seconds
Stop solenoid time	15 seconds
Alarm bypass time	15 seconds
Automatic Test interval	7 days
Automatic Test duration	5 minutes
ALARM output timeout	1 minute
Low Battery voltage setting	11.8 V/23.6V
Over/Under frequency (50Hz,60Hz)	46Hz/53Hz, 56Hz/64Hz

13.0 General Characteristics**Supply Voltage:** 7Vdc to 33Vdc. **Reverse polarity:** permitted for unlimited time.**Supply Ripple:** 15% up to 65 Hz, Over Voltage: 50V (60 secs) at 40 °C.**Supply internal protection:** 300mA /60Vthermal fuse.**Supply Current Consumption:** 50 mA up to 150mA maximum.**DC Relay Outputs:** 8A/30Vdc, an internal, automatic, 4A -Fuse is provided.**Output Relay Voltage:** battery voltage.**AC Relay Outputs:** 8A/250Vac, 2 internal 1A fuses (5x20) are provided on the board.**Nominal Voltage input:** 400Vac (3-Phase). Maximum Voltage: 450 Vac continuously Ph-Ph.**Maximum Display error:** +/- 3%**Current Transformer Size:** 50/5Aac, 100/5Aac, 200/5Aac or 400/5Aac**Maximum Display error:** +/- 5% .**Open circuit voltage of the inputs:** 10Vdc (12V supply) or 22Vdc (24V supply)**Closed circuit current of the inputs:** 15mAdc maximum.**Charger Alternator Monitoring:** up to 33Vdc.**Operating Temperature range:** -30 deg C to +65 deg C.**Humidity Range:** 5% up to 95% non-condensing**Total Weight:** 1500 gr. (includes cable)**General Design:** 89/336 EEC, 89/392 EEC, 73/23 EEC, 93/68 EEC, IEC 68-2-6, EN60950**Certification:** CE**Insulation of the cable CPU-RELAY BOARD:** 300Vac; **Length:** 1 meter/25 poles un-shielded**BM80B2 CPU dimensions:** 224mm X 105mm X 42.5mm**Panel Cut-out:** 172mm X 118mm, operation indoor**BM80B2 Relay Board dimensions:** 195mm X 126mm X 65mm.**Shipping (box dimensions):** 255x230x80

Section 14.0: Programming setup



Potentiometers R2-3-4

R	CW	CCW	PARAMETER
R2	1sec	99 sec	Mains failure/restore
R3	1sec	99 sec	warm up time
R4	150V	200V	Mains/Gen underV

Current Transformer programming and Overload potentiometer R8

S2	S3	Size	R8 range	C.C.W.
OFF	OFF	50/5	10 - 48	INH.
OFF	ON	200/5	40 -190	INH.
ON	OFF	100/5	20 - 96	INH.
ON	ON	400/5	80 - 390	INH.

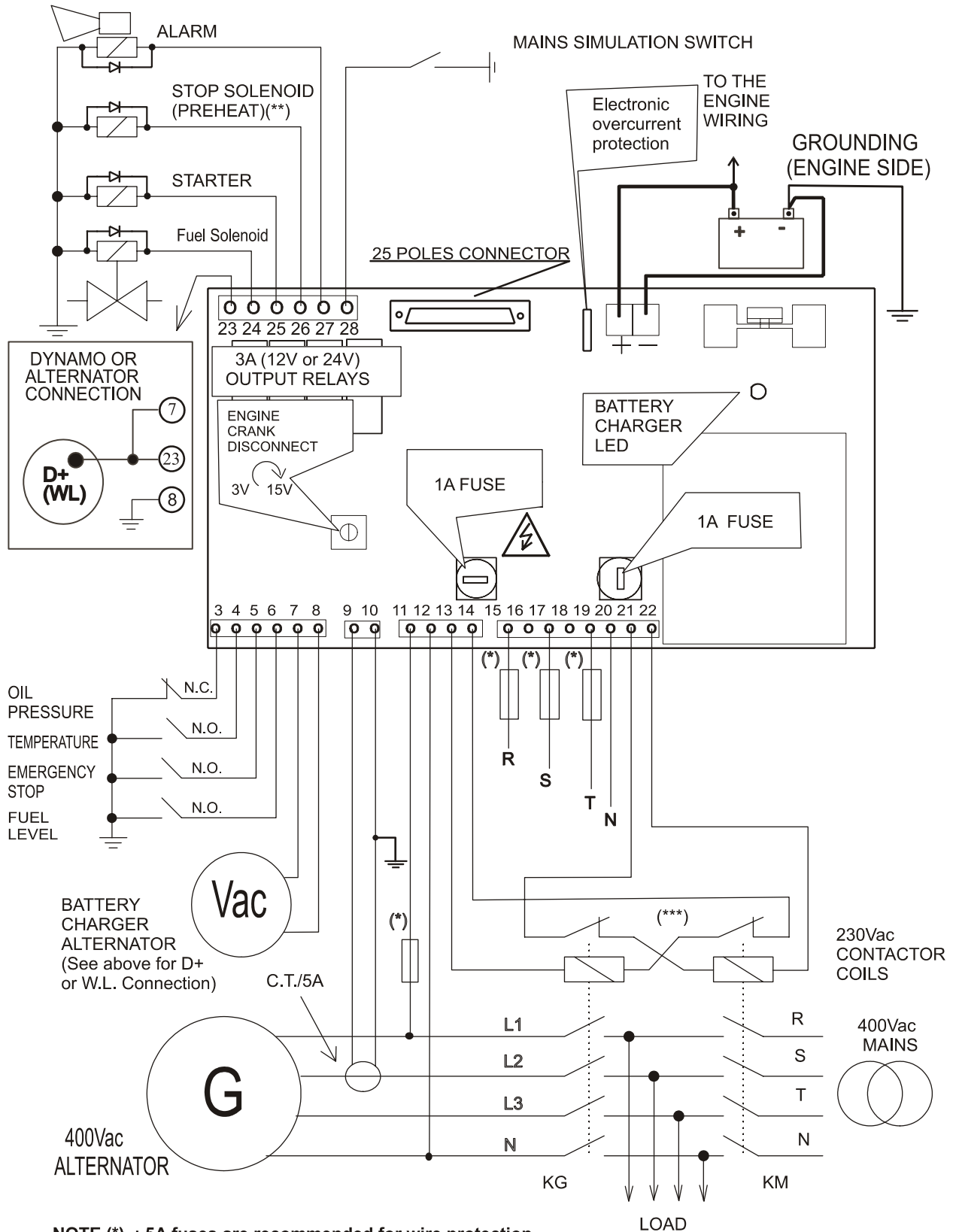
S1	Output #26
OFF	Stop Solenoid
ON	Pre-Glow

S5	Frequency
OFF	50 Hz
ON	60 Hz

S4	Periodic Test
OFF	Disabled
ON	Enabled

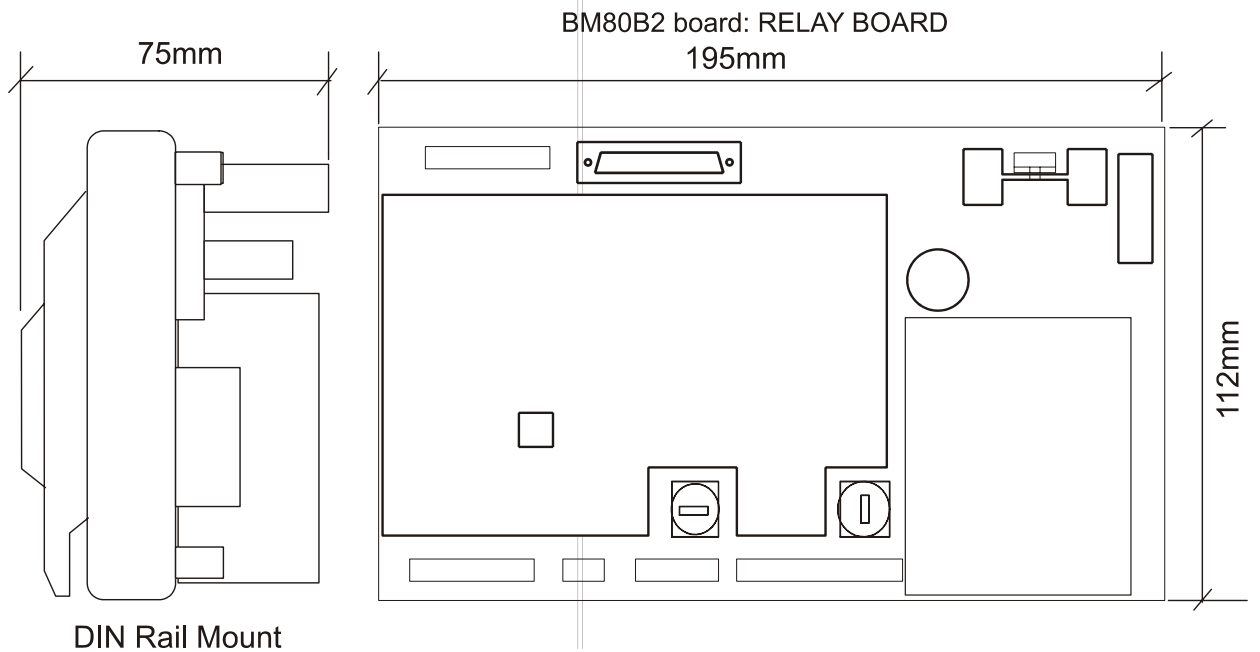
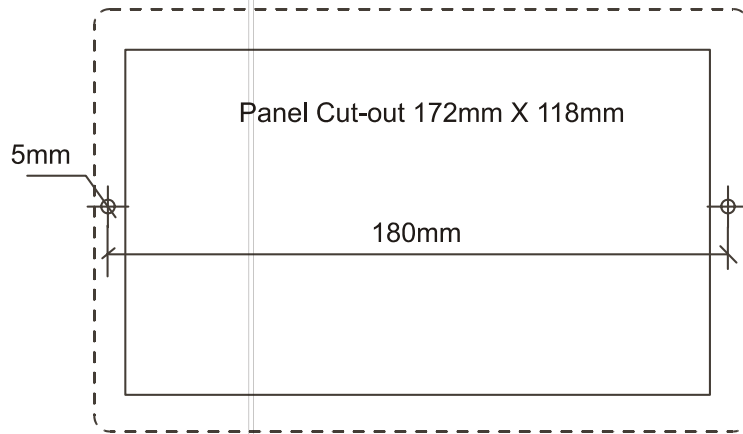
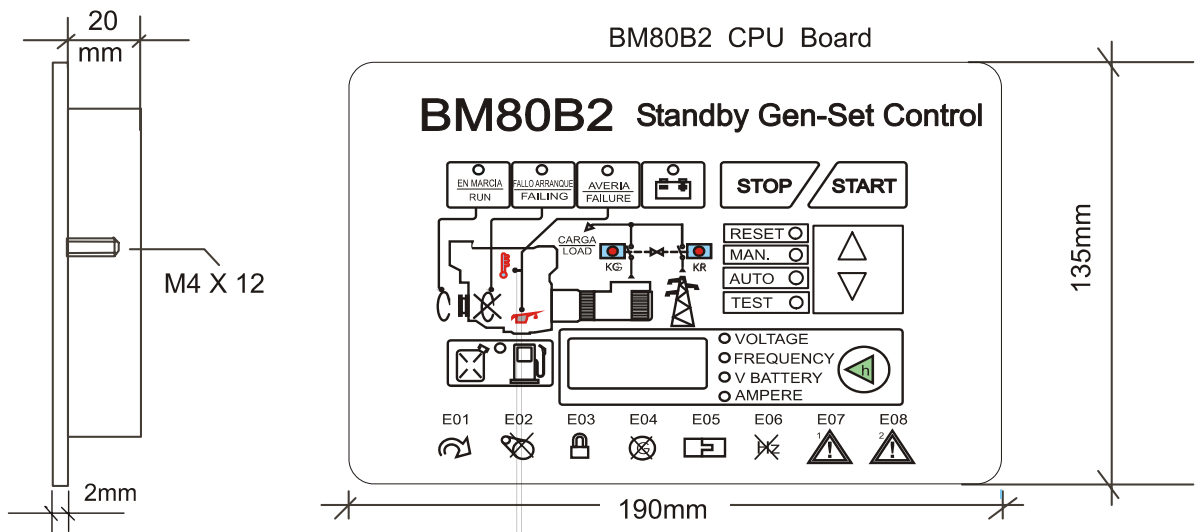
S6	Belt Breack
OFF	Enabled
ON	Disabled

Section 15.0: wiring diagram



NOTE (*) : 5A fuses are recommended for wire protection
 (**) : See section 12.0 to select Pre-Glow or STOP Solenoid (Switch S1)
 (***) : Auxiliary Interlock contacts

Section 16: Dimensions



Section 17.0: FRONT PANEL

