# Be1 /Be1-RS485
# Auto Start Generator Controller
## Installation Manual

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## Warranty

  Bernini Design SRL (hereinafter "BD") warrants that Be1 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 Be1 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 Be1 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 Be1 has not been used in accordance with the User Manual and other operating instruction, particularly if any defects are caused by misuse, improper repair attempts, negligence in use or handling. The warranty does not include the membrane keyboard (front panel) in case of visible signs of misuse. This purchase is non-refundable.

 $C\epsilon$ 

This controller complies with the EMC protection requirements

**WARNING!!   High voltage is present inside the Be1. To avoid electric-shock hazard, operating personnel must not remove the protective cover. Do not disconnect the grounding connection. The Be1 can start the engine at anytime. Do not work on equipment, which is controlled by the Be1. When servicing the engine, disconnect the battery and battery charger. We recommend that warning signs be placed on equipment indicating the above.**

**!! W A R N I N G !!   Relays and solenoids connected to the Be1 must be suppressed using flywheel diodes or  suppression devices as indicated in section 17.0**.

## *Alphabetic index*

# *Be1 OEM's Manual - Contents*

## Section 1.0 Introduction

   The Be1 is a low battery auto start generator controller. The auto start includes an adjustable low battery auto start (see 15.21). It provides a visual indication by means of LEDs. It displays the fuel Level, engine and generator parameters, warnings, and shutdowns. The Be1 features programmable parameters to adapt the auto-start module to any kind of engine. It features several modes of operation and provides, as option, an RS485 serial interface for remote control & monitoring. Software is provided free of charge. Figure 1 presents the panel layout.



Figure 1: Front Panel layout
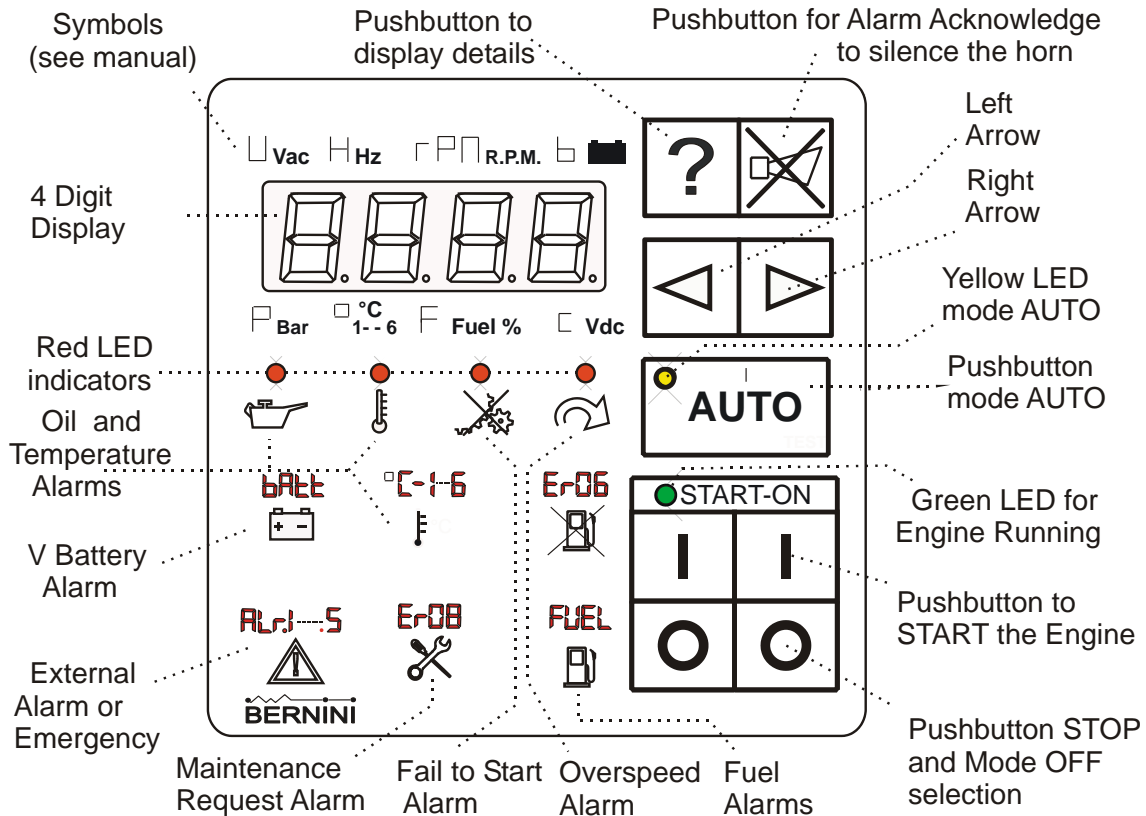
## Section 2.0  Selecting a mode of operation

  The modes of operation are selected by pushbuttons. Every time the power supply is switched on, the Be1 returns to the "OFF"  mode, unless the Be1 was in TEST or AUTO prior to power down. The following table indicates the available modes of operation.

| Mode | Pushbutton | Indications on front fascia | Section |
|---|---|---|---|
| OFF | [ O ] [ O ] (*) | All LEDs are turned Off, dot on display | 2.1 |
| MANUAL | [ I ] [ I ] (*) | The yellow LED AUTO is OFF | 2.2 |
| AUTO | [AUTO] | The yellow LED AUTO is ON | 2.3 |
| TEST | [AUTO] | The yellow LED AUTO blinks | 2.4 |
| PROGRAMMING | see the instructions for the proper use | The display shows the message **[ProG]** (the Leds of [AUTO] and [ I ] buttons will blink) | 6.0 |
| CALIBRATION | | The display shows the message **[-CAL]** (the Leds of [AUTO] and [ I ] will blink) | 11.0 |
| TROUBLESHOOTING | | See section  12.0 | |

(*) these push-buttons are in parallel in order to guarantee a long operational life.


### 2.1  OFF  mode

  Push one of the [ O ] pushbuttons to enter the OFF mode; the Display and LEDs will turn off, a dot on the display will blink slowly and the alarms will be cleared.

### 2.2 MANUAL  mode

  To start and stop the engine follow the instructions:

**A) -** Push one of the [ I ] pushbuttons until the display indicates the message [MAn] and all LEDs illuminate; release the button.
**B) -** Push one of the [ I ] pushbuttons until engine starts (*). When the engine is running, the green LED 'START-ON' will illuminate (see section10.0).
**C) -** To stop the engine, push the [ O ] pushbutton until the [StOP] message appears on the display.
If the engine has already stopped, it is possible to cancel the STOP sequence by pressing the [ O ] pushbutton.
Push [ O ] when the engine is not running if you want to shutdown the panel. This will reduce the supply current.

*Note(*): the display will indicate the message [. . . .] during the starting attempt, and [! ! ! !] during the preheat.*

### 2.3  AUTO  mode

  Push [AUTO] until the yellow LED on the button will illuminate. The engine starts when the 'Remote Start' input activates and stops when the 'Remote Start' input releases. In AUTO  mode, the Be1 will periodically test the engine if the parameters [P.44] and [P.45] have been programmed. During this test, the yellow LED AUTO will continue to blink. To program an input for 'Remote Start' see 7.07B (option [12]). To program a delay to start and stop the engine see the table 7.00 (parameters [P 0] and [P 1]). Once the Be1 is in AUTO mode, push the  [AUTO] pushbutton for a short time if you want to select the MANUAL mode (see 2,2). In case of Alarms, it is not possible to select the AUTO mode.

### 2.4 TEST  mode

Enter the AUTO mode, push and hold for at least 5 seconds (*), the [AUTO] pushbutton until the yellow LED will start blinking (the engine will start automatically). To stop the engine, push the [AUTO] or the [ O ] pushbutton.

*Note(*): if you push the button for less than 5 seconds, the Be1 will only enter the MANUAL mode*


## Section 3.0 Display measurements

  The Be1 features a 4 Digit display and 4 pushbuttons as indicated below.
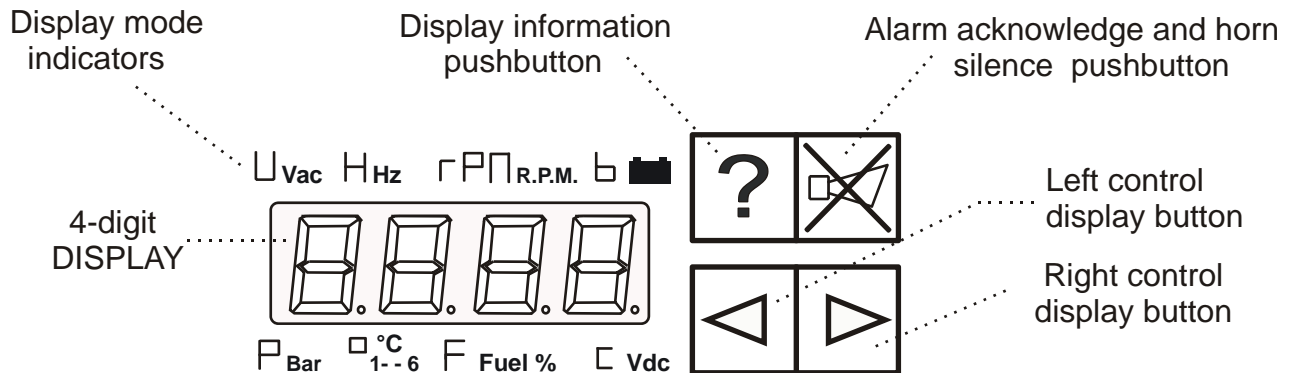
Use [←] and [→] to select a menu. Use [ ? ] to display the name of the parameter. The following table lists the functions of the display.

| Display Function | Display indication (*) | Pushbuttons used to select the function | Push [ ? ] to indicate the name of the parameter |
|---|---|---|---|
| Generator Voltage  (60 - 600Vac) | **[UXXX]** | | **[voLt]** |
| Generator Frequency (20 - 70Hz) | **[HXX.X]** | | **[HErt]** |
| Speed R.P.M. (10 up to 6000RPM) | **[XXXX]** | **[←] or [→]** | **[ rPM]** |
| Battery Voltage Vdc (6-36Vdc) | **[bXX.X]** | | **[ bAtt ]** |
| Charger Voltage Vdc (0-36Vdc) | **[cXX.X]** | | **[ cHAr]** |
| Oil Pressure Bar (up to 20.0 Bar) | **[PXX.X]** | | **[ bAr]** |
| Fuel Level % (0% up to 99%) | **[F XX ]** | | **[FUEL]** |
| Coolant temperature  (0-250 °C) Oil Temperature  (0-250 °C) Canopy Temperature (0-250 °C) | **[XXX°]** | | **[°C-1]** **[°C-2]** **[°C-3]** |
| Hours-count  (0 up to 50.000 h) | **[XXXX]** | | **[Hour]** |

(*)NOTE: X indicates a numerical digit, if the measurement is out of range, the display will indicate [ - - -]


## Section 4.0 Display messages

The Be1 shows alarms (table 4.10) and messages (table 4.20).


### Table 4.10: Alarm messages

The presence of a warning or shutdown is indicated by the message [Alar.]. Push [→] to browse the message(s). Push [ ? ] to display the parameter. Push [ACK] to acknowledge the alarm (see also sect. 8.0)

| Message | Description of the Alarm | Button  [ ? ] |
|---|---|---|
| **[ALAr.]** Indicates the presence of an ALARM. Push [→] to browse the alarm memory | | |
| **[OIL.P]** | Low Oil Pressure Warning (Sensor) | Bar indication |
| **[Er.01]** | Low Oil Pressure Shutdown | |
| **[bELt]** | Engine Belt Break Shutdown (It energizes only if the Charger Alternator fails to work and if there is at least one extra-source of Engine running signal; e.g. Pick-upl, Vac or Hz. | Vdc indication |

| Message | Description of the Alarm | Button  [ ? ] |
|---|---|---|
| **[PicK]** | The Be1 detected a failure of the pick-up. The engine shuts down. | None |
| **[bAtt]** | Battery Voltage Warning (High or Low, delayed 180 seconds). The alarm limits are automatically set to 11.8V-15V and 23,6V-31V | Vdc indication |
| **[°C-1]** **[°C-2]** **[°C-3]** | EngineTemperature Switch (Or Sensor) Shutdown <br> Oil Temperature Switch (or Sensor) Shutdown <br> Canopy Temperature Switch (or Sensor) Shutdown | °C indication (if the sensor is not used, the display will indicate the message [S.on]) |
| **[°C-4]** **[°C-5]** **[°C-6]** | Engine Temperature Warning. Push [?] to display the value. <br> Oil Temperature Warning. Push [?] to display the value. <br> Canopy Temperature Warning. Push [?] to display the value. | |
| **[FUEL]** **[Er.06]** | Fuel level warning (High or Low). Push [?] to display the value. <br> Low Fuel Shutdown (Level switch) | % indication <br> none |
| **[AL. 01]....[AL. 05]** | Input #1.....#5  Alarm (Shutdown or Waring) | none |
| **[Er.07]** | Failure of a Sensor (Oil pressure, Temperatures  or Fuel Level) | [InP1] ...... [InP5] |
| **[Er.08]** | Maintenance Service (when this warning turns on, you are not allowed to enter the AUTO mode). | - |
| **[F.StP]** | Fail to Stop Alarm | none |
| **[F.Str]** | Fail to Start Alarm | none |
| **[Err.]** | Memory Failure | none |
| **[ALt]** | Alternator Failure | none |
| **[U.SPd]** **[O.SPd]** | Underspeed (see parameters [P12] and [P13]) <br> Overspeed Shutdown (see parameters [P10] and [P11]) | Speed |
| **[Hi-H]** **[Lo-H]** | Over Frequency Shutdown (see parameters [P6] and [P7]) <br> Under Frequency Shutdown (see parameters [P8] and [P9]) | Frequency |
| **[Hi-U]** **[Lo-U]** | Over Voltage Shutdown (see parameters [P2] and [P3]) <br> Under Voltage Shutdown (see parameters [P4] and [P5]) | Volatge ac |

### 4.20 Miscellaneous  messages

| Message | Description | Message | Description |
|---|---|---|---|
| **[rESt]** | The Be1 is counting the rest timing | **[ProG]** | The Be1 is in program mode |
| **[. . . .]** | The Be1 is performing the start | **[-CAL]** | The Be1 is in calibration mode |
| **[' ' ' ']** | The Be1 is performing the pre-glow | **[tEst]** | The Be1 is in Troubleshooting mode |
| **[StoP]** | The Be1 is stopping the engine | **[ - - - ]** | The measurement is out of range |
| **[Err.P]** | Wrong programming of a parameter. | **[EPM]** | Engine Protection Mode |
| **[dEL]** | Delay time before cranking | **[dIS]** | Disable of the Manual  mode |
| **[CooL]** | It indicates the colling down time | **[P0 _][P1 _]** | Indicates that the timer P0 (or P1) is counting. The segments of the first digit (_) illuminates in sequence. |

## Section 5.0 LED indicators

### 5.1 Lamp and Display Test

Put the controller in OFF or MANUAL mode. To test the LEDs and DISPLAY, push and hold the [←] and [→] pushbuttons simultaneously. The LEDs and DISPLAY remain energized as long as the pushbuttons are pressed and held together.

## Section 6.0 Programming and Reading Parameters

The display indicates the code of a parameter ([P.0] for example) and its setting ([5"] for example) as explained in section 6.30. Section 7.0 lists all parameters. To enter programming mode use the following instructions.

### 6.10 Enter the Programming Mode

**1) -** Provide a voltage battery supply *over 10V*. Push  [ O ] to enter the OFF  mode

**2) -** Push and hold the [→] and [ACK] pushbuttons simultaneously, for about 5 seconds, until the message [ProG], appears on the display; the LEDs of the [ I ] and [AUTO] pushbuttons start to blink.

**3) -** If the Be1 is ***password protected*** (Note 1), the messages [PASS] and  [4242] will appear in sequence. You are required to follow the instructions of Table 6.11. If the Be1 is ***not password protected*** (Note 2), the programmable parameter [P 0] will be displayed and the Be1 is ready for programming (section 6.12, step-2).

***Note 1: the password consists of 2 groups of digits ranging from 0 to 99. Example: [1234] (12 and 34)***
***Note 2: if you want to protect the programming using a password follow the instructions on section 6.40***

### TABLE 6.11: Enter the PASSWORD

**1) -** Push [ AUTO] or [ I ] in order to choose the proper code between 00 and 99. Do not select the code [4242] (it indicates no password)
**2) -** Push [←] (or [→]) to select the 2 digits on the right (or left) side.
**3) -** Push [AUTO] or [ I ] in order to choose the proper code (between 00 and 99).
**4) -** Push [ACK] to confirm the password; if the password is ok, the Be1 will indicate [P 0] and the unit is ready for programming. If the password is wrong, the display will indicate [4242] and you are required to insert the password again.

*Push [ O ] at anytime to quit. If you loose the password, the unit shall be returned for service.*

### 6.12 Programming

**1) -** Enter the Programming mode (see section 6.10).
**2) -** Press the [←] or [→] pushbutton to select a parameter (see the list in section 7.0).
**3) -** To adjust the parameter, press the [ ? ]  and  [AUTO] (or [ I ] ) simultaneously.
**4) -** Press the [←] or [→] pushbutton to select another parameter.
**5) -** Follow the instructions of section 6.13 or 6.14 according to your needs.

### 6.13 Saving the parameters

Press and hold the [ACK] and [→] pushbuttons simultaneously until the [SAVE] message will appear (approximately 5 seconds); the Be1 saves the settings and will enter the OFF mode. You can select a mode of operation as indicated in section 2.0.

### 6.14 Exit without Saving the parameters

Press and hold the [ O ] pushbutton until the display turns OFF.

### 6.20 Re-programming Default settings

   The parameters of the Be1 are factory  programmed with default settings (section 7.0). To restore them, enter Programming Mode (section 6.10). When the message [P.0] appears, follow the instructions:

**1) -** Press and hold the [←] and [→] pushbuttons simultaneously, for about 5 seconds, until the display blinks twice. Select the option 2A or 2B according to your needs.

**2A)  -** Press and hold the [ O ] pushbutton until the display turns off (exit the procedure without saving the default parameters).

**2B) -** Press and hold the [ACK] and [→] pushbuttons simultaneously until the [SAVE] message appears (approximately 5 seconds); the Be1 saves the Defaults and it will enter the OFF  mode.

### 6.30 Reading the parameters

   To read the setting of the parameters, follow the instructions:
**1) -** Press the [ O ] pushbutton until the LEDs and display turn OFF.
**2) -** Push the [←] or [→] pushbutton to select a parameter (section 7.0).
**3) -** Push [ ? ] to display the setting of the parameter.
**4) -** Push the [←] or [→] pushbutton to select another parameter.

***NOTE: if the pushbuttons remain inoperative for more than 2 minutes, the Be1 turns off the display.***

### 6.40 Activating the password
**1) -** Enter the programming mode as indicated in section 6.10.
**2) -** Push the [ACK] pushbutton for about 10 seconds until the display shows [PPPP] and [4242]; release the button. The two digits on the right will blink.
**3) -** Push [AUTO] or [ I ] in order to choose a code (avoid the use of the number 42).
**4) -** Push  [←] (or [→]  ) to select the 2 digits on the left side. Repeat step 3) in order to choose a code
**5) -** If you want to exit the procedure without activating the password, press and hold the [ O ] pushbutton until the display turns off.
**6) -** Press and hold the [ACK] and [→] pushbuttons simultaneously until the [SAVE] message appears; the Be1 saves the password and remains in PROGRAM mode. To exit, push the  [ O ] pushbutton. You can change the password at anytime as indicated in the section 6.50.

### 6.50 Changing the password
**1) -** Enter the programming as indicated in section 6.10 and table 6.11. Push and hold the [ACK] pushbutton for about 10 seconds until the message [PPPP] and [4242] will appear. The two digits on the right side of the display will blink.
**2) -** Push [ AUTO] or [ I ] in order to choose a code (avoid the use of the number 42).
**3) -** Push [←] to select the 2 digits on the left side. Repeat step 3) in order to choose a code

**4A) -** ***Exit the procedure without changing the old password:***  press the [ O ] pushbutton to exit.

**4B) -** ***Save the password:*** press and hold the [ACK] and [→] pushbuttons simultaneously until the [SaVE] message appears (approximately 5 seconds); the Be1 remains in PROGRAM mode. To exit, push the [ O ] pushbutton.

**6.60 Removing the password**

**1) -** Enter the programming mode as indicated in section 6.10 part 3 (you are required to use the old password).
**2) -** When the display indicates a parameter, push and hold the [ACK] pushbutton, for about 10 seconds, until the display will indicate in sequence [PPPP] and [4242]. The code [4242] disables the use of the password. Follow step 3A of 3B according to your needs.
**3A) - _Exit the procedure:_**  press and hold the [ O ] pushbutton if you do not want anymore to remove the password.
**3B) - _Disables the password:_**  press and hold the [ACK] and [→] pushbuttons simultaneously until the [SaVE] message appears (approximately 5 seconds); the Be1 saves the code [4242] (it disables the password). The Be1 remains in PROGRAM mode. To exit, push the [ O ] pushbutton until the display turns off.

## Section 7.0   Programmable Parameters

The programmable parameters are divided into classes as indicated below.

7.00 - Remote control                      7.07A/B - Programmable inputs
7.01 - Generator Parameters                7.08A/B - Output Programming
7.02A/B  - Speed settings                  7.09 - Oil Pressure Sensor
7.03 - Engine Control                      7.10 - Fuel level Sensor
7.04 - Alarms Options                      7.11 - Coolant Temperature Sensor
7.05 - Fuel Alarms                         7.12 - Oil Temperature Sensor
7.06 - Miscellaneous                       7.13 - Canopy Temperature Sensor

**>Table 7.00 - Remote Start Control**      Note: [  xx " ] = seconds, [  xx ' ] = minutes, [xxh ] = hours

| P 0 | **REMOTE START delay timing**. Seconds, minutes or hours of continuous active REMOTE START command to initiate the automatic engine start (see application note 15.20) | [ 5''] | 0 | 23h |
|---|---|---|---|---|
| P 1 | **REMOTE STOP delay timing.** Seconds, minutes or hours of continuous absence of the REMOTE START command to initiate the stop cycle (see application note 15.20). | [ 5''] | 0 | 23h |

**> Table 7.01 - Generator Parameters**  Note: [ oFF ] = disabled

| Parameter Code & Description | | Default | Min | Max |
|---|---|---|---|---|
| P 2 | **Over Voltage setting** | [ OFF] | 60 | 995 |
| P 3 | **Over Voltage   bypass** | [ 1"] | 1" | 15" |
| P 4 | **Under Voltage setting** | [ OFF] | 60 | 995 |
| P 5 | **Under Voltage bypass** | [ 6" ] | 1" | 15" |
| P 6 | **Over Frequency setting** | [ OFF] | 20 | 70 |
| P 7 | **Over Frequency bypass** | [ 1"] | 1" | 15" |
| P 8 | **Under Frequency setting** | [ OFF] | 20 | 70 |
| P 9 | **Under Frequency  bypass** | [ 6" ] | 1" | 15" |

**>Table 7.02 - SPEED SETTINGS**   Note: [  xx " ] = seconds, [  xx ' ] = minutes, [ oFF ] = disabled

| Parameter Code & Description | Default | Min | Max | Options |
|---|---|---|---|---|
| **P 10 Over Speed** | [oFF] | 100 | 4000 | [oFF] |
| **P 11 Over Speed delay** | [ 1" ] | 1sec | 15secs | - |
| **P 12 Under Speed** | [oFF] | 100 | 4000 | [oFF] |
| **P 13 Under Speed delay** | [ 6" ] | 1sec | 15secs | - |
| **P 14 Number of the Teeth of the flywhell** | [oFF] | 0.1 | 500.0 | [oFF] |
| **P 15 Number of Poles of the alternator**<br><br>Options [2] or [4] allow you to display the speed if the teeth number is [oFF]. It calculates the RPM from the alternator frequency. | [oFF] | 2 | 4 | [oFF] |

**>Table 7.03A -  ENGINE CONTROL**  Note: [  xx " ] = seconds, [  xx ' ] = minutes, [ oFF ] = disabled

| | | | | |
|---|---|---|---|---|
| **P 16** | Crank delay after Fuel Solenoid activation | [ 2" ] | 0 | 15secs | - |
| **P 17** | Crank timing | [ 5" ] | 1 sec. | 15secs | - |
| **P 18** | Rest timing | [ 5" ] | 3secs | 15secs | - |
| **P 19** | Starting attempts (numbers) | [ 3 ] | 1 | 15 | - |
| **P 20** | Purge timing (for Gas fuelled engine) | [ 1" ] | 1sec | 15secs | - |

**>Table 7.03B -  ENGINE CONTROL**  Note: [  xx " ] = seconds, [  xx ' ] = minutes, [ oFF ] = disabled

| Parameter Code & Description | Default | Min | Max | Options |
|---|---|---|---|---|
| **P 21** Pre-glow time | [ oFF ] | 1sec | 59mins | [ oFF ] |
| **P 22** Pre-glow time Modes (see below) | [ 1 ] | - | - | 1-2-3-4 |

Starting Motor          [ P.20 ]   Total rest timing

Pre-glow mode 1  [ P.22 ]              [ P.22 ]

Pre-glow mode 2

Pre-glow mode 3              [ P.21 ]

Pre-glow mode 4 (Choke)  [ P.22 ]

Crank termination (engine running detect)  [ P.26]..27]..28 ]

**>Table 7.03C -  ENGINE CONTROL**  Note: [  xx " ] = seconds, [  xx ' ] = minutes, [ oFF ] = disabled

| Parameter Code & Description | | Default | Min | Max | Options |
|---|---|---|---|---|---|
| **P 23** | Stop Solenoid timing | [  15" ] | 1sec | 59mins | - |
| **P 24** | Crank termination (Charger Alternator) | [ 8.0 ] | 3.0V | 30.0V | [oFF] |
| **P 25** | Belt break setting (Charger Alternator) | [ 8.0 ] | 3.0V | 30.0V | [oFF] |
| **P 26** | Crank termination (RPM SPEED) | [300] | 100 | 800 | [oFF] |
| **P 27** | Engine Warm up timing | [15''] | 0 | 59mins | - |
| **P 28** | Engine cool down timing | [15''] | 0 | 59mins | - |
| **P 29** | Low Oil pressure Warning | [oFF] | 0.1Bar | 20.0 Bar | [oFF] |
| **P 30** | Low Oil pressure Shutdown | [oFF] | 0.1Bar | 20.0 Bar | [oFF] |
| **P 31** | Engine Temperature Warning | [oFF] | 40°C | 250°C | [oFF] |
| **P 32** | Engine temperature Shutdown | [oFF] | 40°C | 250°C | [oFF] |
| **P 33** | Oil temperature Warning | [oFF] | 40°C | 250°C | [oFF] |
| **P 34** | Oil temperature Shutdown | [oFF] | 40°C | 250°C | [oFF] |
| **P 35** | Canopy temperature Warning | [oFF] | 40°C | 250°C | [oFF] |
| **P 36** | Canopy temperature Shutdown | [oFF] | 40°C | 250°C | [oFF] |

**>Table 7.04 - ALARM OPTIONS**    Note: [  xx " ] = seconds, [  xx ' ] = minutes, [ oFF ] = disabled

| Parameter Code & Description | | Default | Min | Max | Options |
|---|---|---|---|---|---|
| **P 37** | Engine Alarms bypass (for Oil, Temperature and Auxiliary alarms) | [  5" ] | 2secs | 90secs | - |
| **P 38** | Fail to stop alarm control (off = inhibited, on = enabled) | [oFF] | - | - | [oFF]/ [on] |
| **P 39** | Horn timeout (see section 8.0) | [  5" ] | 5secs | 15mins | [oFF] |

**>Table 7.05 - FUEL ALARMS OPTIONS**   Note: [  xx " ] = seconds, [  xx ' ] = minutes, [ oFF ] = disabled

| Parameter Code & Description | | Default | Min | Max | Options |
|---|---|---|---|---|---|
| **P 40** | Fuel RESERVE (Switch or sensor). The option OFF disables the reserve bypass; the engine will shutdown immediately. | [  5' ] | 15secs | 99mins | [oFF] |
| **P 41** | Low Fuel % shutdown | [oFF] | 1% | 99% | [oFF] |
| **P 42** | Low Fuel % (warning only) | [oFF] | 1% | 99% | [oFF] |
| **P 43** | High Fuel % (warning only) | [oFF] | 1% | 99% | [oFF] |

**>Table 7.06 - MISCELLANEOUS**          Note: [ xx " ] = seconds, [ xx ' ] = minutes, [ oFF ] = disabled

| Parameter Code & Description | | Default | Min | Max | Options |
|---|---|---|---|---|---|
| P 44 | Periodic Test interval | [oFF] | 1 Day | 60 Days | [oFF] |
| P 45 | Periodic Test duration | [ 5' ] | 1 min | 99 mins | - |
| P 46 | Maintenance SERVICE | [oFF] | 1h | 9999h | [oFF] |
| P 47 | RS485 Node Address | [ 1 ] | 1 | 127 | - |
| P 48 | Hour Counter set (over 9999, a dot will appear to indicate a value multiplied by10. Example [3250.] means 32500 hours. The display  will indicate steps of 10 hours) | [ 0 ] | 0h | 50.000 (the display indicates [5000.]) | - |

**>Table 7.07A - Input programming**

| Parameter Code & Description | | Default | Parameter Code & Description | | Default |
|---|---|---|---|---|---|
| [Inp 1] | Input 1 | [ 1 ] (Oil pressure) | [Inp 4] | Input 4 | [ 12 ] (Remote start) |
| [Pol 1] | Input mode (n.c.-n.o. -Sensor) | [n.c.] | [Pol 4] | Input mode (n.c.-n.o. -Sensor) | [n.o.] |
| [Inp 2] | Input 2 | [ 2 ] (Fuel level) | [Inp 5] | Input 5 | [ 6 ] (Emergency) |
| [Pol 2] | Input mode (n.c.-n.o. -Sensor) | [n.o.] | [Pol 5] | Input mode (n.c.-n.o. -Sensor) | [n.c.] |
| [Inp 3] | Input 3 | [ 3 ] (Temperature) | NOTE: when a Sensor mode ([SEnS]) is selected, you are allowed to use only the options [1]-[2]-[3]-[4]-[5] (see table 7.07B). | | |
| [Pol 3] | Input mode (n.c.-n.o. -Sensor) | [n.o.] | | | |

**>Table 7.07B - Input Options List**

| Option | Description | Option | Description |
|---|---|---|---|
| [ OFF] | Not used | [ 8 ] | Cooling and Stop |
| [ 1 ] | Oil pressure (Switch or Sensor) | [ 9 ] | Bypass+Cooling and Stop |
| [ 2 ] | Fuel Level (Switch or Sensor) | [ 10 ] | Warning |
| [ 3 ] | Coolant Temperature (Switch or Sensor) | [ 11 ] | Warning with auto reset |
| [ 4 ] | Oil Temperature (Switch or Sensor) | [ 12 ] | Remote Start |
| [ 5 ] | Canopy Temperature (Switch or Sensor) | [ 13 ] | Horn Silence |
| [ 6 ] | Emergency Stop | [ 14 ] | Disable of manual mode |
| [ 7 ] | Bypass and Stop | [ 15 ] | Not allowed (reserved) |

**> Table 7.08A - Output programming**

| Option | Factory setting | Available options (see 7.08B) |
|---|---|---|
| [Out1] | [ 1 ] Fuel Solenoid (energized to run) | [ OFF ] [ 1 ] - [ 31 ] |
| [Out2] | [ 2 ] Start Solenoid (energized to start) | [ OFF ] [ 1 ] - [ 31 ] |
| [Out3] | [ 3 ] Pre-glow | [ OFF ] [ 1 ] - [ 31 ] |
| [Out4] | [ 4 ] Horn (common alarm output) | [ OFF ] [ 1 ] - [ 31 ] |

*We do not recommend to change the settings of Out 1 & Out 2. You can not do it via pushbuttons. To adjust these settings you have to use the software for control & monitoring (contact us). You can change the settings of Out 3 & Out 4 at anytime using the pushbuttons.*

**> Table 7.08B - Output Options Table: [Option] & description**

| | | | |
|---|---|---|---|
| **[ OFF ]** | Output not active | **[16]** | Engine Belt Break Shutdown |
| **[ 1 ]** | Fuel Solenoid | **[17]** | Maintenance Service Timeout |
| **[ 2 ]** | Start Solenoid | **[18]** | Fail To START Shutdown |
| **[ 3 ]** | Pre-glow (glow -plugs) | **[19]** | Fail To STOP Shutdown |
| **[ 4 ]** | Alarm (Horn) | **[20]** | P.0 timing (delay to start the engine) |
| **[ 5 ]** | Stop Solenoid | **[21]** | P.1 timing (delay to stop the engine) |
| **[ 6 ]** | Contactor of the Generator (KG) | **[22]** | Be1 in OFF MODE (Status) |
| **[ 7 ]** | Engine Running  Status | **[23]** | Be1 in MANUAL MODE (Status) |
| **[ 8 ]** | PURGE (gas engine valve control) | **[24]** | Be1 in AUTO MODE (Status) |
| **[ 9 ]** | Under-Over Speed Shutdown | **[25]** | Be1 in TEST MODE (Status) |
| **[10]** | Oil Pressure Alarm or Sensor failure | **[26]** | Engine Protection Mode |
| **[11]** | Temperature Alarm or Sensor failure | **[27]** | Automatic Periodic Test |
| **[12]** | Fuel Level Alarm or Sensor failure | **[28]** | Warm UP timing |
| **[13]** | Shutdown Alarm 1/2/3/4 | **[29]** | Cooling down timing |
| **[14]** | Warning Alarm 1/2/3/4 | **[30]** | Over-Under Voltage Shutdown |
| **[15]** | Low Battery Auto Start Mode | **[31]** | Over-Under Frequency Shutdown |

**> Table 7.09 - Oil Pressure Sensor Settings (Note^)**

| Display | Parameter | Default | Range |
|---|---|---|---|
| **[ Pr1]** | Pressure | **[ 0.0]** Bar | 0 up to 20 Bar |
| **[-r1-]** | Resistance | **[ 10]** Ohm | 0 up to 2000 Ohm |
| **[Pr.2]** | Pressure | **[ 2.0]** Bar | |
| **[-r2-]** | Resistance | **[ 51]** Ohm | |
| **[Pr.3]** | Pressure | **[ 4.0]** Bar | |
| **[-r3-]** | Resistance | **[ 86]** Ohm | |
| **[Pr.4]** | Pressure | **[ 6.0]** Bar | |
| **[-r4-]** | Resistance | **[ 122]** Ohm | |
| **[Pr.5]** | Pressure | **[ 8.0]** Bar | |
| **[-r5-]** | Resistance | **[ 152]** Ohm | |
| **[Pr.6]** | Pressure | **[ 10.0]** Bar | |
| **[-r6-]** | Resistance | **[ 180]** Ohm | |

**>Table 7.10 - Fuel Level Sensor (Note^) 7.11      > Table Coolant Temperature Sensor (Note^)**

| Display | Parameter | Default | Range | | Display | Parameter | Default | Range |
|---|---|---|---|---|---|---|---|---|
| **[FUE1]** | Fuel Level | **[ 0 ]** | 1% up to | | **[°C1.1]** | Temperature | **[ 128]** | 0°C up to |
| **[-r1-]** | Resistance | **[ 10]** | 99% | | **[-r1-]** | Resistance | **[ 19 ]** | 250°C |
| **[FUE2]** | Fuel Level | **[ 0]** | 0 Ohm up | | **[°C1.2]** | Temperature | **[ 115]** | 0 Ohm up |
| **[-r2-]** | Resistance | **[ 10]** | to 2000 | | **[-r2-]** | Resistance | **[ 26]** | to 2000 |
| **[FUE3]** | Fuel Level | **[ 0]** | Ohm | | **[°C1.3]** | Temperature | **[ 90]** | Ohm |
| **[-r3-]** | Resistance | **[ 10]** | | | **[-r3- ]** | Resistance | **[ 46]** | |
| **[FUE4]** | Fuel Level | **[ 0]** | | | **[°C 4]** | Temperature | **[ 80]** | |
| **[-r4-]** | Resistance | **[ 10]** | | | **[-r4- ]** | Resistance | **[ 67]** | |
| **[FUE5]** | Fuel Level | **[ 50]** | | | **[°C 5]** | Temperature | **[ 70]** | |
| **[-r5-]** | Resistance | **[ 95]** | | | **[-r5- ]** | Resistance | **[ 95]** | |
| **[FUE6]** | Fuel Level | **[ 99]** | | | **[°C 6]** | Temperature | **[ 40]** | |
| **[-r6-]** | Resistance | **[ 180]** | | | **[-r6- ]** | Resistance | **[ 287]** | |

**> TABLE 7.12 - Oil Temperature Sensor (Note^)      > TABLE 7.13 - Canopy Temperature Sensor (Note^)**

| Display | Parameter | Default | Range | Display | Parameter | Default | Range |
|---|---|---|---|---|---|---|---|
| [°C2.1] | Temperature | [ 128] | 0°C up to 250°C 0 Ohm up to 2000 Ohm | [°C3.1] | Temperature | [ 128] | 0°C up to 250°C 0 Ohm up to 2000 Ohm |
| [-r1-] | Resistance | [ 19 ] | | [-r1-] | Resistance | [ 19 ] | |
| [°C2.2] | Temperature | [ 115] | | [°C3.2] | Temperature | [ 115] | |
| [-r2-] | Resistance | [ 26] | | [-r2-] | Resistance | [ 26] | |
| [°C2.3] | Temperature | [ 90] | | [°C3.3] | Temperature | [ 90] | |
| [-r3- ] | Resistance | [ 46] | | [-r3- ] | Resistance | [ 46] | |
| [°C2.4] | Temperature | [ 80] | | [°C3.4] | Temperature | [ 80] | |
| [-r4- ] | Resistance | [ 67] | | [-r4- ] | Resistance | [ 67] | |
| [°C2.5] | Temperature | [ 70] | | [°C3.5] | Temperature | [ 70] | |
| [-r5- ] | Resistance | [ 95] | | [-r5- ] | Resistance | [ 95] | |
| [°C2.6] | Temperature | [ 40] | | [°C3.6] | Temperature | [ 40] | |
| [-r6- ] | Resistance | [ 287] | | [-r6- ] | Resistance | [ 287] | |

*Note^: the resistance values can be set upward or downward; use different settings for each point of the table*

## Section 8.0 - Alarms, Warnings and Shutdowns
The Be1 features Shutdowns (the engine stops) and Warnings (the engine will continue to run) and provides:
  **A)** - a general indication of alarm presence by means of the message [ALAr.] on the display
  **B)** - 4 configurable outputs with several options for each (see 7.08A-B)
  **C)** - 4 LEDs to indicate: Oil pressure, Temperature, Fail to start and Over speed shutdown.
  **D)** - display messages indicating warnings and shutdowns (see Table 4.1)
  **E)** - an [ACK] pushbutton to silence the Horn
To silence the HORN, push the [ACK] pushbutton or wait for the **[P39]** to expire (see section 7.04). If the **[P39]** is set to **[OFF]**, the only way to silence the Horn is by means of the [ACK] pushbutton.
To browse the alarm memory push the [→] pushbutton. In order to display the details of the alarm, push the [ ? ] pushbutton. To clear the alarm from the panel, remove the cause of the alarm and then press the [ O ] pushbutton. The table 4.10 in the section 4.0 indicates all alarms.

## Section 8.1 – Event History

The Be1 features an Event History register able to records the last 100 shut-downs. To read the contents of the Event History, follow the instructions:

**A)** – Remove the DC power supply (battery voltage)        **B)** – Push and hold the [?] pushbutton

**C)** – Apply the power supply (holding the [?] pushbutton)

**D)** – Release the [?] pushbutton when the display turns on

**E)** – The display will indicate the address of the last event ([E 01]). Push the the [?] pushbutton to display the name of the Event (see table 4.10)

**F)** – You can select an event from [E 01] to [E100] using the [←] and [→] pushbuttons. [E100] indicates the oldest event. [E01] indicates the latest one.

**G)** – To display the code of the Event, push the [?] pushbutton (see table 4.10).

It is not possible to cancel the Event History.

## Section 9.0 Hour Counter

To clear or pre-load the counter, use the following instructions:

**1) -** Enter the programming mode as indicated in the section 6.10 & 6.20

**2) -** Select the parameter [P48] by means of the [←] or [→] pushbutton.

**3) -** Press the [ ? ] and [ I ] (or [ AUTO ]) pushbuttons simultaneously to set a value. If you set [0], you will cancel the [h-counter]. If you set a value between 1 to 50000, you will pre-set the counter.

<u>Follows steps 4A) or 4B)  according to your needs.</u>

**4A) -** Press and hold the [ACK] and [→] pushbuttons simultaneously until the [SaVE] message appears (for about 5 seconds); the Be1 saves the hour counter in the memory and will enter the OFF  mode.

**4B) -** Press the [ O ] pushbutton to exit the procedure without modifying the counter.

## Section 10.0  Engine Running Detect (Charger Alternator)

The Be1 inhibits the starter motor when the engine starts running. When the engine is not running, the voltage of the terminal D+/WL of the charger alternator is 0V. As soon as the Be1 starts the engine, a voltage appears in the D+/WL terminal (0,8 to 2,5V). When the engine starts running, the voltage of the D+/WL terminal increases by up to 3V-6V. When the engine runs, the voltage reaches 14V (28V) needed to charge the battery. The safest point to disconnect the starter motor is between 6V to 10V. The default parameter of [P24] is 8.0V. This value is recommended for engines using 12V batteries. For 24V batteries, we recommend that you set the threshold to 16V.

For a safe calibration, be sure that the green 'START-ON' LED on the front panel is off during all of the starting attempts. The Charger Alternator voltage can be displayed  as indicated in the section 3.0. For Flywheel chargers, the reading is not accurate. The [P24] setting, in this case, expresses only a proportional factor.

The Be1 also uses the Speed measurement to disconnect the crank motor. The parameter [P26] sets the crank termination.

***NOTE: THE 'START-ON' LED MUST BE LIT WHEN THE ENGINE RUNS. USING THE ENGINE WITHOUT THIS SIGNAL MAY BE DANGEROUS.***

Normally, using a diesel engine, we recommend enabling the BELT BREAK protection. This is accomplished by programming a voltage setting in the [P25]. To test the efficiency of the protection, disconnect the terminal D+ from the charger alternator and connect to ground the RUN+ terminal. This protection is delayed by 20 seconds.

## Section 11.0 - Calibration and Memory Reset

**11.1 - Enter the calibration**    To enter the calibration follow the instructions.

**1) -** Make sure the Battery voltage is over 7,0Vdc and select the MAN  mode. Start the engine
**2) -** Push and hold the [←] and [ACK] pushbuttons simultaneously, for about 5 seconds, until the message [-CAL] appears; release the buttons.
**3) -** If the Be1 programming is password protected, the message [4242] will appear; follow the instructions on the table 6.11. If the Be1 is not password protected, the parameter [voLt] will appear on the display and you can proceed as indicated in the section 11.2.

### 11.2 - Calibrating a measurement   (Note: to exit the procedure, push the[ O ] pushbutton at anytime)

**1) -** Press the [←] or [→] pushbutton to select a 'Parameter' (see Table 11.2). Start the engine if necessary.
**2) -** Press the [ ? ] pushbutton to display the reading of the measurement.
**3) -** Press the [AUTO] (or [ I ] ) to adjust the reading according to an external reference.
**4) -** When finished, push the [ ? ] again to display the 'Parameter'. Select another 'Parameter' to calibrate by pushing the [←] or [→] pushbutton.  Choose the option 5A, 5B or 5C.
**5 A ) -** Exit the procedure without saving by pushing the [ O ] pushbutton.
**5 B ) -** Restore the factory original calibration: press and hold the [←] and [→] pushbuttons simultaneously until the display will blink twice. You are required to save the setting as indicated in step 5C.
**5 C ) -** Save the calibration: push and hold the [ACK] and [→] pushbuttons simultaneously until the [SaVE] message appears (approximately 5 seconds); the Be1 saves the calibrations, and will enter the MANUAL mode.

| Table 11-2, List of the Measurements in Calibration Mode | | | |
|---|---|---|---|
| 'Parameter' | Description | Unit | Recommended Calibration Range |
| **[voLt]** | Voltage of the generator | Volt | 200 up to 400 Vac |
| **[HErt]** | Frequency of the generator | Hertz | 40 up to 60Hz |
| **[rPM]** | Speed of the engine | R.P.M. | 1400 up to 2000 R.P.M. |
| **[bAtt]** | Battery voltage | Vdc | 12 up to 27 Vdc |
| **[bAr]** | Oil Pressure | Bar | 2 Bar up to 4 Bar |
| **[FUEL]** | Fuel Level | % | 80% - 90% |
| **[°C-1]** **[°C-2]** **[°C-3]** | Coolant Temperature Oil Temperature Canopy Temperature | °C | 80°C up to 100°C |
| **[MEM]** | Memory initialization | - | - |

### 11.3 - Memory Reset

- Stop the engine if running
**-** Enter the calibration as explained in section 11.1
**-** Select  the message  **[MEM]** on the display, push and hold the [ACK] pushbutton for about 30 seconds until the message [Init] appears. The Be1 downloads the default settings (see section 7.0), clears the hour-count, restores the factory calibrations and will enter the MANUAL  mode.

## Section 12.0 Basic Troubleshooting Guide

 The Basic Troubleshooting Guide provides you a guide to solve problems that you may experience with the Be1. We recommend that you disconnect the unit from the panel and set up the troubleshooting application circuit as indicated in section 12.1. This procedure must be carried out by qualified personnel only.

**! W A R N I N G !** **High voltage is present inside this instrument. To avoid electric-shock hazard, operating personnel must not remove the protective cover. Do not disconnect the grounding connection. Any interruption of the grounding connection can create an electric shock hazard. Before making external connections, always ground the Be1 first by connecting the control panel to ground.**

## Section 12.1 Troubleshooting wiring diagram
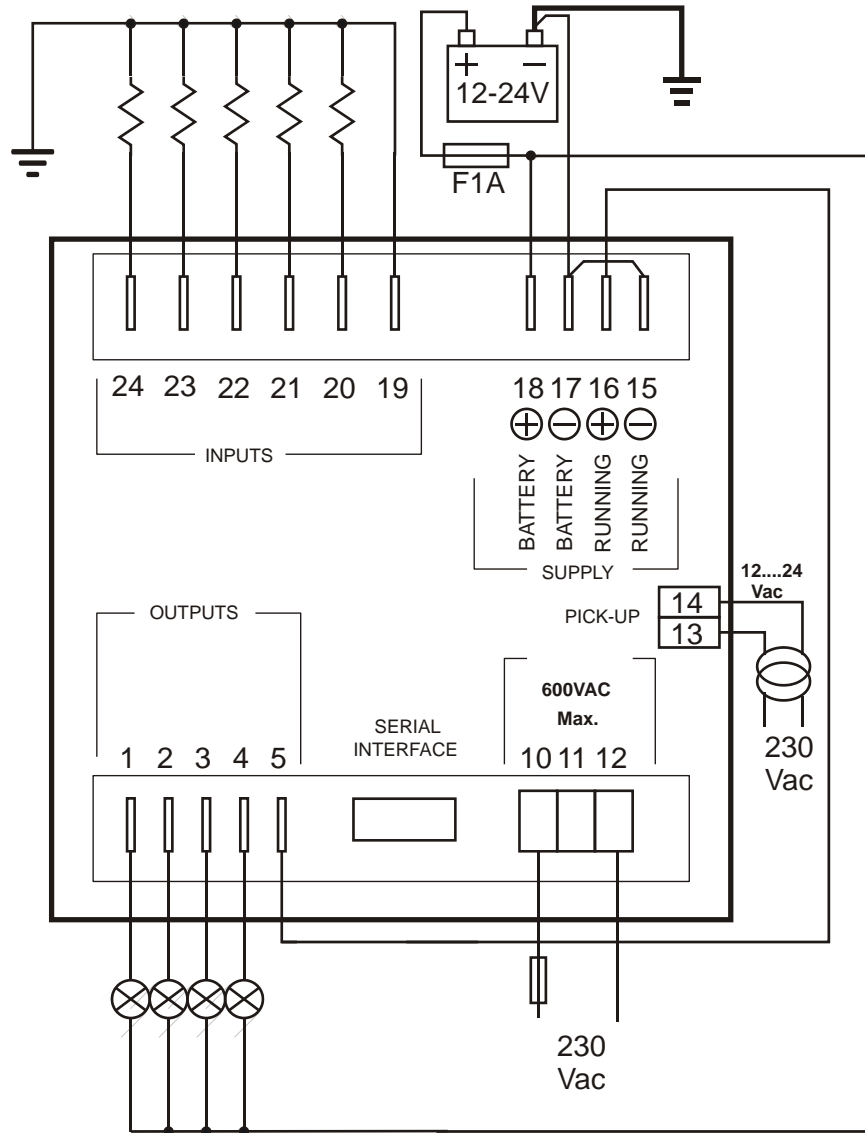
Follow the instructions:

**A) -** Remove the battery power supply; disconnect all connectors and terminals
**B) -** Push and hold the [ACK] pushbutton, apply the Vdc power supply; all LEDs and Display turn on.
**C) -** Release the button after the verification of all indicators; the LEDs will turn off and the message [- in -] will be displayed. If the message [Gnd] appears, you are required to connect the terminal #19.

***NOTE - At this stage of the TEST, if the display indicates one of the codes contained in Table 12.1 or 12.2, the Be1 is damaged and should be returned for service.***

### 12.1 Testing the Inputs

**D) -** Connect the terminal #19 to ground.
**E) -** Connect, one by one, to the battery minus, the inputs #20 to #24 . For each input, a code will be displayed according to Table 12.1. If more than one input is connected (if in short circuit for example), the display indicates the messages in sequence.

**Table 12.1**

| Terminal number (function) | Display Code | NOTE |
|---|---|---|
| #24  (Input 5) | [ inP 5] | If the message [Gnd ] appears, you are required to connect the terminal #19 to ground. |
| #23  (Input 4) | [ inP 4] | |
| #22  (Input 3) | [ inP 3] | |
| #21  (Input 2) | [ inP 2] | |
| #20  (Input 1) | [ inP 1] | |

### 12.2 Testing the Pushbuttons

**A) -** Push the pushbuttons [ACK] pushbutton until the message [butt] will appear.
**A) -** Push the pushbuttons on the front panel one by one. The display will show a message according to Table 12.2. As soon as you release all buttons, the message [butt] will be displayed.

**Table 12.2: Pushbuttons true table**

| Pushbutton | Display Code |
|---|---|
| **[ACK]** | [ ACK ] |
| **[ ? ]** | [ ?] |
| **[←]** | [ LEFt ] |
| **[→]** | [ rIGH ] |
| **[AUTO]** | [ Auto ] |
| **[ I ] [ I ]** | [ StAr ] |
| **[ O ] [ O ]** | [StoP ] |

### *12.3 Testing the Outputs*

**A) -** Push the [ACK] pushbutton, for about 10 seconds, until the message [-out ] appears.
**B) -** Plug the terminals #1 - #4, as indicated in the **Table 12.1**. At this stage, if a lamp turns on, the Be1 is damaged and should be returned for service.
**C) -** Push a button on the front panel. According to **Table 12.3**, the display should indicate the proper message and the lamp turns on. If a lamp fails to turn on, the Be1 is damaged and should be returned for service.

**Table 12.3: Outputs true table**

| Pushbutton | Terminal Output | Display Code | NOTE |
|---|---|---|---|
| [ O ] | # 1 | **[out1]** | Activates the output 1 |
| [ I ] | # 2 | **[out2]** | Activates the output 2 |
| [AUTO-TEST] | # 3 | **[out3]** | Activates the output 3 |
| [→] | # 4 | **[out4]** | Activates the output 4 |

### *12.4 Testing the Sensors*

**A) -** Push the [ACK] pushbutton for about 3 seconds until the message [SEnS] appears.
**B) -** Apply 5 resistors of known value (+/- 1%) in a range 100 Ohm up to 1000 Ohm as indicated in **Table 12.1**.
**C) -** Push the pushbuttons according to the Table 12.4. The display will indicate the value in OHM as long as you push and hold the button. If the indication is 3% or over (that the expected value), the Be1 is damaged and should be returned for service.

**Table 12.4: Sensor true table**

| Pushbutton | Display indication (°) | Terminal number | Function | Note |
|---|---|---|---|---|
| [ O ] | **[XXXX]** | # 20 | | |
| [ I ] | **[XXXX]** | # 21 | | Recommended resistor range (+/-1%) 100-1000 Ohm |
| [AUTO] | **[XXXX]** | # 22 | Configurable Sensor | |
| [→] | **[XXXX]** | # 23 | | |
| [←] | **[XXXX]** | # 24 | | |

(°)Note. [XXXX] indicates a 4 digit number. In case the input is open, the display will indicate 2500

### *12.5 Testing the Pick-up and Measurements*

**A) -** Push the [ACK] pushbutton for about 3 seconds until the message [MEAS] appears.

**Table 12.5: Table of the Measurements**

| Pushbutton | Display indication (°) | Terminal number | Function | Note |
|---|---|---|---|---|
| [ O ] | **[UXXX]** | 10, 12 | Generator Voltage | - |
| [ I ] | **[HXX.X]** | 10, 12 | Frequency Voltage | - |
| [AUTO] | **[XXXX]** | 13, 14 | Frequency of the Pick-up input | Number of the teeth set to 60 automatically |
| [→] | **[cXX.X]** | 15, 16 | Charger alternator voltage | - |
| [←] | **[XXXX]** | 17, 18 | Battery Voltage | - |

(°)Note. [XXXX] indicates a 4 digit number. In case the input is open, the display will indicate 9999

## Section 13.0 General Specifications

**Supply Voltage :** 5.5Vdc to 36Vdc.   **Supply Current:** 50 mA up to 100mA
**Dimensions:** 96mm X 96mm X 47mm,     **Panel Cut-out:** 91mm X 91mm, indoor operation
**Operating Temperature range:** -25 deg C up to +70 deg C. **Humidity Range:** 5% up to 95% non-condensing.
**Weight:** 250 gr., **Vibration:** 40mm/sec
**General Design:** 89/336 EEC, 89/392 EEC, 73/23 EEC, 93/68 EEC, IEC 68-2-6 **Certification:** CE
**Static Outputs:** Output Current: 300mA/100Vdc (internal AUTO-reset 700mA Fuse is provided). Logic: negative.
**Pick-up Input:** Voltage input: 2 - 60Vac. Max Frequency: 10KHz
**Digital Inputs**  Open circuit V: 10Vdc (12V supply) or 22Vdc (24V supply) - Closed circuit current: 15mAdc maximum.
**Charger Alternator Monitoring:**  Operating Voltage up to 36Vdc. Vdc reading accuracy +/- 5%. Excitation Power: max 3W
**Generator Monitoring:** Operating Voltage up to 600Vac. Vac reading accuracy +/- 1,5%. frequency: 20-70Hz
**Serial Interface:** RS485 (it supports the MODBUS protocol, see section 17.0).

**[*]** *NOTE: the sum of the total output current may not exceed 1A at 70°C*

## Section 14.0 Software Upgrades & Revisions

| Software Versions | Date | User manual | Description |
|---|---|---|---|
| V.3.38 | 03-May- 24 | V.338 | Lo Battery Auto Start |

## Section 15.0 Application Notes

 **- Programming of the scheduler (example: 20 minutes every 7 days)**
**A) -** Enter the 'Program Mode' and set [P44] to [ 7 ] days. **B) -** Set [P45] to [ 20'] and save the programming
**C) -** Follows the instructions of the section 15.12
**- Adjusting the starting moment**
**A) -** Disconnect the battery and wait for the desired start time (using an external clock reference).
**B) -** Connect the battery and select the 'AUTO'  mode. The Be1 will start the engine after the programmed days.
The engine will run for 20 minutes.

*IMPORTANT NOTICE  If the Vdc supply is removed, the Be1 looses the counts of the days. If the supply restores, the Be1 starts to count the days from zero. To synchronize the periodic start, follow the instruction of the section 15.12.*

## 15.20 – Remote Start and Low Battery Auto Start

The Be1 monitors the input for remote start in AUTO mode of operation only. Follow the instructions:
- program the parameters P0 and P1 (see table 7.00) according to you needs (default=5 sec).
- program the option [12] for an input. INPUT 4 is programmed with this option as default..
- program the polarity of the contact: [n.o.] to start the engine when you close the switch or set option [n.c.] to start the engine when you open the switch (default =[n.o.]).

## 15.21 Low battery auto start set up

- remove the DC supply. Push and hold the button **[0]**, at the same time turn the supply on; hold the button until the message **[Lobt]** is displayed.
-simultaneously push **[?]** and **[AUTO]** to increase the low battery threshold or push **[?]** and **[ I ]** to decrease the setting. Release the buttons.
- push the button  **[→]** to select the **[Hibt]** threshold. Simultaneously push **[?]** and **[Auto]** to increase the high battery threshold or push **[ ? ]** and **[ I ]** to decrease the setting. Release the buttons.
-to save the settings, push and hold together the buttons **[ACK]** and  **[→]** for about 5 second.
-enter the programming mode and program an output (example 4) with the option **[15]**. You may add a delay before starting and stopping by adjusting the parameters **[P0]** and **[P1]** (see Table 7.00). Save your settings by simultaneously pushing the  **[ACK]** and **[→]** pushbuttons for about 5 seconds
-connect output 4 to the remote input (example input 4)

## 16.00 - Sensor connections
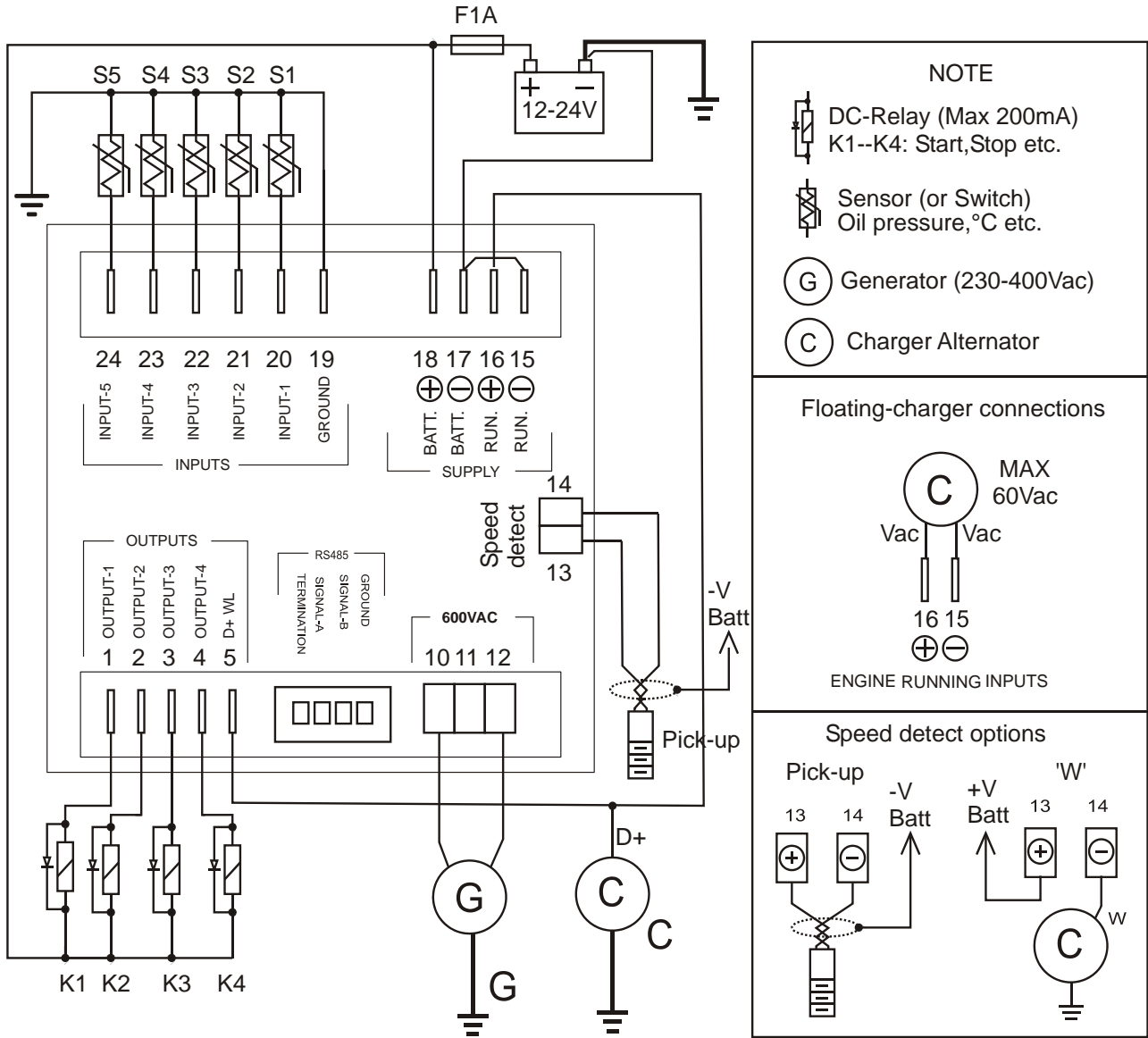
**WIRING OF RESISTIVE SINGLE ENDED SENSORS**



**(*) Separation of AC and DC cables is strongly recommended**
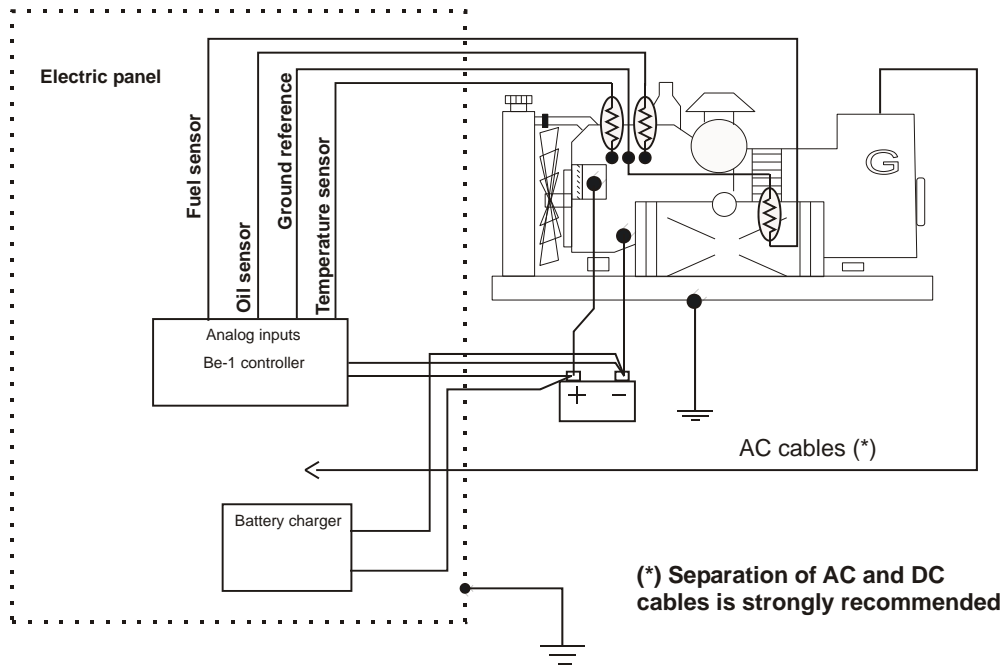
NOT RECOMMENDED WIRING
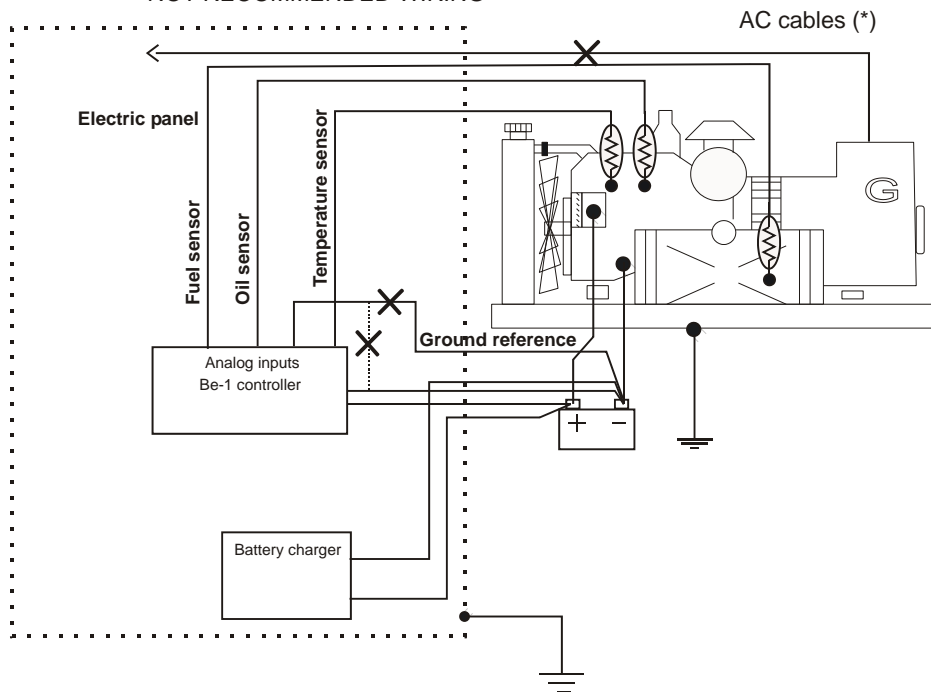
**17.00  -  Typical application wiring diagram & serial interface specification.**

**!!  W A R N I N G !!    Relays and solenoids connected to the Be1 must be suppressed using flywheel diodes or  suppression devices as indicated below**



## Serial Interface Specification

The Be1- RS485 supports the MODBUS protocol via a RS485 port. Software for remote control and monitoring is provided free of charge. To get the MODBUS manual or the remote control software, contact us at bernini@bernini-design.com

## *Section 18.0: Rear view and dimensions*
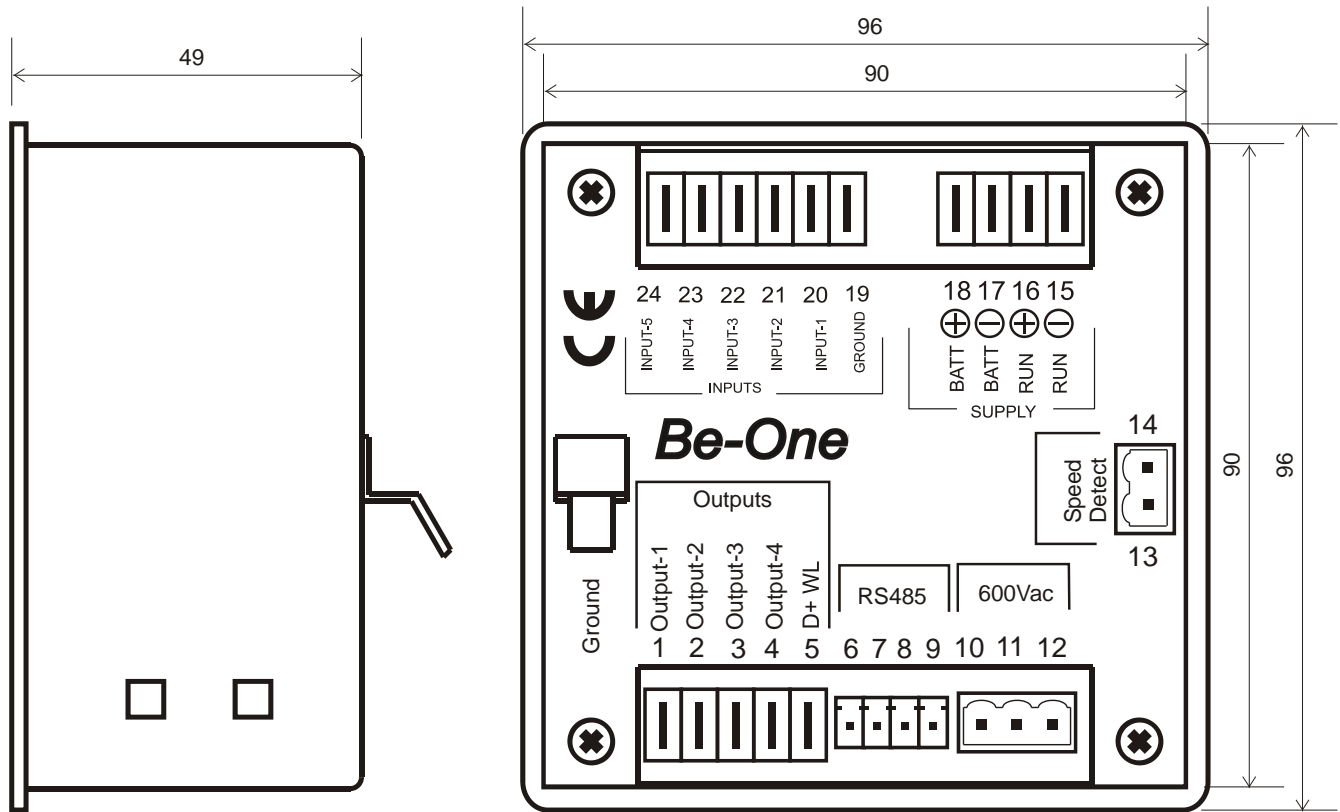


**Note: Drawing subject to change without notice**

## *Section 19.0: Description of the connections*

| Terminal | Description | Note | Section |
|---|---|---|---|
| 1 | Programmable output '1' | 300mA Active 'Low' | 7.08A-B |
| 2 | Programmable output '2' | 300mA Active 'Low' | |
| 3 | Programmable output '3' | 300mA Active 'Low' | |
| 4 | Programmable output '4' | 300mA Active 'Low' | |
| 5 | Alternator Excitement output | Positive Output 3W | |
| 6 | RS485 Termination | See RS485 standard | See Be1 MODBUS user manual |
| 7 | RS485 Signal A | " | |
| 8 | RS485 Signal B | " | |
| 9 | RS485 Common Ground | " | |
| 10 | V Generator input Line or Neutral | Connect to the generator (max 600Vac) | 7.01 |
| 11 | Not used | | |
| 12 | V Generator input Line or Neutral | | |
| 13 | Pick-up  (connect to +Vbatt in case you use  W of the charger alternator) | Connect to pick-up, or the W terminal of the charger alternator | 7.02 |
| 14 | Pick-up (or W terminal of the charger alternator) | | |
| 15 | Engine Running Minus detect | Connect to ground | 10.0 |
| 16 | Engine Running Plus detect | D+ or W.L. sensing | |
| 17 | Supply Battery minus connection | Internal 300mA fuse | 13.0 |
| 18 | Supply +12 or +24V Battery connection | | |
| 19 | Common Sender ground sense | Ground connection | 17.0 |
| 20 | Programmable input  '1' | Sensor or Switch | 7.07A-B |
| 21 | Programmable input  '2' | | |
| 22 | Programmable input  '3' | | |
| 23 | Programmable input  '4' | | |
| 24 | Programmable input  '5' | | |