

Be142 INSTALLATION MANUAL

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Warranty

Bernini Design SRL (hereinafter "BD") warrants that Be142 shall be free from defect in material or workmanship for a period of 3 years from the BD delivery date. BD shall, at its discretion, repair or replace the product without charge. BD shall return the Be142 to the buyer with the Default parameters at no extra charge. The buyer shall provide sufficient information on any alleged defects in the product, so as to enable BD to determine their cause and existence. If the Be142 is not defective, or the product is defective for reasons other than covered by this warranty, the buyer will be charged accordingly. This warranty shall not apply if the Be142 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, and negligence in use or handling.

This purchase is non-refundable.



This equipment complies with EMC protection requirements

WARNING!! High voltage is present inside the Be142. To avoid electric-shock hazard, operating personnel must not remove the protective cover. Do not disconnect the Earth connection. The Be142 can start the engine at anytime. Do not work on equipment, which is controlled by the Be142. 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 Be142 must be suppressed using flywheel diodes or suppression devices as indicated in section 18.0. In case the Vdc supply spuriously introduces spikes over 40 Vdc we recommend placing a 2 A (fast-blow fuse) in series with the terminal #24.

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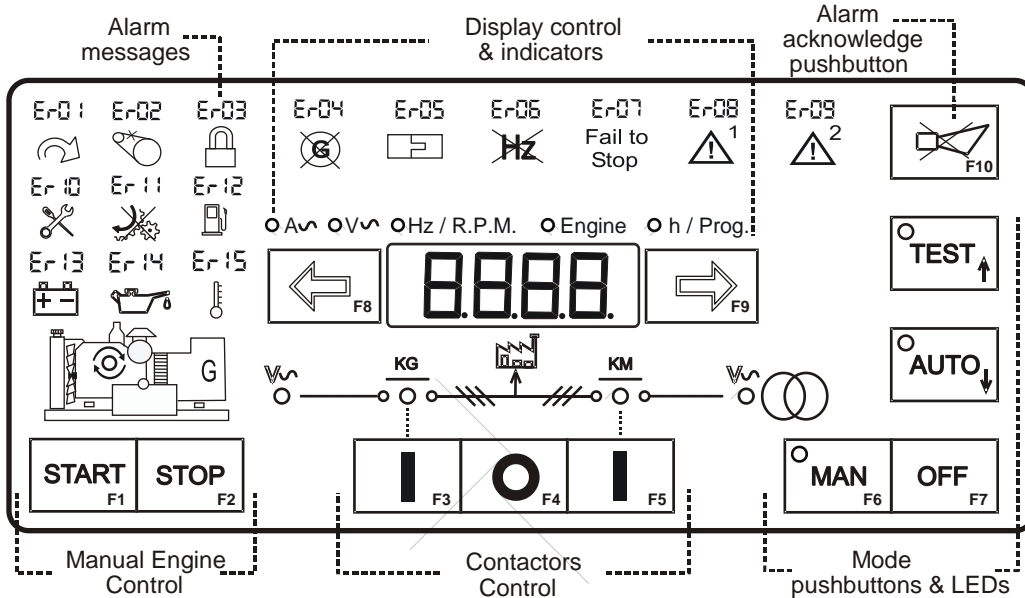
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Section 1.0 Introduction

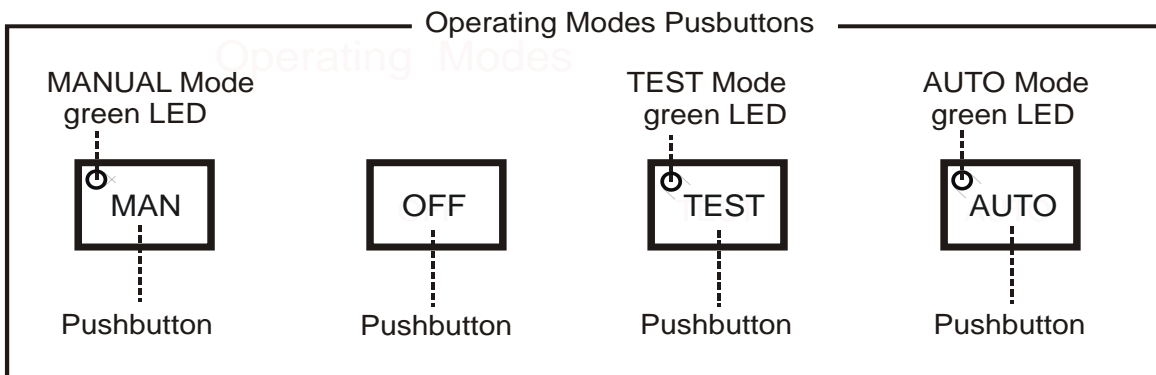
The Be142 integrates a 3-Phase Automatic Mains (or Utility Power if you will) Failure controller and a Generating Set controller. The Be142 provides visual indication by means of LEDs and Displays for Engine & Electrical parameters, Alarms and Status of the contactors. It provides a RS485 (MODBUS-RTU) interface for remote control & monitoring. You can read the current of the load by connecting the CTs on load side. Figure 1 presents the panel layout.

Figure 1: Front Panel layout



Section 2.0: Selection of the Mode of operation

When you apply the DC supply, the display indicates for a second, the version of the software (example 1.0.01) and the date of production (example 22.12, that means week 22 of year 2012). The modes of operation are selected by pushbuttons and indicated by means of green LEDs (indicators) as shown below:



Note: default programming for input #36 is 'normally closed '. To inhibit the alarm [Er.08] you are required to connect terminal #36 to ground (Emergency input).

Every time the power supply is switched on, if the BE142 was in TEST or AUTO prior to power down, the Be142 returns to the "AUTO" mode. In the other cases, the Be142 will enter the OFF mode. The following table indicates the modes of operation.

Mode	Pushbutton	Indication	Section
OFF	[OFF]	All turned Off, dot on display	2.1
MANUAL	[MAN]	Green LED on the button	2.2
AUTO	[AUTO]	Green LED on the button	2.3
TEST	[TEST]	Green LED on the button	2.4
PROGRAMMING	-	The display shows [ProG]	6.0
CALIBRATION	-	The display shows [-CAL]	12.0
TROUBLESHOOTING	-	Various messages	13.0

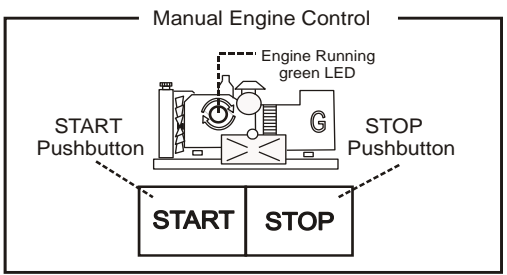
2.1 OFF mode

Push the button [OFF] to enter the OFF mode. The OFF mode clears the fault alarms and allows you to read or program parameters (section 6.0). The Display and LEDs are turned off and a dot on the display will blink slowly. Push one of the pushbuttons on the front panel to energise the display.

2.2 MANUAL mode

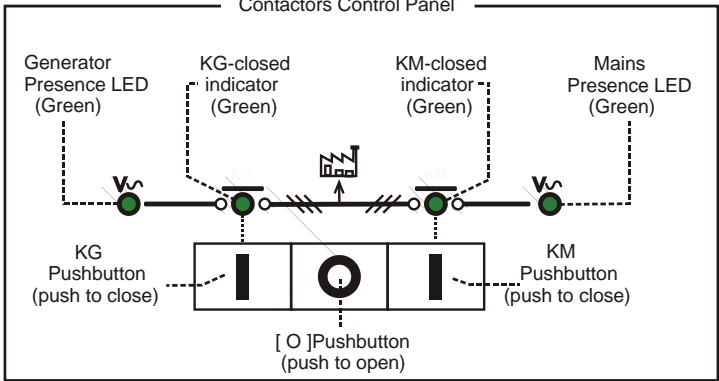
Note: default programming for input #36 is 'normally closed '. To inhibit the alarm [Er.08] you are required to connect terminal #36 to ground (Emergency input).

The MANUAL mode allows manual control of the Engine and Contactors.

Manual Engine Control	Instructions
 <p>The diagram shows a control panel with two pushbuttons labeled 'START' and 'STOP'. Above the 'START' button is a green LED labeled 'Engine Running green LED'. The panel is connected to an engine and generator system.</p>	<p>Push the [MAN] pushbutton to select the MANUAL mode. Push the [START] pushbutton until engine starts; the display indicates the message [. . .] during the starting attempts (and [! ! !] during the preheat). When the engine is running, the green LED turns on. To stop the engine, push the [STOP] pushbutton until the [StOp] message appears on the display. If the engine has already stopped, it is possible to reset the STOP sequence by pressing the [STOP] pushbutton.</p>

2.21 Contactors: Manual control

To control the contactors follow the instructions:

Contactors Control Panel	Instructions
<p>WARNING! DANGEROUS VOLTAGE INSIDE THE CONTROLLER OR THE PANEL MAY BE PRESENT WHEN THE INDICATORS ARE OFF. THE INDICATORS MAY BLINK WHEN VOLTAGE OR FREQUENCY ARE OUTSIDE LIMITS (see Mains & Generator settings).</p>  <p>The diagram shows a control panel with four green LEDs: 'Generator Presence LED (Green)', 'KG-closed indicator (Green)', 'KM-closed indicator (Green)', and 'Mains Presence LED (Green)'. Below the LEDs are three pushbuttons: 'KG Pushbutton (push to close)', '[O] Pushbutton (push to open)', and 'KM Pushbutton (push to close)'. The panel is connected to a generator and mains supply.</p>	<p>Select the MANUAL mode, start the engine (see above) and wait for voltage presence. Push the [I] (KG) pushbutton to close the contactor of the Generator. To transfer the Load to Mains, push the [I] (KM) pushbutton (the [KG] will open). To open a Contactor, push the [O] pushbutton. In manual mode the CHANGEOVER timer lasts one second. The green indicators of voltage (Mains or Generator) blink when the voltage or frequency is out of limit (see the Mains and Generator parameters on table 701-7.02). The indicators are off when the volatge is lower that 48Vac. NOTE: for heavy applications, you can connect external pushbuttons for Start & Stop (see Input options [27]-[28] in table 7.07).</p>

2.3 AUTO mode

Note: default programming for input #36 is 'normally closed'. To inhibit the alarm [Er.08] you are required to connect terminal #36 to battery minus (Emergency input).

Push the [AUTO] pushbutton until the green LED illuminates. The engine starts when the Be142 detects a Mains failure (see table 7.01A). The Contactor of the MAINS (KM) opens after the BREAKER timing. After the warm-up time, if the Voltage and Frequency are within the settings, the contactor of the Generator (KG) will close. If the Mains restores, the KG will open. The KM will close following a programmed changeover timing. The Engine will stop after a cooling down time (see tables 7.02 and 7.03). If the engine shuts down, the KM closes independently of the Mains status if the [P.48] is [ON] (NFPA-110 mode), otherwise the KM will close only if the Mains is within programmed settings. In AUTO mode, the Be142 will periodically test the engine if the parameters [P.41] and [P.42] have been programmed. During this test, the green LED of the AUTO mode will continue to blink. In AUTO mode, the Be142 can start and stop the engine according to programmed inputs (see Tables 7.06 and 7.07 options [10] & [11] for example).

Note: when the Mains (or Generator) is in stable condition, the green LED 'V' is permanently ON. When voltage or frequency is outside limits, the green indicator 'V' blinks slowly (see table 7.01-7.02).

2.4 TEST mode

Push the [TEST] pushbutton until the green LED illuminates. The Be142 starts the engine and transfers the load to the Generator if [P.17] is [on]. To stop the engine, select the AUTO mode (if Mains is present) or select the OFF mode. If you push the [STOP] pushbutton when the Be142 is in AUTO or TEST, the [Er.09] will energise. To clear the alarm, select the OFF mode (section 8.0).

2.5 PROGRAM mode

The PROGRAM mode allows parameter programming and modifications of settings. A password can be set to protect the panel from unauthorised access (see 6.0).

2.6 CALIBRATION mode

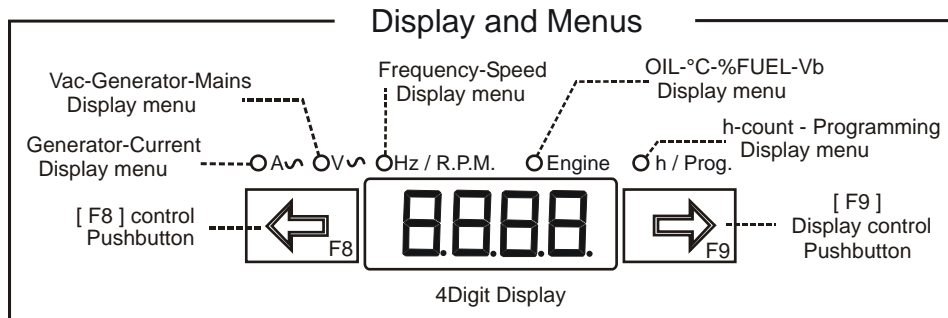
The CALIBRATION mode allows calibration of all analogue measurements (see 12.0).

2.7 TROUBLESHOOTING mode

The TROUBLESHOOTING mode is used to diagnose system faults (see 13.0).

Section 3.0 Display measurements

The Be142 features a 4 Digit display, two pushbuttons and 5 yellow LEDs as indicated below.



Use [←F8] and [F9→] to select a menu. Use [ACK-F10] (see the layout in section 1.0) to display the name of the parameter. The OFF mode of operation shuts down the display and turns on the dot on the right side of it. Push a button to turn on the panel. The following table includes the functions of the display.

Display Function	Display indications (*)	Pushbutton(s)	
Current of the Generator (0 up to 1000A)	[AXXX] Ampere L1 [-XXX] Ampere L2 [_XXX] Ampere L3	[←F8] or [F9→]	A ac menu yellow indicator
	[A -G]	[ACK-F10]	
Voltage of the Generator (60V up to 998V)	[GXXX] Volt L1-L2 [-XXX] Volt L2-L3 [_XXX] Volt L1-L3	[←F8] or [F9→]	V ac menu yellow indicator
	[U -G]	[ACK-F10]	
Voltage of the Mains (60 V up to 998 V). If the Mains is simulated, see option [15] in table 7.07, the display will show the message [n-on]	[nXXX] (V R-S) [-XXX] (V S-T) [_XXX] (L R-T)	[←F8] or [F9→]	
	[U -on]	[ACK-F10]	
Generator Frequency (20Hz up to 70Hz)	[GXXX] Hz	[←F8] or [F9→]	Hz/RPM menu yellow indicator
	[H - G]	[ACK-F10]	
Mains Frequency (20Hz up to 70Hz)	[nXXX] Hz	[←F8] or [F9→]	
	[H - n]	[ACK-F10]	
Speed (600RPM up to 4000RPM)	[XXXX] RPM	[←F8] or [F9→]	Hz/RPM menu yellow indicator
	[SPd]	[ACK-F10]	
Battery Voltage (5.5 Vdc up to 36 Vdc)	[bXX.X] Vdc	[←F8] or [F9→]	<p>Engine yellow indicator</p> <p>NOTE: To enable these indications, you are required to set at least an alarm.</p> <p>EXAMPLE: to display the Oil pressure, program a LOW OIL PRESSURE alarm. If you do not set an alarm, the Be142 understand that you are using only the digital input</p>
	[batt]	[ACK-F10]	
Charger Voltage (3.0 Vdc up to 36 Vdc)	[cXX.X] Vdc	[←F8] or [F9→]	
	[Char.]	[ACK-F10]	
Oil Pressure 0.0 - 20.0 Bar	[PXX.X] Bar	[←F8] or [F9→]	
	[bar]	[ACK]	
Temperature 0° - 250 °C	[XXX °] °C	[←F8] or [F9→]	
	[°C]	[ACK]	
Fuel Level % 0% - 99%	[F XX] %	[←F8] or [F9→]	
	[FUEL]	[ACK-F10]	
Hours-count :0 up to 50,000 h. Over 9999 a dot on the right will appear indicating X10.	[XXXX] h	[←F8] or [F9→]	h/Prog menu yellow indicator
	[Hour]	[ACK-F10]	

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

Section 4.0 Display messages and LOG Events

The Be142 displays alarms (table 4.10) and messages (table 4.20). The presence of alarms is indicated by the blinking message [ALAr.]. Push the [→F9] pushbuttons to display the alarms one by one. Push the [←F8] pushbutton to display additional information (section 8.0).

Table 4.10: Alarm messages

Display Message	Description of the Alarm	Display Message	Description of the Alarm
[Er.01]	Over Frequency Shutdown (see [P.12])	[Er. 14]	Low Oil Pressure Shutdown (Pressure switch connected to input #35)
[Er.02]	Engine Belt Break Shutdown (see [P.26])	[Er. 15]	Temperature Switch Shutdown connected to Input #34. N.O or N.C see P39 page15
[Er.03]	Remote LOCK Shutdown (see 7.07 option [13])	[Hi-C]	Over Current Shutdown or Warning (see [P.13]).
[Er.04]	Alternator Failure Shutdown	[Hi-U]	Over Voltage Shutdown (see [P.10])
[Er.05]	Overload Warning (see 7.07 option [20])	[Lo-U]	Under Voltage Shutdown (see [P.09])
[Er.05]	Overload Shutdown (see 7.07 option [21])	[InP.1]	Input 1 Shutdown / Warning (see 7.07)
[Er.06]	Under Frequency Shutdown (see [P.11])	[InP.2]	Input 2 Shutdown / Warning (see 7.07)
[Er.07]	Fail To STOP Shutdown (see parameter P.34, section 7, table 7.04)	[InP.3]	Input 3 Shutdown / Warning (see 7.07)
[Er.08]	Emergency Shutdown (see parameter N.O or N.C on P.35 page 15)	[InP.4]	Input 4 Shutdown / Warning (see 7.07)
[Er.09]	Emergency Shutdown triggered by Front Panel (Stop or [0] pushbutton)	[-oIL]	Oil pressure warning or sensor failure. Push [←F8] to display the value (see P29).
[Er.10]	Maintenance SERVICE warning (see parameters P44,P45 and P46)	[-°C]	Water temperature warning or sensor failure. Push [←F8] to display the value (see P30).
[Er.11]	Fail To START Shutdown	[FUEL]	Fuel level warning (High or Low) or sensor failure. Push [←F8] to display the value.
[Er.12]	Low Fuel Shutdown (If Low Fuel input, terminal #33, is activated for longer than the P.36 time. See Table 7.04A)	[rEnt]	The rental contract is going to expire (48 hours remaining). Push [←F8] to display the value.
[Er. 13]	Battery Voltage Warning. Push [←F8] to display the value.	[FAIL]	There is an internal failure or memory error in the BE142 controller (see 12.3)

4.20 Miscellaneous messages & description

[rEst]	The Be142 is counting the rest time between the starting attempts	[ProG]	The Be142 is in program mode
[n-on]	MAINS simulated by an input programmed with option [15] (see table 7.07).	[-CAL]	The Be142 is in calibration mode
		[. . . .]	The Be142 is cranking the engine
[' ' ' ']	The Be142 is performing the pre-glow (P22)	[tEst]	The Be142 is in Test mode
[StoP]	The Be142 is stopping the engine (P25)	[- - - -]	Measurement out of range or disabled
[U-uP]	Warm up time of the engine before closing the contactor of the generator (P23).	[CoolL]	The engine is running off load for cooling.
[dEL]	Delay time before cranking (P.19,table 7.03A)		

4.30 LOG EVENTS

To have access to the LOG events follow the instructions:

- Push the [OFF] button.
- Push and hold the [STOP] button until the message [Hist.] appears on display (approx. 10 seconds).
- Release the [STOP] button.
- Using [←F8] and [F9→] you can browse the events E01 up to E100.
- Push the [STOP] button to display the code of the EVENT (see table 4.10). The message [----] indicates 'No Event' in the memory.
- To quit the LOG EVENTS push the [OFF] button.

Note: to cancel the LOG EVENTS push the [←F8] and [F9→] buttons simultaneously until the display blinks one time (approx. 10 seconds).

Section 5.0 LED indicators

5.1 Lamp and Display Testing

To test the LEDs and DISPLAY push the [OFF] pushbutton; the display turns off (OFF mode of operation). Push and hold the [←F8] and [F9→] pushbuttons simultaneously. The LEDs and DISPLAYS remain energised as long as the pushbuttons are pressed and held together.

WARNING! VOLTAGE INSIDE THE CONTROLLER MAY BE PRESENT EVEN IF THE LED INDICATORS ARE OFF.

Section 6.0 Programming and reading the parameters

We recommend that you use the BE142 - SCADA software for programming. You can also program the controller by using the pushbuttons on the front fascia. The 4-digits display indicates the code of a parameter and its setting. Section 7.0 lists all parameters. To enter the Programming Mode, use the following instructions. To use a password see sections 6.40, 6.50 and 6.60. Monitoring via TCP-IP is also allowed.

6.10 Enter the Programming Mode

- 1) - Provide a voltage from a battery supply of *over 11.5 V*. Push the [OFF-F7] pushbutton to enter the OFF mode; the LEDs and display turn OFF (the dot on the right side of the display will start to blink)
- 2) - Push and hold the [F9→] and [ACK-F10] pushbuttons simultaneously for about 5 seconds, until the yellow Led [h/Prog.] starts to blink. When the display indicates [ProG], release the buttons.
- 3) - If the Be142 is ***password protected*** (*), the messages [PASS] and [42.42] will appear in sequence; you are required to follow the instructions of Table 6.11. If the Be142 is ***not password protected***, the programmable parameter [P.0] will be displayed and the Be142 is ready for programming (section 6.12, step-2).

(*) Note: the password consists of 2 groups of digits ranging from 0 to 99. Example: [12.34]; 12 is the 2-digit code on the left, and 34 is the 2-digit code on the right.

TABLE 6.11: Enter the PASSWORD

- 1) - Push [TEST] or [AUTO] in order to choose the proper code (between 00 and 99, except 42).
- 2) - Push [F9→] to select the 2 digits on the right side.
- 3) - Push [TEST] or [AUTO] in order to choose the proper code (between 00 and 99, except 42).
- 4) - Push [ACK-F10] to confirm the password; if the password is ok, the Be142 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 correct password.

If you lose the password, the unit must be returned for service.

6.12 Programming

- 1)** - Enter the Programming mode (see section 6.10).
- 2)** - Press the [←F8] or [F9→] pushbutton to select a parameter (see the list in section 7.0).
- 3)** - To adjust the parameter, press [START-F1] and [TEST ↑] (or [AUTO ↓]) simultaneously.
(example: [P.10] = [500]; the Overvoltage limit is set to 500 Volt. If you want to set 450, push and hold [START-F1] and [AUTO ↓] until the display indicates 450)
- 4)** - To adjust additional features of the same parameter, press [STOP-F2] and [TEST ↑] (or [AUTO ↓]) simultaneously (example: [P.10] [10"]; the timing delay of Overvoltage is set to 10 seconds)
- 5)** - Press the [←F8] or [F9→] pushbutton to select another parameter.
- 6)** - Follow the instructions of section 6.13 or 6.14 according to your needs.

6.13 Saving

Press and hold the [ACK-F10] and [F9→] pushbuttons simultaneously until the [SaVE] message appears (approximately 5 seconds); the Be142 saves the settings and will enter the OFF mode. You can select the mode of operation as indicated in section 2.0.

Note: if the memory fails, the message [FAIL] will appear. Try again to save or remove the power supply. If the message persists, the Be142 is damaged and should be returned to Bernini Design for repair.

6.14 Exit without Saving

Press the [OFF] pushbutton to enter the OFF mode without saving the parameters. You can select a mode of operation as indicated in section 2.0.

6.20 Re-programming Default settings

The parameters of the Be142 are programmed in factory with default settings (section 7.0). To restore them, enter the Programming Mode (section 6.10). When the message [P.0] appears, follow the instructions:

- 1)** - Press and hold the [←F8] and [F9→] pushbuttons simultaneously until the display blinks twice. Select option 2A or 2B according to your needs.
- 2A)** - Press the [OFF] pushbutton to exit the procedure without saving the parameters.
- 2B)** - Press and hold the [ACK-F10] and [F9→] pushbuttons simultaneously until the [SAVE] message appears (approximately 5 seconds); the Be142 saves the settings and the display will indicate [P0]. Push the [OFF] pushbutton in order to enter the OFF mode.

6.30 Reading the parameters

To read the parameter settings, follow the instructions:

- 1)** - Press the [OFF] pushbutton until the LEDs and display turn off (OFF mode of operation).
- 2)** - Push the [←F8] or [F9→] pushbutton to select a parameter (section 7.0).
- 3)** - Push [START-F1] to display the setting of the parameter (example: [P.10] > [450]; the Overvoltage limit is set to 450 Volt).
- 4)** - Push [STOP-F2] to display the setting of the sub-parameter (example: [P.10] > [2"]. The timing delay of Overvoltage is set to 2 seconds).
- 5)** - Push the [←F8] or [F9→] pushbutton to select another parameter.

NOTE: if the pushbuttons remain inoperative for more than 5 minutes, the Be142 enters the OFF mode.

6.40 Activating the password

- 1) - Enter the programming mode as indicated in section 6.10.
- 2) - When the display shows [P.0], push the [ACK-F10] pushbutton for about 10 seconds until the display shows [PPPP]. When the display will indicate [4242], release the button. The two digits on the right will blink.
- 3) - Push [TEST] or [AUTO] in order to choose a code.
- 4) - Push [←F8] to select the 2 digits on the left side. Repeat step 3) in order to choose a code
- 5) - Press the [OFF] pushbutton if you want to exit the procedure without activating the password.
- 6) - Press and hold the [ACK-F10] and [F9→] pushbuttons simultaneously until the [SAVE] message appears; the Be142 saves the password and remains in PROGRAM mode. To exit, push the OFF pushbutton. You can change the password at anytime as indicated in section 6.50.

6.50 Changing the password

- 1) - Enter the programming as indicated in section 6.10 and table 6.11. When the display indicates the parameter [P.0], push and hold the [ACK-F10] pushbutton for about 10 seconds until the messages [PP.PP] and [4242] appear. The two digits on the right side of the display will blink.
- 2) - Push [TEST] or [AUTO] in order to choose a code.
- 3) - Push [←F8] to select the 2 digits on the left side. Repeat step 3) in order to choose a code
- 4) - Press the [OFF] pushbutton if you want to exit the procedure without activating the password.
- 5) - Press and hold the [ACK-F10] and [F9→] pushbuttons simultaneously until the [SAVE] message appears (approximately 5 seconds); the Be142 saves the password and remains in PROGRAM mode. To exit, push the OFF 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 the parameter [P.0], push and hold the [ACK-F10] pushbutton, for about 10 seconds until the display indicates in sequence [PPPP] and [4242]. The two digits on the right side will start to blink. The code [4242] disables the use of the password. Follow step 3 of 4 according to your needs.
- 3) - Press the [OFF] pushbutton if you no longer want to remove the password (exits the procedure).
- 4) - Press and hold the [ACK-F10] and [F9→] pushbuttons simultaneously until the [SAVE] message appears (approximately 5 seconds); the Be142 saves the code [4242] that disables the password. The Be142 remains in PROGRAM mode. To exit, push the OFF pushbutton.

6.70 Loosing the password

In case you loose the password follow the steps:

- remove the supply
- push and hold the [ACK] and [>] push buttons
- apply the supply; a 4 digit code appears on the display
- send the code to support@bernini-design.com together with your credentials.
- you will receive the new password in 24 hours.

Section 7.0 Programmable Parameters

The programmable parameters are divided into classes as indicated below.

- | | |
|-------------------------------------|-----------------------------|
| 7.01 - A, B - Mains Failure Control | 7.07 - Input Options List |
| 7.02 - A, B - Generator Parameters | 7.08 - Programmable Outputs |
| 7.03 - A, B - Engine Parameters | 7.09 - Output Options table |
| 7.04 - Alarms Options | 7.10 - Oil Pressure Sensor |
| 7.05 - Miscellaneous | 7.11 - Temperature Sensor |
| 7.06 - Programmable Inputs | 7.12 - Fuel level Sensor |

Table 7.01A - Mains Failure Control Note: [xx "] = seconds, [xx '] = minutes, [xxh] = hours				
Parameter Code & Description		Default	Min	Max
P.0	Mains Contactor control (KM). If the Mains Failure persists for more than [P.0] (seconds or minutes), the Mains contactor will open and the [P.1] timer will start to count. The Mains contactor will close only after the [P.2] timing.	[5'']	0	59 mins
P.1	Mains Failure time. After the [P.0] timing (see above), the engine will start if the Mains Failure persists for the [P.1] time.	[5'']	0	23 h
P.2	Mains Restore time. The Be142 transfers the Load to the Mains once the MAINS is stable for at least [P.2] (seconds, minutes or hours). During [P.2], the engine will continue to run ON-LOAD. After [P.2], the [P.24] timer will take place to run the engine OFF-LOAD (the contactor of the generator will open).	[5'']	0	23 h

NOTE: WHEN VOLTAGE OR FREQUENCY IS OUTSIDE LIMITS, THE GREEN INDICATORS BLINKS SLOWLY. DANGEROUS VOLTAGE MAY BE PRESENT INTO THE CONTROLLER EVEN IN CASE THE INDICATORS ARE OFF

Table 7.01B - Mains Failure Control Note: [xx "] = seconds, [xx '] = minutes, [oFF] = disabled					
Parameter Code & Description		Default	Min	Max	Options
P.3	Contactors changeover. This timing introduces a delay between the switching of the contactors.	[2'']	0.1secs	15.0secs	-
P.4	Under voltage limit. If the Phase-to-Phase voltage falls under this limit, the [P.0] timer will energise.	[320]	60V	998V	[oFF]
P.5	Over voltage limit. If the Phase-to-Phase voltage rises above the limit, the [P.0] timer will energise.	[500]	60V	998V	[oFF]
P.6	Under Hz limit. If the Phase-to-Phase frequency falls under the limit, the [P.0] timer will energise.	[47.0]	20.0Hz	70.0Hz	[oFF]
P.7	Over Hz limit. If the Phase-to-Phase frequency rises above the limit, the [P.0] timer will energise.	[53.0]	20.0Hz	70.0Hz	[oFF]
P.8	Phase Selection. It allows 3-Phase or Single Phase control of voltages and currents. The following options are available: [0] 3 Phase V Mains & 3 Phase Generator [1] 3 Phase V Mains & 1 Phase Generator [2] 1 Phase V Mains & 3 Phase Generator [3] 1 Phase V Mains & 1 Phase Generator [4] 1 Phase V Mains & 1 Phase Generator (X1.73)(*) See section 16.30 for details and connections.	[0]	0	3	-
		Apply option [4] when, despite the fact that you connect Mains and Generator in single phase, you prefer to read the equivalent 3-phase system reading. Please note that this reading is accurate as long as the neutral voltage is perfectly balanced. You may be required to adjust Over/Under voltage limits.			

Table 7.02A - GENERATOR PARAMETERS Note: [xx "] = seconds, [xx '] = minutes, [oFF] = disabled						
Parameter Code & Description		Mode (°)	Default	Min	Max	Options
P.9	Under voltage (AUTO & TEST mode)	1	[320]	60 V	998 V	[oFF]
	Under voltage delay		[6"]	1 sec	15 secs	-
P.10	Over voltage	2	[500]	60 V	998 V	[oFF]
	Over voltage delay		[2"]	1 sec	15 secs	-
P.11	Under Hz (AUTO & TEST mode)	1	[47.0]	20.0 Hz	70.0 Hz	[oFF]
	Under Hz delay		[6"]	1 sec	15 secs	-
P.12	Over Hz	2	[53.0]	20.0 Hz	70.0 Hz	[oFF]
	Over Hz delay		[1"]	1 sec	15 secs	-
P.13 (*)	Current limit Warning	3	[oFF]	10 A	999 A	[oFF]
	Current delay Warning		[1"]	1 sec	15 mins	-
P.14 (*)	Over current shut down	1	[oFF]	10 A	999 A	[oFF]
	Over current shut down delay		[1"]	1 sec	15 mins	-

(°) Mode1: The engine shuts down after a cooling down time ([P.24]). (°) Mode2: The engine shuts down without a cooling down time.

(°) Mode3: The Be142 provides a warning if the parameters rise above the setting for the specified timing.

(*) The setting is allowed in step of 5 Amps by using the pushbutton on Be142 or in step of 1Amp by using programming by Computer.

NOTE: WHEN VOLTAGE OR FREQUENCY IS OUTSIDE LIMITS, THE GREEN INDICATORS BLINKS SLOWLY. VOLTAGE MAY BE PRESENT INTO THE CONTROLLER EVEN IN CASE THE INDICATORS ARE OFF

Table 7.02B - GENERATOR PARAMETERS Note: [oFF] = disabled, [on] = enabled					
Parameter Code & Description		Default	Min	Max	Options
P.15	Alternator failure options. The alarm [E04] energises if the voltage (or the frequency) is lower than the setting of P.9 (or P11) for more than 150 seconds.	[oFF]	-	-	[on] [oFF]
P.16	Alternator number of Poles. Options [2] or [4] allow you to display the engine speed.	[4]	2	4	-
P.17	Generator Contactor Control. The option [off] inhibits Load transfer to the generator in TEST mode (or remote TEST) when MAINS is present.	[oFF]	-	-	[on] [oFF]
P.18	CT size (/5Aac).	[500]	50 A	1000 A	-

Table 7.03A - ENGINE PARAMETERS Note: [xx "] = seconds, [xx '] = minutes, [oFF] = disabled					
Parameter Code & Description		Default	Min	Max	Options
P.19	Crank delay (it delays the cranking)	[2"]	0	15 secs	-
P.20	Crank time (maximum cranking time if the engine fails to start during the attempt)	[5"]	1 sec	15 secs	-
P.21	Rest time (pause of time between starting attempts)	[5"]	3 secs	15 secs	-
P.22	Pre-glow time (see 'Modes' for the mode of operation)	[oFF]	1 sec	59 mins	[oFF]
	Modes (see the figure below)	[1]	-	-	1-2-3-4
P.23	Engine Warm up time	[15"]	0	59 mins	-
P.24	Engine Cooling time	[15"]	0	59 mins	-
P.25	Stop Solenoid timing (Energized to stop)	[15"]	1 sec	59 mins	-
P.26	Crank termination setting (Charger Alternator)	[8.0]	3.0 V	30.0 V	[oFF]
	Belt break setting (Charger Alternator)	[8.0]	3.0 V	30.0 V	[oFF]
P.27	Crank termination setting (Generator Voltage)	[70]	60 V	998 V	[oFF]
P.28	Crank termination (Generator Frequency)	[25.0]	20.0 Hz	70.0 Hz	[oFF]

Table 7.03B - ENGINE PARAMETERS Note: [xx "] = seconds, [xx '] = minutes, [oFF] = disabled					
Parameter Code & Description		Default	Min	Max	Options
P.29	Low Oil pressure warning	[oFF]	0.1 Bar	20.0 Bar	[oFF]
P.30	High engine temperature warning	[oFF]	40° C	250° C	[oFF]
P.31	Crank attempts (numbers)	[3]	3	15	-
P.32	Purge timing (for Gas fuelled engine)	[1"]	1 sec	15 secs	-

Table 7.04 - ALARM OPTIONS Note: [xx "] = seconds, [xx '] = minutes, [oFF] = disabled					
Parameter Code & Description		Default	Min	Max	Options
P.33	Alarm bypass (for Oil, Temperature, Auxiliary1-2-3-4 alarms)	[5"]	2 secs	90 secs	-
P.34	Fail to stop alarm control (oFF = inhibited, on = enabled)	[oFF]	-	-	[oFF]/ [on]
P.35	Emergency contact type (Input #36). It generates the alarm [Er.08].	[n.c.]	-	-	[n.o. / n.c.]
P.36	No fuel bypass timeout (it starts to count when you activate the Low Fuel Input, terminal #33. It shuts down the engine after timeout.)	[5']	15 secs	99 mins	[oFF]
P.37	Low fuel % limit (WARNING ONLY)	[oFF]	1%	99%	[oFF]
P.38	High fuel % limit (WARNING ONLY)	[oFF]	1%	99%	[oFF]
P.39	Engine Temperature Switch type (input # 34)	[n.o.]	-	-	[n.o. / n.c.]

Table 7.05 - MISCELLANEOUS Note: [xx "] = seconds, [xx '] = minutes, [oFF] = disabled					
Parameter Code & Description		Default	Min	Max	Options
P.40	EJP time	[5"]	1 sec	99 mins	-
P.41	Periodic Test interval (see 16.10)	[oFF]	2 hours	9999 h	[oFF]
P.42	Periodic Test duration (see 16.10)	[5']	1 min	99 mins	-
P.43	Test timeout ([OFF]= no timeout). It limits the running time in case of TEST initiated by a MODBUS command. Idle speed control (see application note in section16.60)	[5']	1 min	99 mins	[oFF]
P.44 P.45 P.46	Maintenance SERVICE 1 / 2 / 3 (for the use, see section 16.40) The alarm generated by these parameters only provides a warning.	[oFF]	1 h	9999 h	[oFF]
P.47	Rental Contract Setting (see section 16.40)	[oFF]	1 h	9999 h	[oFF]
P.48	NFPA - 110 Level 1&2	[on]	-	-	[on]/[oFF]
P.49	RS485 Node Address	[1]	1	127	-
P.50	Horn timeout (see section 8.0)	[5"]	5secs	15 mins	[oFF]
P.51	Hour Counter set (over 9999, a dot will appear to indicate a value multiplied by10. Example 3250. will indicate 32500 hours. In this case the resolution is 10 hours).	[0]	0 h	50.000	[oFF]

Table 7.06 - Programmable inputs (see options list in table 7.07)

Parameter		Options	Default	Parameter		Options	Default
[InP.1] (terminal 32)	Option available	[0] - - - [28]	[2]	[InP.3] (terminal 30)	Option available	[0] - - - [28]	[10]
	Contact type	[n.o.][n.c.]	[n.o.]		Contact type	[n.o.][n.c.]	[n.o.]
[InP.2] (terminal 31)	Option available	[0] - - - [28]	[13]	[InP.4] (terminal 29)	Option available	[0] - - - [28]	[15]
	Contac_t type	[n.o.][n.c.]	[n.o.]		Contact type	[n.o.][n.c.]	[n.o.]

Table 7.07 - Input Options List

Option		Option	
[0]	Off: disables the input	[14]	Generator simulation ON
[1]	Immediate Stop	[15]	Mains Simulated ON
[2]	Bypass and Stop	[16]	Front panel LEDs test
[3]	Cooling and Stop	[17]	Horn silence
[4]	Bypass+Cooling and Stop	[18]	Display Right Pushbutton
[5]	Warning only (^)	[19]	Display Left Pushbutton
[6]	Bypass and Warning	[20]	Overload Input Warning
[7]	Remote Manual Mode (^^)	[21]	Overload Input Shutdown
[8]	Remote Auto Mode (^^)	[22]	KG Forced closed
[9]	Remote Off Mode (^^)	[23]	KM Forced closed
[10]	Remote Engine Test	[24]	KG LED Feedback
[11]	Remote Generator Test	[25]	KM LED Feedback
[12]	Ejp function	[26]	Idle Engine
[13]	Remote LOCK	[27]	Manual START pushbutton
		[28]	Manual STOP pushbutton

(^) The Be142 detects the alarm if the engine is running

(^^) We recommend the use of an AUTO-OFF-MAN switch

7.08 - Programmable Outputs

Parameter Code & description		Default	Parameter Code & description		Default	Options
[Out.1]	Output 1 (terminal 6)	[39]	[Out.3]	Output 3 (terminal 4)	[54]	see 7.09
[Out.2]	Output 2 (terminal 5)	[28]	[Out.4]	Output 4 (terminal 3)	[57]	see 7.09

Table 7.09 - Output Options Table

Option & description		Option & description	
[0]	Output is disabled	[32]	Alarm from Input 2: Shutdown/Warning
[1]	Under Frequency Shutdown	[33]	Alarm from Input 3: Shutdown/Warning
[2]	Over Frequency Shutdown	[34]	Alarm from Input 4: Shutdown/Warning
[3]	Over Current Shutdown	[35]	Cumulative Oil Alarms
[4]	Over Current Warning	[36]	Cumulative Temperature Alarms
[5]	Overload Warning or Shutdown (^^^)	[37]	Cumulative Alternator Alarms
[6]	Over Voltage Shutdown	[38]	Common Fuel Alarms
[7]	Under Voltage Shutdown	[39]	HORN
[8]	Alternator Failure Shutdown	[40]	Crank Delay (Start Warning)
[9]	Low Oil Pressure Warning	[41]	Presence of Nominal Mains Parameters
[10]	Low Oil Pressure Shutdown	[42]	Mains Failure Timing
[11]	Oil Sender Failure Warning	[43]	Mains Restore Timing
[12]	High Temperature Warning	[44]	KG Status
[13]	Temperature Switch Shutdown	[45]	KM Status
[14]	Temperature Sender Failure Warning	[46]	Pre-glow MODE 1/2/3/4
[15]	Low Battery Voltage Warning	[47]	PURGE (gas engine valve control)
[16]	High Battery Voltage Warning	[48]	RENT<48h
[17]	Low Fuel Shutdown (switch)	[49]	RENT=0h (Expired)
[18]	Fuel Low Warning (sensor)	[50]	Engine Running Status
[19]	Fuel Reserve Warning (switch)	[51]	Presence of Nominal Generator Voltage
[20]	Fuel high Warning (sensor)	[52]	Be142 in OFF MODE (Status)
[21]	Fuel Sender Failure Warning	[53]	Be142 in MANUAL MODE (Status)
[22]	Emergency Stop Shutdown (Er08)	[54]	Be142 in AUTO MODE (Status)
[23]	Stop Pushbutton Used in AUTO (Er09)	[55]	Be142 in TEST MODE (Status)
[24]	Maintenance SERVICE 1 (Er10)	[56]	Be142 in LOCK MODE (Status)
[25]	Maintenance SERVICE 2 (Er10)	[57]	Be142 runs the Automatic Periodic Test
[26]	Maintenance SERVICE 3 (Er10)	[58]	Cooling Timing
[27]	Engine Belt Break Shutdown	[59]	Warm up Timing
[28]	Fail To START Shutdown	[60]	Cycling mode (Logical OR of engine running and stop solenoid)
[29]	Fail To STOP Shutdown	[61]	Start Pilot repeat output (it repeats the crank output terminal #9)
[30]	Idle Speed (see section 16.60)	-	--
[31]	Alarm from Input 1: Shutdown/Warning	-	--

(^^^) If an input is configured with option [20] or [21] (see table 7.07)

Table 7.10 - Oil Pressure Sensor Settings

Display	Parameter	Default	Range
[Pr.1]	Pressure	[0.0] Bar	0 up to 20 Bar 0 up to 2000 Ohm
[-r1-]	Resistance	[10] 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	

7.11 - Temperature Sensor				7.12 - Fuel Level Sensor			
Display	Parameter	Default	Range	Display	Parameter	Default	Range
[°C1]	Temperature	[128]	0 °C up to 250 °C 0 Ohm up to 2000 Ohm	[FUE1]	Fuel Level	[0]	0% up to 99% 0 Ohm up to 2000 Ohm
[-r1-]	Resistance	[19]		[-r1-]	Resistance	[10]	
[°C 2]	Temperature	[115]		[FUE2]	Fuel Level	[20]	
[-r2-]	Resistance	[26]		[-r2-]	Resistance	[50]	
[°C 3]	Temperature	[90]		[FUE3]	Fuel Level	[50]	
[-r3-]	Resistance	[46]		[-r3-]	Resistance	[100]	
[°C 4]	Temperature	[80]		[FUE4]	Fuel Level	[80]	
[-r4-]	Resistance	[67]		[-r4-]	Resistance	[150]	
[°C 5]	Temperature	[70]		[FUE5]	Fuel Level	[90]	
[-r5-]	Resistance	[95]		[-r5-]	Resistance	[200]	
[°C 6]	Temperature	[40]		[FUE6]	Fuel Level	[99]	
[-r6-]	Resistance	[287]		[-r6-]	Resistance	[250]	

Section 8.0 - Alarms, Warnings and Shutdowns

The Be142 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 for specific alarm indication with more than 40 options (see 7.08 and 7.09)
- C) - symbols on the front panel to indicate the most important alarms
- D) - display messages indicating warnings and shutdowns (see Table 4.1)
- E) - a pushbutton to silence the Horn ([ACK-F10])

Terminal #6 is pre-configured for HORN output (Option 39). A relay and a HORN should be externally provided. To silence the HORN, push the [ACK-F10] pushbutton or wait for the [P.50] to expire (see section 7.05). If the [P.50] is set to [OFF], the only way to silence the Horn is by means of the [ACK-F10] pushbutton.

To browse the alarm memory push the [→F9] pushbutton. To display alarm details, push the [←F8] pushbutton. To clear the alarm from the panel, remove the cause of the alarm and then press the [OFF] pushbutton. Table 4.10 in the section 4.0 indicates all alarms.

Section 9.0 Hour Meter

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

- 1) - Enter the programming mode as indicated in sections 6.10 & 6.20
- 2) - Select the parameter [P.51] by means of the [←F8] or [F9→] pushbutton.
- 3) - Press the [START-F1] and [TEST ↑] to set a value. If you set [0], you will cancel the [h-counter]. If you set a value between 1 and 50000, you will pre-set the counter. Follow steps 4A) or 4B) according to your needs.
- 4A) - Press and hold the [ACK-F10] and [F9→] pushbuttons simultaneously until the [SaVE] message appears (for about 5 seconds); the Be142 saves the hour counter in the memory and will enter the OFF mode.
- 4B) - Press the [OFF] pushbutton to exit the procedure without modifying the counter.

Section 10.0 Be142 for PUMP SETS

If you use the Be142 to control a PUMP SET, we recommend the use of the following settings:

Parameter	Table 10.0: Recommended settings setup
[P.15]	[oFF] (This disables the 'alternator failure alarm')
[Inp.4]	[15] (This selects the Mains Simulation input mode). Connect a switch (or level switch) to terminal #29 in order to control the set by remote
[P.41]	[oFF] (This disables the Periodic Test interval)
[P.0]	[0] (This disables the Breaker delay time)
[P.1]	According to your needs; the engine will start after a delay
[P.2]	According to your needs; the engine will stop after a delay

Section 11.0 Engine Running Detect (Charger Alternator)

The Be142 inhibits the starter motor when the engine starts running. When the engine is not running, voltage in terminal D+/WL of the charger alternator (input #22) is 0 V. As soon as the Be142 starts the engine, a voltage appears in the D+/WL terminal (0.8 to 2.5 V). When the engine starts running, the voltage of the D+/WL terminal increases by up to 3 V - 6 V. When the engine runs, the voltage reaches 14 V (28 V) needed to charge the battery. The safest point to disconnect the starter motor is between 6 V to 10 V. The default parameter of [P.26] is 8.0 V. This value is recommended for engines using 12 V batteries. For 24 V batteries, we recommend that you set the threshold to 16 V.

For safe calibration, be sure that the green 'ENGINE RUNNING' LED on the front panel is off during all of the starting attempts. The Charger Alternator voltage can be displayed in the 'Engine menu' as indicated in the section 3.0. For Flywheel chargers, the reading is not accurate. The [P.26] setting, in this case, expresses only a proportional factor.

The Be142 also uses the output of the Generator in order to disconnect the crank motor. Parameters [P.27] and [P.28] set the crank termination. These parameters do not affect the status of the green 'ENGINE RUNNING' LED. The insertion of switches or breakers in series to terminals #13 and #14 is not recommended.

NOTE: THE 'ENGINE RUNNING' 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 [P.26] sub-menu. To test the efficiency of this protection, disconnect terminal D+ from the charger alternator and connect to ground the #22 terminal. This protection is delayed by 15 seconds.

Section 12.0 - Calibration and Memory Reset

12.1 - Enter the calibration mode To enter the calibration mode follow the instructions.

- 1)** - Make sure the Battery voltage is over 12.0 Vdc and select the MAN mode. Start the engine if you need to calibrate a parameter of the generator or,
- 2)** - Push and hold the [F9→] and [ACK-F10] pushbuttons simultaneously, for about 5 seconds, until the yellow LED [h/Prog.] starts to blink and display indicates [-CAL]; release the buttons.
- 3)** - If the Be142 programming is password protected, the message [42.42] will appear; follow the instructions in table 6.11. If the Be142 is not password protected, the parameter [n1.n2] will appear on the display and you can proceed as indicated in section 12.2.

12.2 - Calibrating a measurement (Note: to exit the procedure push the [OFF] pushbutton at anytime)

- 1)** - Press the [←F8] or [F9→] pushbutton to select a 'Parameter name' (see Table 12.2).
- 2)** - Press the [ACK-F10] pushbutton to display the reading of the measurement (example 395 V).
- 3)** - Press the [TEST ↑] (or [AUTO ↓]) to adjust the reading according to an external reference (example 400 V).
- 4)** - When finished, push the [ACK-F10] again to display the 'Parameter name'. Select another 'Parameter name' to calibrate by pushing the [←F8] or [F9→] pushbutton. When finished, you have 3 options: 5A, 5B or 5C.
- 5 A)** - Exit the procedure without saving by pushing the [OFF] pushbutton.
- 5 B)** - Restore the factory default calibration: press and hold the [←F8] and [F9→] pushbuttons simultaneously until the display blinks twice. You are required to save the setting as indicated in step 5C).
- 5 C)** - Save the calibration: push and hold the [ACK] and [F9→] pushbuttons simultaneously until the [SAVE] message appears (approximately 5 seconds); the Be142 saves the calibrations and remains in Manual mode.

Table 12-2, List of the Measurements

'Parameter'	Description	Unit	Recommended Calibration Range
[n1.n2]	Mains Voltage phase R-S	Volt	300 up to 400 Vac
[n2.n3]	Mains Voltage phase S-T		
[n1.n3]	Mains Voltage phase T-R		
[FrEq]	Frequency (Mains/Generator)	Hz.	45 up to 55 Hz
[L1.L2]	Generator Voltage L1.L2	Volt	300 up to 400 Vac
[L2.L3]	Generator Voltage L2.L3		
[L1.L3]	Generator Voltage L3.L1		
[C 1]	Generator Current L1	Amp	4 up to 5 Aac (C.T. output)
[C 2]	Generator Current L2		
[C 3]	Generator Current L3		
[bAtt]	Battery voltage	Vdc	Voltage of the battery
[bAr] (°)	Oil Pressure	Bar	2 Bar up to 4 Bar
[°C] (°)	Engine Temperature	°C	80 °C up to 100 °C
[FUEL] (°)	Fuel Level	%	80% - 90%

(°)Note: in order to obtain a reading on display you are required to set a value in P29, P30 and P38

12.3 - To clear the Memory

- Remove the supply. Push and hold the [I-F3] & [I-F5] pushbuttons simultaneously and apply the Vdc supply.
- As soon as the message AUTO-TEST appears, release the pushbuttons; the display will indicate [F1].
- Push [F1] and then push, one by one, all pushbuttons indicated by the message on display.
- After pushing the last pushbutton ([AUTO]), the message [-EPP] will appear; wait a few seconds.
- The memory, now, is erased. The Be142 will use the factory-programmed parameters (defaults).
- Remove the supply and re-program the controller according to your need. We always recommend that you program a password in order to limit the access (see section 6.40).

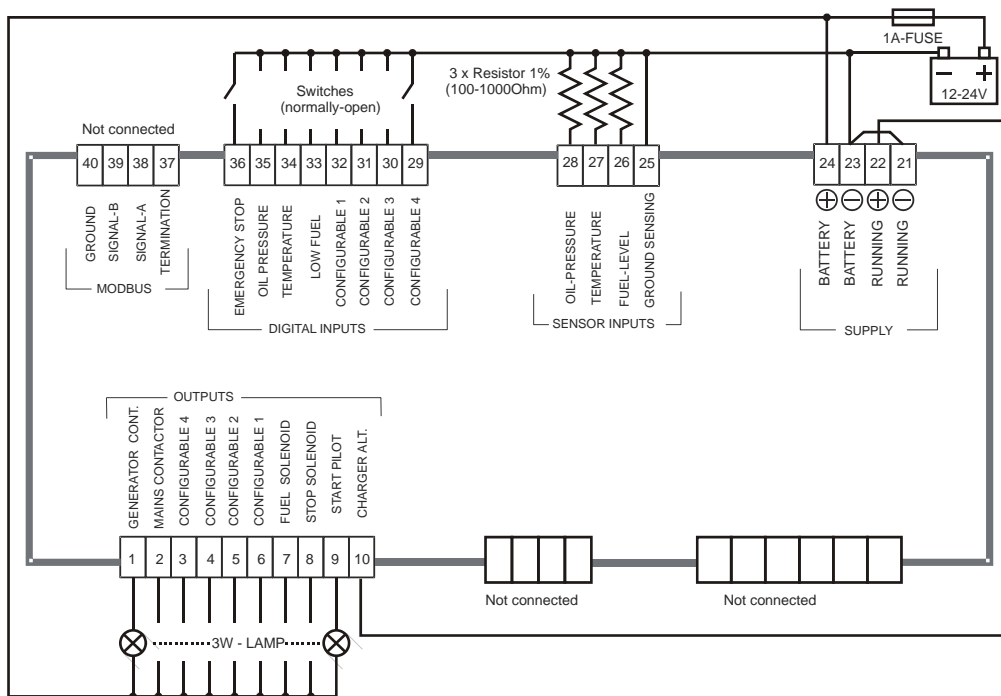
Section 13.0 Troubleshooting Guide

The Basic Troubleshooting Guide is intended to provide you with a guide to problems that you may experience with the Be142. We recommend that you disconnect the unit from the panel and set up the troubleshooting application circuit as indicated in section 13.1. This procedure should only be carried out by qualified personnel.

To exit the Troubleshooting, remove the Vdc supply at anytime

! WARNING ! High voltage is present inside this instrument. To avoid electric-shock hazard, operating personnel must not remove the protective cover. Do not disconnect the Earth connection. Any interruption of the grounding connection can create an electric shock hazard. Before making external connections, always ground the B42 first by connecting the control panel to ground.

Section13.1 - Be142 Troubleshooting circuit



Follow the instructions:

- A) - Remove the battery power supply; disconnect all connectors
- B) - Push and hold the [ACK-F10] pushbutton, apply the Vdc power supply; all LEDs and Display turn on.
- C) - Release the button when you have verified all indicators; the LEDs will turn off and the message [- - -] will be displayed.

NOTE - At this stage of the TEST, if the display indicates one of the codes contained in Table13.1 or 13.2, the Be142 is damaged and should be returned to Bernini Design.

To exit the Troubleshooting, remove the Vdc supply at anytime

13.1 Testing the Pushbuttons

A) - Push the pushbuttons on the front panel one by one. The display will show a message according to Table 13.1. As soon as you release all buttons, the message [- - -] will be displayed.

Table 13.1: Pushbuttons true table

Pushbutton	Display Code	Pushbutton	Display Code
[START-F1]	[F1]	[OFF-F7]	[F7]
[STOP-F2]	[F2]	[AUTO.]	[auto]
[I-F3]	[F3]	[TEST↑]	[tESt]
[O-F4]	[F4]	[←F8]	[F8]
[I-F5]	[F5]	[F9→]	[F9]
[MAN-F6]	[F6]	[ACK-F10]	[F10]

13.2 Testing the Inputs

Push and hold the [ACK-F10] button until the message [-in-] appears. Connect, one by one, inputs #29 to #36 to the battery minus. For each input, a code will be displayed according to Table 13.2. If more than one input is connected together (or some of them in short circuit), the display indicates the messages in sequence.

Table 13.2

Terminal number (function)	Display Code	Terminal number (function)	Display Code
#29 (Input 4)	[inP 4]	#33 (Low fuel)	[FUEL]
#30 (Input 3)	[inP 3]	#34 (Temperature)	[tEMP]
#31 (Input 2)	[inP 2]	#35 (Oil pressure)	[oil]
#32 (Input 1)	[inP 1]	#36 (Emergency)	[EMER]

13.3 Testing the Outputs

- A)** - Push the [ACK-F10] pushbutton, for about 10 seconds, until the message [-out] appears.
B) - Plug the output connector (terminal #1 - #10), as indicated in the section 13.1. At this stage, if a lamp turns on, the Be142 is damaged and should be returned for service.
C) - Push a button on the front panel. According to Table 13.3, the display should indicate the proper message and the lamp turns on. If a lamp fails to turn on, the Be142 is damaged and should be returned for service.

Table 13.3: Outputs true table

Pushbutton	Display Code	Terminal Output	Pushbutton	Display Code	Terminal Output
[START-F1]	[KG]	# 1	[OFF-F7]	[FUEL]	# 7
[STOP-F2]	[KM]	# 2	[DISPLAY-F8]	[StoP]	# 8
[I-F3]	[out 4]	# 3	[DISPLAY-F9]	[StAr]	# 9
[O-F4]	[out 3]	# 4	[AUTO]	none	
[I-F5]	[out 2]	# 5	[TEST]		
[MAN-F6]	[out 1]	# 6	[ACK-F10]		

To exit the Troubleshooting, remove the Vdc supply at anytime

13.4 Testing the senders and analog inputs

A) - Push the [ACK-F10] pushbutton, for about 10 seconds, until the message [SEnS] appears. If the display indicates the message [Gnd] you are requested to connect the ground compensation input terminal #25.

B) - Apply 3 resistors of known value (+/- 1%) in a range 100 Ohm up to 1000 Ohm as indicated in section 13.1.

C) - Push the pushbuttons according to the **Table 13.4**. You should read the value in OHM on the display. The display indicates the reading as long as you push and hold the button. If the value indicated by the display is more than 3% (or less than 3%), the Be142 is damaged and should be returned for service.

Table 13.4: Senders and Analog inputs true table

Pushbutton	Display Code (°)	Terminal number	Function	Recommended range
[I-F5]	[XXXX]	# 26	Fuel Level Sensor	100-1000 Ohm
[O-F4]	[XXXX]	# 27	Temperature Sensor	100-1000 Ohm
[I-F3]	[XXXX]	# 28	Oil Pressure Sensor	100-1000 Ohm
[MAN]	[cXX.X]	#21-22	Voltage of the charger Alternator (*)	10-24 VDC
[OFF]	[bXX.X]	#23-24	Voltage of the Battery	10-24 VDC

(°)Note. [XXXX] indicates a 4-digit number. (*) You are requested to connect terminals 21(Gnd) &22 (Plus battery)

Section 14.0 General Specifications

Supply Voltage [*]:** 4.5 Vdc to 36 Vdc. **Protection:** internal 300 mA thermal fuse. **Supply Current:** 50 mA up to 150 mA (a 2 A fast-blow fuse must be provided in series to the power supply terminal #24). Measurement Precision Vdc: 1%

Dimensions: 224 mm X 105 mm X 68 mm, **Panel Cut-out:** 190 mm X 93 mm, indoor operation

Operating Temperature range: -30 deg C up to +70 deg C. **Humidity Range:** 5% up to 95% non-condensing.

Weight: 500 gr., **Vibration:** 40 mm/sec

General Design: 89/336 EEC, 89/392 EEC, 73/23 EEC, 93/68 EEC, IEC 68-2-6 **Certification:** CE

Static Output Characteristics:

Output Current: 300 mA / 100 Vdc (internal AUTO-reset 700 mA Fuse is provided). Logic: negative.

Mains and Generator Voltage Inputs: Nominal Voltage: 80 Vac up to 600 Vac (permanent & continuously Ph-Ph)

Over voltage: 4 KVac for one second. Measurement precision: +/- 2% [***]. Input impedance: 2 Mega Ohm

Mains and Generator Frequency Measurements: 30-99Hz, Resolution 0,1Hz, Precision/Accuracy 0,2% /0.2%.

Current Transformer Inputs (3-Phases): 10 / 5 Aac up to 1000 / 5 Aac. Maximum Over Current: 8 Aac for 30 seconds.

Measurement precision: +/- 2% [***]. Internal resistance: 0.05 Ohm

Digital /Analog Inputs: Open circuit voltage: 10 /22 Vdc (12 V /24V supply). - Closed circuit current: 15 mAdc max.

Sensors (Analog Inputs): 0-2000 OHM precision +/-2% .(BAR/FUEL%TEMPERATURE reading precision 2%)

Charger Alternator Monitoring: Operating 3-36 Vdc. Vdc reading accuracy +/- 2%. Excitation Power: max 3 W

Hour Run Counter & Timers: internal Quartz Crystal oscillator 4.91Mhz. Resolution 1 second; precision 0,25%

[*] NOTE: the sum of the total output current (# 1- # 10) may not exceed 2 A at 70°C

[**] NOTE: errors can be reduced by using the calibration mode (section 12.0)

[***] NOTE: operations with memory (storing parameters, hours, etc) are allowed only if the Vdc is over 11.5V.

Section 15.0 Software Upgrades & Revisions

Firmware Versions	Date	Description
1.0.01	December 2012	First release
3.0.11	August 2013	Programmable CT Size up to 1000A (It was 2000A)
3.0.12	March 2015	Introduced the reading of the Mains Current. You are required to connect the CTs to LOAD side. Introduced option [4] in single phase mode: the display multiply the voltage by 1.73
3.0.13	April 2015	Over 18VDC supply the Be142 shuts down the display when in Auto mode. It reduces the power consumption when in Standby. The display turns on automatically in case of start or alarms.
3.0.21	June 2016	Miscellaneous minor bugs corrections

Section 16.0 Application Notes

16.10 - Programming of the Automatic Periodic Test (example: 20 minutes every 7 days)

A) - Enter the 'Program Mode' and set [P.41] to [168] hours (168 hours=7days).

B) - Set [P.42] to [20'] and save the programming

C) - Select the AUTO mode

D) - Disconnect the battery and wait for the desired start time (using an external clock reference).

E) - Connect the battery and select the 'AUTO' mode.

The Be142 will start the engine after the programmed hours. The engine will run OFF-LOAD for 20 minutes. If the Mains fails during the automatic periodic test, the Be142 will transfer the load to the generator.

16.11 - Automatic Periodic Test Accuracy

The Be142 does not use an internal real time clock for the programmed hours ([P.41] setting, table 7.05). The user could experiment with shifting the periodic tests (about some minutes a month). To avoid error accumulation, we recommend the following procedures **(D)** and **(E)** as indicated in section 16.10.

***IMPORTANT NOTICE** If the Vdc voltage supply is removed, the Be142 loses count of the days. When the supply restores, the Be142 starts to count the A.P.T. from zero. To synchronize the periodic start follow the above instructions **(D)** & **(E)**.*

16.20 - Interfacing an Autostart with Be142 A.T.S Controller

To use the Be142 as an A.T.S. controller, follow the wiring diagram of the section 17.0. If the engine running output from the AUTOSTART is not available, program the [P.26] to [oFF]. We recommend that you program the [P.31] to [15] (number of attempts) in order to provide proper time for AUTOSTART to start the engine.

16.30 - Single Phase operation

Program the parameter [P.8] with the proper option as indicated in section 7.01B. Connect the Mains to terminals 'R' (Phase) and 'S' (Neutral). Connect the Generator to terminals 'L1' (Phase) and 'L2' (Neutral). Connect the current transformer to terminals 'COM' and 'CT1'. Do not forget to set P4, P5, P9 and P10 (Over/Under Voltage settings) according to your needs.

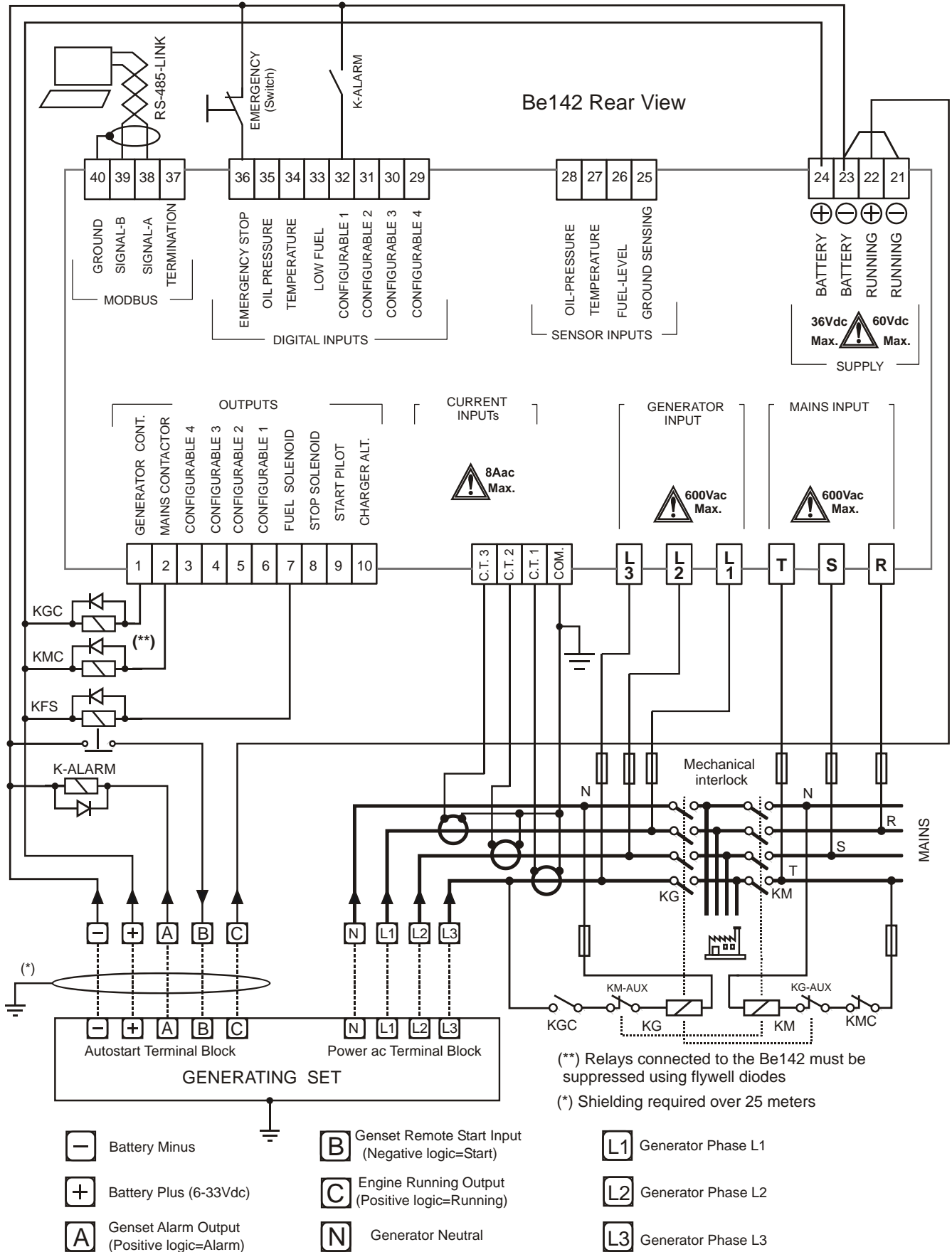
16.40 - Maintenance & Rental Timers

Once a timer expires, the Be142 indicates the [Er.10] on display. To clear the alarm(s), enter the manual mode, push and hold the [ACK-F10] button for at least 20 seconds. You are allowed to modify the programmed Maintenance timer at anytime. Programmable timers are described in section 7, table 7.05A-B (P44, P45 and P46). To restart the Rental Timer, you are required to enter the programming and exit the programming (we recommend that you limit the access to the programming by using a password).

16.50 - Panel & Gen-set Builders Notes:

16.60 – Idle Speed operation

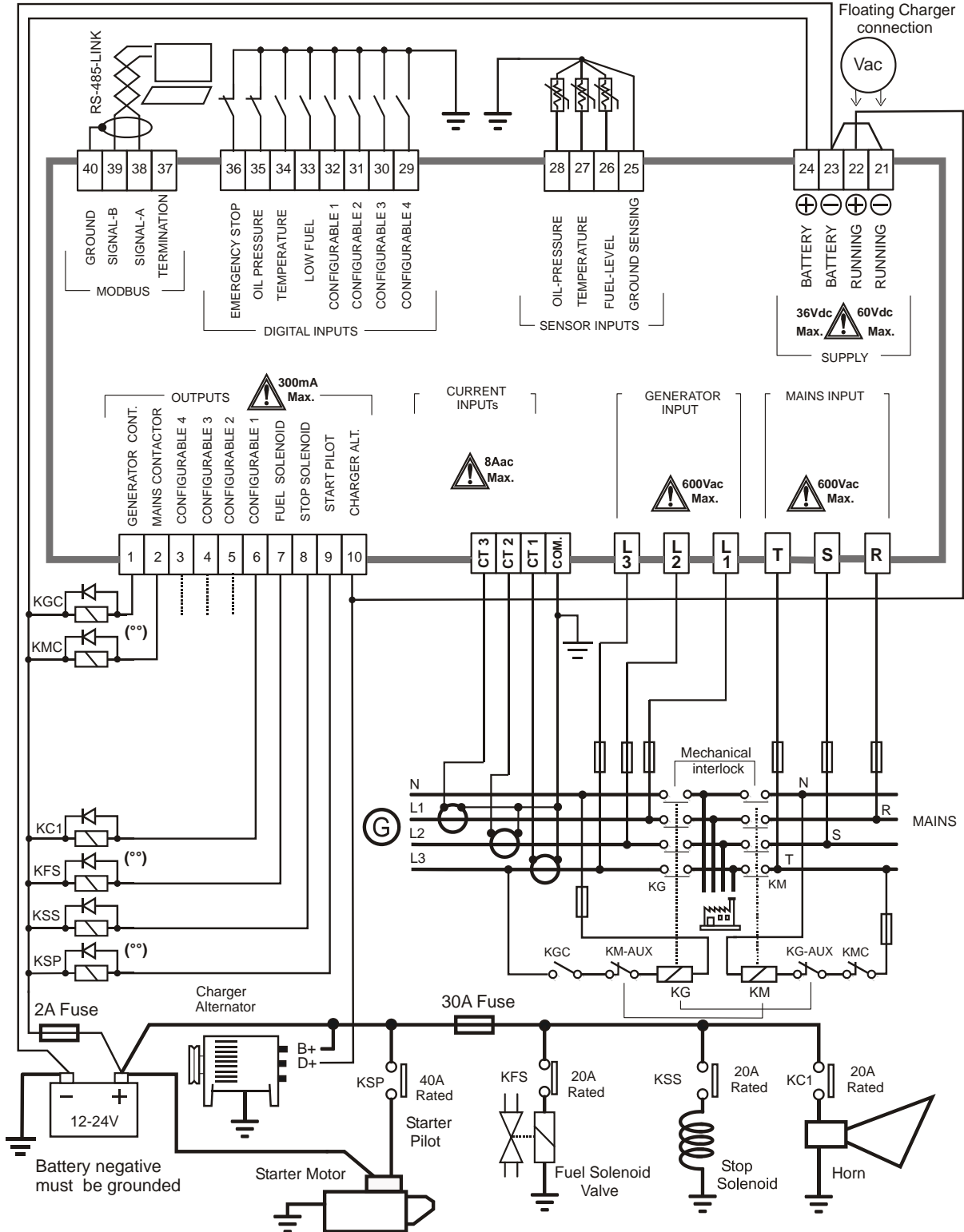
Program an output with option [30] and program the time you need into [P.43]. The output will energize at the beginning of a start attempt. The output will remain active for all time programmed into [P43]. The output will be de-energized after timeout or in case you stop the engine. You can use the output with option [30] to energize a relay that controls the IDLE SPEED function. During the IDLE SPEED timing, the alarm ALTERNATOR FAILURE [Er.04] will be ignored. Please note that [P.43] is used also as TIMEOUT protection in case MODBUS communication fails after sending a start command (e.g. Engine Test or Genset Test). This will prevent Be142 holding engine running for long time: being MODBUS communication out of service you will not be able to stop the engine. After starting the engine by MODBUS, if communication fails, you are sure that BE142 will stop the engine.



18.0 Typical application wiring

Wire the CTs on LOAD side when you need the Mains current measurement

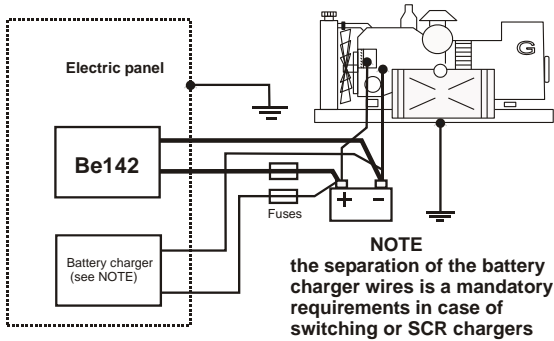
NOTE: a minimum of 4 KVac insulation is recommended for the relays KGC and KMC. A fuse of 2 A (fast-blow) in series with terminal #24 is recommended to protect against large spikes on power supply.



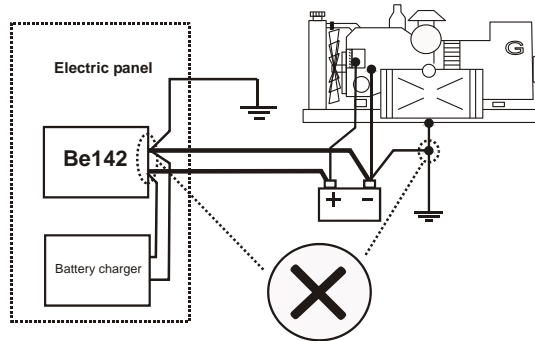
(°) Relays connected to the Be142 must be suppressed using flywheel diodes

Section 19.0: Wiring recommendations

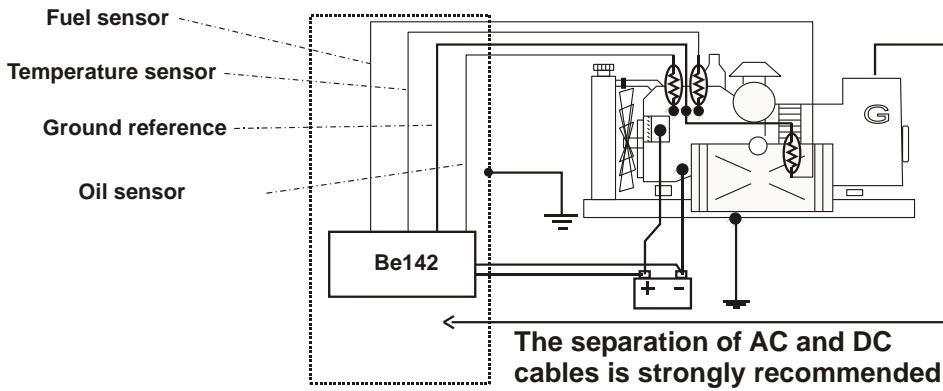
Recommended power supply wiring



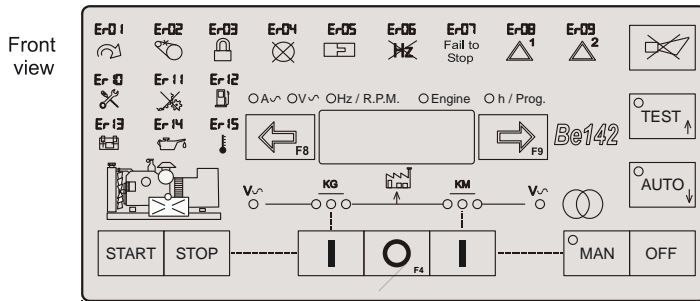
Not Recommended wiring



Sensors wiring



Section 20: Dimensions & Miscellaneous

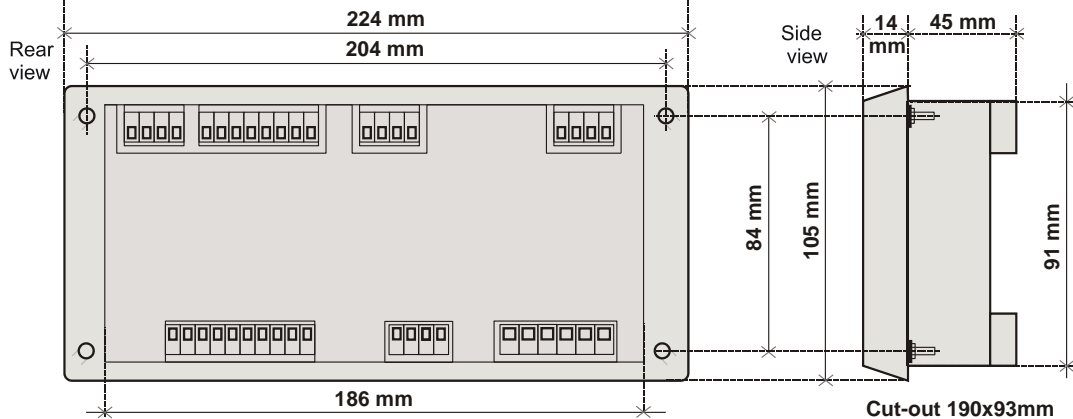


Miscellaneous

Shipping Dimensions: 130x250x60mm

Shipping Weight: 560Gr.

Connectors: removable Plug & Socket



Section 21.0: Connections description

Terminal	Description	Note	Section
1	Generator Contactor output	300 mA Active 'Low'	2.21
2	Mains Contactor output		
3	Programmable output '4'		7.09
4	Programmable output '3'		
5	Programmable output '2'		
6	Programmable output '1'		18.0
7	Fuel Solenoid output		
8	Stop Solenoid output		
9	Crank Pilot output		
10	Alternator Excitement output	Positive Output 3 W	11.0
CT3	Current Transformer 'L3' S1 input	5 Aac nominal; Max 8 Aac You can wire the CTs on LOAD side in case you need the MAINS current measurements.	7.02B ([P.18])
CT2	Current Transformer 'L2' S1 input		
CT1	Current Transformer 'L1' S1 input		
COM	Current Transformer S2 input common input		
L3	Generator Voltage 'Phase L3' input	600 Vac rated	7.02B
L3	Generator Voltage 'Phase L2' input		
L1	Generator Voltage 'Phase L1' input		7.01A
T	Mains Voltage 'Phase T' input		
S	Mains Voltage 'Phase S' input	Connect to ground	11.0
R	Mains Voltage 'Phase R' input		
21	Engine Running Minus detect		D+ or W.L. sensing
22	Engine Running Plus detect	-	14.0
23	Supply Battery minus connection	Internal 300 mA fuse	
24	Supply +12 or +24V Battery connection	-	19.0
25	Common Sender ground sense	2000 Ohm max	7.12
26	Fuel Level Sender input		7.11
27	Temperature Sender input		7.10
28	Oil Pressure Sender input	Active Low (<2 Vdc)	7.07
29	Programmable input Switch '4'		
30	Programmable input Switch '3'		
31	Programmable input Switch '2'		
32	Programmable input Switch '1'		18.0
33	Low Fuel Switch input		
34	High Temperature Switch input		
35	Low Oil Pressure Switch input	See RS485 standard	See Be142 MODBUS user manual
36	Emergency Stop Switch input		
37	RS485 Termination		
38	RS485 Signal A		
39	RS485 Signal B		
40	RS485 Common Ground		

!! W A R N I N G !! Relays and solenoids connected to the Be142 must be suppressed using flywheel diodes or suppression devices as indicated in section 18.0. We recommend that you connect a 2A fuse (Fast-Blow type) in series with the terminal #24; it will protect the controller against large spikes on the power supply.