EVOLVE 7.4kVA-12kVA

Automatic Transfer Switch Panel Installation Manual

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Warranty
Bernini Design SRL (hereinafter "BD") warrants that the Evolve shall be free from failure due to components or manufacturing over a period of 3 years from the BD delivery date. Upon any return by the customer BD shall, at its discretion, either repair or replace the product without charge. BD will then return the Evolve to the buyer, reset to the factory default settings 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 existence and cause. If the Evolve is not defective, or the product is defective for reasons other than that covered by this warranty, then the buyer will be charged accordingly.
Warranty cover will not apply if the Evolve has been used in contravention of the User Manual or other applicable operating instruction, particularly if such defects are caused by misuse, improper repair attempts or negligence in use or handling. This purchase is non-refundable.

This equipment complies with the EMC protection requirements

CE

!! WARNING !!

High voltages are present inside the Evolve. To avoid the risk of electric-shock, operating personnel must not remove the protective cover.
Do not disconnect the Earth (safety ground) connection!
The Evolve can and will start the engine at anytime. Do not work on equipment, which is controlled by the Evolve without isolating it first. When servicing the engine, always disconnect the battery and battery charger.
We recommend that warning signs be placed on equipment indicating the above.

!! WARNING !!

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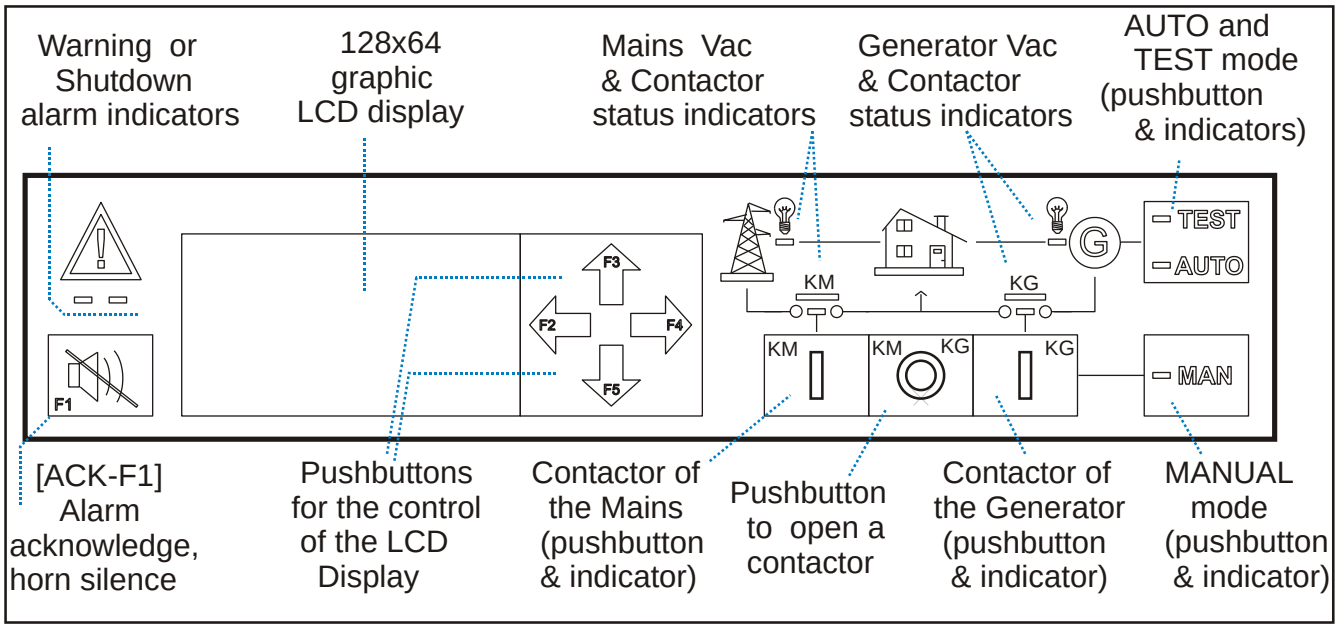
Section 1.0 - INTRODUCTION

The EVOLVE integrates an Automatic Mains Failure (AMF) control module, a Generating Set controller and a 32 Amp (50Amp. EVOLVE-9Kva) Automatic Transfer Switch (ATS). The EVOLVE provides visual indication by means of LEDs and Graphic Display for all parameters and alarms. The EVOLVE features programmable settings and complies with international regulations. Figure 1 illustrates the layout of the front panel. EVOLVE can interface with analog sensors or switches for Oil Pressure, Fuel level, Coolant and Auxiliary Temperature. Additional inputs of remote control, alarms and serial interface allow you to expand the functions of the panel.

Figure 1: Front Panel layout



Section 2.0 - SELECTING AN OPERATIONAL MODE

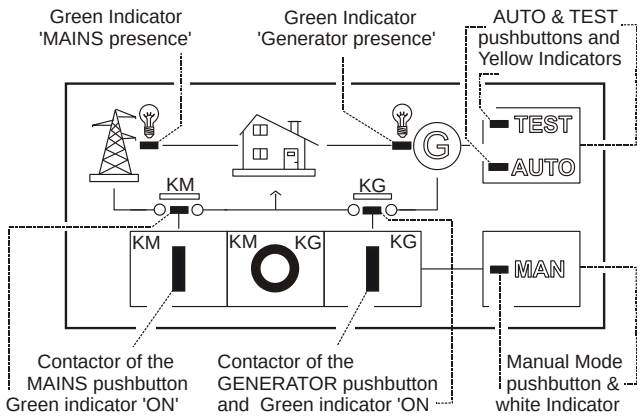
The mode of operation is selected by the pushbuttons **[O] / [MAN] & [AUTO-TEST]**. Before removing the DC power supply, the EVOLVE automatically stores the Mode of operation in a 'non-volatile' memory. When you reconnect the DC power supply, the EVOLVE enters the Mode of operation previously stored in this memory.

Section 2.1 - OFF mode

Push and hold the **[O]** pushbutton for at least 3 seconds to turn the EVOLVE **OFF**: EVOLVE opens the contactor (Mains or Generator) and stops the engine if it is running. Push the **[MAN]** or **[AUTO-TEST]** pushbutton to turn the EVOLVE **ON**.

Section 2.2 - MAN (manual) mode

The **MAN** mode of operation allows you to manually control the generating set and its contactors.



Follow the instructions:

Push the **[MAN]** mode button; the yellow indicator on the button will turn on. Push **[MAN]** until the engine starts (the yellow LED is then blinking fast). When the green indicator 'Generator presence' lights, push the **[I-KG]** pushbutton; the green indicator KG will turn on. If the green indicator 'G' is blinking or it is off, it means that the voltage is outside limits; in this case do not push the **[I-KG]** pushbutton. To transfer the load to the Mains, push the **[I-KM]** pushbutton when the green indicator 'Mains presence' is on; the **KG** will open and **KM** will close after a 2-second delay.

To open a contactor, or to stop the engine, push the [O] pushbutton at anytime. If you push and hold the [O] pushbutton longer than 3 seconds, the EVOLVE enters the OFF mode.

! ! WARNING ! ! ! ! WARNING ! !

LINE VOLTAGE IS EXPOSED WITHIN THE EVOLVE AND ANCILLARY CIRCUITRY EVEN WHEN THE GREEN LEDs ARE TOTALLY OFF
Do not work on equipment, which is controlled by the EVOLVE without isolating it first. When servicing the engine, disconnect the Mains and the battery. We recommend that warning signs are placed on the generating set indicating that the EVOLVE could start the engine at anytime.

Section 2.3 - AUTOMATIC mode of operation

Push the **[AUTO]** pushbutton until the yellow LED illuminates. The engine starts when the EVOLVE detects a Mains failure (section 9.1). The contactor of the Mains opens after the **[MAINS BREAKER]** timing. After the **[WARM UP]** time (see section 9.3) if the voltage and frequency are within the settings, the contactor of the Generator will close. If the Mains restores, the KG will open. The KM will close following a programmed **[KM CHANGEOVER]** timing. The engine will stop after a **[COOL DOWN]** time. In **AUTO** mode, the EVOLVE will periodically test the engine if the 'Test Scheduler' is correctly programmed (section 8.2). During the test, the yellow LED '**TEST**' turns on and will continue to blink when engine runs. In **AUTO** mode, the EVOLVE can start the engine if a 'Remote Test' is activated (the yellow LED TEST will operate in the same way of a Test Scheduler'). You can disable the control of the Mains and starting of the engine by programming the SLEEP mode (section 8.4) or by using the 'Mains Simulated' function (section 12.0). In this case the green LED 'Mains Presence' will continue to blink. You can stop the engine at anytime by selecting the Manual mode. You can also push the **[O]** pushbutton, but in this case Evolve opens the circuit breakers and enters the OFF mode of operation.

Section 2.4 - TEST mode

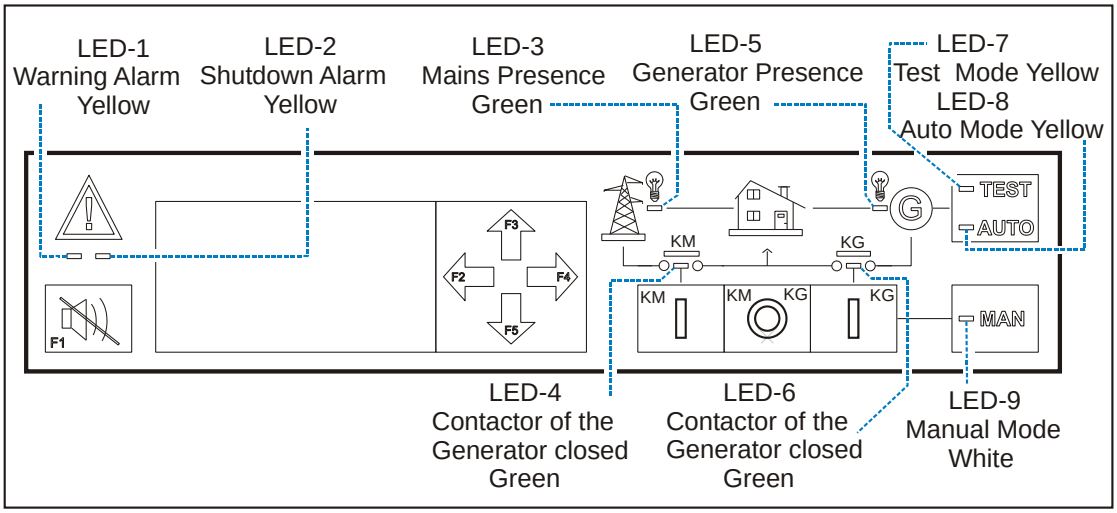
Push and hold the **[AUTO-TEST]** pushbutton until the yellow LED TEST illuminates (5 seconds). When the engine is running, the yellow Led 'TEST' will blink. The EVOLVE will start the engine and transfer the load to the Generator only in the case of Mains failure if not otherwise programmed (parameter **[KG TEST CONTROL]** in section 8.3). To exit the **TEST** mode, push the **[AUTO-TEST]** pushbutton briefly (the engine will stop automatically if mains is present) or push **[MAN]** button (push again to stop the engine).

Section 2.5 - SLEEP mode (AMF Scheduler)

The EVOLVE, once in **[SLEEP MODE]** mode, will not start the engine even in the case of Mains failure. This function is required when you want to disable the EVOLVE in a particular period of the day, during the night for example. First, you have to program the period in which you allow the start of the engine in the case of Mains Failure (see 8.4: AMF scheduler). After that, enter the **AUTO** mode (see 2.3). Outside of the programmed timetable, the green LED 'Mains Presence' will blink and the message **[SLEEP MODE]** will appear on the display. In cases where you need to start the engine during **[SLEEP MODE]**, you are requested to enter the **MAN** mode and proceed according the instructions given in section 2.2. If you enter the AUTO mode when the sleep mode is active, the engine will stop.

Section 3.0 - LED INDICATORS / TEST OF THE LAMPS (LEDS)

The following figure and table describes the LED functions shown on the front panel. To test the LED indicators, push the **[F1]** pushbutton for a few seconds.



The table describes the LED indicators on the front panel.

LED	Name	Color	Function
1	Warning Alarm	Yellow	It blinks indicating a warning alarm.
2	Shutdown Alarm	Red	It blinks indicating a shutdown alarm (it shuts down the engine).
3	Mains Presence	Green	It blinks indicating that the Mains is out of limit (V/Hz), it illuminates continuously when Mains is within the programmed limits. It is off if Mains power is absent. It blinks fast when Mains is simulated (see section12.0) or when outside the AMF Scheduler timetable (see 8.4).
4	KM	Green	ON = Mains contactor closed, OFF = Mains contactor open (no voltage on Load)
5	Generator Presence	Green	It blinks indicating that the Generator is out of limits (V/Hz), it illuminates continuously when Generator is within the programmed limits. It is off if Generator power is absent.
6	KG.	Green	ON = Generator contactor closed, OFF = contactor open (no voltage on load)
7	Test Mode	Yellow	ON = **TEST** mode of operation. It blinks during a Remote Test.
8	Auto Mode	Yellow	ON = **AUTO** mode of operation. It blinks fast when the engine is running after a manual start.
9	Manual Mode	White	ON = **MAN** mode of operation. It blinks fast when the engine is running after a manual start.

Section 4.0 - GRAPHIC DISPLAY- MAIN MENU

Repeatedly push **[←]** until the following main Menu appears. Select an item using **[↑]** or **[↓]** and push **[→]**.

Main MENU	Section	You can:
EVOLVE & ENGINE	5.1	…see the status of EVOLVE and information about the engine.
GENSET METERING	5.2	…read voltages, current, power, energy count of the Generator.
MAINS METERING	5.3	…read voltages, current, power, energy count of the Mains.
ALARM MONITORING	5.4	….see the active alarms..read the history of events and alarms.
SET DATE & TIME	6.0	... set the Clock.
DISPLAY & LANGUAGE	7.0	…select a language or change the performance of the display.
USER PARAMETERS	8.0	... configure the User parameters.
OEM PARAMETERS	9.0	... configure the OEM parameters.
PUSHBUTTONS TEST	15.0	... test the pushbuttons
INPUTS TEST	15.1	... test the digital inputs
SENSORS TEST	15.2	... test the analog inputs
OUTPUTS TEST	15.3	... test the relay outputs

After 30 minutes without operating the **[↑] [↓] [←] [→]** pushbuttons, the display backlight will shut down. The backlight also shuts down at any time the battery voltage falls below 10Vdc (during the starting attempts for example)

Section 5.0 - METERING FUNCTIONS

The display of the EVOLVE9 can indicate measurements of the Engine, Mains, Generator and information about the status of the generator. Repeatedly push **[←]** to select the main menu (see section 4.0), use **[↑]** or **[↓]** to select a sub-menu. Push **[→]** to enter the sub-menu or select other measurements

Section 5.1 – EVOLVE & ENGINE This provides information about the status of the Evolve & Engine.

5.1 EVOLVE & ENGINE STATUS PAGE

Push **[↓]** to browse all the others display pages related to the engine and fuel

MODE OFF(*)

[MESSAGE]

--:--:-- (Time count)(**)

KG OFF(*) KM ON(*)

Note (*) : indicates the mode of the operation of the controller and status of the contactor.

Note (**): indicates the countdown of a running timer (example countdown for the cooling). When in stand by, it indicates date & and time.

This page indicates a [message] that dynamically describes the status of the EVOLVE (E9). In this table you can find a descriptive explanation of the meaning of each message.

RUNNING The engine is running	**NOT RUNNING** The engine is not running	**RUN ON LOAD** The engine is running on load (KG is closed)
REST E9 is starting the engine: Rest time in between the starting attempts.	**STARTING** E9 is starting the engine & is setting up all internal functions.	**CRANK** E9 is starting the engine: in particular it is commanding the cranking of the engine.
STOPPING E9 is stopping the engine by activating the Stop solenoid.	**COOLING** E9 is running the engine Off-Load in order to cool the alternator.	**WARM UP** E9 is warming-up the engine, after that it will close the KG.
MODE TEST Evolve is in the TEST mode of operation.	**PREGLOW** E9 is starting the engine and the pre-glow output is active.	**PRECRANK** E9 is counting the delay before enabling cranking of the engine.
MODE AUTO E9 is in the AUTO mode of operation.	**MAINS FAILURE** E9 detected a mains failure and is running the Mains Failure Timer. After that, the engine will start.	**MAINS RESTORE** E9 detected a mains restore condition and is running the Mains Restore Timer.
MANUAL MODE E9 is in the Manual mode of operation.	**MODE OFF** E9 is in the OFF mode of operation.	**MAINS BREAKER** E9 detected a mains failure condition and is going to open the contactor of the Mains.
MODE SLEEP E9 is in the SLEEP mode of operation according to the table indicated in section 8.4	**MAINS LOAD LIMIT** The load limit is exceeded for the Mains.The engine is going to start.	**MAINS SIMULATED** Mains is simulated. The Evolve will not start the engine (see section 12.0)
REMOTE TEST E9 is in a TEST mode driven by an external source. The E9 triggers this message also in case of a 'Scheduled Test' (see 8.2) **AMF DISABLED** E9 is in a TEST mode driven by an external source. The E9 triggers this message also in case of a 'Scheduled Test' (see 8.2)		**LOAD SHEDDING** The load is supplied by the generator because you exceeded the KVA-START limit (see section 9.1)

- 5.1B - Engine pages; use [↑] or [↓] and [←]. Push [→] to open the generator page *([XXX] indicates numerical digits)*

BATTERY (V) [XX.X]	*If the display indicates [- - - -], it means that the measurement is not available or correct.*	**N° OF STARTS [XXX]**	*If the display indicates [- - - -], it means that the measurement is not available or correct.*	**FUEL % (*) [XXX]**
ALTERNATOR [XX.X]		**SERVICE (!) [XXX]**		**OIL BAR (*) [XXX]**
HOURS RUN [XXXXX]		**COOLANT °C (*)[XXX]**		**AUX °C (**) [XXX]**

Note (!): This shows the remaining hours before the Service timer expires as indicated in section 8.1

Note (*) this parameter is displayed only if you set an alarm and if you connect the sensor on the applicable input

Note (**) this parameter is displayed only if you set an alarm and you have connected the optional temperature probe (see 8.3)

Section 5.2 - GENSET METERING

This indicates the following measurements

Use[↑] or [↓] to select a page, use [←] to return. Push [→] to open the Mains page *([XXX] indicates numerical digits)*				
GEN.V [XXX] **CURRENT [XX.X]** **FREQUENCY [XX.X]**		**KVA [XXX]** **GEN. KW [XXX]** **KVAR [XXX]**		**PF [X.XX]** **KWH [XXXXXX.X]**

Section 5.3 - MAINS METERING

This indicates the following measurements

Use [↑] or [↓]. Use [←] to return. Push [→] to open the alarm pages *(NOTE: [XXX] indicates numerical digits)*				
MAINS V [XXX] **CURRENT [XXX]** **FREQUENCY [XX.X]**		**KVA [XXX]** **MAINS KW [XXX]** **KVAR [XXX]**		**PF [X.XX]** **KWh [XXXXXX.X]**

If the display indicates [- - - -], it means that the measurement is not available or consistent

Section 5.4 - ALARM MONITORING

This menu contains pages of active alarms logged by time. A typical alarm page is indicated below (see section 13.0 for the list of all alarms):

Instructions		
ALARMS PAGE 1/9 **LOW OIL PRESSURE** **SHUTDOWN** **DD:MM:YY HH:MM:SS**		Use **[↑]** or **[↓]** to browse the content of the pages This page opens automatically in the case of alarm(s). The alarm status is also recorded in the Memory Events register. To exit, push the **[←]** pushbutton. Push **[↓]** to open the Event History pages.

Section 5.5 - EVENT HISTORY

This submenu displays the last 200 events providing date & time information for: warnings, shutdowns, switching of the contactors and changing of the mode of operation.

Instructions		
EVENTS PAGE 1 **LOCAL EMERGENCY** **DD:MM:YY HH:MM:SS**		Push **[↑]** or **[↓]** to browse the list of the events. To return to **[EVOLVE & ENGINE]**, push the **[←]** pushbutton twice (see section 13.0 for the description of the alarms)

Note: in order to cancel the **[EVENT HISTORY]**, use the **[CLEAR EVENTS]** command described in section 9.8.

Section 6.0 - SET DATE & TIME

To access this menu push **[MAN]** then, repeatedly push **[←]** until **[EVOLVE & ENGINE]** appears on the top of the display. Push **[↓]** to select **[SET DATE & TIME]**. Push **[→]** to enter the Menu.

Display Indication	Instructions
TIME 00:00:00 **DATE 01/01/00** **FORMAT DD/MM/YY**	Use [↑] or [↓] to select a function. Push [→] to enter the numerical field. Push [↑] or [↓] to set a value. Push [←] to return. After setting the clock, push [↓].
SAVE →	Push [→] to start the EVOLVE clock at the right moment (use an external clock reference)

Section 7.0 - DISPLAY & LANGUAGE

To access this menu push **[MAN]** then, repeatedly push **[←]** until **[EVOLVE & ENGINE]** appears on the top of the display. Repeatedly push **[↓]** to select **[DISPLAY & LANGUAGE]**. Push **[→]** to enter the Menu.

Display	Instructions
LANGUAGE ENGLISH	A) - Use **[↑]** or **[↓]** to select Spanish, Italian, French or English B) - Push the **[←]** to confirm and exit.
CONTRAST 7	You can optimize the readability of the display text: - Push **[→]** to enter the **[CONTRAST]**; push **[↑]** or **[↓]** (range 0..... 15) - Push **[←]** to save and exit
BRIGHTNESS 19	You can optimize the readability of the display text: - Push [→] to enter the [**BRIGHTNESS**]; push [↑] or [↓] (range 0..... 21) - Push [←] to save and exit

Section 8.0 - USER PARAMETERS

Repeatedly push **[←]** until **[EVOLVE & ENGINE]** appears on the top of the display. Repeatedly push **[↓]** to select **[USER PARAMETERS]**. Push **[→]** to enter the Menu. The display will present the options **[READ PARAMETERS]** (free access all the time), **[WRITE PARAMETERS]** (it might require password). We recommend that you restrict the access by setting a USER password. This menu contains the following groups of parameters:

Display Indication	Section	Description
SERVICE TIMER	**8.1**	Use **[↑]** or **[↓]** to select a function. Push **[→]** to enter the function.
TEST SCHEDULER	**8.2**	You can program a **[USER PASSWORD]** to prevent unauthorized access to
MISCELLANEOUS	**8.3**	the parameters within this menu.
AMF SCHEDULER	**8.4**	
SMS MONITORING	**8.5**	**The following sections will describe each function.**
USER PASSWORD	**8.6**	

Section 8.1 - SERVICE TIMER

Use **[↑]** or **[↓]** to select this function from the **[USER PARAMETERS]** list (section 8.0) and push **[→]**.

Display Indication	Instructions
SERVICE OFF (example 200H means that Evolve will trigger a warning after 200 running hours)	Push **[→]** to select the numerical field. Push **[↑]** or **[↓]** to set a value in the range 1-999h. Push **[←]** to return. The Service Timer will generate a warning alarm after the programmed numbers of hours. The remaining time is indicated in the EVOLVE & ENGINE page (see 5.1B). To restart the timer once expired, follow the instructions below: A) Enter the Manual mode of operation, stop the engine if running. Push and hold the  pushbutton for at least 5 seconds. The Evolve will restart the service timer. B) Disconnect the Evolve, disconnect the battery and carry out the maintenance according to the engine user manual.

Section 8.2 - AUTOMATIC TEST (TEST SCHEDULER)

Use **[↑]** or **[↓]** to select the **[TEST SCHEDULER]** from the **[USER PARAMETERS]** list (section 8.00) and push **[→]**

Display Indication			Instructions to Program the Automatic Test (you are required to set date & time first)
	START	**STOP**	You can set the day / time of the Periodic Test. The engine will start automatically according to the START setting and will run off load until the STOP setting. To run the engine on load, you are required to set the parameter [KG TEST CONTROL] (see section 8.3). Use **[↑]** or **[↓]** to select a function. Push **[→]** to enter the numerical field. Push **[↑]** or **[↓]** to set a value. Push **[←]** to return to the function. Automatic test triggers a start only if EVOLVE is in the **AUTO** mode of operation; the yellow LED 'TEST' will blink during the Automatic Test. ***The 'Status Page' (see 5.01) indicates the day and START/STOP time of the programmed test.***
MO	**--:--**	**--:--**	
TU	**--:--**	**--:--**	
WE	**--:--**	**--:--**	
TH	**--:--**	**--:--**	
FR	**--:--**	**--:--**	
SA	**--:--**	**--:--**	
SU	**--:--**	**--:--**	
(--:-- = hours:minutes)			

Section 8.3 - MISCELLANEOUS

Use **[↑]** or **[↓]** to select **[MISCELLANEOUS]** from the **[USER PARAMETERS]** list (section 8.00) and push **[→]** to display the menu. We recommend that you limit the access by setting a User Password (see 8.6).

Display Indication	Description			
KG TEST CONTROL **OFF**	Options: **ON** or **OFF**. The option **ON** will transfer the Load to the Generator when the **TEST** mode of operation is active. The option **OFF** will allow you to run the engine off load when the **TEST** mode of operation is active. A failure of the Mains overrides the option **OFF** and the EVOLVE9 will, in this case, transfer the load to the generator.			
RUN TIMEOUT **OFF**	Maximum time allowed for running the engine (1 hour up to 24 hours). The option **OFF** disables the time-out and the engine will run until a stop is required.			
HORN TIMEOUT **20sec (1sec - 59mins)**	The Horn will automatically shutdown after time out. To disable the timeout, select the option OFF; the horn will then sound until you push [F1].			
HIGH AUX. SD OFF **HIGH AUX. WRN OFF** **LOW AUX. WRN OFF**	-25 -25 -25	125 125 125	OFF OFF OFF	It allows you to monitor an auxiliary temperature function. You can set a Low / High limit. These alarms are always monitored. To enable the reading on the display, you are requested to set at least one of the three parameters and to connect the auxiliary (Optional) temperature probe.

Section 8.4 - AMF SCHEDULER (SLEEP MODE)

Use **[↑]** or **[↓]** to select the **[AMF SCHEDULER]** from the **[USER PARAMETERS]** list (section 8.00) and push **[→]** to activate the menu. We recommend that you limit the access by setting a User Password (see 8.6).

Display Indication			Description of the Automatic Mains Failure Scheduler (you are required to set date & time)
	ON	**OFF**	You can enable the control of the Mains during a particular period of the day (00:00 >24:00). The engine will start, in case of Mains failure, only in between the period [**ON**] and [**OFF**]. Before the [**ON**] setting hour and after the [**OFF**] setting hour, the display indicates the message **[SLEEP MODE]**; the green LED 'Mains Presence' will blink and the engine will not start in cases of Mains failure. Instructions: Use **[↑]** or **[↓]** to select a function. Push **[→]** to enter the numerical field. Push **[↑]** or **[↓]** to set an hour. You can program only the hours (minutes are forced to 00).This will make the programming easier and quicker. Push **[←]** to return to the function.
MO	**00:00**	**24:00**	
TU	**00:00**	**24:00**	
WE	**00:00**	**24:00**	
TH	**00:00**	**24:00**	
FR	**00:00**	**24:00**	
SA	**00:00**	**24:00**	
SU	**00:00**	**24:00**	
Example Monday 8:00 (ON) 17:00 (OFF). Once in auto mode, the Evolve will start the engine in cases of Mains Failure between 8:00-17:00 only. Before 8.00 or after 17:00, the engine will not start in the case of Mains Failure. By leaving the default programming (00:00/24:00) you enable an engine start, or in other words monitoring and acting upon status of the Mains supply, for the whole day. By Programming OFF time the sameof ON time you force EVOLVE to disable the AMF function for the whole day. In this case the display indicates the message --:-- (all dashes)			

Section 8.5 - SMS MONITORING (SEE ALSO THE APPENDIX AT THE END OF THIS MANUAL)

Display Indication	Instructions
INSERT NAME **EVOLVE** **INSERT NUMBER** **XXXXXXXXXXXXXXX**	A) - Use [↑] or [↓] to select **[INSERT NAME]** or **[INSERT NUMBER]**, then push [→]. B) - Use [←] or [→] to select a digit and [↑] or [↓] to insert a letter or number. C) - Repeat steps A) and B) in order to edit the name (max 6 characters). D) - Push [←] to exit and follow the instructions for saving the programming. ***Note: dashes are not allowed in the NAME field except when you program [- - - - -] (6 dashes) to disable the name. Name allows 6 characters***

Section 8.6 - USER PASSWORD (See section 8.0 to enter this function)

Display Indication	Instructions
PASSWORD **CLEAR PASSWORD**	The display will present the option **[PASSWORD]** and **[CLEAR PASSWORD]**. Use **[↑]** or **[↓]** to select a function and push **[→]**.
INSERT PASSWORD **BACK * * * * OK** **<** **>**	A) - Use [←] or [→] to select a digit of the password. B) - Push [↑] or [↓] to edit a number . C) - Repeat steps A) and B) in order to edit the all 4-digits. D) - Select OK using the [→] button (the OK message backlights when selected). E) - Push the [→] button to confirm the password. ***Note: by programming [0000] you disable (clear) the password***

Section 9.0 - OEM PARAMETERS

Use **[↑]** or **[↓]** to select the **[OEM PARAMETERS]** from the main MENU (section 4.0) and push **[→]** to enter the menu. The display will present the options **[READ PARAMETERS]** (free access all the time) and **[MODIFY PARAMETERS]**. You can restrict the access by setting an OEM password (see 9.9). This menu contains the following parameters:

OEM PARAMETER MENU	See Section:		OEM PARAMETER MENU	See Section:
MAINS PARAMETERS	9.1		**OIL PRESSURE**	9.6
GENERATOR PARAM.	9.2		**RESTORE DEFAULTS**	9.7
ENGINE PARAM.	9.3		**CLEAR FUNCTIONS**	9.8
FUEL PARAMETERS	9.4		**OEM PASSWORD**	9.9
COOLANT °C	9.5			

Section 9.1 - MAINS PARAMETERS note: (sec) stands for seconds, (min) stands for minutes

Display Indication	Range		Options	Note
MAINS BREAKER 5sec	0	59 min	-	In case of Mains failure, the **[MAINS BREAKER]** timer will delay the opening of the contactor KM.
MAINS FAILURE 5sec **MAINS RESTORE 5sec**	0 0	59 min 59 min	- -	These timers will delay the start and stop of the engine in order to cancel false Mains Failure / Restore, events.
KM CHANGEOVER 2.0	0.1s	15.0 sec	-	Dead time between the switching of the contactors.
UNDER VOLTAGE 180 **OVER VOLTAGE 265**	60V 60V	300V 300V	OFF OFF	Define operating limits for the Mains. If a parameter is out of limits, a Mains failure condition will occur. The **[OFF]** setting, disables the function.
UNDER HZ 47.0 **OVER HZ 53.0**	20.0 20.0	70.0 70.0	OFF OFF	
OVER KVA WARNING OFF **BYPASS DELAY 1 min**	1 1min	99 kVA 99 min	OFF -	The EVOLVE provides a warning when the Load connected to Mains rises above the **[OVER KVA WARNING]** setting (a programmable **[BYPASS DELAY]** is provided). The Evolve will trigger the alarm **[OVER KVA MAINS].**
OVER KVA START OFF **BYPASS DELAY 1 min**	1 1min	99 kVA 99 min	OFF -	The EVOLVE will start the engine if the load connected to Mains rises above this setting for a time much longer than **[BYPASS DELAY]**.**[OVER KVA START]** must be higher than **[LOW KVA STOP]**. The **[OFF]** setting disables this function. The display will trigger the message **[MAINS LOAD LIMIT].**
LOW KVA STOP OFF **BYPASS DELAY 1 min**	1 1min	99 KVA 99 min	OFF -	The EVOLVE will stop the engine if the load connected to the Generator falls under the setting for a time much longer than **[BYPASS DELAY]**.**[LOW KVA STOP]** must be lower than **[OVER KVA START]**. The **[OFF]** setting disables the function.

Section 9.2 - GENERATOR PARAMETERS note: (sec) stands for seconds, (min) stands for minutes

Display Indication	Range		Options	Note
UNDER VOLTAGE 180	60V	300V	OFF	Define operating limits for the Generator. If a parameter is outside of its selected limits, the EVOLVE triggers the alarm and opens the **KG**. It can stop the engine immediately or after a cooling down time (depending on the kind of alarm). Under V & Under Hz work only if the contactor for enabling the Generator is closed. The **[OFF]** setting, disables the function.
BYPASS DELAY 6sec	1 sec	15 sec	-	
OVER VOLTAGE 265	60V	300V	OFF	
BYPASS DELAY 6sec	1 sec	15 sec	-	
UNDER HZ 47.0	20.0	70.0	OFF	
BYPASS DELAY 6sec	1 sec	15 sec	-	
OVER HZ 53.0	20.0	70.0	OFF	
BYPASS DELAY 6sec	1 sec	15 sec	-	
WARNING CURRENT OFF	1A	99A	OFF	
BYPASS DELAY 6sec	1 sec	5 min	-	
OVER CURRENT OFF	1A	99A	OFF	
BYPASS DELAY 6sec	1 sec	5 min	-	
SHORT CIRCUIT OFF	1A	99A	OFF	
BYPASS DELAY 0.5sec	0.0 sec	15.0 sec	-	

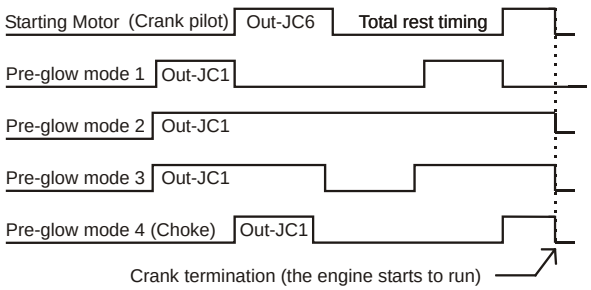
Section 9.3A - ENGINE PARAMETERS note: (sec) stands for seconds, (min) stands for minutes

Display Indication	Range		Options	Note
PRE-CRANK TIME 1 sec	1 sec	15 sec	It delays the crank.	
CRANK TIME 5 sec	1 sec	15 sec		
CRANK REST TIME 5 sec	3 sec	15 sec	These parameters define the start sequence of the engine.	
START ATTEMPTS 10	3	15	You have connect the start pilot relay to terminal 4.	
CRANK VDC 8.0	3.0	30.0	OFF	The EVOLVE terminates the crank when one of these parameters rises above its setting. The setting **[OFF]** disables the control.
CRANK VAC 100	60	260	OFF	
CRANK HZ 40.0	25.0	99.0	-	
PREGLOW TIME OFF	1sec	59 sec	1-2-3-4	Choose the proper working logic for Pre-glow (figure 9.3). You have to connect a relay to terminal 6.
PREGLOW MODE 4	-	-		
WARMUP TIME 15sec	0	5 min	-	The contactor for the generator will close after a **[WARM UP TIME]**.
COOLING TIME 15sec	0	5 min	-	The engine will run Off Load during the **[COOLING TIME].**

Section 9.3B - ENGINE PARAMETERS note: (sec) stands for seconds, (min) stands for minutes

Display Indication	Range		Options	Note
GAS PURGE OFF	1 sec	15 sec	OFF	It allows you to use a Gas fuelled engine. It overrides the preheat function. You can connect a relay to terminal 6.
STOP SOLENOID 15 sec	1 sec	5 min	-	Energised to stop solenoid timing . You can connect a stop solenoid to terminals 8 & 9.
BELT BREAK 8.0	3.0	30.0	OFF	Setting to detect Charger Alternator Failure / belt break
FAIL TO STOP OFF	ON	OFF	-	Enables the Fail to Stop alarm (the alarm is delayed as much as 2 minutes)
BYPASS TIMER 10sec	2 sec	59 sec	-	Bypass timing for Oil Pressure and Temperature alarms.

Figure 9.3: Pre-glow modes timing diagram



Section 9.4 - FUEL LEVEL PARAMETERS note: (sec) stands for seconds, (min) stands for minutes

Important NOTE: if all three parameters **[TANK EMPTY]**, **[LOW FUEL WRN]** and **[HIGH FUEL WRN]** are set to **[OFF]**, the E9 configures the FUEL LEVEL input as digital (you can connect a 'Level Switch' to terminal 16). Once you set at least one of the three parameters, E9 configures the FUEL LEVEL input as analog (you can connect a sensor to terminal 16). In this case, the E9 turns on the % indication on the EVOLVE & ENGINE page. You can program a **[TANK EMPTY DELAY]** timing to trigger a warning and, if required, a shutdown.

Display Indication	Min	Max	Option	Note
TANK EMPTY OFF	1%	99%	OFF	EVOLVE shuts down the engine if the level drops below the limit. A programmable bypass alarm is provided (see below).
DELAY OFF	15 sec	59 min	OFF	EVOLVE shuts down the engine if a Low Fuel condition persists for more than **[DELAY]**. The **[OFF]** setting provides only a warning. This timer works when you connect a Sensor or a Switch to the Fuel Input terminal 16.
LOW FUEL WRN OFF **HIGH FUEL WRN OFF**	1% 1%	99% 99%	OFF OFF	This monitors the Fuel Level providing an alarm warning. The bypass time for these alarms is 15 seconds.
POINT 1 FUEL 0 **POINT 1 OHM 10**	***Settings for the response curve of the sensor connected to terminal 16***			
POINT 2 FUEL 0 **POINT 2 OHM 10**				
POINT 3 FUEL 0 **POINT 3 OHM 10**	You are allowed to edit 6 points for the FUEL Level in a range 0-99% and 6 points for the resistance in a range 0-1000 OHM. You are required to connect the Fuel sensor to the terminal 16.			
POINT 4 FUEL 0 **POINT 4 OHM 10**				
POINT 5 FUEL 50 **POINT 5 OHM 95**				
POINT 6 FUEL 99 **POINT 6 OHM 180**				

Section 9.5 - ENGINE COOLANT TEMPERATURE SETTINGS

Display Indication	Range		Option	Temperature of the engine coolant
HIGH COOLANT SD OFF **HIGH COOLANT WRN OFF** **LOW COOLANT WRN OFF**	1 1 1	250 250 250	OFF OFF OFF	This allows you to monitor the Coolant Temperature. You can set a Low / High limit. The alarms are ignored during **[BYPASS-TIMER]** timing (see section 9.3). By setting **[OFF]**, you can connect a temperature switch (instead of a sensor) to input terminal 17.
POINT 1 °C 128 **POINT 1 OHM 19**	***Settings for the response curve of the sensor connected to terminal 17***			
POINT 2 °C 115 **POINT 3 OHM 26**				
POINT 3 °C 90 **POINT 3 OHM 6**				
POINT 4 °C 80 **POINT 4 OHM 67**				
POINT 5 °C 70 **POINT 5 OHM 95**	You are allowed to edit 6 points for the Temperature in a range 0-250°C and 6 points for the resistance in a range 0-1000 OHM			
POINT 6 °C 40 **POINT 6 OHM 287**				

Section 9.6 - OIL PRESSURE SETTINGS

Display Indication	Range		Options	Note
LOW BAR WARNING OFF	0.1	20.0	OFF	This allows you to monitor the Oil Pressure of the engine. You can set a Low Oil Pressure warning and/or shutdown. The alarm is ignored during **[BYPASS-TIMER]** timing (see section 9.3). If you use a Pressure Switch connected to terminal 15, program both parameters in **[OFF]** mode.
LOW BAR SHUTDOWN OFF	0.1	20.0	OFF	
POINT 1 BAR 0 **POINT 1 OHM 10**	***Settings for the response curve of the sensor connected to terminal 15*** You are allowed to edit 6 points for the OIL pressure in a range 0-20 BAR and 6 points for the resistance in a range 0-1000 OHM			
POINT 2 BAR 2.0 **POINT 2 OHM 51**				
POINT 3 BAR 4.0 **POINT 3 OHM 86**				
POINT 4 BAR 6.0 **POINT 4 OHM 122**				
POINT 5 BAR 8.0 **POINT 5 OHM 152**				
POINT 6 BAR 10.0 **POINT 6 OHM 180**				

Section 9.7 - RESTORE DEFAULTS

You can restore the factory settings. Select **[OEM PARAMETERS]** first, then choose the **[WRITE PARAMETERS]** menu. Repeatedly push [↓] until you select the **[RESTORE DEFAULTS]** function. Push **[→]** to enter.
Follow the instructions:

Display Indication	Instructions for restoring the factory settings (in other word 'Defaults')
RESTORE DEFAULTS **YES NO** **< >**	A) - Push **[←F2]** to confirm or **[F3 →]** to quit the function. B) - If you push **[←F2]** , the EVOLVE triggers the operation and the message **[DONE]** appears. C) - Push **[←F2]** to exit and save in the memory the Defaults. ***Note: we recommend that you remove the DC supply for a few seconds. Then reconnect the DC supply and check or program the parameters according to your needs.***

Section 9.8 – CLEAR FUNCTIONS

Repeatedly push **[←]** until **[EVOLVE & ENGINE]** appears on the top of the display. Repeatedly push **[↓]** to select **[OEM PARAMETERS]**. Push **[→]** to enter the Menu. Choose the option **[WRITE PARAMETERS]** (it might require password). Repeatedly push **[↓]** in order to find the menu **[CLEAR FUNCTIONS]** the; push **[→]**.

Display indication	Description of the function
CLEAR EVENTS	This cancels the Event History (see section 5.5)
CLEAR ENERGY M	This cancels the counter of the Energy Mains (see section 5.3)
CLEAR ENERGY G	This cancels the counter of the Energy Generator (see section 5.2)
CLEAR ALL MEMORY	Total cancellation of the memory and restoration of the factory settings. After that you are required to re-program the controller according to your needs (see 11.0)

Section 9.9 - OEM PASSWORD

Repeatedly push **[←]** until **[EVOLVE & ENGINE]** appears on the top of the display. Repeatedly push **[↓]** to select **[OEM PARAMETERS]**. Push **[→]** to enter the Menu. Choose the option **[WRITE PARAMETERS]** (and push **[→]**. The Evolve opens the list. Repeatedly push **[↓]** until you reach the **[OEM PASSWORD]**; push **[→]** to enter the Menu.

Display Indication	Instructions
PASSWORD **CLEAR PASSWORD**	The display will present the option **[PASSWORD]** and **[CLEAR PASSWORD]**. Use **[↑]** or **[↓]** to select a function and push **[→]** to enter the function; continue to follow the instructions below.
INSERT PASSWORD **BACK * * * * OK** **<** **>**	A) - Use [←] or [→] to select a digit of the password. B) - Push [↑] or [↓] to edit a number . C) - Repeat steps A) and B) in order to edit the 4-digit password. D) - Select OK using the [→] button (the OK backlights when selected). E) - Push the [→] button to confirm the password. ***Note: by programming [0000] you disable (clear) the password***

Section 10.0 - READING PARAMETERS

Repeatedly push **[←]** until the message **[EVOLVE & ENGINE]** appears on the top of the display. Repeatedly push **[↓]** to select the function **[USER PARAMETERS] (**or **[OEM PARAMETERS]**). Push **[→]**; the following screen will appear.

Display Indication	Instructions
READ PARAMETERS **WRITE PARAMETERS**	Push **[→]** to enter directly the **[READ PARAMETERS]** mode. The display will open the page with the list of the parameters. See section 8.0 for the User parameters or section 9.0 for OEM parameters.

Section 11.0 - PROGRAMMING PARAMETERS

11.1 Preliminary operation

Enter the Manual mode of operation and stop the engine if running or, better, enter the OFF mode.
Repeatedly push **[←]** until the message **[EVOLVE & ENGINE]** appears on the top of the display. Repeatedly push **[↓]** to select the function **[USER PARAMETERS]** or **[OEM PARAMETERS]**. Push **[→]**; the following screen will appear.

Display Indication	Instructions
READ PARAMETERS **WRITE PARAMETERS**	A) - Push **[↓]** to select the item **[WRITE PARAMETERS]** B) - Push **[→]** to enter the programming; the display will open the list of the User (or OEM) parameters.

11.2 Type the Password

If a password was inserted, the EVOLVE will present a screen requesting the password as indicated below, otherwise follow directly the instructions on section 11.3.

Display Indication	How to insert a password
INSERT PASSWORD **BACK * * * * OK** **<** **>**	A) - Use [←] or [→] to select a digit of the password. B) - Push [↑] or [↓] to edit a number . C) - Repeat steps A) and B) in order to edit the 4-digit password. D) - Select OK using the [→] button (the OK backlights when selected). E) - Push the [→] button to confirm the password.

11.3 Select a parameter

Choose the MENU of your interest by using the **[↑]** or **[↓]** buttons and then push **[→]**; the list of the parameters will appear.

11.4 Programming a parameter

- Select a parameter by using the **[↑]** or **[↓]** button (see sections 8.0 and 9.0 for the list of parameters).
- Push the **[→]** button to enter the numerical / options field of the parameter.
- Modify the parameter using **[↑]** or **[↓]** according to your need.
- Exit the numerical/options field using the **[←]** pushbutton.
- You can modify another parameter by repeating the previous steps
- Push twice the **[←]** pushbutton. The EVOLVE will open the page 'SAVING' providing you 2 options:

YES [← F2] (exit after saving) **NO [F4 →]** (back to programming)

Choose the option required. In cases where you have chosen to modify some parameters, we recommend that you disconnect the DC supply for a few seconds, re-apply the supply and verify that the modifications have been saved in a way that the EVOLVE will operate according to your needs. In cases where your choice is **[NO]**, by pushing the **[F4 →]** button, you will enter the 'READ/WRITE' page. To exit, push the **[← F2]** pushbutton twice.

Section 12.0 - INPUTS TO MONITOR EXTERNAL FUNCTIONS

The EVOLVE features the following inputs.

Input name	Terminal	Notes and Instructions for the use
MAINS SIMULATED	20	Connect this terminal to the battery minus via a switch, to simulate the presence of the Mains. The green LED 'Mains Presence' will blink at fast rate. In this way, the EVOLVE will not detect a Mains Failure condition and will not start the engine. The display indicates the message **[MAINS SIMULATED]**; the contactor of the Mains will be forced closed.
REMOTE START	21	Connect this terminal to the battery minus, to start the engine. The yellow LED TEST will blink at fast rate when engine runs. Program the option **[KG TEST CONTROL]** to **[ON]** if you want to transfer the load to the generator. The input works in the AUTO mode of operation only and is ignored in Manual & OFF modes of operation. The display will indicate the message **[REMOTE TEST]**.
EMERGENCY	22	When you push the Emergency button (connected to the terminal 22), you trigger the LOCAL EMERGENCY alarm (see 13.2). The red LED Alarm will blink at a fast rate and the Evolve immediately shuts down the engine after opening the contactor of the Generator. If Mains is present, the Evolve transfers the load to the Mains. To cancel the alarm, release the emergency button and push  for a few seconds. If the Evolve panel is in Auto Mode of operation, it may start the engine at anytime.
ALARM WARNING	23	You can connect a switch to the input 23 and battery minus. When you close the switch, you trigger a warning.
AUXILIARY TEMPERATURE	Plug	You can connect a probe (optional purchase only for Evolve9-9KVA) to monitor the temperature of the room. Allowed temperature range is -25/+125 °C. You can set alarms to trigger a warning or a shutdown. (see section 8.3).

Section 13.0 - ALARMS, WARNINGS AND SHUTDOWNS

The EVOLVE features:

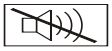
A) - Symbols and LEDs, indicating the presence of Warnings or Shutdowns (see figure 1).

B) - Horn output (terminal 5) with a programmable timing (use  to silence it).

C) - Descriptive messages for alarms with date, time and additional information if available.

D) - Event history capable of recording 200 alarms and events (see section 5.5).

Instructions in case of alarm(s):

1) Look at the front panel: a yellow LED indicates a warning and a red LED indicates a shutdown. The display will automatically open the page that describes the alarm.
2) Some alarms, in order to cool the engine down, shut the engine down after a programmable delay. We recommend that you wait for the complete stop of the engine in all cases.
3) Push the  pushbutton in order to acknowledge the alarm and silence the horn. Push the **[MAN]** button to enter the Manual Mode of operation. Consult the following sections for information about the alarm.
4) Remove the cause of the alarm. Push the  pushbutton for 5 seconds to cancel the alarm totally

The full list of alarm messages is indicated below on the left side. Additional information are also provided

13.1 - Clock and periodic test alarms		Section
CLOCK ERROR	Real time clock failure or wrong programming	6.0
PARAMETER ERROR	Error in a parameter	18.1
MEMORY ERROR	Failure of the memory	

13.2 - Emergency alarms & Shutdowns		Section
EMERGENCY SHUTDOWN	This alarm takes place if you connect the terminal 22 to battery minus via an emergncy switch. This alarm does not effect the status of the MAINS circuit breaker. Do not use this input to remove the electric power from the house.	12.0
ALARM WARNING	This alarm takes place if you activate the alarm connected to terminal **23** of the EVOLVE (switch or pushbutton)	

13.3 - Miscellaneous engine alarms			Section
LOW BATTERY WARNING	Battery Voltage Limits: 11,8V/15,5V (12V battery). A bypass delay of 2 minutes is provided. In case of warning, check connections or status of the battery plant. Maintenance of the battery must carried out by qualified personnel only..		-
HIGH BATTERY WARNING			
FAIL TO START SHUTDOWN	Fail to start shutdown	**High Severity Alarm: check the charger alternator or the settings for the engine running conditions. See section 14.0 for details.**	9.3
FAIL TO STOP SHUTDOWN	Fail to stop shutdown		
BELT BREAK SHUTDOWN	Engine Belt break (or Charger failure) shutdown. You can disable the alarm by setting the option OFF into BELT BREAK parameter.		

13.4 - Alternator alarms		
SHORT CIRCUIT SHUTDOWN	Short circuit shutdown protection of the generator. The engine shuts down after the cooling down time.	**These could be high severity or critical Alarms. The Evolve opens the Generator Circuit Breaker (KG) in a way to protect the generator itself.** **Under voltage / Under frequency may be symptoms of overload. The engine will shut down after a cooling down time.** **Check the settings of the parameters and set properly the bypass timing of each alarm.**
UNDER VOLTAGE SHUTDOWN	Generator Under Voltage protection. The engine shuts down after the cooling down time.	
OVER VOLTAGE SHUTDOWN	Generator Over Voltage protection. The engine shuts down immediately.	
UNDER FREQUENCY SHUTDOWN	Generator Under Frequency protection. The engine shuts down after the cooling down time.	
OVER FREQUENCY SHUTDOWN	Generator Over Frequency protection. The engine shuts down immediately.	
OVER CURRENT WARNING	Generator Over Current protection. The engine is allowed to run, but we recommend to reduce the load of the generator.	
OVER CURRENT SHUTDOWN	Generator Over Current protection. The engine shuts down after the cooling down time.	
ALTERNATOR FAIL FAILURE	Evolve shuts down the engine if the parameters of the Generator are outside of the operating range for at least 150 seconds from engine start.	
OVER KVA MAINS WARNING	The load connected to Mains exceeds the setting. Evolve is going to start the engine and will transfer the Load to the generator. When the load will fall under the setting, Evolve will transfer the load to Mains.	9.1

13.5 - Temperature alarms (Engine and Auxiliary)		Section
HIGH COOLANT °C SHUTDOWN	EVOLVE shuts down the engine where abnormal coolant Temperature is sensed for the engine (Sensor or Switch connected to terminal **17**).	9.5
HIGH COOLANT °C WARNING	Warning of abnormal coolant Temperature of the engine (Sensor connected to terminal **17**).	
LOW COOLANT °C WARNING		
COOLANT SENDER OPEN	This indicates the failure of the temperature sensor connected to terminal **17** (the resistance is over 2100 Ohm).	
HIGH AUX °C SHUTDOWN	EVOLVE shuts down the engine in the case of abnormal Auxiliary Temperature (Probe connected to EVOLVE-9KVA).	8.5 Only if option Aux. Temperature Probe is provided
HIGH AUX °C WARNING		
LOW AUX °C SHUTDOWN		
AUX °C SENDER OPEN	This indicates the failure of the temperature probe connected to EVOLVE.	

13.6 - Fuel Level alarms		Section
LOW FUEL LEVEL WARNING	Low Level /High Level Fuel warning (Sensor connected to input **16**).	9.4
HIGH FUEL LEVEL WARNING		
FUEL RESERVE WARNING	This warning energises during the TANK EMPTY DELAY. It indicates that fuel is going to finish.	
TANK EMPTY SHUTDOWN	EVOLVE shuts down the engine if the level drops (level sensor or switch) below the set limit for more than the programmed time.	
FUEL SENDER OPEN	This indicates the failure of the sensor connected to terminal **16** (resistance over 2100 Ohm)	

13.7 - Oil Pressure alarms		Section
LOW OIL PRESSURE SHUTDOWN	Low Oil Pressure Shutdown (detected by a sensor or a pressure switch connected to the terminal 15).	9.6
LOW OIL PRESSURE WARNING	Low Oil Pressure Warning (detected by a sensor connected to the terminal 15).	
OIL PRESSURE OPEN	Failure of the Oil Pressure Sensor connected to terminal 15.	

13.8 - Maintenance alarm and RUN timeout		Section
SERVICE WARNING	Maintenance alert, provides a warning after timeout. To cancel the alarm, enter the manual mode. Stop the engine if running. Push and hold the  pushbutton for at least 5 seconds. The **[SERVICE]** timer will restart a new cycle. Disconnect the panel and carry out the maintenance according to the Engine/Genset user manual. After reconnecting the panel and the DC supply, enter the Manual mode. You can program a different **[SERVICE]** time if necessary (see section 8.1).	8.1
MAXIMUM RUNTIME SHUTDOWN	Time expired. This timer allows the engine to run a limited number of hours. In the case of an alarm, verify the general status of the engine, cancel the alarm and restart the engine. The timer will initiate a new cycle when the engine runs.	8.3

Section 14.0 - ENGINE RUNNING DETECT

The EVOLVE inhibits the starter motor when the engine starts running. When the engine is not running, voltage of the terminal D+/WL of the charger alternator, input 13, is 0V. When the engine starts running, the voltage of the D+/WL terminal increases; the range to disconnect the starter motor is between 8V to 10V. The default parameter of **[CRANK VDC]** (section 9.3) is 8.0V. For recommended safe use, be sure that during the crank, the alternator voltage indicated by the display (see section 5.1B **[ALTERNATOR]**) is lower than **[CRANK VDC]**. In addition, EVOLVE monitors the voltage/frequency of the Generator for disconnecting the crank motor (see **[CRANK VAC]** and **[CRANK HZ]** parameters in section 9.3).

NOTE: WHEN THE ENGINE RUNS, THE DISPLAY MUST INDICATE THE MESSAGE [ENGINE RUNNING]. IF NOT, YOU ARE REQUIRED TO PROGRAM THE [CRANK VDC] PARAMETER WITH A CORRECT VALUE. IF YOU CONNECT A FLYWEEL GENERATOR THE INDICATION OF ALTERNATOR VOLTAGE (see 5.1B) IS NOT ACCURATE.

Section 15.0 - TROUBLESHOOTING

The Basic Troubleshooting Guide is intended to provide you with helpful guidance relating to problems that you may experience with the EVOLVE. We recommend that you isolate/disconnect the panel from both the Mains and Generator. These procedures should *only* be carried out by qualified personnel.

! W A R N I N G !

High voltages are present within this panel. To avoid an electric shock hazard, operating personnel must not remove the protective cover. Do not disconnect the Earth connection. Any interruption of the safety grounding connection can create an electric shock hazard. Before making external connections, always ground the EVOLVE first by connecting the control panel to Earth.

15.1 Push buttons test

When you press a pushbutton you only activate a message on display. But there is, all the time, the risk to activate an output. In order to avoid shock hazard we recommend that you disconnect the EVOLVE from mains and generator.

Enter the OFF mode (see section 2.1). Push the **[←]** pushbutton to open the main menu. Repeatedly push **[↓]** to find the **[PUSHBUTTONS TEST]** menu. Push **[→]** to enter the function. Push one by one all pushbuttons except **[←]** (otherwise you exit the function).
The display will indicate a message for each button. In case the display fails to indicate a message, Evolve is damaged and must be returned to Bernini Design for repair. Push **[←](F2)** to exit. When you press a pushbutton you only activate a message on display. There is all the time the risk to activate an output. In order to avoid shock hazard we recommend that you *disconnect the EVOLVE from mains and generator*

15.2 Inputs Test

Enter the OFF mode (see section 2.1). Push the **[←]** pushbutton to open the main menu. Repeatedly push **[↓]** to find the **[INPUTS TEST]** menu. Push **[→]** to enter the function. Follow the instructions.

INPUTS TEST **15 OIL OFF** **16 FUEL OFF** **17 °C OFF** Push **[↓]** to open the second page (see on the right).	Connect, one by one, the inputs (terminals 20-21-22-23) to battery minus or to common terminal 24. The display must turn the message to 'ON'.		**20 MAINS OFF** **21 REMOTE OFF** **22 EMERGENCY OFF** **23 WARNING OFF** Push **[↑]** to open the first page of the test (see on the left).	If an input fails to provide the proper message on display, the Evolve is damaged and must be returned to Bernini Design for repair.

15.3 Sensors Test

Enter the OFF mode (see section 2,1). Push the **[←]** pushbutton to open the main menu. Repeatedly push **[↓]** to find the **[SENSORS TEST]** menu. Push **[→]** to enter the function. Connect terminals 18 & 19 together then follow the instructions.

SENSORS TEST **15 OIL 2500 ohm** **16 FUEL 2500 ohm** **17 °C 2500 ohm** Push **[↓]** to open the second page (see on the right).	Connect, one by one, each analog inputs (15-16-17) to battery minus (or to 18/19) via a resistor of a known value (in between 100 up to 500 OHM). The display should indicate the value of the resistor within a 5% tolerance.		**INP AUX 5.00V** Push **[↑]** to open the first page of the test (see on the left).	You are required to connect the TEST PROBE (contact Bernini Design).

15.4 Outputs Test

By carrying out this test, there is the possibility to start the engine or to activate a circuit breaker. We vividly recommend that you disconnect the mains, the generator and the engine.

Enter the OFF mode (see section 2.1). Push the **[←]** pushbutton to open the main menu. Repeatedly push **[↓]** to find the **[OUTPUTS TEST]** menu. Push **[→]** to enter the function. Follow the instructions (you are required to use an OHM-meter)

OUTPUTS TEST [↓] **4 START [→] OFF** **3 FUEL OFF** **STOP REALY OFF** Note: to test the STOP Relay, when you push the button, you should measure around 0 OHM in between the terminals 8 & 9.	Push **[↓]** to move down the symbol **[→]** (on display) until you select the output that you are looking for. Connect a load to the output (a small 3W lamp for example). Push the **[→]** pushbutton to activate the output.		**5 HORN OFF** **KG RELAY OFF** **KM RELAY OFF** **6 PREGLOW OFF** Push **[↑]** to open the first page of the test (see on the left).	To test the KG/KM Relay, disconnect the 4 poles plugs 'G' & 'M'. When you activate the KG, you should measure around 0 OHM in between the terminals 27 & 29. In the same way, when you activate the KM, you have to measure around 0 OHM in between the terminals 32 & 33. In case of troubles you are required to verify the integrity of the all fuses on the board.

Section 16.0 - GENERAL SPECIFICATIONS

DC supply voltage (battery): 5.5Vdc to 18Vdc, 50 -150mA. **Protection:** internal 300mA thermal fuse.

Dimensions: 340 (base)mm X 432(High)mm X 161(depth)mm. Indoor / outdoor operation IP65

Operating temperature range: -25 deg C up to +50 deg C. **Humidity range:** 5% up to 95% non-condensing.

Weight: 6Kg **General design:** ECC 89/336, 89/392, 73/23, 93/68, IEC 68-2-6. **Certification:** CE

DC Relay, output characteristics: Total Output Current: 3 Amp. (protected by 4A electronic fuses)

AC Relay, output characteristics (to drive the coils of the contactors): Output Current: 1 Amp. /250Vac (protected by 1A fuse)

Mains and Generator voltage input: Nominal Voltage input: 180 Vac - 250Vac. Over voltage: 4KVac phase to neutral. Measurement precision: +/- 2%. Input impedance: 2 Mega Ohm

Maximum Current Mains or Generator: 40Aac continuous (7,4kVA) /60Aac continuous (12kVA) .

Digital inputs: Open circuit voltage: Battery voltage minus 2V - Trigger level: < 2Vdc (max 15mA).

Charger alternator monitoring: Operating voltage up to 36Vdc/3W. Vdc reading accuracy +/- 5%.

Section 17.0 - SOFTWARE UPGRADES & REVISIONS

Firmware Versions	Date	User manual	Description
RELEASE 1	06 Feb-2014	-	First release

Section 18.0 - APPLICATION NOTES

18.1 – MEMORY ERROR & PARAMETER ERROR

The message **[MEMORY ERROR]** or **[PARAMETER ERROR]** indicates a DATA corruption fault.
In order to clear the alarm, follow the instructions given below:

(A) – Remove the power supply for one minute or more (disconnect the Battery).
(B) – Reconnect the power supply. If the message disappears you can continue using the controller without problem.

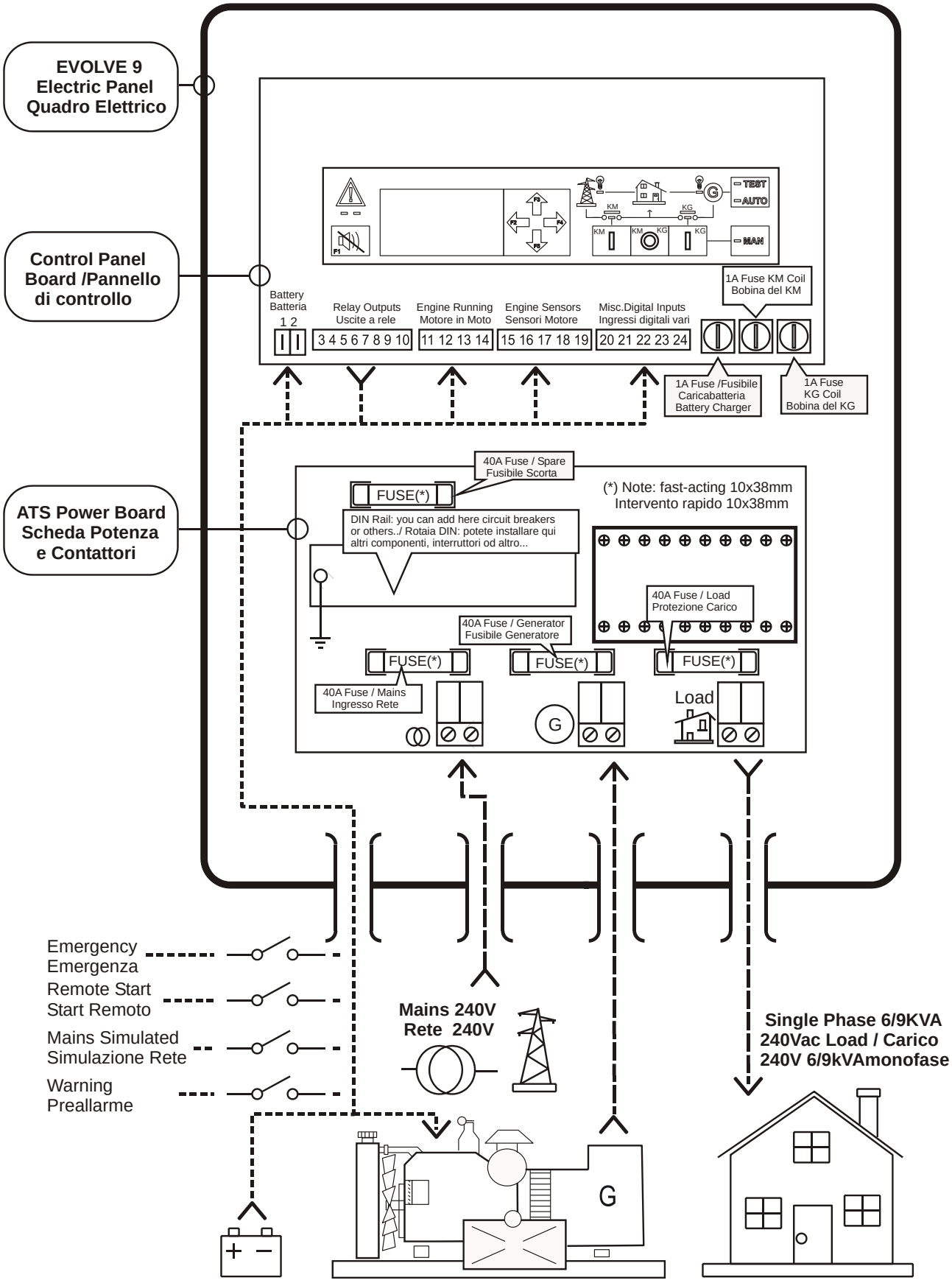
If the message persists on the display, follow these instructions

(C) – Push the  pushbutton in order to cancel the alarm
(D) – Choose the OEM parameters and enter the Programming (see section 11.0).
(E) – Select the function [**CLEAR FUNCTIONS]** (see section 9.8) and trigger the **[CLEAR ALL MEMORY]** command. If the message **[DONE]** appears, you can reprogram the controller.

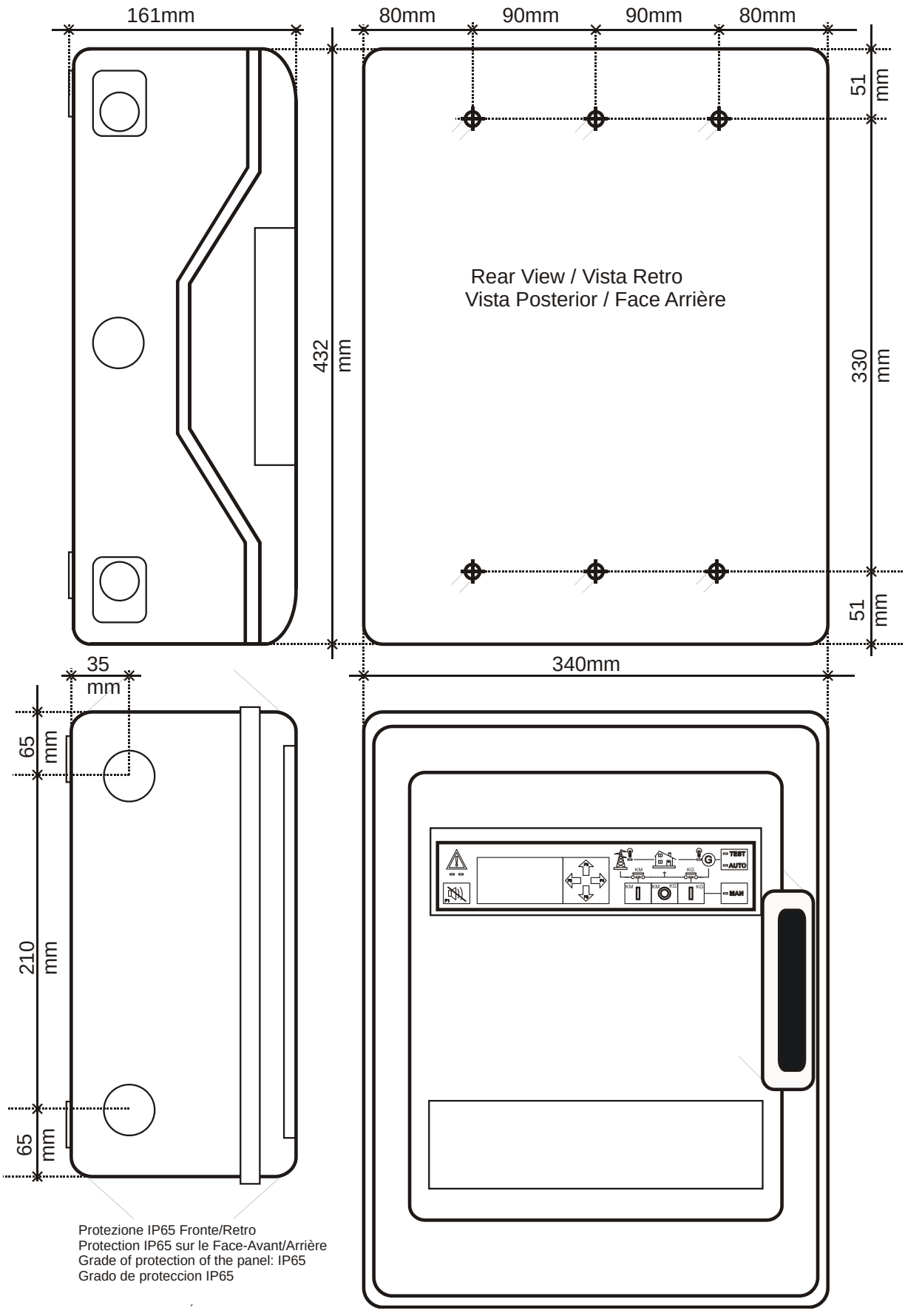
If the EVOLVE returns the message **[MEMORY ERROR]**, the controller is damaged and should be returned to Bernini Design for investigation and repair.

Section 19.0 - ELECTRICIAN & GEN-SET BUILDERS NOTES FOR THE USER

Section 20.0 - TYPICAL APPLICATION & WIRING DIAGRAM



Section 21.0 - Rear view and dimensions



Section 22.0 - TERMINAL DESCRIPTION (1 OF 2)

!! W A R N I N G !!

ANY INTERRUPTION OF THE PROTECTIVE GROUND OR DISCONNECTION OF THE PROTECTIVE EARTH IS LIKELY TO MAKE THE EVOLVE DANGEROUS IN OPERATION!

Terminal	Input name	Notes and Instructions for the user
1	Battery Plus	These terminals must be connected to the 12V battery for the engine. We recommend that you use a minimum cable size of about 4 sq. mm. If the distance is over 5 metres a minimum size of 6 sq. mm will be required. A 10 amp fuse must be provided for cables protection.
2	Battery Minus	

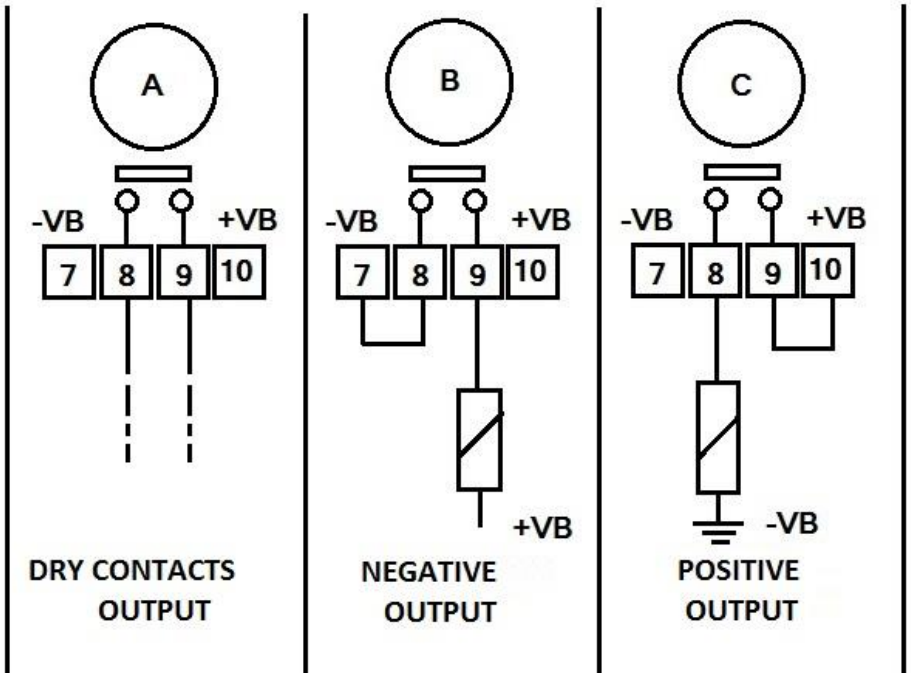
Terminal	Output name	Notes and Instructions for the use
3	FUEL SOLENOID	Connect to a FUEL SOLENOID (energised to run).This output can drive up to 1Adc@12Vdc. The output is protected by an electronic/thermal Fuse rated 4Adc.
4	START PILOT	Connect to a START PILOT. This output can drive up to 1Adc @12Vdc. The output is protected by an electronic/thermal Fuse rated 4Adc.
5	HORN	Connect to a HORN. This output can drive up to 1Adc@12Vdc. The output is protected by an electronic/thermal Fuse rated 4Adc.
6	Pre-Glow	Connect to a Pre-glow pilot relay. This output can drive up to 1Adc@12Vdc. The output is protected by an electronic/thermal Fuse rated 4Adc.
7	Stop Solenoid Minus (*)	Internally connected to battery minus (see the Stop Solenoid connection diagram).
8	Stop Solenoid (*) Dry contact	Dry contact on the Stop Solenoid relay (see the Stop Solenoid connection diagram). The output is protected by an electronic/thermal Fuse rated 4Adc.
9	Stop Solenoid (*) Dry contact	Dry contact on the Stop Solenoid relay (see the Stop Solenoid connection diagram). The output is protected by an electronic/thermal Fuse rated 4Adc.
10	Stop Solenoid Plus (*)	Internally connected to battery plus (see the Stop Solenoid connection diagram).

The following Stop Solenoid connection diagram presents the possible arrangements for the connection of the Stop Solenoid:

(*) - Option A: Stop Solenoid dry contacts (terminals 7 & 10 = open)

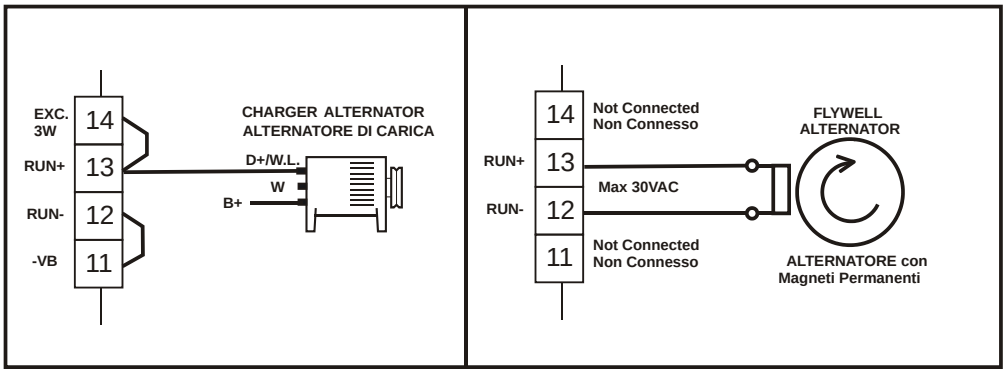
(*) - Option B: Stop Solenoid negative output (terminal 10 = open)

(*) - Option C: Stop Solenoid positive output (terminal 7 = open)

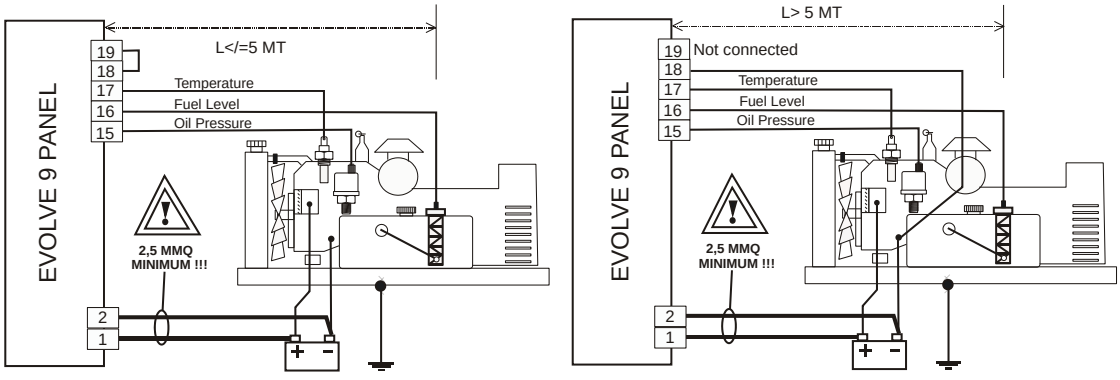


We recommend that you use a STOP SOLENOID rated at max 3Amp 12Vdc or 24Vdc

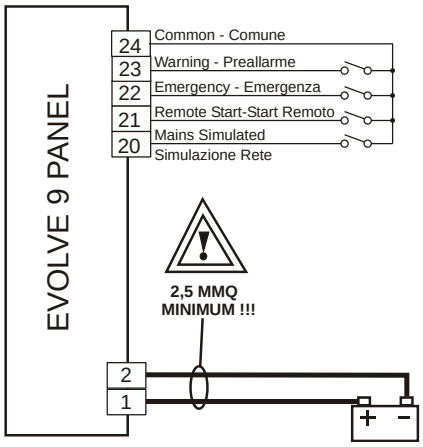
Terminal	Input name	Notes and Instructions for the user
11	Reference Minus	Connect to terminal 12 if your engine has a Charger Alternator with D+/WL or alternatively leave it open in the case of a FLYWHEEL generator.
12	Engine running Minus Engine running AC	Connect to terminal11 if your engine has a Charger Alternator with D+/WL or connect it to one terminal of the Flywheel generator (for gasoline engines, see the drawing below).
13	Engine running Plus Engine running AC	Connect to terminal 14 and D+/WL if your engine has a Charger Alternator or connect it to one terminal of the Flywheel generator (for gasoline engines, see the drawing below).
14	D+/W.L. terminal	This terminal provides excitement current for the Charger Alternator. This must be connected to terminal 13 and to the D+/WL terminal of the charger alternator. Leave it open in the case of a Flywheel generator.

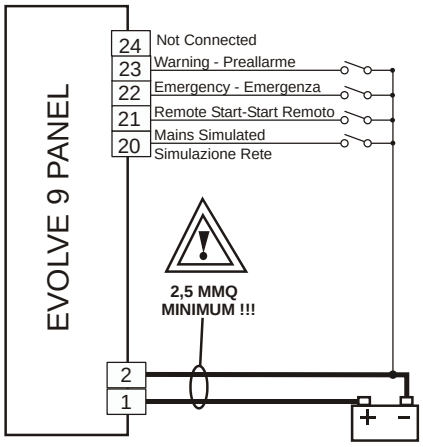


Terminal	Input name	Notes and Instructions for the user
15	Oil Pressure Sensor or Switch	This input monitors the Oil pressure sensor information. To make the input work in the digital mode (switch), you are required to program OFF the Low Bar settings (Warning & Shutdown). You can program any type of response curve (see section 9.6).
16	Fuel Level Sensor or Switch	This input monitors the Fuel level sensor information. To make the input work in digital mode (switch), you are required to program OFF the Low/High Fuel Level settings. You can program any response curve (see section 9.4).
17	Temperature Sensor or Switch	This input monitors the Temperature sensor information. To make the input work in digital mode (switch), you are required to program OFF the Low/High Temperature settings. You can program any response curve (see section 9.5).
18	Compensation Terminal	If the distance to the engine is over 5 metres, we recommend that you connect a wire from the body of the engine to terminal 18 and leave the terminal 19 open.
19	Internal Reference	If the distance from the engine is less than 5 metres, connect terminal 19 to terminal 18. Do not connect the terminal 18 to the body of the engine. See the drawing below.



Terminal	Input name	Notes and Instructions for the user
20	**MAINS SIMULATED**	Connect this terminal to the battery minus (or to terminal 24 if this is easier for you) to simulate the presence of the Mains (see 12.0). You can connect a switch as remotely as 200 metres away. When the input is active, you simulate the presence of the Mains: the engine will not start in case of Mains failure.
21	**REMOTE START SWITCH**	Connect this terminal to the battery minus (or to terminal 24 if this is easier for you), to start the engine (see 12.0). You can connect a switch remotely up to 200 metres away.
22	**EMERGENCY SWITCH**	Connect this terminal to a normally open contact switch (see 12.0). Connect the other side of the switch to battery minus (or to terminal 24 if this is easier for you). You can connect a switch remotely up to 200 metres away. **THIS INPUT AND THE EMERGENCY ALARM DO NOT AFFECT THE STATUS OF THE MAINS CIRCUIT BREAKER.**
23	**WARNING SWITCH**	Connect this terminal to the battery minus (or 24) to trigger a warning (see 12.0). You can connect a switch remotely up to 200 metres away.
24	**INPUT COMMON**	Internally connected to the Battery Minus. It should be used as common terminal for all digital switches #20, #21, #22 and #23. ***DO NOT CONNECT** the terminal 24 to battery minus.*





Terminal	Description & Notes		
MAINS PHASE	Mains Voltage 250 Vac	Phase	Inputs for Mains and Generator power lines up to 250 Vac. Recommended wire size 6 sq mm
MAINS NEUTRAL		Neutral	
GENERATOR-PHASE	Generator Voltage 250 Vac	Phase	
GENERATOR-NEUTRAL		Neutral	
LOAD PHASE	Load connection 250 Vac	Phase	Terminals for the connection of the Load. Recommended wire size 6 sq mm
LOAD NEUTRAL		Neutral	

Terminal	Input name	Notes and Instructions for the user
S-1-8-9	Not used	RS232C interface. 9 Poles Sub-D MALE (only for Evolve-9KVA)
S2	RX Line	
S3	TX Line	
S4	DRT output	
S5	Common Ground	
S6	DSR Input	
S7	Internal Pull-UP	

Appendix SMS commands

To communicate by using your mobile phone, please use the following syntax :

[NAME] [COMMAND]

So, an example is: **EVOLVE START**

NOTES:

1 - The text, as indicated in the example, must be constructed of 2 words: **EVOLVE** (that is the programmable **[NAME]**) and **START** (that is the type of **[COMMAND]**).

2 - The programmable **[NAME]** is a word of 1-8 letters (not case sensitive) or numbers. No symbols are allowed. See section 8.6 for programming.

3 - Between **[NAME]** and **[COMMAND]** you have to insert a space.

4 - The panel will respond to a command only if the **[NAME]** matches the **[NAME]** you programmed in the panel

5 - Factory programmed **[NAME]** is EVOLVE. You can change it at anytime. Names made of a single letter or a number are also acceptable. In this case the Evolve requires a **[COMMAND]** only (the name is no longer necessary).

A listing of the available COMMAND syntax is indicated below. You can use lower or upper case letters; the system will accept the command regardless of selecting upper case or lower case letters.

STATUS	Reads the status of the engine, mode of operation and status of contactors
ALARM	Reads the active alarms of the EVOLVE
GEN	Reads the voltage, frequency, PF, KVA, kW and KVAr of the Generator.
MAINS	Reads the voltage, frequency, PF, KVA, kW and KVAr of the Mains.
ENGINE	Reads the Battery Voltage, Oil Pressure, Fuel Level, Coolant and Hours run.
OFF(*)	Enters the OFF mode of operation; it clears all alarms.
AUTO(*)	Enters the AUTO mode of operation.
TEST (*)	Enters the TEST mode of operation.

(*) NOTE: these commands are ignored if the Evolve is in manual mode of operation