MURPHY®

by ENOVATION CONTROLS

Genset Controller Unit

Model EMS - GC10

Installation Manual

00-02-0794
Section 75
2013-01-28

In order to consistently bring you the highest quality, full featured products, we reserve the right to change our specifications and designs at any time. The latest version of this manual can be found at www.fwmurphy.com.

BEFORE BEGINNING INSTALLATION OF THIS MURPHY PRODUCT:

- Read and follow all installation instructions.

Warning: Please make sure to read this document before working with the EMS-GC10 controller and the Genset to be controlled. Failure to do this could result in human injury or damage to the equipment.

-
- A visual inspection of this product for damage during shipping is recommended before installation.
- It is your responsibility to ensure that qualified mechanical and electrical technicians install this product.
- Be aware of Electrostatic Discharge. Take sufficient care to protect the terminals against static discharges during the installation. Once the unit is installed and connected, these precautions are no longer necessary.
- Installing the unit implies working with dangerous currents and voltages. Therefore, the installation should only be carried out by authorized personnel who understand the risks involved in working with live electrical equipment.

To locate your local distributor, go to
http://www.fwmurphy.com/dealer_search/

Warning: Be aware of the hazardous live currents and voltages. Do not touch any AC measurement inputs as this could lead to injury or death.

Table of Contents

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Introduction

The **EMS-GC10** is a versatile Genset controller designed for various applications including, but not limited to: Gensets used as backup power supply, gensets serving in remote locations and island generator sets.

This document provides installation instructions for the EMS-GC10 unit, Murphy's Automatic Genset Controller, and is intended to aid the person installing and setting up the unit. Also included is a Quick Operators Guide to help the operator carry out simple procedures such as starting, stopping, and controlling the Genset Controller, and operating the unit.

As a Reference point: Please note that the "U" symbol is also used as an indication for the voltage.

EMS-GC10 delivers field-adjustable operating parameters but may require further configuration using the Utility Software. It can support both mechanical and J1939 electronic engines.

The **EMS-GC10** is ideal for use with a remote modem or in a SCADA system offering Modbus® RTU protocol on the RS485 port.

Product Support

You may visit the FW Murphy website at http://www.fwmurphy.com/emsgc10 to download the latest version of the configuration tool software and the EMS-GC10 Operator's Manual 00-02-0878.

Legal Information and Responsibility

Murphy takes no responsibility for installation or operation of the EMS-GC10. If there is any doubt about how to install or operate the generator set controlled by the unit, contact the company responsible for the installation or the operation of the set.

> **NOTE:** Do not open the unit unless you are authorized. Warranty is void if the unit is opened by unauthorized personnel.

Factory settings

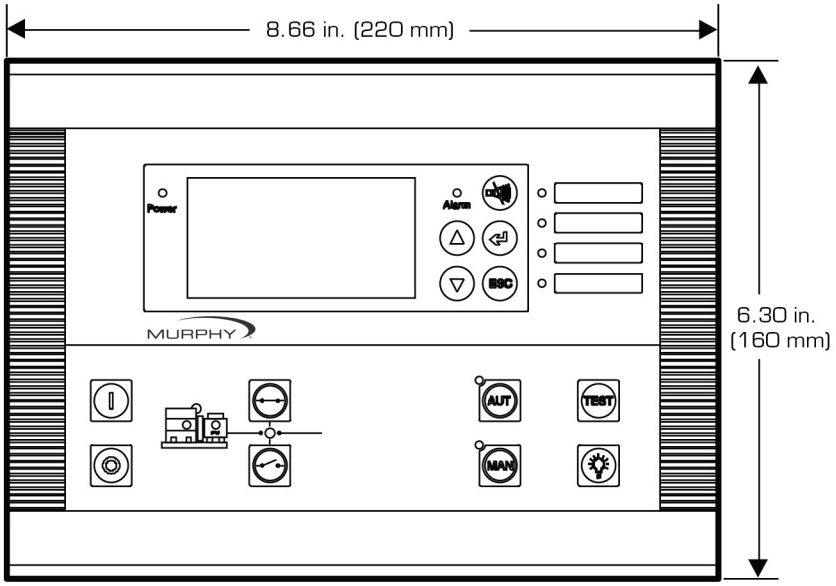
The unit is delivered with certain factory settings. Given the fact that these settings are based on average values, they are not necessarily the correct settings for matching the individual engine. Thus precautions must be taken to check the settings before running the engine.

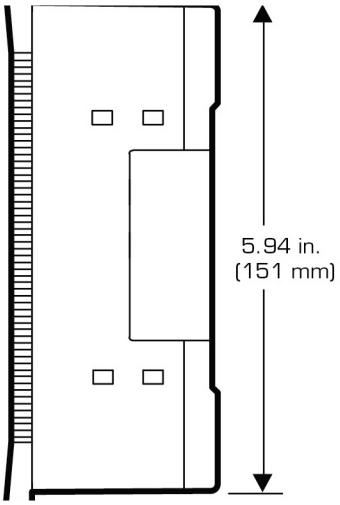
UL Applications

These flat surface panel-mounted controllers are intended to be used in Listed Generator Assemblies, where the suitability of the combination has been determined by Underwriters Laboratories..

Unit Installation

Unit Dimensions and Panel Cut-Out

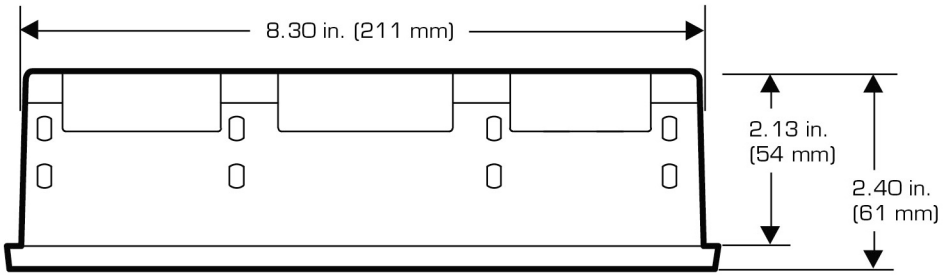




Panel cutout

H x W = 151 x 211 +1 mm

H x W = 5.94” x 8.31” +0.04”



Mounting

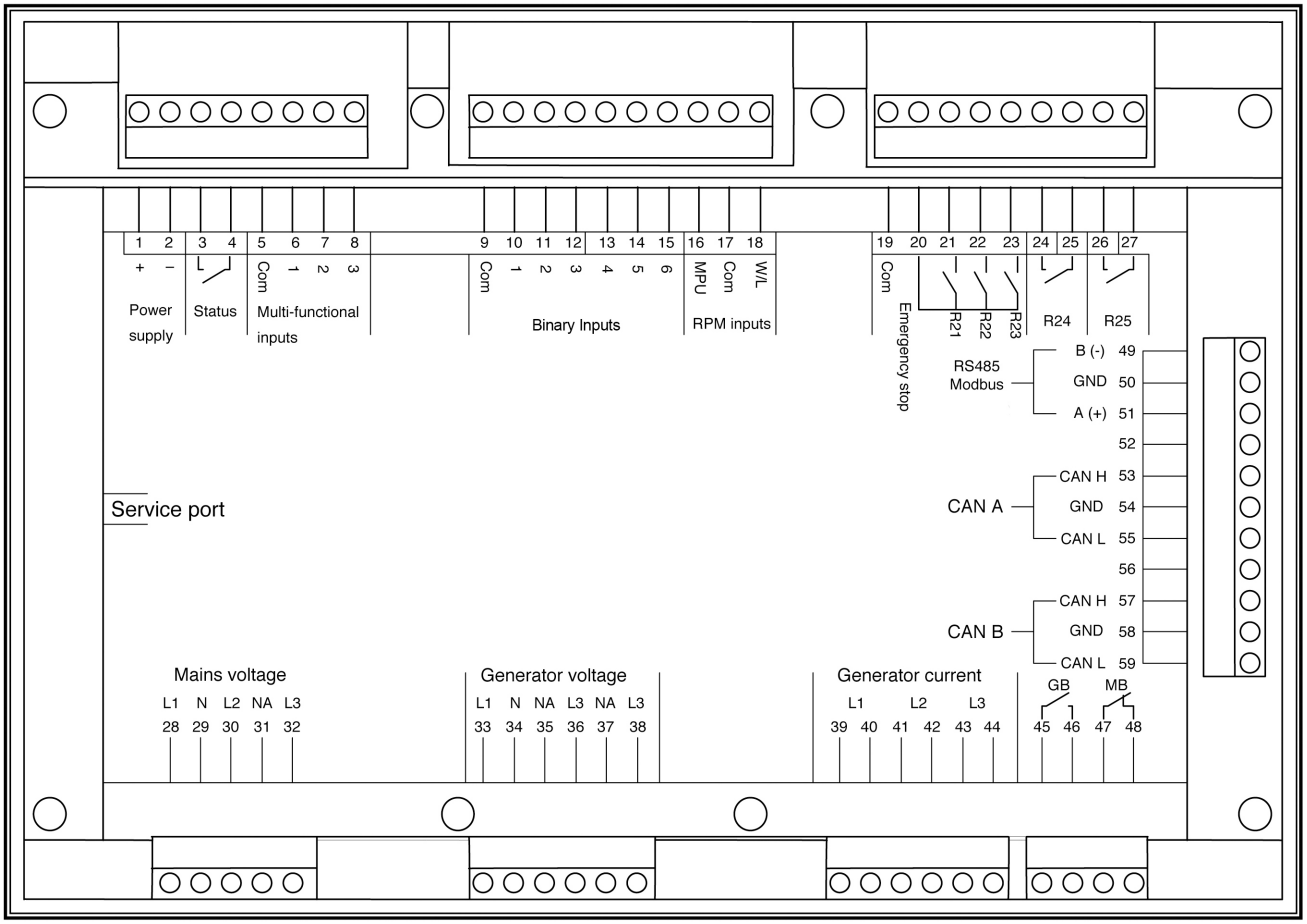
Refer to “**Unit Dimensions and Panel Cut-Out”** for detailed information on switchboard cut-out and unit dimensions.

The unit is designed for flush mounting and provides the IP65 rating, on the front side, when the unit is properly installed using the provided twelve clamps and one gasket.

Place the gasket on the back side of the unit. Mount two fixing clamps on each side of the unit. Mount two fixing clamps on the top and bottom of the unit.

The tightening torque for mounting the EMS-GC10 unit to a panel is 3 Nm.

EMS-GC10 Rear View



NOTE: The cable connector for the PC connection interface box is placed on the side of the unit.

NOTE: When the unit operates for the first time after it is received from the factory, both mains and generator breaker alarms will be activated (shown as a fault) until it is connected to the power system.

Terminal Description

> **NOTE**: For the relay outputs the following terms will be used:
> NO— normally open
> NC—normally closed
> Com.—common terminal for the individual relay

Term.	Technical data	Description
1	Power supply +	6…36V DC (UL/cUL Listed: 7.5…32.7V DC)
2	Power supply –	GND
3-4	Status out/configurable. Contact ratings 1 A 24VDC/V AC Resistive	See “Status Relay”
9	Common	Common for term. 10…15
10	Digital input	Start enable/configurable
11	Digital input	Remote start/stop/configurable
12	Digital input	Charge alternator D+ (running)/configurable
13	Digital input	Configurable
14	Digital input	Coolant temperature/configurable
15	Digital input	Oil pressure/configurable
19	Common	Common for emergency stop term. 20
20	Emergency stop and common for 21…23	Common for relay 21, 22 and 23 and input for emergency stop. See “Status Relay”
21	Relay output 21. Contact ratings 2A 30V DC/V AC (UL/cUL Listed: 1 A Resistive)	Start prepare/configurable. Function NO
22	Relay output 22. Contact ratings 2 A 30V DC/V AC (UL/cUL Listed: 1 A Resistive)	Starter (crank)/configurable. Function NO
23	Relay output 23. Contact ratings 2 A 30V DC/V AC (UL/cUL Listed: 1 A Resistive)	Run coil/configurable. Function NO
24-25	Relay output 24. Contact ratings 8 A 30V DC/V AC (UL/cUL Listed: 6 A Resistive)	Horn/configurable. Function NO
26-27	Relay output 26. Contact ratings 8 A 30V DC/V AC (UL/cUL Listed: 6 A Resistive)	Alarm/configurable. Function NO
Multi-functional inputs		
5	Common	Common for term. 6…8
6	Sender1/0(4)...20mA/binary input	Fuel level/configurable
7	Sender2/0(4)...20mA/binary input	Oil pressure/configurable
8	Sender3/0(4)...20mA/binary input	Water temp./configurable
Tachometer RPM input		
16	RPM input (MPU)	Magnetic pick-up/tacho generator
17	RPM-GND	Common for RPM input
18	RPM input (W/L)	Magnetic pick-up. PNP, NPN or charge alternator W terminal

Term	Technical data	Description
3-phase generator voltage input		
33	Gen. voltage L1	Generator voltage and frequency
34	Gen. neutral	
35	Not used, must not be connected	
36	Gen. voltage L2	
37	Not used, must not be connected	
38	Gen. voltage L3	
3-phase generator current input		
39	Gen. current L1, s1	Generator current
40	Gen. current L1, s2	
41	Gen. current L2, s1	
42	Gen. current L2, s2	
43	Gen. current L3, s1	
44	Gen. current L3, s2	
3-phase mains voltage inputs		
28	Mains voltage L1	
29	Mains voltage neutral	
30	Mains voltage L2	
31	Not used, must not be connected	
32	Mains voltage L3	
Breaker relays		
45	Relay R45. Contact ratings 2 A 30V DC/250V AC (UL/cUL Listed: Contact ratings 2 A 30V DC/30V AC)	Generator circuit breaker/configurable, function NC (normally closed).
46	Relay R45	
Relay for closing mains breaker		
47	Relay R47. Contact ratings 2 A 30V DC/250V AC (UL/cUL Listed: Contact ratings 2 A 30V DC/30V AC)	Mains circuit breaker/configurable, function NO (normally open).
48	Relay R47	
Modbus RS485 interface		
49	B (-)	Modbus RS485 RTU or ASCII
50	GND	
51	A (+)	
CANbus port #1: Engine interface		
53	CAN-H	CAN J1939 engine communication
54	CAN-GND	
55	CAN-L	
58	CAN-GND	
59	CAN-L	

Status Relay

The status relay is the uP watchdog output. This relay is normally energized, and the switch is closed after power-up. If the uP fails or the power is lost, the relay will de-energize and the switch will open. If the unit fails to start up at power-up, then the relay switch will remain open.

> **NOTE**: If terminal 20 is used for emergency stop, please see “Wiring Diagram”.

Relay Output

The relay output functions are configurable via the PC utility software and can be configured to cover the following functions:

- Alarm/limit
- Engine run indication
- Horn
- Idle speed output
- Not used
- Prepare
- Run coil
- Starter
- Stop coil
- Engine heater
- Stop coil (not acc. in start seq.)
- Fuel pump

It is possible to choose run coil on one relay and stop coil on another, thus supporting engines with double systems.

Multi-Functional Inputs

The multi-functional inputs can be configured to cover the following functions:

- Sender sensor input
- 0…20 mA input
- 4…20 mA input
- Binary input with wire break (switch function)

Tachometer RPM Input

Tachometer RPM input (MPU) can be configured to cover the following functions:

- Magnetic pick-up (2-wire)
- NPN or PNP pick-up

NOTE: These RPM inputs require external equipment.

Tachometer RPM input with capacitor (W/L) can be configured to cover the following functions:

- Magnetic pick-up (2-wire)
- W terminal on charger alternator
- NPN or PNP pick-up

NOTE: These RPM inputs require external components.

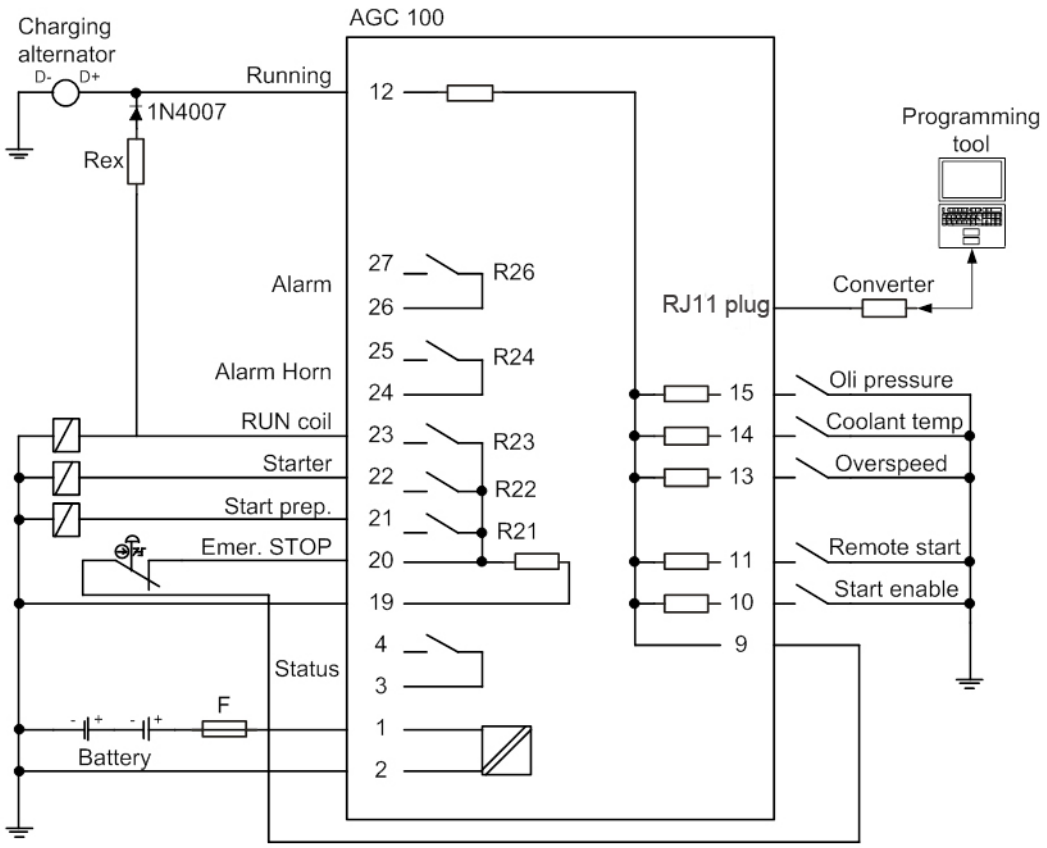
Generator Voltage and Current Input

The generator voltage and current input can be configured to the following:

- Voltage 100…25000 V primary
- Current 5….9000 A primary

Wiring

Wiring Diagram



Term. 12 can be used as alarm input if not used for charger generator terminal D+

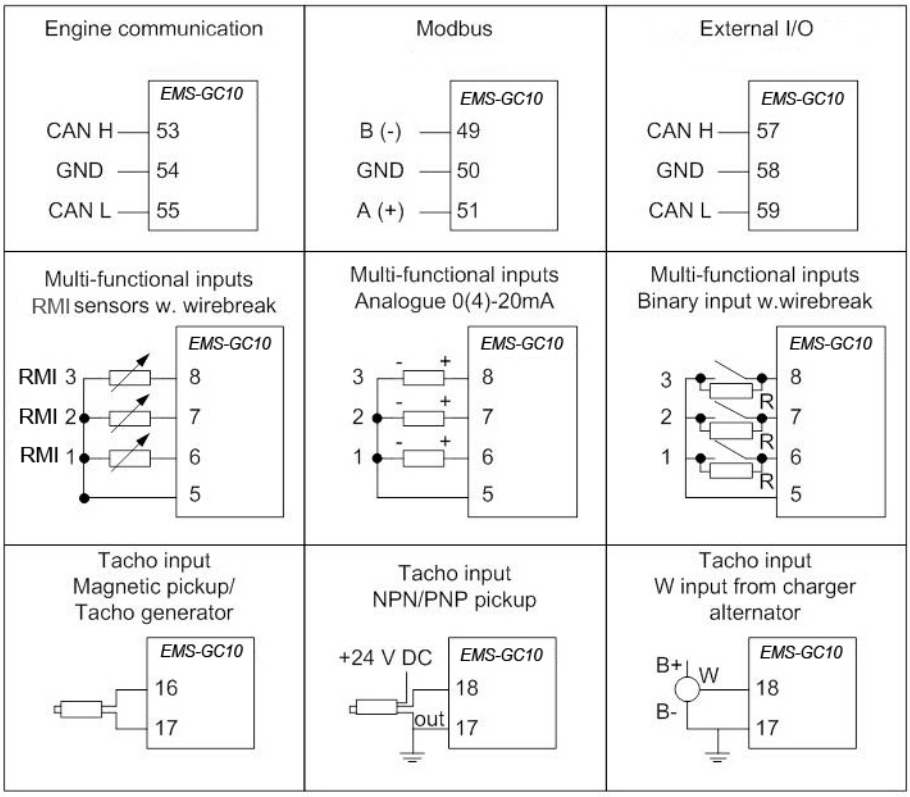
Rex: 12V systems : 47Ω 4W
24V systems : 100Ω 6W

NOTE: If a stop coil is used, the REX resistor can be connected to the starter relay (crank).

NOTE: The illustrated configuration is the default factory setting. The use of the relays can be chosen freely.

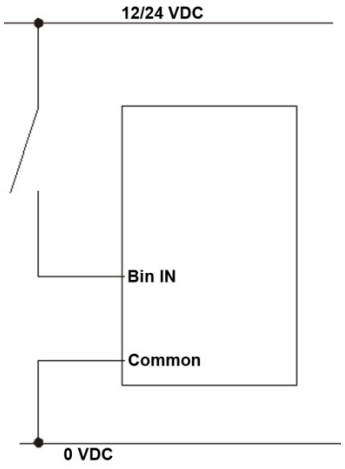
NOTE: It is important to protect the unit against damage caused by high voltages. Therefore, the fuse must not be more than 2 A slow-blow.

DC Connections Diagram



Binary Inputs Diagram

All binary inputs are 12/24 VDC bi-directional optical coupler type. The typical wiring is illustrated below:



NOTE: The binary inputs use fixed signals. Only the mode shift input and the test input (if the timer is used) use pulse signal.

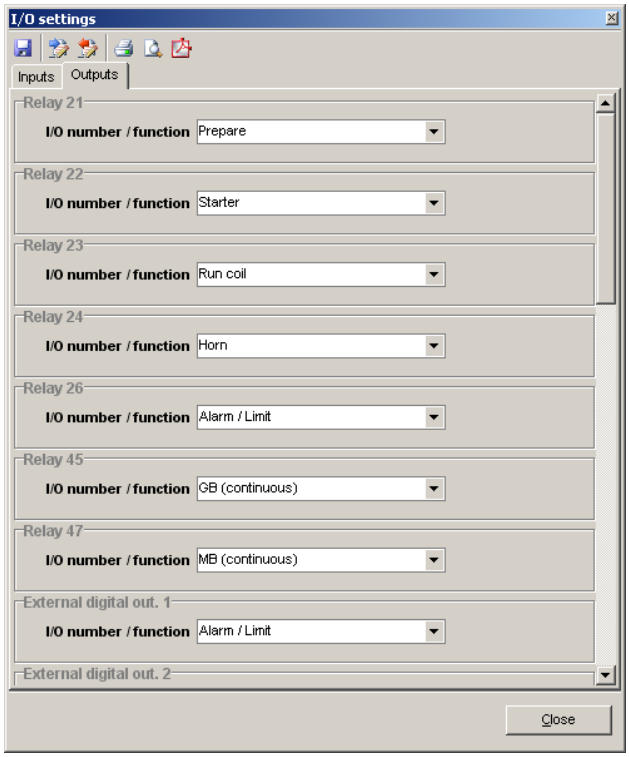
Breaker Selection

The EMS-GC10 can handle contactors and pulse breakers. Selection of breaker type is done under output setting.

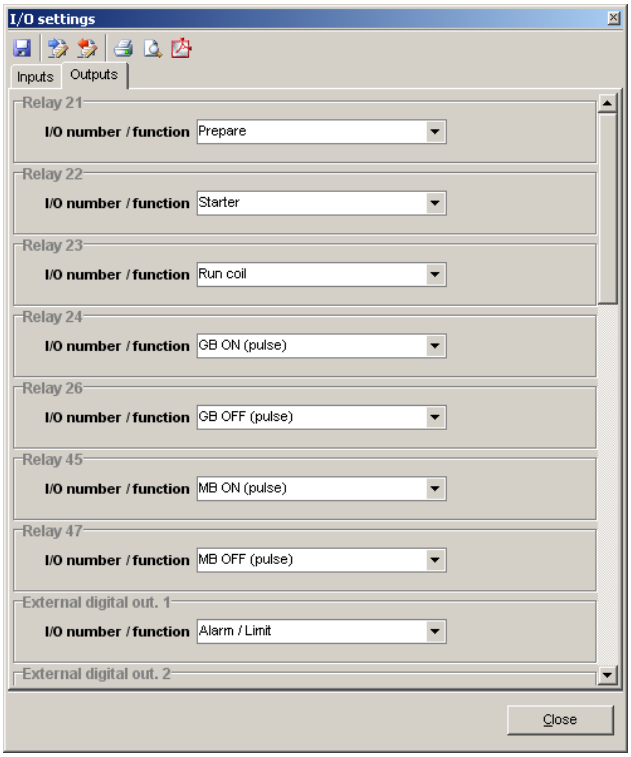
Pulse Breaker: GB ON + GB OFF

GB Pulse ON Time: GB ON + GB OFF can be set in menu 6234

Continuous Breaker: GB constant signal



Continuous breaker selection

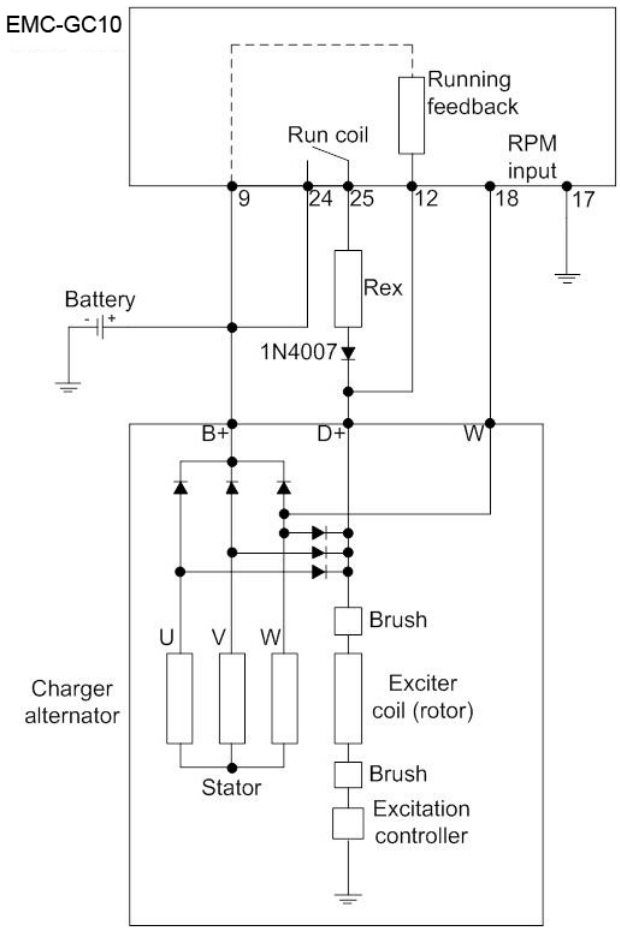


Pulse breaker selection

Charger Alternator Connections

The charger alternator can be used as running-feedback in 2 different ways. (1) Using the D+ terminal connected to terminal 12 or (2) Using the W terminal connected to the RPM input.

> **NOTE**: Usually only one of these possibilities is used.

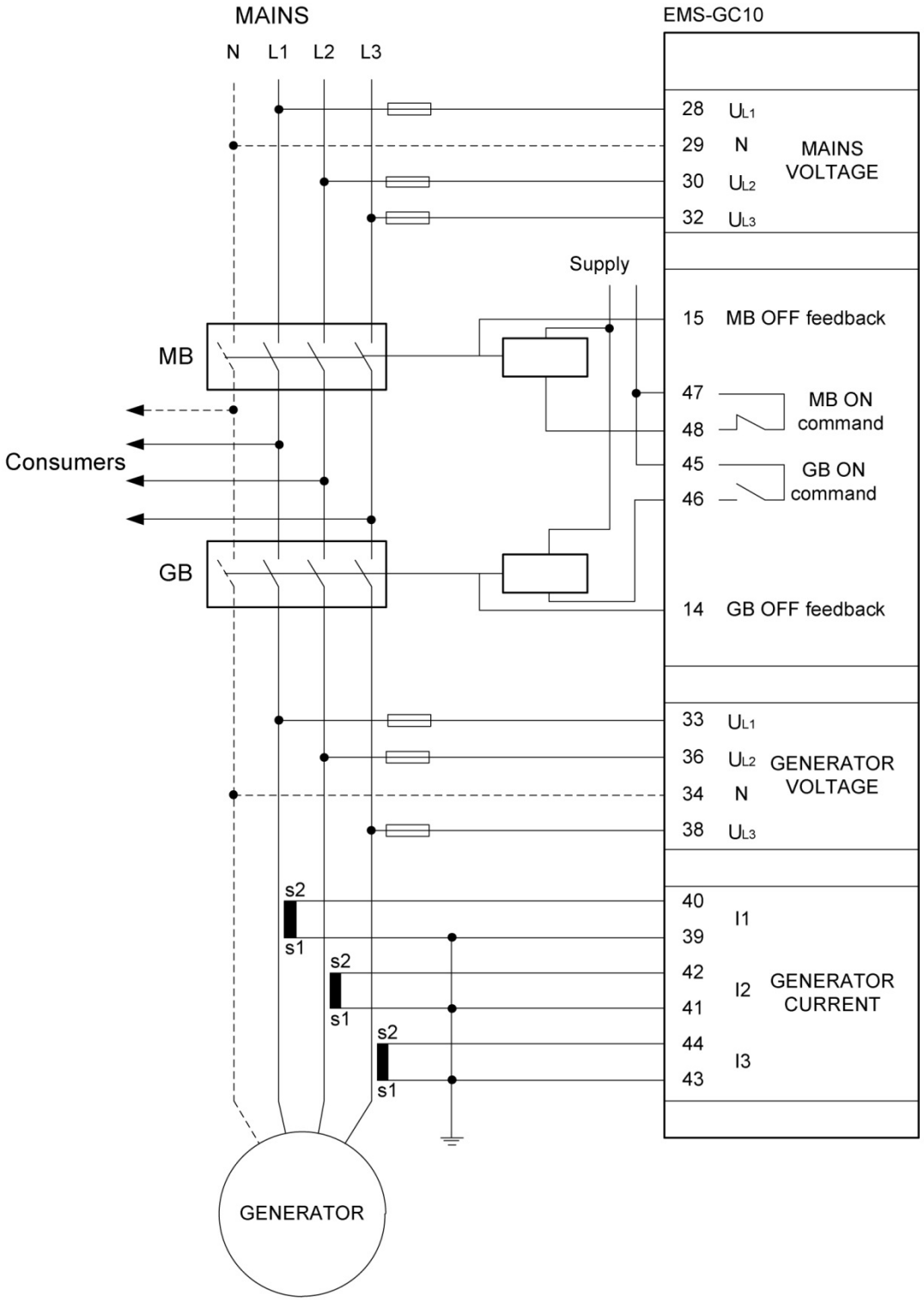


Rex: Excitation Resistor	12 V systems: 47Ω 4 W
	24 V systems: 100Ω 6 W

At standstill the battery + is connected to terminal 9 (common), and a current flows to terminal 12 and via the D+ input on the alternator to ground (battery -). When the starter is engaged (cranking), the battery will supply the D+ through the REX resistor, helping the alternator to excite. When the alternator starts to produce voltage (excitation OK); the speed of the alternator will be above running speed and the voltage on term. 12 will rise to a value higher than the battery voltage and then interrupt the current flow through REX and activate the running feedback input. Engine is running.

> **NOTE:** If a stop coil is used, the REX resistor can be connected to the starter relay (crank).

AMF Wiring


MAINS
N L1 L2 L3
EMS-GC10
28 UL1
29 N
30 UL2
32 UL3
MAINS VOLTAGE
Supply
15 MB OFF feedback
MB
47
48
MB ON command
Consumers
45
46
GB ON command
GB
14 GB OFF feedback
33 UL1
36 UL2
34 N
38 UL3
GENERATOR VOLTAGE
s2
s1
40
39
I1
42
41
I2
GENERATOR CURRENT
44
43
I3
GENERATOR

Communication

Wiring Instructions

Cable

Belden 3106 A or equivalent. 22 AWG (0.324 mm^2) shielded twisted pair, min. 95% shield coverage.

Cable Shield

Connect the cable shield to earth at one end only.

GND Terminal Connection

In case of communication problems, the GND terminals of the EMS-GC10 unit and the external device can be linked together using a third wire.

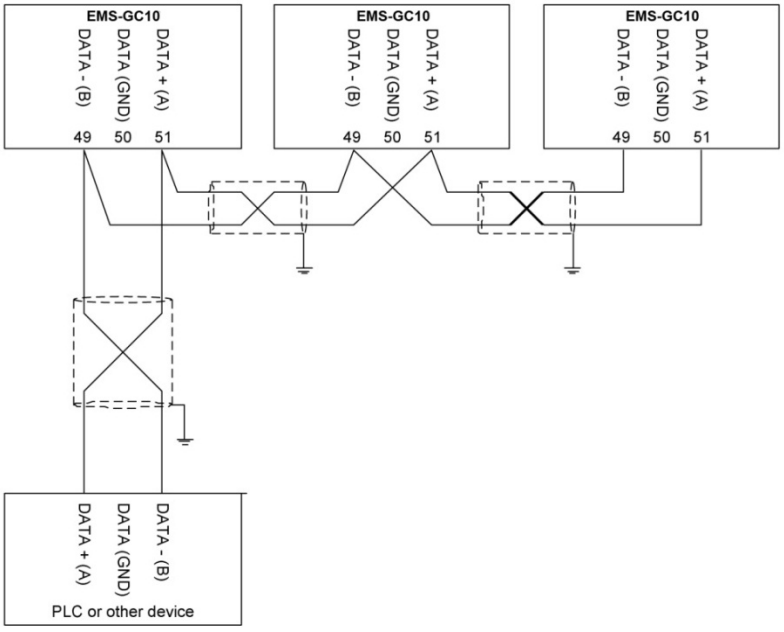
CANbus Termination Resistor

The size of the terminating resistors should be 120 Ω 1%, 0.5 W resistor.

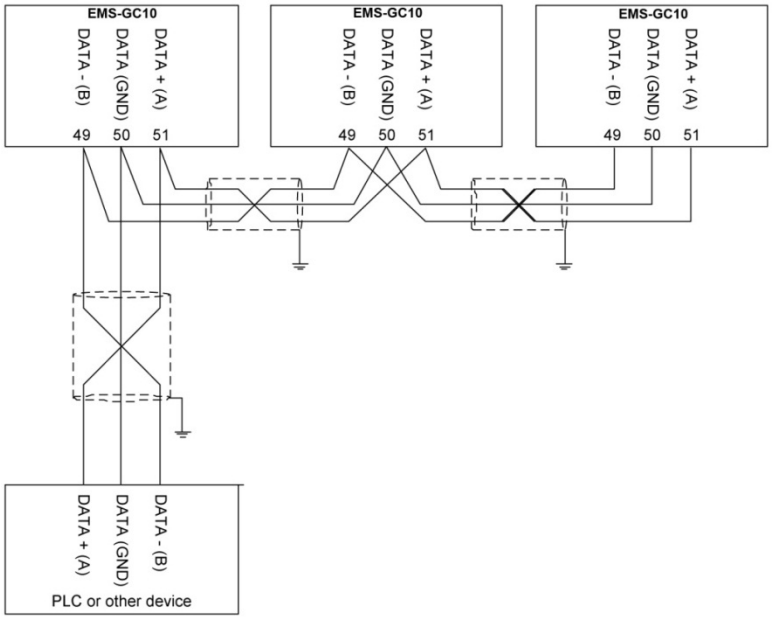
> **NOTE**: Never connect the GND terminal to earth directly or through the shield!
>
> **NOTE**: If the GND terminal is connected to a PLC or other device, the GND connection of this device must be isolated from earth!
>
> **NOTE**: Maximum length of the CANbus line is 40 meters for J1939, and 400 meters for the other CAN communications.

Modbus RTU

Connection with 2-Wire Shielded Cable



Connection with 3-Wire Shielded Cable



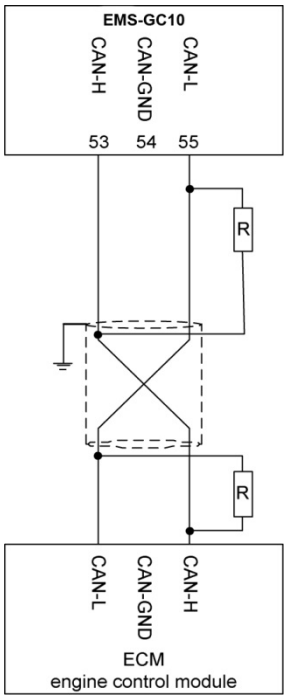
NOTE: For wiring details, please refer to 'Wiring instructions' in this section.

NOTE: In case of very long lines on the network, terminating resistors might be needed (typically 120 Ω 1%, 0.5 W).

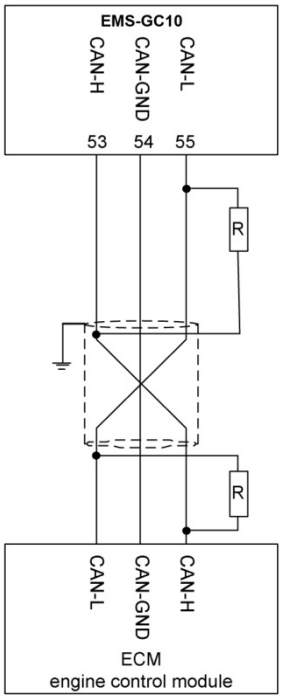
The calculation should be based on the following data:

- A line internal pull-up bias resistor: 22 kΩ
- B line internal pull-down bias resistor: 22 kΩ
- Receiver input sensitivity: +/-200 mV
- Receiver input impedance: 12 kΩ

Connection with 2-Wire Shielded Cable

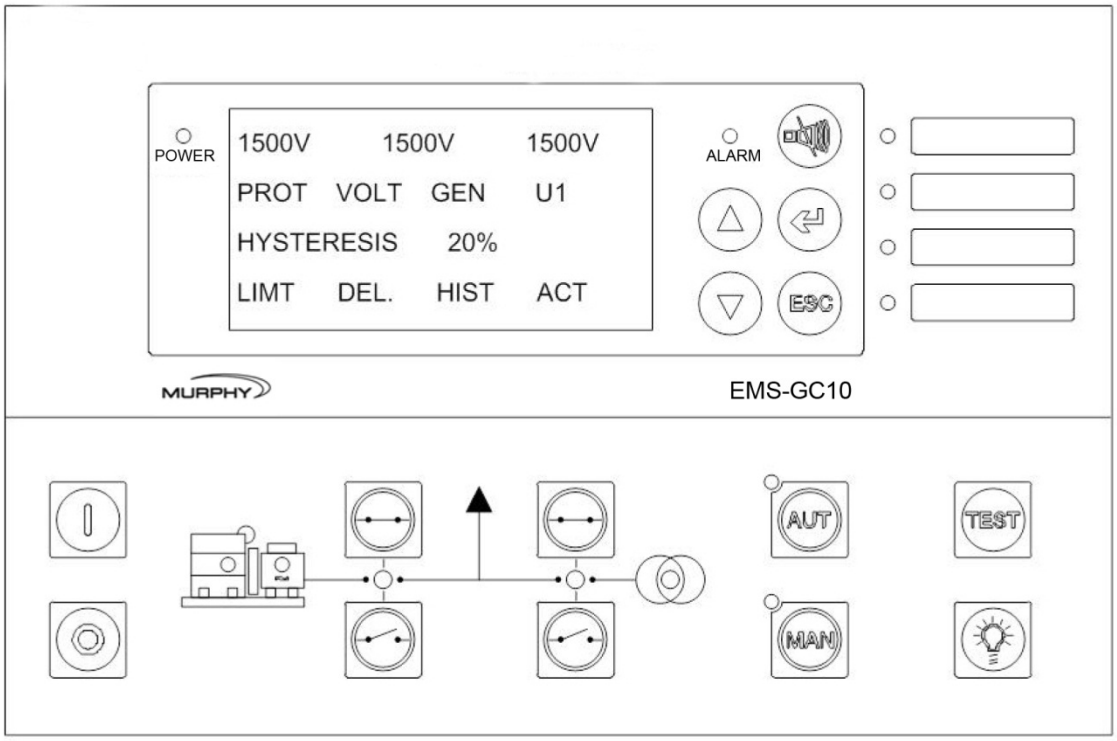


Connection with 3-Wire Shielded Cable:



Display and Folio Layouts

AMF Display Layout Example

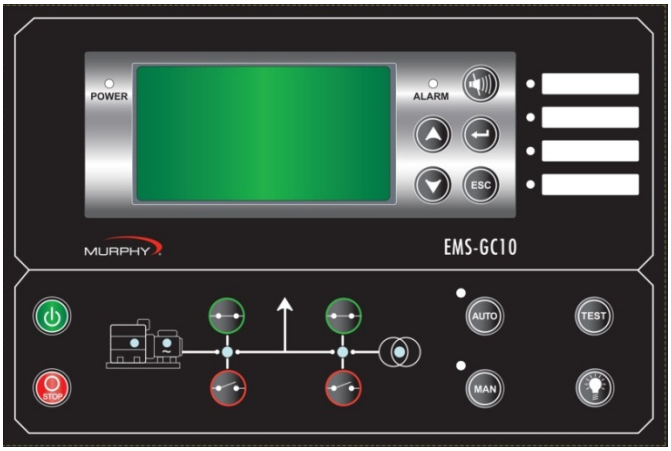


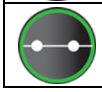
Quick Operator's Guide

This Guide is intended to help the operator carry out simple procedures such as starting, stopping, and controlling the Genset Controller, and operating the unit.

Push-Buttons

The push-buttons on the unit have the following functions:

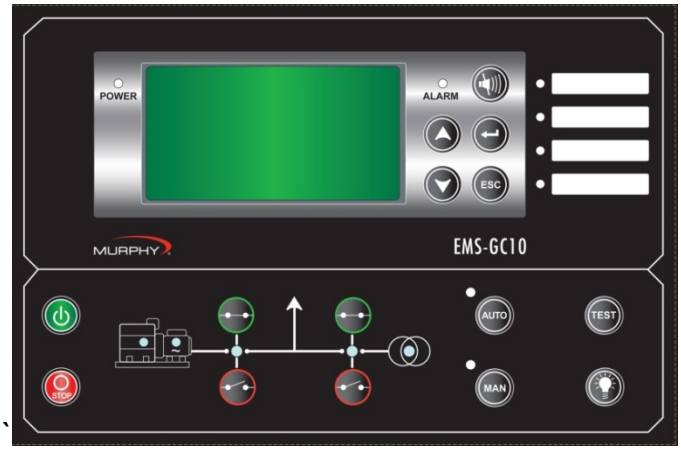


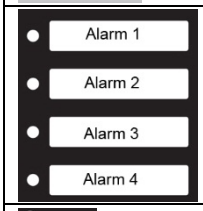
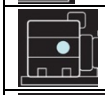
	Normal display: Scrolls the display down once. Programming: Decreases setpoint value.
	Normal display: Scrolls the display up once. Programming: Increases setpoint value.
	Resets horn relay. Extra function: Press and hold button 2 seconds to see alarm list.
	Enter menus/enter value/acknowledges alarm.
	Jumps from parameter settings to display. Removes pop-up messages.
	Initiates the test sequence selected for the push-button.
	Lamp test. One push will illuminate all LEDs for 3 seconds.
	Manual/Block running mode selector. Press MAN twice to activate Block mode.
	AUTO/Semi-auto running mode selector. Press AUT twice to activate semi-auto mode.
	Open breaker.
	Closed breaker.

	Stop engine (local (not auto)) running mode.
	Start engine (local (not auto)) running mode.

LED Indicators

The LED indicators on the unit have the following functions:



	Power OK indicator.
	Alarm LED: Flashing: active, non-acknowledged alarm(s) present. Steady: active, acknowledged alarm(s) present.
	Additional alarm indication LEDs: Flashing: active, non-acknowledged alarm(s) where output A or B is configured to LED 1, 2, 3 or 4. Steady: active, acknowledged alarm(s) where output A or B is configured to LED 1, 2, 3 or 4.
	ON in Manual and Semi-auto mode. Flashing when in Block mode.
	ON in AUTO and Semi-auto mode.
	Generator breaker ON.
	U/f OK, generator.
	Running feedback present.
	Power comes from utilities/gridline.

Menu

The Menu can be viewed without password entry.

View Menu:

The measured values are displayed from this view.

Log Menu:

This menu displays the Event, Alarm, and Battery Logs.

Setup Menu:

Used for setting up the unit, and detailed information. Changing the parameter settings is password-protected.

Alarm List:

This list shows active acknowledged and unacknowledged alarms. In addition, while in this list the alarms can be acknowledged by pressing the ENTER button.

Service Menu:

This menu contains input-, output-, M-Logic status, and data about the unit.

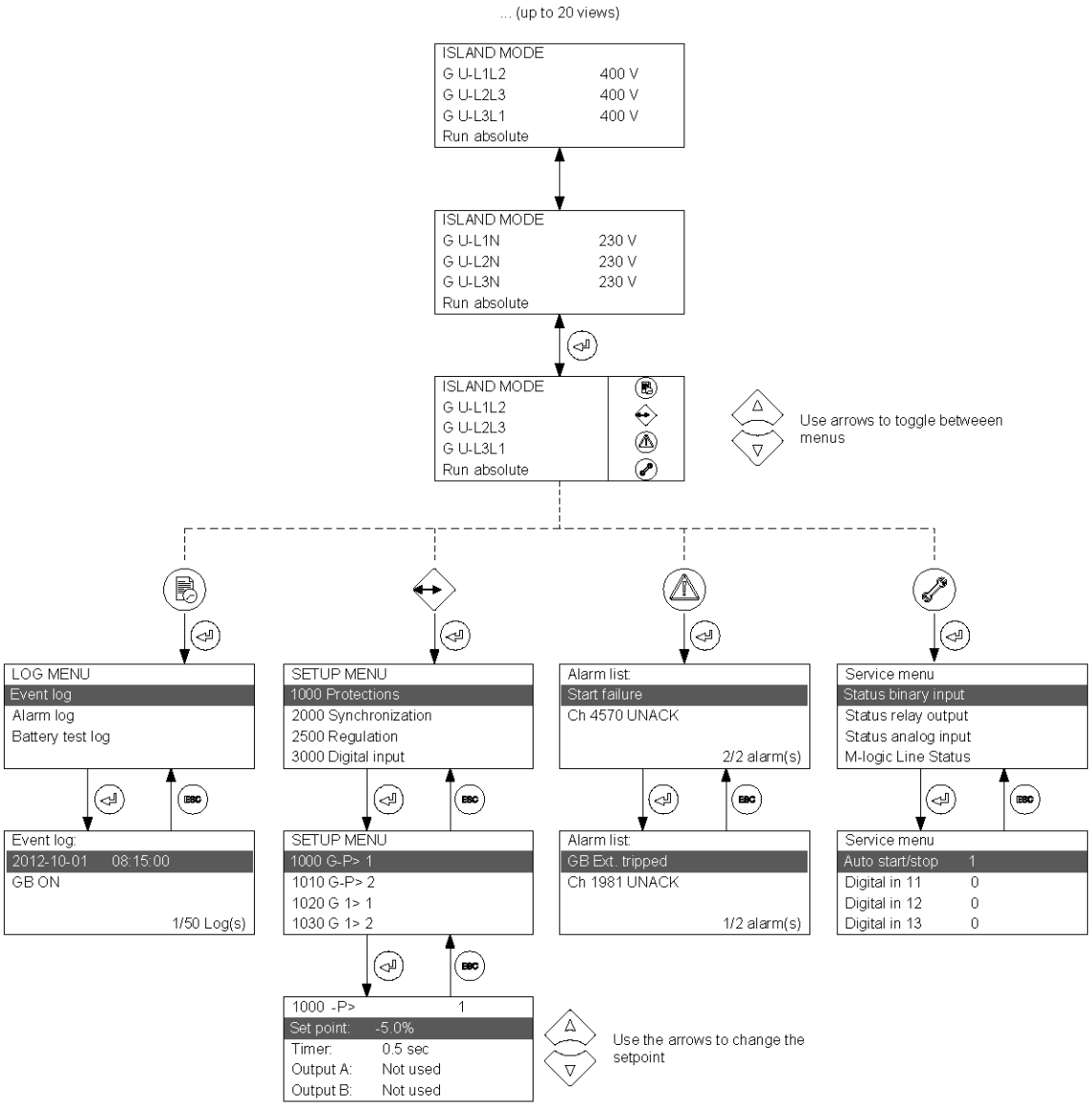
View Menu

The View Menu is used daily by the operator. There are 20 configurable display views, with up to three configurable display lines in each view. View configuration is done through the PC utility software (USW).

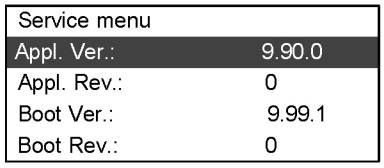
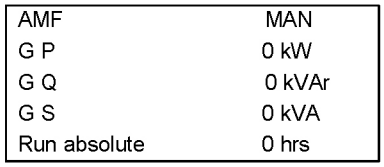
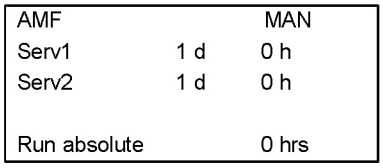
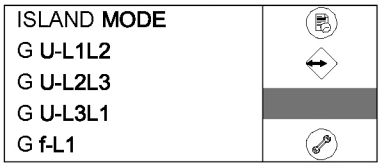
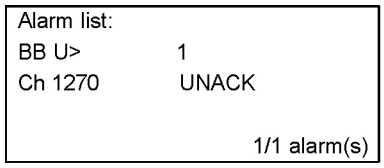
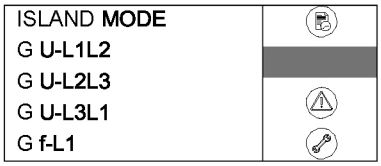
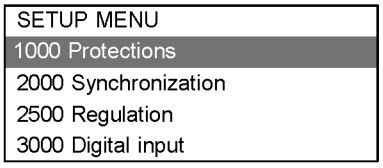
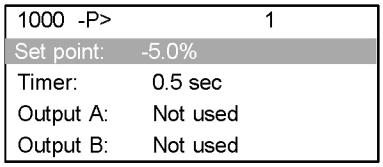
In the View Menu, various measured values are on the display.

AMF MAN G P 0 kW G Q 0 kVAr G S 0 kVA Run absolute 0 hrs	First display line: Genset mode and running mode Second display line: Measurements relating to operational status Third display line: Measurements relating to operational status Fourth display line: Measurements relating to operational status Fifth display line: Running hours

Menu Structure Diagram



Display View Examples

Display View	Description and Notes
View Menu	
	The software version can be found in the Service Menu.
	Status of Generator P, Generator Q, Generator S, and Run Hours.
	Status of Service Timer 1, Service Timer 2, and Run Hours.
Alarm Acknowledge	
	Press ENTER button to enter the list of active alarms.
	The alarm list shows the active alarms. Press ENTER button to acknowledge alarm.
Parameter Settings	
	Press the ENTER button to enter the Parameter Settings.
	Select menu group, press ENTER button to edit.
	Edit value with the UP and DOWN buttons and save the value by pressing the ENTER button.

NOTE: The available parameters depend on the set options. Some parameters can only be changed using the PC utility software (USW) for EMS-GC10. The parameter list will automatically be abandoned, if no button is pressed during a 30 sec. period.

NOTE: For detailed information about changing parameters and setup, please see the Operator's Manual.

Running Modes

The unit has four different running modes and one block mode. The different running modes are selected via the display or the PC utility software. For detailed information please see the Operator's Manual.

Auto:

In auto mode, the unit will operate automatically, and the operator cannot initiate any sequences manually.

Test:

The test sequence will start when the test mode is selected.

Manual:

Manual means that the unit will not initiate any sequences automatically, as is the case with the auto mode. It will only initiate sequences, if external signals are given.

Block:

When the block mode is selected, the unit is not able to initiate any sequences, e.g. the start sequence.

NOTE: Block mode must be selected when maintenance work is carried out on the Genset.

NOTE: The Genset will shut down if block mode is selected while the Genset is running.

Alarm and Logs

When an alarm occurs, the alarm is displayed and saved in the Alarm Log.

Press the ESC button to hide the alarm from the display.

Press the ENTER button to acknowledge the alarm.

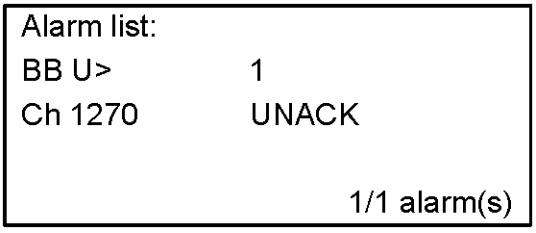
> **NOTE:** When you acknowledge an alarm, and the alarm condition is no longer present, the alarm will no longer be displayed in the Alarm Log.

The alarm log contains both acknowledged and unacknowledged alarms provided that they are still active (i.e., the alarm condition is still present).

Press the HORN button for 2 seconds to view the list of alarms stored in the alarm log.
Press the UP and Down Buttons to view the list.

> **NOTE:** The display will show one alarm at a time.

If there are no alarms, the Alarm List (Log) will be empty. The display example below indicates an unacknowledged alarm.



Log List

The log is divided into three different lists:

- Event Log – closing of breaker and starting of engine
- Alarm Log – overcurrent or high cooling water temperature
- Battery Test Log – test OK or test failed

The event log contains up to 50 events, the alarm log contains up to 30 historical alarms and the battery test log contains up to 52 historical battery tests.

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Printed in the USA