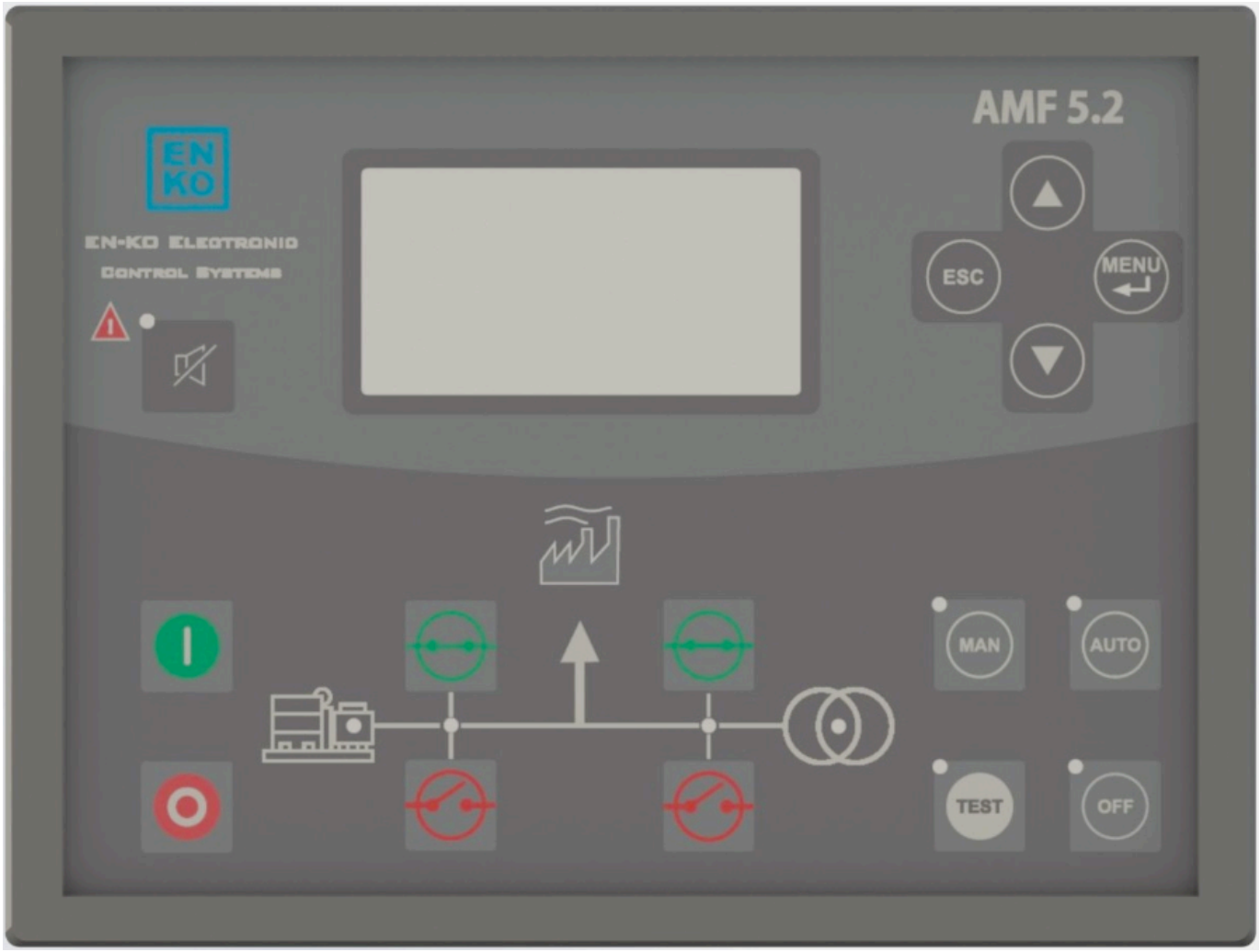
AMF 5.2

GEN-SET CONTROLER

USER MANUAL



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DESCRIPTION

AMF 5.2 is a microprocessor-based controller, which monitors single or 3 phase Mains voltage, transfers the load between the Mains and the Generator and checks for system failures. The unit eliminates the need of common panel indicators, hence reduces the cost of the Generator panel. AMF 5.2 has 4 operation modes, which are Automatic, Manual, Test and Off modes. The desired operation mode can be set via the buttons located on the front panel. By pressing the Menu button for 3 seconds, the user can edit and save any parameter among the 1500 parameters in the unit. This feature allows AMF 5.2 to be easily adapted to any engine without the need of a separate unit. Alternatively the user can receive information about the status of the panel and view/edit prameters over any SMS capable mobile phone using a GSM modem for AMF 5.2.

Functions

- Automatic and Manual engine start / stop
- Automatic Generator start up on Mains voltage failure
- True RMS measurement of voltages and currents of the Mains and Generator
- Adjustable measurement calibrations
- Generator failure conditions are displayed on the front LCD
- Automatic load transfer
- Pre-heat function
- Manual, Auto, OFF and Test modes
- Remote Start
- Graphical LCD display
- Time-stamped list of the last 50 alarms
- Engine running hours measurement and periodic service time warning
- Manual and automatic control of Mains and Generator circuit breakers
- Analog water temperature, oil pressure and fuel level measurement capability
- Adjustable operating modes and timings via parameter menu
- Equipped with built-in communication interface (TTL) to configure parameters by PC
- Isolated RS485 communication port
- Monitoring failures over CANBUS (for CANBUS enabled models)
- Optional I/O Expansion Module accessory (for CANBUS enabled models)
- AT command support for GSM Modem
- Fuel pump function

Inputs / Outputs

- 6 programmable auxiliary inputs
- 3 phase generator and mains voltage inputs
- 3 phase alternator current inputs
- 12V or 24V Battery supply input
- Oil pressure, water temperature and fuel level analog inputs
- Charge alternator input
- Crank relay output
- Magnetic Pickup input
- 4 programmable auxiliary relay outputs
- Fuel solenoid relay output
- Generator breaker relay output
- Mains breaker relay output
- Canbus port
- Standart TTL port
- Optional isolated RS485 port

Protections Against Failures

- Engine start / stop failures
- Under / over speed failures – 2 levels of protection on each
- Under / over voltage failures – 2 levels of protection on each
- Over current failure
- Under / over battery voltage failures – 2 levels of protection on each
- High temperature failure
- Charge failure
- Low oil pressure failure
- 6 engine maintenance timers
- 6 periodic service timers
- Auxiliary input / output failures
- Fuel refilling failures
- Fuel over consumption failures (Stopped or running)
- Phase sequence failure
- Reverse power failure
- ECU failures (Canbus enabled models)
- GSM Modem failures

FRONT PANEL

The front panel consists of an LCD display (128x64 resolution), push buttons and LED indicators. The LCD display indicates the status of the Generator and Mains and any failures in the system if there are. The LCD is also utilized for monitoring / editing paramters and has a backlight so the operator can clearly read information day or night. If the Up and Down buttons are pressed simultaneously, all the LED's are lit at the same time.

Tag	Function Description
	**Alarm Reset / Mute Button** When pressed once, the alarm horn output is silenced. When pressed for the second time, if there are no alarms active in the system (the cause of the alarm has been disappeared) the alarm is acknowledged and the alarm LED is turned off.
	**Start Button** This button will start the Generator only when the AMF is in Manual operation mode. If there are any failures in the system, this button has no function.

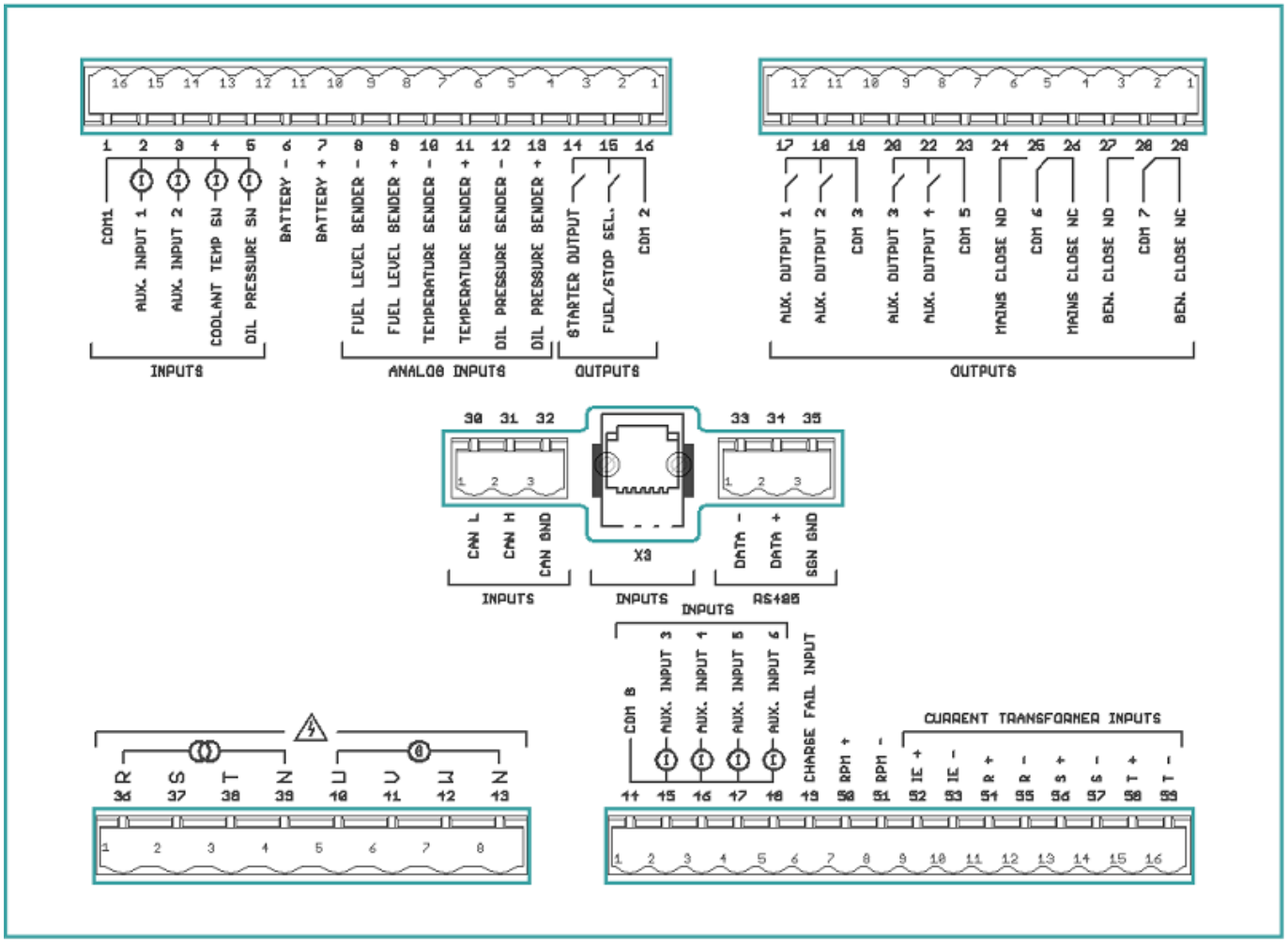
	**Stop Button** When the Stop button is pressed once in Manual operation mode, the Generator will be stopped after being cooled-down, if this button is pressed for the second time the Generator will be stopped immediately. If the AMF is in Auto, Test or Off operation modes when the Stop button is pressed for the second time, the AMF will go into Manual operation mode.

	**Up Button** This button switches to the next page while navigating through the monitoring screens. While navigating through the menu pages, this button functions as next page, parameter index increase and parameter value increase.
	**Down Button** This button switches to the previous page while navigating through the monitoring screens. While navigating through the menu pages, this button functions as previous page, parameter index decrease and parameter value decrease.
	**Esc Button** This button is used to navigate from sub-pages to upper pages while in the AMF menu. It has no function while navigating monitoring screens.
	**Menu Button** By pressing this button for 3 seconds while navigating the monitoring screen, the user can enter the menu screen. When simply pressed and released while in the parameter settings page, the cursor is moved to the right.
	**Mains / Generator Contactor Close Button** This button is active only when the AMF is in Manual operation mode. If the alternator is running within limits, pressing this button will energize the Mains or Generator contactor. In the case where the other contactor is energized or the selected contactor is already energized, this button has no function.
	**Mains / Generator Contactor Open Button** This button is active only when the AMF is in Manual operation mode. Pressing it will de-energize the Mains or Generator contactor.

	**Manual Operation Mode Button** This button switches the AMF to Manual operation mode. The manual operation mode allows manual control of the generator functions. Start, Stop, Mains / Generator Contactor Open and Mains / Generator Contactor Close buttons are activated in this mode.
	**Test Operation Mode Button** This button switches the AMF to Test operation mode. In this mode, the engine is started immediately. Parameter P22 determines wether the test will be on-load (=1) or off-load (=0).

	**Automatic Operation Mode Button** This button switches the AMF to Auto operation mode. In this mode, the AMF monitors the Mains values and if they are outside the limits set by the parameters the AMF will start the Generator and once stable, the Mains contactor is opened (the Load is not allowed to be fed by the out of limits Mains) and Generator contactor closed, hence the load is fed by the Generator.
	**OFF Operation Mode Button** This button switches the AMF to Off operation mode. In this mode, the Generator will NOT be started under any condition. The related parameters determine how the AMF will act in Off operation mode. If parameter P23 has been set as “1: Active” the AMF will check and display any alarms active in the system. If parameter P171 has been set as “1: Active” the AMF will control the Mains circuit breaker according to the status of the Mains.

REAR PANEL



Relay outputs are dry contact

Terminal Connections

No	Terminal Name	Description	Cable Size
1	Com1	Common input terminal for digital inputs with terminal numbers 2 - 5. If oil pressure switch, coolant temperature switch, auxiliary input 1 and auxiliary input 2 digital inputs are connected to battery negative terminal, the positive terminal of the battery is connected to this input. These inputs allow bi-directional connection.	1mm²
2	Aux.Input 1	This is a user configurable digital input and can be configured via parameters P927-P940. The user can either assign one of the preset functions or can define their own failure by setting parameter P927 to “1”.	1mm²
3	Aux.Input 2	This is a user configurable digital input and can be configured via parameters P941-P954. The user can either assign one of the preset functions or can define their own failure by setting parameter P941 to “1”.	1mm²
4	Coolant Temp.Sw.	This is the Coolant (Water) Temperature Switch digital input. The input can be configured via parameters P583-P593.	1mm²

5	Oil Pressure Sw.	This is the Oil Pressure Switch digital input. The input can be configured via parameters P572-P582.	1mm²
6	Battery -	Battery negative terminal is to be connected.	1mm²
7	Battery +	Battery positive terminal is to be connected. 12V/24V (9-35Vdc continuous)	1mm²
8	Fuel Level Sender -	Battery negative terminal is to be connected.	0.5mm²
9	Fuel Level Sender +	Analog Oil Pressure Sender is to be connected to this input and can be configured via parameters P790-P926. The maximum resistance of the compatible Fuel Level Sender is 3Kohm.	0.5mm²
10	Coolant Temperature Sender -	Battery negative terminal to be connected (Genset enclosure).	0.5mm²
11	Coolant Temperature Sender +	Analog Coolant (Water) Temperature Sender is to be connected to this input and can be configured via parameters P681-P789. The maximum resistance of the compatible Coolant (Water) Temperature Sender is 3Kohm. The diameter of the cable connection between the Sender and the AMF should be increased according to the application. This will reduce the cable resistance from the Sender to the AMF, hence increase the accuracy of the Coolant (Water) Temperature measurement.	0.5mm²
12	Oil Pressure Sender -	Battery negative terminal is to be connected (Genset enclosure).	0.5mm²
13	Oil Pressure Sender +	Analog Oil Pressure Sender is to be connected to this input and can be configured via parameters P594-P680. The maximum resistance of the compatible Oil Pressure Sender is 3Kohm. The diameter of the cable connection between the Sender and the AMF should be increased according to the application. This will reduce the cable resistance from the Sender to the AMF, hence increase the accuracy of the Oil Pressure measurement.	0.5mm²
14	Starter Output	This is the crank output relay and the specification is 30Vdv, 16A. The configuration for this output can be done by parameters P89-P91.	2.5mm²
15	Fuel/Stop Selenoid	This is the fuel / stop solenoid output relay (30Vdc 16A). The configuration for this output can be done by parameters P97-P99.	2.5mm²
16	Com2	Common terminal for output terminals 14 and 15. Must be connected to battery positive.	2.5mm²
17	Aux.Output 1	This is a user configurable digital output and can be configured via parameters P1127 and P1128.	1mm²
18	Aux.Output 2	This is a user configurable digital output and can be configured via parameters P1129 and P1130.	1mm²
19	Com3	Common terminal for output terminals 17 and 18. May be connected to battery positive or negative.	1mm²
20	Aux.Output 3	This is a user configurable digital output and can be configured via parameters P1131 and P1132.	1mm²

22	Aux.Output 4	This is a user configurable digital output and can be configured via parameters P1132 and P1133.	1mm²
23	Com5	Common terminal for output terminals 20 and 22. May be connected to battery positive or negative.	1mm²
24	Mains Close NO	Mains Circuit Breaker Close output. This is a normally open terminal.	1mm²
25	Com6	Common terminal for Mains Circuit Breaker Close output.	1mm²
26	Mains Close NC	Mains Circuit Breaker Close output. This is a normally closed terminal.	1mm²
27	Gen.Close NO	Generator Circuit Breaker Close output. This is a normally open terminal.	1mm²
27	Com7	Common terminal for the Generator Circuit Breaker Close output.	1mm²
29	Gen.Close NC	Generator Circuit Breaker Close output. This is a normally closed terminal.	1mm²
30	Can L	CAN Low input for Canbus communication port. Use only 120 ohm CAN approved cable.	0.5mm²
31	Can H	CAN High input for Canbus communication port. Use only 120 ohm CAN approved cable.	0.5mm²
32	Can GND	CAN GND for Canbus communication port.	0.5mm²
X3	TTL RS232	This communication port supports modbus protocol. You can configure the AMF over this communication port using a PC and ENKO Pro-Link software. In addition, you can connect a GSM modem (for parameter setting, alarm monitoring and Generator status via SMS). If a GSM modem is connected, parameter P1343 must be set to “1: GSM Modem”.	
33	Data -	Data - input for the RS485 communication port. A twisted pair cable must be used for noise immunity. If required, use a 120 ohm termination resistor with this input.	0.5mm²
34	Data +	Data + input for RS485 communication port. A twisted pair cable must be used for noise immunity.	0.5mm²
35	Sgn GND	Sgn GND input for RS485 communication port.	0.5mm²
36,37,38,39	Mains Phase Voltages (Vr,Vs,Vt and Neutral)	Mains phase voltages	1mm²
40,41,42,43	Genset Phase Voltages (Vu,Vv,Vw and Notr)	Genset phase voltages	1mm²
44	Com8	Common terminal for output terminals 45,46,47,48. May be connected to battery positive or negative.	1mm²
45	Aux.Input 3	This is a user configurable digital input and can be configured via parameters P955-P968. The user can either assign one of the preset functions or can define their own failure by setting parameter P955 to “1”.	1mm²

46	Aux.Input 4	This is a user configurable digital input and can be configured via parameters P969-P982. The user can either assign one of the preset functions or can define their own failure by setting parameter P969 to “1”.	1mm²
47	Aux.Input 5	This is a user configurable digital input and can be configured via parameters P983-P996. The user can either assign one of the preset functions or can define their own failure by setting parameter P983 to “1”.	1mm²
48	Aux.Input 6	This is a user configurable digital input and can be configured via parameters P997-P1010. The user can either assign one of the preset functions or can define their own failure by setting parameter P997 to “1”.	1mm²
49	Charge Fail / Excitation	The AMF sends an excitation current (DC current) during cranking. The excitation current supplied for 24Vdc systems is 120mA, and for 12Vdc systems is 200mA.	1mm²
50	RPM +	Magnetic pick-up sensor.	0.5mm²
51	RPM -	Magnetic pick-up sensor. This input is configured via parameters P86 and P87.	0.5mm²
52	Ie +	Positive input of the earth current transformer.	2.5mm²
53	Ie -	The negative input of the earth current transformer. This input is configured via parameters P1427-P1443.	2.5mm²
54,55,56, 57,5859	Current Transformer Inputs	Current transformer inputs. This input is configured via parameters P19-P21.	2.5mm²

Table 1 : Terminals

Note: Battery negative terminal must be connected to earth

OPERATION MODES

Automatic Operation Mode

The AMF will enter Auto operation mode when the AUTO button located on the front panel is pressed. In this operation mode the AMF will monitor the Mains and if the values are outside the set limits (the limits can be set by the user via related parameters), the Mains circuit breaker is opened and the Generator is started. If the Generator values are stable at the end of the time period set by P92: Initial Start Engine Stabilization Period and the time period set by P93: Initial Start Generator Contactor Delay has passed, the load is transferred to the Generator. The Generator begins to check all the engine parameters for any possible failures after the time period set by P92. If the Mains values return to normal and stays inside the limits for the time period set by Return Time’s of the respective Mains Failures (P153, P158, P163, P168), then the Generator circuit breaker is opened, the Mains circuit breaker is closed and the load is transferred back to Mains. If while in AUTO mode, the AMF detects an engine running feedback when the engine is supposed to be stopped, the AMF will try to stop the engine.

Test Operation Mode

The AMF will enter Test operation mode when the TEST button located on the front panel is pressed. In this operation mode, the engine will be started immediately. At the end of the time period set by P92: Initial Start Engine Stabilization Period, if the parameter P22: Test Button Function is set to test Off-load (=0), the Generator will wait for a Mains failure in running condition. In this case if a Mains failure occurs, the Mains circuit breaker will be opened and the

Generator circuit breaker will be closed, hence the load will be transferred to the Generator. In a similar manner if the parameter P22: Test Button Function is set to test On-load (=1), when the Test button is pressed, after the time period set by P92 has passed and the engine is stable the Mains circuit breaker will be opened and the Generator circuit breaker will be closed, hence the load will be transferred to the Generator. If the operator desires to stop the engine while in Test mode, the AMF must be returned to Auto or Manual operation mode. In Manual operation mode the engine can be stopped by pressing the Stop button.

Manual Operation Mode

The AMF will enter the Manual operation mode when the MAN button located on the front panel is pressed. In this operation mode, the start, stop and circuit breaker buttons fulfill their respective functions.

Off Operation Mode

The AMF will enter the Off operation mode when the OFF button located on the front panel is pressed. In this operation mode the Gen-Set will NOT run under any condition. The parameter P171 determines how the AMF will act in Off operation mode. If P171 is set to “1”, the AMF will control the Mains circuit breaker according to the status of the Mains. If the Mains is stable, then the Mains breaker is closed, if not the breaker is opened. In order to have any failures indicated on the LCD screen while in Off operation mode, P23 must be set as “1”.

PANEL RUNNING PHASES

Generator is Still

In this condition, runnin feedback must be absent. These are oil pressure, charging alternator warning lamp signal, generator voltage and frequency. In manual mode panel doesn’t react to this signal but in automatic mode panel will try to stop engine. The Generator status LED starts flashing. If the panel can not stop the engine "fail to stop" failure issues. If electricity panel of genset has manual control and these are wanted to be used, Electronic panel must be switched to manual mode.

Pre-Heating

In cold weathers preheating of engine can be necessary. Engine must be still during preheating. If parameter P83 “preheating time” is not zero, preheating is accomplished before starting process by panel. If P24 “Preheat temperature limit active” has been set to “Yes” option, Preheat will be until P85 “preheat temperature limit” is greater than Cooling temperature value.

Cranking

In this stage engine is cranking. All engine signals must be absent and engine must be still before cranking. If one of the engine signal is detected before cranking, panel switch to fail “self starting fail”. In cranking stage all engine signals, alternator frequency , alternator voltage (If P127 has been set “1:Yes”), charge alternator voltage (If P135 has been set “1:Yes”), engine RPM (If P132 has been set “1:Yes”), ”), oil pressure switch (If P146 has been set “1:Yes”), and analog oil pressure (If P142 has been set “1:Yes”) is controlled. If one of the signals is detected, Panel detects engine is running, crank disconnects and switch to P92 “engine stabilization time”. Generator status led starts to blink. During cranking, “Engine is starting” message is shown in the screen.

Stabilization

After generator running signals detected panel waits for engine signals to stabilize. After engine stabilization time, all alarms are activated.

Running

After stabilization time genset is in running condition. If genset in manual and test modes, P93:“alternator breaker time” is waited and alternator breaker is closed. In manual mode operator can close the generator breaker by generator breaker button. In running mode generator status led is lit.

Cooling

If a stop condition occurs by operator or mains status. Generator is switched to cooling period and engine is cooled during P96:“cooling time”. During this time engine status led is blinking. If alternator contactor hasn’t been closed since last start cooling period is bypassed. If mains failure occurs during cooling process generator is switched back to running mode and alternator breaker is closed. After cooling process generator is switched to stopping condition.

Stopping

After cooling stage, generator switches to stopping stage. If fueling system (P99:Fuel System) is operating solenoid, operating solenoid is de-energized. If fueling system is stop solenoid selenid energizes until engine stops. If one of the engine running signals is detected stopping period doesn’t ends. Alternator frequency and voltage, charge alternator warning lamp signal and oil pressure must be absent. If panel detects engine signals after P566: “fail to stop delay” panel will switch to start stop alarm.

Generator Shutdown

Generator is stopped because of a red alarm. Generator cannot be started if alarm is not cleared.

FAILURES

The alarm list can be accessed by pressing the Menu Button for 3 seconds while on the home page and using the Up and Down Buttons in order to navigate to the Alarm List and pressing the Menu Button to enter the list. Many of the failures have a structure similar to the example below. Table 1 will be used as an example.

Parameter Number	Parameter Name	Range	Default Value
P216	Generator Under Frequency Level 1 Failure Alarm Active	0: Passive 1: Active	1: Active
P217	Generator Under Frequency Level 1 Failure Value	10.0 –75.0 hz	47.0 hz
P218	Generator Under Frequency Level 1 Failure Delay	2-20 sec	5 sec
P219	Generator Under Frequency Level 1 Failure Return Time	2-20 sec	5 sec
P220	Generator Under Frequency Level 1 Failure Class	1 - 6	Class 2
P221	Generator Under Frequency Level 1 Failure Auto-acknowledge	0: Passive 1: Active	0: Passive
P222	Generator Under Frequency Level 1 Failure Auto-acknowledge Type	0: Limited 1: Unlimited	0: Limited
P223	Generator Under Frequency Level 1 Failure Auto-acknowledge Number	2-99	3
P224	Generator Under Frequency Level 1 Failure Hystheresis Value	0.1-20 hz	1.0
P225	Generator Under Frequency Level 1 Failure Auto-acknowledge Counter	0-30000	0
P226	Generator Under Frequency Level 1 Failure Auto-acknowledge Counter Decrease Time	0.1 – 6500.0 hours	10.0

Table 2 : Sample Failure Parameter Table

Table 1 shows the parameters related to Generator Under Frequency Level 1 Failure. Most of the other failures have the same structure.

If the failure active parameter (P216) is set to 1: Active, if the related failure conditions appear, the panel will indicate an alarm. If selected as 0: Passive, even though the related failure conditions appear, the unit will not indicate an alarm.

The criteria regarding the failure is set on the next parameter P217. The value on Table 1 indicates 47.0 Hz. If the Generator frequency drops below 47 Hz, the panel will indicate an alarm after waiting for the delay set by the next parameter P218.

After the failure occurs, in order to remove the alarm from the panel, the conditions creating the alarm must be removed and the time period set by P219 must have elapsed.
The failures are classified in 6 classes.

Class 1: Only for warning purposes. Only the alarm will be indicated on the panel.

Class 2: Besides indicating the alarm on the panel, the horn output will also be energized.

Class 3: Alarm indication on front panel, horn output energized and the Generator contactor will be de-energized and the Load will not be fed by the Generator.

Class 4: Alarm indication on front panel, horn output energized, Generator contactor de-energized and the engine will be stopped after cool down.

Class 5: Alarm indication on front panel, horn output energized, Generator contactor de-energized and the engine will be stopped immediately without cooling down.

Class 6: Alarm indication on front panel, horn output energized, Generator contactor de-energized, engine will be stopped immediately without cooling down and the Mains contactor will be de-energized.

The Auto-acknowledge parameter P221 will automatically acknowledge the alarm. Once the number of acknowledged alarms reach the parameter set by P223, the unit will NOT auto-acknowledge any more alarms. In the case where the failure has occurred, but has not repeated within the time period set by the parameter P226, the Auto-acknowledge Counter (P225) will be decreased by 1. If the Auto-acknowledge Type (P222) is chosen as 1: Unlimited, the Auto-acknowledge operation will be done with no limits.

Under Frequency Level 1 and 2

If the Alternator under frequency failure parameters, for level 1 P216-P226 and for level 2 P227-P237, are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The display will indicate “LOW FREQUENCY LEVEL 1” or “LOW FREQUENCY LEVEL 2”.

Under RPM Level 1 and 2

The settings regarding the magnetic pick-up can be made using parameters P86 and P87. If the under RPM failure parameters, for level 1 P260-P270 and for level 2 P270-P280, are set in the same logic as explained above and the conditions for a failure are present (The RPM can be measured from Alternator Frequency, Magnetic Pick-up or ECU), this failure will occur. The display will indicate “LOW REVOLUTION LEV. 1” or “LOW REVOLUTION LEV. 2”.

Over Frequency Level 1 and 2

If the Alternator over frequency failure parameters, for level 1 P238-P248 and for level 2 P249-P259, are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The diplay will indicate “HIGH FREQUEN. LEVEL 1” or “HIGH FREQUEN. LEVEL 2”.

Over RPM Level 1 and 2

The settings regarding the magnetic pick-up can be made using parameters P86 and P87. If the over RPM failure parameters, for level 1 P282-P292 and for level 2 P293-P303, are set in the same logic as explained above and the conditions for a failure are present (The RPM can be measured from Alternator Frequency, Magnetic Pick-up or ECU), this failure will occur. The display will indicate “HIGH REVOLUTION LV. 1” or “HIGH REVOLUTION LV. 2”.

Under Voltage Level 1 and 2

If the Alternator under voltage failure parameters, for level 1 P172-P182 and for level 2 P183-P193, are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The diplay will indicate “LOW VOLTAGE LEVEL 1” or “LOW VOLTAGE LEVEL 2”.

Over Voltage Level 1 and 2

If the Alternator over voltage failure parameters, for level 1 P194-P204 and for level 2 P205-P215, are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The diplay will indicate “HIGH VOLTAGE LEVEL 1” or “HIGH VOLTAGE LEVEL 2”.

RPM Sensor Failure

In the case where P86 is =1, the engine is running (cranking, failure delay, running or cooldown), the measured RPM drops below the value set by P131 and the parameters related to engine RPM sensor (P304-312) are set in the same logic as explained above this failure will occur. The display will indicate “REVOL. SENSOR FAILURE”.

Charge Voltage Failure Level 1 and 2

In the case where P313 is =1 and the charge Alternator failure parameters, for level 1 P314-P324 and for level 2 P325-335, are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The display will indicate “CHARGE FAILURE LEV 1” or “CHARGE FAILURE LEV 2”.

Battery Under Voltage Failure Level 1 and 2

If the battery under voltage failure parameters, for level 1 P336-P346 and for level 2 P347-P348, are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The diplay will indicate “LOW BAT. VOLTAGE LV. 1” or “LOW BAT. VOLTAGE LV. 2”.

Battery Over Voltage Failure Level 1 and 2

If the battery over voltage failure parameters, for level 1 P358-P368 and for level 2 P369-P379, are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The diplay will indicate “HIGH BAT. VOLTAGE L. 1” or “HIGH BAT. VOLTAGE L. 2”.

MCB Contactor Fail to Open

While the AMF is on waiting to open the Mains contactor and the feedback for the Mains contactor is active (at least one of the digital inputs has been set to 15 or 16) and the correct signal has not been received from the feedback and if the parameters P380-P388 are set in the same logic as explained above, this failure will occur. The display will indicate “MAINS CONT. OPEN FAIL”.

MCB Contactor Fail to Close

While the AMF is on waiting to close the Mains contactor and the feedback for the Mains contactor is active (at least one of the digital inputs has been set to 15 or 16) and the correct signal has not been received from the feedback and if the parameters P389-P397 are set in the same logic as explained above, this failure will occur. The display will indicate “MAINS CON. CLOSE FAIL”.

MCB Contactor State Unkown Failure

In the case where both feedbacks for the MCB are active (Two of the digital inputs are assigned 15 and 16), and the feedbacks are sending conflicting signals (both contactor open and contactor closed feedbacks are 0 or 1), and if the parameters P398-P406 are set in the same logic as explained above, this failure will occur. The display will indicate “MAINS CONT. UNDEFINED”.

GCB Contactor Fail to Open

While the AMF is on waiting to open the Generator contactor and the feedback for the Generator contactor is active (at least one of the digital inputs has been set to 13 or 14) and the correct signal has not been received from the feedback and if the parameters P407-P415 are set in the same logic as explained above, this failure will occur. The display will indicate “GEN. CONT. OPEN FAIL”.

GCB Contactor Fail to Close

While the AMF is on waiting to close the Generator contactor and the feedback for the Generator contactor is active (at least one of the digital inputs has been set to 13 or 14) and the correct signal has not been received from the feedback and if the parameters P416-P424 are set in the same logic as explained above, this failure will occur. The display will indicate “GEN CONT. CLOSE FAIL”.

GCB Contactor State Unkown Failure

In the case where both feedbacks for the GCB are active (Two of the digital inputs are assigned 13 and 14), and the feedbacks are sending conflicting signals (both contactor open and contactor closed feedbacks are 0 or 1), and if the parameters P425-P433 are set in the same logic as explained above, this failure will occur. The display will indicate “GEN. CONT. UNDEFINED”.

Over Current Failure Level 1, 2 and 3

If parameters for level 1 P434-P444, for level 2 P445-P455 and for level 3 P456-P466 are set in the same logic as explained above while for single phase systems R phase current, for two or three phase systems R and S phase current, and for three phase systems R, S and T phase current values are creating conditions for a failure, this failure will occur. The display will indicate “OVERCURRENT LEVEL 1” or “OVERCURRENT LEVEL 2” or “OVERCURRENT LEVEL3”.

KW Failure Level 1 and 2

If parameters for level 1 P467-P477 and for level 2 P478-P488 are set in the same logic as explained above while for single phase systems R phase active power, for two or three phase systems R and S phase active power, and for three phase systems R, S and T phase active power values are creating conditions for a failure, this failure will occur. The display will indicate “KILOWATT FAILURE 1” or “KILOWATT FAILURE 2”.

KVar Failure Level 1 and 2

If parameters for level 1 P489-P499 and for level 2 P500-P510 are set in the same logic as explained above while for single phase systems R phase reactive power, for two or three phase systems R and S phase reactive power, and for three phase systems R, S and T phase reactive power values are creating conditions for a failure, this failure will occur. The display will indicate “KILOVAR FAILURE 1” or “KILOVAR FAILURE 2”.

KVA Failure Level 1 and 2

If parameters for level 1 P511-P521 and for level 2 P522-P532 are set in the same logic as explained above while for single phase systems R phase power, for two or three phase systems R and S phase power, and for three phase systems R, S and T phase power values are creating conditions for a failure, this failure will occur. The display will indicate “KILOVA FAILURE 1” or “KILOVA FAILURE 2”.

Power Factor Failure Level 1 and 2

If parameters for level 1 P533-P543 and for level 2 P544-P554 are set in the same logic as explained above while for single phase systems R phase power factor, for two or three phase systems R and S phase power factor, and for three phase systems R, S and T phase power factor values are creating conditions for a failure, this failure will occur. The display will indicate “COSFI FAILURE 1” or “COSFI FAILURE 2”.

Oil Pressure Switch Failure

The oil pressure switch input must be activated via parameter P572 and the right contact type (Normally Open/Normally Closed) must be set using paramter P573. If the status of the digital input is inverse to the contact type and the parameters P574-P582 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The display will indicate “OIL SWITCH FAILURE”.

Analog Low Oil Pressure Failure Level 1 and 2

If the analog oil pressure failure parameters, for level 1 P596-P606 and for level 2 P607-P617, are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The diplay will indicate “ANALOG OIL FAIL 1” or “ANALOG OIL FAIL 2”.

Analog Oil Pressure Sensor Failure

If P619 is set as low level, and the ADC value read by the AMF has dropped below the value determined by P1415, and parameters P618-P627 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. If parameter P619 is set as high level, and the ADC value read by the microprocessor has gone above the value determined by P1416, and parameters P618-P627 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. In the case where P619 has been set as both high level and low level, the failure conditions will have appeared when the ADC value is outside the limits set by P1415 and P1416. In any case the display will indicate “ANALOG OIL SENS. FAIL”.

Water (Coolant) Temperature Switch Failure

The water pressure switch input must be activated via parameter P583 and the right contact type (Normally Open/Normally Closed) must be set using paramter P584. If the status of the digital input is inverse to the contact type and the paramters P585-P593 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The display will indicate “TEMP. SWITCH FAILURE”.

Analog High Water (Coolant) Temperature Failure Level 1 and 2

If the analog water temperature failure parameters, for level 1 P683-P693 and for level 2 P694-P704, are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The diplay will indicate “HIGH TEMP. FAIL 1” or “HIGH TEMP. FAIL 2”.

Analog Low Water (Coolant) Temperature Failure Level 1 and 2

If the analog water temperature failure parameters, for level 1 P705-P715 and for level 2 P716-P726, are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The diplay will indicate “LOW TEMP. FAIL 1” or “LOW TEMP. FAIL 2”.

Analog Water (Coolant) Temperature Sensor Failure

If P728 is set as low level, and the ADC value read by the microprocessor has dropped below the value determined by P1418, and parameters P727-P736 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. If parmeter P728 is set as high level, and the ADC value read by the microprocessor has gone above the value determined by P1419, and parameters P727-P736 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. In the case where P728 has been set as both high level and low level, the failure conditions will have appeared when the ADC value is outside the limits set by P1418 and P1419. In any case the display will indicate “ANALOG TEMP. SEN. FAIL”.

Analog Low Fuel Level Failure Level 1 and 2

If the analog fuel level failure parameters, for level 1 P791-P801 and for level 2 P802-P812, are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The diplay will indicate “LOW FUEL FAIL 1” or “LOW FUEL FAIL 2”.

Fuel Consumption while Stopped Failure

If the analog standby fuel consumption failure parameters P813-P823 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The display will indicate “STOPPED HIGH FUEL”.

Fuel Consumption while Running Failure

If the analog running fuel consumption failure parameters P824-P834 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The display will indicate “RUNNING HIGH FUEL”.

Analog Fuel Level Sensor Failure

If P836 is set as low level, and the ADC value read by the microprocessor has dropped below the value determined by P1421, and parameters P835-P844 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. If parmeter P836 is set as high level, and the ADC value read by the microprocessor has gone above the value determined by P1422, and parameters P835-P844 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. In the case where P836 has been set as both high level and low level, the failure conditions will have appeared when the ADC value is outside the limits set by P1421 and P1422. In any case the display will indicate “FUEL SENSOR FAILURE”.

Fuel Refill Failure Level 1 and 2

If the analog fuel level failure parameters, for level 1 P850-P861 and for level 2 P862-P873, are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The diplay will indicate “FUEL FILLING FAIL 1” or “FUEL FILLING FAIL 2”.

Digital Input 1 Failure

If P927 is set to 1 and Digital Input 1 parameters P928-P940 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The display will indicate “AUX. INPUT 1 FAIL.” however this text string can be customized via P938-P940.

Digital Input 2 Failure

If P941 is set to 1 and Digital Input 2 parameters P942-P954 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The display will indicate “AUX. INPUT 2 FAIL.” however this text string can be customized via P952-P954.

Digital Input 3 Failure

If P955 is set to 1 and Digital Input 3 parameters P956-P968 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The display will indicate “AUX. INPUT 3 FAIL.” however this text string can be customized via P966-P968.

Digital Input 4 Failure

If P969 is set to 1 and Digital Input 4 parameters P970-P982 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The display will indicate “AUX. INPUT 4 FAIL.” however this text string can be customized via P980-P982.

Digital Input 5 Failure

If P983 is set to 1 and Digital Input 5 parameters P984-P996 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The display will indicate “AUX. INPUT 5 FAIL.” however this text string can be customized via P994-P996.

Digital Input 6 Failure

If P997 is set to 1 and Digital Input 6 parameters P998-P1010 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The display will indicate “AUX. INPUT 6 FAIL.” however this text string can be customized via P1008-P1010.

Digital Input 7 Failure

If P1015 is set to 1 and Digital Input 7 parameters P1016-P1028 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The display will indicate “AUX. INPUT 7 FAIL.” however this text string can be customized via P1026-P1028.

⚠ ***Caution:*** *In order for the Digital Input 7 Failure to occur, the* ***Can88 I/O Extention Module*** *must be connected to the CANBUS port (Terminals 30-32)*

Digital Input 8 Failure

If P1029 is set to 1 and Digital Input 8 parameters P1030-P1042 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The display will indicate “AUX. INPUT 8 FAIL.” however this text string can be customized via P1040-P1042.

⚠ ***Caution:*** *In order for the Digital Input 8 Failure to occur, the* ***Can88 I/O Extention Module*** *must be connected to the CANBUS port (Terminals 30-32)*

Digital Input 9 Failure

If P1043 is set to 1 and Digital Input 9 parameters P1044-P1056 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The display will indicate “AUX. INPUT 9 FAIL.” however this text string can be customized via P1054-P1056.

⚠ ***Caution:*** *In order for the Digital Input 9 Failure to occur, the* ***Can88 I/O Extention Module*** *must be connected to the CANBUS port (Terminals 30-32)*

Digital Input 10 Failure

If P1057 is set to 1 and Digital Input 10 parameters P1058-P1070 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The display will indicate “AUX. INPUT 10 FAIL.” however this text string can be customized via P1068-P1070.

⚠ ***Caution:*** *In order for the Digital Input 10 Failure to occur, the* ***Can88 I/O Extention Module*** *must be connected to the CANBUS port (Terminals 30-32)*

Digital Input 11 Failure

If P1071 is set to 1 and Digital Input 11 parameters P1072-P1084 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The display will indicate “AUX. INPUT 11 FAIL.” however this text string can be customized via P1082-P1084.

⚠ ***Caution:*** *In order for the Digital Input 11 Failure to occur, the* ***Can88 I/O Extention Module*** *must be connected to the CANBUS port (Terminals 30-32)*

Digital Input 12 Failure

If P1085 is set to 1 and Digital Input 12 parameters P1086-P1098 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The display will indicate “AUX. INPUT 12 FAIL.” however this text string can be customized via P1096-P1098.

⚠ ***Caution:*** *In order for the Digital Input 12 Failure to occur, the* ***Can88 I/O Extention Module*** *must be connected to the CANBUS port (Terminals 30-32)*

Digital Input 13 Failure

If P1099 is set to 1 and Digital Input 13 parameters P1100-P1112 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The display will indicate “AUX. INPUT 13 FAIL.” however this text string can be customized via P1110-P1112.

⚠ ***Caution:*** *In order for the Digital Input 13 Failure to occur, the* ***Can88 I/O Extention Module*** *must be connected to the CANBUS port (Terminals 30-32)*

Digital Input 14 Failure

If P1113 is set to 1 and Digital Input 14 parameters P1114-P1126 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The display will indicate “AUX. INPUT 13 FAIL.” however this text string can be customized via P1124-P1126.

⚠ ***Caution:*** *In order for the Digital Input 14 Failure to occur, the* ***Can88 I/O Extention Module*** *must be connected to the CANBUS port (Terminals 30-32)*

AN0 Failure

If the AN0 Analog Input which is located on the Can88 I/O Extention Module parameters P1263-P1275 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The display will indicate “AN0 ANALOG FAILURE”

⚠ ***Caution:*** *In order for the AN0 Failure to occur, the* ***Can88 I/O Extention Module*** *must be connected to the CANBUS port (Terminals 30-32)*

AN1 Failure

If the AN1 Analog Input which is located on the Can88 I/O Extention Module parameters P1276-P1287 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The display will indicate “AN1 ANALOG FAILURE”

⚠ ***Caution:*** *In order for the AN1 Failure to occur, the* ***Can88 I/O Extention Module*** *must be connected to the CANBUS port (Terminals 30-32)*

Earth Current Failure

If the earth current input *(Ie Terminal)* failure parameters P1427-P1443 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The display will indicate “EARTH FAULT”.

Reverse Power Protection Failure

If the power reading on any one of the phases drop below the set limit, and the reverse power protection failure parameters P1444-P1455 are set in the same logic as explained above and the conditions for a failure are present, this failure will occur. The display will indicate “REVERSE POWER ERROR”.

Periodic Engine Maintenance Timer

On the AMF 5.2 there are 6 programmable engine maintenance timers. These timers can be programmed via parameters P31-P54. After maintenance, the user can reset the Elapsed Time through the respective parameter in order to keep the accurate maintenance time. The display will indicate “MOTOR MAINTENAN.”

ⓘ ***Info:*** *P30 will reset all the Periodic Maintenance Timers*

Periodic Maintenance Timer

On the AMF 5.2 there are 6 programable maintenance timers. These timers can be programmed via parameters P55-P78. After maintenance, the user can reset the Elapsed Time through the respective parameter in order to keep accurate maintenance time. The display will indicate “PERIOD. MAINTENAN.”.

Info: *P30 will reset all the Periodic Maintenance Timers*

Generator Start Failure

After attempting a certain number of cranks, if the Generator has failed to start, this failure will occur. The settings for this failure can be done via parameters P561-P565. The display will indicate “NOT STARTING FAILURE”.

Generator Self-start Failure

In the case where the Generator has been started through an external source other than the AMF5.2, and the AMF5.2 receives a start command while the engine is already running, this failure will occur. The settings for this failure can be done via parameters P555-P560. The display will indicate “SELF STARTING FAIL”.

Generator Stop Failure

After the AMF5.2 begins the Generator stop process and the Generator does not stop for a certain time period, this failure will occur. The settings for this failure can be done via parameters P566-P571. The display will indicate “FAIL TO STOP”

EEProm Failure

In the case of this **highly critical error** the screen will indicate “EEP”. In this case the qualified service must be contacted and the **panel must definitely NOT be operated.**

Phase Sequence Error

If there is any sequence error in the connections of the Mains R,S,T or Generator U,V,W phases, this failure will occur. The settings for this failure can be done through parameters P1456 and P1457.

Engine Control Unit (ECU) Failure

In the case of this failure, the AMF5.2 does NOT save it on the internal memory, but rather only indicate the failure on its display. This failure will occur if a failure on the ECU occurs. The table below shows some common Suspect Parameter Number’s (SPN) and Failure Mode Indicator’s (FMI). This information may vary among different ECU brands and models.

SPN	Description
94	Fuel distribution pressure sensor or value failure
98	High/low oil level or oil level sensor failure
100	Low oil pressure or oil pressure sensor failure
102	High turbo pressure
105	High intake manifold temperature
107	Air filter clogged
108	Atmosphere pressure sensor failure

110 Overheat
111 Low coolant level
164 High injector pressure or sensor failure
168 Battery voltage failure
172 High intake manifold air temperature or sensor failure
174 Fuel over heat or sensor failure
175 Oil over heat or sensor failure
190 Over speed, speed reading error or speed sensor failure
620 ECU internal +5V failure
651 Cylinder #1 injector failure
652 Cylinder #2 injector failure
653 Cylinder #3 injector failure
654 Cylinder #4 injector failure
655 Cylinder #5 injector failure
656 Cylinder #6 injector failure
657 Cylinder #7 injector failure
658 Cylinder #8 injector failure

FMI	Description
0	The measured value is above the set limit
1	The measured value is below the set limit
2	Unstable or wrong information
3	Over voltage (Electrical Error)
4	Under voltage (Electrical Error)
5	Under current (Electrical Error)
6	Over current (Electrical Error)
7	Mechanical system error (Mechanical Error)
8	Abnormal frequency (Electrical or Mechanical Error)
9	Abnormal communication refresh rate
10	Abnormal large variations (Electrical or Mechanical Error)
11	Unknown failure
12	Device failure
13	Calibration values out of limits
15	Data valid but above normal operating range - least severe level
16	Data valid but above normal operating range - moderately severe level
17	Data valid but below normal operating range - least severe level
18	Data valid but below normal operating range - moderately severe level
19	Information received from source has errors
31	Error condition valid

Engine Control Unit Communication Failure

In the case of this failure, the AMF5.2 does NOT save it on the internal memory, but rather only indicate the failure on its display. If the AMF5.2 can not communicate with the ECU, this failure will occur.

⚠ ***Caution:*** *Please make sure related parameters P1012 and P1013 are set correctly in case of this failure.*

I/O Extention Module Communication Failure

In the case of this failure, the AMF5.2 does NOT save it on the internal memory, but rather only indicate the failure on its display. If the AMF5.2 can not communicate with the I/O Extention

Module, this failure will occur.

⚠ ***Caution:*** *Please make sure related parameters P1011 and P1014 are set correctly in case of this failure.*

Table 3: Failures and Descriptions

INFO MESSAGES

This section desribes the info messages shown on the bottom of the LCD Screen. The area where the info message is shown is called the info bar and the priority is given to alarm messages. If theres a failure in the system, the related alarm will be displayed first, if not the status of the engine or mains will be displayed on the info bar. For the engine, messages such as “Stopped”, “Cranking”, “Preheat”, “Running”, “Cooldown” and “Stopping” messages can be seen. For the Generator, “Loaded” message can be seen which indicates the Generator contactor has been energized. The info bar will also display the reason why the Generator contactor could not be closed in the case where the AMF received a command to close the contactor (From the system, button, remote signal or via communication) but has failed to do so. The reason for the failure will be displayed for a short time period and messages such as “Generator Not Ready”, “Remote Command Active”, “Com. Command Active”, “ Mains Control Active”, “ Phase Sequence Failure” and “Panel Test Mode”.

SCREENS

Measurement Display Screens

The user can view information about the Mains and Generator by using the up and down buttons. The screen on the right is displaying the engine oil pressure in three units of measurement at the same time. The page which has the symbol , the engine RPM is displayed. The page with the symbol displays information about the voltages generated by the battery and charge alternator.

The page with the symbol displays the fuel level as a percentage. The information about the Generator phase to phase or phase to neutral voltages, current, earth current, power values and frequency values are displayed on the screen with the Ⓖ symbol. The information on Mains phase to phase or phase to neutral voltages and frequency values are displayed on the screen with the symbol. The information containing the kW, kVAR, kVA, Cosϕ, current and KWh of each phase is located on the screen with the Ⓟ symbol. The Cosϕ representation is in 0.xx format. If the Load is Capacitive, this is represented with “C” and if inductive, represented with “L”.

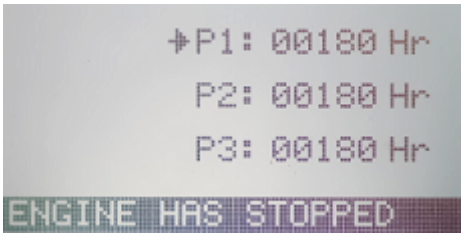
User Defined Pages

The AMF has two pages where the user can select which values are to be shown on the screen. Upto 5 values can be displayed at the same time on one page. The user can set which values are to be shown on these pages via parameters P1470-1479.

Maintenances Page

In order to access the Maintenances page, the user can press and hold the Menu button while in any one of the measurement pages. On the Menu page the user can scroll down to the Maintenances page as shown on the right and press the Menu button the enter the menu. On the Maintenances Page, only the time left until the next maintenances are displayed, and any maintenance resets can NOT be made.

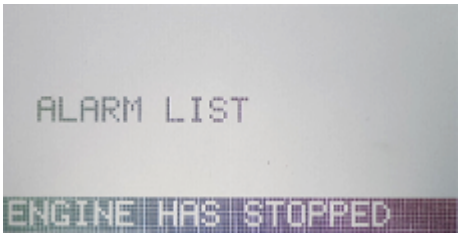
The screen on the left shows the time left for the next maintenances. P1 represents Periodic Maintenance Timer 1 and is displayed in hours (Hr). The user can cycle through other maintenance timers using the up and down buttons. M1 represents Engine Maintenance Timer 1 and is displayed in days.



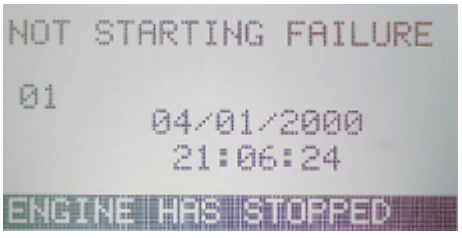
In total there are 6 Periodic Maintenance Timers and 6 Engine Maintenance Timers. The Periodic Maintenance Timers can be set via parameters P55-P78. In order to reset the timer after servicing has been made, the related Elapsed Time parameter can be set to 0. Similarly the Engine Maintenance Timers can be set using parameters P31-P54. If all the maintenance timers are to be reset, the value of P30 can be changed to 1 and all the Elapsed Time parameters will be reset.

Alarm List Page

In order to access the Alarm List page, the user can press and hold the Menu button while in any one of the measurement pages. On the Menu page the user can scroll down to the Alarm List page as shown on the right and press the Menu button the enter the menu.



As seen on the screen to the right, the name of the alarm is displayed on the top of the screen. Below the name, on the left the sequence number can be found. The alarms are listed in a last occurred-first displayed manner. In the middle of the screen the time stamp can be found . The alarm list can store 50 most recent alarms.



The user can cycle through the alarm list by using the up and down buttons, and can exit the list using the Esc button.

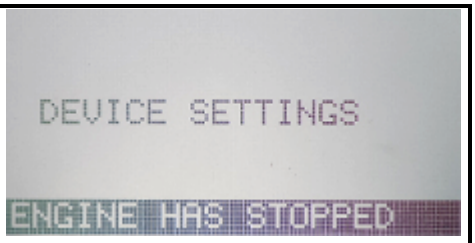
Event Log Page

Similar to the Alarm List, the Event Log's can also be viewed by the user. In order to access the Event Log page, the user can press and hold the Menu button while in any one of the measurement pages. On the Menu page the user can scroll down to the Event Log page and press the Menu button the enter the menu.

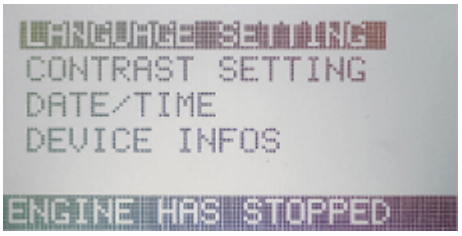
The layout of the event log is also similar to the alarm log. On the top of the screen the name of the event can be found. The sequence number can be found on the center left of the screen and the time stamp on the center of the screen. The event log can store the most recent 30 events.

Device Settings Page

In order to access the Device Settings page, the user can press and hold the Menu button while in any one of the measurement pages. On the Menu page the user can scroll down to the Device Settings page as shown on the right and press the Menu button the enter the menu.
The first item on the menu is language setting and there are two language choices which are English and Turkish for the time being. In this menu by highlighting the desired language and pressing the Menu button the user can change the language.



The second item on the menu is contrast setting and the user can enter the setting by pressing the Menu button. The contrast of the LCD screen can be changed by using up and down buttons. Once the desired contrast ratio is selected, the user can confirm the selection by pressing the Menu button, and can cancel the selection by pressing the Esc button.

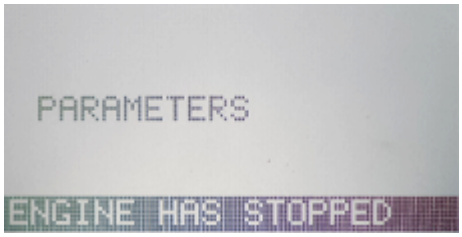


In the Date/Time menu, the current date and time settings can be seen. Please note that the date and time can not be set from this menu, they can only be viwed. The date and time settings can be changed via paramters P1485-P1491. The date and time is displayed as dd/mm/yyyy in the Date/Time menu.

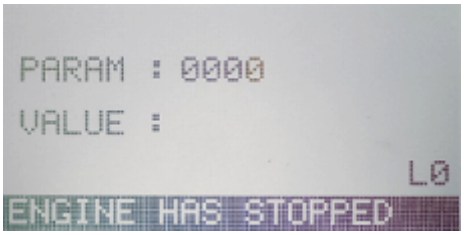
The Device Infos page displays the software version, bootloader software version and hardware version information.

Parameters Page

In order to access the Parameters page, the user can press and hold the Menu button while in any one of the measurement pages. On the Menu page the user can scroll down to the Parameters page as shown on the right and press the Menu button the enter the menu.



As seen on the screen to the right, there are two items, “Param” and “Value”. The desired parameter number can be selected by using the up and down buttons to change the blinking digit. To move to the next digit press the Menu button. Once the desired parameter number is entered the user can press and hold the Menu button to change the value. On the right bottom corner of the screen the L0 indicates that the user password has not been entered.

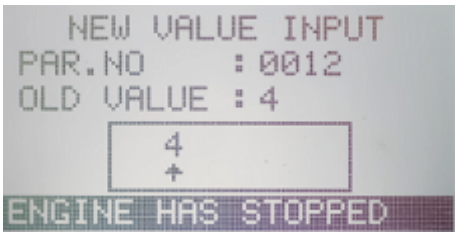


There are 4 levels of password that can be entered. If a password has been entered, then L1 (User Level), L2, L3 or L4 will be displayed on the right bottom conrner. If the parameter selected, requires a higher password level to edit, then the AMF will ask for a password again in order to edit the parameter.

The password entry screen is shown on the right. The password consists of 6 digits, and if the entry is correct, the screen will display the user level of the password instead of displaying L0. The table below shows the default values of each user level passwords.

User Level	Default Value
L1	342425
L2	473832
L3	681541
L4	825356

If the parameter entry has been made correctly, the screen on the right will appear. “Par. No:” indicates the parameter number which has been selected to edit. “Old Value” indicates the previous value of the parameter and the box displayed below that indicates the new value to be entered. The digit that is being edited will be blinking. While blinking, the value can be changed using the up and down buttons. By pressing the Menu button the cursor can be moved to the next digit. Once the last digit has been edited, pressing the Menu button will save the new parameter value and return back to the parameter selection screen. Just as described above, while in parameter selection screen, the user can enter the desired parameter number and access the parameter edit screen by pressing and holding the Menu button. To exit the parameters

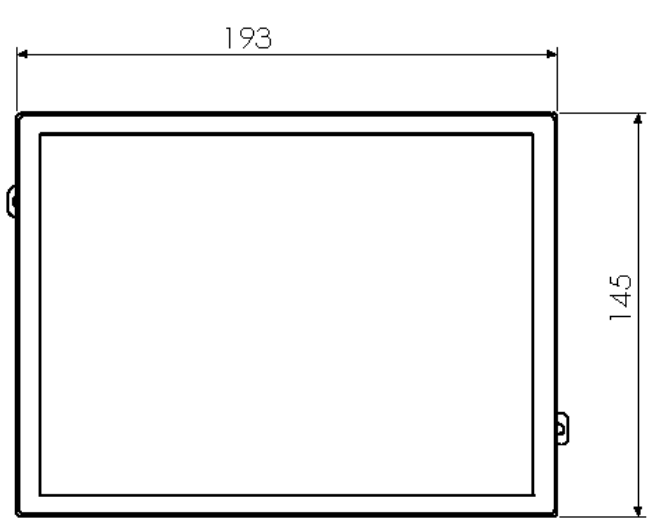


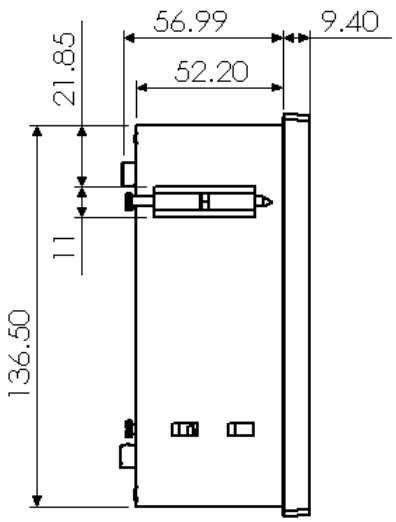
menu or cancel and exit the parameter edit menu, the user can press the Esc button.

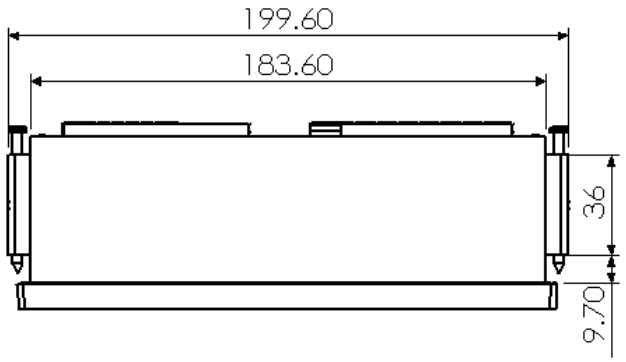
TECHNICAL SPECIFICATIONS

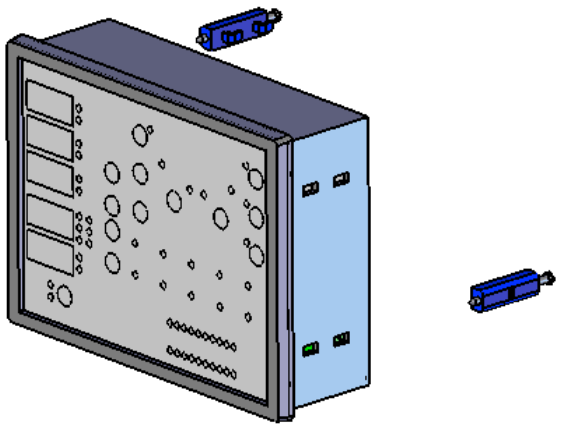
DC Power Supply	9-35 VDC@160 mA (Relays Off Position)
Operating Temperature	-25°C / +70°C
Relative Humidity	20%rH to 99%rH, Non-condensing
Relay Outputs	For Cranking and Fuel Max 250VAC/16 A For the Mains and Generator Contactor 250VAC/10 A For 4 Auxiliary Outputs Max 12V/24VDC 6 A
AC Voltage Measurement	20Vac to 500Vac, phase to phase
Frequency Measurement	1.0Hz to 99.9Hz, ±0.1Hz
Current Measurement	x/5A Current Transformer
Connection Type	Screw Type Socket
Measurement Accuracy	Phase Voltages: ±%2 of scale Frequency: ±0.1 Hz of scale Phase Currents: ±%2 of scale
Charge Alternator Excitation Current	80mA @ 12VDC 160mA@ 24VDC
Housing	High Temperature Resistant Noryl GF %15
Protection Class	IP 52 (Front Panel)
Weight	600 grams
Dimensions (WxHxD)	192 mm x144 mm x 62 mm
Mounting Cut-out	186 mm x138 mm
Mounting Type	Panel mount with metal screw fixings Maximum compatible panel thickness 3 mm

DIMENSIONS and MOUNTING



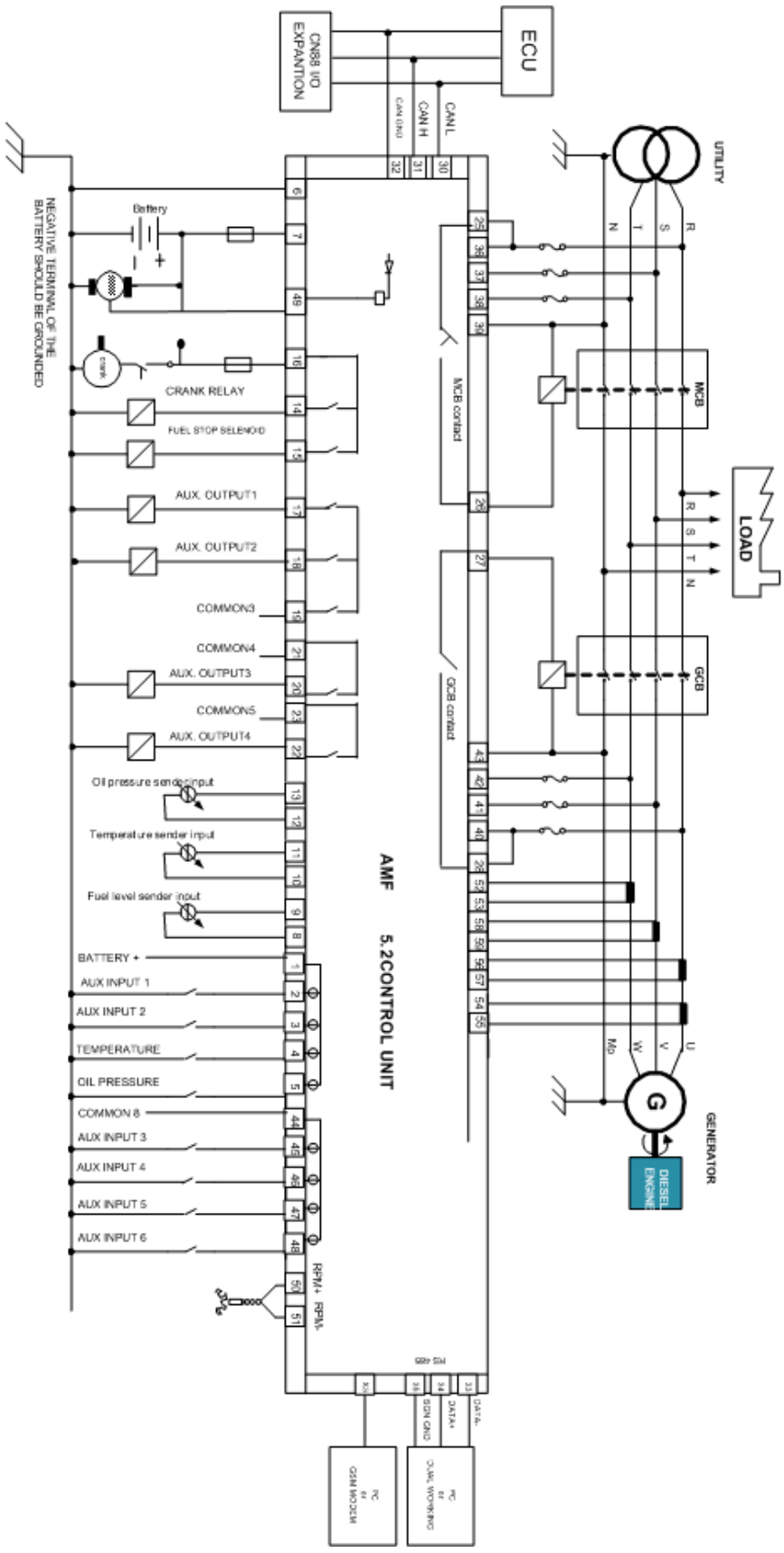






Dimensions are in mm's

CONNECTION DIAGRAM



APPENDIX 1: GSM MODEM APPLICATION

The AMF 5.2 and MSU 5.2 models have the capability of communicating with the user via SMS messages, sending information about the status of the Generator and any failures if exist while also allowing the user to view and edit parameters as desired.

In order to enable the GSM communication, P1343: RS232 Modem Function parameter must be set to 1 and a AT Command Set compatible GSM Modem must be connected to the TTL output of the unit. For example Cinterion MC52i is suitable for a GSM Modem application. The speed (baud rate), stop bit and parity bit of the serial communication port can be set via parameters P1338-P1340. If the modem has an autobaud property, these parameters can stay unchanged. The SIM Card PIN Number can be entered via parameter P1344.

The GSM message center number can be entered using parameters P1345-1347. These parameters create a character string. The message center numbers must begin with "+". For example if the message center number is "+905337778899", then the user must enter this as follows; P1345 must be set to "+90532", P1346 must be set to "77788" and P1347 must be set to "99 ".

The number of the SMS recepient to which the SMS will be sent in case of an alarm must be entered using the same method explained above. The related parameters to the SMS recepient phone number are P1348-P1350. If there is a second recepient to send an SMS, the number should be entered via parameters P1351-P1353. To leave the second SMS recepient empty, all characters for P1351-P1353 must be entered as space characters.

In order to receive the current value of any parameter via SMS, compose a new SMS message on your mobile phone. While composing the new message, write "#GEN1:READ,1320" and send it to the phone number of the SIM Card located on the GSM Modem. In the message you sent, the number "1" after the "#GEN" represents the slave address which is set via P1341. The number "1320" after the ":READ" represents the parameter number which its value is to be read and returned via SMS. The number "1" after the "#GEN" must be the same as the number entered as P1341 which is the slave address.

To reset the existing alarms on the Generator, write "#GEN1:RESET" on your mobile phone and send the SMS to the GSM Modem phone number. The number "1" after the "#GEN" must be the same as the number entered as P1341 which is the slave address.

In order to change the value of a parameter, write "#GEN1:WRITE,1324,12456,123456" on your mobile phone and send the SMS to the GSM Modem phone number. The number "1" after the "#GEN" must be the same as the number entered as P1341 which is the slave address. In the message, the number "1324" represents the paramter value to be edited, the number "12456" represents the new paramter value and "123456" represents the password. If the parameter is entered correctly, the sender will receive an "OK" or "ERROR" message from the AMF.

APPENDIX 2: ECU APPLICATION

In order to connect the ECU with the AMF, the CANL, CANH and CAN GND ports located on the back of the AMF must be connected correctly. After connecting the ECU, the user must activate the ECU by setting the parameter P1012: ECU Module Active to “1”. Than the correct brand of the ECU must be selected using P1013: ECU Engine Type. Lastly the baud rate for the canbus connection must be selected using parameter P1014: CAN Bus Baud Rate. If the connection is made right and the parameters are set correctly, the oil pressure, engine RPM and water temperature information will be received over the ECU (In some engine models other information may be received also).

APPENDIX 3: SCHEDULED TEST APPLICATION

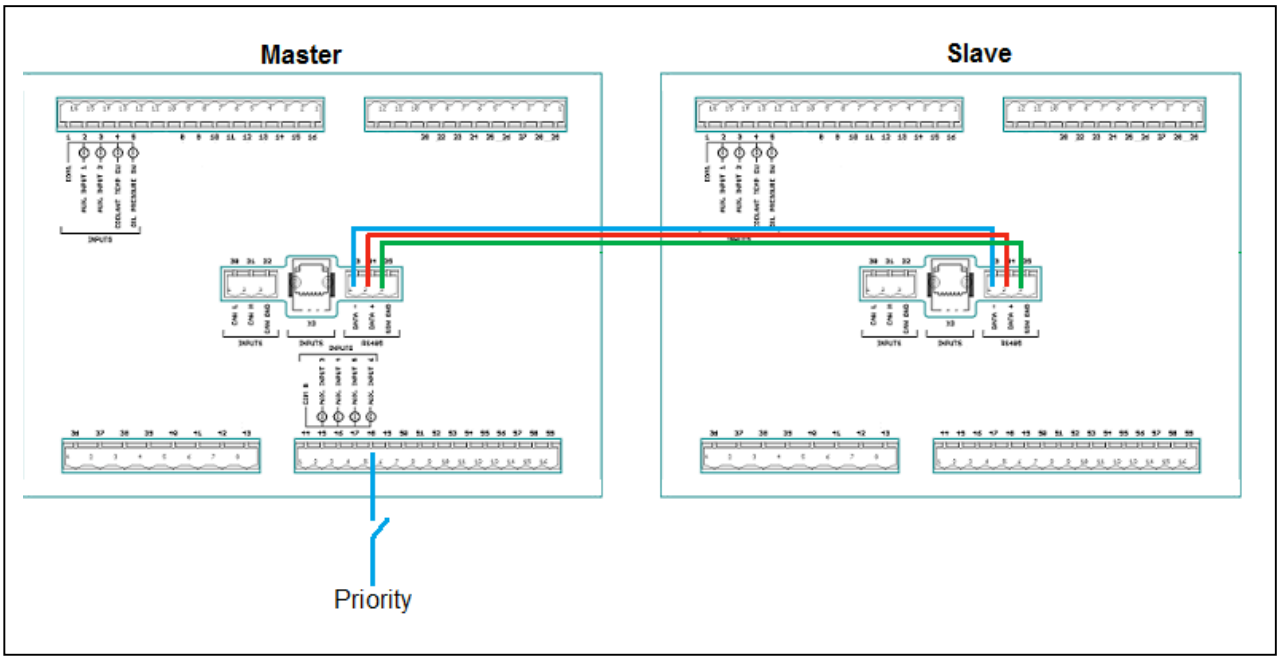
The scheduled tests can be set using parameters P1183-P1262. There are 10 scheduled tests in total. For example, P1183: Scheduled Test 1 Active can be activated by setting it to “1” or “2” which indicate a weekly or monthly test. The type of the test can be set using P1184: Scheduled Test 1 Type which determined wether the test will be on-load or off-load. If the scheduled test will be done monthly (P1183 is = 2) the user can set the desired day of month using parameter P1185: Scheduled Test 1 Day of Month. If the scheduled test will be done weekly (P1183 is = 1) then the user can set the desired day of week using parameter P1186: Scheduled Test 1 Day of Week. The hour and minute the test will start can be set using parameters P1187 and P1188. The duration of the test can be set using parameters P1189 and P1190. If the user desires to schedule more than one test, the other tests can be scheduled in the same logic explained above.

APPENDIX 4: SERVICE RESET for ENGINE AND PERIODIC MAINTENANCES

The AMF 5 series stores 6 engine and 6 priodic maintenance timers. In order to reset these timers after servicing, press and hold the Menu button to enter the menu, then scroll down to the Maintenances page and press the Menu button to enter. Bring the cursor, using the up and down buttons, on to the desired maintenance timer and press the Menu button to reset it. If the user has not previously made a password entry, then the AMF will request a password login. After successfully entering the right password a reset process warning will be displayed on the screen. By pressing the Menu button again, the user will have reset the timer, to cancel and exit without resetting the timer press the ESC button.

APPENDIX 5 : INTERRUPTED DUAL MUTUAL STAND-BY

The AMF and MSU 5 series gen-set controllers have the capability of dual mutual stand-by. The connection diagram is shown below.



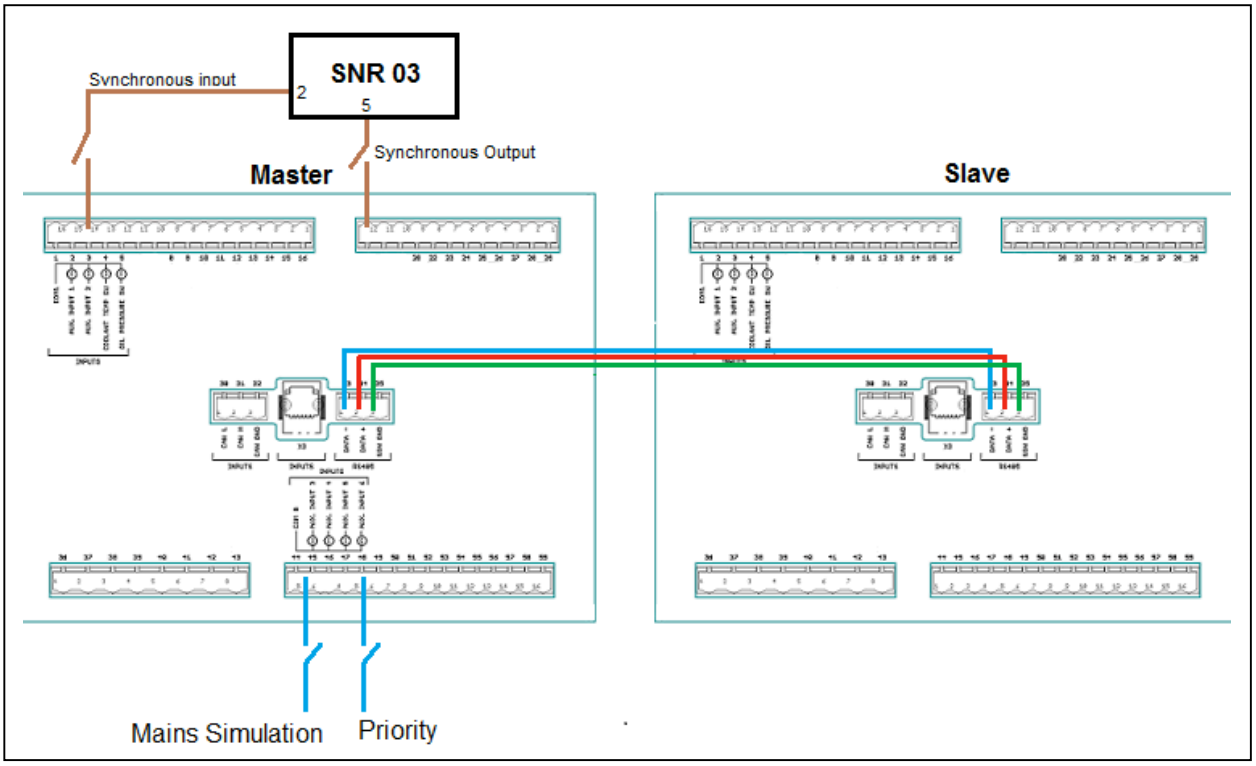
For dual mutual stand-by, both control units must be in AUTO operation mode. As seen on the diagram above, the communication between the two control units is established via the RS485 ports. If needed, a 120ohm terminating resistor must be connected the RS485 inputs of both units. The priority switch must be connected to one of the Auxiliary Inputs (Terminals 2, 3, 45, 46, 47, 48 or one of the inputs on the I/O Extension Module) on the primary group with the MASTER panel (refer to the priority switch shown above). The function of the Auxiliary Input which the priority switch is connected must be set to “49: Dua Mutual Standby Priority”.

Paramters P1458-P1463 must be configured correctly for the users application. On the panel which will be used as MASTER, parameter P1458: RS485 Port Function must be set as “2” or “3”. If this parameter is selected as “2”, the dual mutual stand-by will work without equal aging, the primary group will continue working until the user changes the preference.

When P1458 is selected as “3”, the MASTER panel will read the engine running hours from the SLAVE panel and apply equal aging to both groups. In that case, the two groups will work with the time difference set by parameter P1480 of the MASTER panel. For example if paramter P1480 of the MASTER panel is set as “4” hours, when there is a difference of 4 hours between the two groups, the priority will automatically transferred to the secondary group. For this P1481 must be selected as “0: Does NOT Exist”.

If theres a communication failure between the two units or if they are blocked “Dual Work Failure” message will be displayed on the LCD screen.

APPENDIX 6 : UNINTERUPTED DUAL MUTUAL STAND-BY



For uninterrupted dual mutual stand-by operation, parameter P1481: Pass Synchronization Between Groups Exist must be set to “1: Exists”. If the MASTER panel does not receive a sync succeess signal after a sync command has been set to SNR03, and the time period set by P1482: Synchronization Passover Time Exceed has passed, the MASTER panel will indicate a failure. Parameter P1483: Minimum Co-work Time determines how long the contactors of both groups will be kept closed together after the sync success signal has been received.

The operating conditions explained in Appendix 5: Interrupted Dual Mutual Stand-by are applicable to the uninterrupted dual mutual stand-by in the same way. Additionally ENKO’s chech synchronising relay, model SNR03 and if needed the Mains simulation is also included. The function of one of the Auxiliary Outputs located on the MASTER panel must be set as “150: Dual Mutual Standby Synced Output” and must be connected to terminal 5 on the SNR03 unit.

The sync success input on the SNR03 unit must be connected to one of the Auxiliary Inputs (Terminals 2, 3, 45,46, 48, 48 or one of the inputs on the I/O Extension Module) located on the MASTER panel and the function of the related input must be set as “52: Dual Mutual Standby Sync Success Input”.

In the case where there is a need of Mains simulation, the Mains simulation input must be connected to one of the Auixiliary Inputs (Terminals 2, 3, 45,46, 48, 48 or one of the inputs on the I/O Extension Module) located on the MASTER panel and the function of the related input must be set as “50: Dual Mutual Stand-by Mains Simulation Input”.

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