

AMT910 / AMT920 / BE11-12V / BE11-24V

User's Manual

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1.0 Introduction

AMT 9XX /BE11 features automatic mains failure and generating set (GEN-SET) monitoring. The AMT9XX/BE11 inputs provides visual indication for the following:

FUEL LEVEL, OVERLOAD, REMOTE LOCK, ALARM 1, ALARM 2, LOW OIL PRESSURE, HIGH TEMPERATURE, MAINS SIMULATION, STARTING FAILURE.

The following parameters are displayed on the front panel:

MAINS VOLTAGE, GENERATOR VOLTAGE, BATTERY VOLTAGE, GENERATOR CURRENT, GENERATOR FREQUENCY, PROGRAMMABLE SETTING.

The outputs are relay controlled: START, STOP, ALARM, FUEL SOLENOID, MAINS and GENERATOR CONTACTOR CONTROL.

The front panel includes (see section 14) push buttons, rotary switch, LEDs and 3-digit display.

AMT910/BE11-12: 12V BATTERY SYSTEM (OPERATING 8V TO 18V)

AMT920/BE11-24: 24V BATTERY SYSTEM (OPERATING 16V TO 33V)

2.0 FRONT PANEL selections

The control knob on the front panel has 6 positions: TEST-AUTO-MAN-RESET-LOCK-PROGRAM.

2.1 TEST operating mode

In TEST operating mode the user tests the engine. The system uses the internally programmed parameters and starts the engine.

All alarms are enabled. If the Mains fails during the 'TEST', the Load will be automatically connected to GEN-SET. If the Mains restores, the Load is returned to the Mains but the engine will not stop. To stop the engine the user must select the 'AUTO' operating mode: after the programmed COOLING DOWN time the engine stops. In 'AUTO' or 'TEST' operating mode the action on the 'STOP' push-button drives an emergency 'STOP' sequence and the 'ALARM2' alarm energizes.

To clear the 'ALARM 2' it is necessary to put the control knob in the 'RESET' position.

2.2 AUTO operating mode

The timers for GEN-SET automation are included in the channels '0' and '1' (see section 11). The timers are activated when the voltage falls under the setting (or rises above) of the channels 'd' and 'E'. In 'AUTO' operating mode it is possible to periodically start the engine by setting the parameters 'A' and 'B'. The starting characteristics are specified in the channels '5'-'6'-'7'-'G' and 'F'. Channel 'C' is the overload setting to protect the GEN-SET against over current (the protection is delayed 4 seconds).

2.3 MANUAL operating mode

The manual operating mode allows the 'off-load' starting of the GEN-SET by means of the 'START' and 'STOP' push button. AMT9XX/BE11 transfers the Load in 'AUTO' or 'TEST' operating mode.

2.4 RESET operating mode

This operating mode clears the fault alarms and allows Hour-Meter reset. To clear the Hour-Meter press simultaneously the 'UP'/'DOWN'/'STOP' push buttons for at least 5 seconds.

2.5 LOCK operating mode

The LOCK operating mode keeps the unit in 'OFF': the AMT9XX/BE11 will not react to external inputs or to push buttons action made on the front panel. The Mains is monitored and the status of the Mains contactor follows the internal settings.

2.6 PROGRAM operating mode

The PROGRAM operating mode allows the programming of the AMT9XX/BE11 (see section 6- programming instructions).

2.7 START-STOP pushbuttons

These push-buttons are used to control the engine in 'MANUAL' operating mode. In 'AUTO' or 'TEST' operating modes, the 'STOP' push button will cause an emergency stop (AL.2 energizes).

3.0 DISPLAY FEATURES

The AMT9XX /BE11 features a 3 Digit Display to show parameter settings, measurements and error messages.

By means of the 'UP' and 'DOWN' push buttons the user selects the following indications:

DATA: if the 'PROGRAM' operating mode is selected, the automation parameters are displayed in 'DATA' display mode. The digit on the left side indicates the address of the parameter. The two digits on the right side indicate the parameter setting. If the knob is not in 'PROGRAM' position, the display shows the 'HOURS COUNT'. The hour counter resolution is 1 hour. The maximum count is 999 hours (step of one hour). If a decimal point appears, on the right side of the display, the count ranges from 1000 (100.) to 9990 hours (999.). The resolution is 10 hours. In this way, for example, the number 234. means 2340 hours. To clear the counter push simultaneously, for 5 seconds at least, the 'STOP'/'UP'/'DOWN' push-buttons (the knob must be set in RESET operating mode).

AMPERE: display of the generator current in the range 000 to 800Aac. The setting of the current transformer size is included in the channel 'L'.

VOLTAGE: voltage of the MAINS or GEN-SET (if the fuel solenoid is energized). The range is 86 Vac to 466Vac (see channel 'L', section 10.0, to select the display range).

FREQUENCY: frequency of the alternator. The resolution is 0.1Hz and the range is 00.0 to 99.9 HZ.

BATTERY: battery voltage measurement. The range is 7V to 32.4Vdc.

4.0 ERROR MESSAGES

Some alarms are displayed with a message 'EXX'. 'E' is the indication of error (or alarm) and 'XX' is a code '00' to '09'.

E01 (OVER-SPEED) The source of the alarm comes from the voltage of the GEN-SET. The protection is delayed 2 seconds. The setting is included in channel 'H'.

E02 (BELT BREAK) The alarm is enabled by means of a code in the channel 'I' (see sections 10 and 14). There is a 'Belt Break' condition when the GENERATOR voltage is over the setting but the charger alternator output voltage is lower than the threshold (section 12). To avoid false trigger of the alarm the protection is delayed 20 seconds.

E03 (REMOTE LOCK) When the input JD7 is grounded the system comes in 'OFF' operating mode (the same condition determined by the knob in the 'LOCK' position).

E04 (ALTERNATOR FAILURE) If after 300" from the starting of the engine the voltage of the alternator does not reach the threshold defined at channel 'E' an error 'E04' will be displayed and the engine will stop.

E05 (GEN-SET OVERLOAD) If the current of GEN-SET is greater than the setting of the channel 'C' for at least 4 seconds, the engine will be stopped after cooling down time.

E06 (UNDER SPEED) The under speed setting is automatically detected for 50Hz or 60Hz system. If the 'OVER SPEED' (setting of the channel 'H') is between 50-60 Hz the 'UNDER SPEED' is automatically forced at 47 Hz. If the 'OVER SPEED' setting is greater than 60 Hz then the 'UNDER SPEED' is automatically forced at 57 Hz.

5.0 LED INDICATION

LOW OIL PRESSURE. Indication of Low Oil Pressure alarm. The input is connected to an external normally closed contact.

HIGH ENGINE TEMPERATURE. Indication of High Temperature alarm. This input is connected to a normally open or closed temperature switch. The contact selection is made by means of a code in the parameter 'I'. It is possible to insert a cooling down time (see section 10 and 14)

START FAIL. This alarm is activated if the engine does not start after a complete starting cycle (channels '5', '6' and '7', see section 10).

OVERLOAD. When the input JD3 is grounded an OVERLOAD alarm energizes. The contactor of the generator is disabled and the engine will be stopped after the programmed Cooling Down time.

BATTERY. The alarm settings are 11,8V and 23,6 (12V/24V battery). The alarm is delayed 30 seconds.

AL. 1 AL. 2. these are indication of external stop request. '**AL. 1**' is delayed 10 seconds after the engine has been started. '**AL. 2**' stops the engine without delay. Both alarms provide visual indication.

ENGINE RUN. This led is lit when a voltage applied to the terminals JA3 and JA4 is higher than the threshold setting (adjustable from 3V to 14V see section 12).

FUEL. This is an optical warning indication of Low Level in the fuel tank.

6.0 PROGRAMING INSTRUCTIONS

The TABLE 1 lists the adjustable parameters (see sections 10 and 11). Of the three digits displayed, the left is the address of the parameter and the two digits on the right side include the parameter setting. By placing the knob in the 'PROGRAM' position the user enters in 'PROGRAM' operating mode. After the automatic Lamp test (4 seconds) the display shows the first parameter.

By using the 'UP' and 'DOWN' cursors it is possible to move between the parameters. The setting of the parameter is made by pushing simultaneously the 'STOP' and 'UP' push buttons (or 'DOWN' push button to decrease).

The AMT9XX parameters are already programmed in factory (see TABLE 1 to see defaults). The factory settings are always available. To recall the original programming push simultaneously the cursor 'UP' and 'DOWN' for two seconds at least (the control knob has to be placed 'PROGRAM' position).

7.0 GLOW PLUG PREHEAT

The channel 'F' is set '00' in factory: glow timing is inhibited. If a preheat time is requested, it is necessary to set a time in the channel 'F' (see section 6). If the preheat is used, the 'alarm output' function is not available. The relay output of 'glow plug' uses the same relay of the 'alarm output'. The maximum rating of output relay is 2 A. To drive the glow plugs an external relay able to deliver up to 50A it is recommended.

8.0 MAINS SIMULATION

When the JC5 input is grounded, the AMT9XX/BE11 simulates the presence of the Mains supply. The display shows a flashing '270' indicating 'Mains voltage out of range'. This connection is used in application where MAINS supply is not available and the user requires remote 'start' and 'stop' by means of a switch (external switch, level switch or timer switch).

9.0 PETROL ENGINE 'CHOKE'

To drive the engine 'CHOKE', the JC3 output is provided. Normally it is necessary to put a time from 2 to 4 seconds in channel 'G' and a time of 5 seconds in channel '5' (see sections 6 and 10). The JC3 output is energized at the beginning of each start attempt. To avoid 'CHOKE' action, at high engine temperature, the use of an external temperature switch in series with JC3 terminal is recommended.

10.0 PARAMETERS DESCRIPTION

Display	Parameter	Display	Parameter
0.05	Mains failure time Standard setting: 05secs 0-59secs or 1-9 mins Seconds or minutes of mains failure to initiate automatic GEN-SET start.	7.05	Attempts interval Standard setting: 05secs 1-99secs Time interval between starting pulse attempts
1.05	Mains restore time Standard setting: 05secs 0-59secs or 1-9 mins Seconds or minutes of mains in stable condition to initiate automatic stop of GEN-SET.	8.30	Cooling down time Standard setting: 30secs 0-59secs or 1-9minutes Engine cooling time before stopping. During this time the engine runs without load.
2.10	Low oil pressure delay time Standard setting: 10secs 0-99seconds Delay of the low pressure oil input alarm from engine start	9.05	Generator voltage time Standard setting: 05secs 0-59secs or 1-9minutes Time of stable generator voltage to transfer the load to the generator
3.15	Stop solenoid time Standard setting: 15secs 10-99seconds Enable time for "stop solenoid"	A.00	Periodic start time Standard setting: 00 1-99 days Time between periodic starts of the engine. "00" disables the function.
4.60	Alarm output reset Standard setting: 60secs 0-99seconds Reset time for alarm output. "99" disables the timer. Reset is accomplished by turning the knob in "RESET" position.	b.00	Periodic run-time Standard setting: 00 1-99 mins Time the engine runs after a periodic start. "00" disables the function.
5.05	Cranking up time Standard setting: 05secs 0-99 seconds Enabling time for starter. The timer is reset if the engine runs.		
6.05	Start attempts Standard setting: 05attempts 1-99 Number of automatic attempts during automatic start cycle		

Display	Parameter	Display	Parameter																												
C.00	<p>Generator overload, display x 10 <i>Standard setting: 00</i> 0 to 99 A Generator over current protection, delay 4secs. Up to 99A for C.T. 50/5-100/5 Up to 99(0)A for other current transformer sizes</p>	I.00	<p>Belt break enable/Temp. switch <i>Standard setting: 00</i> 00 to 99 Code SEE SECTION 14</p>																												
d.20	<p>Mains failure voltage <i>Standard setting: 20(0)</i> 16(0)-25(0)V Mains voltage threshold. The hysteresis is -5V/+15V. Example "d"=20: Below 195V a Mains failure is detected, above 215V the Mains is restored.</p>																														
E.20	<p>Generator failure voltage <i>Standard setting: 20(0)</i> 16(0)-25(0)V Generator voltage threshold. The hysteresis is -5V/+15V. Example "d"=20: Below 195V a Generator failure is detected, above 215V the Generator contactor is enabled.</p>																														
F.00	<p>Preheat time <i>Standard setting: 00s</i> 0 to 99secs Engine pre-heat time before cranking. '00' disables the function.</p>	L.00	<p>Display contro and current transformer size <i>Standard setting: 00</i> 00 – 99 Code Very left digit (current transf. size)</p> <table border="0"> <tr> <td>0</td> <td>50/5</td> <td>1</td> <td>100/5</td> </tr> <tr> <td>2</td> <td>200/5</td> <td>3</td> <td>300/5</td> </tr> <tr> <td>4</td> <td>400/5</td> <td>5</td> <td>500/5</td> </tr> <tr> <td>6</td> <td>600/5</td> <td>7</td> <td>150/5</td> </tr> <tr> <td>8</td> <td>800/5</td> <td>9</td> <td>250/5</td> </tr> </table> <p>Right digits (display mode)</p> <table border="0"> <tr> <td>0</td> <td>259 to 466V</td> </tr> <tr> <td>1</td> <td>150 to 270V</td> </tr> <tr> <td>2</td> <td>086 to 155V</td> </tr> <tr> <td>3</td> <td></td> </tr> </table> <p>NOTE: these are only display voltage factor. The allowed voltage input remains 0Vac up to 270Vac. The reading below 150Vac is not accurate and is indicated by means of dashes</p> <p>(SEE SECTION 14)</p>	0	50/5	1	100/5	2	200/5	3	300/5	4	400/5	5	500/5	6	600/5	7	150/5	8	800/5	9	250/5	0	259 to 466V	1	150 to 270V	2	086 to 155V	3	
0	50/5			1	100/5																										
2	200/5			3	300/5																										
4	400/5	5	500/5																												
6	600/5	7	150/5																												
8	800/5	9	250/5																												
0	259 to 466V																														
1	150 to 270V																														
2	086 to 155V																														
3																															
G.99	<p>Fuel solenoid time <i>Standard setting: 99(code)</i> 0-98secs, 0 disables the function. Enabling time for the fuel solenoid output (JC2, 3) after "engine start pulse". The '99' code enables the output permanently. The output is disabled by the stop cycle.</p>																														
H.57	<p>Over speed <i>Standard setting: 57</i> 0 to 99Hz (99 disables the protection function). Over speed protection. Time</p>																														

	delay 2s.		
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11.0 TABLE 1 PARAMETERS LIST

ADDRESS	DESCRIPTION	RANGE	FACTORY VALUE
0	Mains failure time (see 'd' for Voltage setting)	1-9mins, 0-59secs	5 seconds
1	Mains restore (see 'd' for voltage setting)	1-9mins, 0-59secs	5 seconds
2	Delay fault oil pressure	0-99 secs	10 seconds
3	Energized to stop solenoid	10-99 secs	15 seconds
4	Horn enable	00-99 secs	60 seconds
5	Cranking up time	00-99 secs	6 seconds
6	Attempts number	1-99	3 attempts
7	Time between Attempts pulses	1-99 secs	5 seconds
8	Cooling down time	1-9mins, 0-59secs	30 seconds
9	V alternator time	1-9mins, 0-59secs	5 seconds
A	Periodic start	1-99 days	00 days
B	Periodic run time	1-99mins	00 minutes
C	GEN-SET overload	00(0)A-99(9)A	000A (inhibited)
D	Mains failure Volt	16(0)V-25(0)V	200V
E	Generator failure	16(0)V-25(0)V	200V
F	Glow time	0-99secs	0 seconds
G	Engine run set	0-99secs	99 (fuel valve)
H	Over speed/Under-frequency	0-99Hz	57 Hz

I	Belt break / °C	CODE	00 (see section 14)
L	VOLT/AMP. Range	CODE	01 (see section 14)

12.0 ENGINE RUNNING SETTING

The 'ENGINE RUN' input signal gives to the AMT9XX/BE11 system the information to stop the electric starter motor. The starter must be pulled off in the moment that the engine is able to run without the aid of the starter motor.

When the engine is not running the D+ voltage is 0V . As the AMT9XX/BE11 starts the engine (manual attempt or automatic cycle) a current of few hundreds mA flows into D+ terminal. In this moment the engine is not running but a voltage appears to the D+ terminal (0,8 to 2,5V). As the engine start to run the voltage at the D+ terminal increases up to 3V-6V. When the engine runs the voltage will reach the nominal 14V to charge the battery. The safest point to disconnect the starter motor is between 6V to 10V.

The AMT9XX/BE11 is factory calibrated at 7V. The rear cover of the AMT9XX/BE11 includes a hole to allow calibration. The range is between 3V (full clock wise) and 10V (full counter clockwise). For a safe calibration be sure that the LED 'ENGINE RUNNING' on the front panel is off during the starter attempts (disconnect the fuel solenoid to check that the LED is off during the entire starting attempt).

The AMT9XX/BE11 uses the generator voltage to protect against unwanted insertion of the starter motor. When the voltage reaches 150VAC the starter insertion is inhibited. This input does not affect the status of the front panel led 'ENGINE RUNNING'. It is not recommended the insertion of switches in series to the terminal JB1 and JB4.

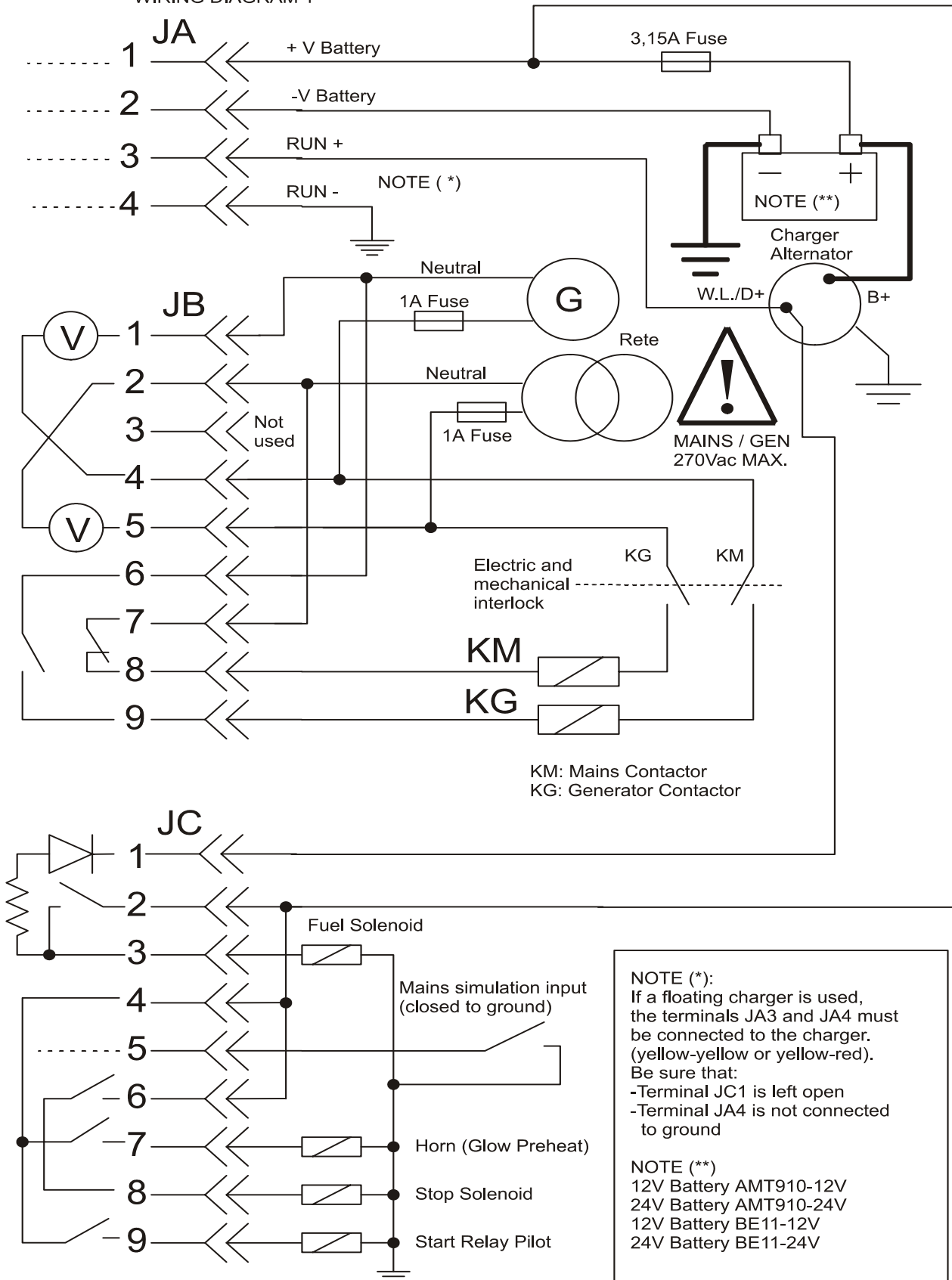
PAY ATTENTION: THE 'ENGINE RUNNING' LED HAS TO BE LIT WHEN THE ENGINE RUNS. THE USE OF THE ENGINE WITHOUT THIS SIGNAL MAY BE DANGEROUS.

Normally, using a diesel engine, we recommend to enable the BELT BREAK protection. This is accomplished by program the code 01 (or 11) in channel 'I' (see section 10 and 14). To test the protection it is necessary to disconnect the terminal D+ from the charger alternator and to connect to ground (leave open the terminal D+ on the charger alternator). The protection is delayed 15 seconds.

WARNING High voltage is present inside the instrument. To avoid electric-shock hazard, operating personnel must not remove the protective cover. Do not defeat the grounding connection. Any interruption of the grounding connection can create an electric-shock hazard. Before making external connections always ground the AMTXX/BE11 first by connecting the control panel to ground.

SECTION 13.00

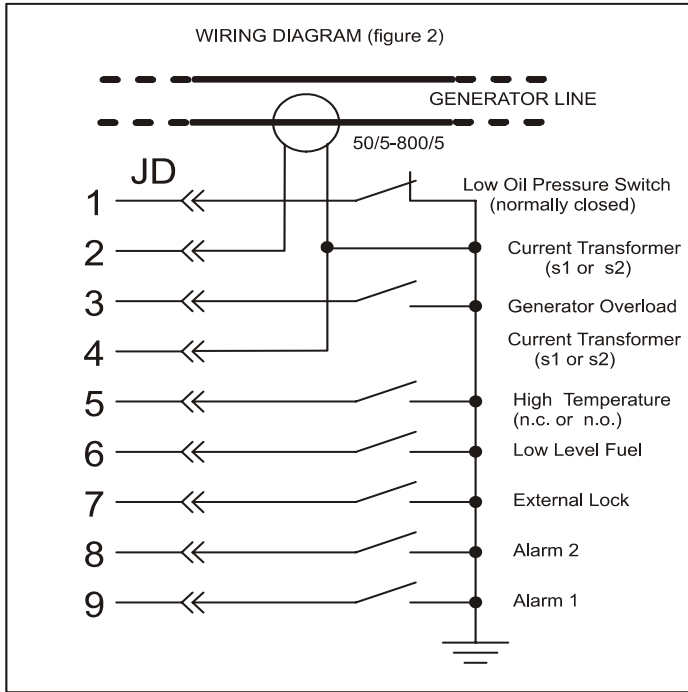
WIRING DIAGRAM 1



NOTE (*):
 If a floating charger is used, the terminals JA3 and JA4 must be connected to the charger. (yellow-yellow or yellow-red).
 Be sure that:
 -Terminal JC1 is left open
 -Terminal JA4 is not connected to ground

NOTE ()**
 12V Battery AMT910-12V
 24V Battery AMT910-24V
 12V Battery BE11-12V
 24V Battery BE11-24V

SECTION 14.00 WIRING and DIMENSIONS



CURRENT TRANSFORMER SELECTION
(Programmable channel 'L')

Channel 'L' indication: **L31**

C.T. SIZE SELECTION	
0	50/5
1	100/5
2	200/5
3	300/5
4	400/5
5	500/5
6	600/5
7	150/5
8	800/5
9	250/5

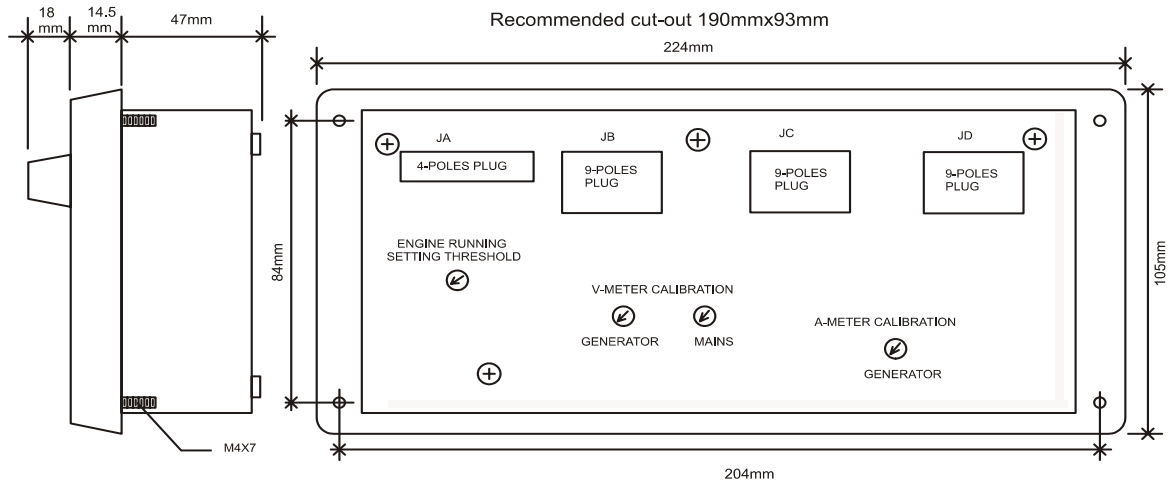
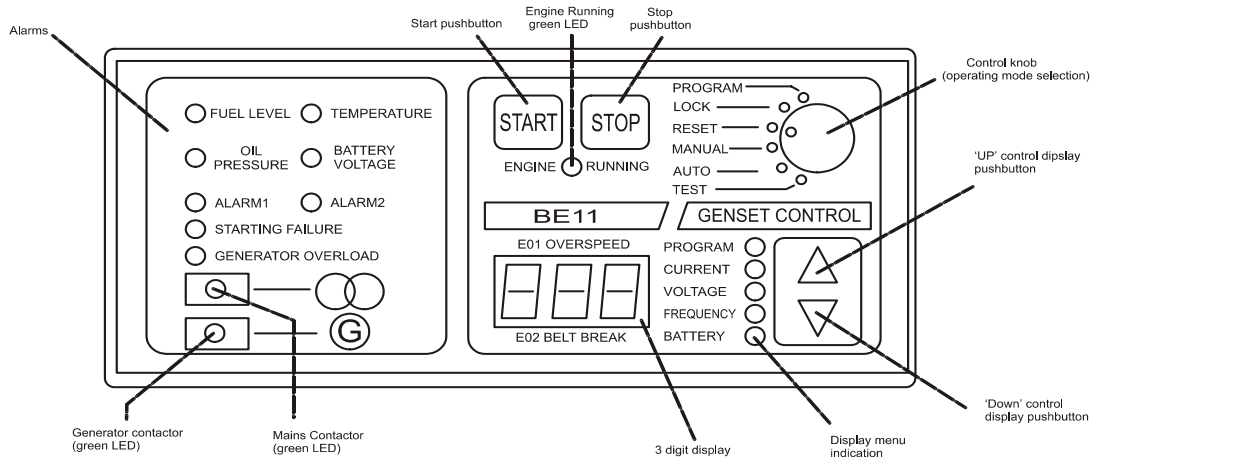
V-METER RANGE
0 259V-488V
1 150V-270V
2 086V-153V

If the range is modified it is necessary to move the settings of the channel 'd' and 'E'. The allowed setting is within the range of the voltmeter

Example L31: C.T.= 300/5 and VOLTMETER 150-270Vac

Temperature switch selection, Cooling down time control and Belt Break alarm enable (Channel 'I').

CODE	CONTACT	COOLING DOWN TIME	BELT BREAK
0.00	Normally open	Included	NO
0.01	Normally open	Included	YES
0.02	Normally open	Excluded	NO
0.03	Normally open	Excluded	YES
0.10	Normally Closed	Excluded	NO
0.11	Normally Closed	Excluded	YES
0.12	Normally Closed	Included	NO
0.13	Normally Closed	Included	YES



15.00 GENERAL SPECIFICATIONS

Supply Voltage: 7Vdc to 33Vdc. **Reverse polarity:** permitted for unlimited period of time

Supply Ripple: 15% up to 65 Hz, **Over Voltage:** 50V/60 seconds at 40 deg. C

Protection: internal 300mA thermal fuse on the supply line

Supply Current Consumption: 50 mA up to 100mA maximum

Supply Threshold to Reset the System: 6,5V for 5 seconds

Data Retention: Non-Volatile memory

Dimensions: 224mm X 105mm X 68mm (includes connectors and rear cover)

Panel Cut-out: 190mm X 93mm, operation indoor

Operating Temperature range: -30 deg C to +65 deg C

Operating Humidity Range: 5% up to 95% non-condensing

Weight: 850 gr., **Vibration:** 40mm/sec

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

Certification: CE (laboratory report available upon request)

DC Relay Outputs Characteristics (Engine Control)

Output Current: 3A/30Vdc, an external 3,15A fuse must be provided

Output Voltage: Battery Voltage

AC Relay Outputs Characteristics (Mains and Generator)

Output Current: 3A/250Vac, an external 1A fuse must be provided

Output Voltage: Battery Voltage

Mains and Generator Voltage Input Characteristics

Nominal Voltage input: 270Vac

Maximum allowed Voltage: 300Vac continuously

Over voltage: 2KVac phase to phase, phase to neutral

Insulation to ground: 2KVac / 300 seconds (5')

Input impedance: 2 Mega Ohm

Current Transformer Characteristics

Current Transformer Size: 50/5Aac up to 800/5Aac

Maximum Current: 8Aac for 10 second

Internal resistance: 0.05 Ohm

Digital Input Characteristics

Open circuit voltage: 10Vdc (12V supply)/22Vdc (24V supply)

Closed circuit current: 15mAdc maximum

Over voltage: 100V/10mS

Charger Alternator Monitoring

Operating Voltage up 33Vdc

Over voltage: 100V / 20mS

Reverse polarity permitted for unlimited period of time

Threshold: 3Vdc-10Vdc (user adjustable)

Excitation Power: max 3W