

1.0 GENERAL DESCRIPTION

BE32 is a control system for STANDBY GEN-SET features 22 powerful programmable parameters (section 10.00 and 11.02). Input from the GEN-SET provides visual indication for the following:

LOW FUEL LEVEL , OVERLOAD, ALARM 1 and2 , LOW OIL PRESSURE, HIGH TEMPERATURE (two channels), FUEL ALARM, EXTERNAL EMERGENCY STOP, ENGINE RUNNING and REMOTE TEST.

The following parameters are measured and sampled as analogue inputs:

MAINS VOLTAGE (3-PHASE), GENERATOR VOLTAGE (3-PHASE), BATTERY VOLTAGE, GENERATOR CURRENT (3-PHASE), GENERATOR and MAINS FREQUENCY.

These outputs are relay controlled : START, STOP SOLENOID, ALARM OUTPUT, FUEL SOLENOID, MAINS CONTACTOR and GENERATOR CONTACTOR , GLOW PREHEAT and 'IDLE SPEED' .

For the remote transmission of alarms, and for special functions, eight static outputs are available: 'OIL' , 'TEMP'. , 'FUEL' , 'STARTING FAILURE' , 'OVERLOAD FIRST LEVEL' , 'ENGINE RUNNING', ' BATTERY FAILURE' and 'GENERATOR VOLTAGE' .

The BE32-NET version includes RS232C interface and SENDERS interface for oil pressure and engine temperature .

1.1 FRONT PANEL SELECTIONS

The control key switch, on the front panel, has 3 positions 'AUTO'-'RESET'-'MAN'. The key position 'RESET' or 'MAN' of the key switch is repeated on the JB9 output connector.

1.10 'AUTO' OPERATING MODE

The timers referring to GEN-SET automation are expressed on the ch. '0' and '1' (see page 7). These timers are activated when the voltage parameters on ch. 'D' and 'E' reach the programmed thresholds. The GEN-SET starts in 'AUTO' for the following : MAINS voltage or frequency failure, periodic 'START' (ch 'A' and 'B'), REMOTE TEST (input JM-10) and/or 'REMOTE START'(input JF7). All starting characteristics are specified on ch.'5'-'6'-'7'-'D'-'E'-'G' and 'F'.

'C' is the trip level of overload protection for the GEN-SET. The first level 'c' warns to disconnect the 'NON VITAL' loads by using JB-4 output. The GEN-SET will stop after full MAINS restoration (or remote control restoration) or when an alarm is detected. The MAINS and GENERATOR contactor are controlled automatically by means of the timers and thresholds . The contactor will be enabled only if the electrical parameters VOLTAGE/FREQUENCY are within the programmed value (ch.'D'-'E'-'H'-'h'-'L'). If the sequences of the phase are not the same for the mains and for the generator an alarm -r- will appear on the display. In this condition the contactor remains disabled.

1.11 'MANUAL' OPERATING MODE

This allows the 'off-load' starting of the GEN-SET by means of the 'START' and 'STOP' push-buttons. The load is not transferred to the generator. To enable the GENERATOR contactor in 'MAN' the user must provide external wiring by using JB3 terminal ('GENERATOR VOLTAGE' output).

NOTE:' ch'. means 'channel of the automation parameter'. Example: ch. 'C' is the 'C' parameter on the automation table (see page 7).

1.12 'RESET' OPERATING MODE

With the key switch in this position it is possible to clear fault alarms and to program the parameters (section 5.0).

1.13 START - STOP

These are the push-buttons for the manual control of the engine (enabled only in 'MAN'). In 'AUTO' the activation of the 'STOP' push button will perform ,if the engine is running, an emergency stop cycle. The message 'E04' will appear on the display, and the user must clear this alarm in order to start the engine.

2.0 BE32 DISPLAY FEATURES

The BE32 features a high performance 3 digit display. With the 'UP'/'DOWN' push-buttons it is possible to select the following measurements:

2.01 Data: the automation parameters are displayed in the program mode (see page 6). On the left one digit is displayed for the appropriate channel and on the right, two digits for the significant value. If the BE32 is not in the 'program mode' the display will show the 'HOUR COUNT'. The resolution is 1 hour. When the count is over 999 a right decimal point will appear as indication multiplied by 10 (resolution 10 hours).To clear the counter press together STOP and ACK for 10 “ when the key switch is in 'MAN' position.

2.02 Aac: value of the generator current in the range 000 to 800A. The current transformer ratio is defined in channel 'L' (page 6b). The reading is selected single/three-phase. The BE32-NET reading range is up to 8000Aac.

2.03 Vac: voltage of the MAINS or of the GEN-SET. The measurement range is 0 Vac to 500 Vac. If the FUEL SOLENOID is opened the display will show the GEN-SET voltage. If the FUEL SOLENOID is closed the display will show the MAINS voltage.

2.04 HZ: frequency of the mains/generator. The resolution is 0.1 HZ. The range is 00.0 to 99.9 Hz . The display shows automatically mains (if 'FUEL SOLENOID' is disabled) or generator (if 'FUEL SOLENOID' is energised).

2.05 Vdc: battery voltage measurement. The range is 00.0 Vdc to 32.4 Vdc. This measurement is displayed by pressing simultaneously the UP and DOWN push-buttons.

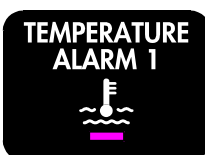
BE32-NET OPTION: see section 11.01 for further information.

3.0 LED INDICATIONS

The front facia has alarms indication by means of red LEDs:



OIL PRESSURE ALARM. This alarm monitors the pressure inputs wired on terminal JF-9(engine shutdown),JM-7(warning). The delay from the engine starting point is programmed on CH. '2' (normally closed contact)



TEMPERATURE ALARM . This alarm monitors the inputs JF-3(shutdown),JM-6(warning) . The engine will stop after the cooling down time. The selection, normally closed or open, is made by programming a code in ch. '1' (see page 7).



These are auxiliary (normally open) STOP inputs. There is a 10 seconds' delay from engine crank disconnection .ALARM1: JF-1 terminal. ALARM 2: JF-8 terminal .



Fail to start alarm: the automatic starting cycle has failed (see parameters '5'-'6'-'7' on page 7).



Yellow LEDs indicating the status of the stop solenoid/glow/fuel relay outputs.



'FUEL THANK' has yellow LED only for optical warning (JF-5). 'NO FUEL IN THE TANK' alarm stops the engine (JF-2). 'BATTERY VOLTAGE ALARM' warns for a Low Voltage condition.



This alarm energize if, after a complete engine start cycle, the voltage of the generator does not reach the threshold defined on ch. 'E' (150 seconds' delay). The engine stops and this two LEDs will light in flashing mode.



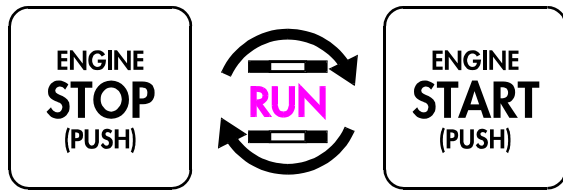
This alarm has 3 sources: one is external and two are internal. The external source is the terminal JF-4 (energized to ground). The first internal source is the threshold 'C' of the CURRENT measurement (see page 7): one of the three current measurements must be greater than the threshold 'C' for 6 seconds at least. The second source is the generator voltage that falls below the voltage threshold 'E' for 6 seconds. The engine will stop after the cooling down time (channel '8').

OVERSPEED

The signal source for OVER SPEED monitoring is the frequency measurement of the generator voltage 'VL1' to 'VL2'. The threshold is defined on ch. 'H' and the trip has a 4 seconds' delay. The cooling down time is not provided.

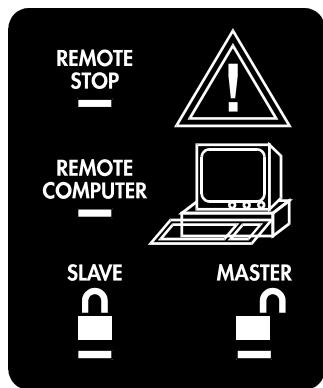
BELT BREAK ALARM

This protection features engine stop if a belt break occurs. To enable this protection, select the code on parameter 'I' (page 9). The protection has a 10" delay and the condition of alarm is the loss of voltage on terminal W.L./D+(inputs JM3-4). The alarm will show a 'r.c.' message on display.



ENGINE CONTROL

These are the push buttons to start and stop the set. The green LEDs 'RUN' indicate the status of the engine: 'RUNNING'(LEDs on) or 'NOT RUNNING' (LEDs off).These LEDs will light if a voltage greater than 130Vac is detected on generator or a voltage is detected on W.L. (JM3-4). The START push button is enabled only by the KEY SWITCH in MAN position. The STOP push button is always enabled. The action on the STOP push button in AUTO mode will energise a REMOTE STOP cycle (see below).



EXT. CONTROL

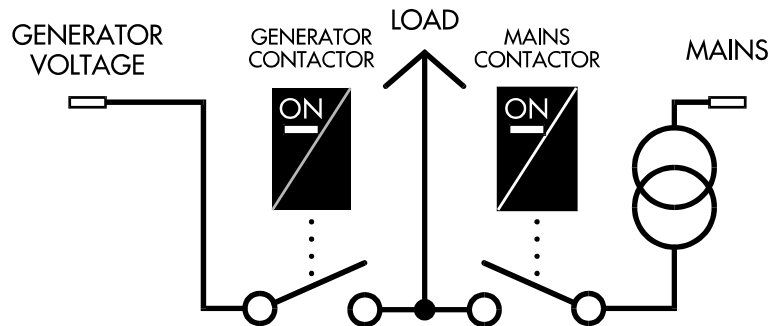
REMOTE STOP alarm monitors the JF-10 input. If grounded, a STOP cycle will be initiated. This alarm, also refers to the STOP push button action in 'AUTO' mode.

REMOTE COMPUTER has yellow LED indicating the communication to external computer by means of RS232C serial interface.

SLAVE (red LED) and MASTER (green LED) are not used.



ALARM / RESET (ACK.) push button has some functions: acknowledges the alarms and, used together with the STOP push button, enables the PROGRAMMING mode (see PROGRAMMING on page 6)



'GENERATOR VOLTAGE' is a green LED indicating the presence of GENERATOR voltage. This Led will light if the voltage of the generator is greater than the threshold on ch. 'E'.

'GENERATOR CONTACTOR'. The green LED 'ON' will light if the generator contactor output relay is energised (JE1-2-3 terminals).

'MAINS CONTACTOR'. The green LED 'ON' will light if the mains contactor output relay is NOT energised (JD4-5-6). To drive an external contactor the user must wire the normally closed contacts(JD5-6). In this way, a failure to the BE32 system will keep the mains contactor closed.

'MAINS' is a green LED indicating the presence of mains voltage. This led will light if the voltage and frequency parameters meet the programmed thresholds (see page 7).

4.0 GENERAL CHARACTERISTICS

SUPPLY:.....7V d.c. to 32V d.c., 40 to 150 mA , transient voltage protection and reverse polarity protection are included.

CURRENT TRANSFORMER:..... 5 Aac. continuously / 10Aac for 30", two wire connection, one side grounded ratio up 8000Aac (BE32-NET) .

VAC INPUTS RATINGS:.....continuously 600Vac max. line to line (generator and mains).

VAC MAXIMUM 2 MINUTES :..... 2000V ac line to line .

VAC MAXIMUM OVER VOLTAGE..... 5000V (8/20 microseconds).

STATIC OUTPUTS:.....12V-24V/150 mA, short circuit protected .

ENGINE RELAY CONTROLS:..... 8A/12 Vdc to 24V dc (external fuse is recommended).

CONTACTOR RELAY CONTROLS...8A/250V resistive,3A/250Vac inductive external protection fuses are recommended.

DIGITAL INPUTS:.....contact grounded polarity, 10mA /closed circuit current, V battery voltage / open circuit, overvoltage protection:250V/10Ms, Hardware and Software filtering for safe operation.

ANALOG INPUT (SENDERS)....resistance range 10 OHM to 500 OHM, overvoltage protection, shielding is recommended over 4M length

DYNAMO/CHARGE ALTERNATOR (W.L.):..... 2,5W 12Vdc or 24Vdc.

W.L./D+ SENSITIVITY.....4Vac/dc to 20Vac/dc , rear cover trimmer calibration.

DIMENSION and WEIGHT:..... see page 14.

OPERATING TEMPERATURE:..... -25°C to 70°C (R.H. 95%).

DISPLAY ACCURACY :.....+/- 2%, +/- 1 LSD(least significant digit).

MEASUREMENTS RESOLUTION.....8 bit (255 point of measure)

PRECISION.....user adjustable by calibration program down to 0 (OPTION -NET)

TIMING PRECISION.....+/- 0.1% over all operating conditions

FREQUENCY MEASUREMENT THRESHOLD:.....150Vac (line to line), resolution 0.1Hz

BE32 USER MANUAL (VERSION A17C)

SERIAL INTERFACE (OPTION-PLUS).....standard RS232C

DATA RETENTION.....eeprom 100 year guaranteed on –40°C to +85°C
CONTROL SYSTEM.....8 bit/6MHz microprocessor with full hardware watch-dog
DESIGN :..... meet EN50081/1/2,50082/1/2,60801-2,61003-1,60546-1.

EXTERNAL OVER VOLTAGE PROTECTION DEVICES , ON MAINS INPUTS, ARE RECOMMENDED (2KV ac) TO AVOID FAILURE DURING HIGH ENERGY LIGHTENING.

5.0 PROGRAMMING INSTRUCTIONS

The table on page 7 lists the adjustable parameters. Of the three digits displayed the left is the address parameter and the right digits are the significant value.

The 'PROGRAM MODE' is enabled by pressing for 5 seconds at least the 'STOP' and 'ACK' push-buttons simultaneously (with the key-switch in the RESET position). In the program mode the led 'DATA' will light. By pressing 'UP' or 'DOWN' it is possible to select the address of automation parameters. By pressing the 'UP' (or 'DOWN') and 'STOP' push-buttons together it is possible to increase (or decrease) the selected parameter.

The BE32 unit is factory pre-programmed with DEFAULT parameters.

The defaults are always available by pressing simultaneously the cursors 'UP' and 'DOWN' for two seconds at least (only in 'PROGRAM MODE').

The data are pushed in a non volatile memory at the first transition of the KEY in 'MAN' or 'AUTO'. It is recommended to check the data changing by the following : a) - put the set in 'MAN', b) - disconnect V battery for 30 seconds, c) - supply the BE32, d) – select 'PROGRAM MODE' and check the modified data. If an error occurs, try a new programming cycle.

6.0 MAINS SIMULATED

When the JC-10 input is grounded BE32 simulates the presence of the mains.

The internal microcomputer will display an '-on' message to indicate the 'MAINS PRESENCE'.

This connection is used in applications where MAINS is not available and the user needs a remote starting by means of an external switch, a level switch, a timer or others.

7.0 MAINS HIGH VOLTAGE

In addition to the MAINS failure due to Under Voltage (parameter 'D') or Frequency (parameters 'h'/'H') there is a MAINS failure for HIGH voltage. The threshold is fixed to 495 Vac. The display will show a message 'E02'. The failure will disappear as the voltage will come in the window between 'D' and 495V.

8.0 UNDER FREQUENCY PROTECTION

The under speed protection is programmable at address 'h'. The source of the signal is the frequency measurement of the ALTERNATOR voltage. If the frequency does not reach the programmed threshold the BE32 will not enable the contactor of the generator. If BE32 detects a frequency failure (with the contactor already enabled and the load transferred to the GEN-SET) an alarm situation is generated: the alternator contactor is opened and the engine is stopped after a cooling down timing. The display will show 'EO1' that means UNDER FREQUENCY.

9.0 MAINS AND GENERATOR CONTACTOR AUTOMATION

The coil of MAINS contactor is enabled if all three Voltage phases are between 'D' and 495Vac. The frequency must be within 'h' and 'H' values. This stability must persist for time '1' timer (mains restore). The MAINS contactor is opened if a failure (V or Hz) is detected for 2 seconds at least. The GEN-SET will start after MAINS FAILURE TIME (channel '0') and will stop after time '1' and '8' timers. The GENERATOR contactor is enabled in the same way but only in 'AUTO'. It will also be opened if any internal or external alarm is detected. The contactor are enabled only if the mains and generator have the same phase sequence (ccw). If the phase rotation is different a message -r- will appear on the display. A safe time delay of 2 seconds is inserted between GENERATOR and MAINS contactor actions.

10.00 PARAMETERS LIST

ADDRESS	DESCRIPTION	RANGE	FACTORY DEFAULT
0	Mains fault delay	1'-9',05"to 59"	5 seconds
1	Mains restore	1'-9',05"to59"	5 seconds
2	Oil pressure fault delay	0"-99"	10 seconds
3	Energised to stop solenoid time	10"-99"	15 seconds
4	Horn enable	00"-99"	60 seconds
5	Cranking up time	00"-99"	5 seconds
6	Attempts number	1-99	3 attempts
7	Time between Attempts pulses	1"-99"	5 seconds
8	Cooling down time	1'-9',0"-59"	30 seconds
9	V alternator time	1'-9',0"-59"	5 seconds
A	Periodic start	1-99 days	00 days
B	Periodic run time	1'-99'	00 minutes
C	Gen set Overload (TRIP)	000A-999A	000A(inhibited)
c	Gen set Overload (WARNING)	000A-999A	000A(inhibited)
D	Mains failure	100V-500V	330V
E	Generator failure	100V-500V	330V
F	Glow time	0"-99"	0 seconds
G	Idle Speed	0"-99"	99 (nominal speed)
H	Over Frequency	00-99(4 seconds delay)	57Hz
h	Under Frequency	00-99(6 seconds delay)	47Hz
I	Belt break/code	CODE (page 9)	00
L	VOLT/AMP. Range	CODE (page 9)	01

NOTE: the values of the 'DEFAULT' are subjected to changes without notice. We recommend to check these values before putting the BE32 control system in use.

11.00 BE32 –NET OPTION

This option features interface to analogue senders, multilink communication to up 10 BE32 units and an extended C.T.s ratio up 8000Aac.

11.01 SENDER INTERFACE and DISPLAY

The system features VDO sender interface as follows.

Oil pressure sensor JM-7		Temperature sensor JM-6 ('0' code)	
0 kg/cm2	10 OHM	40°C	287,4 OHM
2Kg/cm2	42 OHM	70°C	95,2 OHM
4Kg/cm2	82 OHM	115°C	25,8 OHM
6Kg/cm2	119 OHM	128°C	18,7 OHM
8Kg/cm2	152 OHM
10Kg/cm2	180 OHM
....

The pressure has, on display, a range 00.0 KG/cm2 to 25,6 KG/cm2. To display the value press the 'UP' cursor until the 'DATA' LED lights :a message 'H' will appear (hours count). Next action on 'UP' will display a message 'dc' (battery voltage). Further pressure on 'UP' will show a message 't' (temperature in a range 000°C to 255°C). Finally, a last action on 'UP' will show the message 'P' (pressure measure). By pressing again the 'UP' push button the selection 'FREQUENCY' is made on display. The BE32 over the serial number 1200 have ,on the back cover, the holes for close calibration by means trimmer (see page 13 and 14). The Release A17C features the selection of different temperature senders. The programming is made on parameter 'L'. The '0' code,on left side, will enable the above temperature sender (default). A '1' code will select the following relationship: 66°=180 ohm,100°=62ohm,130°=72ohm,150°=18,6ohm.

The code '2' will enable the following relationship:100°=151ohm,150°=40ohm,180°=21ohm,200°=14,3ohm.

11.02 ALARM / PARAMETER PROGRAMMING

Option –NET features additional programming parameters. To access these locations enter the programming mode (page 6). The added parameters are : 'n' (current transformer ratio), 'P' (pressure threshold), 'T' (temperature threshold) and 'SL' (slave number).

11.03 CURRENT TRANSFORMER RATIO

'n' : extends the ratio to of CTs. Permitted value are :00 to 99 (means up 990Aac) and 10. to 80. (means 1000 Aac to 8000Aac). A decimal point means multiplied by 100.

EXAMPLES: 33 is 330Aac, 48 is 480Aac, 48. is 4800Aac, 70.is 7000Aac.

Be careful in programming 'c' and 'C': a decimal point will mean multiplied by one hundred.

11-04 PRESSURE ALARM

'P' : has a range 0.0 to 9.9 Kg/cm2. The alarm warns the user by means of the OIL PRESSURE LED on front panel and by exciting the output alarm relay JC-2 and output alarm JB7. The alarm does not stop the engine (only warning action). To disable the alarm put 0.0 on parameter 'P'.

11.05 TEMPERATURE ALARM

't' :has a range up to 250°C. To program the temperature alarm : a)-enter in the programming mode, b)-by means of the 'UP' cursors select the message 't', c)-press together 'STOP' and 'UP' or 'DOWN' push buttons in order to program the threshold. The alarm drives the 'ALARM 1' led (on front facia) and JC-2/JB-8 ALARM outputs. Not any stop action on the engine is made (only warning action). To disable the protection put a full scale value 250 on parameter 't'.

11.06 SLAVE PROGRAMMING

In a multidrop application where a certain number of BE32 are connected in a same link the user must put a SLAVE number on each BE32. In this way the external computer is able to access to the BE32 data without communication errors. Be32-NET includes a communication program running on P.C..This software operates in a point to point communication system. The user must program the same slave number on the BE32 side and on P.C. side (For multidrop software contact the Factory). To program the slave : a)-enter programming mode, b) by means of the 'UP'/'DOWN' cursors select 'SL', c) – put a number in the field 0-9 , d) PUT THE SAME NUMBER ON THE COMPUTER SIDE (see instruction included in the DEMO.TXT file).

11.07 ADDITIONAL ALARM OUTPUTS

The option –NET has additional output alarm information:

JC-5 OVER FREQUENCY

JC-9 OVER/UNDER VOLTAGE

Be careful in using these low power static outputs (max 20mA at V battery voltage), these outputs are intended to drive low power load (PLC input).

11.08 NEW FEATURES OF THE RELEASE 'A17C'

A) Alarm3 (JF7) is the remote test input. The BE32 will transfer the load to the generator (JM10 is a remote test without load transfer).

B) JB2 : is the alarm repetition of Battery failure

C) JB6 : is the alarm repetition for 'low level fuel' and 'fuel end'

D) Channel L: additional sender models (see 11.00).

11.09 MEASUREMENTS CALIBRATION.

This section are reserved to a product with serial number over 1200.

To adjust the electrical measurements it is available, to the user, the digital correction.

INSTRUCTION:

A) Disconnect the Vdc supply and put the key switch in RESET.

B) Apply the Vdc supply and ,at the same time, press the 'STOP' push button for 2 seconds at least.

C) Connect the electrical parameter to be calibrate (Mains Voltage, Generator Voltage/Current)

D) By means of 'UP' or 'DOWN' push buttons select one of the following parameters (a code number '0' to '5'will appear on the display)

0 : MAINS VOLTAGE (common for all 3-phase).

1 : GENERATOR VOLTAGE (common for all 3-phase).

2 : GENERATOR CURRENT L1.

3 : GENERATOR CURRENT L2.

4 : GENERATOR CURRENT L3.

5 : BATTERY VOLTAGE.

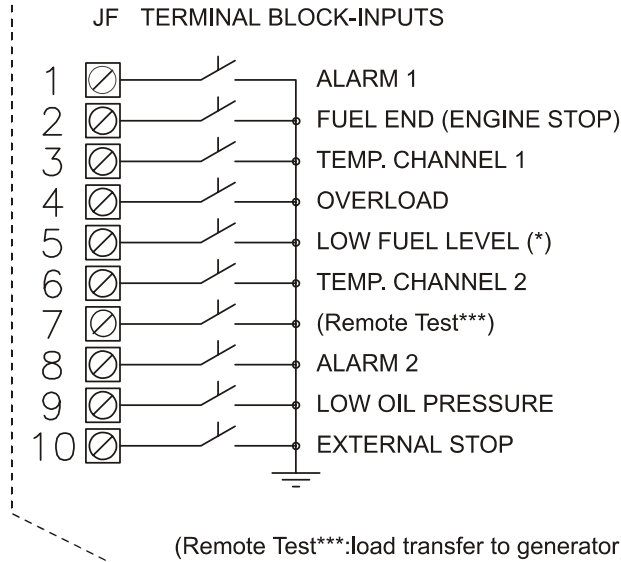
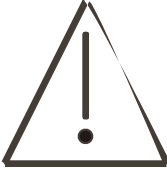
By pushing the 'STOP' push button the actual measure will appear. To adjust the reading: push together 'STOP' and 'UP' (or 'DOWN') until the desired reading is reached.

To save in the memory this new ratio of reading push together 'STOP' and 'ACK': the display will 'flash' once to confirm the 'memory write cycle' operation.

TO COMPLETE THE CALIBRATION: UNPLUG THE SUPPLY AND PUT THE SYSTEM IN 'MANUAL' OR 'AUTO' OPERATING MODE AND CHECK THE ACCURACY OFTHE NEW MEASUREMENTS .

BE32 WIRING DIAGRAM (Release A17C)

section 12.0

ALL INPUTS ARE REFERRED TO GROUND AND ARE FROM SWITCHES CONTACTS. CURRENT OUTPUT IS LIMITED AT 10 mA. OPEN CONTACT VOLTAGE = VBATT.. MAXIMUM INPUT OVERVOLTAGE RATING

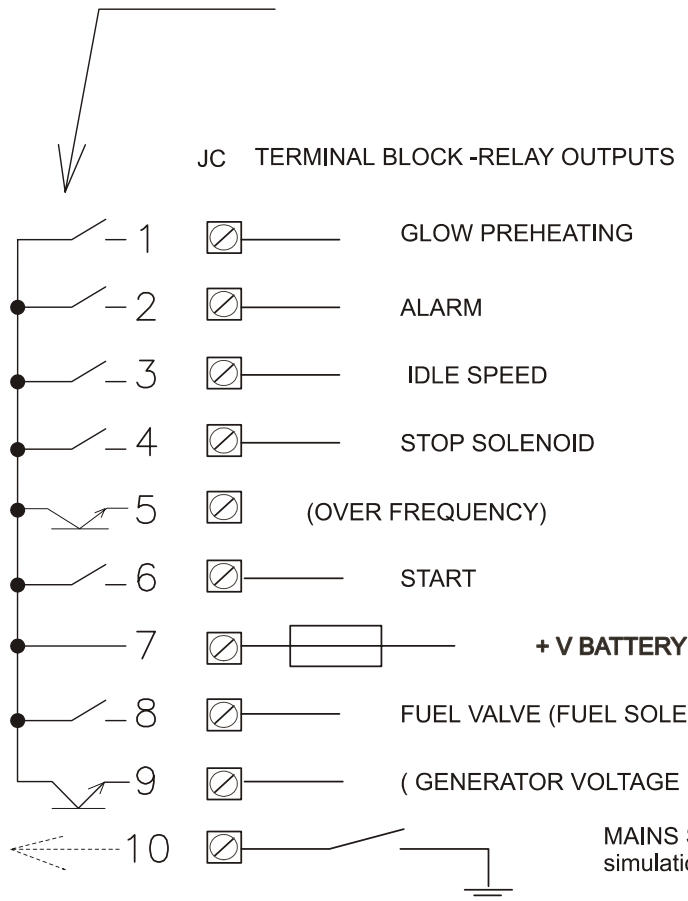

WORKING.....+33VDC/ -33VDC
 OVERVOLTAGE....250V 10mS

(Remote Test***:load transfer to generator)

optical isolation

(*) THIS INPUT DRIVES ONLY ALARM (NO ENGINE STOP CYCLE)

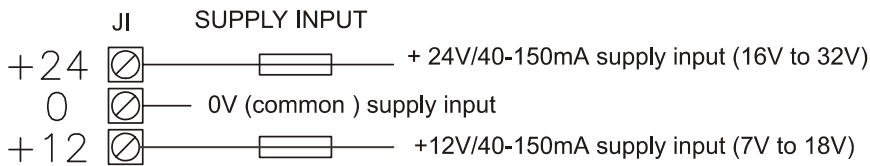
Internal BE32 output relays and static outputs

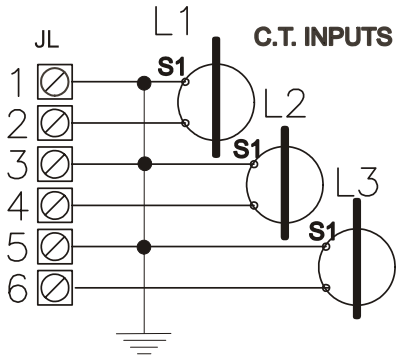
ALL OUTPUTS ARE CONNECTED BY RELAY CONTACTS TO TERMINAL 7 (NORMALLY CONNECTED TO +V BATTERY). EACH OUTPUT IS RATED AT 8A AC/DC. PROTECT THE COMMON TERMINAL JC7 WITH 6,3A FAST BLOWING FUSE. JC5/JC9 30mA FOR ONLY PLC INTERFACE.

BE32 WIRING DIAGRAM (Release A17C)

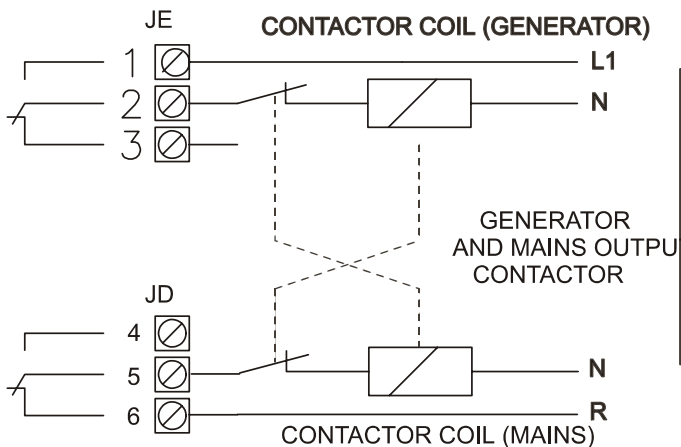
SECTION 13



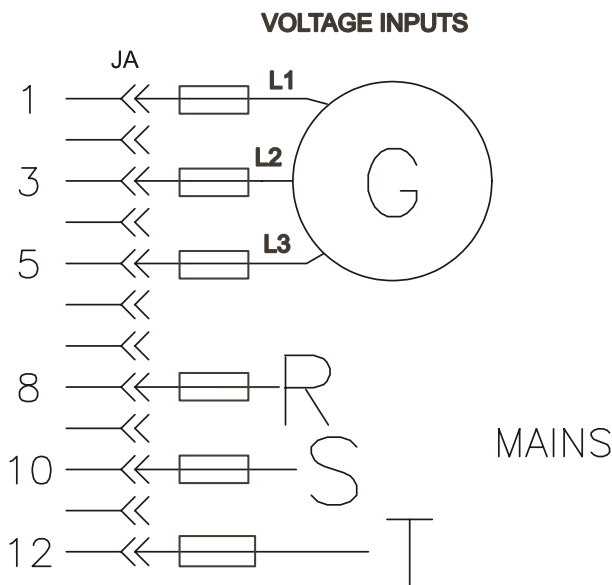
NOTE +24 is used for 24V battery System, +12 for 12V battery System



DO NOT DISCONNECT CT WHEN GENERATOR IS OPERATING. CT OUTPUT RATING 5A. CT RATIO PROGRAMMING AT ADDRESS 'L' ON THE TABLE (see PAGE 6). THE VOLT-AMP BURDEN IS 2,5VA.



PROTECT OUTPUT RELAY WITH 3,15 A FAST BLOWING FUSES. CONTACT RATING 250VAC 5AAC OR 50VDC/1ADC.



MAXIMUM WORKING VOLTAGE 600VAC. INPUT INPEDANCE 4M OHM LINE TO LINE. PROTECTION OF WIRES IS RECOMMENDED WITH 1A FUSES (EXTERNAL TRANSIENT VOLTAGE SUPPRESSION DEVICES ARE RECOMMENDED ON MAINS LINE).

