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**DSEULTRA<sup>®</sup>**

## **DSE332 ATS Control Module**

**Document Number 057-097**

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### DSE Model 332 ATS controller Operators Manual

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### Amendments since last publication

Amd. No.	Comments

### Clarification of notation used within this publication.

	<b>NOTE:</b>	Highlights an essential element of a procedure to ensure correctness.
	<b>CAUTION!</b>	Indicates a procedure or practice, which, if not strictly observed, could result in damage or destruction of equipment.
	<b>WARNING!</b>	Indicates a procedure or practice, which could result in injury to personnel or loss of life if not followed correctly.

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# 1 BIBLIOGRAPHY

This document refers to and is referred to by the following DSE publications which can be obtained from the DSE website [www.deepseapl.com](http://www.deepseapl.com)

DSE PART	DESCRIPTION
053-061	332 installation instructions
057-100	6000 Series Configuration Suite manual

# 2 INTRODUCTION

This document details the installation and operation requirements of the DSE332 Series modules, part of the DSEUltra® range of products.

The manual forms part of the product and should be kept for the entire life of the product. If the product is passed or supplied to another party, ensure that this document is passed to them for reference purposes.

This is not a *controlled document*. You will not be automatically informed of updates. Any future updates of this document will be included on the DSE website at [www.deepseapl.com](http://www.deepseapl.com)

The **DSE 332 series** module has been designed to allow the operator to control the transfer of the load from one supply to another, typically the mains supply and a standby generator.

The user also has the facility to view the system operating parameters via the LCD display.

The **DSE 332** module monitors the supplies, indicating the operational status and fault conditions, automatically transferring the load to the backup supply in case of mains supply failure. The LCD display indicates the status.

The powerful microprocessor contained within the module allows for incorporation of a range of enhanced features:

- *Text based LCD display*
- **True RMS** Voltage monitoring.
- *Supply parameter monitoring.*
- *Fully configurable inputs for use as alarms or a range of different functions.*

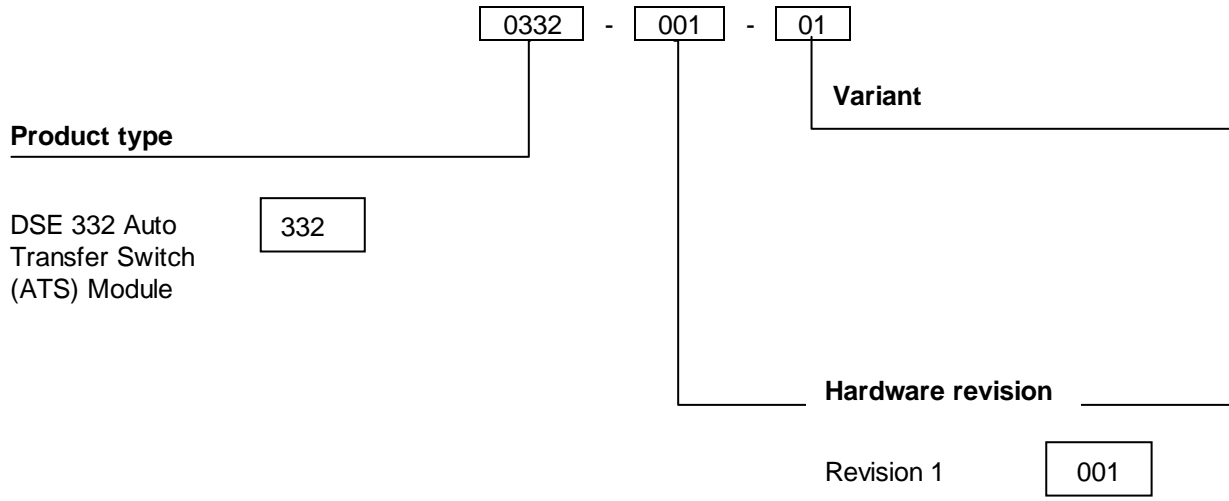
Using a PC and the DSE Configuration Suite software allows alteration of selected operational sequences, timers and alarm trips.

Additionally, the module's integral fascia configuration editor allows adjustment of this information.

A robust plastic case designed for front panel mounting houses the module. Connections are via locking plug and sockets.

### 3 SPECIFICATIONS

#### 3.1 PART NUMBERING



At the time of this document production, there have been no revisions to the module hardware.

### 3.1 POWER SUPPLY REQUIREMENTS

Minimum supply voltage	8V continuous, 5V for up to one minute.
Cranking dropouts	Able to survive 0V for 50mS providing the supply was at least 10V before the dropout and recovers to 5V afterwards.
Maximum supply voltage	35V continuous (60V protection for one minute)
Reverse polarity protection	-35V continuous
Maximum operating current Auto mode will all inputs active and all LEDs illuminated	292mA at 12V, 167mA at 24V
Maximum standby current (Stop mode with no active inputs)	101mA at 12V, 66mA at 24V

#### Plant supply instrumentation display

Range	0V-35V DC (note Maximum continuous operating voltage of 35V DC)
Resolution	0.1V
Accuracy	1% of full scale

### 3.2 TERMINAL SPECIFICATION

Connection type	Screw terminal, rising clamp, no internal spring
Min cable size	0.5mm <sup>2</sup> (AWG 24)
Max cable size	2.5mm <sup>2</sup> (AWG 10)

### 3.3 MAINS VOLTAGE / FREQUENCY SENSING

Measurement type	True RMS conversion
Sample Rate	5KHz or better
Harmonics	Up to 11 <sup>th</sup> or better
Input Impedance	300K $\Omega$ ph-N
Phase to Neutral	15V (minimum required for sensing frequency) to 333V AC (absolute maximum) Suitable for 110V to 277V nominal ( $\pm 20\%$ for under/overvoltage detection)
Phase to Phase	26V (minimum required for sensing frequency) to 576V AC (absolute maximum) Suitable for 190V ph-ph to 479V ph-ph nominal ( $\pm 20\%$ for under/overvoltage detection)
Common mode offset from Earth	100V AC (max)
Resolution	1V AC phase to neutral 2V AC phase to phase
Accuracy	$\pm 1\%$ of full scale phase to neutral $\pm 2\%$ of full scale phase to phase
Minimum frequency	3.5Hz
Maximum frequency	75.0Hz
Frequency resolution	0.1Hz
Frequency accuracy	$\pm 0.2$ Hz

### 3.4 INPUTS

#### 3.4.1 DIGITAL INPUTS

Number	10
Arrangement	Contact between input terminal and the module's plant supply negative terminal
Low level threshold	3.2V minimum
High level threshold	8.1V maximum
Maximum input voltage	+60V DC with respect to module's plant supply negative terminal
Minimum input voltage	-2V DC with respect to module's plant supply negative terminal
Contact wetting current	7mA ±1mA
Open circuit voltage	12V ±1V

### 3.5 OUTPUTS

#### 3.5.1 GENERATOR / MAINS LOADING OUTPUTS

Number	2 (Configurable outputs A & B)
Type	Volts free contacts. Output C Normally closed, Output D Normally open
Rating	8A 250V AC resistive

#### 3.5.2 CONFIGURABLE OUTPUTS

Number	2 (Configurable outputs C,D)
Type	Fully configurable, supplied from DC supply terminal 2.
Rating	2A @ 35V
Protection	Protected against over current & over temperature. Built in load dump feature.

#### 3.5.3 START/RUN OUTPUT

Number	1 (Configurable output E)
Type	Volts free normally closed contact
Rating	2A @ 35V

### 3.6 COMMUNICATION PORTS

USB Port	USB2.0 Device for connection to PC running DSE configuration suite only
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### 3.7 DIMENSIONS AND MOUNTING

#### 3.7.1 DIMENSIONS

216mm x 158mm x 42mm  
(8.5" x 6.2" x 1.6")

#### 3.7.2 PANEL CUTOUT

182mm x 137mm  
(7.2" x 5.4")

#### 3.7.3 WEIGHT

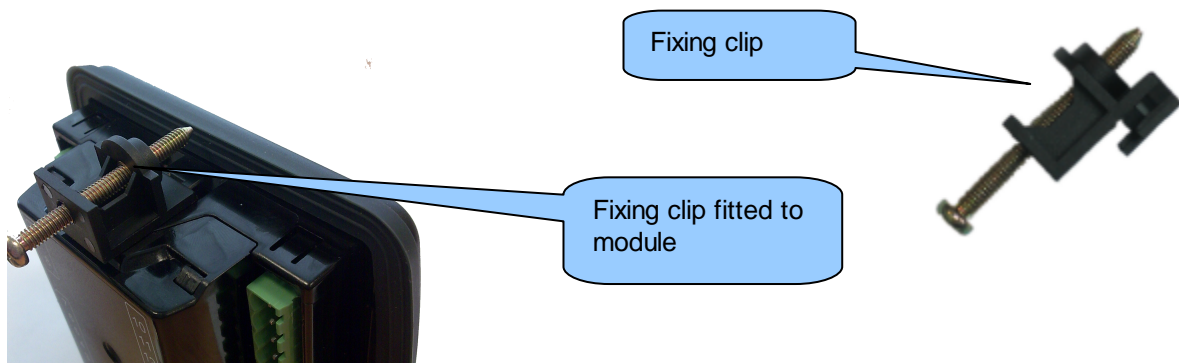
510g (0.51kg)



#### 3.7.4 FIXING CLIPS

The module is held into the panel fascia using the supplied fixing clips.

- Withdraw the fixing clip screw (turn anticlockwise) until only the pointed end is protruding from the clip.
- Insert the three 'prongs' of the fixing clip into the slots in the side of the 6000 series module case.
- Pull the fixing clip backwards (towards the back of the module) ensuring all three prongs of the clip are inside their allotted slots.
- Turn the fixing clip screws clockwise until they make contact with the panel fascia.
- Turn the screws a little more to secure the module into the panel fascia. Care should be taken not to over tighten the fixing clip screws.

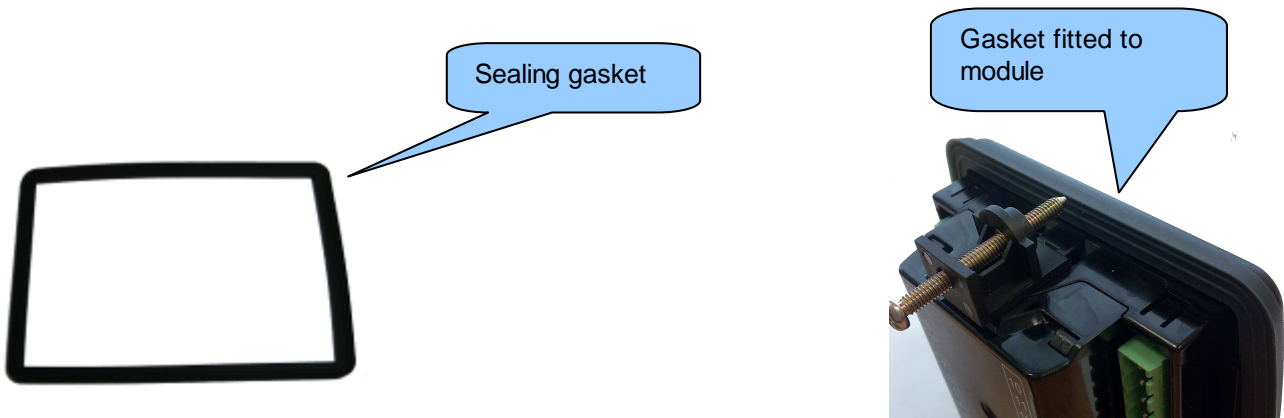


**NOTE:-** In conditions of excessive vibration, mount the panel on suitable anti-vibration mountings.

#### 3.7.5 OPTIONAL SILICON SEALING GASKET

The optional silicon gasket provides improved sealing between the 6000 series module and the panel fascia. The gasket is fitted to the module before installation into the panel fascia.

Take care to ensure the gasket is correctly fitted to the module to maintain the integrity of the seal.



### 3.8 APPLICABLE STANDARDS

<b>BS 4884-1</b>	This document conforms to BS4884-1 1992 Specification for presentation of essential information.
<b>BS 4884-2</b>	This document conforms to BS4884-2 1993 Guide to content
<b>BS 4884-3</b>	This document conforms to BS4884-3 1993 Guide to presentation
<b>BS EN 60068-2-1</b> (Minimum temperature)	-30°C (-22°F)
<b>BS EN 60068-2-2</b> (Maximum temperature)	+70°C (158°F)
<b>BS EN 60950</b>	Safety of information technology equipment, including electrical business equipment
<b>BS EN 61000-6-2</b>	EMC Generic Immunity Standard (Industrial)
<b>BS EN 61000-6-4</b>	EMC Generic Emission Standard (Industrial)
<b>BS EN 60529</b> (Degrees of protection provided by enclosures)	IP65 (front of module when installed into the control panel with the optional sealing gasket) IP42 (front of module when installed into the control panel WITHOUT being sealed to the panel)
<b>UL508</b> <b>NEMA rating</b> (Approximate)	12 (Front of module when installed into the control panel with the optional sealing gasket). 2 (Front of module when installed into the control panel WITHOUT being sealed to the panel)
<b>IEEE C37.2</b> (Standard Electrical Power System Device Function Numbers and Contact Designations)	Under the scope of IEEE 37.2, <i>function numbers can also be used to represent functions in microprocessor devices and software programs.</i> The 3000 series controller is device number 11L-6000 (Multifunction device protecting Line (generator) – 6000 series module).  As the module is configurable by the generator OEM, the functions covered by the module will vary. Under the module's factory configuration, the device numbers included within the module are :  2 – Time delay starting or closing relay 30 – annunciator relay 42 – Running circuit breaker 62 – time delay stopping or opening relay 74– alarm relay 81 – frequency relay 86 – lockout relay

In line with our policy of continual development, Deep Sea Electronics, reserve the right to change specification without notice.

## 4 INSTALLATION

### 4.1 TERMINAL DESCRIPTION





#### 4.1.1 DC SUPPLY AND OUTPUTS




	PIN No	DESCRIPTION	CABLE SIZE	NOTES
	1	DC Plant Supply Input (Negative)	2.5mm <sup>2</sup> AWG 13	
	2	DC Plant Supply Input (Positive)	2.5 mm <sup>2</sup> AWG 13	(Recommended Maximum Fuse 15A anti-surge) Supplies the module (2A anti-surge requirement) and all output relays
	3	Output C	1.0mm <sup>2</sup> AWG 18	Plant Supply Positive from terminal 2. 3 Amp rated.
	4	Output D	1.0mm <sup>2</sup> AWG 18	Plant Supply Positive from terminal 2. 3 Amp rated.
	5	Output E	1.0mm <sup>2</sup> AWG 18	Volts free relay normally configured to START/RUN generator (2A rated)
	6	Output E	1.0mm <sup>2</sup> AWG 18	Volts free relay normally configured to START/RUN generator (2A rated)
	7	System Earth	1.0mm <sup>2</sup> AWG 18	




### 4.1.2 DIGITAL INPUTS

	PIN No	DESCRIPTION	CABLE SIZE	NOTES
	8	Input A	1.0mm <sup>2</sup> AWG 18	Configurable input. Connects to plant supply negative
	9	Input B	1.0mm <sup>2</sup> AWG 18	Configurable input. Connects to plant supply negative
	10	Input C	1.0mm <sup>2</sup> AWG 18	Configurable input. Connects to plant supply negative
	11	Input D	1.0mm <sup>2</sup> AWG 18	Configurable input. Connects to plant supply negative
	12	Input E	1.0mm <sup>2</sup> AWG 18	Configurable input. Connects to plant supply negative
	13	Input F	1.0mm <sup>2</sup> AWG 18	Configurable input. Connects to plant supply negative
	14	Input G	1.0mm <sup>2</sup> AWG 18	Configurable input. Connects to plant supply negative
	15	Input H	1.0mm <sup>2</sup> AWG 18	Configurable input. Connects to plant supply negative
	16	Input I	1.0mm <sup>2</sup> AWG 18	Configurable input. Connects to plant supply negative
	17	Input J	1.0mm <sup>2</sup> AWG 18	Configurable input. Connects to plant supply negative
	18	Input K	1.0mm <sup>2</sup> AWG 18	Generator ready input. Connects to plant supply Positive

### 4.1.3 LOAD SWITCHING AND GENERATOR SENSING

	PIN No	DESCRIPTION	CABLE SIZE	NOTES
	19	Output A	1.0mm <sup>2</sup> AWG 18	Normally configured to control mains contactor coil (Recommend 10A fuse)
	20	Output A	1.0mm <sup>2</sup> AWG 18	Normally configured to control mains contactor coil
	21	Output B	1.0mm <sup>2</sup> AWG 18	Normally configured to control generator contactor coil (Recommend 10A fuse)
	22	Output B	1.0mm <sup>2</sup> AWG 18	Normally configured to control generator contactor coil
	23	Generator L1 (U) voltage monitoring	1.0mm <sup>2</sup> AWG 18	Connect to generator L1 (U) output (AC) (Recommend 2A fuse)
	24	Generator L2 (V) voltage monitoring	1.0mm <sup>2</sup> AWG 18	Connect to generator L2 (V) output (AC) (Recommend 2A fuse)
	25	Generator 31 (W) voltage monitoring	1.0mm <sup>2</sup> AWG 18	Connect to generator L3 (W) output (AC) (Recommend 2A fuse)
	26	Generator Neutral (N) input	1.0mm <sup>2</sup> AWG 18	Connect to generator Neutral terminal (AC)

### 4.1.4 MAINS SENSING


	PIN No	DESCRIPTION	CABLE SIZE	NOTES
	27	Mains L1 (R) voltage monitoring	1.0mm <sup>2</sup> AWG 18	Connect to Mains L1 (R) output (AC) (Recommend 2A fuse)
	28	Mains L2 (S) voltage monitoring	1.0mm <sup>2</sup> AWG 18	Connect to Mains L2 (S) output (AC) (Recommend 2A fuse)
	29	Mains 31 (T) voltage monitoring	1.0mm <sup>2</sup> AWG 18	Connect to Mains L3 (T) output (AC) (Recommend 2A fuse)
	30	Mains Neutral (N) input	1.0mm <sup>2</sup> AWG 18	Connect to Mains Neutral terminal (AC)

### 4.1.5 CURRENT TRANSFORMERS

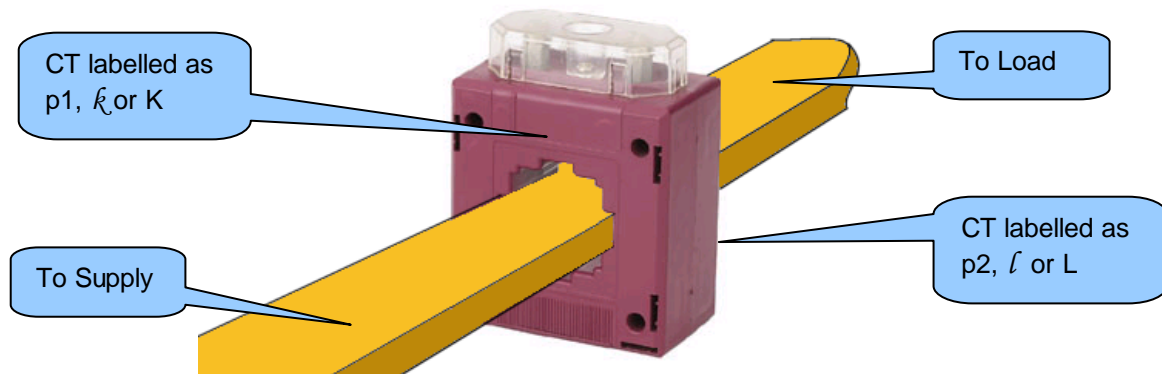
Current transformers are fitted in the feed from the transfer switch to the load. They are used to give mains instrumentation when the mains is on load, and generator instrumentation when the generator is on load.

**⚠ WARNING!:-** Do not disconnect this plug when the CTs are carrying current. Disconnection will open circuit the secondary of the C.T.'s and dangerous voltages may then develop. Always ensure the CTs are not carrying current and the CTs are short circuit connected before making or breaking connections to the module.

**⚠ NOTE:-** The DSE332 series module has a burden of 0.5VA on the CT. Ensure the CT is rated for the burden of the DSE332 series controller, the cable length being used and any other equipment sharing the CT. If in doubt, consult your CT supplier.



	PIN No	DESCRIPTION	CABLE SIZE	NOTES
	31	I1 Current Transformer	1.0mm <sup>2</sup> AWG 18	Connect to CT 1 (s1 / $\hat{k}$ )
	32	I2 Current Transformer	1.0mm <sup>2</sup> AWG 18	Connect to CT 2 (s1 / $\hat{k}$ )
	33	I3 Current Transformer	1.0mm <sup>2</sup> AWG 18	Connect to CT 3 (s1 / $\hat{k}$ )
	34	Current Transformer common connection	1.0mm <sup>2</sup> AWG 18	Connect to CT common (s2 / $\hat{l}$ )

**⚠ NOTE:-** Take care to ensure correct polarity of the CT primary as shown below. If in doubt, check with the CT supplier.



This configuration cable is the same as normally used between a PC and a USB printer.

#### 4.1.6 PC CONFIGURATION INTERFACE CONNECTOR

	DESCRIPTION	CABLE SIZE	NOTES
	Socket for connection to PC with DSE Configuration Suite PC software.	0.5mm <sup>2</sup> AWG 20	This is a standard USB type A to type B cable. 

**NOTE:-** The USB connection cable between the PC and the 6000 series module must not be extended beyond 5m (5yds). For distances over 5m, it is possible to use a third party USB extender. Typically, they extend USB up to 50m (yds). The supply and support of this type of equipment is outside the scope of Deep Sea Electronics PLC.

**CAUTION!:** Care must be taken not to overload the PCs USB system by connecting more than the recommended number of USB devices to the PC. For further information, consult your PC supplier.

**CAUTION!:** This socket must not be used for any other purpose.

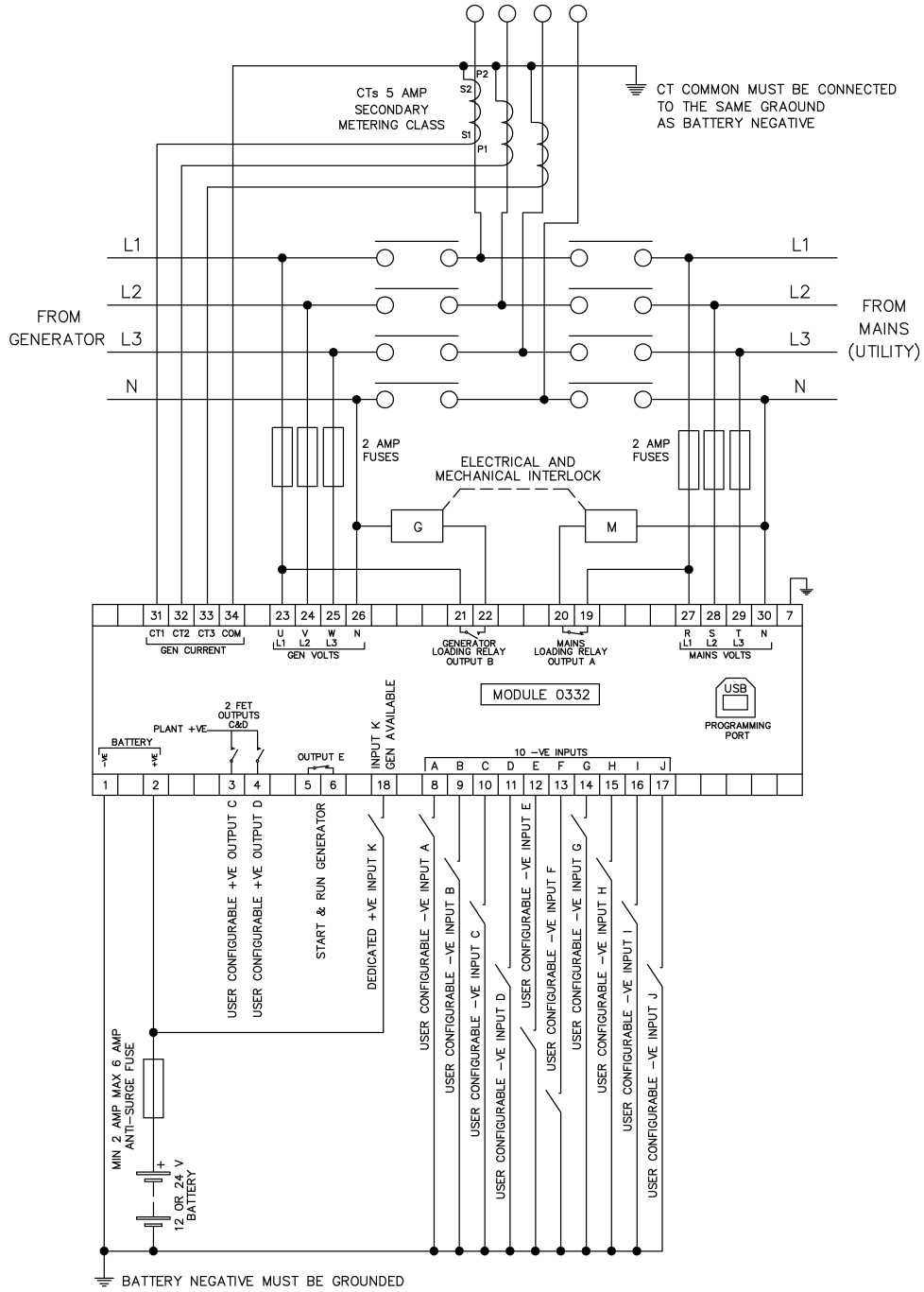
## 4.2 TYPICAL WIRING DIAGRAM

As every system has different requirements, these diagrams show only a TYPICAL system and do not intend to show a complete system.

Genset manufacturers and panel builders may use these diagrams as a starting point, however you are referred to the completed system diagram provided by your system manufacturer for complete wiring detail.

Further wiring suggestions are available in the following DSE publication, available at [www.deepseapl.com](http://www.deepseapl.com).

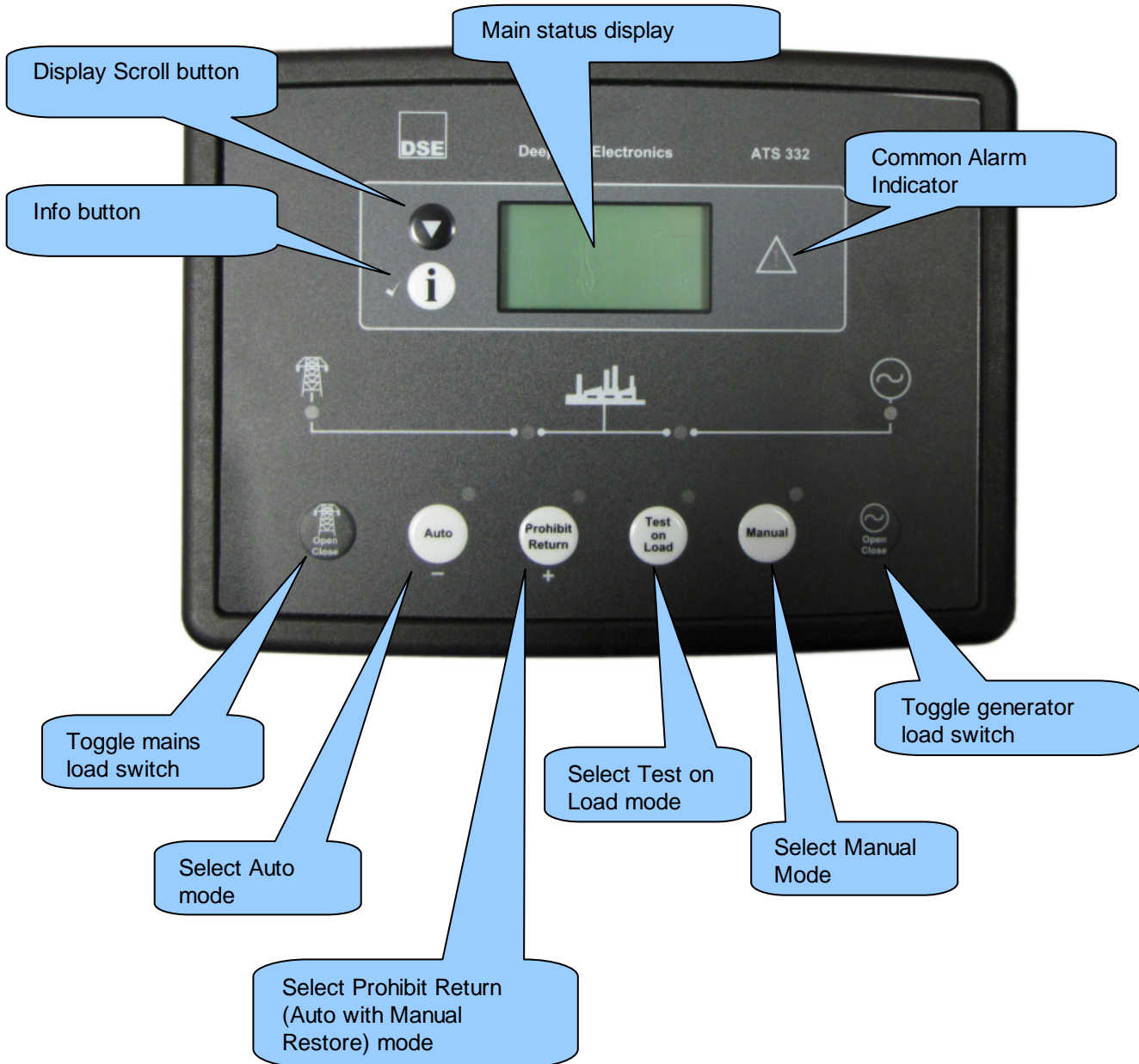
DSE PART	DESCRIPTION
056-022	Breaker Control (Training guide)

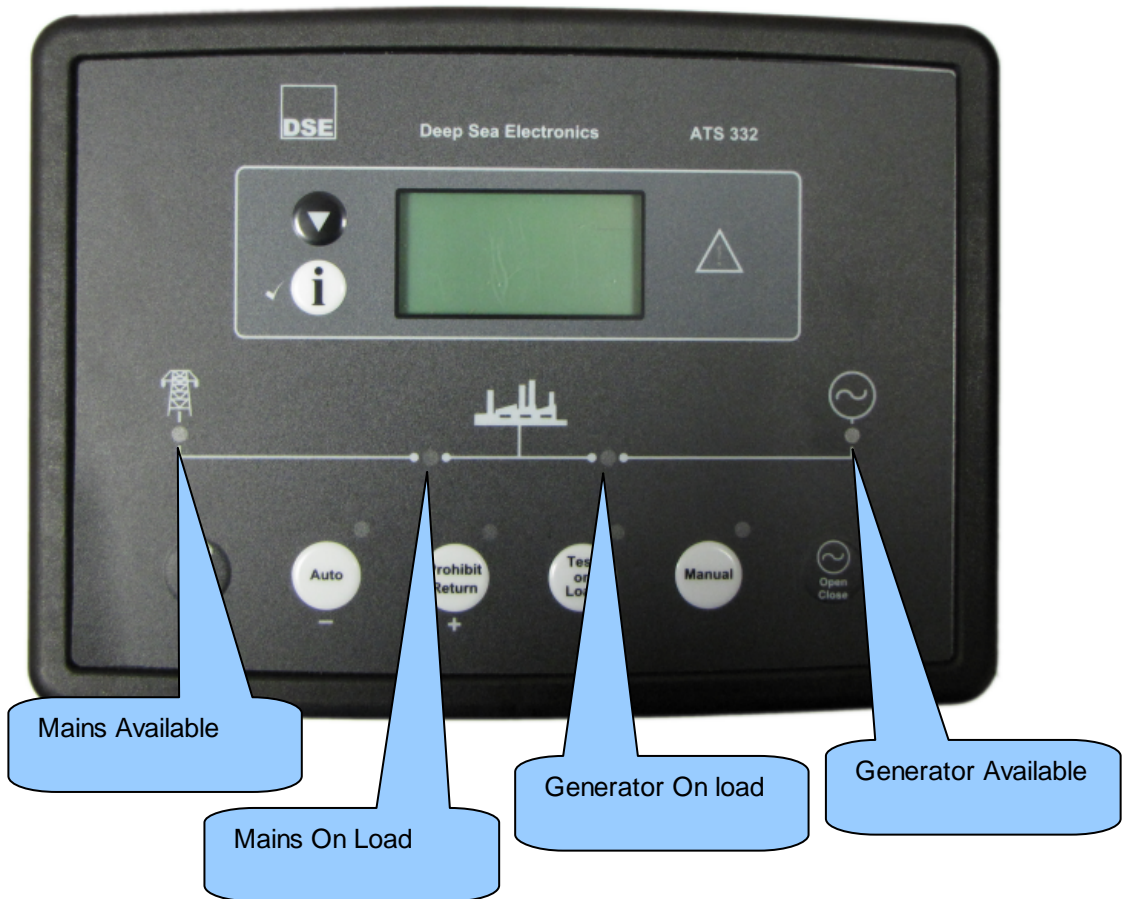


TERMINALS SUITABLE FOR 22-16 AWG  
(0.6mm - 1.3mm ) FIELD WIRING  
TIGHTENING TORQUE = 0.8Nm (7lb-in)

## 5 DESCRIPTION OF CONTROLS

The following section details the function and meaning of the various controls on the module.



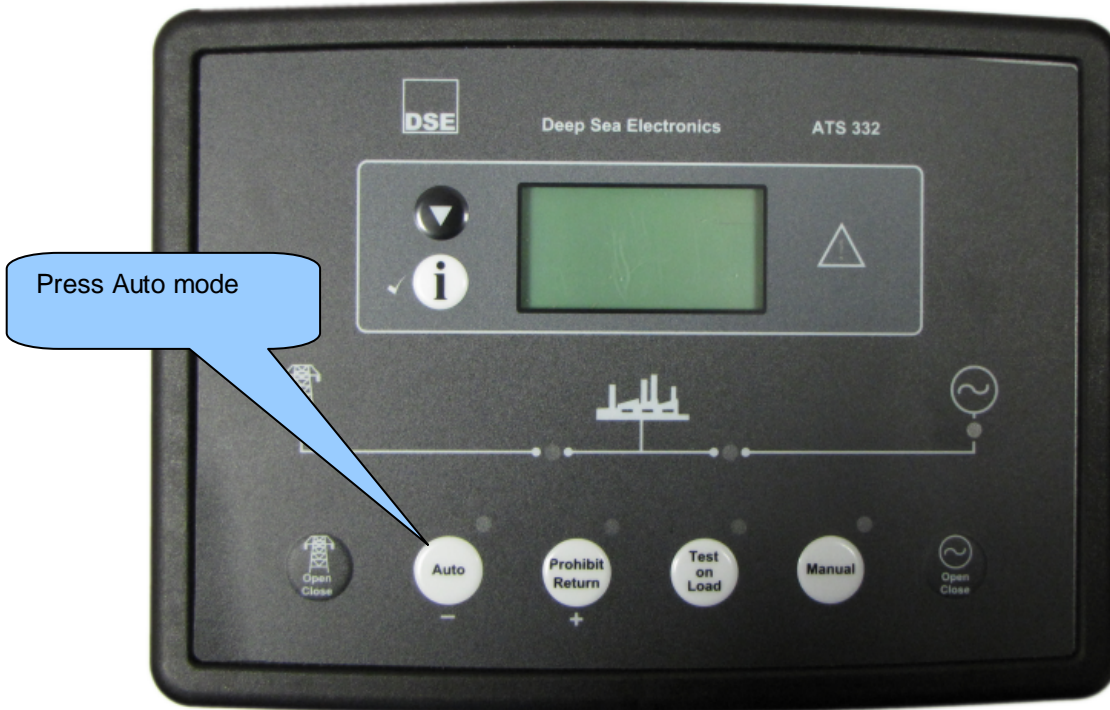




## 5.1 QUICKSTART GUIDE

This section provides a quick start guide to the module's operation.

### 5.1.1 STANDBY OPERATION



**▲ NOTE:-** For further details, see the section entitled 'OPERATION' elsewhere in this manual.


**▲ NOTE:-** If module power is removed, it will 'remember' the last operating mode and return to that mode next time power is applied.



## 5.2 GRAPHICAL DISPLAY

- 4- line, 64 x 132 small Graphic Display with LED Backlight
- Icon and numeric display. Switch to select 'Icon' or 'English' display
- Software controlled contrast
- Mimic of Text insert / 4x indicators via LCD

### 5.2.1 DISPLAY PAGES

It is possible to scroll to display the different pages of information by repeatedly operating the scroll button 

Once selected the page will remain on the LCD display until the user selects a different page or after an extended period of inactivity, the module will revert to the status display.

When scrolling manually, the display will automatically return to the Status page if no buttons are pressed for the duration of the configurable *LCD Page Timer*.

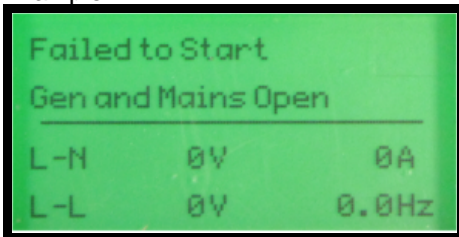
If an alarm becomes active while viewing the status page, the display shows the Alarms page to draw the operator's attention to the alarm condition.

At power up, the display will show the software version, and then display the default display screen, which will display Mains instrumentation.

#### 5.2.1.1 STATUS

Displays current operational status information

Example :

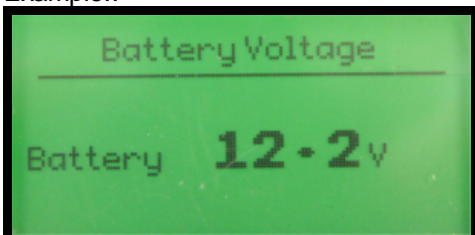


#### 5.2.1.2 INSTRUMENTATION

The instrumentation page contains the following information

Generator Voltage L1-N  
 Generator Voltage L-L  
 Generator Frequency  
 Mains Voltage L1-N  
 Mains Voltage L-L  
 Mains Frequency  
 Load current (A)  
 Battery Voltage

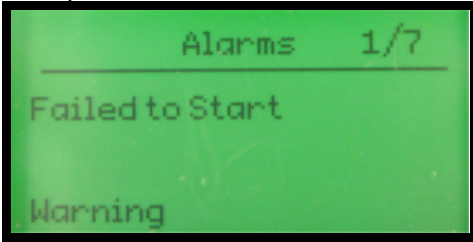
Example::



### 5.2.1.3 ALARMS

Lists any current alarms

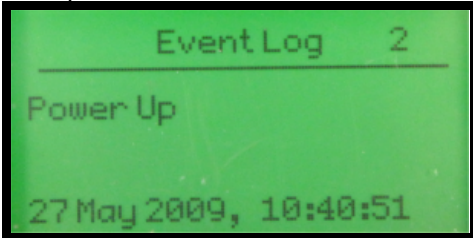
Example



### 5.2.1.4 EVENT LOG

Displays the entire event log

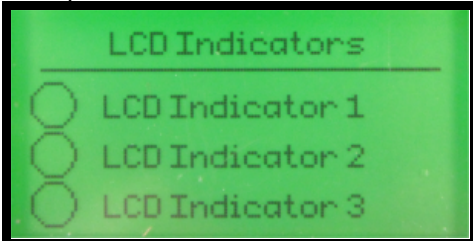
Example:



### 5.2.1.5 LCD INDICATORS

Shows the status of the configurable LCD indicators

Example:



### 5.2.1.6 SCHEDULE

Shows the settings of the exercise scheduler

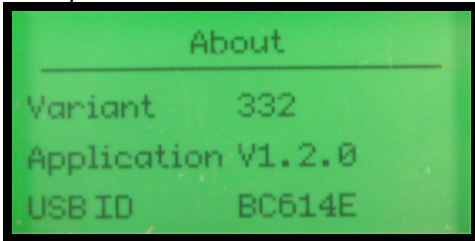
Example:



### 5.2.1.7 ABOUT

Displays the module firmware versions.

Example:



## 5.3 CONTROLS

### 5.3.1 MODE SELECTION

This button places the module into its '**Automatic**' mode. This mode allows the module to control the function of the load switching completely automatically. The module will monitor the *remote start* input and mains supply status and once a start request is made, the set will be placed on load. Upon removal of the starting signal (or the mains supply returns), the module will automatically transfer the load from the generator to the mains and remove the genset starting instruction.

*For further details, please see the more detailed description of 'Auto operation' elsewhere in this manual.*

Operation is as AUTO MODE above but the load is not transferred back to the mains supply when it is reinstated. This function is sometimes called "MANUAL RESTORE"

Once in **Test on load mode** the module will send a start request to the generator and place the set on load. The set will remain on load when in this mode.

This mode allows manual control of the ATS functions. Once in **Manual mode** the module will send a start request to the generator.

Breakers can be opened and close using the transfer buttons detailed below.



### 5.3.2 DISPLAY

This button changes between the various pages About, Status, Instrumentation, Alarms, Event Log, LCD Indicators

This buttons scrolls through the items in the currently displayed page.



### 5.3.3 LOAD SWITCHING CONTROL

Two fascia mounted buttons are provided for load switching operation when in manual mode. These buttons are enabled/disabled in the modules PC configuration Suite so refer to your configuration file to ensure the configuration has enabled the buttons.

Pressing this button when the mains is on load will open the mains load switch.  
Pressing this button when the generator is on load and the mains is healthy, will open the generator load switch, wait for the duration of the *transfer delay*, then close the mains load switch.



Pressing this button when the generator is on load will open the generator load switch.  
Pressing this button when the mains is on load and the generator is available, will open the mains load switch, wait for the duration of the *transfer delay*, then close the generator load switch.



## 6 OPERATION

### 6.1 AUTOMATIC MODE OF OPERATION

 **NOTE:-** If a digital input configured to *panel lock* is active, changing module modes will not be possible. Viewing the instruments and event logs is NOT affected by panel lock.

Activate auto mode by pressing the **Auto** pushbutton.

Auto mode will allow the transfer system to operate fully automatically, starting and stopping the generator as required with no user intervention.

#### 6.1.1 WAITING IN AUTO MODE

If a starting request is made and there is no input present for *Auto Start Inhibit*, the starting sequence will begin. Starting requests can be from the following sources :

- Mains failure
- Activation of an auxiliary input that has been configured to *remote start*
- Activation of the inbuilt exercise scheduler.

#### 6.1.2 STARTING SEQUENCE

To allow for 'false' start requests, the *start delay* timer begins.

Should all start requests be removed during the *start delay* timer, the unit will return to a stand-by state.

If a start request is still present at the end of the *start delay* timer, start signal is given to the generator set by the start/run output.

If the generator fails to become available before the *generator failure* timer expires. This is indicated on the LCD display, but the starting signal remains active.

#### 6.1.3 GENERATOR ON LOAD

Once the generator is measured as being within limits (and the *Auxiliary Generator Ready* signal is received, the mains is removed from the load, and after the *transfer timer* has expired, the generator is placed on load.

If all start requests are removed and there is no input present for *Auto Restore Inhibit*, the *stopping sequence* will begin.

#### 6.1.4 STOPPING SEQUENCE

The *return delay* timer operates to ensure that the starting request has been permanently removed and isn't just a short term removal.

After the return delay timer, the generator load switch is opened, then after the transfer timers, the mains is placed back on load.

Should another start request be made during the cooling down period, the generator will be placed on load.

The *cooling* timer allows the set to run off load and cool sufficiently before being stopped. This is particularly important where turbo chargers are fitted to the engine.

After the *cooling* timer has expired, the set is stopped.

 **NOTE:-** If module power is removed, it will 'remember' the operating mode and return to that mode next time power is applied.

## 6.2 MANUAL OPERATION

 **NOTE:-** If a digital input configured to *panel lock* is active, changing module modes will not be possible. Viewing the instruments and event logs is NOT affected by panel lock.

Manual mode allows the operator to start and stop the set manually, and if required change the state of the load switching devices. Manual off load mode is active when the **Manual** button is pressed.

### 6.2.1 STARTING SEQUENCE

 **NOTE:-** There is no *start delay* in this mode of operation.

The start request is sent to the generator via the start/run relay output.

If the generator fails to become available before the *generator failure* timer expires. This is indicated on the LCD display, but the starting signal remains active.

### 6.2.2 GENERATOR OFF LOAD

The generator will continue run OFF LOAD in this mode unless :

- The mains supply fails
- An input is given for *Auxiliary Mains Failure*
- An input is given for *Transfer to Generator*
- The fascia mounted transfer buttons are pressed (when configured)



### 6.2.3 GENERATOR ON LOAD

Once on load, the generator will remain on load unless:

- An input is given for *Transfer to Mains*
- The fascia mounted transfer buttons are pressed (when configured)
- The module mode is changed to STOP\RESET or AUTO mode. The system may then transfer back to mains supply automatically if conditions are suitable.

### 6.2.4 TRANSFER BUTTONS OPERATION

Two fascia mounted buttons are provided for load switching operation when in manual mode. These buttons are enabled/disabled in the modules PC configuration Suite so refer to your configuration file to ensure the configuration has enabled the buttons.

<p>Pressing this button when the mains is on load will open the mains load switch. Pressing this button when the generator is on load and the mains is healthy, will open the generator load switch, wait for the duration of the <i>transfer delay</i>, then close the mains load switch.</p>	
<p>Pressing this button when the generator is on load will open the generator load switch. Pressing this button when the mains is on load and the generator is available, will open the mains load switch, wait for the duration of the <i>transfer delay</i>, then close the generator load switch.</p>	

### 6.2.5 STOPPING SEQUENCE

The set will not be stopped in this mode of operation.

To begin the stopping sequence, the module should be placed in the AUTO or PROHIBIT RETURN mode.

 **NOTE:-** If module power is removed, it will 'remember' the operating mode and return to that mode next time power is applied.



## 6.3 TEST ON LOAD OPERATION

 **NOTE:-** If a digital input configured to *panel lock* is active, changing module modes will not be possible. Viewing the instruments and event logs is **NOT** affected by panel lock.

Manual mode allows the operator to start and stop the set manually, and if required change the state of the load switching devices. Manual off load mode is active when the **Test on Load** button is pressed.

### 6.3.1 STARTING SEQUENCE

 **NOTE:-** There is no *start delay* in this mode of operation.

The start request is sent to the generator via the start/run relay output.

If the generator fails to become available before the *generator* failure timer expires. This is indicated on the LCD display, but the starting signal remains active.

### 6.3.2 GENERATOR ON LOAD

The generator will continue run ON LOAD in this mode unless :

- The generator supply fails – The mains supply is placed back on load if available.
- An input is given for *Transfer to Mains*

### 6.3.3 STOPPING SEQUENCE

The set will not be stopped in this mode of operation.

To begin the stopping sequence, the module should be placed in the AUTO or PROHIBIT RETURN mode.

 **NOTE:-** If module power is removed, it will 'remember' the operating mode and return to that mode next time power is applied.

## 6.4 LOAD SWITCHING CONTROL

The following timing diagrams detail the differences between the load switching control options.

### 6.4.1 BREAKER SCHEME A

#### 6.4.1.1 CHECK SYNCHRONISING IS DISABLED

**NOTE :** Generator Closed Auxiliary and Mains Closed Auxiliary inputs do not affect the operation of the load switching in *Breaker Scheme A*

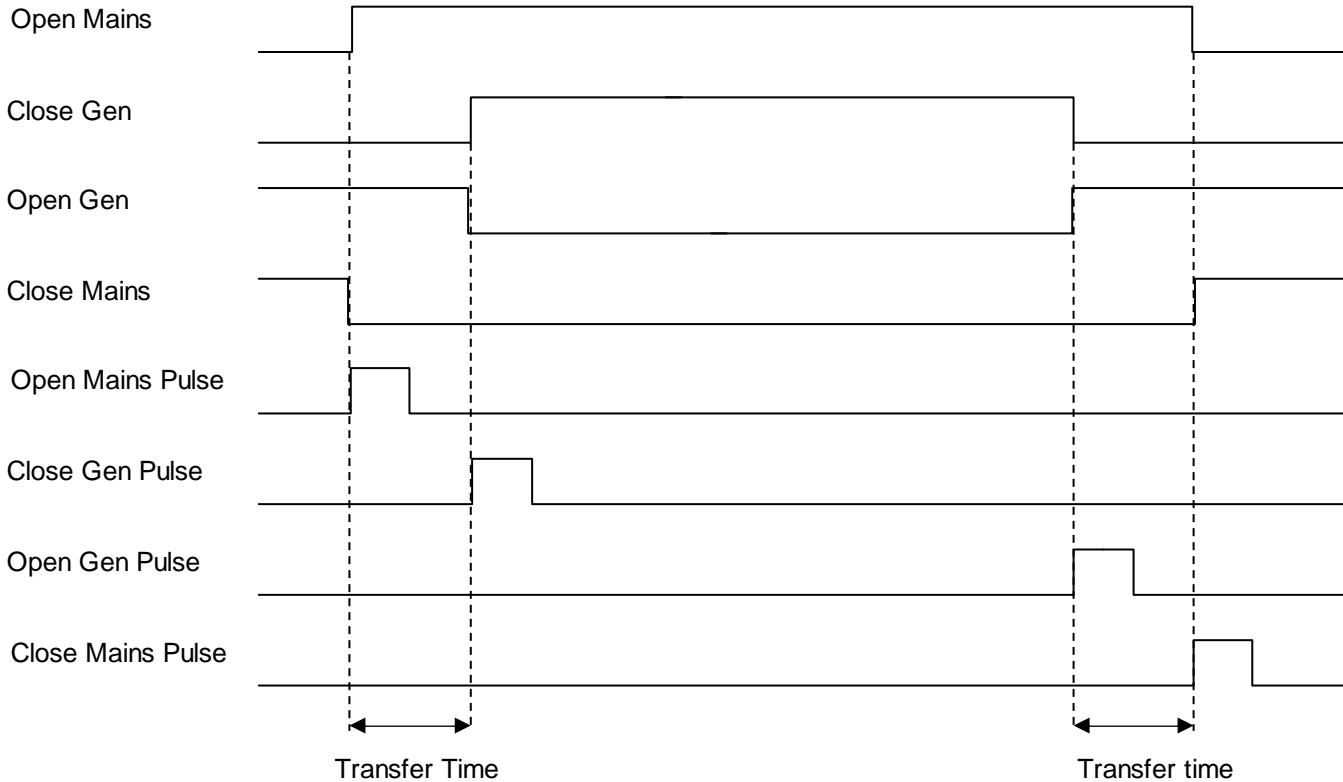
##### 6.4.1.1.1 MAINS / GENERATOR LOAD INHIBIT

Activation of an input configured to *mains load inhibit* or *generator load inhibit* inputs cause the corresponding breaker to be opened immediately. No other change in function will occur. When the input is deactivated the breaker is closed again if appropriate.

##### 6.4.1.1.2 LOAD SHEDDING

If an input configured to Load Shed is activated, outputs set to Open Mains and Open Gen will energise, and inputs configured to Close Mains and Close Gen will de-energise. Open Mains Pulse and Open Gen Pulse outputs will only energise if the corresponding supply was on load before application of the Load Shed input. When the Load Shed input is deactivated, the load will be transferred back to the supply that was disconnected before application of the input.

##### 6.4.1.1.3 TIMING DIAGRAM



### 6.4.1.2 CHECK SYNCHRONISING IS ENABLED

**NOTE :** Generator Closed Auxiliary and Mains Closed Auxiliary inputs do not affect the operation of the load switching in *Breaker Scheme A*

#### 6.4.1.2.1 MAINS / GENERATOR LOAD INHIBIT

Activation of an input configured to *mains load inhibit* or *generator load inhibit* inputs cause the corresponding breaker to be opened immediately. No other change in function will occur. When the input is deactivated the load transfer scheme is followed as below.

#### 6.4.1.2.2 LOAD SHED INPUT

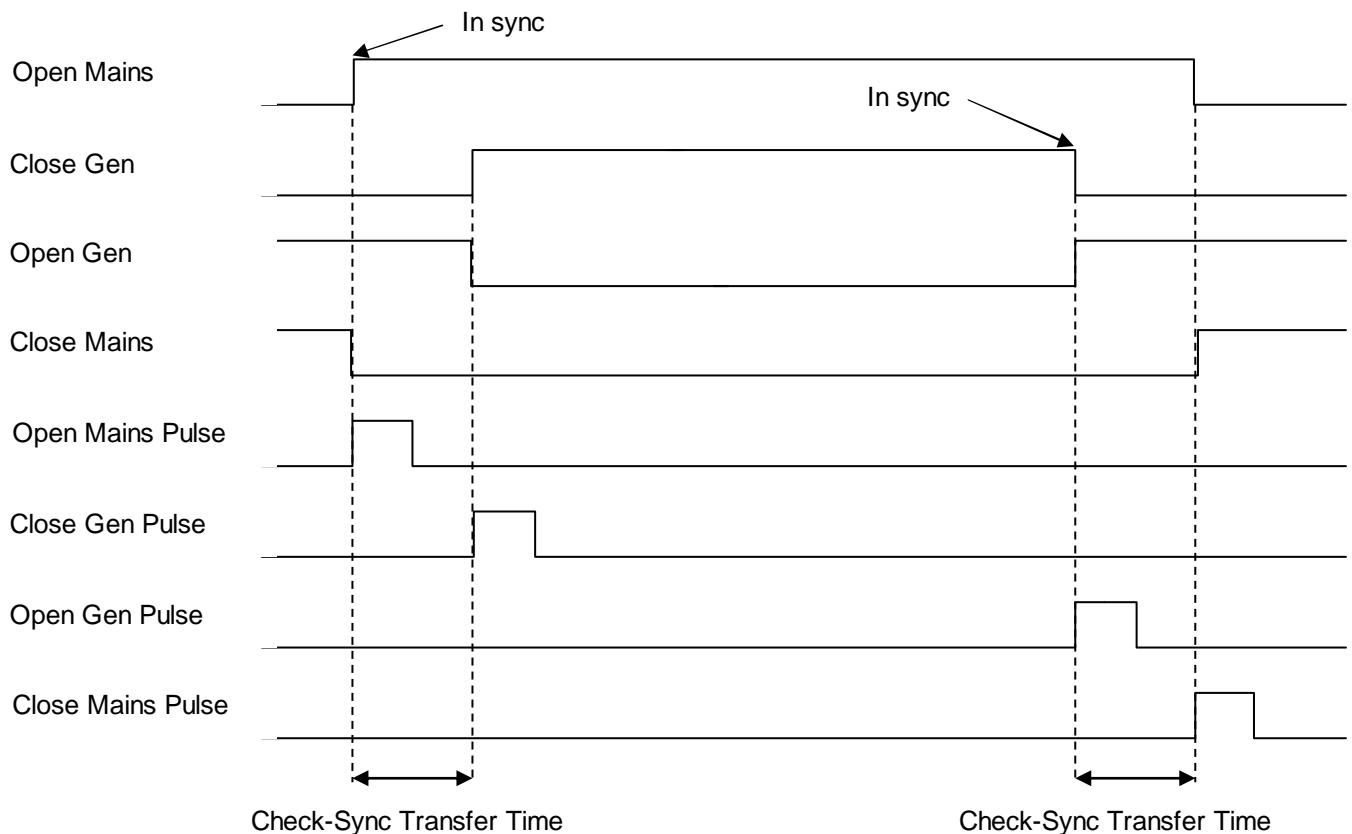
If an input configured to Load Shed is activated, outputs set to Open Mains and Open Gen will energise, and inputs configured to Close Mains and Close Gen will de-energise. Open Mains Pulse and Open Gen Pulse outputs will only energise if the corresponding supply was on load before application of the Load Shed input. When the Load Shed input is deactivated, the load will be transferred back to the supply that was disconnected before application of the input.

#### 6.4.1.2.3 LOAD TRANSFER

When the load is about to be transferred, the check sync function is activated. When the mains and generator are within the phase ( $25^\circ$ ) and frequency (1Hz) window the module transfers the load as shown below.

The module waits indefinitely for synchronisation unless *Return to programmed transition* is active in which case after 2 minutes it performs a non-sync transfer as described in the previous section.

#### 6.4.1.2.4 TIMING DIAGRAM



## 6.4.2 BREAKER SCHEME B

### 6.4.2.1 CHECK SYNCHRONISING IS DISABLED

#### 6.4.2.1.1 TRANSFERRING TO GENERATOR

To open the mains breaker the *Open Mains* output energises, it then de-energises when the *Mains Closed Auxiliary* indicates it has successfully opened, or after 1s whichever occurs first.

When the 'Mains Closed Auxiliary' indicates the mains breaker has opened, the *transfer timer* begins.

When the *transfer timer* expires, the module attempts to close the generator breaker by energising the *Open Mains* and *Close Generator* outputs simultaneously, it then de-energises these outputs when the *Generator Closed Auxiliary* input indicates it has successfully closed, or after 1s whichever occurs first.

#### 6.4.2.1.2 TRANSFERRING TO MAINS

To open the generator breaker the *Open Gen* output energises, it then de-energises when the *Generator Closed Auxiliary* indicates it has successfully opened, or after 1s whichever occurs first.

When the 'Generator Closed Auxiliary' indicates the generator breaker has opened, the *transfer timer* begins.

When the *transfer timer* expires, the module attempts to close the mains breaker by energising the *Open Gen* and *Close Mains* outputs simultaneously, it then de-energises these outputs when the *Mains Closed Auxiliary* input indicates it has successfully closed, or after 1s whichever occurs first

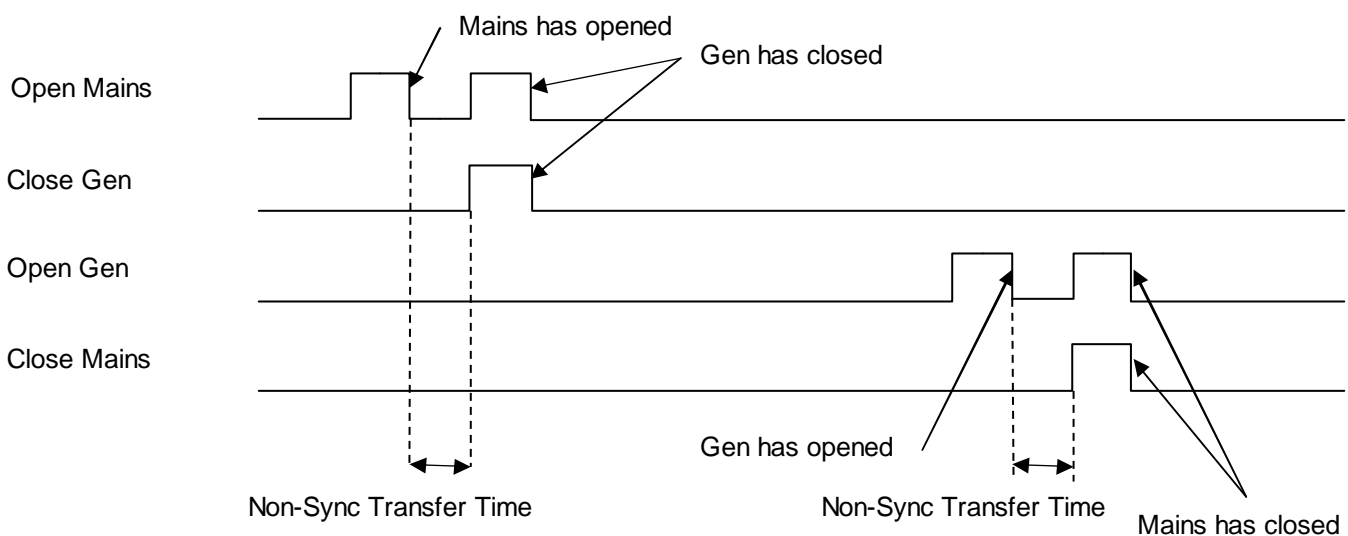
#### 6.4.2.1.3 LOAD SHED INPUT

When the *Load Shed* input is activated while the generator is closed the *Open Gen* output energises, it then de-energises when the *Generator Closed Auxiliary* input indicates that it has successfully opened, or after 1s whichever occurs first.

When the *Load Shed* input is activated while the mains is closed the *Open Mains* output energises, it then de-energises when the *Mains Closed Auxiliary* input indicates that it has successfully opened, or after 1s whichever occurs first.

When the *Load shed* input is de-energised the load will be returned to the supply that was disconnected, providing that supply is healthy.

#### 6.4.2.1.4 TIMING DIAGRAM



### 6.4.2.2 CHECK SYNCHRONISING IS ENABLED

**NOTE :** The module waits indefinitely for synchronisation unless the 'Return to programmed transition' function is active in which case after 2 minutes it performs a non-sync transfer as described in the previous section.

**NOTE :** The transfer time is ignored during a check-sync but is used if the transfer fails and it performs a non-sync transfer.

#### 6.4.2.2.1 TRANSFER TO GENERATOR

When the module is about to transfer from mains to generator it activates the check sync function. When the mains and generator are within the phase (25°) and frequency (1Hz) window the module energises the *Open Mains* and *Close Gen* outputs simultaneously. These outputs are de-energised when the *Generator Closed Auxiliary* input indicates it has successfully closed, or after 1s whichever occurs first.

#### 6.4.2.2.2 TRANSFER TO MAINS

When the module is about to transfer from generator to mains it activates the check sync function. When the mains and generator are within the phase and frequency window the module energises the *Open Gen* and *Close Mains* outputs simultaneously. These outputs are de-energised when the *Generator Closed Auxiliary* input indicates it has successfully closed, or after 1s whichever occurs first.

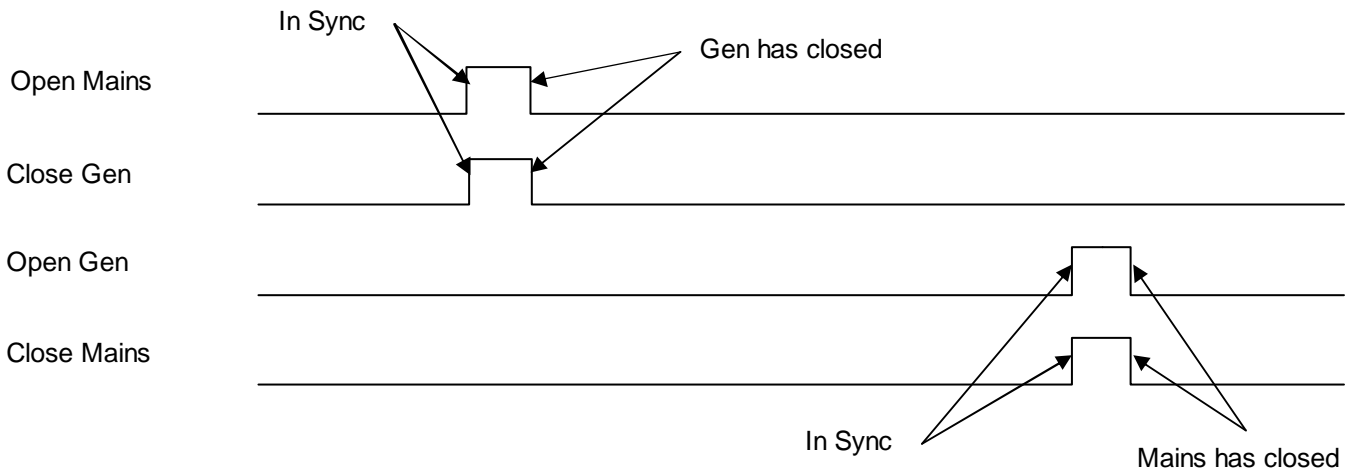
#### 6.4.2.2.3 LOAD SHED INPUT

When the *Load Shed* input is activated while the generator is closed the *Open Gen* output energises, it then de-energises when the *Generator Closed Auxiliary* input indicates that it has successfully opened, or after 1s whichever occurs first.

When the *Load Shed* input is activated while the mains is closed the *Open Mains* output energises, it then de-energises when the *Mains Closed Auxiliary* input indicates that it has successfully opened, or after 1s whichever occurs first.

When the *Load shed* input is de-energised the load will be returned to the supply that was disconnected, providing that supply is healthy.

#### 6.4.2.2.4 TIMING DIAGRAM



## 7 MODULE DISPLAY

### 7.1 BACKLIGHT

The backlight will be on if the unit has sufficient voltage on the power connection while the unit is turned on.

### 7.2 PROTECTIONS

#### 7.2.1 GENERATOR

The 332 ATS module monitors the generator supply to ensure that it remains within configured levels. If the generator supply fails, it is taken off load and the start/run signal is removed.

##### **Generator failure**

The generator has not become available after the period of the *Generator Failure* timer has expired.

##### **Generator Under Voltage shutdown**

The generator supply is below the configured *under voltage* trip level

##### **Generator Under Frequency shutdown**

The generator supply is below the configured *under frequency* trip level

##### **Failed to reach loading voltage**

The generator is running and within under / over voltage trip points, but has failed to reach the configured *Loading Voltage*, hence it is unfit to take load.

##### **Failed to reach loading frequency**

The generator is running and within under / over frequency trip points, but has failed to reach the configured *Loading Frequency*, hence it is unfit to take load.

#### 7.2.2 MAINS

Mains alarms signal that the mains supply is out of limits. In AUTO mode, the generator is called to start (if not already running) and will be placed on load when available.

If the mains supply fails while the generator is running in MANUAL mode, the 332 ATS module transfers load to the generator supply.

Should an input configured to *Simulate Mains Available* be active, the mains failure detection is inhibited.

##### **Mains failure**

Combined message to indicate the failure of the mains supply or activation of an input configured to *Auxiliary Mains Failure*.

##### **Mains Under Frequency trip**

The mains supply is below the configured *Under Frequency* trip level.

##### **Mains Under Voltage trip**

The mains supply is below the configured *Under Voltage* trip level.

##### **Mains Over Frequency trip**

The mains supply is above the configured *Over Frequency* trip level.

##### **Mains Over Voltage trip**

The mains supply is above the configured *Over Voltage* trip level.

### **7.2.3 PLANT BATTERY**

Plant battery alarms are *Warning* alarms only. The module displays the fault but no further action is taken.

#### **Under Voltage warning**

The battery supply is below the configured *Under Voltage* warning level.

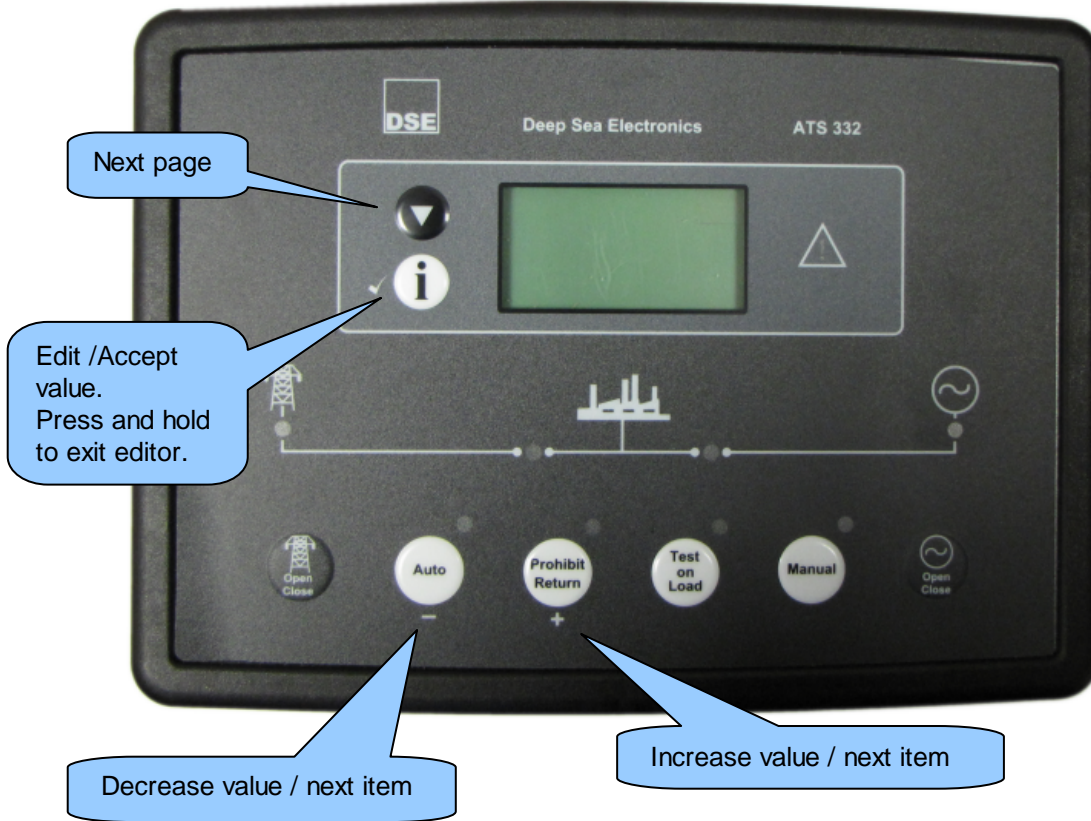
#### **Under Voltage warning**

The battery supply is above the configured *Over Voltage* warning level.

## 8 FRONT PANEL CONFIGURATION



This configuration mode allows the operator limited customising of the way the module operates.




Use the module's navigation buttons to traverse the menu and make value changes to the parameters:









## 8.1 ACCESSING THE FRONT PANEL EDITOR (FPE)

To enter the 'configuration mode' press both the **DOWN**  and **INFO**  buttons together.

 **NOTE:-** To exit the front panel configuration editor and activate your changes, press and hold the  button. Ensure you have saved any changes you have made by pressing the  button first.

 **NOTE:-** When the editor is visible, it is automatically exited after 5 minutes of inactivity to ensure security.


### 8.1.1 EDITING A PARAMETER

- Enter the editor as described above.
- Press  to select the required 'page' as detailed below.
- Press **+** to select the next parameter or **-** to select the previous parameter within the current page. When viewing the parameter to be changed, press the  button. The value begins to flash.
- Press **+** or **-** to adjust the value to the required setting.
- Press  to save the current value, the value ceases flashing.
- Press and hold the  button to activate the changes you have made and exit the editor.




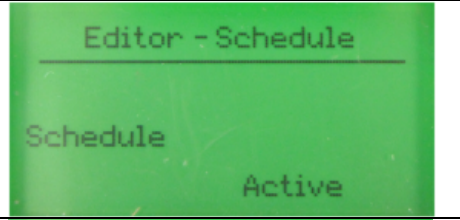
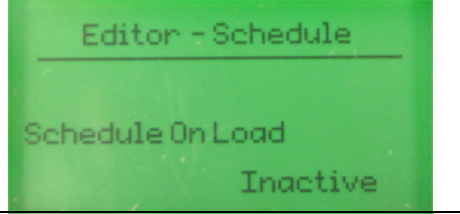
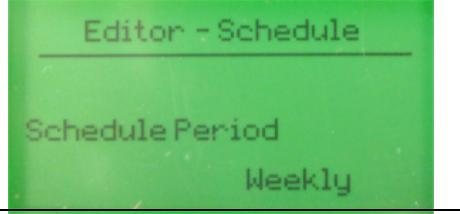




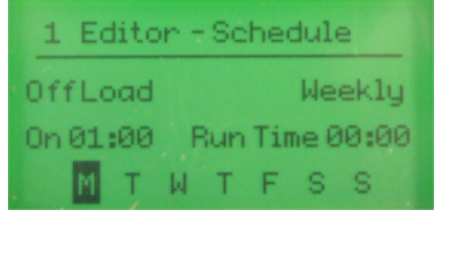
## 8.2 ADJUSTABLE PARAMETERS (CONFIGURATION EDITOR)

When viewing the configuration editor, Press  to select the required 'page' as listed below.

**Front Panel Configuration Editor** (Factory default settings are shown in bold italicised text)

Page	Parameter as shown on	Values
DISPLAY	Contrast	0% - 100% ( <b><i>53%</i></b> )
	Language	<b><i>English</i></b> - Others
	Current date and time	Date month year hh:mm:ss
GENERATOR	Under Voltage Trip	50V - 360V ( <b><i>184V</i></b> )
	Under Frequency Trip	0Hz - 75Hz ( <b><i>40Hz</i></b> )
MAINS	Immediate mains dropout	Active, <b><i>Inactive</i></b>
	Under Voltage Trip	50V - 360V ( <b><i>184V</i></b> )
	Over Voltage Trip	50V - 360V ( <b><i>276V</i></b> )
	Under Frequency Trip	0Hz - 75Hz ( <b><i>45Hz</i></b> )
	Over Frequency Trip	0Hz - 75Hz ( <b><i>55Hz</i></b> )
TIMERS	Warm Up Time	0 - 1hr ( <b><i>0s</i></b> )
	Start Delay	0 - 10hr ( <b><i>5s</i></b> )
	Mains Transient Delay	0 - 30s ( <b><i>2s</i></b> )
	Generator Failed Delay	0 - 1m ( <b><i>60s</i></b> )
	Elevator Delay	0 - 5m ( <b><i>0s</i></b> )
	Non sync Transfer Time	1 - 10m ( <b><i>0.7s</i></b> )
	Check-sync Transfer Time	1 - 10m ( <b><i>0.2s</i></b> )
	Return Delay	0 - 5hr ( <b><i>30s</i></b> )
	Cool Down Timer	0 - 1hr ( <b><i>1m</i></b> )
	Generator Transient Delay	0 - 30s ( <b><i>0s</i></b> )
	Fail to Stop Delay	0 - 2m ( <b><i>30s</i></b> )
	Scroll Delay	0 - 1hr ( <b><i>5s</i></b> )
	Page Timer	0 - 1hr ( <b><i>5m</i></b> )
SCHEDULE	Schedule	Active, <b><i>Inactive</i></b>
	Schedule On Load	Active, <b><i>Inactive</i></b> (only available when Scheduler is active)
	Schedule Period	<b><i>Weekly</i></b> , Monthly (only available when Scheduler is active)
	Schedule time and date selection (1-16)	Press  when editing to select the different parameters within the scheduler.

### 8.2.1 SCHEDULER SETTING

<p>Enter the editor as described above and press the  button to access the Scheduler page.</p> <p>Press  to enter edit mode and use the + / i buttons to make the Schedule function active. Press  to save your change.</p>	
<p>Press + to move to the next item. Review the current setting and choose if the Scheduler is to perform an 'on load' test (active) or 'off load' test (inactive)</p>	
<p>Press + to move to the next item. Review the current setting and choose if the Scheduler is to perform a weekly schedule (repeats every 7 days) or monthly (repeats every 28 days)</p>	
<p>Press + to move to the next item. Press  to select which schedule entry to edit (there are up to 16 entries indicated by the number in the top left corner) Press  to edit the schedule. The item being edited flashes. Press + / - to change the flashing item. Press  to move to the next editable value. (On, Day, Run Time etc) Press  to save your change</p>	






## 9 MAINTENANCE, SPARES, REPAIR AND SERVICING

The DSE332 Series controller is designed to be *Fit and Forget*. As such, there are no user serviceable parts within the controller.


In the case of malfunction, you should contact your original equipment supplier (OEM).

### 9.1 PURCHASING ADDITIONAL CONNECTOR PLUGS FROM DSE

If you require additional plugs from DSE, please contact our Sales department using the part numbers below.

332 series terminal designation	Plug description	Part No.
1-7 	7 way 5.08mm	007-447
8-18 	11 way 5.08mm	007-451
19-26 	8 way 7.62mm	007-454
27-30 	4 way 7.62mm	007-171
31-34 	4 way 5.08mm	007-444

### 9.2 PURCHASING ADDITIONAL FIXING CLIPS FROM DSE

Item	Description	Part No.
	6000 series fixing clips (packet of 4)	020-294

### 9.3 PURCHASING SEALING GASKET FROM DSE

The optional sealing gasket is not supplied with the controller but can be purchased separately.

Item	Description	Part No.
	6000 series silicon sealing gasket	020-389

## 10 WARRANTY

DSE provides limited warranty to the equipment purchaser at the point of sale. For full details of any applicable warranty, you are referred to your original equipment supplier (OEM).

## 11 DISPOSAL

### 11.1 WEEE (WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT)

Directive 2002/96/EC

If you use electrical and electronic equipment you must store, collect, treat, recycle and dispose of WEEE separately from your other waste.



### 11.2 ROHS (RESTRICTION OF HAZARDOUS SUBSTANCES)

Directive 2002/95/EC:2006

To remove specified hazardous substances (Lead, Mercury, Hexavalent Chromium, Cadmium, PBB & PBDE's)

Exemption Note: Category 9. (Monitoring & Control Instruments) as defined in Annex 1B of the WEEE directive will be exempt from the RoHS legislation. This was confirmed in the August 2005 UK's Department of Trade and Industry RoHS REGULATIONS Guide (Para 11).

Despite this exemption DSE has been carefully removing all non RoHS compliant components from our supply chain and products.

When this is completed a Lead Free & RoHS compatible manufacturing process will be phased into DSE production.

This is a process that is almost complete and is being phased through different product groups.

## 12 APPENDIX

### 12.1 COMMUNICATIONS OPTION CONNECTIONS

#### 12.1.1 DESCRIPTION

The DSE Configuration Suite software allows the controller to communicate with a PC. The computer connects to the module as shown below and allows easy adjustment of the operating parameters and firmware update of the controller.

#### 12.1.2 PC TO CONTROLLER (DIRECT) CONNECTION

To connect a 332 ATS module to a PC the following items are required: -

- DSE332 series module
- Configuration Suite software (Supplied on configuration suite software CD or available from [www.deepseapl.com](http://www.deepseapl.com)).
- USB cable Type A to Type B.



**NOTE:-** The DC supply must be connected to the module for configuration by PC.

**NOTE:-** Refer to DSE Configuration Suite software Manual for further details on configuring the module by PC.

## 12.2 ENCLOSURE CLASSIFICATIONS

### 12.2.1 IP CLASSIFICATIONS

**332 series specification under BS EN 60529** Degrees of protection provided by enclosures

**IP65** (Front of module when module is installed into the control panel with the supplied sealing gasket).

**IP42** (front of module when module is installed into the control panel WITHOUT being sealed to the panel)

First Digit		Second Digit	
Protection against contact and ingress of solid objects		Protection against ingress of water	
0	No protection	0	No protection
1	Protected against ingress solid objects with a diameter of more than 50 mm. No protection against deliberate access, e.g. with a hand, but large surfaces of the body are prevented from approach.	1	Protection against dripping water falling vertically. No harmful effect must be produced (vertically falling drops).
2	Protected against penetration by solid objects with a diameter of more than 12 mm. Fingers or similar objects prevented from approach.	2	Protection against dripping water falling vertically. There must be no harmful effect when the equipment (enclosure) is tilted at an angle up to 15° from its normal position (drops falling at an angle).
3	Protected against ingress of solid objects with a diameter of more than 2.5 mm. Tools, wires etc. with a thickness of more than 2.5 mm are prevented from approach.	3	Protection against water falling at any angle up to 60° from the vertical. There must be no harmful effect (spray water).
4	Protected against ingress of solid objects with a diameter of more than 1 mm. Tools, wires etc. with a thickness of more than 1 mm are prevented from approach.	4	Protection against water splashed against the equipment (enclosure) from any direction. There must be no harmful effect (splashing water).
5	Protected against harmful dust deposits. Ingress of dust is not totally prevented but the dust must not enter in sufficient quantity to interfere with satisfactory operation of the equipment. Complete protection against contact.	5	Protection against water projected from a nozzle against the equipment (enclosure) from any direction. There must be no harmful effect (water jet).
6	Protection against ingress of dust (dust tight). Complete protection against contact.	6	Protection against heavy seas or powerful water jets. Water must not enter the equipment (enclosure) in harmful quantities (splashing over).

## 12.2.2 NEMA CLASSIFICATIONS

### 332 series NEMA Rating (Approximate)

12 (Front of module when module is installed into the control panel with the optional sealing gasket).

2 (front of module when module is installed into the control panel WITHOUT being sealed to the panel)

 **NOTE: - There is no direct equivalence between IP / NEMA ratings. IP figures shown are approximate only.**

1 IP30	Provides a degree of protection against contact with the enclosure equipment and against a limited amount of falling dirt.
2 IP31	Provides a degree of protection against limited amounts of falling water and dirt.
3 IP64	Provides a degree of protection against windblown dust, rain and sleet; undamaged by the formation of ice on the enclosure.
3R IP32	Provides a degree of protection against rain and sleet;; undamaged by the formation of ice on the enclosure.
4 (X) IP66	Provides a degree of protection against splashing water, windblown dust and rain, hose directed water; undamaged by the formation of ice on the enclosure. (Resist corrosion).
12/12K IP65	Provides a degree of protection against dust, falling dirt and dripping non corrosive liquids.
13 IP65	Provides a degree of protection against dust and spraying of water, oil and non corrosive coolants.