This manual contains information concerning the safe and proper installation and operating procedures applicable to the ESR range of Three Phase Static Electronic AC Voltage Stabilisers / Regulators.

The manual should be read in full before attempting to use, or operate the equipment.

If any problems are encountered with the procedures contained within this manual then seek assistance from Ashley-Edison or the distributor from whom you purchased the equipment.

Whilst every precaution has been taken to ensure the accuracy and completeness of this manual, Ashley-Edison assumes no responsibility and disclaims all liabilities for damages resulting from use of this information or any error or omission.
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1. Introduction

1.1 Overview

The Ashley Edison ESR range of Voltage Stabilisers are equipped with a number of design features to ensure trouble free service.

Suitable for supporting most types of electrical and electronic equipment, the feature rich Ashley Edison ESR Electronic Static Voltage Stabiliser range of models continuously monitor the incoming supply and provide a controlled voltage output for any input voltage variations within the operating specification of the model in question.

Each model is fitted with protection equipment to ensure that the load is continually protected against harmful mains born high energy spikes and surges.

1.2 Design Topology

1.2.1 Based on the extremely well proven Buck/Boost design topology of our SES & SESL AC Voltage Stabilisers, the ESR range of Voltage Stabilisers utilise SCRs (Silicon Controlled Rectifiers) to select transformer voltage taps to deliver a highly stable output voltage with extremely fast correction times.

1.2.2 The underlying Buck/Boost topology ensures a cost-effective solution to providing a stable mains voltage supply as the SCRs are not required to handle the full load current of the ESR unit and as a result ESR Voltage Stabilisers are able to deliver impressive overload capacities and considerably enhanced reliability.

1.2.3 The utilisation of the latest in microprocessor control and the inclusion on all models of protection against excessive load and supply variations ensures peace of mind to the user.
1.2.4   Diagram showing the voltage control principle for one phase.

1.2.5   Principle of Operation

The control circuit consists of voltage selection power devices selecting the appropriate voltage tap on an autotransformer together with steering devices to adjust the polarity of the voltage applied to the buck/boost transformer thus correcting the output voltage for an over or under-voltage supply on the input terminals.
1.3 Bypass Switch Arrangement

Please Note:
While the Stabiliser is fitted with an input switch, it is highly recommended that the installer/project consultant ensures that the input supply to the Voltage Stabiliser has additional external protection in the form of fuses or a circuit breaker.
2. Safety Note

Safety Instructions
Read and follow all Safety Instructions
Please save these instructions for future reference

2.1 Introduction
These instructions are addressed to the Installer and End User / Operator of the ESR Series of Three Phase AC Voltage Stabiliser / Regulator. We strongly suggest you keep this manual next to the Stabiliser for future reference.

2.2 General Installation & Usage
2.2.1 Do not use the Stabiliser for other than the intended use.
2.2.2 Do not install stabiliser in a back-feed circuit to the grid, input voltage supply cannot be connected to the output of stabiliser.
2.2.3 If on delivery there is evidence of visible damage, do not attempt to install or start the Stabiliser. Advise the transport delivery company and inform Ashley-Edison, or the resale partner from whom you purchased the equipment.
2.2.4 The Stabiliser can contain potentially dangerous voltages – up to 600V AC. Use extreme caution when opening the covers and do not leave the unit unattended with the doors open or covers off.
2.2.5 Hazardous voltages can be present at the unit's output any time AC input power is applied. To avoid possible personal injury, or equipment damage, and to make certain there is no output voltage, turn the unit off and disconnect the AC Input.
2.2.6 To reduce the risk of fire, or electrical shock, install the unit in an indoor area free from conductive contaminants.
2.2.7 Do not use outdoors, unless the system is supplied with the IP54 add-on fitted.
2.2.8 Do not place the unit near water or liquids, gas and combustible materials or in an excessively humid environment where condensation is very likely to occur.

2.2.9 To reduce the risk of overheating, do not block the unit's ventilation panels and try to avoid positioning the unit in direct strong sunlight or close to other heat sources.

2.2.10 Do not allow liquids or foreign objects to enter the unit.

2.2.11 The installation and use of this product must comply with all relevant current electrical installations that are in force in the territory of installation.

2.2.12 Only qualified electrician shall install the equipment. The electrician shall install the AC input according to the instructions contained in this manual. Standard safety practices should be followed at all times.

2.2.13 The unit must be grounded or earthed at all times when in use.

2.3 Symbol Warning Information

The following symbols are used throughout this manual -

- **Warning Information**
  - ![Warning Information]
  - This symbol alerts you to important information

- **Electrical Hazard**
  - ![Electrical Hazard]
  - This symbol indicates an electrical hazard may be present.
3. Transport, Delivery, Storage & Unpacking

3.1 Transport

3.1.1 The Stabiliser should only be transported in an upright position.

3.1.2 The Stabiliser should be positioned in its operation location while enclosed in its original packaging taking due note of its centre of gravity whilst manoeuvring into position.

3.1.3 Do not stack other packages on top of the unit.

3.1.4 If the Voltage Stabiliser has to be lifted use spreading bars and belts or a forklift utilising the lifting points provided.

3.1.5 Before using any form of lifting equipment be it crane, forklift or elevator ensure that it has a lifting capacity suitable for the application.

3.2 Delivery

3.2.1 When delivered carefully check the integrity of the packaging for any physical damage or signs of mishandling that may have occurred during transportation.

3.2.2 On completion of unpacking check again for any signs of any physical damage to the Voltage Stabiliser.

3.2.3 Should any damage be observed immediately notify the shipping agent/transport company involved with the shipping and inform Ashley Edison, or the resale partner from whom you purchased the equipment A detailed report including photographs of any damage observed will be required to support any indemnity/insurance claim.

3.3 Storage

3.3.1 The units are carefully packed for shipment to ensure that when they are installed they are in perfect condition.

3.3.2 Never leave a Stabiliser (whether packed or not) outside with exposure to the elements.
3.3.3 Do not store on top of other packages or allow other packages to be stored on top of the Stabiliser.

3.3.4 Should it be necessary to place the Voltage Stabiliser in storage it should be stored in its original shipping packaging in a clean, dry, dust free environment away from any chemical substances.

3.4 Unpacking

3.4.1 ESR Voltage Stabilisers are despatched from the factory in purpose designed ruggedized carton boxes or wooden crates.

3.4.2 Once on site it is strongly recommended that the unit should be moved to its final location whilst still in its shipping packaging.

3.4.3 Open the shipping container carefully taking special care when utilising opening tools to ensure that the unit is not inadvertently damaged.

3.4.4 After removal of the external packaging and prior to commencement of installation works remove any vapour barriers and internal support fixings.

3.4.5 If any damage, as a result of shipping is observed immediately notify the shipping agent /shipping company and inform Ashley Edison, or the resale partner from whom the unit was purchased.

3.4.6 Do not install the Voltage Stabiliser if there is any sign of damage.

**WARNING**

Do Not Leave The Automatic Voltage Stabiliser Door/s
Opened For Long Periods Of Time Or In The Absence Of Authorised Personnel.

Only Qualified Personnel Are Allowed To Service This Equipment.
4. Positioning, Ventilation & Cooling

4.1 Positioning

4.1.1 The unit should be installed indoors in a clean, dust-free location, which has adequate ventilation or air-conditioning, do not block the stabiliser's air vents. The exception is when the unit is an outdoor IP54 rated ESR Voltage Stabiliser.

4.1.2 Do not operate the Voltage Stabiliser near gas, electric or other heat sources or in direct sunlight.

4.1.3 Do not site the Voltage Stabiliser next to magnetic storage media, monitor screens (VDU's) or any other equipment sensitive to magnetic fields.

4.1.4 Move the Voltage Stabiliser in an upright position, in its original packaging, to its final destination.

4.1.5 To lift the cabinets, use a forklift or lifting belts with spreader bars.

4.1.6 Check for sufficient floor and elevator loading capacity.

4.1.7 Check the integrity of the Voltage Stabiliser equipment carefully.

4.2 Ventilation & Cooling

4.2.1 ESR Stabilisers are forced air-cooled and the airflow paths should not be obstructed.

4.2.2 The Voltage Stabiliser can be installed in sites with ambient temperatures from 0 to 45 degrees C up to 1000 m, relative humidity of up to 90% (non-condensing). The Stabiliser is designed to operate within an ambient temperature range of -15 to 45°C - up to an altitude of 1000 metres. When installed in greater ambient temperatures and / or altitudes, the maximum rating of the machine should be de-rated by 2% for each additional °C, up to a max of 60°C, and 2.5% for each additional 500 metres.

4.2.3 The temperature of the air entering the Voltage Stabiliser cabinet must not exceed the temperature shown above.

4.2.4 To facilitate ease of maintenance and to ensure sufficient airflow movement, it is recommended the units are positioned:
4.2.5 When operational, the Stabiliser itself will generate a certain amount of heat, which will be blown out through the vents on the cubicle. The User should ensure that the room where the Stabiliser is located has sufficient adequate cooling / ventilation facilities to remove the heat. It is imperative that the air should be able to freely circulate through the air inlets and outlets on the Stabiliser.

4.2.6 DO NOT put anything on top of the cabinet or restrict the flow of air to and from the system.
5. Electrical Installation & Cabling

5.0 Electrical Installation of the equipment should only be carried out by a qualified electrician following best safety practices at all times.

5.1 Cabling

5.1.1 The cabling of the Stabiliser has to be sized according to the actual rating of the Voltage Stabiliser.

5.1.2 The cable size and construction should comply with local regulations for installation.

5.1.3 When cutting holes for cable entry/glanding care must be taken that no swarf from the cutting enters the enclosure and that any swarf is removed.

5.1.4 Cover / Block-off any unused holes.

5.2 Protection

5.2.1 While all ESR Voltage Stabilisers are normally fitted with an Input Switch as standard it is recommended that the installer should fit suitable circuit protection.

5.2.2 Care must be taken to ensure that the supply fuses/circuit breaker is correctly sized to provide tripping discrimination between the circuit protection devices in the event of a fault.

5.3 System Grounding

5.3.1 The safety of any Voltage Stabiliser depends upon proper grounding. Grounding is primarily for safety. Correct implementation of grounding also enhances equipment performance.

5.4 Voltage & Load Checks

5.4.1 Before connecting the unit it is essential that the utility mains voltage is verified and that the Voltage Stabiliser’s selected output voltage range is within the specified requirements.
5.4.2 Check that the rating of the load does not exceed the rating of the Voltage Stabiliser as shown on the Stabiliser’s rating plate. The load should be measured using a true RMS reading meter.

5.4.4 In applications where the supply cannot be switched off for any length of time it is recommended that an external wrap-around bypass switch is installed to ensure continued supply to the load while the Voltage Stabiliser is out of service.

5.5 Cable Connections

5.5.1 Connect the mains input supply to terminals marked INPUT (L1, L2, L3) and NEUTRAL (N). This Neutral cable MUST be connected. Also ensure that the equipment is connected to Earth.

5.5.2 Connect the load to terminals marked OUTPUT (L1, L2, L3, N)

Connect the wiring as follows:

**Important Please Note:** For 3 Phase 4 Wire System (with Neutral Connection), Input Neutral must be connected, otherwise the Automatic Voltage Stabiliser will be damaged.
5.5.3 The **New Cable Colour Code** has been harmonised with IEC 60364 and CENELEC HD 60384 and incorporated in the 17th IEE Wiring Regulations (BS 7671:2008).

From **1 March 2011**, only the new colour cables are allowed to be used.

### New Cable Colour Code

<table>
<thead>
<tr>
<th>OLD</th>
<th>NEW</th>
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<tbody>
<tr>
<td>L1</td>
<td>RED</td>
</tr>
<tr>
<td>L2</td>
<td>YELLOW</td>
</tr>
<tr>
<td>L3</td>
<td>BLUE</td>
</tr>
<tr>
<td>N</td>
<td>BLACK</td>
</tr>
<tr>
<td>E</td>
<td>GREENYELLOW</td>
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6. Commissioning

6.1 Pre-Commissioning Checks

6.1.1 Before you switch ON the mains, inspect the Voltage Stabiliser visually to ensure that dust has not accumulated during installation. As necessary clean the Stabiliser thoroughly with compressed air or with a soft brush.

6.1.2 Check the Ground connection. Ensure it is tight.

6.1.3 Check all wiring connections to ensure they have not been loosened in transit. Tighten all connections as necessary.

6.1.4 Before applying power, depending upon the kVA rating of the Voltage Stabiliser it will be necessary to ensure that the Input Switch is open, the Bypass Switch is in the regulated output position (Off) with the interlock plate in position preventing operation of the Bypass Switch.

6.2 Initial Power Up

The initial power up procedure is as follows.

6.2.1 Ensure that no load is connected.

6.2.2 Switch the Input Switch on. The Stabiliser will cycle through its start-up sequence to provide a regulated output.

6.2.3 The load can now be connected to the Stabiliser.

6.2.4 As the Voltage Stabiliser has been pre-commissioned in the factory the display readings should indicate the correct output phase voltages and currents, if this is not the case please refer to Appendices 3, 4 & 5 for calibration instructions.

6.2.5 Apply the load gradually ensuring that the display on the front panel indicates the correct output voltage and that the load current increases as expected.

It is recommended that on initial commissioning of the system you duly record the commissioning date and schedule annual maintenance accordingly.

See Appendix 7
For a Summary of System Switching Sequence Instructions
7. Display Panel

7.1 Introduction

7.1.1 With the presence of an incoming mains supply the Display Panel will light up.

7.1.2 The “Output” Voltage measurement will be displayed. The Display Panel on front of the Voltage Automatic Voltage Stabiliser is shown below:

7.2 Display Features

- Real-time display of Voltage & Current.
- Set output Voltage and accuracy.
- Set over voltage, under voltage and Current overload.
- Set operational parameters.
- Switch between Bypass and Stabilised output.
- Indication of overload, over voltage, under voltage & phase failure.
7.3 Voltage & Current Readings

Operation of the ‘V’ pushbutton will scroll through the actual output voltages for each phase with the final position being the average of the three phases before reverting to ‘R’ phase measurement.

By operation the ‘A’ pushbutton readings of the output current per phase will be obtained in a similar manner. During set-up before any load has been connected these current readings will be approximately zero.

7.4 Parameter Settings & Auto Bypass

The pushbuttons on the left-hand side from the top are:

- Menu
- Set increase
- Set decrease
- Enter / Bypass

**NB: Switch On in Safe Mode to Make Parameter Setting Adjustments**

7.4.1 If one is going to be making adjustments no load should be connected to the Voltage Stabiliser.

7.4.2 To switch ON the Automatic Voltage Stabiliser switch the Input Switch to the “ON” position, the Voltage Stabiliser will now go through its start-up sequence.
7.5 Parameter Pushbutton Operation

7.5.1 Operation of the Menu pushbutton will display the parameter number that is to be adjusted in the Output Current window while the parameter value will be displayed in the Output Voltage window. Pressing again will index the display to the next parameter.

*NB: Parameter settings are normally set at the factory prior to dispatch. For most users access to changing the parameters will not be necessary.*

7.5.2 Set increase & set decrease will alter the value of the parameter setting dependent upon which pushbutton has been operated.

7.5.3 The Enter / Bypass pushbutton will store the adjusted parameter in the setting mode and switch the Stabiliser output to bypass operation during normal operation. Depending upon software settings during manufacture the bypass operation will either latch or transfer back to regulated voltage output after a short delay.

7.6 Parameter 1: Set Output Voltage

7.6.1 ‘1’ will be displayed in the Output Current window and the L-N voltage for R (L1) phase will be displayed in the Output Voltage window, this voltage should be set as the nominal operating voltage of the machine as it will determine the ± operating window of the Stabiliser. Therefore, if 230V is set the Stabiliser will provide a regulated output of 230V L-N for a 230V ±15% voltage supply on the input (assuming that the Stabiliser is a ±15% variant).

7.6.2 The nominal voltage setting can be increased or decreased by means of the ‘Set increase / set decrease’ pushbuttons. When the desired voltage has been set the Enter / Bypass pushbutton should be operated to store the parameter and the menu pushbutton operated to index to the next parameter to be adjusted.

7.7 Parameter 2: Set Output Voltage Regulation Accuracy

7.7.1 ‘2’ will be displayed in the Output Current window on the display while the parameter value will be displayed in the Output Voltage window. Operation of the increase / decrease pushbutton will alter
its value while operation of the Enter / Bypass pushbutton will store the new value.

7.7.2 Display settings -

‘1.0’ = ±1% Output Voltage Accuracy

‘3.0’ = ±3% Output Voltage Accuracy

‘5.0’ = ±5% Output Voltage Accuracy

7.7.3 After storing the new parameter, operation of the Menu pushbutton will index to display to the next parameter.

7.8 Parameter 3: Under Voltage Value

7.8.1 ‘3’ will be displayed in the Output Current window on the display while the parameter value will be displayed in the Output Voltage window. Operation of the increase / decrease pushbutton will alter its value while operation of the Enter / Bypass pushbutton will store the new value.

7.8.2 Typically for a Voltage Stabiliser with a ±15% input voltage operating window the value of the nominal input voltage less 15% needs to be set, therefore for a 400/230V Voltage stabiliser the value of ‘196’ needs to be set as the under voltage setting on the display.

7.8.3 Once the value is confirmed and stored by means of operation of the Enter / Bypass pushbutton the Menu pushbutton should be operated to index the display to the next parameter.

7.9 Parameter 4: Over Voltage Value

7.9.1 ‘4’ will be displayed in the Output Current window on the display while the parameter value will be displayed in the Output Voltage window. Operation of the increase / decrease pushbutton will alter its value while operation of the Enter / Bypass pushbutton will store the new value.

7.9.2 Typically for a Voltage Stabiliser with a ±15% input voltage operating window the value of the nominal input voltage plus 15% needs to be set therefore for a 400/230V Voltage stabiliser the value of ‘264’ needs to be set as the over voltage setting on the display.
7.9.3  Once the value is confirmed and stored by means of operation of the Enter / Bypass pushbutton the Menu pushbutton should be operated to index the display to the next parameter.

7.10  **Parameter 5: Method of Output Voltage Regulation**

7.10.1  ‘5’ will be displayed in the Output Current window on the display while the parameter value will be displayed in the Output Voltage window. Operation of the increase / decrease pushbutton will alter its value while operation of the Enter / Bypass pushbutton will store the new value.

7.10.2  Setting of parameter ‘5’ will determine how the output voltage of the Stabiliser is regulated. The parameter settings are described below: -

7.10.3  Value displayed in Output Voltage window.

7.10.4  Display Settings -

‘0.1’ = The output voltage of each phase of a Three Phase Voltage Stabiliser is controlled individually.

‘0.2’ = The output voltages of each phase of a Three Phase Voltage Stabiliser are controlled together.

‘0.3’ = The output voltages of each phase of a Three Phase Voltage Stabiliser are controlled Automatically.

*(additional hardware is required for this feature so this feature should not be selected).*

7.10.5  After storing the new parameter operation of the Menu pushbutton will index to display to the next parameter.

7.11  **Parameter 6: Current Overload Setting**

7.11.1  ‘6’ will be displayed in the Output Current window on the display while the parameter value will be displayed in the Output Voltage window. Operation of the increase / decrease pushbutton will alter its value while operation of the Enter / Bypass pushbutton will store the new value.

7.11.2  The correct overload setting of the Voltage Stabiliser will be determined by its kVA and output voltage rating. Therefore,
200kVA Voltage Stabiliser with an output voltage of 400/230V will need to have its overload current set to 289 (Amps).

7.11.3 When the parameter has been set and the Enter / Bypass pushbutton operated to store the new setting the Menu pushbutton should be operated to index the display to the next parameter.

7.12 **Parameter 7: Voltage Display**

7.12.1 ‘7’ will be displayed in the Output Current window on the display while the parameter value will be displayed in the Output Voltage window. Operation of the increase / decrease pushbutton will alter its value while operation of the Enter / Bypass pushbutton will store the new value.

7.12.2 The following parameter values will determine how the output voltage of the Stabiliser is displayed.

7.12.3 Display Settings –

‘0.1’ = This setting displays the output voltage as a Phase to Phase value (L-L).

‘0.2’ = This setting displays the output voltage as a Phase to neutral value (L-N).

7.12.4 When the parameter has been set and the Enter / Bypass pushbutton operated to store the new setting the Menu pushbutton should be operated to index the display to the next parameter.

7.13 **Parameter 8: Speed of Correction**

7.13.1 This parameter sets the speed of correction to a change in the supply input voltage and **should not** be altered as it is factory set for optimum performance.
8. Common Fault Conditions

8.0 If the Voltage Stabiliser detects an operating error it will respond in the following manner.

8.1 Overload

8.1.1 If the Stabiliser detects an overload which is in excess of its specified capacity it will trip the input switch thus removing power to the load.

8.1.2 When the overload condition has been rectified the Stabiliser can be restarted by closing the Input switch.

8.2 Over/Under Voltage – S15 & S20 Models

8.2.1 If the Voltage Stabiliser detects an input voltage which is over or under its pre-set value it will automatically transfer to internal bypass without break which means that the load will be supplied by the unregulated voltage measured at the Stabiliser input.

8.2.2 When the input voltage is back within the Stabiliser's pre-set value the load will be automatically transferred back to the regulated output without break.

8.3 Over/Under Voltage – S25 to S50 Models

8.3.1 To protect the Stabiliser and Load Equipment, if the Voltage Stabiliser detects an input voltage which is over or under its pre-set value the Stabiliser will automatically shut down.

8.3.2 When the input voltage is back within the Stabiliser's pre-set value the system will require a manual restart.

8.4 Phase Failure

8.4.1 If the Stabiliser detects the loss of a phase it will trip the Input Switch with a loss of supply to the load.

8.4.2 When the loss of phase has been rectified the Voltage Stabiliser can be restarted.
9. Switched Bypass Operation

9.0 If it is necessary to place the Voltage Stabiliser into the Switched Bypass mode it will mean that the load will need to be disconnected.

9.1 **Bypass Operation.**

9.1.1 Remove the Voltage Stabiliser load as there will be an interruption during switching process.

9.1.2 Switch the Input Switch off.

9.1.3 Move the interlock plate across the Input Switch which is in the ‘Off’ position.

9.1.4 All Switches are now off.

9.1.5 Switch on the Bypass Switch.

9.1.6 The load can now be reconnected.

9.2 **Return from Bypass Operation.**

9.2.1 There will again be a loss of supply to the load during this operation so it may be beneficial to remove all or part of the load.

9.2.2 Switch off the Bypass Switch.

9.2.3 Move the interlock plate to prevent the Bypass Switch from being operated.

9.2.4 Switch on the Input Switch.

9.2.5 The Voltage Stabiliser will go through its start-up sequence.

9.2.6 As the Voltage Stabiliser has been operating normally prior to placing in the Bypass mode of operation the display readings should indicate the correct output phase voltages and currents, if this is not the case please refer to Appendices 3, 4 & 5 for calibration instructions.

9.2.7 If the display readings are correct, apply the load gradually ensuring that the display on the front panel indicates the correct output voltage and that the load current increases as expected.

See Appendix 7
For a Summary of System Switching Sequence Instructions
10. Basic Maintenance & Servicing

**WARNING**

The mains supply to the Automatic Voltage Stabiliser must be switched OFF before attempting any form of maintenance procedures.

10.1 Service Intervals

10.1.1 With extremely high reliability (MTBF >125,000 Hours), ESR Voltage Stabilisers require an exceptionally low level of ongoing annual (or biennial) maintenance or servicing.

10.1.2 A minimum of annual general inspections, cleaning, and operation checks are recommended to ensure the Voltage Stabiliser performance and long service life.

10.1.3 If the unit is located in a particularly hostile environment these checks should be carried out on a more frequent basis.

10.2 Service Skill Sets

10.2.1 Front line servicing, maintenance and most remedial work can usually be performed by universally available skill sets held by most competent qualified electricians.

10.2.2 With our strategically located dedicated teams of technical support specialists and field service engineers, we are always on-hand to offer email or telephone technical support and direct on-site assistance - where deemed appropriate.

10.3 Service Requirements

10.3.1 Service of the Voltage Stabiliser is determined by ‘good housekeeping’ practices in as much as the enclosure needs to be kept free of dust and debris.

10.3.2 Ensure that all the fans are operational and run smoothly.

10.3.3 Fans have a finite life typically 3 to 5 years, provision should be made to replace them on a regular basis to ensure uninterrupted running of the Voltage Stabiliser.

10.3.4 Care should be taken to ensure that there is no build-up of dust and debris on the SCRs and printed circuit boards.
11. Front Line Fault Finding

**WARNING**

The front line remedial action procedures detailed below should only be carried out by duly qualified personnel.

The Stabiliser can contain potentially dangerous and life-threatening voltages – up to 600 V AC. Use extreme caution when opening the covers and do not leave the unit unattended with the doors open or covers off.

### 11.1 Operational Errors

11.1.1 The front panel display will generally identify any error in the operation of the Stabiliser, indicating, over voltage, under voltage phase failure and overload - see Section 8.

If one of the mentioned faults has been indicated the procedure below should be carried out as the faults are all considered detrimental to the correct operation of the Stabiliser.

### 11.2 Fault Identification

The first step in identifying a fault is to follow the following instructions:

11.2.1 Check all fuses. Ensure all fuses are not blown. The fuses have inbuilt indicators to identify which fuse has failed, any fuse that has failed will need to be replaced which will mean that the Voltage Stabiliser will need to be switched off.

11.2.2 With the use of a RMS multi-meter confirm the input and output voltage measurements to ensure that the Stabiliser is operating within its specified range.

11.2.3 Ensure that all the fans are operating correctly and there are no obstructions to their air flow, any failed fans will need to be replaced which will mean that the Voltage Stabiliser will need to be switched off.
11.3 Further Assistance

11.3.1 Contact the Ashley-Edison Technical Assistance Department by email.

11.3.2 Emailing the input and output measurements of voltages and current together with photographs of the printed circuit boards during fault conditions will assist in providing a rapid resolution of the problem.
## Appendix 1 - Technical Specifications

<table>
<thead>
<tr>
<th>Input Voltage Swing Variant Options Available (S*)</th>
<th>Model</th>
<th>Input Swing</th>
<th>Output Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Default</td>
<td>Available</td>
</tr>
<tr>
<td></td>
<td></td>
<td>±3%</td>
<td>±1% to ±5%</td>
</tr>
<tr>
<td>Technology: Digital Buck Boost SCR design Topology</td>
<td></td>
<td>±15%</td>
<td>±3%</td>
</tr>
<tr>
<td></td>
<td>S15</td>
<td>±20%</td>
<td>±1% to ±5%</td>
</tr>
<tr>
<td></td>
<td>S20</td>
<td>±25%</td>
<td>±3%</td>
</tr>
<tr>
<td></td>
<td>S25</td>
<td>±30%</td>
<td>±3%</td>
</tr>
<tr>
<td></td>
<td>S30</td>
<td>±35%</td>
<td>±3%</td>
</tr>
<tr>
<td></td>
<td>S35</td>
<td>±40%</td>
<td>±5%</td>
</tr>
<tr>
<td></td>
<td>S40</td>
<td>±45%</td>
<td>±10%</td>
</tr>
<tr>
<td></td>
<td>S45</td>
<td>±50%</td>
<td>±5% to ±10%</td>
</tr>
<tr>
<td></td>
<td>S50</td>
<td></td>
<td>±5% to ±10%</td>
</tr>
</tbody>
</table>


**HD, HD-X4680 & LD Series Models** - Three Phase, 3 Wire (3 Phase + G/E – *NO Neutral*).

Other swing options available to special order.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>H-X468 Models</td>
<td>440/254V (X440), 460/265V (X460), 480/277V (X480) &amp; 600/346V (X600) - <em>Customer to Specify</em> - Three Phase, 4 Wire</td>
<td></td>
</tr>
<tr>
<td>HD Models</td>
<td>380V, 400V &amp; 415V - <em>Customer to Specify</em> - Three Phase, 3 Wire</td>
<td></td>
</tr>
<tr>
<td>HD-X468 Models</td>
<td>440V (X440), 460V (X460), 480V (X480) &amp; 600V (X600) - <em>Customer to Specify</em> - Three Phase, 3 Wire</td>
<td></td>
</tr>
<tr>
<td>LD Models</td>
<td>190V, 200V, 208V, 220V &amp; 240V - <em>Customer to Specify</em> - Three Phase, 3 Wire</td>
<td></td>
</tr>
</tbody>
</table>
The permissible input voltage swing is relative to the pre-set output voltage.

<table>
<thead>
<tr>
<th>Output Voltage Accuracy:</th>
<th>±3% (Default) – adjustable from ±1% to ±5% (dependent on input swing – see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating:</td>
<td>See label on Unit (Available - 6 to 400 kVA)</td>
</tr>
<tr>
<td>Frequency:</td>
<td>35 to 63 Hz</td>
</tr>
<tr>
<td>Correction Time: (400V Models)</td>
<td></td>
</tr>
<tr>
<td>S15</td>
<td>S20</td>
</tr>
<tr>
<td>63V/s</td>
<td>83V/s</td>
</tr>
<tr>
<td>Efficiency:</td>
<td>≥98%</td>
</tr>
<tr>
<td>Power Factor:</td>
<td>The Power Factor has no effect on performance providing the Stabiliser is being used within its rated capacity</td>
</tr>
<tr>
<td>Overload Capability:</td>
<td>5 x max. current rating for 1 second</td>
</tr>
<tr>
<td></td>
<td>3 x max. current rating for 2 minutes</td>
</tr>
<tr>
<td></td>
<td>1.5 x max. current rating for 10 minutes</td>
</tr>
<tr>
<td>Surge Suppression:</td>
<td>TVSS – Protects loads against high energy Spikes &amp; Transient Voltages</td>
</tr>
<tr>
<td>Harmonic Distortion:</td>
<td>None introduced</td>
</tr>
<tr>
<td>Independent Phase Control:</td>
<td>Maintains each phase voltage stable irrespective of load unbalance, even up to 100% load imbalance</td>
</tr>
<tr>
<td>Automatic Bypass:</td>
<td>Automatic transfer to bypass in the event of an overload or system problem</td>
</tr>
<tr>
<td>Start Up Protection:</td>
<td>Protects load equipment from damaging start up voltage surges</td>
</tr>
<tr>
<td>Environment:</td>
<td>Temperature range 0 to 45 °C. De-rate by 2% for each additional °C Up to max 60 °C . Standard models suitable for indoor tropical use 90% RH (non-condensing). Maximum altitude 4000m. (&lt;IP54 Enclosure Option for Outdoor / more demanding internal environments) De-rate by 2.5% for each additional 500m</td>
</tr>
<tr>
<td>Audible Noise:</td>
<td>Typically &lt; 45 dB (at 1 metre)</td>
</tr>
<tr>
<td>Construction:</td>
<td>Enclosures to IP20 (NEMA 1 Style) - BS EN 60529 (Option -</td>
</tr>
<tr>
<td><strong>Outdoor IP54 / NEMA 3</strong></td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Paint Colour:</strong></td>
<td>As standard RAL 1013 (Oyster White) - Epoxy Powder Coating. Other colours available as an option on specific request.</td>
</tr>
<tr>
<td><strong>EMC Conformance:</strong></td>
<td>Complies with BS EN 55022 and the relevant parts of the BS EN 61000 series of standards.</td>
</tr>
<tr>
<td><strong>CE Conformity:</strong></td>
<td>CE Marked - being fully compliant with European Union Directives 2014/30/EU (The EMC Directive) and 2014/35/EU (The Low Voltage Directive).</td>
</tr>
<tr>
<td><strong>Standard Warranty:</strong></td>
<td>Two Years / 24 Months from date of supply - with extendable option to 5 Years.</td>
</tr>
<tr>
<td><strong>Standard Features:</strong></td>
<td>Input Switch / Breaker with internal Output Isolation and Manual Bypass, Phase Failure Protection, Automatic Electronic Bypass, Class II Lightning Surge Arrestors and LCD Display Panel with RS/485 Interface.</td>
</tr>
<tr>
<td><strong>Add-On Options</strong></td>
<td><strong>-PC</strong></td>
</tr>
<tr>
<td></td>
<td><strong>-IP54</strong></td>
</tr>
<tr>
<td></td>
<td><strong>-AS</strong></td>
</tr>
<tr>
<td></td>
<td><strong>-ADM</strong></td>
</tr>
<tr>
<td></td>
<td><strong>-T2F</strong></td>
</tr>
<tr>
<td>-FP</td>
<td><strong>4 Pole Switches / Breakers.</strong> As standard ESR Stabilisers utilise 3 Pole Switches / Breakers. As an option, 4 Pole alternatives can be supplied.</td>
</tr>
<tr>
<td>-eSP</td>
<td><strong>eSpec Upgrade.</strong> While we endeavour to keep production costs to a minimum by sourcing top specification components from around the globe we realise that some clients have a requirement for their own designated protection devices. Accordingly, we are able to offer our eSpec Pack Upgrade package which offers the client the short circuit and overcurrent protection components from their preferred leading European or American manufacturers.</td>
</tr>
<tr>
<td>-RAL</td>
<td><strong>Alternative Paint Colour.</strong> Alternative Paint Colour Finish - <em>customer to specify.</em></td>
</tr>
</tbody>
</table>
Appendix 2 - Recommended Spares Kit

By holding a front-line spares kit on site you can be assured of the highest level of responsiveness and system uptime. By investing in a spares kit, in the unlikely event of a system problem, you’ll always have quality replacement parts on hand for a quick swap-out.

Our recommended On-Site Spare Parts holdings include –

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Control PCB</td>
</tr>
<tr>
<td>SCR Driver PCB</td>
</tr>
<tr>
<td>Tap Selection SCR</td>
</tr>
<tr>
<td>+/-15 &amp; 5V Power Supply</td>
</tr>
<tr>
<td>24V Power Supply</td>
</tr>
<tr>
<td>SCR Protection Fuse</td>
</tr>
<tr>
<td>SCR Heatsink Main Fan</td>
</tr>
<tr>
<td>SCR Heatsink Exhaust Fan</td>
</tr>
<tr>
<td>Cubicle Exhaust Fan</td>
</tr>
<tr>
<td>Control Relay</td>
</tr>
</tbody>
</table>

For more detailed individual model spares listings and pricing, please contact the Service Department at Ashley-Edison, or the resale partner from whom you purchased the equipment.

Warranty Spares Availability

For spares required under valid warranty claim situations, spares are supplied free of charge. Delivery of these spares is normally arranged through the express door to door courier services of UPS, DHL or FedEx.

We have strategic inventory locations and accurate process and stock control to deliver near total availability on commonly requested spares. For most requests we are able to offer delivery direct from inventory and strive to offer in emergency situations a next working day turn around on shipment.
Appendix 3 - Input Voltage Calibration Adjustment

Input Volts

As live parts may be exposed, qualified personnel obeying safety regulations may only carry out this operation.

Set by means of a potentiometer with screwdriver slot.

The potentiometers are located on the Main Control PCB unit being marked R, S and T - corresponding to each of the three phases L1, L2, & L3.

Calibration must be carried out in conjunction with the front panel display and a multi-meter measuring each of the phase output voltages.
Appendix 4 - Output Voltage Calibration Adjustment

Output Volts

As live parts may be exposed, qualified personnel obeying safety regulations may only carry out this operation.

Set by means of a potentiometer with screwdriver slot.

The potentiometers are located on the Main Control PCB unit being marked U, V and W - corresponding to each of the three phases L1, L2, & L3.

Calibration must be carried out in conjunction with the front panel display and a multi-meter measuring each of the phase output voltages.
Appendix 5 - Current Calibration Adjustment

As live parts may be exposed, qualified personnel obeying safety regulations may only carry out this operation.

Set by means of a potentiometer with screwdriver slot.

The potentiometers are located on the Main Control PCB unit and clearly marked ‘R7’, ‘R33’, ‘R48’, corresponding to each of the three phases L1, L2, & L3.

Calibration must be carried out in conjunction with the front panel display and a current clamp measuring each of the phase output currents.
Appendix 6 - Circuit Diagrams

Diagram 1 – Three Phase Stabiliser Circuit Diagram
Appendix 7 - System Switching Sequence

To avoid inadvertently damaging the voltage stabiliser, the following switching sequence should be strictly followed:

**WARNING:**
- Slide the Mechanical Interlock to the right to prevent the operation of the Manual Bypass Switch (Q1).
- Turn Off (Upwards Position) the Manual Bypass Switch (Q1).
- The stabiliser will now conduct its ‘Start-Up Sequence’. On completion of the sequence, the stabiliser will show ‘AVR’ indicating that the stabiliser is providing a regulated output.

**Stabiliser Initial Power-Up Sequence (AVR Operational Mode):**

1. Place the Stabiliser in Manual Bypass Mode (from AVF Operation).
2. Switch the Manual Bypass Switch (Q1) to ‘On’ (Upwards Position).
3. Switch the Manual Bypass Switch (Q2) to ‘On’ (Upwards Position).
4. The Front Display Panel’s Power Mode status will change to ‘BYPASS’ indicating that the voltage stabiliser is providing an unregulated voltage output.

**Stabiliser Shutdown Sequence (While in Manual Bypass Mode):**

1. Switch the Manual Bypass Switch (Q1) to ‘Off’ (Downwards Position).
2. This action will remove the unregulated voltage output from the Output Terminals and shut down the stabiliser.

**Stabiliser Shutdown Sequence (While in AVR Mode):**

1. Switch the Manual Bypass Switch (Q2) to ‘Off’ (Downwards Position).
2. This action will remove the unregulated voltage output from the Output Terminals and shut down the stabiliser.
**Appendix 8 – RS-232 / 485 Communications Interface**

Baud Rate: 19200

Data Format:

When the command 0x51 is received by the Voltage Stabiliser it will output 10 Words of data (10 x 2 Bytes) with the measurements transmitted as words (each word is represented by 2 bytes) with the first byte being the most significant byte. The host device will need to add the decimal point and ‘V’ or ‘A’ to display the correct value. As the first word transmitted by the Stabiliser will be the Input Voltage of the Red Phase (L1) and could be represented as Hex 08 EA which translated into decimal will give a value of 2282. The host device will need to add the decimal point and identification letter to provide a reading of 228.2V.

The following measurement data will be transmitted in word format in the following sequence:

<table>
<thead>
<tr>
<th>Word</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Phase L1 (L1-N) input voltage measurement.</td>
</tr>
<tr>
<td>2.</td>
<td>Phase L2 (L2-N) input voltage measurement.</td>
</tr>
<tr>
<td>3.</td>
<td>Phase L3 (L3-N) input voltage measurement.</td>
</tr>
<tr>
<td>4.</td>
<td>Phase L1 (L1-N) output voltage measurement.</td>
</tr>
<tr>
<td>5.</td>
<td>Phase L2 (L2-N) output voltage measurement.</td>
</tr>
<tr>
<td>6.</td>
<td>Phase L3 (L3-N) output voltage measurement.</td>
</tr>
<tr>
<td>7.</td>
<td>Phase L1 output current measurement.</td>
</tr>
<tr>
<td>8.</td>
<td>Phase L2 output current measurement.</td>
</tr>
<tr>
<td>9.</td>
<td>Phase L3 output current measurement.</td>
</tr>
</tbody>
</table>
10. This word will provide the status of the Voltage Stabiliser and be represented by the following codes:

**Most significant byte**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>00 00</td>
<td>No faults</td>
</tr>
<tr>
<td>00 01</td>
<td>Phase L1 output overvoltage.</td>
</tr>
<tr>
<td>00 02</td>
<td>Phase L1 output under-voltage.</td>
</tr>
<tr>
<td>00 04</td>
<td>Phase L1 output overload.</td>
</tr>
<tr>
<td>00 08</td>
<td>Phase L1 fuse blown.</td>
</tr>
<tr>
<td>00 00</td>
<td>No faults</td>
</tr>
<tr>
<td>01 00</td>
<td>Phase L2 output overvoltage.</td>
</tr>
<tr>
<td>02 00</td>
<td>Phase L2 output under-voltage.</td>
</tr>
<tr>
<td>04 00</td>
<td>Phase L2 output overload.</td>
</tr>
<tr>
<td>08 00</td>
<td>Phase L2 fuse blown.</td>
</tr>
</tbody>
</table>

**Least significant byte**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>00 00</td>
<td>No faults</td>
</tr>
<tr>
<td>00 01</td>
<td>Phase L3 output overvoltage.</td>
</tr>
<tr>
<td>00 02</td>
<td>Phase L3 output under-voltage.</td>
</tr>
<tr>
<td>00 04</td>
<td>Phase L3 output overload.</td>
</tr>
<tr>
<td>00 08</td>
<td>Phase L3 fuse blown.</td>
</tr>
</tbody>
</table>
Appendix 9 - Product Warranty

1 Standard Warranty

1.1 In purchasing an Ashley-Edison AC Automatic Voltage Stabiliser / Regulator, you are investing in a standard of Quality which fulfils the highest of requirements.

1.2 Subject to the limitations set out below, Ashley-Edison warrants that the products will correspond with their specification at the time of despatch and will be free from defects in material and workmanship for a period of 1 year / 12 months from date of shipment.

2 Warranties & Liabilities

2.1 Subject to the conditions set out below, Ashley-Edison (known as ‘Seller’) warrants that the Goods will correspond with their specification at the time of delivery and will be free from defects in material and workmanship for a period of 12 months from delivery.

2.2 The above warranty is given by Ashley-Edison (Seller) subject to the following conditions:-

2.3 Seller shall be under liability in respect of any defect in the Goods arising from any drawing, design or specification supplied by the Buyer.

2.4 Seller shall be under no liability in respect of any defects arising from fair wear and tear, wilful damage, negligence, abnormal working conditions, failure to follow the Seller’s instructions (whether oral or in writing), misuse or alteration or repair of the Goods without the Seller’s approval;

2.5 Seller shall be under no liability under the above warranty (or any other warranty, condition or guarantee) if the total price for the Goods has not been fully paid by the due date;

2.6 The above warranty does not extend to parts, materials or equipment not manufactured by the Seller.

2.7 Subject as expressly provided in these Conditions and except where the Goods are sold to a person dealing as a consumer
(within the meaning of the Unfair Contract Terms Act 1977), all warranties, conditions or other terms implied by statute or common law are excluded to the fullest extent permitted by law.

2.8 Where the Goods are sold under a consumer transaction (as defined by the Consumer Transactions (Restrictions on Statements Order 1976) the statutory rights of the Buyer are not affected by these Conditions.

2.9 Any claim by the Buyer which is based on any defect in the quality or condition of the Goods or their failure to correspond with specification shall (whether or not delivery is refused by the Buyer) be notified to the Seller within 7 days from the date of delivery or (where the defect or failure was not apparent on reasonable inspection) within a reasonable time after discovery of the defect or failure. If delivery is not refused, and the Buyer does not notify the Seller accordingly, the Buyer shall not be entitled to reject the Goods and the Seller shall have no liability for such defect or failure, and the Buyer shall be bound to pay the price as if the Goods have been delivered in accordance with the Contract.

2.10 Where any valid claim in respect of any of the Goods which is based on any defect in the quality or condition of the Goods or their failure to meet specification is notified to the Seller in accordance with these Conditions, the Seller shall be entitled to repair or modify all defective goods free of charge provided that the goods are returned to the Seller's works carriage paid, if the Buyer does not wish to return the goods, they will be repaired free of charge at the Buyer's nominated premises provided that the Buyer reimburses the Seller for traveling expenses, time and out of pocket expenses. The Seller shall be entitled, at its sole discretion, to replace the Goods free of charge or, refund to the Buyer the price of the goods (or a proportionate part of the price), but the Seller shall have no further liability to the Buyer.

2.11 Except in respect of death or personal injury caused by the Seller's negligence, the Seller shall not be liable to the Buyer by reason of any representation, of any implied warranty, condition or other term, or any duty at common law, or under the express terms of the Contract, for any consequential loss or damage
(whether for loss of profit or otherwise) costs, expenses or other claims for consequential compensation whatsoever (and whether caused by the negligence of the Seller, its employees or agents or otherwise) which arise out of or in connection with the supply of the Goods or other use or resale by the Buyer, except as expressly provided in these Conditions.

2.12 Seller shall not be liable to the Buyer or be deemed to be in breach of the Contract by reason of any delay in performing, or any failure to perform, any of the Seller’s obligations in relation to the Goods, if the delay or failure was due to any cause beyond the Seller’s reasonable control. Without prejudice to the generality of the foregoing, the following shall be regarded as causes beyond the Seller’s reasonable control.

2.12.1 Act of God, explosion, flood, tempest, fire or accident;
2.12.2 wars or threat of war, sabotage, insurrection, civil disturbance or requisition;
2.12.3 acts, restrictions, regulations, bye-laws, prohibitions or measures of any kind on the part of any governmental, parliamentary or local authority;
2.12.4 import or export regulations or embargoes;
2.12.5 strikes, lock-outs or other industrial actions or trade disputes (whether involving employees of the Seller or of a third party);
2.12.6 difficulty in obtaining raw materials, labour, fuel, parts or machinery;
2.12.7 power failure or breakdown in machinery.

3 Extended Warranty – 5 Years

As an option Ashley-Edison offers an extended warranty option which, for a modest fee, extends the standard warranty cover to a full 5 years from date of supply. This extended cover will not only save you possible parts costs, but by priority access to our dedicated technical backup support staff ensures any expensive downtime is minimised. For further information and pricing on the extended warranty option please contact us.
### Voltage Stabilisers
- Servo Electronic Design: 1 to 1500 kVA
- Static Digital Electronic Design: 3 to 3125 kVA
- Industrial Magnetic Induction Design: 200 to 3000 kVA

### Power Line Conditioners
- Ferro-Resonant Design: 0.5 to 5 kVA
- Servo Electronic Design: 1 to 500 kVA
- Static Digital Electronic Design: 6 to 2000 kVA

### Constant Voltage Compensators
- 3 to 1500 kVA

### Automatic Voltage Optimisers
- 10 to 1000 kVA

### Variable Transformers
- 3 to 150 Amps

### Static Frequency Converters
- 3 to 500 kVA

### Variable Voltage & Frequency Converters
- 2 to 200 kVA

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Your Local Contact -

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www.AshleyEdisonUK.com

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