

## Adaptive Power Module Troubleshooting Guide

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### Overview

This document will assist in troubleshooting issues with Phase Adaptive Power Modules. It covers the following models: LQSE-4A-D, QSNE-4A-D, LQSE-4A-120-D, LQSE-4A5-120-D, QSN-4A5-D, QSN-4A5-S, LQSE-4A5-230-D, QSNE-4A5-230-D.

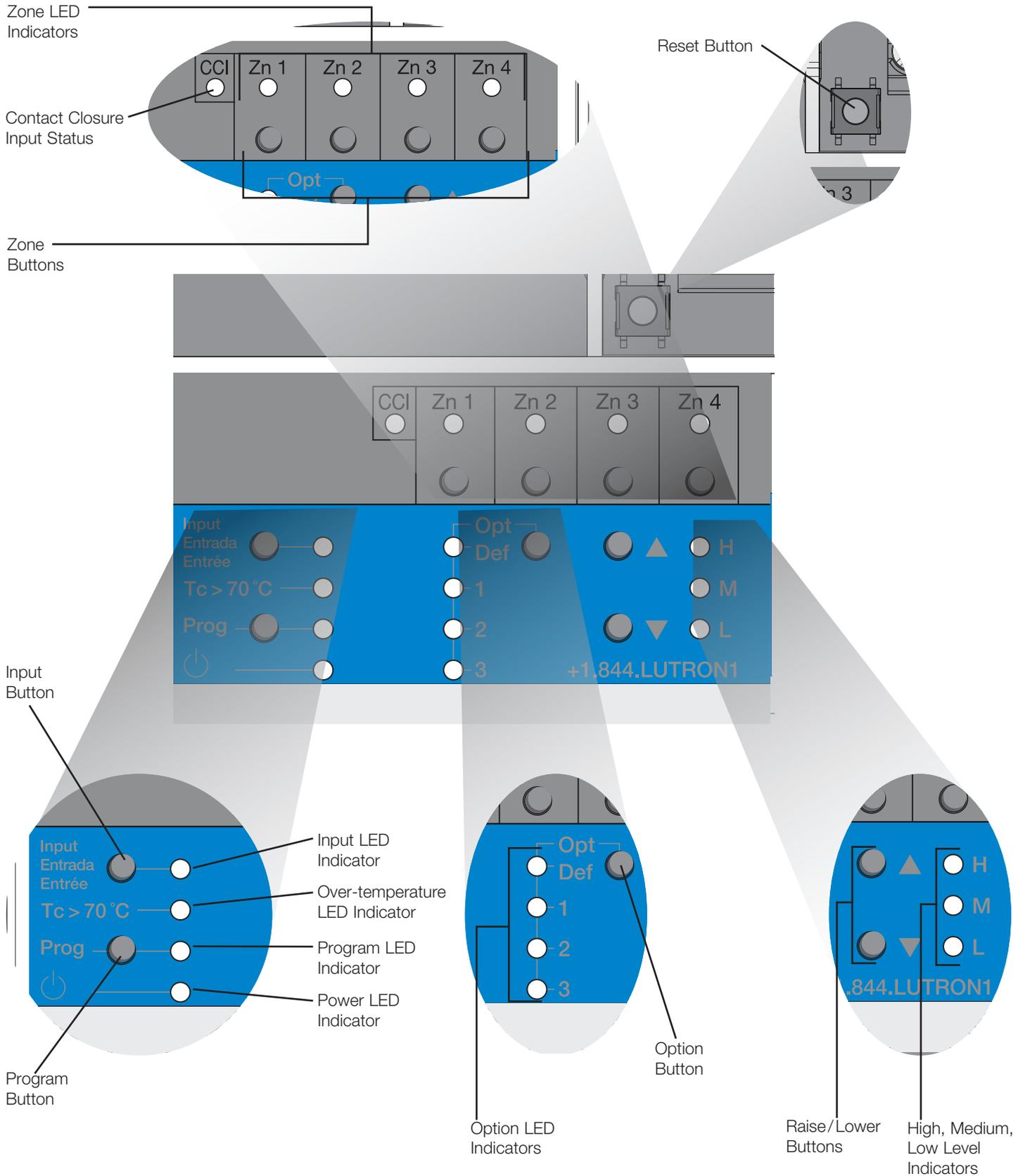
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 **WARNING: SHOCK HAZARD.** May result in serious injury or death. Turn off power at circuit breaker or fuse before installing.

# Local Interface

Phase Adaptive Power Modules have a local user interface which provides troubleshooting and controls.



## **Local Interface *(continued)***

During normal operation, the LED indicators on the face of the module should be as follows:

### ***Contact Closure Input Status***

Solid On - Indicates the device is in normal mode

### ***Zone LED Indicators***

OFF – Indicates load is OFF, no error is present

ON – Indicates load is ON, no error is present

### ***Option LED Indicators***

Option LED indicators are normally off during regular operation

### ***Over-temperature LED Indicator***

OFF - Indicates device temperature is within normal operating range

### ***Program LED Indicator***

OFF - Indicates the device is in normal mode

### ***Power LED Indicators***

Solid On - Indicates power is present

# Zone LED Indicator Feedback

## How to Identify a Zone Error

Zone Error LED codes are indicated via the Zone LEDs. The Zone LED will blink on and off at about 3 times per second indicating an error is present on the corresponding zone. The number of blinks before a 3 second pause indicates the error number and can be referenced in the following sections.

**Example: Over-Current Error on Zone 3:** Zone 3 LED blinks one time followed by a pause, blinks one time, pause, etc. Zone LEDs will flash out errors continually until the errors are remedied.

**Note 1:** If the user enters one of the button menus, the Zone Error LED codes are temporarily disabled to allow the user access to the menu.

**Note 2:** When contacting customer service, it is helpful to include a video of the LED feedback on the module to confirm the error condition.

## One Blink, Pause (D5\*) - Over-Current Error

### Behavior

1. Lights on this output cannot be turned on.
2. User can attempt to clear the error by:
  - a. Turning the output completely off and then back on.
  - b. Power cycling the module.
  - c. Selecting a different phase control in the Lutron Designer software.
  - d. Pressing the reset button.
  - e. Restore to Factory Defaults (Out-of-Box)

**Note:** If in a system, after the out-of-box is completed, the processor will return the device settings to the system programmed settings, not default device settings. This may confuse the troubleshooting process as the selected phase in Lutron Designer software will be re-sent to the module. To avoid this issue, remove the QS Link from the device.

### Potential Causes

1. Load installed on module output is too large.
2. Wiring on the output is shorted to ground, neutral, or another line/hot phase.

### Troubleshooting

1. Try to clear the error using the steps above.
2. Verify there are no wiring faults or shorts on the output.
3. Verify wiring connections are tight and the screw terminals are properly torqued at both the phase adaptive power module and the fixture itself.
4. Verify that the phase control matches the load. For troubleshooting, try Auto Detect (adaptive) phase control in the Lutron Designer software.
5. Reduce the number of loads on the output.
6. If line/hot wiring was performed, auto detect may have improperly detected the load type. Try power cycling the module.
7. For loads which have excessive inrush current, such as LEDs, try a slower fade on from off to give the load more time to warm up.

\* Error codes are numbered in the Designer software as a D followed by a number or letter.

## Zone LED Indicator Feedback (*continued*)

### Two Blinks, Pause (D6\*) - Phase Control Type Not Compatible with Load (Over-Voltage)

#### Behavior

1. Modules with software prior to v10.030.  
Zone is forced on if any zone on the module is turned on.
2. Modules with software v10.030 and up.  
Lights on this output cannot be turned on.
3. User can attempt to clear the error by:
  - a. Wait five minutes, then turn the affected zone off and back on.
  - b. Power cycling the module.
  - c. Selecting a different phase control in the Lutron Designer software.
  - d. Pressing the reset button.
  - e. Restore to Factory Defaults (Out-of-Box)  
**Note:** If in a system, after the out-of-box is completed, the processor will return the device settings to the system programmed settings, not default device settings. This may confuse the troubleshooting process as the selected phase in Lutron Designer software will be re-sent to the module. To avoid this issue, remove the QS Link from the device.

#### Potential Causes

1. Inductive load (transformer, MLV) installed on output and incorrectly configured for reverse/leading edge phase.
2. Soft line - too long of a wire run to the load from the module, from the power distribution to the module or both.
3. Module powered by a transformer with high inductance.
4. Switches wired into the circuit (not allowed, can damage the module).
  - a. Load side switching (a switch is installed between the module and the load).
  - b. Line side switching (a switch is installed between the power source and the module).

#### Troubleshooting

1. This error is most commonly displayed when an MLV load is detected and the output is configured for reverse-phase. To check the phase type, use the instructions in the section Verify Configured Phase Control.
2. Try to clear the error using the steps above.
3. Verify wiring connections are tight and the screw terminals are properly torqued at both the phase adaptive module and the fixture itself. Loose terminals can mimic line or load side switching.
4. Try setting the phase control to Auto Detect (adaptive) phase mode.

\* Error codes are numbered in the Designer software as a D followed by a number or letter.

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## Zone LED Indicator Feedback (*continued*)

### Three Blinks, Pause (D0, D1, or D2\*) - Shorted Component

#### Behavior

The affected zone will be turned on to 100% (like a switch) anytime it or another zone on the same module is turned on.

#### Potential Causes

1. Bypass jumper installed.
2. Shorted component inside module.
3. Power line noise.
4. High power capacitive loads (ELV/LED drivers).
5. High power inductive loads with follow-through current (Magnetic Low-Voltage [MLV] loads with large transformer inductance).
6. AC Line switched rapidly between sources (generator or inverter to line and back).

#### Troubleshooting

1. Power cycle or press the RESET button on the module. Then try to turn on the affected output and observe if the error is gone.
  - a. If the error does not return, the problem may be intermittent and caused by noise on the power line. Most noise on the power line is filtered out by the module, but heavily capacitive or inductive loads can make the module more susceptible to false detections. If the output is in Reverse or Auto phase type, try using forward-phase to better filter the power line noise, if compatible with the load.
2. Verify the bypass jumper is not installed when using Lutron panels. The bypass jumper back-feeds the dimmed hot terminal with line voltage, interfering with the module's ability to detect shorted components.
3. Confirm no voltage is back-fed into the Dimmed Hot (DH) terminal.
  - a. Turn off all zones on the module. If needed use the Manual Control Instructions.
    - i. The relay should make an audible click and all zone LEDs should be off except for the zone with an error.
  - b. Using a multi-meter on AC voltage mode, measure dimmed hot (DH) terminal of the affected output to neutral.
    - i. If voltage is present something is back-feeding the module dimmed hot terminal. Find and fix this back-feed path.
4. Verify there are no wiring faults.
  - a. Turn off power.
  - b. Remove the affected load from the module.
  - c. Power up the module.
  - d. Try to manually control the affected zone.
    - i. Turn the output on and listen for the relay to click.
  - e. If the error is no longer present, the load may have a problem.
  - f. If none of the above fixes the problem, it indicates a shorted component inside the module. The module must be replaced to remedy this problem.

**Important:** Before replacing, confirm the following:

    - i. The load size does not exceed the ratings of the module.
    - ii. The phase type is correct for the load.
      - MLV loads run in reverse-phase may cause this type of damage - MLV loading must only be run in Auto or forward-phase types, never in reverse-phase.
      - Lutron has seen many instances where fixtures appear to be incandescent or halogen but are actually driven by a transformer. This misleads the installer and commissioner to select the incorrect phase type.
      - When in doubt, Auto phase type is the safest option.

\* Error codes are numbered in the Designer software as a D followed by a number or letter.

## Zone LED Indicator Feedback (*continued*)

### Four Blinks, Pause (D9\*) - Over-temperature scale back to 25%

#### Behavior

1. All zones on the module fade back to 25% (or off for switched load types).
2. Dimmable zones cannot be raised above 25%.
3. Switched zones cannot turn on.
4. Hi-Temp LED blinks ON for 1 second then OFF for 7 seconds.
5. Zones with a minimum level set above 0% will not go below their minimum.

#### Potential Causes

Refer to section under Five Blinks, Pause (DA)

#### Troubleshooting

Refer to section under Five Blinks, Pause (DA).

### Five Blinks, Pause (DA\*) - Over-temperature scale back failed to cool unit, turn off and wait

#### Behavior

1. All zones on the module turn off and cannot be turned on until the module cools off.
2. Zone LED indicator blinks five times, then pauses for a few seconds.
3. Module Hi-Temp LED indicator can indicate two different scenarios:
  - a. Module is still hot: Hi-Temp LED is on solid.
  - b. Module has cooled off: Hi-Temp LED blinks ON 1 second, OFF for 1 second.

**Note:** This feedback will persist until manually cleared by following the directions in section Clearing Over-Temperature Error LED.

#### Potential Causes

1. Unit is too hot.
  - a. Installed without adequate ventilation.
  - b. High ambient temperature (electrical closet may be too hot).
  - c. Overload - exceeding the rated loading.
  - d. Module malfunction - Manufacturing issue or component failure causing heating inside.
2. Temperature sensor malfunction.
  - a. Module failure causing incorrect temperatures to be read.

\* Error codes are numbered in the Designer software as a D followed by a number or letter.

## Zone LED Indicator Feedback (*continued*)

### Five Blinks, Pause (DA \*) - Over temperature scale back failed to cool unit, turn off and wait (*continued*)

#### Troubleshooting

1. **Caution - Unit may be hot**
2. Take note of temperatures and error codes.
  - a. Note the ambient room temperature.
  - b. Note the temperature at the Calibration Point (marked on the unit with a label).
  - c. Note which zones have error codes.
3. Confirm temperatures are within an acceptable range.
  - a. Locate the temperature range for the module in its specification submittal. There are various temperature ratings depending on the installation, so it is best to reference the specification submittal.
  - b. Confirm the measured ambient, calibration, and panel (if used) temperatures are within the expected range.
  - c. Once the temperature is lowered, the error can be cleared using the steps in section Clearing Over-Temperature Error LED.
4. If temperatures are within the acceptable range.
  - a. Turn off power to the module.
  - b. If the module is too hot to touch, wait for it to cool off.
  - c. Disconnect the load from the affected zone (zone with blinking error code).
  - d. Reconnect power and turn on affected output.
  - e. Wait and see if zone heats up and the five-blink error code returns.
    - i. If the zone heats up and the five-blink error code returns with the load detached, the module is damaged and must be returned to Lutron for replacement.
 

**Important:** Before replacing with a new module, find the root cause of the failed hardware. Otherwise, replacement module may become similarly damaged.

      - Confirm the load previously attached to the affected output is within the specified load ratings.
      - Confirm there is not a mixed load on the output (MLV + LED, etc.).
      - Confirm there are no wiring faults.
    - ii. If the zone does not heat up with the load detached.
      - Confirm the load is within the specified rating.
        - Connect the affected load directly to line and measure (with a clamp on AC current meter) the current draw from the output.
        - Confirm the current draw is within the specified rating for that load type.
        - Confirm the load type matches the expected load type configured in the Lutron Designer software (i.e., look for signs of using MLV in reverse-phase which could cause overheating).
        - If the output is too large, split into smaller circuits to reduce load. If splitting circuits is not possible, use a power booster (PHPM-PA-xxx).
        - After correcting oversized loads, clear the error by using the steps in section **Clearing Over-Temperature Error LED**.
      - Try Auto-Detect (if not already in use).
        - Turn off power.
        - Reconnect load.
        - Change phase control of the affected output to auto-detect in Lutron Designer software.
        - Turn on power and transfer updated phase control.
        - Clear the error by using the steps in section **Clearing Over-Temperature Error LED**.

\* Error codes are numbered in the Designer software as a D followed by a number or letter.

## Zone LED Indicator Feedback (*continued*)

### **Rapid Flashing (DB\*) - Multiple errors have occurred (any combination of one or more of the above) Behavior**

1. The module has detected multiple errors on a single output and has opened the air gap to prevent further damage.
2. The module displays a rapid flash (10 blinks per second) on the zone LED.
3. All zones on the module are turned off.

### **Potential Causes**

1. The load attached to the affected zone exceeds the rating of the module.
2. The load attached to the affected zone is driven with an invalid phase control (example: reverse-phase for an MLV).
3. Bulb blowout occurred causing an event that damaged the module.
4. A power line event (surge, brownout, transients, etc.) occurred.
5. AC line switched rapidly between sources (generator or inverter to line and back).

### **Troubleshooting**

1. Power cycle or press the RESET button on the module. Then try to turn on the affected output and observe if the error is gone.
2. Verify wiring connections are tight and the screw terminals are properly torqued at both the phase adaptive module and the fixture itself. Loose terminals can mimic line or load side switching.
3. Try setting the phase control to Auto Detect (adaptive) phase mode and then power cycle the module.
4. If the error persists, the module is damaged and requires replacement. Before replacing the module, ensure the root cause of the failure is found to prevent a repeat failure on the replacement.
  - a. Ensure the load can be properly driven when attached directly to line (bypass the module).
  - b. Use an ammeter to measure the current delivered to the load to ensure it is within the rating of the module.
  - c. Understand power line conditions and correct noisy or poor power quality.

\* Error codes are numbered in the Designer software as a D followed by a number or letter.

## Power LED Indicator Feedback

### Power LED Rapid-Flashing

#### Identification

The power LED on the Energi Savr Node (ESN) may enter a mode where it flashes rapidly (> 5 times a second). This LED feedback has also been described as 'heart-attack mode' in previous literature. In this mode, zones are not controllable.

#### Troubleshooting

1. Can you hear the relay periodically clicking (once per every few seconds) when outputs are on?
  - a. Yes - Use the load buttons (see **Manually Controlling Zones on ESN** for details) on the control board to lower all outputs to off.  
Is power LED still flashing?
    - i. Yes - Cycle power to the module.  
Is the power LED still flashing?
      - Yes – Module is damaged and should be replaced.
    - ii. No - Remove loads.  
Is relay still clicking?
      - Yes - Fuse is open, relay cannot close, or AC line is unstable.
        - Is the module powered from an unstable AC source like an inverter or generator?
          - Yes – Module requires a cleaner AC source.
          - No – This would indicate dimmer failure.
      - No:
        - Add loads back one at a time to identify a defective load.
        - Use an indicator, dummy load, or other known good load.
    - b. No - Remove all loads from the module and cycle power.  
Is the power LED still flashing?
      - i. Yes – Module is damaged and should be replaced.
      - ii. No – Add loads back one at a time to locate the defective load. Use an indicator, dummy load, or other known good load to verify the module output.

## CCI Indicator Feedback

### Rapid-Flashing

Unit is in Emergency/Manual Override mode. Outputs will turn on to their configured override level and will not be controllable. Most functionality won't work while in this mode (activation, firmware upgrade, etc.).

## Over-temperature LED Indicator Feedback

### Flashing

If a module ever experiences an over-temperature error, the over-temperature LED will blink until manually cleared by the user (an active over-temperature error is indicated by a solid on over-temperature LED). This feedback persists through power cycles and even after temperature returns to the safe operating range.

### Solid

Module is currently experiencing an over-temperature error. See zone error documentation for over-temperature.

# Additional LED Feedback

## Boot Mode

The module has both a boot program and an application program. During a firmware upgrade or following a firmware upgrade failure, the module can be in boot mode.

### Identification

Boot mode can be identified by viewing the LEDs on the module. There are three possibilities:

1. Both top and bottom boards in boot mode: The four option LEDs alternate blinking with the four zone LEDs. Zone 1, Zone 2, Def, Opt 1 alternate once per second with Zone 3, Zone 4, Opt 2, Opt 3.
2. Top board in boot mode: The four option LEDs alternate once per second, Def & Opt 1 with Opt 2 & Opt 3.
3. Bottom board in boot mode: The four zone LEDs alternate once per second, Zn 1 & Zn 2 with Zn 3 & Zn 4.

### Behavior

1. If boot mode is entered for a firmware upgrade, all zones will go to full on, regardless of the commanded state. If any zone errors occur (see zone errors for more info) all zones will turn off and the air-gap relay will open.
2. If boot mode is entered directly after power up without going to the application program first, all zones will be off.
3. Zones cannot be controlled while in boot mode.
4. Most functions don't work in boot mode (activation, load identification, etc.).

### Troubleshooting

1. Boot mode is intended to receive a firmware upgrade. To return the unit to a working state, a firmware upgrade must be performed. Options for firmware upgrade:
  - a. Using the Lutron Designer software, navigate to the Upgrade QS Devices panel and perform an upgrade on the device type with which you are working.
  - b. Using the HHD app with an Ethernet programmer interface (for standalone devices only).
  - c. Using the QSE-CI-NWK-E connected to a serial port on a Windows PC and the QS Flash Tool PC application.
2. If firmware upgrade failures are happening:
  - a. Try upgrading the failing devices on a smaller QS link by removing additional devices from the link.
  - b. Shorten the QS link distance between the updating device (processor, Ethernet programmer, or QSE-CI-NWK-E) and the affected module.
  - c. Use a different firmware upgrade option.

# Troubleshooting Using Button Interface

## Manually Controlling Zones on Energi Savr Node Phase Adaptive and LED+ Dimmers

1. Make sure the module is not in programming mode (if unknown it will time out in 10 seconds).
2. Press the zone button for the zone you wish to control. The zone LED will begin to blink once per second to indicate you have selected it.
3. Use the “↑” and “↓” buttons to raise and lower the output level.

## Verify Configured Phase Control

1. Make sure the module is not in programming mode (if unknown it will time out in 10 seconds).
2. Press the OPT button one time.
3. View the Zones 1-4 LEDs.
  - a. Flashing LEDs indicate zones are operating in forward-phase.
  - b. Solid LEDs indicate zones are operating in reverse-phase.

**Note:** This feedback identifies which phase type the auto/adaptive phase type algorithm selected.

## Valid Phase Types Depending on Load

Load	Auto Phase	Forward-Phase	Reverse-Phase
<b>MLV (Magnetic Low-Voltage Transformer)</b>	Safe	OK	NEVER OK
<b>LEDs, Drivers, ELVs, Fluorescent Drivers</b>	Safe (Confirm manufacturer’s recommended phase type. Can be either.)	OK (Confirm manufacturer’s recommended phase type)	OK (Confirm manufacturer’s recommended phase type)
<b>Resistive Incandescent or Halogen Loads</b>	Safe	OK	OK

## Restore to Factory Defaults (Out of Box)

1. Triple tap and hold the “Prog” button. DO NOT release the button after the third tap.
2. Keep the button pressed on the third tap until the “Zn 1”, “Zn 2”, “Zn 3”, “Zn 4”, “H”, “M”, and “L” LEDs flash.
3. Release the button and immediately triple tap it again.
4. The “Zn 1”, “Zn 2”, “Zn 3”, “Zn 4”, “H”, “M”, and “L” LEDs flash while the module is restoring to factory defaults.
5. When complete and restored to Factory Defaults, LEDs will stop flashing and the module will turn all outputs on.

## Troubleshooting Using Button Interface *(continued)*

### Clearing Over-Temperature Error LED

If a module ever experiences an over-temperature error, the over-temperature LED will blink until manually cleared by the user (an active over-temperature error is indicated by a solid on over-temperature LED). This feedback persists through power cycles and events after temperature returns to the safe operating range.

Once an over-temperature problem is fixed, it is useful to clear the over-temperature LED feedback so future over-temperature events can be identified. There are two methods to clear the over-temperature LED:

1. Out of box to reset the product to factory defaults. This option will clear all programming from the module.
2. Button Combination:
  - a. Make sure the module is not in programming mode (if unknown it will time out in 10 seconds).
  - b. Press and hold for 3 seconds the following buttons:
    - i. Program
    - ii. Input
    - iii. Raise
    - iv. Lower

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