

# UR<sup>Plus</sup> Series

## Revision 1.73 Release Notes

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### Overview

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#### Summary

Release 1.73 of the UR<sup>Plus</sup> series introduces product-specific and platform-wide enhancements. Highlights include:

- Hardware:
  - New inter-relay communication boards (added in 1.70)
- Protection and Control Elements:
  - Ground Distance Element enhanced (1.70)
  - Settings range changes for Negative Sequence and Neutral Directional Overcurrent (1.70)
  - Selectivity of 67N and 67I\_2 enhanced (1.70)
  - Setting range change for Overvoltage element (1.70)
  - Change in operate time setting range of disconnect switches (1.70)
  - Frequency measures validation method enhanced (1.70)
  - Changes in Ground Directional elements (67N and 67\_2) supervision logic (1.73)
- Automation:
  - Load Shed df/dt enhanced with Basic metering option (1.72)
  - Automation FlexLogic timers enhanced (1.73)
- Communications:
  - Enabling-disabling of UR<sup>Plus</sup> web server (1.70)
  - IEC61850 buffered reports and logical nodes (1.70)
  - IEC61850 GOOSE re-transmission profiles (1.70)
  - Rebooting and high traffic communication management (1.70)
- Platform:
  - Customized operand names (1.70)
  - Firmware upgrade routine and front panel indication (1.70)
- Records:
  - Fault Report with VTs in delta (1.70)
  - Firmware upgrade event (1.70)
- HMI Improvements:
  - Annunciator (1.70)
  - Mimic diagram (1.70)
- UR<sup>Plus</sup> Setup Software:
  - Setting file conversion process (1.70)

This document contains the release notes of the UR<sup>Plus</sup> family, releases 1.70 to 1.73.

- Affected products: C90<sup>Plus</sup>, D90<sup>Plus</sup>
- Date of release: April 10, 2010
- Firmware revision: 1.70

- Date of release: Nov 25, 2010
- Firmware revision: 1.71
- Date of release: Jul 19, 2011
- Firmware revision: 1.72
- Date of release: May 1, 2012
- Firmware revision: 1.73

**For users with UR<sup>Plus</sup> devices with firmware versions of 1.60 or older, a hardware upgrade is required to migrate to the newer version.**

**For users with UR<sup>Plus</sup> devices with firmware versions of 1.50 or older, careful considerations in regards to the UR<sup>Plus</sup> Setup software must be taken into account to migrate to the new version. UR<sup>Plus</sup> Setup software versions 1.7 and higher are NOT compatible with UR<sup>Plus</sup> firmware versions 1.50 or older.**

**Contact the GE Digital Energy Customer Service team to ensure that the UR<sup>Plus</sup> device is suitable, after which new firmware can be downloaded and installed. If the new features and enhancements are not required, then upgrading relay firmware is not necessary.**

## Products Affected

This release encompasses the following UR<sup>Plus</sup> products:

- C90<sup>Plus</sup> Automation Logic Controller
- D90<sup>Plus</sup> Line Distance Protection System

## Firmware Compatibility

The version 1.73 firmware that is a part of this release is compatible with the UR<sup>Plus</sup> hardware version 1.70 and higher.

The use of the 1.73 firmware requires EnverVista UR<sup>Plus</sup> Setup software version 1.70 or higher.

In the following enhancement descriptions, a revision category letter is placed to the left of the description. See the Appendix at the end of this document for a description of the categories displayed.

## Protection and Automation Elements

### E 183-1 Changes in Ground Directional elements (67N and 67\_2) supervision logic

Applicable: C90<sup>Plus</sup> and D90<sup>Plus</sup>

The Ground Directional elements (67N and 67\_2) supervision logic was changed from a fixed hardcoded value to the Voltage Cutoff setting, which is customer-adjustable.

## Automation

### E 183-2 Automation Timers enhanced

Applicable: C90<sup>Plus</sup> and D90<sup>Plus</sup>

The Automation Timers were enhanced to be re-triggerable. In previous versions, the timers acted like accumulators with infinite memory. For example, if a timer was set with a pickup delay of 30 s and the input to

the timer was high for 25 s and then dropped out, when reapplied the timer asserted in 5 seconds rather than timing for another 30 seconds.

## Previous FW 1.72 Release Details

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In the following enhancement descriptions, a revision category letter is placed to the left of the description. See the Appendix at the end of this document for a description of the categories displayed.

## Protection and Automation Elements

### E 182-2 Frequency Rate of Change Load Shedding enhanced

Applicable: C90<sup>Plus</sup>

The Frequency Rate of Change element under Load Shedding was corrected for use with the Basic metering option.

## Previous FW 1.70 Release Details

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In the following enhancement descriptions, a revision category letter is placed to the left of the description. See the Appendix at the end of this document for a description of the categories displayed.

## Hardware

### N 170-1 New inter-relay communication cards supported by UR<sup>Plus</sup> devices

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

Three new Inter-Relay Communication cards (IRC cards) are introduced with firmware version 1.70. These cards enable the UR<sup>Plus</sup> devices to support pilot-schemes that are based on standard communication protocols, and both “Direct” and “Tele-Protection” inputs and output elements are available. The IRC cards can work on either schemes that demand direct UR<sup>Plus</sup>-to-UR<sup>Plus</sup> connection or schemes that have specialized communication devices between the line terminals (multiplexers, microwave, and so on).

The table describes IRC cards types.

Module Specification	Description
IRC Card Type B	B G.703, 64/128 kbps, two channels 100 m
IRC Card Type C	C RS422, 64/128 kbps, two channels, two clock inputs 1200 m (based on transmitter power; does not take into consideration the clock source provided by the user)
IRC Card Type D	D 850 nm, 64/128 kbps, ST multi-mode laser, two channels with DDMI 2.0 km (50/125 μm cable with ST connector); 2.9 km (62.5/125 μm cable with ST connector)

A UR<sup>Plus</sup> can have a single IRC card. The card uses a dedicated slot, so it does not affect the maximum number of other card types supported by the UR<sup>Plus</sup> chassis.

The IRC card also enables UR<sup>Plus</sup> devices to be directly linked with UR devices (tele-protection inputs and outputs only).

# Protection and Automation Elements

## E 170-2 **Ground distance elements have been improved to increase selectivity when facing three-phase or phase-to-phase faults and remote single pole tripping**

Applicable: D90<sup>Plus</sup>

The ground distance protection algorithm was modified to have enhanced overcurrent supervision that incorporates a positive sequence restraint factor.

Zero-sequence current is a vital quantity for correct operation of ground distance elements. However, spurious zero-sequence current resulting from CT saturation and CT errors, switch-off transients during double-line and three-phase faults, and system imbalance can lead to improper operation of the ground distance element. To increase ground distance security during multi-phase faults with specifically low settings of OC supervision, a positive sequence current restraint of 5% was added to overcurrent supervision. Now the current value has to be higher than  $[I_n - 0,05 \times I_{L1}]$  in order to release ground distance operation.

This enhancement allows the ground distance element to deal with ground faults while having a remote single pole open scenario.

These changes increase the ground distance element selectivity, ensuring additional tripping security.

## E 170-3 **Ground distance elements were enhanced to increase selectivity and speed**

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

The ground distance protection algorithms were modified to add additional supervision to the directional and phase selection elements and to increase speed. Now the supervision element depends on I2 and 3I0 current values and, in terms of speed, the coordination timer for current reversal was changed from 4.5 to 1.0 cycles of pickup delay.

## E 170-4 **Increased range for current pickup levels on the “Negative Sequence Directional Overcurrent” element**

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

With firmware version 1.70, the lower limits of the Forward and Reverse current pickup levels have been reduced from 0.05 per unit to 0.015 per unit. In addition, the minimum step has been changed from 0.01 to 0.005. The new range is 0.005 to 30.000 per unit.

The new setting range and minimum step for the “Forward Pickup” and “Reverse pickup” settings increase the relays selectivity and sensitivity by allowing the customer lower pick-up levels with finer adjustment.

## E 170-5 **Increased minimum current pickup levels to the “Neutral Directional Overcurrent” element**

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

With version 1.70, the minimum Forward and Reverse current pickup levels have been increased from 0.002 to 0.006 per unit.

The new setting range for the current “Forward Pickup” and “Reverse pickup” settings is 0.006 to 30.000 per unit.

## F 170-6 **Neutral and Negative sequence directional elements “67N” and “67\_I2” ensure proper selectivity when the negative sequence current value is zero**

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

Neutral directional element “67N” and Negative sequence directional element “67\_I2” have an additional

## UR<sup>Plus</sup> revision 1.73 release notes

supervisor unit that blocks these protection elements if either the polarizing voltage or the operating current is below their cutoff level. Current and voltage cutoff levels are defaulted at 0.02pu.

### E 170-7 **Phase overvoltage pickup upper limit increased to 3.00 per unit**

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

With version 1.70, the upper limit of the phase overvoltage elements “59P” was increased from 1.100 to 3.000 per unit.

The new pickup setting range for the phase overvoltage elements is 0.000 to 3.000 per unit. This change increases the relay selectivity by allowing the customer to set a high pick-up instantaneous-operation overvoltage unit.

### E 170-8 **Increased range for time settings on the “Disconnect” switch elements**

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

The “Disconnect” switch elements have time settings that define the “Operate Time” and the “Discrepancy Time” of each disconnect switch associated with the device. With version 1.70, the time-range for those settings was increased from 0.000 - 2.000 to 0.000 – 60.000.

This change allows the UR<sup>Plus</sup> device to cope with slow motion disconnect switches.

### F 170-9 **Enhanced validation method on the frequency measurement adds more security to the df/dt frequency element when frequency values are read from the auxiliary voltage input**

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

This firmware version introduces a new method to validate the frequency values that are used for all frequency elements to operate. This change increases the consecutive quantity of validated frequency values needed to update the frequency measurement before it is used for the frequency elements.

The change ensures that the correct operation of the df/dt element when sensing transitional frequency changes through the single phase auxiliary VT connection.

For customers that are using the df/dt frequency elements linked to the auxiliary VT connection input, updating their relays to FW version 1.70 is recommended.

### E 170-10 **Additional automation “Selector Switch” elements**

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

The quantity of automation “Selector Switch” elements was increased from two to 10 elements.

## Communications

### E 170-11 **New communication setting allows the UR<sup>Plus</sup> web server function to be enabled or disabled**

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

A communication setting was added to the Network / HTTP configuration of the UR<sup>Plus</sup> device. It allows customers to enable or disable the web server function whereby UR<sup>Plus</sup> data can be viewed in a web browser over the Internet or LAN. When set as enabled, customers can view the UR<sup>Plus</sup> device settings and actual values by entering the IP address of the UR<sup>Plus</sup> device.

**E IEC61850 unbuffered reports have been changed to have independent report control configuration settings, and have been increased to three**

170-12

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

With version 1.70, separate settings for the unbuffered report control block have been added. This allows unbuffered reports to be independently configured from the buffered reports.

Moreover, two additional IEC61850 unbuffered reports are now available for a total of three unbuffered reports. Each unbuffered report supports logical nodes GGIO-1, GGIO-4, and MMXU-4, and it is visible to all five-client connections.

**E UR<sup>Plus</sup> device supports a new IEC61850 generic logical node "GGIO5"**

170-13

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

Version 1.70 adds an IEC61850 generic logical node to the UR<sup>Plus</sup> device. The new logical node is named "GGIO-5" and has been introduced to control the 128 automation virtual inputs that are available in the UR<sup>Plus</sup> device. The new logical node supports both direct and select-before-operate control models with standard security.

**E IEC61850 generic logical node "GGIO-3" to support up to 128 analog values**

170-14

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

With version 1.70, the quantity of "analog data items" supported by the logical node GGIO-3 has been increased from 16 to 128.

**E IEC61850 GOOSE messages to have selectable retransmission profiles**

170-15

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

Configurable IEC61850 GOOSE messages have been enhanced to have programmable retransmission profiles through a new setting added to each configurable GOOSE (Data sets 1 to 8).

The new setting has four profile choices that are outlined in the table.

Scheme	Sq Number	Time from last Tx (ms)
Aggressive	0	0
	1	4
	2	4
	3	8
	4	16
	5	32
Medium	6	Heartbeat
	0	0
	1	16
	2	16
	3	32
	4	64
Relaxed	5	128
	6	Heartbeat
	0	0
	1	100
	2	100
	3	200
	4	400
	5	200
	6	Heartbeat

None	0	0
	1	Heartbeat
	2	Heartbeat
	3	Heartbeat
	4	Heartbeat
	5	Heartbeat
	6	Heartbeat

Additionally, each configurable GOOSE data set has a new setting to define the “Minimum time to live.” This period is either 50 ms or four times the retransmission interval, whichever is longer. The subscriber device counts the time after each data reception, and when that count reaches the time to live value, a “Remote Device Off” alarm is generated.

**C IEC61850 GOOSE data sets have been changed to prevent message transmission when the UR<sup>Plus</sup> device reboots**

170-16

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

A change in the existing IEC61850 data sets ensures that there is not incorrect status change detection when the UR<sup>Plus</sup> device reboots.

Previous firmware versions transmit all the configured GOOSE messages upon improper status change detection.

It is strongly recommended that a UR<sup>Plus</sup> device configured to use GOOSE messages as part of a protection and/or control scheme be updated to firmware version 1.70.

**C New cyber-security feature protects UR<sup>Plus</sup> protection and control functionality from being disrupted by high-traffic cyber attacks**

170-17

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

A traffic-limiting element has been added to the UR<sup>Plus</sup> Ethernet ports to ensure that the protection and control elements are not affected by high traffic volume on the Ethernet ports.

A UR<sup>Plus</sup> device without Ethernet ports does not benefit from this feature.

## Platform

**E UR<sup>Plus</sup> devices have been enhanced to support “Customized Operand Names”**

170-18

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

UR<sup>Plus</sup> devices now have a new setting screen named “Configure Flex-operands” that allows customers to give custom names to all existing FlexLogic operands – **Customized Operand Names**. A maximum of 1024 FlexLogic operands can be customized and a maximum of 20 characters per operand are allowed.

All the renamed operands use the custom name across all the elements available within the UR<sup>Plus</sup> device (logic, event recorder, actual values, and so on).

The customization level offered by this feature fits well in bay controller applications.

**G Customizable names for protection settings groups have been substituted by “customized operand names”**

170-19

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

Previous firmware versions had settings that allowed users to customize the name of each protection-setting group. These names were displayed only when looking at the settings file.

As part of the “customized operand names” enhancement, the setting group names are substituted. The custom name is now available for each setting group operand and can be shown and recorded whenever the setting group is active.

**G** **Firmware upgrade routine has been changed to ensure that the upgrade process is finished when done through Ethernet port two or three**

170-20

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

Changes done to the upgrade routine ensure the successful completion of the firmware upgrade when carried out through either Ethernet port two or three.

Two new operands have been added to indicate the firmware upgrade status. These are “FIRMWARE UPGRADE: DONE” and “FIRMWARE UPGRADE ERROR.”

When upgrading the firmware through Ethernet port two or three, previous firmware versions might break the communication link between the relay and the computer before finishing the upgrade process.

**B** **Some UR<sup>Plus</sup> internal operands have been changed to have shorter names**

170-21

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

Some of the UR<sup>Plus</sup> FlexLogic operands have been renamed to have shorter names. Old and new names are listed as follows:

Old Name	New Name
DATA LOG CH1 HI ALM OFF ->	D LOG CH1 HI ALM OFF
DATA LOG CH1 HI-HI ALM OFF ->	D LOG CH1 HI-HI ALM OFF
DATA LOG CH1 LO ALM OFF ->	D LOG CH1 LO ALM OFF
DATA LOG CH1 LO-LO ALM ->	D LOG CH1 LO-LO ALM
BKR ARC 1 MAX INT OP ->	BKR ARC 1 MAX IN OP
BKR ARC 1 MAX INT DPO ->	BKR ARC 1 MAX IN DPO
BKR ARC 2 MAX INT OP ->	BKR ARC 2 MAX IN OP
BKR ARC 2 MAX INT DPO ->	BKR ARC 2 MAX IN DPO

The change was made because the extra characters of these FlexLogic operands caused the relay to crash if they were programmed as digital channels in the Transient or Disturbance recorder and Comtrade files were retrieved.

**D** **UR<sup>Plus</sup> front panel to show the correct firmware version just after finishing a firmware upgrade**

170-22

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

Changes made to the front panel to allow the firmware version information to be updated right after finishing a firmware update.

UR<sup>Plus</sup> devices with previous firmware versions show the version after the power is cycled.

## Records

**R** **Fault Report to guarantee accurate records when VTs are in delta**

170-23

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

The UR<sup>Plus</sup> fault report algorithm has been improved to ensure that pre-fault and fault phase-to-neutral voltage phasors are properly computed and stored within fault reports when VTs are in delta configuration and the “VT substitution” setting is enabled. Also, the fault report is enhanced to display only those elements that operated at trigger.



**E**      **UR<sup>Plus</sup> device able to register a firmware upgrade event**  
170-24

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

A new event entry has been added to the UR<sup>Plus</sup> devices. It is named "FIRMWARE UPGRADE" and registered by the event recorder. The event appears when a firmware upgrade has been completed successfully.

## HMI Changes

**N**      **New functions for the Annunciator Panel extend UR<sup>Plus</sup> capability and flexibility**  
170-25

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

The functionality of the UR<sup>Plus</sup> annunciator panel has been modified to increase its capabilities and to deliver additional flexibility. The new functions are as follows:

- **New remote clear command for latched-alarms** – This function allows all alarms set as "latched" to be locally or remotely cleared through a configurable FlexLogic operand.
- **New content configuration for annunciator cells** – Every annunciator cell can now be configured as an Actual Value (analog operands – V, A, Hz, and so on), Alarm (digital operand with text), or mixed content. The analog values are updated every half second and can have customized units, scale factor, multiplier, and so on.
- **New configurable alarm type** – When the annunciator cell is set to "alarm," the type of alarm can be configured as "Acknowledgeable," "Self-reset," or "Latched". This setting rules the alarm behavior after it is activated.
- **New navigation functionality** – This function allows users to create a customized page-promoting model based on configurable FlexLogic operands. The promoting model is the one that chooses which annunciator page goes on top of the others and then is the one shown on the annunciator screen. Previous firmware versions had a fixed and pre-defined promotion model, the new firmware version allows the user to choose between the previous or customized model.
- **New text color setting** – This setting allows the customer to choose the color of the text within an inactive cell. Previous firmware versions only allowed choosing the background color.

**N**      **New functionality given to the mimic diagram extends HMI operability**  
170-26

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

The UR<sup>Plus</sup> mimic diagram functionality has been modified to increase operability. New functions are as follows:

- **More user-programmable pushbuttons** – The number of user-programmable pushbuttons has been increased from 20 to 30. Each of the 10 physical pushbuttons can be independently used on three control layers. Each layer can be reached through the control button on the bottom of the mimic diagram. These pushbuttons can also be set to control selector switch elements.
- **New metering summary editor** – This function allows users to create up to four configurable metering pages. Each page can have either text or analog operands. Metering pages can be reached through the metering button on the bottom of the mimic diagram.
- **New mimic diagram Basic and Selected Levels** – The mimic diagram has been enhanced to have independent and configurable screens for two operation levels, "Basic" and "Selected." From the Basic level screen, users can select any dynamic asset in the diagram (breaker, disconnect switches). Once a dynamic device is selected, the screen goes to the Selected level screen where users can operate the

dynamic asset. There are 10 Selected screens for every Basic screen. The D90<sup>Plus</sup> has one Basic screen; the C90<sup>Plus</sup> has three Basic screens.

- **ANSI disconnect switches support colors** – Disconnect switches can now be configured to use red or green to mark the open or closed state.
- **Additional metering blocks available** – The number of metering blocks supported by a single mimic diagram was increased from six to 10.

## UR<sup>Plus</sup> Setup Software

### C UR<sup>Plus</sup> Setup software has been changed to ensure that settings files are correctly converted from version 1.50 to 1.60

170-27

Applicable: C90<sup>Plus</sup>, D90<sup>Plus</sup>

The UR<sup>Plus</sup> Setup software has been modified to ensure that the setting file conversion process is correctly carried out and finished when settings files are converted from version 1.50 to 1.60.

When doing the setting file conversion using a previous software version, the software showed an error message and stopped converting the file.

## Upgrade Paths

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Customers can upgrade to the latest version of UR<sup>Plus</sup> firmware to take advantage of the latest developments and feature enhancements. Firmware upgrades can be performed using the EnerVista UR<sup>Plus</sup> Setup software. This software can also convert settings files from an older version to the latest version and provides a Difference Report once the conversion is complete. This Difference Report identifies new settings and additional information to assist the user during the upgrade.

### Upgrade path for versions 1.70 and above

For UR<sup>Plus</sup> devices having revision “B” CPU or firmware version 1.70 and above, the revision 1.70 release can be uploaded to the relay using the EnerVista UR<sup>Plus</sup> Setup software.

The fourth character of the UR<sup>Plus</sup> device serial number identifies the CPU revision. Revision “B” CPUs are identified with the letter “D.” The serial number can be seen on the device label or annunciator screen.

An example is

**C90P-HE-PE03SSS-XHDAADCE01X**

**Serial Number:** mp4d10000016

### Upgrade path for revisions 1.60 and below

For UR<sup>Plus</sup> devices that have other CPU revision or firmware versions 1.60 and below, contact GE Digital Energy customer service. Those units require hardware updates to support newer firmware versions.

## Appendix

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### Change Categories

This document uses the following categories to classify improvements.

**Table 1: Revision categories**

Code	Category	Comments
N	New feature	A separate feature added to the relay. Changes to existing features even if they significantly expand the functionality are not in this category.
G	Change	A neutral change that does not bring any new value and is not correcting any known problem
E	Enhancement	Modification of an existing feature bringing extra value to the application
D	Changed, incomplete or false faceplate indications	Changes to, or problems with text messages, LEDs, and user pushbuttons
R	Changed, incomplete, or false relay records	Changes to, or problems with relay records (oscillography, demand, fault reports, and so on)
C	Protocols and communications	Changes to, or problems with protocols or communication features
M	Metering	Metering out of specification or other metering problems
P	Protection out of specification	Protection operates correctly but does not meet published specifications (example: delayed trip)
U	Unavailability of protection	Protection not available in a self-demonstrating way so that corrective actions can be taken immediately
H	Hidden failure to trip	Protection does not operate when appropriate
F	False trip	Protection operate when it is not appropriate
B	Unexpected restart	Relay restarts unexpectedly

## GE Technical Support

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GE contact information for product support is as follows:

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