GE Digital Energy

UR Universal Relay Series

Revision 5.72 Release Notes

GE Publication Number: GER-4419C

Overview

Summary

GE Multilin issues the UR 5.72 release that introduces improvements for general and protection functions in the UR Family. The features that were modified in this release are:

- Line Differential: Communication changes for 3 terminal applications.
- Motor Protection
  - Changes to the voltage dependent thermal overload model.
  - Thermal model and replacing CPU module
- Common protection and control elements
  - Changes to the negative sequence elements, Synch check, ground time overcurrent, Auto-reclose, IEEE very-inverse curve, dual breaker control logic and Negative sequence and neutral directional elements
- Communications
  - Communication Enhancements: Changes to IEC60870-5-104 protocol
  - Enhancements to IEC61850 un-buffered RCB and GOOSE analogs into flexelements
- PMU Synchrophasor
  - Recorder Time Stamp
- Events and records
  - Real time clock with DST
- Platform
  - Latching type contact output
  - Non-volatile latches

This document contains the release notes for the 5.72 release of the Universal Relay (UR) Family.

- Affected products: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60
- Date of release: Aug 18th, 2011
- Firmware revision: 5.72

This document also comprises the release notes of previous 5.7x firmware versions.

If uses have existing UR Family relays installed with older version of firmware, they can download and install this new firmware to benefit from the enhancements described in this release note. If the user does not require these new features and enhancements, no upgrading of the relays is required.

Products Affected

This release encompasses the following UR Family products:

- B30 Cost Effective Bus Differential System
- B90 Low Impedance Bus Differential System
- C30 Controller System
- C60 Breaker Protection System
- C70 Capacitor Bank Prot & Ctrl System
- D30 Line Distance Protection System
- D60 Line Distance Protection System
- F35 Multiple Feeder Protection System
- F60 Feeder Protection System
- G30 Generator & Transformer Protection System
- G60 Generator Protection System
- L30 Line Current Differential System
- L60 Line Phase Comparison System
- L90 Line Current Differential System
- M60 Motor Protection System
- N60 Network Stability and Synchrophasor Measurement System
- T35 Transformer Protection System
- T60 Transformer Protection System

Firmware Compatibility

The new 5.72 firmware that is a part of this release is compatible with the UR series hardware version 4.00 and higher.

The use of the new 5.72 firmware requires the EnverVista UR Setup software to be version 5.7x and higher. GE Multilin suggests users to used the latest version available of UR Setup software.

Rev1: Updates release notes for FW version 5.71

FW 5.72 Release details

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

Line Differential Systems L90, L60, L30

U

L90's inter-relay communication for three-terminal schemes has been changed to ensure communication is restored between all L90 devices when a channel failure condition is cleared (rev. 1).

553-3

Applicable: L90.

As a standard behavior, a three terminal line differential scheme will raise "PFLL Fail" (synchronization) and "CH fail" operands on all three terminals when both communication channels fail on at least one terminal.

However, if only one channel goes back to normal, L90s on all terminals might still show PFLL fail and CH Fail, and neither the communication nor the differential protection are restored.

If your relay's FW version matches any of the listed below no action is required.
FW versions that fix this issue: 3.49, 4.43, 5.04, 5.24, 5.53, 5.72

Motor Protection Systems

F

Changes to Voltage Dependent Thermal overload element add security when starting very high inertia motors

572-1

Applicable: M60.

Two key variables of the Thermal overload protection element have been changed to increase the element's security:
- The "Voltage Dependent Thermal Overload curve" has been modified (10% more Stall current at 100% volts) to give motors a longer acceleration time. This is especially useful when protecting very high inertia motors
- Negative sequence currents are now filtered to properly bias the equivalent motor heating current "Ieq" when the relay senses significant motor load changes.

If either your thermal overload element is not set for voltage dependent or your relays' FW version matches any of the listed below, no action is required.
FW versions that fix this issue: 5.72

F

Changes to the Thermal model element prevent an inadvertent trip event when the relay is powered-up after replacing the PWR supply or pulling out and back in the CPU module.

554-1

Applicable: M60.

The motor thermal protection element has been modified to ensure that it does not trip when the relay is powered up after the CPU module is disconnected from the battery on the PWR supply module. This condition is met when pulling out-and-back in either the CPU or PWR supply module, or when replacing the power supply module.

Previous firmware versions might allow the Thermal protection element to misoperate when under the described conditions.

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If end-users maintenance procedure requests the motor to be stopped or your trip command to be isolated when working on the protection relay, the described exception does not affect your motor protection scheme. However, the thermal element could operate so your relay has to be reset before it goes back to service.

If your relay's FW version matches any of the listed below no action is required.
FW versions that fix this issue: 4.43, 5.24, 5.54, 5.72.

Common Protection Systems

E

The "Negative Sequence Directional Overcurrent" element has been enhanced to deliver additional security during phase-to-phase fault conditions

580-14

Applicable: D30, D60, F60, G30, G60, L60, L90

The Negative Sequence Directional Overcurrent "67_2" element has been enhanced with a restraint factor that increases the element security when positive sequence current values are higher than 0.8pu (high fault-currents that are typical for phase-to-phase faults). This restriction is enabled when the element is set to operate on the "Zero-sequence" current.

In addition to this, the operating current formula has been modified to consider a bigger portion of the positive sequence current when compared with the negative sequence component. This also increases the element security

P

The Synchrocheck elements have been changed to correctly detect a dead source when set to "DV1 XOR DV2"

581-3

Applicable: C60, D30, D60, F60, G30, G60, L30, L60, L90, N60, T60

When the "Dead Source Select" setting within the Synchrocheck element is set to "DV1 XOR DV2", the element has to determine two conditions: a) one of the sources is dead evaluating existing voltage vs. the "Dead V1/2 Max Volts" setting, and b) the other source is live evaluating existing voltage vs. the "Live V1/2 Min Volts" setting.

Previous FW versions have the synchrocheck elements verifying dead source by evaluating the existing voltage vs. the "Live V1/2 Min Volts" setting when set as mentioned above. And then the element incorrectly declares dead source.

Changes to the Synchrocheck elements ensure they evaluate the existing voltage vs. the right setting.
This issue does not affect customers who have the "Dead Source Select" setting set different to "DV1 XOR DV2".

P

Ground Time Overcurrent elements have been changed to use the correct signal input when set to "phasor"

581-2

Applicable: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, T35, T60

The "input setting" within the overcurrent elements determines the type of signal input the elements would use for its operation. Phasors or RMS current can be set to the "input setting".

Changes to the ground time overcurrent elements ensure they operate based on the ground current phasor magnitude when their "input setting" is "phasor".

Previous FW versions have the ground time overcurrent elements operating based on the "RMS" current value whether "RMS" or "phasor" were set to the "input setting".

If your relay's FW version matches any of the listed below no action is required. FW versions that fix this issue: 5.24, 5.81, 5.72

P   **The Autoreclose element has been changed to ensure it goes to "lockout" state when the element is blocked and unblocked while in "reclose in progress"**

581-4

Applicable: D30, F35, F60, L30

If the operand set to the "AR Block" setting is activated when a reclose cycle is in progress, the autoreclose element goes to "Lockout" state.

However, if while in such conditions the "AR Block" is subsequently removed, previous FW versions may allow the reclose element to execute reclose shots.

Changes to the autoreclose element ensure the element will stay on "lockout" state when the described conditions are present.

If your relay's FW version matches any of the listed below no action is required. FW versions that fix this issue: 5.24, 5.81, 5.72

P   **Changes to the "IEEE Very Inverse overcurrent curve" ensure accurate tripping times when configured with very low pickup value**

590-15

Applicable: B30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, T35, T60.

This FW version introduces changes to the "IEEE Very Inverse Overcurrent Curve" that make its operating time to better match the specification when the configured pickup value is lower than 0.1 per unit.

Devices with previous FW versions can operate faster than the specified time under such conditions.

Users which Time Overcurrent applications require pickup values higher than 0.1 per unit, are not affected by this issue.

If your relay's FW version matches any of the listed below no action is required. FW versions that fix this issue: 5.72, 5.90

C   **Breaker and switch elements have been changed to ensure they show the right status when there is no feedback from the breaker/switch auxiliary contacts and to comply with the IEC61850 standard**

590-12

Applicable: B30, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60

"Breaker" and "switch" elements declare status depending on the breaker's / Switch's auxiliary contact feedback (normally open and normally close contacts).

This FW version introduces changes to the Breaker and switch elements logic that ensure the proper status indication when there is no feedback from the auxiliary contacts (No DC voltage on both normally open and normally close contacts).

On top of that, the logic related to both "Bad" and "Intermediate" status was modified to comply with the IEC61850 standard (00 = "intermediate", 11 = "Bad")

For further information on these subject please refer to the UR devices instruction manual

If your relay's FW version matches any of the listed below no action is required. FW versions that fix this issue: 5.72, 5.90

U   **The "Negative Sequence and Neutral Directional Overcurrent" elements have been modified to deliver enhanced security and dependability when sensing very low levels of V2 (V0) and significant levels of I2 (I0)**

572-2

Applicable: C70, D30, D60, F60, G30, G60, L30, L60, L90, M60, T60

This FW version introduces important changes to the "Negative sequence directional" and the "Neutral directional" overcurrent elements. which improve the element's security and dependability

(1) Polarizing voltage compensation with offset impedance is only applied when the current magnitude I2 or I0 exceeds 0.2pu. This avoid overcompensation that might lead to possible directionality errors when in presence of conditions with low levels of I2 or I0 currents

(2) Both polarizing and operating quantities are now checked against cutoff level settings that are selectable by the user at "Product Setup\Display Properties" for application flexibilities.

If your relay's FW version matches any of the listed below no action is required. FW versions that fix this issue: 5.72

Communications

E   **UR IEC6870-5-104 implementation has been enhanced to support "Test command with Date/Time"**

572-3

Applicable: B30, B90, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60

IEC60870-5-104 determines that slave devices should respond with a 16-bit value (test sequence counter) and its corresponding timestamp when a test command is received.

This FW version enhances the UR IEC60870-5-104 protocol implementation to the described test command.

C   **The "IEC104 Point Lists" element has been changed to properly display analog values when only one analog point is programmed.**

572-4

Applicable: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

The IEC60870-5-104 protocol supports a configurable point list element that can be programmed with binary or analog inputs.

Previous FW versions may not display analog values properly when only one analog point is programmed.

If your relay's FW version matches any of the listed below no action is required.
FW versions that fix this issue: 5.72

C **The "IEC104 Point Lists" element has been changed to ensure the entire list is retrieved when all analog points are being used.**

572-5

Applicable: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

The IEC60870-5-104 protocol supports a configurable point list element that can be programmed with binary or analog inputs.

Previous FW versions may not allow IEC60870-5-104 masters to retrieve all the analog values when all the 255 analog points are programmed.

If your relay's FW version matches any of the listed below no action is required.
FW versions that fix this issue: 5.72

C **Two additional IEC61850 un-buffered reports are now supported by the UR family (3 un-buffered reports total)**

580-17

Applicable: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

UR IEC61850 implementation now supports two additional un-buffered report control block instances. These control blocks report data from GGIO1, GGIO4 and MMXU1...6 logical nodes.

The total number of existing IEC61850 report control blocks per logical node mentioned above within the UR are:
3 Un-buffered reports
2 buffered report

C **UR Flexelements have been changed to properly operate when programmed to use IEC61850 GOOSE analogs inputs.**

572-6

Applicable: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

The UR Flexelements are universal comparators that can calculate net difference or monitor UR actual analog values.

Previous FW version may allow Flexelements to improperly apply the unit base value when IEC61850 GOOSE analog are set as the flexelement's input, which may lead to an incorrect operation of the flexelement.

If your relay's FW version matches any of the listed below no action is required.
FW versions that fix this issue: 5.72

C **DNP 3.0 protocol to properly report internal time delays under DNP object 52**

504-5

Applicable: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L60, L90, M60, N60, T35, T60.

The DNP3.0 protocol has been changed to accurately estimate and report the value of "time delay fine" that is comprised within the DNP 52 object. This time represents the period between the time of message reception and the time of message reply by the UR relay and helps the DNP master to calculate the delay on the serial wire.

C

581-6

Changes to the GGIO4 data set prevent "Data Access Errors" in its un-buffered report control block

Applicable: B30, B90, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60

GGIO_4 and GGIO_1 data sets have three report control blocks each. When at least four or more data items are configured in GGIO_4 and eight or more within GGIO_1, FW versions 5.71 and 5.80 may allow the GGIO_4 Un-buffered Report Control Block to show the following message "Data Access Error: type-inconsistent".

The changes implemented to GGIO_4 with this release fix this communication issue

C

572-7

UR IEC6870-5-104 implementation has been changed to prevent slave devices from issuing start request command

Applicable: B30, B90, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60

IEC60870-5-104 determines that only master devices should issue StartDT requests. UR relays are 60870-5-104 slave devices and then should not issue this request.

Previous FW versions allow UR devices to issue a StartDT request when receiving a connect request from the IEC60870-5-104 master.

If the IEC60870 protocol is not being used or your relay's FW version matches any of the listed below no action is required.
FW versions that fix this issue: 5.72

PMU Synchrophasor

M
554-3

Changes on Synchrophasor Timestamp ensure an accurate time stamping of the PMU trigger

Applicable: N60, D60, L90, G60.

The PMU recorder element has been modified to ensure the trigger is accurately time stamped.

Previous FW version may time stamp the trigger event with the time of the previous PMU reporting interrupt.

All customers using UR PMU functionality should upgrade their devices

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Events and Records

R

The "Real Time Clock" element has been modified to ensure events-timestamp is correct when the DST function is active and power is cycled.

590-14

Applicable: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60

The Real Time Clock element has a Daylight Saving Time "DST" functionality that allows the device to follow the DST local rules.

Previous FW versions show that if the DST function is active and the device auxiliary power is cycled, the events timestamp could shift one hour from the actual time.

This FW version ensures the DST time is preserved when the auxiliary power is remove from the relay. Furthermore, the DST function setting is correctly applied to the timestamp that is shown on the fault report summary page when accessed through URsetup software or web-browser

UR Platform

P

The "Non-Volatile Latches" elements have been changed to ensure they will maintain the output status when cycling power to the relay

581-5

Applicable: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60

Changes to the Non-volatile Latches ensure those elements will maintain the output status (on or off) when the relay is power off and on.

Previous FW versions could allow the elements' output to momentarily change state when the relay power is cycled.

Customers using the "non-Volatile Latches" for protection or control purposes are advised to upgrade their relays FW version.

C

Logic of the Latching type Contact outputs has been modified to ensure contact outputs correctly exit from Test Mode

590-22

Applicable: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

The UR test mode functionality allows users to force the actual state of programmable contact outputs. However, latching type contact outputs found in the I/O modules didn't update their state to the real condition when returning from Test Mode.

This FW version ensures the latching type contact outputs will effectively update their state to the actual device condition after coming back from Test Mode.

(Previous) FW 5.71 Release details

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

Bus Protection

D

571-1

"Digital" and "Trip Bus" elements to turn on the correct LED in the front panel when the element operates.

Applicable: B90.

This firmware version ensures the LED identified as "other" lights on when either "Digital elements" or "Trip Bus elements" operate. Relays with previous firmware versions turn on the "Bus Zone 1" LED when any "Digital" or "Trip Bus" element operates.

This issue does not affect internal operands, flags, or protection elements.

C70

H

571-2

The Neutral current unbalance element "60N" was modified to effectively operates when the element is set to a source different from source # 1.

Applicable: C70.

Sources are used to link the relay's internal elements to the current and voltage inputs (CT/VT), this link is defined using a setting. When a three-phase current input is assigned to any source other than # 1 and the Neutral Current Unbalance Element is linked to the same source, the protection element may not operate.

Firmware version 5.71 ensures that the neutral current unbalance element "60N" always operate when the "Neutral Current Unbalance # Bank Source" setting is configured to a source other than source #1. Customers with C70 relays set as mentioned above are encouraged to upgrade to firmware version 5.71.

Protection elements are typically set to Source #2 when the relay has more than one set of 3-phase current inputs.

If your 60N element is set this way, the issue will be detected during commissioning tests. If your C70 already passed the commissioning tests, no action has to be taken.

M60

U

571-3

Enhanced thermal overload element prevents permanent lockout after a motor thermal overload trip when the element is disabled or the relay is powered off.

Applicable: M60.

When the thermal overload element "49" operates, it is intended to go to a lockout state until the motor temperature returns to a safe level. This is known as motor cooling time, and the thermal lockout automatically resets after this period. However, there were specific situations where the Thermal overload element may trip and stay permanently locked out unless an emergency re-start is performed. These conditions are:

1. When in thermal lockout state, the thermal element is disabled and, after the motor cooling time has elapsed, the thermal element is enabled again. It is important to remark that changing settings during a thermal lockout is not a normal procedure.

2. When in thermal lockout state, the relay is powered off and, after the motor cooling time has elapsed, the relay is powered on again.

Under these conditions the thermal lockout remained on until an emergency re-start command was performed.

Users who perform procedures as described above are advice to update the FW version to 5.71.

Common Protection & Control Elements

F

571-4

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: F35, F60, G30, G60, L30, M60, N60, T60

This firmware version introduces a new method to validate the frequency values that are used for all the frequency elements to operate. This changes 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 the correct operation of the df/dt element when sensing transitional frequency changes through the single phase auxiliary voltage input.

For customers that are using the df/dt frequency elements linked to the auxiliary voltage input, updating their relays to FW version 5.71 is recommended.

M

571-5

Sensitive directional power element to correctly update its actual value when the element is in blocked state.

Applicable: G30, G60, F60, M60, N60

This firmware version ensures that "sensitive directional power" actual value shown by the relay is properly updated when the "sensitive directional power" element is blocked. Previous firmware versions allow this value to freeze on the value the relay showed just before the element was blocked.

This issue doesn't affect the correct operation of the protection element, just the power value that is shown.

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B

Two-terminals redundant Inter relay communication was enhanced to prevent the local relay from rebooting if power cycled after the remote relay.

571-15

Applicable: B30, C30, C60, C70, D30, D60, F35, F60, G30, G60, L60, M60, N60, T35, T60.

This firmware version ensures that, for two terminals-redundant channel applications, the relay in one end would not reboot when it has been powered on after the relay in the other end.

This issue does not affect relays with firmware version prior to 5.40.

Communications

G

UR devices to show the encrypted form of the password when communicating with a PC through web browser software.

571-6

Applicable: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

The UR devices support communication through standard web-browser software such as Internet Explorer. Customers using this medium to access to the relay's modbus memory map may see that the encrypted form of the password is not shown on the respective addresses (4000, 4002). This firmware version ensures the encrypted form of the password is shown in the respective address when users connect with the relay using web-browser software.

PMU - Synchrophasors

M

Changes on Synchrophasor Timestamp ensure the correct rollover of milliseconds' field

571-7

Applicable: N60, D60, L90, G60.

During continuous polling of PMU data it was found that "the seconds' field" of synchrophasors timestamp didn't show the correct rollover from milliseconds approximately once every 45 minutes. As a consequence, every 45 minutes one package of PMU data may show an incorrect time stamp on the mili-seconds field.

Firmware version 5.71 corrects this issue.

Fault and Event Recorders

R

The Fault Report element was modified to guarantee accurate fault location when VTs are WYE connected and the "VT substitution" setting is set to zero sequence current "I_O"

571-8

Applicable: B30, B90, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, T35, T60.

The UR fault report algorithm was modified to ensure an accurate measure of fault distance "fault location value" for all scenarios of VT configuration and Fault Report settings. Previous firmware versions could show an imprecise "fault location value" when the setting "Fault report VT substitution" is set to "I_O" and VTs are WYE connected.

The setting "Fault report VT substitution" is required to be set as "I_0" when VTs are in Delta and there isn't an available source of "3VO" (eg. broken-delta connected VTs).

Transducer Inputs

M
571-9

Transducer "DCMA outputs" have a new pu-base value when assigned to frequency values

Applicable: B30, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

The transducer DC mili-Amps output elements were modified to have a new pu-base value when the setting field "DCMA output source" of an analog output element is set to frequency values. The new pu-base value is 1Hz (1pu = 1Hz).

Previous firmware versions have a pu-base value of 1pu = 100Hz.

Customers using the transducer DC mili-Ampere output to represent frequency values are advice to review their settings and re-test this function after upgrading their device with FW version 5.71

Enervista UR Setup Software

G
571-10

Motor Settings Auto Configurator was changed to effectively populate the M60 setting file.

Applicable: M60.

The UR setup software has a "Motor Settings Auto-config" tool that automatically generates a setting file that suits the motor and scheme characteristics (FLA, LRA, CT, PT, etc).

The motor configurator was changed to properly update the M60 setting file once the user finished the Auto-config routine. Previous versions of the configurator left the file with default settings.

G
571-11

Print and Print preview functions were changed to show the proper source selection setting.

Applicable: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Some protection elements have a "source selection" setting that connects the element itself to a single or group of CT/VT inputs.

When printing a setting file, this setting was displayed as "Source 1" all the time even if it was set to a different source.

This issue doesn't affect or change the settings within the setting file, just the information shown on the setting file printed version.

G
571-12

UR Setup software was updated to show the "CT Trouble Zone 2" element on the B30 Bus Differential system.

Applicable: B30.

The settings screen logic of UR Setup software was updated to display the CT Trouble Zone two element that is embedded in the B30 Bus differential system. Previous UR setup software version didn't show this screen, however settings were available via B30's front panel.

The second differential zone was added to the B30 in UR Firmware version 5.70.

G

571-13

UR Setup software was updated to show the "Transducer I/O" screens on the T60 Transformer Differential system.

Applicable: T60.

The settings screen logic of UR Setup software was updated to display the "Transducer I/O screens" when the RRTD module is the only source of RTD inputs connected to the T60. Previous UR setup software version didn't show these screens, however settings were available via T60's front panel.

The RRTD module support was added to the T60 in UR Firmware version 5.70.

E

571-14

UR Engineer software to support the "IEC 61850 configurator" tool.

Applicable: VP UR Engineer, B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

The traditional **Viewpoint Engineer** software (version 3.30) supports the following functionality:

Standard Functionality	Optional-Advanced functionality "System Designer" option
Logic Designer	System Designer
Logic Monitor	System Monitor
Front Panel Report	Connectivity Report
Comtrade Viewer	IEC61850 configurator

With UR FW version 5.70, the standard functionality (Logic designer, Logic monitor, Front panel report and Comtrade Viewer) of **VP Engineer 3.30** evolved to **VP UR Engineer 5.70**.

The advanced functionality (System Designer option) of **VP Engineer 3.30** is still under development and will be released as follows:

Optional-Advanced functionality "System Designer" option	Software Version - period
System Designer	5.80 – Q1 2010
System Monitor	5.80 – Q1 2010
Connectivity Report	5.80 – Q1 2010
IEC61850 Configurator	5.71 – now available ✓

Customers having UR devices with FW version 5.7x should use VP UR Engineer 5.7x.

(Previous) FW 5.70 Release details

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

Bus Protection Enhancements

N   **Additional protection flexibility to the Bus Differential System "B30" through the addition of a 2nd differential zone.**

Applicable: B30.

The low impedance bus differential protection system "B30" delivers more flexibility for protection schemes by adding an independent second bus differential zone. This 2nd zone is identical to the 1st one (settings, operands, targets) and enables the "B30" to suit bus bar applications for two separate small bars, split bars or single bus bar with supervision zone.

E   **Enhanced bus differential element "87B" prevents miss-operation due to an unblocking command.**

Applicable: B30, B90.

This firmware version ensures that unblocking the 87B element does not generate a miss-operation. Previous firmware version could allow the differential element to miss-operate when a block condition was removed immediately after the fault condition was cleared.

Users that have the "block" setting of the differential function set to disable, are not affected by this exception. If the block setting of the differential element is being used, it is recommended to upgrade the firmware.

C70 Enhancements

G   **Enhanced ease-of-use in the C70 protection menu when using the front panel**

Applicable: C70.

The menu structure in the C70 was enhanced to easily differentiate the settings of the "Voltage Unbalance" element from the "Voltage Differential" element by giving independent space to each element's settings. Both elements are still located at "Settings>Grouped Elements>group 1_6>Voltage elements", but now have their owned sub-menus.

This way, users can easily find the settings of these elements when using the front panel.

P   **Improved accuracy of the "Bank Phase Over-voltage" element for voltages values higher than 80V secondary**

Applicable: C70.

The "bank Phase Over-voltage" element responds to voltages across the capacitors of the bank. In order to properly estimate the phase voltage, the element has to know the capacitor bank connection – "Bank OV bank ground".

In previous firmware versions, when the bank connection is set to "ungrounded" or "ungrounded w/o Vn" and, the over-voltage level is higher than 80V secondary, the element could operate out of its specified accuracy.

This Firmware version corrects this issue.

Distance Enhancements

N   **A new compensated over-voltage element "59C" to detect overvoltage at the remote end of the line.**

Applicable: D60

The D60 relay now support a "Compensated Over-voltage" element, which protects against an over-voltage condition caused by a breaker opening in the remote end of a transmission line.

The element uses the local positive sequence current and voltage, and the line impedance to calculate the positive sequence voltage at the remote end of the transmission line.

The element also has three separate over-voltage pick-up levels "Compensated OV STG1 , 2 and 3" with independent timers that allow scheme customization for additional flexibility.

N   **New setting for determining open pole based on current and voltage values was added to the UR**

Applicable: D60, L90, L60.

The protection algorithms "AR Single Pole", "Open Pole", "Phase Selector" and "Trip Output" have been enhanced to allow the implementation of single-pole tripping and reclosing schemes using the phase current and voltage values to determine pole status (open or close) rather than reading the breaker's auxiliary contacts (52a, 52b).

E   **Ground distance elements were enhanced to increase selectivity when facing three-phase or phase-to-phase faults and remote single pole tripping.**

Applicable: D30, D60, G60, L60, L90, T60.

The ground distance protection algorithm was modified to have an enhanced over-current supervision that incorporates a positive sequence restraint factor.

This enhancement increase selectivity when the relay is dealing with balanced three-phase or phase-to-phase faults that might produce spurious zero-sequence currents due to either CT saturation or single breaker pole opening that might lead to an element miss-operation.

In addition, the operation of Ground distance zones A, B and C are now supervised for phase currents A, B and C correspondingly.
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.

Generation Protection Enhancements

E **The Split Phase element was enhanced to ensure its proper operation on phases B and C when time delay is set to zero.**

Applicable: G30, G60.

An enhanced "Split phase" element ensures a proper operation when detecting a split phase condition on phases B or C and having a time delay setting of zero. In previous firmware versions, the split phase element would not operate when detecting a split phase condition on phases B or C when the time delay was set to zero.

E **The differential characteristic graph shown by the UR Setup software was enhanced to always show values in pu.**

Applicable: G60.

In firmware version 5.70, the stator current differential characteristic graph has been enhanced in the G60 Generator Protection Relay. The enhancement includes showing all values in pu when the UR PC Setup program is connected to the G60 relay. Previous firmware versions allowed values to switch between pu and amps when the G60 UR PC Setup program was displaying differential currents read from the G60.

E **Enhanced sensitivity of the "100% Stator Ground" element**

Applicable: G60.

The "100% Stator Ground" element was enhanced to be more sensitive through having an increased upper limit of settings for "Stage 1 pickup" and "Stage 2 pickup". The previous range of 0 to 0.25pu was increased to 0 to 0.9pu.

In addition, a new analog operand is added for visualizing the zero sequence component of the generator third harmonic "Stator Gnd V0 3rd". This analog operand is one of the values used in the "100% stator ground" algorithm.

G **Phase rotation setting to ensure the correct value when saving settings into a file while the "reverse phase rotation's" operand is active**

Applicable: G30, G60.

The setting "Reverse Phase Rotation" allows the G30 and G60 generator protection systems to change the nominal "phase rotation" setting of the power system depending on a logic operand.

If the relay's settings are read and saved into a file when the logic operand assigned to "Reverse phase rotation" is active, the "phase rotation" setting saved in file would be incorrect. Firmware version 5.70 changes the UR setup software to read the set value.

For users that enabled this functionality, it is recommended to verify that the correct setting is configured in both relay and setting file.

L90 Enhancements

N   **A new ground differential function "87G" is added to the extensive protection capabilities of the L90 to detect sensitive ground faults.**

Applicable: L90

The L90 relay has a new "Ground Differential" function for protecting against low-current single line-to-ground faults.

The function uses the vectorial sum of all in-zone phase currents to calculate the Neutral differential current; and the maximum value of phase current is used as restraint current.

The settings of this function (Enabling, Pick-up, single slope and timer) are located together with the Phase Differential function "Current Differential Element"

This new ground differential function together with the existent phase differential increase L90's sensibility and selectivity by allowing the use of a low pick-up setting for detecting line-to-ground faults and a high pick-up setting for detecting line-to-line faults.

M60 Enhancements

N   **M60 has a new advance-diagnostic element to detect motor Broken Rotor Bars.**

Applicable: M60.

Firmware version 5.7 introduces four new software options in the M60 enabling the Broken Rotor Bar detection.

This new element uses the Motor Current Signature Analysis (MCSA) for detecting a rotor bar failure and is enabled while the motor is running.

The element can be programmed as an alarm allowing users to carry out opportune maintenance at opportune times. A broken rotor bar condition can lead to a heavy motor overload during motor starts, so the early detection of this condition allows the users to prevent major damage on the motor.

New four software options are available. They can be ordered when purchasing the relay and are identified as follow:
"28" Broken Rotor Bar
"29" Broken Rotor Bar + EGD
"30" Broken Rotor Bar + IEC61850
"31" Broken Rotor Bar + EGD + IEC61850

T60 Enhancements

N   **New Software options allow protection of Power Transformer with up to 5 windings / current sources.**

Applicable: T60.

Firmware version 5.7 introduces four new software options that allow the T60 to have a third CT/VT (DSP) module to protect power transformers having up to five current sources. This enables the T60 to suit complicated power transformer protection schemes, e.g. breaker and half in the HV winding and multiple feeders in the LV winding.

Supported combinations when having three DSP modules are: three current plus three voltage inputs, four current plus two voltage inputs and five current plus one voltage input.

The software options are available when purchasing the relay and are identified as follow:
"20" Five windings (No breaker Failure)
"21" Five windings (No breaker Failure) + EGD
"22" Five windings (No breaker Failure) + IEC61850
"23" Five windings (No breaker Failure) + EGD + IEC61850

Like the "Breaker Failure" elements the "Load Encroachment", "Breaker Arching Current", "POTT Scheme" and "Breaker Flashover" elements are no longer available.

N **New RTD protections settings are added enabling direct tripping and alarming on over-temperature conditions.**

Applicable: T60

The T60 has new RTD protection settings to provide advanced monitoring of power transformer's temperature. The T60 can be programmed to generate alarm and trips based on the temperature value of each RTD input. Each RTD input can be set for specific applications such as Stator, Bearing, Oil and Ambient. The RTD element also support RTD trip voting that requires more than one RTD input to confirm over-temperature conditions before tripping, and provides open RTD failure alarms.

Common Protection & Control Elements

N **Support for RRTD Module to the T60 and g60 protection and control systems**

Applicable: T60, G60

The T60 & G60 relays have been enhanced to incorporate the GE Multilin RRTD module.

The remote RTD module "RRTD" provides additional RTD temperature-metering capabilities for the GE Multilin T60 Transformer Protection System and G60 Generation Protection System. The RRTD module monitors up to 12 RTD's with all metered values accessible through serial communication. The 12 programmable RTD inputs in the RRTD module are used for monitoring the stator, bearing and ambient temperatures and have 2 operational levels: alarm, and trip. The T60 & G60 support RTD trip voting and provides open RTD failure alarm.

The RRTD module has been designed to be mounted close to the transformer or generator to reduce the length of the RTD cables. The T60 and G60 can then monitor the RTD's from a remote location and use the temperature information for protection and metering purposes.

The RRTD module communicates via a RS485 port using Modbus RTU protocol at speeds up to 19,200 baud. The RRTD's can be configured through either the UR setup program or the RRTD setup program.

With the integration of the RRTD module into the T60 & G60 users are allowed to remotely monitor RTD's rather than cabling all RTD wires back to the protection relays providing cost savings.

E **The breaker Failure element was enhanced to increase selectivity when facing evolving faults on single-pole schemes.**

Applicable: B30, B90, C60, C70, D60, F60, L30, L60, L90, M60, T60.

An enhanced breaker failure element has new individual timers assigned to the algorithm BF phase detectors. These new timers increase the element selectivity and speed when dealing with evolving faults in schemes with single-pole breakers.

Previous firmware version required the time delay setting to be increased in order to avoid selectivity issues when facing evolving faults on single pole schemes. This enhancement makes the 50BF element faster and more secure.

E   **Enhanced Neutral and Negative sequence directional elements "67N" and "67_I2" ensures proper selectivity when negative sequence current is zero.**

Applicable: C70, D30, D60, F60, G30, G60, L60, L90, M60, T60.

Enhanced Neutral directional element "67N" and Negative sequence directional element "67_I2" has an additional supervisor unit that blocks these protection elements if either the polarizing voltage or the operating current are below the cutoff levels. Current and voltage cutoff levels are defaulted at 0.02pu.

R   **Restricted Ground Fault element "87G" to ensure accurate oscillography records of differential current.**

Applicable: G30, G60, T60.

The lower limit of the "Restricted Ground Fault" element's pickup was increased from 0.000pu to 0.005pu to ensure that oscillography records will show accurate values of differential current when the 87G element trips having a pickup setting lower than 0.005pu. Previous FW version did not show the value under such conditions.

G   **Selector switch elements were changed to ensure that flash messages are not shown when targets are disabled.**

Applicable: B30, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Selector Switch elements were changed to avoid flash messages from being shown in the front panel when targets are set as "disabled".

Communication Enhancements

N   **IEC61850 GOOSE messages have been enhanced to incorporate a 2nd fast configurable GOOSE.**

Applicable: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

This firmware version increases the transmission speed of the 2nd data set of configurable GOOSE to 2 mili-seconds on a state change, enabling this group to handle with protection signals like trip, block, etc.

Therefore, configurable GOOSE data sets one and two are fast GOOSE (2ms), whereas data sets three to eight are slow GOOSE (100ms).

C   **Enhanced DNP 3.0 protocol to properly report internal time delays under DNP object 52**

Applicable: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

The DNP3.0 protocol was enhanced to accurately estimate and report the value of "time delay fine" that is comprised within the DNP 52 object. This time represents the period between the time of message reception and the time of message reply by the UR relay and helps the DNP master to calculate the delay in the serial wire.

N   **New IEC60870-5-104 setting to define when the relay is connected to two IEC60870-5-104 masters.**

Applicable: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

UR relays have been improved to prevent data duplication when communicating using the IEC60870-5-104 protocol and connected to two masters. To do so, a new setting was added "IEC Redundancy

Enabled". When this setting is set to "yes", the events previous to a communication break with the first master, are not resent when the communication break is cleared.

Previous firmware version resent old events thus duplicating them.

C **Enhanced DNP 3.0 over TCP/IP protocol allows up to two hours of time out connection**

Applicable: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

The "DNP TCP Connection Timeout" setting range for the DNP3.0 over TCP/IP protocol was increased from 0 - 300s to 0 – 7200s (two hours). This new upper limit allows the UR relays to communicate over networks that may have longer break times (i.e. radio).

R **Enhanced IEC61850 logical node GGIO2 to properly update timestamp of data items 32 to 64.**

Applicable: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

The IEC61850 logical node element "GGIO2" was enhanced to properly update the time stamp of data items # 32 to 64 on a status change. Previous FW versions would show an incorrect time stamp.

C **IEC61850 GOOSE messages to have selectable retransmission profiles.**

Applicable: B30, B90, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, T35, T60.

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 detailed below.

Scheme	Sq Number	Time from last Tx (ms)
Aggressive	0	0
	1	4
	2	4
	3	8
	4	Heartbeat
	5	Heartbeat
Medium	0	0
	1	16
	2	16
	3	32
	4	Heartbeat
	5	Heartbeat
Relaxed	0	0
	1	100
	2	100
	3	300
	4	Heartbeat
	5	Heartbeat
Heartbeat	0	0
	1	Heartbeat
	2	Heartbeat
	3	Heartbeat
	4	Heartbeat
	5	Heartbeat

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Note that profiles "Aggressive" and Medium" are supported by configurable GOOSE one and two only.

PMU - Synchrophasor

N   **New communication elements in the N60 allow sychrophasor transmission through GOOSE messages and direct analog outputs.**

Applicable: N60.

Transmission of PMUs that are traditionally limited to the use of the IEEE C37.118 communication protocol.

The UR firmware version 5.70 introduces a new method to transmit PMUs through the implementation of three communication elements:

- New Flex-integers that were created to give access to PMUs time stamp
- A new IEC61850 logical node named "GGIO5" that gives IEC61850 access to Flex-integers
- Direct integer elements that allows the transmission of flex-integers via "direct I/O" (UR inter-relay communication)

Then, using the logical nodes "GGIO1, GGIO4 and GGIO5" allows the transmission of PMU - synchrophasors via IEC61850 GOOSE messages.

In addition, using the direct integers together with "direct analogs and direct I/O" allows the transmission of PMU - synchrophasors via UR inter-relay communications.

Synchrophasors over GOOSE allow users to concentrate PMU data within a substation into a single N60. Synchrophasor via direct analog outputs gives to users the flexibility to send concentrated PMUs through low bandwidth 64/128kbps channels.

E   **The PMU's recording rate was enhanced to add 4 times per second (250ms).**

Applicable: D60, G60, L30, L90, N60.

The PMU element has a new recording rate of 4 times per second (250ms) that was added to the existent range of values. This adds flexibility to the element and the capability of handling with PMU transmission via IEC61850 GOOSE messages.

Fault and Event Recorders

R   **An Improved Fault Report guarantee accurate fault location when I_0 is set for VT substitution and the relay is connected to 5A CTs**

Applicable: B30, B90, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, T35, T60.

UR fault report algorithm has been improved to ensure an accurate calculation of fault distance "fault location value". Previous firmware versions could show an imprecise value provided that the setting "Fault report VT substitution" was set to "I_O" and the relay were connected to a 5Amps CTs.

The setting "Fault report VT substitution" is required to be set as "I_0" when VTs are in Delta and there isn't an available source of "3VO" (ex. broken-delta connected VTs).

R   **Data Logger and Oscillography elements were improved to show correct harmonic index**

Applicable: C70, F35 (voltage), F60, T60.

Firmware version 5.7 introduces changes in data logger and oscillography elements that allow them to show the correct index when recording current and voltages harmonic values. Previous firmware version would show the correct value but an incorrect index – i.e. Harmonic [0] instead of Harmonic [2].

Flex-Elements / Operands

G   **Preventing users from making programming mistakes when setting up contact output sealing.**

Applicable: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

The flex-operands "Cont OP ## Ion/Ioff" are directly related to the form "a" contact outputs that have a current monitor. The "Con OP ## Ion" is used to seal-in the contact when it is closed until the current level flowing through it is low enough to allow a save open. This setting protects the contact against damage for interrupting the close or trip coil currents.

However, if by mistake the operand "Cont OP ## Ioff" is assigned for seal-in, the contact will be allow to open when the load current is still flowing through it. This could potentially damage to the contact output.

To prevent this kind of mistakes, the operand "Cont OP ## Ioff" was removed from the list of choices.

M   **Enhanced Flex-elements to show correct actual values when using analog GOOSE as an input which PU base has decimal values**

Applicable: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

UR Flex-elements were enhanced to show a correct "flex-element actual value" provided that either "input Plus" or "input minus" were set to read a GOOSE analog input, and the flex-element's "analog input PU base" setting was using a decimal value.

Self-test Diagnostic

N   **NEW monitors of internal voltage rails alarm users about potential defects in the power supply module before it fails.**

Applicable: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

The UR relays have a new self-test monitor to verify internal 12Vdc and 5Vdc rails (firmware and hardware implementation). This new element will generate alarms when, because of component degradation or other factors, the internal voltage levels are out of range. This way, users can schedule service to the power supply module before it fails.

The alarm self-test messages are:
"Voltage Monitor Power Supply 12V Low"
"Voltage Monitor Power Supply 12V High"
"Voltage Monitor Power Supply 5V Low"
"Voltage Monitor Power Supply 5V High"

These messages will be shown and recorded upon their activation.

This self-test warning is classified as a minor self-test alarm, and allows users to carry out scheduled maintenance prior to a major failure on the power supply module. GE Multilin recommends users to replace the power supply module and contact GE Mutlilin technical services if any of these messages are shown.

Enervista UR Setup Software

N **New version of Enervista Viewpoint Engineer for UR supports the on-line functionalities of URSetup**

Applicable: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

Enervista Viewpoint Engineer now supports all the on-line functionality of the UR Setup software to the existent off-line functionality.

Viewpoint Engineer is a software application created as an ease-of-use tool for advanced logic configuration & monitoring, system designing & monitoring (distributed logic), IEC61850 configuration, advance oscillography analysis and settings files configuration. The previous software version would only create settings files, so UR setup software was required to download and upload settings, and to monitor actual values.

The new version of Viewpoint Engineer has all the online menus that UR setup has (Commands, User Displays, Targets, Actual Values, Maintenance) and then offers the entire suit of online functionality included in UR Setup software.

This way, Viewpoint Engineer becomes a complete tool where users can setup a single device or a complete advanced systems with several devices on IEC61850.

G **UR setup to show the correct lower limit of time delay setting for phase and ground distance elements in the T60.**

Applicable: T60.

The phase and ground distance element on the T60 relay has a minimum time delay setting of 150ms. Previous software versions would erroneously show 0ms. Software version 5.70 shows the correct lower limit value.

G **UR setup to include the Line current differential elements on the protection summary screen in L90 and L30.**

Applicable: L90, L30.

The protection summary screen is an ease-of-use tool that shows and gives direct access to all the available protection and control elements in the UR Relays; and also allows user to seamlessly set protection trips. Previous software version would show all the protection elements available in the L30 and L90, but the line current differential "87L"; then users had to access those elements via the protection menus.

This software version ensures the "87L" are shown and accessible via the protection summary.

E **UR setup software and firmware to avoid local settings change from the front panel URPC screen.**

Applicable: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

The URsetup software has a screen that shows the actual status of UR front panel (LEDs, Display) and gives operational access to keyboard and push buttons. Previous software versions allowed users to change settings via this screen even if the local setting access was restricted. Software and firmware version 5.70 remove settings change capability of this screen, limiting the operational access only to the navigation buttons.

E   **UR setup to properly update settings in the M60 setting file after using the Motor settings Auto-configurator**

Applicable: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60.

The Motor setting auto-configurator is an ease-of-use tool that defines the settings required to protect and control a motor in six easy steps. After those steps, the configurator updates the M60 setting file. Previous software versions would default the protection settings in the M60 setting file after executing the Motor setting auto configurator. Software version 5.70 ensure that settings are properly updated.

Upgrade paths

It is our recommendation that all customers upgrade to the latest version of UR-series firmware to take advantage of the latest developments and feature enhancements. Firmware upgrades can be easily preformed using the EnerVista UR 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 has been completed. This Difference Report identifies new settings and additional information to assist the user during the upgrade.

Upgrade path for versions 4.00 and above

For UR-series devices installed with versions 4.00 firmware and above, the revision 5.72 release can be uploaded to the relay using the EnerVista UR Setup software.

Upgrade path for revisions below version 4.00

For UR-series devices installed with versions of firmware below 4.00, an upgrade package must be obtained from GE Multilin to upgrade the relay CPU and CT/VT modules.

Benefits of revision 4.00 and above:

The benefits of revision 4.00 and above are as follows:

- Supports many new features and functionality
    - IEC 61850 communications protocol
    - 100 Mb Ethernet
    - IRIG-B repeater
    - Isolated RS485 and IRIG-B
    - Synchrophasors in the D60, L90, N60 & G60
    - Support for Breaker-and-a-Half Transmission Line Protection (D60, L90)
    - Motor Health Diagnostics (M60)
    - Enhanced Front Panel
- Exceeds new IEEE C37.90 requirements
    - Transient immunity (2 to 4 kV)

Appendix

Change categories

This document uses the following categories to classify the changes.

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, etc.)
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 could be taken immediately
H	Hidden failure to trip	Protection may not operate when it should
F	False trip	Protection may operate when it should not
B	Unexpected restart	Relay restarts unexpectedly

The revision category letter is placed to the left of the change description.

GE Multilin technical support

GE Multilin contact information and call center for product support is shown below:

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