GE
Grid Solutions

UR Family

Version 5.4x

Release Notes

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Overview

This document contains the release notes for firmware and software versions 5.40 to 5.49 of the Universal Relay (UR) family of products.

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

Date of release 5.49: 20 September 2017

Date of release 5.48: 27 June 2014

Date of release 5.44: 4 December 2007

Date of release 5.42: 19 October 2007

Date of release 5.40: 26 June 2007

In the following descriptions, a category letter is placed to the left of the title. See the table at the end of this document for descriptions of the categories.

Firmware

Firmware 5.49

Summary

Improvements include the following.

- Common Platform Functions
  - Removed password recovery from encrypted passwords
  - Improved System Exception mechanism by preventing spurious interrupts from causing a System Exception

Common Platform Functions

G **Removed password recovery from encrypted passwords**

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

Impacted firmware: All to 5.82, 5.90 to 5.91, 6.00 to 6.01

Corrected firmware: 5.49, 5.83, 5.92, 6.02, 6.03, 6.04, 6.05, 7.x

Workaround: None

Description: In firmware versions less than 7.x, the relay uses numeric passwords. In previous versions, the relay displays the encrypted passwords, which enables the user to recover the passwords and regain access to the relay, in the event that the passwords are forgotten.

In corrected versions, the front panel menus for the encrypted passwords display 1234567890 if a password is set, regardless of the value of the password. If the password is not set, the relay displays "----------", as before this change. If the passwords are set, the respective Modbus registers (0x4000 and 0x4002) also return the value 1234567890. Hence, if the passwords are forgotten, it is not possible to recover the passwords anymore from their encrypted value.

A new service command is added to enable the user to regain access to the relay if the passwords are forgotten. Entering the value 20511 as a service command from the front panel, menu "COMMANDS > RELAY MAINTENANCE > SERVICE COMMAND," sets all the relay's settings to factory defaults, and also resets the passwords, after which the relay reboots. This service command can be entered only from the relay's front panel and can be entered even if the relay is protected by settings/command passwords.

In version 5.49, the passwords 1234567890 and the password that results in an encrypted password of 1234567890 are not allowed. If any of these two passwords were set in an earlier version, upon upgrading the firmware to version 5.49, the relay removes any of these two passwords. Any other password value is retained on upgrading the firmware to version 5.49.

GE tracking number: 549-1

G **Improved System Exception mechanism by preventing spurious interrupts from causing a System Exception**

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

Impacted firmware: All to 5.70

Corrected firmware: 5.49, 5.71 and above

Workaround: None

Description: In previous versions, the relay asserts a System Exception when a spurious interrupt is detected.

In the corrected versions, the relay filters out spurious interrupts, preventing the appearance of nuisance

System Exceptions.
GE tracking number: 549-2

Firmware 5.48

Summary

- Low Impedance Bus Bar Differential Systems– B30, B90
    - Changes to Bus Differential unblocking
    - Trip-Bus and digital element indication
    - Oscillography values on B90 with 8K DSP type
- Capacitor Bank Protection and Control Systems – C70
    - Phase Current Unbalance Auto Setting, 60N element and Neutral Voltage Unbalance Autoset and Voltage Differential Autoset
- Generator Protection Systems– G30, G60
    - Split phase element
- Line Differential Protection and Control Systems – L60, L90
    - Inter-relay communications for two and three terminal schemes
    - Setting changes to distance protection
    - Master-slave mode for three terminal applications
    - Loopback mode and testing
- Motor Protection and Control System – M60
    - Overload element Lockout
- Common Protection and Control elements
    - Restricted ground fault
    - Phase and Ground distance elements, phase selector
    - Inter-relay communication, direct I/O
    - Sensitive Directional Power element
    - Phase and ground Time Overcurrent elements
    - Synchrocheck
    - Negative Sequence Directional
    - Auto-reclose
    - Neutral Directional Overcurrent
    - Setting groups
- Communications
    - Web browser and password
    - DNP 3.0
    - IEC60870-5-104
    - IEC61850 GOOSE
    - Error message for Ethernet connection
- Platform
    - FlexElements
    - Push buttons

        - Transduced outputs
        - IRIG-B
        - Non-voltatile latches and latched contact outputs
        - Frequency measures at low RMS
        - Equipment mismatch alarm
    - Events and Records
        - Data logger
        - Fault report
        - Events time stamp
        - Event recorder flood
        - Events description
    - PMU Synchrophasors
        - Phasors and PMU trigger time stamp
    - Cyber Security
        - Debug port

Low Impedance Bus Differential System – B90

R **Oscillography functionality has been changed to accurately show current values of the 7th analog channel of 8K type DSP modules**

603-01

Applicable: B90

Analog values shown on an oscillography record are a scaled representation of captures values.

B90 devices with previous firmware versions showed that scale factors were incorrectly applied to the 7th analog channel of any 8K type Digital Signal processor (DSP) module installed in the relay.

This firmware version ensures that accurate values are shown and scale factors are applied correctly to all analog channels regardless the type of DSP module installed.

Performance of protection elements is not compromised by this issue.

For details on the B90 oscillography, see the B90 instruction manual.

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

571-1

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.

F **Bus differential element "87B" has been changed to prevent mis-operation due to an unblocking command**

504-1

Applicable: B30, B90

The 87B element has a "Block" setting that allow users to block the element's operation previous or after a fault condition.

If during a block condition generated after the 87B element operates, the fault condition is removed and then the block on the element is removed as well, the 87B element misoperates.

This firmware release ensures that 87B will not misoperate when the block condition is removed under the described conditions.

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.

Capacitor Bank Protection and Control System – C70

P **Neutral Voltage Unbalance Autoset and Voltage Differential Autoset operational when C70 has only voltage inputs, for example only 8V CT/VT DSPs**

720-04

Applicable: C70

This firmware version introduces the following fixes to the Neutral Voltage Unbalance and Voltage Differential elements:

- The Autoset functionality of these elements does not change any of the coefficients as expected if the C70 has only voltage inputs, hence is this not an issue if the C70 has any CT bank inputs in its order code.

P **C70 to ensure the 60N element properly operates when a source different from "source one" is set as the element's input.**

571-2

Applicable: C70

The sources are used to link relay's internal elements with the current and voltage inputs (CT/VT), so every protection and control element has a setting to define the source to use. Typically, currents are assigned to a second or higher source when the relay is connected to more than one current source (set of CTs).

This firmware version ensures that the neutral current unbalance element "60N" properly operates when the "Neutral Current Unbalance # Bank Source" setting is configured to a source different from source one. Customers that have this kind of scheme and/or setting must upgrade their C70 relays to this new firmware version.

E **An improved "Phase Current Unbalance Auto Setting" element ensures accurate compensation factors when phase and differential CT ratios difference is high.**

524-1

Applicable: C70

The "Phase Current Unbalance Auto Setting" element was enhanced so that compensation factors, applicable to the "Phase Current Unbalanced" element, are accurately estimated even with high levels of CT mismatch. Previous FW version could calculate incorrect compensation factors in the case where there is a large difference between the CT ratio of phase CTs and CT ratio of differential CTs (E.g. Phase CT ratio 3300; Differential CT ratio 10).

This issue only affects customers who have set the "Current Unbalance Auto Setting Element" to "manual" or "Auto".

Generator Protection System – G30, G60

E **The Split Phase element has been changed to ensure its proper operation on phases B and C when time delay setting is set to zero.**

504-2

Applicable: G30, G60

An enhanced "Split phase" element ensures a proper operation on detection of 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.

Line Differential Protection Systems – L30, L90

E **Increased security for line differential protection when experiencing Phase and Frequency Locked Loop (PFLL) transition errors**

720-7

Applicable: L30, L90

When line differential protection (87L) schemes are exposed to extremely noisy or unreliable channel conditions, the PFLL element can lose synchronism and then re-synchronize. GE strongly recommends that, for maximum security, the disturbance detector element (50DD) be assigned to supervise operation of the 87L element.

Failing to follow this recommendation can potentially cause the 87L element to misoperate during re-synchronizing attempt.

This firmware version improves the 87L element security to prevent misoperation when, under the described conditions, the 50DD element is not supervising the 87L element.
Customers who have followed GE recommendations for heavily noisy channels or having reliable inter-relay communication are not required to take action.

H **Line differential element to ensure all three terminals correctly trip when the differential scheme is set with 50DD SV supervision and is operating in master slave mode**

601-2

Applicable: L30, L90

In a three line terminal system, the Line differential element operates in master-master mode provided there is not any channel failure. If one communication channel fails, the 87L element changes to master-slave mode. When in that mode, the channel failure blocks the disturbance detector element 50DD SV in the slave relays, and the master relay (relay with no channel failure) would trip the slave relays by sending DTT commands if fault within the differential zone was detected.

Therefore, if the disturbance detector element "50DD SV" is set to supervise the line differential element "87L" and there is a line fault while the 87L element is in Master-Slave mode, the slave relays would not trip after receiving the DTT signal issued by the Master relay.

This FW version introduces a change to the 87L element so a local source disturbance detector "SCRx 50DD" is used in parallel to supervise the 87L element when the "50DD SV" element is not available. This allows the slave relays trip after receiving the DTT command from the Master relay upon the condition described above.

This fix only affects users who have L30 or L90 devices applied to a three line terminal system and have enabled both the master-slave mode and the 50DD SV supervision.

Affected users can either upgrade their UR devices' firmware with this FW version or use the UR FlexLogic to implement the parallel supervision explained above.

E **Loopback mode has been enhanced to allow channel monitoring**

601-4

Applicable: L30, L90

Upon detection of a loopback test, an UR device goes into Loopback Mode which, among other elements, disables the channel monitoring. Without channel monitoring commissioning or troubleshooting procedures with loopback tests may become complex.

This firmware version changes the UR devices loopback mode to allow channel monitoring while a loopback test is performed. This allows users access to the Channel status data (channel 1/2 status, number of lost packets, etc), which simplifies commissioning and/or troubleshooting procedures.

F **The voltage memory for distance polarization in L90 relays has been changed to not reset when synchronizing communication channels after a channel failure**

710-11

Applicable: L90

Communication between L90 devices located at each line terminal is primarily required for line differential and pilot scheme applications. Single or redundant communication channels can be applied.

After recovering from a channel failure, L90 devices must synchronize for the Line Differential element to return to normal operation. During this process, the voltage memory used by the distance element can be reset, which changes the polarization voltage references, and then, can cause distance element operation.

This firmware version prevents the reset of the voltage memory and, for added security, blocks protection elements for one protection pass (two milliseconds) when synchronizing channels after a communication

failure.

This issue does not affect end users who have the distance protection elements disabled.

End users who set the distance element to enable are advised to upgrade their relay firmware version with version 7.10/6.02/5.48.

F **The Distance protection element has been changed to ensure that setting changes to Line protection elements, made when the relays is in service, do not cause the phase distance element to operate**

710-12

Applicable: L90

Setting changes to UR devices can be carried out by uploading a complete setting file or editing individual setting fields via front panel or UR setup software.

When editing individual settings to a relay that is in service and reading close-to-nominal current and voltage signals, changing any of the line differential or distance protection setting fields might cause the phase distance element to operate.

This FW release ensures the phase distance element does not operate under the described conditions.

Standard operating procedures require users to remove the relay from service when protection related settings are changed or updated. Users who follow this type of procedure are not at risk of experiencing a miss operation.

U **L90's inter-relay communication for three-terminal schemes was improved to ensure the devices restore communication between them after a real failure is cleared on at least one of the two comm.**

553-3

Applicable: L90

As a standard behavior, a three terminal line differential schemes will raise the "PFLL Fail" (synchronization) and "CH fail" operands on all three terminals when both comm. channels fail in one terminal,

However, if only one channel goes back to normal all terminal might stay showing PFLL fail and CH Fail, and then neither the communication nor the differential protection are restored.

C **L90's redundant inter-relay communication for two-terminals schemes was improved to ensure the correct data is received by channel 2 when a loopback test is performed on the multiplexer**

553-1

Applicable: L90

This FW version introduces separate receiving buffers per channel to the inter-relay communication modules. These independent buffers ensure that, for two-terminals redundant channel with multiplexer schemes, the channel 2 will receive and process the right direct input status when a loopback test is performed to channel 1 on the multiplexer side.

Previous FW versions might allow channel one to overwrite the direct input status with its default value when the described loopback test is performed.

If your line differential scheme is having direct communication between the L90 devices, this issue does not affect them.

For customer having schemes with multiplexers, standard maintenance procedures request protection devices to be isolated from the breaker(s) when a function related to the protection elements within the device is being tested. If your maintenance procedures fit to this criteria, there is no risk of misoperation on your system. Otherwise, your device FW version must be upgraded.

C **L90's redundant inter-relay communication for two-terminals schemes was improved to ensure relays in both terminals keep on synchronization after performing a loopback test on the multiplexer**

553-2

Applicable: L90

Some multiplexers available on the market, allows users to perform a loopback test on the local unit while still sending data to remote end. As a consequence L90s with redundant channels and communicating through this kind of multiplexers might lose synchronization between them while one channel is being tested (PFLL fail activated) and stay latched in that condition after the test.

This FW version adds the "ID Fail" status to the data stream used for the inter relay communication modules. This "ID fail" status allows the remote L90 to detect the channel under loopback test condition and then it only uses the other channel for synchronization. This way synchronization is never lost.

If your line differential scheme is having direct communication between the L90 devices, this issue does not affect them"

F **L90's test functionality was enhanced to prevent miss-operation while performing communication tests**

443-2

Applicable: L90

Internal algorithms were improved so that a remote loopback test does not cause a miss-operation of the 87L element when working in a two terminals-redundant channel scheme. The previous FW versions showed up that, after experiencing both "channel fail" and "channel ID fail" alarms in one channel, the 87L element could miss operate if a remote loopback test had performed on the same failed channel.

GE Multilin strongly recommends that, once the relays be in service, users must freeze (via UR Setup software) or disconnect (via hardwire) the trip contact output before performing any kind of test.

U **Enhanced two-terminal Inter relay communication ensures 87L goes back to normal after a channel fail is cleared and prevents events flooding**

443-3a

Applicable: L90

This firmware version ensures that, for two terminal-single channel applications, the inter-relay communication link goes back to normal once a communication failure is cleared. Previous firmware version showed that, "channel fail" and "PFLL" operands oscillated every 10 seconds when a channel fail alarm had appeared, so the 87L element didn't return to normal operation and the event recorder was flooded.

U **Changes on the three-terminal Inter relay communication ensure 87L goes back to normal when Channel and PFLL alarms are reset**

443-3b

Applicable: L90

This firmware version ensures that, for three terminal applications, the inter-relay communication link returns to normal operation in the case that, in one terminal, both communication channels fail and then just one comes back. In previous version, "channel fail" and "PFLL" operands started to oscillate, so that one communication link didn't return to normal operation.

Motor Protection and Control System – M60

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

571-3

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 are situations where the thermal overload element trips and remains locked out until an emergency restart 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 restart command was performed.

Users who proceed as described are advised to update their firmware version to 5.48, 5.71, 5.92, or newer.

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

571-3

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 5.48, 5.71, 5.92 or newer.

Common Protection and Control Elements

P **The "Fault Type" comparator logic, that is part of distance protection elements, has been changed to correctly block the ground distance elements when sensing a double-line-to-ground fault**

710-8

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

In order to maintain selectivity during a double-line-to-ground fault, the Ground Distance element is supervised by the "Fault Type" comparator that uses phase angle between the negative and zero-sequence currents.

However, the "Fault Type" comparator can also be removed when under the following conditions:

a. During an open pole condition or
b. When "3I_0 > OC Supv and I_2 < CutOff"

Any of these conditions prevents the "Fault Type" comparator from blocking the ground distance elements.

Devices with previous firmware versions show the CutOff level is not correctly scaled, which breaks the condition "b" described.

End users who set the distance element to enabled are advised to upgrade their relay's firmware version to version 7.1x or later.

For details on the "Fault Type" comparator, see the instruction manual of any applicable UR device.

P **The Restricted Ground fault algorithm has been changed to correctly apply timers that determine the value of negative sequence restraining current used during transformers energization and operation**

710-13

Applicable: G30, G60, L90, T60

The Restricted Ground Fault element uses the maximum among the three current components as restraining signal:

Irest = max (IRO, IR1, IR2)

Where, the negative-sequence component of the restraining signal (IR2) is calculated as follows:

IR2 = 1 x |I_2| or IR2 = 3 x |I_2|

Multiplier “1” is used right after 5 cycles of complete transformer de-energization, while multiplier “3” is used right after 2 cycles of complete transformer energization (during transformer’s normal operation). UR devices with previous FW versions showed timers were set to 10 and 4 cycles instead.

This FW version fixes this out-of-spec issue.

For more details on the “Restricted Ground Fault” element, see the Instruction manual of any applicable UR device.

E **Phase selector to supervise phase distance elements for improved protection selectivity**

720-22

Applicable: D60, L90

Phase distance elements can operate when sensing the following fault types: three-phase, phase-to-phase, phase-to-phase-to-ground (PPG) and single phase-to-ground (SLG).

With this FW release, the phase selector element supervises the operation of the phase distance element when sensing a SLG or PPG fault type. Thus once ground distance elements have picked up, it prevents phase-to-phase elements from tripping. For instance, a phase A to ground fault makes the ground distance element operate (phase A), but prevents operation of phase distance elements (phases A-B and/or C-A).

This new supervisor also maintains selectivity for evolving faults that go from SLG/PPG type to phase-to-phase type.

For details on the described phase selector supervisor, see the applicable instruction manual.

P **Neutral Directional Overcurrent detection error fix**

720-26

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

Neutral Directional Overcurrent element flags NTRL DIR OC FWD and NTRL DIR OC REV do not operate as expected when polarization is selected as Dual.

When ground current (IG) is not supplied, the V0 and I0 comparator had a small error, reducing the operate region by 20 to 40 degrees (from the limit angle) and was found to be smaller for the NTRL DIR OC REV operand. This applies to all previous firmware versions and is fixed with this firmware release.

U **Setting Group elements have been changed to prevent taking relays out of service when switching setting groups**

603-03

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

Setting group switching is a fast operation that, under normal conditions, should not trigger any self-test alarm.

Some UR devices with previous firmware revisions have shown that switching setting groups can activate a major self-test alarm (Module failure 5) that takes the relay out-of-service. The relay has to be rebooted to get it back in service.

This firmware release ensures that UR relays do not trigger unnecessary alarms when switching setting groups.

End users whose URs are not configured for switching setting groups are not affected by this issue.

For details on setting group switching, see the instruction manual of any applicable UR device.

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, and then a firmware update is not required.

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".

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 **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.

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

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.

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

571-5

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.

B **Two-terminal 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.

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

561-12

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.

P **Elements "TOC" ensure correct operation time when the relay status is change from "Not Programmed" to "Programmed"**

554-2

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

All TOC elements have been modified to ensure the element is inactive when the relay is in "Not Programmed" status.

Previous FW versions allow the TOC elements to run while in the described condition, so if there were a fault while changing the relay status to "Programmed" (setting change required), the TOC elements may operate faster than specified.

Standard maintenance procedures request users to block or disconnect trip commands (Eg. through test blocks, freezing contact outputs, etc) while working on the protective relays. If your procedures do not fulfill this, upgrading your devices firmware version is advisable.

E **Distance elements have been improved to increase selectivity.**

552-

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

The distance protection algorithms were modified as follow:

1. The memory voltage element is now reset not immediately after all phase currents are below 0.05pu indicating that breaker is open, but delayed by 6 cycles. This gives distance elements opportunity to operate, when temporarily line current becomes less than 0.05pu with voltage below 0.8pu (creating conditions to reset memory voltage) as a result of a fault or remote/upstream breaker operation and then subsequently evolving fault on the protected line.

2. For phase and ground distance zone 2 only, there is a provision to start zone timer when other distance zones or loops pick up during the fault. This will allow not prolonging phase distance zone 2 operation, if fault evolves from one type to another or migrates from the other zone to zone 2. Common zone 2 timer is achieved with appropriate settings in Trip Output element.

3. Ground distance element may operate now even if there is a zero-sequence source only behind the relay, such as in the case of the line terminated by a power transformer with grounded neutral. Before this change, ground distance required both zero-sequence and negative sequence current to discriminate fault direction and allow operation.

These changes increase the distance elements selectivity ensuring additional tripping security.

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

552-

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.

Zero-sequence current is a vital quantity for ground distance elements correct operation. However, spurious zero-sequence current resulting from CT saturation and CT errors, switch-off transients during double-line and three-phase faults and system unbalance, may lead to improper operation of 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 over-current supervision. Now current value has to be higher than [In-0,05 x I_1] 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.

F **Restricted Ground Fault" element to ensure correct operation when phase currents are > 13*CT**

443-4

Applicable: T60, G30, G60

The "Restricted Ground Fault" element was enhanced to ensure the relay will operate correctly when currents incoming from phase CTs are higher than thirteen times the nominal CT current (13*CT).

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

443-5

Applicable: D30, D60, G60, L90, T60

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

Zero-sequence current is a vital quantity for ground distance elements correct operation. However, spurious zero-sequence current resulting from CT saturation and CT errors, switch-off transients during double-line and three-phase faults and system unbalance, may lead to improper operation of 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 over-current supervision. Now current value has to be higher than [In-0,05 x I_1] 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.

Communications

C **UR FlexElements have been changed to operate properly when programmed to use analog IEC 61850 GOOSE values together with local FlexAnalog values**

603-04

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

UR FlexElements are universal comparators that can calculate net difference between two values or monitor UR actual analog values. Local FlexAnalog and GOOSE analogs are supported by FlexElements.

Previous firmware revisions have shown that there was a mismatch of per unit bases between GOOSE analogs and local FlexAnalogs, which prevented correct operation of FlexElements when configured to use these two types of analog values.

This firmware release ensures correct operation of FlexElements when set with GOOSE analogs and local FlexAnalogs. This kind of setting is found on advanced applications, such as voltage synch-check between local and remote line terminals.

If FlexElements in your existing UR devices are not set with GOOSE analogs together with local FlexAnalogs, a firmware upgrade is not required.

For details on FlexElements, see the instruction manual of any applicable UR device.

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

572-7

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: 5.48, 5.72 or later.

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.

E Incorrect Message displayed during Primary Ethernet Connection Failure

560-

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

The redundant Ethernet option in the UR product family has been improved to eliminate incorrect status messages being recorded through DNP protocol. In the event that the Primary Ethernet channel is interrupted, the secondary Ethernet channel takes over communication and transmits data correctly. However, prior to this release, upon interruption of the primary Ethernet and the transfer to the secondary Ethernet channel an Ethernet failure was recorded in the event recorder and momentarily displayed in the HMI and in the communications.

The incorrect message status indication has been corrected in this release.

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

Platform

F **Potential Overfrequency misoperation at low RMS metered values**

720-57

Applicable: D60, F60, G30, G60, L90, M60, N60, T60; however mostly Generator Protection applications

At very low signal sources (less than 5%), the measured frequency value can be incorrectly perceived as much higher than actual, at low frequency levels. This effect is experienced typically during static generator startup. The measured frequency is based on zero-crossings, which can be invalid.

The following changes were made to correct the frequency metering at low signal and frequency levels:

- Hysteresis is increased to 5% of the signal RMS cutoff threshold
- Five consecutive cycles of good RMS waveform metered signal are checked to validate a good signal

U **The "Equipment Mismatch" self-test warning alarm has been changed to prevent settings from being defaulted and to prevent continuous rebooting when triggered by I/O modules**

603-05

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

A defective input and output (I/O) module can trigger an "Equipment Mismatch" self-test alarm. Previous firmware revisions have shown that, under this condition, the relay settings can be defaulted and, if an "update order code" command is submitted, the relay can fall into continuous rebooting.

This firmware release ensures that settings are not defaulted and prevents continuous reboot when UR relays are under the described conditions.

Users having URs with a previous firmware version can detect that settings have been defaulted when an "Equipment Mismatch" alarm and a "Relay out-of-service" alarm are active simultaneously. A continuous rebooting condition can be detected by identifying intermittent and consistent communication in and out events.

For details on self-test warning functionality, see the instruction manual of any applicable UR device.

M **Transduced outputs have been modified to show the accurate values when used to represent fault location**

601-7

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

The UR Transducer output elements "DCMA Outputs" can be programmed to represent a number of analog values available in the UR relay. One of the choices is fault location (distance to fault).

Relays with previous firmware version show transduced distance to fault values that don't match the calculated distance.

This firmware version makes DCMA output elements use the "line length" setting as the element's base unit when a DCMA output is used to represent fault location, thus providing accurate transduced fault location.

This firmware change only affects users who have configured the UR DCMA outputs to represent fault location.

R **IRIG-B clock synchronization to properly update time when time is set on Dec-31st of a leap year**

601-8

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

If the date and time settings were provided to an UR devices on December 31st of a leap year, the relay showed the "Maintenance Alert: IRIG-B error" and did not update its date and time.

This FW version ensures the relay's date and time are properly updated regardless when these parameters are set and the type of year.

P **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.

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.

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

571-9

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 this FW version

P **Ensuring programmable push buttons reset when keeping them pressed for a period longer than the "Auto Reset Delay" setting**

524-7

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

Internal control algorithm of programmable push buttons was improved to guarantee that they would reset properly even if they were kept pressed for a period longer than their "Auto Reset Delay" setting.

It only applies when the "Auto Reset Function" is set to "enable".

M **FlexElements to ensure accurate actual values when inputs are assigned to analog parameters that have a decimal point in the CT or VT ratio setting**

524-8

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

UR FlexElements were enhanced to show exact "FlexElement's actual values" when their analog inputs, "InputPlus" or "InputMinus", are assigned to parameters that have a decimal point in their scale factor. E.g. voltage values which VT ratio contains decimals such as VT 6900V: 120V = 57,5:1), frequency values.

P **FlexElements to ensure accurate actual values when both inputs are assigned to Frequency values**

524-9

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

UR FlexElements are improved to show precise "Flex-element's actual values" when both analog inputs, "Input Plus" and "InputMinus", are assigned to Frequency values. In such conditions, the previous FW versions could calculate the corresponding actual value incorrectly.

PMU Synchrophasors

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

554-4

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.

Events and Records

E **Event description added to distinguish event types in an Event Report**
720-44
Applicable: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60

Event descriptions of contact inputs and outputs, virtual inputs and outputs, direct inputs and outputs, remote inputs, double point inputs, field contact inputs and outputs, field latching outputs, shared inputs and outputs, FlexElements, and digital elements now include added abbreviated text to distinguish among various event types with the same name. For example, Contact Input 1 ON with default settings is presented as Cont Ip 1 ON(CI1).

R **UR Event recorder to avoid events flooding when there is an Ethernet port failure**
601-6
Applicable: B30, B90, C30, C60, C70, D30, D60, F35, F60, G30, G60, L30, L60, L90, M60, N60, T35, T60

The UR Event Recorder registers all UR self-test events which include Ethernet Port Failures “Pri Ethernet Fail/Sec Ethernet Fail”.

Relays with previous FW versions show the event recorder properly registers Ethernet Failure events when they appear. However, as long as the Ethernet failure condition remains, this event is generated every two seconds, which floods the event recorder.

This FW version fixes the event recorder to prevent event flooding by registering only one event per Ethernet port failure.

UR devices with no Ethernet ports are not affected by this issue.

This change applies to UR devices with FW version 6.01 or newer.

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 fault report timestamp on the fault report summary page did not apply the DST settings when accessed through URsetup software or web-browser.

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_0" 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 "3V0" (eg. broken-delta connected VTs).

R **Data logger element has been modified to ensure the newest data is placed at the end of the queue when rolling over**

524-6

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

This firmware version ensures the "data logger" element always displays the older data first followed by the newer data. Previous firmware versions may show the newest data at the start of the queue instead of at the end.

Relays with firmware version previous to 4.80 are not affected by this issue.

R **DNP 3.0 and IEC60870-5-104 protocols have been modified to ensure an accurate time stamping of binary signal**

443-9

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

The binary point scan routine of DNP 3.0 and IEC61870-5-104 protocols was improved for correctly time stamping.

Previous FW version might show a difference of +/- 2ms between the relay's SOE and DNP/IEC 104 time stamp.

UR devices which FW version is 4.80 or later are not affected by this issue.

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

443-10

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

UR fault report algorithm has been improved to ensure prefault and fault voltage phasors are properly computed and stored within fault reports when VTs are in delta configuration and "VT substitution" setting is enabled. Also, the fault report is further enhanced to display only those elements that operated at trigger.

Cyber Security

C **The UR operating system debug port has been changed to reject Ethernet traffic**

592-1

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

All UR devices equipped with an Ethernet port support the logical port #17185. This logical port is a debug port dedicated to the device operating system. This port is used for factory service only.

Any port scanner connected to a UR Ethernet port detects that port as “open”. However, UR devices with firmware version 5.92/5.48 do support a data filter that discards any data for the debug port. The debug port traffic is only allowed when a factory service password requirement is met.

End users having UR devices with an Ethernet port and being concerned about cyber security in their substation L.

Firmware 5.47

Summary

- L90 Enhancements
  - L90's test functionality was enhanced to prevent unwanted operations while performing communication tests
  - Enhanced L90 ensures correct source reading when switching settings groups and having several local sources
  - Enhanced two-terminal Inter relay communication ensures 87L goes back to normal after a channel fail and prevents events flooding
  - Enhanced three-terminal Inter relay communication ensures 87L goes back to normal when Channel and PFLL alarms are reset
- Communications
  - Faster Data File Transmission
  - IEC61850 configurable GOOSE re-transmission time reduced
  - Enhanced IEC61850 client/server communication prevents UR relays from losing communication when two clients are polling data
  - Enhanced IEC61850 GOOSE messages prevent unwanted alarms
  - Improved IEC60870-5-104 prevents possible communications freezing when losing one of the masters
  - IEC61850 logical node GG01 was improved to guarantee proper time stamp
  - Enhanced IEC 61850 client/server communication ensures proper interaction with 02 Siemens SICAM PAS clients
- Fault Report
  - Improved Fault Report guarantee accurate records when VTs are in delta
- Event Recorder
  - Enhanced event recorder to guarantee proper sequence of Contacts inputs events when having different debounce time
- Real Time Clock
  - Improved IRIG-B noise immunity
- Synchrophasor
  - Improvements on Synchrophasor Timestamp ensure the correct rollover of milliseconds' field

L90 Enhancements

F **L90's test functionality was enhanced to prevent unwanted operations while performing communication tests**

Applicable: L90

Internal algorithms were improved so that a remote loopback test does not cause a miss-operation of the 87L element when working in a two terminals-redundant channel scheme. The previous FW versions showed up that, after experiencing both "channel fail" and "channel ID fail" alarms in one channel, the 87L element could miss operate if a remote loopback test had performed on the same failed channel.

GE Multilin strongly recommends that, once the relays are in service, users must freeze (via UR Setup software) or disconnect (via hardwire) the trip contact output before performing any kind of test.

F Enhanced L90 ensures correct source reading when switching settings groups and having several local sources

Applicable: L90

The L90 setting group function was improved to guarantee that all required sources are read when switching from one setting group to another one. Previous firmware version might read only the source assigned to group 1.

This only applies for protections schemes were more than one local source contribute to the differential current estimation.

U Enhanced two-terminal Inter relay communication ensures 87L goes back to normal after a channel fail and prevents events flooding

Applicable: L90

This firmware version ensures that, for two terminal-single channel applications, the inter-relay communication link goes back to normal once a communication failure is cleared. Previous firmware version showed that, "channel fail" and "PFLL" operands oscillated every 10 seconds when a channel fail alarm had appeared, so the 87L element didn't return to normal operation and the event recorder was flooded.

L90s with firmware version prior to 4.61 are not affected by this issue.

U Enhanced three-terminal Inter relay communication ensures 87L goes back to normal when Channel and PFLL alarms are reset

Applicable: L90

This firmware version ensures that, for three terminal applications, the inter-relay communication link returns to normal operation in the case that, in one terminal, both communication channels fail and then just one comes back. In previous version, "channel fail" and "PFLL" operands started to oscillate, so that one communication link didn't return to normal operation.

L90s with firmware version prior to 4.61 are not affected by this issue.

Communications

E Faster Data File Transmission

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

UR Relays now use the TFTP ports to transmit data files reducing the transmission time. E.g. event records, oscillography, fault reports, data logger.

E IEC61850 configurable GOOSE re-transmission time reduced

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

The retransmission rate of configurable GOOSE dataset 2 to 8 was modified to enhance speed from a rate of 100ms, 500ms, 1000ms to a speed of 100ms, 100ms, 100ms.

C Enhanced IEC61850 client/server communication prevents UR relays from losing communication when two clients are polling data

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

When two or more IEC61850 clients were linked to one UR relay, and at least one of them was polling a report (buffered or not), all clients could lose connection in the event that, the client polling the report, was disconnected from the LAN. Then the relay had to be powered off and on to recover communications. This firmware version corrects this issue.

E Enhanced IEC61850 GOOSE messages prevent unwanted alarms

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

Now GOOSE messaging has a dynamic algorithm to estimate "time to live period", which prevents the generation of unnecessary "Remote device off" Alarms. Previous firmware version could raise this alarm when communication channels and remote devices were linked.

C Improved IEC60870-5-104 prevents possible communications freezing when losing one of the masters

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

UR relays have been improved to prevent communication freezing when linked to an IEC60870-5-104 Master. In the Previous firmware versions relay communication could freeze on the condition that the IEC60870 master dropped after about 02 days of polling message integrity.

C IEC61850 logical node GG01 was improved to guarantee proper time stamp

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

The IEC61850 logical node GGIO1 was improved to accurately transmit its time stamp. In previous firmware version, when IEC61850 was communicating in client/server mode, the client detected GGIO state changes but the time stamp was not updated.

C Enhanced IEC 61850 client/server communication ensures proper interaction with 02 Siemens SICAM PAS clients

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

The IEC61850 station bus communication has been enhanced to operate correctly when two connected SICAM PAS clients are recovering from broken link. Previous firmware version could allow one of the connected UR relays to re-start when experiencing that condition.

Fault Report

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

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

UR fault report algorithm has been improved to ensure accurate fault records. In previous firmware versions, in cases where VTs were in Delta configuration and new fault records were substituting old records in memory, the voltages values could not be recorded.

Event Recorder

R **Enhanced event recorder to guarantee proper sequence of Contacts inputs events when having different debounce time**

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

UR event recorder was improved to ensure that all contact input events are correctly sequenced by the event recorder. Previous firmware version could allow the event recorder to miss the correct order if two contacts inputs with different debounce time settings operated almost at the same time.

This issue does not affect relays with firmware version prior to 4.60.

Real Time Clock

B **Improved IRIG-B noise immunity**

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

IRIG-B inputs were enhanced to reduce noise sensitivity by rejecting short duration input pulses (lower than 250micro-sec). In previous firmware version, on the condition that a “DC Shift” IRIG-B signal had been set and a high frequency noise came in through IRIG-B inputs, the relay could reboot.

Synchrophasor

M **Improvements on Synchrophasor Timestamp ensure the correct rollover of milliseconds’ field**

Applicable: N60, D60, L90, G60

The continuous polling of PMU data revealed that “the seconds’ field” of synchrophasors timestamp didn’t show the correct rollover from milliseconds approximately once every 45 minutes.

This firmware version corrects this issue.

Firmware 5.46

Summary

- Front Panel
  - Preventing programmable push buttons from latching up when pressing more than one simultaneously

Front Panel

D Preventing programmable push buttons from latching up when pressing more than one simultaneously

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

Internal control algorithm of programmable push buttons was improved to guarantee that no one of them would latch when more than one button are pressed simultaneously.

Firmware 5.45

Summary

- Communications
  - Preventing more than 5 IEC61850 Clients from connecting to the UR

Communications

E Preventing more than 5 IEC61850 Clients from connecting to the UR

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

The IEC61850 Client/Server protocol was enhanced to prevent more than 5 clients from simultaneously connecting to the UR device as is specified in the manual. In the previous version of the firmware, if more than 5 clients attempted to simultaneously connect to a UR device, the connection to the 6th and additional clients would remain open even after communications had ceased. By having these additional connections remaining open, the overall communications to the UR would be slower than desired In this new version of firmware, a maximum of 5 IEC61850 clients can communicate to the UR at one time and thus, all connections will open and close correctly.

Firmware 5.44

Summary

- Platform Enhancements
  - Enhancement to correctly measure system frequency if device has breaker failure element
- Communications
  - IEC 60870-5-104: Communicating to multiple masters properly

Platform Enhancements

U Enhancement to correctly measure system frequency if device has breaker failure element

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

The Frequency Tracking feature that was updated in the 5.42 version of firmware has been enhanced to operate correctly when the model of relay being used has the Breaker Failure element. In the 5.42 version of firmware, the Frequency Tracking feature was modified to increase the range of frequencies that could be measured by the UR, and in this version of the firmware, if the relay had a Breaker Failure element, the frequency would be measured with a value of "0". When this occurred, relay functions that used the frequency measurements would operate incorrectly however, all other protection and control elements would operate properly. Reading of incorrect frequency values only occurred in the 5.42 version of firmware. Frequency measurements made using the 5.40 firmware or other previous versions of firmware did not experience this issue and measured frequency correctly. Relays experiencing this issue can be easily verified by viewing the frequency reading of each source and they if erroneously display a "0" value, should be upgraded to the 5.44 version of firmware.

Communications

C IEC 60870-5-104: Communicating to multiple masters properly

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

The IEC60870-5-104 protocol was enhanced to ensure that the UR device correctly communicates to multiple IEC60870-5-104 masters. In the previous version of firmware, if two IEC60870-5-104 masters were communicating to a UR device and one of those masters were interrupted or stopped sending requests, the UR would stop IEC60870-5-104 communications and the front panel of UR would respond slow when navigation buttons were pressed. When communications were disrupted due to a loss of one of the masters, all protection and control functions would continue to operate correctly.

Firmware 5.42

Summary

- Security Enhancements
  - Locking and Securing of FlexLogic Equations
  - Relay Setting Verification
- M60 Enhancement
  - Motor Setting Auto-Configurator
- L90 Enhancement
  - Multi-Ended Fault Location
  - Single-Pole Tripping functionality tripping all three poles
- L60 Enhancements
  - L60 Fault detection enhancements for Breaker-and-a-Half applications
  - Pickup settings to create square pulses range increased
- Platform Enhancements
  - Support for varying frequency conditions
- Communications Enhancements
  - DNP3.0: Analog Values not being reported correctly

Security Enhancements

N Locking and Securing of FlexLogic Equations

Applicable: Entire UR Family

The UR family now supports a method for allowing users to select parts or all of the FlexLogic configured in a relay and securely prevent unauthorized users from viewing or changing the logic.

Using the "Template" function that is found in both the Online and Offline window menus, users can select individual lines of logic to be protected and apply a password to this template. Once applied, selected lines of logic will be unavailable for viewing unless the user has the appropriate password. Unselected lines of logic will always be available for viewing and modifying.

Templates that are applied to a setting file will be retained when setting files are sent to and retrieved from a relay. All methods of viewing the FlexLogic will continue to secure Locked lines of FlexLogic including through the software and on the Front Panel display.

N Relay Setting Verification

Applicable: Entire UR Family

The UR and the UR Setup Software has been enhanced to log and record when a particular settings file has been loaded into a relay. The date and time that any setting file has been sent to a UR will be logged in the relay and can be viewed on the front panel or through the UR Setup Software. This same date and

time will also be logged into the setting file that has been sent to the relay and can be viewed through the UR Setup software and on a printed hard copy of the setting file. Comparing the dates stored in the relay and on the setting file will indicate to users if any changes have been made to the relay's configuration since the setting file was originally sent to the relay.

M60 Enhancement

N Motor Setting Auto-Configurator

Applicable: M60

The UR Setup software now contains an M60 Motor Setting Auto-Configurator that configures the settings required to protect and control a motor in six simple steps. Simply entering the motor nameplate data, the CT and VT parameters, motor starting data, and application information, will allow the UR Setup Software to generate a complete setting file customized for protecting and controlling the motor.

L90 Enhancement

N Multi-Ended Fault Location

Applicable: L90

The L90 now supports Multi-ended Fault Location that uses information collected at each end of the transmission line to provide high-accuracy fault location information. By sharing information through the communication channel about the fault characteristic as measured by the relay at each end of the transmission line, the L90 can consistently calculate the location of the fault within 2% accuracy.

If users are using a C37.94 inter-relay communications card to link the L90's (modules 2A, 2B, 2E, 2F, 76, 77), a new revision of the communications module (Rev D) must be purchased from GE Multilin. Modules that support this feature will have Rev D marked on the module's label. All other types of inter-relay communications modules (fiber, G.703, RS422) do not need to be upgraded and will support the Multi-ended Fault Location simply by upgrading the relay's firmware.

P Single-Pole Tripping functionality tripping all three poles

Applicable: L90

The L90 Line Differential protection (87L) single pole tripping logic was enhanced to ensure that the relay only trips one pole during single-phase fault conditions. In the previous version of firmware, when the 87L TRIP function detected a single-phase fault, a command to trip all 3 phases was given.

L60 Enhancements

P L60 Fault detection enhancements for Breaker-and-a-Half applications

Applicable: L60

The L60 fault detection algorithm was enhanced for Breaker-and-a-Half applications by adding

supervision that operates on the summed current from both breaker CT's. In the previous version of the firmware, the fault detectors operated independently from each breaker CT that could cause a mal-operation of protection in some Breaker-and-a-Half situations.

E Pickup settings to create square pulses range increased

Applicable: L60

The L60 Pickup setting for creating square pulses was decreased from 0.02pu to 0.005pu to create reliable square pulses at low fault currents.

Platform Enhancements

N Support for varying frequency conditions

Applicable: Entire UR family

The Frequency Tracking feature has been enhanced to accept a wider range of operating frequencies to support conditions that may have a varying operating frequency. The UR now provides a wider tolerance around the fundamental frequency before an invalid frequency condition is declared.

Communications Enhancements

C DNP3.0: Analog Values not being reported correctly

Applicable: all UR-Series Relays

The DNP3.0 Analog reporting has been enhanced to ensure that analog values are correctly updated and reported to the DNP master. In the previous version of firmware, the Universal Relay would meter analog values properly however, after prolonged periods of time, the analog values being reported over DNP would stop being updated and continually report the last known value. All protection and control functions continued to operate correctly when this occurred.

Firmware 5.40

Summary

- Ease of Use Enhancements
  - Enhanced Horizontal Front Panel
  - Direct Tripping of Protection and Control Elements (Trip Bus)
  - Automatic Discovery of Ethernet Devices
  - Quick Action hot links
  - Enhanced Self-Test messaging
  - Additional Information Stored in Setting File
- Security Enhancements
  - Local and Remote Settings and Commands Passwords
- M60 Motor Management Relay
  - Enhanced Motor Health Diagnostics (Motor Learned Data)
  - Enhanced Thermal Overload Algorithm
  - Undercurrent Protection
  - Overfrequency / Underfrequency Protection
  - Two-Speed Motor Protection
  - Underpower Protection
  - Enhanced RTD Protection
  - IEC60255-8 Thermal Overload Curves
  - Reduced Voltage Starting
- G60 Generator Management Relay
  - Synchrophasor Measurement available on the G60
  - Accumulated Overfrequency / Underfrequency
  - Enhanced RTD Protection
- L90 Line Differential Relay
  - Single Pole Distance Tripping and Reclosing
- C30 Controller
  - IEC61850 – Support for additional Remote Devices and Remote Inputs
- B30 Bus Protection Relay
  - Support for six Breaker Failure elements
- Communications
  - GOOSE Communications - Data Set transmission rate modifications
  - Protecting network bandwidth from an oscillating IEC61850 GOOSE message
  - DNP 3.0 – Support for Binary Input Change, Variation 3
  - IEC61850 – Support for buffered report control block event reporting
  - IEC61850 – Circuit breaker Select Before Operate (SBO) requiring select request before operand accepted
  - Streaming PMU data incorrectly transmitted when Rectangular format was requested
  - SNTP not alarming on a loss of signal when IRIG-B time-synchronization is also used
- Platform Enhancements

- Enhanced resolution of DCMA Inputs in Oscillography and Data Logger recording
- Increased harmonic resolution for FlexElements
- Improved Breaker Failure reset response time
- Additional sensitivity of negative sequence supervision voltage for the VT Fuse Failure element
- Number of PMU records available inaccurately shown
- FlexElement unavailable when using PMU (Phasor Measurement Unit) Angle data as the input to the element
- FlexElement incorrectly reading input value if the Summator is used as the input to the element and the Summator settings were changed when the relay is online
- Neutral Overvoltage operate (OP) status incorrectly changing state during Setting Group change
- Hysteresis applied to the Phase and Ground Distance protection elements
- Volts per Hertz element operating earlier than specified
- Distance element requiring larger impedance than expected for faults occurring in the reverse direction and through a transformer
- LED FlexState status showing incorrect value when used in FlexLogic equations or as and input to an element

Ease of Use Enhancements

N Enhanced Horizontal Front Panel

Applicable: Entire UR Family

The UR Horizontal Front Panel has been enhanced to provide expanded functionality and increased visualization to power system events. This enhanced front panel can be purchased on new units ordered from the factory or as an upgrade kit for relays currently installed in the field. The enhanced front panel is completely backwards compatible with older units and firmware versions and can be installed without removing the relay from service. Enhancements to the UR horizontal Front Panel include:

- **Larger Display** – The Enhanced Front Panel has a new LCD display that is brighter and is 2.5 times larger than the basic Front Panel.

- **Lockable RS232 port** – The new lockable RS232 port ensures that the communications cable is secure during configuration and relay interrogation.

- **Four Additional User-Programmable pushbuttons** – Four additional User-Programmable Pushbuttons have been added to the pushbutton option of the Enhanced Front Panel. These fully

configurable User-Programmable Pushbuttons replace the 4 blue User Buttons that were previously offered on Front Panels ordered with the Pushbutton option.

- **Easy labeling of User-Programmable LEDs** – The method of labeling the User-Programmable LED's has been enhanced to provide users with an easy method of customizing the text shown next to each LED. The Enhanced Front Panel comes with perforated template cards that can be run through a standard printer and punched out to create customized labels. These labels can then be slid into protective pockets next to each row of LED's using a simple tool that is included with the Front Panel.

- **Easy labeling of User-Programmable Pushbuttons** - The method of labeling the User- Programmable Pushbuttons has been enhanced to provide users with an easy method of customizing the text shown above each User-Programmable Pushbutton. The Enhanced Front Panel comes with perforated template cards that can be run through a standard printer and punched out to create customized labels. These labels are then slid into protective pockets above each set of Pushbuttons using a simple tool that is included with the Front Panel.

- **Larger User pushbuttons** – The 3 User pushbuttons have been enhanced to be larger in size and of similar construction to the User-Programmable pushbuttons. As in the basic version of the Front Panel, these User pushbuttons are available on both options of the Enhanced Front Panels that contain User-Programmable Pushbuttons and those without.

- **Large, robust hinge mechanism** – The hinge construction that connects the Front Panel to the chassis has been modified to provide secure opening and closing of the Front Panel

- **Ability to change power supply module without removing Front Pane**l – The Enhanced Front Panel hinge construction allows the Front Panel to open completely and allow insertion and removal of the Power Supply module without having to remove Front Panel.

- **Order Code Options** – Several new ordering code options have been made available to allow ordering of UR devices with the Enhanced Front Panel. The options for front panel ordering are located in the eighth character of the UR order codes (e.g., D60-D00-HPH-F8L-H6A-L6L-M6L-W7R)

K – Enhanced English Front Panel
L – Enhanced English Front Panel with User-Programmable Pushbuttons
M – Enhanced French Front Panel
N – Enhanced French Front Panel with User-Programmable Pushbuttons
Q – Enhanced Russian Front Panel
T - Enhanced Russian Front Panel with User-Programmable Pushbuttons
U - Enhanced Chinese Front Panel
V - Enhanced Chinese Front Panel with User-Programmable Pushbuttons

N Direct Tripping of Protection and Control Elements (Trip Bus)

Applicable: Entire UR Family

The UR has been enhanced to allow Protection and Control elements to directly control the status of Contact Outputs for the purpose of tripping breakers without having to use FlexLogic. This Ease-of-Use enhancement allows using the Protection Summary for configuring protection and control elements as well as assigning them to control specific Contact Outputs all from one location.

N Automatic Discovery of Ethernet Devices

Applicable: Entire UR Family

The UR Setup Software now has the ability to automatically discover and communicate to all of the UR's that are located on an Ethernet Network. Using the Quick Connect Feature, a single click of the mouse will trigger the software to automatically detect any UR relays located on the Ethernet network. The Setup Software will then proceed to configure all settings and order code options in the Device Setup menu for the purpose of communicating to multiple relays. Utilizing this feature will allow users to identify and interrogate all UR devices found in a particular location in seconds.

N Quick Action hot links

Applicable: Entire UR Family

The UR Setup Software has several new Quick Action buttons that provide users with instant access to several functions that are often performed when using UR relays. In the Online Window, users can select which relay they wish to interrogate from a pull-down window, and then click on the button for the action they wish to perform. The Quick Action functions available are:

- View device's Event Record
- View device's last recorded Oscillography Record
- View status of all device Inputs and Outputs
- View all of the device Metering values
- View the device's Protection Summary

N Enhanced Self-Test messaging

Applicable: Entire UR Family

The messages that are displayed on the UR have been enhanced to clearly identify the cause of the Self-Test and indicate what action if any should be taken by the user.

N Additional Information Stored in Setting File

Applicable: Entire UR Family

The UR setup software has been enhanced to include additional information in the setting file when settings are retrieved from the relay. Information that is now stored in the setting file include:

- The serial number of the relay
- The serial number of each module in the relay
- The version of firmware installed in the relay (i.e. 5.40)
- The version of boot code installed in the relay (i.e. 2.00)

Security Enhancements

N Local and Remote Settings and Commands Passwords

Applicable: Entire UR Family

The UR has been enhanced with additional password security functions that aid in allowing users to adhere to NERC CIP compliance. For each of the functions of sending Settings to the relay and sending Commands to a device, a Local Password and Remote Password setting is available. Having the Local Password will give access to users interrogating the relay through the keypad or the front RS232 port. Having the remote password will give access to users interrogating the relay through the rear RS485 ports or the Ethernet port.

M60 Motor Management Relay

N Enhanced Motor Health Diagnostics (Motor Learned Data)

Applicable: M60

The M60 now provides advanced motor health diagnostics that displays the operating characteristics of the motor and indicates to users that maintenance may be required on the motor before damage occurs and costly repairs are required. The M60 logs and creates a detailed report of the last 250 consecutive motor starts. For each motor start, the M60 will provide a report that contains the following information:

- Date of each motor start
- Learned motor acceleration time
- Learned motor starting current
- Learned motor thermal capacity used during starts
- Learned average motor load
- Learned running time after a start

The Motor Health Diagnostic information can be retrieved from the M60 and displayed using the UR Setup Software. Analyzing this report for changes that have occurred in the operating characteristics of the motor over successive motor starts can indicate motor maintenance requirements sooner than is possible using any other observable method.

N Enhanced Thermal Overload Algorithm

Applicable: M60

The M60 Thermal Overload algorithm was enhanced to provide protection for a large variety of motor types, regardless of how they were designed to operate with respect to their temperature rising over ambient. Users now have the ability to configure how the thermal overload curve will operate with respect to the Service Factor of the motor. Users can choose to “Cut Off” the part of the thermal overload curve that exists below the service factor level or, “Shift” the thermal overload curve so that the curve begins at just above the service factor level.

N Undercurrent Protection

Applicable: M60

The new Undercurrent Protection element provides the ability of tripping the motor due to external conditions that can cause the load being pulled by the motor to drop below a pre-set level. This element is useful when the process being driven also cools the asset (i.e. pumping applications that are cooled by the liquid it pumps). Using the Undercurrent element can prevent damaging from occurring when the loss of the load results in a loss of cooling which will cause the asset to overheat.

N Overfrequency / Underfrequency Protection

Applicable: M60

The Overfrequency and Underfrequency protection element provides the ability to detect when the motor is operating at off-nominal frequencies. This feature can be used to trip the motor if operating at other than nominal frequencies can damage the process or, to signal to upstream protections or controls to implement load shedding actions.

N Two-Speed Motor Protection

Applicable: M60

The Two-Speed Motor protection feature allows for protection of motors that can operate at two different speeds and have different full load capacity levels at each speed. This feature can be used on motors that have two sets of windings on each stator where each set is used to operate the motor at a different speed.

N Underpower Protection

Applicable: M60

The Underpower protection feature provides for sensitive detection of a loss of load condition. The Underpower protection element can be more sensitive for detecting loss of load conditions caused by process related problems than is possible using a standard under undercurrent element.

N Enhanced RTD Protection

Applicable: M60

The M60 has been enhanced to provide advanced RTD protection for monitoring the temperature of a motor. The configuration of the RTDs now allow for configuring the Alarming and Tripping Temperature of each RTD, detecting RTD shorting conditions, and selecting RTD voting that requires more than one RTD to detect an over-temperature condition before it will issue a Trip command.

N IEC60255-8 Thermal Overload Curves

Applicable: M60

The M60 now provides the IEC60255-8 thermal overload curves among the list of thermal overload curves

that can be selected. These new curves allow the M60 to be programmed to accurately match the operating characteristics of many additional types of motors.

N Reduced Voltage Starting

Applicable: M60

The Reduced Voltage Starting feature can provide the controls for signaling the motor to switch over from a reduced voltage that is being used during starting, to the full voltage for motor running operation. This feature can issue the command to switch to full operating voltage by detecting the motor load has reached a pre-set current level, that a time delay after starting has elapsed, or both of these conditions combined.

G60 Generator Management Relay

N Synchrophasor Measurement available on the G60

Applicable: G60

The G60 Generator Management Relay is now available with the option for having Synchrophasor Measurement in the same device as the protection relay. Measurement of Synchrophasor data will allow for accurately measuring and analyzing the state of the power system based on real-time data collected from Phasor Measurement Units located all across the network. Through collection of this accurately time-tagged Phasor data, System Controllers can quickly identify power system events through visualization of system quantities such as power flow, dynamic phase angle separation, and the rate of change of frequency from different parts of the system.

N Accumulated Overfrequency / Underfrequency

Applicable: G60

This Accumulated Overfrequency / Underfrequency element now provides users with the ability to monitor that amount of time that their generator is running at off nominal frequencies that can cause wear on the generator. Users are now able to set alarms that will alert them when the generator has accumulated a pre-set amount of running time at overfrequency or underfrequency conditions allowing them to schedule maintenance thus preventing excessive wear that can result in expensive generator repairs.

N Enhanced RTD Protection

Applicable: G60

The G60 has been enhanced to provide advanced RTD protection for monitoring the temperature of a generator. The configuration of the RTDs now allow for programming the Alarming and Tripping Temperature of each RTD, detecting RTD shorting conditions, and selecting RTD voting that requires more than one RTD to detect an over-temperature condition before it will issue a Trip command.

L90 Line Differential Relay

N Single Pole Distance Tripping and Reclosing

Applicable: L90

Single Pole Distance Tripping and Reclosing has been added to the three zones of Backup Distance protection to compliment the differential protection scheme.

C30 Controller

N IEC61850 – Support for additional Remote Devices and Remote Inputs

Applicable: C30

The IEC61850 GSSE and GOOSE communications were enhanced in the C30 to allow the controller to receive addition pieces of information from more remote devices in the substation. The C30 now supports 64 Remote Inputs and 32 Remote Devices which means it can receive 64 pieces of digital information from up to 32 different IEC61850 devices.

B30 Bus Protection Relay

U Support for six Breaker Failure elements

Applicable: B30

The B30 was enhanced to support up to six independent Breaker Failure elements.

Communications

C GOOSE Communications - Data Set transmission rate modifications

Applicable: Entire UR Family

The function of the Data Sets available for GOOSE communications was modified to provide high-speed transmission of critical information and slower transmission of non-critical or operational data that does not require single-digit millisecond responses.

Items programmed to be in Data Set 1 will have changes in their status transmitted as soon as the change is detected. Data Set 1 should now be used for high-speed transmission of data that is required for applications such as transfer tripping, blocking, and breaker fail initiate.

Items programmed to be in Data Set 2 through Data Set 8 will have changes in their status transmitted at a maximum rate of every 100ms. Data Sets 2 to 8 will regularly analyze every data item configured within them every 100ms. to identify if any changes have been made. If any changes in the data items are detected, these changes will be transmitted through a GOOSE message. If no changes are detected during this 100ms. period, no GOOSE message will be sent.

For all Data Sets 1 through 8, the integrity GOOSE message will still continue to be sent at the preconfigured rate even if no changes in the data items are detected.

C Protecting network bandwidth from an oscillating IEC61850 GOOSE message

Applicable: Entire UR Family

The GOOSE functionality was enhanced to prevent the relay from flooding a communications network with GOOSE messages due to an oscillation being created that is triggering a message. The UR now has the ability of detecting if a data item in one of the GOOSE Data Sets is erroneously oscillating which can be caused by events such as: an error in logic programming, an input improperly being asserted/deasserted, or a failed station component. If detected, the UR will stop sending a GOOSE message from that Data Set for a minimum period of one second. Should this oscillation persist after the one-second timeout period, the relay will continue to block transmission of this Data Set.

C DNP 3.0 – Support for Binary Input Change, Variation 3

Applicable: Entire UR Family

The DNP3.0 functionality was enhanced to support Variation 3 for Binary Input Changes (Object 2). This enhancement now allows for the UR to support "Binary Input Change with Relative Time" functionality.

C IEC61850 – Support for buffered report control block event reporting

Applicable: Entire UR Family

The IEC61850 protocol was enhanced to properly report changes in events for the Buffered Report Control Block (brcbST) in logical node GGIO1. In the previous version of firmware, the brcbST reporting function would not report on status changes that occurred in the GGIO1 logical node. The brcdST01 function in the GGIO1 logical node did however report these changes properly.

C IEC61850 – Circuit breaker Select Before Operate (SBO) requiring select request before operand accepted

Applicable: Entire UR Family

The IEC61850 protocol was enhanced to require the XCBR SBO function to receive a "Select" command before receiving and operating on an "Operate" command. In the previous version of firmware, the SBO function of the XCBR element did not require the receiving of a "Select" command before receiving and operating on an "Operate" command.

C Streaming PMU data incorrectly transmitted when Rectangular format was requested

Applicable: D60, L90, N60

The PMU functionality was improved to provide the correct information when the data was being sent in "Rectangular format". In the previous version of the firmware, the relay would report the magnitude's Peak value rather than the RMS value of the magnitude when the data was being transmitted in rectangular format.

C SNTP not alarming on a loss of signal when IRIG-B time-synchronization is also used

Applicable: Entire UR Family

The SNTP function was enhanced to allow for proper alarming of a loss of the SNTP signal when IRIG-B is also enabled. When SNTP and IRIG-B time-synchronization methods are used in unison, the IRIG-B signal takes precedence while the SNTP remains as a backup in case the IRIG-B signal fails. In the previous version of firmware, the SNTP feature would not provide an alarm to indicate a loss of the SNTP signal if the IRIG-B feature was also enabled. In this configuration, the IRIG-B feature did function properly and provide appropriate alarming when the IRIG-B signal was lost. The SNTP feature did alarm properly when used alone without the IRIG-B feature enabled.

Platform Enhancements

E Enhanced resolution of DCMA Inputs in Oscillography and Data Logger recording

Applicable: Entire UR Family

The resolution of the DCMA inputs was increased to allow for showing smaller changes in measurement when recording in the Oscillography records and the Data Logger.

E Increased harmonic resolution for FlexElements

Applicable: C70, F60, T60

The FlexElements were enhanced to provide additional resolution to the pickup levels for current and voltage harmonic metering. The one per unit (p.u.) value for both current and voltage harmonics has been changed from 100% harmonic content to 1% harmonic content. This decrease in the per unit level will allow for smaller changes in the harmonics to be detected by the FlexElements.

E Improved Breaker Failure reset response time

Applicable: B30, C60, D60, F60, L60, L90, M60

The Breaker Failure element was enhanced to provide a faster reset response time by monitoring both the Phase and Neutral currents to detect a reset condition. The previous version of the firmware only monitored the Phase current for detecting reset conditions.

E Additional sensitivity of negative sequence supervision voltage for the VT Fuse Failure element

Applicable: C60, C70, D30, D60, F60, G30, G60, L60, L90, M60, N60

The pickup and hysteresis levels of the negative sequence voltage supervision element was decreased to provide additional sensitivity at lower input levels for the VT Fuse Failure element. The negative-sequence voltage supervisory threshold was decreased from 0.15pu to 0.10pu and the hysteresis was decreased from 0.12pu to 0.09pu.

R Number of PMU records available inaccurately shown

Applicable: D60, L90, N60

The PMU recording functionality was modified to show the correct number of PMU records available. In the previous version, the actual number of records available was actually one less than was shown in the settings. For example, if 32 records were configured, 31 records was actually available in the device for recording

U FlexElement unavailable when using PMU (Phasor Measurement Unit) Angle data as the input to the element

Applicable: D60, L90, N60

The FlexElements were modified to operate properly when the input to the FlexElement is a PMU Angle data item. In the previous version of firmware, if a PMU Angle was selected as the input and power was cycled to the unit, the FlexElement would always remain in OFF state.

P FlexElement incorrectly reading input value if the Summator is used as the input to the element and the Summator settings were changed when the relay is online

Applicable: N60

The FlexElements were enhanced to correctly read the value of the Summator input. In the previous version of the firmware, if the Summator was programmed as the input of the FlexElement and the p.u. (per unit) setting of the Summator was modified, the FlexElement would continue to use the old p.u. value in its calculations. This issue only identified itself if the p.u. setting of the Summator was changed through the Online Window after the Summator was chosen as the FlexElement input. If these settings were sent to the relay as a complete setting file or the relay subsequently had its power cycled, the FlexElement would not be exhibit this characteristic.

P Neutral Overvoltage operate (OP) status incorrectly changing state during Setting Group change

Applicable: Entire UR Family

The Neutral Overvoltage element has been improved to prevent the element's Operate flag from incorrectly changing from OP (operate) to DPO (dropout) and back to OP when the active Setting Group is changed. This characteristic only exhibited itself when multiple Setting Groups are used and was limited only to the Neutral Overvoltage protection element.

P Hysteresis applied to the Phase and Ground Distance protection elements

Applicable: D60, G60

The Phase Distance protection element and the Ground Distance Protection element have been enhanced to include a 3% hysteresis to the dropping out of the element. In the previous version of the firmware, a line impedance hovering around the pickup level could cause the element to continuously pickup and dropout. With the hysteresis now applied, the impedance must drop 3% below the pickup level before the element will dropout.

P Volts per Hertz element operating earlier than specified

Applicable: G30, G60, T60

The Volts per Hertz element was enhanced to allow the element to operate within the correct time specified by the selected operating curve. In the previous version of firmware, the Volts per Hertz element would operate sooner than expected if the Volts per Hertz ratio fell between the pickup level and 1.02 times the pickup level. If the Volts per Hertz ratio was greater than 1.02 time the pickup level, the element operated within the expected time requirements.

P Distance element requiring larger impedance than expected for faults occurring in the reverse direction and through a transformer

Applicable: G60, D60

The distance element was modified to allow for proper detection of faults that were occurring in the reverse direction and through a power transformer. In the previous version of firmware, the distance element required a three times larger fault impedance than is specified by the pickup setting in order for the element to detect a fault under these conditions.

D LED FlexState status showing incorrect value when used in FlexLogic equations or as and input to an element

Applicable: Entire UR Family

The status of the LED FlexStates have been improved to show their correct state when used in the FlexLogic equations and as the inputs to other elements. In the previous version of the firmware, the status of the LED FlexStates would show the status of Operand driving the LED whether or not the LED was Latched. In the new version of the firmware, if the LED is programmed as Latched, the FlexState status of the LED will remain ON until the operand driving the LED has turned OFF and the Reset command has been given to the relay.

Upgrade

Path for versions 4.00 and above

For UR devices with version 4.00 firmware and above, upload the 5.4x release to the relay using the EnerVista UR Setup software.

Path for revisions below version 4.00

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

Upgrade

If upgrading both EnerVista software and UR firmware, upgrade the software first. Upgrade takes 15 to 20 minutes and can be done over an Ethernet connection. The USB port cannot be used for the upgrade.

To upgrade the software:

1. If a beta version of the EnerVista UR Setup software is installed, uninstall it, for example using the Windows Control Panel.
2. Download the new software from http://www.gegridsolutions.com/app/ViewFiles.aspx?prod=urfamily&type=7
   The software is a .exe file.
3. Install the new software by clicking the file.
4. Refresh the order code in EnerVista under the **Device Setup** button.

To upgrade the firmware:

1. Download the firmware from http://www.gegridsolutions.com/app/ViewFiles.aspx?prod=urfamily&type=7
   The firmware is a .bin file.
2. In the EnerVista software, navigate to **Maintenance > Update Firmware** and select the .bin file.
   For any issues, see a UR instruction manual.
   When the update finishes, the relay restarts.
3. Restart the EnerVista software, and refresh the order code in EnerVista under the **Device Setup** button.
4. Convert the existing setting file, then load the converted settings to the relay.
5. Set the device to "Programmed" under **Settings > Product Setup > Installation**.

Categories

This document uses the following categories to classify changes.

Revision categories

Code	Category	Description
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 add 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 operates when it is not appropriate
B	Unexpected restart	Relay restarts unexpectedly

For further assistance

For product support, contact the information and call center as follows:

GE Grid Solutions
650 Markland Street
Markham, Ontario
Canada L6C 0M1
Worldwide telephone: +1 905 927 7070
Europe/Middle East/Africa telephone: +34 94 485 88 54
North America toll-free: 1 800 547 8629
Fax: +1 905 927 5098
Worldwide e-mail: multilin.tech@ge.com
Europe e-mail: multilin.tech.euro@ge.com
Website: http://www.gegridsolutions.com/multilin/