



UR Universal Relay Series

Revision 5.00 release note

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Overview

Summary

This document contains the release notes for the 5.00 release of the UR Universal Relay series.

- Affected products: UR Universal Relay series
- Date of release: March 31, 2006
- Firmware revision: 5.00

Description

The version 5.00 release is compatible with EnerVista version 5.00 and UR-series relays operating with version 4.00 and higher hardware (refer to *Upgrade paths* on page 7). The following relay models are covered by this note:

- B30 Bus Differential Relay
- C30 Controller
- C60 Breaker Management Relay
- D30 Line Distance Relay
- D60 Line Distance Relay
- F35 Multiple Feeder Management Relay
- F60 Feeder Management Relay
- G30 Generator Management Relay
- G60 Generator Management Relay
- L60 Line Phase Comparison Relay
- L90 Line Differential Relay
- M60 Motor Relay
- N60 Network Stability and Synchrophasor Measurement System
- T35 Transformer Management Relay
- T60 Transformer Management Relay

Release details

In the following change descriptions, a revision category letter is placed to the left of the description. Refer to the appendix at the end of this document for additional details.

New features

N Directional comparison unblocking (DCUB) pilot scheme is introduced on the D60 relay

Applicable to: D60 relay

The directional comparison unblocking (DCUB) pilot scheme has been implemented on D60 Line Distance relay for the 5.00 release. This scheme is intended for use with frequency-shift keying (FSK) narrowband power line carriers and provides excellent security against communications noise or complete signal loss. This security is achieved by continuous channel monitoring during normal channel operation, before faults, and during faults.

A radio frequency (RF) signal is transmitted continuously in one of two modes: Block (also known as Guard) and Unblock (also known as Trip). During normal system operation, a Block signal is continuously being transmitted, permanently blocking all remote peers. During an internal fault, the relays are shifting the Block signal to Unblock to permit the relays to trip.

When Block signal disappears during normal operation, the scheme is instantaneously blocked and returned to service only after the Block signal is re-established for specified amount of time. When the Block is lost during a fault without shifting to Unblock, the scheme is allowed to produce a trip (for a typical time of 150 ms, based on local determination of the fault only). This is based on the assumption that pilot channel loss is caused by the fault.

The directional comparison unblocking (DCUB) scheme uses distance elements and optional ground directional elements to detect a fault on the line. The element is enhanced with current reversal logic, an echo feature for weak-feed applications, and is available for three-pole and single-pole tripping applications with capability to employ up to four pilot bits.

N Time offsets: time offsets (time zone and daylight savings time) added to relays

Applicable to: all UR-series relays

The 5.00 release introduces new settings and functionality to allows UR-series relays to determine their local time offset from Universal Time (UTC). The SNTP protocol provides UTC time synchronization. The new time zone and daylight savings time (DST) settings allow the relay to offset its clock to its own local time.

The IRIG-B function provides local time. When IRIG-B is in use, the DST settings are ignored.

The time zone offset setting and UTC time are used to calculate the IEC 61850 protocol timestamps, which are required to be UTC.

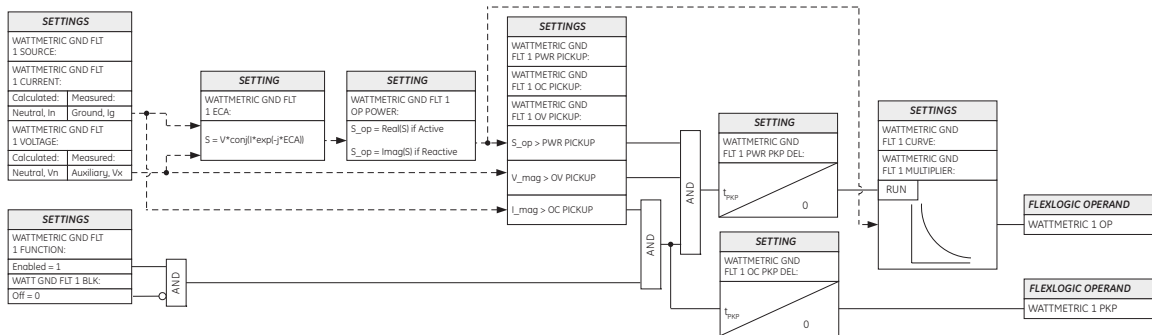
N Wattmetric ground fault protection: new function implemented for 5.00 release

Applicable to: D60, F60, L60, and L90 relays

A sensitive wattmetric zero-sequence directional function can be used on isolated or resonant (Petersen coil) grounded, low-resistance grounded and solidly grounded systems to detect ground faults. The function determines the presence and direction of ground faults by measuring the value and direction of zero-sequence power.

The element responds to power derived from zero-sequence voltage and current in a direction specified by the element characteristic angle. The angle can be set within all four quadrants, and the power can be selected as active, reactive, or apparent. Therefore, the element may be used to sense either forward or reverse ground faults

in inductive, capacitive, or resistive networks. An inverse time characteristic allows time coordination of the elements across the network.



The time delay characteristic can be definite time, inverse time, or any timing curve programmed with FlexCurves™. There are two elements available in the relay.

Modified features

E Autoreclose: changes to the 1P/3P autoreclose element

Applicable to: C60, D60, L60, and L90 relays

The following changes were implemented for the autoreclose function:

- Pause functionality:** Prior to this change, if the autoreclose element was paused for a time longer than the incomplete sequence timer setting, then autoreclose was locking out. The autoreclose logic has been changed to pause the reclose cycle as well as the incomplete sequence timer, thus allowing pausing for times longer than the incomplete sequence timer alone.

Moreover, in earlier revisions, the autoreclose element would always resume with the **AR 3P DEAD TIME 2** timer when the pause terminated. With the 5.00 release, the autoreclose logic has changed so that if the **AR 3P DEAD TIME 1** timer has not timed out when the pause started, then autoreclose will resume with the **AR 3P DEAD TIME 1** timer.
- Bus Faults with breaker-and-a-half configuration.** In earlier revisions, the autoreclose element did not operate for a bus or other fault in an adjacent zone that resulted in the opening of only one breaker, due to a logic requirement that both breakers have to be opened. With the 5.00 release, the implemented change now allows the autoreclose element to reclose if only one of the two breakers opens and the FlexLogic™ operand assigned to the **AR BUS FLT INIT** setting is asserted. Otherwise, two breakers must be open as per the earlier revisions.

The new **AR BUS FLT INIT** setting is used to assign a FlexLogic™ operand to indicate that a trip occurred due to a bus or other fault in an adjacent zone. It is used in breaker-and-a-half applications to allow the autoreclose function to perform reclosing with one breaker open only as a result of previous bus protection operation. For line faults, both breakers still must be open for the autoreclose reclosing cycle to be performed.

C Communications: all timestamps for IEC 61850 logical nodes GGIO1 and GGIO2 are now updated

Applicability: all UR-series relays

In earlier revisions, the timestamps for the IEC 61850 data items **Mod**, **Beh**, and **Health** in the GGIO1 and GGIO2 logical nodes were not updated on the occurrence of state changes. With the 5.00 release, the timestamps are now updated as required.

G **Communications: change in logic for primary and secondary Ethernet self-tests for 100 MB hardware and FEFI disabled**

Applicability: all UR-series relays

The UR-series 100 megabit Ethernet hardware differs from the 10 megabit Ethernet hardware. The primary and secondary Ethernet self test logic was changed to reflect the different capability of the 100 megabit hardware. When both primary and secondary channels are disconnected, both the primary and secondary Ethernet self-tests are level triggered and active. When either the primary or secondary channel is connected, the self-tests are edge triggered (that is, a failure indication occurs on channel switchover). This prevents incorrect self test indications.

Also, the FEFI feature of the physical Ethernet chip was disabled.

C **Communications: configurable GOOSE functionality added to IEC 61850 protocol features**

Applicability: all UR-series relays

The IEC 61850 GOOSE support in the UR-series was enhanced to include user configurable datasets. This allows the relay to interoperate with IEC 61850 devices from other manufacturers. Multiple dataset for transmission and reception are now supported.

Other changes and additions include:

- Logical device name setting improvements,
- addition of the PDIF logical node for the T60 relay,
- allowing simultaneous reception of GSSE and GOOSE,
- addition of a setting for LPHD location,
- addition of settings for report control configuration parameters, and
- addition of new settings for GGIO1 FlexLogic™ operands (FlexState settings are no longer used).

R **Event recorder: problem with system time reset at power on resolved**

Applicable to: all UR-series relays

In earlier revisions, a remote chance existed that the UR-series system time could revert to January 1, 1970, 12:00AM after a power off/on event. This could happen in relays with a real time clock chip on the CPU board and at least one transducer input/output card in the chassis. This has been resolved for the 5.00 release.

E **Fault location: enhancements to the fault locator feature**

Applicable to: C60, D30, D60, F35, F60, L60, and L90 relays

In earlier revisions of the UR-series relay, the fault locator was unable to measure the distance to the ground fault correctly if the voltage to the relay was supplied from the delta-connected VTs. This occurred because zero-sequence voltages were not available for correct calculations.

The 5.00 release allows the fault locator to locate ground faults by using either the zero-sequence voltage supplied from broken-delta VTs or by approximating the zero-sequence voltage from zero-sequence current and equivalent zero-sequence impedance sources behind the relay.

In additions, the fault type selection was improved for the D60, L60, and L90 line relays.

The following new settings have been added for the 5.00 release:

- **FAULT REP 1 VT SUBSTITUTION**: specifies whether the zero-sequence voltage is measured from wye-connected VTs (none), supplied from broken-delta VT connected to fourth VT input (V0), or approximated from the zero-sequence current and source impedance (I0).

- **FAULT REP 1 SYSTEM Z0 MAG** and **FAULT REPORT 1 SYSTEM Z0 ANGLE**: these settings are used only when the **FAULT REP 1 VT SUBSTITUTION** setting is set to "I0". The magnitude entered is in secondary ohms and is based on average system zero-sequence equivalent impedance behind the relay.

D **FlexElements™: the FlexElement™ value for df/dt has been corrected**

Applicable to: F60, G30, G60, and N60 relays

In previous revisions, the actual value displayed would be incorrect when the frequency rate of change (df/dt) was used as an input FlexAnalog value for FlexElements™. This has been fixed for the 5.00 release

R **High impedance fault detection: modifications to high-impedance fault detection sequence of events**

Applicable to: F60 relay

Modifications to the sequence of events recording have been made to allow the user to apply a chatter filter to the generation of the high-impedance fault detection "arcing detected" event. Additional FlexLogic™ operands have been added for determination of the armed/disarmed status of the high-impedance fault detection algorithm. Please refer to the instruction manual for additional details.

G **Internal enhancement: incorrect timestamp strings corrected**

Applicability: all UR-series relays

In previous revisions, internal system functionality may have caused incorrect timestamp strings to be created. Any problems caused by this were likely to be extremely intermittent. This has been corrected for the 5.00 release.

D **L90 power system: undefined message in L90 power system menu removed**

Applicable to: L90 relay

In previous revisions, the **UNDEFINED** message would appear when pressing the message right key while the **CHARGING CURRENT COMPENSATN** setpoint was displayed on the front panel. This message has been removed for the 5.00 release.

E **Pilot schemes: block setting added to all D60 pilot schemes**

Applicable to: D60 relay

A block setting has been added to all five D60 pilot schemes for the 5.00 release. This setting is typically required to take the pilot scheme out of service, either locally using a panel cut-off switch or remotely via software. When the pilot scheme is blocked, scheme operation is inhibited as well as the transmittal of the pilot bits to remote peers.

M **Synchrocheck: additional resolution on the Synchrocheck element**

Applicable to: C60, D30, D60, F60, G30, G60, L60, L90, and N60 relays

Additional resolution has been added to the measured frequency quantity used when evaluating the operational condition of the synchrocheck element. This allows for finer adjustment when comparing two input frequency values.

R Synchrophasors: erasing phase measurement unit (PMU) record now erases all records

Applicable to: N60 relay

In previous revisions, the first phase measurement unit (PMU) record "PMU000.*" would not erase when attempting to erase all records. With the 5.00 release, the first record is now labelled as "PMU001.*" and will erase when required.

D Synchrophasors: new selection added for phase measurement unit (PMU) communication port type

Applicable to: N60 relay

The "None" selection has been added for the phase measurement unit (PMU) communications port type setting.

C Synchrophasors: phase measurement unit (PMU) data transmission now disables correctly

Applicable to: N60 relay

For the 5.00 release, the PMU "disable data transmit" command has been changed so it only turns off the transmission of data frames. In earlier revisions, the command disabled the transmission of configuration frames as well as header frames.

R Synchrophasors: phase measurement unit records now available in binary format

Applicable to: N60 relay

The phase measurement unit (PMU) records are now supported in binary format. The file naming convention is as follows:

- Binary format: PMU###.dat
- ASCII format: PMU###A.dat

where "###" is a sequential filename; for example, "PMU012.dat".

Due to the extensive on-board memory allocated for PMU recording, the file size of a PMU record in ASCII format can be very large. As such, it is recommended to retrieve PMU files in binary format. If the number of PMU records is only 1, it has been noted during testing that retrieval of large files via TFTP in ASCII format can cause the TFTP client to timeout. On some occasions, repeated failed attempts to retrieve the large file may cause the N60 to restart. Ensuring that the PMU recorder is configured to create a minimum of two files alleviates this issue.

E System setup: phase sequence reversal setting

Applicable to: G30 and G60 relays

This new setting allows the phase sequence expected by the relay to be dynamically reversed based on the state of a FlexLogic™ operand. For example, if the nominal phase rotation setting is "ABC" but the condition defined for opposite phase rotation is true, then the expected phase rotation will switch to "ACB". This feature is only intended for use in special applications, such as pumped storage schemes.

E User-programmable pushbuttons: enhancements to user-programmable pushbutton operation

Applicable to: all UR-series relays

The UR-series user-programmable pushbuttons were enhanced to provide remote control capability of pushbuttons in parallel with control from the faceplate. This provides a single output to control station equipment from both the front panel interface and remote controls with capability of interlocking between local and remote controls.

The following new settings have been added:

- **PUSHBUTTON 1(12) SET**: assigns a FlexLogic™ operand to operate pushbutton 1(12) and assert the **PB 1(12) ON** FlexLogic™ operand
- **PUSHBTN 1(12) RESET**: assigns a FlexLogic™ operand to reset pushbutton 1(12) and assert **PB 1(12) OFF** FlexLogic™ operand
- **PUSHBTN 1(12) AUTORESET**: enables automatic reset of pushbutton 1(12).
- **PUSHBTN 1(12) AUTORESET DELAY**: specifies the delay for automatic reset of pushbutton 1(12).
- **PUSHBTN 1(12) REMOTE LOCK**: assigns a FlexLogic™ operand to lock out remote control for pushbutton 1(12).
- **PUSHBTN 1(12) LOCAL LOCK**: assigns a FlexLogic™ operand to lock out faceplate control for pushbutton 1(12).
- **PUSHBTN 1(12) DROP-OUT TIME**: specifies the dwelling time of the **PB 1(12) ON** operand in self-reset mode.
- **PUSHBTN 1(12) LED CONTROL**: specifies the FlexLogic™ operand driving corresponding pushbutton LED.

The **PUSHBTN 1(12) TARGETS** setting was changed to read **PUSHBUTTON 1(12) MESSAGE**. This setting defines the priority of the pushbutton targets.

Upgrade paths

It is our recommendation that all customers upgrade to the latest version of UR-series firmware to take advantage of the latest developments and feature enhancements. Firmware upgrades can be easily performed using the EnerVista UR Setup software. This software can also convert settings files from an older version to the latest version and provides a difference report once the conversion has been completed. This Difference Report identifies new settings and additional information to assist the user during the upgrade.

Upgrade path for versions 4.00 and above

For UR-series versions 4.00 and above, the revision 5.00 release can be uploaded to the relay CPU via the EnerVista UR Setup software.

Upgrade path for revisions below version 4.00

For UR-series versions below 4.00, an upgrade package must be obtained from GE Multilin to upgrade the relay CPU and CT/VT modules to revision 4.xx.

Benefits of revision 4.00 and above:

The benefits of revision 4.00 and above are as follows:

- Exceeds new IEEE C37.90 requirements
 - Transient immunity (2 to 4 kV)
- Supports many new features and functionality
 - IEC 61850 communications protocol
 - 100 Mb Ethernet
 - IRIG-B repeater
 - Isolated RS485 and IRIG-B

Appendix

Change categories

This document uses the following categories to classify the changes.

Table 1: Revision categories

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

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

GE Multilin technical support

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

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