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Firmware update release 2.1.15 for 620 series IEC product version 2.0 FP1 protection relays

Scope

Firmware update release 2.1.15 is for the following 620 series protection relays:

- REF620
- REM620
- RET620

To verify that the firmware update applies to the protection relay version, ensure that the first two characters and the last two characters of the order code on the label on top of the human-machine interface (HMI) match the corresponding characters of the order code in Fig. 1.

```
xBXXXXXXXXXXXXXXXXX1G
  ↑                   ↑↑
xCXXXXXXXXXXXXXXXXX1G
  ↑                   ↑↑
```

Fig 1. Order code of the 620 series protection relays

To identify the current firmware (SW) version of the 620 series protection relay, please refer to Fig. 2.

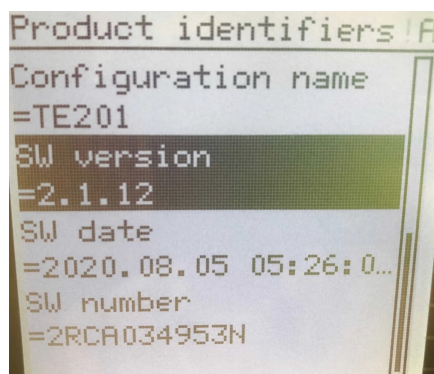


Fig. 2. Product identifiers of the 620 series protection relay

Implemented usability improvements

The firmware update release includes usability and operational improvements. The following improvements have been implemented:¹

Firmware update release 2.1.15:

Cyber Security

- Cyber security improvement
Following vulnerability (CVE, Common Vulnerabilities and Exposures) has been identified in the product and fixed by the update:
 - CVE-2021-22283: MMS file transfer vulnerability.

Additional details and mitigation methods can be found from mentioned (CVE, Common Vulnerabilities and Exposures) advisory.

Supervision

- Multiple improvements to relay self-supervision.
Improvements areas including, but not limited to
 - fault self-recovery improvements and harmonization
 - fast self-recoveries
 - HMI indications
 - RAM & EEPROM supervision improvements
 - composition detection improvement

More information and details at latest product Technical Manual under chapter Self-supervision.

Engineering

- Analog and sensor input Angle correction range change. Current and voltage angle correction factors setting range has been adjusted to -8.0000...8.0000 degrees.

¹ The relay firmware update may also include some minor usability improvements not listed in this note.

Protection

- *Three-phase underexcitation protection UEXPDIS* function timer reset improvement. In switch onto fault situation, it could be possible that operate delay time not fully waited, when Definite Time (DT) mode selected.
- Enhancement to *Three-phase voltage-dependent overcurrent protection PHPVOC*. Earlier there has been narrow current range where PHPVOC start could reset incorrectly and such affecting function operation
- REM620: *Stabilized and instantaneous differential protection for machines MPDIF* improvement on fault indication clearance conditions. Before it has been possible that fault has been cleared, but fault LED might have been still active at HMI, until motor is stopped.
- REM620: *Stabilized and instantaneous differential protection for machines MPDIF* improvement to CT ratio correction handling. Now also Sample Based MPDIF calculation can take account CT ratio correction.

Firmware update release 2.1.14:

HMI

- Improvements to LHMI firmware updating to prevent unwanted downgrade. Earlier it was possible that LHMI firmware updated in SW patch by FUT got downgraded when factory restore was done.

Firmware update release 2.1.13:

Cyber Security

- Cyber Security improvements to the "Ripple20" vulnerability in TCP/IP communication stack for normal product usage conditions. Following vulnerabilities has been identified in the product and fixed by the update:
 - CVE-2020-11907
 - CVE-2020-11909
 - CVE-2020-11910
 - CVE-2020-11911
 - CVE-2020-11912

Note! Some of the security scanners might still report existence of Ripple20 vulnerability after the update. This is a false positive, since the scanners indicate the presence of the IP stack, without being able to check the vulnerability and its fixes.

Supervision

- Improving Time counter rollover in relay's communication module that may have caused internal relay fault with error code *IRF116 COM card error* and relay to self-reboot after time interval(s) which is divisible by ~50 days from previous restart.

Communication

- Improvement on GOOSE receiving. In a system where one relay is receiving GOOSE communication from multiple senders, it is possible that a communication break in one sender might impact handling of received values from other senders.
- Improving IEEE 1588 (PTPv2) Time synchronization when using non-zero (ID>0) PTP Domain ID. Enhancement at transparent clock peer-to-peer measurement and improving Path delay compensation. (Compensating delay for long communication cables).

Firmware update release 2.1.12:

Supervision

- Improvement to relay CPU FPGA (IRF 83) internal fault supervision – the supervision interval speed is fastened to reach faster issue detection.

Firmware update release 2.1.11:

Protection

- Improvement to relay multifrequency admittance-based EF protection function – operate output activation now requires one more peak detection after operation timer elapsed for operate output activation.

Measurement

- Improvement to relay frequency measurement function – frequency measurement quality isn't any more affected by internal vector shift detection.

Communication

- Improvement to SNTP time synchronization in HSR loops and with 9-2LE – improved handling of duplicated frames.
- Improvement to relay time accuracy after relay restart in SNTP time synchronization system with drifting synchronization masters.
- Improvement to time synchronization in IEEE1588 PTP systems - improved handling of PTP configuration parameters.

Supervision

- Improvement to COM FPGA (IRF 116) internal fault supervision – minor extension to diagnostics information in relay fault logs.
- Improvement to relay IRF handling – improved IRF counter clearing for IRF 83 and IRF 116 to enable faster temporary fault clearing and fault recovery.

Firmware update release 2.1.10:

Protection

- Improvement to capacitor current unbalance protection function CUBPTOC unbalance value reporting to MMS – possibility to engineer unbalance value to cyclic dataset reporting.

Measurement

- Improvement to power and energy measurement function PEMMXU integral deadband supervision reporting.

Other

- Improvement to logic function AND20 and OR20 function block input tooltips in PCM600 Application Configuration Tool.

Firmware update release 2.1.9:

Protection

- The improvement for the Wattmetric-based earth-fault protection WPWDE increases the function sensitivity in intermittent earth-faults when the fault has fault resistance > 100 Ohm.
- Relay setting group change via SPCGGIO outputs control improved.

Measurement

- Improvement to load profile storing in short AC aux voltage interruption.

Communication

- Limitation to the maximum number of files that can be opened by the MMS client. This improves the situation with certain types of MMS clients stressing the relay's filesystem and then causing the Internal Fault "File system error" (Fault code 7).
- Modbus communication bit SSR3 Bit 6 indicating device startup behavior improved.
- Correction to the Modbus protocol initialization in cases where the Modbus is used together with the Profibus/SPA-ZC302. Correction prevents unexpected self-restarting of the relay in the situations where the Modbus is not first manually initialized by restarting the relay after Modbus is enabled.
- Improvement to the 1588 PTP time synchronization master switch-over situation.
- Time synchronization performance improvement for less accurate SNTP time master setups causing unwanted Synch status up/down events.

Supervision

- Self-supervision recovery handling improved in case of IRF Code 79.
- Internal diagnostic improvement for the self-supervision.

Other

- Improvement to functions SPCGAPC and OLATCC loading in their initialisation phase.
- Improved relay virtual file handling.

Firmware update release 2.1.8:

Protection

- Multi-frequency admittance-based EF protection (MFADPSDE) internal blocking improved.

Measurement

- Current total demand distortion monitoring CMHAI internal TDD calculation fixed.

Communication

- Transformer tap changer control (OLATCC) IEC 61850 quality tag improved.
- Relay moving from Application mode to Bootloader mode improved for Ethernet communication.

Firmware update release 2.1.7:

Communication

- Improved SNTP time synchronization tolerance for inaccurate time sync masters.

Supervision

- Self-supervision recovery time improved in case of IRF code 83 and 116.

Engineering

- Improved currents and voltages IEC 61850 data objects mapping to different data object levels.

Firmware update release 2.1.6:

Measurement

- Improved voltages total harmonics distortion and current total demand distortion ALARM output activation is short disturbances.
- Improvement to load profile storing in short AC aux voltage interruptions.

Control

- Improvement to the synchrocheck (25) function for preventing unexpected short period reset of SYNC_OK output. The reset could have been seen in some start-up situations with high load currents even when the synchronism conditions were fulfilled, and voltages were aligned on both sides of the breaker.

Communication

- Improvement to PRP where messages egressing LAN A and LAN B ports, PRP sequence is kept incremental without any sequence hops.
- Improved power and energy measurement (PEMMXU) function accumulated energy values reading for RTUs and systems only supporting IEC 61850 Edition 1 data types.
- Improvement to event reporting to include events when functions are put on or off.
- Improved relay 1588 transparent clock message TC path information in Switch and HSR modes.

Supervision

- Improvement to relay internal fault logs content for signal output coil supervision information
- Important correction of fuse failure supervision (SEQSPVC) function – solving an issue in 620 series firmware revision 2.1.5.

The fuse failure supervision function is typically used to block an activation of under voltage and/or voltage-based unbalance protection if there is a failure in the external voltage measurement circuit (e.g. blown fuse or broken wire), resulting in a too low or completely lacking voltage measured by the protection relay. The fuse failure supervision function in 2.1.5 does not measure properly the supervised voltages. If the fuse failure supervision function is taken into use in the protection relay, it can lead to a situation of a voltage-based protection operation at faults occurring in the external voltage measurement chain. This means that the protection relay will work in the same way as if there would not be a fuse failure supervision function in use.

Please note that this issue solved in 2.1.6 is only in firmware revision 2.1.5 and not in older revisions. If you have this supervision function in use with 2.1.5, we recommend making an update with latest firmware version at your earliest convenient time.

The software revision 2.1.5 is in relays delivered from factory during the time period of June - December 2017.

HMI

- Improved LHMI firmware to avoid some rare HMI freezing in very short and repetitive auxiliary power interruptions.
- Improvement to WebHMI information for relay hardware composition change counter before a hardware change is acknowledged – information harmonized with local HMI counter information.

Engineering

- Improved PCM600 Parameter Setting Tool for changing relay Ethernet IP address settings – enabling to change IP addresses for relay front port or other IP related communication parameters like subnet masks.

Firmware update release 2.1.5:

Control

- Improvement to autorecloser (DARREC) function operation with second autoreclosing sequence.

Supervision

- Improvement to fuse failure supervision (SEQSPVC) function operation minimum current blocking when voltages and currents applied to function.

Firmware update release 2.1.4:

Communication

- Improvement to current and voltage harmonics demand value reporting for IEC 61850 communication.

Firmware update release 2.1.3:

Control

- Improvement to the synchrocheck function for preventing unexpected short period reset of SYNC_OK output. The reset could have been seen in very rare situations earlier even when the synchronism conditions were fulfilled, and voltages were aligned on both sides of the breaker.

Communication

- Improvement to relay communication stack software to handle certain type of the GOOSE frames.

Firmware update release 2.1.2:

Protection

- Improvement to intermittent earth-fault protection operation in “intermittent_EF”-mode with a very small earth-fault current I_0 and a very high earth-fault voltage U_0 .
- Extended three-phase non-directional instantaneous overcurrent protection start value setting minimum range from 1.00 to 0.20 in local HMI.
- Improved multifrequency admittance-based earth-fault protection and intermittent earth-fault protection presentation for U_0 value in measured U_0 and calculated U_0 modes.

Control

- Improvement to syncrocheck function monitored value “Energy state” information with different VT voltage group connection selections.

Communication

- Improved relay interpretation of different syntax for Open/Close commands coming from different substation automation systems.
- Improvement to power measurement accumulated power value reporting to communication.

HMI

- Improved WebHMI behavior when relay disturbance recordings are triggered continuously in “overwrite” mode.
- Improvement to relay application image storing and handling in relay flash memory to avoid rare and temporary local HMI to relay communication disconnection.

Engineering

- Extended the maximum amount of logics points allowed in relay application configurations.

Tools for updating the IED

Tools needed to update to SW version 2.1.15:

- PCM600 2.8 or later
- 620 Series Connectivity package 2.1.7 or later
- Relay Update file version 2.1.15
 - Example: REF620_IEC_Config_A_Version_2.1.15_2RCA034949R.bin
 - F refer to: Feeder protection and control REF620
 - 620 refer to: 620 product series
 - IEC refer to: International Standard
 - A refer to: Standard Configuration A
 - 2.1.15 refer to: Update file version 2.1.15

Update procedure

Firmware updates represent an integral part of ABB's life cycle management of distribution protection and control relays. The updates ensure optimized usability throughout the relay's entire life cycle by offering the latest improvements. The ideal time for a firmware update would be at device commissioning, during periodical testing or during a maintenance break.

All 620 series IEC version 2.0 FP1 (1G) products manufactured later than 3rd June 2022, include the stated relay firmware update 2.1.15 or newer.

Please note that ABB will not be liable for any direct or indirect costs related to the firmware update procedure. The update procedure shall be performed at the sole responsibility of the possessor of the devices.