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# Firmware update release 1.2.1 for REX640 control and protection relay

# Scope

This update release 1.2.1 concerns all REX640 protection relays and LHMIs delivered from the factory earlier than 3<sup>rd</sup> of February 2022.

To verify whether the update applies to the protection relay at hand, there are two things to check:

 Product Connectivity Level shall be three (PCL3). This information can be checked from LHMI, WHMI or from the product label. The PCL is a part of product composition code, as the example below shows.

REX640B10Nx + xxxx + COMx + PSMx + BIOx + PCL3

2. Relay firmware version is 1.2 This can be checked from LHMI or from WHMI.

Following figures show how to locate the above-mentioned information from the LHMI Device Information page and from the WHMI Product Identifiers page. The LHMI Device Information page can be accessed by tapping the menu bar on upper part of the LHMI screen and locating the Device Information button from the lower left-hand corner of the screen. The relay Firmware version is referred as "SW version". The "PCL" part of the composition code is pointed out as well.

Visiting Address Strömberg Park, Muottitie 2 A FI-65320 Vaasa FINLAND Phone: +358 10 2211 Fax: +358 1022 41599 e-mail: first name.last name @fi.abb.com Business identity code: 0763403-0 Domicile: Helsinki www.abb.fi



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REX640 Device In REX640	nformation	26.01.2022 12:00	늘 🕰 o	=
Product identifiers	Туре		REX640	
	Product version		1	
Site identifiers	Serial number		1VHR81028237	
15000000000000000	Production date		08.12.2020 00:00:00.000	
System identifiers	SW version		1.2	
HW modules Legal information	SW date		19.02.2021 17:15:00.000	
	SW number		2RCA053167A	
	Interface level		0	
	Order code		REX640_14UP	
HMI version: 21-06-04-12:18D	Composition code		REX640B10NN+COM2+BIO1+ RTD1+BIO1+AIM2+AIM1+PSM 2+ADD1+ADD2+APP1+APP10+ APP11+APP12+APP13+APP2+ APP3+APP4+APP5+APP6+APP 74APP8+APP9+CMP2+LNG1+ PCL3	

Fig 1. LHMI Device Information page

Fisste identifiers       Product version       1       ?         System identifiers       Serial number       1VHR81028237       ?         Production date       08.12.2020 0:00:00:000       ?         SW version       1.2       ?         SW date       19.02.2021 17:15:00:000       ?         SW number       2RCA053167A       ?         Order code       REX6405101*RT01+       ?         BIO1+AIM2+AMP14APP14APP14APP14APP54APP6       ?	Image: Product identifiers       Type       REX640         Image: Site identifiers       Product version       1         Image: System identifiers       Serial number       IVHR81028237         Production date       08.12.2020 0:00:00:000         SW version       1.2         SW date       19.02.2021 17:15:00:000         SW number       2RCA053167A         Interface level       0         Order code       REX640_14UP         REX640BIONN+COM2+BIOT+RF01+ BIO1+AM2+ADIT+APP12+APP         D2+APP1+APP2+APP3+APP5         Composition code       P13+APP2+APP3+APP4+APP5+APF5	ch <b>Q "</b>	mation / Product Identifiers	Recordings Import/Export			Status EN 22.01.2010 2
Fiste identifiers       Product version       1       ?         Serial number       1VHR81028237       ?         Production date       08.12.2020 0:00:00:00       ?         Wversion       1.2       ?         SW version       1.2       ?         SW date       19.02.2021 17:15:00:000       ?         Interface level       0       ?         Order code       REX640_14UP       ?         Composition code       PEX640010NH=COM2+BIOTHETO1+ BIO1+AMP24APP14APP5+APP6       ?	Fissite identifiers     Product version     1       System identifiers     Serial number     IVHR81028237       Production date     08.12.2020 0:00:00:000       SW version     12       SW date     19.02.2021 17:15:00:000       SW number     2RCA053167A       Interface level     0       Order code     REX640_14UP       REX640B10NN+COM2+BI0T+RF01+ BI01+AM2+APD1+APP12+APP       Composition code     PIXAPD2+APD3+APD1+APP12+APP	Information PAR	RAMETER NAME	RELAY VALUE	UNIT MIN.	MAX.	STEP
System identifiers     Serial number     1VHRB1028237     ?       Production date     08.12.2020 0:00:00:00     ?       SW version     1.2     ?       SW date     19.02.2021 17:15:00:000     ?       SW number     2RCA053167A     ?       Order code     REX640_14UP     ?       Order code     REX640_14UP     ?       Composition code     D2+APP1+APP1+APP1+APP1+APP1+APP1+APP1+APP	E System identifiers     Serial number     IVHR81028237       Production date     08.12.2020.0:00:00:00       SW version     12       SW date     19.02.2021 17:15:00:000       SW number     2RCA053167A       Interface level     0       Order code     REX640_14UP       REX640BIONN+COM2+BIOT+RF01+ BIO1+AM2+APD1+APP12+APP       BIO1+AM2+APD1+APP12+APP       Composition code     P2+APP1+APP14+PP5+APP5	E Product identifiers Type	be	REX640			?
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PCL3		Com	mposition code	BIO1+AIM2+AIM1+PSM2+ADD1+AD D2+APP1+APP10+APP11+APP12+AF P13+APP2+APP3+APP4+APP5+APP + <u>APP</u> 7+APP8+APP9+CMP2+LNG1+	000		?

Fig 2. WHMI Product Identifiers page



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## Implemented usability improvements

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

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## **Cyber Security**

- Cyber security improvements 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.

- Also other Cyber Security related updates.Improvement areas including, but not limited to
  - o Cryptography library
  - o Webserver

#### Supervision

- Improving supervision and handling of PKI certificate renewal.
- User Account Management (UAM) enhancements.

- UAM Roles and Rights changes from PCM600 does not require relay restart anymore to become activated.

- Preventing firmware updates with operator credentials from PCM600 Firmware Update Tool.

- Improvements to password change via LHMI & WHMI.

HMI

- Enhancing Web Human-Machine interface (WHMI) stability. WHMI server stability improvement by limiting parallel web server sessions.
- Language fallback support for WHMI. When any other language than English in use and translation for certain word(s) is missing, WHMI utilize english default text instead of indicating "String Not Found".

<sup>&</sup>lt;sup>1</sup> The relay firmware update may also include some minor usability improvements not listed in this note.



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## Communication

- Improvement in IEC104 secure authentication mode. IEC104 spontaneous event sending does not get interrupted by erroneous SCADA control+key exchange sequence.
- Improving communication error handling in case of SFP transceiver is unplugged while Line Differential communication is in use.

#### Protection

- Line differential protection with in-zone power transformer LNPLDF, improving CT connection type 2 measurement buffer handling and such stabilizing LNPLDF operation.
- Three-phase underexcitation protection UEXPDIS function timer reset improvement. In switch onto fault situation, it could been 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 have resetted incorrectly and such affecting function operation.
- Autosynchronizer for generator breaker ASGCSYN. Interaction between bypass and GCB\_TEST inputs has been aligned with the description in the technical manual.
- *High-impedance fault detection PHIZ* function operation and stability has been enhanced.
- Stabilized and instantaneous differential protection for two winding transformers TR2PTDF function Improvement to waveform and 2<sup>nd</sup> harmonics blocking/de-blocking.
- Improvements on Stabilized and instantaneous differential protection for two or three-winding transformers TR3PTDF function CT ratio correction in current group 3.
- Stabilized and instantaneous differential protection for machines MPDIF improvement to CT ratio correction handling. Now also Sample Based MPDIF calulation can take account CT ratio correction.
- Improvement to all overcurrent and earth fault protection functions with user programmable or UK
  rectifier operating curve types. (IDMT operating curve types.) There has been very narrow operate
  range where very low overshoot above the protection functions set starting value, which could
  cause immediate operation, instead of delayed operation as per mentioned user programmable or
  UK rectifier curves delay times.



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# Tools for updating the IED

Tools needed to update to SW version 1.2.1:

- PCM600 2.10 (Hotfix 20201215) or later
- REX640 Connectivity package 1.2.1 or later
- Relay Update file version 1.2.1 (REX640\_ALL\_Config\_640\_Version\_1.2.1\_2RCA053167B.cab)

# 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 REX640 relays and LHMI product Deliveries manufactured later 3<sup>rd</sup> of February 2022 includes the stated relay firmware update 1.2.1 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.

# Glossary

Abbreviations and acronyms are spelled out in the glossary. The glossary also contains definitions of important terms.

CT CVE	Current transformer Common Vulnerabilities and Exposures
FW	Firmware
HMI	Human-machine interface
HW	Hardware
IDMT	Inverse definite minimum time
LHMI	Local human-machine interface
MMS	Manufacturing message specification
PCL	Product Connectivity Level
PCM600	Protection and Control IED Manager – Software
PKI	Public Key Infrastructure
SCADA	Supervision, control and data acquisition
SFP	Small Form-factor Pluggable - transceiver
SW	Software
UAM	User Account Management
WHMI	Web human-machine interface