

Document classRelease NoteDocument ID2NGA001536Business UnitABB Oy, Distribution SolutionsPage1/7Date28.10.2022

# Firmware update release 1.2.3 for REX640 control and protection relay

# Scope

This update release 1.2.3 concerns all REX640 protection relays and LHMIs delivered from the factory earlier than 28<sup>th</sup> of October 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, 1.2.1 or 1.2.2 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.

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



28.10.2022 2/7 Firmware update release

REX640 Device	Information	26.01.2022 12:00			Ξ
Product identifiers	Туре		REX640		
	Product version		1		
Site identifiers	Serial number		1VHR81028237		
	Production date		08.12.2020 00:00:00.000		
System identifiers	SW version		1.2		
	SW date		19.02.2021 17:15:00.000		
HW modules	SW number		2RCA053167A		
Legal information	Interface level		0		
	Order code		REX640_14UP		
MI version: 1-06-04-12:18D	Composition cod	le	REX640B10NN+COM2-B RTD1+BI01+AIM2+AIM1 2+ADD1+ADD2+APP1+AF APP11+APP12+APP13+A APP21+APP14-APP13+APP Z+APP8+APP9+CMP2+LN PCL3	PSM PP10+ PP2+ +APP	

Fig 1. LHMI Device Information page

Information  PARAMETER NAME  RELAV VALUE  UNIT  MIN.  MAX.  STEP    I product identifiers  Type  REX640  ??  ??    Product version  1  ??  ??    Product identifiers  Serial number  UVHR81028237  ??    Product on date  08.12.2020 0:00:00:000  ??  ??    SW version  12  ??    SW date  19.02.2021 17:15:00:000  ??    Order code  REX640Ja(JUNP  ??    Order code  REX640Ja(JUNP  ??    Order code  REX640Ja(JUNP+CMCPHB)APP11APP11APP11APP11APP11APP11APP11APP	arch Q 19. Ввод-1		rs roduct Identifiers			22.01.2010 2:2
Fishe identifiers    Product version    1    ?      System identifiers    Serial number    1VHR81028237    ?      Production date    08.12.2020 0:00:00:00    ?      SW version    1.2    ?      SW date    19.02.2021 17:15:00:000    ?      SW date    19.02.2021 17:15:00:000    ?      Or der code    REX6405187A    ?      Order code    REX640_1AUP    ?      Order code    REX6404101+HAD11+BIO1+HAD12+ADP1-AAPP5+AAPP6    ?      Dir1AMP2AHP3+APP5+APP6+APP5+APP6    ?    ?      AD27+APP1AAPP1-APP5+APP6+APP5+APP6    ?    ?	Information	PARAMETER NAME	RELAY VALUE UNIT	MIN.	MAX. ST	EP
System identifiers  Serial number  1VHR81028237  ?    Production date  08122020 0:00:00:00  ?    SW version  1.2  ?    SW date  19.022021 17:15:00:000  ?    SW number  2RCA053167A  ?    Interface level  0  ?    Order code  REX640_14UP  ?    REX640BIONN+COM/#BIOT+NEDI+ BEOX4AMBI-PSM2+ADD1+ADP  ??    Interface level  0  ??	E Product identifiers	Туре	REX640			?
HW modules      Production date      08.12.202 0.000.0000      ?        SW version      1.2      ?      ?        SW date      19.02.2021 17.15.00.000      ?      ?        SW date      19.02.2021 17.15.00.000      ?      ?        SW date      19.02.2021 17.15.00.000      ?      ?        SW number      2RCA053167A      ?      ?        Order code      REX640_14UP      ?      ?        Order code      REX640_14UP      ?      ?        Composition code      D2+APP1+APP10+APP11+APP12+AP P13+APP2+APP5+APP5+APP5      ?	E Site identifiers	Product version	1			?
SW version      1.2      ??        SW date      19.02.2021.17.15.00:000      ??        SW date      19.02.2021.17.15.00:000      ??        SW number      2RCA053167A      ??        Interface level      0      ??        Order code      REX640_14UP      ??        REX640BIONN+COM*BIOT+REDI+ BIO1+AIM2+AIM1+PSM2+ADD1+AD D21+APP1+APP10+APP11+APP12+AP P13+APP2+APP3+APP3+APP3+APP5      ??        +AEP?1+APP4+APP3+APP3+APP5+APP5      ??	E System identifiers	Serial number	1VHR81028237			?
SW date  19.02.2021 17:15:00:000  ?    SW number  2RCA053167A  ?    Interface level  0  ?    Order code  REX640_14UP  ?    REX640_114UP  ?  ?    Composition code  D214APP14APP51APP542+ADD1+ADD D214APP14APP51APP54APP5  ??	+ 📑 HW modules	Production date	08.12.2020 0:00:00:000			?
SW number  2RCA053167A  ?    Interface level  0  ?    Order code  REX640_14UP  ?    Order code  REX640_10NH+COM2+BIOT+RFQ1+ BIO1+AIM2+AIM1+P5M2+ADD1+AD D2+APP1+APP10+APP11+APP12+AP P13+APP2+APP3+APP3+APP5+APP6  ??		SW version	1.2			?
Interface level 0 (?) Order code REX640_14UP (?) Composition code D24A0P1+APD10+APD1+APD D24A0P1+APP3APP5+APP5 +APP7+APP3APP5+APP5 +APP7+APP3APP5+APP5 +APP7+APP3APP3+APP5+APP5 +APP7+APP3APP3+APP5+APP5 +APP7+APP3APP3+APP5+APP5 +APP7+APP3+APP3+APP5+APP5 +APP7+APP3+APP3+APP5+APP5 +APP7+APP3+APP3+APP5+APP5 +APP7+APP3+APP3+APP5+APP5 +APP7+APP3+APP3+APP3+APP5+APP5 +APP7+APP3+APP3+APP3+APP5+APP5 +APP7+APP3+APP3+APP3+APP5+APP5 +APP7+APP3+APP3+APP3+APP5+APP5 +APP7+APP3+APP3+APP3+APP5+APP5 +APP7+APP3+APP3+APP3+APP3+APP5+APP5 +APP7+APP3+APP3+APP3+APP5+APP5 +APP7+APP3+APP3+APP3+APP5+APP5 +APP7+APP3+APP3+APP3+APP3+APP5+APP5 +APP7+APP3+APP3+APP3+APP5+APP5 +APP7+APP3+APP3+APP3+APP3+APP5+APP5 +APP7+APP3+APP3+APP3+APP3+APP3+APP3+APP3		SW date	19.02.2021 17:15:00:000			?
Order code  REX640_14UP  ?    Bio1+AIM2+AIM1+P5M2+ADD1+AD  Bio1+AIM2+AIM1+P5M2+ADD1+AD  Composition code    D2+APP1+APP10+APP11+APP12+APP  P13+APP2+APP5+APP6    +ADP2+APP8+APP3+APP6+APP5+APP6  ?		SW number	2RCA053167A			?
REX640BIDNN+COM2+BIDT+#F01+ BID1+AIM2+AIM1+E5M2+ADD1+AD    Composition code  D2+APP1+APP1+APP1+APP1+APP1+APP    P13+APP2+APP3+APP3+APP3+APP5  ?		Interface level	0			?
BIO1+AIM2+AIM1+PSM2+ADD1+AD Composition code D2+App1+ApP0+ApP9+ApP6 P13+ApP2+ApP9+ApP9+ApP6 +ApP2+ApP9+ApP9+ApP6 +ApP2+ApP8+ApP9+ApP6		Order code	REX640_14UP			?
		Composition code	BIO1+AIM2+AIM1+P5M2+ADD1+AD D2+APP1+APP10+APP11+APP12+AP P13+APP2+APP3+APP4+APP5+APP6 + <u>APP</u> 7+APP8+APP9+CMP2+LNG1+*	)		?

Fig 2. WHMI Product Identifiers page



28.10.2022 3/7 Firmware update release

# Implemented usability improvements

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

## Firmware update release 1.2.3 for relay

#### Protection

 Compensated neutral unbalance voltage protection CNUPTOV enhancement. Improvement to residual voltage scaling (Uo), when compensating capacitor bank neutral voltage measurement.

## Engineering

Handling of erroneous SMV SCL communication configuration improved.
 Prior, the relay might become unresponsive if an erroneous SMV configuration was written to the relay.

## Communication

• Improvement to the Frequency measurement FMMXU avoids unnecessary reporting during momentary vector shift situations.

#### Firmware update release 1.2.2 for relay

#### Protection

 Autosynchronizer for generator breaker ASGCSYN function operation has been improved to allow generator circuit breaker close command activation also in cases where the generator and the network are running in phase and with zero, or close to zero, frequency difference. This enhancement concerns cases where ASGSYN function parameter "Synchronization Dir" is having value "2=Both direction".

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



28.10.2022 4/7 Firmware update release

# Firmware update release 1.2.1 for relay

# **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

## 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.
- Improvement to IEEE 1588 PTPv2 Time synchronization Timesource field indications fixed. Before relay announced PTPv2 TimeSource=GPS if the relay was previously synced to a GNSS/GPS grandmaster, even GPS connection was lost. Now the REX640 ordinary clock was modified to announce TimeSource=Internal Oscillator accordingly regardless of previous state.
- Enhancements to IEEE 1588 PTPv2 Time synchronization to expedite master negotiation process.

## Supervision

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



Date28.10.2022Page5/7SubjectFirmware update release

 Improvement to relay self-supervision to mitigate rare occurrence of Card error, slot A2 (IRF code -42) during relay startup situation. Possible occurrence has been limited to certain communication card types only (listed below).

Communication card type and revision in use can be verified e.g., from REX640 LHMI or WHMI. Menu --> Device/Information/HW modules/x000 (COM)

Check Article number and HW revision

List of COM cards that can be updated by normal FUT update process:

Article number	HW revision
2RCA034478A0001	F, G
2RCA034478A0901	F, G
2RCA034483A0001	F, G
2RCA034483A0901	F, G
2RCA034488A0001	F, G
2RCA034488A0901	F, G
2RCA034493A0001	E, F
2RCA034493A0901	E, F
2RCA034497A0001	E, F
2RCA034497A0901	E, F

List of COM cards that need update by process requiring factory support and tools: Please contact your local ABB representative for further guidance. Technical support is available for all ABB employees at: https://abb.custhelp.com

Article number	HW revision
2RCA034478A0001	H, J
2RCA034478A0901	H, J
2RCA034483A0001	H, J
2RCA034483A0901	H, J
2RCA034488A0001	H, J
2RCA034488A0901	H, J
2RCA034493A0001	G, H
2RCA034493A0901	G, H
2RCA034497A0001	G, H
2RCA034497A0901	G, H

All other types of communication cards and revisions are not affected by this issue.

#### 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".



28.10.2022 6/7 Firmware update release

# 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.



28.10.2022 7/7 Firmware update release

# Tools for updating the REX640 (PCL3) relay

Tools needed to update to SW version 1.2.3:

- PCM600 2.10 (Hotfix 20201215) or later
- REX640 Connectivity package 1.2.1 or later
- Relay Update file version 1.2.3 (REX640\_ALL\_Config\_640\_Version\_1.2.3\_2RCA053167D.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 (PCL3) relays and LHMI product deliveries manufactured later than 28<sup>th</sup> of October 2022, include the stated relay firmware update 1.2.3 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.

СТ	Current transformer
CVE	Common Vulnerabilities and Exposures
FW	Firmware
HMI	Human-machine interface
HW	Hardware
IEC104	IEC 60870-5-104 communication protocol
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
SCL	System Configuration description Language defined by IEC 61850
SFP	Small Form-factor Pluggable – transceiver
SMV	Sampled measured values
SW	Software
UAM	User Account Management
WHMI	Web human-machine interface