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PS00017990A01

GE21-TF-RTC

Memory Expansion Card (with Built-in RTC)

User Guide

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Preface

■ Introduction

This guide presents the information about all application scenarios of this product, including product information, installation, and configuration and commissioning. Read this guide carefully before operating the product to ensure safe and proper operation.

■ Standards compliance

The following table lists the certifications, directives, and standards that the product may comply with. For details about the acquired certificates, see the certification marks on the product nameplate.

Certification	Directive		Standard
CE certification	EMC directive	2014/30/EU	**24 VDC products:** EN 61131-2 **220 VAC products:** EN 61131-2 EN 61000-3-2 EN 61000-3-3
	LVD directive	2014/35/EU	EN 61010-1 EN 61010-2-201
	RoHS directive	2011/65/EU amended by (EU) 2015/863	EN IEC 63000
UL/cUL certification	-		UL 61010-1 UL 61010-2-201 CAN/CSA-C22.2 No. 61010-1 CSA C22.2 NO. 61010-2-201
KCC certification	-		-
EAC certification	-		-

Certification	Directive		Standard
UKCA certification	Safety regulations	Electrical Equipment (Safety) Regulations 2016	EN 61010-1 EN 61010-2-201
	EMC regulations	Electromagnetic Compatibility Regulations 2016	**24 VDC products:** EN 61131-2 **220 VAC products:** EN 61131-2 EN 61000-3-2 EN 61000-3-3
	RoHS regulations	Directive (RoHS) Regulations 2012	EN IEC 63000

■ More documents

Document	Code	Description
Easy321 and Easy511 Programmable Logic Controller User Guide	PS00017976	Presents the information about all application scenarios of Easy321 and Easy511 series products, including product information, installation, wiring, configuration and commissioning, product features, installation, fault diagnosis, maintenance, and appendix.
H5U and Easy Series Programmable Logic Controller Programming Guide	19012249	Presents the basics of PLC programming, quick start guidance, communication, motion control, and high-speed counter usage.
H5U and Easy Series Programmable Logic Controller Instruction Guide	19012250	Presents the basic and advanced instructions used in PLC programming, along with corresponding examples.
GE21-TF-RTC Memory Expansion Card (with Built-in RTC) User Guide (this guide)	PS00017990	Presents the information about all application scenarios of this product, including product information, installation, and configuration and commissioning.

■ Revision history

Date	Version	Description
2026-05	A01	Updated the fundamental safety instructions.
2025-05	A00	Initial release.

■ Access to the guide

This guide is not delivered with the product. You can download the PDF version in the following ways:

- Visit https://www.inovance.com/global, and choose Service&Support > Support > Documentation Download.
- Scan the QR code on the product with your smart phone.
- Scan the QR code below to install My Inovance app, where you can search for and download the guide.

■ Warranty

Inovance provides warranty service within the warranty period (as specified in your order) for any fault or damage that is caused by proper operation of the user. Maintenance will be charged after the warranty expires.

Even within the warranty period, maintenance can be charged for the following product damage:

- Damage caused by operations not following the instructions in the guide
- Damage caused by fire, flood, or abnormal voltage
- Damage caused by using the product for unintended functions
- Damage caused by using the product outside the specified scope
- Damage or secondary damage caused by force majeure (natural disaster, earthquake, and lightning strike)

When applicable, relevant maintenance fee will be charged according to the latest Price List of Inovance. If otherwise agreed upon, the agreed terms and conditions shall prevail.

For details, see the Warranty Card.

1 Fundamental Safety Instructions

1.1 General Safety Instructions

■ Safety Disclaimer

1. Read and comply with the safety instructions during installation, operation, and maintenance of the product.
2. To ensure personal and equipment safety, observe all safety precautions marked on the product and described in this guide during installation, operation, and maintenance.
3. The "CAUTION", "WARNING", and "DANGER" are only supplements to the safety instructions.
4. Use this product according to the designated environment requirements. Damage caused by improper use is not covered by warranty.
5. Inovance shall take no responsibility for any personal injury or property damage caused by improper use.

■ Safety Levels and Definitions

	The "DANGER" sign indicates that failure to comply with the notice will result in death or serious injury.
	The "WARNING" sign indicates that failure to comply with the notice could result in death or serious injury.
	The "CAUTION" sign indicates that failure to comply with the notice could result in minor or moderate injury, or equipment damage.

Unpacking

WARNING

- Do not install the product in the case of any damage, rust, or signs of use on the product or accessories upon unpacking.
- Do not install the product in the case of water seepage into the product or missing or damaged components upon unpacking.
- Do not install the product in the case of any discrepancy between the product you received and the product name on the packing list.

Caution

- Check whether the packing is intact and whether there is damage, water seepage, dampness, and deformation before unpacking.
- Unpack the package by following the unpacking sequence. Do not strike the package violently.
- Check for damage, rust, or dents on the surfaces of the product and accessories upon unpacking.
- After unpacking, check the contents against the packing list to ensure that the equipment and accessories are in the correct quantities, and that all documentation is complete.

Storage and transportation

WARNING

- Large or heavy equipment must be handled by qualified professionals using specialized hoisting equipment. Failure to comply could result in personal injury or equipment damage.
- Before hoisting the equipment, ensure that components such as the front cover and terminal blocks are secured firmly with screws. Loosely connected components may fall off and result in personal injury or equipment damage.
- Do not stand or stay below the product which is being hoisted.
- When hoisting the equipment with a steel rope, ensure the equipment is hoisted at a constant speed without suffering from vibration or shock. Do not turn the equipment over or let the equipment stay hanging in the air. Failure to comply could result in personal injury or equipment damage.

Storage and transportation

Caution

- Handle the equipment with care and mind your steps during transportation to prevent personal injury or equipment damage.
- When carrying the equipment with bare hands, hold the equipment casing firmly with care to prevent parts from falling. Failure to comply could result in personal injury.
- Store and transport the equipment based on the storage and transportation requirements. Failure to comply could result in equipment damage.
- Do not store or transport the equipment in locations where the equipment may be exposed to splashing water or rain, direct sunlight, strong electric field, strong magnetic field, or strong vibration.
- Store the equipment for up to three months. Take stricter protective measures and carry out the necessary inspections for a longer storage time.
- Pack the equipment securely and properly before transportation. Use a fully enclosed container for long-distance transportation.
- Never transport the equipment with other devices or items that could impact or cause harm to the equipment.

Design

DANGER

- Provide a safety circuit and include an error handling program in the software to ensure that the product remains in a safe state in case of an external power failure or an internal fault.
- If a sustained overcurrent occurs due to overload or load short circuit, the product may smoke or catch fire. An external safety device (such as a fuse or circuit breaker) must be installed.

WARNING

Design

- If an output component (such as a relay or transistor) in this product is damaged, the corresponding output may become uncontrolled and remain permanently ON or OFF.
- The product design must comply with the overvoltage category requirements specified in the environmental specifications. A system-level lightning protection device must be installed on the power supply to ensure that lightning-induced overvoltages do not reach the product’ s power input, signal input, or control output terminals, thereby preventing damage to the product.
- Ensure that appropriate actions have been taken to prevent product malfunction caused by a communication fault between the product and related devices. Failure to comply could cause personal injury or equipment damage.



Switches that could cause personal injury or equipment damage must not be configured on the touch screen. Use independent switches for performing critical operations. Failure to comply could result in accidents caused by wrong outputs or faults.

Installation



This equipment must be operated only by trained and qualified electrical personnel. Non-professionals must not operate this equipment.



Installation

- Read through the guide and safety instructions before installation.
- Do not install this equipment in places with strong electric or magnetic field.
- Before installation, check that the mechanical strength of the installation site can bear the weight of the equipment. Failure to comply may result in mechanical hazards.
- Before installation, ensure that the installation site meets the required environmental conditions. Failure to comply could result in equipment damage.
- Do not wear loose clothes or accessories during installation. Failure to comply could result in electric shock.
- When installing the equipment in an enclosed environment (such as a cabinet or case), use cooling devices (such as fans or air conditioners) to cool the space and meet the installation environment requirements. Failure to do so could result in equipment overheating or fire.
- Do not retrofit the equipment.
- Never loosen or turn the fixing bolts on product components, or any bolts marked in red.
- This equipment must be installed inside an indoor cabinet or terminal equipment. The cabinet or terminal equipment itself must be provided with the necessary protective enclosures, such as a fireproof enclosure, an electrical protective enclosure, and a mechanical protective enclosure. The IP rating of these enclosures must comply with the relevant IEC standards, and applicable local laws and regulations.
- Before installing devices with strong electromagnetic interference, such as a transformer, install a shielding device for the equipment to prevent malfunction.
- Install the equipment onto a non-combustible object such as metal. Keep the equipment away from combustible objects. Failure to comply could result in fire.
- For products not supporting hot swapping, disconnect all external power supplies of the system before installing/removing the product. Failure to comply could result in electric shock, product failure, or malfunction.

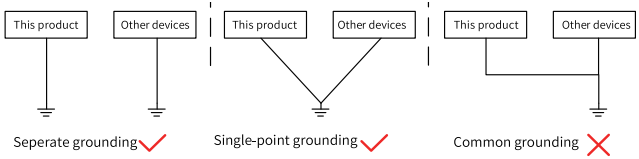


- Cover the top of the equipment with a piece of cloth or paper during installation. This is to prevent unwanted objects such as metal chippings, oil, and water from falling into the product and causing faults. After installation, remove the cloth or paper on the top of the equipment to prevent the ventilation holes from being blocked, which could cause overheating due to poor heat dissipation.
- During installation, ensure the equipment is connected to the respective connector securely and hook the equipment firmly. Improper installation may result in malfunction, failure, or detachment.

Wiring

DANGER

- This equipment must be operated only by trained and qualified electrical personnel. Non-professionals must not operate this equipment.
- Before wiring, disconnect all the power supplies of the equipment. Wait for at least the time designated on the warning label before further operations because residual voltage still exists after power-off. After waiting for the designated time, measure the DC voltage in the main circuit to ensure the DC voltage is within the safe voltage range. Failure to comply could result in electric shock.
- Do not perform wiring, remove the equipment cover, or touch the circuit board with power ON. Failure to comply could result in electric shock.
- Ensure that the equipment is grounded properly. Failure to comply could result in electric shock. Separate grounding or single-point grounding, other than common grounding, is recommended.



- Insulate the cable terminals properly to ensure the insulation distance between cables will not be shortened after cables are connected to the terminal block. Failure to comply could result in electric shock or equipment damage.
- Install the terminal cover attached to the equipment before power-on or operation after wiring is completed. Failure to comply could result in electric shock.

WARNING

Wiring

- Never connect the power cable to output terminals of the equipment. Failure to comply could cause equipment damage or even fire.
- Cables used for wiring must comply with the requirements for the cross-sectional area and shielding. The shielding layer of the shielded cable must be reliably grounded at one end.
- Tighten the terminal screws with the torque specified in the user guide. Insufficient or excessive torque may cause overheating and damage to the joint, which could result in fire.
- After wiring is done, ensure that all cables are connected properly and no screws, washers or exposed cables are left inside the equipment. Failure to comply could result in electric shock or equipment damage.



- Follow the proper electrostatic discharge(ESD) procedure, and wear an anti-static wrist strap to perform wiring. Failure to comply could damage the equipment or its internal circuits.
- Use shielded twisted pair cables for the control circuit. Connect the shield to the grounding terminal of the equipment. Failure to comply may result in equipment malfunction.

Power-on



- This equipment must be operated only by trained and qualified electrical personnel. Non-professionals must not operate this equipment.
- Before power-on, ensure that the equipment is installed and wired properly.
- Ensure that the power supply meets equipment requirements before power-on to prevent equipment damage or fire accident.
- Do not open the cabinet door or protective cover of the product, touch any wiring terminal of the product, or remove any components or parts while the product is powered on. Failure to comply could result in personal injury or even death.



Perform a trial run after wiring to ensure the equipment operates safely. Failure to comply could result in personal injury or equipment damage.

Operation

DANGER

- The equipment must be operated only by professionals. Failure to comply can result in injury or death.
- Do not touch any connecting terminals or disassemble any unit or component of the equipment during operation. Failure to comply could result in electric shock.

WARNING

- Do not touch the enclosure, fan, or resistor with bare hands. Failure to comply could result in burns.
- Prevent metal or other objects from falling into the equipment during operation. Failure to comply could result in fire or equipment damage.
- During operation, do not bring live parts into contact with the metal enclosure of the product. Failure to comply could result in fire or product damage.

Caution

- Operate the equipment within the specified environmental conditions. Failure to comply could result in equipment failure or damage.
- Touch the HMI panel with hands only. Failure to comply could cause panel damage, which is out of the warranty range.

Safety recommendations

- In positions where the operator directly touches the mechanical parts, for example, where a mechanical device is loaded/unloaded, or where a machine runs automatically, manually-operated devices or other alternative means must be carefully designed so that they are independent of the equipment to start or stop the automatic operation of the system.
- If you need to modify the program while the system is running, use the lock function or other protective measures. Ensure that only authorized personnel can make the necessary modifications.

Battery usage

WARNING

- Do not use batteries that do not meet the product requirements. Failure to comply could result in death, personal injury, explosion, or fire.
- Do not throw batteries into fire or hot ovens. Do not crush or cut the battery. Failure to comply could result in death, personal injury, explosion, or fire.
- Do not expose the battery to extremely high temperatures. Failure to comply could result in death, personal injury, explosion, or fire.
- Do not swallow batteries. Failure to comply could result in chemical burns.
- Seek for medical treatment immediately if a button battery is swallowed by accident, because this may cause severe internal burns within two hours and even death.

Caution

- Keep batteries out of reach of children.
- If the battery compartment is not shut tight, stop using the product and keep it away from children.

Maintenance

DANGER

- Maintenance must be performed only by trained and qualified electrical personnel.
- Do not maintain the equipment with power ON. Failure to comply could result in electric shock.
- Before maintenance, disconnect all the power supplies of the equipment and wait for at least the time specified on the warning label.
- Disconnect all external power supplies of the system before cleaning the equipment or re-tightening screws on the terminal block or screws for connector installation. Failure to comply could result in electric shock.
- Disconnect all external power supplies of the system before removing or installing the product, or connecting or disconnecting cables. Failure to comply could result in electric shock or malfunction.

WARNING

Perform routine and periodic inspection and maintenance on the equipment according to maintenance requirements and keep a maintenance record.

Repair

DANGER

- Repair must be performed only by trained and qualified electrical personnel.
- Do not repair the equipment with power ON. Failure to comply could result in electric shock.
- Before inspection or repair, disconnect all the power supplies of the equipment and wait for at least the time specified on the warning label.

WARNING

- Submit a request for repair based on the warranty agreement.
- When the fuse is blown or the circuit breaker or earth leakage circuit breaker (ELCB) trips, wait for at least the time designated on the equipment warning label before power-on or further operations. Failure to comply could result in equipment damage, personal injury, or death.
- Troubleshooting and repair of a faulty or damaged equipment must be performed by professionals based on the repair instructions, with the repair records kept properly.
- Replace quick-wear parts of the equipment according to the replacement instructions.
- Do not use damaged equipment. Failure to comply could result in death, personal injury, or severe equipment damage.
- Recheck the wiring and reset the parameters after equipment replacement.

Disposal

WARNING

- Dispose of the retired equipment in accordance with applicable national regulations and standards. Failure to comply could result in property damage, personal injury, or death.
- Recycle retired equipment in accordance with industry waste disposal standards to avoid environmental pollution.
- Treat the scrapped equipment as industrial waste. Dispose of the batteries according to local laws and regulations.

■ Safety Label

To ensure safe operation, comply with safety labels on the equipment and do not damage or remove the labels. The following table describes the meanings of the safety labels.

Safety Label	Description
	• Before using the equipment, read the guide and safety precautions carefully. Failure to comply could result in personal injury, death, or equipment damage. • Do not touch the terminals or remove the cover with power-on or within 10 min after power-off. Failure to comply could result in electric shock. • The surface of the equipment may become very hot during operation. Do not touch these hot areas, as this may cause burns.

1.2 Industrial Information Security

The product provides interfaces for network connection and data transmission. To protect factories, systems, machines, and networks from cyberattacks, it is essential to implement proper protection mechanism for industrial security.

Customers are responsible for providing and maintaining a secure connection between the product and their network or any other network to protect their factories, systems, machines, and networks from unauthorized access. Such systems or machines can be connected to an enterprise network or the Internet only when a secure connection is established and appropriate security measures (such as using antivirus software or installing firewalls) are in place.

Inovance continuously develops and improves its products and solutions to enhance safety. It is strongly recommended that you update the product promptly and always use the latest version.



Malware (such as viruses, Trojans, and worms) can bring the device into an unsafe operating state, resulting in death, serious injury, and property damage. Observe the following precautions:

- Always use the latest software version. If the product version is no longer supported or the latest version is not used, you will be exposed to increased risk of cyber attacks.
- Develop and maintain appropriate protective measures (including but not limited to antivirus software, firewalls, WAF, IPS/IDS, situational awareness system, identity authentication, and data encryption) to prevent the files in mobile storage devices from being damaged by malware, and to protect the products, networks, systems, and interfaces from unauthorized access, tampering, hacking, data leakage, or information theft.
- Check all safety-related interfaces and settings after commissioning.

2 Product Introduction

2.1 Product Overview

The GE21-TF-RTC expansion card is the GE21 series storage (with integrated RTC) expansion card independently developed by Inovance. This card can be used with Easy321 and Easy511 series PLCs and supports upgrading user programs and firmware. During the upgrade, the RTC clock remains running normally.

2.2 Model and Nameplate

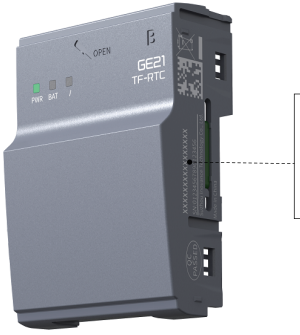
■ Model description

GE21 - TF - RTC

① ② ③

① **Product Information** GE21 series general-purpose expansion card	③ **Product Code** RTC clock card
② **Product Code** TF card	-

■ Nameplate description

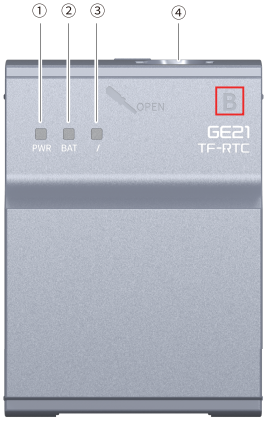


QC PASSED

Memory and Clock Expansion Card
SN:01234567890123456
Suzhou Inovance Technology Co., Ltd.
Made in China

Model	Description	Code
GE21-TF-RTC	PLC controller option-GE21-TF-RTC-GE21 series TF card (with integrated RTC)	01480074

2.3 Components



No.	Component	Mark	Definition	Indicator Color	Description
①	Power supply status indicator	PWR	Power supply state	Yellow-green	• ON: The power supply is normal • OFF: The power supply is abnormal.
②	Battery alarm indicator	BAT	RTC battery low	Red	• ON: Indicates low battery. Replace the battery in time to prevent RTC clock loss. • OFF: Indicates normal battery level

No.	Component	Mark	Definition	Indicator Color	Description
③	-	/	-	-	Reserved
④	Card slot	SD	-	-	-

Note

The letter "B" on the product indicates that only the card slot B of the PLC is supported.

2.4 Product Specifications

2.4.1 General Specifications

No.	Specification
IP rating	IP20
Dimensions (W x H x D)	58 mm × 42 mm × 21.4 mm
Weight	About 27 g

2.4.2 Power Supply Specifications

Item	Specification
Short circuit protection	Supported
Hot swap	Not supported

2.4.3 TF Card Specifications

No.	Specification
Communication interface	SDIO
Capacity	Max. 32 GB
Specification	TransFlash (Micro SD)
File format	FAT32
Mounting method	Self-eject

2.4.4 Clock Specifications

No.	Specification
Communication interface	I^2C
Clock accuracy	120 seconds/month
Time format	YYYY-MM-DD hh-mm-s
Battery specifications	Coin cell battery, 3-year service life, replaceable
Battery replacement time	⩽ 60 seconds (power-off time does not exceed 15 seconds) **Notes:** If the power-off time exceeds 15 seconds, the RTC clock time needs to be reset after the battery is replaced.

2.5 Environmental Specifications

Take the operability, serviceability, and adaptability to environment into account when installing the expansion card to the PLC.

Item	Specification
Installation/Ambient environment	Free from conductive dust, conductive fibers, explosive dust, flammable gases, water mist/greasy dirt, corrosive dust/gases, strong vibration, and repetitive shock.
Max. altitude	⩽ 2000 m
Pollution degree	Level 2
Interference immunity	2 kV on DC power supply line (IEC61000-4-4)
Overvoltage category	I
EMC immunity level	Zone B, IEC61131-2
ESD protection level	Contact discharge +/-6 kV, air discharge +/-8 kV
Vibration resistance	• Application scenario: Tested according to IEC60068-2-6. 3.5 mm amplitude at 5 Hz to 8.4 Hz; 1 g acceleration at 8.4 Hz to 200 Hz; in ten cycles/axes • Transportation scenario: Tested according to IEC60068-2-64, 0.01 g^2/Hz power spectral density at 5 Hz to 100 Hz; 0.001 g^2/Hz power spectral density at 200 Hz; 1.14 g Grms

Item	Specification
Shock resistance	Application/Transportation scenario: Tested according to IEC60068-2-27; 15 g peak acceleration, 11 ms pulse width, 18 cycles in total in X, Y and Z axial directions
Ambient temperature/ humidity	• Temperature: -20°C to +55°C • Humidity: < 95% RH (30°C), without condensation
Storage temperature/ humidity	• Temperature: -20°C to +60°C • Humidity: < 95% RH (30°C), without condensation
Transportation temperature/humidity	• Temperature: -40°C to +70°C • Humidity: < 95% RH (40°C), without condensation

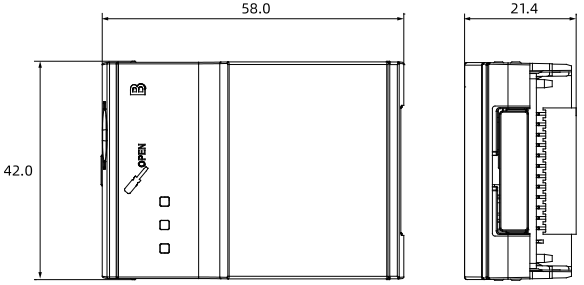
3 Installation

3.1 Installation Precautions

- Make sure the PLC is powered off before installing or removing the expansion card.
- Do not connect/disconnect the expansion card with power ON. This may lead to master restart or user data loss or damage.
- Do not drop or shock the housing or terminals of the expansion card to avoid damage.

3.2 Installation Dimensions

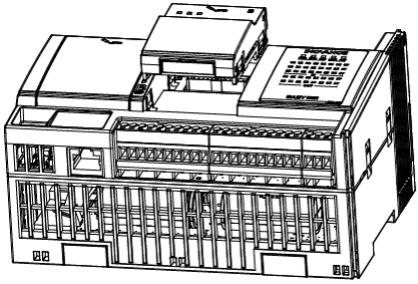
The installation dimensions (in mm) are shown in the figure below.



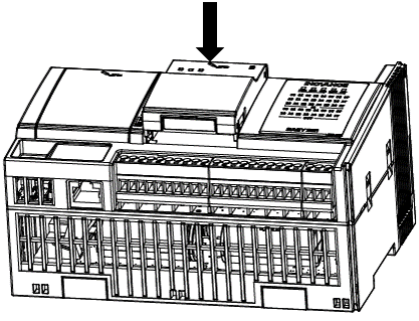
3.3 Installation Method

■ Installing the expansion card

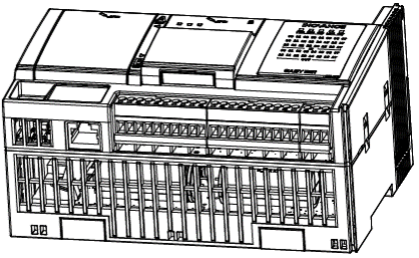
1. Place the PLC and the expansion card horizontally.



2. Insert the expansion card into the card slot B vertically along the guide ribs, and press the expansion card.

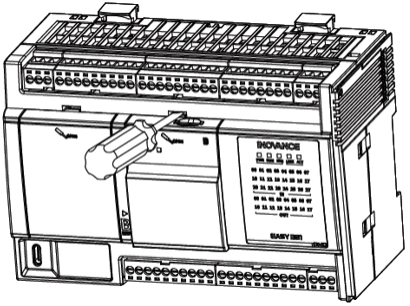


3. The installation is complete when you hear a click and the surface of the expansion card is flush with the surface of the PLC.

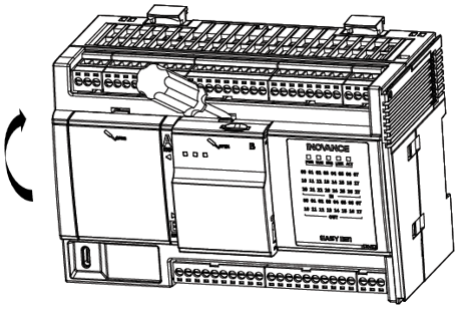


■ Removing the expansion card

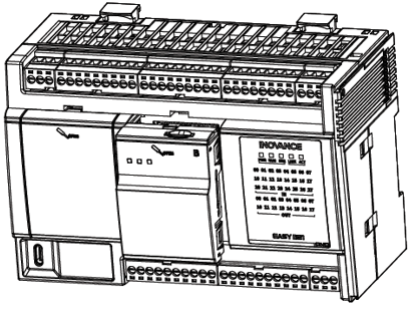
1. Place the PLC horizontally and insert a slotted screwdriver into the inner snap-fit position.



2. Pry the expansion card module in the direction of the arrow.



3. Remove the expansion card module vertically when you hear a distinct sound indicating that the expansion card has partially detached from the PLC.



4 Configuration and Commissioning

Caution

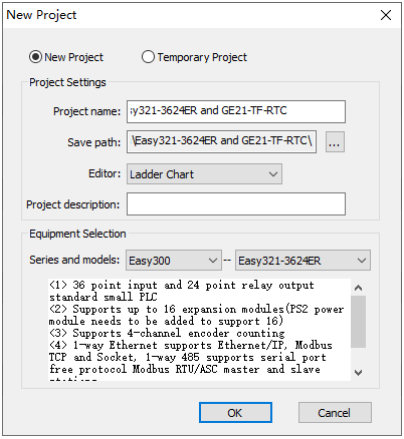
- The GE21-TF-RTC expansion card only supports EXP-B.
- The type ID of the GE21-TF-RTC expansion card is 17. The configured expansion card type must be consistent with the actually installed expansion card type.

Operating procedure

1. Create a project.

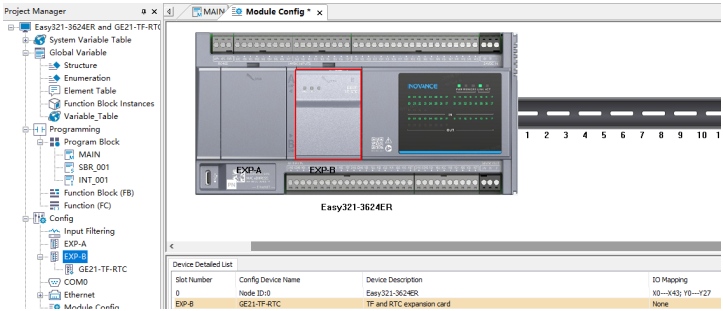
   a. Double-click the AutoShop shortcut icon on the PC desktop to open the AutoShop programming software.

   b. Select **File** > **New Project** in the menu bar to open the **New Project** dialog box.



   c. Set **Project name**, **Save path**, **Editor**, **Project description**, and **Series and models**. Click **OK**.

2. In the **Project Manager** pane, go to **Config** > **EXP-B**. Right-click **EXP-B** and select **GE21-TF-RTC**. Alternatively, go to **Config** > **Module Config**. Right-click **Module Config** and select **Auto Scan** to add the GE21-TF-RTC expansion card, as shown in the figure below.



3. After successful compiling, download the project and run it.

   a. Click the download button  in the toolbar to download the program to the PLC.

   b. After the download is complete, click the run button in the toolbar to run the program.

5 Appendix: Replacing the Backup Battery

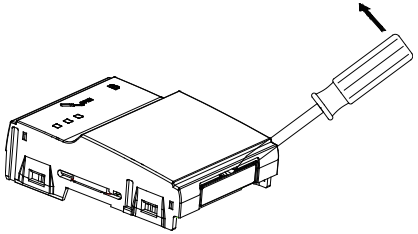
The backup battery supplies power to the product when the PLC is out of power, with a maximum battery life of 3 years, depending on the use environment. When the backup battery runs out of power, replace it promptly.

Caution

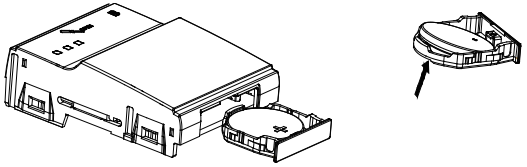
The replacement of the backup battery must be completed within 15 seconds (excluding the time for removing the expansion card); otherwise, the RTC clock will be lost.

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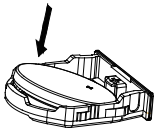
1. Remove the expansion card as described in “Removing the Expansion Card” in *"3.3 Installation Method" on page 21*.
2. Insert a pointed tool, such as a screwdriver, into the notch in the housing and lever the battery compartment out of the expansion card with force obliquely upward.

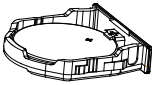


3. Remove the old battery from the battery compartment.



4. Place a new battery in the battery compartment according to the polarity markings on the battery and make sure the battery is secured.





5. Push the battery compartment into the expansion card until you hear a click (Note that the positive polarity of the battery faces the notch in the housing).

