Modicon M580 Controller FPGA Upgrade

User Guide

Original instructions

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Legal Information

The information provided in this document contains general descriptions, technical characteristics and/or recommendations related to products/solutions.

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Safety Information

Important Information

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result** in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

Before You Begin

Do not use this product on machinery lacking effective point-of-operation guarding. Lack of effective point-of-operation guarding on a machine can result in serious injury to the operator of that machine.

⚠WARNING

UNGUARDED EQUIPMENT

- Do not use this software and related automation equipment on equipment which does not have point-of-operation protection.
- Do not reach into machinery during operation.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

This automation equipment and related software is used to control a variety of industrial processes. The type or model of automation equipment suitable for each application will vary depending on factors such as the control function required, degree of protection required, production methods, unusual conditions, government regulations, etc. In some applications, more than one processor may be required, as when backup redundancy is needed.

Only you, the user, machine builder or system integrator can be aware of all the conditions and factors present during setup, operation, and maintenance of the machine and, therefore, can determine the automation equipment and the related safeties and interlocks which can be properly used. When selecting automation and control equipment and related software for a particular application, you should refer to the applicable local and national standards and regulations. The National Safety Council's Accident Prevention Manual (nationally recognized in the United States of America) also provides much useful information.

In some applications, such as packaging machinery, additional operator protection such as point-of-operation guarding must be provided. This is necessary if the operator's hands and other parts of the body are free to enter the pinch points or other hazardous areas and serious injury can occur. Software products alone cannot protect an operator from injury. For this reason the software cannot be substituted for or take the place of point-of-operation protection.

Ensure that appropriate safeties and mechanical/electrical interlocks related to point-of-operation protection have been installed and are operational before placing the equipment into service. All interlocks and safeties related to point-of-operation protection must be coordinated with the related automation equipment and software programming.

NOTE: Coordination of safeties and mechanical/electrical interlocks for point-of-operation protection is outside the scope of the Function Block Library, System User Guide, or other implementation referenced in this documentation.

Start-up and Test

Before using electrical control and automation equipment for regular operation after installation, the system should be given a start-up test by qualified personnel to verify correct operation of the equipment. It is important that arrangements for such a check are made and that enough time is allowed to perform complete and satisfactory testing.

⚠WARNING

EQUIPMENT OPERATION HAZARD

- Verify that all installation and set up procedures have been completed.
- Before operational tests are performed, remove all blocks or other temporary holding means used for shipment from all component devices.
- Remove tools, meters, and debris from equipment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Follow all start-up tests recommended in the equipment documentation. Store all equipment documentation for future references.

Software testing must be done in both simulated and real environments.

Verify that the completed system is free from all short circuits and temporary grounds that are not installed according to local regulations (according to the National Electrical Code in the U.S.A, for instance). If high-potential voltage testing is necessary, follow recommendations in equipment documentation to prevent accidental equipment damage.

Before energizing equipment:

- Remove tools, meters, and debris from equipment.
- Close the equipment enclosure door.
- Remove all temporary grounds from incoming power lines.
- Perform all start-up tests recommended by the manufacturer.

Operation and Adjustments

The following precautions are from the NEMA Standards Publication ICS 7.1-1995:

(In case of divergence or contradiction between any translation and the English original, the original text in the English language will prevail.)

- Regardless of the care exercised in the design and manufacture of equipment or in the selection and ratings of components, there are hazards that can be encountered if such equipment is improperly operated.
- It is sometimes possible to misadjust the equipment and thus produce unsatisfactory or unsafe operation. Always use the manufacturer’s instructions as a guide for functional adjustments. Personnel who have access to these adjustments should be familiar with the equipment manufacturer’s instructions and the machinery used with the electrical equipment.
- Only those operational adjustments required by the operator should be accessible to the operator. Access to other controls should be restricted to prevent unauthorized changes in operating characteristics.

About the Book

Document Scope

This manual describes how to update a Modicon M580 controller specific component, the Field Programmable Gate Array (FPGA). FPGA is used in the power management unit of Modicon M580 controllers.

NOTE: These instructions apply to Modicon M580 controllers with firmware greater than or equal to 4.10.

Validity Note

This document has been updated for the release of the FPGA firmware version 1.60.

For product compliance and environmental information (RoHS, REACH, PEP, EOLI, etc.), go to www.se.com/ww/en/work/support/green-premium/.

FPGA Update Procedure

Before proceeding with an update, read and follow our Cybersecurity Best Practices.

This document presents a two-part maintenance operation that consists of:

- Reconfiguration of FPGA component using an intermediate version.
- Downloading the operational firmware to the Modicon M580 controller.

The described procedure requires the controller to be in a *STOP* state.

NOTE: For Hot Standby controllers, applications can continue to operate during the FPGA update. For more information, refer to Modicon M580 Hot Standby, System Planning Guide for Frequently Used Architectures.

NOTE: The firmware version **04.91.01** is an intermediate version intended to enable the download of the final firmware version in the Step 2 procedure. Firmware version **04.91.01** is not an operational version.

Related Documents

Title of documentation	Reference number
Modicon M580, Hardware, Reference Manual	EIO0000001578 (English), EIO0000001579 (French), EIO0000001580 (German), EIO0000001582 (Italian), EIO0000001581 (Spanish), EIO0000001583 (Chinese)
Modicon M580 Standalone, System Planning Guide for Frequently Used Architectures	HRB62666 (English), HRB65318 (French), HRB65319 (German), HRB65320 (Italian), HRB65321 (Spanish), HRB65322 (Chinese)
Modicon M580 Hot Standby, System Planning Guide for Frequently Used Architectures	NHA58880 (English), NHA58881 (French), NHA58882 (German), NHA58883 (Italian), NHA58884 (Spanish), NHA58885 (Chinese)
EcoStruxure Automation Device Maintenance, Firmware Upgrade Tool, Online Help	EIO0000004033 (English), EIO0000004048 (French), EIO0000004046 (German), EIO0000004049 (Italian), EIO0000004047 (Spanish), EIO0000004050 (Chinese), EIO0000005089 (Turkish), EIO0000005090 (Portuguese)

To find documents online, visit the Schneider Electric download center (www.se.com/ww/en/download/).

Product Related Information

⚠WARNING

LOSS OF CONTROL

- Perform a Failure Mode and Effects Analysis (FMEA), or equivalent risk analysis, of your application, and apply preventive and detective controls before implementation.
- Provide a fallback state for undesired control events or sequences.
- Provide separate or redundant control paths wherever required.
- Supply appropriate parameters, particularly for limits.
- Review the implications of transmission delays and take actions to mitigate them.
- Review the implications of communication link interruptions and take actions to mitigate them.
- Provide independent paths for control functions (for example, emergency stop, over-limit conditions, and error conditions) according to your risk assessment, and applicable codes and regulations.
- Apply local accident prevention and safety regulations and guidelines.[1]
- Test each implementation of a system for proper operation before placing it into service.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

[1] For additional information, refer to NEMA ICS 1.1 (latest edition), *Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control* and to NEMA ICS 7.1 (latest edition), *Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems* or their equivalent governing your particular location.

Interrupting the update procedure before it has completed will cause an interruption of the connection and can cause irreparable damage to the Modicon M580 controller.

NOTICE

INOPERABLE EQUIPMENT

During the transfer of the firmware file:

- do not remove power from the Modicon M580 controller.
- do not remove power from the PC.
- do not exit the EcoStruxure Automation Device Maintenance software.
- do not disconnect the communication cable.
- do not remove or insert the optional SD memory card.

Failure to follow these instructions can result in equipment damage.

Information on Non-Inclusive or Insensitive Terminology

As a responsible, inclusive company, Schneider Electric is constantly updating its communications and products that contain non-inclusive or insensitive terminology. However, despite these efforts, our content may still contain terms that are deemed inappropriate by some customers.

Terminology Derived from Standards

The technical terms, terminology, symbols and the corresponding descriptions in the information contained herein, or that appear in or on the products themselves, are generally derived from the terms or definitions of international standards.

In the area of functional safety systems, drives and general automation, this may include, but is not limited to, terms such as *safety*, *safety function*, *safe state*, *fault*, *fault reset*, *malfunction*, *failure*, *error*, *error message*, *dangerous*, etc.

Among others, these standards include:

Standard	Description
IEC 61131-2:2007	Programmable controllers, part 2: Equipment requirements and tests.
ISO 13849-1:2023	Safety of machinery: Safety related parts of control systems. General principles for design.
EN 61496-1:2020	Safety of machinery: Electro-sensitive protective equipment. Part 1: General requirements and tests.
ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN 60204-1:2006	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 14119:2013	Safety of machinery - Interlocking devices associated with guards - Principles for design and selection
ISO 13850:2015	Safety of machinery - Emergency stop - Principles for design
IEC 62061:2021	Safety of machinery - Functional safety of safety-related electrical, electronic, and electronic programmable control systems
IEC 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: General requirements.
IEC 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Requirements for electrical/electronic/programmable electronic safety-related systems.
IEC 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Software requirements.
IEC 61784-3:2021	Industrial communication networks - Profiles - Part 3: Functional safety fieldbuses - General rules and profile definitions.
2006/42/EC	Machinery Directive
2014/30/EU	Electromagnetic Compatibility Directive
2014/35/EU	Low Voltage Directive

In addition, terms used in the present document may tangentially be used as they are derived from other standards such as:

Standard	Description
IEC 60034 series	Rotating electrical machines
IEC 61800 series	Adjustable speed electrical power drive systems
IEC 61158 series	Digital data communications for measurement and control – Fieldbus for use in industrial control systems

Finally, the term *zone of operation* may be used in conjunction with the description of specific hazards, and is defined as it is for a *hazard zone* or *danger zone* in the *Machinery Directive* (*2006/42/EC*) and *ISO 12100:2010*.

NOTE: The aforementioned standards may or may not apply to the specific products cited in the present documentation. For more information concerning the individual standards applicable to the products described herein, see the characteristics tables for those product references.

Updating the FPGA Configuration

The following section presents step-by-step instructions showing you how to:

1. Update the Modicon M580 controller FPGA using the firmware version **04.91.01** in the *BMEx58x0x0 FPGA update package v01.sedp* file.
2. Update the Modicon M580 controller firmware to version 4.20 or later.

Updating the FPGA to 1.6 enables new features that are not available with firmware version 4.20 and FPGA 1.5.

Verify that your PC can communicate with the Modicon M580 controller using the HTTPS protocol.

NOTE:

- Before proceeding with an update, read and follow our Cybersecurity Best Practices.
- Verify that your PC can communicate with the Modicon M580 controller using HTTPS protocols. (Cybersecurity policies applied to some networks may block this update procedure.)

Overview

All operations in this guide are performed using EcoStruxure Automation Device Maintenance (EADM) software.

The process of upgrading the Modicon M580 controller FPGA is accomplished installing the *BMEx58x0x0 FPGA update package v01.sedp* file using the EADM software to provide the controller with a new functionality. Thereafter use the EADM software to perform:

- Step 1: FPGA Firmware Update, page 12
- Step 2: M580 Firmware Download, page 16

After completion of this procedure, you need to cycle power - off then on - to the controller to enable the new FPGA functionalities.

To obtain the *BMEx58x0x0 FPGA update package v01.sedp* file, contact your local Schneider Electric service representative.

EcoStruxure Automation Device Maintenance and instructions for using it are available on the Schneider Electric website at the following URL: https://www.se.com/ca/en/download/document/EADM/.

NOTE: This procedure does not affect the application previously loaded on the controller.

Preliminary Tasks

Before beginning:

- Configure your firewall to allow PC to controller communications.
- Confirm that you know the credentials of the controller application, including the application password.

When you apply this procedure to your Modicon M580 controller, it is important that you are in front of the equipment to monitor the progress of the update or, at a minimum, have a contact or other means of observing and reporting the state of the application before attempting the update.

Identifying the FPGA Version

You can use %SW130 to read the FPGA version for M580 controllers with firmware version 4.20 or later.

%SW130 description:

- bit 0: 1 Enables M580 auto-reboot if the controller becomes non-operational, 0 disables M580 auto-reboot.

  NOTE:

  - Auto-reboot applies only to non-safety-related M580 controllers.
  - Auto-reboot applies only for FPGA versions 1.6 and later.
  - Bit 0 is automatically re-set to 0 after a reset or cold start.
- bits 1...3: unused
- bits 4...15: version of the FPGA

For example:

- FPGA 1.5: %SW130 = hex 1050
- FPGA 1.6 + auto-reboot inactive: %SW130 = hex 1060
- FPGA 1.6 + auto-reboot active: %SW130 = hex 1061

During an auto-reboot, the outputs enter fallback state. After auto-reboot the controller enters STOP state and:

- Outputs in the local rack are de-energized.
- Outputs in remote racks enter fallback.

⚠ WARNING
UNINTENDED EQUIPMENT OPERATION Design your system so de-energized local rack outputs do not create a hazard. **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

Step 1: FPGA Firmware Update

EADM uses the *Modicon M580 Controller FPGA Update* firmware files provided by your local Schneider Electric service representative.

The name of the file, in SEDP format, that you use depends upon the reference of the controller. Generically, the name of the file is *Modicon M580 Controller FPGA Update*, with the reference of your controller replacing the generic controller reference.

Procedure

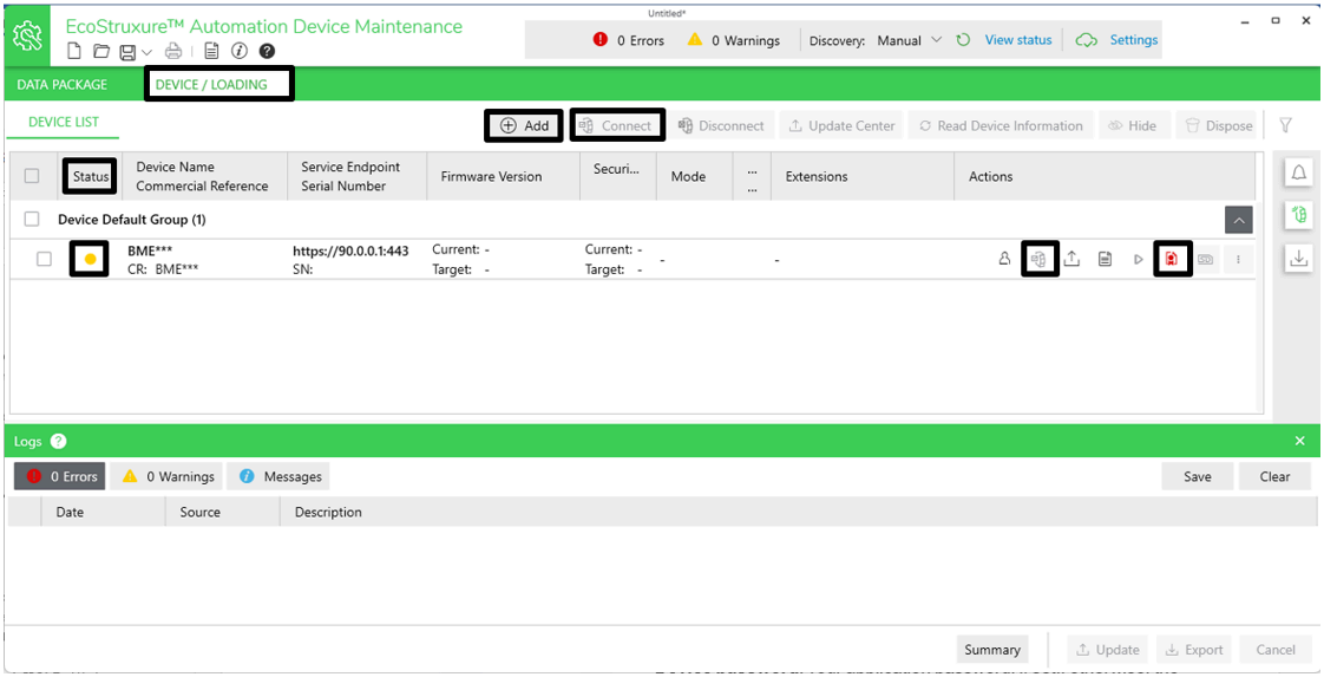
1. Perform this part of the update using either one of the following ports of the Modicon M580 controller:
   - USB port
   - Ethernet service port (Port 1, connecting the PC directly to the service port).
2. Open EcoStruxure Automation Device Maintenance.
3. Add the installation package *BMEx58x0x0 FPGA update package v01.sedp*

4. Add your controller in the **Device/Loading** menu (use HTTPS protocol).

   NOTE: If you are using USB cable, enter 90.0.0.1 as the **IP Address**.

   The device **Status** should be yellow, indicating the device is reachable on the network.

   NOTE: If the device **Status** is gray, the device is unreachable.



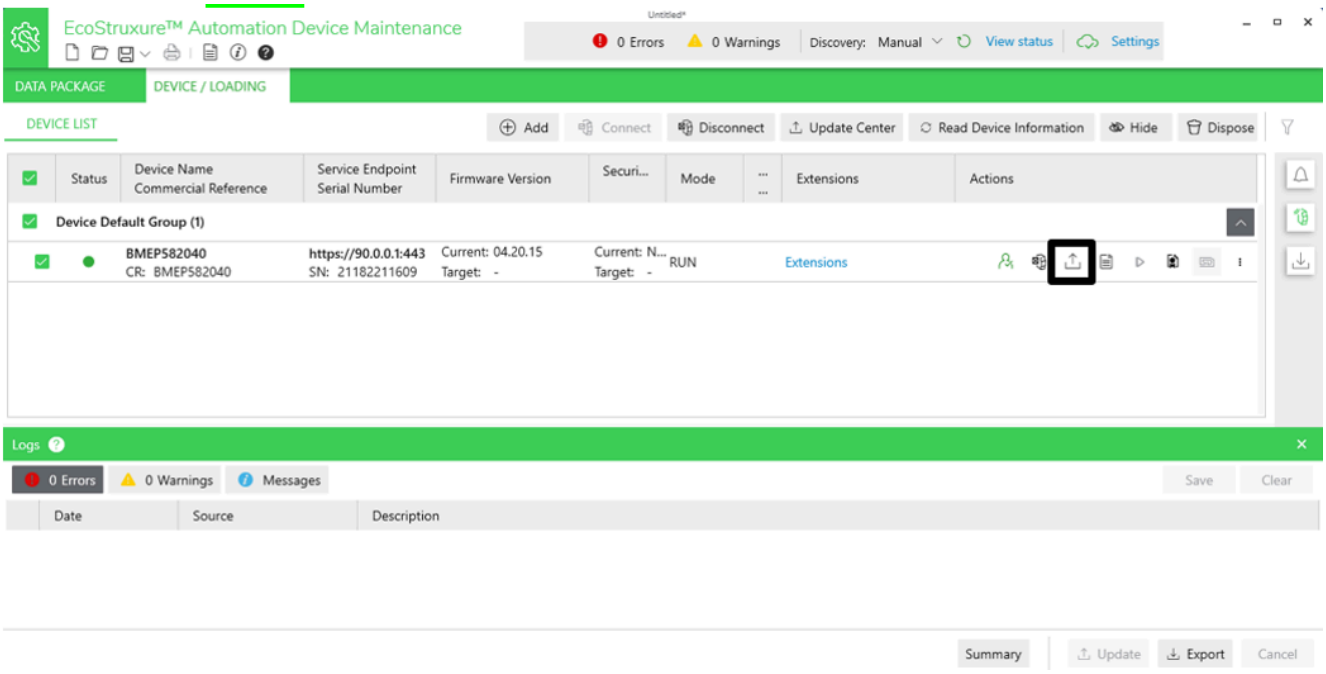
5. Verify if the device certificate can be trusted:

   a. Click the certificate icon ( ).

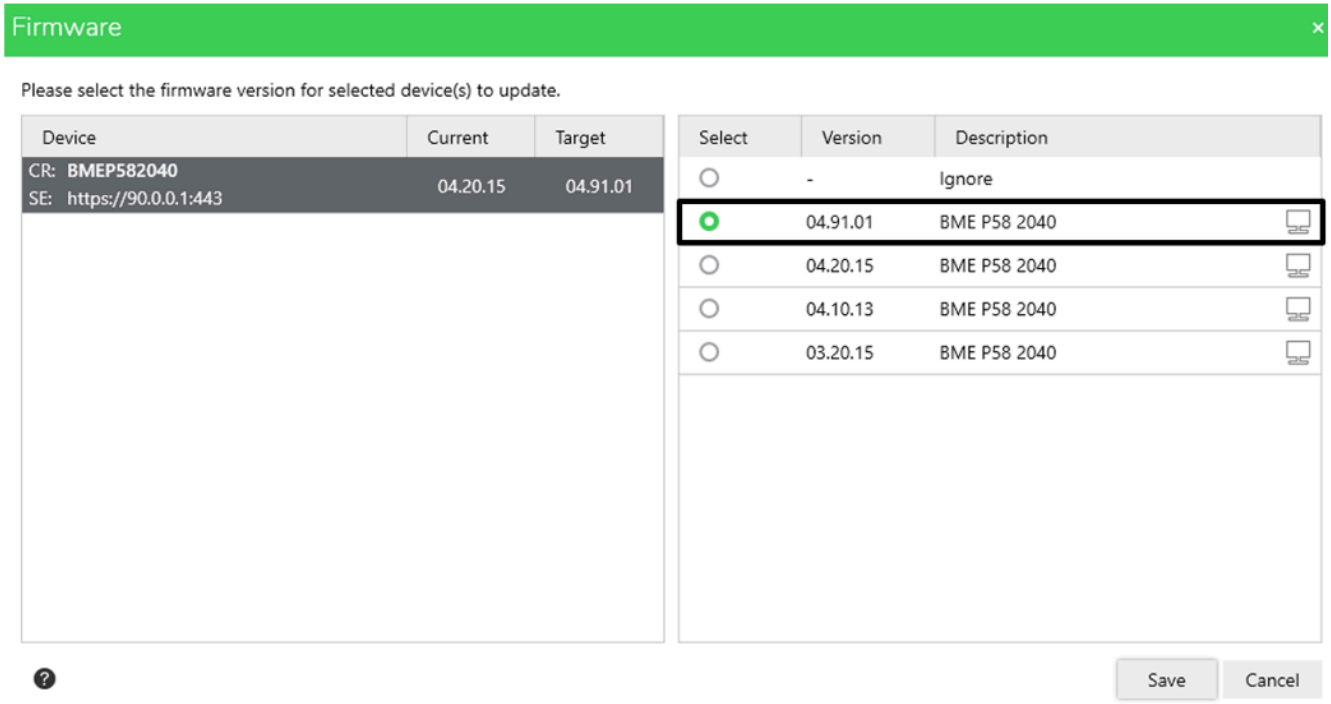
   b. Verify the certificate information and, if you agree, click **Trust**.

6. Connect to the controller using your credentials:
   - **Device User Name**: *loader*
   - **Device password**: your application password, if set.; otherwise, the default password: *fwdownload*
   - Click **Save and Connect**.

   Device status is GREEN, indicating that EcoStruxure Automation Device Maintenance has successfully connected to the controller.



7. Click the update icon ( ) to open the **Update Center**, where you will select the firmware to download to the controller.
8. Select firmware version **04.91.01** and click **Save**:

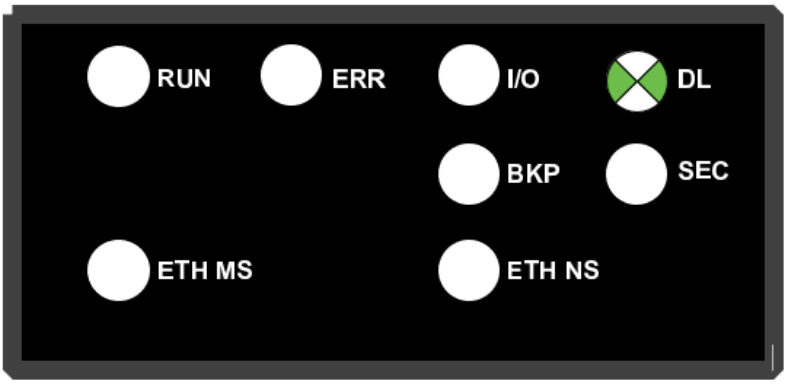


9. In the **Device/Loading** screen, click **Update** to download the firmware package to the controller.

   If power to the controller is interrupted, the controller can become corrupted and unable to restart.

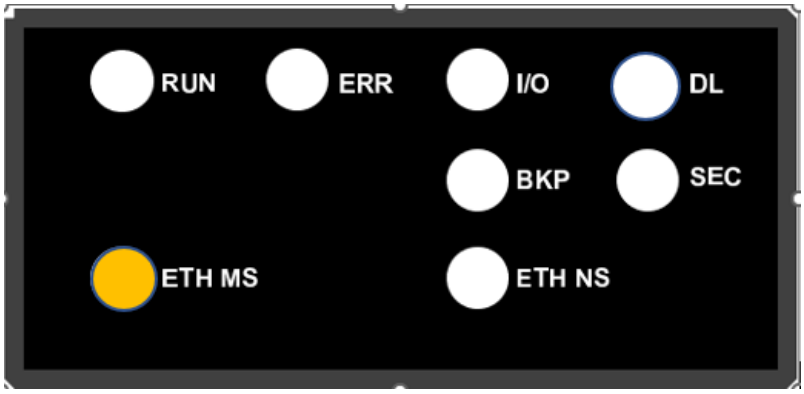
NOTICE
INOPERABLE EQUIPMENT Maintain continuous power to the controller. **Failure to follow these instructions can result in equipment damage.**

10. The **DL** LED flashes green, indicating the intermediate firmware is being downloaded to the controller:



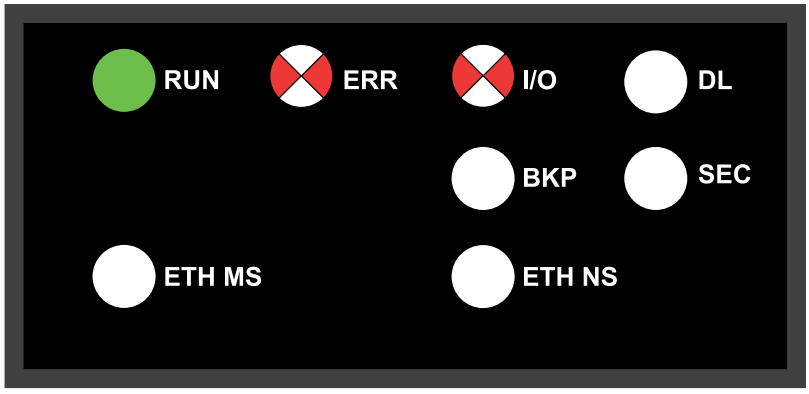
NOTE: The firmware download process can take several minutes.

The controller restarts and applies the intermediate firmware. The **ETH MS** LED turns orange:



At the conclusion of the process.

- **RUN** LED turns GREEN
- **ERR** and **IO** LEDs flash RED



Result: The intermediate firmware has been downloaded and applied. Proceed to Step 2.

Step 2: M580 Firmware Download

EcoStruxure Automation Device Maintenance uses the Modicon M580 Controller firmware v4.20 or later provided by your local Schneider Electric service representative.

The name of the file, in SEDP format, that you use depends upon the reference of the controller. Generically, the name of the file is “BMEx58x0x0_SV04.20”, with the reference of your controller replacing the generic controller reference.

Procedure

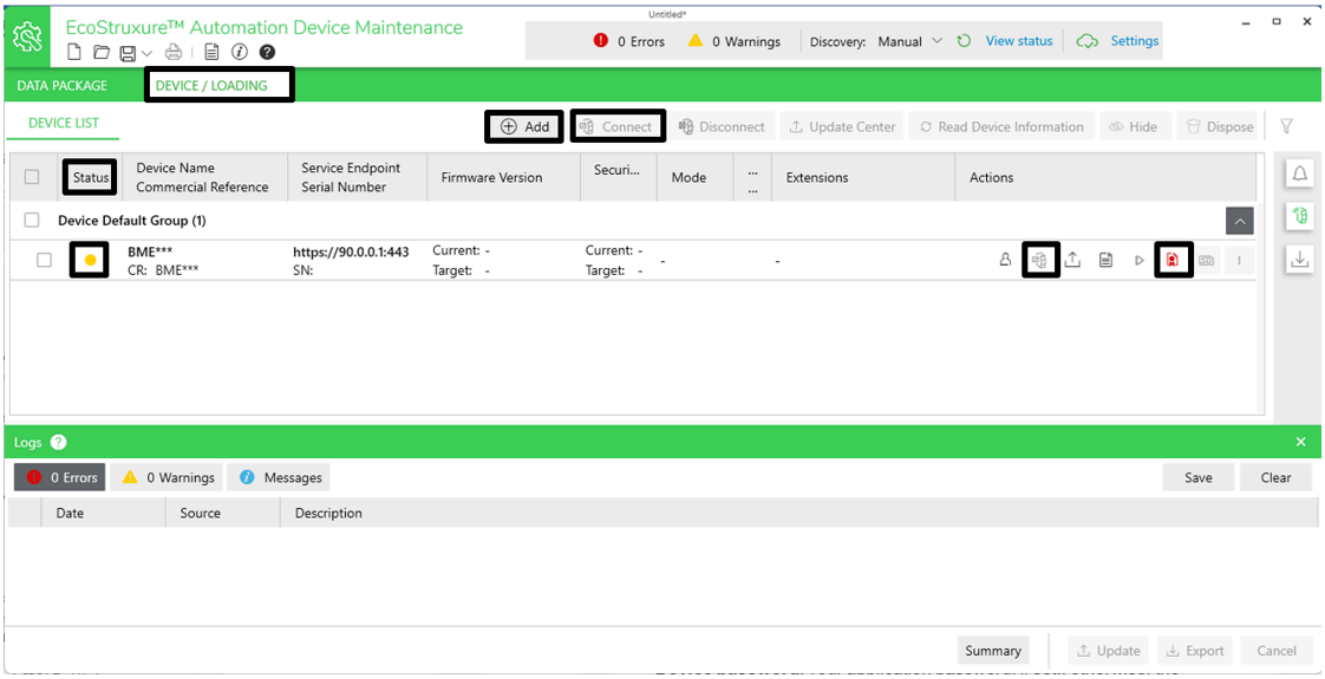
1. Perform this part of the update using either one of the following ports of the Modicon M580 controller:
   - USB port
   - Ethernet service port (Port 1, connecting the PC directly to the service port).
2. Open EcoStruxure Automation Device Maintenance.
3. Add an operational firmware package, in this example *BMEx58x0x0_SV04.20.sedp*.
4. 

your controller in the **Device/Loading** menu (use HTTPS protocol).

   NOTE: If you are using USB cable, enter 90.0.0.1 as the **IP Address**.

   The device **Status** should be yellow, indicating the device is reachable on the network.

   NOTE: If the device **Status** is gray, the device is unreachable.



5. Verify if the device certificate can be trusted:
   a. Click the certificate icon ( ).
   b. Verify the certificate information and, if you agree, click **Trust**.

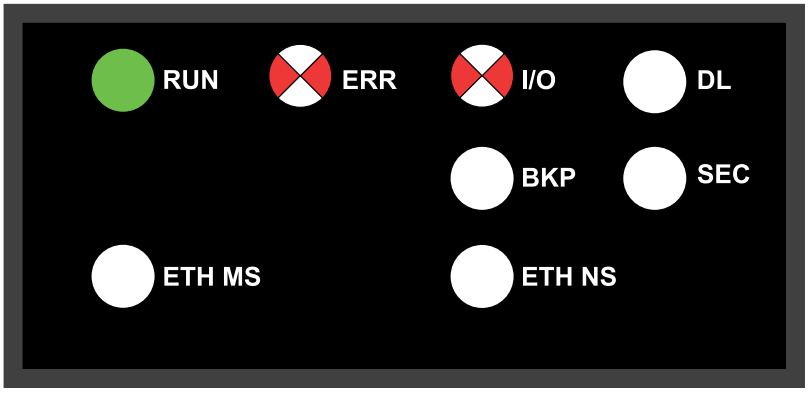
6. Connect to your controller, which should be using firmware version 4.91.01:
   - **Device User Name**: *loader*
   - **Device password**: *fwdownload*
   - Click **Save and Connect**.

   Device status is GREEN, indicating that EcoStruxure Automation Device Maintenance has successfully connected to the controller.
7. Click the update icon ( ) to open the **Update Center**.
8. Select the firmware you want to download to the controller and click **Save**.
9. In the **Device/Loading** screen, click **Update** to download the firmware package to the controller.

   If power to the controller is interrupted, the controller can become corrupted and unable to restart.

NOTICE
INOPERABLE EQUIPMENT Maintain continuous power to the controller. **Failure to follow these instructions can result in equipment damage.**

   At the conclusion of the process.
   - **RUN** LED turns GREEN
   - **ERR** and **IO** LEDs flash RED



   The firmware package download can take several minutes. A message is displayed, indicating the percentage of firmware upgrade progress.

   After the download of the firmware has completed, the controller is restarted and EcoStruxure Automation Device Maintenance is disconnected.

   After successful reboot the controller resumes running with the selected firmware.

   NOTE: When the controller reboots, EcoStruxure Automation Device Maintenance may incorrectly indicate that the firmware was not successfully installed. This is due to the disconnection of the EADM software during the reboot of the controller.

   Result: The firmware package has been downloaded and applied. Your controller is now updated with an operational firmware and is running same application that was deployed before starting the FPGA update.

Final Tasks

The new FPGA reconfiguration is performed only during a power-cycle, by power cycling the Modicon M580 controller.

NOTE: Resetting the controller does not reconfigure the FPGA.

After cycling power to the controller and a successful reboot sequence, the Modicon M580 controller is updated.

Confirm FPGA Version

Connect to the controller, then use the following system word to identify the FPGA version and verify that the FPGA update has been applied correctly. The expected version is v1.60.

- %SW130 value should be hex 1060

If %SW130 is different, the update was not successful. In this case, contact your local Schneider Electric service representative.

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As standards, specifications, and design change from time to time, please ask for confirmation of the information given in this publication.

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