

Reyrolle 7SR1 & 7SR2 IEC 61850

Updating EN100 Ethernet Module Firmware & FPGA Configuration Files

Introduction

Siemens Protection Devices Ltd (SPDL) began updating their current 7SRx generation of electronic protection relays in 2011 with the addition of IEC 61850 support, beginning with the Reyrolle Multifunction 7SR2 platform. It was decided that the most cost-effective way to do this was to follow on from the success of the Siemens SIPROTEC 4 range of protection relays, which already offered IEC 61850, facilitated by an Ethernet expansion card known as the EN100 (EtherNet 100Mbps). The EN100 was integrated into the 7SR2 hardware and software to bring IEC 61850 communications and functionality to the Reyrolle devices. Subsequently, the same upgrade was rolled out to the Reyrolle Compact 7SR1 platform, with the case size expanding from E4 to E6 on devices ordered with IEC 61850 communications to accommodate the EN100 card and related hardware.

EN100 Firmware and FPGA

The EN100 card is essentially a standalone device built into the protection relay, and as such it has its own firmware, for which new versions are periodically released by Siemens. It also has an FPGA (Field Programmable Gate Array) for which new configuration files are also released on occasion, for example to support

certain redundancy protocols. The purpose of this document is to describe the process of updating this firmware and FPGA configuration file.

Key Points

There exist two main versions of the EN100 module – the older EN100, and the newer EN100+. The EN100+ contains the hardware required to use the electrical version of it as a switch, which facilitates its use for PRP redundancy. All new Reyrolle 7SR1 and 7SR2 devices ordered with IEC 61850 will have an EN100+ module fitted. The two main versions are then broken down into an Electrical version with RJ45 connectors, and an Optical

version with duplex LC fibre-optic connectors, giving us the 4 versions of the EN100 in use today:

- EN100_E
- EN100_O
- EN100_E+
- EN100_O+

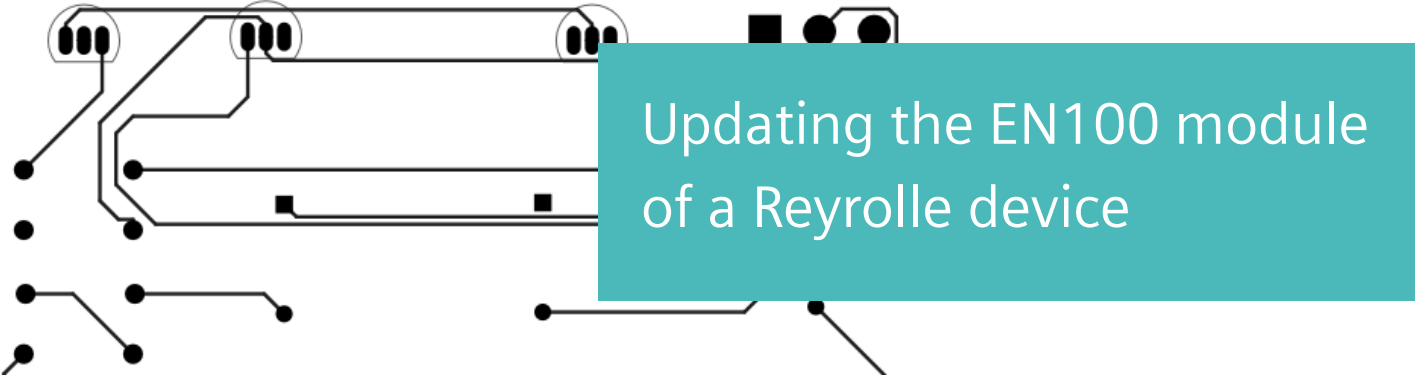
All versions of the EN100 share the same main firmware. However, the FPGA configuration files differ between models:

- Both EN100+ types use the same FPGA configuration file.
- A different FPGA configuration file is used for the EN100_O.
- As the EN100_E does not have switching functionality, there is no FPGA file for this.

Firmware versions and FPGA files can quickly and easily be either upgraded or downgraded as required to meet the needs of the individual application.



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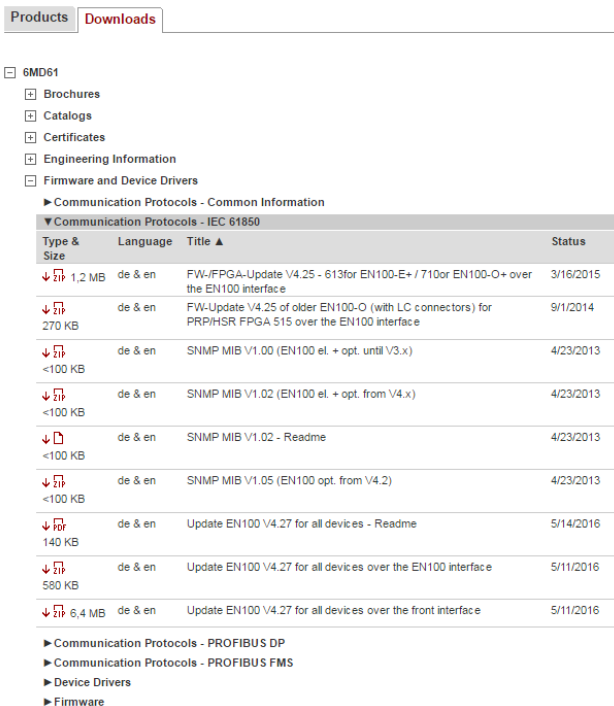
Updating the EN100 module of a Reyrolle device

1 – Download the required files to your PC

As the EN100 modules came from the SIPROTEC 4 platform, the Firmware and FPGA configuration files are found under the SIPROTEC 4 product downloads on the Siemens website.

Visit www.siemens.com/protection, and locate the SIPROTEC 4 Protection product range. On clicking the Downloads tab, you will be presented with a list of devices in the SIPROTEC 4 range.

Choose any one of these devices which supports IEC 61850 e.g. **6MD61 > Firmware and Device Drivers > Communication Protocols – IEC 61850**. This lists the current files available to download relating to IEC 61850 communications.



The screenshot shows the Siemens website interface. At the top, there are tabs for 'Products' and 'Downloads'. Below this, a tree view shows the navigation path: '6MD61' > 'Firmware and Device Drivers' > 'Communication Protocols - IEC 61850'. A table of download files is displayed with columns for 'Type & Size', 'Language', 'Title', and 'Status'. The table lists several files, including firmware updates and SNMP MIB files.

Type & Size	Language	Title	Status
1,2 MB	de & en	FW-/FPGA-Update V4.25 - 613for EN100-E+ / 710or EN100-O+ over the EN100 interface	3/16/2015
270 KB	de & en	FW-Update V4.25 of older EN100-O (with LC connectors) for PRP/HSR FPGA 515 over the EN100 interface	9/1/2014
<100 KB	de & en	SNMP MIB V1.00 (EN100 el. + opt. until V3.x)	4/23/2013
<100 KB	de & en	SNMP MIB V1.02 (EN100 el. + opt. from V4.x)	4/23/2013
<100 KB	de & en	SNMP MIB V1.02 - Readme	4/23/2013
<100 KB	de & en	SNMP MIB V1.05 (EN100 opt. from V4.2)	4/23/2013
140 KB	de & en	Update EN100 V4.27 for all devices - Readme	5/14/2016
580 KB	de & en	Update EN100 V4.27 for all devices over the EN100 interface	5/11/2016
6,4 MB	de & en	Update EN100 V4.27 for all devices over the front interface	5/11/2016

The EN100 modules in the Reyrolle devices can only be updated by the rear Ethernet ports (the EN100 itself), and not by the front USB or rear RS485 interfaces, so the file **“Update EN100 V4.27 for all devices over the EN100 interface”** is needed to update the main EN100 firmware (current version as of 08/2016).

The two different FPGA configuration files are the top two downloads in the list depicted above. You will notice one of them is for the EN100-E+ and EN100-O+, and the other is for the EN100-O. Download the correct one for the device if

required. It is advisable to keep the FPGA configuration file up to date as it often maintains compatibility between devices when using certain redundancy protocols.

2 – Prepare the files for uploading to the device

The main EN100 firmware file is downloaded as a .zip file containing an .exe file. Upon running the .exe, a directory will be created (default **C:\Siemens\IEC61850_81**) containing the .pck package file which will be uploaded to the relay. (e.g. **IEC61850_81_V04.27.00.pck**)

The FPGA configuration file is also downloaded as a .zip file, which contains the .pck file directly. Extract the .pck file to your desired location on the PC where you can later upload it to the relay. (e.g. **EN100_O_FPGA_515.pck**)

3 – Connect your PC to the Ethernet port of the device

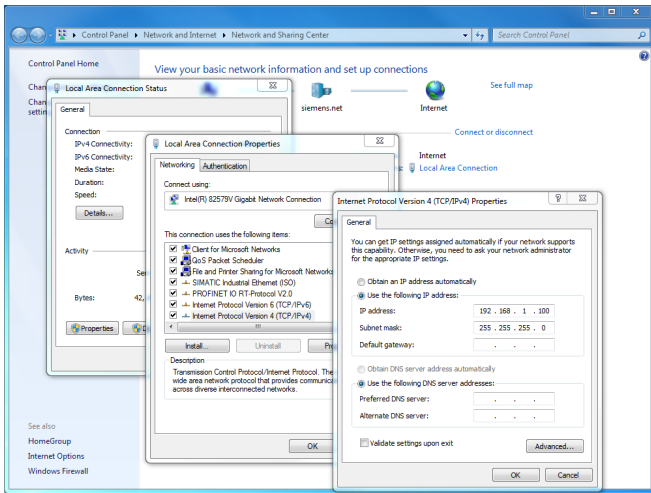
This can be done either by a direct connection with a single Ethernet cable, via an external switch with one or more devices connected, or by either locally or remotely connecting to an existing network from which the device can be accessed.

4 – Set the IP address of your PC to use the same IP subnet as the device

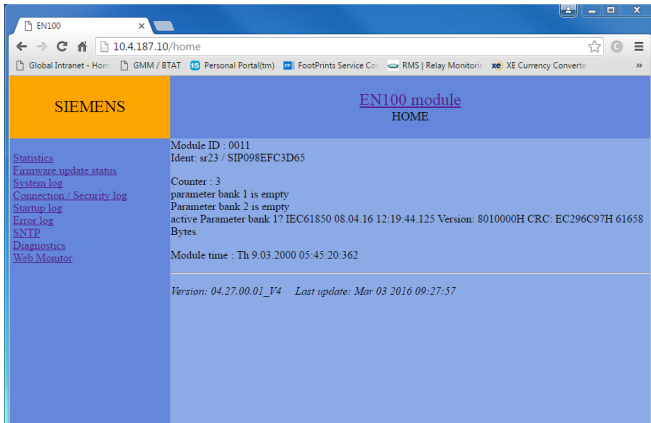
You will need to know the current IP address of the device you wish to update. If this is not known, you can easily find it from the device’s front panel – go to **Instruments Mode > Communication Meters**, and scroll down until you find the IP address.

In the IPv4 settings of your PC’s network adapter, set the PC’s IP address to one which is compatible with the relay. For example, if the relay is **192.168.1.5** with subnet mask **255.255.255.0**, set the PC to **192.168.1.X** where **X** is any number between 0 and 255, except 5 or any other number used by another device on the same subnet (e.g. other relays).

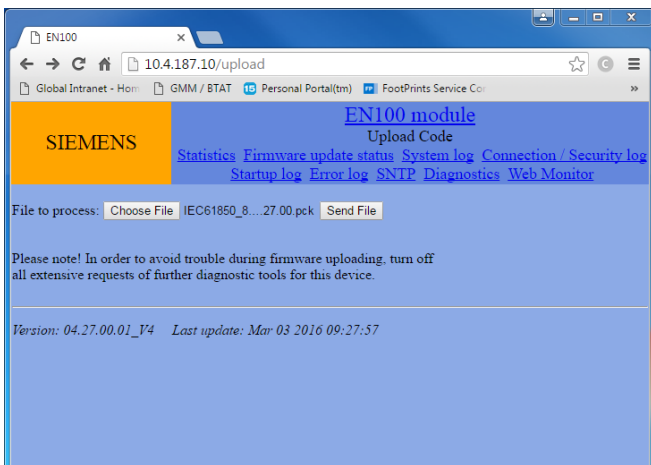
See example on following page.



4 – Open a browser connection to the required device
 You should now be able to connect to the EN100 home page of the device to be updated. To check this, open an internet browser and type the IP address of the device followed by /home, e.g. 192.168.1.5/home.

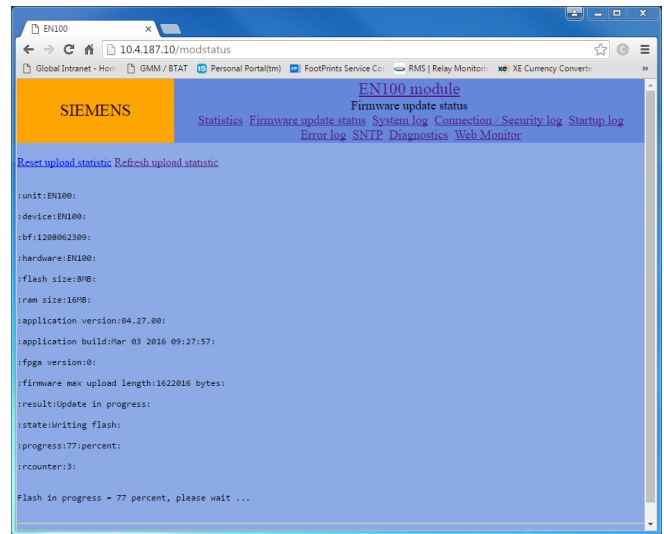


5 – Upload the .pck file to the device
 To upload the new firmware file or FPGA configuration file, visit the Upload page of the device, e.g. 192.168.1.5/upload. Click **Choose File**, navigate to the .pck file you wish to upload, and click **Send File**.



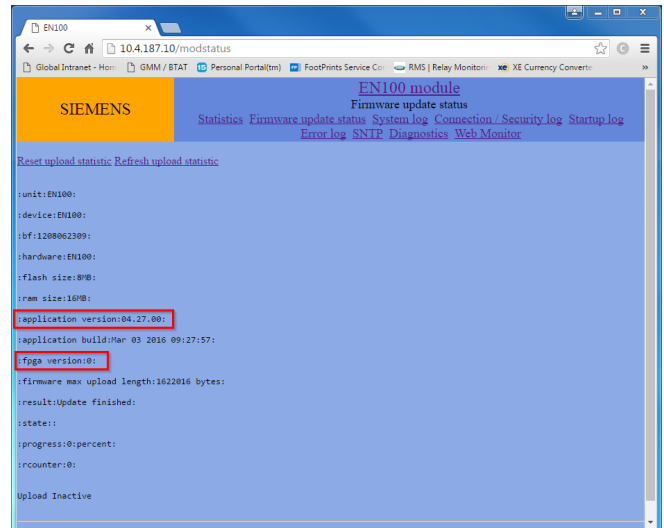
If the chosen file is valid and is accepted by the EN100, it will begin uploading to the module and a progress screen will be displayed. You can click **Refresh Upload Statistic** to

check on the upload progress percentage until the update completes.



6 – When the update completes, power down the relay for a few seconds, and power it back up.

The new firmware or configuration file cannot take effect until the device is restarted. Power down the relay and allow a few seconds for components to discharge, then power it back up. Once the relay has restarted, you can check if the update has successfully been applied by again visiting the **Home** page of the EN100 as before. The main firmware version is displayed at the bottom of most of the home pages, and the FPGA version can be checked in the **Firmware update status** tab.



If the version numbers match the version of the firmware or FPGA configuration you uploaded, the update has successfully completed.

Appendix

To update EN100 modules with existing firmware versions v4.07 or below

Previously to version 4.08 of the EN100 firmware, Siemens used .bin files rather than .pck files for the firmware. These old firmware versions don't know how to accept the upload of a .pck file, so the update has to be done in two stages.

Use the same method as described in this document to upload the .bin file for v4.08. Once the module is successfully updated to v4.08, it will be able to accept the .pck file for your required firmware version after that. Perform the same procedure again using the .pck file for the required firmware, and the module should be brought up to date.



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