



Connecting Devices™

Anybus CompactCom 40 POWERLINK

**Application note firmware upgrade
using B&R Automation Studio 4.x**

Version history

Version	History	Author	Date
1.00	Initial version	JoG	2019-07-10
1.01	Added section 3.1 describing the necessary network topology.	JoG	2020-03-02
1.02	Minor changes after review	JoG	2020-05-29

About this document

This document describes how to use the automatic firmware upgrade functionality in Automation Studio 4.x together with the Anybus CompactCom 40 POWERLINK.

Referenced documents

Short	Title	Number	Author	Ver
[XML_FW_HEADER]	XML Header for Firmware Files		Ethernet POWERLINK Standardization Group	0.0.3
[ABCC_EPL_NW_GUIDE]	Network Guide Anybus CompactCom 40 Ethernet POWERLINK	HMSI-27-219	HMS Industrial Networks	3.3
[ABCC_SW_DESIGN_GUIDE]	Anybus CompactCom 40 Software Design Guide	HMSI-216-125	HMS Industrial Networks	3.9

Table of Contents

1	Creating the firmware file	4
1.1	Firmware file data	4
1.1.1	Upgrade of Anybus CompactCom 40 POWERLINK only	4
1.1.2	Upgrade of host application only	4
1.1.3	Upgrade of both Anybus CompactCom 40 POWERLINK and host application	4
1.2	Firmware file header	4
1.2.1	Firmware file header attributes	4
1.3	Firmware file name	5
2	Updating the XDD file	6
3	Automation studio firmware upgrade	7
3.1	Network topology	7
4	Host application firmware upgrade implementation guideline	8
4.1	Pre-requirements	8
4.2	Implementation guideline	8

1 Creating the firmware file

1.1 Firmware file data

The firmware file is created differently depending on what parts of the product that shall support firmware upgrade using Automation Studio 4.x.

1.1.1 Upgrade of Anybus CompactCom 40 POWERLINK only

HMS supplies a POWERLINK firmware file with the correct format and file ending .fw (included in release package from HMS), so there is no action necessary for the customer to create the firmware file. Jump ahead to section 2.

1.1.2 Upgrade of host application only

In this case the firmware file data consists of the complete data used for host application firmware upgrade. The format of this data is customer specific.

1.1.3 Upgrade of both Anybus CompactCom 40 POWERLINK and host application

In this case the firmware file data shall consist of both the complete data from the .hiff firmware file supplied by HMS as well as the complete data used for host application firmware upgrade. How the different firmwares are packaged within the firmware file data is customer specific. It is however important that the host application knows the format and can separate the firmwares.

1.2 Firmware file header

For Automation Studio to recognize the file as a valid firmware file it needs to contain the firmware file header. **The header shall be placed first in the firmware file and be followed by a NULL-termination character (ASCII code 0x00).**

This header is specified in [XML_FW_HEADER] and shall look according to this:

```
<Firmware Ven="0x0000001B" Dev="40" Ver="17629696" Use="fw" Fct="_" Var="1" Len="1272368"
Mat="Anybus CompactCom " ApplSwDate="12723" ApplSwTime="60881000" KeepXmlHeader="0" />
```

1.2.1 Firmware file header attributes

The attributes in the firmware file header are described in Table 1 below.

Field	Description
Ven	This attribute shall contain the vendor ID reported by the product. The value can be found in sub-index 1 on object 0x1018. The vendor ID shall be in hexadecimal format.
Dev	This attribute shall contain the product code reported by the product. The value can be found in sub-index 2 on object 0x1018. The product code shall be in decimal format.
Ver	This attribute shall contain the version number of the firmware in the firmware file. Format of the version is customer specific. The value in the example above (17629696) is 0x010D0200 represented as hex which indicates version 1.13.02.
Use	Indicates usage of the file. Shall have fixed value "fw"
Fct	Indicates function of the file. Shall have fixed value "_"

Field	Description
Var	This attribute shall contain the revision number reported by the product. The value can be found in sub-index 3 on object 0x1018. The revision number shall be in decimal format.
Len	Length of the firmware file data in bytes, excluding the firmware file XML header and the following NULL-termination character. The length shall be in decimal format.
Mat	This attribute shall contain the order reference of the product in ASCII text. The maximum length is 18 characters.
ApplSwDate	This attribute shall contain the Application Software Date that the new firmware will report to the managing node in the IdentResponse frames as well as in object entry 0x1F52:01. ApplSwDate shall be in decimal format. The value for this attribute depends on what parts of the products that are being updated. Anybus CompactCom 40 POWERLINK only: ApplSwDate shall contain the default value indicated in the XDD file for object entry 0x1F52:01 supplied together with the .hiff firmware file. Host application only or both host application and Anybus CompactCom: ApplSwDate shall contain the value that the new host application firmware will set in attribute 21 (Application software date and time) on the POWERLINK host application object. See [ABCC_EPL_NW_GUIDE] for details on this attribute. Note: It is mandatory to support attribute 21 on the POWERLINK host application object when supporting host application firmware upgrade.
ApplSwTime	This attribute shall contain the Application Software Time that the new firmware will report to the managing node in the IdentResponse frames as well as in object entry 0x1F52:02. ApplSwTime shall be in decimal format. The value for this attribute depends on what parts of the products that are being updated. Anybus CompactCom 40 POWERLINK only: ApplSwTime shall contain the default value indicated in the XDD file for object entry 0x1F52:02 supplied together with the .hiff firmware file. Host application only or both host application and Anybus CompactCom: ApplSwTime shall contain the value that the new host application firmware will set in attribute 21 (Application software date and time) on the POWERLINK host application object. See [ABCC_EPL_NW_GUIDE] for details on this attribute. Note: It is mandatory to support attribute 21 on the POWERLINK host application object when supporting host application firmware upgrade.
KeepXmlHeader	If set to 0 the managing node will not include the firmware file XML header when downloading the firmware file to the product. If set to 1 the firmware file XML header will be included. When upgrading Anybus CompactCom 40 POWERLINK only this attribute must be set to 0. For the other two cases the value is customer specific.

Table 1 Firmware file header attributes

1.3 Firmware file name

The firmware file name shall be the same as the XDD file name. Additionally the revision number may be added. The firmware file ending shall be .fw.

The vendor ID shall be in hex format without a leading "0x". The device name shall not contain spaces.

For example: 0000001B_CompactCom40Epl.fw or 0000001B_CompactCom40Epl_1.fw

Important: The firmware file name cannot be longer than 28 characters. So if the XDD-file has a name that is longer, the device name part of the firmware file name needs to be truncated. Firmware files with a name longer than 28 characters are not downloaded by Automation Studio.

2 Updating the XDD file

Before importing the XDD file into Automation Studio a section indicating that firmware shall be upgraded in case of mismatch needs to be added.

Add the following information in the <ProfileBody><DeviceFunction><capabilities><characteristicsList>-element:

```
<characteristic>
  <characteristicName>
    <label lang="en">FirmwareFile</label>
  </characteristicName>
  <characteristicContent>
    <label lang="en">0000001B_CompactCom40Epl.fw</label>
  </characteristicContent>
</characteristic>
```

Replace 0000001B_CompactCom40Epl.fw with the name of the created firmware file.

3 Automation studio firmware upgrade

Make sure the created firmware file is in the same directory as the XDD file before starting the import in Automation Studio.

Once the firmware file has been created, the XDD file has been updated and the firmware file and XDD file are in the same directory, the XDD file can be imported as a third party device in Automation Studio.

Once the device has been added to a configuration and the configuration downloaded to a PLC, the PLC will check the ApplSwDate and ApplSwTime fields in the IdentResponse returned by the device. If any of the values differ compared to the corresponding values in the firmware file header, Automation Studio will download the firmware file and reset the device before taking it to operational. This is why it is important that the host application updates attribute 21 on the POWERLINK host application object (Application software date and time) after successful host application firmware upgrade. Otherwise the PLC will not notice that the firmware was updated and will simply try the updated process again. If only updating the Anybus CompactCom 40 POWERLINK firmware, the ApplSwDate and ApplSwTime fields are updated automatically by the CompactCom.

3.1 Network topology

If several devices are to be upgraded at the same time it is necessary that the network is built as a star. If daisy chain is used it is not guaranteed that SwReset command from the master is received by all of the devices. If the first slave in the daisy chain receives the SwReset command first and resets fast, the downstream devices will not receive the command and Automation Studio will retry firmware upgrade for the devices that didn't reset.

4 Host application firmware upgrade implementation guideline

4.1 Pre-requirements

To be able to support firmware upgrade of the host application over POWERLINK the host application needs to support the following functionality:

- Attribute 5 (Candidate firmware available) on the Application (0xFF) host application object. See [ABCC_SW_DESIGN_GUIDE] for more details.
- Reading a file from the firmware candidate area of the Anybus CompactCom 40 POWERLINK using the Anybus file system interface object. See [ABCC_SW_DESIGN_GUIDE] for more details.
 - If both host application and Anybus CompactCom 40 POWERLINK firmware upgrade shall be supported, writing a file to the firmware candidate area of the module also needs to be supported.
- Attribute 21 (Application software date and time) on the POWERLINK (0xE9) host application object. See [ABCC_EPL_NW_GUIDE] for more details.
- Anybus CompactCom 40 POWERLINK with firmware version 1.14 or higher. Firmware download related SDO requests could time out in earlier versions, causing firmware upgrade over POWERLINK not to work.

4.2 Implementation guideline

1. Once the PLC has written the firmware file to object 0x1F50, the “Candidate firmware available” attribute on the Application object will be set to TRUE.
2. This event means that the host application shall start reading the firmware file from the candidate area of the Anybus. The candidate area is the “firmware” folder of the Anybus filesystem, and the name of the file to transfer is “firmware.hif”.
3. Shortly after the “Candidate firmware available” attribute has been set to TRUE, the PLC will send a SwReset NMT command to the device. This will generate a Reset command of “PowerOn” type towards the Application object. The host application can acknowledge this command, but must not reset the Anybus until it has read the entire firmware file. If the file isn’t a valid .hiff file supplied by HMS (which is not the case when doing host application firmware upgrade) the file will be deleted by the Anybus during startup and will no longer be available for reading.
4. Once the file has been read the host application should take the necessary steps for upgrading. This behavior is customer specific and depends on how host application firmware upgrade works.

If the Anybus should be updated as well, the part of the firmware file that is for the Anybus shall be written to the firmware candidate area before the Anybus is reset.

The host application can now reset the Anybus and itself and necessary.

If the Anybus is updated as well, it will start flashing after reset has been released, a process which takes around 90 seconds. The Anybus is not responsive during this time.

5. Once firmware upgrade has taken place, and before the Setup Complete command is sent to the Anybus the value of attribute 21 on the POWERLINK host object must be updated to the same values as the ApplSwDate and ApplSwTime in the firmware file XML header to indicate to the PLC that firmware upgrade was successful.