



Anybus[®] CompactCom[™] B40 Modbus Serial

CC-Link IE Field

USER MANUAL

SCM-1202-179 1.0 en-US ENGLISH

Important User Information

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1 Preface

1.1 About this Document

This document is intended to provide a good understanding of the functionality offered by the Anybus CompactCom B40 Modbus Serial - CC-Link IE Field.

The reader of this document is expected to be familiar with high level software design and communication systems in general. The information in this network guide, along with the Anybus CompactCom B40 Modbus Serial user manual should normally be sufficient to implement a design. However, if advanced CC-Link IE Field specific functionality is required for the network interface of the device, in-depth knowledge of CC-Link IE Field networking internals and/or information from the official CC-Link IE Field specifications may be required. In such cases, the persons responsible for the implementation of this product should either obtain the CC-Link IE Field specification to gain sufficient knowledge or limit their implementation in such a way that this is not necessary.

For additional information, please visit the support website at www.anybus.com/support.

1.2 Document History

Version	Date	Description
1.0	2021-04-15	First release

1.3 Document Conventions

Numbered lists indicate tasks that should be carried out in sequence:

1. First do this
2. Then do this

Bulleted lists are used for:

- Tasks that can be carried out in any order
- Itemized information
- An action
 - and a result

User interaction elements (buttons etc.) are indicated with bold text.

Program code and script examples

Cross-reference within this document: [Document Conventions, p. 3](#)

External link (URL): www.hms-networks.com



WARNING

Instruction that must be followed to avoid a risk of death or serious injury.



Caution

Instruction that must be followed to avoid a risk of personal injury.



Instruction that must be followed to avoid a risk of reduced functionality and/or damage to the equipment, or to avoid a network security risk.



Additional information which may facilitate installation and/or operation.

1.4 Document Specific Conventions

- The terms “Anybus” or “module” refers to the Anybus CompactCom module.
- The terms “host” or “host application” refer to the device that hosts the Anybus.
- Hexadecimal values are written in the format NNNNh or 0xNNNN, where NNNN is the hexadecimal value.
- A byte always consists of 8 bits.
- All dimensions in this document have a tolerance of ± 0.10 mm unless otherwise stated.
- Outputs are TTL compliant unless otherwise stated.
- Signals which are “pulled to GND” are connected to GND via a resistor.
- Signals which are “pulled to 3V3” are connected to 3V3 via a resistor.
- Signals which are “tied to GND” are directly connected to GND,
- Signals which are “tied to 3V3” are directly connected to 3V3.

1.4.1 Pin Types

The pin types of the connectors are defined in the table below. The pin type may be different depending on which mode is used.

Pin type	Definition
I	Input
O	Output
I/O	Input/Output (bidirectional)
OD	Open Drain
Power	Pin connected directly to module power supply, GND or 3V3

1.5 Trademark Information

Anybus® is a registered trademark of HMS Networks.

All other trademarks are the property of their respective holders.

2 About the Anybus CompactCom B40 Modbus Serial - CC-Link IE Field

2.1 General Information

The Anybus CompactCom B40 Modbus Serial - CC-Link IE Field is a communication solution for simple industrial field devices. The host application communicates with the product using the Modbus RTU protocol. The Anybus CompactCom B40 Modbus Serial - CC-Link IE Field then communicates the data to the network. Typical applications are basic level I/O blocks, temperature controllers, measuring devices, and sensors.

The Anybus CompactCom B40 Modbus Serial - CC-Link IE Field software interface is designed to be network protocol independent, making it possible to support several networking systems using the same application software code/driver.

The Anybus CompactCom B40 Modbus Serial - CC-Link IE Field share footprint and electrical interface with the other members of the product family, independent of fieldbus or network. The host application connector provides an interface between the host application (Modbus RTU) and the Anybus CompactCom, while the network connector provides access to the chosen network. The Anybus CompactCom acts as a Modbus RTU slave on the host application side.



The Anybus CompactCom 40 family offers a wide range of functionality. For advanced products and applications, we recommend the standard Anybus CompactCom 40.

For general information about other products using the Anybus CompactCom 40 platform, consult www.anybus.com/support.



This is a class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

This product contains ESD (Electrostatic Discharge) sensitive parts that may be damaged if ESD control procedures are not followed. Static control precautions are required when handling the product. Failure to observe this may cause damage to the product.

2.2 Features

- CC-Link IE Field Network intelligent device station
- Sample configuration file (CSP+) provided by HMS Networks (requires adaptations).
- Possibility to customize Vendor Code, Model Code, Vendor Name, Model Type/Device Type, Model Name and Version via application interface
- Fixed 1 Gbit/s Baud Rate
- Station Number configuration via application interface
- Galvanic isolation between the host application and the industrial network available if used with the CompactCom B40 connector board
- I/O: up to 1536 bytes in each direction. 2048 bytes in total



All Anybus CompactCom 40 Modbus Serial, where the host is running an example application, will be precertified for network conformance. This is done to ensure that the final product can be certified, but it does not necessarily mean that the final product does not require recertification. Contact HMS Networks for further information.

2.3 Overview

The picture below shows the data flow in the Anybus CompactCom B40 Modbus Serial - CC-Link IE Field. The application sets up the Modbus RTU communication, and the Anybus CompactCom maps the process data to the industrial network/fieldbus.

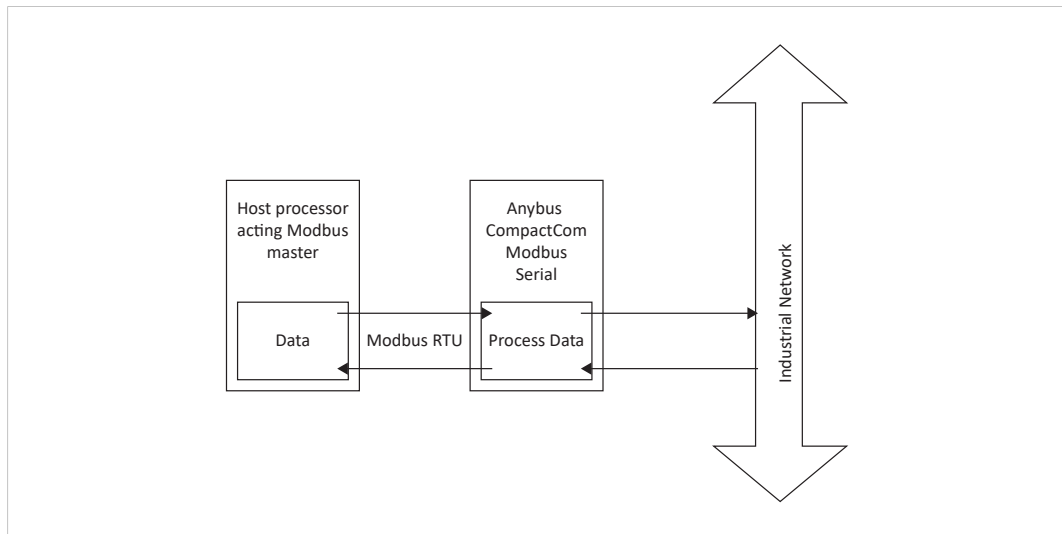


Fig. 1

2.4 Fieldbus Conformance Notes

- The Anybus CompactCom B40 Modbus Serial - CC-Link IE Field has been tested standalone and found to comply with the CC-Link Conformance Test specification, publication BAP-05028-H. The end product will however need to be re-certified in order to comply with CC-Link certification policies.

3 Basic Operation

3.1 Software Requirements

No additional network support code needs to be written in order to support the Anybus CompactCom B40 Modbus Serial - CC-Link IE Field, however due to the nature of the CC-Link IE Field networking system certain restrictions must be taken into account:

- Parameter names, types and similar attributes cannot be accessed from the network.
- No support for network reset requests.

3.2 CC-Link Family System Profile (CSP+) File

Each device on CC-Link IE Field is associated with a CC-Link Family System Profile (CSP+) file, which holds a description of the device and its functions.

HMS Networks supplies a generic CSP+ file which can serve as a basis for new implementations. A tool for modifying the file is available at the CLPA web page (www.cc-link.org, membership is required).

3.3 Communications Settings

Station Number:

On CC-Link IE Field, each device on the network must be assigned a unique Station Number.

Network Number:

The Network Number is set to 1, and cannot be changed.

3.4 Startup and Identity Customization

To customize the identity of the Anybus CompactCom (e.g. Vendor Code, Model Code, etc.), Virtual Attributes are used.

The most common customizations will be described here. For more detailed information, see the related documents listed in the beginning of this document.

Setting up the virtual attributes in the Anybus CompactCom can be accomplished in two different ways.

- Using the user-defined Modbus function code (Function code 70).
The use of Function code 70 can be included in the Modbus master. Hence the CompactCom does not need to be preprogrammed before mounting it in the host application.
- Using the Anybus Virtual Attributes Manager.
The Virtual Attributes Manager is recommended for use during development and for low volume production, since manual user operations are needed for every Anybus CompactCom that shall be programmed.

Once the virtual attributes are written to the Anybus CompactCom, they are saved in non-volatile memory. It is not necessary to write the virtual attributes at each startup.

3.4.1 Virtual Attributes with Specific Modbus Function Code 70

With Modbus function code 70, the Modbus master has access to the Anybus CompactCom internal messaging protocol. This means that all attributes within the Anybus CompactCom are potentially accessible.

When writing the virtual attributes to the Anybus CompactCom, the Anybus object, Object 01h, Instance 1, Attribute 17 is used. All information relevant for the basic virtual attributes will be covered here. For more information, refer to the related documents section in this document.

The example shows example values to the basic virtual attributes:

Virtual Attribute	Example Value
Vendor Code:	0x0212
Model Code:	0x00000002
Enable SLMP:	0x00 (disabled)
Serial Number:	0x12345678
Vendor Name:	Vendor Name
Model Name:	Model Name
SW Version:	1.2.3

To set the virtual attributes in the Anybus CompactCom to these values, using the Modbus function 70, create the request below:

Modbus function 70 Request

	Value	Note
Modbus Address	0xXX	
Function Code	0x46	FC70
Command	0x42	Set_Attribute
Object	0x01	Anybus Object
Instance	0x01	
	0x00	
Ext0	0x11	Attribute 17
Ext1	0x00	Not used
Data Size	0x4F	The data size in this example is 79 bytes
	0x00	
Data	0xE6 0x01 0x00 0x01 0x02 0x00 0x12 0x02 0xE6 0x01 0x00 0x05 0x04 0x00 0x02 0x00 0x00 0x00 0xE6 0x01 0x00 0x07 0x01 0x00 0x00 0xFF 0x01 0x00 0x03 0x04 0x00 0x78 0x56 0x34 0x12 0xFF 0x01 0x00 0x08 0x0B 0x00 0x56 0x65 0x6E 0x64 0x6F 0x72 0x20 0x4E 0x61 0x6D 0x65 0xFF 0x01 0x00 0x09 0x0C 0x00 0x50 0x72 0x6F 0x64 0x75 0x63 0x74 0x20 0x4E 0x61 0x6D 0x65 0xFF 0x01 0x00 0x0A 0x03 0x00 0x01 0x02 0x03	Vendor Code Model Code SLMP Disabled Serial Number Vendor Name Model Name FW Version
CRC	0xXX	CRC-16
	0xXX	

Response

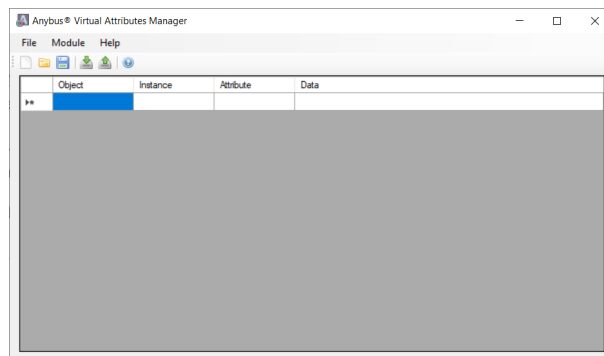
	Value	Note
Modbus Address	0xXX	
Function Code	0x46	FC70
Command	0x02	Set_Attr_Resp
Object	0x01	Anybus Object
Instance	0x01	
	0x00	
Ext0	0x11	Attribute 17
Ext1	0x00	Not used
Data Size	0x00	
	0x00	
CRC	0xXX	CRC-16
	0xXX	



Requests with a size larger than 244 bytes will return Modbus exception code ILLEGAL DATA VALUE.

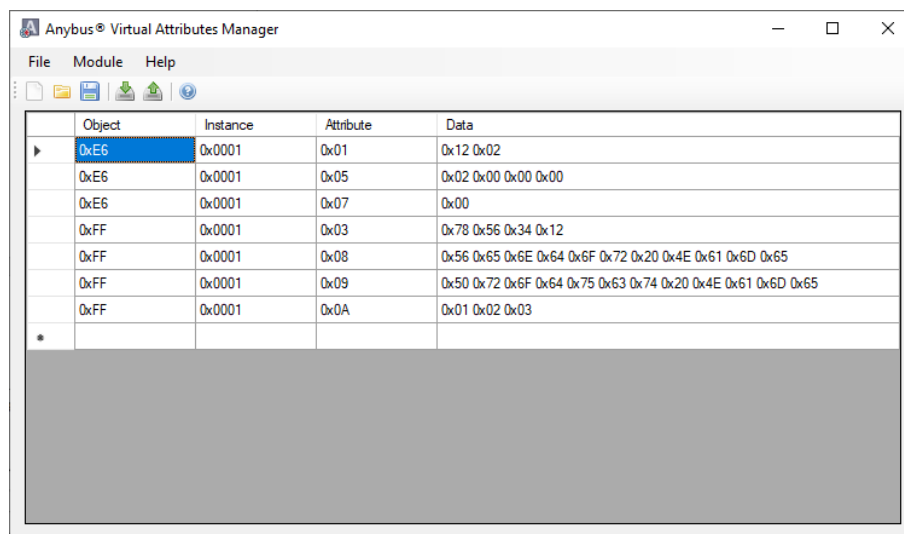
3.4.2 Virtual Attributes with Anybus Virtual Attributes Manager

1. Start the Anybus Virtual Attributes Manager



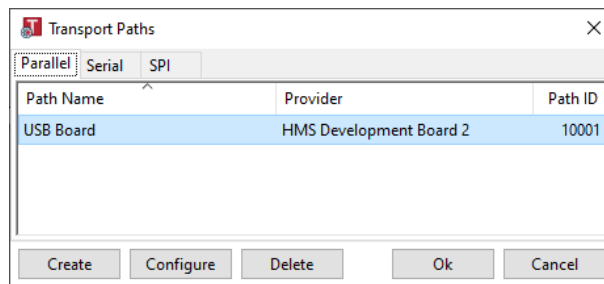
2. Enter the virtual attributes data for the attributes needed. The example below is setting up the attributes with the following values:

Virtual Attribute	Example Value
Vendor Code:	0x0212
Model Code:	0x00000002
Enable SLMP:	0x00 (disabled)
Serial Number:	0x12345678
Vendor Name:	Vendor Name
Model Name:	Model Name
SW Version:	1.2.3



3. Mount the Anybus CompactCom to the USB starterkit board.

4. Select Module->Download and select the correct Transport Path to your USB board.



5. The virtual attributes will be programmed and saved in non-volatile memory.

3.5 Data Exchange

The mapping and allocation towards the CC-Link IE Field network is done with a granularity of 16 bit points and 4 word points.

3.5.1 Bit Area vs. Word Area

On CC-Link IE Field, data is divided into two categories as follows:

Bit Area:

Not accessible.

Word Area:

Data is accessed as 16-bit words. Data is commonly referred to as RWr #nn (Slave->Master) and RWw #nn (Master->Slave) where “nn” represents an addressable point (i.e. a word) in the Word Area.

Direction	Word Area Points (dec)
Slave -> Master	1024 points, RWr0... RWr1023
Master -> Slave	1024 points, RWw0 ... RWw1023

Due to restrictions in the module, the maximum total amount of IO data in each direction is 1536 bytes

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A Implementation Details

A.1 Anybus State Machine

The table below describes how the Anybus State Machine relates to the CC-Link IE Field network.

Anybus State	Implementation
WAIT_PROCESS	Waiting for the network cyclic/status ok.
ERROR	Possible causes: <ul style="list-style-type: none">• Buffer memory configuration set by the application does not match the configuration set by the master.• Error in the network controlling application (the PLC program) or not receiving Mystatus at all from the master.
PROCESS_ACTIVE	Everything is running normally on the network and in the controlling application.
IDLE	E.g. when a PLC CPU/application is not in RUN state.
EXCEPTION	Possible causes: <ul style="list-style-type: none">• Configuration error• Other error that cannot be indicated to the application in any other way. Example: <ul style="list-style-type: none">• Invalid node number set.• Invalid station number set.

B LED Indications

B.1 RUN LED

LED State	Indication/Description
Off	No network participation, time out status (no power)
Green	Participating, normal operation
Red	Major fault (FATAL error)

B.2 ERROR LED

LED State	Indication/Description
Off	No error detected (no power)
Red	An error occurred in the module

B.3 LINK LEDS

These LEDs indicate the CC-Link IE Field link status.

LED State	Indication	Description
Off	No link	Link is not up (or no power)
Green	Link is up	Link is up on port (Giga bit communication)

C Certification Information

C.1 Basics

The following steps are necessary to perform in the software design of the application to enable a certification:

1. Change Vendor Code

Replace the HMS Vendor ID with a unique vendor code. This is done by implementing the CC-Link IE Field Host Object (E6h), instance #1, attribute #1, and returning the vendor code when receiving a Get_Attribute request.

Membership in the CLPA organization is necessary to obtain a vendor code. The vendor code consists of digits 5 — 8 in the CLPA ID number, issued when you join.

2. Increment software Version

Increment the software version in the CC-Link IE Field host object (E6h), instance #1, attribute #6, if you want to keep track of the versions. This number should be incremented at each change in network functionality, leading to a recertification. Implement the CC-Link IE Field host object (E6h) instance #1, attributes #6, and return the software version when receiving a Get_Attribute request.

3. Generate a customized CSP+ file

A customized CSP+ file must be generated if the product is going to be certified. See [CSP+ File Customization, p. 16](#)

These steps constitute the identification changes required to obtain a certification. For the complete conformance test requirements, please consult the Conformance Test Specifications (publication BAP-C0401-037-D) from CLPA. The Anybus CompactCom B40 Modbus Serial - CC-Link IE Field has passed the CC-Link IE Field Conformance Test, so the test item list in table 2 in the Overview section of the Conformance Test Specifications shall be used.

C.1.1 Exceptions to Test Item List

The application should be tested according to the Test Item List, with the following exceptions:

- The host application does not have to implement “Cyclic start/stop to host station” (item 2.3 (2) in test item list). If not implemented, this shall be reported as “not supported” in the test report.
- The host application does not have to implement “Synchronization slave station” (item 2.6 (1) in test item list). If not implemented, this shall be reported as “not supported” in the test report.
- It is not always necessary to perform the complete 1000BASE-T compliance test (item 1.6 in test item list). For more information, see [1000BASE-T Compliance, p. 16](#)

C.2 Model Type

When the module is delivered, the Model Type (CC-Link IE Field host object (E6h), instance #1, attribute #3, is set to 007Fh (Generic device). If the host application is similar to an existing CC-Link IE Field profile, this code should be changed to reflect that profile.

C.3 Other

C.3.1 1000BASE-T Compliance

The Anybus CompactCom B40 Modbus Serial - CC-Link IE Field, module version, is tested for 1000BASE-T compliance. When the end product is sent for compliance test, the HMS Networks certificate can be used, with the exception of the mandatory test “Common mode output voltage”.

When using the brick version, the HMS Networks certificate can not be used, and a full 1000BASE-T compliance test is mandatory.

C.3.2 Noise

The shield of the RJ45 connector is not connected to FE. If there are problems to pass the CC-Link IE Field noise test, the Ethernet cable shield may have to be connected to the chassis ground at each port.

C.4 CSP+ File Customization

An generic CSP+ file is provided by HMS Networks. This file is based on the example application that follows with the Anybus CompactCom 40 Starter Kit, but can be used as a basis for customizing to any other host application. A tool, “Profile Creation Tool”, for modifying the file is available at the CLPA web page (www.cc-link.org, membership is required). Also available at the CLPA web page is a document containing guidelines for creating CSP+ files, *CC-Link Family System Profile (CSP+) Creation Guidelines*.

Open the example file with the Profile Creation Tool, and change the entries given below. The entries will show as described in the GX Works 2 PLC and network configuration tool.

C.4.1 Fileinfo

In the “Fileinfo” section of the CSP+ file, change the following entries:

- ModDate
- ModTime

C.4.2 DeviceInfo

In the “DeviceInfo” section of the CSP+ file, change the following entries:

Entry	Description	Note
VendorName	Vendor name	All devices will be listed under this vendor name in the Module List window in GX Works 2.
DeviceModel	Device model name.	Defines the device model name in the Module list under the CC IE Field Configuration Module window in GX Works 2.
VendorCode	The code assigned by CLPA (taken from the member number).	These settings shall comply with any setting don in the CC-Link Field Network Host Object (E6h) in the application. The settings are not validated against the setting in the CSP+ file, but never the less shall comply. They are validated in a conformance test.
Product ID	The device product code (vendor specific),	
Version	Version of the network interface. Changed when network functionality change	
DeviceTypeID	Defines the profile used for the device in the GX Works Module list under your vendor name. PLC corresponds to 0x0001, Generic Device corresponds to 0x007F).	

C.4.3 CommIfInfo

The “CommIfInfo” section of the CSP+ file, identifies the communication interface information list. Change the following entries:

Entry	Description	Note
VendorName	Vendor name	All devices will be listed under this vendor name CC- IE Field module (VendorName) in the Module List window in the configuration tool.
VendorCode	Vendor code	The code assigned by CLPA (taken from the member number).
Version	Network interface version	Changed when network functionality change.
DeviceModel	Device model name	See corresponding entry in the DeviceInfo section
ModelCode	Model code	Set to same value as DeviceTypeID in section DeviceInfo.
RYSIZE	RY size used by module	Set to the RY size used by the module. Turns up in the RXRY Setting window (under Points) in the configuration tool.
RWwSize	RWw size used by module	Set to the RWw size used by the module. Turns up in the RWw/RWR Setting window (under Points in the configuration tool).
RXSize	RX size used by module	Set to the RX size used by the module. Turns up in the RXRY Setting window (under Points in the configuration tool).
RWRSize	RWR size used by module	Set to the RWR size used by the module. Turns up in the RWw/RWR Setting window (under Points in the configuration tool).

