

X-gateway Interface Addendum CC-Link Slave Interface

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Important User Information

This document is intended to provide a good understanding of the functionality offered by the Interface described here.

The reader is expected to be familiar with high level software design, and communication systems in general. The use of advanced interface-specific functionality may require in-depth knowledge of networking internals and/or information from the network specifications. In such cases, the persons responsible for the implementation of this product should either obtain the necessary specifications to gain sufficient knowledge, or alternatively limit the implementation in such a way that this is not necessary.

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WARNING: 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.

ESD Note: 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.

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P. About This Document

This document describes network specific features and procedures needed when operating the CC-Link Slave Interface for the Anybus X-gateway. For general information and operating instructions for the Anybus X-gateway, consult the Anybus X-gateway User Manual.

The reader of this document is expected to be familiar with CC-Link networking technology, and communication systems in general.

For further information, documentation etc., please see www.anybus.com

P.1. Related Documents

Document	Author
Anybus X-gateway User Manual	HMS
Anybus-S CC-Link Fieldbus Appendix	HMS
CC-Link Cable Wiring Manual, publication CC0208-06	Mitsubishi
Cc-Link Specification (Profile), publication BTP-05028-B	Mitsubishi

P.2. Document History

Revision List

Revision	Date	Author(s)	Chapter(s)	Description
2.00	May 2014	SDa	Multiple	New hardware & Anybus Configuration Manager
1.10	Nov 2007	PeP	-	Major update
1.00	Oct 2005	PeP	-	First official release

P.3. Conventions & Terminology

The following conventions are used throughout this document:

- Numbered lists provide sequential steps
- Bulleted lists provide information, not procedural steps
- The term 'X-gateway' refers to the Anybus X-gateway
- The term 'Slave Interface' refers to the CC-Link Slave interface for the Anybus X-gateway.
- The term 'user manual' refers to the Anybus X-gateway User Manual.
- Hexadecimal values are written in the format NNNNh, where NNNN is the hexadecimal value.
- 16/32 bit values are generally stored in Motorola (big endian) format unless otherwise stated.

P.4. Support

For general contact information and support, please refer to the contact and support pages at www.hms-networks.com.

1. About the CC-Link Slave Interface

1.1. General Information

The CC-Link Slave Interface for the X-gateway implements a galvanically isolated CC-Link interface. The interface acts as a slave device, which means it can be accessed by a CC-Link master, but it will not initiate communication by itself.

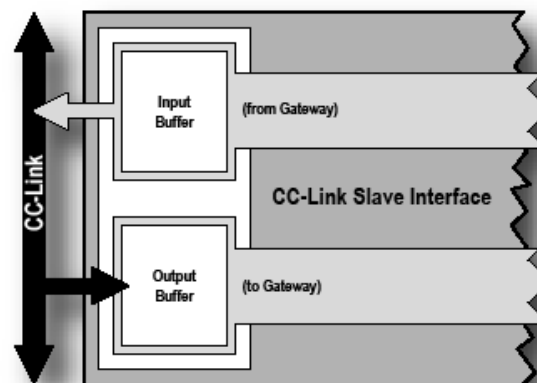
Data is exchanged through two buffers as follows:

- **Input Buffer**

This buffer holds data forwarded *from* the other network, i.e. data which can be read by the CC-Link master.

- **Output Buffer**

This buffer is forwarded *to* the other network, i.e. data which can be written by the CC-Link master.



1.2. Features

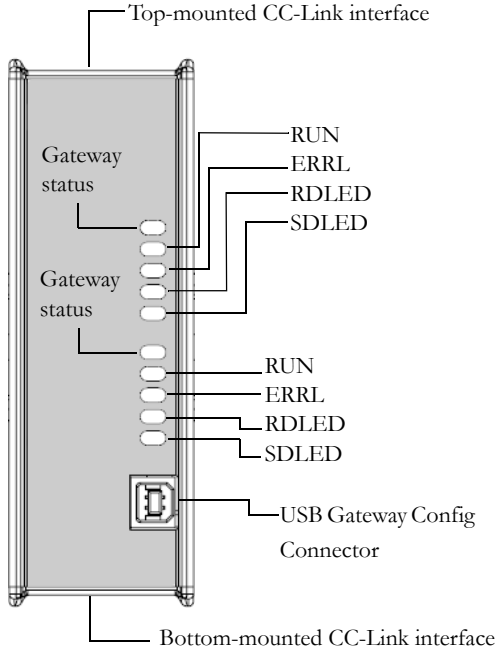
- Galvanically isolated network electronics
- On-board configuration switches
- Supports CC-Link v1 and v2
- Up to 8 extension cycles
- Up to 128 I/O points (bits) and 16 I/O words (16-bit) in each direction (CC-Link v1)
- Up to 896 I/O points (bits) and 128 I/O words (16-bit) in each direction (CC-Link v2)
- Supports all common baudrates between 156kbps and 10Mbps
- Transparent CC-Link communication (Standard Mode)
- PLC Profile compliant communication (PLC profile mode)

1.3. External View

1.3.1. CC-Link Interface Status LEDs

LED	Colour	Indication
Gateway Status		Consult the user manual for further details
RUN	Green	Normal operation
	Off	Network non-participating, timeout status
ERRL	Red	CRC error, illegal station number or illegal baudrate
	Off	Normal operation
RDLED	Green	Receiving data
	Off	Not receiving data
SDLED	Green	Transmitting data
	Off	Not transmitting data

Front View



1.3.2. Connectors & Switches

CC-Link Connector

See “CC-Link Connector” on page 17.

Station number (x10)

See “Station Address” on page 8.

Station number (x1)

See “Station Address” on page 8.

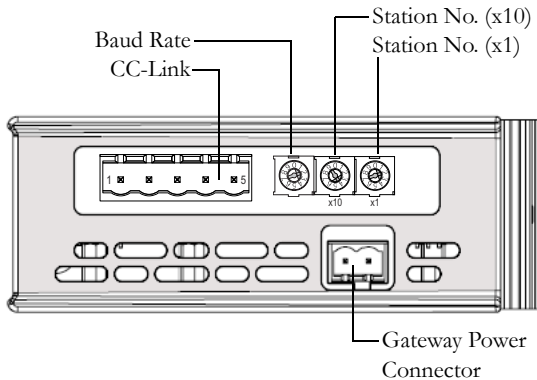
Baudrate switch

See “Baud Rate” on page 8.

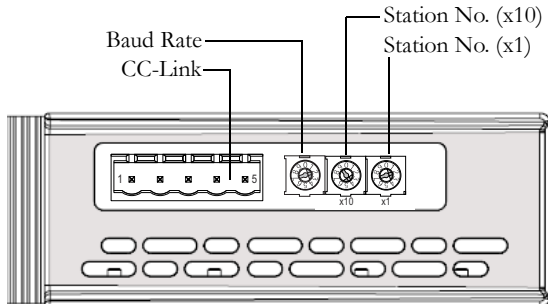
Gateway Power Connector

See the X-Gateway user manual for further details

Top-mounted interface



Bottom-mounted interface



USB Gateway Config Connector

See the X-Gateway user manual for further details

2. Installation and Configuration

2.1. Station Address

The station number is specified using two switches, one for each digit.

Switch x10	Switch x1	Station Address
0	0	(not valid)
0	1	1
0	2	2
...
3	4	34
3	5	35
3	6	36
...
6	4	64

The switches provide a theoretical address range of 1... 64. However, depending on the number of occupied stations, the highest allowed station address may be less.

Occupied Stations	Valid Station Address Range
1	1... 64
2	1... 63
3	1... 62
4	1... 61

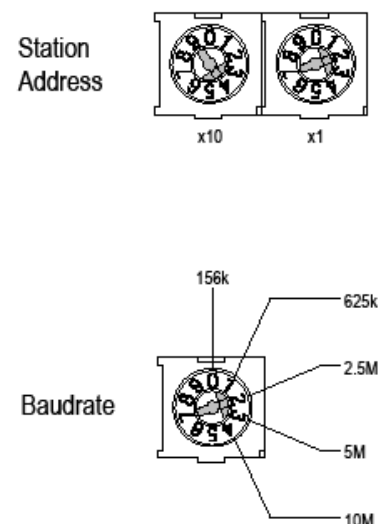
Example:

In this example, the station address will be 42.
 $(4 \times 10) + (2 \times 1)$

2.2. Baud Rate

The baudrate is specified using as shown in the figure.

Switch Value	Baud rate
0	156kbps
1	625kbps
2	2.5Mbps
3	5Mbps
4	10Mbps



2.3. Gateway Config Interface

The CC-Link-specific settings in the X-gateway are configured with the help of **Anybus Configuration Manager** (ACM), which is available from www.anybus.com.

The CC-Link Slave Interface features the following settings:

Network Type	
Name	CC-Link Slave
General	
Offline option	Clear
Control word/Status word	Disable
Fieldbus Specific	
System area mode	Standard
Diagnostic location	Bit area
Version 2	Disabled
Number of occupied stations	4

See the Anybus X-gateway user manual for further information on using this tool, and see the online help in ACM for help on specific settings.

3. Data Exchange

3.1. General Information

Since the X-gateway implementation of the CC-Link interface has no equivalent to ‘Parameter Data’, all data exchanged by the interface is considered to be (cyclic) I/O Data.

The CC-Link Slave Interface for the X-gateway communicates according to the CC-Link Specification (publication BTP-05028-B), which means that the last 16-bits in the Bit Areas are reserved for various CC-Link communication flags and *cannot* be used for data exchange. This behaviour, which is slightly different from that of most other networking systems, must be taken into account when setting up the network communication.

The gateway offers two different modes of operation regarding these flags, a.k.a. ‘System Area Modes’.

See also...

- “Standard Mode (Default)” below.
- “PLC Profile Mode” on page 13.
- “Gateway Config Interface” on page 9.

3.2. System Area Modes

3.2.1. Standard Mode (Default)

In this mode, the Bit Area is exchanged transparently. If a specific communication profile is to be used, that profile must be implemented entirely in the application PLC (i.e. the PLC on the other network).

From the application point of view, it will appear as if the CC-Link network goes online instantly after start-up. In effect, this may or may not be the case, depending on the type of CC-Link master that is used and how it has been set up to operate. The reason for this is that on CC-Link, the validity of the data is determined on a higher layer. This means that even though the CC-Link master is exchanging data with the CC-Link interface, the data in question may or may not be considered valid, depending on the handshaking flags in the CC-Link system area.

Exactly how all this shall be implemented is beyond the scope of this document. The application PLC (i.e. the PLC on the other network) is solely responsible for handling the CC-Link system area flags in accordance with one of the profiles defined in the CC-Link specification. Note however that most masters do not require the use of the System Area-bits to operate, i.e. the CC-Link interface may be able to exchange data even if these flags are left untouched.

See also...

- “PLC Profile Mode” on page 13.
- “Gateway Config Interface” on page 9 (“See the Anybus X-gateway user manual for further information on using this tool, and see the online help in ACM for help on specific settings.”).

3.2.2. PLC Profile Mode

In this mode, the gateway handles the CC-Link System Area handshaking flags automatically according to the CC-Link PLC profile.

Note that this also means that certain flags must be managed from the application PLC (i.e. the PLC on the other network) in order for the gateway to start exchanging data.

- **System Area Byte 0 (Output)**

7	6	5	4	3	2	1	0	Description
								Initial Data Processing Complete Flag
								Initial Data Setting Request Flag
								Error Reset Request Flag
								(reserved; mask off and ignore)

- **System Area Byte 1 (Output)**

(reserved, ignore)

- **System Area Byte 0 (Input)**

7	6	5	4	3	2	1	0	Description
								Initial Data Processing Request Flag
								Initial Data Setting Complete Flag
								Error Status Flag
								Remote READY
								(reserved; set to zero)

- **System Area Byte 1 (Output)**

(reserved, set to zero)

Note: For more information about the meaning of these flags, consult the CC-Link Specification.

See also...

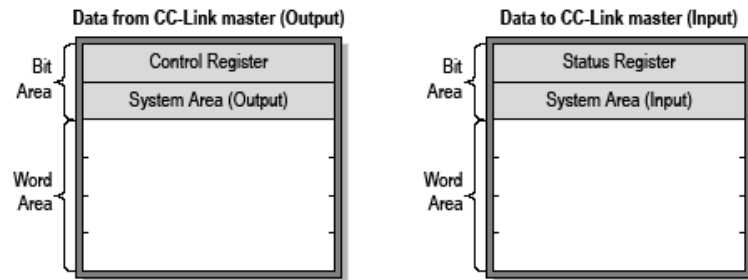
- “Standard Mode (Default)” on page 12.
- “Network Start-Up Procedure” on page 15.
- “Gateway Config Interface” on page 9 (“See the Anybus X-gateway user manual for further information on using this tool, and see the online help in ACM for help on specific settings.”).

3.3. Configuration Examples

Example 1

- Diagnostic Location= Bit Area
- Control/Status Words= Enabled
- Live List= Disabled

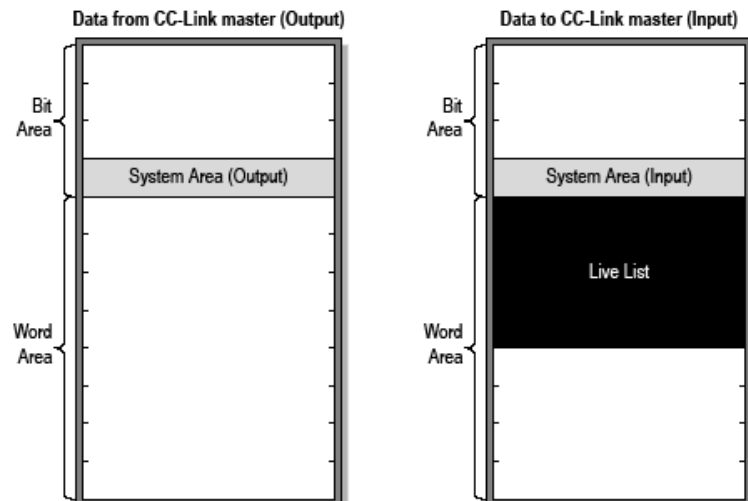
Note: As illustrated below, the Bit Area is occupied with status information and cannot be used for data exchange.



Example 2

- Diagnostic Location= Word Area
- Control/Status Words= Disabled
- Live List= Enabled

Note: As illustrated below, the Live List is placed in the Word Area, freeing up the Bit Area for data exchange.



4. Network Start-Up Procedure

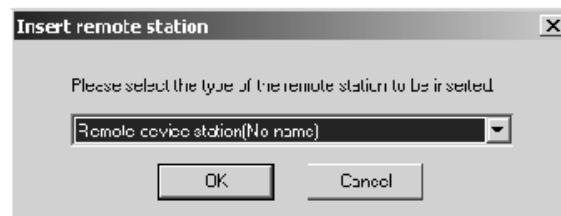
4.1. Configuration


The following example shows how to use the gateway with the Mitsubishi CC-Link configuration tool.

1. Review the gateway configuration using the ACM application (see page 9), and ensure the settings for the slave interface are set as shown here:
2. In the CC-Link configuration tool, set up the type of master to use, and add the gateway to the configuration as a 'Remote device station'.
3. Edit the Remote device station so that it is set up as 2 occupied stations, as shown to the right.

It should now be possible to exchange data. This can be tested by using 'Remote Station Monitor/Test'.

Network Type	
Name	CC-Link Slave
General	
Offline option	Clear
Control word/Status word	Disable
Fieldbus Specific	
System area mode	Standard
Dagnostic location	Bit area
Version 2	Disabled
Number of occupied stations	4



Edit remote station			
Top station	1	Display switch: Up Down	OK
Type:	Remote device station (No name)	Cancel	
Display bitmap(32*32):	Reference...		
remote_dv.bmp			
Station type: Remote device	<input checked="" type="radio"/> Normal station <input type="radio"/> Reserved station <input type="radio"/> Error invalid station		
Reserved and error invalid station			
Number of occupied stations:	<input type="radio"/> 1 <input checked="" type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4		
Size of send buffer(bank1):	0	hex	
Size of receive buffer(bank1):	0	hex	
Size of automatic update buffer(bank2):	0	hex	
Comment:			
Warning! Device peculiar parameter (RW) cannot be set on this screen. Please [File]->[Remote parameter file]. Please do [Edit] -> [Master parameter details] to the specification of the standby master.			

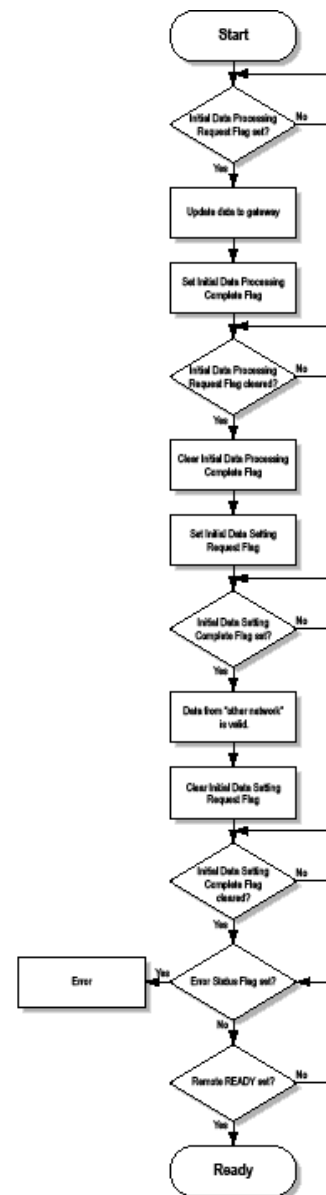
4.2. System Area Status Flags

Note: The following information applies only when System Area Mode is set to 'PLC Profile'.

As mentioned before, the System Area holds various CC-Link status flags. When starting the network communication, some of these flags must be processed and set as illustrated in this flowchart in order for the CC-Link interface to start exchanging data.

See also...

- “System Area Modes” on page 12.
- “PLC Profile Mode” on page 13.



5. Technical Specifications

5.1. Implementation Details

- Complete CC-Link slave functionality & Conformance according to BTP-05027-B
- Transparent CC-Link communication (Standard Mode)
- PLC Profile compliant communication (PLC profile mode)
- Galvanically isolated network electronics
- On-board configuration switches
- Supports CC-Link v1 and v2
- Up to 8 extension cycles
- Up to 128 I/O points (bits) and 16 I/O words (16-bit) in each direction (CC-Link v1)
- Up to 896 I/O points (bits) and 128 I/O words (16-bit) in each direction (CC-Link v2)
- Supports all common baudrates between 156kbps and 10Mbps
- Supports the PLC Profile
- Vendor Code: 0212h (HMS Industrial Networks)
- Model Code: 0001h (PLC)

5.2. CSP-File

Each device in a CC-Link network is associated with a CSP (CC-Link System Profile) file. This file is used by network configuration tools and holds a description of the device.

The CSP-file for the CC-Link Slave interface can be obtained by contacting HMS or downloaded directly from www.anybus.com.

5.3. CC-Link Connector

#	Signal	Description
1	DA	Communication line
2	DB	Communication line
3	DG	Digital GND
4	Shield	Cable shield
5	FG/PE	Frame ground



For more information regarding cables and wiring, consult the CC-Link Cable Wiring Manual, publication CC0208-06.