

User Manual

Anybus[®] Communicator[™] PROFINET/USS Gateway

Rev. 1.01

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About This Document

How To Use This Document

This document contains a general introduction as well as a description of the technical features provided by the Anybus Communicator PROFINET-USS Gateway.

The reader of this document is expected to be familiar with USS and PROFINET network technology, as well as communication systems in general. The reader is also expected to be familiar with the Microsoft Windows operating system.

Important User Information

The data and illustrations found in this document are not binding. We, HMS Industrial Networks AB, reserve the right to modify our products in line with our policy of continuous product development. The information in this document is subject to change without notice and should not be considered as a commitment by HMS Industrial Networks AB. HMS Industrial Networks AB assumes no responsibility for any errors that may appear in this document.

There are many applications of this product. Those responsible for the use of this device must ensure that all the necessary steps have been taken to verify that the application meets all performance and safety requirements including any applicable laws, regulations, codes, and standards.

Anybus® is a registered trademark of HMS Industrial Networks AB. All other trademarks are the property of their respective holders.

The examples and illustrations in this document are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular implementation, HMS cannot assume responsibility or liability for actual use based on these examples and illustrations.

- | | |
|------------------|---|
| 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. |

Related Documents

[illegible]

Document History

Summary of Recent Changes (1.00... 1.01)

[illegible]

Revision List

[illegible]

Conventions & Terminology

The following terms and conventions are used throughout this document:

- Numbered lists provide sequential steps
- Bulleted lists provide information, not procedural steps
- The terms ‘gateway’ and ‘ABC’ refers to the Anybus Communicator gateway.
- The term ‘USS’ refers to the Universal Serial Interface networking system.
- ‘PRT’ refers to the PROFINET networking system.
- ‘Slave Data Set’ refers to all data associated with a slave.
- Hexadecimal values are written in the format 0xNNNN, where NNNN is the hexadecimal value.

Support

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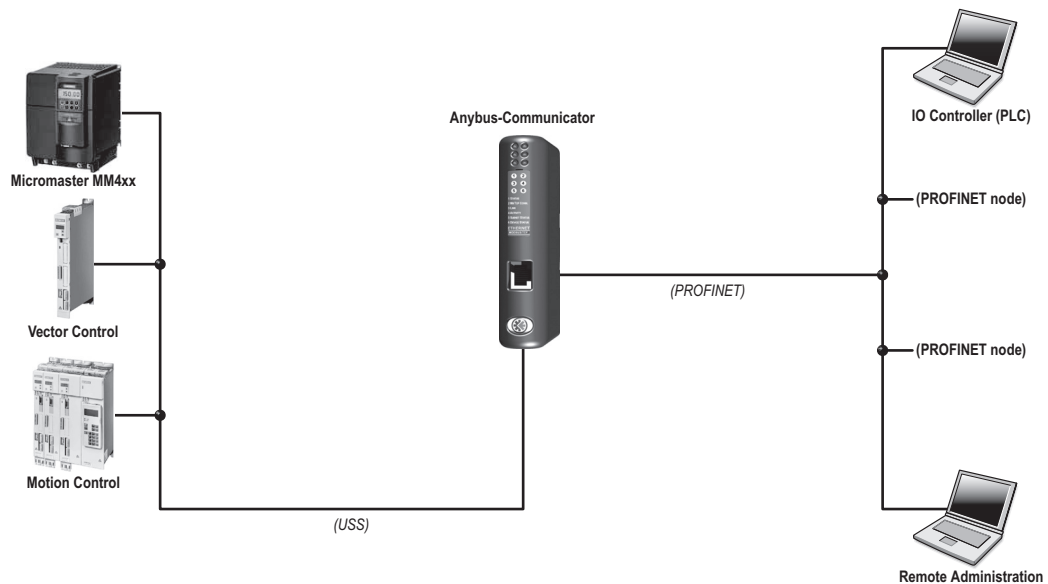
Introduction

General Information

The Anybus Communicator Ethernet-USS Gateway functions as a gateway between the Universal Serial Interface Protocol (from now on referred to as 'USS') and PROFINET IO. Acting as a slave with Real Time capabilities on the PROFINET side, and as a master on the USS network, it controls up to 31 USS slaves.

The gateway can be configured solely via the PROFINET configuration tool, i.e. no proprietary configuration utilities are required.

The built-in web server allows monitoring of data through an easy to use web-based user interface. Additionally, a built-in email client can issue email-messages as the status of the slaves on the USS network changes.



Features

- PROFINET IO slave, Real Time operation
- USS master, controls up to 31 USS slaves
- Up to 16 words of Process Data (PZD) per slave
- Up to 4 words of Parameter Data (PKW) per slave
- Configuration via PROFINET
- Web-based monitoring of data
- Status notifications via Email
- DCP (Discovery and Basic Configuration) capable
- DHCP capable
- Supports Anybus IPconfig (HICP)

External View

(See also B-1 “Connector Pin Assignments”).

A: PROFINET Interface

See also...

- B-1 “PROFINET Interface (RJ45)”

B: Status LEDs

See also...

- 1-3 “Status LEDs”

C: Service Port

(reserved)

D: USS Interface

See also...

- B-1 “USS Interface (DB9F)”

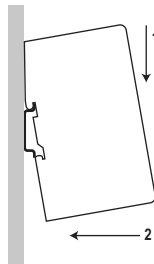
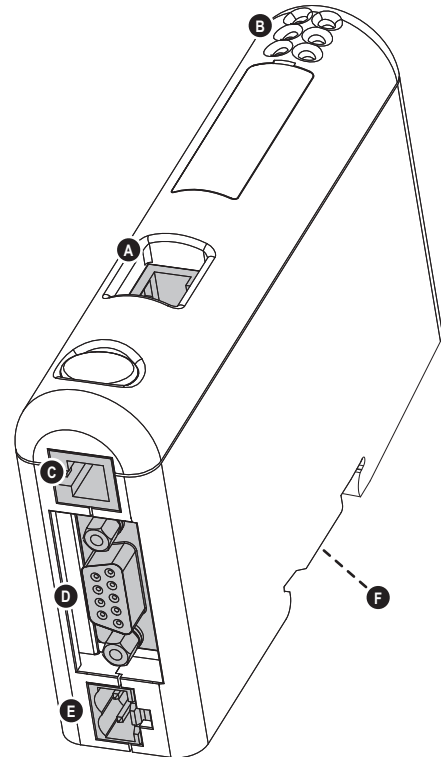
E: Power Supply Input

See also...

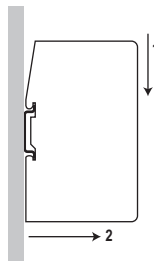
- B-1 “Power Connector”
- C-1 “Technical Specification”

F: DIN-rail Mechanism

The DIN-rail mechanism works as follows:



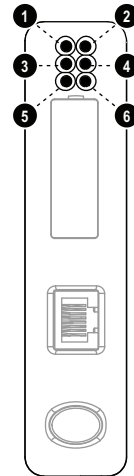
To snap the gateway *on*, first press the it downwards (1) to compress the spring in the DIN-rail mechanism, then push it towards the DIN-rail as to make it snap on (2)



To snap the gateway *off*, push the it downwards (1) and pull it out from the DIN-rail (2), as to make it snap off.

Status LEDs

#	State	Status
1 - Comm. Status	Off	Off line - No connection with IO Controller
	Green	On line, RUN - Connection to IO Controller established - IO Controller is in RUN state
	Green, flashing	On line, STOP - Connection to IO Controller established - IO Controller in STOP state
2 - Module Status	Off	No power or not initialized
	Green	Initialized
	Green, 1 flash	Diagnostic data available
	Green, 2 flashes	Blink. Used by engineering tools for identification.
	Red, 1 flash	Configuration Error: - I/O Size or Configuration Mismatch
	Red, 3 flashes	No Station Name or invalid TCP/IP configuration
	Red, 4 flashes	Internal error
3 - Link/Activity	Off	Ethernet link established
	Green	Transmitting/receiving data on ethernet interface
	Green, flashing	Ethernet link not established
4 - (not used)	-	-
5 - Gateway Status	Off	(no power)
	Red (short period)	Accessing new configuration
	Red, flashing (1Hz)	No configuration present
	Red, flashing (2Hz)	Configuration error
	Red, flashing (4Hz)	Initialization error
	Green	Operational
	Green, flashing (1Hz)	Configuration in progress
	Green, flashing (4Hz)	Initialization in progress
6 - USS Status	Off	Idle (or no power)
	Green	Communication detected
	Green, flickering	Transmitting data
	Red	Communication timeout



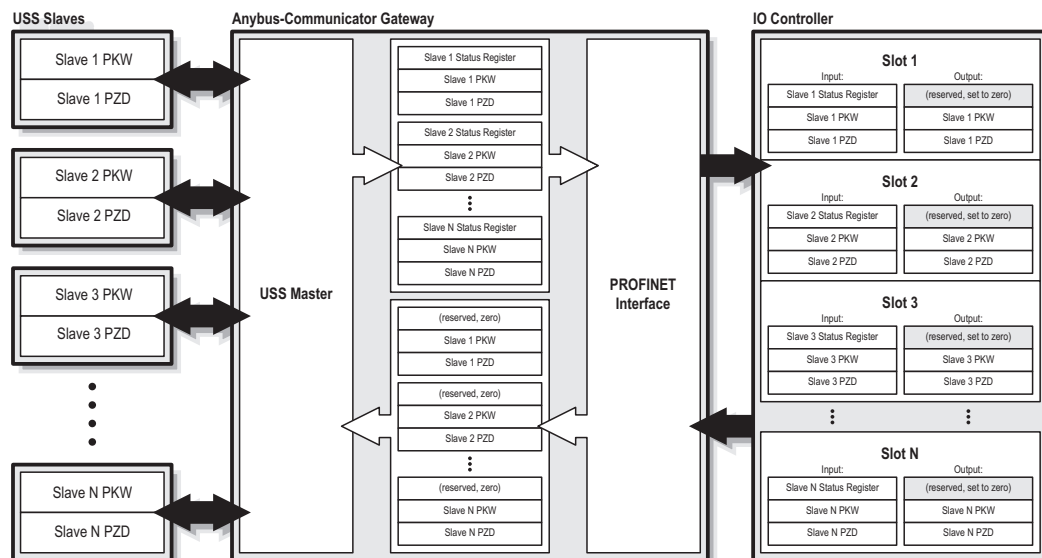
Data Exchange

Overview

The mapping of USS data to PROFINET is based on the mapping scheme defined by the PNO working group for PROFINET IO Proxy Devices. In short, this means that on PROFINET, each USS slave is represented through a dedicated slot. Slot #0 is reserved for the gateway itself, while slot #1... 31 is associated with the slaves on the USS network. Each slot uses one subslot for the mapping of its assigned data to PROFINET.

In addition to the Process Data (PZD) and Parameter Data (PKW), the Slave Data Set also features a Slave Status Register, which reflects the overall status of the slave.

Note that all data is exchanged transparently. This means that in order to be able to access Parameter Data (PKW), the parameter access protocol used to access PKW data must be implemented entirely on the PLC side.



See also...

- 2-2 “USS Master Implementation”
- 2-3 “Slave Data Set”
- 3-4 “USS & PROFINET Configuration (SIMATIC Manager)”
- 4-1 “Web Interface” (4-3 “Master Configuration”)

USS Master Implementation

General Information

The USS protocol (Universal Serial Interface Protocol), defines an access technique according to the Master-Slave principle for communication via a serial RS-485 based communication bus. The protocol includes fixed- or variable frame length, cyclic, acyclic and point-to-point communications. The gateway communicates according to a subset of the protocol, implementing support for cyclic communication with fixed frame lengths.

All PKW and PZD data is exchanged transparently. This means that the parameter access protocol used to access PKW data, if required, must be implemented entirely on the PLC side.

Configuration

The gateway can be configured solely using the PROFINET Configuration Tool, e.g. Step 7. No local configuration tools or settings are required.

See also...

- 3-1 “Network Configuration”

Operation

The gateway will only poll slaves marked as ‘Operational’ in the internal scanlist. Each time a bus cycle is completed, the gateway checks the status of slaves previously marked as ‘Non-Operational’ and updates the scanlist for the next cycle as necessary.

The status of each individual USS slave can be read in its’ corresponding Slave Status Register.

See also...

- 2-3 “Slave Status Register”
- 4-5 “Slave Diagnostics” (4-5 “Slave Diagnostics”)

Slave Data Set

General Information

The data associated with each slave is organized as follows:

Data from Gateway	Data from IO Controller	
Slave Status Register	(reserved, set to zero)	(2 bytes)
Parameter Data (PKW)	Parameter Data (PKW)	(size is device dependent)
Process Data (PZD)	Process Data (PZD)	- " -

Slave Status Register

This register reflects the current status of the slave.

(lsb)	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0	(lsb)
	RES					FNF	USSF	OP	RES	CFG	RES	Slave No.					

- RES (Reserved)**
 Reserved for future use, mask off and ignore.
- FNF (Fieldbus Network Fault)**
 This bit indicates if the fieldbus has gone on- (set) or off- (cleared) line.
- USSF (USS Fault)**
 This bit is set if a USS master-slave communication fault has been detected.
- OP (Operational)**
 This bit is set if the gateway has detected the slave and found it operational.
- CFG (Configured)**
 This bit is set (1) if the node is configured in the master or cleared (0) if not configured.
- Slave No.**
 USS slave address (0... 31).

Process Data (PZD)

This is the actual Process Data (PZD) image.

Parameter Data (PKW)

The gateway does not process the Parameter Data (PKW) data in any way. This means that the parameter access protocol used to access PKW data, if required, must be implemented entirely on the PLC side. Exactly how this is done is beyond the scope of this document.

Network Configuration

General Information

As mentioned previously, the gateway can be configured solely via the PROFINET configuration tool (e.g. Step 7). No local configuration utilities or settings are required. The configuration is based on the PROFINET GSD-file, which can be downloaded from the HMS web site (www.anybus.com).

TCP/IP Settings

To participate on the PROFINET network, the gateway needs a valid TCP/IP configuration. The gateway fully supports the DCP protocol, allowing the IO Controller/Supervisor to change the TCP/IP settings of the gateway during runtime. In addition, the gateway supports DHCP and Anybus IPconfig (HICP). The TCP/IP settings can also be accessed via the web-based configuration interface.

When using DHCP, the gateway will attempt to retrieve the TCP/IP settings from a DHCP server during startup. If no DHCP server is found, the gateway falls back to its current settings (i.e. any manual settings that may have been specified earlier).

If no current settings are available (i.e. if the previous settings are invalid), the gateway will halt and indicate an error on the on-board status LEDs. The TCP/IP configuration may however still be accessed via Anybus IPconfig (HICP).

See also...

- 4-2 “IP Address Settings”
- A-1 “Anybus IPconfig (HICP)”

SMTP Account Setting

In addition, in order to be able to send notification messages via email, the gateway needs a valid SMTP server account. These settings can be accessed through the web-based configuration interface.

See also...

- 4-2 “IP Address Settings”

Station Name

General Information

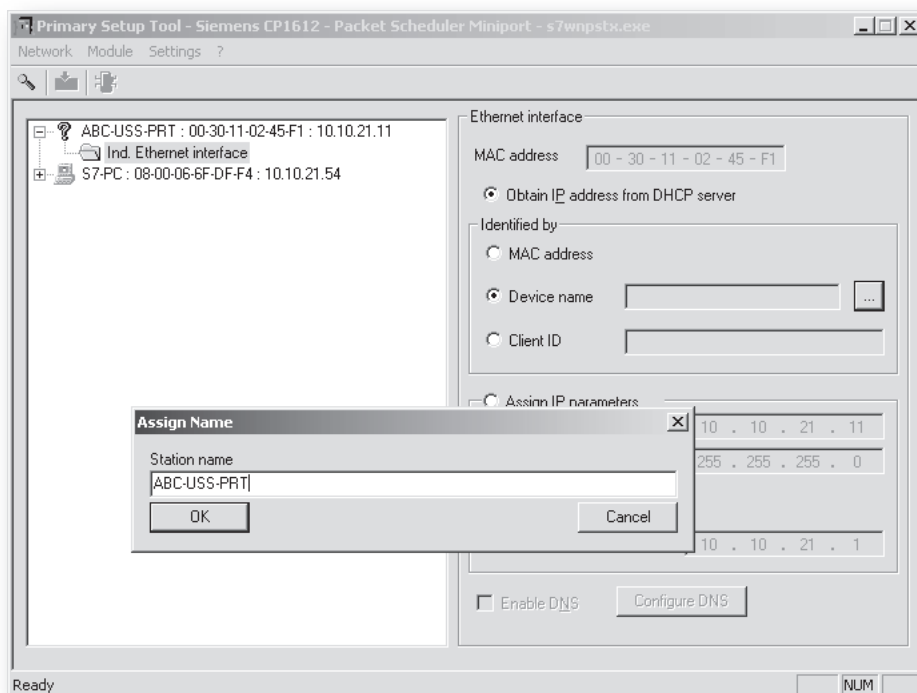
When used for the first time, the gateway needs to be assigned a Station Name. This can either be done using the SIMATIC Manager or using the SIMATIC Primary Setup Tool. Both cases are described in this document.

SIMATIC Primary Setup Tool

Note: The following example uses the SIMATIC Primary Setup Tool. This tool is sometimes not included in a typical Step 7 installation. In such case, it is also possible to use a built-in function called 'Edit Ethernet node', see 3-3 "SIMATIC Manager (Edit Ethernet Node)"

To specify the Station Name using the Primary Setup Tool, perform the following steps.

1. Open the SIMATIC Primary Setup Tool
2. Select the 'Network Adapter'-entry in the 'Settings'-menu
3. Highlight the ethernet interface used for the gateway, and select the 'Browse'-entry in the 'Network'-menu.
4. When prompted, enter the station name (e.g. 'ABC-USS-PRT')



See also...

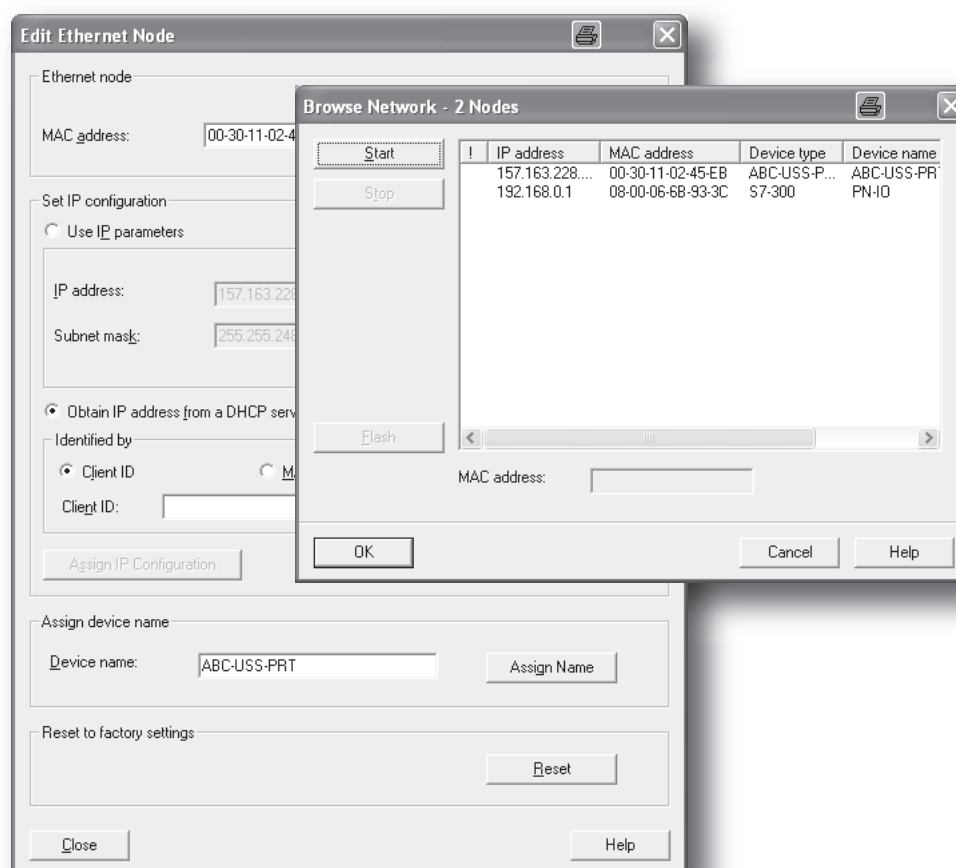
- 3-3 "SIMATIC Manager (Edit Ethernet Node)"

SIMATIC Manager (Edit Ethernet Node)

Note: The following example uses the SIMATIC Manager. It is also possible to use the SIMATIC Primary Setup Tool, see 3-2 “SIMATIC Primary Setup Tool”

To specify the Station Name using the SIMATIC Manager, perform the following steps.

1. Open the SIMATIC Manager.
2. Select the ‘Edit Ethernet Node...’-entry in the ‘PLC’-menu
3. Select the gateway in the list of devices (‘Browse Network’) and click ‘OK’
4. Specify the Station Name in the ‘Assign device name’-field.
5. When done, click ‘Close’.



See also...

- 3-2 “SIMATIC Primary Setup Tool”

USS & PROFINET Configuration (SIMATIC Manager)

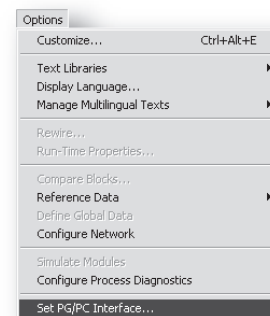
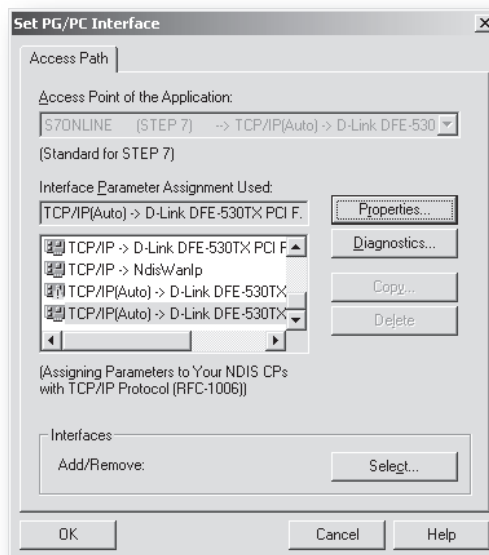
General Information

The purpose of this section is to illustrate how to add the gateway and data from the USS slaves to the PROFINET configuration. Note that a prerequisite for the following examples is that all TCP/IP settings are properly configured.

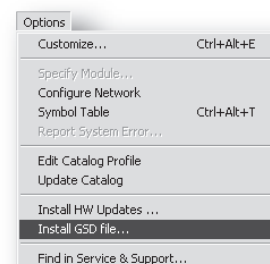
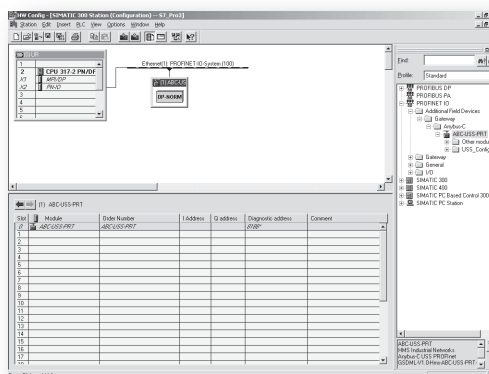
Step 1: Set Up and Add the Gateway to the Configuration

To configure the gateway, perform the following steps.

1. Open the SIMATIC Manager and start a new project.
2. Select 'Set PG/PC Interface...' -entry in the 'Options'-menu.
3. Change the PG/PC Interface to 'TCP/IP (Auto)'.



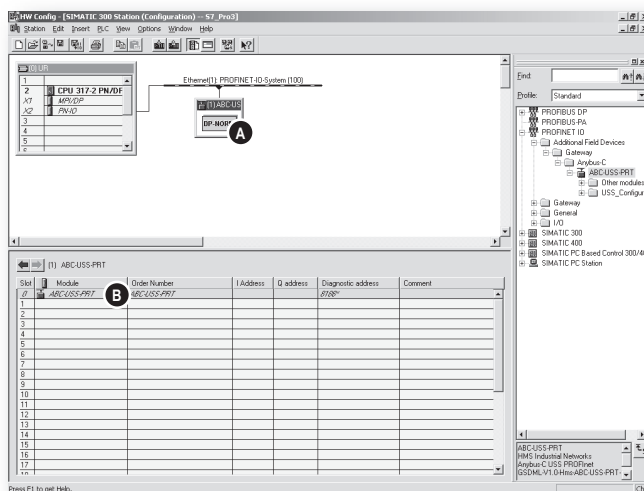
4. Highlight the station and double-click on 'Hardware'.
5. In the 'HW Config'-window, import the GSD-file by selecting the 'Install GSD file...' -entry in the 'Options'-menu.
6. Drag & Drop the ABC-USS-PRT into the network.



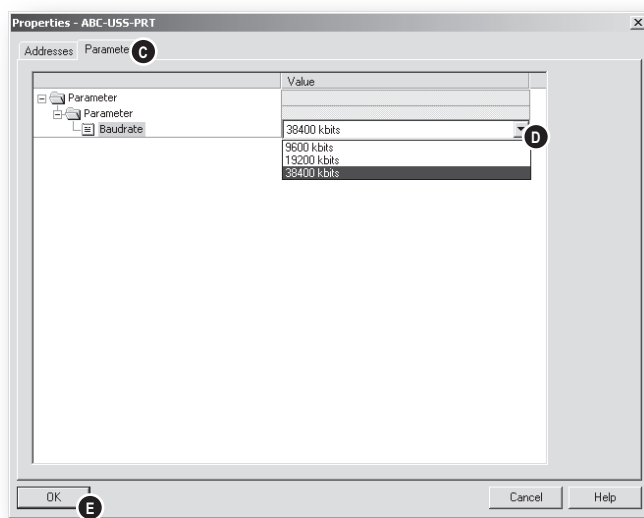
Step 2: Specify the Baudrate for the USS Network

To specify the baudrate for the USS communication, perform the following steps:

1. Highlight the gateway in the network configuration ('HW Config'-window, 'A')
2. Right-click on slot #0 ('B') and select 'Object Properties'.



3. Select the 'Parameter'-tab ('C')
4. Specify the baudrate for the USS network ('D')



5. Click 'OK' when done ('E')

Step 3: Add Data from the USS Network to the Configuration

Each slave on the USS network is represented through a dedicated slot. The slot number correlates 1:1 to the USS slave number, i.e. slot #23 on PROFINET represents USS slave #23.

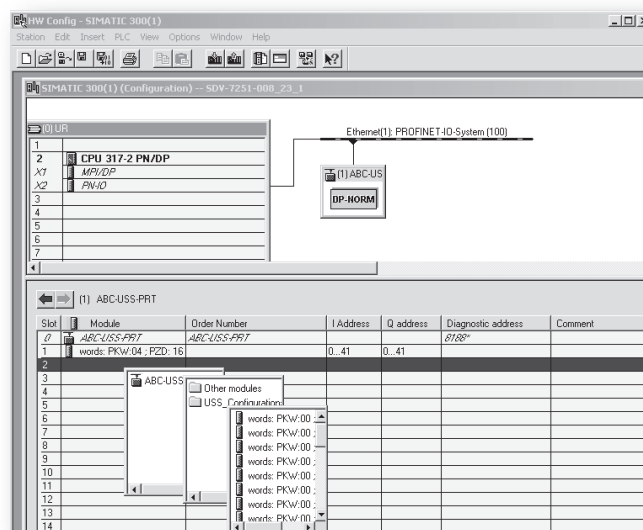
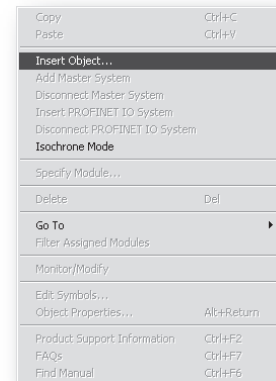
To add data from the USS network to the configuration, perform the following steps:

1. Right-click on a slot corresponding to the USS slave for which data shall be added.
2. Select the 'Insert Object...' entry.
3. Select an object which matches the data sizes (PKW and PZD) of the slave which shall be added.
4. Repeat steps 1... 3 for all USS slaves which shall be included in the configuration.

Example:

Example with a single USS slave with the following properties:

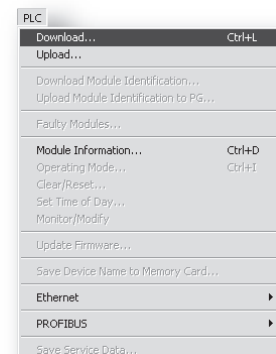
- Slave address #1
- 4 words of Parameter Data (PKW)
- 16 words of Process Data (PZD)



Note: The ranges shown in the 'I Address'- and 'Q address'-columns includes space for the Slave Status Register in both directions.

Step 4: Downloading the Configuration

To download the finished configuration to the IO Controller, select the 'Download...' entry in the 'PLC'-menu.



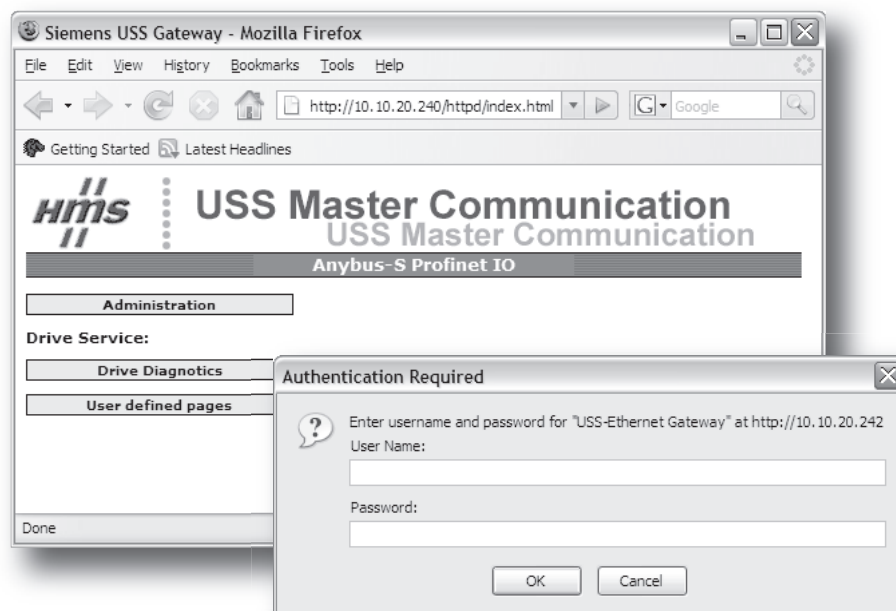
Web Interface

General Information

The gateway features a web-based configuration and monitoring interface, used to set up basic communication properties (i.e. IP address, network mask etc.) as well as to monitor the status and data of the individual slaves on the USS network.

To access the web-based configuration interface, perform the following steps:

1. Open a web browser (e.g. Mozilla Firefox)
2. Enter the IP address of the gateway in the address field. The gateway will ask for authentication. The username is 'USS Gateway', and the password is '1234'.



The main page contains links to the following sub-pages:

- **Administration**
See also...
 - 4-2 “Administration Pages”
- **Slave Diagnostics**
See also...
 - 4-5 “Slave Diagnostics”
- **User defined pages (Expert Users Only)**
Optionally, advanced users may create custom web pages. Contact HMS for further information.

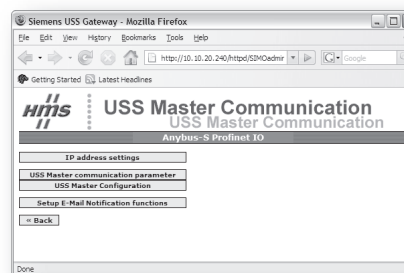
Note: Certain features requires a JAVA-capable browser.

Administration Pages

General Information

The main administration page features the following sub-pages:

- **IP address settings**
See also...
 - 4-2 “IP Address Settings”
- **Master Communication Settings**
See also...
 - 4-3 “Master Communication Settings”
- **Master Configuration**
See also...
 - 4-3 “Master Configuration”
- **E-Mail Notification Settings**
See also...
 - 4-4 “E-Mail Notification Settings”



IP Address Settings

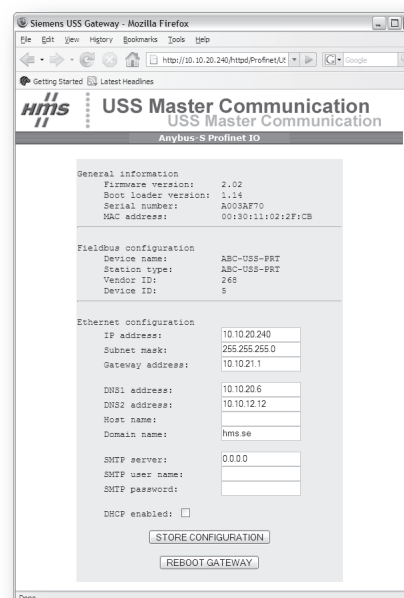
This page provides access to basic network settings, i.e. IP address, subnet mask etc.

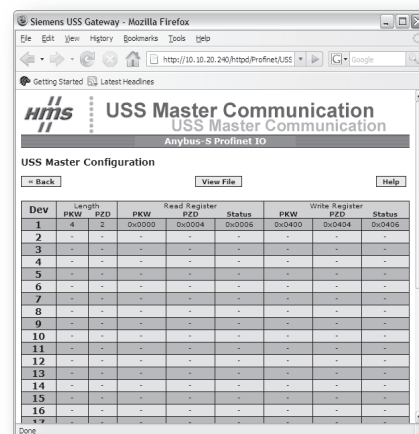
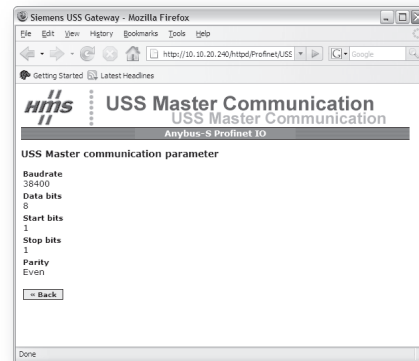
By default, the gateway retrieves these settings from a DHCP server. If using manually specified settings, make sure to uncheck the ‘DHCP enabled’-checkbox.

See also...

- 3-1 “TCP/IP Settings”

Note: Generally, any changes made to the settings on this page requires a reset to have effect.





E-Mail Notification Settings

The gateway continuously monitors the status of OP, USSF and FNF in the Slave Status Registers. Optionally, an email notification can be issued when the status of a slave changes.

- **Recipient**
Destination address.
- **Sender**
Address of the sender.
- **Subject**
Subject for the message.
- **Message**
Actual message body.
Optionally, additional keywords can be included in the message as follows:

Keyword	Action
<Slave>	Includes the number of the slave
<Status>	Includes the status of the slave

- **Email Notification Setup**
Specifies which slaves that shall trigger email status notifications; to enable notification for a particular slave, check the corresponding checkbox. To disable notification for a slave, uncheck the checkbox.

Click 'Store' to save any changes.

Example:

Recipient: 'cliff@barnes.com'
 Sender: 'bobby@ewing.com'
 Subject: 'Oops'
 Message: 'Slave no. <Slave> has changed status to <Status>'

Note: This features requires a valid SMTP server account. The SMTP account settings can be accessed via the built-in web server.

See also...

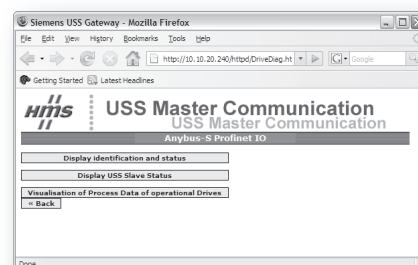
- 4-2 "IP Address Settings"

Slave Diagnostics

General

The main diagnostic page features the following sub-pages:

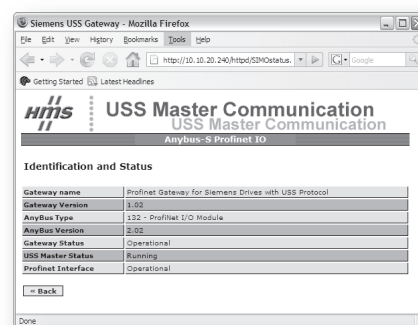
- **Identification and Status**
See also...
 - 4-5 “Identification and Status”
- **Slave Status**
See also...
 - 4-6 “Slave Status”
- **View Process Data of Operational Slaves**
See also...
 - 4-6 “View Process Data of Operational Slaves”



Identification and Status

This page displays information about the gateway as well as the general status of the USS network (this information may be useful when contacting HMS support services).

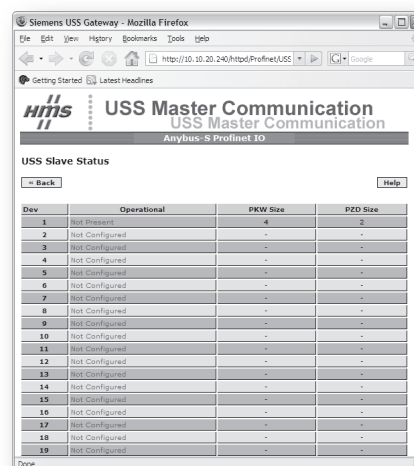
- **Gateway Name**
(‘Profinet Gateway for Siemens Drives with USS Protocol’).
- **Gateway Version**
(General gateway firmware revision).
- **Anybus Type**
(Higher level network interface type).
- **Anybus Version**
(Fieldbus interface firmware revision).
- **Gateway Status**
(Overall gateway status).
- **USS Master Status**
(Status of USS master).
- **PROFINET Interface**
(Fieldbus interface status).



Slave Status

This page shows status information for each slave device on the USS network.

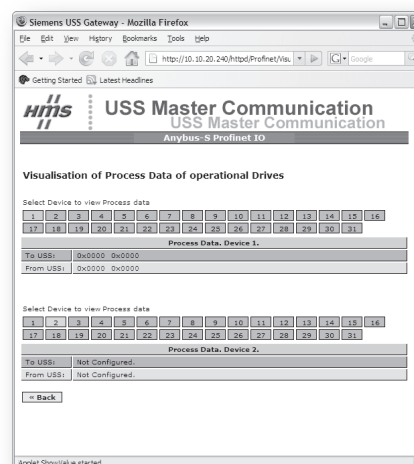
- **Dev**
Device address.
- **Operational**
Device status (e.g. 'Operational', 'Non-Operational', 'Not Present' etc.).
- **PKW Size**
Size (in words) of Parameter Data (PKW) associated with the slave device.
- **PZD Size**
Size (in words) of Process Data (PZD) associated with the slave device.



Dev	Operational	PKW Size	PZD Size
1	Not Present	-	-
2	Not Configured	-	-
3	Not Configured	-	-
4	Not Configured	-	-
5	Not Configured	-	-
6	Not Configured	-	-
7	Not Configured	-	-
8	Not Configured	-	-
9	Not Configured	-	-
10	Not Configured	-	-
11	Not Configured	-	-
12	Not Configured	-	-
13	Not Configured	-	-
14	Not Configured	-	-
15	Not Configured	-	-
16	Not Configured	-	-
17	Not Configured	-	-
18	Not Configured	-	-
19	Not Configured	-	-

View Process Data of Operational Slaves

This page can be used to monitor the Process Data (PZD) of all operational slaves on the USS network. All data is represented as an array of words in hexadecimal format.



Visualisation of Process Data of operational Drives

Select Device to view Process data

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	

Process Data, Device 1.

To USS: 0x0000 0x0000

From USS: 0x0000 0x0000

Select Device to view Process data

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	

Process Data, Device 2.

To USS: Not Configured.

From USS: Not Configured.

[Back](#)

Applet ShowValue started

Anybus IPconfig (HICP)

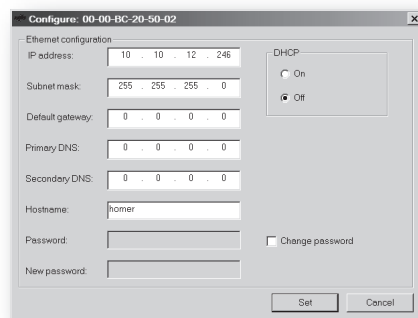
General

The gateway supports the HICP protocol used by the Anybus IPconfig utility, which can be downloaded free of charge from the HMS web site. This utility may be used to access the TCP/IP settings of any Anybus product connected to the network via UDP port 3250.

Operation

Upon starting the program, the network is scanned for Anybus products. The network can be rescanned at any time by clicking ‘Scan’.

In the list of detected devices, the gateway will by default appear as ‘ABC-PRT-USS’.



To alter the network settings of the gateway, double-click on its entry in the list. A window will appear, containing the actual IP settings.

Validate any changes by clicking ‘Set’, or click ‘Cancel’ to cancel.

Optionally, the configuration can be protected from unauthorized access by a password. To enter a password, click on the ‘Change password’ checkbox, and enter the password under ‘New password’.

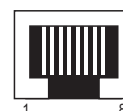
See also...

- 3-1 “TCP/IP Settings”
- 4-2 “IP Address Settings”

Connector Pin Assignments

PROFINET Interface (RJ45)

Pin	Signal	Notes
1	TD+	-
2	TD-	-
3	RD+	-
4	-	Normally left unused; to ensure signal integrity, these pins are tied together and terminated to PE via a filter circuit.
5	-	
6	RD-	-
7	-	Normally left unused; to ensure signal integrity, these pins are tied together and terminated to PE via a filter circuit.
8	-	



Power Connector

Pin	Signal	Notes
1	+24VDC	-
2	GND	-

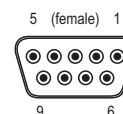


Notes:

- Use good quality 60/75 or 75×C copper (CU) wire only.
- Terminal tightening torque must be between 5... 7 lbs-in (0.5... 0.8 Nm)

USS Interface (DB9F)

Pin	Signal	Notes
1	+5V Output	100mA max.
2	-	(do not connect)
3	-	
4	-	
5	Signal Ground	IMPORTANT: This pin should only be connected to the Signal Ground of other nodes (if available). It must <u>not</u> be connected to Protective Earth (PE), since doing so <u>may cause serious damage</u> to the serial transceivers in the gateway.
6	-	(do not connect)
7	-	
8	RS485 +	-
8	RS485 -	-



Technical Specification

Mechanical Properties

Housing

Plastic housing with snap-on connection to DIN-rail, protection class IP20

Dimensions

120 mm x 75 mm x 27 mm, L x W x H (inches: 4,72" x 2,95" x 1,06"; L x W x H)

Electrical Characteristics

Power Supply

Power: 24V \pm 10%

Power Consumption

Maximum power consumption is 280mA. Typically around 100 mA

Environmental Characteristics

Relative Humidity

The product is designed for a relative humidity of 0 to 95% non-condensing

Temperature

Operating:	$\pm 0^{\circ}\text{C}$ to $+55^{\circ}\text{C}$
Non Operating:	-25°C to $+85^{\circ}\text{C}$

Regulatory Compliance

EMC Compliance (CE)

This product is in accordance with the EMC directive 89/336/EEC, with amendments 92/31/EEC and 93/68/EEC through conformance with the following standards:

- **EN 50082-2 (1993)**
EN 55011 (1990) Class A

- **EN 61000-6-2 (1999)**
EN 61000-4-3 (1996) 10V/m
EN 61000-4-6 (1996) 10V/m (all ports)
EN 61000-4-2 (1995) ±8kV Air Discharge
 ±4kV Contact discharge
EN 61000-4-4 (1995) ±2kV Power port
 ±1kV Other ports
EN 61000.4.5 (1995) ±0.5kV Power ports (DM/CM)
 ±1kV Signal ports

UL/c-UL compliance

The certification has been documented by UL in file E214107.

