

# Advantys STB

## Standard Profibus DP Network Interface Module Applications Guide

8/2009

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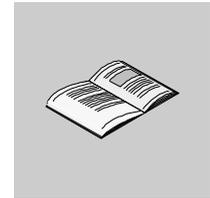
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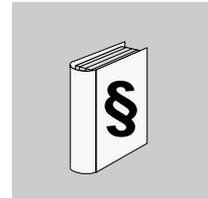
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## Safety Information



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### Important Information

#### NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

### **DANGER**

**DANGER** indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

### **WARNING**

**WARNING** indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

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 **CAUTION**

**CAUTION** indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

**CAUTION**

**CAUTION**, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result in** equipment damage.

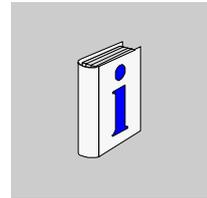
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A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and the installation, and has received safety training to recognize and avoid the hazards involved.

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## About the Book



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### At a Glance

#### Document Scope

This *Guide* describes the common hardware and software features of the Advantys STB NDP 2212, which is the standard Advantys STB interface to a Profibus DP network. To assist you with setting up Advantys STB as a node on a Profibus DP network, Profibus DP parameterization and configuration requirements are described in detail, and real-world Profibus DP application examples are included.

The following information about NIMs in general and the STB NDP 2212 in particular appears in this *Guide*:

- the NIM's role as the Advantys STB gateway to a fieldbus network
- the NIM's integrated power supply and its role in the distribution of logic power across the island bus
- common external interfaces:
  - the two-pin receptacle to an external, SELV-rated power supply
  - RS-232 interface to optional devices, including the Advantys configuration software and a human-machine interface (HMI) operator panel
- Profibus DP specific features, including the STB NDP 2212's interface to the Profibus DP network and how to establish communications between an Advantys STB island bus and the upstream Profibus DP fieldbus master
- the applicable Profibus DP and ISO OSI Reference Model standards
- island bus configuration options, such as default settings, I/O module current load requirements, the auto-configuration process and custom configuration options
- the removable memory card option
- advanced configuration features, such as island bus fallback scenarios

#### Who Should Use This Manual?

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This manual is intended to support the customer who has installed the Advantys STB island bus on a Profibus DP network and needs to understand the communications and connections between the STB NDP 2212 and:

- a Profibus DP fieldbus master
- other island modules
- the devices connecting to it locally—the Advantys configuration software, the HMI panel, the removable memory card

This manual assumes familiarity with the Profibus DP protocol.

### Validity Note

This document is valid for Advantys 4.5 or later.

### Related Documents

Title of Documentation	Reference Number
Advantys STB Analog I/O Modules Reference Guide	31007715 (E), 31007716 (F), 31007717 (G), 31007718 (S), 31007719 (I)
Advantys STB Digital I/O Modules Reference Guide	31007720 (E), 31007721 (F), 31007722 (G), 31007723 (S), 31007724 (I)
Advantys STB Counter Modules Reference Guide	31007725 (E), 31007726 (F), 31007727 (G), 31007728 (S), 31007729 (I)
Advantys STB Special Modules Reference Guide	31007730 (E), 31007731 (F), 31007732 (G), 31007733 (S), 31007734 (I)
Advantys STB System Planning and Installation Guide	31002947 (E), 31002948 (F), 31002949 (G), 31002950 (S), 31002951 (I)

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Advantys STB Configuration Software Quick Start User Guide	31002962 (E), 31002963 (F), 31002964 (G), 31002965 (S), 31002966 (I)
Advantys STB Reflex Actions Reference Guide	31004635 (E), 31004636 (F), 31004637 (G), 31004638 (S), 31004639 (I)

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# Introduction



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## Introduction

This chapter introduces the network interface module (NIM) in the context of its role as the gateway to the island bus. The chapter includes an overview of an Advantys STB island bus and concludes with an introduction to the Profibus DP protocol and standard. Profibus DP communications services to an Advantys STB island via the STB NDP 2212 NIM are highlighted.

## What's in this Chapter?

This chapter contains the following topics:

Topic	Page
What Is a Network Interface Module?	12
What Is Advantys STB?	15
What Is Profibus DP?	19
Profibus DP Transmission Specifications and Limitations	21

## What Is a Network Interface Module?

### Purpose

Every island requires a network interface module (NIM) in the leftmost location of the primary segment. Physically, the NIM is the first (leftmost) module on the island bus. Functionally, it is the gateway to the island bus. That is, all communications to and from the island bus pass through the NIM. The NIM also has an integrated power supply that provides logic power to the island modules.

### The Fieldbus Network

An island bus is a node of distributed I/O on an open fieldbus network, and the NIM is the island's interface to that network. The NIM supports data transfers over the fieldbus network between the island and the fieldbus master.

The physical design of the NIM makes it compatible with both an Advantys STB island and your specific fieldbus master. Whereas the fieldbus connector on each NIM type may differ, the location on the module front panel is essentially the same.

### Communications Roles

Communications capabilities provided on a standard NIM include:

Function	Role
data exchange	The NIM manages the exchange of input and output data between the island and the fieldbus master. Input data, stored in native island bus format, is converted to a fieldbus-specific format that can be read by the fieldbus master. Output data written to the NIM by the master is sent across the island bus to update the output modules and is automatically reformatted.
configuration services	Custom services can be performed by the Advantys configuration software. These services include changing the operating parameters of the I/O modules, fine-tuning island bus performance, and configuring reflex actions. The Advantys Configuration Software runs on a computer attached to the NIM's CFG interface ( <i>see page 34</i> ). (For NIMs with Ethernet port connectivity, you can also connect to the Ethernet port.)
human-machine interface (HMI) operations	A serial Modbus HMI panel can be configured as an input and/or output device on the island. As an input device, it can write data that can be received by the fieldbus master; as an output device, it can receive updated data from the fieldbus master. The HMI can also monitor island status, data, and diagnostic information. The HMI panel must be attached to the NIM's CFG port.

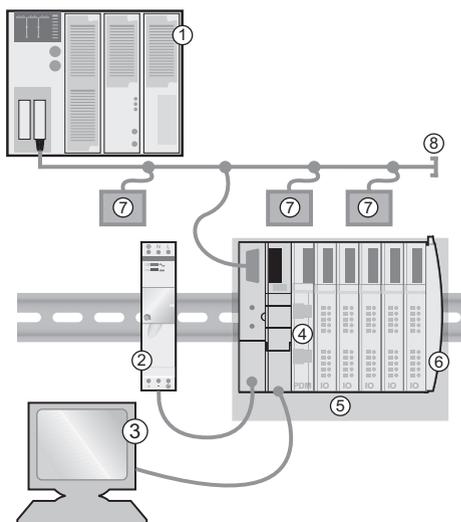
## Integrated Power Supply

The NIM's built-in 24-to-5 VDC power supply provides logic power to the I/O modules on the primary segment of the island bus. The power supply requires a 24 VDC external power source. It converts the 24 VDC to 5 V of logic power for the island. Individual STB I/O modules in an island segment generally draw a logic bus current of between 50 and 265 mA. (Consult the *Advantys STB System Planning and Installation Guide* for current limitations at various operating temperatures.) If the logic bus current drawn by the I/O modules totals more than 1.2 A, additional STB power supplies need to be installed to support the load.

The NIM delivers the logic power signal to the primary segment only. Special STB XBE 1300 beginning-of-segment (BOS) modules, located in the first slot of each extension segment, have their own built-in power supplies, which provide logic power to the STB I/O modules in the extension segments. Each BOS module that you install requires 24 VDC from an external power supply.

## Structural Overview

The following figure illustrates the multiple roles of the NIM. The figure provides a network view and a physical representation of the island bus:



- 1 fieldbus master
- 2 external 24 VDC power supply, the source for logic power on the island
- 3 external device connected to the CFG port (a computer running the Advantys Configuration Software or an HMI panel)
- 4 power distribution module (PDM): provides field power to the I/O modules
- 5 island node
- 6 island bus terminator plate
- 7 other nodes on the fieldbus network

**8** fieldbus network terminator (if required)

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## What Is Advantys STB?

### Introduction

Advantys STB is an assembly of distributed I/O, power, and other modules that function together as an island node on an open fieldbus network. Advantys STB delivers a highly modular and versatile slice I/O solution for the manufacturing and process industries.

Advantys STB lets you design an island of distributed I/O where the I/O modules can be installed as close as possible to the mechanical field devices that they control. This integrated concept is known as *mechatronics*.

### Island Bus I/O

An Advantys STB island can support as many as 32 I/O modules. These modules may be Advantys STB I/O modules, preferred modules, and enhanced CANopen devices.

### The Primary Segment

STB I/O modules on an island may be interconnected in groups called segments.

Every island has at least one segment, called the *primary segment*. It is always the first segment on the island bus. The NIM is the first module in the primary segment. The primary segment must contain at least one Advantys STB I/O module and can support a logic bus current of up to 1.2 A. The segment also contains one or more power distribution modules (PDMs), which distribute field power to the I/O modules.

### Extension Segments

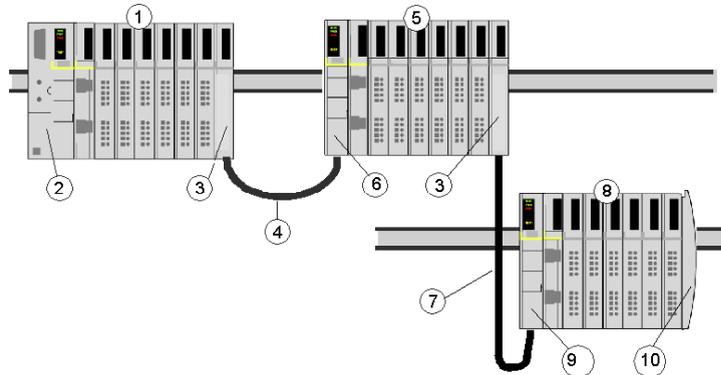
When you are using a standard NIM, Advantys STB I/O modules that do not reside in the primary segment can be installed in *extension segments*. Extension segments are optional segments that enable an island to be a truly distributed I/O system. The island bus can support as many as six extension segments.

Special extension modules and extension cables are used to connect segments in a series. The extension modules are:

- STB XBE 1100 EOS module: the last module in a segment if the island bus is extended
- STB XBE 1300 BOS module: the first module in an extension segment

The BOS module has a built-in 24-to-5 VDC power supply similar to the NIM. The BOS power supply also provides logic power to the STB I/O modules in an extension segment.

Extension modules are connected by lengths of STB XCA 100x cable that extend the island communication bus from the previous segment to the next BOS module:



- 1 primary segment
- 2 NIM
- 3 STB XBE 1100 EOS bus extension module(s)
- 4 1 m length STB XCA 1002 bus extension cable
- 5 first extension segment
- 6 STB XBE 1300 BOS bus extension module for the first extension segment
- 7 4.5 m length STB XCA 1003 bus extension cable
- 8 second extension segment
- 9 STB XBE 1300 BOS bus extension module for the second extension segment
- 10 STB XMP 1100 termination plate

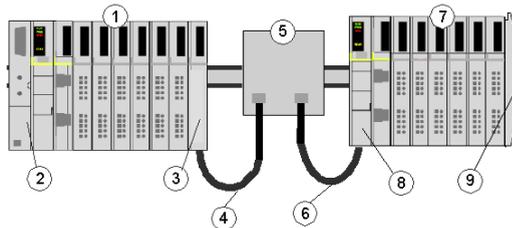
Bus extension cables are available in various lengths, ranging from 0.3 m (1 ft) to 14.0 m (45.9 ft).

## Preferred Modules

An island bus can also support those auto-addressable modules referred to as *preferred modules*. Preferred modules do not mount in segments, but they do count as part of the 32-module maximum system limit.

A preferred module can connect to an island bus segment through an STB XBE 1100 EOS module and a length of STB XCA 100x bus extension cable. Each preferred module has two IEEE 1394-style cable connectors, one to receive the island bus signals and the other to transmit them to the next module in the series. Preferred modules are also equipped with termination, which must be enabled if a preferred module is the last device on the island bus and must be disabled if other modules follow the preferred device on the island bus.

Preferred modules can be chained to one another in a series, or they can connect to Advantys STB segments. As shown in the following figure, a preferred module passes the island bus communications signal from the primary segment to an extension segment of Advantys STB I/O modules:



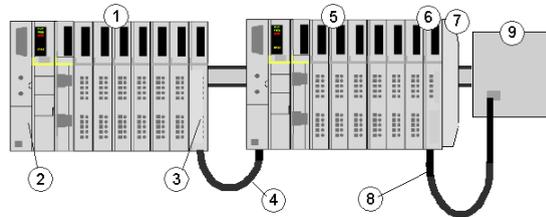
- 1 primary segment
- 2 NIM
- 3 STB XBE 1100 EOS bus extension module
- 4 1 m length STB XCA 1002 bus extension cable
- 5 preferred module
- 6 1 m length STB XCA 1002 bus extension cable
- 7 extension segment of Advantys STB I/O modules
- 8 STB XBE 1300 BOS bus extension module for the extension segment
- 9 STB XMP 1100 termination plate

### Enhanced CANopen Devices

You may also install one or more enhanced CANopen devices on an island. These devices are not auto-addressable, and they must be installed at the end of the island bus. If you want to install enhanced CANopen devices on an island, you need to use an STB XBE 2100 CANopen extension module as the last module in the last segment.

**NOTE:** If you want to include enhanced CANopen devices in your island, you need to configure the island using the Advantys Configuration Software, and you need to configure the island to operate at 500 kbaud.

Because enhanced CANopen devices cannot be auto-addressed on the island bus, they must be addressed using physical addressing mechanisms on the devices. The enhanced CANopen devices together with the CANopen extension module form a sub-network on the island bus that needs to be separately terminated at the beginning and end. A terminator resistor is included in the STB XBE 2100 CANopen extension module for one end of the extension sub-network; the last device on the CANopen extension must also be terminated with a 120  $\Omega$  resistor. The rest of the island bus needs to be terminated after the CANopen extension module with an STB XMP 1100 termination plate:



- 1 primary segment
- 2 NIM
- 3 STB XBE 1100 EOS bus extension module
- 4 1 m length STB XCA 1002 bus extension cable
- 5 extension segment
- 6 STB XBE 2100 CANopen extension module
- 7 STB XMP 1100 termination plate
- 8 typical CANopen cable
- 9 enhanced CANopen device with 120  $\Omega$  termination

### Length of the Island Bus

The maximum length of an island bus (the maximum distance between the NIM and the last device on the island) is 15 m (49.2 ft). This length must take into account the extension cables between segments, extension cables between preferred modules, and the space consumed by the devices themselves.

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## What Is Profibus DP?

### Introduction

Profibus DP (Distributed Process Periphery) is an integrated transmission and bus access protocol for high-speed communications on open industrial communication networks with remote I/O requirements.

### Basic Characteristics

Profibus DP is a speed-optimized Profibus variant with these key characteristics:

- Profibus DP is a serial fieldbus that connects sensors, actuators, and I/O modules to an upstream master control device.
- Profibus DP enables high-speed data exchange (*see page 59*) at the sensor and actuator level.
- The Profibus DP fieldbus enables communication between a master device and its distributed input and output devices (slaves). (The TSX PBY 100 Profibus DP master module on a Premium PLC is one such master device.)  
The master reads input information from its slave devices and writes output information to them.
- Data communication between the master and its distributed I/O devices is cyclic. For predictable results, the bus cycle time must be shorter than the master's program cycle time.

### Standards

Profibus DP is based on Profibus Standard DIN 19245, Parts 1 and 3, the Profibus standard for distributed peripherals. The technology is in accordance with existing parts of the IEC Fieldbus Standard, IEC 61158. The Profibus DP protocol complies with the ISO OSI reference model for open systems (standard ISO 7498).

### Profibus DP, the STB NDP 2212, and the ISO OSI Reference Model

Profibus DP and the STB NDP 2212 use the functions and comply with ISO OSI reference model layer 1 (physical) and layer 2 (data link) standards as follows:

- Layer 1—potential-isolated RS-485 interface
- Layer 2— Profibus Controller 3, Medium Access Control (MAC) slave layer; the STB NDP 2212 software provides additional layer 2 interface services and network management functionality

## Standard Services

Interactions between a Profibus DP fieldbus master and any node on its network comprise a series of service access points (SAPs) that are defined in Profibus Standard DIN 19245. All communications data is transmitted as a Profibus DP telegram. In its communications with the island bus, Profibus DP uses the following SAPs:

Service	Description
set_parameter (see page 62)	send parameter setting data
get_configuration	read configuration data
check_configuration (see page 64)	check configuration data
slave_diagnostic (see page 81)	read slave diagnostic data
read_inputs	read slave input data
read_outputs	read slave output data
global_command (see page 80)	control command to support the <b>freeze</b> , <b>unfreeze</b> , or <b>clear_data</b> functions
*write_read data (see page 69)	data exchange
*default SAP	

## Diagnostic Capability

Profibus DP provides robust diagnostic services that permit rapid error localization. Diagnostic messages are transmitted over the fieldbus to the master from the slave device(s).

Profibus DP's diagnostic functionality can report on the status of a slave, and identify and locate faults at the following levels:

- operational (see page 87)—overall status of communications between the master and its slave
- slave device (see page 87)—overall status of the whole device, in this case, the entire Advantys STB island bus
- module (see page 92)—status of an individual I/O module: each Advantys STB I/O module is represented by a specific bit in the diagnostic register area of the process image
- channel (see page 95)—status of up to 14 channels can be reported. Information is provided in 3 bytes per channel that includes the module slot number, channel number, channel type and error type.

**NOTE:** The STB NDP 2212 Profibus\_DP channel related diagnostic capabilities are available at firmware version 4.0 and above.

## Profibus DP Transmission Specifications and Limitations

### Summary

The following information provides the specifications and limitations for the Profibus DP network on which the island bus node resides.

### Data Throughput

Profibus DP's high rate of data throughput can be traced to the fact that input and output data are transferred in a message cycle using ISO OSI's layer 2 send and receive data services.

### Transmission Medium

The Profibus DP industrial network on which the Advantys STB node resides is electrical. The transmission medium to the island bus is a shielded, twisted pair line.

### Baud

The island bus and the other devices running off the same Profibus DP fieldbus must have the same baud setting. The common rate is automatically detected and automatically set for the Advantys STB node. Available rates range from 9600 bits/s through 12 Mbits/s:

Available Rates	
45450 bits/s	1.5 Mbits/s
9600 bits/s	3 Mbits/s
19200 bits/s	6 Mbit/s
93750 bits/s	12 Mbits/s
187500 bits/s	
500000 bits/s	

### Limitations on Data Transfer

The following information lists the limitations on the amount of data that Profibus DP can transfer to the island bus:

Parameter	Limitation
protocol	Profibus DP, DIN 19245, Parts 1 and 3
maximum input data length	240 bytes
maximum output data length	240 bytes
maximum diagnosis data length	32 or 64 bytes*
maximum I/O data length	240 bytes

<b>Parameter</b>	<b>Limitation</b>
maximum user parameter data length	8 bytes
maximum configuration data length	208 bytes
address range	1 ... 125
*Dependent upon firmware version no. ( <i>see page 81</i> ) and ( <i>see page 82</i> )	

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# The STB NDP 2212 NIM

# 2

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## Introduction

This chapter describes the external features, connections, power requirements, and the product specification of the STB NDP 2212.

## What's in this Chapter?

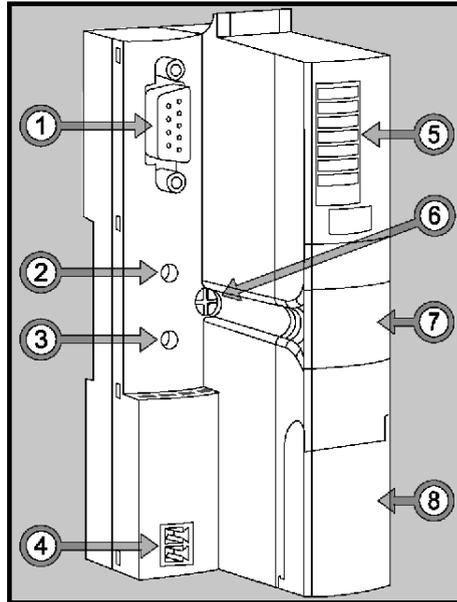
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Selecting a Source Power Supply for the Island's Logic Power Bus	41
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## External Features of the STB NDP 2212

### Summary of Features

The following figure indicates where the physical features critical to STB NDP 2212 NIM operations are located:



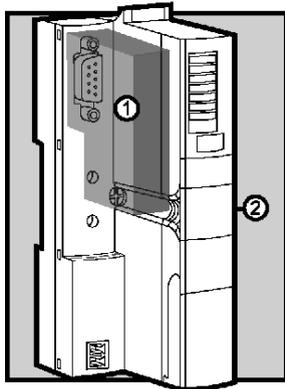
The physical features are described briefly in the following table:

Feature	Function
1 fieldbus interface	A nine-receptacle SUB-D connector ( <i>see page 26</i> ) is used to connect the NIM and the island bus to a Profibus DP network.
2 upper rotary switch	The two switches ( <i>see page 28</i> ) are used together to specify the island's node ID on the Profibus DP network.
3 lower rotary switch	
4 power supply interface	A two-receptacle connector for connecting an external 24 VDC power supply ( <i>see page 41</i> ) to the NIM.
5 LED array	Colored LEDs ( <i>see page 30</i> ) that use various patterns to visually indicate the operational status of the island bus, and the status of communications from the fieldbus master to the island bus.

Feature		Function
6	release screw	A mechanism used for removing the NIM from the DIN rail. (See the <i>Advantys STB System Planning and Installation Guide</i> 890 USE 171 00 for details.)
7	removable memory card drawer	A plastic drawer in which a removable memory card (see page 49) can be seated and then inserted into the NIM.
8	CFG port cover	A hinged flap on the NIM's front panel that covers the CFG interface (see page 34) and the RST button (see page 55).

## Housing Shape

The L-shaped design of NIM's external housing accommodates the attachment of a fieldbus connector without raising the depth profile of the island:



- 1 space reserved for the network connector
- 2 NIM housing

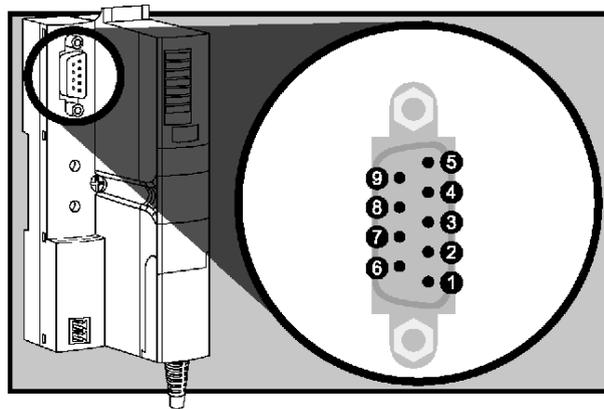
## STB NDP 2212 Fieldbus Interface

### Summary

The fieldbus interface on the STB NDP 2212 is the point of connection between an Advantys STB island bus and the Profibus DP network. The interface is a nine-receptacle SUB-D (female) connector.

### Fieldbus Port Connections

The fieldbus interface is located on the front of the Profibus DP NIM at the top:



The following table describes the pin assignments for the nine-receptacle SUB-D (female) connector:

Pin	Description
1	shield, protective ground
2	reserved
3	receive/transmit data (positive)
4	request to send
5	data ground
6	voltage pin
7	reserved
8	receive/transmit data (negative)
9	reserved

## Profibus DP Networking Cable and Connectors

The Profibus DP networking cable is a shielded, twisted-pair electrical cable that is compliant with Profibus standard DIN 19245. The cable shielding consists of an inner copper foil shielding and an outer braided layer. There should not be an interruption to any wire in the fieldbus cable.

A nine-pin (male) SUB-D Profibus DP connector compliant with DIN 19245, Parts 1 and 3 must be used with the cable from the fieldbus to the island. Depending on where the island bus node is positioned on the Profibus DP network, you will need to attach either an inline or a terminated end connector to the fieldbus cable (see page 27).

**NOTE:** For complete information about the Profibus DP network cable and available connectors, refer to *Profibus Cabling Guidelines* published by Profibus International.

## Accessories

Use the information in the following table to identify the STB NDP 2212 module and the Profibus DP accessories that are compatible with your installation:

Description	Part No.	Standard
NIM, including the Advantys STB terminator plate	STB NDP 2212	Profibus DP standard DIN 19245, Parts 1 and 3
Profibus DP networking cable, by the meter (or foot)	TSX PBS CA 100 10 0 ft cable (in U.S.)	
	KAB PROFIB 2 m cable (in Europe)	
terminated end connector, yellow (see 1)	490 NAD 911 03	
inline connector, gray (see 2)	490 NAD 911 04	
<b>Diagnostic and Troubleshooting Accessories</b>		
inline connector with service port, gray (see 2)	490 NAD 911 05	
1. Use a terminated end connector only if the island is the last node on the Profibus DP network.		
2. Use an inline connector if the island is located at a Profibus DP network address other than the last.		

## Rotary Switches: Setting the Network Node Address

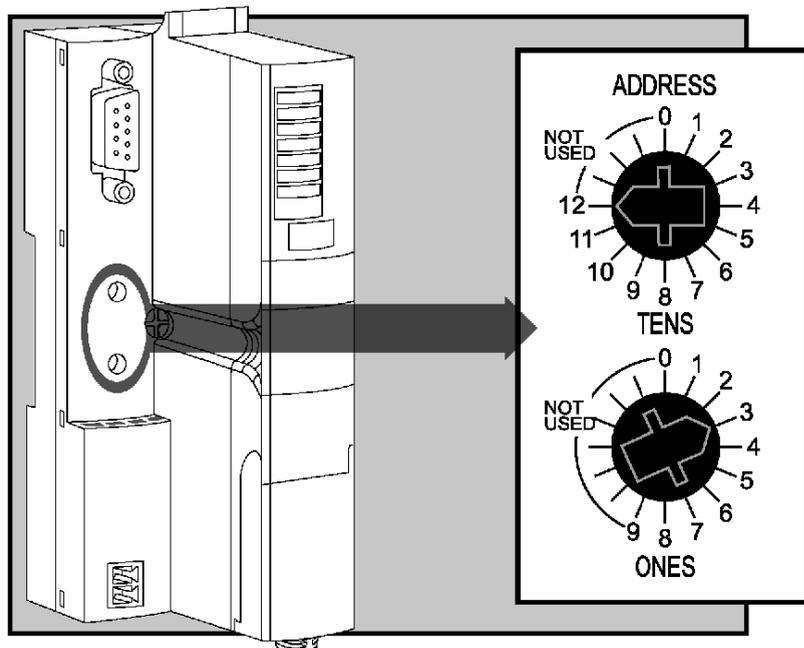
### Summary

The island is a single node on the Profibus DP network, and it requires a network address. The address can be any numeric from 1 to 125 that is unique with respect to the other node addresses on the same network. The node address is set with a pair of rotary switches on the NIM.

The fieldbus master and the NIM can communicate over the Profibus DP network only while the rotary switches are set to a valid node address.

### Physical Description

The two rotary switches are positioned one above the other on the front of the STB NDP 2212. The upper switch represents the tens digit and the lower switch represents the ones digit:



## Valid and Invalid Profibus DP Node Addresses

Each rotary switch position that you can use to set the node address for your island is marked incrementally on the NIM housing. The available positions on each switch are:

- upper switch—0 to 12 (tens digit)
- lower switch—0 to 9 (ones digit)

**NOTE:** Using both switches, it is mechanically possible to set any node address from 0 to 129. However, Profibus DP reserves addresses 0, 126, and 127 and prohibits the use of addresses 128 and 129.

If the island has an invalid node address, it cannot communicate with the master.

To establish communication, set the switches to a valid address and cycle power on the island.

## Using the Node Address

The node address is not saved. Instead, the NIM reads the address from the rotary switches each time that the island is powered up. For this reason, the rotary switches should *always* remain set to the node address. This way, the fieldbus master will identify the island bus at the same node address at each power up.

**NOTE:** If your Profibus DP configuration software requires a slave address (*see page 112*), you will need to provide the island node address that you set with these rotary switches.

## Setting the Node Address

Instructions for setting the node address appear in the following table:

Step	Action	Comment
1	Select a node address that is currently available on your fieldbus network.	
2	With a small screwdriver, set the lower rotary switch to the position that represents the digit in the ones position of your node address.	For example, for a node address of 123, set the lower switch to 3.
3	With a small screwdriver, set the upper rotary switch to the position that represents the digit(s) in the tens position of your node address.	Using the example address 123, set the upper switch to 12. The rotary switches in the figure ( <i>see page 28</i> ) are correctly set to the example address 123.
4	Power up the island bus.	The NIM reads the rotary switch settings only during power up.

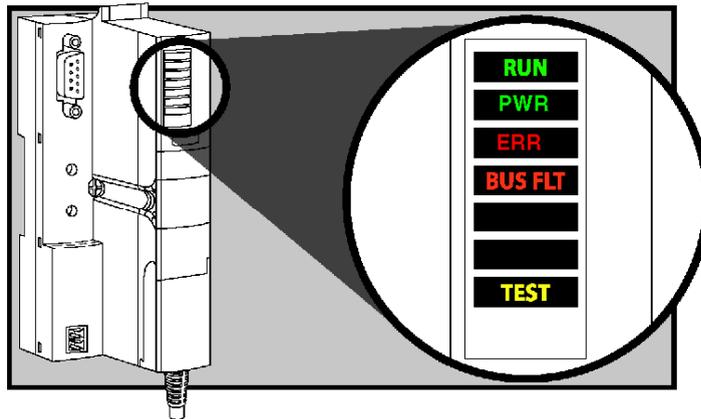
## LED Indicators

### LED Location

Five LEDs on the STB NDP 2212 visually indicate the operational status of the island bus (see page 15) on a Profibus DP network. The LED array is located at the top of the NIM's front bezel:

- LED 4 (BUS FLT) (see page 30) indicates the status of data exchange (see page 59) between the Profibus DP fieldbus master and the Advantys STB island bus.
- LEDs 1, 2,3, and 7 indicate activity and/or events on the NIM. (see page 31)
- LEDs 5 and 6 are not used.

The illustration shows the five LEDs used by the STB NDP 2212:



### Profibus DP Communications LED

The Profibus DP fieldbus master uses the red-colored LED 4 *BUS FLT* on the STB NDP 2212 to communicate whether or not it is currently engaged in data exchange with the Advantys STB island. The LED indications are as follows:

- on: The master is *not* in data exchange with the island bus because of an error on the fieldbus.
- off: The master is exchanging data with the island bus.

## Advantys STB Island Status LEDs

### About the Island Status LEDs

The following table describes:

- the island bus condition(s) communicated by the LEDs
- the colors and blink patterns used to indicate each condition

As you refer to the table, keep in mind the following:

- It is assumed that the *PWR* LED is on continuously, indicating that the NIM is receiving adequate power. If the *PWR* LED is off, logic power (*see page 39*) to the NIM is off or insufficient.
- Individual blinks are approximately 200 ms. There is a 1-second interval between blink sequences. Please note:
  - blinking: blinks steadily, alternating between 200 ms on and 200 ms off.
  - blink 1: blinks once (200 ms), then 1 second off.
  - blink 2: blinks twice (200 ms on, 200 ms off, 200 ms on), then 1 second off.
  - blink *N*: blinks *N* (some number of) times, then 1 second off.
  - If the *TEST* LED is on, either the Advantys configuration software or an HMI panel is the master of the island bus. If the *TEST* LED is off, the fieldbus master has control of the island bus.

### Island Status LED Indicators

RUN (green)	ERR (red)	TEST (yellow)	Meaning
blink: 2	blink: 2	blink: 2	The island is powering up (self test in progress).
off	off	off	The island is initializing. The island is not started.
blink: 1	off	off	The island has been put in the pre-operational state by the RST button. The island is not started.
		blink: 3	The NIM is reading from the removable memory card ( <i>see page 52</i> ).
		on	The NIM is overwriting its Flash memory with the card's configuration data. (See note 1.)
off	blink: 8	off	The contents of the removable memory card are invalid.
blinking (steady)	off	off	The NIM is configuring ( <i>see page 45</i> ) or auto-configuring ( <i>see page 48</i> ) the island bus. The island bus is not started.
blinking	off	on	Auto-configuration data is being written to Flash memory. (See note 1.)
blink: 3	blink: 2	off	Configuration mismatch detected after power up. At least one mandatory module does not match. The island bus is not started.

<b>RUN (green)</b>	<b>ERR (red)</b>	<b>TEST (yellow)</b>	<b>Meaning</b>
off	blink: 2	off	The NIM has detected a module assignment error; the island bus is not started.
	blink: 5		invalid internal triggering protocol
off	blink: 6	off	The NIM detects no I/O modules on the island bus.
	blinking (steady)	off	<p>The NIM detects no I/O modules on the island bus ... or ...</p> <p>No further communications with the NIM are possible. Probable causes:</p> <ul style="list-style-type: none"> <li>● internal condition</li> <li>● wrong module ID</li> <li>● device did not auto-address (<i>see page 46</i>)</li> <li>● mandatory module is incorrectly configured (<i>see page 130</i>)</li> <li>● process image is not valid</li> <li>● device is incorrectly configured (<i>see page 48</i>)</li> <li>● The NIM has detected an anomaly on the island bus.</li> <li>● receive/transmit queue software overrun</li> </ul>
on	off	off	The island bus is operational.
on	blink 3	off	At least one standard module does not match. The island bus is operational with a configuration mismatch.
on	blink: 2	off	There is a serious configuration mismatch (when a module is pulled from a running island). The island bus is now in pre-operational mode because of one or more mismatched mandatory modules.
blink: 4	off	off	The island bus is stopped (when a module is pulled from a running island). No further communications with the island are possible.
off	on	off	Internal condition: The NIM is inoperable.
[any]	[any]	on	Test mode is enabled: The configuration software or an HMI panel can set outputs. (See note 2.)
<p><b>1</b> The TEST LED is on temporarily during the Flash overwrite process.</p> <p><b>2</b> The TEST LED is on steadily while the device connected to the CFG port is in control.</p>			

### Power LED

The PWR (power) LED indicates whether or not the STB NIC 2212's internal power supplies are operating at the correct voltages. The PWR LED is directly driven by the STB NIC 2212's reset circuitry.

The following table summarizes the PWR LED states:

<b>Label</b>	<b>Pattern</b>	<b>Meaning</b>
PWR	Steady on	The STB NIC 2212 internal voltages are all at or above their minimum voltage level.
PWR	Steady off	One or more of the STB NIC 2212 internal voltages is below minimum voltage level.

## The CFG Interface

### Purpose

The CFG port is the connection point to the island bus for either a computer running the Advantys Configuration Software or an HMI panel.

### Physical Description

The CFG interface is a front-accessible RS-232 interface located behind a hinged flap on the bottom front of the NIM:



The port uses an 8-pin HE-13 (male) connector.

### Port Parameters

The CFG port supports the set of communication parameters listed in the following table. If you want to apply any settings other than the factory default values, you must use the Advantys Configuration Software:

Parameter	Valid Values	Factory Default Settings
bit rate (baud)	2400/4800/9600/19200/ 38400/ 57600	9600
data bits	7/8	8
stop bits	1 or 2	1
parity	none / odd / even	even
Modbus communications mode	RTU	RTU

**NOTE:** To restore all of the CFG port's communication parameters to their factory default settings, push the RST button (*see page 55*) on the NIM. Be aware, however, that this action overwrites all of the island's current configuration values with factory default values.

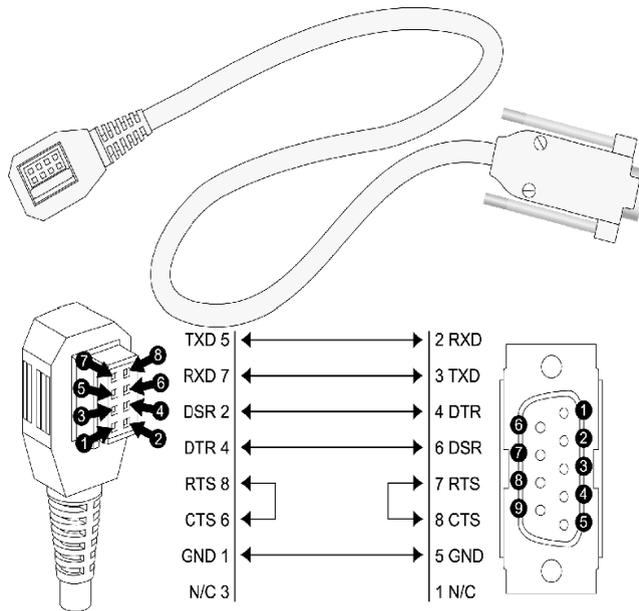
If you want to retain your configuration and still use the RST button to reset your port parameters, write the configuration to an STB XMP 4440 removable memory card (*see page 49*) and insert the card in its drawer in the NIM.

You can also password-protect a configuration (*see page 140*). If you do this, however, the RST button is disabled and you are unable to use it to reset the port parameters.

## Connections

An STB XCA 4002 programming cable must be used to connect the computer running the Advantys Configuration Software or a Modbus-capable HMI panel to the NIM through the CFG port.

The STB XCA 4002 is a 2 m (6.23 ft) shielded, twisted-pair cable with an 8-receptacle HE-13 (female) connector on one end that plugs into the CFG port and a 9-receptacle SUB-D (female) connector on the other end that plugs into a computer or an HMI panel:



**TXD** transmit data  
**RXD** receive data  
**DSR** data set ready  
**DTR** data terminal ready  
**RTS** request to send  
**CTS** clear to send  
**GND** ground reference  
**N/C** not connected

The following table describes the specifications for the programming cable:

<b>Parameter</b>	<b>Description</b>
model	STB XCA 4002
function	connection to a device running the Advantys Configuration Software
	connection to an HMI panel
communications protocol	Modbus, either RTU or ASCII mode
cable length	2 m (6.23 ft)
cable connectors	<ul style="list-style-type: none"> <li>● 8-receptacle HE-13 (female)</li> <li>● 9-receptacle SUB-D (female)</li> </ul>
cable type	multiconductor

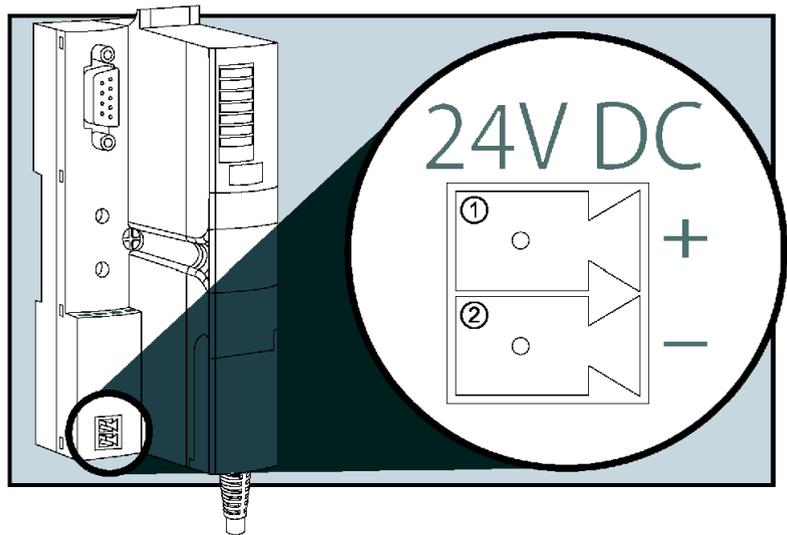
## The Power Supply Interface

### Introduction

The NIM's built-in power supply requires 24 VDC from an external SELV-rated power source. The connection between the 24 VDC source and the island is the two-receptacle connector illustrated below.

### Physical Description

Power from the external 24 VDC supply comes in to the NIM via a two-receptacle connector located at the bottom left of the module:

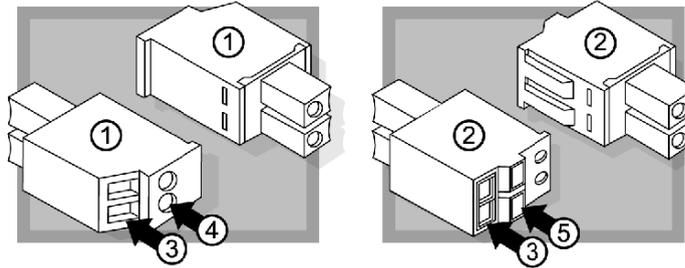


- 1 receptacle 1—24 VDC
- 2 receptacle 2—common

### Connectors

Screw-type and spring-type connectors are provided with the NIM. Replacement connectors are also available.

The following illustrations show two views of each power connector type. A front and back view of the STB XTS 1120 screw type connector is shown on the left, and a front and back view of the STB XTS 2120 spring clamp connector is shown on the right:



- 1 STB XTS 1120 screw-type power connector
- 2 STB XTS 2120 spring clamp power connector
- 3 wire entry slot
- 4 screw clamp access
- 5 spring clamp actuation button

Each entry slot accepts a wire in the range 0.14 to 1.5 mm<sup>2</sup> (28 to 16 AWG).

## Logic Power

### Introduction

Logic power is a 5 VDC power signal on the island bus that the I/O modules require for internal processing. The NIM has a built-in power supply that provides logic power. The NIM sends the 5 V logic power signal across the island bus to support the modules in the primary segment.

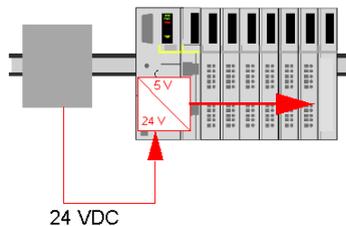
### External Source Power

<b>⚠ CAUTION</b>
<b>IMPROPER GALVANIC ISOLATION</b>
The power components are not galvanically isolated. They are intended for use only in systems designed to provide SELV isolation between the supply inputs or outputs and the load devices or system power bus. You must use SELV-rated supplies to provide 24 VDC source power to the NIM.
<b>Failure to follow these instructions can result in injury or equipment damage.</b>

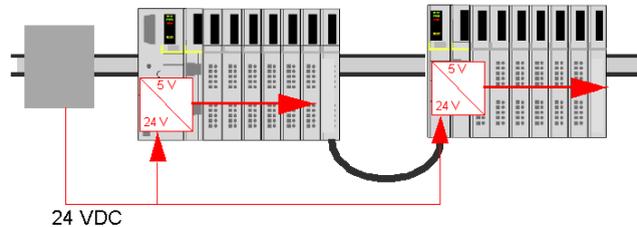
Input from an external 24 VDC power supply (*see page 41*) is needed as the source power for the NIM's built-in power supply. The NIM's built-in power supply converts the incoming 24 V to 5 V of logic power. The external supply must be rated *safety extra low voltage* (SELV-rated).

### Logic Power Flow

The figure below shows how the NIM's integrated power supply generates logic power and sends it across the primary segment:



The figure below shows how the 24 VDC signal is distributed to an extension segment across the island:



The logic power signal is terminated in the STB XBE 1100 module at the end of the segment (EOS).

### Island Bus Loads

The built-in power supply provides logic bus current to the island. If the logic bus current drawn by the I/O modules exceeds the available current, install additional STB power supplies to support the load. Consult the *Advantys STB System Planning and Installation Guide* for the current provided and consumed by Advantys STB modules at various operating temperatures and voltages.

## Selecting a Source Power Supply for the Island's Logic Power Bus

### Logic Power Requirements

An external 24 VDC power supply is needed as the source for logic power to the island bus. The external power supply connects to the island's NIM. This external supply provides the 24 V input to the built-in 5 V power supply in the NIM.

The NIM delivers the logic power signal to the primary segment only. Special STB XBE 1300 beginning-of-segment (BOS) modules, located in the first slot of each extension segment, have their own built-in power supplies, which provide logic power to the STB I/O modules in the extension segments. Each BOS module that you install requires 24 VDC from an external power supply.

### Characteristics of the External Power Supply

#### CAUTION

##### IMPROPER GALVANIC ISOLATION

The power components are not galvanically isolated. They are intended for use only in systems designed to provide SELV isolation between the supply inputs or outputs and the load devices or system power bus. You must use SELV-rated supplies to provide 24 VDC source power to the NIM.

**Failure to follow these instructions can result in injury or equipment damage.**

The external power supply needs to deliver 24 VDC source power to the island. The supply that you select can have a low range limit of 19.2 VDC and a high range limit of 30 VDC. The external supply must be rated *safety extra low voltage* (SELV-rated).

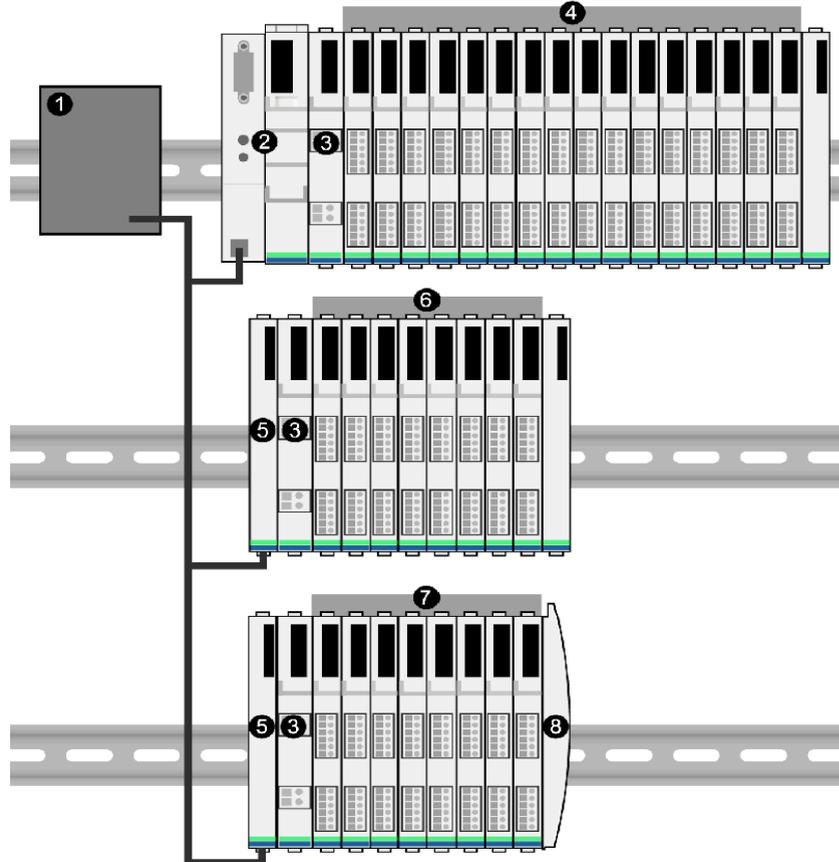
The SELV rating means that, in addition to basic insulation between hazardous voltages and the DC output, a second supplementary insulation layer has been added. As a result, if a single component/insulation does not perform, the DC output does not exceed SELV limits.

### Calculating the Wattage Requirement

The amount of power (*see page 39*) that the external power supply must deliver is a function of the number of modules and the number of built-in power supplies installed on the island.

The external supply needs to provide 13 W of power for the NIM and 13 W for each additional STB power supply (like an STB XBE 1300 BOS module). For example, a system with one NIM in the primary segment and one BOS module in an extension segment would require 26 W of power.

Here is an example of an extended island:



- 1 24 VDC source power supply
- 2 NIM
- 3 PDM
- 4 primary segment I/O modules
- 5 BOS module
- 6 first extension segment I/O modules
- 7 second extension segment I/O modules
- 8 island bus terminator plate

The extended island bus contains three built-in power supplies:

- the supply built into the NIM, which resides in the leftmost location of the primary segment
- a power supply built into each of the STB XBE 1300 BOS extension modules, which reside in the leftmost location of the two extension segments

In the figure, the external supply would provide 13 W of power for the NIM plus 13 W for each of the two BOS modules in the extension segments (for a total of 39 W).

**NOTE:** If the 24 VDC source power supply also supplies field voltage to a power distribution module (PDM), you must add the field load to your wattage calculation. For 24 VDC loads, the calculation is simply *amps x volts = watts*.

### **Suggested Devices**

The external power supply is generally enclosed in the same cabinet as the island. Usually the external power supply is a DIN rail-mountable unit.

We recommend using ABL8 Phaseo power supplies.

## Module Specifications

### Specifications Detail

The general specifications for the STB NDP 2212, which is the Profibus DP network interface module (NIM) for an Advantys STB island bus, appear in the table:

General Specifications		
dimensions	width	40.5 mm (1.594 in)
	height	130 mm (4.941 in)
	depth	70 mm (2.756 in)
interface connectors	to the Profibus DP network	nine-receptacle SUB-D connector
	RS-232 port for device running the Advantys configuration software or HMI panel	eight-receptacle HE-13
	to the external 24 VDC power supply	two-receptacle
built-in power supply	input voltage	24 VDC nominal
	input power range	19.2 ... 30 VDC
	internal current supply	400 mA @ 24 VDC, consumptive
	output voltage to the island bus	5 VDC
	output current rating	1.2 A @ 5 VDC
	isolation	no internal isolation <b>Isolation must be provided by an external 24 VDC source power supply, which must be SELV- rated.</b>
addressable modules supported	per segment	16 maximum
	per island	32 maximum
segments supported	primary (required)	one
	extension (optional)	six maximum
standards	Profibus DP conformance	DIN 19245, Part 1, 3
	MTBF	200,000 hours GB (ground benign)
	electromagnetic compatibility (EMC)	EN 61131-2
storage temperature	-40 to 85° C	
operating temperature range*	0 to 60° C	
agency certifications	refer to the <i>Advantys STB System Planning and Installation Guide, 890 USE 171 00</i>	
*This product supports operation at normal and extended temperature ranges. Refer to the <i>Advantys STB System Planning and Installation Guide, 890 USE 171 00</i> for a complete summary of capabilities and limitations.		

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# How to Configure the Island

# 3

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## Introduction

The information in this chapter describes the auto-addressing and auto-configuration processes. An Advantys STB system has an auto-configuration capability in which the actual configuration of I/O modules on the island is read and saved to Flash.

The removable memory card is discussed in this chapter. The card is an Advantys STB option for storing configuration data offline. Factory default settings can be restored to the island bus I/O modules and the CFG port by engaging the RST button.

The NIM is the physical and logical location of all island bus configuration data and functionality.

## What's in this Chapter?

This chapter contains the following topics:

Topic	Page
How Do Modules Automatically Get Island Bus Addresses?	46
How to Auto-Configure Default Parameters for Island Modules	48
How to Install the STB XMP 4440 Optional Removable Memory Card	49
Using the STB XMP 4440 Optional Removable Memory Card to Configure the Island	52
What is the RST Button?	55
How to Overwrite Flash Memory with the RST Button	56

## How Do Modules Automatically Get Island Bus Addresses?

### Introduction

Each time that the island is powered up or reset, the NIM automatically assigns a unique island bus address to each module on the island that engages in data exchange. All Advantys STB I/O modules and preferred devices engage in data exchange and require island bus addresses.

### About the Island Bus Address

An island bus address is a unique integer value in the range 1 through 127 that identifies the physical location of each addressable module on the island. The NIM's address is always 127. Addresses 1 through 32 are available for I/O modules and other island devices.

During initialization, the NIM detects the order in which modules are installed and addresses them sequentially from left to right, starting with the first addressable module after the NIM. No user action is required to address these modules.

### Addressable Modules

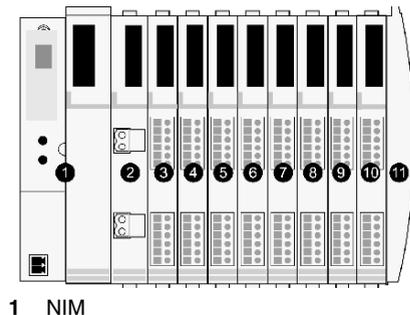
Advantys STB I/O modules and preferred devices are auto-addressable. Enhanced CANopen modules are not auto-addressable. They require manual address settings.

Because they do not exchange data on the island bus, the following are not addressed:

- bus extension modules
- PDMs such as the STB PDT 3100 and STB PDT 2100
- auxiliary power supplies, such as the STB CPS 2111
- termination plate

### An Example

For example, if you have an island bus with eight I/O modules:



1 NIM

- 2 STB PDT 3100 (24 VDC power distribution module)
- 3 STB DDI 3230 24 VDC (2-channel digital input module)
- 4 STB DDO 3200 24 VDC (2-channel digital output module)
- 5 STB DDI 3420 24 VDC (4-channel digital input module)
- 6 STB DDO 3410 24 VDC (4-channel digital output module)
- 7 STB DDI 3610 24 VDC (6-channel digital input module)
- 8 STB DDO 3600 24 VDC (6-channel digital output module)
- 9 STB AVI 1270 +/-10 VDC (2-channel analog input module)
- 10 STB AVO 1250 +/-10 VDC (2-channel analog output module)
- 11 STB XMP 1100 (island bus termination plate)

The NIM would auto-address it as follows. Note that the PDM and the termination plate do not consume island bus addresses:

Module	Physical Location	Island Bus Address
NIM	1	127
STB PDT 3100 PDM	2	not addressed: does not exchange data
STB DDI 3230 input	3	1
STB DDO 3200 output	4	2
STB DDI 3420 input	5	3
STB DDO 3410 output	6	4
STB DDI 3610 input	7	5
STB DDO 3600 output	8	6
STB AVI 1270 input	9	7
STB AVO 1250 output	10	8
STB XMP 1100 termination plate	11	not applicable

### Associating the Module Type with the Island Bus Location

As a result of the configuration process, the NIM automatically identifies physical locations on the island bus with specific I/O module types. This feature enables you to hot swap a non-operational module with a new module of the same type.

## How to Auto-Configure Default Parameters for Island Modules

### Introduction

All Advantys STB I/O modules are shipped with a set of predefined parameters that allow an island to be operational as soon as it is initialized. This ability of island modules to operate with default parameters is known as auto-configuration. Once an island bus has been installed, assembled, and successfully parameterized and configured for your fieldbus network, you can begin using it as a node on that network.

**NOTE:** A valid island configuration does not require the intervention of the optional Advantys Configuration Software.

### About Auto-Configuration

Auto-configuration occurs under these circumstances:

- The island is powered up with a factory default NIM configuration. (If this NIM is subsequently used to create a new island, auto-configuration does not occur when that new island is powered.)
- You push the RST button (*see page 55*).
- You force an auto-configuration using the Advantys Configuration Software.

As part of the auto-configuration process, the NIM checks each module and confirms that it has been properly connected to the island bus. The NIM stores the default operating parameters for each module in Flash memory.

### Customizing a Configuration

In a custom configuration, you can:

- customize the operating parameters of I/O modules
- create reflex actions (*see page 133*)
- add enhanced CANopen standard devices to the island bus
- customize other island capabilities
- configure communication parameters (STB NIP 2311 only)

## How to Install the STB XMP 4440 Optional Removable Memory Card

### Introduction

#### CAUTION

##### **LOSS OF CONFIGURATION: MEMORY CARD DAMAGE OR CONTAMINATION**

The card's performance can be degraded by dirt or grease on its circuitry. Contamination or damage may create an invalid configuration.

- Use care when handling the card.
- Inspect for contamination, physical damage, and scratches before installing the card in the NIM drawer.
- If the card does get dirty, clean it with a soft dry cloth.

**Failure to follow these instructions can result in injury or equipment damage.**

The STB XMP 4440 removable memory card is a 32-kbyte subscriber identification module (SIM) that lets you store (*see page 139*), distribute, and reuse custom island bus configurations. If the island is in edit mode and a removable memory card containing a valid island bus configuration is inserted in the NIM, the configuration data on the card overwrites the configuration data in Flash memory, and is adopted when the island starts up. When the island is in protected mode, it ignores the presence of a removable memory card.

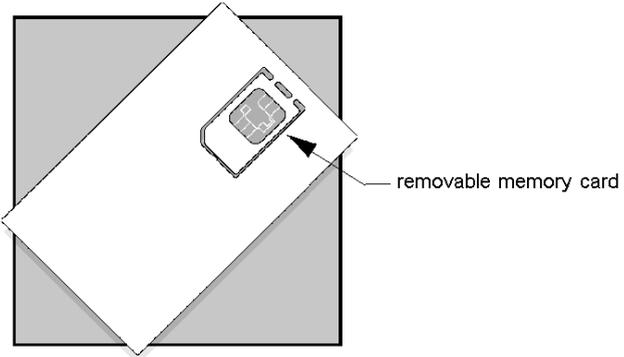
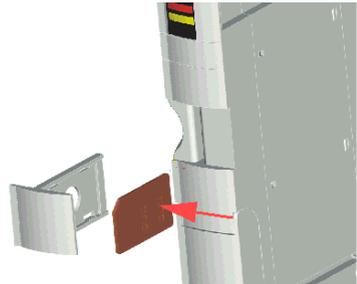
The removable memory card is an optional Advantys STB feature.

Remember:

- Keep the card free of contaminants and dirt.
- Network configuration data, such as the fieldbus baud setting, cannot be saved to the card.

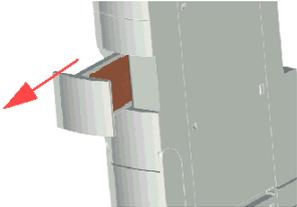
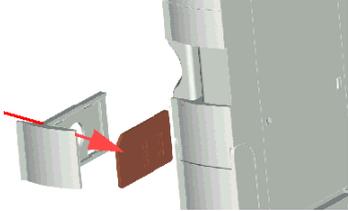
## Installing the Card

Use the following procedure to install the memory card:

Step	Action
1	<p>Punch out the removable memory card from the plastic card on which it is shipped.</p>  <p>removable memory card</p> <p>Make sure that the edges of the card are smooth after you punch it out.</p>
2	<p>Open the card drawer on the front of the NIM. If it makes it easier for you to work, you may pull the drawer completely out from the NIM housing.</p>
3	<p>Align the chamfered edge (the 45° corner) of the removable memory card with the one in the mounting slot in the card drawer. Hold the card so that the chamfer is in the upper left corner.</p> 
4	<p>Seat the card in the mounting slot, applying slight pressure to the card until it snaps into place. The back edge of the card must be flush with the back of the drawer.</p>
5	<p>Close the drawer.</p>

## Removing the Card

Use the following procedure to remove the memory card from the NIM. As a handling precaution, avoid touching the circuitry on the card.

Step	Action
1	Open the card drawer. 
2	Push the removable memory card out of the drawer through the round opening at the back. Use a soft but firm object like a pencil eraser. 

## Using the STB XMP 4440 Optional Removable Memory Card to Configure the Island

### Introduction

A removable memory card is read when an island is powered on or during a reset operation. If the configuration data on the card is valid, the current configuration data in Flash memory is overwritten.

A removable memory card can be *active* only if an island is in *edit* mode. If an island is in protected mode (*see page 140*), the card and its data are ignored.

### Configuration Scenarios

The following discussion describes several island configuration scenarios that use the removable memory card. (The scenarios assume that a removable memory card is already installed in the NIM.):

- initial island bus configuration
- replace the current configuration data in Flash memory in order to:
  - apply custom configuration data to your island
  - temporarily implement an alternative configuration; for example, to replace an island configuration used daily with one used to fulfill a special order
- copying configuration data from one NIM to another, including from a non-operational NIM to its replacement; the NIMs must have the same part number
- configuring multiple islands with the same configuration data

**NOTE:** Whereas writing configuration data *from* the removable memory card to the NIM does not require use of the optional Advantys Configuration Software, you must use this software to save (write) configuration data *to* the removable memory card in the first place.

### Edit Mode

Your island bus must be in edit mode to be configured. In edit mode, the island bus can be written to as well as monitored.

Edit mode is the default operational mode for the Advantys STB island:

- A new island is in edit mode.
- Edit mode is the default mode for a configuration downloaded from the Advantys Configuration Software to the configuration memory area in the NIM.

## Initial Configuration and Reconfiguration Scenarios

Use the following procedure to set up an island bus with configuration data that was previously saved (*see page 139*) to a removable memory card. You can use this procedure to configure a new island or to overwrite an existing configuration. (**NOTE:** The use of this procedure destroys your existing configuration data.)

Step	Action	Result
1	Install the removable memory card in its drawer in the NIM ( <i>see page 49</i> ).	
2	Power on the new island bus.	The configuration data on the card is checked. If the data is valid, it is written to Flash memory. The system restarts automatically, and the island is configured with this data. If the configuration data is invalid, it is not used and the island bus stops. If the configuration data was in edit mode, the island bus remains in edit mode. If the configuration data on the card was password-protected ( <i>see page 140</i> ), your island bus enters protected mode at the end of the configuration process. <b>NOTE:</b> If you are using this procedure to reconfigure an island bus and your island is in protected mode, you can use the configuration software to change the island's operational mode to edit.

## Using the Card and the RST Function to Reconfigure an Island

You can use a removable memory card in combination with the RST function to overwrite the island's current configuration data. The configuration data on the card can contain custom configuration features. Using the data on the card, you can add password protection to your island, change the I/O module assembly, and change the user-modifiable CFG port settings (*see page 34*). *Using this procedure destroys your existing configuration data.*

Step	Action	Comment
1	Place the island bus in edit mode.	If your island is in protected mode, you can use the configuration software to change the island's operational mode to <i>edit</i> .
2	Press the <b>RST</b> button for at least two seconds.	If your configuration data was in edit mode, the island bus remains in edit mode. If the configuration data on the card was protected, your island bus enters protected mode at the end of the configuration process.

### **Configuring Multiple Island Buses with the Same Data**

You can use a removable memory card to make a copy of your configuration data; then use the card to configure multiple island buses. This capability is particularly advantageous in a distributed manufacturing environment or for an OEM (original equipment manufacturer).

**NOTE:** The island buses may be either new or previously configured, but the NIMs must all have the same part number.

## What is the RST Button?

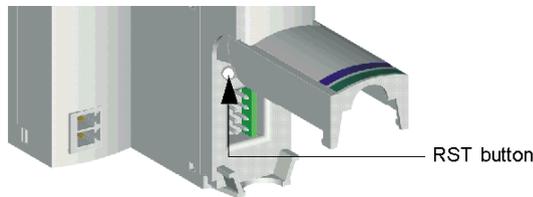
### Summary

The RST function is basically a Flash memory overwriting operation. This means that RST is functional only after the island has been successfully configured at least once. All RST functionality is performed with the RST button, which is enabled only in edit mode (*see page 52*).

### Physical Description

<b>⚠ CAUTION</b>
<b>UNINTENDED EQUIPMENT OPERATION/CONFIGURATION OVERWRITE—RST BUTTON</b>
Do not attempt to restart the island with the RST button. Pushing the RST button reconfigures the island with default settings (no custom parameters).
<b>Failure to follow these instructions can result in injury or equipment damage.</b>

The RST button is located immediately above the CFG port (*see page 34*), and behind the same hinged cover:



Holding down the RST button for 2 seconds or longer causes Flash memory to be overwritten, resulting in a new configuration for the island.

If the island is already auto-configured, there is no consequence other than the island stops during the configuration process. However, island parameters that you previously customized with the Advantys Configuration Software are overwritten by default parameters during the configuration process.

### Engaging the RST Button

To engage the RST button, it is recommended that you use a small screwdriver with a flat blade no wider than 2.5 mm (.10 in). Do not use a sharp object that might damage the RST button, nor a soft item like a pencil that might break off and jam the button.

## How to Overwrite Flash Memory with the RST Button

### Introduction

#### CAUTION

##### **UNINTENDED EQUIPMENT OPERATION/CONFIGURATION DATA OVERWRITTEN—RST BUTTON**

Do not attempt to restart the island by pushing the RST button. Pushing the RST button (*see page 55*) causes the island bus to reconfigure itself with factory default operating parameters.

**Failure to follow these instructions can result in injury or equipment damage.**

The RST function allows you to reconfigure the operating parameters and values of an island by overwriting the current configuration in Flash memory. RST functionality affects the configuration values associated with the I/O modules on the island, the operational mode of the island, and the CFG port parameters.

The RST function is performed by holding down the RST button (*see page 55*) for at least two seconds. The RST button is enabled only in edit mode. In protected mode (*see page 140*), the RST button is disabled; pressing it has no effect.

**NOTE:** Pressing the RST button does not affect network settings.

### RST Configuration Scenarios

The following scenarios describe some of the ways that you can use the RST function to configure your island:

- Restore factory-default parameters and values to an island, including to the I/O modules and the CFG port (*see page 34*).
- Add a new I/O module to a previously auto-configured (*see page 48*) island. If a new I/O module is added to the island, pressing the RST button forces the auto-configuration process. The updated island configuration data is automatically written to Flash memory.

## Overwriting Flash Memory with Factory Default Values

The following procedure describes how to use the RST function to write default configuration data to Flash memory. Follow this procedure if you want to restore default settings to an island. This is also the procedure to use to update the configuration data in Flash memory after you add an I/O module to a previously auto-configured island bus. *Because this procedure overwrites the configuration data, you may want to save your existing island configuration data to a removable memory card before pushing the RST button.*

Step	Action
1	If you have a removable memory card installed, remove it ( <i>see page 51</i> ).
2	Place the island in edit mode ( <i>see page 52</i> ).
3	Hold the RST button ( <i>see page 55</i> ) down for at least two seconds.

## The Role of the NIM in this Process

The NIM reconfigures the island bus with default parameters as follows:

Stage	Description
1	The NIM auto-addresses ( <i>see page 46</i> ) the I/O modules on the island and derives their factory-default configuration values.
2	The NIM overwrites the current configuration in Flash memory with configuration data that uses the factory-default values for the I/O modules.
3	It resets the communication parameters on its CFG port to their factory-default values ( <i>see page 34</i> ).
4	It re-initializes the island bus and brings it into operational mode.



---

# Fieldbus Communications Support

# 4

---

## Introduction

The information in this chapter describes how the Profibus DP master sets up communications between itself and an Advantys STB island. The chapter describes the parameterization, configuration, and diagnostics services that are performed in order to configure the Advantys STB island bus as a node on a Profibus DP network.

To communicate with an Advantys STB island, the Profibus DP master sends output data across its network to the STB NDP 2212 NIM. The STB NDP 2212 transfers this output data from the master across the island bus to the destination output modules. The STB NDP 2212 will collect input data from the island bus I/O modules. The input data is transmitted in bit-packed format over the Profibus DP network to the fieldbus master.

## What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Setting Up Communications with the Island Bus	60
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Check_Configuration Service	64
Exchanging Data with the Profibus DP Fieldbus Master	69
Global_Command Service	80
The Profibus DP Diagnostics Service	81
Standard Mandatory Profibus DP Data in the Diagnostics Service	85
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Enabling Channel-related Data in the Profibus DP Diagnostics Service	95
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## Setting Up Communications with the Island Bus

### Introduction

The following information describes how the fieldbus master parameterizes and configures the island bus node for communications over a Profibus DP network.

### Set-Up Process Overview

After power on, Profibus DP uses the following process to establish network communications with the Advantys STB island bus:

Stage	Description	Standard SAP/Comments
1	The Profibus DP master sends a diagnostic request to the STB NDP 2212. The purpose of the request is to verify that the island bus is alive, on the network, and not assigned to another master.	
2	The STB NDP 2212 acknowledges its network presence and its availability in a diagnostics response ( <i>see page 81</i> ).	<b>Note: Any time after the successful completion of this stage, the STB NDP 2212 can initiate the diagnostics service to notify the master that it has status information to report.</b>
3	The Profibus DP master transmits standard parameter-setting data ( <i>see page 62</i> ) that establishes the fieldbus master's identity for the island bus and the identity of the island bus as a node on this particular Profibus DP network.	set_parameter
4	The STB NDP 2212 sends a response, confirming that the parameter data was received and that there are no transmission errors.	
5	The Profibus DP master issues a command causing the STB NDP 2212 to compare the actual island bus configuration ( <i>see page 64</i> ) to the configuration in the master's configuration file. The STB NDP 2212 acknowledges receipt of the transmission.	check_configuration

Stage	Description	Standard SAP/Comments
6	Profibus DP sends a diagnostic request inquiring whether or not the STB NDP 2212 will accept the parameter and configuration data.	
7	<p>The STB NDP 2212 response indicates whether or not the parameterization and the configuration are OK.</p> <p>The following conditions will cause the STB NDP 2212 to reject a configuration and send an error response to the master:</p> <ul style="list-style-type: none"> <li>● module is absent</li> <li>● address-assignment error</li> <li>● configuration error with a mandatory module</li> </ul>	<p><b>Note:</b> The master can use the get_configuration SAP to read the actual island bus configuration data.</p>
8	The Profibus DP master will allow data exchange ( <i>see page 69</i> ) to begin after the STB NDP 2212 accepts the parameter and configuration data.	<p>write_read data</p> <p><b>Note:</b> Profibus DP also uses the read_inputs and read_outputs SAPs in its communications with the island bus.</p>

## Set\_Parameter Service

### Introduction

The Set\_Parameter service is the first setup routine that the Profibus DP master performs when configuring a node on its network. Using this service, Profibus DP specifies how a node must operate on the Profibus DP network on which it resides. During the service, the Profibus DP master identifies itself to the node and establishes the node's network identity.

### Service Description

The Set\_Parameter SAP contains communication parameters, expected functions (e.g., how diagnostics will be handled), a unique vendor identification code for the STB NDP 2212 NIM, and other STB NDP 2212-related parameters.

Profibus DP allows a maximum of 244 parameter data bytes. This number comprises Profibus DP standard data bytes and vendor-specific data bytes.

Schneider Electric's Advantys STB system uses a total of eight data bytes. The first seven bytes are mandatory, as defined by Profibus DP Standard, DIN 19245, Part 3. The eighth byte is specific to Advantys STB. All eight bytes are transmitted as part of the Profibus DP parameterization service for the island.

### About the Profibus DP Data Format

In any Profibus DP data byte, bit 7 is the most significant bit (MSB) and bit 0 is the least significant bit (LSB).

### Mandatory Parameterization Data

All seven of the Profibus DP mandatory data bytes are described in the following table:

Byte	Value	Description
0	—	station_status (see Profibus DP standard)
1	0 ... 255	watchdog factor 1
2	0 ... 255	watchdog factor 2
3	11 ... 255	minimum response time (for Profibus DP)
4	06	Profibus DP identification no. for the STB NDP 2212 (high byte)
5	40	Profibus DP identification no. for the STB NDP 2212 (low byte)
6	—	group assignment (see Profibus DP standard)

## Advantys STB Island Parameterization Data

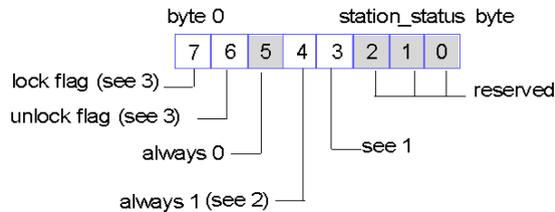
The following table shows that Schneider Electric reserves byte 7 for its own Advantys STB parameter data:

Byte	Value	Description
7	—	reserved for Advantys STB parameter data

**NOTE:** During parameterization, byte 7 is transferred and analyzed as the data for the island bus. This byte contains information about start bit monitoring, stop bit monitoring, and the base time for the watchdog timer.

## First Mandatory Parameter Byte

The following figure illustrates byte 0, the station\_status byte. The station\_status byte is the first Profibus DP mandatory parameter data byte:



- 1 A value of 1 in bit 3 means that the watchdog timer is enabled for the Advantys STB island bus.
- 2 Bit 4 is always set to 1 because Freeze mode is supported.
- 3 Bits 6 and 7 are set by the fieldbus master.

## Check\_Configuration Service

### Summary

The purpose of the Check\_Configuration service is to compare the *actual* island bus configuration to the configuration data for the island in the master's configuration file. The Check\_Configuration service is performed after the Set\_Parameter SAP (see page 62) completes successfully.

### Service Description

Upon receipt of a Check\_Configuration request from the master, the STB NDP 2212 NIM performs a comparison between the actual and the anticipated configurations. The actual configuration is the island's configuration at power on. If a mismatch exists, the STB NDP 2212 will reject the configuration data at the next diagnostic request from the master.

**NOTE:** Keep in mind that data exchange (see page 69) is not possible as long as the actual configuration and the configuration specified by the master do not match.

### Advantys STB Module Data Format

An Advantys STB data module on a Profibus DP network must contain the following types of bytes in the sequence listed:

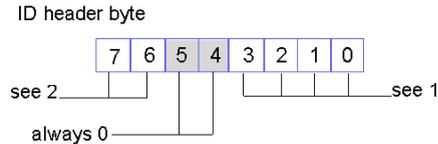
- ID header byte
- length bytes
- vendor-specific byte

The tabular information and the illustrations that follow describe how I/O data must be formatted for a Profibus DP environment. Note that the vendor-specific data will be unique to Schneider Electric:

Special	previous ID	ID header	length of outputs	length of inputs	vendor-specific data	next ID
Configuration ID		x x 0 0 x x x x	only if outputs	only if inputs	00 ... FF <sub>hex</sub>	

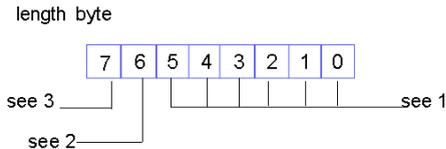
## ID Header Byte Data Format

The following figure illustrates the ID header byte. Bit 4 and bit 5 are set to 0, signifying that this is a *special* module according to the Profibus DP standard. Note that the values for bits 6 and 7 depend on whether the length byte that follows the ID header is an output byte or an input byte:



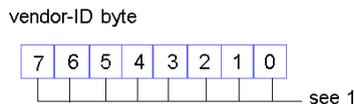
- 1 00 dec (0 hex) = no. of vendor-specific data, 14dec (Ehex) = 14 bytes of vendor-specific data.
- 2 Bits 6 and 7 are used in combination. The values of these bits are determined by the following byte. Bits 6 and 7 are both set to 0, i.e., 0 0, if an empty module (no input or output configuration data) follows; Bit 6 is set to 1 and bit 7 is set to 0, i.e., 0 1, if one length byte for inputs follows; Bit 6 is set to 0 and bit 7 is set to 1, i.e., 1 0, if one length byte for outputs follows; bits 6 and 7 are both set to 1, i.e., 1 1, if one length byte of outputs and one length of inputs follow.

The length byte, shown below, immediately follows the ID header byte. The length byte represents the size of an output or the size of an input. The size can be in units of either a byte or a word (two bytes). Consistency (*see page 66*) information for the data is stored in bit 7. Consistency can be either over the entire module or over the unit, as represented in bit 6:



- 1 The values in bits 0 ... 5 represent the number of configured data (inputs/outputs): 00dec (00hex) = 1 unit (byte/word); 63dec (3Fhex) = 64 unit (byte/word).
- 2 A value of 1 in bit 6 means that the unit is a word; a value of 0 means that the unit is a byte.
- 3 A value of 1 in bit 7 means that consistency is over the module (i.e., the entire data block); a value of 0 means that consistency is over a unit (byte or word).

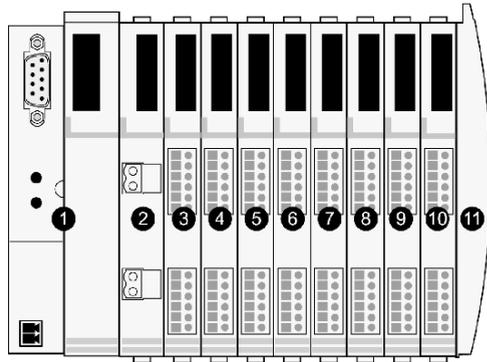
The vendor-specific byte follows the length byte(s):



- 1 vendor-specific ID: defined by the vendor: 00 ... 255 dec (00 ... FFhex)

### Sample Island Configuration

Now we will apply the configuration formatting information described above (see page 64) to the sample island bus assembly as shown in the following figure:



- 1 NIM
- 2 STB PDT 3100 24 VDC power distribution module
- 3 STB DDI 3230 24 VDC two-channel digital input module
- 4 STB DDO 3200 24 VDC two-channel digital output module
- 5 STB DDI 3420 24 VDC four-channel digital input module
- 6 STB DDO 3410 24 VDC four-channel digital output module
- 7 STB DDI 3610 24 VDC six-channel digital input module
- 8 STB DDO 3600 24 VDC six-channel digital output module
- 9 STB AVI 1270 +/-10 VDC two-channel analog input module
- 10 STB AVO 1250 +/-10 VDC two-channel analog output module
- 11 STB XMP 1100 island bus termination plate

The I/O modules in the sample island configuration have the following addresses:

I/O Model	Module Type	Island Bus Address
STB DDI 3230	two-channel digital input	1
STB DDO 3200	two-channel digital output	2
STB DDI 3420	four-channel digital input	3
STB DDO 3410	four-channel digital output	4
STB DDI 3610	six-channel digital input	5
STB DDO 3600	six-channel digital output	6
STB AVI 1270	two-channel analog input	7
STB AVO 1250	two-channel analog output	8

### Configuration Telegram for the Sample Island

A configuration telegram (packet) is used to transmit the configuration data recorded in the master's configuration file.

The following table represents the configuration telegram for the I/O modules in the sample island bus assembly above (see page 66). Note that the first byte (identification byte) for each module describes all of that module's bytes; information about the number of configured bytes and consistency is included in the second byte:

Identifier Byte	Value	Description
DDI 3230		
1	41h	identification byte, one length byte for inputs (see 1), module-specific byte
2	00h	one byte input, consistency over one byte
3	01h	module ID
DDO 3200		
1	C1h	identification byte, one length byte for outputs + one length byte for inputs (see 1), module-specific byte
2	00h	one byte output, consistency over one byte
3	00h	one byte input, consistency over one byte
4	08h	module ID
DDI 3420		
1	41h	identification byte, one length byte for inputs (see 1), module-specific byte
2	00h	one byte input, consistency over one byte
3	09h	module ID
DDO 3410		
1	C1h	identification byte, one length byte for outputs + one length byte for inputs (see 1), module-specific byte
2	00h	one byte output, consistency over one byte
3	00h	one byte input, consistency over one byte
4	0Ah	module ID
DDI 3610		
1	41h	identification byte, one length byte for inputs (see 1), module-specific byte
2	01h	two bytes input, consistency over one byte
3	03h	module ID
DDO 3600		
1	C1h	identification byte, one length byte for outputs + one length byte for inputs (see 1), module-specific byte
2	00h	one byte output, consistency over one byte
3	01h	two bytes input, consistency over one byte

Identifier Byte	Value	Description
4	10h	module ID
AVI 1270		
1	41h	identification byte, one length byte for inputs (see 1), module-specific byte
2	42h	three words of input, consistency over one word
3	40h	module ID
AVO 1250		
1	C1h	identification byte, one length byte for outputs + one length byte for inputs (see 1), module-specific byte
2	41h	two words output, consistency over one word
3	40h	one word input data, consistency over one word
4	4Ah	module ID
1 input is status and echo output data.		

## Exchanging Data with the Profibus DP Fieldbus Master

### Introduction

Data exchange between the island and the fieldbus master works cyclically. Data from the Profibus DP master is written to the output data image area in the NIM's process image. Status and input data information from the I/O modules on the island are then placed in the input data image area of the process image, where they can be read by the Profibus DP master.

### Data and Status Objects

Data exchange between the island and the fieldbus master involves three types of objects:

- *data* objects, which are operating values that the Profibus DP master either reads from the input modules or writes to the output modules
- *status* objects, which are module health records sent to the input process image by all the I/O modules and read by the Profibus DP master
- *echo output data* objects, which the digital output modules send to the input process image; these objects are usually a copy of the data objects, but they can contain useful information if a digital output channel is configured to handle the result of a reflex action

The following table shows the relationship between the different object types and the different module types. It also shows the size of the different objects:

Module Type		Objects in the Input Data Image		Objects in the Output Data Image	
		Objects	Size	Objects	Size
digital input—(8 pt or less)		data	1 byte or less		
		status <sup>1</sup>	1 byte or less		
digital output—(8 pt or less)		echo output data	1 byte or less	data	1 byte or less
		status <sup>1</sup>	1 byte or less		
analog input— (16-bit resolution)	channel 1	data	2 bytes		
		status	1 byte		
	channel 2	data	2 bytes		
		status	1 byte		
analog output— (16-bit resolution)	channel 1	status	1 byte	data	2 bytes
	channel 2	status	1 byte	data	2 bytes

<sup>1</sup>Status information is not available for every module. For the applicable digital modules, check the *Advantys STB Digital I/O Modules Reference Guide* (890 USE 171 00).

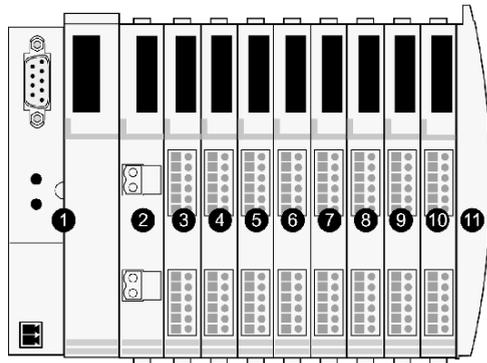
## Bit-packing Rules

Bit-packing allows bits associated with the objects for each I/O module to be combined in the same byte whenever possible. The following rules apply:

- Bit-packing follows the addressing order of the island bus I/O modules, from left to right starting with the primary segment.
- Each Profibus DP byte contains information (i.e., objects) for only a single module.
- The data object (or echo output data object) for a specific module precedes the status object for that module.
- The data object and the status object for a specific digital I/O module may be packed in the same byte, if the size of the combined objects is eight bits or less.
- If the combination of objects for a single module requires more than eight bits, the two objects will be placed in separate contiguous bytes.
- For analog input modules, channel 1 data is followed immediately by channel 2 data, then channel 1 status and channel 2 status.

## A Data Exchange Example

The following example illustrates how data and status objects are exchanged. A sample island comprising 10 modules and a termination plate is the basis of the example:



- 1 the network interface module
- 2 a 24 VDC power distribution module
- 3 STB DDI 3230 24 VDC two-channel digital input module
- 4 STB DDO 3200 24 VDC two-channel digital output module
- 5 STB DDI 3420 24 VDC four-channel digital input module
- 6 STB DDO 3410 24 VDC four-channel digital output module
- 7 STB DDI 3610 24 VDC six-channel digital input module
- 8 STB DDO 3600 24 VDC six-channel digital output module
- 9 STB AVI 1270 +/-10 VDC two-channel analog input module
- 10 STB AVO 1250 +/-10 VDC two-channel analog output module
- 11 the island bus termination plate

The I/O modules have the following island bus addresses:

I/O Model	Module Type	Island Bus Address
STB DDI 3230	two-channel digital input	1
STB DDO 3200	two-channel digital output	2
STB DDI 3420	four-channel digital input	3
STB DDO 3410	four-channel digital output	4
STB DDI 3610	six-channel digital input	5
STB DDO 3600	six-channel digital output	6
STB AVI 1270	two-channel analog input	7
STB AVO 1250	two-channel analog output	8

The PDM and the termination plate do not consume island bus addresses (see page 46), nor do they exchange data or status objects with the fieldbus master.

## Output Data Objects

First let's look at an output data exchange. The Profibus DP master writes data objects over the fieldbus to the NIM so that it can update the output modules on the island bus. Data objects are sent as a series of bytes, where bit 7 is the most significant bit (MSB) and bit 0 is the least significant bit (LSB):

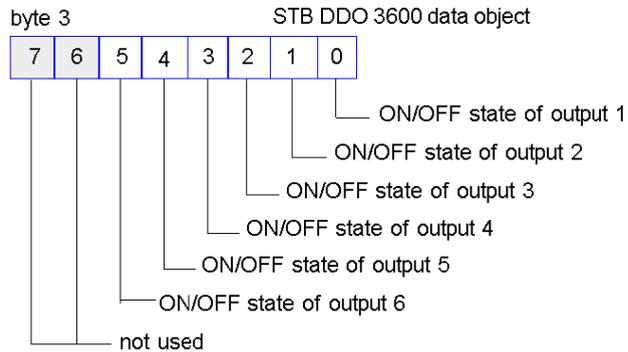
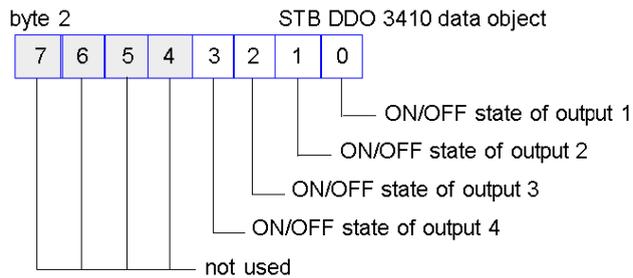
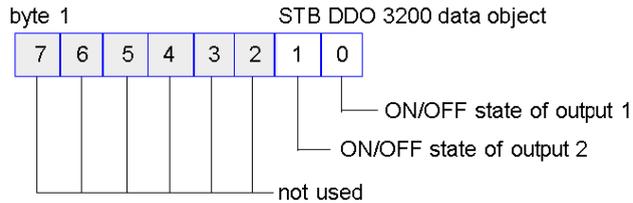


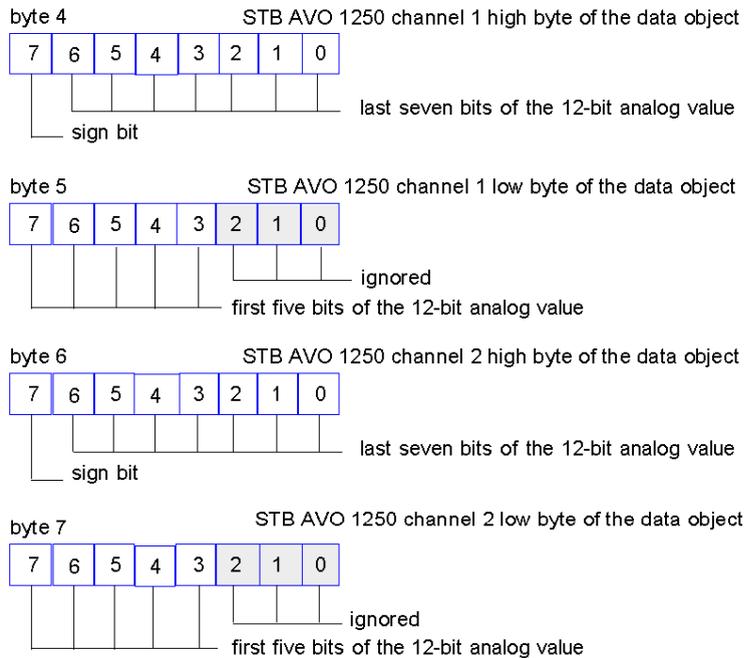
For digital output modules, the data is represented as Boolean 1s or 0s, which represent the on/off states of the output channels. The data for each digital output module is written in a separate byte.

For analog output modules, each analog channel expects a 16-bit word of data. The Profibus DP master will write two contiguous bytes to convey the data object for each channel. The high byte of the data object is sent first, followed by the low byte. The fieldbus master needs to write four contiguous bytes to exchange data objects with a two-channel analog output module.

### A Sample Output Data Exchange

The following example shows the format of the data objects for the three digital output modules and one analog output module. Seven bytes are required:



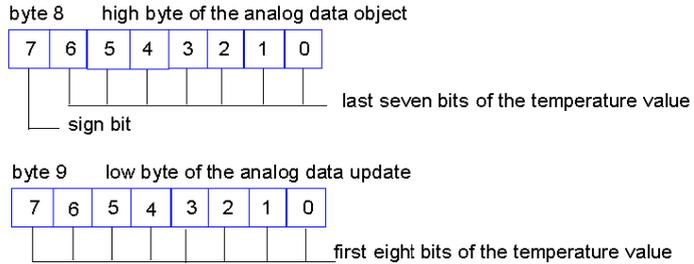


The data objects are ordered according to the island bus addresses of the four output modules—first the two-channel digital output, followed by the four-channel digital output, then the six-channel digital output, and finally the two-channel analog output. The three digital output modules each use one byte (*see page 70*) to convey their data objects. Each of these bytes uses less than eight bits. The analog output module requires four bytes (*see page 70*), two per analog channel.

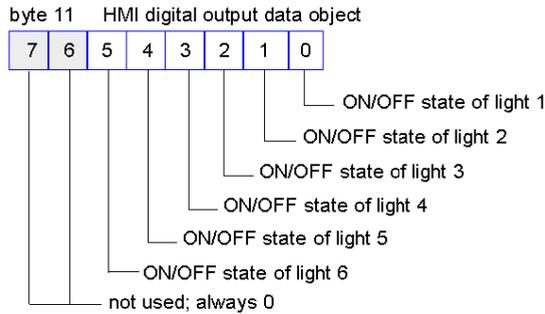
### Handling Output Data for an HMI Panel

If an island configuration contains an HMI panel set up as an output device, the Profibus DP master will send an additional group of output data objects at the end of the output data exchange.

Because HMI data uses a word format, two words of data must be configured to accommodate an HMI panel with six indicator lights and a temperature read-out display. The two words appear as four bytes in the following figure. Note that byte 10 is empty:



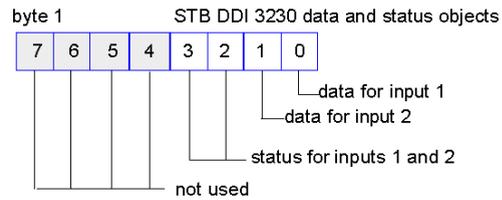
*byte 10 is empty*



### A Sample Input Data and I/O Status Exchange

Now let's look at the input data exchange for the example presented above. This exchange involves all the I/O modules on the island that place status, data, and/or echo output data objects in the input data and I/O status block in the NIM's process image.

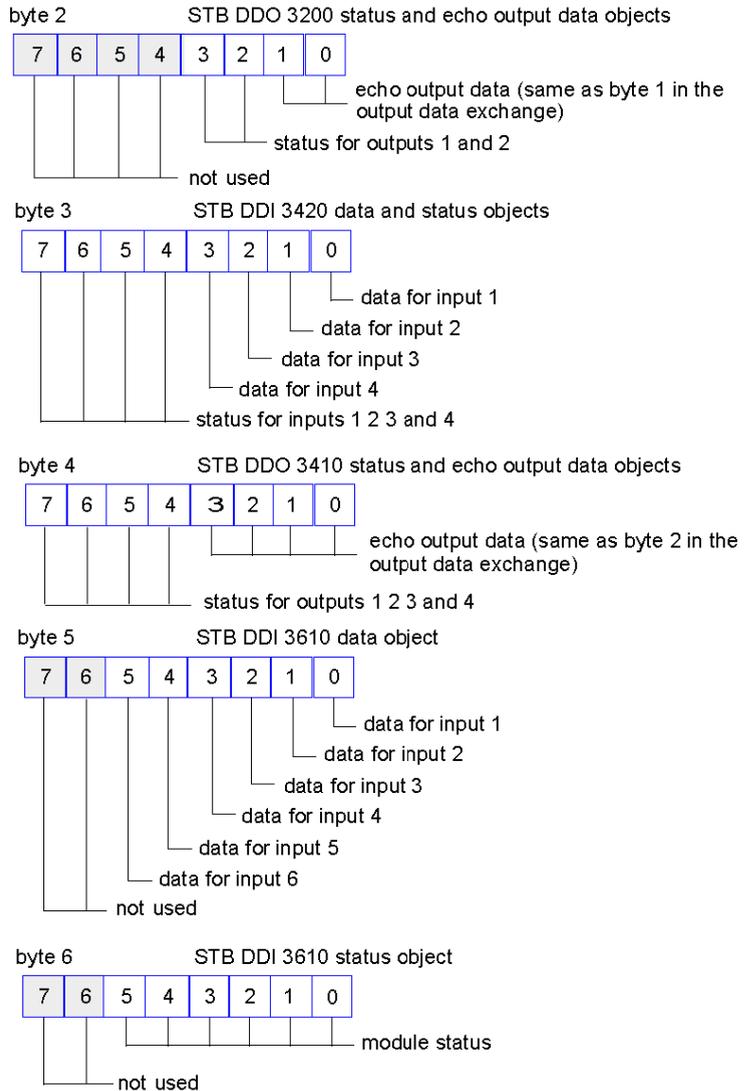
Bit-packing (*see page 70*) becomes more obvious in this part of data exchange. Byte 1 of the input data transfer, for example, combines the data and the status objects associated with a two-channel digital input module:



where bits 0 and 1 contain the input data object and bits 2 and 3 contain the input status object.

## A Sample Input Data and I/O Status Transfer

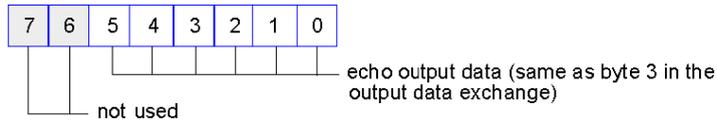
Now let's look at the rest of the input data exchange:



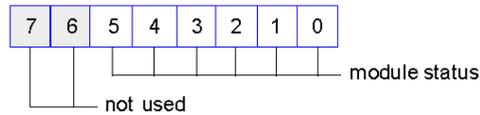
**NOTE:** The combined data and status bits for the STB DDI 3610 digital input module are more than eight bits—six data bits and six status bits. Therefore, the data object and the status object are transferred in separate bytes (byte 5 and byte 6).

The same situation holds true for the six-channel STB DDO 3600 digital output module shown in bytes 7 and 8 below:

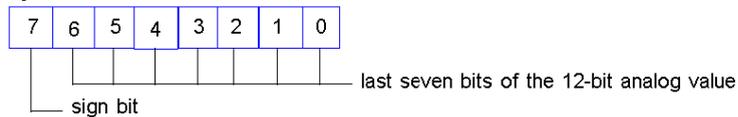
byte 7 STB DDO 3600 echo output data object



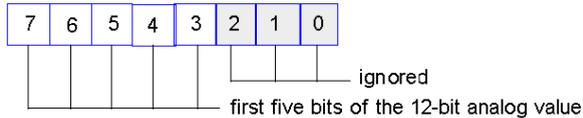
byte 8 STB DDO 3600 status object



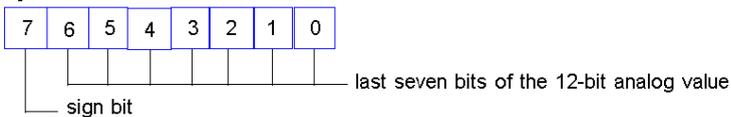
byte 9 STB AVI 1270 channel 1 high byte of the data object



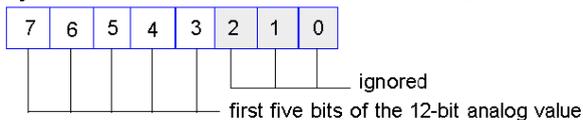
byte 10 STB AVI 1270 channel 1 low byte of the data object



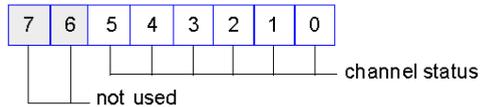
byte 11 STB AVI 1270 channel 2 high byte of the data object



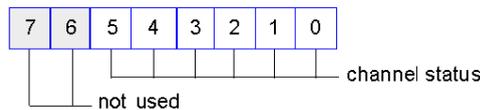
byte 12 STB AVI 1270 channel 2 low byte of the data object



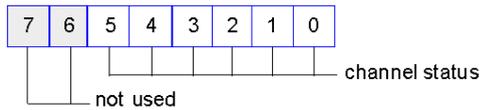
byte 13 STB AVI 1270 channel 1 status object



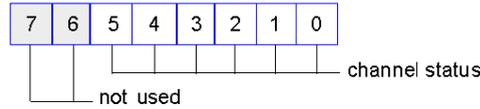
byte 14 STB AVI 1270 channel 2 status object



byte 15 STB AVO 1250 channel 1 status



byte 16 STB AVO 1250 channel 2 status

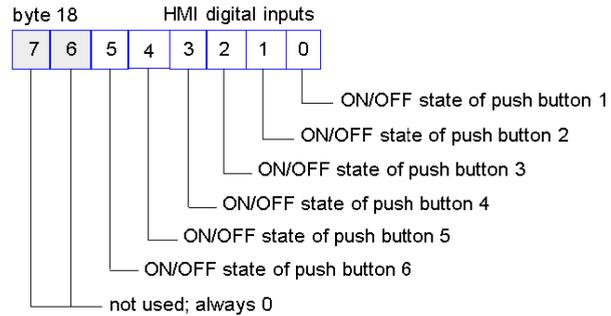


### Handling Input to an HMI Panel

If an island configuration contains an HMI panel that has been set up as an input device, the NIM will exchange an additional group of bytes at the end of the island's input data exchange with the fieldbus master.

Suppose an HMI panel with six push buttons is added to our example island configuration. The input data exchange would require an additional word of data, which appears in the following figure as bytes 17 and 18. Note that byte 17 is empty.

*byte 17 is empty*



## Global\_Command Service

### Definition

A `global_command` is a control command that the fieldbus master broadcasts or multicasts across a Profibus DP industrial network between normal I/O data exchange (*see page 69*) cycles. The Profibus DP master can send a global command to one node, some nodes, or all nodes on the network.

**NOTE:** Network address 127 is reserved for global commands; all other nodes on the network are configured to listen to this address.

The `global_command` SAP becomes available only after data exchange has begun.

### Freeze Command

If the STB NDP 2212 receives a Freeze command from Profibus DP, it transfers the latest input data from the island bus to Profibus DP.

While in Freeze mode, the STB NDP 2212 continues to scan the island bus input modules and stores their data in the process image input buffer. When Profibus DP issues the next Freeze command, the new input data is transferred to the fieldbus master.

### Unfreeze Command

The Unfreeze command ends Freeze mode. When Profibus DP issues the Unfreeze command, normal data exchange resumes.

### Clear\_Data

The `Clear_Data` command empties the current contents of the output buffer.

## The Profibus DP Diagnostics Service

### STB NDP 2212 Diagnostic Messaging Structures

The Profibus DP diagnostics service informs the fieldbus master about the status of the nodes on its network and notifies the master if a fault occurs and where the fault is located. Each node on the fieldbus is responsible for sending its own diagnostics message to the master.

In the following discussion, the node described is an Advantys STB island, and the device on the island responsible for handling the diagnostics exchange with the master is the STB NDP 2212 NIM.

### Default and Optional Diagnostic Message Structures

By default, the STB NDP 2212 diagnostics service message comprises 32 contiguous bytes. The message structure contains the following information:

- 6 bytes of standard, mandatory Profibus DP diagnostics
- 9 bytes of diagnostic information about the status of the island bus
- 17 bytes of module-specific health data (only the first four are used)

Beginning with NIM firmware version 4.0 and above, you have the option of increasing the number of bytes available in the diagnostics service message up to 62, with up to 42 bytes available for exchanging channel-specific data.

### Default Message Structure

The following table describes way the bytes are used in a default diagnostics service message sent by the STB NDP 2212. Bytes 20 ... 31 are reserved.

Byte	Name	Description
0	station_status 1	Profibus DP standard diagnostic data—mandatory bytes ( <i>see page 85</i> )
1	station_status 2	
2	station_status 3	
3	diag_master_add	Profibus DP master address—a mandatory byte ( <i>see page 86</i> )
4	Ident. number high	MSB of the STB NDP 2212 Profibus DP identification number—a mandatory byte ( <i>see page 86</i> )
5	ident. number low	LSB of the STB NDP 2212 Profibus DP Identification number—a mandatory byte ( <i>see page 86</i> )
6	header byte	value = 09h; header for the next 8 bytes of island bus-level diagnostics ( <i>see page 87</i> )
7	Version LB	low byte of the current STB NDP 2212 firmware release ( <i>see page 87</i> )

Byte	Name	Description
8	Version HB	high byte of the current STB NDP 2212 firmware release (see page 87)
9	NIM status 1	low byte of the Profibus DP device status diagnostic (see page 87)
10	island bus state 1	low byte of the island bus states diagnostic (see page 87)
11	island bus state 2	high byte of the island bus states diagnostic (see page 87)
12	global_bits	lower of the two global error bits bytes (see page 89)
13	global_bits	higher of the two global error bits bytes (see page 89)
14	NIM status 2	high byte of the Profibus DP device status diagnostic (see page 90)
15	header byte	value = 51h; header for the next 16 bytes of module-related diagnostics (see page 92)
16	modules 1 ... 8	One diagnostic bit for each of up to 32 modules in bytes 16 ... 19. The value of each bit indicates whether the module is healthy or not, where: ● 0 = healthy ● 1 = not healthy (see page 93)
17	modules 9 ... 16	
18	modules 17... 24	
19	modules 25 ... 32	
↓		Reserved—the STB NDP 2212 does not support more than 32 modules on its island bus
31		

**Optional Message Structure (with Channel-related Information)**

For NIM firmware version 4.0 and above, the STB NDP 2212 diagnostics service message can be changed to include channel-related information for supported STB I/O modules. To change the message structure from the default structure, you need to enable the option for this node with the Profibus master configuration software (see page 96).

The first 15 bytes in this optional diagnostics message (bytes 0 ... 14) are identical to the first 15 bytes in the default diagnostics message. Byte 15, the module-specific header byte, holds a different value indicating that only four bytes are available for module-specific information. Unlike the default message structure, the optional structure does not reserve any bytes to represent module slots beyond address 32 on the island bus. This frees up the previously reserved bytes (20 - 31) for channel-specific information.

The number of bytes provided in the optional message structure is not fixed. The length of the message can vary between 20 and 62 bytes depending on the number of channels that are reporting diagnostics. A maximum of 14 channels can report diagnostics at any time via the diagnostics message service. Each channel that reports diagnostics contributes three contiguous bytes to the message.

Byte	Name	Description
0	station_status 1	Profibus DP standard diagnostic data—mandatory bytes ( <i>see page 85</i> )
1	station_status 2	
2	station_status 3	
3	diag_master_add	Profibus DP master address—a mandatory byte ( <i>see page 86</i> )
4	Ident. number high	MSB of the STB NDP 2212 Profibus DP identification number—a mandatory byte ( <i>see page 86</i> )
5	ident. number low	LSB of the STB NDP 2212 Profibus DP Identification number—a mandatory byte ( <i>see page 86</i> )
6	header byte	value = 09h; header for the next 8 bytes of island bus-level diagnostics ( <i>see page 87</i> )
7	Version LB	low byte of the current STB NDP 2212 firmware release ( <i>see page 87</i> )
8	Version HB	high byte of the current STB NDP 2212 firmware release ( <i>see page 87</i> )
9	NIM status 1	low byte of the Profibus DP device status diagnostic ( <i>see page 87</i> )
10	island bus state 1	low byte of the island bus states diagnostic ( <i>see page 87</i> )
11	island bus state 2	high byte of the island bus states diagnostic ( <i>see page 87</i> )
12	global_bits	lower of the two global error bits bytes ( <i>see page 89</i> )
13	global_bits	higher of the two global error bits bytes ( <i>see page 89</i> )
14	NIM status 2	high byte of the Profibus DP device status diagnostic ( <i>see page 90</i> )
15	header byte	value = 45h; header for the next 4 bytes of module-related diagnostics ( <i>see page 93</i> )
16	modules 1 ... 8	One diagnostic bit for each of up to 32 modules in bytes 16 ... 19. The value of each bit indicates whether the module is healthy or not, where: <ul style="list-style-type: none"> <li>● 0 = healthy</li> <li>● 1 = not healthy</li> </ul>
17	modules 9 ... 16	
18	modules 17... 24	
19	modules 25 ... 32	
20	1st channel diagnostics-module location	island bus address of the first module with a channel that is reporting diagnostics

Byte	Name	Description
21	1st channel diagnostics-channel location	number of the channel that is reporting diagnostics on the module located at the island bus address indicated in byte 20
22	1st channel diagnostics-error condition	diagnostics condition of the channel indicated in byte 21 <i>(see page 100)</i>
23 thru 58	 2nd thru 13th Channel	
59	14th channel diagnostics-module location	island bus address of the last module with a channel that is reporting diagnostics
60	14th channel diagnostics-channel location	number of the channel that is reporting diagnostics on the module located at the island bus address indicated in byte 59
61	14th channel diagnostics-error condition	diagnostics condition of the channel indicated in byte 60 <i>(see page 100)</i>

## Standard Mandatory Profibus DP Data in the Diagnostics Service

### Introduction

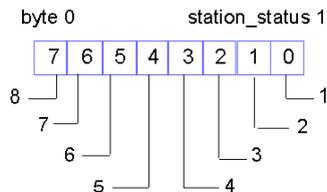
The first six bytes (bytes 0 ... 5) of the Profibus DP diagnostics service message contain three types of standard mandatory Profibus DP diagnostic data:

- station status, which describes the state of the communications between the node and the fieldbus master
- the fieldbus address of the master
- the Profibus DP device identification code of the node

### The Station\_Status Bytes

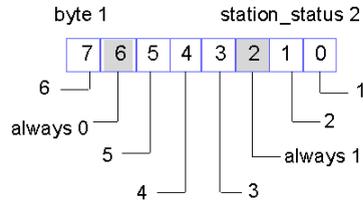
Bytes 0 ... 3 are the station\_status bytes, which describe communications status conditions between the Profibus DP master and a node on the fieldbus (e.g., an Advantys STB island).

The following figure illustrates byte 0, station\_status 1:



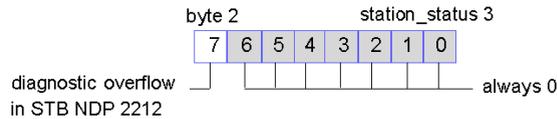
- 1 The master sets the value of bit 0 to 1 if the node does not respond. Check the following: 1. Is the node address correct? 2. Is the node powered on? 3. Is the fieldbus connection OK? 4. Is the Profibus DP installation OK?
- 2 A value of 1 in bit 1 means that the node is not ready to begin data exchange: Allow the node (e.g., the STB NDP 2212) to finish booting up.
- 3 A value of 1 in bit 2 means that a configuration fault was detected: Confirm that the actual configuration of the node (e.g., the Advantys STB island) matches the configuration data for it in the master's file.
- 4 A value of 1 in bit 3 means that at least one diagnostic message was sent by the node: Check the module- and identifier-related diagnostics. This bit will clear when there are no more diagnostic messages to report.
- 5 A value of 1 in bit 4 means that the node does not support the requested parameter (e.g., the Advantys STB island does not support synch(ronized) mode)
- 6 The master sets the value of bit 5 to 1 if a response by the node is invalid: Confirm that the actual configuration of the node (e.g., the Advantys STB island) matches the configuration data for it in the master's file.
- 7 A value of 1 in bit 6 means a parameterization problem was reported.
- 8 The master sets the value of bit 7 to 1 if the node is locked because it is assigned to a different master: Delete the assignment from the other master's configuration file.

The following figure illustrates byte 1, station\_status 2:



- 1 A value of 1 in bit 0 means that the node (e.g., the Advantys STB island) requires new parameterization.
- 2 A value of 1 in bit 1 means a possible problem with the node's backplane: Try power cycling the node to correct the problem. The Profibus DP master will continue to request diagnostic information until this bit is reset.
- 3 A value of 1 in bit 3 means that response monitoring/watchdog is on.
- 4 A value of 1 in bit 4 means that the node is in freeze mode.
- 5 Bit 5 always has a value of 0 because the STB NDP 2212 does not support synch(ronized) mode.
- 6 The Profibus DP master sets the value of bit 7 to 1 if the node has been removed from cyclic I/O processing: Check the master's configuration file for more information.

The following figure illustrates byte 2, station\_status 3:



The diagnostic overflow bit is set when the Advantys STB island has been configured to support channel-related diagnostics (*see page 95*) and more than 14 channel-related diagnostic messages are present on the island.

### The Profibus DP Master Address Byte

Byte 3 contains the fieldbus address of the Profibus DP master that parameterized the island bus. If no master has parameterized the island or if that master is no longer controlling the island, the STB NDP 2212 writes the value 255 in this byte

### The NIM Identification Bytes

Profibus DP assigns a unique identification code to each fieldbus device type. For the STB NDP 2212 NIM, the identification code is 0640hex.

Byte 4 contains the high byte of the identification code and byte 5 contains the low byte.

## Island Bus Diagnostic Data

### Introduction

Profibus DP diagnostic response bytes 6 through 14 contain diagnostic data that affects the entire island bus. This data reports the current STB NDP 2212 (NIM) firmware version, the status of communications between the fieldbus master and an Advantys STB island bus (*see page 15*), error conditions related to the island bus states and those related to the COMS (island bus scanner).

### Byte 6

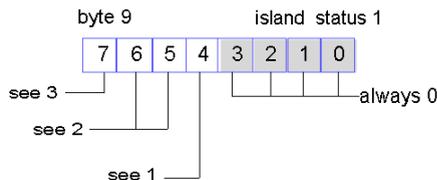
Byte 6 is the header byte for the island-level diagnostic data bytes.

### Current Firmware Version Bytes

Bytes 7 and 8 indicate the current firmware version of the NIM. Byte 7 is the low byte and byte 8 is the high byte.

### NIM Status Byte 9

The status information reported in bytes 9 and 14 (*see page 90*) relates to the entire island. Byte 9, the low byte, contains a bit specifying whether or not a diagnostic error occurred during either the Set\_Parameter (*see page 62*) or the Check\_Configuration (*see page 64*) service. The following figure illustrates the bits in byte 9, status 1:



- 1 Bit 4 is used during initialization to indicate whether or not the actual island bus assembly matches the configuration specified in the Profibus DP configuration telegram. A value of 0 indicates that the configurations match; a value of 1 indicates a configuration mismatch.
- 2 Bits 5 and 6 together indicate the NIM type; the STB NDP 2212 type is 1 0.
- 3 A value of 0 in bit 7 indicates a Siemens Profibus DP controller; a value of 1 indicates a Profichip Profibus DP controller.

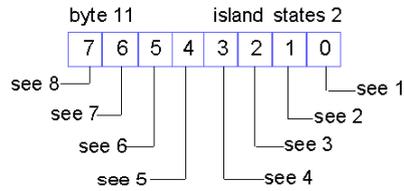
### Island Bus States Bytes

Bytes 10 and 11 report diagnostics related to the state of communications across the island bus. Byte 10, the low byte, uses 15 possible eight-bit patterns to indicate the presence or absence of a specific error condition. In byte 11, which is the high byte, each bit signals the presence or absence of a specific error condition.

The information in the following table describes byte 10, which is the low byte reporting error conditions related to the states of the island bus:

<b>Byte 10</b>	<b>Description</b>
00 <sub>hex</sub>	The island is initializing.
40 <sub>hex</sub>	The island has been set to pre-operational mode, for example, by the reset function.
60 <sub>hex</sub>	The NIM is configuring or auto-configuring—communication to all modules is reset.
61 <sub>hex</sub>	The NIM is configuring or auto-configuring—checking the module ID.
62 <sub>hex</sub>	The NIM is auto-addressing the island.
63 <sub>hex</sub>	The NIM is configuring or auto-configuring—bootup is in progress.
64 <sub>hex</sub>	The process image is being set up.
80 <sub>hex</sub>	Initialization is complete, the island bus is configured, the configuration matches, and the island bus is not started.
81 <sub>hex</sub>	Configuration mismatch—non-mandatory or unexpected modules in the configuration do not match, and the island bus is not started.
82 <sub>hex</sub>	Configuration mismatch—at least one mandatory module does not match, and the island bus is not started.
83 <sub>hex</sub>	Serious configuration mismatch—the island bus has been set to pre-operational mode, and initialization is aborted.
A0 <sub>hex</sub>	The configuration matches, and the island bus is operating.
A1 <sub>hex</sub>	The Island is operational with a configuration mismatch. At least one standard module does not match, but all the mandatory modules are present and operating.
A2 <sub>hex</sub>	Serious configuration mismatch—the island bus was started but is now in pre-operational mode because of one or more mismatched mandatory module(s).
C0 <sub>hex</sub>	The island has been set to pre-operational mode, for example, by the stop function.

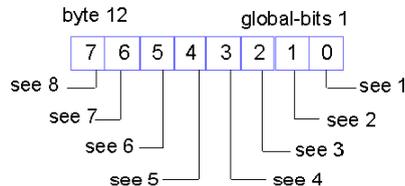
The following figure illustrates byte 11:



- 1 A value of 1 in bit 0 is a fatal error. It indicates a low-priority receive queue software overrun error.
- 2 A value of 1 in bit 1 indicates a NIM overrun error.
- 3 A value of 1 in bit 2 indicates an island bus-off error.
- 4 A value of 1 in bit 3 is a fatal error. It indicates that the error counter in the NIM has reached the warning level and the error status bit has been set.
- 5 A value of 1 in bit 4 indicates that the NIM's error status bit has been reset.
- 6 A value of 1 in bit 5 is a fatal error. It indicates a low-priority transfer queue software overrun error.
- 7 A value of 1 in bit 6 is a fatal error. It indicates a high-priority receive queue software overrun error.
- 8 A value of 1 in bit 7 is a fatal error. It indicates a high-priority transfer queue software overrun error.

## Global-Bit Bytes

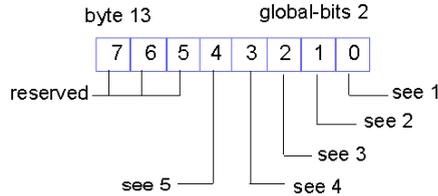
Bytes 12 and 13 are termed global-bit bytes. In these bytes, specific error conditions related to the COMS are indicated. Byte 12 is the low byte and byte 13 is the high byte. A value of 1 in a bit indicates that a specific global error was detected. Byte 12 is shown in the following figure:



- 1 Fatal error. Because of the severity, no further communications are possible on the island bus.
- 2 Module ID error. A standard CANopen device is using a module ID reserved for the Advantys STB modules.
- 3 Auto-addressing has failed.
- 4 Mandatory module configuration error.
- 5 Process image error—either the process image configuration is inconsistent, or it could not be set during auto-configuration.

- 6 Auto-configuration error—a module has been detected out of order and the NIM cannot complete auto-configuration.
- 7 Island bus management error detected by the NIM.
- 8 Assignment error—the initialization process in the NIM has detected a module assignment error, possibly the result of application parameter mismatches.

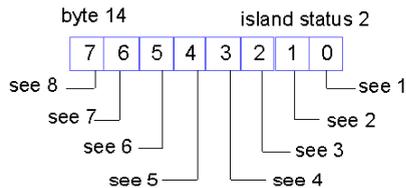
Byte 13 is shown in the following figure:



- 1 internal triggering protocol error
- 2 module data length error
- 3 module configuration error
- 4 reserved
- 5 timeout error

### NIM Status Byte 14

Byte 14, the high byte, includes bits reporting error conditions related to island bus failure, application parameters and output data image mastery, and protected mode (see page 140). The bits in byte 14, status 2 are described in the following figure:



- 1 Module failure—bit 0 is set to 1 if any module on the island bus fails.
- 2 A value of 1 in bit 1 indicates an internal failure—at least one global bit was set.
- 3 A value of 1 in bit 2 indicates an external failure—the problem is on the fieldbus.
- 4 A value of 1 in bit 3 indicates that the configuration is protected—the RST button is disabled and the island configuration requires a password to write to it. A bit value of 0 indicates that the island configuration is unprotected—the RST button is enabled, and the configuration is not password-protected.
- 5 A value of 1 in bit 4 indicates that the configuration on the removable memory card is invalid.
- 6 A value of 1 in bit 5 indicates reflex action functionality has been configured. (For NIMs with firmware version 2.0 or greater.)
- 7 A value of 1 in bit 6 indicates that one or more island modules have been hot-swapped. (For NIMs with firmware version 2.0 or greater.)

- 8** Island bus output data master—a value of 0 in bit 7 indicates that the fieldbus master is controlling the output data of the island's process image; a bit value of 1 indicates that the Advantys configuration software is controlling the output data of the island's process image.

## Module-related Data in the Profibus DP Diagnostics Service

### Byte Usage for Module-related Diagnostics

The Profibus DP diagnostics service message uses a set of contiguous bytes for module-related data. These bytes describe the health of each I/O module on the island bus. The health of each module is represented by the value of a bit in one of the bytes.

By default, 17 bytes are provided for module-related data, starting with header byte 15. Bytes 16 ... 31 are available for indicating module health. The number of bytes offers the potential to report on the health of up to 128 modules (8 bits x 16 bytes). Because an STB NDP 2212 NIM cannot support more than 32 modules on an island, bytes 16 ... 19 carry all the significant module health data. Bytes 20 ... 31 are reserved and do not carry meaningful health information in a default diagnostics message.

Starting with version 4.0 of the STB NDP 2212 firmware, you have the option to change the default diagnostics message structure so that it supports channel-related diagnostics. When this optional message structure is enabled, only 5 bytes are provided for module-related diagnostics—header byte 15 and module health bytes 16 ... 19. The remaining message bytes are available for channel-related diagnostics (*see page 95*).

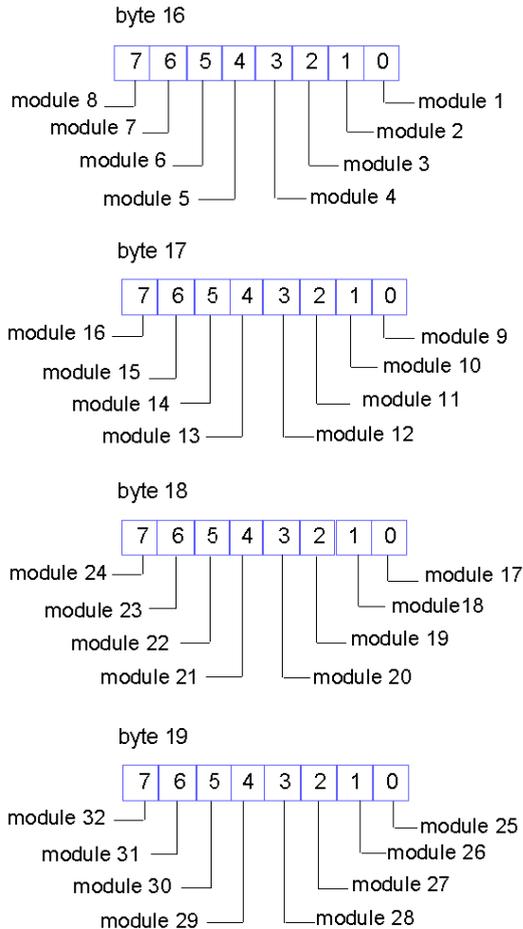
### The Header Byte

Byte 15 is the header byte for module-related diagnostics.

- The default value in this header byte is 51h
- If the channel-related diagnostics option is enabled, the value of this header byte is 45h

## The Module Health Bytes

Bytes 16 ... 19 provide the 32 bits that represent the 32 available addresses on an island bus.



If your STB NDP 2212 is using firmware version 2 or higher, a value of 0 in a bit signifies *good module health*. If your STB NDP 2212 is using firmware version 1, a value of 1 in a bit signifies good module health.

Good module health is reported under any of the following circumstances:

- The module is being configured and is working properly
- The module is not part of the fieldbus master's configuration
- The module is not operating because the island bus has not started

A bit value of 1 (for firmware version 2 or higher) or 0 (for firmware version 1) signifies *bad module health*. A module that is not healthy does not operate under any of the following circumstances:

- The island bus has been stopped
- The island bus is preoperational because a mandatory module is missing
- The module has failed
- The module expected to be at the island bus address is missing

---

## Enabling Channel-related Data in the Profibus DP Diagnostics Service

### Summary

With version 4.0 or higher of the Profibus STB NDP 2212 NIM firmware, you can enable channel-related data in the diagnostics service message for selected STB I/O modules. An updated GSD file is provided with version 4 and higher of the NIM to support this feature; you can also download the GSD file from [www.Telemecanique.com](http://www.Telemecanique.com).

### Limits and Priorities

The STB NDP 2212 NIM can report diagnostics for a maximum of 14 channels. If more than 14 channels are reporting diagnostics messages simultaneously on the island, the STB NDP 2212 signifies an overflow by setting the value of the station status 3 byte to 0x80 (*see page 85*). You cannot access the content of any overflowing messages.

The order that the 14 reporting channels appear in the diagnostic message is determined by the physical locations (i.e., the island bus addresses) of the modules that contain the channels. Modules mounted closer to the STB NDP 2212 have priority when their channels report diagnostics. Within a module, channel 1 reports before channel 2, channel 2 before channel 3, etc.

### Requirements

Channel-related diagnostics are reported as text string messages that can be viewed on a Profibus DP Class 2 configuration (or equivalent) tool such as Sycon (*see page 112*). Each text string is limited to 32 characters of content predefined for the type of module reporting the diagnostic data. These strings are predefined in the GSD file.

All the I/O modules that reside on the island bus are listed in the GSD file, and the modules that support channel-related diagnostics can be listed via the Sycon tool.

**NOTE:** Only Advantys STB digital and analog I/O modules capable of reporting status are able to report channel-related data.

### Editing the GSD File to Enable Channel-related Diagnostics

To enable channel-related diagnostics, open version 4 or higher of the GSD file in the Profibus DP master configuration software tool. The following procedure uses Sycon as the configuration tool:

Step	Action	Result
1	In the Slave Configuration menu, click the <b>Parameter Data</b> button.	The Parameter Data menu appears.
2	Click the <b>Common</b> button.	<p>The screenshot shows two overlapping dialog boxes. The top one is 'Slave Configuration' with fields for Device, Station Address, and Description. The bottom one is 'Parameters Data' with a table of parameters. The table has columns for Byte, Description, and Value. The 'Structure of diag frame' parameter (Byte 0) has a value of 'like for FW up to rev 2x'. A smaller dialog box is open over this value, showing 'like for FW up to rev 2x' and 'channel related diag enabled'.</p>
3	Double click the <b>like for FW up to rev 2x</b> in the Value column.	
4	Highlight the <b>channel related diag enabled</b> selection.	
5	Click <b>OK</b> .	

## Viewing Generic and Manufacturer-specified diagnostic Messages

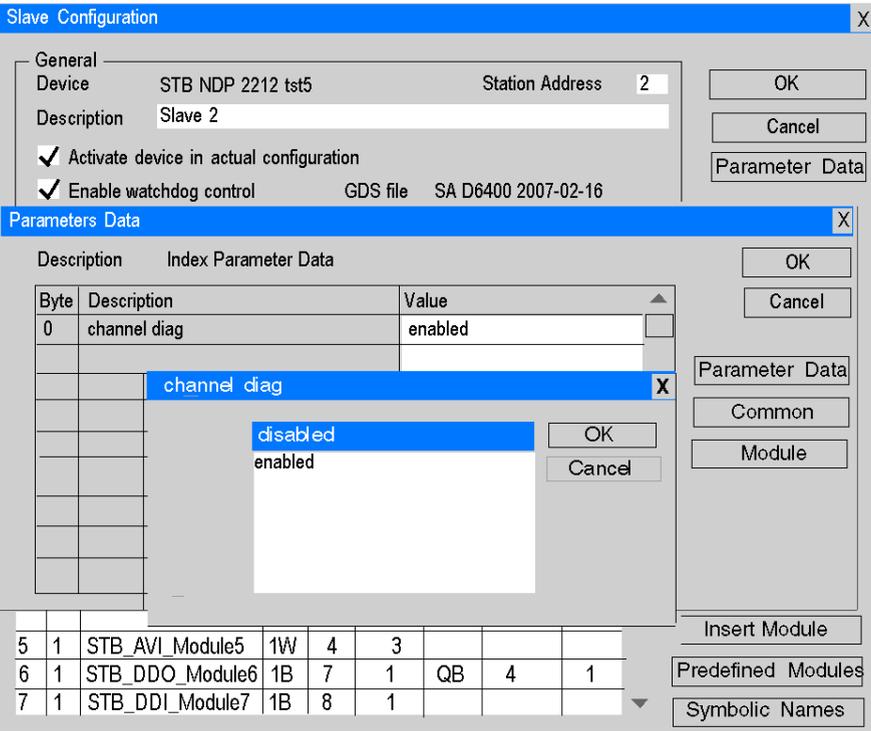
Once you have enabled channel-related diagnostics, you may optionally choose how to report the error conditions associated with the node. These diagnostics may be generic messages dictated by Profibus DP or manufacturer-specified text strings. If you do not choose, the default is manufacturer-specific diagnostics. To view generic diagnostics, here is how you change the default:

Step	Action	Result
1	Double click the <b>No restriction on CRD error type</b> in the Value column.	The <b>Selection of CRD error type</b> dialog box appears.
2	Highlight the <b>Do not use manufact spec CRD err</b> selection.	
3	Click <b>OK</b> .	Generic Profibus DP diagnostics will be reported by the channels

## Disabling Diagnostic Reporting from Specific Modules

When you enable channel-related diagnostics, all modules that provide channel-related diagnostics are enabled by default. You may not want all the modules that can report channel-related diagnostics to do so. For example, if the channels you want to monitor are located far away from the NIM on the island bus and you do not their reports to overflow, you can disable some modules that report noncritical channel data closer to the NIM so that the desired modules are within 14 channels of the NIM. To disable a module's channel-related messaging:

Step	Action	Result															
1	Click the <b>Module</b> button	The <b>Select Module</b> dialog box appears.															
2	Click on the desired module to highlight it.	<table border="1" style="margin-top: 10px;"> <thead> <tr> <th>Byte</th> <th>Description</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>channel diagnostic</td> <td>enabled</td> </tr> <tr> <td>5</td> <td>STB_AVI_Module5</td> <td>1W 4 3</td> </tr> <tr> <td>6</td> <td>STB_DDO_Module6</td> <td>1B 7 1 QB 4 1</td> </tr> <tr> <td>7</td> <td>STB_DDI_Module7</td> <td>1B 8 1</td> </tr> </tbody> </table>	Byte	Description	Value	0	channel diagnostic	enabled	5	STB_AVI_Module5	1W 4 3	6	STB_DDO_Module6	1B 7 1 QB 4 1	7	STB_DDI_Module7	1B 8 1
Byte	Description	Value															
0	channel diagnostic	enabled															
5	STB_AVI_Module5	1W 4 3															
6	STB_DDO_Module6	1B 7 1 QB 4 1															
7	STB_DDI_Module7	1B 8 1															
3	Click <b>OK</b> .	The <b>channel diag</b> dialog box appears.															

Step	Action	Result																											
4	<p>Click <b>disabled</b>.</p>  <p>The screenshot shows two overlapping dialog boxes. The top dialog is titled 'Slave Configuration' and has a 'General' tab. It contains fields for 'Device' (STB NDP 2212 tst5), 'Station Address' (2), and 'Description' (Slave 2). There are checkboxes for 'Activate device in actual configuration' and 'Enable watchdog control' (GDS file SA D6400 2007-02-16). The bottom dialog is titled 'Parameters Data' and shows a table with columns 'Byte', 'Description', and 'Value'. The first row has '0', 'channel diag', and 'enabled'. A sub-dialog is open over the 'channel diag' entry, showing a list with 'disabled' selected. At the bottom of the Parameters Data dialog is a table with 9 columns and 3 rows of data.</p> <table border="1" data-bbox="226 868 850 974"> <tr> <td>5</td> <td>1</td> <td>STB_AVI_Module5</td> <td>1W</td> <td>4</td> <td>3</td> <td></td> <td></td> <td></td> </tr> <tr> <td>6</td> <td>1</td> <td>STB_DDO_Module6</td> <td>1B</td> <td>7</td> <td>1</td> <td>QB</td> <td>4</td> <td>1</td> </tr> <tr> <td>7</td> <td>1</td> <td>STB_DDI_Module7</td> <td>1B</td> <td>8</td> <td>1</td> <td></td> <td></td> <td></td> </tr> </table>	5	1	STB_AVI_Module5	1W	4	3				6	1	STB_DDO_Module6	1B	7	1	QB	4	1	7	1	STB_DDI_Module7	1B	8	1				<p><b>Result</b></p>
5	1	STB_AVI_Module5	1W	4	3																								
6	1	STB_DDO_Module6	1B	7	1	QB	4	1																					
7	1	STB_DDI_Module7	1B	8	1																								
5	Click <b>OK</b> .	The channel diagnostic feature for the module is disabled and listed as disabled in the Index Parameter Data chart.																											
6	Repeat the above steps for each module you wish to disable.																												

## Content of the Channel-related Diagnostics Bytes

### Channel-related Diagnostic Content

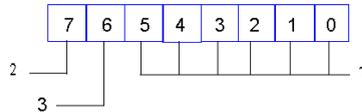
When channel-related diagnostics are enabled (*see page 96*) and a channel is reporting a problem, the following information is provided for that channel:

- the module's slot number
- the channel number on the module
- whether the channel is an input or an output
- the binary makeup of the channel data, i.e., single-bit, 2-bit, 4-bit, byte, or multi-byte
- a predefined text string describing the problem

This data is provided in 3 bytes/channel for up to 14 simultaneously reporting channels.

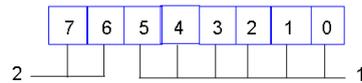
### Byte Assignments

The first channel-related byte indicates the island bus address of the module reporting the channel-related diagnostic. Bits 0 ... 5 indicate a value equal to the island address, between 1 ... 32.



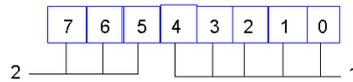
- 1 Module location reporting the channel related diagnostic. The value is between 0 and 63 decimal (3F Hex). 00Hex=Module location 1 is reporting a channel -related diagnostic. 1FHex=32Decimal=Module location 32 is reporting a channel-related diagnostic.
- 2 always 1
- 3 always 0

The second channel-related byte indicates the number of the channel that is reporting the diagnostic and whether that channel is an input or output channel.



- 1 Channel number, between 0 ... 63 decimal (3FHex), where 00Hex = channel 1 is reporting a diagnostic and 1FHex (32 decimal) = channel 32 is reporting a diagnostic
- 2 when:
  - a bit 7 = 0 and bit 6 = 1, the channel is an input
  - b bit 7 = 1 and bit 6 = 0, the channel is a output
  - c bit 7 = 1 and bit 6 = 1, the channel is mixed (input and output)

The third channel-related byte sends the diagnostic error code reported by the channel and the binary makeup of the channel data.



- 1 5-bit error code defining the diagnostic error message (see the table below)  
 2 3-bit indicator of the binary makeup of the channel data (see the table below)

You have the option of displaying either generic or manufacturer-specific diagnostic messages (*see page 97*). In the table below, the first five messages displayed in bits 4 ... 0 are generic. The next 13 bit combinations are used to display manufacturer-specific messages.

Here are the binary values and predefined text strings for the channel-related diagnostic messages:

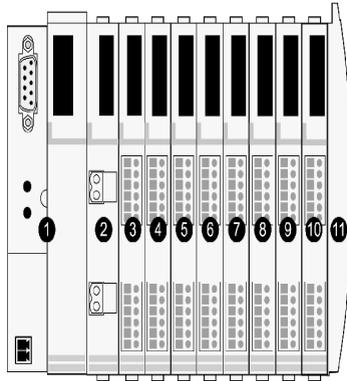
Bit Values in the Third Byte								Meaning/String	Examples
7	6	5	4	3	2	1	0		
0	0	1						single-bit channel data makeup	STBDDO3200 STBDDO3230
0	1	0						2-bit channel data makeup	STBDDI3230 STBDDO3410 STBDDO3600
0	1	1						4-bit channel data makeup	STBDDI3420
1	0	0						one-byte channel data makeup	STBDDI3610
1	0	1						two-byte channel data makeup	analog modules

Bit Values in the Third Byte								Meaning/String	Examples
7	6	5	4	3	2	1	0		
			0	0	0	1	0	Undervoltage	no field power
			0	0	1	1	0	Line break	Broken wire
			0	0	1	1	1	Overrange	overcurrent, over temperature, overvoltage warning or error
			0	1	0	0	0	Underrange	undercurrent, under temperature, undervoltage warning or error
			0	1	0	0	1	Error	Internal error
			1	0	0	0	1	Overrun warning	overcurrent, over temperature, overvoltage warning
			1	0	0	1	0	Overrun error	overcurrent, over temperature, overvoltage error
			1	0	0	1	1	Underrun warning	undercurrent, under temperature, undervoltage warning
			1	0	1	0	0	Underrun error	undercurrent, under temperature, undervoltage error
			1	0	1	0	1	Broken wire	
			1	0	1	1	0	Internal error	
			1	1	0	0	0	No field pwr or fault in bin grp	
			1	1	0	0	1	No field pwr and overrun warning	
			1	1	0	1	0	No field pwr and overrun error	
			1	1	0	1	1	No field pwr and underrun warning	
			1	1	1	0	0	No field pwr and underrun error	
			1	1	1	0	1	No field pwr and broken wire	
			1	1	1	1	0	No field pwr and internal error	
			1	1	1	1	1	No field pwr and internal error	

## A Channel-related Diagnostics Example

### Sample Island

The following example illustrates how channel-related diagnostics are reported by the STB NDP 2212 NIM. In this example, the island consists of a NIM, 10 Advantys STB I/O modules, and a termination plate.



- 1 the STB NDP 2212 NIM
- 2 a 24 VDC power distribution module
- 3 STB DDI 3230 two-channel digital 24 VDC input module
- 4 STB DDO 3200 two-channel digital 24 VDC output module
- 5 STB DDI 3420 four-channel digital 24 VDC input module
- 6 STB DDO 3410 four-channel digital 24 VDC output module
- 7 STB DDI 3610 six-channel digital 24 VDC input module
- 8 STB DDO 3600 six-channel digital 24 VDC output module
- 9 STB AVI 1270 two-channel analog +/-10 VDC input module
- 10 STB ACI 0320 four-channel analog current input module
- 11 the island bus termination plate

The I/O modules have the following island bus addresses:

I/O Model	Island Bus Address
STBDDI3230 two-channel digital input	1
STBDDO3200 two-channel digital output	2
STBDDI3420 four-channel digital input	3
STBDDO3410 four-channel digital output	4
STBDDI3610 six-channel digital input	5
STBDDO3600 six-channel digital output	6
STBAVI1270 two-channel analog input	7
STBACI0320 four-channel analog input	8

## Acquiring Channel-related Diagnostics

Using a Profibus DP master configuration tool such as Sycon, you enable the NIM to transmit channel-related data in its diagnostics service message (*see page 96*). All eight modules on the island bus are able to report channel diagnostics.

Assume that all the digital I/O modules are healthy and not reporting any diagnostic problems. Channel 1 on the STB AVI 1270 module at the island bus address 7 reports an overvoltage error. Channel 2 on the STBACI0320 module at island bus address 8 simultaneously reports a broken wire condition.

The STB NDP 2212 provides the following data to the Profibus DP fieldbus master in the channel-related diagnostics bytes of the diagnostics service message:

Byte	Value (hex)	Meaning
20	86	The module reporting the first channel diagnostic error is at island bus address 7
21	40	The channel reporting the error from the module at address 7 is channel 1, and it is an input channel.
22	B2	Input channel 1 on the module at address 7 is reporting an overrun error.
23	87	The module reporting the second channel diagnostic error is at island bus address 8.
24	41	The channel reporting the error from the module at address 8 is channel 2, and it is an input channel.
25	B5	Input channel 2 on the module at address 8 is reporting a broken wire.

By default, the node is displaying manufacturer-specific diagnostic messages (*see page 97*).

## Dealing with Diagnostic Data Overflow

Although there are 30 channels on the island bus that are capable of reporting errors, you are not running into an overflow condition (*see page 95*) because only two channels are actually reporting diagnostic data at this time.

Suppose that diagnostic data is being reported simultaneously by:

- both channels on the STBDDI3230 module at island bus address 1
- all six channels on the STBDDI3610 module at island bus address 5
- all six channels on the STBDDO3600 at island bus address 6
- channel 1 on the STBAVI1270 module at island bus address 7

In this case, 15 channels are reporting diagnostics. The diagnostics service message bytes are filled by the diagnostic data from 14 channels on the three digital modules. As a result, the channel diagnostics from the STBAVI1270 module (the module furthest from the NIM on the island bus) overflows. The data cannot be captured in the message nor be sent by the NIM to the Profibus DP master.

If your application requires that you always see diagnostics from the analog channels and if the analog data is more valuable than data from some of the digital channels, you can edit the GSD file to disable some of the digital channel diagnostics (*see page 97*). For example, if you disable the six channels on the STBDDI3610 module at address 5, the six channels on the STBDDO3600 at address 6, and the four channels on the STBDDO3410 at address 4, the island will have only 14 channels enabled to report diagnostics. You can be sure that you will always get your analog diagnostics even if all the enabled channels are reporting simultaneously.



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# Application Examples

# 5

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## Introduction

The information in this chapter provides two examples describing how to configure an Advantys STB on a Profibus DP network. In the first application example, a Telemecanique Premium PLC is the fieldbus master. In the second, a Siemens CPU 318-2 is configured with Siemens S7 software.

## What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Generic Slave Data (GSD) File	108
Physical Network	109
Configuring the TSX PBY 100 Profibus DP Master	111
Configuring the Profibus DP Master with SyCon	112
Verifying the Operation of the Profibus DP Master	116
Using Siemens S7 to Configure a CPU 318-2 as the Profibus DP Master	117

## Generic Slave Data (GSD) File

### Summary

A generic slave data (GSD) file is a required file for every device on a Profibus DP network. A GSD file is a device description file that defines a device's functionality. The manufacturer of the device supplies its GSD file.

### File Description

The GSD file contains mandatory and optional parameter data. Included in the file are the product name and model (STB NDP 2212), the unique device identification number, and the number of input and output data bytes. The baud rates, message lengths, meaning of diagnostic messages, maximum response time, and global control commands that the device supports are defined.

Whereas an Advantys STB island bus is a single node on a Profibus DP network, its internal structure is modular. For this reason, the NIM and the island bus I/O modules are described separately in the GSD file. After the STB NDP 2212 module is selected as the Profibus DP slave device, a scrollable list of available I/O and preferred modules is displayed. You will select the modules that you want to be part of your island bus assembly. Your selected modules will display in a GSD window, in the order in which they are to appear on the physical island.

### File Format

The GSD file is an ASCII text file that can be viewed with any text editor.

### File Compatibility

The configuration software used by a Profibus DP master must be able to process any manufacturer's GSD file. Because the STB NDP 2212 is compatible with any Profibus DP master, that master's configuration software can be used to parameterize and configure the island bus as a node on its network.

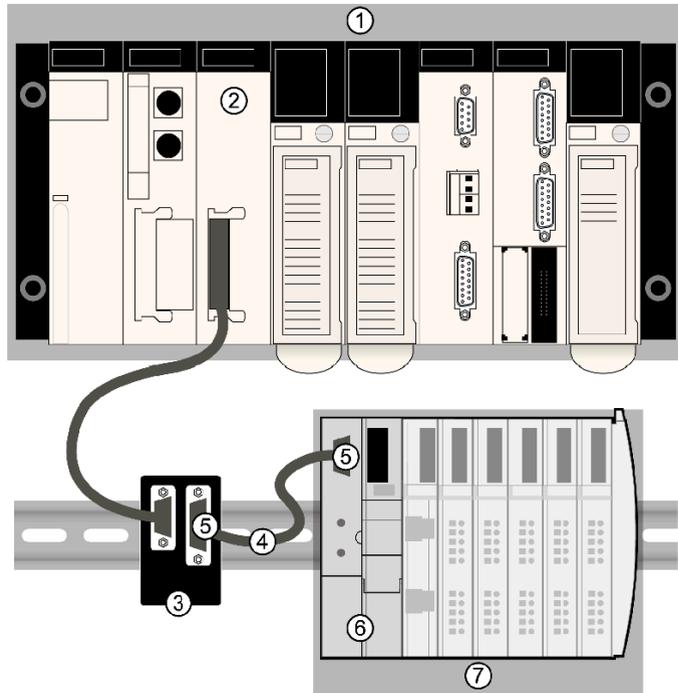
### File Availability

The GSD file for the STB NDP 2212 is included with your Advantys STB system and is also available from the Advantys STB product web site at [www.Schneiderautomation.com](http://www.Schneiderautomation.com). You will need to import, copy, or download the file according to the requirements of your configuration software.

## Physical Network

### Connection Diagram

The following diagram shows the hardware components used in the TSX PBY 100 Profibus DP fieldbus master application example. In the example, an STB NDP 2212 NIM is connected to a Premium PLC over a Profibus DP network:



- 1 Premium controller configuration
- 2 TSX PBY 100 Profibus DP master module
- 3 490 NAE 91100 Profibus tap
- 4 TSX PBS CAx Profibus DP cable
- 5 Two 490 NAD 91103 Profibus DP end-of-line connectors
- 6 STB NDP 2212 Profibus DP NIM in position in an Advantys STB island
- 7 Advantys STB I/O modules

## CAUTION

### **UNINTENDED EQUIPMENT OPERATION**

Read and understand this manual and the TSX PBY 100E Premium Profibus user's manual before installing or operating this equipment. Installation, adjustment, repair and maintenance of this equipment must be performed by qualified personnel.

- Disconnect all power to the Premium PLC before making the network connection.
- Place a DO NOT TURN ON sign on the system power disconnect.
- Lock the disconnect in the open position.

You are responsible for conforming to all applicable code requirements with respect to grounding all equipment.

**Failure to follow these instructions can result in injury or equipment damage.**

## Configuring the TSX PBY 100 Profibus DP Master

### Information

The following information summarizes the procedures used to configure the TSX PBY 100 as the Profibus DP fieldbus master.

### Software Requirements

Two software packages are needed to successfully complete the fieldbus master configuration process:

- PL7 PRO, version 4.1 or greater
- Hilscher's TLXLFBCM Profibus system configurator (SyCon) software

You also need the GSD file for the STB NDP 2212. The most current GSD (*see page 108*) file is always maintained on the Advantys STB product web site at [www.schneiderautomation.com](http://www.schneiderautomation.com).

### Configuring the Profibus DP Master

The configuration process requires the completion of the following procedures in sequence:

Sequence	Procedure
1	Import the Advantys STB GSD file into SyCon ( <i>see page 112</i> ).
2	Configure the TSX PBY 100 Profibus master module using SyCon ( <i>see page 112</i> ).
3	Save the configuration to disk.
4	Write the Premium PLC configuration using PL7 PRO software ( <i>see page 114</i> ).
5	Download the configuration to the Premium PLC and verify it ( <i>see page 116</i> ).

## Configuring the Profibus DP Master with SyCon

### Summary

After you configure the TSX PBY 100 as the Profibus master module using PL7 PRO, continue the configuration process by launching the Hilscher system configurator (SyCon) software.

### Creating a Configuration File with SyCon

The following procedure describes how to launch SyCon from PL7 PRO and use it to create a configuration file:

Step	Action	Result
1	From the TSX PBY 100 (Rack x Position <i>x</i> ) window in PL7 PRO, double-click on the HILSCHER icon to launch the Sycon program.	
2	From the SyCon File menu, select <b>New</b> . Then, select PROFIBUS from the Select Fieldbus list and click on <b>OK</b> .	An untitled SyCon workspace opens.
3	From the Sycon workspace menus, select <b>Insert–Master</b> .	The cursor becomes a large M.
4	Place the M-cursor to the left of the black vertical line on the screen; then click.	The Insert Master window appears.
5	Select TSX PBY 100 and click on <b>Add</b> .	TSX PBY 100 is listed as the master.
6	Your Station Address should be set to 1. Click on <b>OK</b> ,	The TSX PBY 100 module is added as the fieldbus master.
7	Import the GSD file. Then select <b>File–Copy GSD</b> and choose the STB NDP 2212 GSD file ( <i>see page 108</i> ).	An informational message lets you know that the GSD file was successfully imported into the SyCon database. The STB NDP 2212 appears in the Slaves selection list, indicating that it has become a known node to the configuration software.
8	Select <b>Insert–Slave</b> .	The cursor becomes a large S.
9	Place the S-cursor on the right side of the black vertical line and below the TSX PBY 100 Master that you added above. Then, click to display the Insert Slave window.	

Step	Action	Result
10	Select STB NDP 2212 from the Available Slaves list, and click on <b>Add</b> .	STB NDP 2212 is listed as a slave.
11	Set the Station Address to the <i>same</i> node ID value that you assigned to your Advantys STB island with the NIM's rotary switches ( <i>see page 28</i> ). If you want, you can also add descriptive text (a comment) in the field provided ( <i>do not use spaces</i> ). Click on <b>OK</b> .	The STB NDP 2212 is added as the slave.

### Completing the SyCon Configuration File

You are ready to configure the I/O modules for your island bus with SyCon:

Step	Action	Result
1	Double click on the Advantys STB icon.	All of the Advantys STB I/O modules from the GSD file appear in the Modules window on the Slave screen.
2	To assemble your island bus, double click on the model numbers, one by one. Select the modules in the order, from left to right, that they will be physically located on your island bus. If your configuration includes run-time parameters, virtual modules (analog, digital, or both), or data exchange with an HMI panel, then these modules must be added to the configuration after the physical modules. Install these modules in the following order, as appropriate: 1. virtual digital 2. virtual analog 3. run-time parameters 4. PLC-to-HMI (output data) 5. HMI-to-PLC (input data) After you have selected all of the modules for your island bus, click on <b>OK</b> .	An ordered list of the modules that you have selected for your island bus appears under the Modules window.
3	From the menus, select <b>File–Save</b> .	A Save As... window appears.
4	Name your configuration file and click on <b>Save</b> .	The file name will appear in the title bar. Note that the file has a .PB extension for Profibus.
5	Click on the Master and select <b>File–Export–ASCII</b> .	A Save As ... window appears.

Step	Action	Result
6	Name your export file the same name that used in Step 4 and click on <b>Save</b> .	The .PB configuration file is now saved with a .CNF extension in the directory that you specify. The default path is C:\PROGRAM FILES\HILSCHER\SYCON\PROJECT.
7	Close the SyCon application window.	You are now ready to return to PL7 (see page 114) to complete the configuration program.

### Completing the Configuration Program

After you have saved the SyCon configuration file as a .CNF file (see page 113), you need to complete the configuration program using PL7 PRO:

Step	Action	Result
1	From your desktop, double click the PL7 icon. Then select Hardware Configuration from the list in the Application Browser.	The TSX PBY 100 (Rack x Position x) appears in the Hardware Configuration window.
2	Double click on the TSX PBY 100 module.	The Profibus DP module configuration window opens.
3	Click on <b>Load CNF</b> . From the Open list, select the .CNF file that you created in the previous procedure (see page 113). Save the file by selecting <b>File–Save</b> .	The Profibus DP master module's configuration data is saved.
4	From the Profibus DP module configuration screen, select a module address from the list in the Profibus DP Slave Configuration window at the upper right.	The total amount of input/output data associated with the module appears on the lower right, under the Slave Configuration window (see page 115). In the Profibus DP Slave Data window at the lower left, the addresses for data associated with the module are displayed. Note that there is an input (%iw) data byte area and an output (%qw) data byte area. You will reference the input and output data bytes in the application programs that you will create.
5	Upload your configuration program to the PLC.	After you verify the operation of Profibus DP on your PLC (see page 116), you will be ready to write a Profibus DP application program for Advantys STB.



## Verifying the Operation of the Profibus DP Master

### Summary

The following procedure describes how to verify the operation of the Profibus DP master.

### Verification Procedure

The following verification procedure requires that the PC running PL7 PRO remain connected to the PLC on the Premium:

Step	Action	Result
1	From the PLC menu in the PL7 PRO Application Browser, select <b>Connect</b> .	The PC goes on-line with respect to the PLC.
2	Click the RUN icon, then click on <b>OK</b> .	The PLC goes into run mode.
3	Double click on <b>Configuration</b> .	
4	Double click on <b>Hardware Configuration</b> .	
5	Double click on the TSX PBY 100 module.	
6	Click on a slave address.	You can monitor the values of the input and output words in the Profibus DP Data field.

## Using Siemens S7 to Configure a CPU 318-2 as the Profibus DP Master

### Summary

The following discussion describes how to use Siemens' S7 software to configure the CPU 318-2 as a Profibus DP master for the STB NDP 2212 and how to configure the island bus as a CPU 318-2 slave device. The discussion assumes that you are familiar with factory automation hardware and software in general and Siemens' fieldbus masters and its S7 software in particular. As you read this discussion, you may find it helpful to refer to the other chapters in this *Guide* and to your Siemens S7 documentation.

### Before You Begin

Before you use the procedures that follow, it is assumed that you have already completed the following tasks:

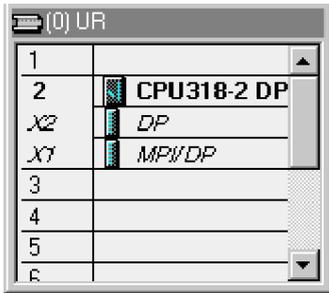
- Installed the CPU 318-2.
- Installed the S7 software on a programming terminal (PC).
- Created a new project using the S7 software and the new project wizard.
- Built your Advantys STB island bus. To assist you, a sample island bus assembly is included later in this discussion (*see page 122*).

**NOTE:** You must set a Profibus DP network node address (*see page 28*) for your island with the rotary switches on the front of the STB NDP 2212.

### Configuring the Profibus DP Master

Complete the following steps to configure the CPU 318-2 Profibus DP master. Note that you can use the following procedure with other Siemens' Profibus DP fieldbus masters.

Step	Action	Result
1	From your desktop, double-click the Simatic Manager icon to launch the S7 software.	The S7_Connection window opens. The Simatic 300 Station pane is on the left side of your display; the Hardware pane is on the right.
2	In the Hardware pane, double-click on <b>Hardware</b> to display the HW Config window.	The HW Config window opens on the left side of your display. The available Profibus masters for the CPU 318-2 are listed, and a hardware rack is displayed. The CPU 318-2 is installed in the rack.

Step	Action	Result
3	<p>From the list of available Profibus masters for the CPU 318-2, right-click on <b>DP</b>. Then click on <b>Add Master System</b>.</p>  <p>The Properties screen for this Profibus DP master opens.</p>	
4	<p>Use the Properties screen to configure the master's properties. For this example:</p> <ul style="list-style-type: none"> <li>Under the General tab, locate the master's station address.</li> <li>Under the Network Settings tab, confirm that the Transmission Rate is 1.5.</li> </ul> <p>Click on <b>OK</b>.</p>	<p>You have now configured the network properties for the master.</p> <p>On the HW Config screen, a dashed line representing the network cable is displayed.</p>
5	<p>Click on the network cable (dashed line) graphic.</p>	<p>The graphic becomes a solid line signifying that the network is available for configuration.</p>

### Importing the STB NDP 2212's GSD File

You need to import a GSD (*see page 108*) file only once. Once imported, a GSD file is saved in the Siemens database. Use the following steps to import the GSD file for an Advantys STB island (*see page 15*). The most current GSD file is always maintained on the Advantys STB product website at [www.schneiderautomation.com](http://www.schneiderautomation.com):

Step	Action	Result
1	<p>From the HW Config window menus, select <b>Options –Install New GSD</b>.</p>	<p>The Installing New GSD window opens.</p>
2	<p>Locate the path for your Advantys STB GSD file. Select it, then click on <b>Open</b>.</p> <p>At the prompt, click on <b>Yes</b> to confirm that this is the correct GSD file for Advantys STB.</p>	<p>The Advantys STB GSD file is now stored as a file in the Additional Field Devices/I/O record in Siemens' database. In the Hardware pane, the STB NDP 2212 file is located in the I/O folder in the Additional Field Devices directory.</p>

## Configuring an Advantys STB Island as a Slave Device on this Network

Configure the sample Advantys STB island as a slave on the CPU 318-2's Profibus DP network. First configure the STB NDP 2212 NIM. Then identify the addressable modules on your island bus in the order that you assembled them. The following procedure uses the sample island bus assembly (*see page 122*):

Step	Action	Result
1	In the HW Config window, if the network cable graphic is a dashed line, click on it once.	The graphic representing the network cable becomes a solid line signifying that this network is available for configuration.
2	Configure the STB NDP 2212 as a node on this network. Either double-click the STB NDP 2212 icon in the Hardware pane or drag and drop it on the Profibus DP network cable graphic in the HW Config window.	The STB NDP 2212 is added to the CPU 318-2's Profibus DP network.
3	In the HW Config window, right-click on the STB NDP 2212 icon to display the slave's properties.	The Properties screen for the STB NDP 2212 opens in the Hardware pane.
4	Configure the STB NDP 2212 properties: <ul style="list-style-type: none"> <li>Under the General tab, check that the value for the node address is the address that you set with the STB NDP 2212's rotary switches (<i>see page 28</i>). If not, change the value on the STB NDP 2212's Properties screen accordingly.</li> <li>Under the Parameters tab, confirm that the value for the Transmission Rate is 1.5 (for this example).</li> </ul> Click <b>OK</b> .	
5	Then select <b>Station – Save</b> from the HW Config window menus.	The STB NDP 2212 (Advantys STB) is configured as a slave device on the CPU 318-2's Profibus DP network. A table for configuring the device's modules displays in the HW Config window.
6	In the Hardware pane, expand the STB NDP 2212 folder by clicking on <b>+</b> .	A list of the configurable modules that can be used to build an Advantys STB island bus displays.

Step	Action	Result
7	<p>In the Hardware pane, double-click the module that you want to locate in slot 0 of your island bus assembly. (Alternatively, you can drag and drop the module next to slot 0 in the table in the HW Config window.) For this example, use module DDI 3230, the first configurable module in the sample island bus assembly (<i>see page 122</i>).</p>	<p>The STB DDI 3230 module appears in slot 0 on the rack in the HW Config window (<i>see page 121</i>).</p>
8	<p>Repeat step 7, incrementing the slot number by one for each of the five remaining I/O modules in the sample assembly.</p> <p>If your configuration includes run-time parameters, virtual modules (analog, digital, or both), or data exchange with an HMI panel, then these modules must be added to the configuration after the physical modules. Install these modules in the following order, as appropriate:</p> <ol style="list-style-type: none"><li>1. virtual digital</li><li>2. virtual analog</li><li>3. run-time parameters</li><li>4. PLC-to-HMI (output data)</li><li>5. HMI-to-PLC (input data)</li></ol>	<p>Assign the STB DDO 3200 to slot 1, the STB DDI 3420 to slot 2, and so on.</p>
9	<p>After you complete your island bus assembly, save the device's configuration. Select <b>Station—Save</b> from the HW Config window menus.</p>	<p>Your Advantys STB configuration is saved in the Siemens' database. Now you can symbolize (<i>see page 123</i>) the I/O modules so that you can use them in an application program.</p>

## Hardware Configuration Screen

The Hardware Configuration Screen is shown in the following figure:

The screenshot displays the hardware configuration interface. On the left, a rack of modules is shown with the following configuration:

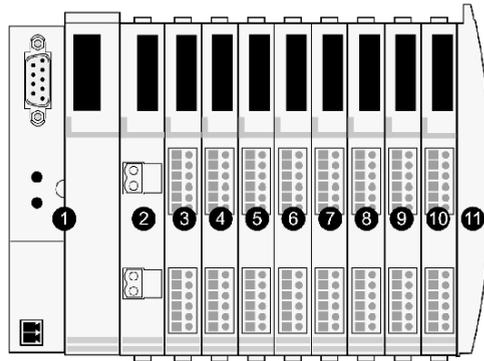
Slot	Module
1	
2	CPU318-2 DP(1)
X2	DP
X1	MPI/DP
3	
4	
5	
6	
7	

A network diagram to the right shows a PROFIBUS(1) DP master system (1) connected to a (1) STB NDP module. Below this, a detailed view of the (1) STB NDP 2212 module is shown with the following table:

Slot	Module / ...	Order number	I Address	Q Address	Comment
0					
1	65	STB_DDI_3230	0		
2	193	STB_DDO_3200	1	0	
3	65	STB_DDI_3420	2		
4	193	STB_DDO_3410	3	1	
5	65	STB_AVI_1270	256...261		
6	193	STB_AVO_1250	262...263	256...259	
7					
8					

### Sample Island Bus Configuration

A representative island bus assembly appears in the following figure. Note that the STB NDP 2212 occupies the leftmost position.



- 1 STB NDP 2212
- 2 STB PDT 3100 24 VDC power distribution module
- 3 STB DDI 3230 24 VDC two-channel digital input module
- 4 STB DDO 3200 24 VDC two-channel digital output module
- 5 STB DDI 3420 24 VDC four-channel digital input module
- 6 STB DDO 3410 24 VDC four-channel digital output module
- 9 STB AVI 1270 +/-10 VDC two-channel analog input module
- 10 STB AVO 1250 +/-10 VDC two-channel analog output module
- 11 STB XMP 1100 island bus termination plate

## Symbolizing I/O Module Data Addressees

You must symbolize the data address for an I/O module to be able to subsequently include the module in an application. Use the following procedure to symbolize the data addresses of the Advantys STB I/O modules in your island bus assembly:

Step	Action	Result
1	In the table on the HW Config screen, select a module for symbolization. Then, select <b>Edit→Symbols</b> from the menus.	The Edit Symbol window opens. The bit structure of the selected module displays. The module is pre-symbolized with default values that include its logical address.
2	You can either accept the default values for a module or customize them: <ul style="list-style-type: none"> <li>● To accept the default values for a module, click on <b>Add Symbol</b>.</li> <li>● To customize a module, edit its values. For example, you can combine bits into a unique word, create a symbolic name for the module, or add a comment. To effect your values, click on <b>Apply</b>.</li> </ul>	The module's data address is symbolized.
3	Repeat step 2 for each module to symbolize its address.	
4	After you have finished symbolizing the modules' data addresses, select <b>Station→Save</b> from the HW Config window menus.	Your modular configuration data is saved. You are ready to write an application program.



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# Advanced Configuration Features

# 6

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## Introduction

This chapter describes the advanced and/or optional configuration features that you can add to an Advantys STB island.

## What's in this Chapter?

This chapter contains the following topics:

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## STB NDP 2212 Configurable Parameters

### Introduction

The following information describes how to the configure parameters for the STB NDP 2212 using the Advantys configuration software.

The following operating parameters are user configurable:

- data size (in words) of PLC output data transmitted to the HMI panel and HMI input data sent to the PLC
- maximum node ID for the last module assembled on the island bus, including CANopen devices

### General Information

For general information about the NIM module (model name, version number, vendor code, etc.), do the following:

Step	Action	Comment
1	Open your island configuration with the Advantys configuration software.	The STB NDP 2212 is the leftmost module in your island bus assembly.
2	Double-click on the NIM in the island editor.	The <i>module editor</i> window appears.
3	Select the <i>General</i> tab.	General information about the STB NDP 2212 is displayed.

### Accessing Configurable Parameters

To access the configurable parameters for the STB NDP 2212:

Step	Action	Comment
1	Double-click on the STB NDP 2212 in the island editor.	The <i>module editor</i> window appears.
2	Select the <i>Parameters</i> tab.	Configurable parameters are located under this tab.
3	In the <i>Parameter name</i> column, expand the <i>Additional Info Store list</i> by clicking on the plus (+) sign.	The configurable parameters are displayed.

## Selecting the Display Format

By default, the values for the configurable NIM parameters use decimal notation. You can change the display format to hexadecimal notation, and vice-versa:

Step	Action	Comment
1	Double-click the NIM in the island editor.	The <i>module editor</i> window appears.
2	Select the <i>Parameters</i> tab.	
3	Click on the checkbox in front of <i>Hexadecimal</i> at the top right of the module editor window. Note: To use decimal notation, again, click on this checkbox to disable hexadecimal notation.	The values for the configurable parameters will display in hexadecimal notation.

## Reserved Sizes (HMI to PLC)

The network interprets data from the HMI as input and reads it from the input data table in the process image. This table is shared with data from all input modules on the island bus. When the reserved size (HMI to PLC) value is selected, the range of available data sizes (in words) appears in the window (see the above figure). The maximum size includes both the input data produced by the island modules and the HMI to PLC data. Therefore, space that you reserve for the HMI to PLC data—plus the input data from the island bus modules—must not exceed the maximum value shown. For example, if your input modules produce 8 words of input data, you can reserve only the remaining 112 words (out of 120 maximum) of the input data table for the HMI to PLC data.

## Reserved Sizes (PLC to HMI)

The network transmits data to the HMI as output by writing it to the output data table in the process image. This table is shared with data for all output modules on the island bus. When the reserved size (PLC to HMI) value is selected, the range of available data sizes (in words) appears in the window (see the above figure). The maximum size includes both the data sent to the island modules and the PLC to HMI data. Therefore, space that you reserve for PLC to HMI data—plus the output data for the island bus modules—must not exceed the maximum value. For example, if your output modules consume 4 words of output data, you can reserve only the remaining 116 words (out of 120 maximum) of the output data table for the PLC to HMI data.

## Reserving Data Sizes

To transfer data to the PLC from a Modbus HMI panel attached to the CFG port, you must reserve space for that data. To reserve data sizes:

Step	Action	Result
1	In the <i>module editor</i> window, select the <i>Parameters</i> tab.	
2	In the <i>Parameter name</i> column, expand the <i>NIM parameters list</i> by clicking on the plus (+) sign.	The configurable NIM parameters are displayed.
3	Double-click in the <i>Value</i> column next to the <i>Reserved Size (Words) of HMI to PLC table</i> .	The value is highlighted.
4	Type a value for the data size to be reserved for data sent from the HMI panel to the PLC.	The value <i>plus</i> the data size of your island cannot exceed the maximum value. If you accept the default value (0), no space will be reserved in the HMI table in the process image.
5	Repeat steps 2-4 to select a value for the <i>Reserved Size (Words) of PLC to HMI table</i> row.	
6	Click on the <i>OK</i> button to save your work.	
7	Click on the <i>Apply</i> button to configure the NIM with these values.	

## CANopen Device Node IDs

From the Parameters tab, you can set the maximum node ID of the last module on the island bus. The last module may be a standard CANopen device. Standard CANopen devices follow the last segment of STB I/O modules. CANopen modules are addressed by counting backwards from the value that you specify here. The ideal node ID sequence is sequential.

For example, if you have an island with five STB I/O modules and three CANopen devices, a maximum node ID of at least 8 (5 + 3) is required. This will result in node IDs of 1 through 5 for STB I/O modules and 6 through 8 for standard CANopen devices. Using the default ID of 32 (the maximum number of modules the island can support) will result in node IDs of 1 through 5 for STB I/O modules and 30 through 32 for standard CANopen devices. Unless required, high addresses are not desirable if any of your standard CANopen devices has a limited address range.

**Assigning the Max. Node ID (CANopen Devices)**

To enter the highest node ID used by a CANopen device on the island bus:

<b>Step</b>	<b>Action</b>	<b>Comment</b>
1	In the <i>module editor</i> window, select the <i>Parameters</i> tab.	Configurable parameters are located under this tab.
2	In the box next to <i>Max. node ID on the CANopen extension</i> , enter a node ID.	This node ID represents the last CANopen module on the island bus.

## Configuring Mandatory Modules

### Summary

As part of a custom configuration, you can assign *mandatory* status to any I/O module or preferred device on an island. The mandatory designation indicates that you consider the module or device critical to your application. If the NIM does not detect a healthy mandatory module at its assigned address during normal operations, the NIM stops the entire island.

**NOTE:** The Advantys Configuration Software is required if you want to designate an I/O module or a preferred device as a mandatory module.

### Specifying Mandatory Modules

By default, the Advantys STB I/O modules are in a non-mandatory (*standard*) state. Mandatory status is enabled by clicking on the mandatory checkbox on a module or preferred device's **Options** tab. Depending on your application, any number of modules that your island supports can be designated as mandatory modules.

### Effects on Island Bus Operations

The following table describes the conditions under which mandatory modules affect island bus operations and the NIM's response:

Condition	Response
A mandatory module is not operating during normal island bus operations.	The NIM stops the island bus. The island enters fallback mode ( <i>see page 137</i> ). I/O modules and preferred devices assume their fallback values.
You attempt to hot swap a mandatory module.	The NIM stops the island bus. The island enters fallback mode. I/O modules and preferred devices assume their fallback values.
You are hot swapping a standard I/O module that resides to the left of a mandatory module on the island bus, and the island loses power.	When power is restored, the NIM attempts to address the island modules but must stop at the empty slot where the standard module used to reside. Because the NIM is now unable to address the mandatory module, it generates a mandatory mismatch condition. The island does not start when this condition is present.

## Recovering from a Mandatory Stop

### **WARNING**

#### **UNINTENDED EQUIPMENT OPERATION/LOSS OF CONFIGURATION—RST BUTTON WHILE RECOVERING FROM MANDATORY STOP**

Pushing the RST button (*see page 55*) causes the island bus to reconfigure itself with factory-default operating parameters, which do not support mandatory I/O status.

- Do not attempt to restart the island by pushing the RST button.
- If a module is unhealthy, replace it with the same module type.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

Pushing the RST button (*see page 55*) while recovering from a mandatory stop loads the island's default configuration data.

## Hot Swapping a Mandatory Module

If the NIM has stopped island bus operations because it cannot detect a healthy mandatory module, you can recover island bus operations by installing a healthy module of the same type. The NIM automatically configures the replacement module to match the removed module. Assuming that other modules and devices on the island bus are correctly configured and conform to their configuration data as written to Flash memory, the NIM starts or restarts normal island bus operations.

## **Prioritizing a Module**

### **Summary**

Using the Advantys configuration software, you can assign priority to digital input modules in your island assembly. Prioritization is a method of fine tuning the NIM's I/O scan of the island bus. The NIM will scan modules with priority more frequently than other island modules.

### **Limitations**

You can prioritize only modules with digital inputs. You cannot prioritize output modules or analog modules. You can prioritize only 10 modules for a given island.

## What Is a Reflex Action?

### Summary

Reflex actions are small routines that perform dedicated logical functions directly on the Advantys island bus. They allow output modules on the island to act on data and drive field actuators directly, without requiring the intervention of the fieldbus master.

A typical reflex action comprises one or two function blocks that perform:

- Boolean AND or exclusive-OR operations
- comparisons of an analog input value to user-specified threshold values
- up- or down-counter operations
- timer operations
- the triggering of a latch to hold a digital value high or low
- the triggering of a latch to hold an analog value at a specific value

The island bus optimizes reflex response time by assigning the highest transmission priority to its reflex actions. Reflex actions take some of the processing workload off the fieldbus master, and they offer a faster, more efficient use of system bandwidth.

### How Reflex Actions Behave

#### **WARNING**

##### **UNEXPECTED OUTPUT OPERATION**

For outputs that are configured to respond to reflex actions, the output state represented in the island's network interface module (NIM) may not represent the actual states of the outputs.

- Turn off field power before you service any equipment connected to the island.
- For digital outputs, view the echo register for the module in the process image to see the actual output state.
- For analog outputs, there is no echo register in the process image. To view an actual analog output value, connect the analog output channel to an analog input channel.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

Reflex actions are designed to control outputs independently of the fieldbus master controller. They may continue to turn outputs on and off even when power is removed from the fieldbus master. Use prudent design practices when you use reflex actions in your application.

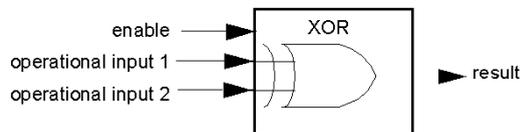
## Configuring a Reflex Action

Each block in a reflex action must be configured using the Advantys configuration software.

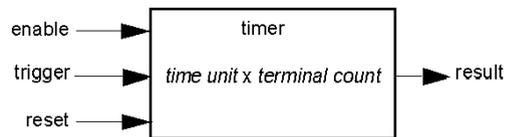
Each block must be assigned a set of inputs and a result. Some blocks also require that you specify one or more user-preset values—a compare block, for example, requires that you preset threshold values and a delta value for hysteresis.

## Inputs to a Reflex Action

The inputs to a reflex block include an enable input and one or more operational inputs. The inputs may be constants or they may come from other I/O modules on the island, from virtual modules or outputs from another reflex block. For example, an XOR block requires three inputs—the enable and two digital inputs that contain the Boolean values to be XORed:



Some blocks, such as the timers, require reset and/or trigger inputs to control the reflex action. The following example shows a timer block with three inputs:



The trigger input starts the timer at 0 and accumulates *time units* of 1, 10, 100 or 1000 ms for a specified number of counts. The reset input causes the timer accumulator to be reset.

An input to a block may be a Boolean value, a word value, or a constant, depending on the type of reflex action it is performing. The enable input is either a Boolean or a constant *always enabled* value. The operational input to a block such as a digital latch must always be a Boolean, whereas the operational input to an analog latch must always be a 16-bit word.

You will need to configure a source for the block's input values. An input value may come from an I/O module on the island or from the fieldbus master via a virtual module in the NIM.

**NOTE:** All inputs to a reflex block are sent on a change-of-state basis. After a change-of-state event has occurred, the system imposes a 10 ms delay before it accepts another change of state (input update). This feature is provided to minimize jitter in the system.

## Result of a Reflex Block

Depending on the type of reflex block that you use, it will output either a Boolean or a word as its result. Generally, the result is mapped to an *action module*, as shown in the following table:

Reflex Action	Result	Action Module Type
Boolean logic	Boolean value	digital output
integer compare	Boolean value	digital output
counter	16-bit word	first block in a nested reflex action
timer	Boolean value	digital output
digital latch	Boolean value	digital output
analog latch	16-bit word	analog output

The result from a block is usually mapped to an individual channel on an output module. Depending on the type of result that the block produces, this action module may be an analog channel or a digital channel.

When the result is mapped to a digital or analog output channel, that channel becomes dedicated to the reflex action and can no longer use data from the fieldbus master to update its field device.

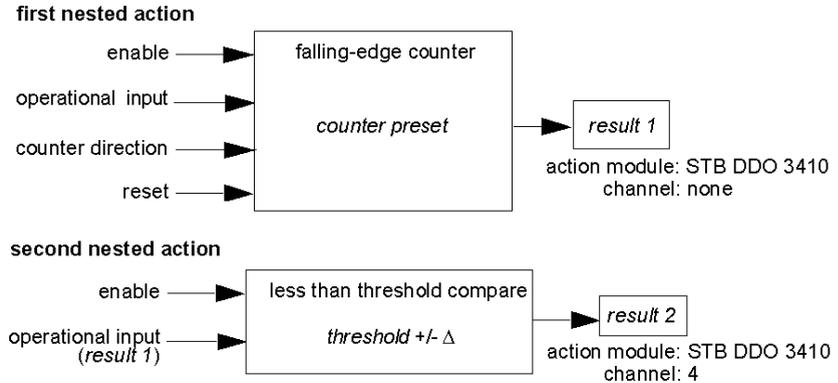
The exception is when a reflex block is the first of two actions in a nested reflex action.

## Nesting

The Advantys configuration software allows you to create nested reflex actions. One level of nesting is supported—i.e., two reflex blocks, where the result of the first block is an operational input to the second block.

When you nest a pair of blocks, you need to map the results of both to the same action module. Choose the action module type that is appropriate for the result of the second block. This may mean that in some cases you will need to choose an action module for the first result that does not seem to be appropriate according to the table above.

For example, say you want to combine a counter block and a compare block in a nested reflex action. You want the result of the counter to be the operational input to the compare block. The compare block will then produce a Boolean as its result:



*Result 2* (from the compare block) is the result that the nested reflex action will send to an actual output. Because the result of a compare block needs to be mapped to a digital action module, *result 2* is mapped to channel 4 on an STB DDO 3410 digital output module.

*Result 1* is used only inside the module—it provides the 16-bit operational input to the compare block. It is mapped to the same STB DDO 3410 digital output module that is the action module for the compare block.

Instead of specifying a physical channel on the action module for *result 1*, the channel is set to *none*. In effect, you are sending *result 1* to an internal reflex buffer where it is stored temporarily until it is used as the operational input to the second block. You are not really sending an analog value to a digital output channel.

### Number of Reflex Blocks on an Island

An island can support up to 10 reflex blocks. A nested reflex action consumes two blocks.

An individual output module can support up to two reflex blocks. Supporting more than one block requires that you manage your processing resources efficiently. If you are not careful with your resources, you may be able to support only one block on an action module.

Processing resources are consumed quickly when a reflex block receives its inputs from multiple sources (different I/O modules on the island and/or virtual modules in the NIM). The best way to preserve processing resources is to:

- use the *always enabled* constant as the enable input whenever possible
- use the same module to send multiple inputs to a block whenever possible

## Island Fallback Scenarios

### Introduction

In the event of a communications interruption on the island or between the island and the fieldbus, output data is put into a fallback state. In this state, output data is replaced with pre-configured fallback values. This makes known the module's output data values when the system recovers from this condition.

### Fallback Scenarios

There are several scenarios in which Advantys STB output modules go into their fallback states:

- loss of fieldbus communications: Communications with the PLC are lost.
- loss of island bus communications: There is an internal island bus communications interruption, indicated by a missing heartbeat message from either the NIM or a module.
- change of operating state: The NIM may command the island I/O modules to switch from a running to a non-running (stopped or reset) state.
- missing or non-operating mandatory module: The NIM detects this condition for a mandatory island module.

**NOTE:** If a mandatory (or any other) module is not operating, it needs to be replaced. The module itself does not go into its fallback state.

In all of these fallback scenarios, the NIM disables the heartbeat message.

### Heartbeat Message

The Advantys STB system relies on a heartbeat message to verify the integrity and continuity of communications between the NIM and the island modules. The health of island modules and the overall integrity of the Advantys STB system are monitored through the transmission and reception of these periodic island bus messages.

Because island I/O modules are configured to monitor the NIM's heartbeat message, output modules go into their fallback states if they do not receive a heartbeat message from the NIM within the defined interval.

### Fallback States for Reflex Functions

Only an output module channel to which the result of a reflex action (*see page 133*) has been mapped can operate in the absence of the NIM's heartbeat message.

When modules that provide input for reflex functionality are not operating or are removed from the island, the channels that hold the result of those reflex actions go into their fallback states.

In most cases, an output module that has one of its channels dedicated to a reflex action goes to its configured fallback state if the module loses communication with the fieldbus master. The only exception is a two-channel digital output module that has both of its channels dedicated to reflex actions. In this case, the module may continue to solve logic after a loss of fieldbus communication. For more information about reflex actions, refer to the *Reflex Actions Reference Guide*.

## Configured Fallback

To define a customized fallback strategy for individual modules, you are required to use the Advantys Configuration Software. Configuration is done channel by channel. You can configure a single module's multiple channels with different fallback parameters. Configured fallback parameters (implemented only during a communications interruption) are part of the configuration file stored in the NIM's non-volatile Flash memory.

## Fallback Parameters

You can select either of two fallback modes when configuring output channels with the Advantys Configuration Software:

- *hold last value*: In this mode, outputs retain the last values they were assigned before the fallback condition was triggered.
- *predefined value*: In this (default) mode, you can select either of two fallback values:
  - 0 (default)
  - some value in acceptable range

The permissible values for fallback parameters in the *predefined value* mode for discrete and analog modules and reflex functions appear in the following table:

Module Type	Fallback Parameter Values
discrete	0/off (default)
	1/on
analog	0 (default)
	not 0 (in range of acceptable analog values)

**NOTE:** In an auto-configured system, default fallback parameters and values are always used.

## Saving Configuration Data

### Introduction

The Advantys configuration software allows you to save configuration data created or modified with this software to the NIM's Flash memory and/or to the removable memory card (*see page 49*). Subsequently, this data can be read from Flash memory and used to configure your physical island.

**NOTE:** If your configuration data is too large, you will receive a message when you attempt to save it.

### How to Save a Configuration

The following procedure describes the steps you use to save a configuration data file to Flash memory directly and to a removable memory card. For more detailed procedural information, use the configuration software's online help feature:

Step	Action	Comment
1	Connect the device running the Advantys Configuration Software to the CFG port ( <i>see page 34</i> ) on the NIM.	For NIM modules that support Ethernet communications, you can connect the device directly to the Ethernet port.
2	Launch the configuration software.	
3	Download the configuration data that you want to save from the configuration software to the NIM.	A successful download saves the configuration data to the NIM's flash memory.
4	Install the card ( <i>see page 50</i> ) in the host NIM, then use the <b>Store to SIM card</b> command.	Saving the configuration data to the removable memory card is optional. This operation overwrites old data on the SIM card.

## Write-Protecting Configuration Data

### Introduction

As part of a custom configuration, you can password-protect an Advantys STB island. Only authorized persons have write privileges to the configuration data currently stored in Flash memory:

- Use the Advantys Configuration Software to password-protect an island's configuration.
- For some modules, it is possible to password-protect the island configuration through an embedded web site.

The island runs normally in protected mode. All users have the ability to monitor (read) the activity on the island bus. If a configuration is write-protected, access to it is restricted in the following ways:

- An unauthorized user is unable to overwrite the current configuration data in Flash memory.
- The RST button (*see page 55*) is disabled, and pushing it has no effect on island bus operations.
- The presence of a removable memory card (*see page 49*) is ignored. The configuration data currently stored in Flash cannot be overwritten by data on the card.

**NOTE:** The STB NIP 2311 NIM never ignores the removable memory card.

### Password Characteristics

A password must meet the following criteria:

- It must be between 0 and 6 characters in length.
- Only alphanumeric ASCII characters are permitted.
- The password is case-sensitive.

If password protection is enabled, your password is saved to Flash memory (or to a removable memory card) when you save the configuration data.

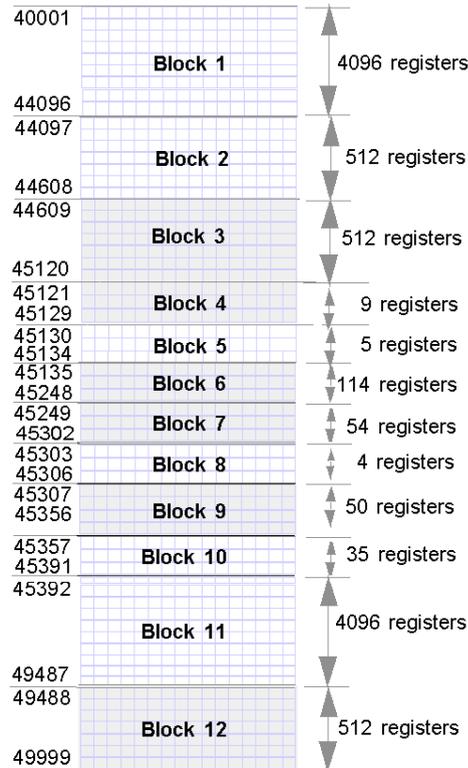
**NOTE:** A password-protected configuration is inaccessible to anyone who does not know the password. Your system administrator is responsible for keeping track of the password and the list of authorized users. If the assigned password is lost or forgotten, you are unable to change the island's configuration.

If the password is lost and you need to reconfigure the island, you need to perform a destructive reflash of the NIM. This procedure is described on the Advantys STB product Web site at [www.schneiderautomation.com](http://www.schneiderautomation.com).



## The Data Image

The 9999 contiguous registers in the Modbus data image start at register 40001. This figure shows the subdivision of data into sequential blocks:



- Block 1** output data process image (4096 registers available)
- Block 2** fieldbus master-to-HMI output table (512 registers available)
- Block 3** reserved (512 registers available)
- Block 4** 9-register block reserved for future read/write use
- Block 5** 5-register RTP Request Block
- Block 6** 114-register block reserved for future read/write use
- Block 7** 54-register block reserved for future read/write use
- Block 8** 4-register RTP Response Block
- Block 9** 50-register block reserved for future read-only use
- Block 10** 35 predefined island bus status registers
- Block 11** input data/status process image (4096 registers available)
- Block 12** HMI-to-fieldbus master input table (512 registers available)

Each block has a fixed number of registers reserved for its use. Whether or not all the registers reserved for that block are used in an application, the number of registers allocated to that block remains constant. This permits you to know at all times where to begin looking for the type of data of interest to you.

For example, to monitor the status of the I/O modules in the process image, look at the data in block 11 beginning at register 45392.

### **Reading Register Data**

All the registers in the data image can be read by an HMI panel connected to the island at the NIM's CFG port (*see page 34*). The Advantys configuration software reads all this data, and displays blocks 1, 2, 5, 8, 10, 11, and 12 in the Modbus Image screen in its I/O Image Overview.

### **Writing Register Data**

Some registers, usually configured number of registers in block 12 (registers 49488 through 49999) of the data image, may be written to by an HMI panel (*see page 162*).

The Advantys configuration software or an HMI panel may also be used to write data to the registers in block 1 (registers 40001 through 44096). The configuration software or the HMI panel must be the island bus master in order for it to write to the data image—i.e., the island must be in *test* mode.

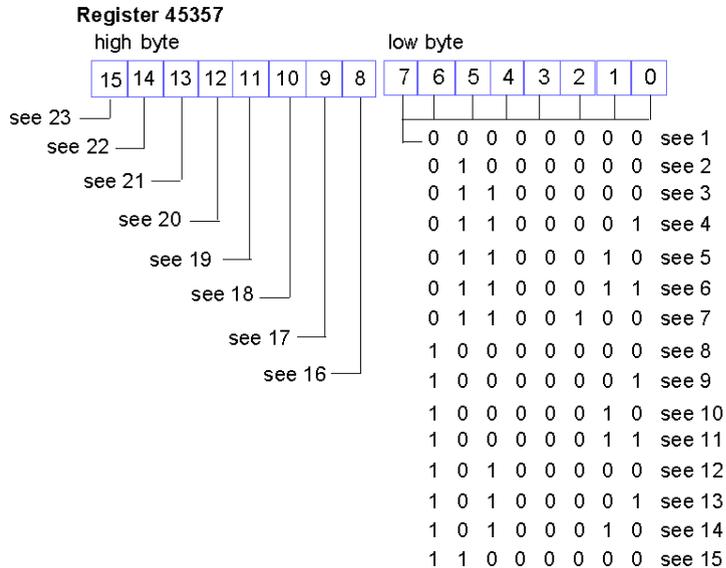
## Predefined Diagnostics Registers in the Data Image

### Summary

Thirty-five contiguous registers (45357 through 45391) in the island bus data image (see page 142) are provided for reporting diagnostic information. These registers have predefined meanings that are described below. They can be accessed and monitored through an HMI panel or by the Advantys configuration software.

### Island Communications Status

Register 45357 describes the state of communications across the island bus. The low byte (bits 7 through 0) displays one of 15 possible eight-bit patterns that indicates the current state of communication. Each bit in the high byte (bits 15 through 8) is used to signal the presence or absence of a specific error condition.

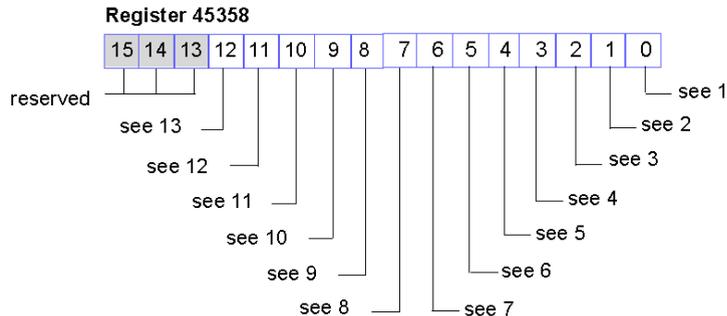


- 1 The island is initializing.
- 2 The island has been set to pre-operational mode, for example, by the reset function.
- 3 The NIM is configuring or auto-configuring—communication to all modules is reset.
- 4 The NIM is configuring or auto-configuring—checking for any modules that are not auto-addressed.
- 5 The NIM is configuring or auto-configuring—Advantys STB and preferred modules are being auto-addressed.
- 6 The NIM is configuring or auto-configuring—boot-up is in progress.
- 7 The process image is being set up.

- 8 Initialization is complete, the island bus is configured, the configuration matches, and the island bus is not started.
- 9 Configuration mismatch—non-mandatory or unexpected modules in the configuration do not match, and the island bus is not started.
- 10 Configuration mismatch—at least one mandatory module does not match, and the island bus is not started.
- 11 Serious configuration mismatch—the island bus has been set to pre-operational mode, and initialization is aborted.
- 12 The configuration matches, and the island bus is operational.
- 13 The island is operational with a configuration mismatch. At least one standard module does not match, but all the mandatory modules are present and operating.
- 14 Serious configuration mismatch—the island bus was started but is now in pre-operational mode because of one or more mismatched mandatory module(s).
- 15 The island has been set to pre-operational mode, for example, by the stop function.
- 16 A value of 1 in bit 8 is a fatal error. It indicates a low-priority receive queue software overrun error.
- 17 A value of 1 in bit 9 is a fatal error. It indicates a NIM overrun error.
- 18 A value of 1 in bit 10 indicates an island bus-off error.
- 19 A value of 1 in bit 11 is a fatal error. It indicates that the error counter in the NIM has reached the warning level and the error status bit has been set.
- 20 A value of 1 in bit 12 indicates that the NIM's error status bit has been reset.
- 21 A value of 1 in bit 13 is a fatal error. It indicates a low-priority transfer queue software overrun error.
- 22 A value of 1 in bit 14 is a fatal error. It indicates a high-priority receive queue software overrun error.
- 23 A value of 1 in bit 15 is a fatal error. It indicates a high-priority transfer queue software overrun error.

## Error Reporting

Each bit in register 45358 is used to report a global error condition. A value of 1 in the bit indicates that a specific global error has been detected.



- 1 Fatal error. Because of the severity of the error, no further communications are possible on the island bus.

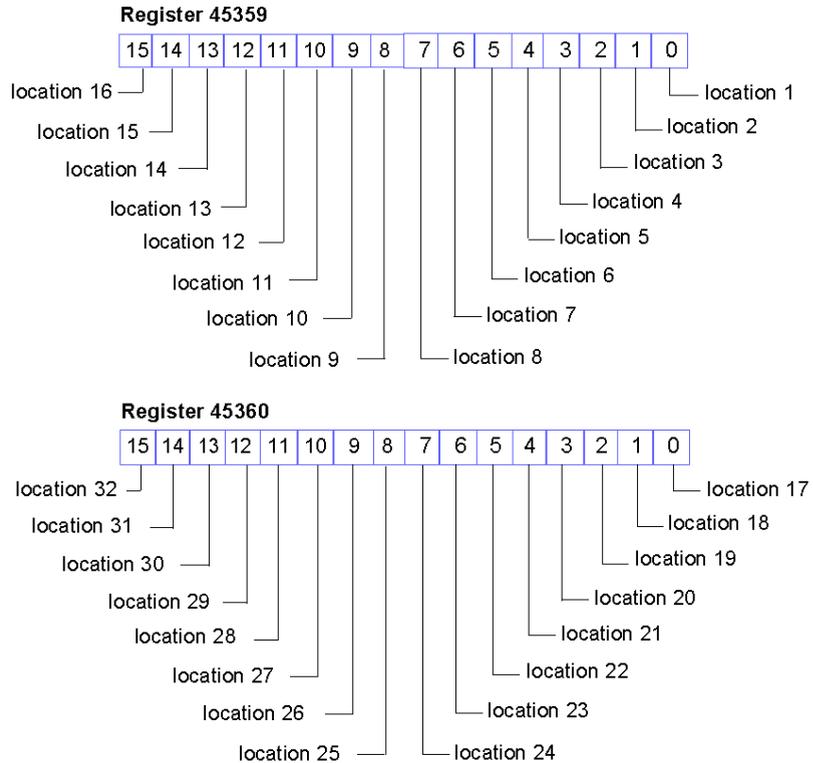
- 2 Module ID error—A standard CANopen device is using a module ID reserved for the Advantys STB modules.
- 3 Auto-addressing has failed.
- 4 Mandatory module configuration error.
- 5 Process image error—either the process image configuration is inconsistent, or it could not be set up during auto-configuration.
- 6 Auto-configuration error—a module is not in its configured location, and the NIM cannot complete auto-configuration.
- 7 The island bus management error detected by the NIM.
- 8 Assignment error—the initialization process in the NIM has detected a module assignment error, possibly the result of at least one application parameter mismatch.
- 9 Internal triggering protocol error.
- 10 Module data length error.
- 11 Module configuration error.
- 12 reserved
- 13 Timeout error.

## Node Configuration

The next eight contiguous registers (registers 45359 through 45366) display locations where modules have been configured on the island bus. This information is stored in Flash memory. At start up, the actual locations of the modules on the island are validated by comparing them to the configured locations stored in memory. Each bit represents a configured location:

- A value of 1 in a bit indicates that a module has been configured for the associated location.
- A value of 0 in a bit indicates that a module has not been configured for the associated location.

The first two registers, shown below, provide the 32 bits that represent the module locations available in a typical island configuration. The remaining six registers (45361 through 45366), are available to support the island's expansion capabilities.

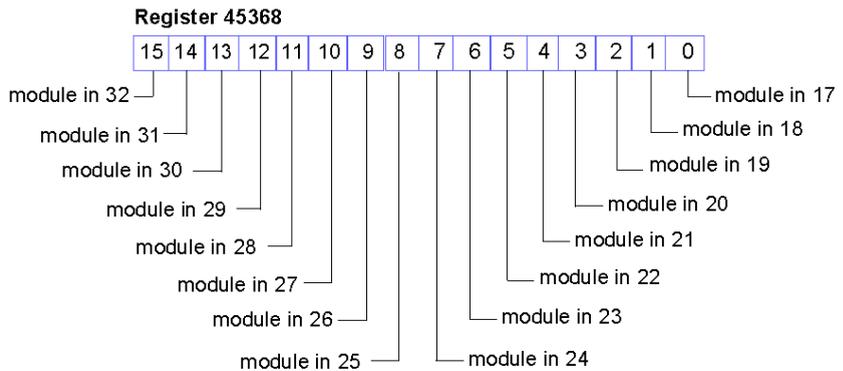
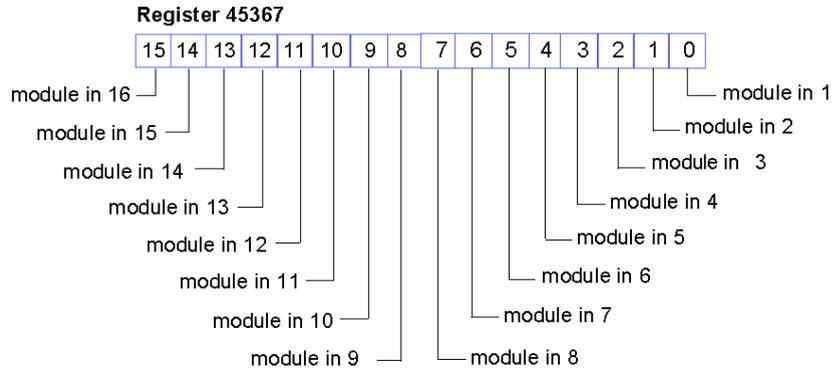


## Node Assembly

The next eight contiguous registers (registers 45367 through 45374) indicate the presence or absence of configured modules in locations on the island bus. This information is stored in Flash memory. At start up, the actual locations of the modules on the island are validated by comparing them to the configured locations stored in memory. Each bit represents a module:

- A value of 1 in a given bit indicates either that the configured module is not present or that the location has not been configured.
- A value of 0 indicates that the correct module is present in its configured location.

The first two registers, shown below, provide the 32 bits that represent the module locations available in a typical island configuration. The remaining six registers (45369 through 45374) are available to support the island's expansion capabilities.

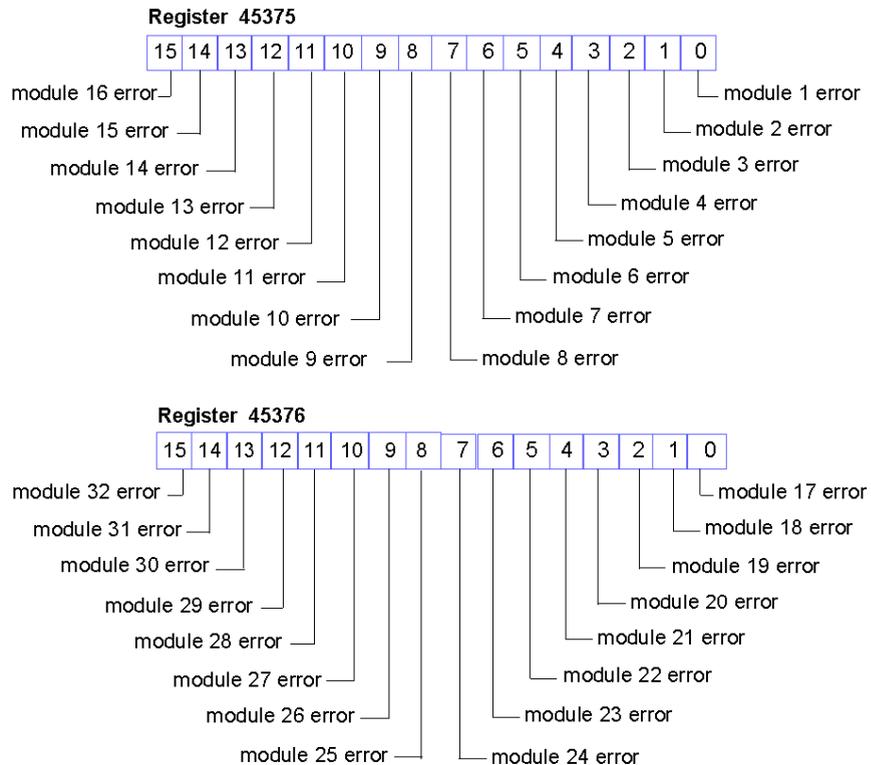


### Emergency Messages

The next eight contiguous registers (registers 45375 through 45382) indicate the presence or absence of newly received emergency messages for individual modules on the island. Each bit represents a module:

- A value of 1 in a given bit indicates that a new emergency message has been queued for the associated module.
- A value of 0 in a given bit indicates that no new emergency messages have been received for the associated module since the last time the diagnostic buffer was read.

The first two registers, shown below, provide the 32 bits that represent the module locations available in a typical island configuration. The remaining six registers (45377 through 45382) are available to support the island's expansion capabilities.



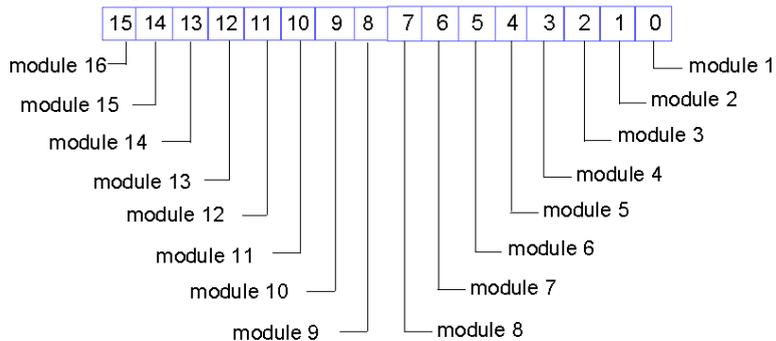
## Fault Detection

The next eight contiguous registers (registers 45383 through 45390) indicate the presence or absence of operational faults detected on the island bus modules. Each bit represents a module:

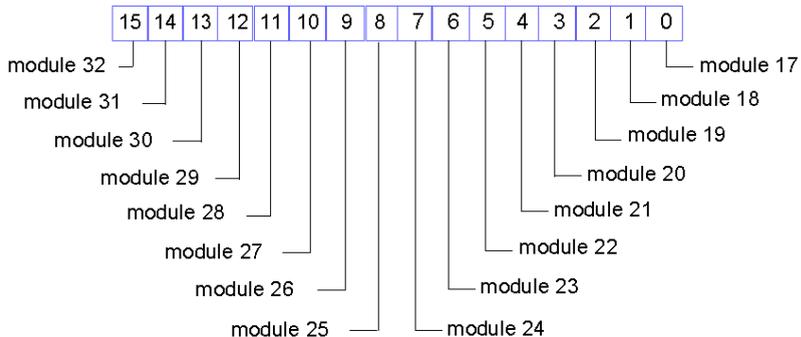
- A value of 1 in a bit indicates that the associated module is operating and that no faults were detected.
- A value of 0 in a bit indicates that the associated module is not operating either because it has a fault or because it has not been configured.

The first two registers, shown below, provide the 32 bits that represent the module locations available in a typical island configuration. The remaining six registers (45385 through 45390) are available to support the island's expansion capabilities.

**Register 45383**

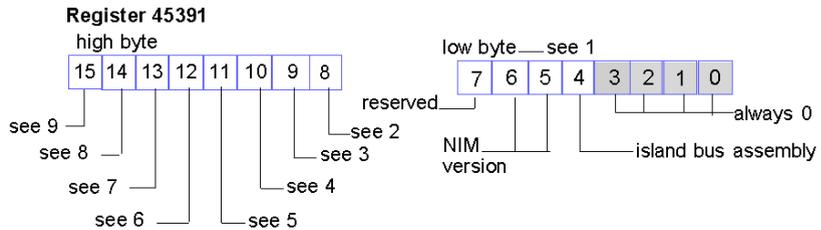


**Register 45384**



## NIM Status

The eight LSBs (bits 7 through 0) in register 45391 report the status of the NIM.



- 1 Profibus DP fieldbus low byte: A value of 0 in bit 4 indicates that the actual island bus assembly matches the configuration specified in the configuration telegram, a value of 1 indicates an error; bits 5 and 6 together indicate the NIM version, which is 1 0 for the STB NDP 2212; a value of 0 in bit 7 indicates a Siemens Profibus DP controller; a value of 1 indicates a Profichip Profibus DP controller.
- 2 Module failure—bit 8 is set to 1 if any module on the island bus fails.
- 3 A value of 1 in bit 9 indicates an internal failure—at least one global bit was set.
- 4 A bit value of 1 in bit 10 indicates an external failure—the problem is on the fieldbus.
- 5 A value of 1 in bit 11 indicates that the configuration is protected—the RST button is disabled and the island configuration requires a password to write to it; a bit value of 0 indicates that the island configuration is unprotected—the RST button is enabled, and the configuration is not password-protected.
- 6 A value of 1 in bit 12 indicates that the configuration on the removable memory card is invalid.
- 7 A value of 1 in bit 13 indicates that reflex action functionality has been configured. (For NIMs with firmware version 2.0 or greater.)
- 8 A value of 1 in bit 14 indicates that one or more island modules have been hot-swapped. (For NIMs with firmware version 2.0 or greater.)
- 9 Island bus output data master—a value of 0 in bit 15 indicates that the fieldbus master device is controlling the output data of the island's process image; a bit value of 1 indicates that the Advantys configuration software is controlling the output data of the island's process image.

## The Island's Process Image Blocks

### Summary

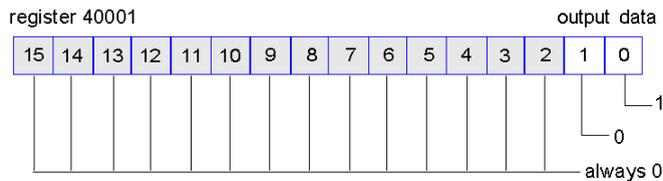
Two blocks of registers in the island's data image (*see page 142*) are the focus for this discussion. The first block is the output data process image, which starts at register 40001 and goes to register 44096. The other block is the input data and I/O status process image, which also consumes 4096 registers (45392 through 49487). The registers in each block are used to report island bus device status and to dynamically exchange input or output data between the fieldbus master and the island's I/O modules.

### Output Data Process Image

The output data block (registers 40001 through 44096) handles the output data process image. This process image is a Modbus representation of the control data that has just been written from the fieldbus master to the NIM. Only data for the island's output modules is written to this block.

Output data is organized in 16-bit register format. One or more registers are dedicated to the data for each output module on the island bus.

For example, say you are using a two-channel digital output module as the first output module on your island bus. Output 1 is on and output 2 is off. This information would be reported in the first register in the output data process image, and it would look like this:



where:

- Normally, a value of 1 in bit 0 indicates that output 1 is on.
- Normally, a value of 0 in bit 1 indicates that output 2 is off.
- The remaining bits in the register are not used.

Some output modules, such as the one in the example above, utilize a single data register. Others may require multiple registers. An analog output module, for example, would use separate registers to represent the values for each channel, and might use the 11 or 12 most significant bits to display analog values in IEC format.

Registers are allocated to output modules in the output data block according to their addresses on the island bus. Register 40001 always contains the data for the first output module on the island (the output module closest to the NIM).

## Output Data Read/Write Capabilities

The registers in the output data process image are read/write-capable.

You can read (i.e., monitor) the process image using an HMI panel or the Advantys Configuration Software. The data content that you see when you monitor the output data image registers is updated in near-real time.

The island's fieldbus master also writes updated control data to the output data process image.

## Input Data and I/O Status Process Image

The input data and I/O status block (registers 45392 through 49487) handles the input data and I/O status process image. Every I/O module on the island bus has information that needs to be stored in this block.

- Each digital input module reports data (the on/off status of its input channels) in one register of input data and I/O status block, then reports its status in the next register.
- Each analog input module uses four registers in the input data and I/O status block. It represents the analog data for each channel in separate registers and the status of each channel in separate registers. Analog data is usually represented with 11- or 12-bit resolution in the IEC format; status in an analog input channel is usually represented by a series of status bits that report the presence or absence of an out-of-range value in a channel.
- Each digital output module reports an echo of its output data to a register in the input data and I/O status block. Echo output data registers are essentially copies of the register values that appear in the output data process image. This data is usually not of much interest, but it can be useful in the event that a digital output channel has been configured for a reflex action. In this case, the fieldbus master can see the bit value in the echo output data register even though the output channel is being updated inside the island bus.
- Each analog output module uses two registers in the input data and I/O status block to report status. Status in an analog output channel is usually represented by a series of status bits that report the presence or absence of an out-of-range value in a channel. Analog output modules do not report data in this block.

A detailed view of how the registers in the input data and I/O status block are implemented is shown in the process image example.

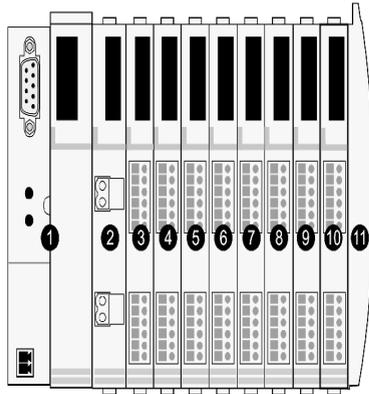
## An Example of a Modbus View of the Process Image

### Summary

The following example shows what the output data process image and the input data and I/O status process image might look like when it represents a specific island bus configuration.

### The Sample Configuration

The sample island comprises the following 10 modules and a termination plate:



- 1 network interface module
- 2 24 VDC power distribution module
- 3 STB DDI 3230 24 VDC two-channel digital input module
- 4 STB DDO 3200 24 VDC two-channel digital output module
- 5 STB DDI 3420 24 VDC four-channel digital input module
- 6 STB DDO 3410 24 VDC four-channel digital output module
- 7 STB DDI 3610 24 VDC six-channel digital input module
- 8 STB DDO 3600 24 VDC six-channel digital output module
- 9 STB AVI 1270 +/-10 VDC two-channel analog input module
- 10 STB AVO 1250 +/-10 VDC two-channel analog output module
- 11 STB XMP 1100 island bus termination plate

The I/O modules have the following island bus addresses (*see page 46*):

I/O Model	Module Type	Island Bus Address
STB DDI 3230	two-channel digital input	1
STB DDO 3200	two-channel digital output	2
STB DDI 3420	four-channel digital input	3
STB DDO 3410	four-channel digital output	4
STB DDI 3610	six-channel digital input	5

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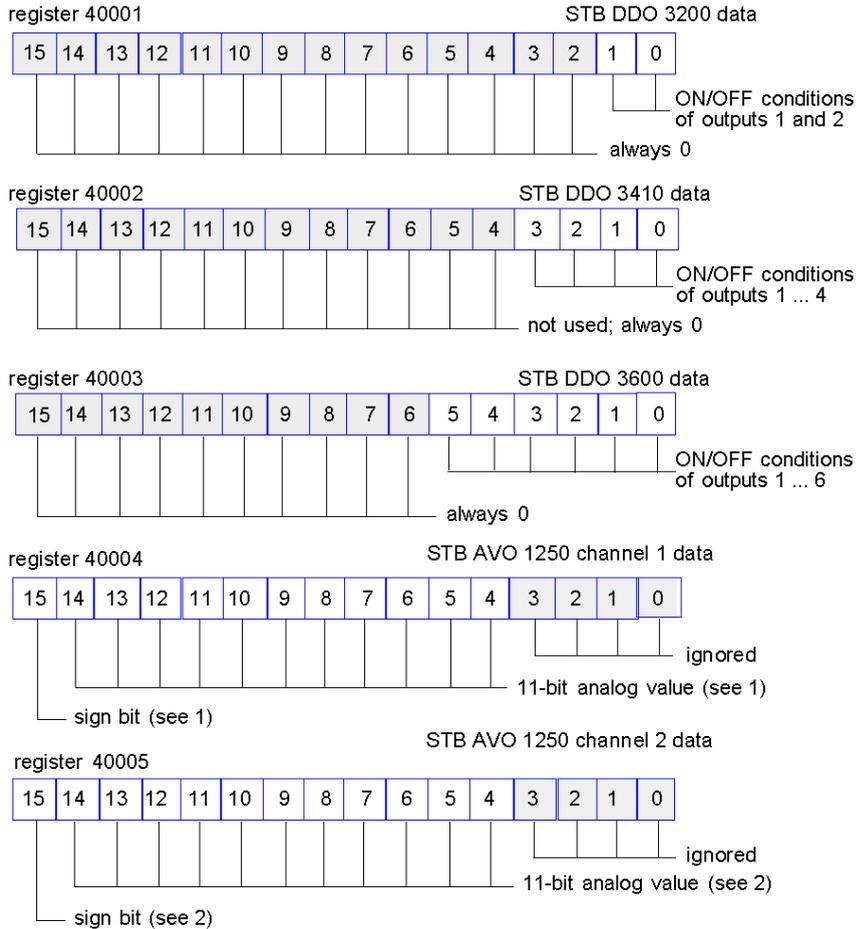
<b>I/O Model</b>	<b>Module Type</b>	<b>Island Bus Address</b>
STB DDO 3600	six-channel digital output	6
STB AVI 1270	two-channel analog input	7
STB AVO 1250	two-channel analog output	8

The PDM and the termination plate do not consume island bus addresses and are not represented in the process image.

### **The Output Data Process Image**

Let's look first at the register allocation required to support the output data process image (*see page 152*). This is the data written to the island from the fieldbus master to update the output modules on the island bus. The four output modules are affected—the three digital output modules at addresses 2, 4, and 6 and the one analog output module at address 8.

The three digital output modules utilize one Modbus register apiece for data. The analog output module requires two registers, one for each output channel. A total of five registers (registers 40001 through 40005) are used for this configuration:



- 1 The value represented in register 40004 is in the range +10 to -10 V, with 11-bit resolution plus a sign bit in bit 15.
- 2 The value represented in register 40005 is in the range +10 to -10 V, with 11-bit resolution plus a sign bit in bit 15.

The digital modules use the LSBs to hold and display their output data. The analog module uses the MSBs to hold and display its output data.

## The Input Data and I/O Status Process Image

Now let's look at the register allocation required to support the input data and I/O status process image (*see page 153*). This is the information that the NIM collects from the island modules so that it can be read by the fieldbus master or by some other monitoring device.

All eight I/O modules are represented in this process image block. The modules are assigned registers in the order of their island bus addresses, starting at register 45392.

Each digital I/O module uses two contiguous registers:

- Digital input modules use one register to report data and the next to report status.
- Digital output modules use one register to echo output data and the next to report status.

**NOTE:** The value in an *echo output data* register is basically a copy of the value written to the corresponding register in the output data process image. Generally, this is the value written to the NIM by the fieldbus master, and its echo is of not much interest. When an output channel is configured to perform a reflex action (*see page 133*), however, the echo register provides a location where the fieldbus master can look to see the current value of the output.

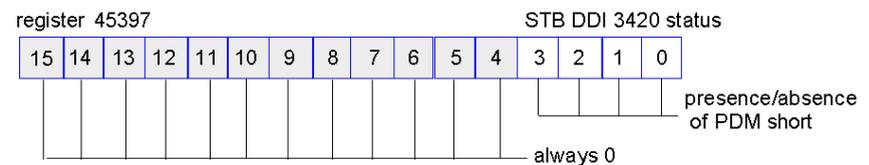
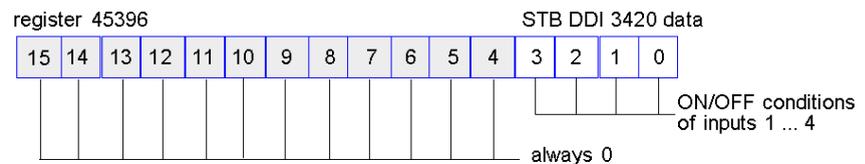
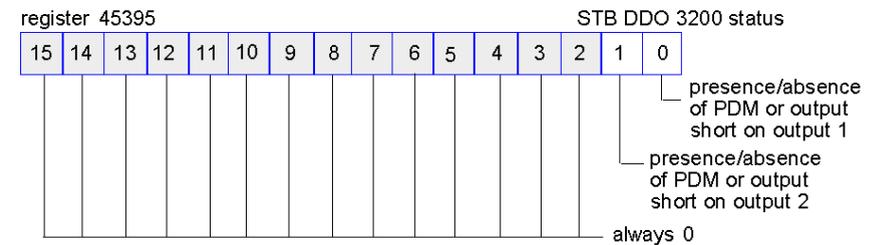
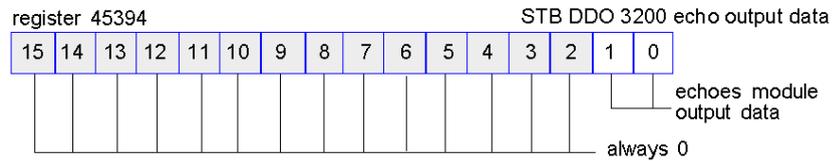
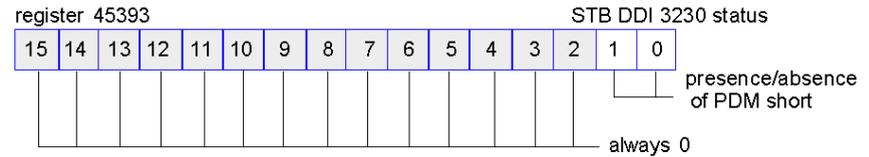
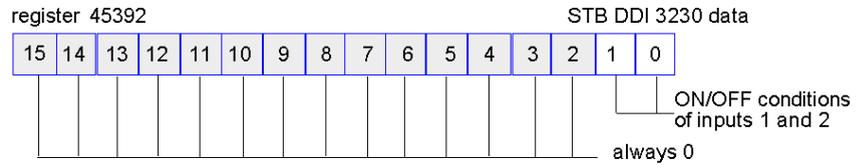
The analog input module uses four contiguous registers:

- the first register to report the data for channel 1
- the second register to report status for channel 1
- the third register to report the data for channel 2
- the fourth register to report status for channel 2

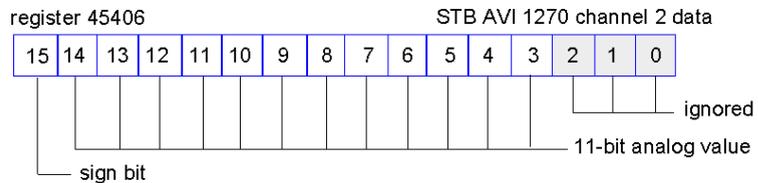
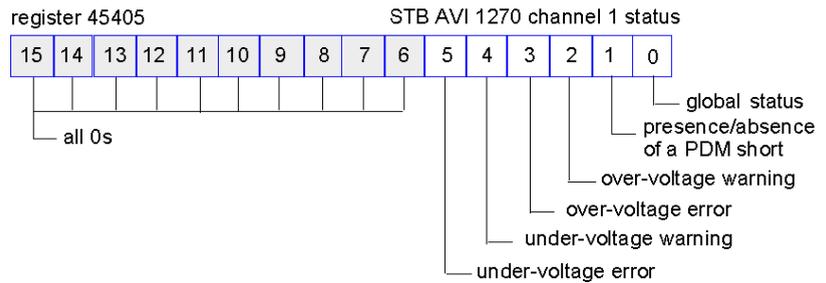
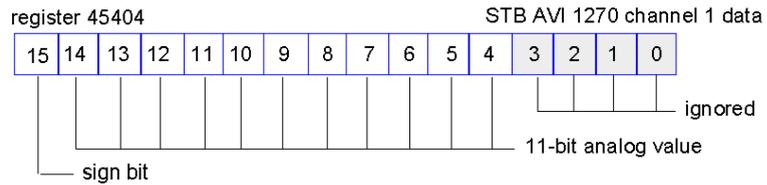
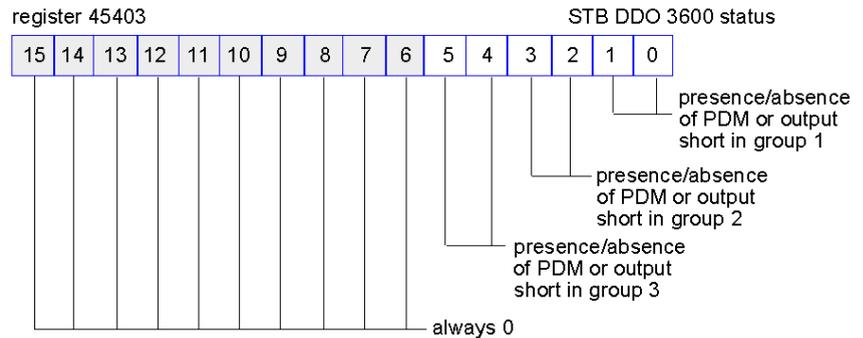
The analog output module uses two contiguous registers:

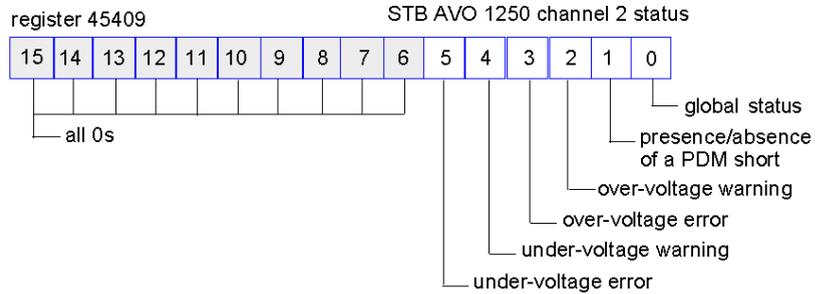
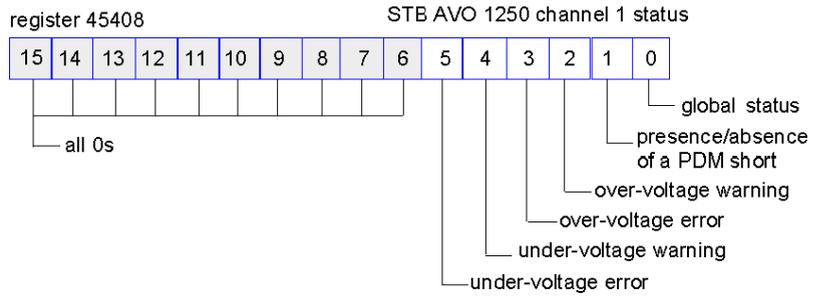
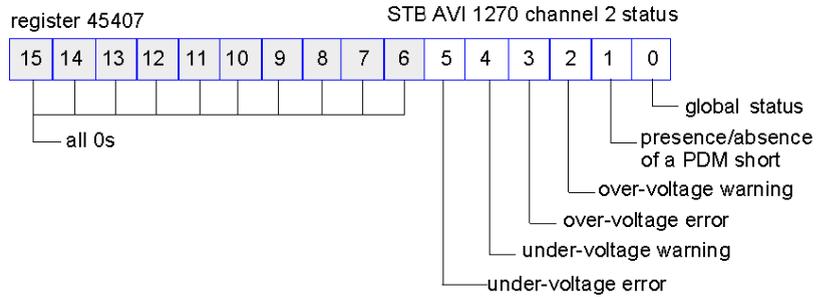
- the first register to report status for channel 1
- the second register to report status for channel 2

In total, 18 registers (registers 45392 through 45409) are used to support our configuration:









## The HMI Blocks in the Island Data Image

### Summary

An HMI panel that communicates using the Modbus protocol can be connected to the CFG port (*see page 34*) on the NIM. Using the Advantys configuration software, you can reserve one or two blocks of registers in the data image (*see page 141*) to support HMI data exchange. When an HMI panel writes to one of these blocks, that data is accessible to the fieldbus master (as inputs). Data written by the fieldbus master (as outputs) is stored in a different reserved block of registers that the HMI panel can read.

### HMI Panel Configuration

Advantys STB supports the ability of an HMI panel to act as:

- an input device, which writes data to the island's data image that is read by the fieldbus master
- an output device, which can read data written by the fieldbus master to the island's data image
- a combined I/O device

### HMI Input Data Exchange

Input data to the fieldbus master can be generated by the HMI panel. Input controls on an HMI panel might be elements such as:

- push buttons
- switches
- a data entry keypad

To use an HMI panel as an input device on the island, you need to enable the HMI-to-fieldbus master block in the island's data image (*see page 142*) and specify the number of registers in this block that you want to use for HMI-to-fieldbus master data transfers. You must use the Advantys configuration software to make these configuration adjustments.

The HMI-to-fieldbus master block can comprise up to 512 registers, ranging from register 49488 to 49999. (Your actual register limit will be dictated by your fieldbus.) This block follows immediately after the standard input data and I/O status process image (*see page 153*) block (registers 45392 through 49487) in the island's data image.

The HMI panel writes the input data to a specified number of registers in the HMI-to-fieldbus master block. The NIM manages the transfer of the HMI data in these registers as part of the overall input data transfer—it converts the 16-bit register data to a fieldbus-specific data format and transfers it together with the standard input data and I/O status process image to the fieldbus. The fieldbus master sees and responds to HMI data as if it were standard input data.

## HMI Output Data Exchange

In turn, output data written by the fieldbus master can be used to update enunciator elements on the HMI panel. Enunciator elements might be:

- display indicators
- buttons or screen images that change color or shape
- data display screens (for example, temperature read-outs)

To use the HMI panel as an output device, you need to enable the fieldbus-to-HMI block in the island's data image (*see page 142*) and specify the number of registers in this block that you want to use. You need to use the Advantys configuration software to make these adjustments to your configuration.

The fieldbus master-to-HMI block can comprise up to 512 registers, ranging from register 44097 to 44608. This block follows immediately after the standard output data process image (*see page 152*) block (registers 40001 through 44096) in the island's data image.

The fieldbus master writes output update data in native fieldbus format to the HMI data block concurrent with writing this data to the output data process image area. The output data is placed in the fieldbus master-to-HMI block. Upon request by the HMI via a Modbus *read* command, the role of the NIM is to receive this output data, convert it to 16-bit Modbus format, and send it over the Modbus connection at the CFG port to the HMI panel.

**NOTE:** The *read* command enables all Modbus registers to be read, not just those in the block reserved for fieldbus master-to-HMI data exchange.

## Test Mode

### Summary

Test Mode indicates that the output data of the STB island's process image is not controlled by a fieldbus master device, but is instead controlled by either the Advantys Configuration Software or an HMI. When the STB island is operating in Test Mode, the fieldbus master cannot write the STB island's outputs, but can continue to read its inputs and diagnostic data.

Test Mode is configured off-line, downloaded with the island configuration, then activated online.

Select Test Mode Settings in the **Online** menu to open the Test Mode configuration window, where you can select a test mode setting. Test Mode settings are stored with other STB island configuration settings both in the NIM's flash memory and in a SIM card, if one is attached to the NIM.

When Test Mode is activated, the NIM's TEST LED is lit, and bit #5 of the NIM Status word in register 45391 is set to 1.

**NOTE:** Loss of Modbus communications do not affect Test Mode.

There are three Test Mode settings:

- Temporary Test Mode
- Persistent Test Mode
- Password Test Mode

The following sections describe the process and effect of activating Test Mode.

### Temporary Test Mode

When operating online, use the Advantys Configuration Software (not an HMI) to activate Temporary Test Mode, by selecting **Test Mode** in the **Online** menu.

Once activated, Temporary Test Mode is deactivated by:

- de-selecting **Test Mode** in the **Online** menu
- cycling power to the NIM
- selecting **Reset** in the **Online** menu
- performing Autoconfiguration
- downloading a new island configuration to the NIM (or inserting a SIM card with a new island configuration into the NIM and cycling power to the NIM).

Temporary Test Mode is the default Test Mode configuration setting.

## Persistent Test Mode

Use the Advantys Configuration Software to configure the STB island for Persistent Test Mode. When the download of this configuration is complete, Persistent Test Mode is activated. Thereafter, the STB island operates in Test Mode each time power is cycled to the island. When Persistent Test Mode is activated, the STB island's process image output data is controlled exclusively by either the HMI or the configuration software. The fieldbus master no longer controls these outputs.

Persistent Test Mode is deactivated by:

- downloading a new island configuration to the NIM (or inserting a SIM card with a new island configuration into the NIM and cycling power to the NIM)
- performing Autoconfiguration.

## Password Test Mode

Use the Advantys Configuration Software to enter a password to the STB island's configuration settings. The password you input must have an integer value from 1 to 65535 (FFFF hex).

After the changed configuration (including the password) has been downloaded, you can activate Password Test Mode only by using an HMI to issue a single Modbus Register write command to send the password value to Modbus Register 45120.

After Password Test Mode is activated, the STB island's process image output data is controlled by either the HMI or the configuration software. In this case, the fieldbus master no longer controls these outputs.

Password Test Mode, once activated, is deactivated by:

- cycling power to the NIM
- selecting **Reset** in the **Online** menu
- performing Autoconfiguration
- downloading a new island configuration to the NIM (or inserting a SIM card with a new island configuration into the NIM and cycling power to the NIM)
- using an HMI to issue a single Modbus register write command to send the password value to Modbus Register 45121 (STB NIC 2212 and STB NIP 2311 NIMs only)

**NOTE:** Password Test Mode must be activated only by using the NIM's configuration port. All attempts to enter Password Test Mode using the fieldbus (via NIM models STB NMP 2212 or STB NIP 2212) are unsuccessful.

## Run-Time Parameters

### Introduction

For STB modules, the Advantys Configuration Software provides the RTP (run-time parameters) feature. It can be used for monitoring and modifying selected I/O parameters and Island bus status registers of the NIM while the Island is running. This feature is available only in standard STB NIMs with firmware version 2.0 or later.

RTP must be configured using the Advantys Configuration Software before it can be used. RTP is not configured by default. Configure RTP by selecting **Configure run-time Parameters** in the **Options** tab of the NIM Module Editor. This allocates the necessary registers within the NIM's data process image to support this feature.

### Request and Response Blocks

Once configured, use the RTP feature by writing up to 5 reserved words in the NIM's output data process image (the RTP request block) and by reading the value of 4 reserved words in the NIM's input data process image (the RTP response block). The Advantys Configuration Software displays both blocks of reserved RTP words in the Island's **I/O Image Overview** dialog box, both in the **Modbus Image** tab and (for NIMs with a separate fieldbus image) in the **Fieldbus Image** tab. In each tab, the blocks of reserved RTP words appear after the block of process I/O data and before the block of HMI data (if any).

**NOTE:** The Modbus address values of the RTP request and response blocks are the same in all standard NIMs. The fieldbus address values of the RTP request and response blocks depend upon the network type. Use the **Fieldbus Image** tab of the **I/O Image Overview** dialog box to obtain the location of the RTP registers. For Modbus Plus and Ethernet networks, use the Modbus register numbers.

### Exceptions

Any parameter you modify using the RTP feature does not retain its modified value if one of the following events occurs:

- Power is cycled to the NIM.
- A **Reset** command is issued to the NIM using the Advantys Configuration Software.
- A **Store to SIM Card** command is issued using the Advantys Configuration Software.
- The module whose parameter has been modified is hot-swapped.

If a module is hot-swapped, as indicated by the HOT\_SWAP indicator bit, you can use the RTP feature to detect which module has been hot-swapped and to restore the parameters to their previous values.

## Test Mode

When the NIM is operating in test mode, the NIM's output data process image (including the RTP request block) can be controlled either by the Advantys Configuration Software or by an HMI (depending upon the test mode configured). Standard Modbus commands can be used to access the RTP words. If the NIM is in test mode, the fieldbus master cannot write to the RTP request block in the NIM's output data process image.

## RTP Request Block Words Definitions

The following table lists RTP request block words:

Modbus Address	Upper Byte	Lower Byte	Data Type	Attribute
45130	sub-index	<code>toggle + length</code>	unsigned 16	RW
45131	index (high data byte)	index (low data byte)	unsigned 16	RW
45132	data byte 2	data byte 1 (LSB)	unsigned 16	RW
45133	data byte 4 (MSB)	data byte 3	unsigned 16	RW
45134	<code>toggle + CMD</code>	Node ID	unsigned 16	RW
<p><b>NOTE:</b> The RTP request block is also presented in the manufacturer specific area of the CANopen fieldbus as an object with a dedicated index of 0x4101 and sub-index 1 to 5 (data type = unsigned 16, attribute = RW).</p>				

The NIM performs range checking on the above bytes as follows:

- index (high / low byte): 0x2000 to 0xFFFF for write; 0x1000 to 0xFFFF for read
- `toggle + length`: length = 1 to 4 bytes; the most significant bit contains the toggle bit
- `toggle + CMD`: CMD = 1 to 0x0A (see the table *Valid Commands*, below); most significant bit contains toggle bit
- Node ID: 1 to 32 and 127 (the NIM itself)

The `toggle+CMD` and `toggle+length` bytes are at either end of the RTP request register block. The NIM processes the RTP request when the same value is set in the respective toggle bits of these two bytes. The NIM processes the same RTP block again only when both values have changed to a new identical value. We recommend that you configure new matching values for the two toggle bytes (`toggle+CMD` and `toggle+length`) only after you have constructed the RTP request between them.

## ⚠ WARNING

### UNINTENDED EQUIPMENT OPERATION

Write all bytes in the RTP request before you set the `toggle+CMD` and `toggle+length` bytes to the same new value.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### RTP Response Block Words Definitions

The following list shows RTP response block words:

Modbus Address	Upper Byte	Lower Byte	Data Type	Attribute
45303	status (the most significant bit is used to indicate whether RTP service is enabled: MSB=1 means enabled)	<code>toggle + CMD</code> <code>echo</code>	unsigned 16	RO
45304	data byte 2	data byte 1 (LSB)	unsigned 16	RO
45305	data byte 4 (MSB)	data byte 3	unsigned 16	RO
45306	-	<code>toggle + CMD</code> <code>echo</code>	unsigned 16	RO

**NOTE:** The RTP response block is also presented in the manufacturer specific area of the CANopen fieldbus as an object with a dedicated index of 0x4100 and sub-index 1 to 4 (data type = unsigned 16, attribute = RO).

The `toggle+CMD` `echo` bytes are located at the end of the register range to let you validate the consistency of the data wrapped within these bytes (in case RTP response block words are not updated in a single scan). The NIM updates the status byte and the 4 data bytes (if applicable) before updating the `toggle+CMD` `echo` bytes in Modbus register 45303 and 45306 to equal the value of the `toggle+CMD` byte of the corresponding RTP request. You must first check that both `toggle+CMD` bytes match the `toggle+CMD` byte in the RTP request block before making use of the data inside the RTP response block.

## Valid RTP Commands

The following list shows valid commands (CMDs):

Command (CMD)	Code (Except the msb)	Valid Node IDs	Allowed State of the Addressed Node	Data Bytes
Enable RTP (Only After RTP Has Been Configured Using the Advantys Configuration Software)	0x08	127	N/A	-
Disable RTP	0x09	127	N/A	-
Reset Hot-Swap Bit	0x0A	1-32	N/A	-
Read Parameter	0x01	1-32, 127	pre-operational operational	data bytes in response, length to be given
Write Parameter	0x02	1-32	operational	data bytes in request, length to be given

The most significant bit of an RTP request block's `toggle+CMD` byte is the toggle bit. A new command is identified when the value of this bit changes and matches the value of the toggle bit in the `toggle+length` byte.

A new RTP request is processed only if the preceding RTP request has finished. Overlapping RTP requests are not allowed. A new RTP request made before the completion of a preceding request is ignored.

To determine when an RTP command has been processed and its response is complete, check the values of the `toggle+CMD echo` bytes in the RTP response block. Continue to check both `toggle+CMD` bytes in the RTP response block until they match the RTP request block's `toggle+CMD` byte. Once they match, the contents of the RTP response block is valid.

**Valid RTP Status Messages**

The following list shows valid status messages:

Status Byte	Code	Comment
Success	0x00 or 0x80	0x00 for successful completion of a Disable RTP command
Command not Processed due to Disabled RTP	0x01	-
Illegal CMD	0x82	-
Illegal Data Length	0x83	-
Illegal Node ID	0x84	-
Illegal Node State	0x85	Access is denied because a node is absent or not started.
Illegal Index	0x86	-
RTP Response Has More Than 4 Bytes	0x87	-
No Communication Possible on the Island Bus	0x88	-
Illegal Write to Node 127	0x89	-
SDO Aborted	0x90	If an SDO protocol error is detected, the data bytes in the response contain the SDO abort code according to DS301.
General Exception Response	0xFF	This is a status event of a type other than those specified above.

The most significant bit of the status byte in the RTP response block indicates whether RTP is enabled (1) or disabled (0).

## Virtual Placeholder

### Summary

The virtual placeholder feature lets you create a standard island configuration and depopulated variations of that configuration that share the same fieldbus process image, thereby letting you maintain a consistent PLC or fieldbus master program for various island configurations. The depopulated islands are physically built using only those modules that are not marked as *not present*, thus saving cost and space.

As part of an Advantys STB island custom configuration, you can set *Virtual Placeholder* status for any STB I/O or preferred third-party module whose node address is assigned by the NIM during auto-addressing.

After a module has been assigned Virtual Placeholder status, you can physically remove it from its Advantys STB island base, while retaining the island's process image. All modules that physically remain in the Advantys STB island configuration will retain their previous node addresses. This lets you physically alter the design of your island, without having to edit your PLC program.

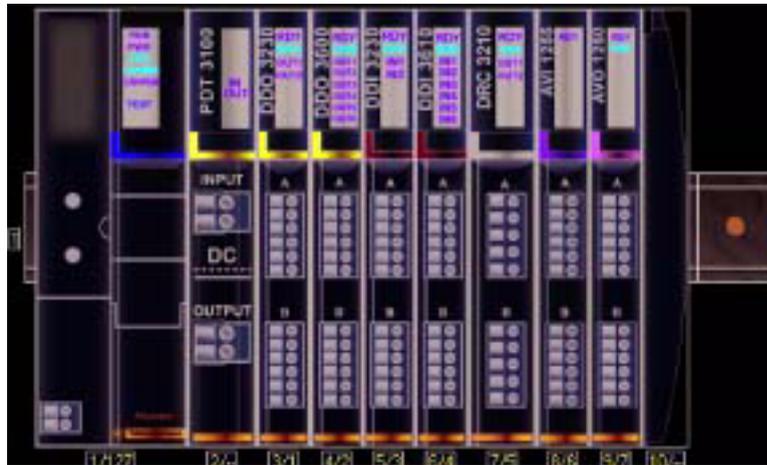
**NOTE:** Advantys configuration software is required to set Virtual Placeholder status.

### Setting Virtual Placeholder Status

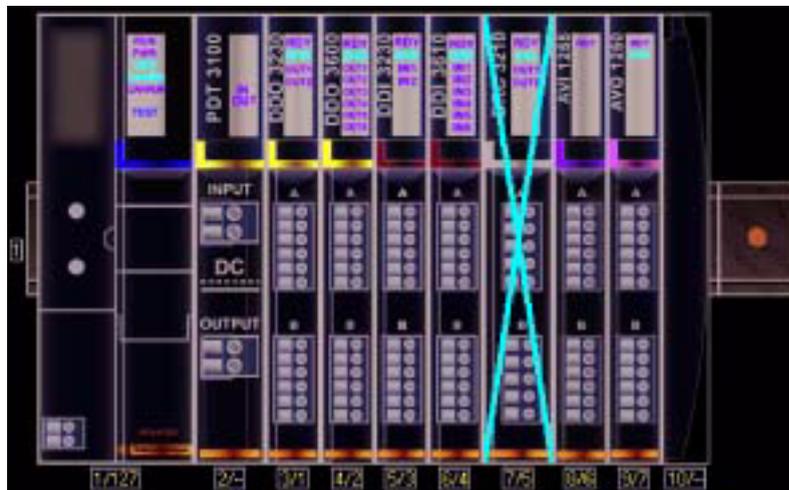
To set Virtual Placeholder status:

Step	Action
1	Open the STB I/O or preferred third-party module's property window.
2	In the Options tab, select <b>Not Present</b> .
3	Click <b>OK</b> to save your settings. The Advantys STB configuration software marks the virtual placeholder module with a red "X" (as shown below).

For example, the following island configuration contains a NIM, a PDM, 2 digital Input modules, 2 digital output modules, a digital relay output module, an analog input module, and an analog output module:



After you assign Virtual Placeholder status to the DRC 3210 digital relay output module (by selecting **Not Present** in its Options tab), the Advantys STB configuration software marks the virtual placeholder module with a red "X" as shown below:

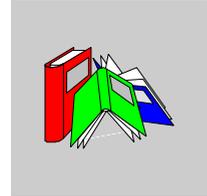


For example, when you physically construct the above configuration, you would build the island without the DRC-3210 and its base.

**NOTE:** Any reflex output, that is configured to use a virtual placeholder module as an input, will constantly be in fallback.

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# Glossary



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## 0-9

### 100Base-T

An adaptation of the IEEE 802.3u (Ethernet) standard, the 100Base-T standard uses twisted-pair wiring with a maximum segment length of 100 m (328 ft) and terminates with an RJ-45 connector. A 100Base-T network is a baseband network capable of transmitting data at a maximum speed of 100 Mbit/s. "Fast Ethernet" is another name for 100Base-T, because it is ten times faster than 10Base-T.

### 10Base-T

An adaptation of the IEEE 802.3 (Ethernet) standard, the 10Base-T standard uses twisted-pair wiring with a maximum segment length of 100 m (328 ft) and terminates with an RJ-45 connector. A 10Base-T network is a baseband network capable of transmitting data at a maximum speed of 10 Mbit/s.

### 802.3 frame

A frame format, specified in the IEEE 802.3 (Ethernet) standard, in which the header specifies the data packet length.

## A

### agent

1. SNMP – the SNMP application that runs on a network device.
2. Fipio – a slave device on a network.

**analog input**

A module that contains circuits that convert analog DC input signals to digital values that can be manipulated by the processor. By implication, these analog inputs are usually direct. That means a data table value directly reflects the analog signal value.

**analog output**

A module that contains circuits that transmit an analog DC signal proportional to a digital value input to the module from the processor. By implication, these analog outputs are usually direct. That means a data table value directly controls the analog signal value.

**application object**

In CAN-based networks, application objects represent device-specific functionality, such as the state of input or output data.

**ARP**

The ARP (address resolution protocol) is the IP network layer protocol, which uses ARP to map an IP address to a MAC (hardware) address.

**auto baud**

The automatic assignment and detection of a common baud rate as well as the ability of a device on a network to adapt to that rate.

**auto-addressing**

The assignment of an address to each Island bus I/O module and preferred device.

**auto-configuration**

The ability of Island modules to operate with predefined default parameters. A configuration of the Island bus based completely on the actual assembly of I/O modules.

**B**

**basic I/O**

Low-cost Advantys STB input/output modules that use a fixed set of operating parameters. A basic I/O module cannot be reconfigured with the Advantys Configuration Software and cannot be used in reflex actions.

**basic network interface**

A low-cost Advantys STB network interface module that supports up to 12 Advantys STB I/O modules. A basic NIM does not support the Advantys Configuration Software, reflex actions, nor the use of an HMI panel.

**basic power distribution module**

A low-cost Advantys STB PDM that distributes sensor power and actuator power over a single field power bus on the Island. The bus provides a maximum of 4 A total power. A basic PDM requires a 5 A fuse to protect the I/O.

**BootP**

BootP (bootstrap protocol) is an UDP/IP protocol that allows an internet node to obtain its IP parameters based on its MAC address.

**BOS**

BOS stands for beginning of segment. When more than 1 segment of I/O modules is used in an Island, an STB XBE 1200 or an STB XBE 1300 BOS module is installed in the first position in each extension segment. Its job is to carry Island bus communications to and generate logic power for the modules in the extension segment. Which BOS module must be selected depends on the module types that shall follow.

**bus arbitrator**

A master on a Fipio network.

**C****CAN**

The CAN (controller area network) protocol (ISO 11898) for serial bus networks is designed for the interconnection of smart devices (from multiple manufacturers) in smart systems for real-time industrial applications. CAN multi-master systems ensure high data integrity through the implementation of broadcast messaging and advanced diagnostic mechanisms. Originally developed for use in automobiles, CAN is now used in a variety of industrial automation control environments.

**CANopen protocol**

An open industry standard protocol used on the internal communication bus. The protocol allows the connection of any enhanced CANopen device to the Island bus.

**CI**

This abbreviation stands for command interface.

**CiA**

CiA (CAN in Automation) is a non-profit group of manufacturers and users dedicated to developing and supporting CAN-based higher layer protocols.

**CIP**

*Common Industrial Protocol.* Networks that include CIP in the application layer can communicate seamlessly with other CIP-based networks. For example, the implementation of CIP in the application layer of an Ethernet TCP/IP network creates an EtherNet/IP environment. Similarly, CIP in the application layer of a CAN network creates a DeviceNet environment. Devices on an EtherNet/IP network can therefore communicate with devices on a DeviceNet network via CIP bridges or routers.

**COB**

A COB (communication object) is a unit of transportation (a message) in a CAN-based network. Communication objects indicate a particular functionality in a device. They are specified in the CANopen communication profile.

**configuration**

The arrangement and interconnection of hardware components within a system and the hardware and software selections that determine the operating characteristics of the system.

**CRC**

*cyclic redundancy check.* Messages that implement this error checking mechanism have a CRC field that is calculated by the transmitter according to the message's content. Receiving nodes recalculate the field. Disagreement in the two codes indicates a difference between the transmitted message and the one received.

**CSMA/CS**

*carrier sense multiple access/collision detection.* CSMA/CS is a MAC protocol that networks use to manage transmissions. The absence of a carrier (transmission signal) indicates that a network channel is idle. Multiple nodes may try to simultaneously transmit on the channel, which creates a collision of signals. Each node detects the collision and immediately terminates transmission. Messages from each node are retransmitted at random intervals until the frames are successfully transmitted.

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## D

### DDXML

Device Description eXtensible Markup Language

### device name

A customer-driven, unique logical personal identifier for an Ethernet NIM. A device name (or *role name*) is created when you combine the numeric rotary switch setting with the NIM (for example, STBNIP2212\_010).

After the NIM is configured with a valid device name, the DHCP server uses it to identify the island at power up.

### DeviceNet protocol

DeviceNet is a low-level, connection-based network that is based on CAN, a serial bus system without a defined application layer. DeviceNet, therefore, defines a layer for the industrial application of CAN.

### DHCP

*dynamic host configuration protocol*. A TCP/IP protocol that allows a server to assign an IP address based on a device name (host name) to a network node.

### differential input

A type of input design where two wires (+ and -) are run from each signal source to the data acquisition interface. The voltage between the input and the interface ground are measured by two high-impedance amplifiers, and the outputs from the two amplifiers are subtracted by a third amplifier to yield the difference between the + and - inputs. Voltage common to both wires is thereby removed. Differential design solves the problem of ground differences found in single-ended connections, and it also reduces the cross-channel noise problem.

### digital I/O

An input or output that has an individual circuit connection at the module corresponding directly to a data table bit or word that stores the value of the signal at that I/O circuit. It allows the control logic to have discrete access to the I/O values.

### DIN

*Deutsche industrial norms*. A German agency that sets engineering and dimensional standards and now has worldwide recognition.

### **Drivecom Profile**

The Drivecom profile is part of CiA DSP 402 (profile), which defines the behavior of drives and motion control devices on CANopen networks.

## **E**

### **economy segment**

A special type of STB I/O segment created when an STB NCO 1113 economy CANopen NIM is used in the first location. In this implementation, the NIM acts as a simple gateway between the I/O modules in the segment and a CANopen master. Each I/O module in an economy segment acts as a independent node on the CANopen network. An economy segment cannot be extended to other STB I/O segments, preferred modules or enhanced CANopen devices.

### **EDS**

*electronic data sheet.* The EDS is a standardized ASCII file that contains information about a network device's communications functionality and the contents of its object dictionary. The EDS also defines device-specific and manufacturer-specific objects.

### **EIA**

*Electronic Industries Association.* An organization that establishes electrical/electronic and data communication standards.

### **EMC**

*electromagnetic compatibility.* Devices that meet EMC requirements can operate within a system's expected electromagnetic limits without interruption.

### **EMI**

*electromagnetic interference.* EMI can cause an interruption, malfunction, or disturbance in the performance of electronic equipment. It occurs when a source electronically transmits a signal that interferes with other equipment.

### **EOS**

This abbreviation stands for end of segment. When more than 1 segment of I/O modules is used in an Island, an STB XBE 1000 or an STB XBE 1100 EOS module is installed in the last position in every segment that has an extension following it. The EOS module extends Island bus communications to the next segment. Which EOS module must be selected depends on the module types that shall follow.

**Ethernet**

A LAN cabling and signaling specification used to connect devices within a defined area, e.g., a building. Ethernet uses a bus or a star topology to connect different nodes on a network.

**Ethernet II**

A frame format in which the header specifies the packet type, Ethernet II is the default frame format for NIM communications.

**EtherNet/IP**

EtherNet/IP (the Ethernet Industrial Protocol) is especially suited to factory applications in which there is a need to control, configure, and monitor events within an industrial system. The ODVA-specified protocol runs CIP (the Common Industrial Protocol) on top of standard Internet protocols, like TCP/IP and UDP. It is an open local (communications) network that enables the interconnectivity of all levels of manufacturing operations from the plant's office to the sensors and actuators on its floor.

**F****fallback state**

A known state to which an Advantys STB I/O module can return in the event that its communication connection is not open.

**fallback value**

The value that a device assumes during fallback. Typically, the fallback value is either configurable or the last stored value for the device.

**FED\_P**

*Fipio extended device profile.* On a Fipio network, the standard device profile type for agents whose data length is more than 8 words and equal to or less than 32 words.

**Fipio**

*Fieldbus Interface Protocol (FIP).* An open fieldbus standard and protocol that conforms to the FIP/World FIP standard. Fipio is designed to provide low-level configuration, parameterization, data exchange, and diagnostic services.

**Flash memory**

Flash memory is nonvolatile memory that can be overwritten. It is stored on a special EEPROM that can be erased and reprogrammed.

**FRD\_P**

*Fipio reduced device profile.* On a Fipio network, the standard device profile type for agents whose data length is two words or less.

**FSD\_P**

*Fipio standard device profile.* On a Fipio network, the standard device profile type for agents whose data length is more than two words and equal to or less than 8 words.

**full scale**

The maximum level in a specific range—e.g., in an analog input circuit the maximum allowable voltage or current level is at full scale when any increase beyond that level is over-range.

**function block**

A function block performs a specific automation function, such as speed control. A function block comprises configuration data and a set of operating parameters.

**function code**

A function code is an instruction set commanding 1 or more slave devices at a specified address(es) to perform a type of action, e.g., read a set of data registers and respond with the content.

**G**

**gateway**

A program or hardware that passes data between networks.

**global\_ID**

*global\_identifier.* A 16-bit integer that uniquely identifies a device's location on a network. A global\_ID is a symbolic address that is universally recognized by all other devices on the network.

**GSD**

*generic slave data* (file). A device description file, supplied by the device's manufacturer, that defines a device's functionality on a Profibus DP network.

**H****HMI**

*human-machine interface*. An operator interface, usually graphical, for industrial equipment.

**hot swapping**

Replacing a component with a like component while the system remains operational. When the replacement component is installed, it begins to function automatically.

**HTTP**

*hypertext transfer protocol*. The protocol that a web server and a client browser use to communicate with one another.

**I****I/O base**

A mounting device, designed to seat an Advantys STB I/O module, hang it on a DIN rail, and connect it to the Island bus. It provides the connection point where the module can receive either 24 VDC or 115/230 VAC from the input or output power bus distributed by a PDM.

**I/O module**

In a programmable controller system, an I/O module interfaces directly to the sensors and actuators of the machine/process. This module is the component that mounts in an I/O base and provides electrical connections between the controller and the field devices. Normal I/O module capacities are offered in a variety of signal levels and capacities.

**I/O scanning**

The continuous polling of the Advantys STB I/O modules performed by the COMS to collect data bits, status, and diagnostics information.

## **IEC**

*International Electrotechnical Commission Carrier.* Founded in 1884 to focus on advancing the theory and practice of electrical, electronics, and computer engineering, and computer science. EN 61131-2 is the specification that deals with industrial automation equipment.

### **IEC type 1 input**

Type 1 digital inputs support sensor signals from mechanical switching devices such as relay contacts and push buttons operating in normal environmental conditions.

### **IEC type 2 input**

Type 2 digital inputs support sensor signals from solid state devices or mechanical contact switching devices such as relay contacts, push buttons (in normal or harsh environmental conditions), and 2- or 3-wire proximity switches.

### **IEC type 3 input**

Type 3 digital inputs support sensor signals from mechanical switching devices such as relay contacts, push buttons (in normal-to-moderate environmental conditions), 3-wire proximity switches and 2-wire proximity switches that have:

- a voltage drop of no more than 8 V
- a minimum operating current capability less than or equal to 2.5 mA
- a maximum off-state current less than or equal to 1.5 mA

## **IEEE**

*Institute of Electrical and Electronics Engineers, Inc.* The international standards and conformity assessment body for all fields of electrotechnology, including electricity and electronics.

## **industrial I/O**

An Advantys STB I/O module designed at a moderate cost for typical continuous, high-duty-cycle applications. Modules of this type often feature standard IEC threshold ratings, usually providing user-configurable parameter options, on-board protection, good resolution, and field wiring options. They are designed to operate in moderate-to-high temperature ranges.

## **input filtering**

The amount of time that a sensor must hold its signal on or off before the input module detects the change of state.

**input polarity**

An input channel's polarity determines when the input module sends a 1 and when it sends a 0 to the master controller. If the polarity is *normal*, an input channel sends a 1 to the controller when its field sensor turns on. If the polarity is *reverse*, an input channel sends a 0 to the controller when its field sensor turns on.

**input response time**

The time it takes for an input channel to receive a signal from the field sensor and put it on the Island bus.

**INTERBUS protocol**

The INTERBUS fieldbus protocol observes a master/slave network model with an active ring topology, having all devices integrated in a closed transmission path.

**IOC object**

*Island operation control object.* A special object that appears in the CANopen object dictionary when the remote virtual placeholder option is enabled in a CANopen NIM. It is a 16-bit word that provides the fieldbus master with a mechanism for issuing reconfiguration and start requests.

**IOS object**

*Island operation status object.* A special object that appears in the CANopen object dictionary when the remote virtual placeholder option is enabled in a CANopen NIM. It is a 16-bit word that reports the success of reconfiguration and start requests or records diagnostic information in the event that a request is not completed.

**IP**

*internet protocol.* That part of the TCP/IP protocol family that tracks the internet addresses of nodes, routes outgoing messages, and recognizes incoming messages.

**IP Rating**

Ingress Protection rating according to IEC 60529.

IP20 modules are protected against ingress and contact of objects larger than 12.5 mm. The module is not protected against harmful ingress of water.

IP67 modules are completely protected against ingress of dust and contact. Ingress of water in harmful quantity is not possible when the enclosure is immersed in water up to 1 m.

## L

### LAN

*local area network.* A short-distance data communications network.

### light industrial I/O

An Advantys STB I/O module designed at a low cost for less rigorous (e.g., intermittent, low-duty-cycle) operating environments. Modules of this type operate in lower temperature ranges with lower qualification and agency requirements and limited on-board protection; they usually have limited or no user-configuration options.

### linearity

A measure of how closely a characteristic follows a straight-line function.

### LSB

*least significant bit, least significant byte.* The part of a number, address, or field that is written as the rightmost single value in conventional hexadecimal or binary notation.

## M

### MAC address

*media access control address.* A 48-bit number, unique on a network, that is programmed into each network card or device when it is manufactured.

### mandatory module

When an Advantys STB I/O module is configured to be mandatory, it must be present and healthy in the Island configuration for the Island to be operational. If a mandatory module is inoperable or is removed from its location on the Island bus, the Island goes to a pre-operational state. By default, all I/O modules are not mandatory. You must use the Advantys Configuration Software to set this parameter.

### master/slave model

The direction of control in a network that implements the master/slave model is always from the master to the slave devices.

**Modbus**

Modbus is an application layer messaging protocol. Modbus provides client and server communications between devices connected on different types of buses or networks. Modbus offers many services specified by function codes.

**MOV**

*metal oxide varistor*. A 2-electrode semiconductor device with a voltage-dependant nonlinear resistance that drops markedly as the applied voltage is increased. It is used to suppress transient voltage surges.

**MSB**

*most significant bit, most significant byte*. The part of a number, address, or field that is written as the leftmost single value in conventional hexadecimal or binary notation.

**N****N.C. contact**

*normally closed contact*. A relay contact pair that is closed when the relay coil is de-energized and open when the coil is energized.

**N.O. contact**

*normally open contact*. A relay contact pair that is open when the relay coil is de-energized and closed when the coil is energized.

**NEMA**

*National Electrical Manufacturers Association*

**network cycle time**

The time that a master requires to complete a single scan of all of the configured I/O modules on a network device; typically expressed in microseconds.

**NIM**

*network interface module*. This module is the interface between an Island bus and the fieldbus network of which the Island is a part. A NIM enables all the I/O on the Island to be treated as a single node on the fieldbus. The NIM also provides 5 V of logic power to the Advantys STB I/O modules in the same segment as the NIM.

**NMT**

*network management.* NMT protocols provide services for network initialization, diagnostic control, and device status control.

**O**

**object dictionary**

Part of the CANopen device model that provides a map to the internal structure of CANopen devices (according to CANopen profile DS-401). A device's object dictionary (also called the *object directory*) is a lookup table that describes the data types, communications objects, and application objects the device uses. By accessing a particular device's object dictionary through the CANopen fieldbus, you can predict its network behavior and build a distributed application.

**ODVA**

*Open Devicenet Vendors Association.* The ODVA supports the family of network technologies that are built on the Common Industrial Protocol (EtherNet/IP, DeviceNet, and CompoNet).

**open industrial communication network**

A distributed communication network for industrial environments based on open standards (EN 50235, EN50254, and EN50170, and others) that allows the exchange of data between devices from different manufacturers.

**output filtering**

The amount that it takes an output channel to send change-of-state information to an actuator after the output module has received updated data from the NIM.

**output polarity**

An output channel's polarity determines when the output module turns its field actuator on and when it turns the actuator off. If the polarity is *normal*, an output channel turns its actuator on when the master controller sends it a 1. If the polarity is *reverse*, an output channel turns its actuator on when the master controller sends it a 0.

**output response time**

The time it takes for an output module to take an output signal from the Island bus and send it to its field actuator.

## P

### **parameterize**

To supply the required value for an attribute of a device at run-time.

### **PDM**

*power distribution module.* A module that distributes either AC or DC field power to a cluster of I/O modules directly to its right on the Island bus. A PDM delivers field power to the input modules and the output modules. It is important that all the I/O clustered directly to the right of a PDM be in the same voltage group—either 24 VDC, 115 VAC, or 230 VAC.

### **PDO**

*process data object.* In CAN-based networks, PDOs are transmitted as unconfirmed broadcast messages or sent from a producer device to a consumer device. The transmit PDO from the producer device has a specific identifier that corresponds to the receive PDO of the consumer devices.

### **PE**

*protective earth.* A return line across the bus for fault currents generated at a sensor or actuator device in the control system.

### **peer-to-peer communications**

In peer-to-peer communications, there is no master/slave or client/server relationship. Messages are exchanged between entities of comparable or equivalent levels of functionality, without having to go through a third party (like a master device).

### **PLC**

*programmable logic controller.* The PLC is the brain of an industrial manufacturing process. It automates a process as opposed to relay control systems. PLCs are computers suited to survive the harsh conditions of the industrial environment.

### **PowerSuite Software**

PowerSuite Software is a tool for configuring and monitoring control devices for electric motors, including ATV31, ATV71, and TeSys U.

**preferred module**

An I/O module that functions as an auto-addressable device on an Advantys STB Island but is not in the same form factor as a standard Advantys STB I/O module and therefore does not fit in an I/O base. A preferred device connects to the Island bus via an EOS module and a length of a preferred module extension cable. It can be extended to another preferred module or back into a BOS module. If it is the last device on the Island, it must be terminated with a 120  $\Omega$  terminator.

**premium network interface**

A premium NIM has advanced features over a standard or basic NIM.

**prioritization**

An optional feature on a standard NIM that allows you to selectively identify digital input modules to be scanned more frequently during a the NIM's logic scan.

**process I/O**

An Advantys STB I/O module designed for operation at extended temperature ranges in conformance with IEC type 2 thresholds. Modules of this type often feature high levels of on-board diagnostics, high resolution, user-configurable parameter options, and higher levels of agency approval.

**process image**

A part of the NIM firmware that serves as a real-time data area for the data exchange process. The process image includes an input buffer that contains current data and status information from the Island bus and an output buffer that contains the current outputs for the Island bus, from the fieldbus master.

**producer/consumer model**

In networks that observe the producer/consumer model, data packets are identified according to their data content rather than by their node address. All nodes *listen* on the network and consume those data packets that have appropriate identifiers.

**Profibus DP**

*Profibus Decentralized Peripheral.* An open bus system that uses an electrical network based on a shielded 2-wire line or an optical network based on a fiber-optic cable. DP transmission allows for high-speed, cyclic exchange of data between the controller CPU and the distributed I/O devices.

---

## R

### reflex action

A simple, logical command function configured locally on an Island bus I/O module. Reflex actions are executed by Island bus modules on data from various Island locations, like input and output modules or the NIM. Examples of reflex actions include compare and copy operations.

### repeater

An interconnection device that extends the permissible length of a bus.

### reverse polarity protection

Use of a diode in a circuit to protect against damage and unintended operation in the event that the polarity of the applied power is accidentally reversed.

### rms

*root mean square*. The effective value of an alternating current, corresponding to the DC value that produces the same heating effect. The rms value is computed as the square root of the average of the squares of the instantaneous amplitude for 1 complete cycle. For a sine wave, the rms value is 0.707 times the peak value.

### role name

A customer-driven, unique logical personal identifier for an Ethernet NIM. A role name (or *device name*) is created when you:

- combine the numeric rotary switch setting with the NIM (for example, STBNIP2212\_010), or . . .
- edit the **Device Name** setting in the NIM's embedded web server pages

After the NIM is configured with a valid role name, the DHCP server uses it to identify the island at power up.

### RTD

*resistive temperature detect*. An RTD device is a temperature transducer composed of conductive wire elements typically made of platinum, nickel, copper, or nickel-iron. An RTD device provides a variable resistance across a specified temperature range.

**RTP**

*run-time parameters.* RTP lets you monitor and modify selected I/O parameters and Island bus status registers of the NIM while the Advantys STB Island is running. The RTP feature uses 5 reserved output words in the NIM's process image (the RTP request block) to send requests, and 4 reserved input words in the NIM's process image (the RTP response block) to receive responses. Available only in standard NIMs running firmware version 2.0 or higher.

**Rx**

*reception.* For example, in a CAN-based network, a PDO is described as an RxPDO of the device that receives it.

**S**

**SAP**

*service access point.* The point at which the services of 1 communications layer, as defined by the ISO OSI reference model, is made available to the next layer.

**SCADA**

*supervisory control and data acquisition.* Typically accomplished in industrial settings by means of microcomputers.

**SDO**

*service data object.* In CAN-based networks, SDO messages are used by the fieldbus master to access (read/write) the object directories of network nodes.

**segment**

A group of interconnected I/O and power modules on an Island bus. An Island must have at least 1 segment and, depending on the type of NIM used, may have as many as 7 segments. The first (leftmost) module in a segment needs to provide logic power and Island bus communications to the I/O modules on its right. In the primary or basic segment, that function is filled by a NIM. In an extension segment, that function is filled by an STB XBE 1200 or an STB XBE 1300 BOS module.

**SELV**

*safety extra low voltage.* A secondary circuit designed and protected so that the voltage between any 2 accessible parts (or between 1 accessible part and the PE terminal for Class 1 equipment) does not exceed a specified value under normal conditions or under single-fault conditions.

**SIM**

*subscriber identification module*. Originally intended for authenticating users of mobile communications, SIMs now have multiple applications. In Advantys STB, configuration data created or modified with the Advantys Configuration Software can be stored on a SIM (referred to as the “removable memory card”) and then written to the NIM’s Flash memory.

**single-ended inputs**

An analog input design technique whereby a wire from each signal source is connected to the data acquisition interface, and the difference between the signal and ground is measured. For the success of this design technique, 2 conditions are imperative: the signal source must be grounded, and the signal ground and data acquisition interface ground (the PDM lead) must have the same potential.

**sink load**

An output that, when turned on, receives DC current from its load.

**size 1 base**

A mounting device, designed to seat an STB module, hang it on a DIN rail, and connect it to the Island bus. It is 13.9 mm (0.55 in.) wide and 128.25 mm (5.05 in.) high.

**size 2 base**

A mounting device, designed to seat an STB module, hang it on a DIN rail, and connect it to the Island bus. It is 18.4 mm (0.73 in.) wide and 128.25 mm (5.05 in.) high.

**size 3 base**

A mounting device, designed to seat an STB module, hang it on a DIN rail, and connect it to the Island bus. It is 28.1 mm (1.11 in.) wide and 128.25 mm (5.05 in.) high.

**slice I/O**

An I/O module design that combines a small number of channels (usually between 2 and 6) in a small package. The idea is to allow a system developer to purchase just the right amount of I/O and to be able to distribute it around the machine in an efficient, mechatronics way.

**SM\_MPS**

*state management\_message periodic services.* The applications and network management services used for process control, data exchange, diagnostic message reporting, and device status notification on a Fipio network.

**SNMP**

*simple network management protocol.* The UDP/IP standard protocol used to manage nodes on an IP network.

**snubber**

A circuit generally used to suppress inductive loads—it consists of a resistor in series with a capacitor (in the case of an RC snubber) and/or a metal-oxide varistor placed across the AC load.

**source load**

A load with a current directed into its input; must be driven by a current source.

**standard I/O**

Any of a subset of Advantys STB input/output modules designed at a moderate cost to operate with user-configurable parameters. A standard I/O module may be reconfigured with the Advantys Configuration Software and, in most cases, may be used in reflex actions.

**standard network interface**

An Advantys STB network interface module designed at moderate cost to support the configuration capabilities, multi-segment design and throughput capacity suitable for most standard applications on the Island bus. An Island run by a standard NIM can support up to 32 addressable Advantys STB and/or preferred I/O modules, up to 12 of which may be standard CANopen devices.

**standard power distribution module**

An Advantys STB module that distributes sensor power to the input modules and actuator power to the output modules over two separate power buses on the Island. The bus provides a maximum of 4 A to the input modules and 8 A to the output modules. A standard PDM requires a 5 A fuse to protect the input modules and an 8 A fuse to protect the outputs.

**STD\_P**

*standard profile.* On a Fipio network, a standard profile is a fixed set of configuration and operating parameters for an agent device, based on the number of modules that the device contains and the device's total data length. There are 3 types of standard profiles: Fipio reduced device profile (FRD\_P), Fipio standard device profile (FSD\_P), and the Fipio extended device profile (FED\_P).

**stepper motor**

A specialized DC motor that allows discrete positioning without feedback.

**subnet**

A part of a network that shares a network address with the other parts of a network. A subnet may be physically and/or logically independent of the rest of the network. A part of an internet address called a subnet number, which is ignored in IP routing, distinguishes the subnet.

**surge suppression**

The process of absorbing and clipping voltage transients on an incoming AC line or control circuit. Metal-oxide varistors and specially designed RC networks are frequently used as surge suppression mechanisms.

**T****TC**

*thermocouple.* A TC device is a bimetallic temperature transducer that provides a temperature value by measuring the voltage differential caused by joining together two different metals at different temperatures.

**TCP**

*transmission control protocol.* A connection-oriented transport layer protocol that provides reliable full-duplex data transmission. TCP is part of the TCP/IP suite of protocols.

**telegram**

A data packet used in serial communication.

**TFE**

*transparent factory Ethernet*. Schneider Electric's open automation framework based on TCP/IP.

**Tx**

*transmission*. For example, in a CAN-based network, a PDO is described as a TxPDO of the device that transmits it.

**U**

**UDP**

*user datagram protocol*. A connectionless mode protocol in which messages are delivered in a datagram to a destination computer. The UDP protocol is typically bundled with the Internet Protocol (UPD/IP).

**V**

**varistor**

A 2-electrode semiconductor device with a voltage-dependant nonlinear resistance that drops markedly as the applied voltage is increased. It is used to suppress transient voltage surges.

**voltage group**

A grouping of Advantys STB I/O modules, all with the same voltage requirement, installed directly to the right of the appropriate power distribution module (PDM) and separated from modules with different voltage requirements. Never mix modules with different voltage requirements in the same voltage group.

**VPCR object**

*virtual placeholder configuration read object*. A special object that appears in the CANopen object dictionary when the remote virtual placeholder option is enabled in a CANopen NIM. It provides a 32-bit subindex that represents the actual module configuration used in a physical Island.

**VPCW object**

*virtual placeholder configuration write object.* A special object that appears in the CANopen object dictionary when the remote virtual placeholder option is enabled in a CANopen NIM. It provides a 32-bit subindex where the fieldbus master can write a module reconfiguration. After the fieldbus writes to the VPCW subindex, it can issue a reconfiguration request to the NIM that begins the remote virtual placeholder operation.

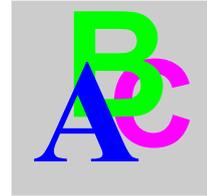
**W****watchdog timer**

A timer that monitors a cyclical process and is cleared at the conclusion of each cycle. If the watchdog runs past its programmed time period, it generates a fault.



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