Advantys STB
INTERBUS Basic
Network Interface Module
Applications Guide

890USE19600 Version 1.0

Telemecanique
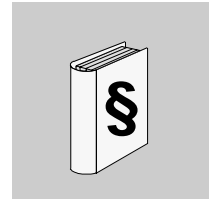
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Safety Information

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.

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

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About the Book
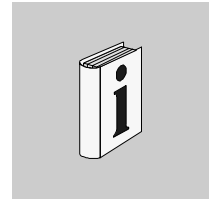
At a Glance

Document Scope   This guide describes the specific functionality of the STB NIB 1010, the Advantys STB basic network interface module to an INTERBUS network. To assist you with setting up your Advantys STB island on an INTERBUS network, extensive, real-world INTERBUS application examples are included. These instructions assume the reader has a working familiarity with the INTERBUS fieldbus protocol.

This guide includes the following information about the STB NIB 1010:
- role in an INTERBUS network
- role as the gateway to Advantys STB island
- external and internal interfaces
- flash memory
- integrated power supply
- auto-configuration
- island bus scanner functionality
- data exchange between the island and the master
- diagnostic messages
- specifications

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Related Documents

Title of Documentation	Reference Number
The Advantys STB System Planning and Installation Guide	890USE17100
The Advantys STB Hardware Components Reference Guide	890USE17200

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Introduction

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At a Glance

Summary

This chapter describes the Advantys STB NIB 1010 basic INTERBUS network interface module and its role in making the island a node on an INTERBUS open fieldbus network.

What's in this Chapter?

This chapter contains the following topics:

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What Is a Network Interface Module?	11
About INTERBUS	13

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 industry, with a migration path to the process industry.

Island Bus I/O A basic Advantys STB island can support up to 12 Advantys STB I/O modules. The only I/O devices that may be used in the basic segment are Advantys STB modules; preferred modules, standard CANopen devices and Advantys STB extension modules are not supported.

The Basic Segment STB I/O modules may be interconnected in a group called the basic segment. The basic NIM is the first module in this segment. The basic segment must contain at least one Advantys STB I/O module and can support as many as 12 addressable Advantys STB modules, drawing a current load of up to 1.2 A. The segment must also contain one or more PDMs, which distribute field power to the I/O modules. The basic segment must be terminated by a 120 Ω termination plate, which ships with the NIM.

What Is a Network Interface Module?

Purpose

An island of STB I/O modules requires a network interface module (NIM) in the leftmost location of the basic island. Physically, the NIM is the first (leftmost) module on the island bus. Functionally, it is the gateway to the island bus—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. Other NIM connectors, such as the power supply interface, are identical for all NIM types.

Communications Roles

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.

Integrated Power Supply

The NIM's built-in 24-to-5 VDC power supply provides logic power to the I/O modules on the basic 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, providing 1.2 A of current to the island. Individual STB I/O modules in an island segment generally draw a current load of between 50 and 90 mA. (Consult the *Advantys STB Hardware Components Reference Guide* [890 USE 172] for a particular module's specifications.)

A basic NIM supports up to 12 Advantys STB I/O modules.

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:
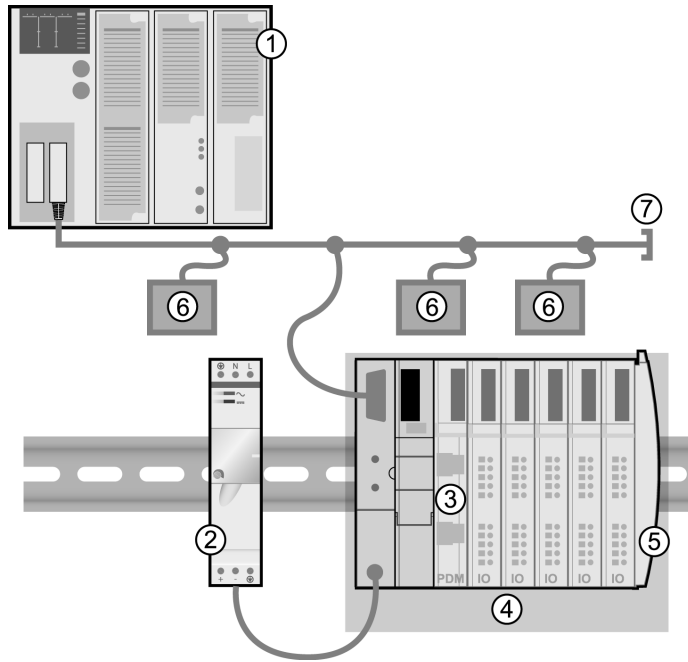
1 fieldbus master

2 external 24 VDC power supply, the source for logic power on the island

3 power distribution module (PDM)

4 island node

5 island bus terminator plate

6 other nodes on the fieldbus network

7 fieldbus network terminator (if required)

About INTERBUS

Introduction   INTERBUS implements a master/slave network model. It can communicate with up to 512 nodes over a distance of 12.8 km, and can read 1024 inputs and write 1024 outputs in 4 ms.

Each network slave has an *in* connector for receiving data and an *out* connector for transmitting data on the ring. The last device automatically closes and terminates the network ring; sometimes this last device has no *out* connector.

Components of a simplified INTERBUS network are shown below:
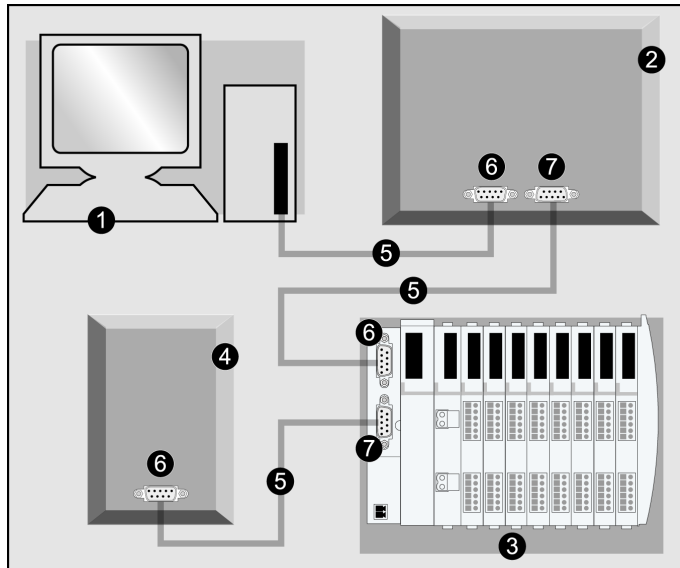
1	PC/PLC
2	slave device
3	Advantys STB island with INTERBUS NIM at the head
4	slave device
5	INTERBUS network cable
6	in connection (receive)
7	out connection (transmit)

INTERBUS Club is the supporting trade association that creates specifications for INTERBUS networks and devices. For more on INTERBUS specifications and mechanisms, refer to www.interbusclub.com.

Physical Layer	The physical layer contains a single twisted pair of shielded wires. The STB NIB 1010 INTERBUS implements the SUPI 3 (serial universal peripheral interface) ASIC from Phoenix Contact.

Network Topology

The INTERBUS network observes a master/slave model with active ring topology, having all devices integrated in a closed transmission path. There are three types of bus structures in the ring:

- *remote bus*—The Advantys STB island (with an STB NIB 1010 INTERBUS NIM at the head) connects to this section. Remote bus characteristics include:
  - 12.8 km (maximum) network length
  - 512 possible connections
  - 400 m (maximum) between devices
  - 256 devices (maximum)
- *local bus* (not supported)—The local bus ring is used to connect I/O devices in a remote substation enclosure. Local bus characteristics include:
  - 8 devices (maximum)
  - 1.5 m (maximum) between devices
  - 10 m (maximum) network length
  - 800 mA (maximum) current
- *sensor loop*—The sensor loop is connected directly to sensors and actuators without the use of bridge routers. Sensor loop characteristics include:
  - 1 unshielded pair (+24 V)
  - 32 devices (maximum)
  - 10 m (maximum) network length

> **Note:** An Advantys STB island with an INTERBUS NIM head can be implemented only as a remote bus node.

Transmission Media

While it is possible to connect INTERBUS devices with a variety of media (fiber optics, SMG, etc.), the STB NIB 1010 NIM only supports networks that are connected with twisted pair copper wiring (RS-485). Network connectors (*in* and *out*) are 9-pin SUB-D types. The TDMA transmission method is implemented for transmission rates of 500 kbits/s.

Node Addressing

The INTERBUS master device is self-configuring because INTERBUS slave devices are auto-addressed according to their sequence in a serial ring structure. The master identifies read/write data in terms of a node's relative position in the ring, not by a fixed address. The sequential location of slaves corresponds to the order of input and output data in the master's buffer.

The ring structure uses a distributed shift register. In a single bus cycle, data from the master to the slaves (and from the slaves to the master) is transferred. The cycle ends when the loop back word is returned to the master. Each node is a component on the shift register ring on which data is circulated.

The NIM's EDS

For a particular device to be recognized on your network, a corresponding EDS file must be exported to your master device. This ASCII file contains information about a device's:

- *identity*—the node's classification is presented in terms of the manufacturer code
- *data size*—the master's input buffer must account for the amount of data expected from the device

NIM Limitations

The STB NIB 1010 INTERBUS basic NIM supports up to 16 words of INTERBUS cyclic data. It does not support the parameter communication protocol (PCP).

The STB NIB 1010 Basic NIM Module

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At a Glance

Introduction

This chapter describes the external features, connections, power requirements and product specifications of the basic INTERBUS NIM.
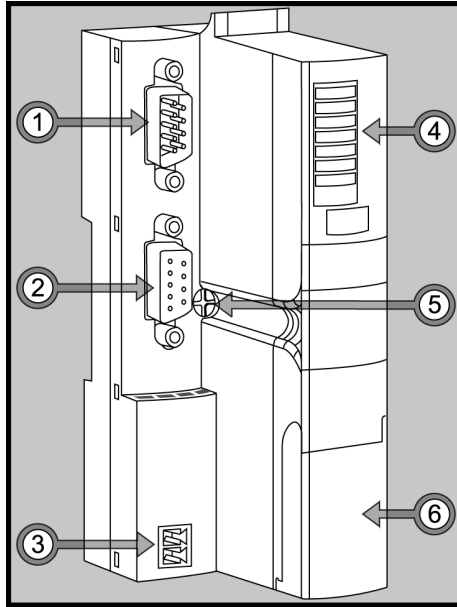
What's in this Chapter?

This chapter contains the following topics:

External Features of the STB NIB 1010 NIM

Hardware Features

The physical features critical to STB NIB 1010 INTERBUS NIM operations are called out in the illustration below:

Feature		Function
1	fieldbus interface (in)	Nine-pin SUB-D (male) connector used for the incoming INTERBUS fieldbus network cable.
2	fieldbus interface (out)	Nine-pin SUB-D (female) connector used for the outgoing INTERBUS fieldbus network cable.
3	power supply interface	A two-receptacle connector for connecting an external 24 VDC power supply to the NIM.
4	LED array	Colored LEDs that use various patterns to visually indicate the operational status of the island bus.
5	release screw	A mechanism used to remove the NIM from the DIN rail. (See the *Advantys STB System Planning and Installation Guide* for details.)
6	CFG port cover	A hinged flap on the NIM's front panel that covers the CFG interface and the RST button. The CFG port is for firmware upgrades only.

Housing Shape   The L-shaped external housing of the NIM is designed to accommodate the attachment of the in and out INTERBUS network connectors without raising the depth profile of the island:
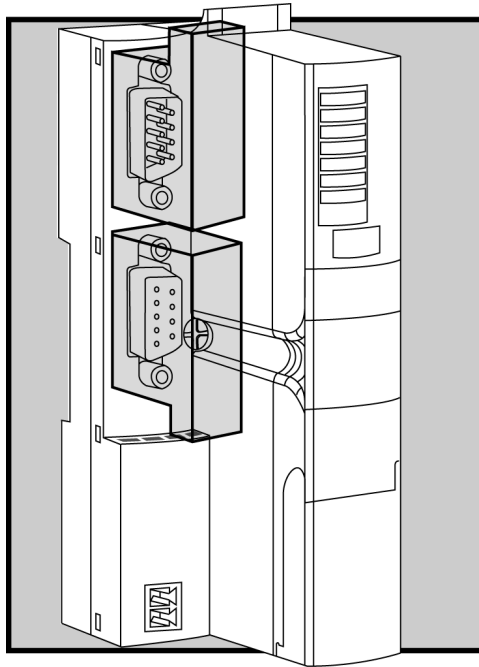
1 space reserved for the network connectors

2 NIM housing

STB NIB 1010 Fieldbus Interface

Summary   The fieldbus interface on the STB NIB 1010 is the point of connection between an Advantys STB island bus and the INTERBUS network. Like every INTERBUS node, the NIM has two nine-pin SUB-D connectors for data reception (*in*) and transmission (*out*). The connectors are located on the face of the NIM.

Fieldbus Port Connections   The *in* and *out* fieldbus interfaces are located on the front of the INTERBUS NIM at the top:
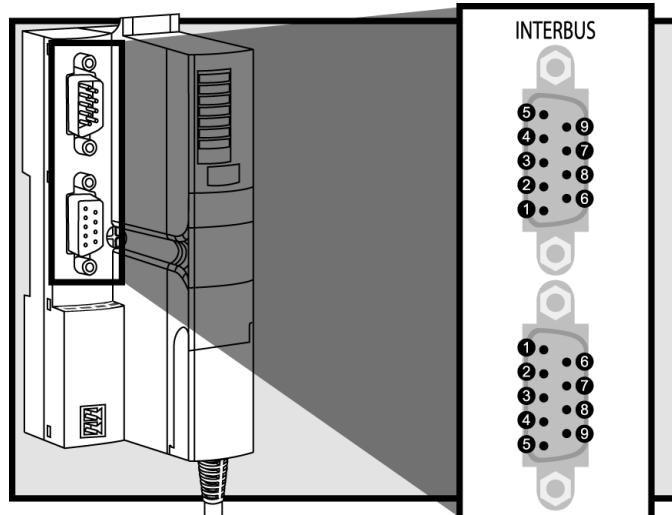
It is recommended that you use 9-pin SUB-D connectors compliant with INTERBUS Club or corresponding international standard.

The *in* connector is optically isolated. The signal level is according to EIA RS-485.

The pin-out for both the *in* (upper) and *out* (lower) connectors should be according to the table below (pin numbers correspond to callouts in the figure above):

Pin	Signal (in)	Signal (out)
1	DO1	DO2
2	DI1	DI2
3	GND1	GND
4	unused	unused
5	unused	+5 V
6	/DO1	/DO2
7	/DI1	/DI2
8	unused	unused
9	unused	RBST (see note below)

Note: The RBST pin detects the presence of a subsequent node on the ring. In the absence of this detection (or if the node has no *out* connector at all), the network ring is closed.

INTERBUS Networking Cable and Connectors

The drop cable from the fieldbus to the Advantys STB INTERBUS NIM (and the one from the NIM to the next INTERBUS node) must have connectors that observe this pin assignment scheme. INTERBUS networking cables are shielded, twisted-pair electrical cables, compliant with INTERBUS standard DR-303-1. There should not be an interruption to any wire in bus cables. This allows for a future specification for use of reserved pins.

LED Physical Description

Overview

The six LEDs implemented in the STB NIB 1010 INTERBUS NIM are visual indications of the operating status of the island bus on an INTERBUS network. The LED array is located at the top of the NIM front bezel.
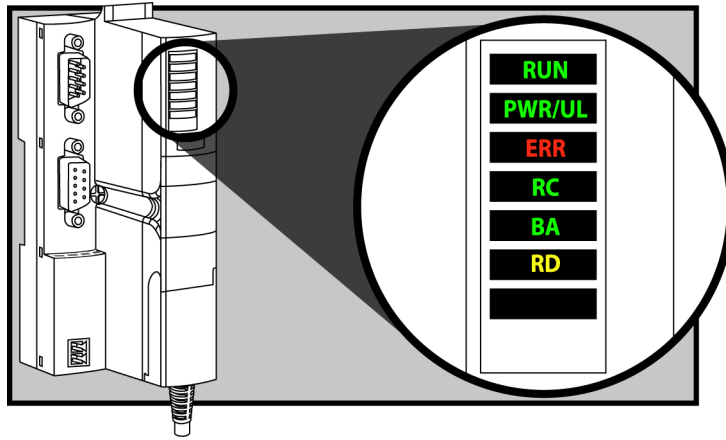
General Indications

The bottom three LEDs indicate the status of data exchange between the INTERBUS fieldbus master and the Advantys island bus:

- LED 4—RC (remote bus check)
- LED 5—BA (bus active)
- LED 6—RD (remote bus disabled)

The top three LEDs indicate activity or events on the NIM:

- LED 1—RUN
- LED 2—PWR/UL
- LED 3—ERR

The following tables describe the LED behavior in more detail. When you refer to these tables, keep in mind:

- It is assumed that the *PWR/UL* LED is on continuously, indicating that the NIM is receiving adequate power. If the *PWR/UL* LED is off, logic power to the NIM is off or insufficient.
- Individual blinks are approximately 200 ms. There is a 1-second interval between blink sequences. For example:
    - 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) times, then 1 second off

INTERBUS Data Exchange LEDs

The following table describes the indicated condition(s) and the colors and blink patterns that the RC, BA and RD LEDs use to show normal operations and error conditions for the NIM on an INTERBUS fieldbus.

Label	Pattern	Meaning
BA (green)	on	The module is transmitting data messages on the network.
	off	The module is not transmitting data messages on the network.
RC (green)	on	The island's incoming bus is correctly connected, and the bus master device is not sending a bus reset signal.
	off	The island's incoming bus is not correctly connected, or the bus master device is sending a bus reset signal.
RD (yellow)	on	The island's outgoing bus is disabled.
	off	The island's outgoing bus is enabled.

NIM Activity LEDs

The table that follows describes the island bus condition(s) communicated by the LEDs, and the colors and blink patterns used to indicate each condition.

RUN (green)	ERR (red)	Meaning
blink 2	blink 2	The island is powering up (self test in progress).
off	off	The island is initializing—it is not started.
blink 1	off	The island has been put in the pre-operational state by the RST button—it is not started.
blinking (steady)	off	The NIM is auto-configuring the island bus—the bus is not started.
blink 3	off	Initialization is complete, the island bus is configured, the configuration matches, and the bus is not started.
off	blink 6	The NIM detects no STB I/O modules on the island bus.
off	blink 2	Assignment error—the NIM has detected a module assignment error; the island bus is not started.
	blink 5	Internal triggering protocol error.
off	blinking (steady)	Fatal error. Because of the severity of the error, no further communications with the island bus are possible and the NIM stops the island. The following are fatal errors: ● significant internal error ● module-ID error ● auto-addressing failure ● process image error ● auto-configuration error ● island bus management error ● receive/transmit queue software overrun error
on	off	The island bus is operational.
on	blink 3	At least one module does not match—the island bus is operational with a configuration mismatch.
blink 4	off	The island bus is stopped—no further communications with the island are possible.
off	on	Fatal error—internal failure.

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 Advantys STB island is the two-receptacle connector illustrated below.

Physical Description   Power from the external 24 VDC supply comes in to the NIM through a two-receptacle connector located at the bottom left of the module:
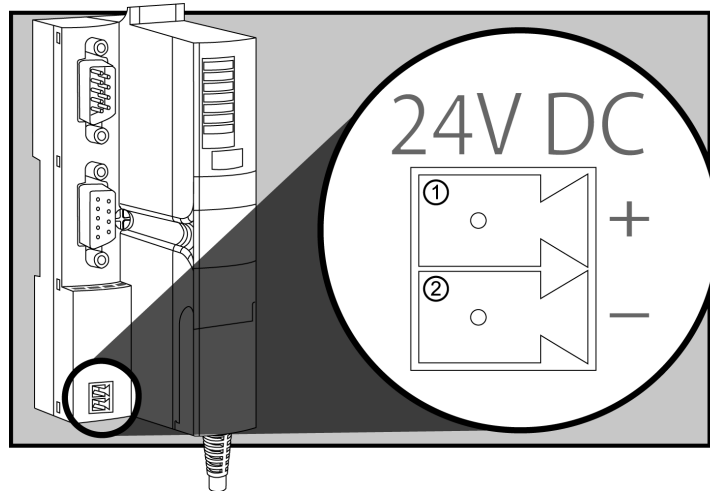
1   receptacle 1—24 VDC

2   receptacle 2—common

Connectors

Use either:

● a *screw type* power connector, available in a kit of 10 (model STB XTS 1120)

● a *spring clamp* power connector, available in a kit of 10 (model STB XTS 2120)

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:
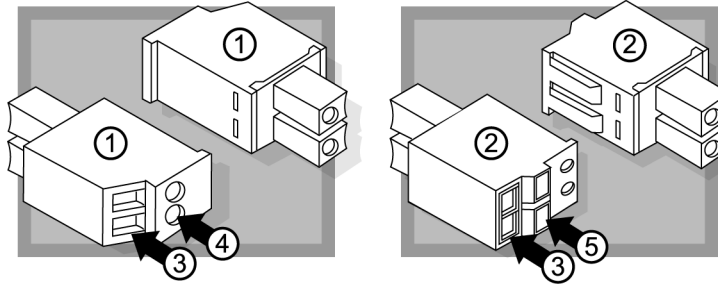
1 STBXTS 1120 screw-type power connector

2 STBXTS 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 to1.5 mm^2 (28 to 16 AWG). Each connector has a 3.8 mm (0.15 in) pitch between the receptacles.

We recommend that you strip at least 9 mm from the wire's jacket to make the connection.

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 basic segment.

External Source Power

Input from an external 24 VDC power supply 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).

⚠	**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 island.
	Failure to follow this precaution can result in injury or equipment damage.

Logic Power Flow

The figure below shows how the NIM's integrated power supply generates logic power and sends it across the basic segment:
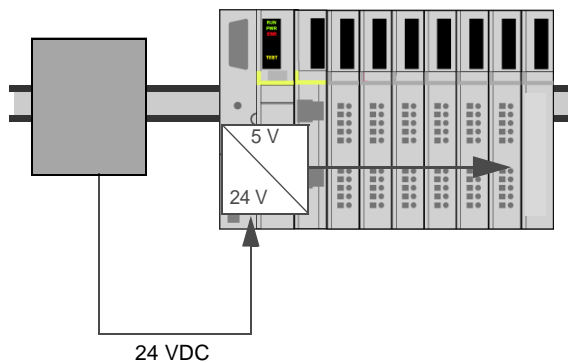
Selecting a Source Power Supply for the Island's Logic Power Bus

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.

Characteristics of the External Power Supply

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 SELV isolation is provided between the power supply's inputs and outputs, the power bus, and the devices connected to the island bus. Under normal or single-fault conditions the voltage between any two accessible parts, or between an accessible part and the protective earth (PE) terminal for Class 1 equipment, will not exceed a safe value (60 VDC max.).

⚠	**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 island.
	Failure to follow this precaution can result in injury or equipment damage.

Calculating the Wattage Requirement

The external supply needs to provide 13 W of power to the NIM.

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.
For installations that require 72 W or less from a 24 VDC source power supply, we recommend a device such as the ABL7 RE2403 Phaseo power supply from Telemecanique, distributed in the United States by Square D. This supply is DIN rail-mountable and has a form factor similar to that of the island modules.
If you have room in your cabinet and your 24 VDC power requirements are greater than 72 W, summable power supply options such as Schneider's Premium TSX SUP 1011 (26 W), TSX SUP 1021 (53 W), TSX SUP 1051 (120 W), or TSX SUP 1101 (240 W) can be considered. These modules are also available from Telemecanique and, in the United States, from Square D.

STB NIB 1010 Module Specifications

**Table of
Technical
Specifications**

dimensions	width	40.5 mm (1.59 in)
	height	130 mm (5.12 in)
	depth	70 mm (3.15 in)
interface connectors	from INTERBUS network	nine-pin SUB-D connector (male)
	to INTERBUS network	nine-pin SUB-D connector (female)
	RS-232 port for configuration software or HMI panel	8-receptacle HE-13
	to external 24 VDC power supply	2-receptacle
built-in power supply	input voltage	24 VDC nominal
	input power range	19.2 ... 30 VDC
	input current	400 mA @ 24 VDC
	output voltage to island bus	5 VDC @ 1.2 A
		2% variation due to temperature drift, intolerance, or line regulation
		1% load regulation
		$\leq$50 mΩ output impedance up to 100 kHz
	output current rating	5 VDC @ 1.2 A
	isolation	no internal isolation (isolation must be provided by a SELV-rated external 24 VDC source power supply)
	noise immunity (EMC)	IEC 1131-2
addressable I/O modules supported		12 maximum
segments supported		one
hot swapping		no
standards	INTERBUS conformance	INTERBUS Club (*www.interbusclub.com*)
MTBF		200,000 hours GB (ground benign)

Configuring the Island Bus

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At a Glance

Introduction

The information in this chapter describes the auto-addressing and auto-configuration processes. This data is saved to Flash memory automatically.

What's in this Chapter?

This chapter contains the following topics:

Auto-Addressing

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 will engage in data exchange. All Advantys STB I/O modules engage in data exchange.

About the Island Bus Address

An island bus address is a unique integer value in the range 0 through 127 that identifies the physical location of each addressable module on the island. Address 127 is always the NIM's address. Addresses 1 through 12 are available for addressable Advantys STB modules. The remaining addresses are not used in a basic island configuration.

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.

Addressable Modules

Only the Advantys STB I/O modules in the basic segment require island bus addresses.

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

- PDMs
- empty bases
- termination plate

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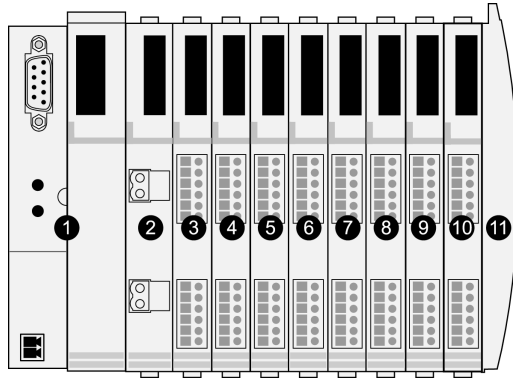
1   NIM

2   STB PDT 3100 24 VDC power distribution module

3   STB DDI 3230 24 VDC two-channel digital input module

4   STB DDO 3200 24 VDC two-channel digital output module

5   STB DDI 3425 24 VDC four-channel digital input module

6   STB DDO 3415 24 VDC four-channel digital output module

7   STB DDI 3615 24 VDC six-channel digital input module

8   STB DDO 3605 24 VDC six-channel digital output module

9   STB AVI 1275 +/-10 VDC two-channel analog input module

10 STB AVO 1255 0 ... 10 VDC two-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 3425 input	5	3
STB DDO 3415 output	6	4
STB DDI 3615 input	7	5
STB DDO 3605 output	8	6
STB AVI 1275 input	9	7
STB AVO 1255 output	10	8

Auto-Configuration

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, you can begin using it as a node on that network.

About Auto-Configuration   Auto-configuration occurs when:
- You power up an island for the first time.
- You push the RST button.

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.
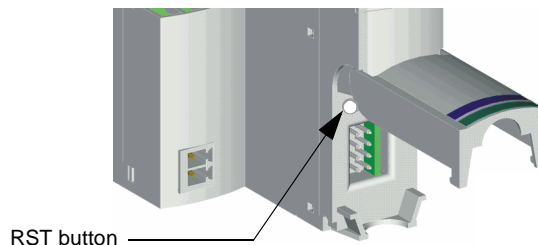
The RST Button

Summary
Use the RST function to reconfigure your island after you have added a new I/O module to a previously auto-configured 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 saved. RST works only after the island has been successfully configured at least once.

Physical Description
The RST button is located immediately above the CFG port, and behind the same hinged cover:

RST button

Holding down the RST button for two seconds or longer causes the island to auto configure and the Flash memory to be overwritten.

Engaging the RST Button
To engage the RST button, 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 or a soft item such as a pencil that might break off and jam the button.
When you push the RST button for at least two seconds, the NIM reconfigures the island bus as follows:

Stage	Description
1	The NIM auto-addresses 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 re-initializes the island bus and brings it into operational mode.

Note: Network settings such as the fieldbus baud and the fieldbus node ID remain unaffected.

Island Fallback Scenarios

Introduction

In the event of a communications failure on the island or between the island and the fieldbus, output data is put into a predefined fallback state so that the module's values are known when the system recovers from the failure.

When you use a basic NIM, you cannot change the fallback parameters of any modules in the segment. All output channels on the modules go to a predefined fallback value of 0.

Fallback Scenarios

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

- loss of fieldbus communications—Communications with the fieldbus master are lost.
- loss of island bus communications—There is an internal island bus communications error, 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.

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

Note: If a module fails, it needs to be replaced. The module may not go to its fallback state.

Heartbeat Message

The Advantys STB system relies on a heartbeat message to ensure 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 will go into their fallback states if they do not receive a heartbeat message from the NIM within the defined interval.

Fieldbus Communications Support

4

At a Glance

Introduction

This chapter describes how the INTERBUS master sets up communications with an Advantys STB island and the network parameterization, configuration and diagnostics services performed to configure the island as an INTERBUS node.

To communicate with an Advantys STB island, the INTERBUS master sends output data across its network to the STB NIB 1010 basic NIM. The NIM transfers this output data across the island bus to the destination output modules. The NIM collects input data from the island's input modules and sends the data back to the fieldbus master in a bit-packed format.

What's in this Chapter?

This chapter contains the following topics:

The INTERBUS ID Code

Introduction The ID cycle is part of the INTERBUS network's initialization process. After determining the length of its own data during network initialization, every network device reports its functionality and byte length in the two-byte ID code. The INTERBUS ID code is a 16-bit word that describes the data type, data length and module type (digital/analog, input/output/mixed) of network devices.

The Low and High Bytes Data type is transmitted in the ID code's low byte; data length and message information are reported in the high byte:

15	14	13	12	11	10	9	8		7	6	5	4	3	2	1	0
	❸				❷							❶				
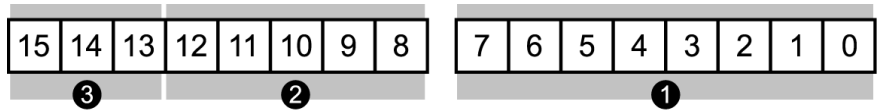
1   data type (03h, 33h)

2   data length (0 to 16 words)

3   messages (for management functions)

Data Type The INTERBUS NIM recognizes one of two possible data types:

Data Type	Signal Direction	Signal Type
03h	input/output	digital
33h	input/output	analog or mixed

Data Length The following table shows the relationship between the actual data length of the island and the length of the code on INTERBUS. The actual data length (anywhere from 0 to 16 words) represents the greater of the input or output data length.

Actual Length of Island Data	INTERBUS Data Length	Data Length Code (Hex)
up to 1 word*	1 word	1
2 words	2 words	2
3 words	3 words	3
4 words	4 words	4
5 words	5 words	5
6 words	6 words	E
7 words	7 words	F
8 words	8 words	6
9 words	9 words	7
10 words	10 words	15
11 to 12 words	12 words	16
13 to 14 words	14 words	17
15 to 16 words	16 words	12
17 to 24 words**	24 words	13
25 to 26 words**	26 words	11

* The status word is included in the data length, so the minimum allowable data length for an Advantys island is 2 words (data word + status word).

** The STB NIB 1010 INTERBUS NIM supports only up to 16 words in each direction (input/output).

Data Exchange

Introduction

Process image data is exchanged between the STB NIB 1010 NIM and an INTERBUS fieldbus master in a bit-packed format.

> **Note:** In this discussion, data and words described as *input* and *output* are defined relative to the master. For example, the master receives input data and transmits output data.

Data and Status Objects

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

- *data objects*—operating values the INTERBUS master either reads from the input modules or writes to the output modules
- *status objects*—module health records sent by I/O modules and read by the INTERBUS master
- *echo output data objects*—sent by digital object modules to the INTERBUS master; these objects are usually a copy of the data objects, but they can contain useful information when a digital output point is configured to handle the result of a reflex action

Standard Advantys STB I/O modules support all three of the above objects. Basic Advantys STB I/O modules support only data objects, not status or echo objects. The following table shows the relationship between different object types and 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		data	1 byte or less	does not apply	
		status[1]	1 byte or less	does not apply	
digital output		echo output data	1 byte or less	data	1 byte or less
		status[1]	1 byte or less	does not apply	
analog input	channel 1	data	2 bytes	does not apply	
		status[2]	1 byte	does not apply	
	channel 2	data	2 bytes	does not apply	
		status[2]	1 byte	does not apply	
analog output	channel 1	status[2]	1 byte	data	2 bytes
	channel 2	status[2]	1 byte	data	2 bytes

[1] Echo and status information is not available for every module. For example, basic I/O modules do not report this information. Refer to *The Advantys STB Hardware Components Reference Guide* (890 USE 172 00) for details.

[2] Status information is not available for every analog module. For example, basic analog modules do not report status. Refer to *The Advantys STB Hardware Components Reference Guide* (890 USE 172 00) for details.

The Internal Process Image

The STB NIB 1010's process image contains memory areas (buffers) for the temporary storage of input and output data. The internal process image is part of the NIM's island bus scanner area.

The island bus manages data exchange in both directions:

- *input data from the island bus*—The island bus scanner operates continuously, gathering data as well as status and confirmation bits and putting them into the process image's input buffer.
- *output data to the island bus*—The island bus scanner handles output data and places it in the process image's output buffer.

Input data and output data are assembled in the order of the island bus I/O modules (from left to right).

Word Boundaries and Bit Packing

Every entry in the process image is in a multiple-word format. If modules on the island bus have input or output data entries that are not multiple words, the corresponding word in the process image is moved to the next word boundary.

For example, a module with one bit of output data starts on a word boundary in the process image's output data buffer. The next process image entry starts on the next word boundary, thereby transmitting 15 unused bits of the module's first word, resulting in latency during data transmission on the fieldbus.

Bit packing allows bits of data on the fieldbus from different digital I/O modules to be put together in a single byte, resulting in optimized bandwidth.

Bit Packing Rules

The STB NIB 1010 NIM observes the following rules for the bit packing of the external process image:

- The input and output process image sizes are limited to 16 words each.
- The first word of the input process image contains NIM status information. The first word of the output process image contains the NIM control word.
- Bit packing follows the addressing order of the island bus I/O modules, from left to right in the basic segment.
- When the data object (or echo output data object) for a specific module is available, it precedes the status object for that module.
- Status objects and data objects for the same or different I/O module may be packed in the same word if the size of the combined objects is 16 bits or less.
- If the combination of objects requires more than 16 bits, the objects will be placed in separate contiguous bytes. A single object cannot be split over two word boundaries.
- For standard analog input modules, channel 1 data is followed immediately by channel 1 status, then channel 2 data and channel 2 status.

Input and Output Data Exchange

The application of the INTERBUS bit packing rules to the sample island assembly results in four words of output data and five words of input data. The tables that follow show how digital data is bit packed for optimization, and how data, status, and echo output data (from outputs) appear in the PLC as the same data type (*digital input data*). In these tables, *N* refers to the island node number. That is, *N1* represents the first addressable node (module) on the sample island bus, *N2* the second, and so forth.

Output Data Exchange

The following table shows how the four words in the sample island assembly output data process image are organized after applying the bit packing rules:

	Bit Number															
Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	NIM control word															
2	empty (set to 0)				N6 output data						N4 output data				N2 output data	
3	N8 (channel 1) analog output data															
4	N8 (channel 2) analog output data															

Input Data Exchange

The following table shows how the five words of the sample island assembly output data process image are organized after applying the bit packing rules. The first word contains the NIM status.

	Bit Number															
Word	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	NIM status															
2	empty (set to 0)				N3 input data				N2 output status		N2 output echo		N1 input status		N1 input data	
3	empty (set to 0)										N5 input data					
4	N7 (channel 1) analog input data															
5	N7 (channel 2) analog input data															

Application Example

5

At a Glance

Introduction   This chapter presents two examples for configuring the Advantys STB island on an INTERBUS network. Each example implements the same sample island assembly with an Advantys STB NIB 1010 basic NIM.

What's in this Chapter?   This chapter contains the following topics:

Sample Island Assembly

Introduction   The configuration example(s) in this chapter use a particular Advantys STB island assembly, described below. Your island assembly is independent of the network's master scanner because the island is represented by the NIM as a single node on the fieldbus network.

Sample Island Assembly   The sample I/O system used in this chapter's application example(s) implements a variety of analog and digital modules.
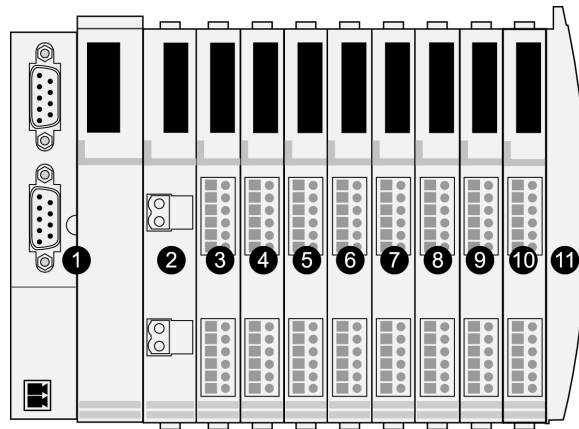
1   STB NIB 1010 INTERBUS NIM

2   STB PDT 3100 24 VDC PDM

3   STB DDI 3230 two-channel 24 VDC digital input module (2 bits of data, 2 bits of status)

4   STB DDO 3200 two-channel 24 VDC digital output module (2 bits of data, 2 bits of echo output data, 2 bits of status)

5   STB DDI 3425 four-channel 24 VDC digital input module (4 bits of data, 4 bits of status)

6   STB DDO 3415 four-channel 24 VDC digital output module (4 bits of data, 4 bits of echo output data, 4 bits of status)

7   STB DDI 3615 six-channel 24 VDC digital input module (6 bits of data, 6 bits of status)

8   STB DDO 3605 six-channel 24 VDC digital output module (6 bits of data, 6 bits of echo output data, 6 bits of status)

9   STB AVI 1275 two-channel +/-10 VDC analog input module (16 bits of data [channel 1], 16 bits of data [channel 2], 8 bits of status [channel 1], 8 bits of status [channel 2])

10 STB AVO 1255 two-channel 0 ... 10 VDC analog output module (8 bits of status [channel 1], 8 bits of status [channel 2], 16 bits of data [channel 1], 16 bits of data [channel 2])

11 STB XMP 1100 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 3425	four-channel digital input	3
STB DDO 3415	four-channel digital output	4
STB DDI 3615	six-channel digital input	5
STB DDO 3605	six-channel digital output	6
STB AVI 1275	two-channel analog input	7
STB AVO 1255	two-channel analog output	8

The NIM, the PDM, and the termination plate do not consume island bus addresses, and they do not exchange data with the fieldbus master.

Network Configuration Considerations

Introduction   This topic covers items to consider before you configure your INTERBUS network for use with an Advantys STB island.

Connection Figure   The following figure shows the connections between a master device and its slave devices on an INTERBUS network:
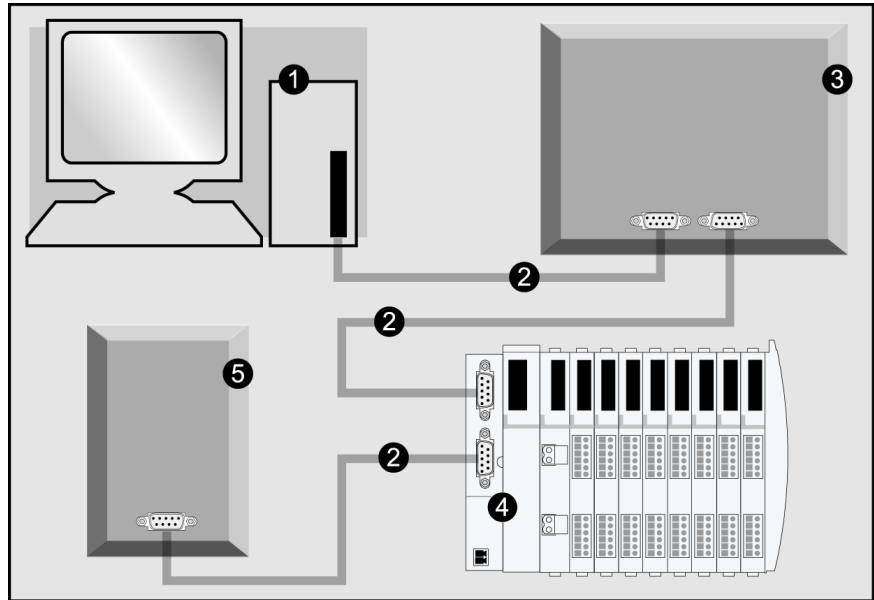
   1   PC/PLC

   2   INTERBUS network cable (not supplied)

   3   network node

   4   Advantys STB sample island assembly

   5   slave device (terminating)

   Note: An Advantys STB island with an INTERBUS NIM can be implemented only as a remote bus node.

Before You Begin

Before attempting to use the application examples in this chapter, make sure:

- your Advantys STB modules are assembled, installed, and powered according to your particular system, application, and network requirements
- you know the input and output process data lengths for your specific configuration (the sample island assembly's input length is 80 bits and the output length is 64 bits)

You should have a working familiarity with both the INTERBUS fieldbus protocol and your configuration software, either SyCon or CMD.

> **Note:** For specific information about your configuration software, consult the manufacturer's documentation included with the Hilscher (SyCon) or Phoenix Contact (CMD) product.

SyCon Considerations

You should have the EDS file and corresponding bitmap files that were supplied with the STB NIB 1010 INTERBUS NIM (also available at *www.schneiderauto-mation.com*), or you have created an EDS that is specific to the sample island assembly with the Advantys or SyCon configuration software.

CMD Considerations

You should have the Schneider device database, Schneider_Device_DB, available at *www.schneiderautomation.com*. It includes the Advantys STB catalog entry. If you don't have this database, you can create a configuration-specific device by following the instructions for CMD configuration.

The sample island assembly's input length is 80 bits and the output length is 64 bits. If you do not account for the entire data length of your island, process data will be truncated or connection to the network will be impossible.

Using SyCon to Configure an STB Island on INTERBUS

Introduction   To add any master device and an Advantys STB island slave to your configuration with SyCon:

Stage	Description
1	Add a master to your network configuration.
2	Add the NIM to your network configuration.
3	Create an EDS for the Advantys STB island.
4	Save and download the configuration

Add a Master   Use the following procedure to add an INTERBUS master to your configuration. In this case, the Hilscher CIF30 PCMCIA card is used. The steps are the same for all master devices.

Step	Action	Comment
1	From SyCon's Insert menu, select Master.	A list of INTERBUS masters appears in the Insert Master dialogue box.
2	Select CIF30-IBM from the Available devices list and click Add.	The CIF30-IBM appears in the Selected devices list.
3	Press OK.	The CIF30-IBM appears in the SyCon workspace.

Add the NIM   You must import the NIM's EDS before you configure the island as a network device.
To add the NIM to the network configuration:

Step	Action	Comment
1	From SyCon's Insert menu, select Remote Bus Device or the insert remote device icon.	The Advantys STB island can only be used as a remote node on INTERBUS.
2	Decide where you want to insert the NIM device.	Blue circles in the workspace indicate possible insertion points.
3	Click in the appropriate blue circle.	The Insert Remote Bus Device dialogue box appears.
4	Select the NIM's EDS from the Available devices list and click Add.	The EDS appears in the Selected devices list. If not, follow the directions at *Create an EDS*.
5	Press OK.	The island appears in the SyCon workspace.

Configuring in the SyCon Workspace   After you use the *Add a Master* and *Add the NIM* instructions to add the CIF30 master and INTERBUS NIM slave to your network configuration, a SyCon workspace similar to this appears:

Create an EDS   You can create an EDS using SyCon's EDS Generator by following these instructions:

Step	Action	Comment
1	From SyCon's Tools menu, select EDS Generator.	The EDS Generator dialogue box appears.
2	In the Created by text field, enter the creator's name.	Use your own name.
3	In the Device text field, enter the device name and manufacturer.	The device will use the name you enter here when it appears in the configuration workspace.
4	From SyCon's Type pull-down menu, select Remote Bus Device.	The Advantys STB island can only be used as a remote node on INTERBUS.
5	Specify the Process data direction by selecting input/output.	The selection of input/output supports the mixture of input *and* output modules in the sample island.
6	Specify the analog Device class.	The selection of analog supports the mixture of digital and analog modules in the sample island. PCP capability is not supported by the INTERBUS NIM.
7	Specify the Process data length by selecting an input length of 10 octets, and an output length of 8 octets.	Bit packing for the sample island indicates 5 words of input and 4 words of output. (An octet represents one-half of a data word.)
8	An Ident code should appear under Device identification.	The above selection of analog (Device class) will put *51* (33h) in the Ident code, although other values are available in the Ident code pull-down menu.
9	In the Configuration (Bitmap) text field, select the desired .bmp file or accept the defaults.	The .bmp file graphically represents the node in the SyCon workspace. Accepting default bitmaps or importing others will not affect system performance.

After you customize the SyCon EDS Generator screen, it will resemble this:

Saving and Downloading the Configuration	You can save your configuration with the standard Windows commands in the File menu. The Online menu provides options for downloading and debugging your configuration.

Using CMD to Configure an STB Island on INTERBUS

Introduction

Use these directions to add an Advantys STB island slave to your INTERBUS network using Phoenix Contact's CMD software. The employed master device is a controller board that you select. In this example, we will use a PC with an IBS/4K controller board. The stages of this process are described in the following table:

Stage	Description
1	Add the controller board
2	Add the island slave
3	Save and download the configuration

The CMD Workspace

In this configuration example, you will add a master device and an Advantys STB island slave to your configuration using CMD.

The CMD workspace should resemble the following figure after you've added the controller board and INTERBUS NIM slave to your network configuration with the following instructions:
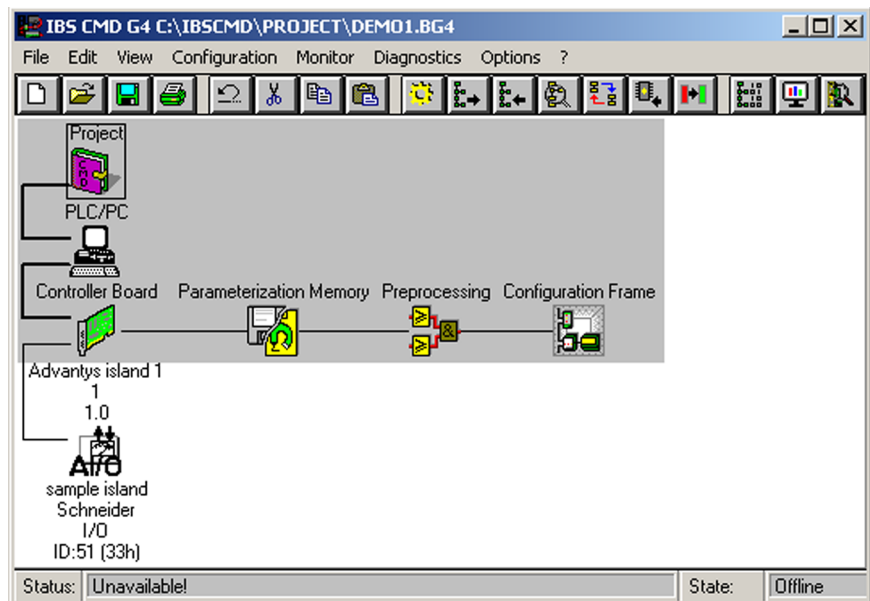
Add the Controller Board

Use the following instructions to add a master device (the selected controller board) to your configuration project.

Step	Action	Comment
1	To create a new project, choose New from the File menu.	A new project window appears. Default project components are already in the project view.
2	In the project window, select (left-click) the Controller Board icon.	A selection box appears around the Controller Board icon.
3	Right-click on the Controller Board icon, scroll down, and left-click Type.	The Select Controller Board dialogue box appears.
4	From the Available Types list, select your controller board.	In this case, select the IBS/4K.

Adding the Island Slave

If you have Schneider's device database (Schneider_Device_DB), you can import it into CMD. The following instructions are for manually creating a new configuration-specific device when a configured one is not available:

Step	Action	Comment
1	In your configuration, right-click on the Controller Board icon, scroll down, and left-click Insert ID Code.	The Insert Device Description dialogue box appears.
2	In the ID Code field, enter the ID code for your island.	Use **51** (33h) for the ID code data type of the sample island.
3	In the Process Data Channel field, enter your island's process data length.	The sample island assembly's input data length is 80 bits and the output data length is 64 bits (including the control and status words).
4	At Device Type, select Remote Bus Device.	The Advantys island is always configured as a remote bus device.
5	In the Station Name field, enter a station name for your island node.	Choose your own station name for the Advantys island.
6	In the Device Name field, enter a name for your island node.	Choose your own device name for the Advantys island.
7	In the Manufacturer Name field, enter a name for your island node.	Enter Schneider for the manufacturer name.
8	In the Device Type field, enter a name for your island node.	Enter a device type that you feel describes the nature of the Advantys island. I/O will suffice.

Saving and Downloading the Configuration

You can save your configuration with the standard Windows commands in the File menu. The Online menu provides options for downloading and debugging your configuration.

Glossary

!

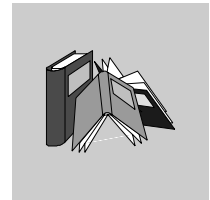|	
10Base-T	An adaptation of the IEEE 802.3 (Ethernet) standard, the 10Base-T standard uses twisted-pair wiring with a maximum segment length of 100 m (328 ft) and terminates with an RJ-45 connector. A 10Base-T network is a baseband network capable of transmitting data at a maximum speed of 10 Mbit/s.
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—i.e., 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—i.e., 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	*address resolution protocol.* 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 a single segment of up to 12 Advantys STB I/O modules. A basic NIM does not support the Advantys configuration software, reflex actions, island bus extensions, 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 one 5 A fuse to protect the I/O.
BootP	*bootstrap protocol.* A UDP/IP protocol that allows an internet node to obtain its IP parameters based on its MAC address.
BOS	*beginning of segment.* When more than one segment of I/O modules is used in an island, an STB XBE 1200 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.
bus arbitrator	A master on a Fipio network.

C

CAN	*controller area network.* The CAN 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 error 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 standard CANopen device to the island bus.
CI	*command interface.*
CiA	*CAN in Automation.* CiA is a non-profit group of manufacturers and users dedicated to developing and supporting CAN-based higher layer protocols.
COB	*communication object.* A 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.
COMS	*island bus scanner.*
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.

D

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 role 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.

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 standard 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 error.
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	*end of segment.* When more than one segment of I/O modules is used in an island, an STB XBE 1000 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.
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.0
Ethernet II	A frame format in which the header specifies the packet type, Ethernet II is the default frame format for STB NIP 2212 communications.

F

fallback state	A safe state to which an Advantys STB I/O module can return in the event that its communication connection fails.
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 eight words and equal to or less than thirty-two 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 eight 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 one 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.

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, error, 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. IEC 1131 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 two- or three-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), three-wire proximity switches and two-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 will send a 1 to the controller when its field sensor turns on. If the polarity is *reverse*, an input channel will send 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.
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.

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 fails or is removed from its location on the island bus, the island will go into 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 two-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, error control, and device status control.

O

object dictionary	(aka *object directory*) 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 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.
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 will turn its actuator on when the master controller sends it a 1. If the polarity is *reverse*, an output channel will turn 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.
preferred module	An I/O module that functions as an auto-addressable node 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 STB XBE 1000 EOS module and a length of STB XCA 100*x* bus extension cable. It can be extended to another preferred module or back into a standard island segment. If it is the last device on the island, it must be terminated with a 120 Ω terminator.
premium network interface	An Advantys STB network interface module designed at a relatively high cost to support high module densities, high transport data capacity (e.g., for web servers), and more diagnostics on the island bus.
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 physical location. 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 two-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 one 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 Modbus TCP/IP NIM. A role name is created either as a combination of a numeric rotary switch setting and the STB NIP 2212 part number or by modifying text on the Configure Role Name web page. After the STB NIP 2212 is configured with a valid role name, the DHCP server will use 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.

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 one 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 one segment and, depending on the type of NIM used, may have as many as seven 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 BOS module. (An island running with a basic NIM does not support extension segments.)

SELV   *safety extra low voltage.* A secondary circuit designed and protected so that the voltage between any two accessible parts (or between one 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 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. Two conditions are imperative to the success of this design technique—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 wide and 128.25 mm 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 wide and 128.25 mm 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 wide and 128.25 mm high.

slice I/O   An I/O module design that combines a small number of channels (usually between two and six) 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, error 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 six 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. Three types of standard profiles are available—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 two-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.

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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