Advantys STB System Planning and Installation Guide

890USE17100 Version 1.0

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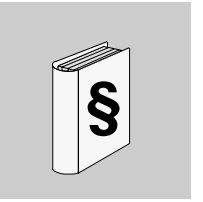
Safety Information



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.

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, serious injury, or equipment damage.

⚠ WARNING

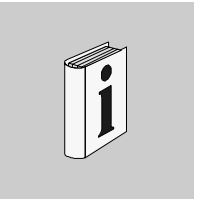
WARNING indicates a potentially hazardous situation, which, if not avoided, **can result** in death, serious injury, or equipment damage.

⚠ CAUTION

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

PLEASE NOTE Electrical equipment should be serviced only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material. This document is not intended as an instruction manual for untrained persons.

About the Book



At a Glance

Document Scope

This book describes concepts for planning and procedures for installing an Advantys STB island. The installation will comprise some combination of an Advantys STB network interface module, one or more power distribution modules, various I/O modules, and perhaps some island bus extension modules and cables.

Validity Note

The data and illustrations found in this book are not binding. We reserve the right to modify our products in line with our policy of continuous product development. The information in this document is subject to change without notice and should not be construed as a commitment by Schneider Electric.

Related Documents

Title of Documentation	Reference Number
The Advantys STB Hardware Components Reference Guide	890USE17200
The Advantys STB Profibus DP Network Interface Applications Guide	890USE17300
The Advantys STB INTERBUS Network Interface Applications Guide	890USE17400
The Advantys STB DeviceNet Network Interface Applications Guide	890USE17500
The Advantys STB CANopen Network Interface Applications Guide	890USE17600
The Advantys STB Ethernet Modbus TCP/IP Network Interface Applications Guide	890USE17700
The Advantys STB Modbus Plus Network Interface Applications	890USE17800
The Advantys STB Fipio Network Interface Applications Guide	890USE17900
The Advantys Configuration Software Quick Start User Guide	890USE18000

Product Related Warnings

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to assure compliance with documented system data, only the manufacturer should perform repairs to components.

User Comments

We welcome your comments about this document. You can reach us by e-mail at TECHCOMM@modicon.com

Site Requirements for an Advantys STB Island Installation

1

At a Glance

Overview

This chapter describes the external requirements that need to be considered when you select and plan your Advantys STB installation.

What's in this Chapter?

This chapter contains the following topics:

Advantys STB Islands of Automation

System Definition

Advantys STB is an open, modular distributed I/O system designed for the machine industry, with a migration path to the process industry. Modular I/O and power distribution devices reside on the island bus. The island functions as a node on a fieldbus control network and communicates with the fieldbus master controller.

Open Fieldbus Choices

An island can function as a node on the following open industry-standard fieldbus networks:

- Profibus DP
- DeviceNet
- Ethernet
- CANopen
- Fipio
- Modbus Plus
- INTERBUS

A network interface module (NIM) resides in the first position of the island bus (leftmost on the physical setup). The NIM acts as the gateway between the island and the fieldbus, facilitating data exchange between the fieldbus master and the I/O modules on the island. It is the only module on the island that is fieldbus-dependent—a different type of NIM module is available for each fieldbus. The rest of the I/O and power distribution modules (PDMs) on the island bus function exactly the same, regardless of the fieldbus on which the island resides. You have the advantage of being able to select I/O modules and establish island functionality independent of the fieldbus on which it will operate.

I/O Modules on the Island

In your application, you can combine a comprehensive set of I/O modules specifically designed for the island with island-compliant devices from other Schneider product catalogs (called *preferred modules*). Standard CANopen devices can also be included in your combination of I/O devices.

Granularity

Advantys STB I/O modules are designed to be small, economical devices that provide you with just enough input and output channels to satisfy your application needs. Specific types of I/O modules are available with two or more channels. You can select exactly the amount of I/O you need and you do not have to pay for channels that you don't need.

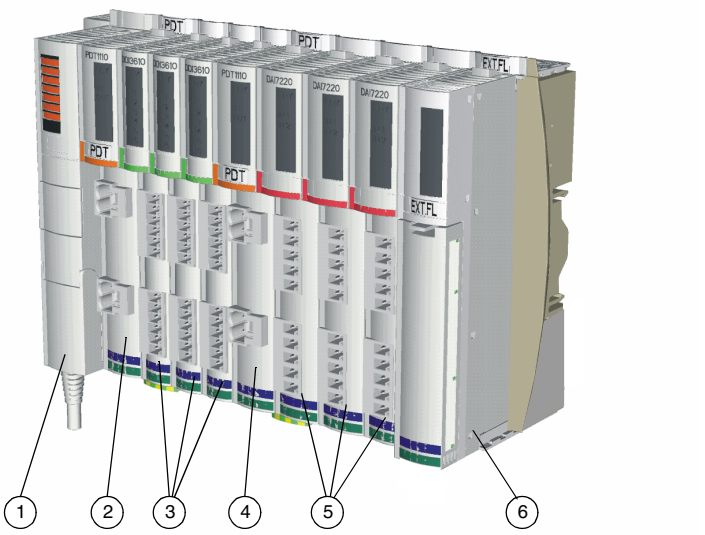
Mechatronics

One of the key reasons for selecting Advantys STB is so that you can design a system where the control electronics in the I/O modules reside as close as possible to the mechanical devices they are controlling. This concept is known as *mechatronics*.

Advantys STB allows you to extend an island bus to multiple segments of I/O on one or more DIN rails. It allows you to position the I/O as close as possible to the sensors and actuators they control. Using bus extension cables and modules, an island bus can be stretched to distances up to 15 m (49.21 ft).

An Illustrative Example

The illustration below shows an example of a primary segment with I/O modules from two voltage groups—DC-powered analog and digital I/O modules and AC-powered digital I/O modules.



1 The NIM: Always installed in the leftmost location in the primary segment. One and only one NIM must be used on an island.

2 A 24 VDC PDM: An STB PDT 3100 module, which will distribute 24 VDC across the island bus to a voltage group of DC I/O modules. The PDM is installed directly to the right of the NIM.

3 A set of analog and digital DC I/O modules installed directly to the right of the STB PDT 3100 PDM.

4 A 115/230 VAC PDM: An STB PDT 2100 module installed directly to the left of a voltage group of AC I/O modules. Notice that this PDM also provides isolation between the AC voltage group and the DC voltage group that precedes it.

5 A set of digital VAC I/O modules: These modules are installed together in a voltage group to the right of the STB PDT 2100 PDM, which distributes either 115 or 230 VAC field power to them and isolates them from the DC voltage group.

6 EOS bus extension module: An STB XBE 1000 module that is installed in the rightmost location in the primary segment. It enables the island bus to be extended to another segment of Advantys STB modules or to a preferred module.

Note: The illustration above is of the first segment of an island that contains more than one segment. Therefore, the required 120 Ω logic termination resistor would be located beyond it.

Inside the Enclosure

Open System Requirement

To assure performance to specs, open equipment must be installed in an enclosure that meets NEMA 250 Type 1 requirements and IP 20 requirements conforming to IEC 529. The enclosure must restrict direct access to qualified service personnel.

Module Dimensions

The following table describes the width, height , and depth of the standard Advantys island components.

Module size	Width of module alone	Height of module in base	Depth of module in base with field connectors attached
1	13.9 mm (.55 in.)	128.25 mm (5.05 in.)	75.5 mm (2.97 in.)
2	18.4 mm (.73 in.)	128.25 mm (5.05 in.)	75.5 mm (2.97 in.)
2-PDM	18.4 mm (.73 in.)	137.90 mm (5.45 in)	79.5 mm (3.13 in.)
3	28.1 mm (1.11 in.)	128.25 mm (5.05 in.)	70.1 mm (2.76 in)

These depth and height dimensions do not take into account the dimensions of external power equipment, preferred modules and/or standard CANopen devices.

Thermal Clearance

For proper heat dissipation, allow a minimum clearance of 100 mm (3.94 in) above and below each island segment.

Power Supply Selection

Overview

In an Advantys island there are at least three connections that need to be supplied power by an external source:

- Logic power connection (to the NIM)
- Actuator power connection (to a PDM)
- Sensor power connection (to a PDM)

Source power for these can come from one, two or three supplies. Your requirements are dictated by:

- Field devices
- Voltage and current needs
- Isolation requirements
- EMI/RFI suppression needs
- CE compliance needs
- Cost limitations

The AC voltage for AC PDMs is 85 VAC to 264 VAC

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

You need to supply 24 VDC to your NIM. It converts the 24 VDC to 5 VDC for logic power across the island bus. Beginning of segment (BOS) modules on additional segments of your Advantys island need to be supplied their own 24 VDC for logic power, either from the same supply or an additional one. Either way the supplies that you select for logic power must have a low voltage limit of 19.2 VDC and a high voltage limit of 30 VDC.

Sensor and Actuator Power

The power distribution module (PDM) distributes field power across the island's sensor bus to all the input modules in a particular voltage group and along the island's actuator bus to all the output modules in that voltage group. Each PDM on an island is supplied whatever voltage it will distribute to a particular voltage group of I/Os (24 VDC, 115 VAC, or 230 VAC).

There are two types of PDMs used on an island (both use the STB XBA 2200 base):

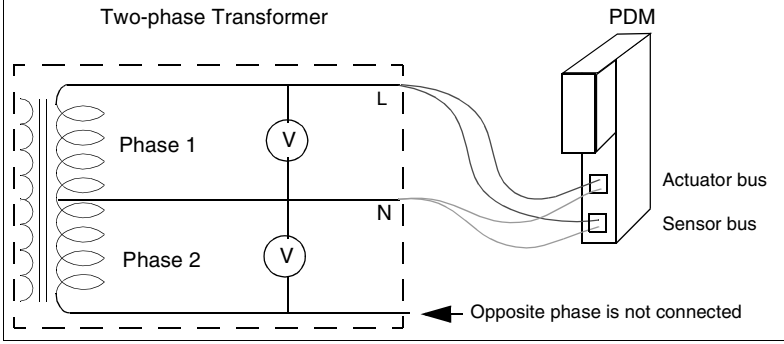
- An STB PDT 3100 module, which distributes field power to 24 VDC digital and/or analog I/O modules
- An STB PDT 2100 module, which distributes field power to either 115 VAC or 230 VAC digital I/O modules

You must choose an appropriate 24 VDC source power supply for the STB PDT 3100. The STB PDT 2100 uses AC voltage.

Note: When an island bus is supporting both 115 VAC I/O modules and 230 VAC I/O modules, the 115 VAC modules and the 230 VAC modules must be in separate voltage groups behind separate STB PDT 2100 PDMs.

Note: PDM damage is possible if the actuator and sensor power sources, on a 115 VAC PDM, are from multiple phases of a source transformer/s. The transformer will generate more than 300 VAC, which exceeds the PDM tolerance. Multiple phases of a source transformer can generate more than 300 VAC. This exceeds a 115 VAC PDM's tolerance, and may cause damage.

The example below shows a 115 VAC PDM correctly wired to a two phase AC power supply.



Wattage Requirements

The NIM must be supplied 13 W of power. In addition each BOS module on your island must be supplied 7 W of power. When selecting your power sources keep in mind these power requirements. For instance, if you have a NIM and a single BOS on your island and you are using a single supply, add their power requirements together to come up with the total power requirement for the single supply.

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

Recommended Supplies

We recommend the Phaseo ABL7 family of power supplies. Phaseo power supplies are distributed in the United States by Square D. Here are three possible power supply solutions for an island with 24 VDC modules:

- 1 supply for 3 connections (logic power, actuator power and sensor power):
  ABL7 RP 2410 (10 A maximum)
- 2 supplies for 3 connections (1 for logic power, 1 for actuator and sensor power
  For Logic power: ABL7 RP 2402 or ABL RE 2402
  For the 24 VDC PDM: ABL7 RP 2410 (10 A maximum)
- 3 supplies for 3 connections (1 for logic power, 1 for actuator power, 1 for sensor power)
  For logic power: ABL7 RP 2402 or ABL7 RE 2402
  For the 24 VDC PDM sensor: ABL7 RP 2405 or ABL7 RE 2405 (5 A maximum)
  For the 24 VDC PDM actuator: ABL RP 2410 (10 A maximum)

For more information on recommended supplies contact your Schneider Electric representative.

Extending the Island

Summary

Advantys STB allows you to extend the island bus out to multiple segments of I/O modules along a single DIN rail or on separate DIN rails. The DIN rail can support Advantys STB I/O modules or preferred modules. Standard CANopen devices are extended beyond the island segments.These bus extensions enable you to install the I/O in close proximity to the sensors and actuators they control. An Advantys STB island can support up to 32 I/O modules—including Advantys I/O, preferred modules, and CANopen devices.

Segments on an Island

An island can comprise up to seven segments of Advantys STB I/O—the primary segment and as many as six extension segments. The primary segment is always a necessary part of the island architecture. Extension segments are optional.

Length of an Island Bus

The maximum length permissible for an island bus is 15 m (49.2 ft) end-to-end. This length must take into consideration:

- The width of all Advantys modules on all segments
- The width of all preferred modules on the island bus
- All extension cables between the segments and the standalone modules

This 15 m maximum length does not include the space required for external devices such as source power supplies and the wiring between these devices and the island.

Note: The use of CANopen devices on systems using 800 kBd reduces the maximum length to 6.5 m (21.3 ft).

Advantys STB Bus Extension Cables

Advantys STB bus extension cables are specially designed cables in the IEEE 1394 style. They are used to carry the island bus to extension segments of STB I/O and to preferred modules.

Note: Advantys STB bus extension cables are not used to extend the island bus to standard CANopen devices.

Advantys STB bus extension cables are available in five lengths:

Model	Cable Length
STB XCA 1001	0.3 m (1 ft)
STB XCA 1002	1.0 m (3.3 ft)
STB XCA 1003	4.5 m (14.8 ft)
STB XCA 1004	10.0 m (32.8 ft)
STB XCA 1006	14.0 m (45.9 ft)

Each cable has IEEE 1394-style connectors on each end. The cable will transmit the following signals:

- island bus communications between the extension I/O and the NIM
- the island bus address line
- the return signal

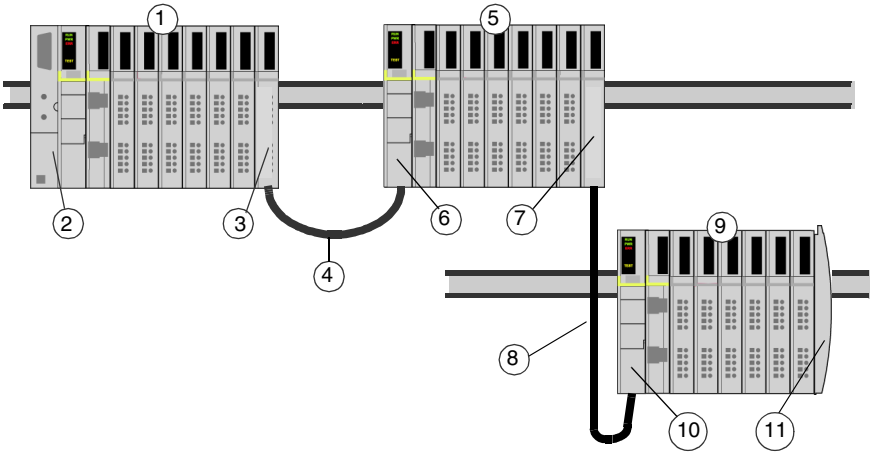
The cable does not transmit the 5 VDC logic signal to the next segment or preferred device.

An Advantys STB bus extension cable may be run:

- from an EOS module at the end of one segment to a BOS module at the beginning of an extension segment
- from an EOS module at the end of one segment to a preferred device
- from one preferred device to another preferred device
- from a preferred device to a BOS module at the beginning of an extension segment

I/O Modules in a Segment

The primary segment is where the NIM resides. It supports as many I/Os whose total logic bus current is less than 1.2 A.
System wide, an island bus can support up 32 auto-addressable I/O modules, some or all of which may be Advantys STB I/O.
The system supports a maximum of six extension segments. An extension segment can support up to as many I/O whose total logic bus current is less than 1.2 A, up to the system maximum of 32 I/O modules.
Extension segments are connected with each other in series using a combination of special extension modules and extension cables. The following illustration shows how a primary segment and two extension segments can be connected in series.

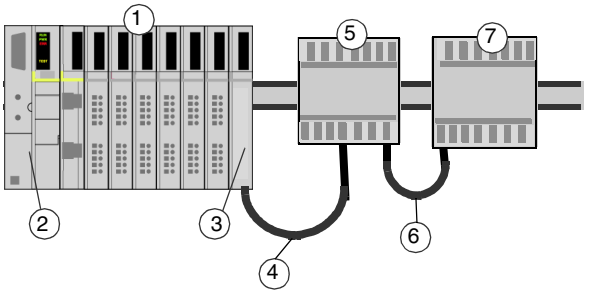


1 The primary segment
2 The NIM
3 An STB XBE 1000 EOS bus extension module on a STB XBA 2400 base
4 A 1 m length of STB XCA 1002 bus extension cable
5 The first extension segment
6 The STB XBE 1200 BOS bus extension module (on a STB XBA 2300 base) for the first extension segment
7 Another STB XBE 1000 EOS extension module
8 A 4.5 m length of STB XCA 1003 bus extension cable
9 The second extension segment
10 The STB XBE 1200 BOS bus extension module for the second extension segment
11 The STB XMP 1100 termination plate

The extension modules are the STB XBE 1000 EOS module, which is the last module in a segment from which the bus is extended, the STB XBE 1200 BOS module, the first module in each extension segment. These modules are connected together by lengths of STB XCA 100*x* Advantys STB bus extension cable (See *Advantys STB Bus Extension Cables, p. 18*).

Preferred Modules

An island bus can support auto-addressable preferred modules as well as Advantys STB I/O modules. Preferred modules are not mounted in segments.
A preferred module can be connected to an Advantys STB segment via an STB XBE 1000 EOS module in the segment and a length of STB XCA 100*x* bus extension cable. As the illustration below shows, preferred modules can also be chained together in series along the island bus, connected by STB XCA 100*x* bus extension cables.



1 The primary segment

2 The NIM

3 An STB XBE 1000 EOS bus extension module

4 A 1 m length of STB XCA 1002 bus extension cable

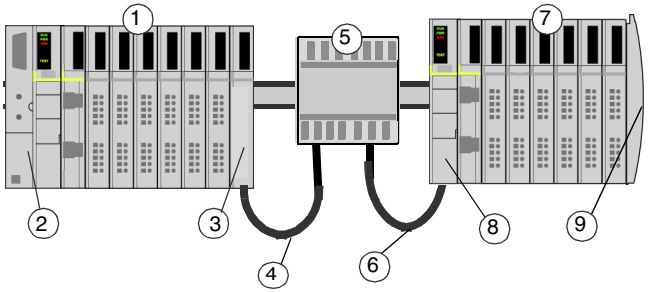
5 The first preferred module

6 A 0.3 m STB XCA 1001 bus extension cable

7 The second preferred module

Each preferred module is equipped with two IEEE 1394 connectors, one to receive the island bus signals and the other to pass them on to the next module in the series. Preferred modules are also equipped with 120 Ω termination, which can be enabled in the event that module is the last device on the island bus.

A preferred module can also pass the island bus communications signal to an extension segment of Advantys STB I/O modules, as shown below.



1 The primary segment

2 The NIM

3 An STB XBE 1000 EOS bus extension module

4 A 1 m length of STB XCA 1002 bus extension cable

5 A preferred module

6 A 1 m length of STB XCA 1002 bus extension cable

7 An extension segment of Advantys STB I/O modules

8 The STB XBE 1200 BOS bus extension module for the extension segment

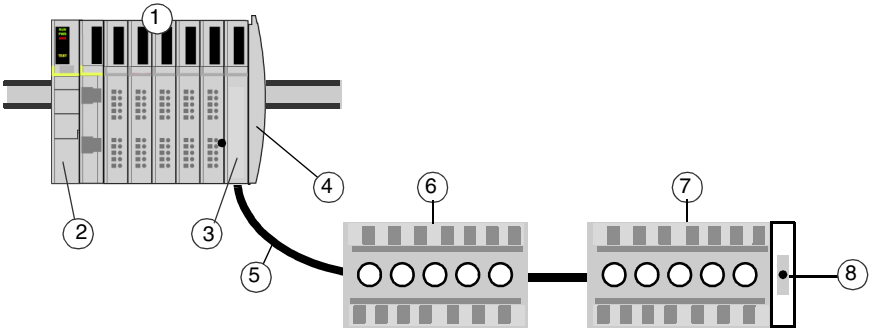
9 The STB XMP 1100 termination plate

Standard CANopen Devices

An island bus can support standard CANopen devices as well as Advantys STB I/O modules and preferred modules. A maximum of 12 standard CAN open devices can be added to an island. They do count as part of the 32-module system limit. Standard CANopen devices are not mounted in segments. They are added at the end of the primary segment or the last segment on the island. The segment before the standard CANopen device/s are connected must end with an STB XBE 2100 CANopen extension module (in a STB XBA 2000 base) followed by an STB XMP 1100 termination plate. The CANopen extension module has a 9 pin standard open style receptacle that connects to your supplied extension cable. The last CANopen device must be terminated with a 120 Ω resistor. This is usually a switch located on the standard CANopen device itself or it may need to be hard wired in. Only the CAN H and CAN L communication signal is passed from the last segment to the standard CANopen device/s.

Note: The use of CANopen devices on systems using 800 kBd reduces the maximum island length to 6.5 m (21.3 ft).

The following illustration shows a primary segment connected to two standard CANopen devices.



1 The primary segment
2 The NIM
3 An STB XBE 2100 CANopen extension module
4 The STB XMP 1100 termination plate
5 User supplied cable
6 Standard CANopen device
7 The last standard CANopen device
8 120 Ω temination resistor switch

Note: Advantys STB supports all V4 standard CANopen devices.

Operating Environment

Types of Environmental Specifications

The following information describes systemwide environmental requirements and specifications for the Advantys STB system.

Enclosure

This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted and/or radiated disturbance.
All Advantys STB modules meet CE mark requirements for *open equipment* and should be installed in an enclosure that is designed for specific environmental conditions and designed to prevent personal injury resulting from access to live parts. The interior of the enclosure must be accessible only by the use of a tool.

Environmental Requirements

This equipment meets agency certification for UL, CSA, CE and FM class 1 div 2. This equipment is intended for use in a Pollution Degree 2 industrial environment, in over-voltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 m (6500 ft) without derating.

Parameter	Specification	
protection	ref. EN61131-2	IP20, class 1
agency	ref. EN61131-2	UL 508, CSA 1010-1, FM Class 1 Div. 2, CE
isolation voltage	ref. EN61131-2	2000 VDC field-to-bus for 24 VDC
		3250 VDC field-to-bus for 115/230 VAC
	Note: No internal isolation voltage; isolation requirements must be met by using SELV-based external power supply.	
over-voltage class	ref. EN61131-2	category II
operating temperature	0 ... 60° C (32 ... 140° F)	
storage temperature	-40 ... +85° C (-40 ... +185° F)	
operating humidity	95% relative humidity @ 60° C (noncondensing)	
nonoperating humidity	95% relative humidity @ 85° C (noncondensing)	
supply voltage variation, interruption, shut-down and start-up	IEC 61000-4-11	
damped oscillatory wave	IEC 61000-4-12	
sinusoidal vibration	5 ... 20 Hz with 6.35 mmDA	
	20 ... 500 Hz with 5 g	
shock	ref. IEC88, part 2-27	30 g half sine
operating altitude	2000 m (2187 yd)	
transport altitude	3000 m (3281 yd)	
free-fall	ref. EN61131-2	1 m (1.09 yd)

Electromagnetic Susceptibility

The following table lists the electromagnetic susceptibility specifications:

Characteristic	Specification
electrostatic discharge	ref. EN61000-4-2
radiated	ref. EN61000-4-3
fast transients	ref. EN61000-4-4
surge withstand (transients)	ref. EN61000-4-5
conducted RF	ref. EN61000-4-6
pulse-modulated field	ref. EN61131-2

Radiated Emission

The following table lists the emission specification ranges:

Description	Specification	Range
radiated emission	ref. EN 55011 Class A	30 ... 230 MHz, 10 m @ 40 dBµV
		230 ... 1000 MHz, 10 m @ 47 dBµV

Advantys STB System Installation Procedures

2

At a Glance

Overview

This chapter focuses on procedures for constructing the backplane for an island bus and installing modules on that bus.

What's in this Chapter?

This chapter contains the following topics:

The Layout of Modules on an Island Bus

Making a Plan

Before you begin to install the modules, you need to establish a solid plan that identifies:

- The number and type of I/O modules on your island
- Their power requirements
- The order in which they will be placed on the island bus
- Base unit needs
- A keying scheme that helps match the correct modules with their bases
- A Labelling plan

Establishing and following a clear plan is necessary. The island bus will be constructed with a series of interconnected base units, and these base units are module-specific. The structure of the island backplane, therefore, will be defined by the type and order of modules that will reside in it. You will need to make these decisions in advance so that you can build the correct backplane, and key your base to module connections. Although there is inherent keying in the Advantys I/O system, optional keying of modules and connectors is available and recommended (See *Keying Considerations, p. 42*). Careful marking of your island base to module combinations is also recommended (See *Labeling the Bases and the Modules, p. 32*).

Selecting I/O Modules

When you plan an island layout, the most important things you need to know are the number and type of I/O modules and their matching bases. Once these two issues have been determined, it becomes easy to determine your external power requirements, power distribution requirements and the overall hardware design.

Note: If you mix AC and DC voltage groups in a single segment we recommend that the AC group be installed to the left of the DC group.

Up to 32 I/O modules can be supported on an island bus. These modules can be any combination of digital, relay, analog, and special-purpose Advantys STB modules and preferred modules. As many as 12 of these modules may be standard CANopen devices—if you use standard CANopen devices, they must be installed at the end of the island bus.

Positioning the STB I/O

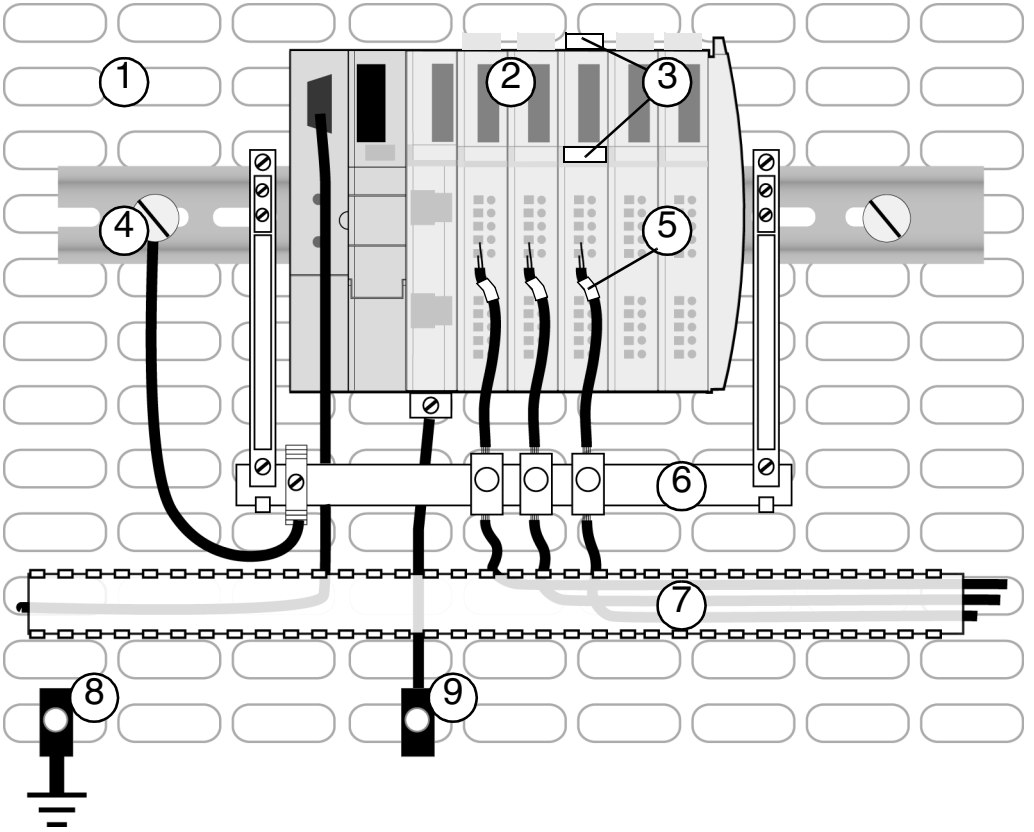
The Advantys STB I/O modules need to be installed in structures called *segments*. A segment comprises a series of interconnected I/O, power distribution modules, and either a termination or extension device. These interconnected modules need to be inserted in bases which snap together on a DIN rail. These interconnected bases form the backplane over which the island passes:

- logic power
- island bus communications
- sensor and actuator field power
- protective earth ground (PE)
- functional earth ground (FE)

At least one segment, referred to as the *primary segment*, must be included in the island. The primary segment is the first segment on the island and the one that contains the NIM. As many as six additional *extension segments* can be placed on the island after the primary segment. Any one segment can support up to 1.2 A worth of Advantys STB I/O modules not to exceed the system max of 32 modules. Using bus extension cables and modules, an island bus can be stretched to distances up to 15 m (49.21 ft).

Suggested Design Example

The following illustration shows a typical island system with one segment (the primary segment) terminated with a STB XMP 110 termination plate. Item 3, marking labels, are a suggested part of your design plan. They can be ordered from the Schneider catalog.



1 The DIN rail mounting surface and Earth grounded grid.

2 The primary segment.

3 Marking labels (STB XMP 6700).

4 Functional Earth (FE) grounding point.

5 Suggested label position (these labels are not provided by Schneider).

6 Grounding bar from an EMC kit. Used as a FE point for shielded cables and as a cable stabilizer.

7 A cable channel.

8 Large braided cable to Earth ground.

9 Protective Earth (PE) grounding point. Make this as close as possible to the I/O.

Determining Power Distribution Requirements

The island bus is designed to distribute field power to all its I/O modules over separate sensor buses (to the input modules) and actuator buses (to the output modules). The modules used to distribute field power are called PDMs. Two PDM modules are available:

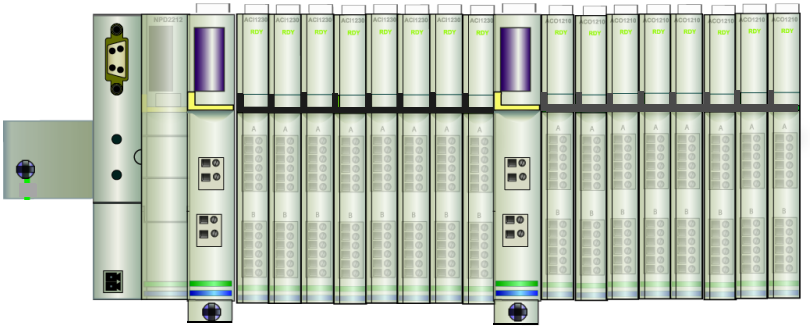
- The STB PDT 3100, which distributes 24 VDC field power
- The STB PDT 2100, which can distribute either 115 VAC field power or 230 VAC field power

In general, analog I/O and relay output modules rely on STB PDT 3100 24 VDC PDMs for power distribution. Some digital modules (with DDI or DDO in the model number) rely on STB PDT 3100 PDMs, while other digital modules (with DAI and DAO model numbers) rely on STB PDT 2100 VAC PDMs for power distribution. The PDM needs to be installed directly to the left of the I/O modules to which it is distributing field power. If you intend to support both VDC I/O modules and VAC I/O modules in the same segment, you will need to install different PDMs in the segment to support the different voltage groups.

As you plan your island layout, it is important to remember that all the I/O modules that require 24 VDC need to be placed together in a voltage group that is separated from any 115 or 230 VAC modules. Likewise, all I/O modules that require 115 VAC need to be separated from any 230 VDC modules in the segment.

Note: For better immunity in noisy environments It is recommended, but not imperative, that in the event a segment consists of groups of AC *and* DC I/O modules, the AC group be placed before the DC group (from left to right).

The following illustration shows a primary segment with two voltage groups in it. The PDMs are used both to distribute power to their I/O modules and to segregate their I/O modules from other voltage groups.

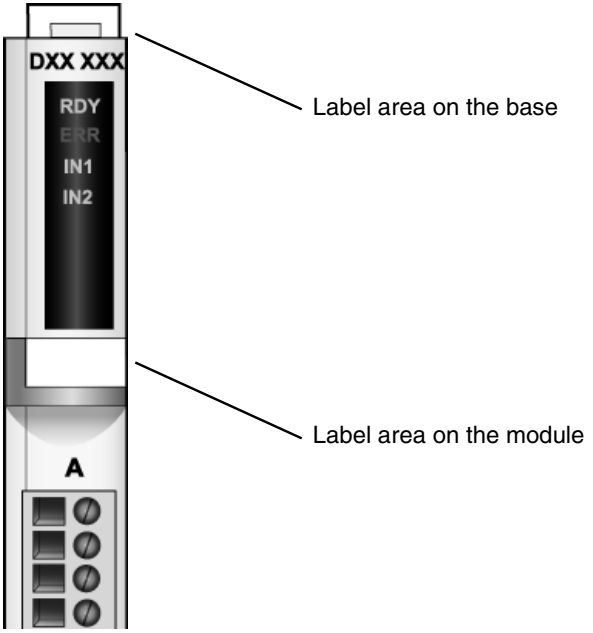


The illustration above shows an island segment mounted on a DIN rail. The segment comprises:

- a NIM in the leftmost location
- an STB PDT 2100 PDM, which terminates the 24 VDC field power distribution buses to its left and initiates a two new 115 VAC field power distribution buses for the I/O modules on its right
- an STB PDT 3100 PDM immediately to the right of the NIM
- a voltage group of 115 VAC I/O modules (identifiable by their red identity stripes), immediately after the STB PDT 2100 PDM
- a voltage group of 24 VDC I/O modules (identifiable by their green identity stripes), immediately after the STB PDT 3100 PDM

Labeling the Bases and the Modules

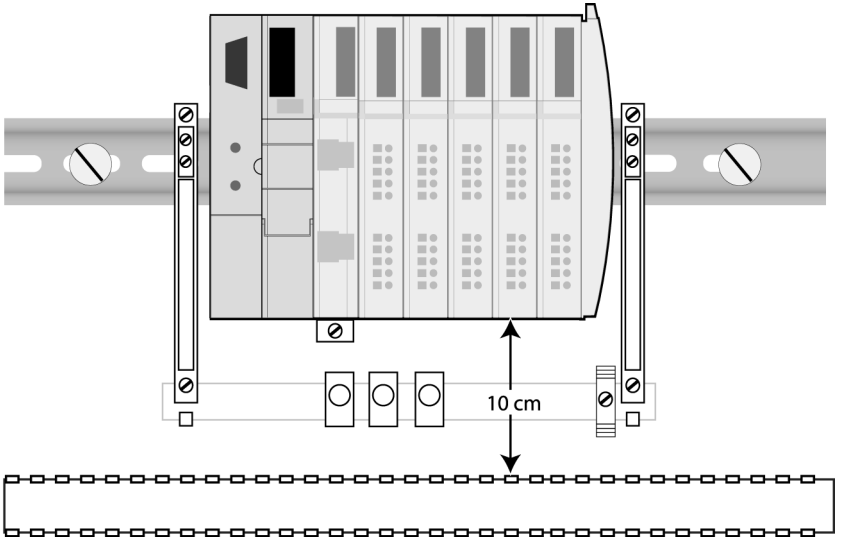
Each individual I/O base and module combination has two spaces on its front reserved for marking labels. Using marking labels can help you quickly identify information on individual bases and modules. They can also help match I/O to their matching bases.The kit (STB XMP 6700) comes with a printer friendly sheet of fifty 5mm x 10mm adhesive backed pre-scored labels. They can be ordered from your Schneider representative. In addition, a label printing template is available on the CD that came with your NIM. The template can also be found on the Userdoc CD (STB SUS 8800) that can be ordered from Schneider, and on the Schneider web site: www.modicon.com.
The following illustration shows the label areas on a module/base combination.



Cable Channels

Cable channels are recommended for an island's physical stability and ease of system assembly. We recommend the 30 mm model #AK2 GA33 from the Schneider catalog.

A distance of 10 cm between the tray and the island segment (see below) is recommended for thermal stability of the island.



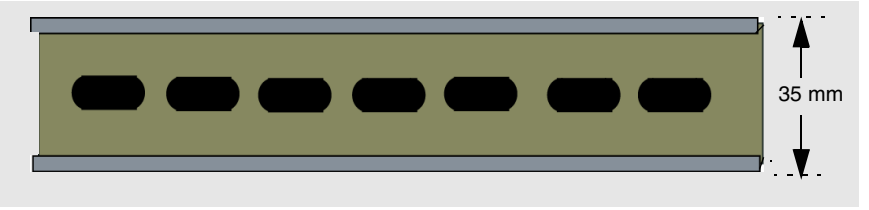
The DIN Rail

Carrier Rails for the Island Bus

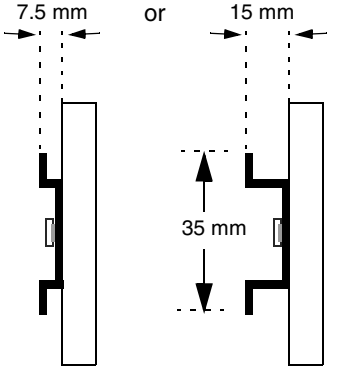
The island is mounted on one or more DIN carrier rails. A DIN rail can be attached to a flat mounting surface or hung on an EIA rack or in a NEMA cabinet. The DIN rail provides the functional earth ground across the island.There are two sizes of DIN rail you can use with an Advantys island, 7.5 mm and 15 mm. The 15 mm rail is used to provide room for higher profile mounting hardware.

Rail Dimensions

The DIN rail is 35 mm (1.38 in) high, as illustrated below.



The physical backplane for the island is established by placing a NIM and a sequence of interlocked base units on the DIN rail. The DIN rail may be either 7.5 mm (0.3 in) or 15 mm (0.6 in) deep.



Recommended Materials

Lengths of 1.5 mm thick tinned copper DIN rail are recommended. Suitable DIN rail can be purchased from Schneider Electric:

Rail Depth	Catalog Number
7.5 mm (0.3 in)	AM1DP200
15 mm (0.6 in)	AM1DE200

Rail Mounting Considerations

If you are using 7.5 mm DIN rail, make sure that the region along the rail where the island bases will be installed does not have any screw heads on it. The base units may not make proper contact with the rail if there are screw heads behind them. For high vibration environments where the rail needs to be fastened to the mounting surface along areas where the island modules will be mounted, use 15 mm DIN rail. The bolt heads on 15 mm rail will be sufficiently recessed so that they do not interfere with the base-to-rail contacts.

Installing the NIM in the First Location on the Island

The First Module on the Island Bus

Every Advantys STB island must contain one and only one NIM. It is the first (leftmost) module on the DIN rail in the primary segment.

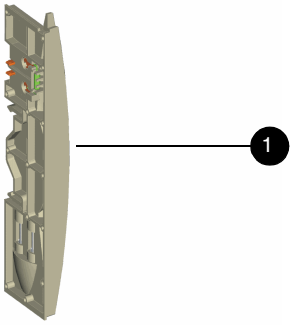
Choosing the Correct NIM

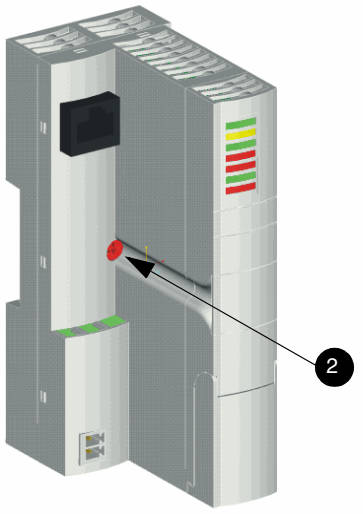
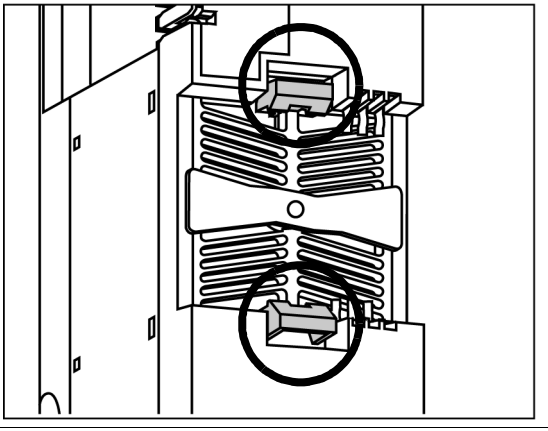
Make sure that you have chosen the NIM model that is appropriate for the fieldbus protocol on which your island will operate.

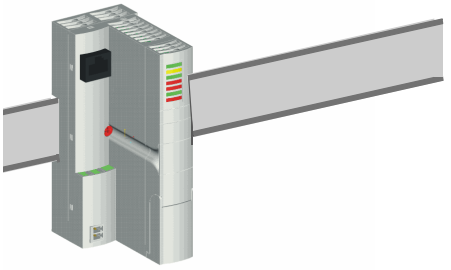
Fieldbus	NIM Model	for more details, refer to the...
Profibus DP	STB NDP 2212	*Advantys STB Profibus DP Network Interface Applications Guide* (890 USE 173 00)
CANopen	STB NCO 2212	*Advantys STB CANopen Network Interface Applications Guide* (890 USE 176 00)
DeviceNet	STB NDN 2212	*Advantys STB DeviceNet Network Interface Applications Guide* (890 USE 175 00)
Ethernet	STB NIP 2212	*Advantys STB Ethernet Network Interface Applications Guide* (890 USE 177 00)
Fipio	STB NFP 2212	*Advantys STB Fipio Network Interface Applications Guide* (890 USE 179 00)
Modbus Plus	STB NMP 2212	*Advantys STB Modbus Plus Network Interface Applications Guide* (890 USE 178 00)
INTERBUS	STB NIB 2212	*Advantys STB INTERBUS Network Interface Applications Guide* (890 USE 174 00)

How to Install the NIM

Unlike other Advantys STB modules, the NIM's mounting base is permanently attached to the module. The NIM is installed on the DIN rail in one piece. To install the NIM, use the following procedure:

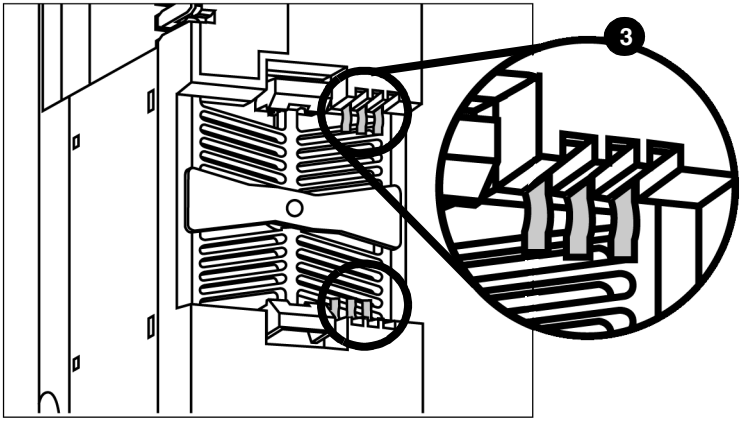
Step	Action
1	Remove the STB XMP 1100 termination plate (1) from the NIM package and set it aside for later use. 
2	Choose the exact location on the DIN rail where you want to position the NIM before you place it on the rail. **Note Do not slide the NIM on the rail—this could crush the functional earth (FE) contacts on the back of the NIM.** Make sure that you have reserved enough space to the right of the NIM for all the other island modules you want to mount on the DIN rail. In addition, reserve enough space for any DIN-mounted external devices you intend to use, such as source power supplies and safety relays. If a 7 mm rail is used, make sure that there are no mounting screws located in the part of the rail where the island modules will be installed.

Step	Action
3	Turn the release screw (2) on the NIM so that the mounting clips on the back are in their relaxed state. 
4	Align the mounting clips with the DIN rail and push the NIM onto the rail. The slope of these clips allows them to be opened by the rail when light pressure is applied. 

Step	Action
5	When the module is pushed completely on to the rail, the clips will snap closed. 

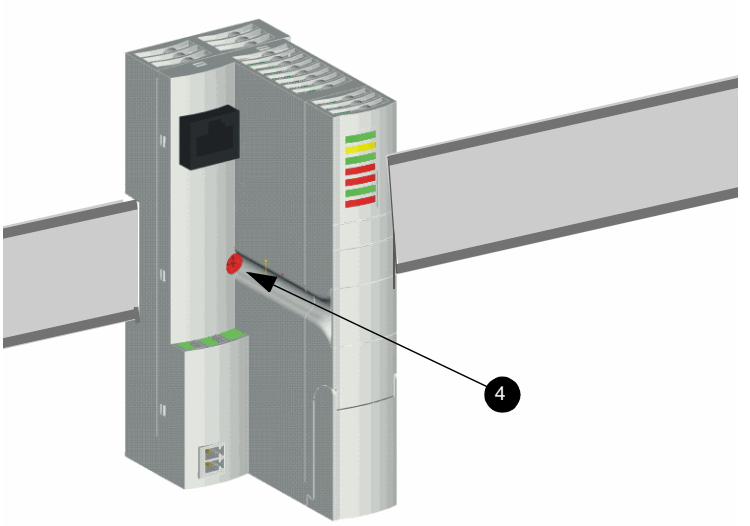
FE Contacts

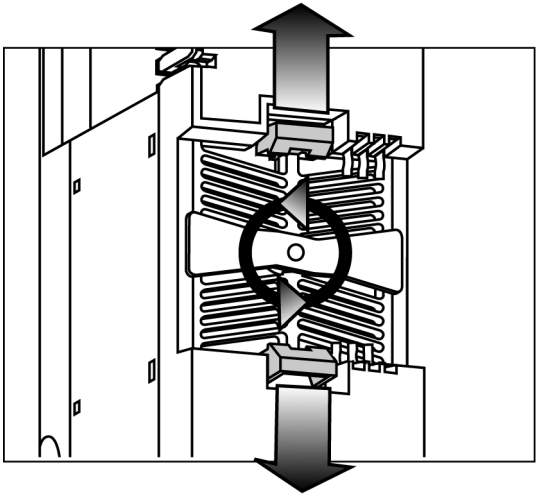
One of the roles of the DIN rail is to provide a FE for the modules on the island. FE provides the island with noise immunity control and RFI/EMI protection. The contacts on the back of the NIM, shown in (3) below, make the functional ground connection between the rail and the NIM. See *Functional Earth (FE) on the DIN Rail, p. 73*.



How to Remove a NIM from the DIN Rail

If for any reason you need to remove the NIM from the rail on which it has been mounted, follow these steps:

Step	Action
1	Remove any Modules or PDMs that are mounted to the right of the NIM (start from the right and move left). **Note:** Base units do not need to be removed.
2	Loosen the NIM's grip on the rail via the release screw on the front of the module, as shown in (4) below. 

Step	Action
3	Use a small flathead screwdriver to turn the release screw 90 degrees in either direction. This will spread open the mounting clips on the back of the NIM, allowing you to pull it off the rail: 

Keying Considerations

Overview

Along with the inherent keying designed into Advantys STB products and the wise use of labels, you have the option of using keying pins to assure correct installation of modules into their assigned bases, and connectors into their assigned receptacles. Make your keying scheme prior to attaching your I/O bases to the island's DIN rail.
In this manual we recommend a keying scheme for base to module connections only. Keying schemes for connectors are similar. Keys for modules must be ordered separately (see the Keying Kit Table that follows). PDM Connectors come with a set of their own keys.

Note: If your scheme includes keying the module to base connections, remove any break-off pins from the bases before installing them on the DIN rail.

Keying Kit Table

Keying pin kits are available for the I/O to base connection, the field wire connection (for sensor or actuator connections), the 24 VDC connection to the NIM, and the power connection on the PDM.
Here is a table matching your keying needs with the correct keying kits:

If you want to ...	**use a key from an ...**	**key quantity**
key the I/O module to a base connection	STB XMP 7700 module keying pin kit	60
key the field wire connection on the front of an I/O module	STB XMP 7800 I/O connector keying pin kit	96
key the 24 VDC connection on the NIM	STB XMP 7800 kit	96
key the PDM power connection	STB XMP 7800 kit and an STB XMP 7810 PDM connector keying kit	96 24

Creating a Keying Scheme

There are a multitude of keying schemes you can use in you Advantys STB island. Here are some strategies to keep in mind when designing your scheme .When keying module connectors:

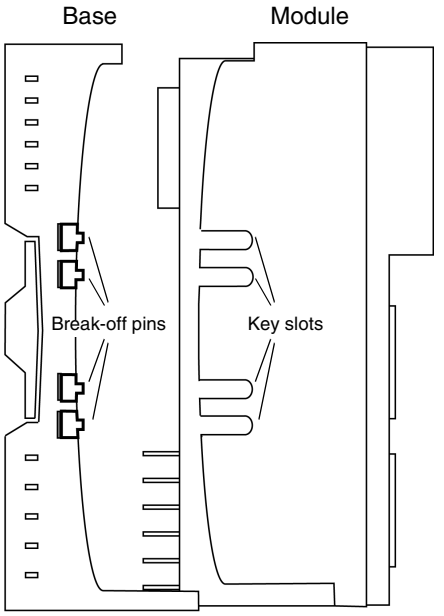
- key the top and bottom connections differently
- key adjacent modules differently

When keying the module to base connections:

- key adjacent modules differently

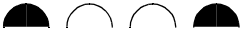
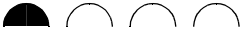
The following is a suggested keying scheme for base to module connections. We use the six keying combinations that are unique, meaning a module with a different keying profile will not fit into the uniquely keyed base. However, you can design your keying scheme with more than the six keying combinations. Verify your keying scheme prior to starting up your system.

We are going to key all the base/module combinations on our island. We have decided to use the six unique keying patterns(#1 to #6) and one non unique pattern (#7). The illustration below points out the key slots (which will be left open or keyed) and the break-off pins (which will be left alone or removed).



Here are the keying pattern combinations we will use to key our base/module combinations. The first six are unique. The seventh pattern is not.

A  represents a slot with a key inserted. A  represents a key slot without a key inserted. A  represents a break-off pin present. A  represents a break-off pin removed.

keying pattern #	Slots on the module	Break-off pins on the base
1	pattern: 	pattern: 
2	pattern: 	pattern: 
3	pattern: 	pattern: 
4	pattern: 	pattern: 
5	pattern: 	pattern: 
6	pattern: 	pattern: 
7	pattern: 	pattern: 

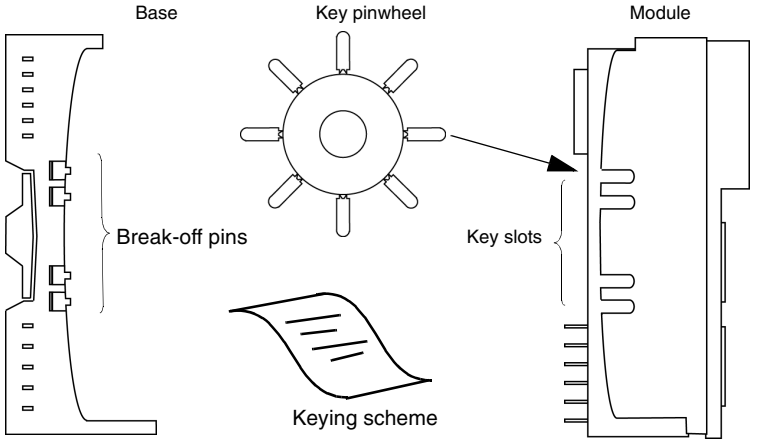
Referencing the previous pattern table, the following table shows us where to add keys to, or remove break-off pins from, our modules and bases.

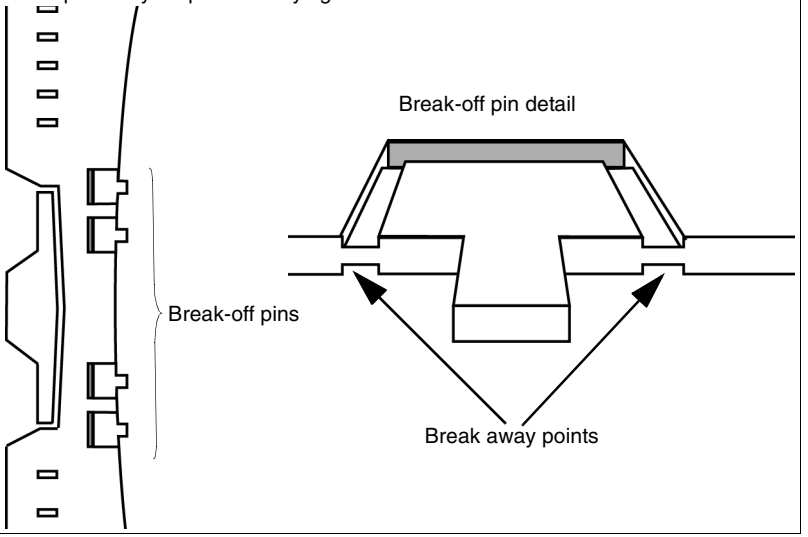
Module type	Model #	Key pattern to use
DC PDM <30 VDC	STB PDT 3100	1
DC PDM 48-60 VDC	TBA	2
DC PDM 125 VDC	TBA	3
DC input	STB DDI xxxx	1
DC output	STB DDO xxxx	2
DC analog in	STB AVI 1270, STB ACI 1130, and STB ART 0200	1
DC analog out	STB AVO 1250 and STB ACO 1210	2
DC special purpose	STB EPI 1145, STB EPI 2145, and STB EHC 3020	3
AC in	STB DAI xxxx	4
AC out	STB DAO xxxx	5
AC special purpose	TBA	6
AC PDM <60 VAC	TBA	4
AC PDM 115 VAC	STB PDT 2100 switched to 115	5
AC PDM 230 VAC	STB PDT 2100 switched to 230	6
BOS	STB XBE 1200	3
EOS	STB XBE 1000	3
CANopen ext. module	STB XBE 2100	3
Auxiliary Power Supply	TBA	7

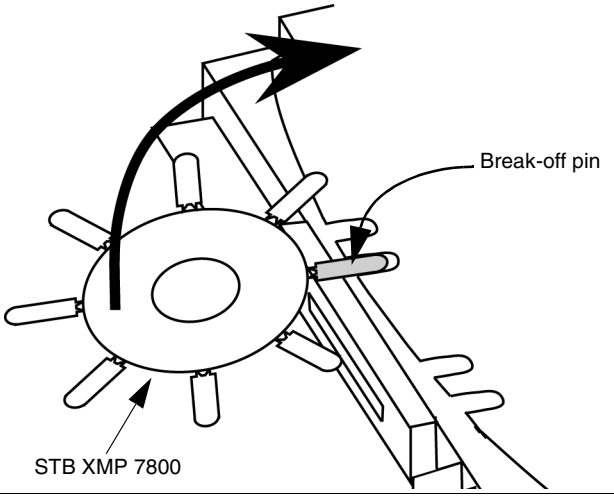
How to Key the I/O Module to Base Connection

To key an I/O module to base connection, use the STB XMP 7800 keying kit. It comes with ten pinwheels. Each pinwheel has a set of keys that can be pushed into the desired key slots on the module according to your keying scheme. You can establish a unique keying pattern for up to 16 modules. The keys that are insert

Step	Action
1	To key a base to module connection you will need your keying scheme, a key pin wheel from kit #STB XMP 7800, the base free of the DIN rail, and the module free of the base.
2	Use a pair of needle nose pliers to break off the pins on the module base that correspond to your planned keying scheme.



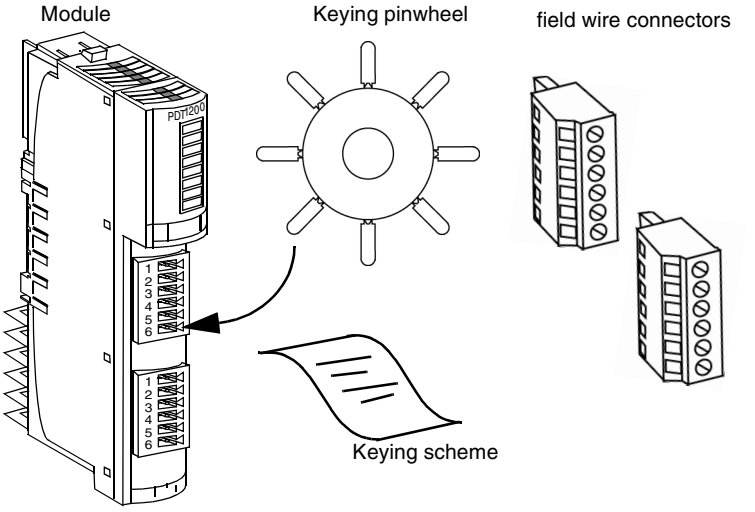


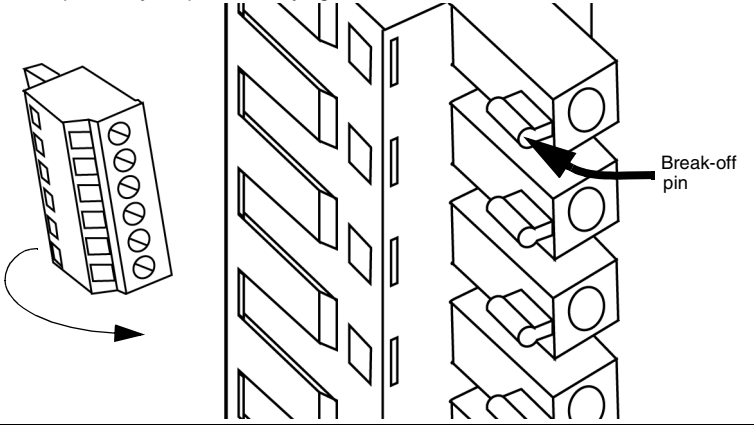
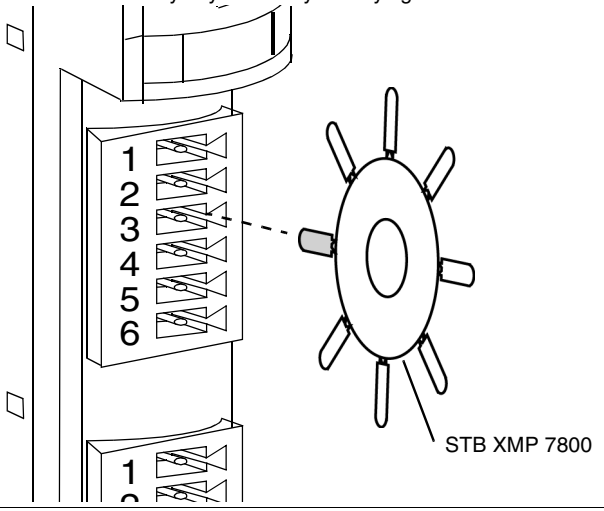
Step	Action
3	Push the key, still attached to the STB XMP 7800 pinwheel into the key slot on the module. Then lift the pinwheel to an angle sharp enough to break the key off of the pinwheel. Do this to as many key slots as your keying scheme dictates. 

How to Key the I/O Module Field Wire Connection

Use an STB XMP 7800 keying kit to key an I/O module field wire connection. The keys can be inserted into the desired slots on the module per your keying scheme. When keying this connector, the key pin from the key pin wheel is pushed into the field wire receptacle at the front of the module, then the break off pin on the connector plug is broken off to match. Here are the steps for keying the field wire connections on your modules:

Step	Action
1	To key a field wire connection on your module you will need your keying scheme, a key pin wheel from an STB XMP 7800 kit (or the keys that came with your connector kit), access to the front of the module, and the two field wire connectors separated from the module.



Step	Action
2	Use a pair of needle nose pliers to break off the pins on the field wire connector that correspond to your planned keying scheme. 
3	Push the key, still attached to the pinwheel (STB XMP 7800), into the open key slot on the module. Then twist the pinwheel enough to break the key off of the pinwheel. Do this to as many key slots as your keying scheme dictates. 

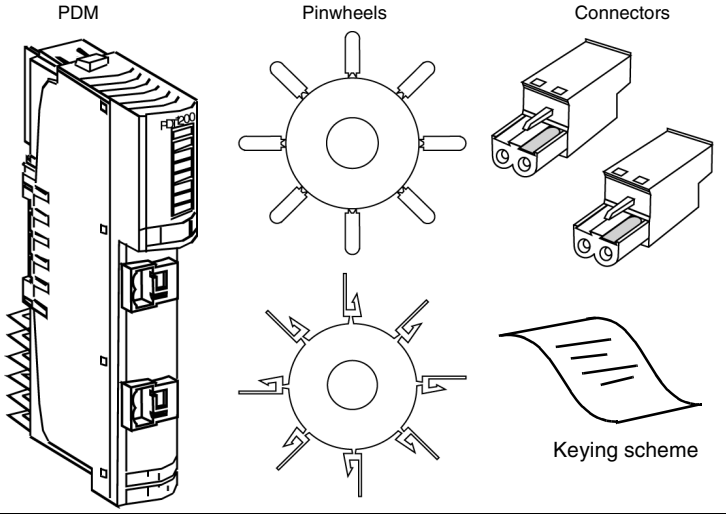
How to Key the NIM Power Connection

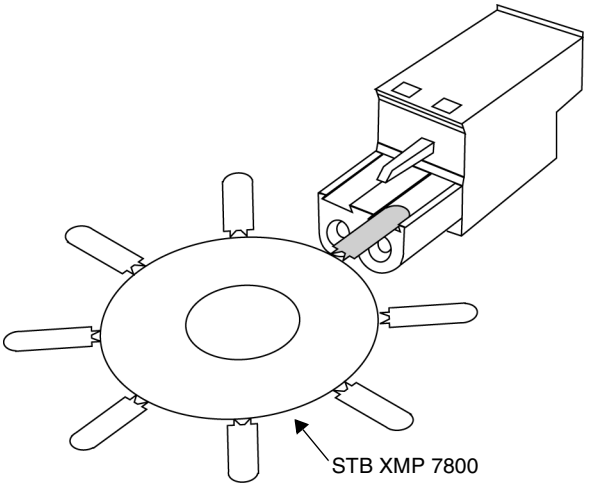
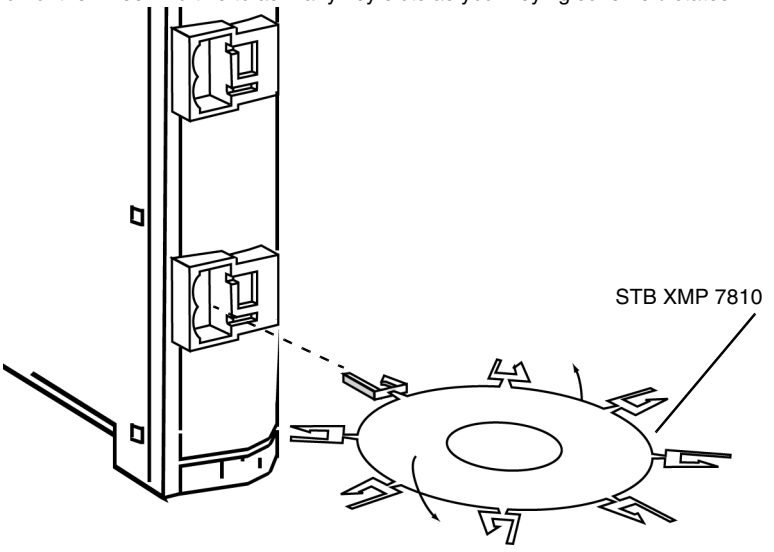
The NIM power connector is a two-pin version of the I/O connector. Follow the same steps in *Keying the I/O Field Wire Connection* above.

Keying the PDM Power Connection

Keying the scalloped power connection on the front of a PDM requires keying pins from two different kits, the STB XMP 7800 and STB XMP 7810 (or the keys that came with your connector kit). Keys need to be inserted in both the connector and its matching receptacle.

Step	Action
1	To key a power connection on your PDM you will need your keying scheme, a key pinwheel from the STB XMP 7800 kit (or the keys that came with your connector kit), another pinwheel from the STB XMP 7810 kit, access to the front of the PDM, and the two-pin power connectors separated from the PDM.

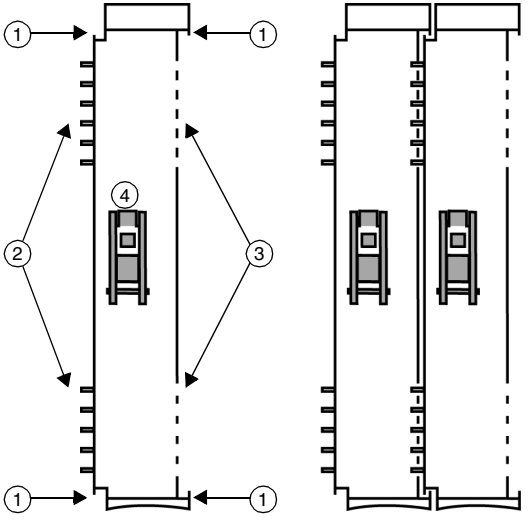


Step	Action
2	Push the key, still attached to the STB XMP 7800 pinwheel all the way into the key slot on the connector plug. Lift or twist the pinwheel enough to break the key off of the wheel. Do this to as many key slots as your keying scheme dictates. 
3	Push a key attached to the STB XMP 7810 pinwheel into the key slot on the receptacle on the front of the PDM. Then twist the pinwheel enough to break the key off of the wheel. Do this to as many key slots as your keying scheme dictates. 

Interlocking Base Units on the DIN Rail

The Backplane of the Island Bus

After the NIM has been attached to the DIN rail, attach the proper sequence of interconnected base units. Start directly to the right of the NIM with a PDM base unit, followed by a series of I/O base units. Base units are installed from left to right along the rail. These base units together with the NIM will form the backplane for the primary segment of the island.
The following illustration points out features important in connecting base units to the DIN rail.



1 Interlocking channels

2 Electrodes

3 Electrode channels

4 DIN rail latch

Note: If your plan includes keying the module to their base connections (See *How to Key the I/O Module to Base Connection, p. 46*), remove any break-off pins from the bases before installing them on the DIN rail.

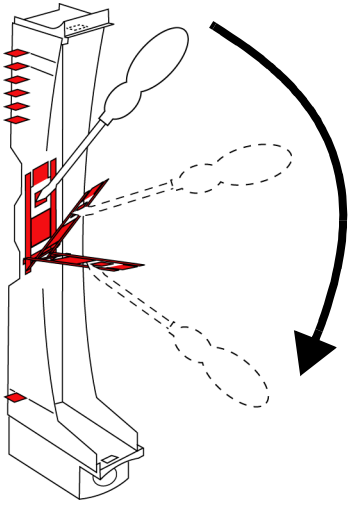
The Base Units

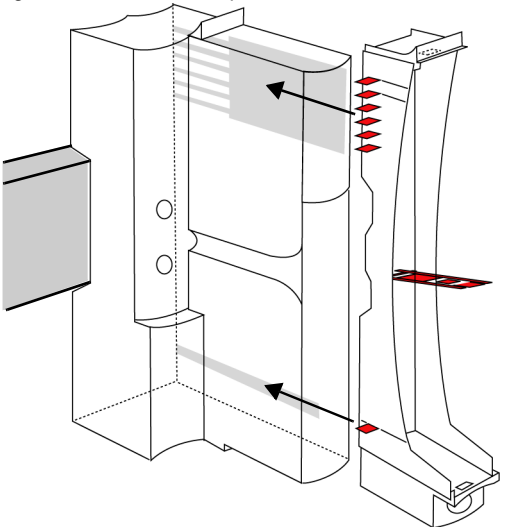
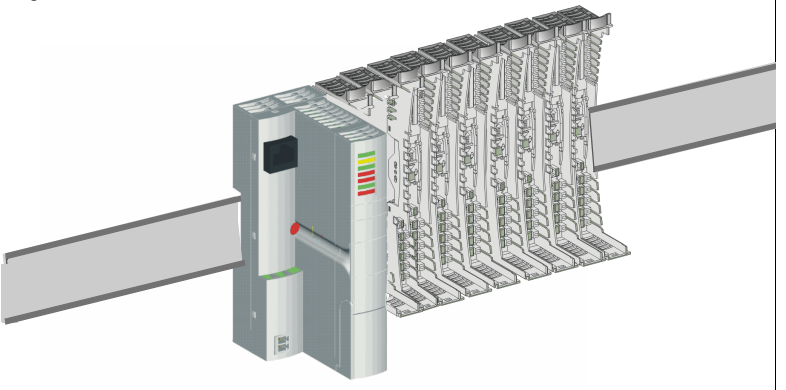
The following table lists the six types of bases. Five of these base types may be used in the primary segment.

Base Model	Base Width	Advantys STB Modules It Supports
STB XBA 1000	13.9 mm (0.53 in)	size 1 I/O modules, such as 24 VDC digital I/O, analog I/O and CANopen extension module
STB XBA 2000	18.4 mm (0.71 in)	size 2 I/O modules, such as 115/230 VAC digital I/O and the relay modules
STB XBA 2200	18.4 mm (0.71 in)	the 24 VDC and115/230 VAC PDMs
STB XBA 2300	18.4 mm (0.71 in)	the BOS module
STB XBA 2400	18.4 mm (0.71 in)	the EOS module
STB XBA 3000	28.1 mm (1.06 in)	size 3 modules such as the STB EHC 3020 counter

How To Attach Base units to the DIN Rail

The following table describes the PDM base unit insertion procedure. Always work from left to right.

Step	Action
1	Working from your installation plan, select an STB XBA 2200 base unit for the PDM that will be located directly to the right of the NIM.
2	Remove any break-off pins that correspond to your keying scheme.
3	Using a screwdriver, move the DIN rail latch on the base unit to it's full open position. 

Step	Action
4	Align the electrodes on the base with the electrode channels on the NIM and push the base toward the DIN rail until the interlocking channels meet. Using the interlocking channels as guides, slide the base toward the DIN rail (push from the center of the base). When the base meets the DIN rail hold the base unit firmly against the DIN rail and push the DIN rail latch into the locked position. 
5	Working from your installation plan, select the correct base unit for the module that will be located directly to the right of the previous base unit, and repeat steps 2 ...5
6	Repeat steps 2 ... 4 until base units for all the I/O and PDM modules in the primary segment are installed. 
7	Refer to the procedures in the next section for information on installing the last device in the segment.

Installing the Last Device on the Primary Segment

One or More Segments?

The last device on the island bus needs to be terminated with a 120 Ω terminator resistor. If the island bus ends at the last module on the primary segment (if the island bus is not *extended*), then the segment needs to be terminated with the STB XMP 1100 termination plate which houses a 120 Ω termination resistor. If the island bus is extended to either another segment of Advantys STB modules, a preferred module or to some other compatible device, do not use the termination plate at the end of the primary segment. Instead, an STB XBA 2400 type 2 base carrying an end-of-segment module (EOS) or a CANopen extension module should be used.

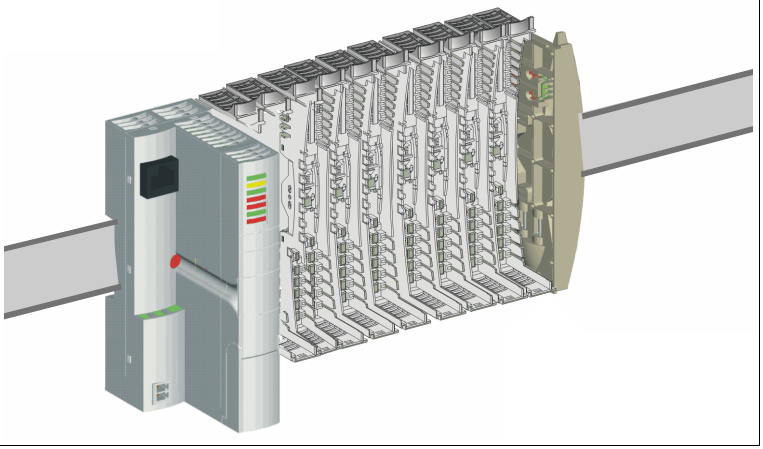
Termination Options

The following table describes the different ways to terminate the island bus, depending on the type of installation.

If the island bus ...	then ...
comprises just the primary segment with no extensions	terminate the segment with an STB XMP 1100 termination plate.
needs to be extended to another segment of Advantys STB modules	install an STB XBA 2400 base at the end of the segment. This base will hold an STB XBE 1000 EOS module. The EOS module provides an interconnect for a bus extension cable that will run to an STB XBE 1200 beginning-of-segment (BOS) module in the first location of the extension segment.
needs to be extended to a preferred module	install an STB XBA 2400 base at the end of the segment. This base will hold an STB XBE 1000 EOS module. The EOS module provides an interconnect for a bus extension cable that will run to the preferred module.
needs to be extended to a standard CANopen device	install an STB XBA 2400 base at the end of the last segment, followed by an STB XP 1100 termination plate. STB XBA 2400 base will hold an STB XBE 2100 CANopen extension module. The CANopen extension module provides an interconnect for a standard CANopen cable that will run to the CANopen device. The standard CANopen device/s will be the last device on the island.

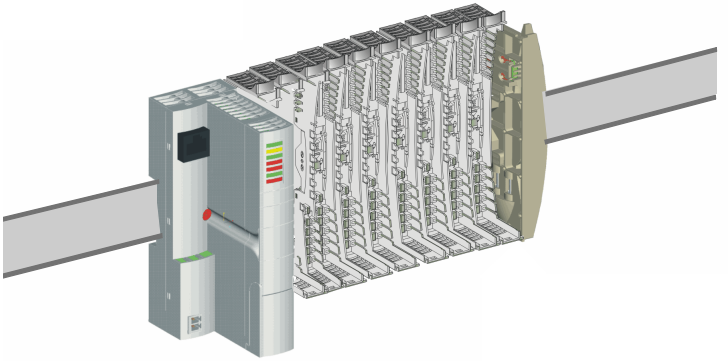
How to Terminate the Primary Segment

Use the following procedure when you terminate the island bus at the end of the primary segment.

Step	Action
1	Find the STB XMP 1100 termination plate that you set aside when you unpacked your NIM. If you cannot locate the plate that shipped with the NIM, it can be ordered by its STB XMP 1100 model number as a standalone accessory.
2	Align the interlocking channels at the top and bottom left of the termination plate with the channels on the right side of the last I/O base.
3	Using the interlocking channels as guides, slide the plate toward the DIN rail until it snaps onto the rail. 

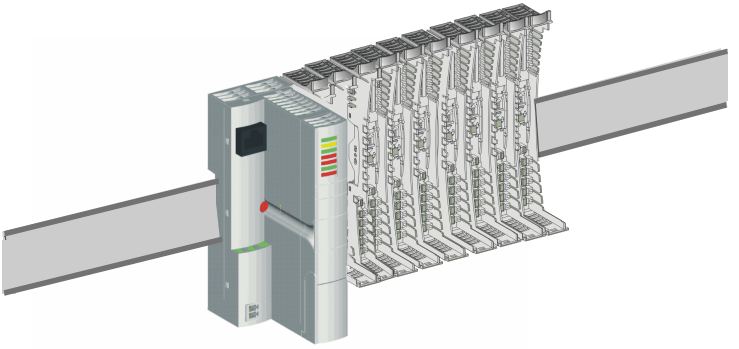
How to Remove a Termination Plate

Use the following procedure to remove a termination plate at the end of primary or extension segment.

Step	Action
1	Remove the module directly to the left of the STM XMP 1100 termination plate.
2	With a firm grip on the lip at the center of the termination plate, pull the plate straight out from its channel guides. 

Extending the Island beyond a Segment

If you intend to extend the island bus from one segment to another or to a preferred device, *do not use an STB XMP 1100 termination plate at the end of the first segment*. Select an STB XBA 2400 base as the last base on the segment, and install it as you would any other base in the last position in the segment.



Depending on the type of extension you want to make, the STB XBA 2400 base may house either an EOS module or a CANopen extension module.

Note: If intend to extend to standard CANopen devices, a termination plate must be added to the right of the STB XBA 2400 base.

Installing Advantys STB Modules in their Bases

Summary

The insertion of an Advantys STB module into its base is very simple. The important thing to remember is that you need to match the correct module with its appropriate base. For this reason, an installation plan should be made before you begin the actual installation process. The following procedures are to be implemented without power connected to the island. For procedures implemented under power see *Hot Swapping Advantys STB Modules, p. 88*.

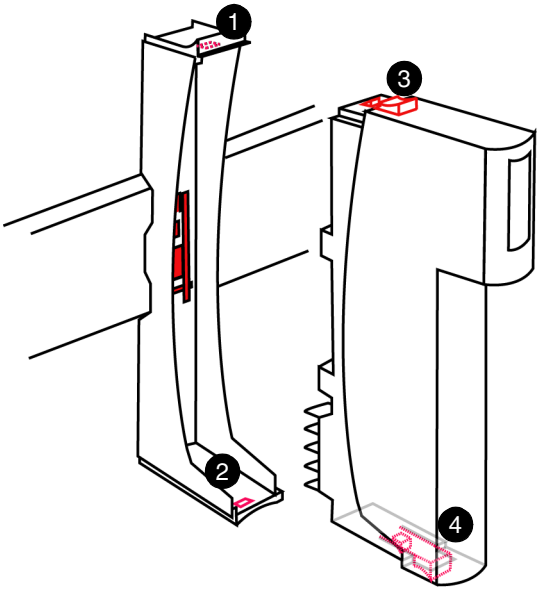
Preliminary Considerations

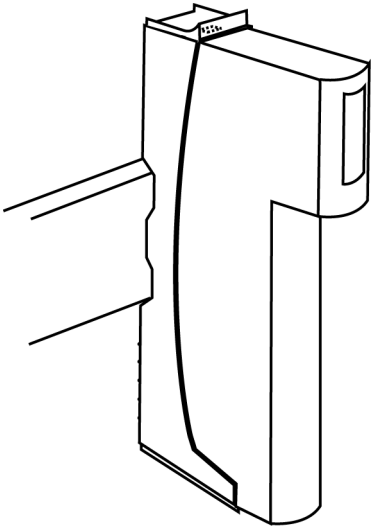
Before you install the modules in their bases, we recommend that you:

- Make sure that you have the correct base in each position on the island backplane
- Use a keying strategy (See *How to Key the I/O Module to Base Connection, p. 46*) to prevent modules from being installed in the wrong bases
- Use the STB XMP 6700 marking label kit to clearly match modules to their bases

How to Insert a Module in a Base

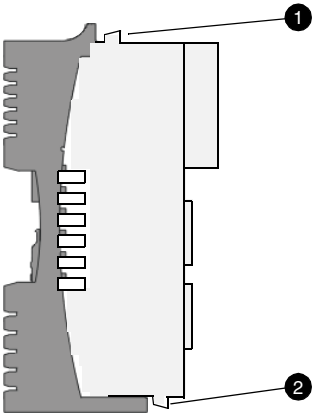
Do the following:

Step	Action
1	Guide the bottom of the module into the tray at the bottom of the base. Push the module evenly toward the back of the base until the module to base latches meet the modules to base latch windows.  **1** Module to base unit latch window (top) **2** Module to base unit latch window (bottom) **3** Module to base unit latch (top) **4** Module to base unit latch (bottom)
2	With a rocking motion, push the module toward the back of the base until the module and base latches mate.
3	Apply pressure to the top latches (items 1 and 3 above) until you hear them click together.

Step	Action
4	Apply pressure to the bottom latches (items 2 and 4 above) until you hear them click together.  **Note Make sure that the latches on both the top and bottom of the module-to-base connection are secured.**

How to Remove a Module from its Base

To remove an I/O module from its base:

Step	Action
1	Remove any connectors from the module.
2	Using both your hands, release the module from the base by depressing the two module to base latches on the module.  **1** Module to base latch (top) **2** Module to base latch (bottom)
3	With a rocking motion, slowly pull the module evenly out of the base.

Extending an Advantys STB Island Bus

3

Overview

Why Extend the Island Bus?

There are five key reasons why you might want to extend the island bus beyond the primary segment:

- Mechatronic design considerations requiring more distance to keep the I/O modules closer to the sensor and actuator devices
- System requirements for >1.2 Amps worth of Advantys STB I/O modules on the island bus
- The need for one or more preferred module(s) on the island bus
- The need for standard CANopen devices
- Cabinet size limitations

What's in this Chapter?

This chapter contains the following topics:

Island Bus Extensions

Bus Extensions

An island bus can be extended beyond the primary segment by using a bus extension module as the last device in the segment. The bus can be extended to another segment of Advantys STB Island I/O and/or to one or more *preferred modules*. You can also extend the island bus from a segment to one or more standard CANopen devices using an STB XBE 2100 CANopen extension module as the last device in the segment.

The island bus can be extended in several ways:

- with additional extension segments of Advantys STB I/O
- with one or more preferred modules
- with one or more standard CANopen devices
- with a combination of the Advantys STB, preferred modules and/or standard CANopen devices

The End-of-segment Module

When you extend the island bus from one segment to another or from a segment to a preferred module, the last module in that segment is an STB XBE 1000 EOS module. The EOS module has an IEEE 1394-style output connector, from which you can run an island bus extension cable.

Advantys STB Bus Extension Cables

Advantys STB bus extension cables are specially designed cables in the IEEE 1394 style. They are used to carry the island bus to extension segments of STB I/O and to preferred modules.

Note: Advantys STB bus extension cables are not used to extend the island bus to standard CANopen devices.

Advantys STB bus extension cables are available in five lengths:

Model	Cable Length
STB XCA 1001	0.3 m (1 ft)
STB XCA 1002	1.0 m (3.3 ft)
STB XCA 1003	4.5 m (14.8 ft)
STB XCA 1004	10.0 m (32.8 ft)
STB XCA 1006	14.0 m (45.9 ft)

Each cable has IEEE 1394-style connectors on each end. The cable will transmit the following signals:

- island bus communications between the extension I/O and the NIM
- the island bus address line
- the return signal

The cable does not transmit the 5 VDC logic signal to the next segment or preferred device.

An Advantys STB bus extension cable may be run:

- from an EOS module at the end of one segment to a BOS module at the beginning of an extension segment
- from an EOS module at the end of one segment to a preferred device
- from one preferred device to another preferred device
- from a preferred device to BOS module at the beginning of an extension segment

The Beginning-of-segment Module

If you are extending the island bus to another segment of Advantys STB Island I/O, the *extension* segment begins with an STB XBE 1200 BOS module in the first (leftmost) location. The BOS module is followed immediately by a PDM, then one or more Advantys STB Island I/O modules.

An STB XBE 1200 BOS module has an on-board 24-to-5 VDC power supply. It must be connected to a 24 VDC logic power source. You may use the same power supply that supports the NIM or an independent 24 VDC supply. See *Overview, p. 14*.

Preferred Modules

Preferred modules must also be equipped with input and output IEEE 1394-style connectors to receive and extend the island bus signals to other extensions. It is possible, for instance, to extend the island bus from a primary segment to a preferred device, and then from that preferred device to an extension segment of Advantys STB I/O.

CANopen Extension Module

If you want to put standard CANopen devices on an island bus, you need to make the extension from a segment of STB I/O modules. The last module in the segment needs to be an STB XBE 2100 extension module. The CANopen extension module has a five-pin connector on it that can be used with any standard CANopen cable. You must supply this cable. A CANopen extension module passes island bus communications only. It does not pass power or addressing. For more intsallation information see *Standard CANopen Devices, p. 22*.

Length of the Island Bus

The total length of an island bus cannot exceed 15 m (49.2 ft). This is the maximum length of the island bus, from the NIM in slot 1 to the 120 Ω terminator at the end of the last device on the island. It includes the sum of the lengths of all the extension cables as well as the lengths of the hardware modules themselves.

Note: The use of CANopen devices on systems using 800 kBd reduces the maximum length to 6.5 m (21.3 ft).

Installing Extension Segments of Advantys STB Island Modules

Preliminary Considerations

An island bus can support up to six extension segments of Advantys STB I/O modules in addition to the primary segment. Extension segments may be installed on the same or on separate DIN rails. The BOS module is connected via an STB XCA 100*x* bus extension cable to the previous segment or preferred module. You can use the configuration software to design your island or use information from the I/O book to do a design on paper.

How to Build an Extension Segment

In all aspects except one, an extension segment is built the same way as the primary segment. Instead of using a NIM in the first location, an STB XBE 1200 BOS module is installed.

Note: The BOS module mounts in a special size 2 base, the STB XBA 2300, which is designed to deliver logic power across the extension island backplane. Just as with the NIM, a BOS module needs to be connected to an external 24 VDC power supply.

The rest of the modules are assembled the same as in a primary segment. The second module is a PDM followed by a voltage group of I/O modules.
The last device in the segment may be:

- an STB XMP 1100 termination plate, if this is the end of the island bus
- an STB XBE 1000 EOS module, if the island bus is to be extended to a preferred module or to another segment of STB I/O
- an STB XBE 2100 CANopen extension module followed by a STB XMP 1100 termination plate

How to Extend the Island Bus

Use the following procedure to extend the island bus from one segment to another segment:

1	Make sure that an STB XBE 1000 EOS module is in the last (rightmost) position in the previous segment.
2	Install an STB XBE 1200 BOS module (in an STB XBA 2300 base) in the first position in the extension segment.
3	Install the appropriate PDM (in an STB XBA 2300 base) next to the BOS module.
4	Connect the EOS module in the previous segment to the BOS module in the extension segment with a length of STB XCA 100*x* bus extension cable. Make sure the connectors are seated firmly into their respective receptacles.

Installing a Preferred Module Extension

Preliminary Considerations

When you use preferred modules on an island, you need to create the island configuration using the STB SPU 1000 Advantys configuration software, then download it to the physical island.

Selecting Preferred Modules in the Configuration Software

The Advantys configuration software maintains the device profiles of all the preferred modules that are currently available. A list of preferred modules appears in the catalog browser, which appears by default on the right side of the workspace display when you open an island file.

Note: If a preferred module that you want to configure does not appear in the catalog browser, you will need to update the software with the latest catalog. The latest version of the catalog is always available on the Advantys website, which can be downloaded from the Advantys page on the Schneider Automation website at www.schneiderautomation.com.

Before you select a preferred module from the catalog browser and place in the island configuration, configure the NIM and all the i/O modules that precede the preferred module on the island bus. The first preferred module on an island bus must be immediately preceded by a segment of STB I/O modules that has an STB XBE 1000 EOS module as its last (rightmost) module.

Physically Connecting a Preferred Module to the Island

Preferred modules must be connected to the previous island module via an STB XCA 100x island bus extension cable. The preceding module may be either:

- an STB XBE 1000 EOS module
- another preferred module

If the preferred module is the last module on the island it must be terminated with a 120 Ω resistor. If it is not the last module on the island, it can continue the island bus extension to either:

- an STB XBE 1200 BOS module in an extension segment
- another preferred module

Power Requirements

A preferred module does not receive logic power or field power from the island bus. It will require its own power supply and power source.

Safety and Grounding Considerations

4

Overview

Summary

Some required and optional precautions for making Advantys STB island bus operation safe are presented. Grounding considerations and techniques for Advantys STB systems are also presented.

What's in this Chapter?

This chapter contains the following topics:

Power Isolation Requirements on the Island Bus

Isolation Requirements

The power source for the NIM, and any BOS modules on the extension segments, must be galvanically isolated. Isolation is not provided by the NIM or BOS modules themselves.

External Power Supply Requirement

Any external 24 VDC power supply that provides the source power to the island bus must be SELV-rated. The input side must be galvanically isolated from the output side.
This SELV requirement applies to all 24 VDC power supplies supporting both logic power and field power—i.e., supplies that provide 24 VDC to the NIM or to an STB PDT 3100 power distribution module.

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.

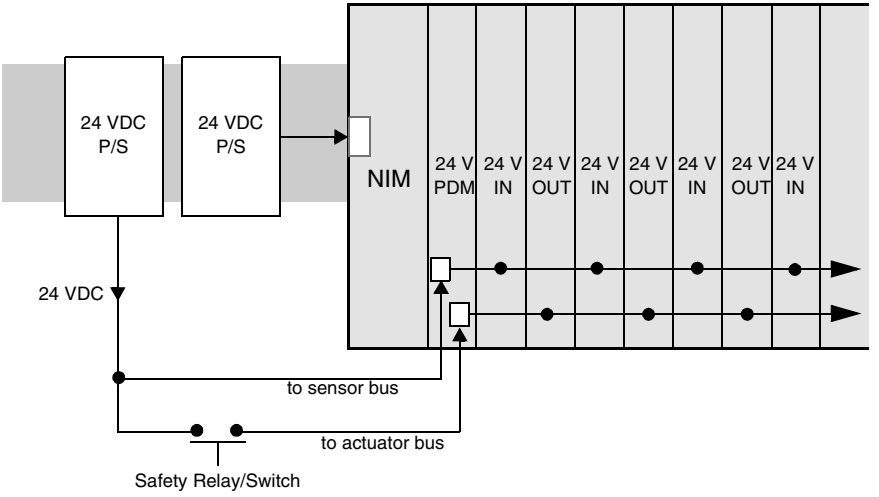
Safety Switching

Advantage of the Power Distribution Method

One of the key features of Advantys STB island is the separate distribution of field power to input and output modules. A PDM distributes field power to the input modules via the island's sensor bus and independently distributes field power to the output modules over the island's actuator bus.

This design provides an important safety feature during testing: With a simple relay switch installed between the source power supply and the OUTPUT (actuator) connection on the PDM, you can test your application program with live inputs while the outputs are disabled. Activate the relay switch to prevent power from switching the field actuators.

Here is an example of a safety relay switch setup:



Recommended Safety Relays

Schneider recommends their Preventa line of safety relays. For a complete selection contact your Schneider representative and ask for catalog DHMED 198043 XX.

The Protective Earth Connection

PE Contact for the Island

One of the key functions of a PDM, in addition to distributing sensor and actuator power to the I/O modules, is the provision of protective earth (PE) to the island. On the bottom of each STB XBA 2200 PDM base is a captive screw in a plastic block. By tightening this captive screw, you can make a PE contact with the island bus. Every PDM base on the island bus should make PE contact.

How PE Contact Is Made

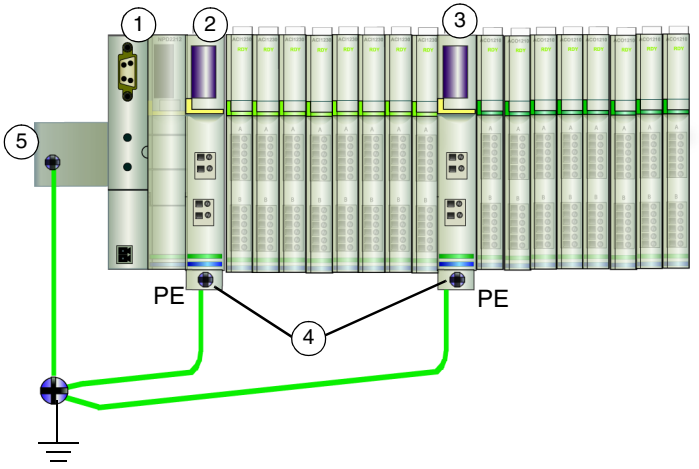
PE is brought to the island by a heavy-duty cross-sectional wire, usually a copper braided cable, 4.2 mm^2 (10 gage) or larger. The wire needs to be tied to a single grounding point. The ground conductor connects to the bottom of the each PDM base and is secured by the PE captive screw.
Local electrical codes take precedence over our PE wiring recommendations.

Handling Multiple PE Connections

It is possible that more than one PDM will be used on an island. Each PDM base on the island will receive a ground conductor and distribute PE as described above.

Note: Tie the PE lines from more than one PDM to a single PE ground point in a star configuration. This will minimize ground loops and excessive current from being created in PE lines.

This illustration shows separate PE connections tied to a single PE ground:



1 the NIM
2 a PDM
3 another PDM
4 captive screws for the PE connections
5 FE connection on the DIN rail

The Functional Earth Connection

Functional Earth (FE) on the DIN Rail

The DIN rail for your Advantys STB island is considered the functional earth ground (FE) plane for your system. Here EFI and RFI is suppressed. The connection between this ground and your island is made at the contacts on the back of your island's NIM and at the back of the I/O bases. It is essential that this connection be sound.

Rail Mounting Considerations

If you are using 7.5 mm DIN rail, make sure that the region along the rail where the island bases will be installed does not have any screw heads on it. The base units may not make proper contact with the rail if there are screw heads behind them, and the FE contact may be compromised.

For high vibration environments where the rail needs to be fastened to the mounting surface along areas where the island modules will be mounted, use 15 mm DIN rail. The bolt heads on 15 mm rail will be sufficiently recessed so that they do not interfere with the base-to-rail FE contacts.

EMC Kits

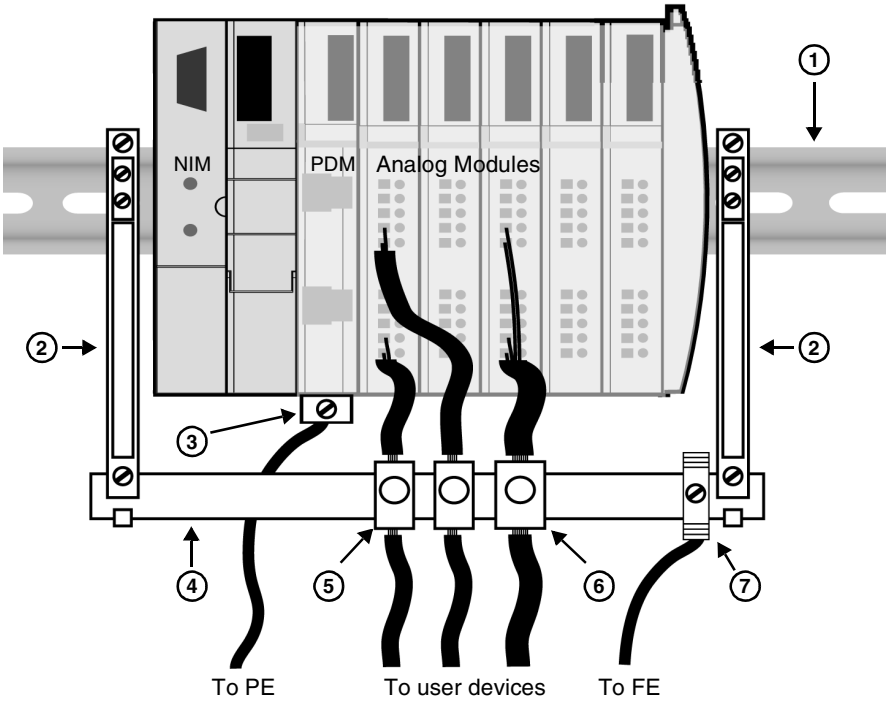
Overview

EMC kits reduce electromagnetic and radio interference by grounding, at close proximity, the shielded cables entering your Advantys I/O modules. The cables are stripped, exposing the braided shield, then clamped to an FE grounded bar mounted in front of your island segment. Kit STB XSP 3000 comes with a 1 m grounding bar that can be cut to needed length/s.

There are three reasons for using the EMC kits on your Advantys island:

- To make Advantys analog I/O modules CE compliant
- To reduce RFI/EMI to Advantys analog modules
- To reduce RFI/EMI to any of your I/O modules

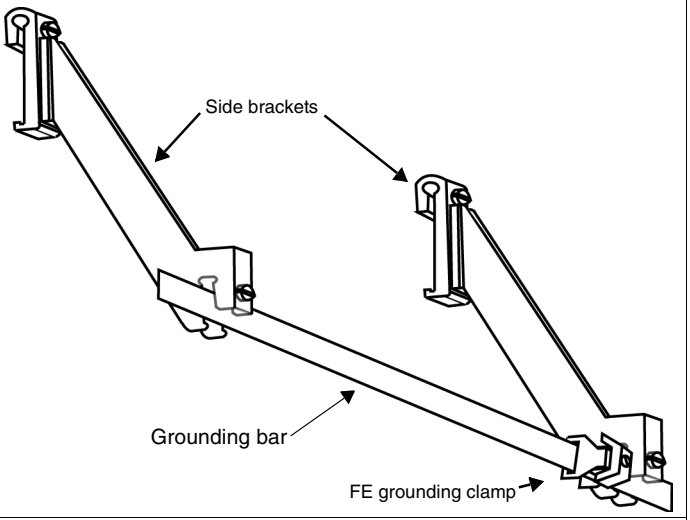
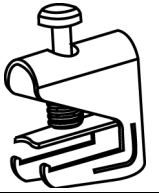
The illustration below is an example of an assembled Advantys STB island segment using an EMC kit to make the analog I/Os CE compliant .



1 DIN rail
2 EMC side bracket
3 PDM PE screw
4 EMC FE ground bar
5 EMC small cable clamp
6 EMC medium cable clamp
7 EMC FE clamp

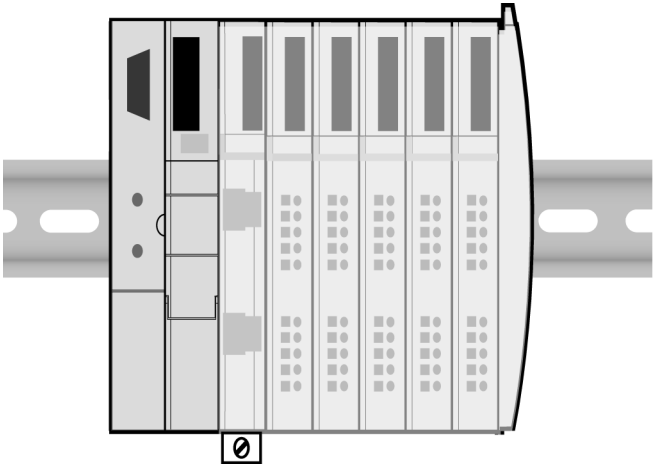
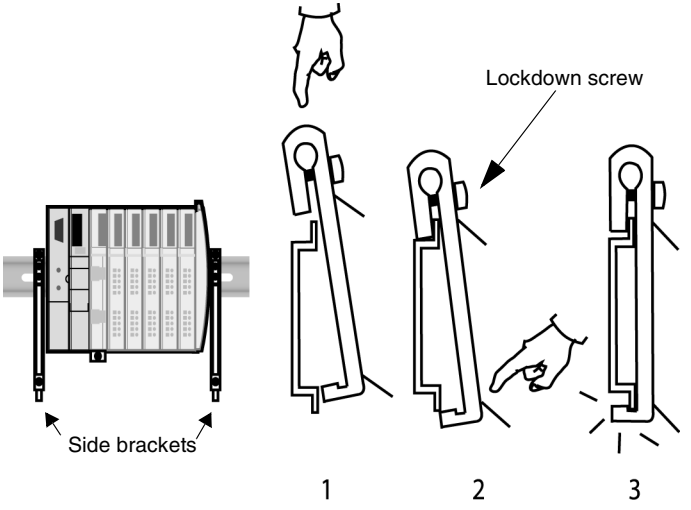
The Kits

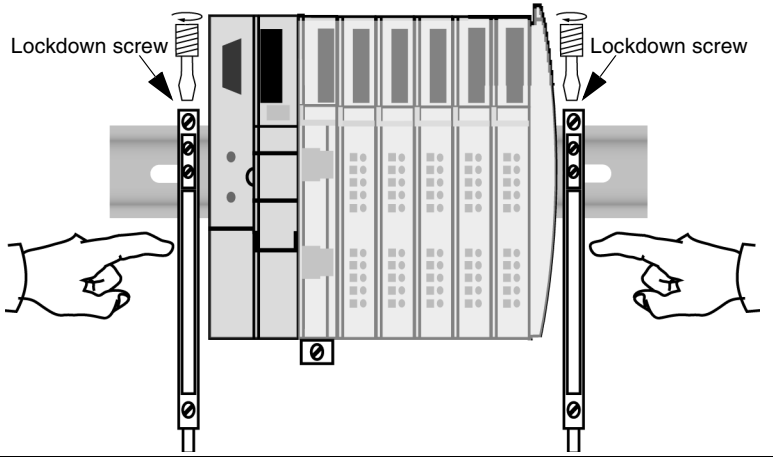
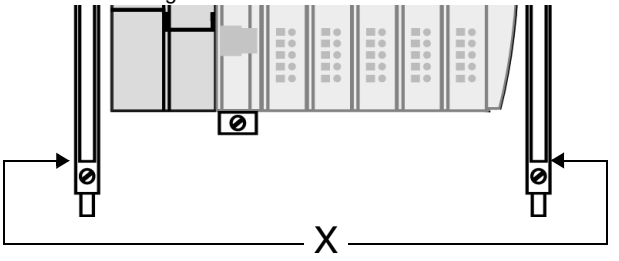
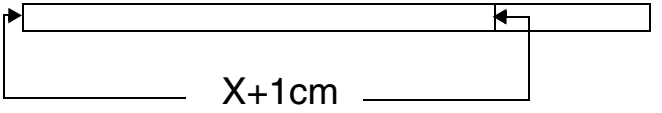
There are three kits you can use to ground your shielded cable. To do an initial set up you need STB XSP 3000 and at least one of the cable clamp kits (STB XSP 3010 or STB XSP 3020). STB XSP 3010 comes with ten cable clamps for 1.5 mm to 6.5 mm size cable. STB XSP 3020 comes with ten cable clamps for 5 mm to 11 m size cables.The three kits are illustrated in the table below.

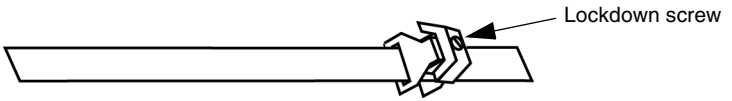
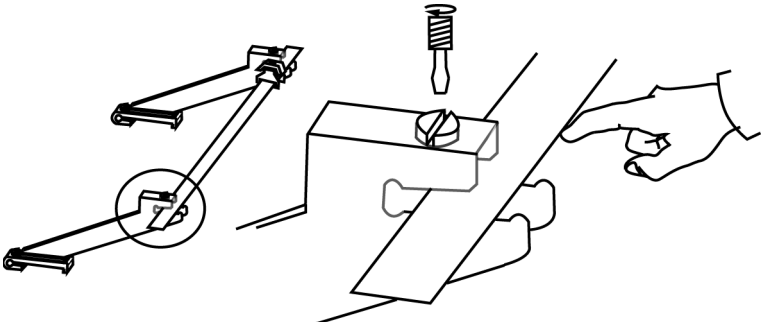
Kit	Comes with...
STB XSP 3000	two side brackets, one 1 m grounding bar and one FE grounding clamp 
STB XSP 3010	10 small cable clamps for 1.5mm to 6.5mm cable 
STB XSP 3020	10 medium cable clamps for 5mm to 11mm cable 

STB XSP 3000 Assembly

Use the following procedure to assemble kit STB XSP 3000. After this is done go to the next assembly procedure to attach cable clamps to the grounding bar.

Step	Action
1	Open kit STB XSP 3000 and make sure you have the two side brackets, one grounding bar and one FE grounding clamp. (Refer to the Kits section above).
2	Assemble an Advantys STB island segment. 
3	Loosen the bracket lock down screw located on each side bracket. Attach the side brackets to the DIN rail on both ends of your assembled Advantys STB island segment. They will gently snap into place. 

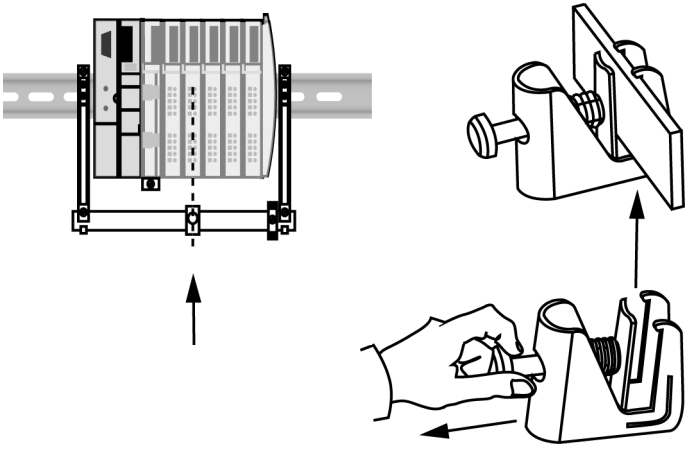
Step	Action
4	Push the side brackets toward both ends of your segment so that they are snug against its walls, and tighten the lock down screws. 
5	Determine the grounding bar length by measuring the distance between the outsides of the side bracket/segment assembly and add 1 cm. (this is a general rule for grounding bar length. You can make adjustments to satisfy your particular needs). Cut the bar to length.   The grounding bar is originally 1 M long x 18 mm wide x 3 mm thick tinned copper. To order extra grounding bars alone contact a local supplier.

Step	Action
6	With the grounding bar cut to length, slide the FE grounding clamp onto the grounding bar and tighten the lock down screw on top of the clamp. 
7	Attach the grounding bar to the side brackets and tighten the lockdown screws on the side brackets. 
8	Ground the FE grounding clamp to your supplied FE ground using flat braided gounding cable.

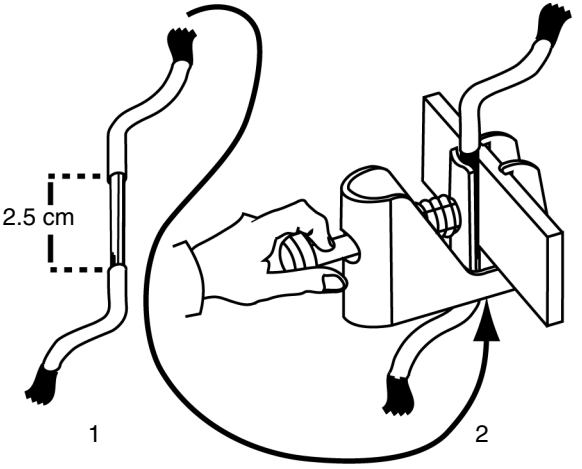
Clamp and Cable Assembly

The grounding clamps are used to ground the shielding of the stripped cable to the FE grounding bar. The assembly consists of attaching the grounding clamp to the FE grounding bar, stripping the insulation off of the cabling to expose the braided shield underneath and inserting it into the ground clamp. It is described in the following procedure.

Step	Action
1	Position the grounding clamp in front of the module who's cable will be secured by it. On the clamp: pull back on the spring loaded lock down bolt, slip the clamp onto the grounding bar, and release to secure.



1 2

Step	Action
2	Strip 2.5 cm of insulation off of your cable to expose the braided shield below. (Be sure the cable on either side of the stripped area is long enough to reach the I/Os and user devices). Pull back on the spring loaded lockdown bolt and slip the cable into the clamp. Release the lockdown bolt.  Alternatively, you can clamp your cable to the grounding bar while you attatch the cable clamp to the bar.
3	Secure your cable to its I/Os and devices.

Commissioning an Advantys STB Island

5

Overview

Commissioning the Island

Once the island hardware has been installed and you are sure that the installation has been properly grounded, you can follow the procedures in this chapter to commission the island as an operational node on your fieldbus network.

What's in this Chapter?

This chapter contains the following topics:

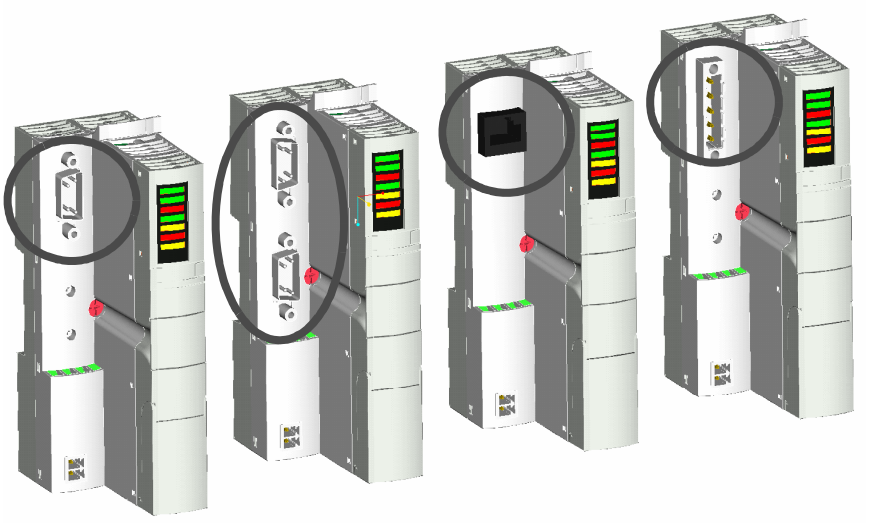
Making Fieldbus and Power Connections

Overview

The fieldbus and power connections to your island must be made with the power off. The cable and connector types for the fieldbus connection on your NIM differ depending on which fieldbus protocol you are using. Refer to the manual that came with your particular NIM for detailed information on cabling and connectors.

Fieldbus Connection

The fieldbus connection is made between your fieldbus master and the NIM on your physically completed Advantys island. To make the connection simply push your fieldbus connector into its matching receptacle and lock in place.
There are seven NIM types representing the seven fieldbus protocols that can be used with Advantys STB. Here are illustrations of four different NIM types. Notice the difference in their fieldbus receptacles.



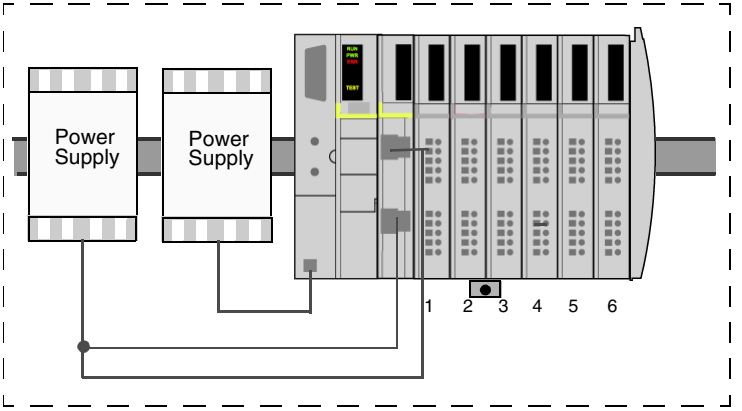
Power Connections

There are at least three power connections to be made to your island from your source power supply or supplies:

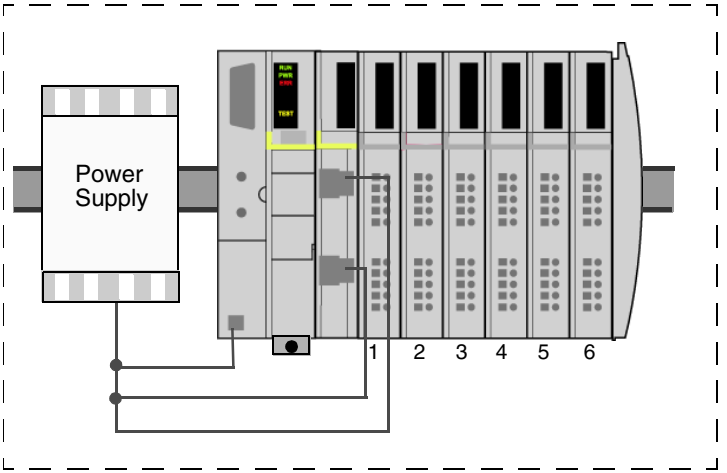
- 24 VDC to the NIM logic power input
- 24 VDC, 115 VAC, or 230 VAC to the actuator power input of the first PDM
- 24 VDC, 115 VAC, or 230 VAC to the sensor power input of the first PDM

Power to these receptacles can be supplied by the same power supply (delivered in parallel) or by independent power supplies. In general, we recommend using two supplies, one for the logic power to the NIM and one for field power (sensors and actuators). The power supplies you use should be SELV rated. Your design decision should be based primarily on current needs and capabilities. These supplies can be mounted on the same DIN rail as part of the island or mounted separately. They are generally enclosed in the same EIA rated enclosure that your island is in. To make the connection simply push your power connectors into their matching receptacles. The DC power distribution modules (PDMs) are designed with reverse polarity protection. This will help prevent damage to the DC modules and protect them from possible unexpected field operation. However, this is only intended as a temporary protection during commisioning of the island.

Here is an independent power scheme for an Advantys STB island using two power supplies.



Here is a 24 V parallel power scheme for an Advantys STB island.



Configuring the Island

Summary

There are three ways to configure your Advantys STB I/O:

- Using the I/O default parameters (auto-configuration)
- Using the Advantys configuration software to custom configure the I/O
- Using the I/O configurations stored in a removable memory card inserted into your NIM

To configure your NIM and correctly power up your system read the applications guide that came with your NIM.

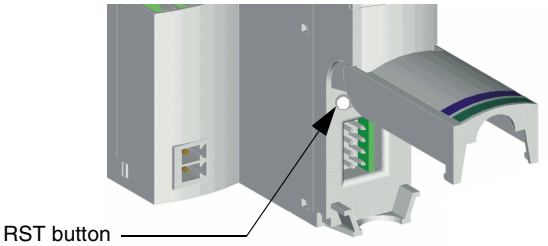
Auto-configuration

All Advantys STB I/O modules are default-configured with a set of predefined parameters. This allows your island to be operational as soon as it is powered up and initialized. This quick launch I/O configuration is called auto-configuration. Upon island startup the predefined parameters stored in your I/O modules are automatically read and written by the NIM and stored in Flash memory. As part of the auto-configuration process, the NIM checks each module and confirms that it has been properly connected to the island bus.

Auto-configuration occurs when:

- You power up an island for the first time
- You push the RST button.

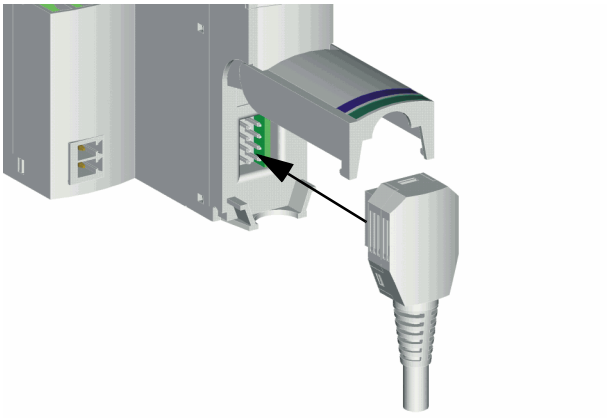
Here is a view of the reset button on the NIM:



Note: Using the Advantys configuration software you can disable the reset button. In this situation pressing the reset button will not effect the existing configuration.

Custom Configuration

Custom I/O configuration using the Advantys configuration software is done after your island has been powered up and initialized. Refer to your Advantys configuration software manual for more details.
Here is a picture of the bottom of the NIM showing where you connect your STB XCA 4002 configuration cable to custom configure the I/Os using the Advantys configuration software:



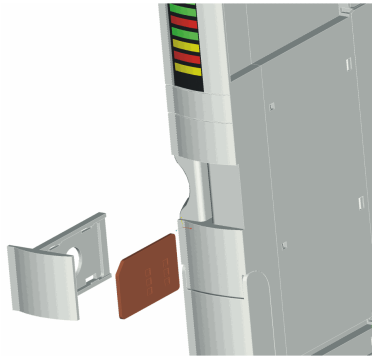
In addition to setting custom parameters for the I/O modules the Advantys configuration software lets you:

- Create, modify and save the logical description of all physical devices used in a project
- Monitor, adjust data values, and debug the project in online mode
- See a graphical display of the selected equipment and a hierarchical structure (the "workspace browser") representing the equipment hierarchy
- Configure reflex actions
- Enhance performance of specific modules

Removable Memory Card

The optional removable memory card (I^2C SIM card, part STB XMP 4400) lets you store, reuse and distribute custom island bus configurations. This custom configuration was initially loaded into the memory card using the Advantys configuration software. By simply installing the memory card with your custom configuration into your NIM, and pressing the RST button, you can custom configure an island without using the Advantys configuration software a second time. For detailed information on the removable memory card see your NIM's applications guide.

Here is a picture of the memory card being installed in a NIM. The card is installed by pulling the memory card drawer out of the front of the NIM, inserting the memory card into the drawer and pushing the drawer back into the NIM:



Note: Use appropriate care when handling the memory card.

Hot Swapping Advantys STB Modules

Module Insertion and Removal

The assembled base units on a DIN rail together with a NIM form the island bus. Advantys STB modules can then be inserted into and removed from these base units to complete or adjust the physical design.

Note: If any of your modules are being used to provide operating power to a large inductive load (at or near a maximum of 0.5 H), make sure that you turn any field devices OFF before removing the field power connector from the modules. The output channel on the modules may be damaged if you remove the connector while the field devices are ON.

Maximum Insertion/ removal Cycles

The base units are designed to withstand up to 50 module insertion/removal cycles.

Note: If modules are inserted and removed from a base more than 50 times, the integrity of the module-to-base contacts cannot be guaranteed. Be sure the history of your modules is known before hot swapping them.

Definition

Hot swapping is the ability to replace an I/O module in a base unit while the island is under power without disrupting the normal operations of the other modules on the island. The Advantys STB island bus allows you to hot swap most I/O modules from their bases.

DANGER

ELECTRIC SHOCK HAZARD

When removing or inserting a module into a base on an island that has power, use only your hands. Do not use metal tools, they can come in contact with dangerous live voltage. Also, remove any plugs that are attached to the module before removing.

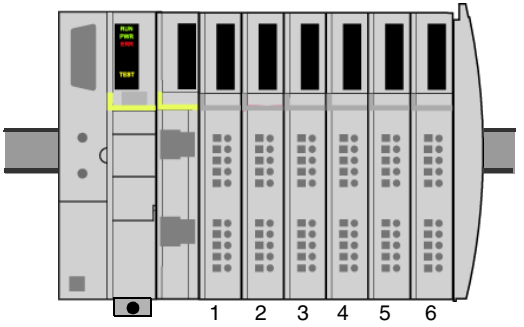
Failure to follow this precaution will result in death, serious injury, or equipment damage.

Advantys STB modules that cannot be hot swapped:

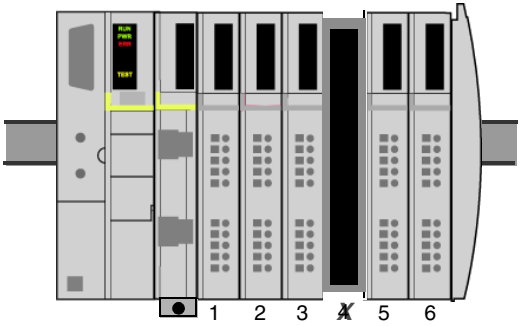
Modules that Can't Be Hot Swapped	Reasons
The NIM	A NIM must be present and operational to manage communications on the island bus and to supply logic power across the primary segment of the island. Also, the design of the NIMs is such that the module cannot be removed from its base.
Advantys STB I/O modules that have been designated *Mandatory* (Mandatory designation is only available through the use of the Advantys configuration software)	By definition, when a mandatory I/O module is removed from the island, all the other I/O modules will go to their fallback states, and the island will not be operational. If a mandatory I/O module is swapped out of the island bus, normal bus operations will be disrupted.
PDMs	PDMs must be present and operational in order for field power and PE to be available to a voltage group of I/O modules on the island bus.
BOS Modules	A BOS module must be present and operational in an extension segment to extend island bus communications.
EOS Modules	An EOS module must be present and operational at the end of an island segment whenever you need to extend island communications to any extension segments or preferred devices.
CANopen extension module	A CANopen extension module must be present and operational at the end of an island segment whenever you need to extend island communications to any standard CANopen device.

Hot Swapping Modules with the Same Model Number

If an I/O module is removed from its base and then replaced by another module with the same model number, the NIM will auto-configure and auto-address the new module with values that are identical to those of the previous module. The NIM will then automatically put the new module in operation.
For example, say you have an island that comprises a NIM, a PDM and six I/O modules. All these modules are *optional* I/O—i.e., none have been configured as mandatory.



Suppose you have an STB DDO 3230 output module in address location 4, and it is malfunctioning. When you remove the module from its base, as shown below, the remaining five I/O modules in locations 1, 2, 3, 5 and 6 will continue to operate.



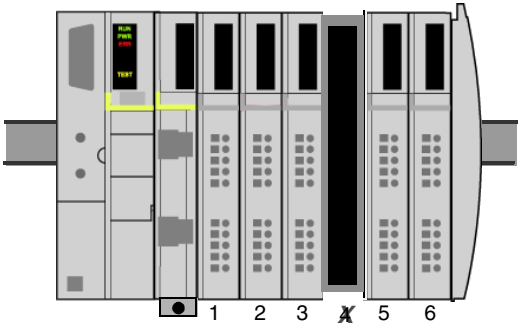
If you then place a new STB DDO 3230 output module in location 4, the NIM will recognize its device profile, configure it like the old module, and start supporting all six I/O modules the same as it did before the hot swap.
If a power cycle is performed while the module is missing, only the modules to the left of the missing one will be operational. If you then replace the missing module, the NIM will start supporting all six modules the same as it did before the hot swap—there is no need to power cycle again.

Do Not Hot Swap Modules with Different Model Numbers

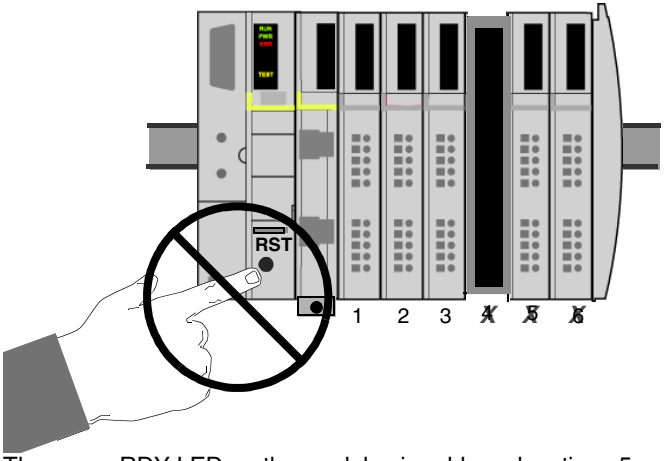
If an I/O module is removed from its base and then replaced by a module with a different model number, the remaining modules on the island will continue to operate but the new module will not be operational. The green RDY LED on the new module will blink to indicate that it is in pre-operational mode, and an LED on the NIM will indicate that a device mismatch has been detected.
If you choose to keep the module with a different model number in the base, you will have to reconfigure the system to make it operational.

Do Not Reset the Island Bus while a Module is Removed

If you push the RST button on the NIM while an I/O module is missing from the island bus, the island will re-configure, and only the modules to the left of the missing one will be operational.
For example, if an I/O module is removed from address location 4 of the island bus as shown below:



and then the RST button on the NIM is pushed, the modules in locations 1, 2 and 3 will remain operational, and the modules to the right of the empty location will not be detected.

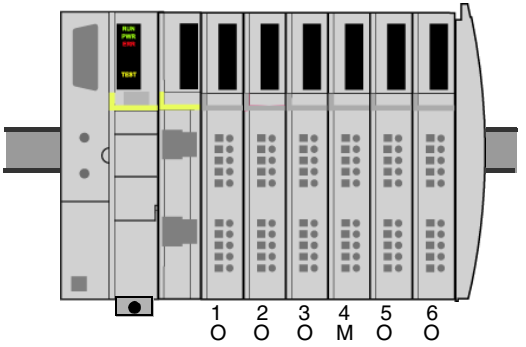


The green RDY LED on the modules in address locations 5 and 6 will flash to indicate that they are in pre-operational mode.

Note: Using the Advantys configuration software you can disable the reset button. In this situation pressing the reset button will not effect the configuration. If the reset button is active, pressing it will erase the existing configuration.

Mandatory Module Considerations

If the island contains any I/O modules that have been configured as mandatory, you need to be aware of how the island will behave in the event of a reset or power cycle. Suppose you have an island that comprises a NIM, a PDM and six I/O modules. The modules at address locations 1, 2, 3, 5 and 6 are optional, and the module at location 4 is mandatory.

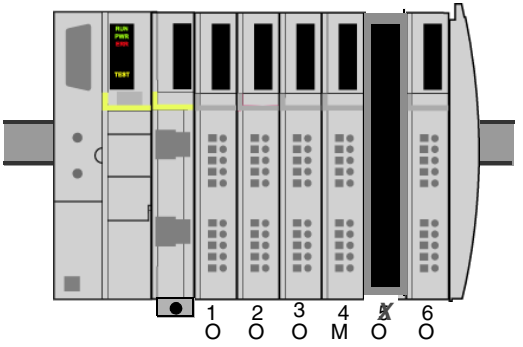


O optional

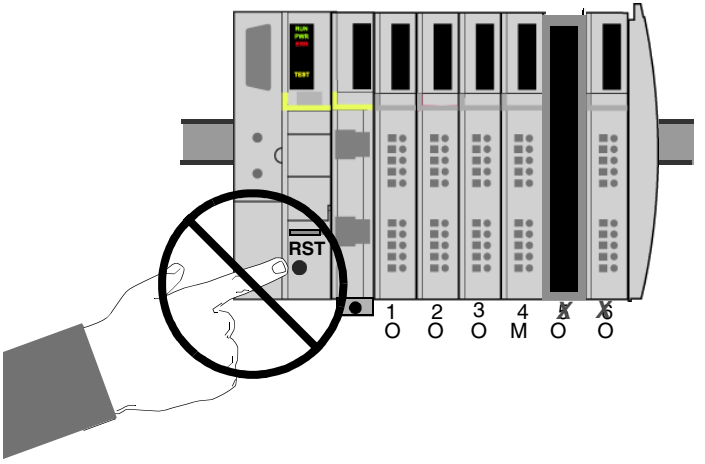
M mandatory

If the mandatory module in location 4 is removed, all the modules will go into pre-operational mode and the island will not function. However, there are also some special circumstances involving the hot swapping of optional modules when a mandatory module is present on the island.

If we remove an optional module that resides to the right of any and all mandatory modules, as shown below,

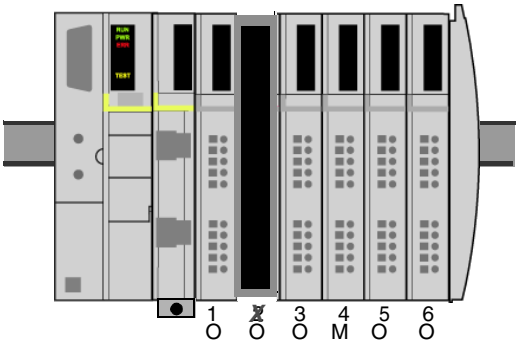


the island will behave the same way as it would if all the modules were optional—all of the existing modules would continue to be operational. Now, If the reset button is pushed your configuration will be erased and modules 1 through 4 will be default configured—all optional. If you power cycle instead of pushing the reset button, all the existing modules, except for the module in position 6, will be operational again and module 4 will continue to be configured as mandatory:

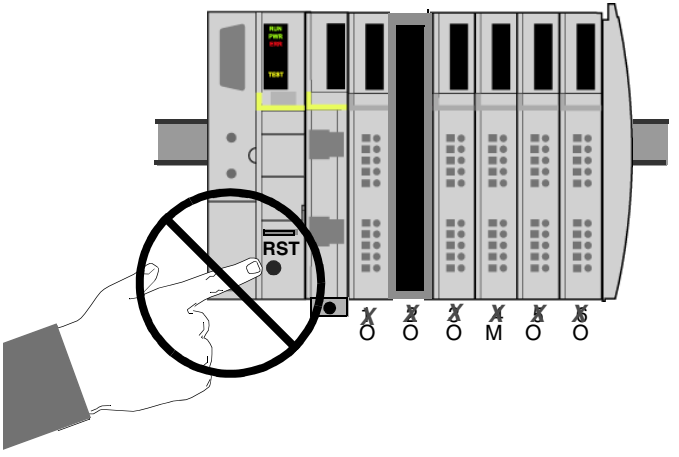


The island behavior changes, however, if an optional module to the left of a mandatory module is removed.

Suppose that the module in location 4 is mandatory and the optional module in location 2 is removed from its base, as shown below.



Again, the island will behave the same way as it would if all the modules were optional—all of the existing modules would continue to be operational. However, if you push the RST button while the module is removed the current configuration will be erased and only the module in location 1 will be operational. If you power cycle, instead of pushing the reset button, the island will not recognize the modules to the right of the missing module in location 2. Since one of the modules that is not recognized is the mandatory module in location 4, the entire island will go into pre-operational mode and will not function.



Fault Detection and Troubleshooting

Summary

By connecting to your islands NIM via its CFG port and by viewing the LED readouts on your NIM and I/O you can detect faults and troubleshoot your Advantys STB island.
Your particular fieldbus master should have its own fault detection abilities as well, refer to its user guide.
Use the following general information to detect faults and troubleshoot your system.

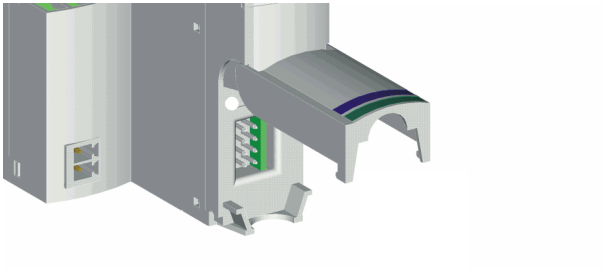
CFG port

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

Note: After making the physical connection from your PC to your NIM or from your HMI panel to your NIM, refer to their user guides to continue.

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 a male eight-pin HE-13 connector.

Port Parameters

The CFG port supports the following communication parameters:

Parameter	Valid Values	Factory Default Settings
bit rate (baud)	2400/4800/ 9600/9200/ 38400/ 57600	9600 (see 1)
data bits	7/8	8 (see 2)
stop bits	1/2	1 (see 2)
parity	none/odd/even	even (see 2)
protocol	Modbus RTU or Modbus ASCII	Modbus RTU
1 To modify the default baud or communication mode parameter, you must use the Advantys configuration software.		

Connections

An STB XCA 4002 programming cable must be used to connect the computer running the Advantys configuration software or a HMI panel capable of running your fieldbus protocol to the NIM via the CFG port.
The following table describes the specifications for the programming cable:

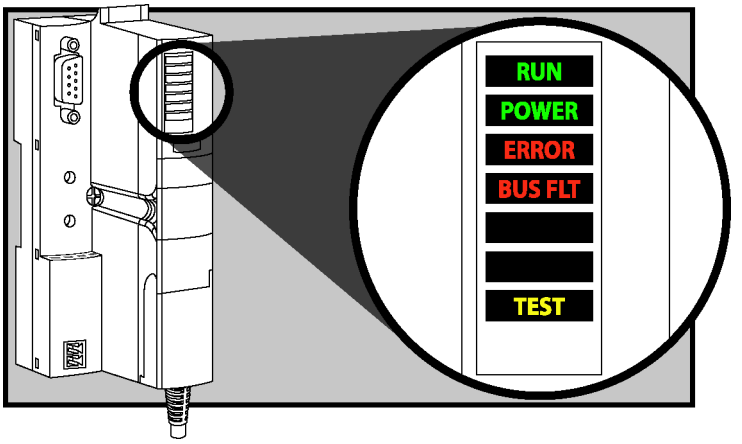
Parameter	Description
model	STB XCA 4002
function	connection to device running configuration software
	connection to HMI panel
communications protocol	Modbus (either RTU or ASCII mode)
cable length	2 m (6.23 ft)
cable connectors	eight-receptacle HE-13 (female) nine-receptacle SUB-D (female)
cable type	multiconductor

LED Indicators

LEDs on your NIM give you a visual indication of the operational status of the island bus on your particular network. The LED array is located at the top of the NIM's front panel:

Description

The illustration shows a typical LED array:



Use the condition table below to look up what your LED array indicates.

LED Condition Table

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

- It is assumed that the *POWER* LED is on continuously, indicating that the NIM is receiving adequate power. If the *POWER* LED is off, logic power to the NIM is off or insufficient.
- Individual blinks are approximately 200 ms. There is a one-second interval between blink sequences. Please note the following:
  - 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 one second off.
  - blink *N*—blinks N (some number of) times, then one 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.

Use the following table to help troubleshoot your system:

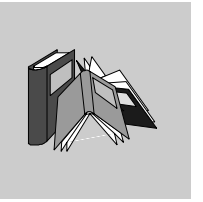
RUN (green)	ERROR (red)	TEST (yellow)	Meaning
blink: 2	blink: 2	blink: 2	The island bus is powering up (self test in progress).
off	off	off	The island bus is initializing but is not started or there is no power present.
blink: 1	off	off	The island bus has been put in the pre-operational state by the RST button and is not started.
		blink: 3	The NIM is reading the contents of the removable memory card.
		on	The NIM is overwriting its Flash memory with the card's configuration data (see 1).
off	blink: 8	off	The contents of the removable memory card is invalid.
blinking (steady)	off	off	The NIM is configuring or auto-configuring the island bus, which is not started.
blink: 3	off	off	Initialization is complete, the island bus is configured, the configuration matches—the island bus is not started.
		on	Auto-configuration data is being written to Flash memory (see 1).
off	blink: 6	off	The NIM detects no I/O modules on the island bus.
blink: 3	blink: 3	off	Configuration mismatch—non-mandatory or unexpected modules in the configuration do not match; the island bus is not started.
blink: 3	blink: 2	off	Configuration mismatch—at least one mandatory module does not match; the island bus is not started.

RUN (green)	ERROR (red)	TEST (yellow)	Meaning
off	blink: 2	off	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)	off	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 • mandatory module configuration error • process image error • auto-configuration/configuration error • island bus management error • application parameter error • receive/transmit queue software overrun error
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	Serious configuration mismatch—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—no further communications with the island bus are possible.
off	on	off	Fatal error—internal failure.
[any]	[any]	on	Test mode is enabled—the configuration software tool or an HMI panel can set outputs and/or application parameters (see 2).

1 The TEST LED is on temporarily during the Flash overwrite process.

2 The TEST LED is on steadily while the device connected to the CFG port is in control.

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.* IP's network layer protocol 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

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

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 except the final segment on the island. Its job is to extend island bus communications and send 24 VDC for logic power 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 in operation.

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 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 1+ input Type 1+ 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 mA
- a maximum off-state current less than or equal to 0.8 mA

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.

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.

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. The network interface module's built-in power supply provides 5 V logic power to the Advantys STB I/O modules as well as 24 V source power, as needed, to the support I/O modules. The NIM also has an RS-232 interface that is the connection point for the Advantys configuration software.

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

O

object dictionary Sometimes called the "object directory," this part of the CANopen device model is a map to the internal structure of CANopen devices (according to CANopen profile DS-401). A given 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 structure through the CANopen fieldbus, you can predict its network behavior and, therefore, build a distributed application that implements it.

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 separately 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 Prioritization is an optional feature that allows you to selectively identify digital input modules to be scanned more frequently during the NIM's logic scan of the island bus.

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 The execution of a simple, logical command function configured locally at 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 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 segment, that function is filled by a NIM. In an extension segment, that function is filled by an STB XBE 1200 BOS module.

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 network interface An Advantys STB network interface module designed at moderate cost to support the kind of configuration capabilities and throughput capacity suitable for most standard applications on the island bus.

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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T