Modbus Advantys OTB
Remote I/O

September 2004

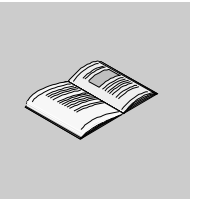
Eng V1.1

W9 1606383 01 11 A02 09/04

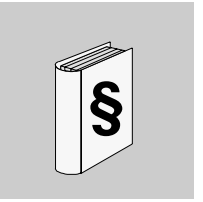
a brand of Schneider Electric

Telemecanique

Table of Contents



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

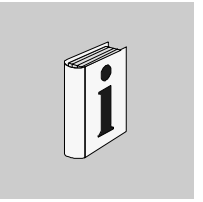
WARNING indicates a potentially hazardous situation, which, if not avoided, **can result** in death, serious injury, or equipment damage.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation, which,**can result** in personal 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 guide contains the information necessary to install a Modbus Advantys OTB network interface module.
It has been designed to facilitate a rapid familiarization with the system, while optimizing the system's features with the most advanced technology available.
This equipment's installation needs the relative communication protocol pre-requisites and should only be installed by qualified personnel. Special points and warnings regarding safety are highlighted in the different chapters.
The initial chapters aim to provide information for designers and fitters for installing the mechanical and electrical part of the system. They describe the characteristics which are common to the whole Advantys OTB range and are not dependent on the selected communication protocol.
The following chapters, from the "network interface" section, are specific to the communication protocol. They contain information on specific wiring for the network interface and all the necessary information for the software application programmer, and for the end user (diagnostics).

Chapter	Subject dealt with
Introduction	General introduction to the network interface module and expansion modules
Description	Software installation, dimensions, installation and assembly of an island
Description, characteristics, and wiring of the Advantys OTB module	Description, electrical and mechanical characteristics and wiring diagrams for the OTB module
Description, characteristics and wiring of expansion modules	Description, electrical and mechanical characteristics and wiring diagrams for expansion modules

Chapter	Subject dealt with
Advantys OTB module Modbus network interface	Introduction to the OTB module network interface Reminders on the communication protocol Management of behavior of the island on the network
Application-specific functions	Description of application-specific functions Remote I/O and specific function registers table
Software installation	Software installation help
Advantys OTB island diagnostics	Description of hardware diagnostics Description of software diagnostics How to perform diagnostics in the event of a failure
Advantys OTB island registers table	Description of the registers accessible for communication
Glossary	Acronyms Definitions.

User Comments

We welcome your comments about this document. You can reach us by e-mail at techpub@schneider-electric.com

Introduction

1

At a Glance

Introduction

This chapter provides an overview of the Advantys OTB network interface modules, the different expansion modules, the maximum configuration and the specific functions of the module, as well as a communication architecture.

What's in this Chapter?

This chapter contains the following topics:

About Advantys OTB

Introduction

The Advantys OTB (Optimized Terminal Block) network interface module with built-in Inputs/Outputs is small in size. Its modularity, by adding I/O expansions, can be used to optimize an application by providing the necessary number of I/Os. The Advantys OTB module connects directly to a field bus or communication network. The available field buses or networks are as follows:

- CANopen field bus: Module OTB1C0DM9LP
- Modbus field bus: Module OTB1S0DM9LP
- Ethernet communication network: Module OTB1E0DM9LP

The network interface module accepts up to 7 I/O expansion modules

Network Interface Module with Built-In I/Os

The following illustration shows the different network interface modules with built-in I/Os:

OTB1C0DM9LP

OTB1S0DM9LP

OTB1E0DM9LP

Each network interface modules with built-in I/Os has:

- 12 Discrete inputs
- 6 relay outputs
- 2 positive logic transistor outputs (source)
- a 24 VDC power supply terminal
- a dedicated connector to the communication bus
- an indicator LED to display the communication and I/O status

The following table shows the main characteristics of the network interface module:

Reference	Channels	Channel channel	Input/Output type	Electrical
OTB1•0DM9LP	12	Inputs	24 VDC	24 VDC
	6 2	Outputs Outputs	Relay 24 VDC positive logic transistor (source)	

Digital Expansion I/O Modules

The following table lists the digital and relay expansion I/O modules:

Module Name	Reference	Channels	Channel Type	Input/Output type	Terminal type
Input modules					
8 channel input	TWDDDI8DT	8	Inputs	24 VDC	Screw removable terminal block
8 channel input	TWDDAI8DT	8	Inputs	120 VAC	Screw removable terminal block
16 channel input	TWDDDI16DT	16	Inputs	24 VDC	Screw removable terminal block
16 channel input	TWDDDI16DK	16	Inputs	24 VDC	Connector HE10
32 channel input	TWDDDI32DK	32	Inputs	24 VDC	Connector HE10
Output Modules					
8 channel output	TWDDDO8TT	8	Outputs	Positive logic transistor (source)	Screw removable terminal block
8 channel output	TWDDDO8UT	8	Outputs	Transistor sink	Screw removable terminal block
8 channel output	TWDDRA8RT	8	Outputs	Relay	Screw removable terminal block
16 channel output	TWDDDO16TK	16	Outputs	Positive logic transistor (source)	Connector HE10
16 channel output	TWDDDDO16UK	16	Outputs	Transistor sink	Connector HE10
16 channel output	TWDDRA16RT	16	Outputs	Relay	Screw removable terminal block
32 channel output	TWDDDO32TK	32	Outputs	Positive logic transistor (source)	Connector HE10
32 channel output	TWDDDO32UK	32	Outputs	Transistor sink	Connector HE10

Module Name	Reference	Channels	Channel Type	Input/Output type	Terminal type
Mixed modules					
4 channel input/ 4 channel output	TWDDMM8DRT	4	Inputs	24 VDC	Screw removable terminal block
		4	Outputs	Relay	
16 channel input/8 channel output	TWDDMM24DRF	16	Inputs	24 VDC	Spring non-removable terminal block
		8	Outputs	Relay	

Analog Expansion I/O Modules

The following table lists the analog expansion I/O modules:

Module name	Reference	Type	Channel type	Details	Terminal type
2 inputs	TWDAMI2HT	2	Inputs	12 Bit 0-10 V 4-20 mA	Screw removable terminal block
1 output	TWDAM01HT	1	Outputs	12 Bit 0-10 V 4-20 mA	Screw removable terminal block
2 inputs/1 output	TWDAMM3HT	2	Inputs	12 Bit 0-10 V 4-20 mA	Screw removable terminal block
		1	Outputs		
2 inputs / 1 output	TWDALM3LT	2	Inputs	12 Bit resistance temperature detector, thermocouple	Screw removable terminal block
		1	Outputs	12 Bit 0-10 V 4-20 mA	
2 outputs	TWDAVO2HT	2	Outputs	10 Bit +/-10 V	Screw removable terminal block
4 inputs	TWDAMI4HT	4	Inputs	12 Bit Voltage/ current resistance temperature detector, thermocouple Ni	Screw removable terminal block
8 inputs	TWDAMI8HT	8	Inputs	10 Bit Voltage/ current	Screw removable terminal block
8 inputs	TWDARI8HT	8	Inputs	10 Bit PTC NTC	Screw removable terminal block

Communication expansion module block

Module name	Reference	Type	Channel type	Details	Terminal type
Joint block	OTB9ZZ61JP	16	passive	2 x 8 contacts	Screw removable terminal block

Cables

The following table catalogs the different cables:

Cable name	Reference
Digital I/O Cables	
0.5 meter, HE10 connector of the I/O expansion module to 20-wire free cable	ABFT20E050
1 meter, HE10 connector of the I/O expansion module to 20-wire free cable	ABFT20E100
2 meter, HE10 connector of the I/O expansion module to 20-wire free cable	ABFT20E200
Advantys Telefast 2 prewiring system for Twido	
TWDDDO16TK TWDDDO32TK compatible	ABE7E16SPN20
	ABE7E16SPN22
	ABE7E16SRM20
TWDDDI16DK TWDDDI32DK compatible	ABE7E16EPN20

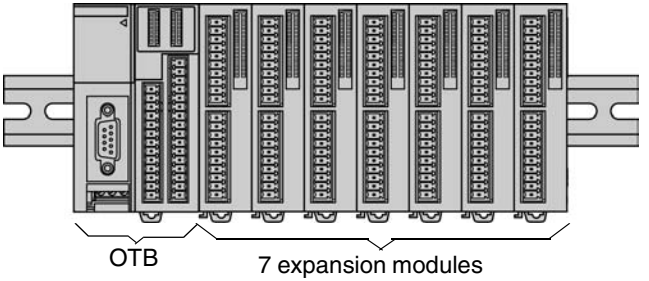
Maximum hardware configuration

Introduction

This section presents the maximum hardware configuration for the network interface module with built-in I/Os integrated associated with the expansions modules.
The hardware configuration is limited by:

- the number of expansion modules. The OTB module accepts up to a maximum of 7 Discrete I/O expansion modules,
- the number of analog channels of the same type,
- the total consumption of the expansion modules must be lower than 450 mA.

Each module (whether or not associated with the expansion modules) constitutes an island on the bus or the communication network. Each island offers a modular and polyvalent I/O solution.
The figure below shows an example of an I/O island.



Maximum Number of I/Os

The following table catalogs the maximum number of discrete I/O types for the island:

Type of built-in I/Os	Number of I/Os
Standard digital inputs	12
Standard digital outputs	8

Type of I/Os with expansion modules	Total number of I/Os
Max Discrete inputs (I/O module + exp I/O)	12+(7x32)=236
Max Discrete outputs (I/O module + exp I/O)	8+(7x32)=232
Max digital I/O (I/O module + exp I/O)	20+(7x32)=244
Max relay outputs	6 base + 96 expansion

Maximum Number of Analog Channels

The following table catalogs the maximum number of analog channels by types for the island:

Type of analog I/O	Number of analog channels
Analog inputs	24
Analog outputs	24

Consumption of the expansion modules

The total consumption of the expansion modules must be lower than 450 mA. The following table lists the consumption of each expansion module:

Expansion module	Consumption
TWDDDI8DT	25 mA
TWDDAI8DT	60 mA
TWDDDI16DT	40 mA
TWDDDI16DK	35 mA
TWDDDI32DK	65 mA
TWDDDO8TT	10 mA
TWDDDO8UT	10 mA
TWDDRA8RT	30 mA
TWDDDO16TK	10 mA
TWDDDDO16UK	10 mA
TWDDRA16RT	45 mA
TWDDDO32TK	20 mA
TWDDDO32UK	20 mA
TWDDMM8DRT	25 mA
TWDDMM24DRF	65 mA
TWDAMI2HT	50 mA
TWDAMO1HT	50 mA
TWDAMM3HT	50 mA
TWDALM3LT	50 mA
TWDAVO2HT	50 mA
TWDAMI4LT	50 mA
TWDAMI8HT	50 mA
TWDARI8HT	50 mA

⚠ CAUTION

UNEXPECTED EQUIPMENT OPERATION

Failure to observe the 450 mA limit may lead to the inconsistent operation of the island.

Failure to follow this instruction can result in injury.

Specific Functions of the Network Interface Module

Introduction

By default, all I/Os of the network interface module are configured as Discrete I/Os. However, certain I/Os can be assigned to remote function blocks.

Specific Functions

The following table lists the specific functions of the network interface module:

Function	Description
Fast counter: RFC	2 fast up/down counters: 5 kHz (1-phase)
Very fast counter: RVFC	2 very fast counters: Up/down counters - 20 kHz (2-phase)
Pulse generator: RPLS	2 pulse generators Pulse output, maximum 7 kHz.
Pulse generator with pulse width modulation: RPWM	2 pulse generators with pulse width modulation RPWM pulse width modulation, maximum 7 kHz.
Programmable input filter	Input filter time can be changed during configuration No filtering or filtering at 3 ms or 12 ms

Communication Overview

Introduction

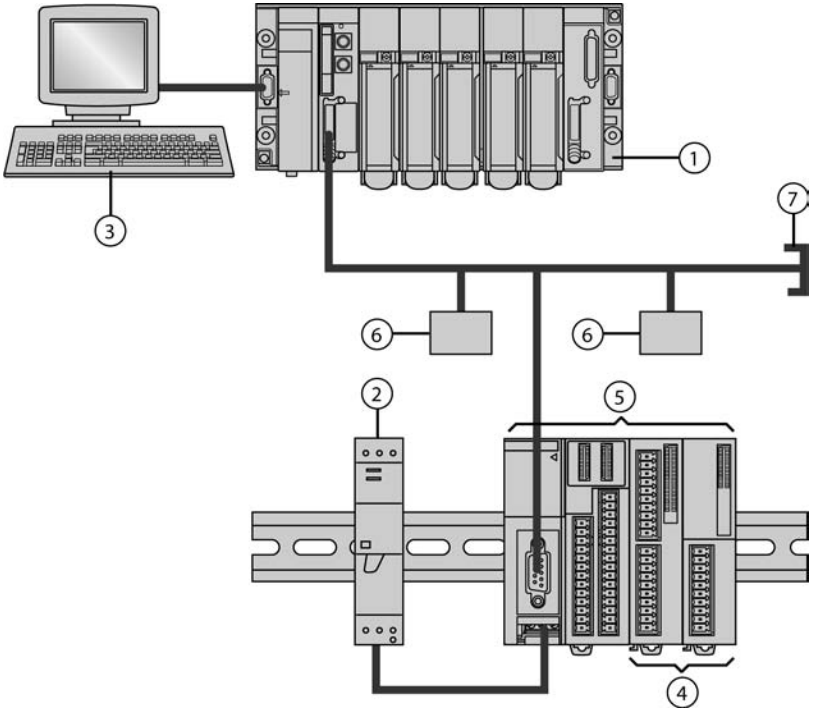
The Advantys OTB network interface modules are available for CANopen and Modbus field buses, and for the Ethernet network. They are used to exchange data from the built-in I/Os and expansion module I/Os with the bus master or client.

Field bus or network

A module with or without expansion constitutes an I/O island. The network interface module manages data transfers between the island and the master or client, via the field bus or network.

Communication Architecture

The following figure illustrates the different roles of the network interface module. This figure shows a network architecture with all the elements necessary for its implementation:



1 PLC with master and/or client

2 external 24 VDC electrical supply

3 PC with the PLC configuration software

4 I/O expansion module

5 Advantys OTB island

6 other islands or products on the field bus or network

7 termination according to the field bus or network (if necessary)

Installation

2

At a Glance

Introduction

This chapter provides dimensions, installation, and mounting instructions for Advantys OTB network interface modules, and digital and analog expansion I/O modules.

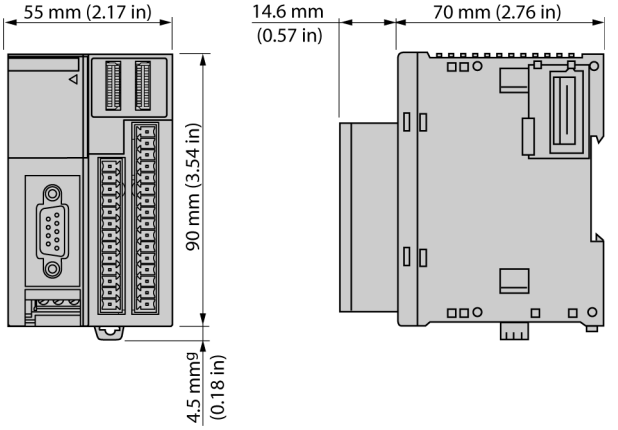
What's in this Chapter?

This chapter contains the following topics:

Dimensions of the Network Interface Modules

OTB1•0DM9LP Dimensions

The following figure shows the dimensions of the Advantys OTB network interface module (OTB1•0DM9LP).



Note: * 8.5 mm (0.33 in) when the clamp is pulled out.

Dimensions for the Digital and Analog I/O Expansion Modules

Introduction

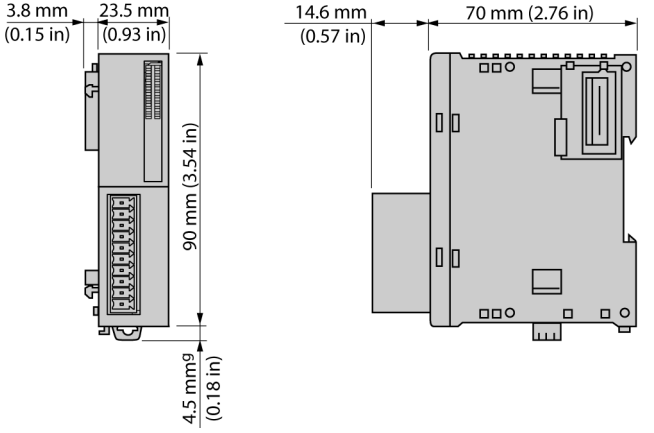
The following section shows the dimensions for all digital and analog I/O expansion modules.

Digital I/O and Analog Modules

The following figure shows the dimensions of the modules

- Discrete I/Os: TWDDDI8DT, TWDDDO8TT, TWDDDO8UT, TWDDRA8RT, TWDDMM8DRT
- Analog I/Os: TWDAMI2HT, TWDAMO1HT, TWDAMM3HT, TWDALM3LT, TWDAVO2HT, TWDAMI4LT, TWDAMI8HT and TWDARI8HT.

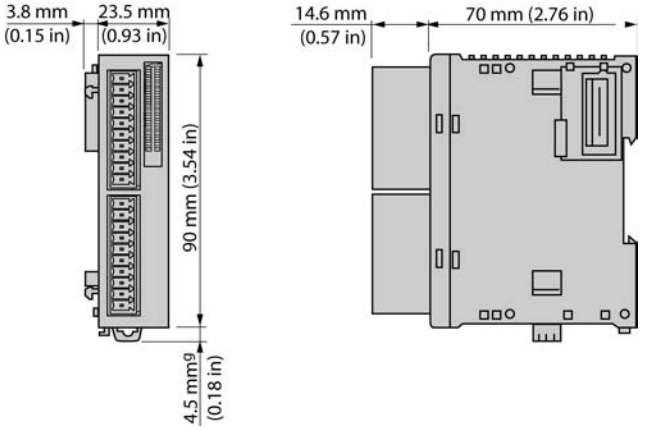
Illustrations of the TWDDDI8DT or TWDDAI8DT module:



Note: * 8.5 mm (0.33 in) when the clamp is pulled out.

Digital I/O Modules

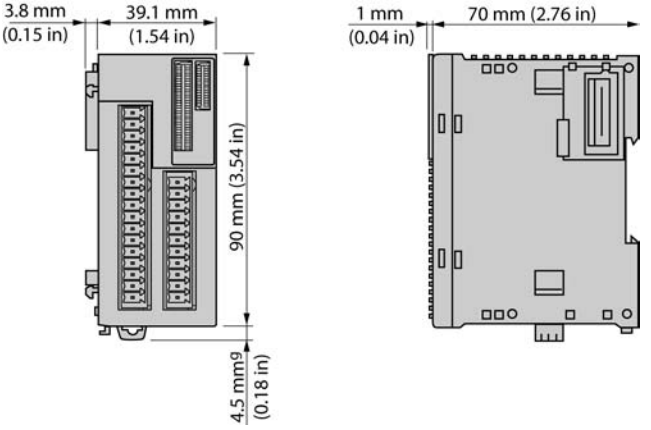
The following diagrams show the dimensions for the TWDDDI16DT, TWDDRA16RT, and OTB9ZZ61JP Discrete I/O modules.
Illustrations showing a TWDDDI16DT module:



Note: * 8.5 mm (0.33 in) when the clamp is pulled out.

Digital I/O Modules

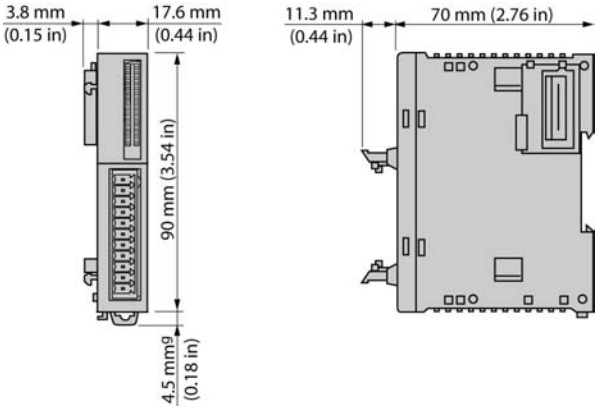
The following diagram shows the dimensions for the TWDDMM24DRF Discrete I/O module.



Note: * 8.5 mm (0.33 in) when the clamp is pulled out.

Digital I/O Modules

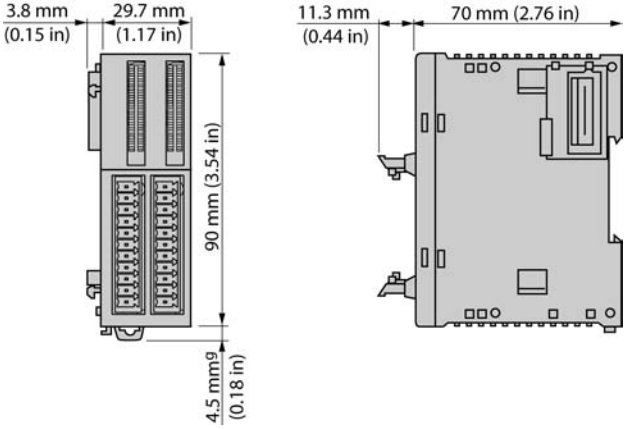
The following diagrams show the dimensions for the TWDDDI16DK, TWDDDO16TK, and TWDDDO16UK Discrete I/O modules.
Illustrations showing a TWDDDI16DK module:



Note: * 8.5 mm (0.33 in) when the clamp is pulled out.

Digital I/O Modules

The following diagrams show the dimensions for the TWDDDI32DK, TWDDDO32TK and TWDDDO32UK Discrete I/O modules.
Illustrations showing a TWDDDI32DK module:



Note: * 8.5 mm (0.33 in) when the clamp is pulled out.

How to Direct Mount on a Panel Surface

Introduction

This section provides mounting hole layouts for each network interface module or expansion module. Your module may differ from the illustrations in this procedure but the mechanism are the same.

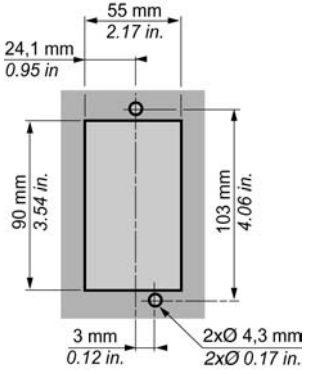
Installing a Mounting Strip

Panel assembly requires the use of a strip. The following procedure explains how to install an assembly strip: TWD DXMT5.

Step	Action
1	Remove the clamp from the back side of the module by pushing the clamp inward.
2	Insert the mounting strip, with the hook entering last, into the slot where the clamp was removed.
3	Slide the mounting strip into the slot until the hook enters into the recess in the module.

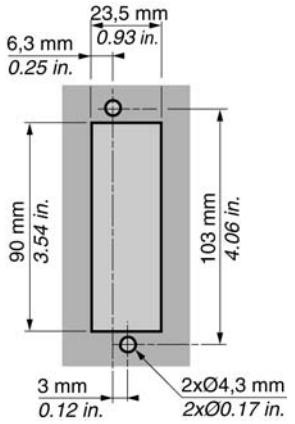
Layout of the mounting holes of the network interface module

The following diagram shows the Mounting hole layout for the Advantys OTB network interface modules.



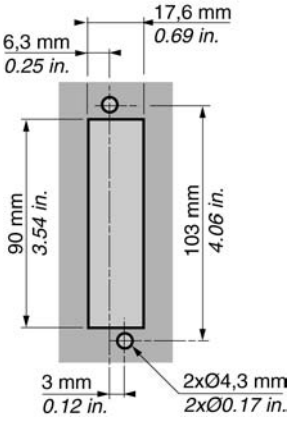
Mounting Hole Layout of the Expansion Module

The following diagram shows the mounting hole layout for the expansion modules.

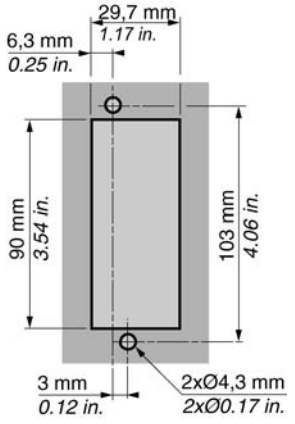


TWDDDI8DT
TWDDDI16DT
TWDDRA8RT
TWDDRA16RT
TWDDDO8UT
TWDDDO8TT

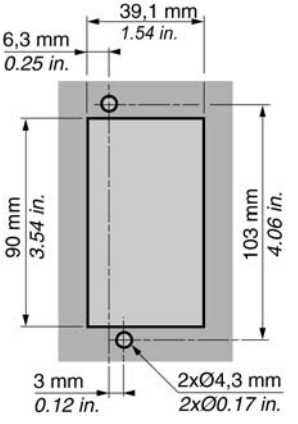
TWDDMM8DRT
TWDALM3LT
TWDAMM3HT
TWDAMI2HT
TWDAMO1HT



TWDDDI16DK
TWDDDO16TK
TWDDDO16UK



TWDDDI32DK
TWDDDO32TK
TWDDDO32UK



TWDDDO32UK

Installation Preparation

Introduction

The following section provides information on installing network interface modules and expansion I/O modules.

Before Starting

Before installing network interface modules, read the Safety Information at the begging of this book.

> **⚠ CAUTION**
>
> **EQUIPMENT DAMAGE**
>
> Before removing an expansion module, power down the network interface module. Otherwise there is a risk of damaging the modules or the modules no longer working correctly
>
> **Failure to follow this instruction can result in injury.**

Note: All options and expansion I/O modules should be installed in the network interface module before installing an island on a DIN rail, on a mounting plate, or in a cabinet. The island should be removed from a DIN rail, a mounting plate or a cabinet before disassembling the different modules.

Mounting Positions for the Network Interface Module and the Expansion Modules

Introduction

This section shows the correct and incorrect mounting positions for all network interface modules and expansion I/O modules.

⚠ WARNING

THE TEMPERATURE OF THE ISLAND MAY RISE

Keep adequate spacing around the island for proper ventilation and to maintain an ambient temperature between 0°C (32°F) and 55°C (131°F).

Failure to follow this instruction can result in death or serious injury.

⚠ CAUTION

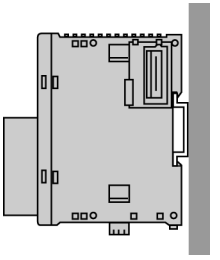
PLACING HEAT GENERATING DEVICES NEAR THE ISLAND

Do not place heat generating devices such as transformers and supply blocks under the island.

Failure to follow this instruction can result in injury.

Correct Mounting Position

Network interface modules and expansion I/O modules must be mounted horizontally on a vertical plane as shown in the figures below.



Incorrect Mounting Position

The following diagrams show the incorrect mounting positions for the network interface modules and expansion modules.

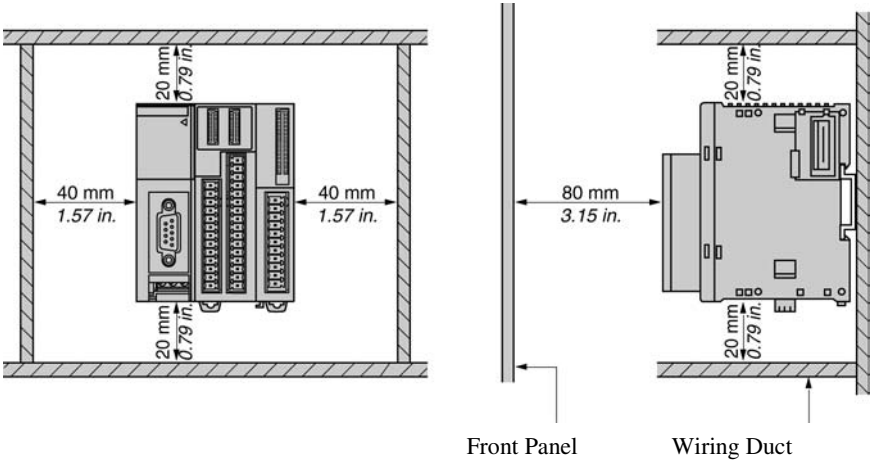
Assembly Precautions for an Island or a Panel in a Cabinet

Introduction

This section presents the assembly precautions required for islands on a control panel or in a cabinet.

Required Assembly Space for an Island

In order for air to be able to circulate freely around the islands mounted in a control panel or in a cabinet, you must respect the minimum distances given in the following diagram.



Assembly of an Expansion Module to a Network Interface Module

Introduction

This section shows how to assemble an expansion module to a network interface module. Your network interface module or expansion module may differ to the ones shown in the illustrations for this procedure, but the mechanism remains the same.

⚠ CAUTION

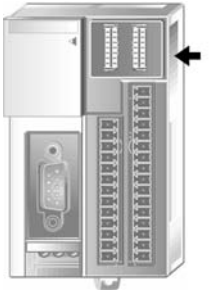
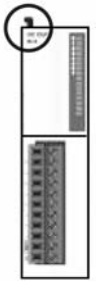
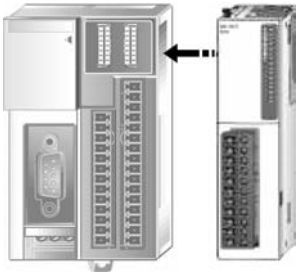
UNEXPECTED EQUIPMENT OPERATION

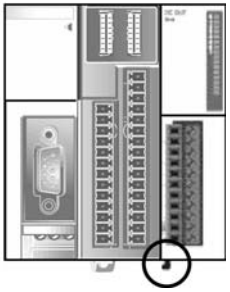
- If you change the hardware configuration of the island and do not update the master or client application program, the island will no longer operate normally.
- The I/Os built into the network interface module will continue to operate normally.

Failure to follow this instruction can result in injury.

Assembly of an Expansion Module to a Network Interface Module

The following procedure must be performed with all products powered down. It shows how to assemble a network interface module to an expansion module.

Step	Action
1	Remove the protective label located on the side of the network interface module. 
2	Make sure the black latch button on the expansion module is in the up position. 
3	Align the connector on the left side of the expansion module to the connector on the right side of the network interface module. 
4	Press the expansion module to the network interface module until it "clicks" into place.

Step	Action
5	Push down the black latch button on the top of the expansion module to lock the modules together. 
6	Begin the operation again from step 1 for each expansion module to be added.

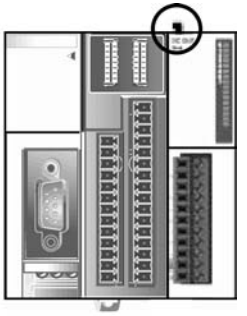
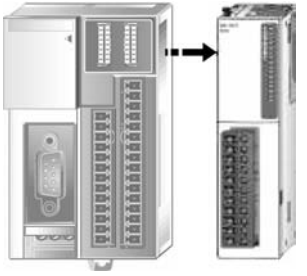
Disassembly of an Expansion Module and a Network Interface Module

Introduction

This section shows how to disassemble an expansion interface from a network interface module. Your network interface module or expansion module may differ to the ones shown in the illustrations for this procedure, but the mechanism remains the same.

Disassembly of an Expansion Module from a Network Interface Module

The following procedure must be performed with all products powered down. It shows how to disassemble an expansion module from a network interface module.

Step	Action
1	Remove the island (network interface module + expansion module(s)) from the DIN rail before disassembling them. See *Introduction, p. 43*.
2	Push the black latch from the bottom of the expansion module to disengage it from the network interface module. 
3	Separate the modules. 
4	Begin the operation again from step 2 for each expansion module to be separated.

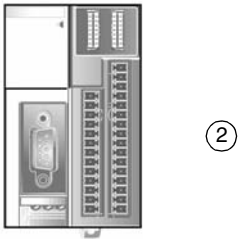
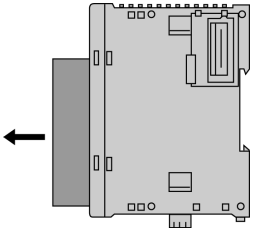
Removing a Terminal Block

Introduction

This section describes the removal of terminals from Advantys OTB network interface modules.

Removing a Terminal Block

The following procedure describes how to remove terminals from network interface modules.

Step	Action
1	Power down the network interface module and disconnect all wires. **Note:** The terminal block on the left (1) must be removed before the terminal block on the right (2).  2
2	Remove the terminal block by holding the center of the terminal block and pulling it out straight. 

⚠ CAUTION

REMOVING THE TERMINAL BLOCK. ONLY PULL FROM THE SIDE.

Only pull the terminal from the side to remove it.

Failure to follow this instruction can result in injury.

How to Install and Remove a Network Interface Module from a DIN Rail

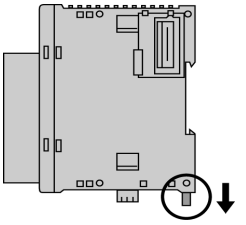
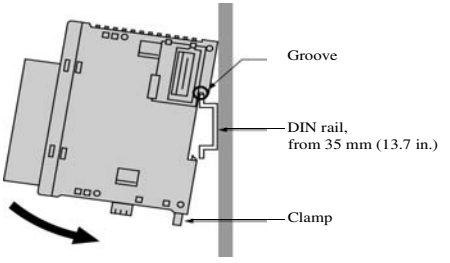
Introduction

This section shows how to install and remove an island from a DIN rail. Your island may differ from the illustrations in this procedure but the mechanism is the same.

Note: When mounting modules on a DIN rail, use two end stops, type AB1AB8P35 or equivalent.

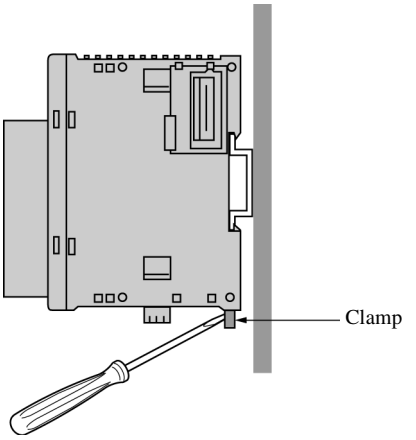
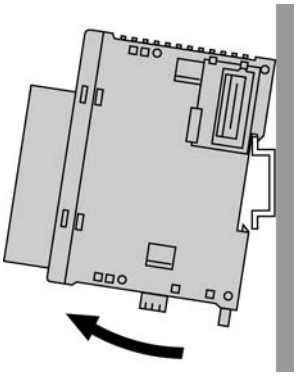
Installing an Island on a DIN Rail

The following procedure must be performed with all products powered down. It describes how to install an island on a DIN rail.

Step	Action
1	Fasten the DIN rail to a panel using screws.
2	Before any installation on a DIN rail, attach the communication module to the expansion modules. See *Assembly of an Expansion Module to a Network Interface Module, p. 37*
3	Pull out the clamp at the bottom of each module. 
4	Put the top groove of the island on the DIN rail and press it toward the rail. 
5	Push the clamp up to lock the island to the DIN rail.
6	Position the mounting stops of both sides of the modules to prevent the system from moving sideways.

Removing an island from a DIN Rail

The following procedure must be performed with all products powered down. It shows how to remove an island from the DIN rail.

Step	Action
1	Insert a flat screwdriver into the slot in the module clamp. 
2	Pull out the clamp.
3	Repeat steps 1 and 2 for each module comprising the island.
4	Pull the island to remove it from the DIN rail. 

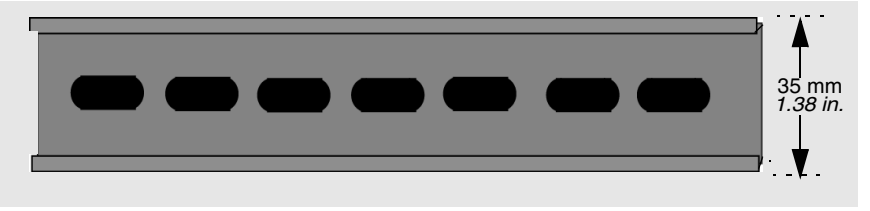
The DIN Rail

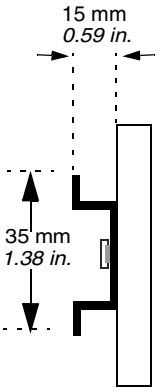
Introduction

The island is mounted on a DIN rail. A DIN rail can be attached to a smooth mounting surface or suspended from a EIA rack or in a NEMA cabinet. You can mount the island to a 35 mm x 15 mm DIN rail (*1.38 in. x 0.59 in.*).

Dimensions of the DIN Rail

The DIN rail measures 35 mm (*1.38 in.*) high and 15 mm (*0.59 in.*) deep, as shown below.





Recommended Equipment

You can order the suitable DIN rail from Schneider Electric:

Rail depth	Catalogue part number
15 mm (*0.59 in.*)	AM1DE200

Description, characteristics, and wiring of the OTB module

3

At a Glance

Introduction

This chapter describes the wiring rules and recommendations, overviews, part references, characteristics and wiring diagrams for the Advantys OTB network interface module.

What's in this Chapter?

This chapter contains the following topics:

Wiring Rules and Recommendations

Introduction

There are several rules that must be followed when wiring a module or network interface. Recommendations, when needed, are provided on how to comply with the rules.

⚠ DANGER

ELECTRIC SHOCK

- Be sure to remove ALL power from ALL devices before connecting or disconnecting inputs or outputs to any terminal or installing or removing any hardware.
- Make sure you have COMPLETELY powered down ALL devices before connecting or disconnecting the bus or network.

Failure to follow this instruction will result in death or serious injury.

⚠ WARNING

UNEXPECTED EQUIPMENT OPERATION

If outputs should fail, outputs may remain on or off. Where personnel and or equipment hazards exist, use an appropriate hard-wired safety system.

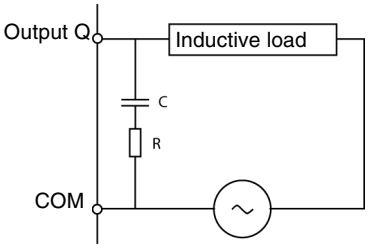
Failure to follow this instruction can result in death or serious injury.

Rules

- Each connector terminal accepts up to two wires fitted with cable ends or tags, with sections between 0.08 mm^2 and 0.75 mm^2, (0.12 10^{-3} $in.^2$ and 1.16 10^{-3} $in.^2$)
- Output module fusing is the responsibility of the user. It is not within the OTB network interface module itself. Select a fuse appropriate for the load with respect to the electrical codes.
- Depending on the load, a protection circuit may be needed for relay outputs on modules.
- The power supply wire should be between 0.33 mm^2 and 0.75 mm^2 (0.51 10^{-3} $in.^2$ and 1.16 10^{-3} $in.^2$). Use the shortest wire length possible.
- The grounding wire should be 1.50 mm^2 (2.3 10^{-3} $in.^2$).
- Be sure to connect the grounding wire to a proper ground.
- Power supply wires routed inside the panel must be kept separate from I/O and communication wiring. Route wiring in separate cable ducting.
- Take care when wiring output modules that are designed to work as either source or sink. Incorrect wiring can cause equipment damage.
- Make sure that the operating conditions and environments are within the specification values.
- Use proper wire size to meet voltage and current requirements.
- Fit cable ends to the cables.

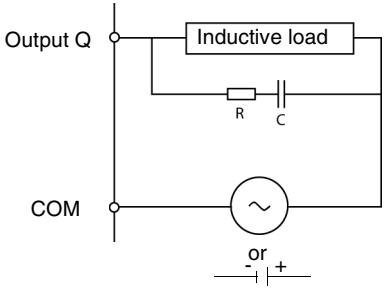
Contact Protection Circuit for Relay and Transistor Outputs

Depending on the load, a protection circuit may be needed for relay outputs. Choose a protection circuit, from the following diagrams, according to the power supply. Connect the protection circuit to the outside of the module for the relay outputs.
Protection Circuit A: this protection circuit can be used when the load impedance is smaller than the RC impedance in an AC load power circuit.



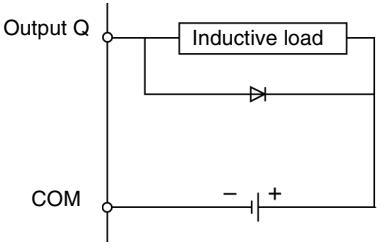
- C represents a value from 0.1 to 1 µF.
- R represents a resistor of approximately the same resistance value as the load.

Protection Circuit B: this protection circuit can be used for both AC and DC load power circuits.



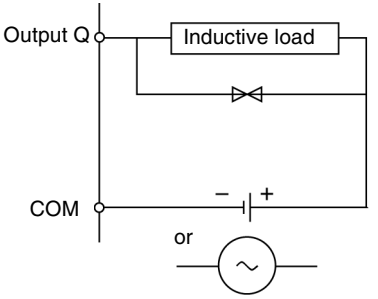
- C represents a value from 0.1 to 1 µF.
- R represents a resistor of approximately the same resistance value as the load.

Protection Circuit C: this protection circuit can be used for DC load power circuits.



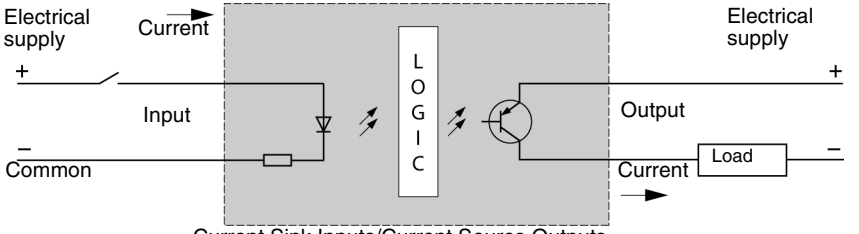
Use a diode with the following ratings:
- Reverse withstand voltage: power voltage of the load circuit x 10.
- Forward current: more than the load current.

Protection Circuit D: this protection circuit can be used for both AC and DC load power circuits.



Operation of Source Inputs/ Sink Outputs

Note: Sink corresponds to the sensors' common on the (+) terminal of the power supply.

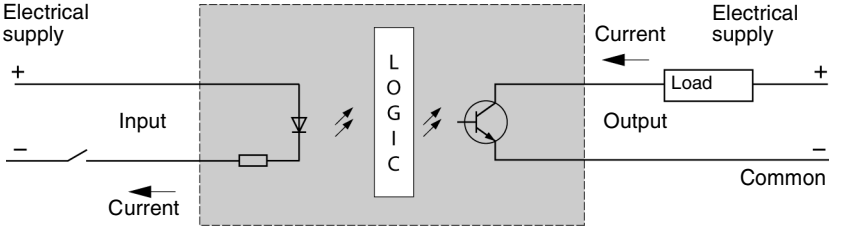


Current Sink Inputs/Current Source Outputs

Input side COM field terminal connects to the "-" terminal or common of the field power supply. Output side COM field terminal connects to +24V field power supply.

Operation of Source Inputs and Outputs

Note: Source corresponds to the sensors' common on the (-) terminal of the power supply.



Current Source Inputs/Current Sink Outputs

The input side COM field terminal connects to the +24 V power supply. The output side COM field terminal connects to the "-" terminal or common of the field power supply.

Overview of the Network Interface Modules

Introduction

This section describes the entire range of Advantys OTB network interface modules.

Illustrations

The following illustrations show the different network interface modules:

Module type	Illustration
Network interface module: ● has 12 digital inputs, 6 relay outputs, and 2 transistor source outputs ● has a terminal block for wiring ● accepts up to 7 expansion I/O modules	 OTB1C0DM9LP  OTB1S0DM9LP  OTB1E0DM9LP

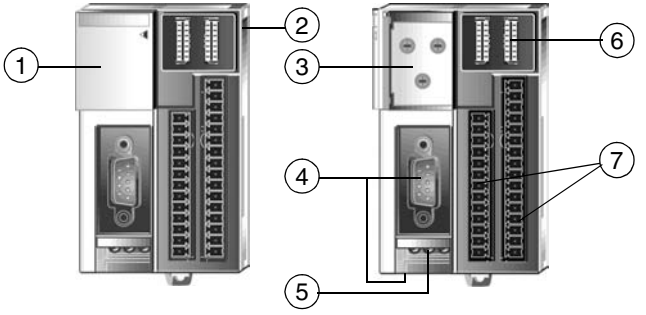
Physical Description of an Advantys OTB Network Interface Module

Introduction

This section describes the different sections of a network interface module. Only the communication section is dedicated to each field bus or network. This may differ from the illustrations, but the general description remains the same.

Physical Description of a Network Interface Module

The following illustration describes the different sections of a network interface module.



Legend

Label	Description
1	Hinged lid
2	Connector for expansion modules
3	Encoder wheels (sets the node address and communication speed on the bus or network)
4	Communication bus connectors
5	24 VDC power supply terminals
6	Indicator light
7	I/O terminals

General Characteristics of the Network Interface Module

Introduction

This section describes the general characteristics common to the network interface modules.

Normal Operating Specifications

Network interface module	**OTB1•0DM9LP**
Operating temperature	0 to 55°C (32°F to 131°F) operating ambient temperature
Storage temperature	-25 ... +70°C
Relative humidity	30 ... 95% (non-condensing)
Pollution degree	2 (IEC60664)
Degree of protection	IP20
Altitude	Operation: from 0 to 2000 m Transport: from 0 to 3000 m
Resistance to Vibration	When mounted on a DIN rail: from 10 to 57 Hz amplitude 0.075 mm, from 57 to 150 Hz acceleration 9.8 ms^2 (1G), 2 hours per axis on each of three mutually perpendicular axes. When mounted on a panel surface: 2 to 25 Hz, amplitude 1.6 mm, 25 to 100 Hz, acceleration 39.2 ms^2 (4G), 90 min per axis on each of three mutually perpendicular axes.
Impact strength	147 ms^2 (15G), 11 ms duration, 3 shocks per axis, on three mutually perpendicular axes (IEC 61131).
Weight	185 g

Electrical Specifications

Network interface module	**OTB1•0DM9LP**
Rated power voltage	24 VDC
Allowable voltage range	from 20.4 to 26.4 VDC (including ripple)
Peak voltage	39 VDC +/- 1 V
Consumed power	Communication module with 7 expansion modules
	19 W (26.4 VDC)
Allowable momentary power interruption	10 ms (@ 24VDC)
Dielectric strength	Between power and ground terminals: 500 VAC, 1 min Between I/O and ground terminals: 500 VAC, 1 min
Insulation resistance	Between power and ground terminals: 10 MΩ minimum (500 VDC) Between I/O and ground terminals: 10 MΩ minimum (500 VDC)
Noise resistance IEC 1131-2	DC power terminals: 1 kV, 50 ns to 1 µs I/O terminals (coupling clamp): 1.5 kV, 50 ns to 1 µs
Inrush current	50 A maximum (24 VDC)
Ground wiring	UL1015 22 AWG (0.33 mm^2), UL1007 18 AWG (0.82 mm^2)
Power supply wiring	UL1015 22 AWG (0.33 mm^2), UL1007 18 AWG (0.82 mm^2)
Tightening torque of the 24 VDC supply terminals	0.8 Nm (7.04 in.pounds)
Tightening torque of the I/O terminals	0.6 Nm (5.28 in.pounds)
Effect of improper power supply connection	Reverse polarity: no operation, no damage Improper voltage or frequency: permanent damage may be caused Improper lead connection: permanent damage may be caused

I/O Characteristics of the Network Interface Module

Introduction

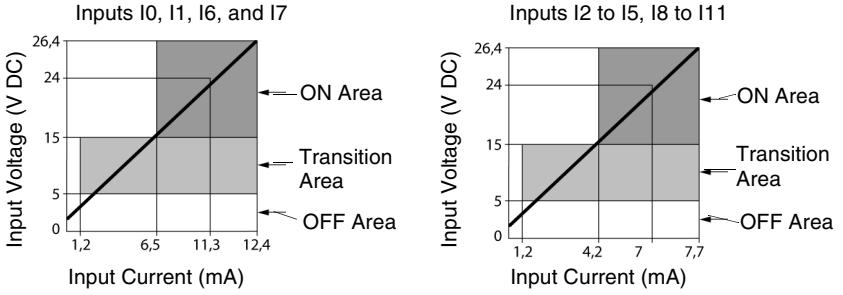
This section describes the I/O characteristics of the Advantys OTB network interface modules.

Input Specifications

Network interface module	**OTB1•0DM9LP**
Input points	12 inputs with common line
Rated input voltage	24 VDC source/sink input signal
Input voltage range	from 20.4 to 26.4 VDC
Rated input current	I0, I1, I6, I7: 5 mA/input (24 VDC) I2 to I5, I8 to I11: 7 mA/input (24 VDC)
Input impedance	I0, I1, I6, I7: 5.7 kΩ I2 to I5, I8 to I11: 3.4 kΩ
Switching time at high status (ON Time)	I0 to I7: 35 µs + filter value I8 to I11: 40 µs + filter value
Switching time at low status (OFF Time)	I0, I1, I6, I7: 45 µs + filter value I2 to I5, I8 to I11: 150 µs + filter value
Isolation	Between input terminals: not isolated Internal circuit: photocoupler isolated 1500 Vca
Filtering: 3 possibilities • none • 3 ms • 12 ms	I0 to I11
Input type	Type 1 (IEC 61131)
External load for I/O interconnection	Not needed
Signal determination method	Static
Effect of improper input connection	The input signals can be both sink and source. But if any input exceeding the rated value is applied, permanent damage may be caused.
Cable length	3m (9.84 ft) for compliance with electromagnetic immunity
Connector insertion/ removal durability	100 times minimum

Input Operating Range

The input operating range of the Type 1 (IEC 61131-2) input module is shown below.

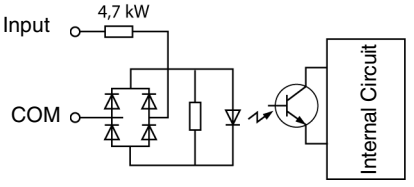


Input Internal Circuit

The internal input circuit is described below.

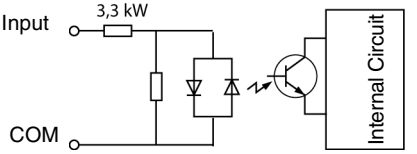
Sink Or Source Input with state latching or high baud rate

Inputs I0, I1, I6, and I7

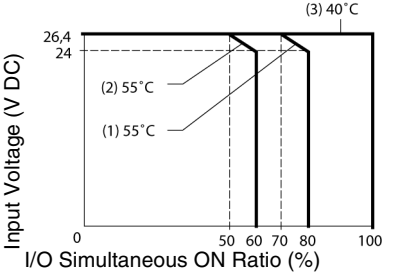


Sink Or Source Input (standard)

Inputs I2 to I5, I8 to I11



I/O Usage Limits



When using OTB1•0DM9LP modules, all I/O can be turned on simultaneously at 40°C, all I/O can be turned on simultaneously at 26.4 VDC as indicated with line (3).

Source Transistor Output Characteristics Q0,Q1

Network interface module	OTB1•0DM9LP
Output type	Source output
Output points per common Line	2
Rated load voltage	24 VDC
Maximum load current	1 A per common line
Operating load voltage range	from 20.4 to 28.8 VDC
Voltage drop (on voltage)	1 V maximum (voltage between COM and output terminals when output is on)
Rated load current	0.3 A per output
Inrush current	1 A maximum
Leakage current	0.1 mA maximum
Clamping voltage	39 V +/-1 V
Maximum lamp load	8 W
Inductive load	L/R = 10 ms (28.8 VDC, 1 Hz)
External current draw	100 mA maximum, 24 VDC (power voltage at the -V terminal)
Isolation	Between output terminal and internal circuit: photocoupler isolated Between output terminals: not isolated 1500 Vca
Average number of connector insertions/ removals	100 times minimum
Output delay - turn on time	5 µs maximum
Output delay - turn off time	5 µs maximum

Relay Output Specifications Q2 to Q7

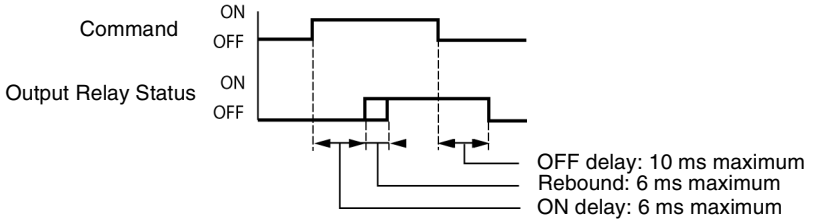
Network interface module	OTB1•0DM9LP
Number of outputs	8 digital inputs consisting of 6 relay outputs and 2 transistor source outputs
Output points per common line - COM0	2 outputs
Output points per common line - COM1	3 NO contacts
Output points per common line - COM2	2 NO contacts
Output points per common line - COM3	1 NO contact
Maximum load current	2 A per output 8 A per common line
Minimum switching load	0.1 mA/0.1 VDC (reference value)
Initial contact resistance	30 mΩ maximum
Mechanical life	20,000,000 operations minimum (rated load 18,000 operations/h)
Dielectric strength	Between output to internal circuit: 1500 VAC, 1 min Between output to terminals (COMs): 1500 VAC, 1 min
Connector insertion/removal durability	100 times minimum
Output delay - turn on time	300 µs maximum
Output delay - turn off time	300 µs maximum

Usage category	Rated load	Electrical life (number of operations)
AC1 Resistive load command	500 VA(*)	10^5
AC14 Weak solenoid load	250 VA	10^5
AC15 Solenoid	200 VA	10^5
DC1 Resistive load command	60 W(*)	10^5
DC13 Solenoid L/R=150ms	30 W	10^5

(*) for AC1 & DC1 the outputs indicated here take the maximum per point on OTB (2A) into account.

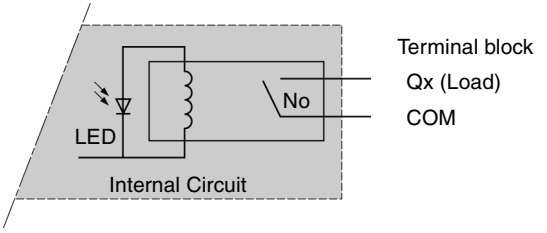
Relay Output Delay

The output delay is illustrated below.



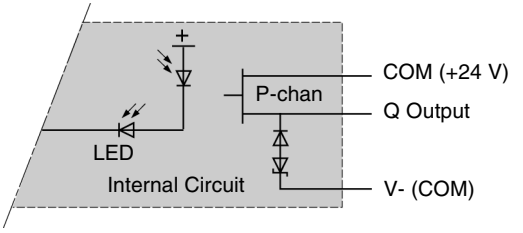
Relay Output Contact

The relay output contact is shown below.



Transistor Source Output Contact

The transistor source output contact is shown below.



Wiring diagram of the network interface module

Introduction

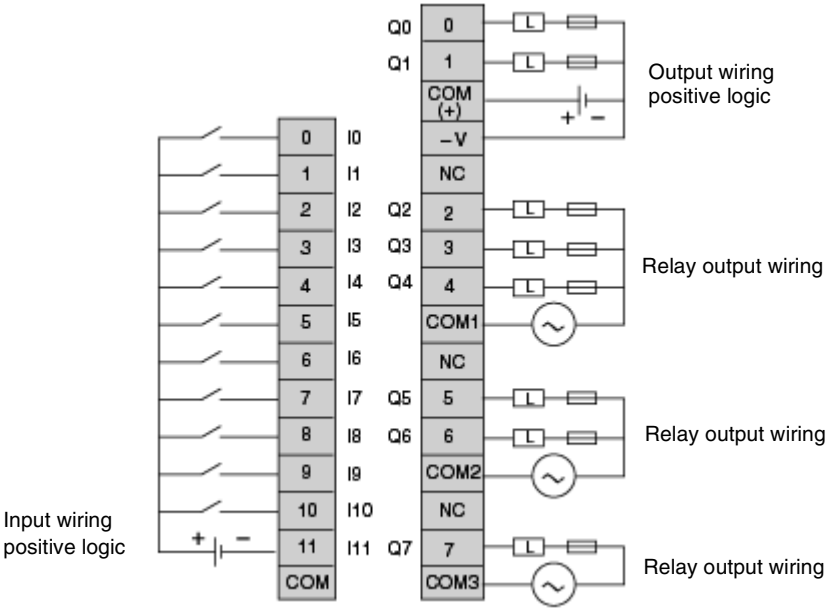
This section shows examples of wiring diagrams for Advantys OTB network interface modules.

Note: These schematics are for external wiring only.

Note: The shaded boxes are markings on the module. The I and Q numbers are the input and output points.

Wiring Diagram for OTB Modules

This schematic is for OTB1•0DM9LP modules.



- Output points 0 and 1 are transistor source outputs, all other output points are relay.
- The COM terminals are **not** connected together internally.
- Connect an appropriate fuse for the load.

How to Connect the Power Supply

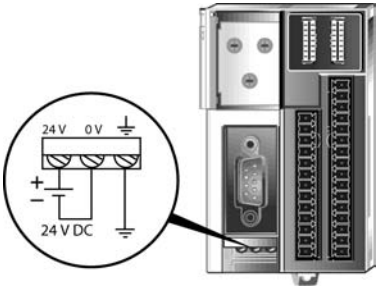
Introduction

This section describes how to connect the power supply to the network interface modules.

> **⚠ WARNING**
>
> **UNEXPECTED EQUIPMENT OPERATION**
>
> When operating outside of the specified voltage range, outputs may not switch accordingly. Use an appropriate externally wired safety system (voltage controllers) and voltage monitoring circuits.
>
> **Failure to follow this instruction can result in death or serious injury.**

Power Connection for a Network Interface Module

The following diagram describes the power connection for an Advantys OTB network interface module.



Network Interface Module Power Supply Specifications

The following table describes the power supply specifications for the network interface module.

Item	Characteristics
Power supply voltage	Rated power voltage: 24 VDC Allowable range: from 20.4 to 26.4 VDC **Note:**Momentary power interruption for 10 ms or less at 24 VDC is not recognized as failure.
Inrush current flow at power-up	50 A maximum
Power supply wiring	0.64 mm^2 (UL1015 AWG22) or 1.02 mm^2 (UL1007 AWG18) Make the power supply wiring as short as possible.
Ground wiring	0.64 mm^2 (UL1015 AWG22) or 1.02 mm^2 (UL1007 AWG18) Do not connect ground wire in common with ground wire of motor equipment. The earth connection should be as short as possible < 10 cm (3.9 inch).

Connection of the Field Bus or Network

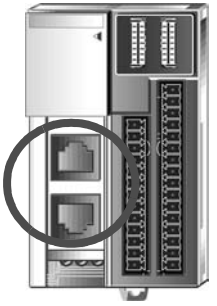
Overview

The specific types of cables and connectors for connecting the field bus or network of the OTB module vary according to the network used. Detailed cabling and connector information is given in Chapter 5 "Communication".

Connection of the Field Bus or Network

The field bus is connected between your master or server and the complete and physically installed OTB island. In order to make this connection, simply press the field bus connector into the specially-provided receptacle, and lock the connector in place.
There are three types of OTB module: CANOpen, Modbus and Ethernet. These represent the three available field bus protocols or networks. Below are the illustrations of the three types of different module. We draw your attention to the different field bus or network plugs.

OTB CANopen



OTB Modbus

Description, characteristics, and wiring of the expansion modules

4

At a Glance

Introduction

This chapter provides an overview of the analog and Discrete I/O expansion modules. Information on functions and wiring is given for each expansion module.

What's in this Chapter?

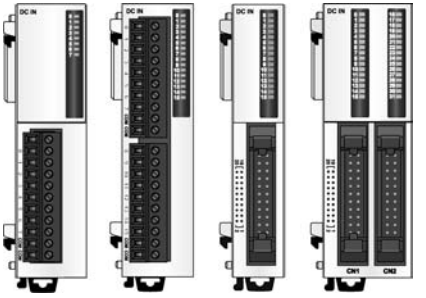
This chapter contains the following topics:

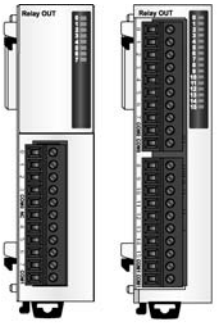
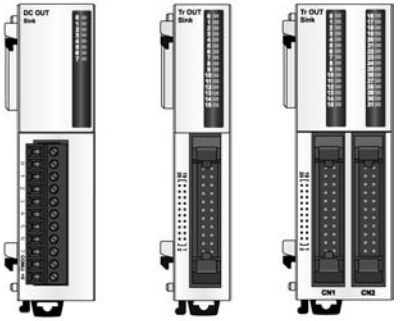
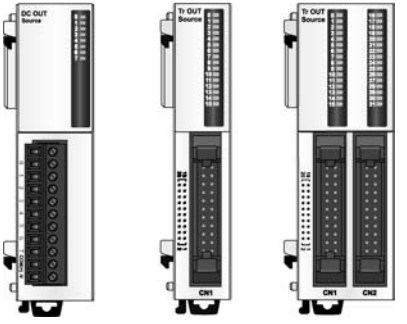
Overview of Digital I/O Modules

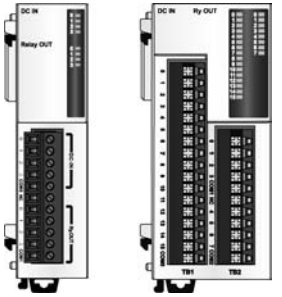
Introduction The following section provides an overview of the digital I/O modules.

Illustrations

The following illustrations are the digital input, output, and mixed I/O modules.

Module type	Illustration
There are 5 digital input modules: ● 8-point module with a terminal block (TWDDDI8DT, TWDDAI8DT) ● 16-point module with a terminal block (TWDDDI16DT) ● 16-point module with a connector (TWDDDI16DK) ● 32-point module with a connector (TWDDDI32DK) These modules can be attached to any communication module.	TWDDDI8DT TWDDAI8DT TWDDDI16DK TWDDDI16DT TWDDDI32DK 

Module type	Illustration
There are 8 digital output modules: ● 8-point relay output module with a terminal block (TWDDRA8RT) ● 16-point relay output module with a terminal block (TWDDRA16RT) ● 8-point transistor sink module with a connector (TWDDDO8UT) ● 16-point transistor sink module with a connector (TWDDDO16UK) ● 32-point transistor sink module with a connector (TWDDDO32UK) ● 8-point transistor source module with a terminal block (TWDDDO8TT) ● 16-point transistor source module with a connector (TWDDDO16TK) ● 32-point transistor source module with a connector (TWDDDO32TK) These modules can be attached to any communication module.	TWDDRA8RT TWDDRA16RT  TWDDDO8UT TWDDDO16UK TWDDDO32UK  TWDDDO8TT TWDDDO16TK TWDDDO32TK 

Module type	Illustration
There are 2 digital mixed input and output modules: ● 4-point input/4-point output module with a terminal block (TWDDMM8RT) ● 16-point input/8-point output module with a wire-clamp terminal block (TWDDMM24DRF) These modules can be attached to any communication module.	TWDDMM8RT TWDDMM24DRF 

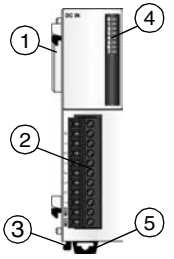
Parts Description of Digital I/O Modules

Introduction

The following section describes the parts of a digital I/O module with a terminal block and with a connector. Your I/O module may differ from the illustrations but the parts will be the same.

Parts Description of a Digital I/O Module with a Terminal Block

The following figure shows the parts of a digital I/O module with a terminal block. This figure is the TWDDDI8DT module.

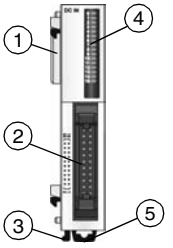


Legend

Label	Description
1	Expansion connector - one on each side, right side not shown
2	Terminal block
3	Latch button
4	LEDs
5	Clamp

Parts Description of a Digital I/O Module with a Connector

The following figure shows the parts of a digital I/O module with a connector. This figure is the TWDDDO16TK module.



Legend

Label	Description
1	Expansion connector - one on each side, right side not shown
2	Connector
3	Latch button
4	LEDs
5	Clamp

Specifications for the Digital I/O Modules

Introduction

This section presents the specifications for the digital I/O modules.

TWDDDI8DT, TWDDDI16DT, TWDDDI16DK, TWDDDI32DK and TWDDAI8DT Specifications

> **⚠ WARNING**
>
> **HAZARD OF UNINTENDED EQUIPMENT OPERATION AND EQUIPMENT DAMAGE**
>
> If any input exceeding the rated value is applied, permanent damage may be caused.
>
> **Failure to follow this instruction can result in death or serious injury.**

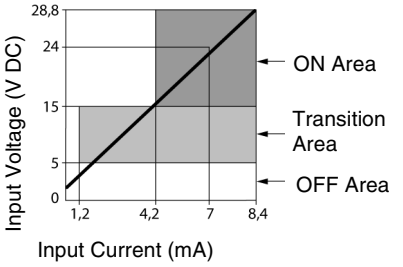
Reference	TWDDDI8DT	TWDDDI16DT	TWDDDI16DK	TWDDDI32DK	TWDDAI8DT
Input points	8 points in 1 common line	16 points in 1 common line	16 points in 1 common line	32 points in 2 common lines	8 points in 2 common lines
Rated input voltage	24 VDC source/sink input signal				120 VAC
Input voltage range	from 20.4 to 28.8 VDC				Maximum 132 VAC
Rated input current	7 mA/input (24 VDC)		5 mA/input (24 VDC)		7.5 mA/input (100 VDC)
Input impedance	3.4 kΩ		4.4 kΩ		11 kΩ
Turn on time 24 VDC/120 VAC	8 ms				25 ms
Turn off time 24 VDC/120 VAC	8 ms				30ms
Isolation	Between input terminals and internal circuit: photocoupler isolated (isolation protection up to 500 V) Between input terminals: not isolated				
External load for I/O interconnection	Not needed				
Signal determination method	Static				
Effect of improper input connection	The input signals can be both sink and source.				Input signals must be AC type
Cable length	3m (9.84 ft.) in compliance with electromagnetic immunity				
Connector insertion/ removal durability	100 times minimum				
Internal current draw - all inputs on	25 mA (5 VDC) 0 mA (24 VDC)	40 mA (5 VDC) 0 mA (24 VDC)	35 mA (5 VDC) 0 mA (24 VDC)	65 mA (5 VDC) 0 mA (24 VDC)	55 mA (5 VDC) 0 mA (24 VDC)

Reference	TWDDDI8DT	TWDDDI16DT	TWDDDI16DK	TWDDDI32DK	TWDDAI8DT
Internal current draw - all inputs off	5 mA (5 VDC) 0 mA (24 VDC)	5 mA (5 VDC) 0 mA (24 VDC)	5 mA (5 VDC) 0 mA (24 VDC)	10 mA (5 VDC) 0 mA (24 VDC)	25 mA (5 VDC) 0 mA (24 VDC)
Weight	85 g (3 oz)	100 g (3.5 oz)	65 g (2.3 oz)	100 g (3.5 oz)	81 g (2.9 oz)

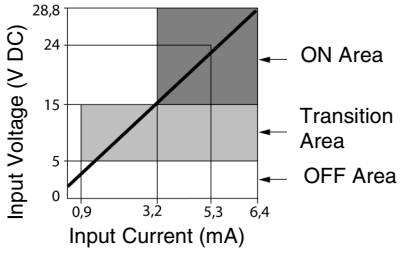
TWDDDI8DT, TWDDDI16DT, TWDDDI16DK, TWDDDI32DK and TWDDAI8DT Operating Range

The operating range of the Type 1 (IEC 61131-2) input module is shown below.

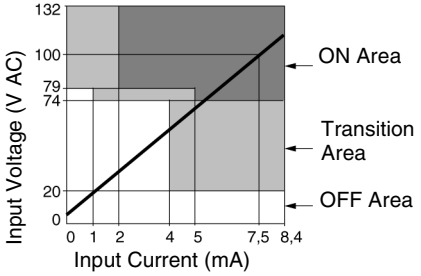
TWDDDI8DT and TWDDDI16DT



TWDDDI16DK and TWDDDI32DK



TWDDAI8DT

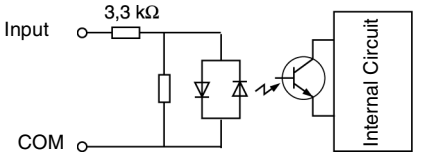


TWDDDI8DT, TWDDDI16DT, TWDDDI16DK, TWDDDI32DK and TWDDAI8DT Internal Circuit

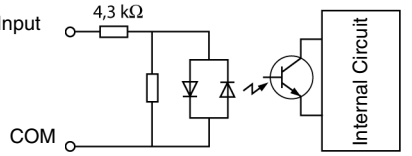
The input internal circuit is shown below.

Sink Or Source Input

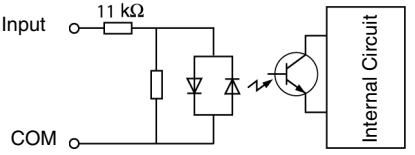
TWDDDI8DT and TWDDDI16DT



TWDDDI16DK and TWDDDI32DK

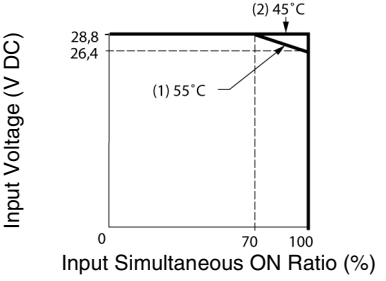


TWDDAI8DT

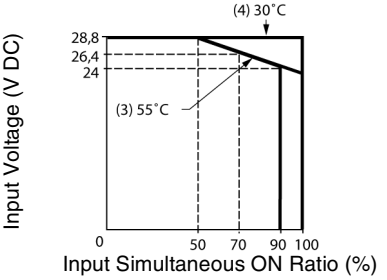


TWDDDI8DT, TWDDDI16DT, TWDDDI16DK, TWDDDI32DK and TWDDAI8DT Usage Limits

When using TWDDDI16DT at 55°C (131°F) in the normal mounting direction, limit the inputs which turn on simultaneously along line (1). At 45°C (113°F), all inputs can be turned on simultaneously at 28.8 VDC as indicated with line (2).



When using TWDDDI16DK and TWDDDI32DK at 55°C (131°F), limit the inputs which turn on simultaneously on each connector along line (3). This limitation applies per connecter. At 30°C (86°F), all inputs can be turned on simultaneously at 28.8 VDC as indicated with line (4).



When using TWDDDI8DT, all inputs can be turned on simultaneously at 55°C (131°F), input voltage 28.8 VDC.

TWDDRA8RT and TWDDRA16RT Specifications

⚠ CAUTION

ELECTRIC SHOCKS AND FIRE HAZARDS

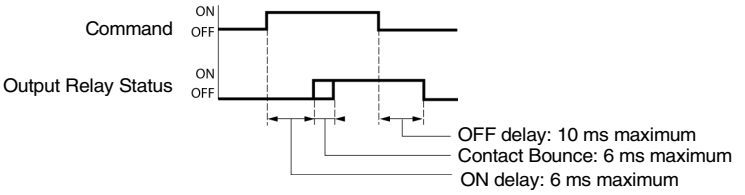
Possible current overload; size cable accordingly.

Failure to follow this instruction can result in injury.

Reference number	TWDDRA8RT	TWDDRA16RT
Output points and common lines	8 NO contacts in 2 common lines	16 NO contacts in 2 common lines
Maximum load current	2 A per output	
	7 A per common line	8 A per common line
Minimum switching load	0.1 mA/0.1 VDC (reference value)	
Initial contact resistance	30 mΩ maximum	
Electrical life	100,000 operations minimum (rated load 1,800 operations/h)	
Mechanical life	20,000,000 operations minimum (rated load 18,000 operations/h)	
Rated load (resistive/inductive)	240 VAC/2 A, 30 VDC/2 A	
Dielectric strength	Between output to terminals: 1,500 VAC, 1 minute Between output terminal and internal circuit: 1,500 VAC, 1 minute Between output terminals (COMs): 1,500 VAC, 1 minute	
Connector insertion/removal durability	100 times minimum	
Internal current draw - all outputs on	30 mA (5 VDC) 40mA (24 VDC)	45 mA (5 VDC) 75 mA (24 VDC)
Internal current draw - all outputs off	5 mA (5 VDC) 0 mA (24 VDC)	5 mA (5 VDC) 0 mA (24 VDC)
Weight	110 g (3.9 oz)	145 g (5.1 oz)

TWDDRA8RT and TWDDRA16RT Delay

The output delay is shown below.



TWDDDO8UT, TWDDDO16UK, and TWDDDO32UK Specifications

Reference number	TWDDDO8UT	TWDDDO16UK	TWDDDO32UK
Output type	Transistor sink output		
Output points per common Line	8 points in 1 common line	16 points in 1 common line	32 points in 2 common lines
Rated load voltage	24 VDC		
Operating load voltage range	from 20.4 to 28.8 VDC		
Rated load current	0.3 A per output	0.1 A per output	
Maximum load current	0.36 A per output 3 A per common line	0.12 A per output 1 A per common line	
Voltage drop (on voltage)	1 V maximum (voltage between COM and output terminals when output is on)		
Inrush current	1 A maximum		
Leakage current	0.1 A maximum		
Clamping voltage	39 V +/-1 V		
Maximum lamp load	8 W		
Inductive load	L/R = 10 ms (28.8 VDC, 1 Hz)		
External current draw	100 mA maximum, 24 VDC (power voltage at the +V terminal)		
Isolation	Between input terminals and internal circuit: photocoupler isolated (isolation protection up to 500 V) Between input terminals: not isolated		
Connector insertion/removal durability	100 times minimum		
Internal current draw - all outputs on	10 mA (5 VDC) 20 mA (24 VDC)	10 mA (5 VDC) 40mA (24 VDC)	20 mA (5 VDC) 70 mA (24 VDC)
Internal current draw - all outputs off	5 mA (5 VDC) 0 mA (24 VDC)	5 mA (5 VDC) 0 mA (24 VDC)	10 mA (5 VDC) 0 mA (24 VDC)
Output delay	Turn on time: 300 µs maximum Turn off time: 300 µs maximum		
Weight	85 g (3 oz)	70 g (2.5 oz)	105 g (3.7 oz)

TWDDDO8TT, TWDDDO16TK, and TWDDDO32TK Specifications

Reference number	TWDDDO8TT	TWDDDO16TK	TWDDDO32TK
Output type	Transistor source output		
Output points per common Line	8 points in 1 common line	16 points in 1 common line	32 points in 2 common lines
Rated load voltage	24 VDC		
Operating load voltage range	from 20.4 to 28.8 VDC		
Rated load current	0.3 A per output	0.1 A per output	
Maximum load current	0.36 A per output 3 A per common line	0.12 A per output 1 A per common line	
Voltage drop (on voltage)	1 V maximum (voltage between COM and output terminals when output is on)		
Inrush current	1 A maximum		
Leakage current	0.1 mA maximum		
Clamping voltage	39 V +/-1 V		
Maximum lamp load	8 W		
Inductive load	L/R = 10 ms (28.8 VDC, 1 Hz)		
External current draw	100 mA maximum, 24 VDC (power voltage at the +V terminal)		
Isolation	Between input terminals and internal circuit: photocoupler isolated (isolation protection up to 500 V) Between input terminals: not isolated		
Connector insertion/removal durability	100 times minimum		
Internal current draw - all outputs on	10 mA (5 VDC) 20 mA (24 VDC)	10 mA (5 VDC) 40mA (24 VDC)	20 mA (5 VDC) 70 mA (24 VDC)
Internal current draw - all outputs off	5 mA (5 VDC) 0 mA (24 VDC)	5 mA (5 VDC) 0 mA (24 VDC)	10 mA (5 VDC) 0 mA (24 VDC)
Output delay	Turn on time: 300 µs maximum Turn off time: 300 µs maximum		
Weight	85 g (3 oz)	70 g (2.5 oz)	105 g (3.7 oz)

TWDDMM8DRT and TWDDMM24DRF Input Specifications

⚠ WARNING

HAZARD OF UNINTENDED EQUIPMENT OPERATION AND EQUIPMENT DAMAGE

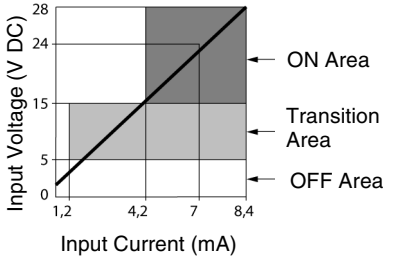
If any input exceeding the rated value is applied, permanent damage may be caused.

Failure to follow this instruction can result in death or serious injury.

Reference number	TWDDMM8DRT	TWDDMM24DRF
I/O points	4 inputs and 4 outputs	16 inputs and 8 outputs
Rated input voltage	24 VDC source/sink input signal	
Input voltage range	from 20.4 to 28.8 VDC	
Rated input current	7 mA/input (24 VDC)	
Input impedance	3.4 kΩ	
Turn on time (24 VDC)	4 ms (24 VDC)	
Turn off time (24 VDC)	4 ms (24 VDC)	
Isolation	Between input terminals and internal circuit: photocoupler isolated (isolation protection up to 500 V) Between input terminals: not isolated	
External load for I/O interconnection	Not needed	
Signal determination method	Static	
Effect of improper input connection	Both sinking and sourcing input signals can be connected.	
Cable length	3m (9.84 ft.) in compliance with electromagnetic immunity	
Connector insertion/removal durability	100 times minimum	Not removable
Internal current draw - all I/O on	25 mA (5 VDC) 20 mA (24 VDC)	65 mA (5 VDC) 45 mA (24 VDC)
Internal current draw - all I/O off	5 mA (5 VDC) 0 mA (24 VDC)	10 mA (5 VDC) 0 mA (24 VDC)
Weight	95 g (3.3 oz)	140 g (4.9 oz)

TWDDMM8DRT and TWDDMM24DRF Input Operating Range

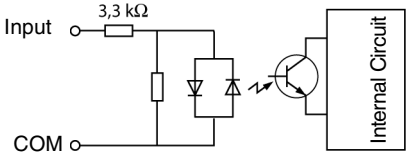
The input operating range of the Type 1 (IEC 61131-2) input module is shown below.



TWDDMM8DRT and TWDDMM24DRF Input Internal Circuit

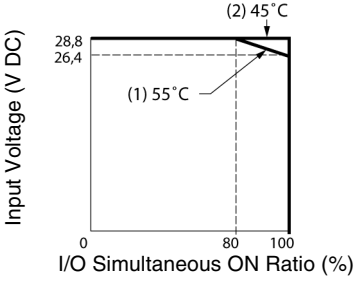
The input internal circuit is shown below.

Standard Sink or Source Input



TWDDMM8DRT and TWDDMM24DRF Usage Limits

When using TWDDMM24DRF at an ambient temperature of 55°C (131°F) in the normal mounting direction, limit the inputs and outputs, respectively, which turn on simultaneously along line (1). At 45°C (113°F), all inputs and outputs can be turned on simultaneously at 28.8 VDC as indicated with line (2).



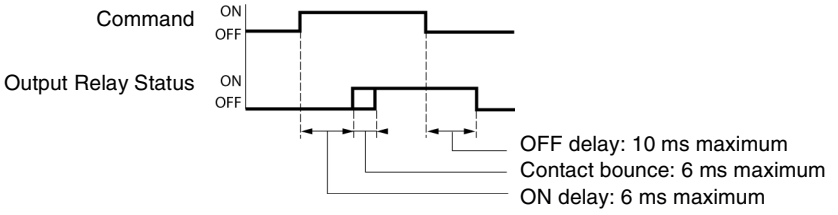
When using TWDDMM8DRT, all inputs and outputs can be turned on simultaneously at 55°C (131°F), input voltage 28.8 VDC.

TWDDMM8DRT and TWDDMM24DRF Output Specifications

Reference number	TWDDMM8DRT	TWDDMM24DRF
Output points and common lines	4 NO contacts in 1 common line	8 NO contacts in 2 common lines
Maximum load current	2 A per output 7 A per common line	
Minimum switching load	0.1 mA/0.1 VDC (reference value)	
Initial contact resistance	30 mΩ maximum	
Electrical life	100,000 operations minimum (rated load 1,800 operations/h)	
Mechanical life	20,000,000 operations minimum (rated load 18,000 operations/h)	
Rated load (resistive/inductive)	240 VAC/2 A, 30 VDC/2 A	
Dielectric strength	Between the output and ground terminals: 1,500 VAC, 1 minute Between output terminal and internal circuit: 1,500 VAC, 1 minute Between output terminals (COMs): 1,500 VAC, 1 minute	

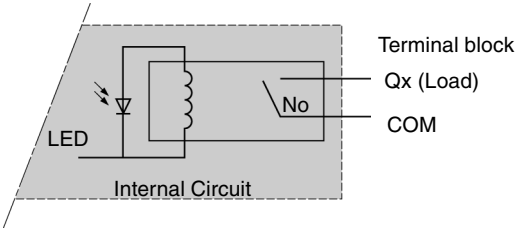
TWDDMM8DRT and TWDDMM24DR Output Delay

The output delay is shown below.



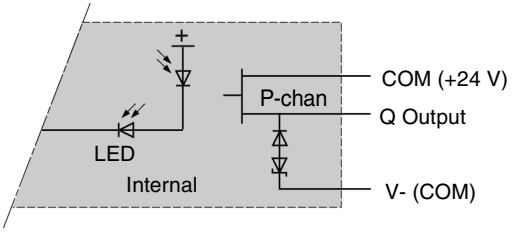
Relay Output Contact

The relay output contact is shown below.



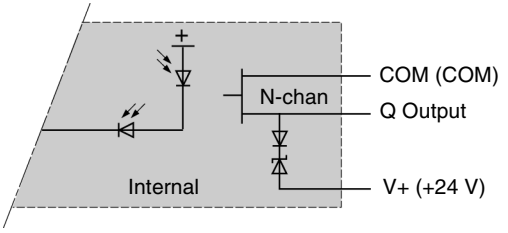
Transistor Source Output Contact

The transistor source output contact is shown below.



Transistor Sink Output Contact

The transistor sink output contact is shown below.



Digital I/O Module Wiring Schematics

Introduction

This section shows examples of wiring schematics for the digital I/O modules.

⚠ DANGER

ELECTRIC SHOCK

- Be sure to remove ALL power from ALL devices before connecting or disconnecting inputs or outputs to any terminal or installing or removing any hardware.
- Make sure you have COMPLETELY powered down ALL devices before connecting or disconnecting the bus or network.

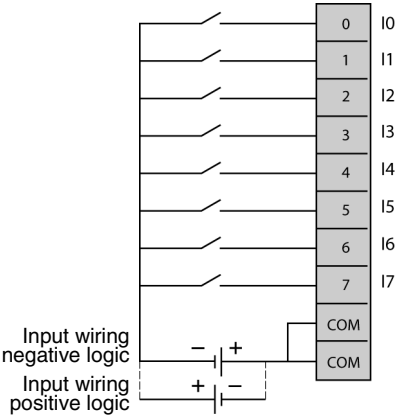
Failure to follow this instruction will result in death or serious injury.

Note: These schematics are for external wiring only.

Note: The shaded boxes are markings on the digital I/O modules. The I and Q numbers are the input and output points.

TWDDDI8DT Wiring Schematic

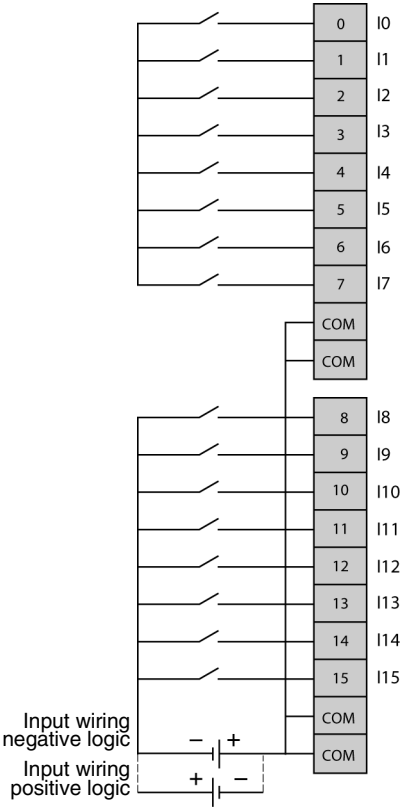
This schematic is for the TWDDDI8DT module.



- The two COM terminals are connected together internally.

TWDDDI16DT Wiring Schematic

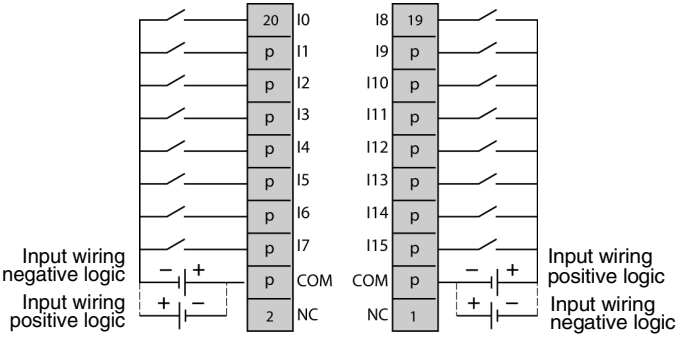
This schematic is for the TWDDDI16DT module.



- The four COM terminals are connected together internally.

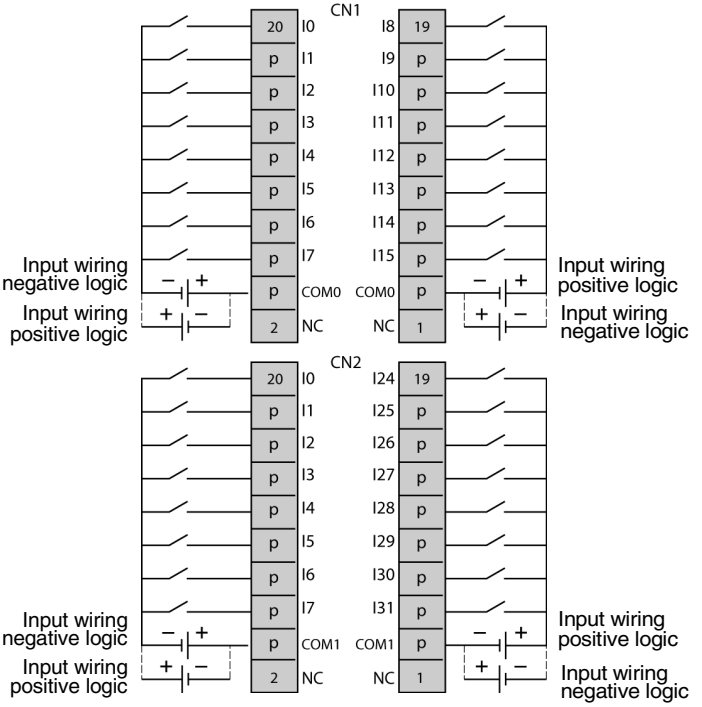
TWDDDI16DK Wiring Schematic

This schematic is for the TWDDDI16DK module.



TWDDDI32DK Wiring Schematic

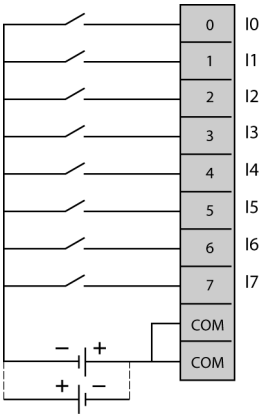
This schematic is for the TWDDDI32DK module.



- The COM0 terminals are connected together internally.
- The COM1 terminals are connected together internally.
- The COM0 and COM1 terminals are **not** connected together internally.

TWDDAI8DT Wiring Schematic

This schematic is for the TWDDAI8DT module.

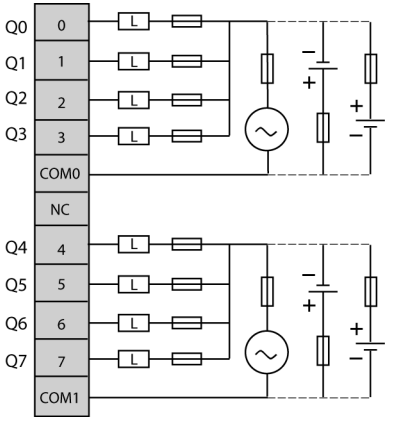


- The COM0 and COM1 terminals are **not** connected together internally.

TWDDRA8RT Wiring Schematic

This schematic is for the TWDDRA8RT module.

Relay output wiring

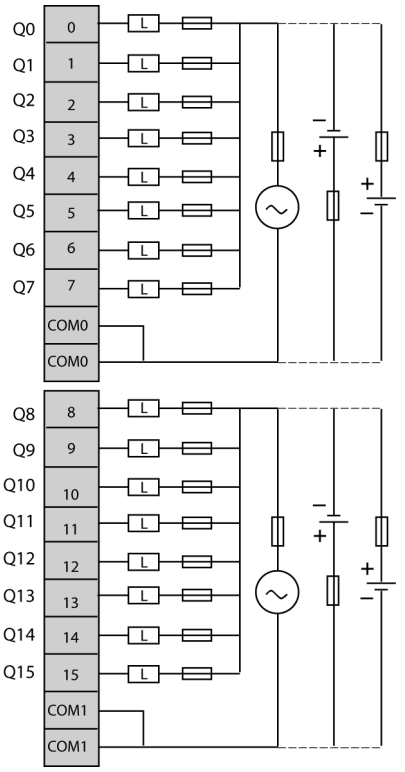


- The COM0 and COM1 terminals are **not** connected together internally.
- Connect an appropriate fuse for the load.

TWDDRA16RT Wiring Schematic

This schematic is for the TWDDRA16RT module.

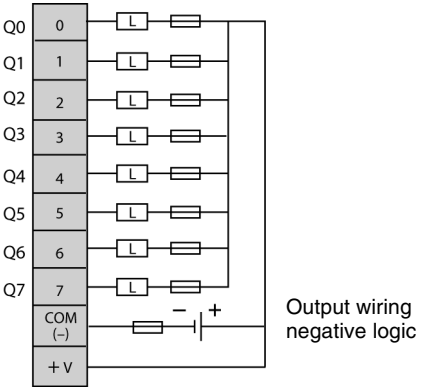
Relay output wiring



- The COM0 terminals are connected together internally.
- The COM1 terminals are connected together internally.
- The COM0 and COM1 terminals are **not** connected together internally.
- Connect an appropriate fuse for the load.

TWDDDO8UT Wiring Schematic

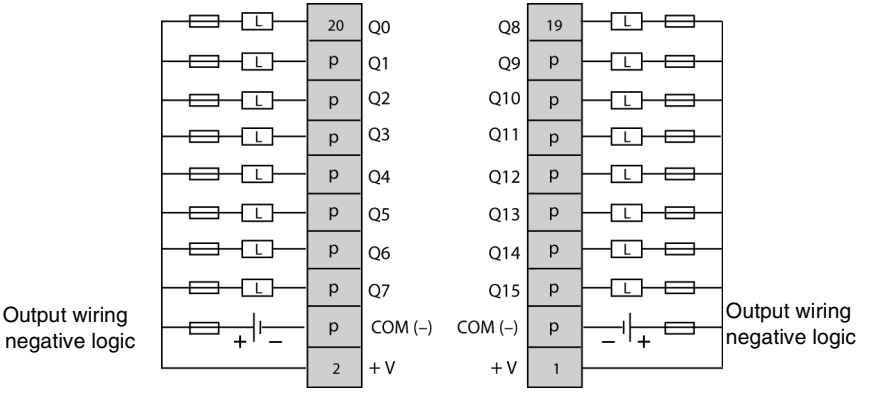
This schematic is for TWDDDO8UT module.



- Connect an appropriate fuse for the load.

TWDDDO16UK Wiring Schematic

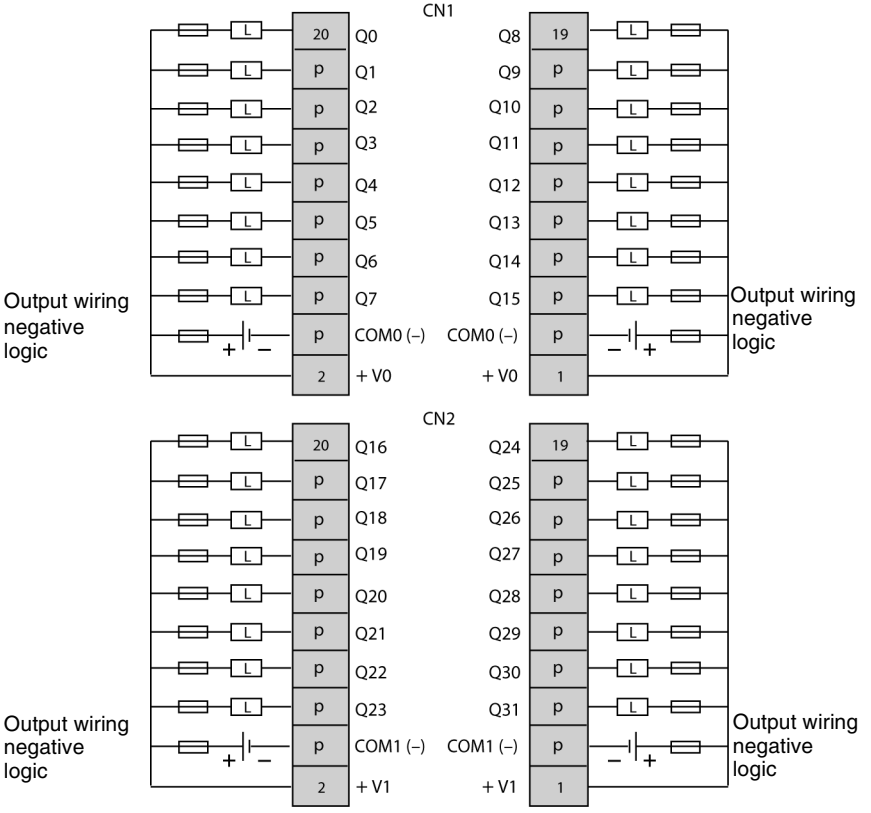
This schematic is for the TWDDDO16UK module.



- The COM(-) terminals are connected together internally.
- The +V terminals are connected together internally.
- Connect an appropriate fuse for the load.

TWDDDO32UK Wiring Schematic

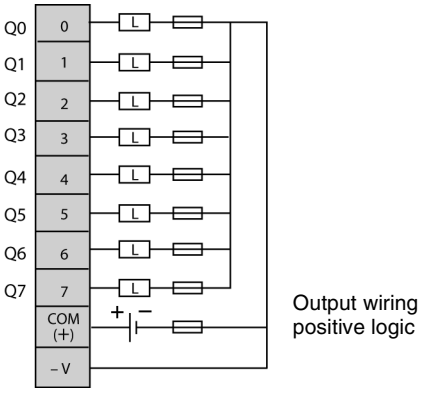
This schematic is for the TWDDDO32UK module.



- Terminals on CN1 and CN2 are **not** connected together internally.
- The COM0(-) terminals are connected together internally.
- The COM1(-) terminals are connected together internally.
- The +V0 terminals are connected together internally.
- The +V1 terminals are connected together internally.
- Connect an appropriate fuse for the load.

TWDDDO8TT Wiring Schematic

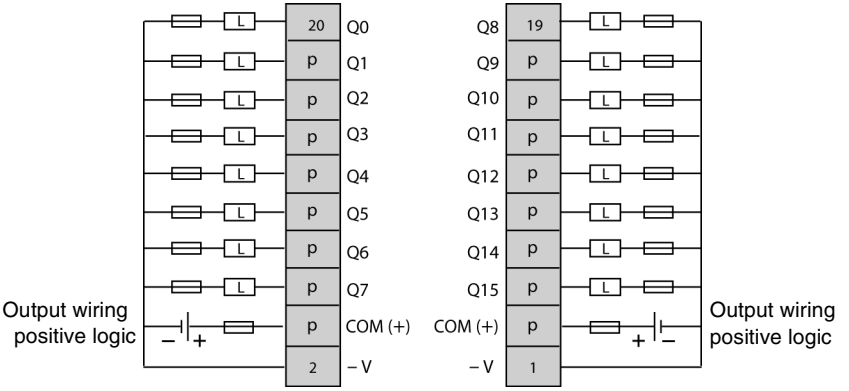
This schematic is for the TWDDDO8TT module.



- Connect an appropriate fuse for the load.

TWDDDO16TK Wiring Schematic

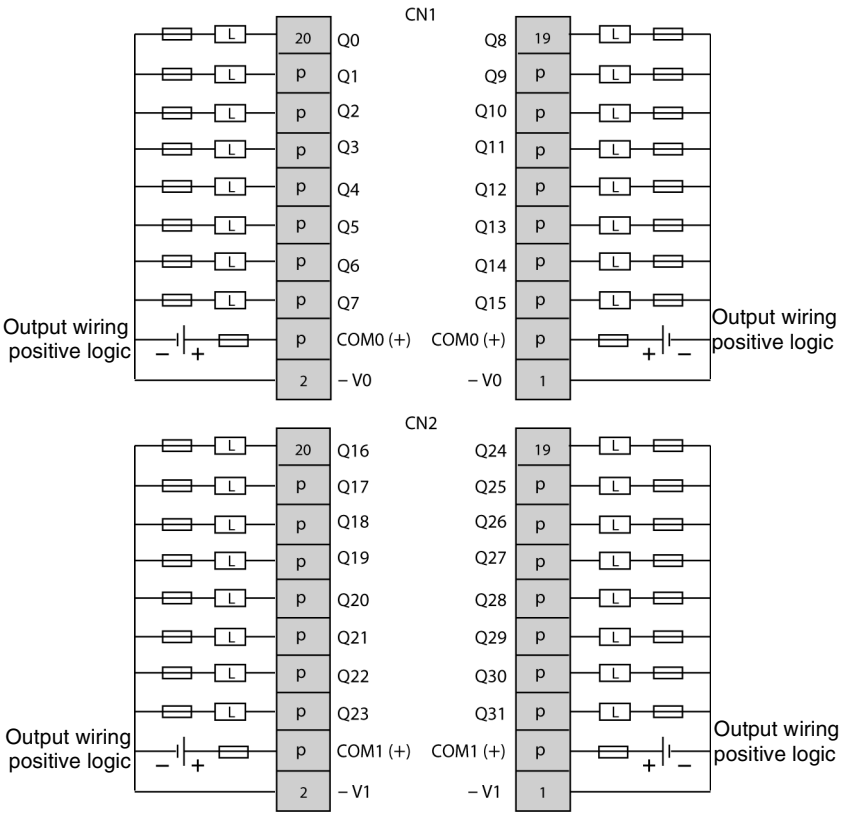
This schematic is for the TWDDDO16TK module.



- The COM(+) terminals are connected together internally.
- The -V terminals are connected together internally.
- Connect an appropriate fuse for the load.

TWDDDO32TK Wiring Schematic

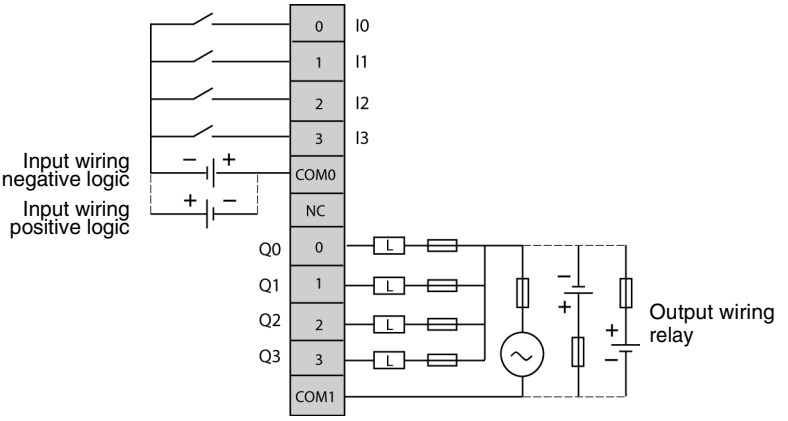
This schematic is for the TWDDDO32TK module.



- Terminals CN1 and CN2 are **not** connected together internally.
- The COM0(+) terminals are connected together internally.
- The COM1(+) terminals are connected together internally.
- The -V0 terminals are connected together internally.
- The -V1 terminals are connected together internally.
- Connect an appropriate fuse for the load.

TWDDMM8DRT Wiring Schematic

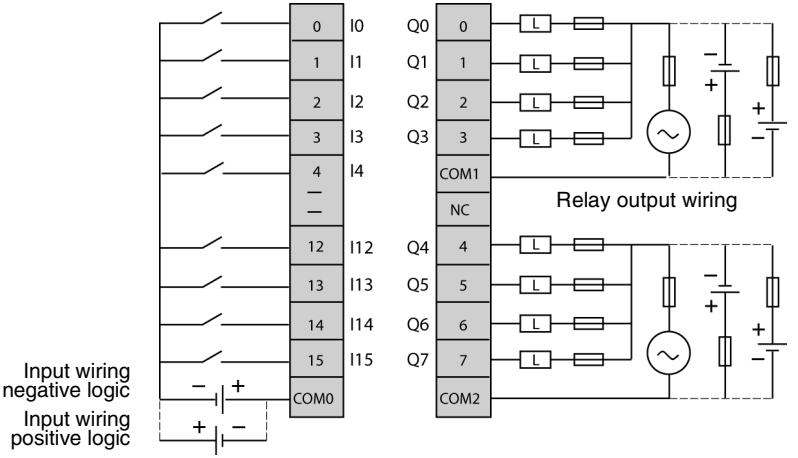
This schematic is for the TWDDMM8DRT module.



- The COM0 and COM1 terminals are **not** connected together internally.

TWDDMM24DRF Wiring Schematic

This schematic is for the TWDDMM24DRF module.



- The COM0, COM1 and COM2 terminals are **not** connected together internally.
- Connect an appropriate fuse for the load.

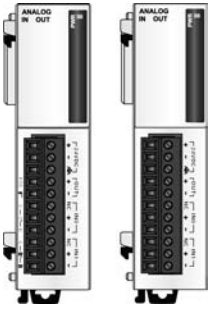
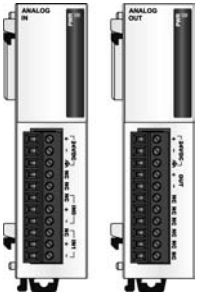
Overview of Analog I/O Modules

Introduction

The following section provides an overview of the analog I/O modules.

Illustrations

The following illustrations are the analog I/O modules.

Module type	Illustration
These 2 analog I/O modules are: ● 2-point input/1-point output module with a terminal block, accepts thermocouple and resistance thermometer signals (TWDALM3LT) ● 2-point input/1-point output module with a terminal block (TWDAMM3HT) These modules can be attached to any communication module.	TWDALM3LT TWDAMM3HT 
These 2 analog I/O modules are: ● 2-point input module with a terminal block (TWDAMI2HT) ● 1-point output module with a terminal block (TWDAMO1HT) These modules can be attached to any communication module.	TWDAMI2HT TWDAMO1HT 

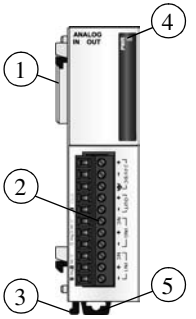
Parts Description of Analog I/O Modules

Introduction

The following section describes the parts of an analog I/O module. Your I/O module may differ from the illustrations but the parts will be the same.

Parts Description of an Analog I/O Module

The following figure shows the parts of an analog I/O module. This figure is the TWDALM3LT module.



Legend

Label	Description
1	Expansion connector - one on each side, right side not shown
2	Removable terminal block
3	Latch button
4	LEDs
5	Clamp

General Specifications for the Analog I/O Modules

Introduction

This section is general specifications for analog I/O modules.

General Specifications

Reference	TWDALM3LT	TWDAMM3HT	TWDAMI2HT	TWDAMO1HT
Rated power voltage	24 VDC			
Allowable voltage range	from 20.4 to 28.8 VDC			
Average number of connector insertions/ removals	100 times minimum			
Internal current draw - internal power	50mA (5 VDC) 0 mA (24 VDC)			
Internal current draw - external power	40mA (24 VDC)			
Weight	85 g (3oz)			

Specifications for the Analog I/O Modules

Introduction

This section contains the I/O specifications for the analog I/O modules.

Input Specifications

Analog Input Specifications	Voltage Input	Current Input	Thermocouple	Resistance Thermometer
Input range	from 0 to 10 VDC	from 4 to 20 mA DC	Type K (0 to 1300 °C) (32 to 2372 °F) Type J (0 to 1200 °C) (32 to 2192 °F) Type T (0 to 400 °C) (32 to 742 °F)	Pt 100 3-wire type (-100 to 500 °C) (-148 to 932 °F)
Input impedance	1 MΩ min.	10 Ω	1 MΩ min.	1 MΩ min.
Sample duration time	16 ms max.		50 ms max.	
Sample repetition time	16 ms max.		50 ms max.	
Measurement conversion time	32 ms		100 ms	
Input type	Single-ended input	Differential input		
Operating mode	Self-scan			
Conversion mode	ΣΔ type ADC			
Input error - maximum error at 25°C (77°F)	±0.2% of full scale		±0.2% of full scale plus reference junction compensation accuracy ±4°C max	±0.2% of full scale
Input error - temperature coefficient	±0.006% of full scale/degree C			
Input error - repeatable after stabilization time	±0.5% of full scale			
Input error - nonlinear	±0.2% of full scale			
Input error - maximum error	±1% of full scale			
Digital resolution	4096 increments (12 bits)			
Input value of LSB	2.5 mV	4 µA	K: 0.325 °C J: 0.300 °C T: 0.100 °C	0.15 °C

Analog Input Specifications	Voltage Input	Current Input	Thermocouple	Resistance Thermometer
Data type in application program	0 to 4095 (12 bit data) -32768 to 32767 (optional range designation)[2]			
Monotonicity	Yes			
Input data out of range	Detectable[3]			
Noise resistance - maximum temporary deviation during electrical noise tests	±3% maximum when a 500 V clamp voltage is applied to the power and I/O wiring			Accuracy is not assured when noise is applied
Noise resistance - common mode characteristics	Common mode reject ration (CMRR): -50 dB			
Noise resistance - common mode voltage	16 VDC			
Noise resistance - input filter	No			
Noise resistance - cable	Twisted-pair shielded cable is recommended for improved noise immunity		—	
Noise resistance - crosstalk	2 LSB maximum			
Dielectric strength	500 V between input and power circuit			
Type of protection	Photocoupler between input and internal circuit			
Maximum permanent allowed overload (no damage)	13 VDC	40 mA DC	—	
Selection of analog input signal type	Using software programming			
Calibration or verification to maintain rated accuracy	Approximately 10 years			

Note:

1. Total input system transfer time = repetition of the sample x 2
2. The 12-bit data (0 to 4095) processed in the Analog I/O module can be linear-converted to a value between -32768 and 32767. The optional range designation and analog I/O data minimum and maximum values can be selected using data registers allocated to analog I/O modules.
3. When an error is detected, a corresponding error code is stored to a data register allocated to analog I/O operating status.

Output Specifications

Analog Output Specifications	Voltage output	Current Output
Output range	from 0 to 10 VDC	from 4 to 20 mA DC
Load impedance	2 kΩ max	300 Ω maximum
Application load type	Resistive load	
Settling time	20 ms	
Total output system transfer Time	20 ms	
Output error - maximum error at 25°C (77°F)	±0.2% of full scale	
Output error - temperature coefficient	±0.015% of full scale/degree C	
Output error - repeatable after stabilization time	±0.5% of full scale	
Output error - output voltage drop	±1% of full scale	
Output error - nonlinear	±0.2% of full scale	
Output error - output ripple	1 LSB maximum	
Output error - overshoot	0%	
Output error - total error	±1% of full scale	
Digital resolution	4096 increments (12 bits)	
Output value of LSB	2.5 mV	4 μA
Data type in application program	0 to 4095 (12 bit data) -32768 to 32767 (optional range designation)[1]	
Monotonicity	Yes	
Current loop open	—	Detectable[2]
Noise resistance - maximum temporary deviation during electrical noise tests	±3% maximum when a 500 V clamp voltage is applied to the power and I/O wiring	
Noise resistance - cable	Twisted-pair shielded cable is recommended for improved noise immunity	
Noise resistance - crosstalk	No crosstalk because of 1 channel output	
Dielectric strength	500 V between output and power circuit	
Type of protection	Photocoupler between output and internal circuit	
Selection of analog input signal type	Using software programming	
Calibration or verification to maintain rated accuracy	Approximately 10 years	

Note:

1. The 12-bit data (0 to 4095) processed in the Analog I/O module can be linear-converted to a value between -32768 and 32767. The optional range designation and analog I/O data minimum and maximum values can be selected using data registers allocated to analog I/O modules.
2. When an error is detected, a corresponding error code is stored to a data register allocated to analog I/O operating status.

Analog I/O Modules Wiring Schematics

Introduction

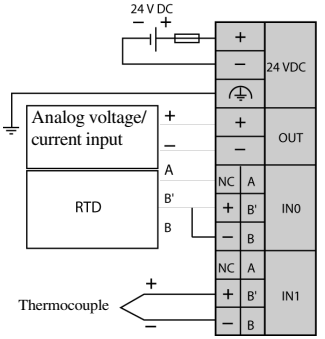
This section shows examples of wiring schematics for the Analog I/O modules.

TWDALM3LT Wiring Schematic

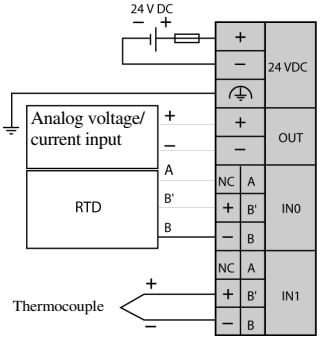
> **⚠ WARNING**
>
> **HAZARD OF UNINTENDED EQUIPMENT OPERATION AND EQUIPMENT DAMAGE**
>
> - Do not connect any wiring to unused channels.
> - Do not connect the thermocouple to a hazardous voltage (60 VDC or 42.4 V peak or higher.)
>
> **Failure to follow this instruction can result in death or serious injury.**

This schematic is for the TWDALM3LT module.

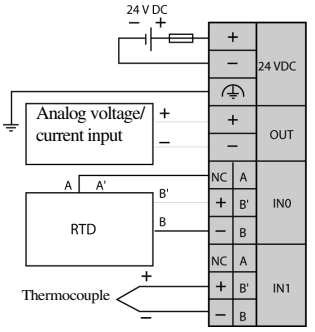
2-wire cabling:



3-wire cabling:



4-wire cabling:

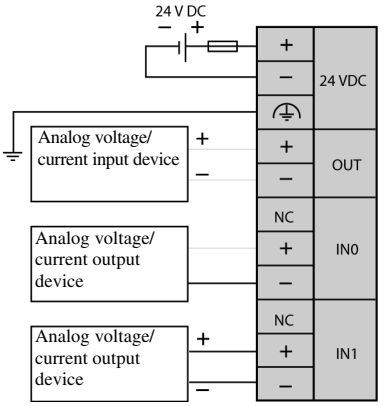


Note: For 4-wire cabling, output A' is not connected.

- Connect a fuse appropriate for the applied voltage and current draw, at the position shown in the diagram.
- When connecting an RTD, connect the three wires to terminals A, B', and B of input channel 0 or 1.
- When connecting a thermocouple, connect the two wires to terminals B' and B of input channel 0 or 1.

TWDAMM3HT Wiring Schematic

This schematic is for the TWDAMM3HT module.

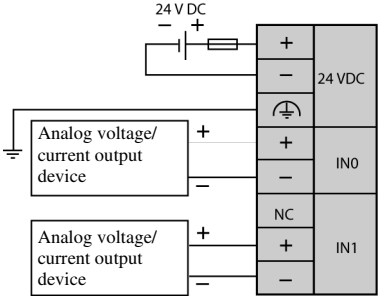


- Connect a fuse appropriate for the applied voltage and current draw, at the position shown in the diagram.
- Do not connect any wiring to unused channels.

Note: The (-) poles of inputs IN0 and IN1 are connected internally.

TWDAMI2HT Wiring Schematic

This schematic is for the TWDAMI2HT module.

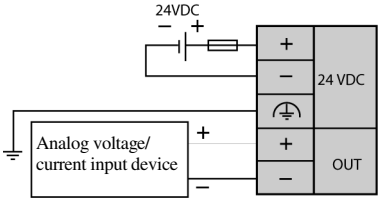


- Connect a fuse appropriate for the applied voltage and current draw, at the position shown in the diagram.
- Do not connect any wiring to unused channels.

Note: The (-) poles of inputs IN0 and IN1 are connected internally.

TWDAMO1HT Wiring Schematic

This schematic is for the TWDAMO1HT module.

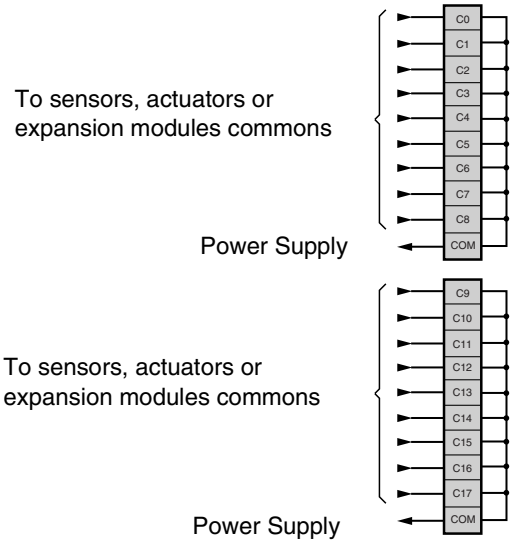


- Connect a fuse appropriate for the applied voltage and current draw, at the position shown in the diagram.
- Do not connect any wiring to unused channels.

Communication expansion module block wiring schematics

OTB 9ZZ61JP Wiring Schematic

This schematic is for the OTB 9ZZ61JP module.



Modbus Network Interface of the OTB Module

5

At a Glance

Introduction

This chapter describes the external Modbus characteristics of the Advantys OTB network interface module and the general Modbus features supported by the module.

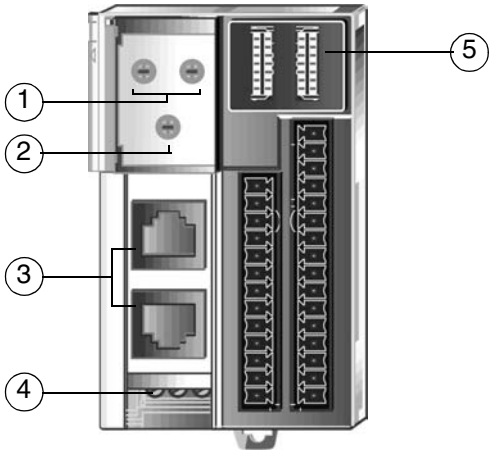
What's in this Chapter?

This chapter contains the following topics:

Description of the OTB Module Modbus Network Interface

Introduction

The physical characteristics necessary for Modbus operation are given in the following illustration:



The characteristics of the above illustration are described briefly in the following table:

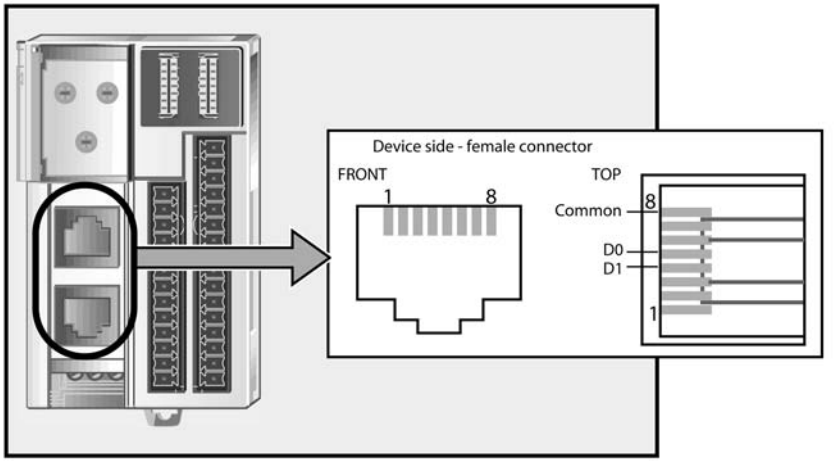
Description		Function	Cross-reference
1	Upper encoder wheels	• Left encoder wheel: decimal encoding between 1 and 12 • Right encoder wheel: decimal encoding between 1 and 9 These are used to define the address of the interface module node on the Modbus field bus.	Address (See *Network Node Address, p. 112*)
2	Lower encoder wheel	The lower encoder wheel (decimal encoded binary value between 0 and 9) is used to define the value of the field bus baud rate.	Speed (See *Network Node Address, p. 112*)

Description		Function	Cross-reference
3	Field bus interface	Two eight-pin RJ45 connectors are used to connect the interface module to a Modbus field bus.	Interface (See *Modbus Field Bus Interface, p. 108*)
4	Electrical supply interface	Terminal for an external 24 VDC supply of the network interface module.	Supply (See *How to Connect the Power Supply, p. 61*)
5	Indicator LED	The colored LEDs use various types of display to visually reflect the operational status of the island bus.	Indicator LED (See *Indicator Lights (LEDs), p. 184*)

Modbus Field Bus Interface

Connections to the Field Bus

The connectors on the front of the interface module are wired in parallel:



We recommend that you use an 8-pin male RJ45 connector compliant with the RS 485 standard. The connection must correspond to the following table:

Contact	Signal	Description
1	Unused	-
2	Unused	-
3	Unused	-
4	D1	Transmission signal
5	D0	Reception signal
6	Unused	Reserved
7	VP	5...24 Vdc power supply
8	Common	Common of signal and supply
Note: The contact numbers correspond to the legend for the following figure.		

Correspondence of Contact Names

Advantys OTB network interface modules can be connected with other Schneider products over Modbus. These products have different contact names which are however compliant with RS 485 standards.
The table below specifies the correspondence between contact names and products

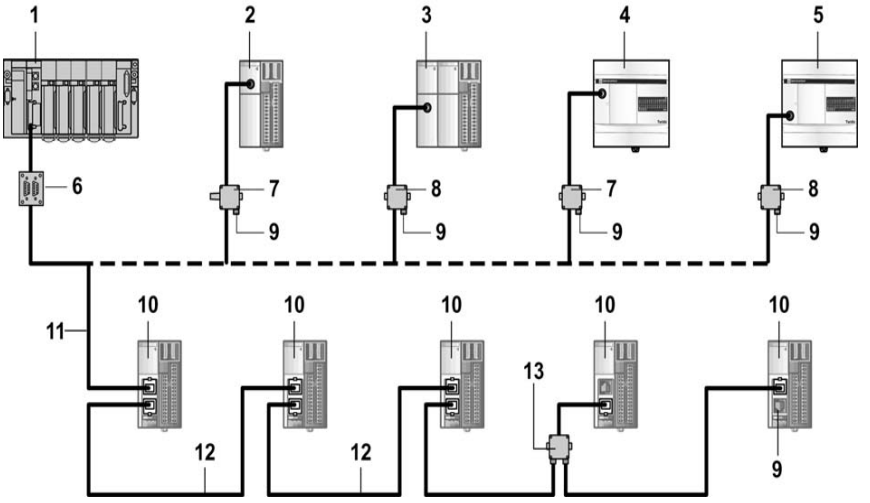
OTB1S0DM9LP	EIA/TIA 485	TWIDO	SCA64	SCA62 SCA50 Tesys LU9CG3
D1	B	A or A(+)	M+	D(B)
D0	A	B or B(+)	M-	D(A)
Common	C	SG or 0V	0VL	0VL

Modbus Network Connectors and Cables

The branch cable between the field bus and the island must have a female connector complying with the following contact assignment diagram. The Modbus network cable is a shielded twisted pair cable complying with the RS 485 standard.

Example of a Network Architecture

The illustration below provides an example of a network architecture with a Premium or Twido bus master and the cables with the specified product references.



References and description of numbers in the above illustration

	Reference	Description
1	Premium + SCY11601, or SCY21601, or SCP114	Premium PLC with Modbus communication card
2	TWDLMDA.0D..	Twido modular controller
3	TWDLMDA.0D.. + TWDNOZ485D	Twido modular controller with RS 485 communication port
4	TWDLCAA..DRF	Twido compact controller
5	TWDLCAA..DRF + TWDNAC485T	Twido compact controller with RS 485 communication port
6	TSXSCA62/64	Subscriber socket
7	TWDXCARJ030	MiniDIN RJ45 interface cable
8	TWDXCARJ030	MiniDIN RJ45 interface cable
9	VW3A8306RC	Line End Adapter
10	OTB1S0DM9LP	Network interface modules
11	VW3A8306	3 m lead with one RJ45 connector and one 15-pin SUB-D connector for TSXSCA62/64 subscriber socket
	VW3A8306D30	3 m lead with one RJ45 connector and one stripped end

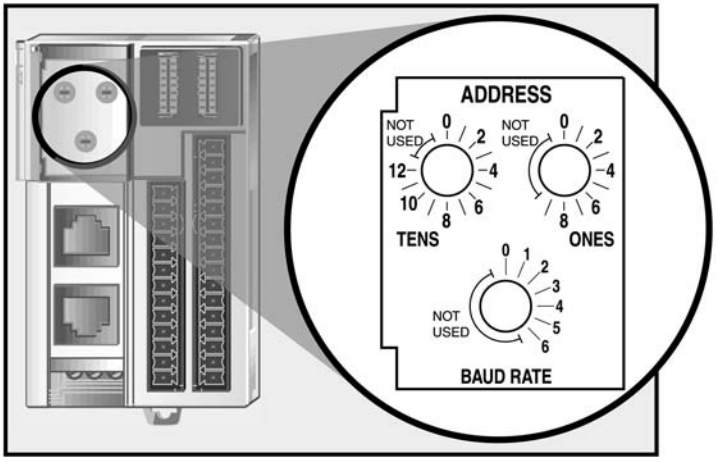
	Reference	Description
12	VW3A8306R03	0.3 m lead with 2 RJ45 connectors
	VW3A8306R10	1 m lead with 2 RJ45 connectors
	VW3A8306R30	3 m lead with 2 RJ45 connectors
13	VW3A8306TF03	T branch with 0.3 m cable
	VW3A8306TF10	T branch with 1 m cable

Network Node Address

Summary

Two encoder wheels on the Advantys OTB Modbus module OTB1S0DM9LP are used to define the address of the network node.

Parts Description



Node Addresses

The Advantys OTB module only has one single field bus network address. The Modbus interface module reads the address of the node from the encoder wheels every time the island is powered up.
The address of the node is a numerical value between 1 and 127, which must be different to all other node addresses on the network.

Configuring the Node Address

The instructions for configuring the node address are described in the following table.

Step	Action	Comment
1	Cut the power supply to the island.	The changes you make will be detected on the next power up.
2	Select the node address currently available on your field bus network.	The list of active nodes on the field bus indicates which addresses are available.
3	Adjust the upper encoder wheels • Left encoder wheel — 0 to 12 (tens) • Right encoder wheel — 0 to 9 (units)	Note that it is *mechanically* possible to specify all node addresses from 00 to 129. However, address 00 is never used as a Modbus node address and addresses 128 and 129 are not operative.
4	Power up the island in order to implement the new configuration.	The network interface module reads the encoder wheel adjustments only on power up.

Field Bus Communication

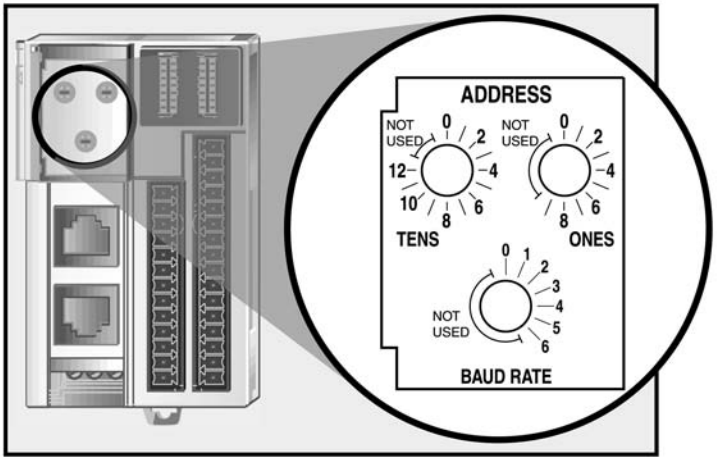
The Advantys OTB interface module communicates when the encoder wheels are configured to a valid Modbus node address if the baud rate is the same as that of the system.
If the island has a invalid node address, it cannot communicate with the master. To establish communication, configure the encoder wheels to a valid address and power up the island.

Network Baud Rate

Summary

An encoder wheel on the Advantys OTB Modbus module OTB1S0DM9LP is used to define the network node baud rate.

Parts Description



Baud Rate

The Modbus interface module reads the node address and baud rate indicated by the encoder wheels each time the island is powered up.

Configuration of Baud Rate

The instructions for configuring the baud rate of the module are given in the following table:

Step	Action	Comment
1	Cut the power supply to the island.	The changes you make will be detected on the next power up.
2	Select the baud rate to be used for field bus communications.	The baud rate configuration depends on the specifications of your system and the network.
3	Set the lower encoder wheel to the position corresponding to the required baud rate.	Use the following baud rate selection table.
4	Power up the island in order to implement the new configuration.	The network interface module reads the encoder wheel parameters only on power up.

Baud Rate Selection Table

.

Position (lower encoder rate)	Baud Rate
0	19200 bits/s
1	1200 bits/s
2	2400 bits/s
3	4800 bits/s
4	9600 bits/s
5	19200 bits/s
6	38400 bits/s

Modbus Configuration

Electrical Specifications

The network interface module supports 2-wire Modbus. Communication is half duplex type.

Communications Configuration

The Modbus communication parameters which define the frame can be configured in a number of different ways.
The Advantys OTB network interface module supports the following communications parameters:

Parameter	Value
Mode	RTU
Parity	EVEN
Stop bit	1
Data bit	8

Communication on a Modbus Network

Introduction

The Modbus protocol is a master-slave protocol that allows for one, and only one, master to request responses from slaves, or to act based on the request. The master can address individual slaves, or can initiate a broadcast message to all slaves. Slaves return a message (response) to queries that are addressed to them individually. Responses are not returned to broadcast queries from the master.

Modbus Message Structure

Modbus protocol uses 16 bit words. A Modbus message starts with a header. A Modbus message uses a Modbus function code (See *List of Supported Commands, p. 118*) as its first byte.
The following table describes the full structure of a Modbus RTU message:

Header	Address	Modbus function code	Data	CRC	End
-	one byte	one byte	n-byte field	two bytes	-

Note: For further information on the message structure, please refer to the Modbus master documentation.

Exchange report

0: Correct exchange
1: Illegal function (not supported)
2: Non-existent register
3: Non-compliant data value
4: Faulty slave

List of Supported Commands

The following table is a summary of the Modbus commands supported by the OTB1S0DM9LP module:

Modbus function code: Index Dec (Hex)	Sub-function: Sub-index	Command
3 (3H)		read n output registers
6 (6H)		write a single register
16 (10H)		write n registers
17 (11H)		read slave identification report
22 (16H)		mask n write registers
23 (17H)		read/write n registers
43 (2BH)	14	read slave identification registers

Note: Reading or writing registers can be performed if and only if the registers are contiguous.

Read n registers (03):
This function code is used to read the content of one or more contiguous registers in a slave.

Write register (06):
This function code is used to write the content of a register in a slave.

Write n registers (16):
This function code is used to write the content of one or more contiguous registers in a slave.

Write mask (22):
This function code is used to modify the content (of all or part) of a register. This function is a combination of an AND mask, an OR mask, and AND/ mask and the current content of the register.
Example:

	Hexadecimal	Binary
Current content	12	0001 0010
AND mask	F2	1111 0010
OR mask	25	0010 0101
AND/ mask	0D	0000 1101
Result	17	0001 0111

Read Write n registers (23):
This function code is used to execute a combination of reading and writing n registers.

Identification (43 sub-index 14):
This function code is used to read the identification and other information relating to the parts description of a slave.

List of Identification Objects

The following table provides a list of the island's Modbus identification objects:

Identifier	Object name, description	Description	Data type
0 (000H)	Manufacturer name	TELEMECANIQUE	ASCII string
1 (0001H)	Product code	(065277)	
2 (0002H)	Version number (Major version, minor version)	XYxy (0100H for V01.00)	
4 (0004H)	Product name	OTB1S0DM9LP	

Identification Report

The following ASCII string is sent in response to the "Read identification report" module function code: Communication block ref, e.g OTB 1S0DM9LP

Management of Island Behavior

Configuration of Analog Expansion Modules

To configure analog expansion modules, you must stop activity on the island's internal bus by writing the value 1 to the register 1005.
Once the configuration parameters of the expansion modules have been updated, the content of the object 1005 must be reset to 0 to resume activity on the internal bus with the new parameters.

Note: The expansion module outputs are deactivated and switch to zero when this operation is performed.

Note: If a parameter is non-compliant (invalid configuration), it is impossible to write zero to the register 1005.

32 Bit Function

The function of the register 1008 is to define the order of 32 bit information. It can only be used for parameters in 32 bit format. Its default value is 0 (MSB/LSB).
Register 1008 - Bit 0 = 0
The registers concerned by 32 bit format are in MSB/LSB format.
Register 1008 - Bit 0 = 1
The registers concerned by 32 bit format are in MSB/LSB format.

Setting Network Monitoring Times

The register 1006 is used to set the monitoring time in ms.
Values for register 1006
- 0: no network monitoring (default value)
- x: monitoring time in ms (1 to 65535 ms)

Network Monitoring

The island goes into fallback mode if the connection to the network is lost or if no client is present on the network.
If no frame is detected on the network before the monitoring time expires, the island detects that the client has disconnected. The outputs and special function switch to the fallback value defined by the user.
Bit 9 of register 900 switches to 1.
Writing the value 0 to the command register 1007 enables you to set bit 9 of register 900 to zero in order to resume network monitoring.

⚠ CAUTION

FALLBACK MODE AFTER DISCONNECTION

It is possible to write to outputs once reconnected without the need for acknowledgement.

Failure to follow this instruction can result in injury.

Saving and Restoring Parameters

Initialization

An OTB module is initialized with default parameters. When detected by the bus master, the OTB module is configured with the parameters defined in the configuration tool. These parameters must be backed-up in order to be acknowledged the next time the system is started.

Current parameters

Register 1000 indicates the current set of parameters:

- 0: the island is using the default parameter set (factory settings)
- 1: the island is using the last saved parameter set
- 2: one or more parameters have been modified since the last backup or startup.

Saving parameters

The back-up operation is performed by modifying the value of register 1002.
This saves the current parameters of the OTB module and tells it to use these saved parameters on future start-ups.
A backup counter is available in register 1001. This counter is reset to 0 when factory settings are restored.

Note: The backed up registers correspond to the parameter registers of the different zones.
When a backup is in progress, the module stops communication for 300 ms and the expansion module outputs switch to 0.

Restoring parameters

The different possible restores are described in the following table:

To restore...	you must modify the value of the register...
the last backed up configuration	1003
the factory settings	1004

Identification of Island Modules

The following table describes the mapping of descriptions of modules on the island

Registers	Functions	Object code
1100	OTB product code	FEFDH
1101	OTB software version	XYxy
1102	Type of expansion module 1	(1)
1103	Type of expansion module 2	(1)
1104	Type of expansion module 3	(1)
1105	Type of expansion module 4	(1)
1106	Type of expansion module 5	(1)
1107	Type of expansion module 6	(1)
1108	Type of expansion module 7	(1)

Note: (1) depending on the type of expansion module connected. See the table of Expansion Module Identification Codes. The default value is equal to FFFFH

Expansion module identification codes

List of Identification Codes

Object code table for each expansion module:

Type of digital I/O module	Object code Hexadecimal value
8 inputs	0004
16 inputs	0000
32 inputs	0200
8 outputs	0005
16 outputs	0001
32 outputs	0301
8 DRF	0006
24 DRF	0205

Type of analog I/O module	Object code Hexadecimal value
TWDAMI2HT	6002
TWDAM01HT	6003
TWDAMM3HT	6001
TWDALM3LT	6000
TWDAVO2HT	6007
TWDAMI4HT	6004
TWDAMI8HT	6005
TWDARI8HT	6006

Application-Specific Functions

6

At a Glance

Introduction

This section describes the application-specific functions of the Advantys OTB modules. Information on I/O assignments, configuration and usage are provided for each expansion module and each specific remote function.

What's in this Chapter?

This chapter contains the following topics:

Island Registers

At a Glance

The registers table depends on the configuration of the network interface module, the connected expansion modules and the type of those modules. Specific register zones are reserved for different types of data.
The order of the parameters (registers) is defined by expansion modules added to the OTB module from left to right.

Registers Table (mapping)

Zone containing the register numbers associated with the functions supported by OTB:

Registers	Function	Pages
0 to 99	Status of island inputs	0 to 99 (See *Status of inputs , p. 192*)
100 to 199	Island output commands	100 to 199 (See *Output Commands , p. 192*)
200 to 599	Island I/O configuration parameters	200 to 599 (See *I/O Parameters, p. 193*)
600 to 699	Remote Fast Counter (RFC) function block	600 to 699 (See *Fast Counters, p. 194*)
700 to 799	Remote Very Fast Counter (RVFC) function block	700 to 799 (See *Very Fast Counters , p. 195*)
800 to 899	Remote pulse generator function block (RPLS) Remote pulse generator function block with pulse width modulation (RPWM)	800 to 899 (See *Pulse Generator, p. 197*)
900 to 999	Island diagnostics	900 to 999 (See *Diagnostics, p. 198*)
1000 to 1099	Management of module behavior	1000 to 1099 (See *Management of Island Behavior, p. 202*)
1100 to 1108	Description of modules constituting the island	1100 to 1108 (See *Management of Island Behavior, p. 202*)

OTB Module Registers

For each application-specific function, the OTB network interface module uses the number of registers indicated in the following table:

Status of inputs	Output commands	Parameters	RFC	RVFC	RPLS RPWM	Diagnostics	Module behavior
0 to 99	**100 to 199**	**200 to 599**	**600 to 699**	**700 to 799**	**800 to 899**	**900 to 999**	**1000 to 1099**
1	1	14	8 per counter	14 per counter	10 per generator	11	6

Expansion Module Registers

For each application-specific function, the expansion modules use the number of registers indicated in the following table:

Product references	Function I/O type / voltage	Status of inputs	Output commands	Parameters	Diagnostics
		0 to 99	**100 to 199**	**200 to 599**	**900 to 999**
TWDDDI8DT	8 IN / 24 VDC	1	0	0	1
TWDDAI8DT	8 IN / 120 VAC	1	0	0	1
TWDDDI16DT	16 IN / 24 VDC	1	0	0	1
TWDDDI16DK	16 IN / 24 VDC	1	0	0	1
TWDDDI32DK	32 IN / 24 VDC	2	0	0	1
TWDDDO8TT	8 OUT / 24 VDC source	0	1	2	1
TWDDDO8UT	8 OUT / 24 VDC sink	0	1	2	1
TWDDRA8RT	8 OUT relay	0	1	2	1
TWDDDO16TK	16 OUT / 24 VDC source	0	1	2	1
TWDDDDO16UK	16 OUT / 24 VDC sink	0	1	2	1
TWDDRA16RT	16 OUT relay	0	1	2	1
TWDDDO32TK	32 OUT / 24 VDC source	0	2	4	1
TWDDDO32UK	32 OUT / 24 VDC sink	0	2	4	1
TWDDMM8DRT	4 IN / 24 VDC 4 OUT relay	1	1	2	1
TWDDMM24DRF	16 IN / 24 VDC 8 OUT relay	1	1	2	1
TWDAMI2HT	2 IN (U/I)	2	0	8	1
TWDAM01HT	1 OUT (U/I)	0	1	6	1
TWDAMM3HT	2 IN / 1 OUT (U/I)	2	1	14	1
TWDALM3LT	Thermocouple	2	1	14	1
TWDAVO2HT	2 OUT (+/- 10 VDC, 10 bits)	0	2	12	1
TWDAMI4HT	4 IN (U/I, Pt, Ni)	4	0	16	1
TWDAMI8HT	8 IN (U/I, 10 bits)	8	0	32	1
TWDARI8HT	8 IN (PTC, NTC, 10 bits)	8	0	56	1

Read Input Registers

At a Glance

This section describes how to read the status of the Advantys OTB island inputs.

Note: The order of the parameters is defined by expansion modules added to the OTB module from left to right. The number of parameters depends on the number and type of expansion modules connected. Discrete inputs of expansion modules are not filtered.

Table of Read Input Registers 0 to 32

The following table gives the bit assignment for each of the read input registers:

Register	Function	Bit assignment
0	Status of Advantys OTB module inputs	Bit 0: channel 0 ... Bit 11 channel 11
1	Input status of first expansion module with inputs	Bit 0: channel 0 ... Bit X channel X
...	...	...
32	...	...

Note: Only those registers that correspond to a present expansion module are accessible in read.

Output Command Registers

At a Glance

This section describes how to write to Advantys OTB island outputs.

Note: The order of the parameters is defined by expansion modules added to the OTB module from left to right. The number of parameters depends on the number and type of expansion modules connected.

Table of Output Command Registers 100 to 128

The following table gives the bit assignment for each of the write output registers:

Register	Function	Bit assignment
100	Advantys OTB module output commands	Bit 0: channel 0 ... Bit 11 channel 11
101	Commands to outputs of first expansion module with outputs	Bit 0: channel 0 ... Bit X channel X
...	...	...
128	...	...

Note: Only those registers that correspond to a present expansion module are accessible in read and write.

Advantys OTB Module I/O Parameter Registers

At a Glance

The I/Os of the Advantys OTB network interface module use I/O parameter registers.

Table of I/O Parameter Registers 200 to 213

The following table describes the different registers reserved for I/O parameters of the OTB module.

Register	Bit	Description	Parameter
200		Filtering of channel 0	0: no filtering 1: filtering at 3ms (default value) 2: filtering at 12ms
201		Filtering of channel 1	
202		Filtering of channel 2	
203		Filtering of channel 3	
204		Filtering of channel 4	
205		Filtering of channel 5	
206		Filtering of channel 6	
207		Filtering of channel 7	
208		Filtering of channel 8	
209		Filtering of channel 9	
210		Filtering of channel 10	
211		Filtering of channel 11	
212	Bit 0	Fallback mode for output 0	0: maintain 1: fallback value (default value)
	...	...	
	Bit 7	Fallback mode for output 7	
213	Bit 0	Fallback value for output 0	0: fallback to 0 (default value) 1: fallback to 1
	...	...	
	Bit 7	Fallback value for output 7	

Expansion Module Discrete I/O Parameter Registers 214 to 599

At a Glance

The Discrete I/Os of the expansion modules use the parameter registers described in the following tables. The register number (N) depends on the position of the module in the island.

> **Note:** Only those registers that correspond to a present expansion module are accessible in read and write.

TWDDDI8DT, TWDDAI8DT, TWDDDI16DT, TWDDDI16DK, TWDDDI32DK

The discrete input expansion modules do not use parameter registers.

TWDDDO8TT, TTWDDDO8UTT, WDDRA8RT

The discrete output expansion modules use parameter registers to define the fallback mode and value.

Register	Bit	Description	Parameter
N	Bit 0	Fallback mode, output 0	1: fallback value (default value) 0: maintain
	...	...	
	Bit 7	Fallback mode, output 7	
N+1	Bit 0	Fallback value, output 0	0: fallback to 0 (default value) 1: fallback to 1
	...	...	
	Bit 7	Fallback value, output 7	

> **Note:** Bits 8 to 15 are non-significant

TWDDDO16UK, TWDDDO16TK, TWDDRA16RT

The discrete output expansion modules use parameter registers to define the fallback mode and value.

Register	Bit	Description	Parameter
N	Bit 0	Fallback mode, output 0	1: fallback value (default value) 0: maintain
	...	...	
	Bit 15	Fallback mode, output 15	
N+1	Bit 0	Fallback value, output 0	0: fallback to 0 (default value) 1: fallback to 1
	...	...	
	Bit 15	Fallback value, output 15	

TWDDDO32UKT WDDDO32TK

The discrete output expansion modules use parameter registers to define the fallback mode and value.

Register	Bit	Description	Parameter
N	Bit 0	Fallback mode, output 0	1: fallback value (default value) 0: maintain
	...	...	
	Bit 15	Fallback mode, output 15	
N+1	Bit 16	Fallback value, output 0	0: fallback to 0 (default value) 1: fallback to 1
	...	...	
	Bit 31	Fallback value, output 15	
N+2	Bit 0	Fallback mode, output 16	1: fallback value (default value) 0: maintain
	...	...	
	Bit 15	Fallback mode, output 31	
N+3	Bit 16	Fallback value, output 16	0: fallback to 0 (default value) 1: fallback to 1
	...	...	
	Bit 31	Fallback value, output 31	

TWDDMM8DRT The discrete output expansion modules use parameter registers to define the fallback mode and value.

Register	Bit	Description	Parameter
N	Bit 0	Fallback mode, output 0	1: fallback value (default value) 0: maintain
	...	...	
	Bit 3	Fallback mode, output 3	
N+1	Bit 0	Fallback value, output 0	0: fallback to 0 (default value) 1: fallback to 1
	...	...	
	Bit 3	Fallback value, output 3	

Note: Bits 4 to 15 are non-significant

TWDDMM24DRF The discrete output expansion modules use parameter registers to define the fallback mode and value.

Register	Bit	Description	Parameter
N	Bit 0	Fallback mode, output 0	1: fallback value (default value) 0: maintain
	...	...	
	Bit 7	Fallback mode, output 7	
N+1	Bit 0	Fallback value, output 0	0: fallback to 0 1 : fallback to 1
	...	...	
	Bit 7	Fallback value, output 7	

Note: Bits 8 to 15 are non-significant

Expansion Module Analog I/O Parameter Registers 214 to 599

At a Glance

The Analog I/Os of the expansion modules use the parameter registers described in the following tables. The first table shows all the possible values and the following tables indicate the parameter registers used by each type of expansion module.

Registers Reserved for Analog I/Os

The analog expansion modules use different parameter registers according to their type.

The following table shows the possible values common to all channels and for each register.

Channel	Register	Description	Parameter
Vx	N	Range	0: not used 1: 0..20mA 2: 4 .. 20 mA 3: 0..10V 4: +/- 10 V 5: thermo K 6: thermo J 7: thermo T 8: thermo PT100 9: thermo PT1000 10: thermo NI100 11: thermo NI1000 12: temperature
	N+1	Unit	0: normal 1: customized 2: Celsius 3: Fahrenheit 4: Resistor
	N+2	Minimum value (where N+1 = 1)	Min.
	N+3	Maximum value (where N+1 = 1)	Max.
	N+4	Fallback mode	1: fallback 0: maintain
	N+5	Fallback value	Fallback value

The following table shows the possibilities for mixing channel ranges and converter accuracy.

Product reference	Possibilities for mixing channels	Accuracy
TWDAMI2HT	Yes	12 Bit
TWDAMO1HT	Not applicable	12 Bit
TWDAMM3HT	Yes	12 Bit
TWDALM3LT	Yes	12 Bit
TWDAVO2HT	No	10 Bit
TWDAMI4LT	No	12 Bit
TWDAMI8HT	No	10 Bit
TWDARI8HT	No	10 Bit

TWDAMI2HT

The analog input expansion module uses parameter registers to define the range of the inputs (voltage/current) and the unit that can be customized.

Channel	Register	Description	Parameter	Default value of the parameter
V0 input	N	Range	0: Not used 2: 4 .. 20 mA 3: 0..10V	0
	N+1	Unit	0: normal 1: customized	1
	N+2	Minimum value (where N+1 = 1)	Min.	0
	N+3	Maximum value (where N+1 = 1)	Max.	7FFFH
V1 input	N+4	Range	0: Not used 2: 4 .. 20 mA 3: 0..10V	0
	N+5	Unit	0: normal 1: customized	1
	N+6	Minimum value (where N+5 = 1)	Min.	0
	N+7	Maximum value (where N+5 = 1)	Max.	7FFFH

TWDAMO1HT

The analog output expansion module uses parameter registers to define the range of the output (voltage/current), the unit that can be customized, and the fallback mode and value.

Channel	Register	Description	Parameter	Default value of the parameter
V0 outputs	N	Range	0: Not used 2: 4 .. 20 mA 3: 0..10V	0
	N+1	Unit	0: normal 1: customized	1
	N+2	Minimum value (where N+1 = 1)	Min.	0
	N+3	Maximum value (where N+1 = 1)	Max.	7FFFH
	N+4	Fallback mode	0: fallback 1: maintain	0
	N+5	Fallback value	Fallback value	0

TWDAMM3HT

The analog I/O expansion module uses parameter registers to define the range of the I/Os (voltage/current), the unit that can be customized, and the fallback mode and value of the output.

Channel	Register	Description	Parameter	Default value of the parameter
V0 input	N	Range	0: Not used 2: 4 .. 20 mA 3: 0..10V	0
	N+1	Unit	0: normal 1: customized	1
	N+2	Minimum value (where N+1 = 1)	Min.	0
	N+3	Maximum value (where N+1 = 1)	Max.	7FFFH
V1 input	N+4	Range	0: Not used 2: 4 .. 20 mA 3: 0..10V	0
	N+5	Unit	0: normal 1: customized	1
	N+6	Minimum value (where N+5 = 1)	Min.	0
	N+7	Maximum value (where N+5 = 1)	Max.	7FFFH
V2 output	N+8	Range	0: Not used 2: 4 .. 20 mA 3: 0..10V	0
	N+9	Unit	0: normal 1: customized	1
	N+10	Minimum value (where N+9 = 1)	Min.	0
	N+11	Maximum value (where N+9 = 1)	Max.	7FFFH
	N+12	Fallback mode	1: fallback 0: maintain	1
	N+13	Fallback value	Fallback value	0

TWDALM3LT

The thermocouple input expansion module uses parameter registers to define the range of the thermocouples and the unit that can be customized. The analog output uses parameter registers to define the range of outputs (voltage/current), the unit that can be customized, and the fallback mode and value.

Channel	Register	Description	Parameter	Default value of the parameter
V0 input	N	Range	0: Not used 5: thermo K 6: thermo J 7: thermo T 8: thermo PT100	0
	N+1	Unit	0: normal 1: customized 2: Celsius 3: Fahrenheit	1
	N+2	Minimum value (where N+1 = 1)	Min.	0
	N+3	Maximum value (where N+1 = 1)	Max.	7FFFH
V1 input	N+4	Range	0: Not used 5: thermo K 6: thermo J 7: thermo T 8: thermo PT100	0
	N+5	Unit	0: normal 1: customized 2: Celsius 3: Fahrenheit	1
	N+6	Minimum value (where N+5 = 1)	Min.	0
	N+7	Maximum value (where N+5 = 1)	Max.	7FFFH

Channel	Register	Description	Parameter	Default value of the parameter
V2 output	N+8	Range	0: Not used 2: 4 .. 20 mA 3: 0..10V	0
	N+9	Unit	0: normal 1: customized	1
	N+10	Minimum value (where N+9 = 1)	Min.	0
	N+11	Maximum value (where N+9 = 1)	Max.	7FFFH
	N+12	Fallback mode	1: fallback 0: maintain	1
	N+13	Fallback value	Fallback value	0

TWDAVO2HT

The analog output expansion module uses parameter registers to define the range of outputs, the unit that can be customized, and the fallback mode and value.

Channel	Register	Description	Parameter	Default value of the parameter
V0 output	N	Range	0: Not used 4: +/- 10 V	0
	N+1	Unit	0: normal 1: customized	1
	N+2	Minimum value (where N+1 = 1)	Min.	0
	N+3	Maximum value (where N+1 = 1)	Max.	7FFFH
	N+4	Fallback mode	1: fallback 0: maintain	1
	N+5	Fallback value	Fallback value	0
V1 output	N+6	Range	0: Not used 4: +/- 10 V	0
	N+7	Unit	0: normal 1: customized	1
	N+8	Minimum value (where N+5 = 1)	Min.	0
	N+9	Maximum value (where N+5 = 1)	Max.	7FFFH
	N+10	Fallback mode	1: fallback 0: maintain	1
	N+11	Fallback value	Fallback value	0

TWDAMI4LT

The analog or thermocouple input expansion module uses configuration registers to define the range of the thermocouples or voltage/current and the unit that can be customized.

Channel	Register	Description	Parameter	Default value of the parameter
V0 input	N	Range	0: not used 1: 0 .. 20 mA 3: 0..10V 8: thermo PT100 9: thermo PT1000 10: thermo NI100 11: thermo NI1000	0
	N+1	Unit	0: normal 1: customized 2: Celsius 3: Fahrenheit 4: Resistor	1
	N+2	Minimum value (where N+1 = 1)	Min.	0
	N+3	Maximum value (where N+1 = 1)	Max.	7FFFH
V1 input	N+4	Range	0: not used 1: 0 .. 20 mA 3: 0..10V 8: thermo PT100 9: thermo PT1000 10: thermo NI100 11: thermo NI1000	0
	N+5	Unit	0: normal 1: customized 2: Celsius 3: Fahrenheit 4: Resistor	1
	N+6	Minimum value (where N+5 = 1)	Min.	0
	N+7	Maximum value (where N+5 = 1)	Max.	7FFFH

Channel	Register	Description	Parameter	Default value of the parameter
V2 input	N+8	Range	0: not used 1: 0 .. 20 mA 3: 0..10V 8: thermo PT100 9: thermo PT1000 10: thermo NI100 11: thermo NI1000	0
	N+9	Unit	0: normal 1: customized 2: Celsius 3: Fahrenheit 4: Resistor	1
	N+10	Minimum value (where N+9 = 1)	Min.	0
	N+11	Maximum value (where N+9 = 1)	Max.	7FFFH
V3 input	N+12	Range	0: not used 1: 0 .. 20 mA 3: 0..10V 8: thermo PT100 9: thermo PT1000 10: thermo NI100 11: thermo NI1000	0
	N+13	Unit	0: normal 1: customized 2: Celsius 3: Fahrenheit 4: Resistor	1
	N+14	Minimum value (where N+9 = 1)	Min.	0
	N+15	Maximum value (where N+9 = 1)	Max.	7FFFH

TWDAMI8HT

The analog input expansion module uses parameter registers to define the range of the inputs (voltage/current) and the unit that can be customized.

Channel	Register	Description	Parameter	Default value of the parameter
V0 input	N	Range	0: not used 2: 4 .. 20 mA 3: 0..10V	0
	N+1	Unit	0: normal 1: customized	1
	N+2	Minimum value (where N+1 = 1)	Min.	0
	N+3	Maximum value (where N+1 = 1)	Max.	7FFFH
V1 input	N+4	Range	0: not used 2: 4 .. 20 mA 3: 0..10V	0
	N+5	Unit	0: normal 1: customized	1
	N+6	Minimum value (where N+5 = 1)	Min.	0
	N+7	Maximum value (where N+5 = 1)	Max.	7FFFH
V2 input	N+8	Range	0: not used 2: 4 .. 20 mA 3: 0..10V	0
	N+9	Unit	0: normal 1: customized	1
	N+10	Minimum value (where N+9 = 1)	Min.	0
	N+11	Maximum value (where N+9 = 1)	Max.	7FFFH
V3 input	N+12	Range	0: not used 2: 4 .. 20 mA 3: 0..10V	0
	N+13	Unit	0: normal 1: customized	1
	N+14	Minimum value (where N+13 = 1)	Min.	0
	N+15	Maximum value (where N+13 = 1)	Max.	7FFFH

Channel	Register	Description	Parameter	Default value of the parameter
V4 input	N+16	Range	0: not used 2: 4 .. 20 mA 3: 0..10V	0
	N+17	Unit	0: normal 1: customized	1
	N+18	Minimum value (where N+17 = 1)	Min.	0
	N+19	Maximum value (where N+17 = 1)	Max.	7FFFH
V5 input	N+20	Range	0: not used 2: 4 .. 20 mA 3: 0..10V	0
	N+21	Unit	0: normal 1: customized	1
	N+22	Minimum value (where N+21 = 1)	Min.	0
	N+23	Maximum value (where N+21 = 1)	Max.	7FFFH
V6 input	N+24	Range	0: not used 2: 4 .. 20 mA 3: 0..10V	0
	N+25	Unit	0: normal 1: customized	1
	N+26	Minimum value (where N+25 = 1)	Min.	0
	N+27	Maximum value (where N+25 = 1)	Max.	7FFFH
V7 input	N+28	Range	0: not used 2: 4 .. 20 mA 3: 0..10V	0
	N+29	Unit	0: normal 1: customized	1
	N+30	Minimum value (where N+29 = 1)	Min.	0
	N+31	Maximum value (where N+29 = 1)	Max.	7FFFH

TWDARI8HT

The temperature probe input expansion module uses parameter registers to define the range of the inputs (voltage/current), the probe type and the unit that can be customized.

Channel	Register	Description	Parameter	Default value of the parameter
V0 input	N	Range	0: not used 12: temperature	0
	N+1	Unit	0: normal 1: customized 2: Celsius 3: Fahrenheit 4: Resistor	1
	N+2	Minimum value (where N+1 = 1)	Min.	0
	N+3	Maximum value (where N+1 = 1)	Max.	7FFFH
	N+4		R	14AH
	N+5		T	7477H
	N+6		B	DF1H
V1 input	N+7	Range	0: not used 12: temperature	0
	N+8	Unit	0: normal 1: customized 2: Celsius 3: Fahrenheit 4: Resistor	1
	N+9	Minimum value (where N+8 = 1)	Min.	0
	N+10	Maximum value (where N+8 = 1)	Max.	7FFFH
	N+11		R	14AH
	N+12		T	7477H
	N+13		B	DF1H

Channel	Register	Description	Parameter	Default value of the parameter
V2 input	N+14	Range	0: not used 12: temperature	0
	N+15	Unit	0: normal 1: customized 2: Celsius 3: Fahrenheit 4: Resistor	1
	N+16	Minimum value (where N+9 = 1)	Min.	0
	N+17	Maximum value (where N+9 = 1)	Max.	7FFFH
	N+18		R	14AH
	N+19		T	7477H
	N+20		B	DF1H
V3 input	N+21	Range	0: not used 12: temperature	0
	N+22	Unit	0: normal 1: customized 2: Celsius 3: Fahrenheit 4: Resistor	1
	N+23	Minimum value (where N+13 = 1)	Min.	0
	N+24	Maximum value (where N+13 = 1)	Max.	7FFFH
	N+25		R	14AH
	N+26		T	7477H
	N+27		B	DF1H

Channel	Register	Description	Parameter	Default value of the parameter
V4 input	N+28	Range	0: not used 12: temperature	0
	N+29	Unit	0: normal 1: customized 2: Celsius 3: Fahrenheit 4: Resistor	0
	N+30	Minimum value (where N+17 = 1)	Min.	0
	N+31	Maximum value (where N+17 = 1)	Max.	7FFFH
	N+32			
	N+33			
	N+34			
V5 input	N+35	Range	0: not used 12: temperature	0
	N+36	Unit	0: normal 1: customized 2: Celsius 3: Fahrenheit 4: Resistor	1
	N+37	Minimum value (where N+21 = 1)	Min.	0
	N+38	Maximum value (where N+21 = 1)	Max.	7FFFH
	N+39		R	14AH
	N+40		T	7477H
	N+41		B	DF1H

Channel	Register	Description	Parameter	Default value of the parameter
V6 input	N+42	Range	0: not used 12: temperature	0
	N+43	Unit	0: normal 1: customized 2: Celsius 3: Fahrenheit 4: Resistor	1
	N+44	Minimum value (where N+25 = 1)	Min.	0
	N+45	Maximum value (where N+25 = 1)	Max.	7FFFH
	N+46			
	N+47			
	N+48			
V7 input	N+49	Range	0: not used 12: temperature	0
	N+50	Unit	0: normal 1: customized 2: Celsius 3: Fahrenheit 4: Resistor	1
	N+51	Minimum value (where N+29 = 1)	Min.	0
	N+52	Maximum value (where N+29 = 1)	Max.	7FFFH
	N+53		R	14AH
	N+54		T	7477H
	N+55		B	DF1H

Specific Functions of the Advantys OTB Modules

Overview

The network interface module Advantys OTB features specific I/Os and programmable functions.
List of built-in functions:

- 4 fast inputs (40 ms) with programmable filtering,
- 8 inputs (150 ms) with programmable filtering,
- 2 fast Discrete outputs (5 ms),
- 6 relay outputs,
- 2 remote fast counters (5kHz)
- 2 remote very fast counters (20kHz)
- 2 remote pulse generators (PLS or PWM)
- Possible connection of 7 expansion modules
- 1 communication port

A configuration zone is reserved for each of these functions.

Discrete I/O Filtering

The inputs can be filtered or non filtered. The filtering value is programmable to 3 ms or 12 ms.

Remote Fast Counter (RFC)

The Advantys OTB network interface module authorizes the use of a maximum of 2 fast counters. The function blocks RFC0 and RFC1 are allocated to the inputs I8 and I9 respectively. These inputs can be used as standard discrete inputs if the function block is not used.

Remote Very Fast Counter (RVFC)

The Advantys OTB network interface module authorizes the use of a maximum of 2 very fast counters. The function blocks RVFC0 and RVFC1 are allocated to the inputs 0 to 3 and 4 to 7 respectively. These inputs can be used as standard discrete inputs if the function block is not used.

Remote Pulse Generators (RPLS or RPWM)

The Advantys OTB network interface module authorizes the use of 2 RPLS or RPWM pulse generators. The function blocks RPLS0/RPWM0 and RPLS1/RPWM1 are allocated to the outputs 0 and 1 respectively. These outputs can be used as standard discrete outputs if the function block is not used.

Associated I/O and Functions The I/Os associated with the pulse counters and generators are defined in the following table:

I/O	Very fast counter 0 (RVFC0)	Very fast counter 1 (RVFC1)	Fast counter0 (RFC0)	Fast counter0 (RFC1)	Pulse generator 0 (RPLS0/ RPWM0)	Pulse generator 1 (RPLS1/ RPWM1)
Input 0	X					
Input 1	X					
Input 2	X					
Input 3	X					
Input 4		X				
Input 5		X				
Input 6		X				
Input 7		X				
Input 8			X			
Input 9				X		
Output 0					X	
Output 1						X
Output 2	X					
Output 3	X					
Output 4		X				
Output 5		X				

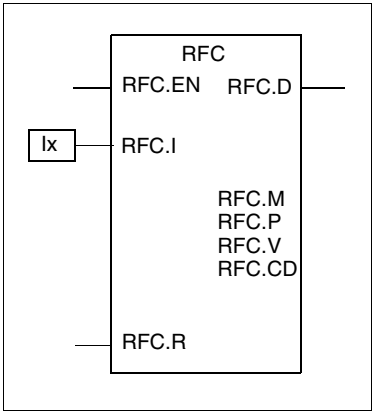
Remote Fast Counter (RFC) Function Block

Introduction

The remote fast counter (RFC) function block can be used in up- or down-counting mode. It can count the pulses on the Discrete inputs dedicated to frequencies of up to 5 kHz.
Two remote fast counter function blocks are available. The fast counter function blocks RFC0 and RFC1 use the dedicated inputs I8 and I9 respectively. These inputs are not exclusively reserved for these function blocks, and may be used as standard Discrete inputs.

Representation

The figure below shows a Remote Fast Counter (RFC) function block.



Parameters

The following table shows the parameters for the Remote Fast Counter function block.

Parameter	Description	Description
RFC.M	Counting mode	Parameter used to select between: ● not used, ● counter, ● Down Counter
RFC.P	Preset value	Value to trigger the RFC.D Done bit and reset the RFC.V current value.
RFC.V	Current Value	The current value increments or decrements according the counting mode selected. This value is between zero and the RFC.P preset value.
RFC.EN	Enter to enable	Validation of the RFC block operation. When set to 0, the block is inhibited and the current value is unchanged.
RFC.R	Reset	Used to initialize the block. When set to 1, the current value is set to: ● 0 if the block is configured in counting mode, ● RFC.P if the block is configured in downcounting mode.
RFC.D	done	Done switches to 1 if: ● RFC.V reaches RFC.P in upcounting mode, ● RFC.V reaches zero in downcounting mode.
RFC.CD	Reset Done	When set to 1, this bit is used to reset the RFC.D bit. This bit is processed depending on its level; if the user does not reset it to 0, the RFC.D bit is never reactivated.
RFC.I	Physical input	Input dedicated to up/down counting: ● I8 for the RFC0 fast counter, ● I9 for the RFC1. fast counter,

Operation

When the RFC function block is configured to up-count, the current value is incremented by one when a rising edge appears at the dedicated input. When the preset value RFC.P is reached, the Done output bit RFC.D is set to 1 and the current value RFC.V is set to zero.
If the RFC function block is configured to down-count, the current value is decreased by one when a rising edge appears at the dedicated input. When the value is zero, the Done output bit RFC.D is set to 1 and the current value RFC.P is set to the preset value.

Notes

The function block will only be activated after the RFC.R function block is initialized and the RFC.EN input enabled.
The selection or modification of the RFC.M counting mode will only be taken into account on activation of the RFC.R command.

Fallback Modes RFC.EM

When the PLC stops or detects a communication error, the RFC function block may operate differently according to the programmed fallback mode.
The programmable fallback modes of the RFC function block are as follows:

- counter reset (equivalent of setting the RFC.R to 1),
- set the current value of the RFC function block counter (equivalent of setting RFC.EN to 0),
- continue counting.

Fast Counter (RFC) Parameter Registers

At a Glance

The fast counters (RFC0 and RFC1) use the configuration parameters of the supported functions.

Registers 600 to 627

Specific function of fast counter 0 (RFC0).

Registers	Parameter	Description	Access
600 601	RFC.V	Current Value Current Value	read
602	RFC.D	Bit [0]: D (Done)	read
603	RFC.M	Counting mode: ● 0: not used ● 1: counter ● 2: downcounter	read/write
604	RFC.EM	Fallback mode: ● 0: reset to zero of the counter ● 1: stop counting, save the last value read and freeze counter ● 2: continue counting	read/write
605 606	RFC.P	Preset value Preset value	read/write
607	RFC.EN RFC.R RFC.CD	Bit [0]: validation of the input EN Bit [1]: R (Reset) Bit [2]: reset of the RFC.D bit	read/write

Specific function of fast counter 1 (RFC1).

Registers	Description	Access	Access
620...627		Description identical to that for counter 0	

Remote Very Fast Counter (RVFC) Function Block

Introduction

The Remote Very Fast Counter (RVFC) function block can be configured to perform any one of the following functions:

- Up/down counter
- Up/down 2-phase counter
- Single Up Counter
- Single Down Counter
- Frequency Meter

Two very fast counters are available. The RVFC function block supports counting of Discrete inputs up to frequencies of 20 kHz. The very fast counter function blocks RVFC0 and RVFC1 respectively use the I/Os dedicated to these functions.
A Remote Very Fast Counter (RVFC) operates at a maximum frequency of 20 kHz, and for a value range between 0 and 4 294 967 295.

Notes

The function block will only be activated after the RVFC.R function block is initialized and the RVFC.EN input enabled.
The selection or modification of the RVFC.M counting mode will only be taken into account on activation of the RVFC.R command.

Dedicated I/O Assignments

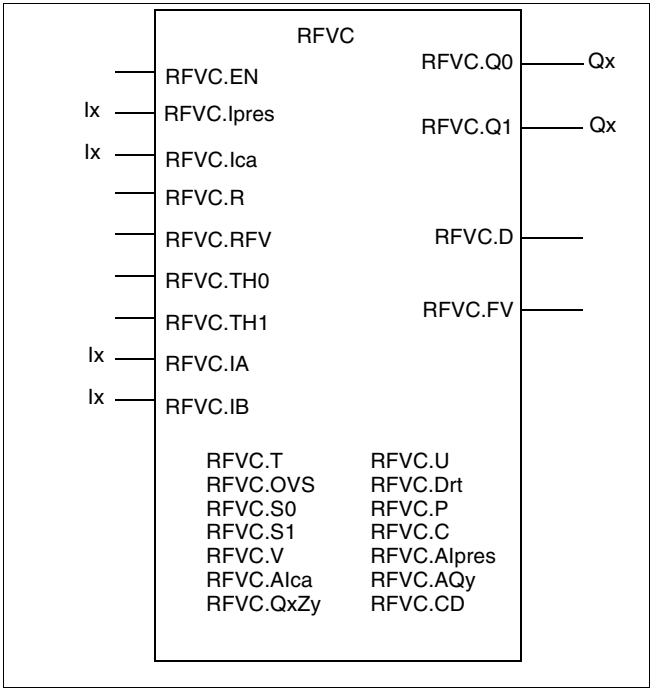
The Remote Very Fast Counter (RVFC) function blocks use dedicated inputs and outputs. These inputs and outputs are not exclusively reserved for these function blocks, and may be used as Discrete I/Os.

The following array summarizes the possible assignments:

		Main inputs		**Auxiliary inputs**		**Reflex outputs**	
RVFC0	Operating mode	IA input	IB input	IPres	Ica	Output 0	Output 1
	Up/down counter	I1 pulse	I0 0=UP/1=DO	I2 (1)	I3 (1)	Q2 (1)	Q3 (1)
	Up/down 2-phase counter	I1 Phase A	I0 Phase B	I2 (1)	I3 (1)	Q2 (1)	Q3 (1)
	Single Up Counter	I1	Not used	I2 (1)	I3 (1)	Q2 (1)	Q3 (1)
	Single Down Counter	I1	Not used	I2 (1)	I3 (1)	Q2 (1)	Q3 (1)
	Frequency Meter	I1	Not used	Not used	Not used	Not used	Not used
RVFC1	Selected Use	IA input	Input IB)	IPres	Ica	Output 0	Output 1
	Up/down counter	I7 Pulse	I6 0=UP/1=DO	I5 (1)	I4 (1)	Q4 (1)	Q5 (1)
	Up/Down 2-Phase Counter	I7 Phase A	I6 Phase B	I5 (1)	I4 (1)	Q4 (1)	Q5 (1)
	Single Up Counter	I7	Not used	I5 (1)	I4 (1)	Q4 (1)	Q5 (1)
	Single Down Counter	I7	Not used	I5 (1)	I4 (1)	Q4 (1)	Q5 (1)
	Frequency Meter	I7	Not used	Not used	Not used	Not used	Not used

Key:
(1) = optional
Input IA = pulse input
Input IB = pulses or UP/DO
UP/DO = Up / Down counting
Ipres = preset input
Ica = catch input
When not used by the function, the input or output remains a Discrete I/O.

Representation The figure below shows a Remote Very Fast Counter (RVFC) function block.



Parameters

The following table shows the parameters for the Remote Very Fast Counter (RVFC) function block.

Parameter	Description	Description
RVFC.M	Counting mode	Parameter used to select between: ● not used ● up/down counter ● up/down 2-phase counter ● counter ● downcounter ● measurement frequency
RVFC.V	Current Value	The current value increments or decrements according the counting mode selected. This value can be set or to the preset value (RVFC.P) using the preset input (RVFC.Aipres).
RVFC.Drt	Counting direction	This bit, which is only used in up/downcounting mode, indicates the counting direction: 0 : upcounting 1 : downcounting
RVFC.P	Preset value	When the preset input (RVFC.Ipres) is activated, the current value (RVFC.V) takes the preset value (RVFC.P). This function is only used in up/downcounting mode, upcounting mode and downcounting mode. ● 0 if the block is configured in counting mode, ● RFC.P if the block is configured in downcounting and upcounting/downcounting mode.
RVFC.C	Capture Value	When the catch input (RVFC.Ica) is activated, the current value (RVFC.V) is stored in the catch value (RVFC.C). This function is only used in up/downcounting mode, upcounting mode and downcounting mode.
RVFC.TH0	Threshold Value S0	This value contains the threshold S0 value. This value must be less than the threshold S1 value (RVFC.TH1).
RVFC.TH1	Threshold Value S1	This value contains the threshold S1 value. This value must be greater than the threshold S0 value (RVFC.TH0).
RVFC.S0	Bit 0 threshold	This bit is set to 1 when the current value is >= the value of threshold S0 (RVFC.TH0).
RVFC.S1	Bit 1 threshold	This bit is set to 1 when the current value is >= the value of threshold S1 (RVFC.TH1).
RVFC.D	done	The Done bit switches to 1 if: ● RVFC.V reaches RVFC.P in upcounting mode, ● RVFC.V reaches zero in downcounting and upcounting/downcounting mode. The Done bit switches to 0 on activation of the RVFC.R bit).

Parameter	Description	Description
RVFC.CD	Reset Done	When set to 1, this bit is used to reset the RVFC.D bit. This bit is processed depending on its level; if the user does not reset it to 0, the RVFC.D bit is never reactivated.
RVFC.T	Frequency Measure Time Base	Timebase configuration element ● 100 milliseconds ● 1000 milliseconds This function is only used for the frequency measurement mode.
RVFC. Ipres	Physical preset input	On a rising edge, the current value (RVFC.V) is forced to the preset value. When set to 0, up or downcounting in progress.
RVFC. AIpres	Validation of the input Ipres	Validation of the preset value command.
RVFC.Ica	Physical catch input	On a rising edge, the current value (RVFC.V) is stored in the catch value (RVFC.C).
RVFC. AIca	Validation of the input Ica	Validation of the catch command.
RVFC.EN	Enter to enable	Activation of the RVFC function. At state 1, the current value (RVFC.V) is updated according to the pulses. At state 0, the current value (RVFC.V) is not updated according to the pulses.
RVFC.R	Reset	The effect of this bit depends on the counting mode used when set to 1: ● up/down counting and downcounting, the preset value (RVFC.P) is stored in the current value (RVFC.V). ● upcounting, the current value is set to zero ● frequency meter, reset to zero of the current value and the valid frequency measurement bit (RVFC.FV This function is also used to initialize the threshold outputs and acknowledge the threshold value modifications. Reset of the RVFC.EN bit
RVFC.FV	Frequency Measure Valid	This bit is set to 1 when the frequency measurement is complete.
RVFC.RFV	Reset frequency measurement	This bit is set to 1 to reset the frequency measurement (RVFC.FV).
RVFC.Q0	Physical output Q0	-
RVFC.AQ0	Activation physical output Q0	This parameter is used to activate the use of reflex output 0
RVFC.Q1	Physical output Q1	-

Parameter	Description	Description
RVFC.AQ1	Activation physical output Q1	This parameter is used to activate the use of reflex output 1
RVFC.Q0Z 1	State of reflex output 0 in zone 1	State of reflex output 0 (RVFC.Q0) when the current value (RVFC.V) is less than the threshold S0 value (RVFC.TH0)
RVFC.Q0Z 2	State of reflex output 0 in zone 2	State of reflex output 0 (RVFC.Q0) when the current value (RVFC.V) is between the threshold S0 value (RVFC.TH0) and the threshold S1 value (RVFC.TH1) RVFC.TH0 £ RVFC.V £ RFVC.TH1
RVFC.Q0Z 3	State of reflex output 0 in zone 3	State of reflex output 0 (RVFC.Q0) when the current value (RVFC.V) is greater than the threshold S1 value (RVFC.TH1)
RVFC.Q1Z 1	State of reflex output 1 in zone 1	State of reflex output 1 (RVFC.Q1) when the current value (RVFC.V) is less than the threshold S0 value (RVFC.TH0)
RVFC.Q1Z 2	State of reflex output 1 in zone 2	State of reflex output 1 (RVFC.Q1) when the current value (RVFC.V) is between the threshold S0 value (RVFC.TH0) and the threshold S1 value (RVFC.TH1) RVFC.TH0 £ RVFC.V £ RFVC.TH1
RVFC.Q1Z 3	State of reflex output 1 in zone 3	State of reflex output 1 (RVFC.Q1) when the current value (RVFC.V) is greater than the threshold S1 value (RVFC.TH1)

Description of the Up and Downcounting Functions

When the RVFC function block is configured for upcounting, the current value is incremented by 1 once a rising edge appears on the dedicated input. When the RVFC.P preset value is reached, the Done bit RVFC.D is set to 1 and the current value RVFC.V is set to zero.
When the function block RVFC is configured to downcount, the current value is decreased by one when a rising edge appears on the dedicated input. When the value is zero, the Done RVFC.D bit is set to 1 and the current value becomes equal to the preset value RVFC.P.
Upcount or downcount operations are made on the rising edge of pulses, and only if the counting block is enabled (RVFC.EN). Two optional inputs are used in upcounting mode: RVFC.ICa and RVFC.IPres.

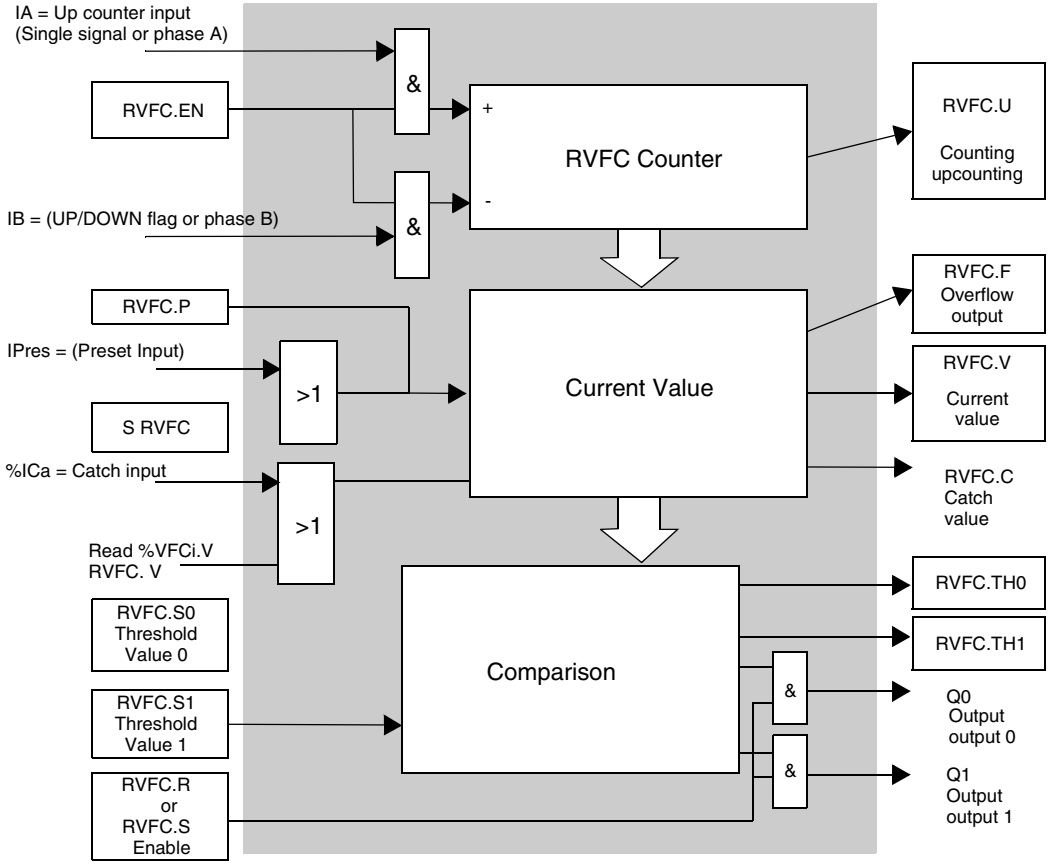
Notes on Function Block Outputs

Note: Not applicable to the frequency meter counting mode

The current value is compared with two threshold values (RVFC.TH0 and RVFC.TH1). The states of both threshold bits (RVFC.S0 and RVFC.S1) depend on the results of this comparison. State 1 if the current value is greater than or equal to the threshold value and 0 if the current value is less than the threshold value. Reflex outputs (if configured) are activated in accordance with these comparisons. It is possible to configure zero, one or two reflex outputs.

Counting Function Diagram

The following is a counting function diagram:

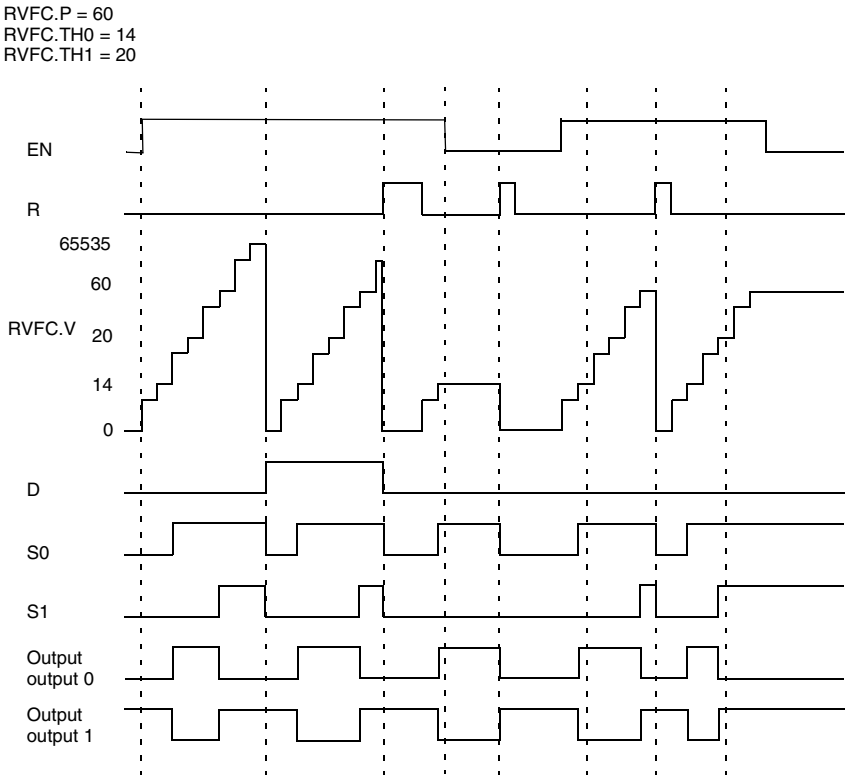


Usage in Simple Upcounting Mode

The following is an example of using RVFC in a single up counter mode. The following configuration elements have been set for this example:
The RVFC.P preset value is 60, while the RVFC.TH0 lower threshold value is 14, and the RVFC.TH1 upper threshold is 20.

Reflex Output	RVFC.V < RVFC.TH0	RVFC.TH0 £ RVFC.V < RVFC.TH1	RVFC.V >= RVFC.TH1
Q2		X	
Q3	X		X

A timing chart follows:

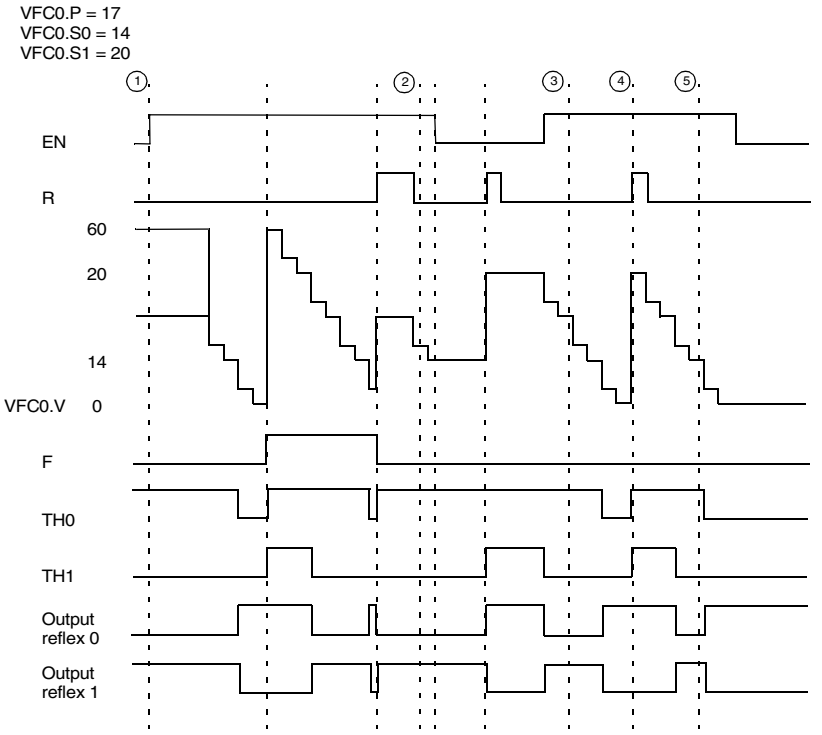


Usage in Simple Downcounting Mode

The following is an example of using RVFC in a single down counter mode. The following configuration elements have been set for this example:
The RVFC.P preset value is 60, while the RVFC.TH0 lower threshold value is 14, and the RVFC.TH1 upper threshold is 20.

Reflex Output	RVFC.V < RVFC.TH0	RVFC.TH0 £ RVFC.V < RVFC.TH1	RVFC.V >= RVFC.TH1
Q2	X		X
Q3		X	

Example :



① : VFC0.U = 0 because VFC is a down-counter

② : change VFC0.P to 20

③ : change VFC0.S1 to 17

④ : S input active makes threshold S1 new value to be granted in next count

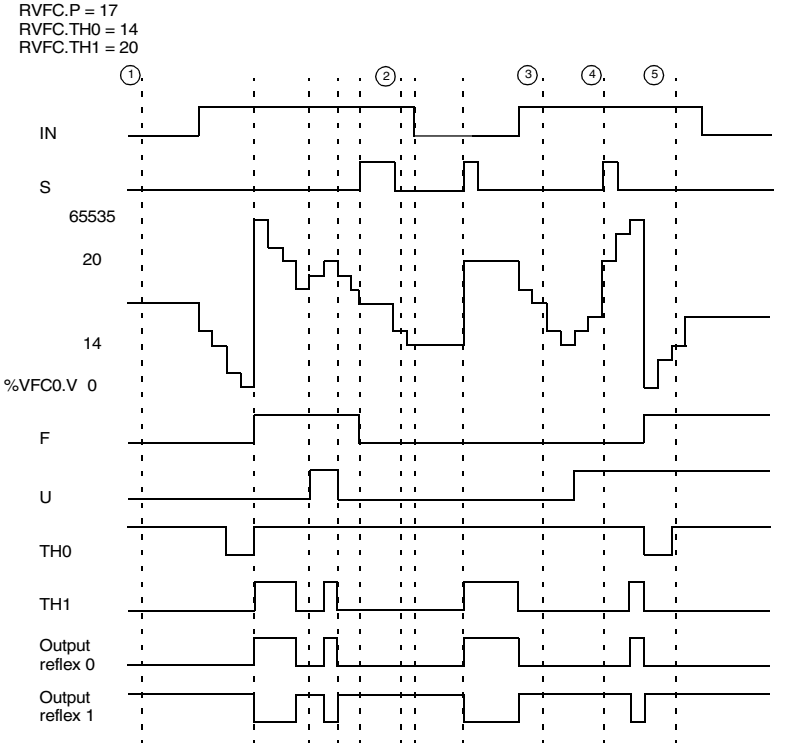
⑤ : a catch of the current value is made, so VFC0.C = 17

Usage in Up/ Downcounting Mode

The following is an example of using RVFC in an up-down counter mode. The following configuration elements have been set for this example:
The RVFC.P preset value is 60, while the RVFC.TH0 lower threshold value is 14, and the RVFC.TH1 upper threshold is 20.

Reflex Output	RVFC.V < RVFC.TH0	RVFC.TH0 £ RVFC.V < RVFC.TH1	RVFC.V >= RVFC.TH1
Q2			X
Q3	X	X	

Example :



① : Input IN is set to 1 and input S set to 1

② : change VFC0.P to 20

③ : change VFC0.S1 to 17

④ : S input active makes threshold S1 new value to be granted in next count

⑤ : a catch of the current value is made, so VFC0.C = 17

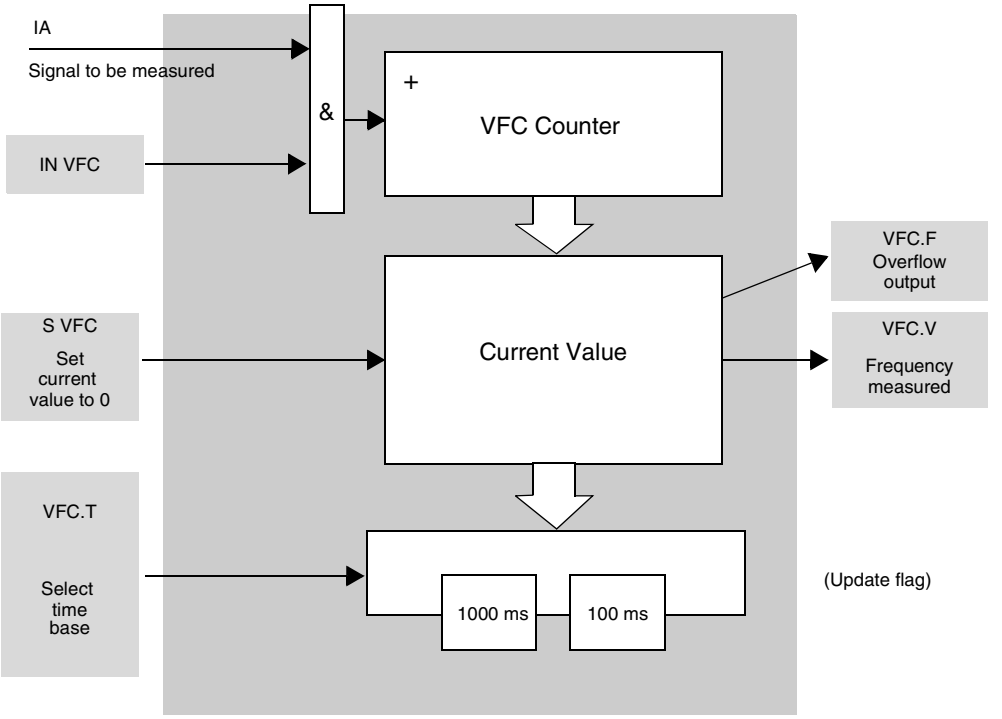
Frequency Meter Function Description

The frequency meter function of a RVFC is used to measure the frequency of a periodic signal in Hz on input IA. The frequency range which can be measured is from 10 to 20kHz. The user can choose between two time bases: This choice is made by a new object RVFC.T (Time base). A value of 100 = time base of 100 ms and a value of 1000 = time base of 1 second.

Time Base	Measurement range	Accuracy	Update
100 ms	100 Hz to 20 kHz	0.05 % for 20 kHz, 10 % for 100 Hz	10 times per second
1 s	10 Hz to 20 kHz	0.005 % for 20 kHz, 10 % for 10 Hz	Once per second

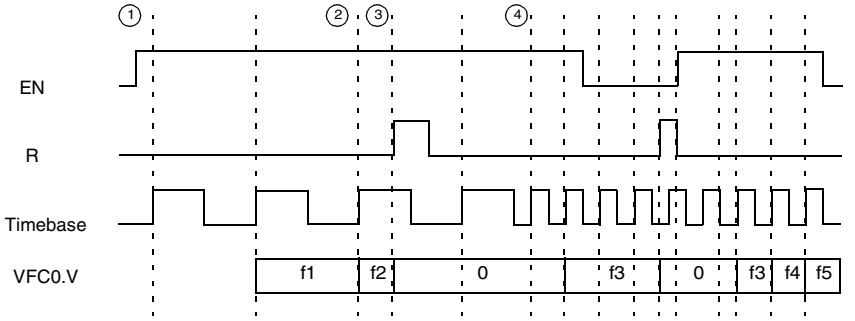
Frequency Meter Function Diagram

The following is a frequency meter function diagram:



Use in Frequency Meter Mode

The following is a timing diagram example of using RVFC in a frequency meter mode.



(1) : The first frequency measurement starts here.

(2) : The current frequency value is updated.

(3) : Input IN is set to 1 and input S set to 1

(4) : Change RVFC.T to 100 ms: this change cancels the current measurement and starts another one.

Fallback Modes

When the PLC stops or detects a communication error, the RVFC function block may operate differently according to the programmed fallback mode.
The programmable fallback modes of the RVFC function block are as follows:

- reset to zero of the very fast counter (equivalent of setting RVFC.R to 1),
- set the current value of the RVFC function block counter (equivalent of setting RVFC.EN to 0),
- continue counting.

Remote Very Fast Counter (RVFC) Parameter Registers

At a Glance

The very fast counters (RVFC0 and RVFC1) use the configuration parameters of the supported functions.

Registers 700 to 734

Specific function of Remote Very Fast Counter 0 (RVFC0)

Registers	Parameter	Description	Access
700 701	RVFC.V	Current Value	read
		Current Value	
702	RVFC.Drt	Bit[0]: count direction	read
	RVFC.D	Bit [1]: output overshoot	
	RFVC.S0	Bit [2]: S0 threshold reached. When set to 1, the current value is greater than S0.	
	RFVC.S1	Bit [3]: S1 threshold reached. When set to 1, the current value is greater than S1.	
	RFVC.FV	Bit [4]: measurement frequency valid	
703 704	RVFC.C	Capture Value	read
		Capture Value	
705	RVFC.M	Counting mode: ● 0: not used ● 1: up/down counter ● 2: 2-phase counter ● 3: single up counter ● 4: single down counter ● 5: frequency meter	read/write
706 707	RVFC.P	Preset value	read/write
		Preset value	

Registers	Parameter	Description	Access
708	RVFC. AQ0	Bit [0]: activates the reflex output 0	read/write
	RVFC. AQ1	Bit [1]: activates the reflex output 1	
	RVFC.T	Bit [2]: frequency measure time base 0: 100ms, 1: 1s	
	RVFC. AIpres	Bit [3]: validates the preset input	
	RVFC. AIca	Bit [4]: validates the sensor input	
	RVFC. Q0Z1	Bit [5]: status of reflex output 0 when the value is in zone 1	
	RVFC. Q0Z2	Bit [6]: status of reflex output 0 when the value is in zone 2	
	RVFC. Q0Z3	Bit [7]: status of reflex output 0 when the value is in zone 3	
	RVFC. Q1Z1	Bit [8]: status of reflex output 1 when the value is in zone 1	
	RVFC. Q1Z2	Bit [9]: status of reflex output 1 when the value is in zone 2	
	RVFC. Q1Z3	Bit [10]: status of reflex output 1 when the value is in zone 3	
709	RVFC.EM	Fallback mode: ● 0: reset to zero of the counter ● 1: stop counting, save the last value read and freeze counter ● 2: continue counting	read/write
710 711	RVFC.TH0	Threshold Value S0	read/write
		Threshold Value S0 where S0 < S1	
712 713	RVFC.TH1	Threshold Value S1	read/write
		Threshold Value S1 where S1 > S0	
714	RVFC.EN RVFC.R RVFC.RFV RVFC.CD	Bit [0]: enable input Bit [1]: reset input Bit [2]: reset the status of the valid measurement frequency (RFVC.FV) Bit [3]: reset RVFC.D bit	read/write

Specific function of Remote Very Fast Counter 1 (RVFC1)

Registers	Parameter	Description	Access
720...734	RVFC.	Description identical to that for very fast counter RVFC0	

Remote Pulse Generator (RPLS) Function Block

Introduction

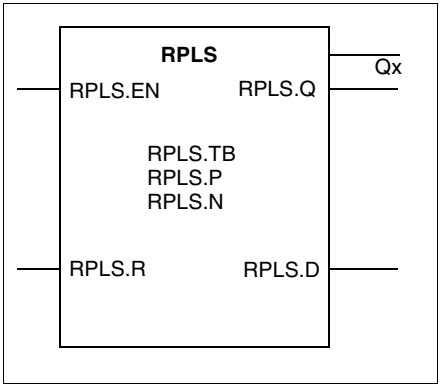
The RPLS function block is used to generate a sequence of square wave signals. There are two RPLS functions available. The RPLS0 block uses the dedicated output Q0 and the RPLS1 block uses the dedicated output Q1. The RPLS and RPWM function blocks share the same dedicated outputs. You must choose one or other of the functions for each output.

Notes

The function block will only be activated after the RPLS.R function block is initialized and the RPLS.EN input enabled.
The selection or modification of the RPLS.M counting mode will only be taken into account on activation of the RPLS.R command.

Representation

The following figure shows a pulse generator function block:



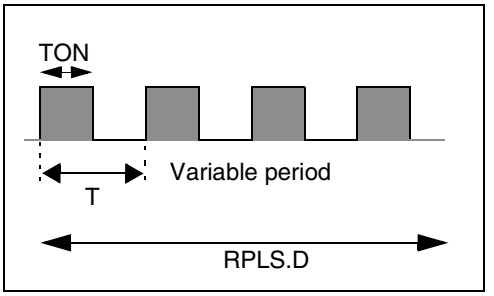
Parameters

The following table shows the different parameters of the RPLS pulse generator function block.

Parameter	Description	Description
RPLS.TB	Time base	This parameter can take the following time base values: ● 0.127 ms ● 0.508 ms ● 10 ms ● 1 s (default value)
RPLS.P	Period coefficient value	Authorized values for the preset period: ● not used ● 0 < RPLS.P < 255 with a time base 0.127 ms or 0.508 ms ● 1 < RPLSP < 65535 (FFFF H) with a time base of 10 ms or 1 s
RPLS.N	Number of pulses	The number of pulses to be generated over a period T can be limited to 0 < RPLS.N < 4 294 967 295 (FFFF FFFF H). The default value is set to 0. To produce an unlimited number of pulses, set RPLS.N to zero.
RPLS.EN	Validation of the pulse generator	Validation of the RPLS block operation. When set to 0, this block is inhibited and the RPLS.Q output reset to zero.
RPLS.R	Reset	At state 1, outputs RPLS.Q and RPLS.D are set to 0. The number of pulses generated in period T is set to 0.
RPLS.Q	Generation of the pulses in progress	When set to 1, this indicates that the pulse signal is generated at the dedicated output channel.
RPLS.Qx	Dedicated outputs	Physical output to which the pulse train is applied.
RPLS.D	Pulse generation done output	At state 1, signal generation is complete. The number of desired pulses has been reached. This is reset by activating RPLS.R

Operation

The following diagram illustrates the RPLS function block:



Duration of the pulse train: RPLS.N * T
The output signal period is set on configuration, by selecting the time base RPLS.TB and the period coefficient value RPLS.P.

- T = RPLS.P * RPLS.TB
- TON = T/2 for time bases 0.142 ms and 0.508 ms
  = (RPLS.P * RPLS.TB)/2
- TON = [whole part (RPLS.P)/2] * RPLS.TB for the 10ms to 1s time bases.

Note:

- To obtain a good level of precision from the duty cycle with time bases of 10ms and 1s, you are recommended to have a RPLS.P >= 100 if P is odd.
- Any modification of the RPLS.P coefficient value is immediately taken into account.
- Where the RPLS function is used, the writing of the Q0 and Q1 outputs does not interrupt signal generation.

Period Ranges Available

The available period ranges are as follows:

- 0.127 ms to 32.38 ms in steps of 0.127 ms (30.9 Hz to 7.87 kHz)
- 0.508 ms to 129.54 ms in steps of 0.508 ms (7.72 Hz to 1.97 kHz)
- 20 ms to 5.45 mins in steps of 10 ms
- 1 sec to 1193046 hours in steps of 1 sec

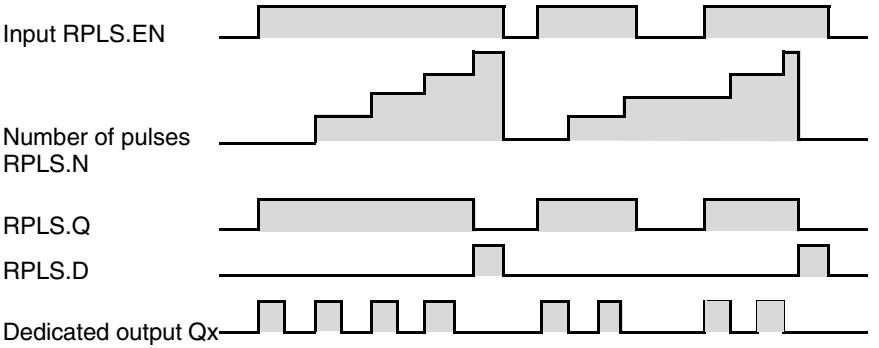
Fallback Modes RPLS.EM

When the PLC stops or detects a communication error, the RPLS function block may operate differently according to the programmed fallback mode.
The programmable fallback modes of the RPLS function block are as follows:

- generator reset with output reset (equivalent of setting RPLS.R to 1).
- stop at the end of the current interval (equivalent of setting RPLS to 0),
- continue generating pulses.

Pulse Generator Example

The following is an illustration of a pulse diagram of the RPLS function block.



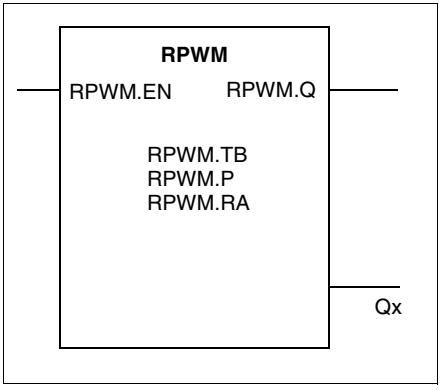
Remote Pulse Width Modulator Function Block

Introduction

The remote pulse width modulator (RPWM) function block generates a rectangular signal on the dedicated output channels. The signal duty cycle is variable.
There are two RPWM blocks available. The RPWM0 block uses the dedicated output Q0 and the RPMW1 block uses the dedicated output Q1. The RPLS and RPWM function blocks share the same dedicated outputs. You must choose one or other of the functions for each output.

Representation

The following figure shows a remote pulse width modulator function block:



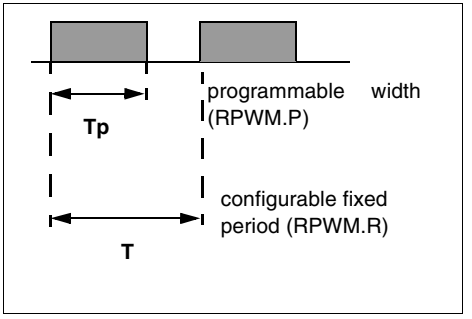
Parameters

The following table shows the different parameters of the remote pulse width modulator (RPWM) function block.

Parameter	Description	Description
RPWM.TB	Time base	This parameter can take the following time base values: ● 0.127 ms ● 0.508 ms ● 10 ms ● 1 s (default value)
RPWM.P	Period coefficient value	Authorized values for the preset period: ● not used ● 0 < RPWM.P < 255 with a time base 0.127 ms or 0.508 ms ● 1 < RPWM.P < 65535 (FFFF H) with a time base of 10 ms or 1 s
RPWM.RA	Duty cycle	This value sets the percentage (0% < R < 100%) of the signal in state 1 in a period T. The default value is 0 (values greater than 100 are considered to be equal to 100).
RPWM.EN	Validation of the pulse generator	Validation of the RPWM block operation. When set to 0, this block is inhibited and the RPLS.Q output reset to zero.
RPLS.Q	Generation of the pulses in progress	When set to 1, this indicates that the pulse signal is generated at the dedicated output channel.
RPWM.Qx	Dedicated outputs	Physical output to which the pulse train is applied.

Operation

The following diagram illustrates the RPWM function block:



The output signal period is set on configuration, by selecting the time base RPWM.TB and the period coefficient value PWM.P. Modifying the RPWM.RA duty cycle in the program enables the signal width to be modulated.

Range of Periods

The coefficient value and the time base can be modified during configuration. They are used to set the signal period T = RPWM.P * TB. The range of periods available:

- 0.127 ms to 32.38 ms in steps of 0.127 ms (30.9 Hz to 7.87 kHz)
- 0.508 ms to 129.54 ms in steps of 0.508 ms (7.72 Hz to 1.97 kHz)
- 10 ms to 5.45 mins in steps of 10 ms
- 1 sec to 1193046 hours in steps of 1 sec

Pulse Modulation

Calculation of the Tp width: Tp = T * (RPWM.RA/100)
If the signal period is programmed to 500 s, then,

- where the RPWM.RA ratio is set to 20%, the duration of the signal at state 1 is then: 20 % x 500 ms = 100 ms,
- where the RPWM.RA ratio is set to 50 % (duration = 250 ms),
- where the RPWM.RA ratio is set to 80 % (duration = 400 ms).

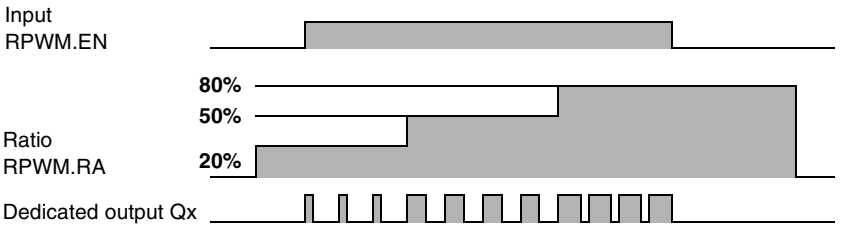
Fallback Modes RPWM.EM

When the PLC stops or detects a communication error, the RPWM function block may operate differently according to the programmed fallback mode.
The programmable fallback modes of the RPWM function block are as follows:

- generator reset with output reset,
- stop at the end of the current interval (equivalent of setting RPWM.EN to 0),
- continue generating pulses.

Example of a Pulse Generator with Pulse Width Modulation

Below is an illustration of a pulse diagram for the RPWM function block with varying duty cycles.



Remote Pulse Generators (RPLS, RPWM) Parameter Registers

At a Glance

The pulse generators (RPLS) and pulse width modulation generators (RPWM) use the configuration parameters of the supported functions.

Registers 800 to 828

Remote pulse generator specific function (RPLS0 or RPWM0).

Registers	Parameter	Description	Access
800	RPLS.Q RPWM.Q	Bit [0]: output Q. When set to 1, the pulse signal is generated at the dedicated output channel configured.	read
	RPLS.D RPWM.D	Bit [1]: output D. When set to 1, signal generation is complete. The number of desired pulses has been reached.	
801	RPLS/ RPWM	Operating mode: ● 0: not used ● 1: PLS ● 2: PWM	read/ write
802	RPLS.TB RPWM.TB	Time base: ● 0: 0.127 ms ● 1: 0.508 ms ● 2: 10 ms ● 3: 1 s	read/ write
803	RPLS.P RPWM.P	Preset period: P ● 0: not used ● 0< P < 255 with a time base of 0.127 ms or 0.508 ms ● 1< P < 65535 (FFFFH) with a time base of 10 ms or 1 s	read/ write
804 805	RPLS.N	Number of pulses: ● 0: Unlimited number of pulses: ● 1< N < 4 294 967 295 (FFFF FFFFH)	read/ write
806	RPWM.RA	Duty cycle: 0% < R < 100%. Duration of high status / Duration of low status	read/ write
807	RPLS.EM RPWM.EM	Fallback mode: ● 0: generator reset with zeroing of output ● 1: stop at the end of current interval ● 2: continue generating pulses	read/ write

Registers	Parameter	Description	Access
808	RPLS. EN RPWM.EN	Bit [0]: pulse generation input. When set to 1, the pulse generation is produced on the dedicated output channel. When set to 0, the output channel is set to 0.	read/ write
	RPLS. R RPWM.R	Bit [1]: generator reset input. When set to 1, outputs Q and D are reset to 0. The number of pulses generated over a period T is reset to 0.	

Specific function of RPLS1 or RPWM1.

Registers	Description	Access
820...828	Description identical to that for PLS0 or PWM0 functions	

Software Installation

7

Advantys Configuration Tool

At a Glance

The purpose of the Advantys Configuration Tool is to help the user configure an island. It generates a mapping image of the registers which are to be entered manually into PL7 / TwidoSoft.

Note: Under no circumstances will the software be able to download the configuration directly to the island.

Diagnostics of the Advantys OTB Island

8

Overview

At a Glance

Diagnostics of the Advantys OTB island enables us to analyze the behavior of the network by referring to:

- The LEDs indicating the communication and I/O status,
- The communications objects used for diagnostics of the different functions.

What's in this Chapter?

This chapter contains the following topics:

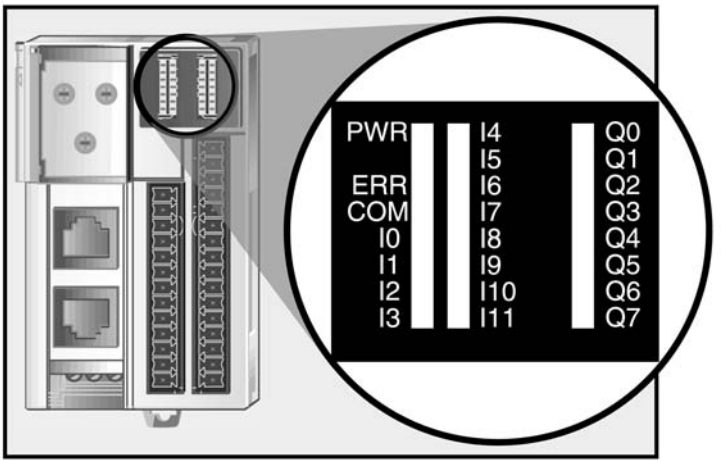
Indicator Lights (LEDs)

Introduction

23 indicators on the OTB1S0DM9LP module provide information on the functional status of the island on a Modbus network. The indicators are located in the upper section of the network interface module.

Description

The following illustration shows the LEDs used by the Advantys OTB Modbus network interface module:



Meaning of the indicators

- The PWR LED indicates the presence of a 24 VDC power supply to the network interface module.
- The ERR and COM LEDs show the data exchange status between the Modbus field bus master and the Advantys OTB island.
- The LEDs I0 to I11 and Q0 to Q7 reflect the activity and/or events observed on the network interface module.
- The LED 2 is not used.

Note: When you consult the table, make sure you check the status of the Power LED

Modbus Communication LEDs

The following table describes the conditions of and the colors used by the COM and ERR LEDs to display the normal operating modes and error conditions of an Advantys OTB Modbus network interface module on the field bus.

Name	LED color	Type of flashing	Function
Com (communication)	yellow	random flashing	On when sending and receiving
Err (error)	red	on	Internal error
		random flashing	Other errors: communication errors or configuration fault

I/O Status Indicators

The following table describes the conditions of and the colors used by the PWR LEDs, I0 to I11 and Q0 to Q7 to display the normal operating modes and error conditions for the power supply and I/Os of the Advantys OTB Modbus network interface module.

Name	LED color	Status	Function
PWR (power)	green	on	Presence of a 24 VDC for the OTB module
I0 to I11	green	on	Input set to 1
		off	Input set to 0
Q0 to Q7	green	on	Active output
		off	Inactive output

OTB Island Diagnostics Registers

At a Glance

Diagnostics uses the monitoring parameters of the supported functions. All parameters in this zone are accessible in read-only.

Registers 900 to 917

Registers 900 and 901: Island status

Registers	Function	Description
900	Island status word	Bits [0...8]: not used Bit [9]: communication fault or external fault Bits [10...12]: not used Bit [13]: configuration fault (expansion modules missing or badly configured) Bits [14...15]: not used
901	Expansion module status word	Bit [0]: status word of first expansion module Bit [1]: status word of second expansion module Bit [2]: status word of third expansion module Bit [3]: status word of fourth expansion module Bit [4]: status word of fifth expansion module Bit [5]: status word of sixth expansion module Bit [6]: status word of seventh expansion module

Note:
Bit values:
- 0: no fault
- 1: fault

Registers 902 to 907: diagnostics for functions specific to Advantys OTB module (configured functions only)

Registers	Function	Description
902	Fast Counter 0	Bits [0...8]: not used Bit [9]: configuration consistency error Bits [10...15]: not used
903	Fast Counter 1	Description identical to register 902
904	Very Fast Counter 0	Description identical to register 902
905	Very Fast Counter 1	Description identical to register 902

Registers	Function	Description
906	Pulse generator PLS/PWM 0	Description identical to register 902
907	Pulse generator PLS/PWM 1	Description identical to register 902

Note:
Bit values:
- 0: no fault
- 1: fault

Registers 908 to 910: diagnostics for functions specific to Advantys OTB module (configured functions only)

Registers	Function	Description
908	Inputs associated with Fast Counter and Very Fast Counter functions (function configured and input used)	Bit [0]: input 0 (if used by RVFC0) Bit [1]: input 1 (if used by RVFC0) Bit [2]: input 2 (if used by RVFC0) Bit [3]: input 3 (if used by RVFC0) Bit [4]: input 4 (if used by RVFC1) Bit [5]: input 5 (if used by RVFC1) Bit [6]: input 6 (if used by RVFC1) Bit [7]: input 7 (if used by RVFC1) Bit [8]: input 8 (if used by RFC0) Bit [9]: input 9 (if used by RFC1) Bits [10...15]: not used
909	Outputs associated with Very Fast Counter, PLS and PWM functions (function configured and output used)	Bit [0]: output 0 (if used by PLS/PWM 0) Bit [1]: output 1 (if used by PLS/PWM 1) Bit [2]: output 2 (if used by RVFC0) Bit [3]: output 3 (if used by RVFC0) Bit [4]: output 4 (if used by RVFC1) Bit [5]: output 5 (if used by RVFC1) Bits [6...15]: not used

Registers	Function	Description
910	Status of OTB Module I/Os	Bit [0]: channels operating normally (for all its channels) Bit [1]: module initializing (or initializing information of all channels). Bit [2]: hardware failure. Bit [3]: OTB module configuration fault Bit [4...7]: not used Bit [8]: value error in last command Bit [9]: value consistency error in last command Bit [10...15]: not used

Note:
Bit values:
- 0: no fault
- 1: fault

Registers 911 to 917: expansion module diagnostics (1 register per expansion module)

Type	Description of diagnostics register
Discrete module	No diagnostics
Analog module	Bit [0]: fault Bit [1]: module initializing (or initializing information of all channels). Bit [2]: hardware failure (external power supply failure, common to all channels). Bit [3]: analog expansion module configuration fault Bit [4]: conversion of data input channel 0 in progress Bit [5]: conversion of data input channel 1 in progress Bit [6]: thermocouple input channel 0 not configured Bit [7]: thermocouple input channel 1 not configured Bit [8]: not used Bit [9]: Inconsistent configuration Bit [10]: analog input data channel 0 over range Bit [11]: analog input data channel 1 over range Bit [12]: incorrect wiring (analog input data channel 0 below current range, open current loop) Bit [13]: incorrect wiring (analog input data channel 1 below current range, open current loop) Bit [14]: mixing of analog input types not allowed Bit [15]: output value outside scale

Type	Description of diagnostics register
Analog module TWDAVO2 HT	Bit [1], Bit [0]: channel 0 output ● 0 , 0: no fault ● 0 , 1: configuration fault ● 1 , 0: incorrect value Bit [3], Bit [2]: channel 1 output ● 0 , 0: no fault ● 0 , 1: configuration fault ● 1 , 0: incorrect value Bit [4...15]: not used
Analog module TWDAMI4 LT	Bit [1], Bit [0]: channel 0 input ● 0 , 0: no fault ● 0 , 1: configuration fault ● 1 , 0: incorrect value (module under initialization or under conversion) ● 1 , 1: incorrect value (outside range) Bit [3], Bit [2]: channel 1 input description identical to channel 0 Bit [5], Bit [4]: channel 2 input description identical to channel 0 Bit [7], Bit [6]: channel 3 input description identical to channel 0 Bit [8...15]: not used
Analog module TWDAMI8 HT TWDARI8 HT	Bit [1], Bit [0]: channel 0 input ● 0 , 0: no fault ● 0 , 1: configuration fault ● 1 , 0: incorrect value (module under initialization or under conversion) ● 1 , 1: incorrect value (outside range) Bit [3], Bit [2]: channel 1 input description identical to channel 0 Bit [5], Bit [4]: channel 2 input description identical to channel 0 Bit [7], Bit [6]: channel 3 input description identical to channel 0 Bit [9], Bit [8]: channel 4 input description identical to channel 0 Bit [11], Bit [10]: channel 5 input description identical to channel 0 Bit [13], Bit [12]: channel 6 input description identical to channel 0 Bit [15], Bit [14]: channel 7 input description identical to channel 0

Note:
Bit values:
- 0: fault
- 1: no fault

Behavior in the Event of a Fault

Management of Island in the Event of a Fault

If a fault occurs on one of the modules, the module behaves in the following way:

- island switches to fallback mode,
- impossible to read / write (exchange report 04),
- possible to read exchange registers 900 to 917.

Island Registers Table

9

Registers Table (mapping) for Modbus Advantys OTB Module

At a Glance

The registers table depends on the network interface module, the connected expansion modules and the type of those modules. Specific register zones are reserved for different types of data.

Registers Table (mapping)

Zone containing the register numbers associated with the functions supported by OTB. The following register numbers must be coded in Modbus requests:

Registers	Function	Pages
0 to 99	Status of island inputs	0 to 99 (See *Status of inputs , p. 192*)
100 to 199	Island output commands	100 to 199 (See *Output Commands , p. 192*)
200 to 599	Island I/O configuration parameters	200 to 599 (See *I/O Parameters, p. 193*)
600 to 699	Remote Fast Counter (RFC) function block	600 to 699 (See *Fast Counters, p. 194*)
700 to 799	Remote Very Fast Counter (RVFC) function block	700 to 799 (See *Very Fast Counters , p. 195*)
800 to 899	Remote pulse generator function block (RPLS) Remote pulse generator function block with pulse width modulation (RPWM)	800 to 899 (See *Pulse Generator, p. 197*)
900 to 999	Island diagnostics	900 to 999 (See *Diagnostics, p. 198*)
1000 to 1099	Management of island behavior	1000 to 1099 (See *Management of Island Behavior, p. 202*)

Registers	Function	Pages
1100 to 1108	Island structure	1100 to 1108 (See *Management of Island Behavior, p. 202*)

Status of inputs

The status of island inputs can be read in zones 0 to XX (XX depends on the number of expansion modules connected).

Register	Description
0	Status of inputs 0 to 11 of OTB module
1	first input status word of first expansion module
...	following input status words of expansion modules
XX	last input status word of last expansion module

Output Commands

The island output commands can be read in zones 100 to 1XX (XX depends on the number of expansion modules connected).

Registers	Description
100	Outputs 0 to 8 of OTB module
101	first output command word of first expansion module
...	following output command words of expansion modules
1XX	last output command word of last expansion module

I/O Parameters

The OTB module's I/O parameter registers can be read in zones 200 to 213 and the registers for the expansion modules' I/O parameters are in zones 214 to 2XX (XX depends on the number of expansion modules connected).

Registers	Description
200...211	Configuration of inputs 0 to 11 of OTB module Input filtering value: ● 0: no filtering ● 1: filtering at 3ms (default value) ● 2: filtering at 12ms
212	Configuration of fallback mode of OTB module discrete outputs Bit value: ● 0: maintain ● 1: fallback (default value) Bit [0...7]: output 0...7 Bit [8...15]: not used
213	Configuration of fallback values of OTB module discrete outputs Bit value: ● 0: force output to 0 (default value) ● 1: force output to 1 Bit [0...7]: output 0...7 Bit [8...15]: not used
214	First input configuration word of first expansion module with this parameter
2..	Following input configuration words of expansion module with parameters
2XX	Last input configuration word of last expansion module with parameters

Note: The order of the parameters is defined by expansion modules added from left to right. The number of parameters depends on the types of expansion modules connected. Discrete inputs of expansion modules are not filtered.

Discrete I/O Expansion Modules

Expansion Module Discrete I/O Parameter Registers 214 to 599, p. 132

Analog I/O Expansion Modules

Expansion Module Analog I/O Parameter Registers 214 to 599, p. 135

Fast Counters

Specific fast counter function 0 (RFC).

Registers	Parameter	Description	Access
600 601	RFC.V	Current Value Current Value	read
602	RFC.D	Bit [0]: D (Done)	read
603	RFC.M	Counting mode: ● 0: not used (default value) ● 1: counter ● 2: downcounter	read/write
604	RFC.EM	Fallback mode: ● 0: Reset counter to zero (default value) ● 1: stop counting, save the last value read and freeze counter ● 2: continue counting	read/write
605 606	RFC.P	Preset value Preset value	read/write
607	RFC.EN RFC.R RFC.CD	Bit [0]: validation of the input EN Bit [1]: R (Reset) Bit [2]: reset of the RFC.D bit	read/write

Specific function of fast counter 1 (RFC1).

Registers	Description	Access
620...627	Description identical to that for counter 0	read

Very Fast Counters

Specific function of Remote Very Fast Counter 0 (RVFC0)

Registers	Parameter	Description	Access
700 701	RVFC.V	Current Value	read
		Current Value	
702	RVFC.Drt	Bit[0]: count direction	read
	RVFC.D	Bit [1]: output overshoot	
	RFVC.S0	Bit [2]: S0 threshold reached. When set to 1, the current value is greater than S0.	
	RFVC.S1	Bit [3]: S1 threshold reached. When set to 1, the current value is greater than S1.	
	RFVC.FV	Bit [4]: measurement frequency valid	
703 704	RVFC.C	Capture Value	read
		Capture Value	
705	RVFC.M	Counting mode: • 0: not used (default value) • 1: up/down counter • 2: 2-phase counter • 3: single up counter • 4: single down counter • 5: frequency meter	read/write
706 707	RVFC.P	Preset value	read/write
		Preset value	
708	RVFC.AQ0	Bit [0]: activates the reflex output 0	read/write
	RVFC.AQ1	Bit [1]: activates the reflex output 1	
	RVFC.T	Bit [2]: frequency measure time base 0: 100ms, 1: 1s	
	RVFC.AIpres	Bit [3]: validates the preset input	
	RVFC.AIca	Bit [4]: validates the sensor input	
	RVFC.Q0Z1	Bit [5]: status of reflex output 0 when the value is in zone 1	
	RVFC.Q0Z2	Bit [6]: status of reflex output 0 when the value is in zone 2	
	RVFC.Q0Z3	Bit [7]: status of reflex output 0 when the value is in zone 3	
	RVFC.Q1Z1	Bit [8]: status of reflex output 1 when the value is in zone 1	
	RVFC.Q1Z2	Bit [9]: status of reflex output 1 when the value is in zone 2	
	RVFC.Q1Z3	Bit [10]: status of reflex output 1 when the value is in zone 3	

Registers	Parameter	Description	Access
709	RVFC.EM	Fallback mode: • 0: reset counter to zero (default value) • 1: stop counting, save the last value read and freeze counter • 2: continue counting	read/write
710 711	RVFC.TH0	Threshold Value S0	read/write
		Threshold Value S0 where S0 < S1	
712 713	RVFC.TH1	Threshold Value S1	read/write
		Threshold Value S1 where S1 > S0	
714	RVFC.EN RVFC.R RVFC.RFV RVFC.CD	Bit [0]: enable input Bit [1]: reset input Bit [2]: reset the status of the valid measurement frequency (RFVC.FV) Bit [3]: reset RVFC.D bit	read/write

Specific function of Remote Very Fast Counter 1 (RVFC1)

Registers	Description	Access
720...733	Description identical to that for very fast counter RVFC 0	

Pulse Generator

Remote pulse generator specific function (RPLS0 or RPWM0).

Registers	Parameter	Description	Access
800	RPLS.D RPWM.D	Bit [0]: output Q. When set to 1, the pulse signal is generated at the dedicated output channel configured Bit [1]: output D. When set to 1, signal generation is complete. The number of desired pulses has been reached.	read
801	RPLS/ RPWM	Operating mode: ● 0: not used (default value) ● 1: PLS ● 2: PWM	read/write
802	RPLS.TB RPWM.TB	Time base: ● 0: 0.127 ms (default value) ● 1: 0.508 ms ● 2: 10 ms ● 3: 1 s	read/write
803	RPLS.P RPWM.P	Period coefficient: P ● 0: not used (default value) ● 0< P < 255 with a time base of 0.127 ms or 0.508 ms ● 1< P < 65535 (FFFFH) with a time base of 10 ms or 1 s	read/write
804 805	RPLS.N	Number of pulses: ● 0 : unlimited number of pulses (default value) ● 1< N < 4 294 967 295 (FFFF FFFFH)	read/write
806	RPWM.RA	Duty cycle: 0% < R < 100%. Duration of high status / Duration of low status	read/write
807	RPLS.EM RPWM.EM	Fallback mode: ● 0: generator reset with zeroing of output ● 1: stop at the end of current interval ● 2: continue generating pulses	read/write
808	RPLS. Q RPWM.Q RPLS. R RPWM.R	Bit [0]: pulse generation input. When set to 1, the pulse generation is produced on the dedicated output channel. When set to 0, the output channel is set to 0. Bit [1]: generator reset input. When set to 1, outputs Q and D are reset to 0. The number of pulses generated over a period T is reset to 0.	read/write

Specific function PLS1 or PWM1.

Registers	Description	Access
820...828	Description identical to that for PLS0 or PWM0 functions	

Diagnostics

All parameters in this zone are accessible in read-only
Registers 900 and 901: Island status

Registers	Function	Description
900	Island status word	Bits [0...8]: not used Bit [9]: communication fault or external fault Bits [10...12]: not used Bit [13]: configuration fault (expansion modules missing or badly configured) Bits [14...15]: not used
901	Expansion module status word	Bit [0]: status word of first expansion module Bit [1]: status word of second expansion module Bit [2]: status word of third expansion module Bit [3]: status word of fourth expansion module Bit [4]: status word of fifth expansion module Bit [5]: status word of sixth expansion module Bit [6]: status word of seventh expansion module

Note:
Bit values:
- 0: no fault
- 1: fault

Registers 902 to 907: diagnostics for functions specific to Advantys OTB module (configured functions only)

Registers	Function	Description
902	Fast Counter 0	Bits [0...8]: not used Bit [9]: configuration consistency error Bits [10...15]: not used
903	Fast Counter 1	Description identical to register 902
904	Very Fast Counter 0	Description identical to register 902
905	Very Fast Counter 1	Description identical to register 902
906	Pulse generator PLS/PWM 0	Description identical to register 902
907	Pulse generator PLS/PWM 1	Description identical to register 902

Note:
Bit values:
- 0: no fault
- 1: fault

Registers 908 to 910: diagnostics for functions specific to Advantys OTB module (configured functions only)

Registers	Function	Description
908	Inputs associated with Fast Counter and Very Fast Counter functions (function configured and input used)	Bit [0]: input 0 (if used by RVFC0) Bit [1]: input 1 (if used by RVFC0) Bit [2]: input 2 (if used by RVFC0) Bit [3]: input 3 (if used by RVFC0) Bit [4]: input 4 (if used by RVFC1) Bit [5]: input 5 (if used by RVFC1) Bit [6]: input 6 (if used by RVFC1) Bit [7]: input 7 (if used by RVFC1) Bit [8]: input 8 (if used by RFC0) Bit [9]: input 9 (if used by RFC1) Bits [10...15]: not used
909	Outputs associated with Very Fast Counter, PLS and PWM functions (function configured and output used)	Bit [0]: output 0 (if used by PLS/PWM 0) Bit [1]: output 1 (if used by PLS/PWM 1) Bit [2]: output 2 (if used by RVFC0) Bit [3]: output 3 (if used by RVFC0) Bit [4]: output 4 (if used by RVFC1) Bit [5]: output 5 (if used by RVFC1) Bits [6...15]: not used
910	Status of OTB Module I/Os	Bit [0]: channels operating normally (for all its channels) Bit [1]: module initializing (or initializing information of all channels). Bit [2]: hardware failure (external power supply failure, common to all channels). Bit [3]: OTB module configuration fault Bit [4...7]: not used Bit [8]: value error in last command Bit [9]: value consistency error in last command Bit [10...15]: not used

Note:
Bit values:
- 0: no fault
- 1: fault

Registers 911 to 917: expansion module diagnostics (1 register per expansion module)

Type	Description of diagnostics register
Discrete module	No diagnostics
Analog modules TWDAMI2HT TWDAMO1HT TWDAMM3HT TWDALM3LT	Bit [0]: fault Bit [1]: module initializing (or initializing information of all channels). Bit [2]: hardware failure (external power supply failure, common to all channels). Bit [3]: analog expansion module configuration fault Bit [4]: conversion of data input channel 0 in progress Bit [5]: conversion of data input channel 1 in progress Bit [6]: thermocouple input channel 0 not configured Bit [7]: thermocouple input channel 1 not configured Bit [8]: not used Bit [9]: inconsistent configuration Bit [10]: analog input data channel 0 over range Bit [11]: analog input data channel 1 over range Bit [12]: incorrect wiring (analog input data channel 0 below current range, open current loop) Bit [13]: incorrect wiring (analog input data channel 1 below current range, open current loop) Bit [14]: mixing of analog input types not allowed Bit [15]: output channel not available
Analog module TWDAVO2HT	Bit [1], Bit [0]: channel 0 output ● 0 , 0: no fault ● 0 , 1: configuration fault ● 1 , 0: incorrect value Bit [3], Bit [2]: channel 1 output description identical to channel 0 Bit [4...15]: not used

Type	Description of diagnostics register
Analog module TWDAMI4 LT	Bit [1], Bit [0]: channel 0 input ● 0 , 0: no fault ● 0 , 1: configuration fault ● 1 , 0: incorrect value (module under initialization or under conversion) ● 1 , 1: incorrect value (outside range) Bit [3], Bit [2]: channel 1 input description identical to channel 0 Bit [5], Bit [4]: channel 2 input description identical to channel 0 Bit [7], Bit [6]: channel 3 input description identical to channel 0 Bit [8...15]: not used
Analog module TWDAMI8 HT TWDARI8 HT	Bit [1], Bit [0]: channel 0 input ● 0 , 0: no fault ● 0 , 1: configuration fault ● 1 , 0: incorrect value (module under initialization or under conversion) ● 1 , 1: incorrect value (outside range) Bit [3], Bit [2]: channel 1 input description identical to channel 0 Bit [5], Bit [4]: channel 2 input description identical to channel 0 Bit [7], Bit [6]: channel 3 input description identical to channel 0 Bit [9], Bit [8]: channel 4 input description identical to channel 0 Bit [11], Bit [10]: channel 5 input description identical to channel 0 Bit [13], Bit [12]: channel 6 input description identical to channel 0 Bit [15], Bit [14]: channel 7 input description identical to channel 0

Note:
Bit values:
- 0: no fault
- 1: fault

Management of Island Behavior

The OTB module management registers can be read in zones 1000 to 1099.

Registers	Function
1000	Indicates the source of configuration parameters: ● 0: use default values ● 1: use saved values ● 2: use current unsaved values
1001	Indicates the number of backups performed. It is set to zero when default settings are restored.
1002	Save parameters command. When a value different to the current value is written to this register, the module saves the parameters and the configuration of expansion modules.
1003	Restore parameters command. When a value different to the current value is written to this register, the module restores the most recent saved parameters. The current expansion module configuration is the same as the last saved expansion module configuration.
1004	Restore default parameters command. When a value different to the current value is written to this register, the module restores the default factory settings.
1005	Expansion bus reset . This function is used to update expansion module I/O parameters: ● 1: setting it to 1 initiates an expansion bus Reset. ● New parameters written to expansion modules by the application. ● 0: setting it to zero activates a bus reset, if the expansion bus parameters are consistent. **A bus reset sets all the expansion module outputs to zero**. The OTB module outputs are maintained. This register is set to zero when the OTB module is reset.
1006	Network monitoring: ● 0: default value, no monitoring ● x: monitoring time in ms.
1007	Bit [0]: This bit is used to relaunch network monitoring after a monitoring fault: ● 0: monitoring active ● 1: monitoring fault
1008	Bit [0]: LSB/MSB order: ● 0: the registers concerned by 32 bit format are in MSB / LSB format (default value) ● 1: the registers concerned by 32 bit format are in MSB/LSB format
1009...1019	Reserved registers

The object code values according to expansion module type are defined in the following table.

Type of expansion module	Product code value
Discrete input modules	
TWDDDI8DT	0004H
TWDDAI8DT	0004H
TWDDDI16DT	0000H
TWDDDI16DK	0000H
TWDDDI32DK	0200H
Discrete output modules	
TWDDDO8TT	0005H
TWDDDO8UT	0005H
TWDDRA8RT	0005H
TWDDDO16TK	0001H
TWDDDDO16UK	0001H
TWDDRA16RT	0001H
TWDDDO32TK	0301H
TWDDDO32UK	0301H
Discrete mixed modules	
TWDDMM8DRT	0405H
TWDDMM24DRF	0205H
Analog modules	
TWDAMI2HT	6002H
TWDAM01HT	6003H
TWDAMM3HT	6001H
TWDALM3LT	6000H
TWDAVO2HT	6007H
TWDAMI4HT	6004H
TWDAMI8HT	6005H
TWDARI8HT	6006H
Shared junction block	
OTB9ZZ61JP	-

Appendices

At a Glance

Introduction

This appendix provides information on common IEC symbols used in this manual.

What's in this Appendix?

The appendix contains the following chapters:

IEC Symbols

A

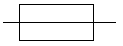
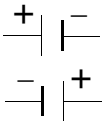
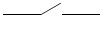
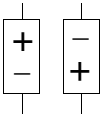
Glossary of Symbols

Introduction

This section contains illustrations and definitions of common IEC symbols used in describing wiring schematics.

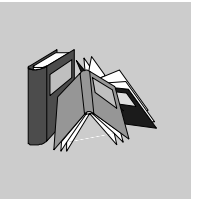
Symbols

Common IEC symbols are illustrated and defined in the table below:

	Fuse
	Load
	AC power
	DC power
	Digital sensor/input, for example, contact, switch, initiator, light barrier, and so on.
	Earth ground
	2-wire sensor

	Thermocouple element

Glossary



!

10Base-T An adaptation of the IEEE 802.3 (Ethernet) standard, the 10Base-T standard requires a twisted pair cable of a maximum segment length of 100m, terminating with a RJ-45 connector. A 10Base-T network is a low bandwidth local area network capable of transferring data at a maximum speed of 10 Mbit/s.

802.3u, frame A frame format specified in the IEEE 802.3 (Ethernet) standard according to which the header species the packet length.

A

agent **1.** SNMP — the server application that runs on a network device. **2.** Fipio — a slave device on the network.

analog input A module containing circuits that enable analog dc (direct current) input signals to be converted into digital values that can be handled by the processor. This implies that the analog inputs are generally direct values — in other words: a value in the data table is a direct reflection of the analog signal value.

analog output A module containing circuits that transmit an analog dc (direct current) input signal proportional to a digital input value to the processor module. This implies that the analog outputs are generally direct values — in other words: a value in the data table directly governs the analog signal value.

application object — On networks based on the CAN protocol, application objects represent a specific functionality of the device, such as the state of input or output data.

ARP — *Address Resolution Protocol* The IP network layer protocol uses ARP technology to map an IP address to a MAC (hardware) address.

automatic addressing — An address is assigned automatically to each preferred island bus I/O module and device.

automatic baud rate selection — Automatic assignment and detection of a common baud rate, as well as a device's capacity to adapt to this rate.

automatic configuration — The capacity of island modules to operate with the preset default settings. An island bus configuration wholly based on a physical assembly of I/O modules.

B

BootP — *boot protocol ("bootstrap").* UDP/IP protocol enabling an Internet node to obtain its IP settings from its MAC address.

BOS — *Beginning Of Segment*. If the island comprises several I/O module segments, an STB XBE 1200 BOS module is positioned at the start of each extension segment. Its role is to transmit communication messages from the island bus and to generate the logic power required by the modules on the extension segment.

bus arbiter — A master device on a Fipio network.

C

CAN — *Controller Area Network.* The CAN protocol (ISO 11898) for serial bus networks is designed to connect a series of intelligent devices (from different manufacturers) together into intelligent systems for real-time industrial applications. Multi-master CAN systems provide a high level of data integrity, by implementating message broadcast mechanisms and a strict error checking procedure. Initially developed for the automotive industry, the CAN protocol is now used in a wide range of automation environments.

CANopen, protocol An open standard industrial protocol used on the internal communication bus. This protocol can be used to connect any CANopen standard-compliant device to the island bus.

CI *Command Interface*

CiA *CAN in Automation*. The acronym CiA denotes a non-profit making organization of manufacturers and users who wish to promote and develop the use of high layer protocols based on CAN.

COB *Communication Object*A communication object is a unit of transfer (a "message") used on a CAN network. Communication objects indicate specific device functionality. They are specified in the CANopen communication profile.

COMS ("CANopen Master Scanner") *island bus scanner.*

configuration The arrangement and connections made between the hardware components of a system, as well as the selected hardware and software options that determine the system's operating characteristics.

CRC *cyclic redundancy check.* The messages that use this error finding mechanism have a CRC field that is calculated by the sender according to the content of the message. The receiving nodes recalculate the CRC field. Any difference between the two codes indicates a difference between the message sent and that received.

D

DeviceNet, protocol DeviceNet is a network based on low level connections and established over CAN, using a serial bus system without a defined application layer. Consequently, DeviceNet defines a layer for the industrial application of the CAN protocol.

DHCP *Dynamic Host Configuration Protocol.* DHCP is a TCP/IP protocol that enables a server to assign an IP address based on a role name (host name) to a network node.

differential input An input design in which two wires (+ and -) run from each signal source to the data acquisition interface. The voltage between the input and the interface ground is measured by two high-impedance amplifiers, and the outputs of the two amplifiers are subtracted by a third amplifier to give the difference between the + and - inputs. The voltage common to the two wires is thus eliminated. A differential design eliminates the problem of ground differences encountered with single end connections. It also minimizes the problem of noise interference between channels.

digital input/ output Another expression used is discrete input/output. Designates an input or output featuring an individual circuit connection to the module corresponding directly to a bit or word of the data table storing the value of the signal on this I/O circuit. A digital I/O gives the control logic discrete access to I/O values.

DIN *"Deutsche Industrie Norm".* German standardization body that defines dimensional and engineering standards. These standards are currently recognized worldwide.

E

EDS *Electronic Data Sheet*The EDS is a file in standard ASCII format containing information on a communication functionality of a network device and the content of its object dictionary. The EDS also defines device-specific and manufacturer-specific objects.

EIA *Electronic Industries Association.* Body that draws up data communication and electrical/electronic standards.

electro-magnetic disturbance *Electro-Magnetic Interference (EMI).* Electro-magnetic disturbances are liable to cause interruptions, anomalies or interference in the performance of electronic hardware. They occur when a source electronically transmits a signal that interferes with other devices.

EMC *Electro-Magnetic Compatibility.* Devices that comply with EMC requirements are capable of error-free operation within the specified electro-magnetic limits of the system.

EOS *"End Of Segment".* If the island comprises several I/O module segments, an STB XBE 1000 EOS module is positioned at the start of each extension segment, except the last segment in the island. Its role is to pass on communication messages from the island bus and to transmit the 24 VDC logic power supply to the next segment.

Ethernet Wiring and indicator specification for LANs (Local Area Networks) used to connect devices together on a specific site, such as within a building. Ethernet uses a bus or star topology to connect different network nodes together.

Ethernet II A frame format according to which the header species the packet type. Ethernet II is the default frame format for communication with the Advantys STB NIP 2212 NIM.

F

fallback state A secure state to which any Advantys STB I/O module can revert should the communication connection fail.

fallback value The value adopted by a device when it enters the fallback state. Generally, the fallback value is either configured, or is the device's last stored value.

FED_P *Extended Fipio, device profile.* On a Fipio network, the standard type of device profile for agents whose data length is greater than eight words and less than or equal to 32 words.

Fipio *Fieldbus Interface Protocol (FIP)* open fieldbus protocol and standard, compliant with FIP/World FIP standards. Fipio is designed to provide configuration, setup, data exchange and low-level diagnostics services.

Flash memory Flash memory is a type of memory that is non-volatile (or remanent) but liable to be overwritten. Data is stored in a special EEPROM chip, which is erasable and reprogrammable.

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

FSD_P *Standard Fipio, device profile.* On a Fipio network, the standard type of device profile for agents whose data length is greater than two words and less than or equal to eight words.

full scale The maximum level in a specific range. For an analog input circuit, for example, the maximum authorized voltage or current is said to be at full scale when a minimal increase in level would cause an authorized range overrun.

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

function code A function code is a series of instructions ordering one or more slave devices, located at one or more specified addresses, to perform a type of action, for example to read a set of data registers and to respond by writing the content of the set in question.

G

gateway A program or hardware component whose role is to relay data between networks.

global_ID *global_identifier.* 16-bit integer that uniquely identifies the position of a device on a network. This global identifier (global_ID) is a symbol address universally recognized by all other devices on the network.

GSD *Generic Slave Data* file. A GSD file is a device description file supplied by the manufacturer, which defines the functionality of the device concerned on a Profibus DP network.

H

HMI **human-machine interface** A user interface (usually graphic) for industrial devices.

HMI *human-machine interface* A user interface (usually graphic) for industrial devices.

hotswap Designates a procedure that allows a component to be replaced without needing to interrupt system operation. It is sometimes called a "hot" replacement although this expression can be confusing.

HTTP *HyperText Transfer Protocol.* The protocol used for communication between a web server and a client browser.

I

I/O connection base Mounting device for an I/O module, allowing it to be attached to a DIN rail and connected to the island bus. It can be used as a connection channel via which the module can receive a 24 VDC or 115/230 VAC power supply from an input or output power bus, distributed by a PDM.

I/O module In a programmable control system, an I/O module communicates directly with sensors or actuators used in the machine or process. This module is the component that is installed in the I/O connection base and establishes the electrical connections between the controller and the fieldbuses. The functionalities common to all I/O modules are offered in a range of signal capacities and levels.

I/O scanning Continual polling of Advantys STB I/O modules, performed by the COMS in order to obtain data bits and state, error and diagnostics information.

IEC *International Electrotechnical Commission.* Commission officially founded in 1906 and devoted to the advancement of theory and practice in the following sciences: electrical engineering, electronic engineering, information technology and computer engineering. The IEC 1131 standard covers industrial automation equipment.

IEC 1 type input Type 1 digital inputs support sensor signals from mechanical switching devices such as contact relays and push-buttons operating under normal climatic conditions.

IEC 1+ type input Type 1+ digital inputs support sensor signals from mechanical switching devices such as contact relays and push-buttons (under normal to moderate climatic conditions), three-wire proximity switches and two-wire proximity switches with the following characteristics:

- a voltage drop of less than or equal to 8 V
- a minimum operating current capacity of less than or equal to 2 mA
- a maximum current in blocked state of less than or equal to 0.8 mA

IEC 2 type input Type 2 digital inputs support sensor signals from solid-state devices and mechanical switching devices such as contact relays, push-buttons (under normal to rigorous climatic conditions), and two or three-wire proximity switches.

IEEE *Institute of Electrical and Electronics Engineers, Inc.* An international association for the standardization and evaluation of compliance in all areas of electro-technology, including electricity and electronics.

industrial I/O Advantys STB I/O modules are designed, at moderate cost, generally for continuous high-yield cycle applications. Modules of this type are often characterized by IEC standard threshold indices, and generally offer user-definable configuration options, internal protection, good resolution and fieldbus wiring options. They are designed to operate in moderate to high temperatures.

input filter The period for which a sensor must keep its signal activated/deactivated before the input module detects a change of state.

input polarity The polarity of an input channel determines when the input module sends a 1 (one) and when it sends a 0 (zero) to the master controller. If the polarity is *normal*, an input channel will send a 1 (one) to the controller as soon as its fieldbus sensor is activated. If the polarity is *reversed*, an input channel will send a 0 (zero) to the controller as soon as its fieldbus sensor is activated.

input response time The time required for an input channel to receive a signal from a fieldbus sensor and pass it on to the island bus.

INTERBUS, protocol The INTERBUS fieldbus protocol complies with a master/slave network model using an active ring topology, in which all devices are integrated to form a closed channel of transmission.

IP *Internet Protocol.* The part of the family of TCP/IP protocols that keeps track of the internet addresses of nodes, routes outgoing messages and recognizes incoming messages.

L

LAN *Local Area Network.* Designates a data communication network covering short distances.

light industrial I/O An Advantys STB I/O module designed at very low cost for less demanding environments (intermittent, low yield cycles). Modules of this type are for use at more moderate temperatures, subject to less strict compliance and homologation requirements and under circumstances where limited internal protection is acceptable. These modules offer significantly less user-configurable options or none at all.

linearity Measurement of how closely a characteristic follows a linear function.

LSB *Least Significant Bit or Least Significant Byte.* The part of a number, address or field that is written as the value furthest to the right in conventional hexadecimal or binary notation.

M

MAC address *Medium Access Control.* 48-bit number that is unique on a network, and is programmed into every network card or device at the time of manufacture.

mandatory module — If an Advantys STB I/O module is configured as mandatory, it has to be present and in good operating condition as part of the island configuration for the latter to be functional. If a mandatory module fails or is removed from its slot on the island bus, the whole island switches to Pre-operational mode, and ceases operation. By default, no I/O module is mandatory. The Advantys configuration software must be used to set this parameter.

master/slave model — In a network using a master/slave model, the direction of control is always from the master to slave devices.

MIB — *Management Information Base.* Public database containing the network management variables for a device compatible with SNMP (Simple Network Management Protocol). Each network management variable is identified by a unique name, a standardized description and the position that it is assigned in the data structure of an internet Management Information Base (MIB). In this public database, Schneider Electric has its own MIB extension (3833). Schneider's private Management Information Base itself contains another MIB that is private and devoted to Transparent Factory Ethernet (TFE). These private MIB extensions enable Schneider to provide its proprietary and non-proprietary network management software with additional information on network management variables.

Modbus — Modbus is an application layer messaging protocol. Modbus enables client and server communication between devices connected via different types of bus or network. Modbus offers a large number of services specified by function codes.

MSB — *Most Significant Bit or Most Significant Byte.* The part of a number, address or field that is written as the value furthest to the left in conventional hexadecimal or binary notation.

N

N.C. contact — Designates a *normally closed* contact. Also called break contacts. A pair of contact relays that is closed when the relay coil is low and open when it is energized.

N.O. contact — *Normally Open contact* Also called make contacts. A pair of contact relays that is open when the relay coil is low and closed when it is energized.

NEMA — *National Electrical Manufacturers Association.*

network cycle time — The time it takes a master to complete a single scan of all I/O modules configured on a network device. This period is generally expressed in microseconds.

NIM *Network Interface Module.* This module provides the interface between an island bus and the fieldbus network to which the island belongs. The NIM's built-in power supply supplies logic power of 5 V to Advantys STB I/O modules and 24 V electrical power, as required, to support I/O modules. The NIM also includes a RS-232 port that is used to establish a connection with the Advantys configuration software.

NMT *network management.*NMT protocols offer services for network initialization, error checking and checking device states.

O

object dictionary Sometimes referred to as the "object directory", this element of the CANopen device model provides the plan for the internal structure of CANopen devices (in accordance with the DS-401 CANopen profile). The object dictionary of a given device is a conversion table describing the data types, the communication objects and the application objects used by the device. By accessing the object dictionary structure of a specific device via the CANopen fieldbus, you can anticipate its network behavior enabling you to design a distributed application in which it can be implemented.

open industrial communication network A distributed communication network for industrial environments, based on open standards (EN 50235, EN50254 and EN50170, to citer a few) that enable data to be exchanged between devices from different manufacturers.

output filter The time it takes for an output channel to transmit change of state information to an actuator once the output module has received updated data from the NIM.

output polarity The polarity of an output channel determines when the output module activates its fieldbus actuator and when it deactivates. If the polarity is *normal*, an output channel will activate its actuator as soon the master controller sends it the value 1. If the polarity is *reversed*, an output channel will activate its actuator as soon the master controller sends it the value 0.

output response time The time it takes for an output module to receive an output signal from the island bus and transmit it to its fieldbus actuator.

P

parameterize To specify the value required by a device attribute during execution.

PDM *Power Distribution Module.* Module that distributes an AC or DC fieldbus power supply to a group of modules positioned immediately to its right on the island bus. The PDM provides a separate fieldbus power supply terrain to the input modules and the output modules. It is essential that all the I/Os grouped immediately to the right of a PDM are of the same voltage group (+ 24 VDC, 115 VAC or 230 VAC.

PDO, object *Process Data Object.*On networks based on CAN technology, PDOs (Process Data Objects) are transmitted as broadcast messages without confirmation or sent from a producer device to a consumer device. The transmitted PDO (TxPDO) from the producer device has a specific identifier corresponding to the PDO (RxPDO) received from client devices.

PE *Protective Earth* Current return line running the length of the bus, destined to carry leakage currents generated by a sensor or actuator in the control system.

peer to peer communications In peer to peer communications, there is no master/slave or client/server relation. Messages are exchanged between entities of comparable or equivalent levels of functionality, without needing to pass via a third party such as a master device.

PLC *Programmable Logic Controller.* The PLC is the nerve center of the industrial manufacturing process. Such a device is said to "automate a process", in contrast to a relay control system. These PLCs are in fact simply computers designed to survive under the sometimes harsh conditions of an industrial environment.

preferred module I/O module that functions as an auto-addressable node on an Advantys STB island bus, but which does not have the same form factor as a standard Advantys STB I/O module and which, therefore, cannot be installed in an I/O connection base. A preferred device is connected to the island bus via an STB XBE 1000 EOS module and an STB XCA 100*x* bus extension cable. The island bus can be extended to another preferred module or to another Advantys STB I/O segment. If the device or module is the last one on the island bus, it must be terminated using a 120 Ω bus terminator resistor (or "bus resistance jack").

Premium network interface An Advantys STB network interface module designed at relatively high cost to support a large number of modules and provide high data transfer capacities (for web servers, for example) and other diagnostics on the island bus.

process I/O An Advantys STB I/O module designed specially to operate in extreme temperature ranges, in compliance with IEC type 2 thresholds. Modules of this type are generally characterized by advanced built-in diagnostics capacities, high resolution; user-definable configuration options, and stricter homologation criteria.

process image Section of NIM firmware used to store real-time data for the data exchange process. The process image includes an input buffer that contains current state information and data from the island bus, and an output buffer that groups all current outputs from the island bus as they are received from the fieldbus master.

producer/ consumer model On networks employing a producer/consumer model, data packets are identified by their data content rather than their physical position. All nodes "listen" to the network and consume data packets with identifiers corresponding to their functionality.

Profibus DP *Profibus Decentralized Peripheral.* An open bus system that uses an electrical network based on a shielded two-wire cable or an optical network based on a fiber optic cable. DP transmission is designed to enable high-speed cyclical exchange of data between the PLC processor and distributed I/O devices.

R

ranking Ranking (or prioritization) is an optional functionality enabling you to selectively identify digital input modules to be scanned more frequently than others when the NIM logically scans the island bus.

reflex action The execution of a simple logic command function configured locally on an I/O module of the island bus. Reflex actions are executed by island bus modules on data from various locations on the island, such as input and output modules or the NIM. For example, reflex actions include copy and compare operations.

repeater A connection device that extends the authorized length of a bus.

reverse polarity protection In a circuit, use of a diode to protect against damage and any inadvertent operations that may be caused if 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 producing the same heating effect. The rms value is calculated by taking the square root of the mean of the sum of the squares of the instantaneous amplitude of a given full cycle. For a sinusoidal wave, the rms value corresponds to 0.707 of the peak value.

role name A unique logical personal identifier, generated by the client and assigned to an Ethernet Modbus TCP/IP NIM. Two methods can be used to create the role name: either by using a combination of manual settings on a numerical rotary switch and the reference number of the STB NIP 2212 NIM, or by going to the role name configuration web page. Once you have configured a valid role name for the STB NIP 2212 NIM, the DHCP server will use this value to identify the island on power up.

RTD *Resistive Temperature Detector.* Also known as a Resistance Temperature Device or thermocoupler. An RTD consists of a temperature transducer composed of conducting wires generally made of platinum, nickel, copper or nickel-iron. The RTD generates a variable resistance within a specific temperature range.

Rx *reception.* On a CAN, for example, 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 a communications layer, as defined in the ISO OSI reference model, can be accessed from the next layer.

SCADA *Supervisory Control And Data Acquisition.* In an industrial environment, these operations are generally performed by computers.

SDO, object *Service Data Object.* On CAN networks, the fieldbus master (CANopen) uses SDO messages for (read/write) access to the network node object dictionaries.

segment Designates a group of I/O modules and power modules connected together on an island bus. Any island must include at least one segment and can have a maximum of seven segments. The first module (furthest to the left) of a segment must provide a power bus and send communications from the island bus to the I/O modules located to its right. In the main segment, this function is always performed by a NIM. In an extension segment, the STB XBE 1200 BOS module assumes this function.

SELV *Safety Extra Low Voltage.*A secondary circuit designed and protected to ensure that the voltage measured between two accessible components (or between an accessible component and the PE terminal for Class 1 devices) never exceeds a specified safety value under normal or single fault conditions.

SIM — *Subscriber Identification Module.* Initially designed for the authentication of mobile telephone subscribers, SIM cards are now used for many other applications. The Advantys STB configuration software enables you to store configuration data created or modified using the software on a removable SIM card, and then save them to the NIM's flash memory.

single-ended inputs — An analog input design in which a cable from each signal source is connected to the data acquisition interface and the difference between the signal and the ground is measured. The success of this design technique requires two conditions to be met: the signal source must be connected to the ground and, in addition, the signal ground and the data acquisition interface ground (the PDM ground wire) must have the same potential.

sink load (or positive logic load) — Designates an output which, when activated, receives DC current from its load.

Size 1 connection base — Mounting device for an Advantys STB module, allowing it to be attached to a DIN rail and connected to the island bus. This base is 13.9 mm wide and 128.25 mm high.

Size 2 connection base — Mounting device for an Advantys STB module, allowing it to be attached to a DIN rail and connected to the island bus. This base is 18.4 mm wide and 128.25 mm high.

Size 3 connection base — Mounting device for an Advantys STB module, allowing it to be attached to a DIN rail and connected to the island bus. This base is 28.1 mm wide and 128.25 mm high.

SM_MPS — *State Management Message Periodic Services.* Designates the application and network management services used for controlling processes, data exchange, error report generation, and for automatic warning in the event of an error on the Fipio network.

SNMP — *Network Management Protocol.* The standard UDP/IP protocol used for managing IP network nodes.

source load — Also called a negative logic load. Designates a load with a directed input current. This load must come from a current source.

Split I/O — An I/O module design providing a modest number of channels (generally between two and six) in a very compact unit. The purpose of such a design is to enable the system manufacturer or integrator to only buy as many I/Os as he really needs, whilst being able to distribute these I/Os around the machine in an efficient and mechatronic manner.

standard network interface An Advantys STB network interface module developed at a reasonable cost to support the configuration and baud rate capacities that suit most standard applications on the island bus.

STD_P *Standard Profile.* On a Fipio network, a standard profile includes a fixed set of configuration and operation parameters for an agent device. This profile is based on the number of modules the device contains, and on the total length of its data. Three types of standard profile are available: FRD_P (Fipio Reduced Device Profile), FSD_P (Fipio Standard Device Profile), and FED_P (Fipio Extended Device Profile).

stepper motor Specialist DC motor used to obtain a discrete positioning without feedback.

sub-mask Number used to identify the sub-network.

sub-network Network segment that shares a network address with the other parts of a network. Any sub-network can be physically and/or logically independent from the rest of the network. It is up to a part of the Internet address – the sub-network number – to identify the sub-network. This number is not acknowledged during IP routing.

suppression of over-voltage Process consisting of absorbing and limiting transient over-voltage on an incoming AC line or a control circuit. Specially designed metal oxide limiters (varistors) and RC networks are frequently used as over-voltage suppression mechanisms.

suppressor A circuit generally used to suppress inductive loads, comprising as standard a resistor with a condenser (case of an RC suppressor) and/or a metal oxide limiter placed through the AC load.

T

TC *Thermocoupler.* A TC (thermocoupler) comprises a bi-metal temperature transducer that gives a temperature value by measuring the difference in potential caused by the joining of two different metals, at different temperatures.

TCP *Transmission Control Protocol.* Connection-based transport layer protocol that provides a reliable simultaneous bi-directional transmission of data. TCP is part of the TCP/IP protocol suite.

telegram A data packet used in serial communications.

TFE *Transparent Factory Ethernet.* Schneider Electric's open PLC architecture, based on TCP/IP protocol.

Tx *Transmission.*On a CAN, for example, a PDO is described as an TxPDO of the device that transmits it.

U

UDP *User Datagram Protocol.* A protocol in unconnected mode to which messages are distributed to a recipient computer in the form of a datagram (data telegram). UDP protocol is generally provided at the same time as Internet protocol (UPD/IP).

V

varistor Also known as a limiter. This is a two-electrode semi-conductor device with a non-linear varistance that causes a considerable drop as the applied voltage gradually increases. A varistor is used to remove transient over-voltages.

voltage group A group of Advantys STB I/O modules with the same voltage requirements (for example: AC modules), installed immediately to the right of the power distribution module (PDM) in question, and physically separated from modules with other voltage requirements (DC). Never mix different voltage group modules within the same module group.

W

watchdog timer Tracking clock that controls a cyclical process and which is cleared at the end of each cycle. The watchdog timer generates an error when it exceeds the assigned delay time.

Index

E

F

I

L

M

N

O

P

R

S

T

U

V

W