Modbus Advantys OTB

Remote Inputs/Outputs
User Manual

2.0

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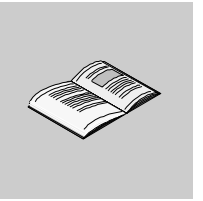
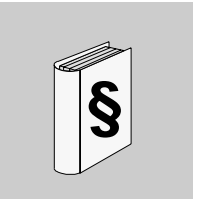


Safety Information



Important Information

NOTICE

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

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

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

⚠ DANGER

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

⚠ WARNING

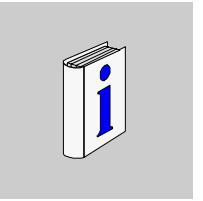
WARNING indicates a potentially hazardous situation, which, if not avoided, **can result** in death, serious injury, or equipment damage.

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

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

About the Book



At a Glance

Document Scope

This user manual contains the information for installing an Advantys OTB Modbus network interface module.

It has been designed to facilitate rapid familiarization with the system, while optimizing the system's features for the most advanced technology available.

Anyone installing this equipment must be familiar with the relevant communication protocol, and installation should only be performed by qualified personnel. Special points and warnings regarding safety are highlighted in the different chapters.

The early chapters provide information for designers and installers on installing the mechanical and electrical elements of the system.

The following chapters, from the section on "Modbus network interface", are specific to the communications 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	Hardware 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
Modbus network interface	Introduction to the OTB module network interface Reminders on the communication protocol Managing the island's behavior on the network
Application-specific functions	Description of the application-specific functions Table of remote I/O and specific function registers
Software tools	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
Table of Advantys OTB island registers	Description of the registers accessible for communication
Appendices	Introduction Appendix A: List of IEC symbols
Glossary	Acronyms Definitions.

Record of Revisions:

Version	List of Revisions
2.0	- Addition of TWD AMM6HT and TWD AMI2LT expansion modules - New communication fault acknowledgement management - Downloadable embedded software

Validity Note

This user manual applies to V2.0 or later versions of Advantys OTB Modbus modules. For earlier versions, visit http://www.schneider-electric.com.

Related Documents

Title of Documentation	Reference Number
Instruction sheet	1724121
Hardware guide for TM2 discrete I/O expansion modules	EIO0000000028
Hardware guide for TM2 analog I/O expansion modules	EIO0000000034
Updating embedded OTB software	35015001
FAQ: If you still have questions after reading this guide, visit the FAQ section on http://www.schneider-electric.com.	-

You can download these technical publications and other technical information from our website at www.schneider-electric.com.

User Comments

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

Introduction

1

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 very compact. Its modularity, by adding I/O expansions, can optimize an application by providing the necessary number of I/O. The Advantys OTB module connects directly to a fieldbus or communication network.

The available fieldbuses or networks are as follows:

Fieldbus or Network	OTB Module Reference
CANopen	OTB 1C0DM9LP
Modbus	OTB 1S0DM9LP
Ethernet	OTB 1E0DM9LP

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

Network Interface Module with Built-In I/O

The illustration below shows the different network interface modules with built-in I/O:

OTB 1C0DM9LP OTB 1S0DM9LP OTB 1E0DM9LP

Each network interface module with built-in I/O has:

- 12 discrete inputs
- 6 relay outputs
- 2 transistor outputs with positive logic (source)
- A 24 VDC power supply terminal block (Volt Direct Current)
- Communication bus connectors
- Indicator LEDs to display the communication status and I/O status

The table below lists the main characteristics of the network interface module:

Reference	Channel	Type of Channel	Input/Output type	Power Supply
OTB 1•0DM9LP	12	Inputs	24 VDC	24 VDC
	6 2	Outputs Outputs	Relay 24 VDC source transistor	

Discrete I/O Expansion Modules

The table below lists the discrete and relay I/O expansion modules:

Module Name	Reference	Channel	Type of Channel	Input/Output Type	Terminal Type
Input Modules					
8-channel input	TM2 DDI8DT	8	Inputs	24 VDC	Removable screw terminal block
8-channel input	TM2 DAI8DT	8	Inputs	120 VAC(1)	Removable screw terminal block
16-channel input	TM2 DDI16DT	16	Inputs	24 VDC	Removable screw terminal block
16-channel input	TM2 DDI16DK	16	Inputs	24 VDC	HE10 connector
32-channel input	TM2 DDI32DK	32	Inputs	24 VDC	HE10 connector
Output Modules					
8-channel output	TM2 DDO8TT	8	Outputs	Source transistor	Removable screw terminal block
8-channel output	TM2 DDO8UT	8	Outputs	Sink transistor	Removable screw terminal block
8-channel output	TM2 DRA8RT	8	Outputs	Relay	Removable screw terminal block
16-channel output	TM2 DDO16TK	16	Outputs	Source transistor	HE10 connector
16-channel output	TM2 DDO16UK	16	Outputs	Sink transistor	HE10 connector
16-channel output	TM2 DRA16RT	16	Outputs	Relay	Removable screw terminal block
32-channel output	TM2 DDO32TK	32	Outputs	Source transistor	HE10 connector
32-channel output	TM2 DDO32UK	32	Outputs	Sink transistor	HE10 connector
Mixed modules					
4-channel input/4-channel output	TM2 DMM8DRT	4	Inputs	24 VDC	Removable screw terminal block
		4	Outputs	Relay	
16-channel input/8-channel output	TM2 DMM24DRF	16	Inputs	24 VDC	Fixed spring terminal block
		8	Outputs	Relay	

(1) VAC : Volt Alternating Current

Analog I/O Expansion Modules

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

Module Name	Reference	Channel	Type of Channel	Details	Terminal Type
Input Modules					
2 inputs	TM2 AMI2HT	2	Inputs	12 bits 0-10 V 4-20 mA	Removable screw terminal block
2 inputs	TM2 AMI2LT	2	Inputs	12 bits thermocouple type J, K or T	Removable screw terminal block
4 inputs	TM2 AMI4LT	4	Inputs	12 bits Voltage/current RTD	Removable screw terminal block
8 inputs	TM2 AMI8HT	8	Inputs	10 bits Voltage/current	Removable screw terminal block
8 inputs	TM2 ARI8HT	8	Inputs	10 bits PTC NTC	Removable screw terminal block
8 inputs	TM2 ARI8LT	8	Inputs	12 bits PT100 PT1000	Removable screw terminal block
8 inputs	TM2 ARI8LRJ	8	Inputs	12 bits PT100 PT1000	8 x RJ11 connectors
Output Modules					
1 output	TM2 AMO1HT	1	Outputs	12 bits 0-10 V 4-20 mA	Removable screw terminal block
2 outputs	TM2 AVO2HT	2	Outputs	10 bits +/-10 V	Removable screw terminal block
Mixed Modules					
2 inputs/1 output	TM2 AMM3HT	2	Inputs	12 bits 0-10 V 4-20 mA	Removable screw terminal block
		1	Outputs		
2 inputs/1 output	TM2 ALM3LT	2	Inputs	12 bits RTD, thermocouple	Removable screw terminal block
		1	Outputs	12 bits 0-10 V 4-20 mA	
4 inputs/2 outputs	TM2 AMM6HT	4	Inputs	12 bits 0-10 V 4-20 mA	Removable screw terminal block
		2	Outputs		

Common Expansion Module

Module Name	Reference	Channel	Type of Channel	Details	Terminal Type
Common module	OTB 9ZZ61JP	16	Passive	2 x 8 contacts	Removable screw terminal block

Cables

Cable Name	Reference
Cable fitted with a 20-pin HE connector at both ends. (*AWG 28*/0.08 mm; length: 0.5 m/*1.64 ft*)	ABF T20E050
Cable fitted with a 20-pin HE connector at both ends. (*AWG 28*/0.08 mm; length: 1 m/*3.28 ft*)	ABF T20E100
Cable fitted with a 20-pin HE connector at both ends. (*AWG 28*/0.08 mm; length: 2 m/*6.56 ft*)	ABF T20E200

Maximum hardware configuration

Introduction

This section presents the maximum hardware configuration for the Advantys OTB network interface module.

The OTB module functions can be extended through the use of expansion modules, subject to the following limitations:

- The OTB module accepts up to 7 discrete I/O expansion modules
- The total consumption of the expansion modules must be less than 450 mA

⚠ WARNING

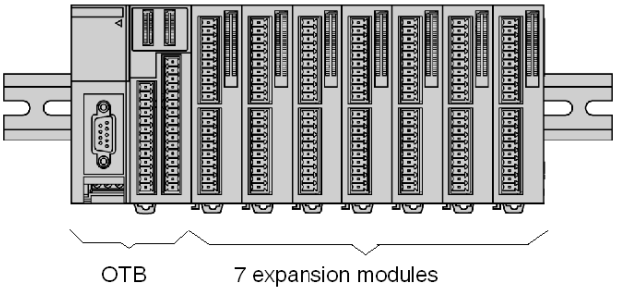
Risk of unintended equipment operation

Do not exceed the 450 mA current limit for the OTB module and its expansion modules. Exceeding this limit can cause the I/O power supplies to stop. The device can operate in an unintended manner depending on how the inputs and outputs are configured.

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

Each OTB module (whether or not associated with expansion modules) constitutes an island on the bus or the communication network. Each island offers a modular and flexible I/O solution.

The figure below is an example of an I/O island.



Maximum Number of Discrete I/O

The table below lists the maximum number of discrete I/O for the island:

Type of Built-in I/O	Maximum Number of Discrete I/O
Standard discrete inputs	12
Standard discrete outputs	8

Type of I/O with Expansion Modules	Maximum Number of Discrete I/O
Maximum discrete inputs (I/O module + exp I/O)	12+(7x32)=236
Maximum discrete outputs (I/O module + exp I/O)	8+(7x32)=232
Maximum discrete I/O (I/O module + exp I/O)	20+(7x32)=244
Maximum relay outputs	6 on base + 96 on expansion

Maximum Number of Analog I/O

The following table lists the maximum number of analog I/O by type for the island:

Type of Analog I/O	Maximum Number of Analog I/O
Analog inputs	24
Analog outputs	14

NOTE: No configuration should have more than 32 analog I/O.

Expansion Module Power Consumption

The total power consumption of the expansion modules must be less than 450 mA (See the above safety message). The table below lists the power consumption of each expansion module:

Expansion Module	Consumption
TM2 DDI8DT	25 mA
TM2 DAI8DT	60 mA
TM2 DDI16DT	40 mA
TM2 DDI16DT	35 mA
TM2 DDI32DK	65 mA
TM2 DDO8TT	10 mA
TM2 DDO8UT	10 mA
TM2 DRA8RT	30 mA
TM2 DDO16TK	10 mA
TM2 DDDO16UK	10 mA

Expansion Module	Consumption
TM2 DRA16RT	45 mA
TM2 DDO32TK	20 mA
TM2 DDO32UK	20 mA
TM2 DMM8DRT	25 mA
TM2 DMM24DRF	65 mA
TM2 AMI2HT	50 mA
TM2 AMO1HT	50 mA
TM2 AMM3HT	50 mA
TM2 AMM6HT	50 mA
TM2 ALM3LT	50 mA
TM2 AVO2HT	50 mA
TM2 AMI2LT	60 mA
TM2 AMI4LT	50 mA
TM2 AMI8HT	50 mA
TM2 ARI8HT	50 mA
TM2 ARI8LT	90 mA
TM2 ARI8LRJ	90 mA

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 functions.

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 or RPWM	2 RPLS or RPWM pulse generators (Pulse width modulation): - RPLS pulse generator output, 7 kHz maximum - RPWM pulse width modulation, 7 kHz maximum
Programmable input filter	Input filter time can be changed during configuration No filtering or filtering at 3 ms or 12 ms

For further information, see *Application-Specific Functions, page 87*.

Communication Overview

Introduction

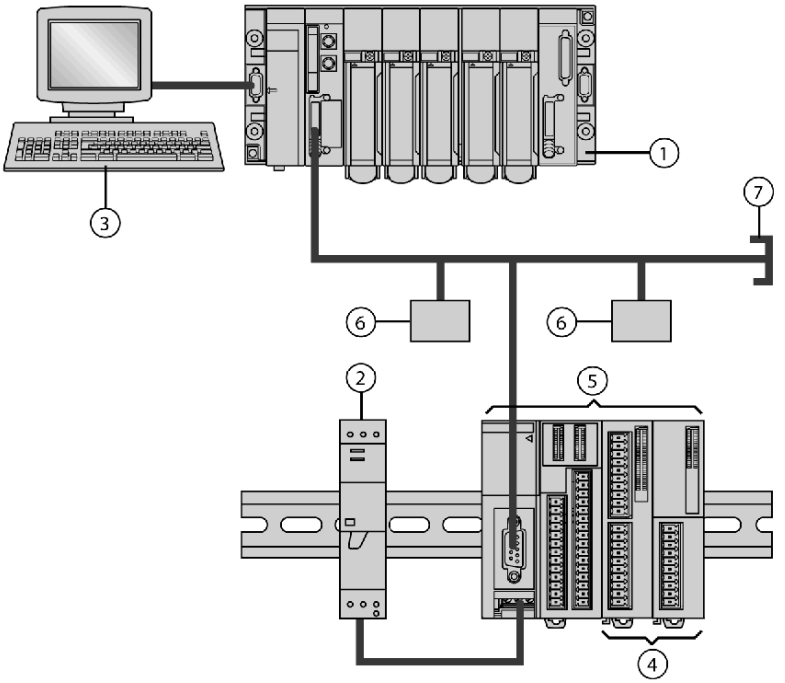
The Advantys OTB network interface modules are available for CANopen and Modbus field buses, and for the Ethernet network. They are used to exchange data from the built-in I/Os and expansion module I/Os with the bus master or client.

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 (API)
4 Expansion I/O modules
5 Advantys OTB island
6 Other islands or products on the field bus or network
7 Line terminator according to the field bus or network (if necessary)

Installation

2

Introduction

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

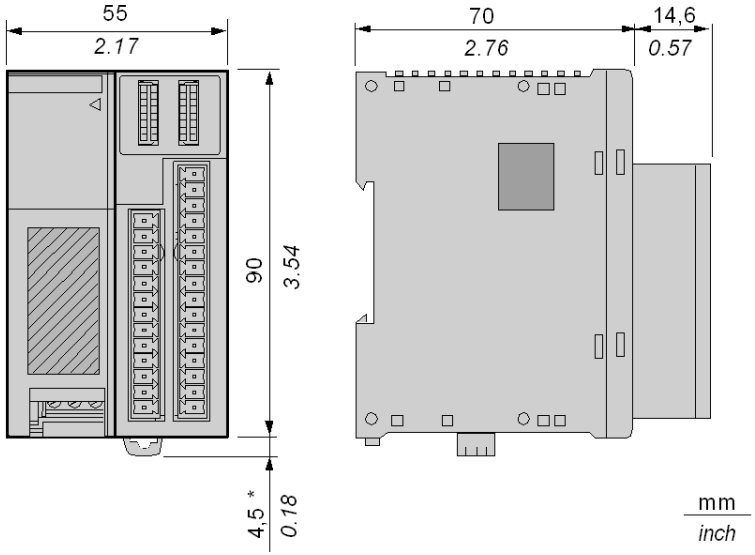
What's in this Chapter?

This chapter contains the following topics:

Dimensions of the Network Interface Modules

OTB 1•0DM9LP Dimensions

The following figure shows the dimensions of the Advantys OTB network interface module (OTB 1•0DM9LP):



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

How to Direct Mount on a Panel

Introduction

This section shows the positions of the mounting holes for each network interface module. Your module may differ from the illustrations in this procedure but the mechanism remains the same.

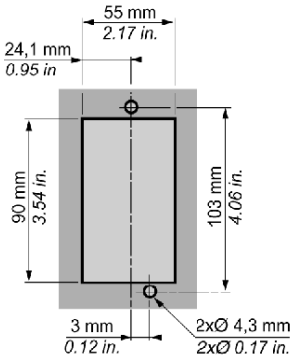
Installing a Mounting Strip

Mounting on a panel requires the use of a strip. The procedure below explains how to install a mounting strip (reference: TWD XMT5).

Step	Action
1	Remove the clamp at the rear 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 the recess in the module.

Position of the Mounting Holes on the Network Interface Module

The diagram below shows the position of the mounting holes on the Advantys OTB network interface modules:



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 beginning of this book.

⚠ WARNING

RISK OF UNINTENDED EQUIPMENT OPERATION

Do not add or remove an expansion module to or from the system before first removing all power. Adding or removing an expansion module while under power may cause damage to the module and the system, resulting in unexpected operation of inputs and outputs. Depending on I/O configuration, unintended equipment operation may occur.

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

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

RISK OF UNEXPECTED EQUIPMENT OPERATION

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)*. Overheating of the OTB module and/or the I/O expansion modules may result in unexpected operation of inputs and outputs.

Depending on the I/O configuration, unintended equipment operation may occur.

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

⚠ WARNING

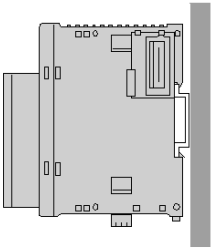
RISK OF UNEXPECTED EQUIPMENT OPERATION

Do not place heat generating devices such as transformers and supply blocks under the island. Heat generating devices in the proximity of the OTB module and I/O expansion modules could result in elevated temperatures and overheating, and may result in unexpected operation of the inputs and outputs. Depending on the I/O configuration, unexpected equipment operation may occur.

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

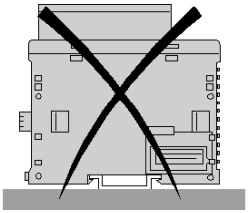
Correct Mounting Position

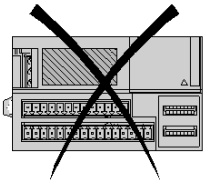
Network interface modules and expansion I/O modules must be mounted horizontally on a vertical plane as shown in the figures below.

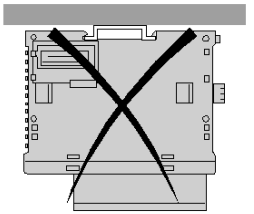


Incorrect Mounting Position

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







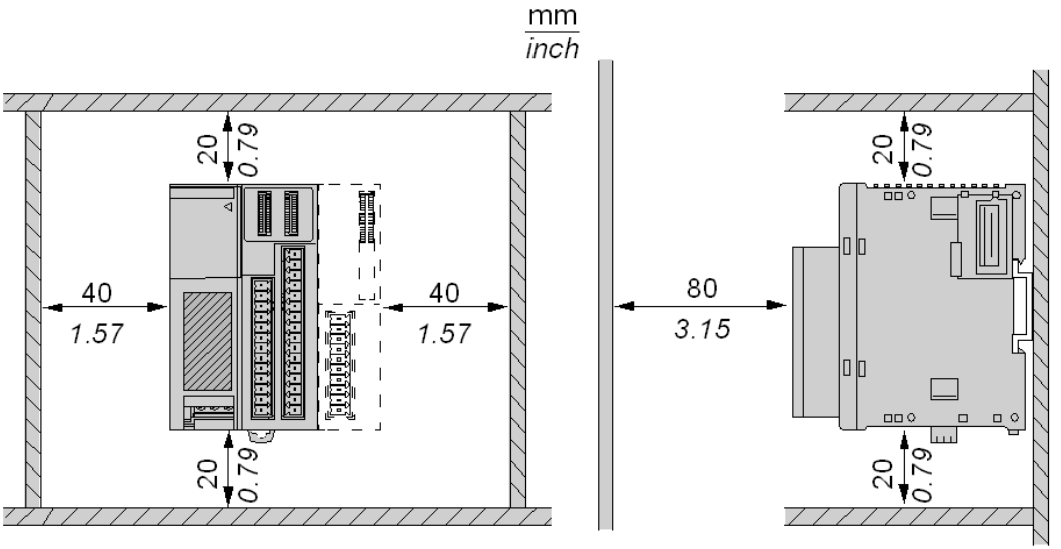
Assembly Precautions for an Island on a Panel or in a Cabinet

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.

⚠ WARNING

RISK OF UNEXPECTED EQUIPMENT OPERATION

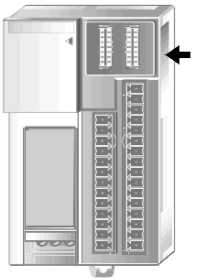
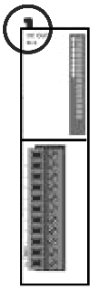
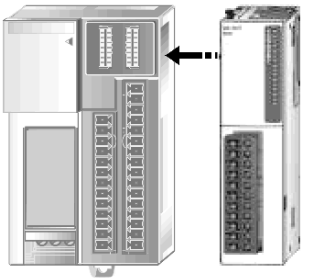
Do not change the hardware configuration without updating both the master device and the client application program. Do not reapply power after reconfiguring hardware until all updates to the master device and client application program have been accomplished and confirmed.

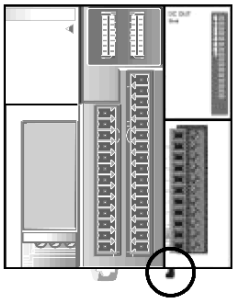
Failure to make these required updates may cause unintended operation of the inputs and outputs. Depending on I/O configuration, unintended equipment operation may result.

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

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. 

Step	Action
4	Press the expansion module to the network interface module until it "clicks" into place.
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.

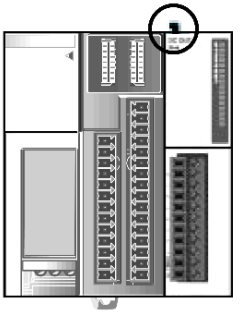
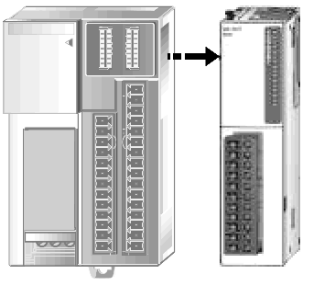
Disassembling an Expansion Module and a Network Interface Module

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, page 40*.
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.

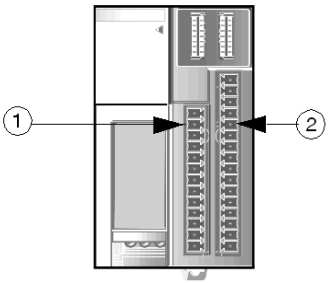
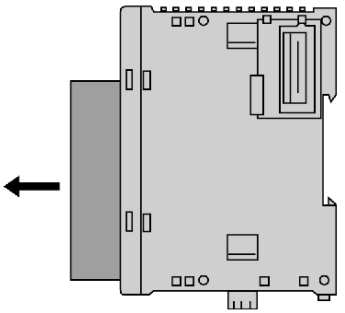
Removing a Terminal Block

Introduction

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

Removing a Terminal Block

The following procedure describes how to remove terminal blocks from the network interface module.

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	Remove the terminal block by holding the center of the terminal block and pulling it out straight. 

⚠ CAUTION

RISK OF EQUIPMENT DAMAGE

Do not attempt to remove the terminal by pulling on its top or bottom surfaces. Only pull on the terminal from the sides. Pulling from the top or bottom may cause the terminal to exit at an angle and damage the connector pins.

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

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

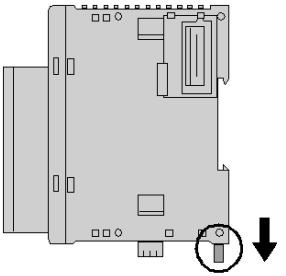
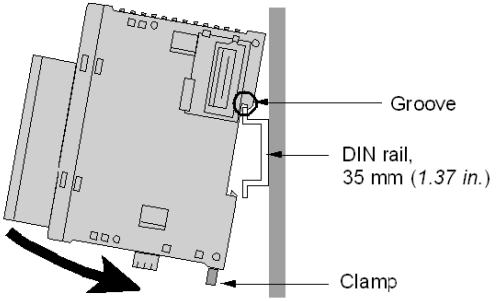
Introduction

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.

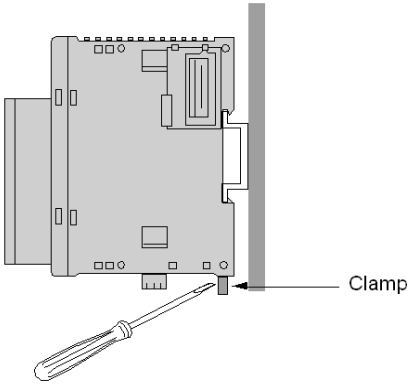
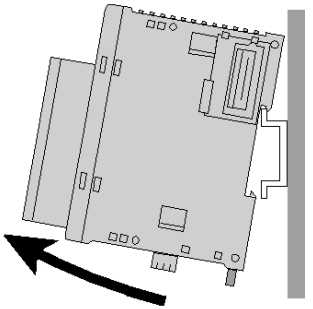
Installing an Island on a DIN Rail

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, page 33*.
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. 

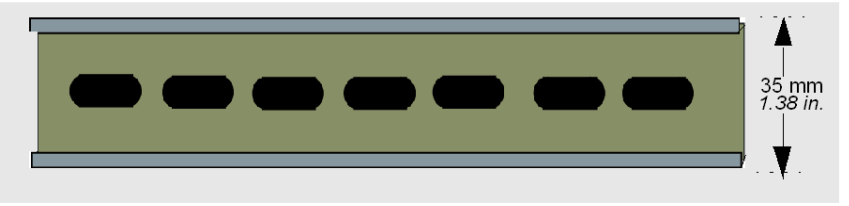
The DIN Rail

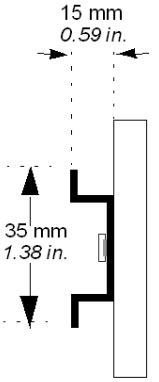
Introduction

The OTB modules are 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.

Dimensions of the DIN Rail

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





Recommended Equipment

You can order the appropriate DIN rail from Schneider Electric:

Rail Depth	Catalog Reference
15 mm (*0.59 in.*)	AM1 DE200

Description, characteristics, and wiring of the OTB module

3

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 these instructions will result in death or serious injury.

⚠ WARNING

RISK OF UNINTENDED 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 these instructions can result in death, serious injury, or equipment damage.

Rules

- Each connector terminal accepts up to two wires fitted with cable ends or tags, with sections between 0.14 mm^2 and 1.5 mm^2, (*AWG26* and *AWG16*).
- 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 0.14 mm^2 and 1.5 mm^2(*AWG26* and *AWG16*). Use the shortest wire length possible.
- The grounding wire should be 1.50 mm^2 (*AWG16*).
- 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.

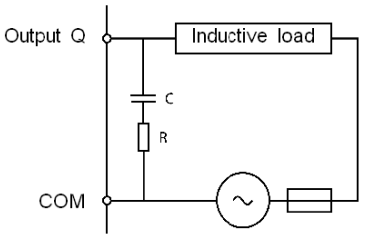
⚠ CAUTION

RISK OF EQUIPMENT DAMAGE

Apply a circuit protection to all outputs. Failure to add a circuit protection can result in the malfunction of the output(s) in the case of short circuit or overload condition.

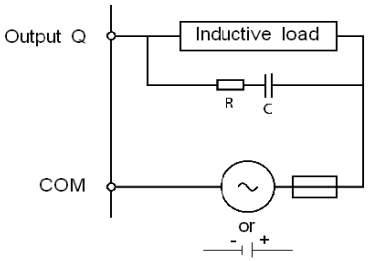
Failure to follow these instructions can result in injury or equipment damage.

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.



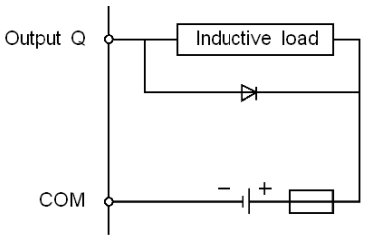
- C represents a value from 0.1 to 1 μF.
- R represents a resistor of approximately the same resistance value as the load.

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.

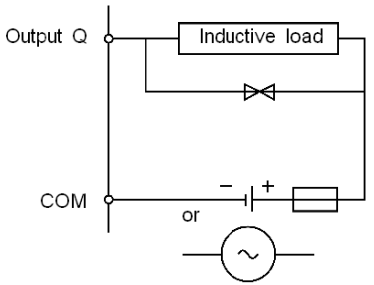
Protection Circuit C: this protection circuit can be used for DC load power circuits.



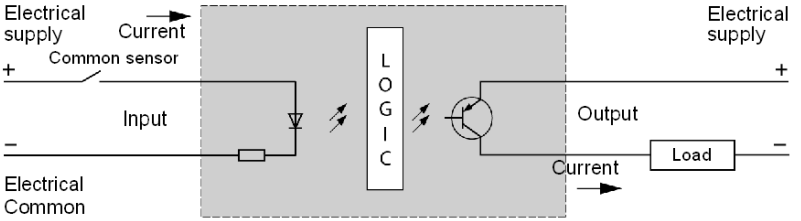
Use a diode with the following ratings:

- 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.



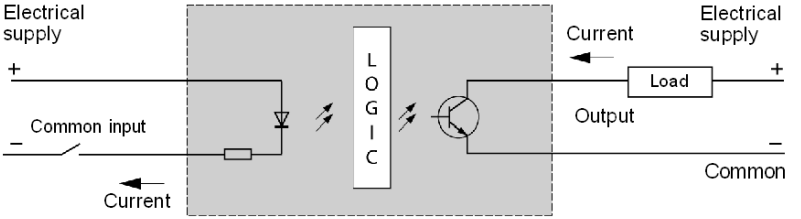
Operation of Source Inputs/Outputs



Source inputs/outputs

Input COM terminals are connected to the "-" terminal or common of the power supply. Output COM terminals are connected to the +24V power supply.

Operation of Sink Inputs/Outputs



Sink inputs/outputs

The input COM terminals are connected to the +24 V power supply. The output COM terminals are connected to the "-" terminal or common of the power supply

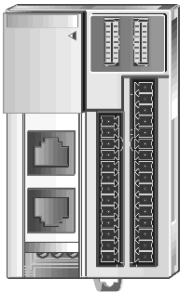
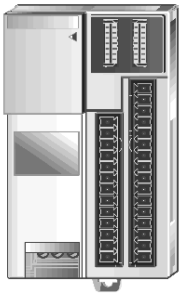
Overview of the Network Interface Modules

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 discrete inputs, 6 relay outputs, and 2 source transistor outputs ● has terminal blocks for wiring ● accepts up to 7 expansion I/O modules	 OTB1 C0DM9LP  OTB 1S0DM9LP  OTB 1E0DM9LP

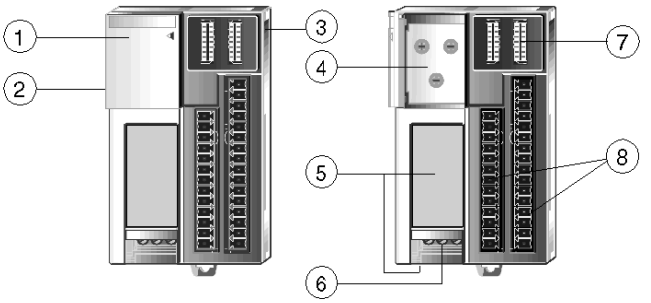
Physical Description of an Advantys OTB Network Interface Module

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	OS update socket (RJ45 socket)
3	Expansion module connector
4	Encoder wheels (sets the island address and communication speed on the bus or network)
5	Communication bus connectors (the position depends on the reference)
6	24 VDC power supply terminals
7	Indicator light
8	I/O terminals

General Characteristics of the Network Interface Module

Introduction

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

⚠ WARNING

RISK OF EQUIPMENT DAMAGE OR UNEXPECTED EQUIPMENT OPERATION

The OTB modules were designed, manufactured and tested within specification limits as indicated in the following tables. Operating the product(s) outside of these limits may cause damage to the module and the system, resulting in unexpected operation on the inputs and outputs. Depending on the I/O configuration, unexpected equipment operation may result.

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

Normal Operating Specifications

Network interface module	**OTB 1•0DM9LP**
Operating temperature	0 ... 55 °C *(32 ... 131 °F)*
Storage temperature	-25 ... +70 °C *(-13 ... 158 °F)*
Relative humidity	30 ... 95% (non-condensing)
Degree of pollution	2 (IEC60664)
Degree of protection	IP20
Altitude	Operation: 0 ... 2 000 m *(0 ... 6561 ft)* Transport: 0 ... 3 000 m *(0 ... 9842 ft)*
Resistance to Vibration	When mounted on a DIN rail: from 10 to 57 Hz with amplitude of 0.075 mm *(0.0029 in.)*, from 57 to 150 Hz with acceleration of 9.8 m/s^2 (1G), 2 hours per axis on each of three mutually perpendicular axes. When mounted on a panel surface: from 2 to 25 Hz with amplitude of 1.6 mm *(0.062 in)*, from 25 to 100 Hz with acceleration of 39.2 m/s^2 (4G), 90 min per axis on each of three mutually perpendicular axes.
Impact strength	147 m/s^2 (15G), 11 ms duration, 3 shocks per axis, on three mutually perpendicular axes (IEC 61131).
Weight	185 g *(6.52 oz)*

Electrical Characteristics

Network interface module	**OTB 1•0DM9LP**
Rated power voltage	24 VDC
Allowable voltage range	20,4 ... 26.4 VDC (including ripple)
Consumed power	Communication module with 7 expansion modules
	19 W (26.4 VDC)
Allowable momentary power interruption	10 ms (24 VDC)
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	1 mm^2 *(AWG 18)*, 1.5 mm^2 *(AWG 16)*
Power supply wiring	0.14 mm^2 *(AWG 26)*, 1.5 mm^2 *(AWG 16)*
Tightening torque of the 24 VDC supply terminals	0.8 Nm *(7.08 lb-in)*
Tightening torque of the I/O terminals	0.6 Nm *(5.31 lb-in)*

Network Interface Module I/O Characteristics

Introduction

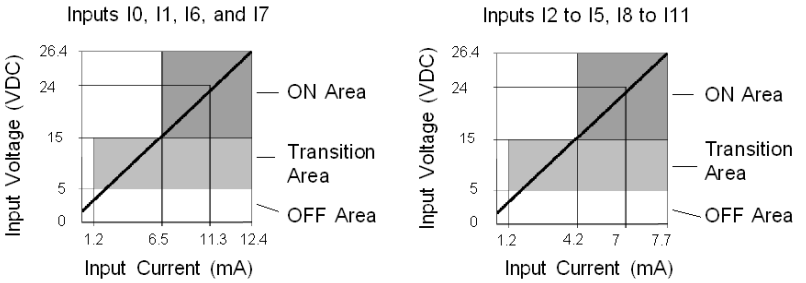
This section describes the characteristics of the Advantys OTB network interface module I/O.

Input Characteristics

Network Interface Module	**OTB 1•0DM9LP**
Number of inputs	12 inputs with common
Nominal input voltage	24 VDC source/sink input signal
Input voltage range	20.4 ... 26.4 VDC
Nominal 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 kΩ I2 to I5, I8 to I11: 3.4 kΩ
Switching time at high state (ON Time)	I0 to I7: 35 μs + filter value I8 to I11: 40 μs + filter value
Switching time at low state (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: Optocoupler isolated (up to 500 VAC rms)
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 incorrect input connection	The input signals can be both sink and source. But if any input exceeding the nominal value is applied, permanent damage may be caused. In all cases, the user is responsible for the wiring.
Input cable length	30 m *(98.4 ft)* for compliance with electromagnetic immunity
Average number of connector insertions/removals	100 times minimum

Input Operating Range

The module input operating range is shown below.



I/O Usage Limits

100% of the I/O can be used at 55°C *(131°F)*.

Q0 and Q1 Output Characteristics

Network Interface Module	**OTB 1•0DM9LP**
Output type	2 source transistor outputs
Number of outputs per common	2
Nominal load voltage	24 VDC
Maximum load current	1 A per common
Operating load voltage range	20.4 ... 28.8 VDC
Residual voltage (on voltage)	1 V maximum (voltage between COM and output terminals when output is active)
Nominal load current	0.3 A per output
Inrush current	1 A maximum
Leakage current	0.1 mA maximum
Limit voltage	39 V +/-1 V
Absorbed power	8 W
Inductive load	L/R = 10 ms (28.8 VDC, 1 Hz)
External current drawn	100 mA maximum, 24 VDC (voltage at the -V terminal)
Isolation	Between output terminals and internal circuit: Optocoupler isolated (up to 500 VAC rms) Between output terminals: not isolated
Average number of connector insertions/removals	100 times minimum
Output delay - turn-on time	300 µs maximum
Output delay - turn-off time	300 µs maximum

Q2 to Q7 Output Characteristics

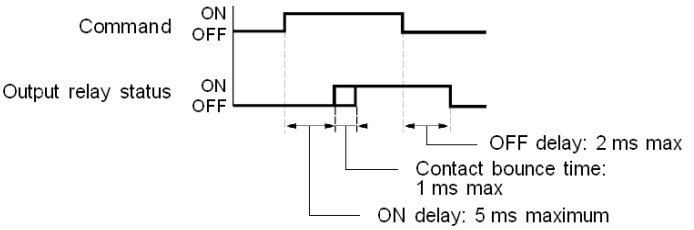
Network Interface Module	OTB 1•0DM9LP
Output type	6 relay outputs
Number of outputs per common - COM0	2 outputs
Number of outputs per common - COM1	3 NO contacts
Number of outputs per common - COM2	2 NO contacts
Number of outputs per common - COM3	1 NO contact
Maximum load current	2 A per output 8 A per common
Minimum switching load	0.1 mA/0.1 VDC (reference value)
Initial contact resistance	30 mΩ maximum
Mechanical life	20,000,000 operations minimum (estimated load 18,000 operations/hr)
Dielectric strength	1500 VACrms between the output and internal circuit, 1 min 750 VACrms between the output and COM terminal, 1 min
Average number of connector insertions/removals	100 times minimum
Closing delay	5 ms typ, 10 ms max
Opening delay	2 ms typ, 5 ms max
Closing bounce time	1 ms maximum

Operating Category	Nominal Load	Electrical Life (Number of Operations)
AC1 Resistive load control	500 VA(*)	10^5
AC14 Weak electromagnet load	250 VA	10^5
AC15 Electromagnet	200 VA	10^5
DC1 Resistive load control	60 W(*)	10^5
DC13 Electromagnet L/R=150 ms	30 W	10^5

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

Relay Output Delay

The output delay is illustrated below.



Wiring diagram for the network interface modules

Introduction

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

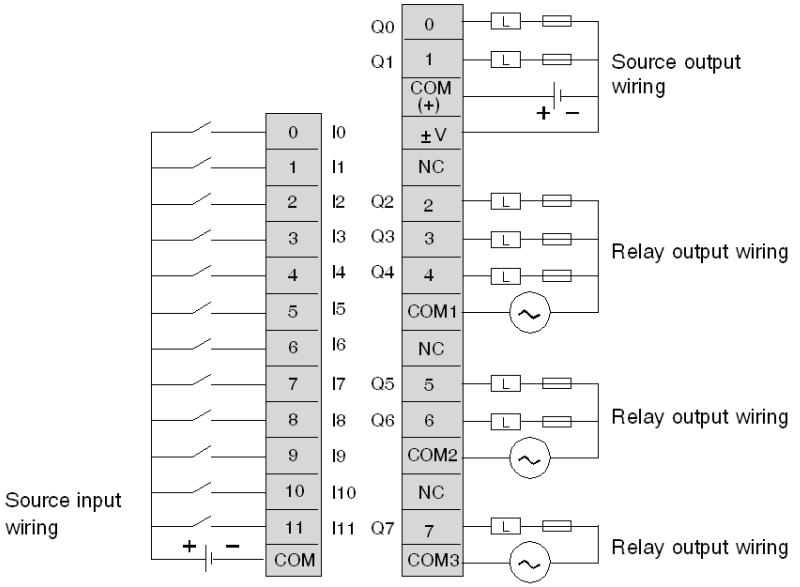
NOTE: These schematics are for external wiring only.

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

NOTE: The inputs that are used as counting inputs must be connected with shielded cables.

Wiring Diagram for OTB Modules

This diagram applies to OTB 1•0DM9LP modules.



- Output points 0 and 1 are source transistor 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

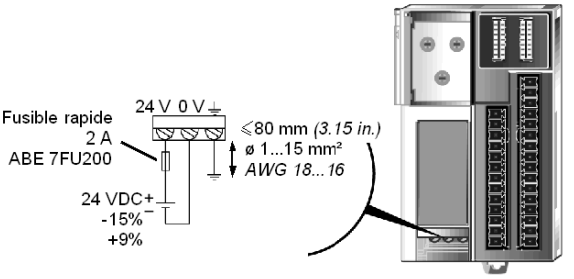
RISK OF UNINTENDED EQUIPMENT OPERATION

When the power supply voltage is outside of the specified voltage range, outputs may not operate as expected. Use an appropriate externally-wired safety system to control and monitor the system voltage and ensure the specified voltage range is maintained.

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

Power Connection for a Network Interface Module

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



NOTE: Grounding wire length should not exceed 80 mm *(3.15 in.)*.

The sensor/actuator cables must be shorter than 30 m *(98.42 ft.)*.

⚠ WARNING

DANGER: UNEXPECTED EQUIPMENT OPERATION RISK

If the unit is not connected to the ground, or if the ground connection is made using an inappropriate cable, the product will be sensitive to electromagnetic disturbances. This may lead to unexpected equipment operation (*(see page 57)*).

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

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
Inrush current flow at power-up	50 A maximum
Power supply wiring	0.14 mm^2 *(AWG26)* or 1.5 mm^2 *(AWG16)* Make the power supply wiring as short as possible.
Ground wiring	1 mm^2 *(AWG18)* or 1.5 mm^2 *(AWG16)* Do not connect ground wire in common with ground wire of motor equipment. The grounding connection should be as short as possible < 8 cm *(3.15 in)*.

NOTE: Momentary power interruption for 10 ms or less at 24 VDC is not recognized as failure.

EMC Compatibility

Product Compliance

CE

This product complies with the European directive 89/336/EEC on "electromagnetic compatibility".

The products described in this manual meet all the conditions regarding electromagnetic compatibility and are compliant with the applicable standards. However, this does not mean that the electromagnetic compatibility of your installation is assured.

This is why it is strongly recommended to follow all instructions concerning an EMC-compliant installation. Only in these conditions and thanks to the exclusive use of CE approved components, will the devices used be deemed to comply with the EMC directives.

When handling the products, ensure that all safety measures related to electromagnetic compatibility and all conditions for the use of the products are complied with by all persons concerned. This is especially important when handling products sensitive to electrostatic discharges.

⚠ WARNING

RISK OF ELECTROMAGNETIC INTERFERENCE AND UNINTENDED EQUIPMENT OPERATION

The products described in this manual contain highly complex semiconductors that can be damaged or destroyed by electrostatic discharges (ESD). If, for example, they are used within the vicinity of devices rated as class A or B according to IEC 6100-4-4, the level of electromagnetic interference may be enough to cause the device to operate unexpectedly, and/or to damage it.

Damage may not necessarily cause a failure or malfunction that is immediately detectable. It may occur sporadically or in a delayed manner.

If there is a risk of electromagnetic interference, the system designer must implement the necessary protective measures.

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

Grounding

The grounding cable must be shorter than 8 cm *(0.262 ft)*.

⚠ WARNING

RISK OF UNINTENDED EQUIPMENT OPERATION

If the unit is not connected to the ground, or if the ground connection is made using an inappropriate cable, the product will be sensitive to electromagnetic disturbance. This can lead to unintended equipment operation.

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

Cable Routing

Make sure that the following basic wiring rules are observed:

- Make sure there is a space of at least 10 cm *(3.94 inches)* between the data cables and the power cables.
- The data cables and power cables must only cross at a right angle to one another.
- It is advisable to route the data cables and power cables through separate shielded ducts.
- When laying the cables, the noise voltage from other devices or wires must be considered. This particularly applies to frequency converters, motors and other devices or cables generating high frequency disturbance. High-frequency sources and the cables described in this manual must be as far apart from each other as possible.

⚠ WARNING

RISK OF UNINTENDED EQUIPMENT OPERATION

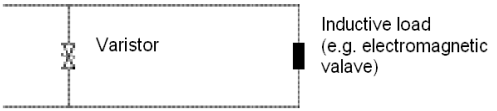
Please read and comply with the cabling rules listed above. Failure to comply with these wiring rules is a common cause of EMC problems! This can lead to unintended equipment operation.

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

Control of Inductive Loads

The outputs of the devices described in this manual are equipped with an integrated protective system against the high noise voltages that may be generated by inductive loads.

Integrated protective system against the high noise voltages generated by inductive loads



The varistor rapidly discharges the energy accumulated in the magnetic field of the inductive load.

The high voltages arising from the disconnection of inductive loads create large fields in the wires that may cause disturbances in nearby circuits or devices. It is advisable to fit an anti-interference device on the load. In this way, the voltage peak generated by the inductive load is short-circuited directly at the point where it occurs.

Field Bus or Network Connection

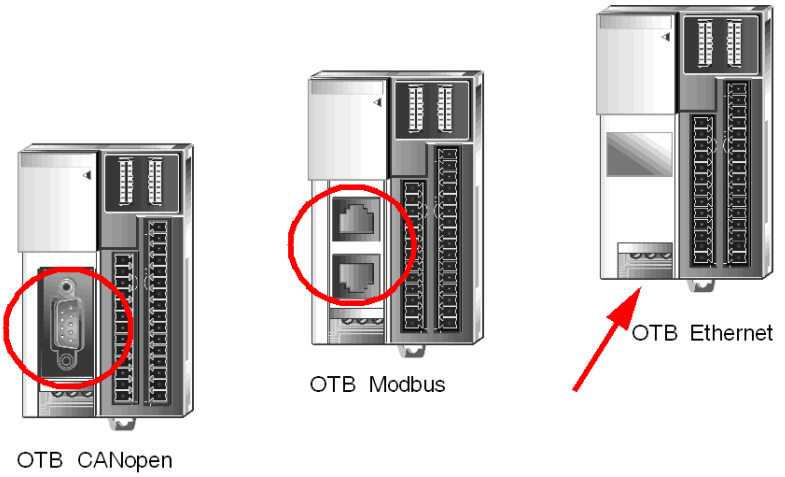
Overview

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 "Network Interface".

Field Bus or Network Connection

The field bus is connected between your master or server and the complete and physically installed OTB island. 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 modules: CANopen, Modbus and Ethernet. These represent the three available field bus protocols or networks. Below are the illustrations of the three types of different modules. Please note the differences between the field bus and network plugs.



Description, characteristics, and wiring of the expansion modules

4

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 sections:

4.1 Discrete Expansion Modules

Discrete Expansion Modules

Reference Documents

Refer to the hardware installation manual for TM2 discrete I/O modules.

4.2 Analog Expansion Modules

Analog Expansion Modules

Reference Documents

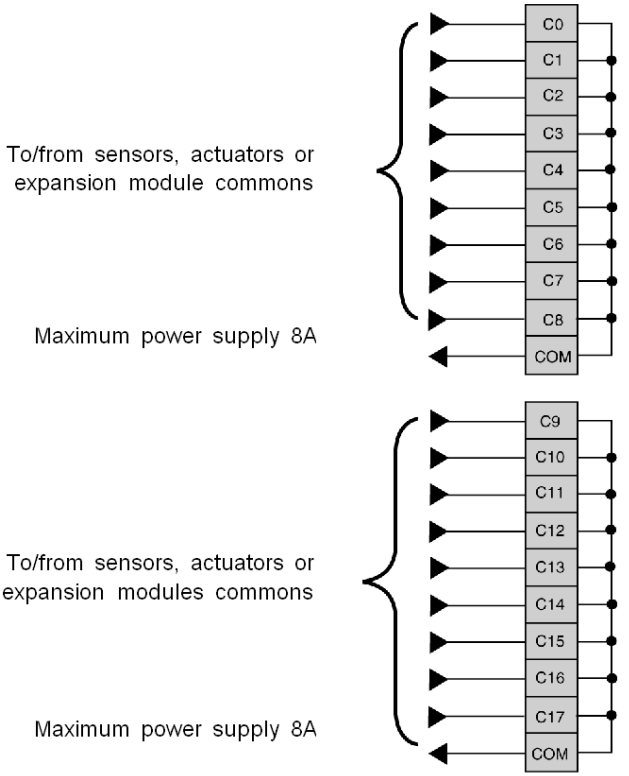
Refer to the hardware installation manual for TM2 analog I/O modules.

4.3 Expansion Module Common Blocks

Common Block Expansion Module Wiring Diagrams

OTB 9ZZ61JP Wiring Diagram

This diagram is for OTB 9ZZ61JP common block expansion modules. The common blocks can be used in a variety of ways, such as grouping I/O commons or power distribution.



⚠ DANGER

DANGER OF ELECTRIC SHOCK OR FIRE

Do not exceed 8A per common group.

Failure to follow these instructions will result in death or serious injury.

Modbus Network Interface of the OTB Module

5

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 sections:

5.1 General Principles

Communication on the Modbus Network

Introduction

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

⚠ WARNING

RISK OF UNINTENDED EQUIPMENT OPERATION

Do not use more than one master on the Modbus network. Unexpected I/O behavior can result if more than one master is able to communicate on the network at the same time.

Depending on the I/O configuration, unexpected equipment operation can result if more than one master is in use.

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

Modbus Message Structure

The Modbus protocol uses 16-bit words (registers) divided into two bytes of 8 bits. A Modbus message starts with a header followed by a 1-byte address. A Modbus message uses a Modbus function code *(see page 67)* as its first byte.

The table below describes the full structure of a Modbus RTU message:

	Modbus Messages		
Address	**Function code**	**Data**	**CRC**
one byte	one byte	n-byte field	two bytes

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

List of Supported Commands

The table below lists the Modbus commands supported by the OTB module:

Modbus Function Code: Dec Index (Hex)	Sub-Function: Sub-Index	Command
3 (0003H)		Read n registers
6 (0006H)		Write a single register
16 (0010H)		Write n registers
22 (0016H)		Mask write register
23 (0017H)		Read/Write n registers
43 (002BH)	14	Read slave identification registers

NOTE: Registers can be read or written if and only if the registers are adjacent.

Reading n registers (03):

This function code is used to read the content of one or more adjacent registers in a slave.

Writing a register (06):

This function code is used to write the content of a register in a slave.

Writing n registers (16):

This function code is used to write the content of one or more contiguous registers in a slave.

Mask writing (22):

This function code is used to modify the content (in whole or part) of a register. This function is a combination of an AND mask, an OR mask, an AND NOT mask and the current content of the register.

Example:

	Hexadecimal	Binary
Current content	18 (12H)	0001 0010
AND mask	242 (F2H)	1111 0010
OR mask	37 (25H)	0010 0101
AND NOT mask	13 (0DH)	0000 1101
Result	23 (17H)	0001 0111

Reading/Writing 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 physical description of a slave.

List of Identification Objects

The table below provides a list of the Modbus identification objects on the OTB module island:

Index	Object Name, Description	Description	Data Type
0 (000H)	Manufacturer name	TELEMECANIQUE	ASCII string
1 (0001H)	Product code	OTB 1S0DM9LP	
2 (0002H)	Version number (Major version, minor version)	XYxy (0100H for V01.00)	

Abort Code

The meaning of error codes is given in the table below:

Function Code	Abort Code	Description
03H	02H	One of the registers does not exist.
	03H	Incorrect register number
	04H	Unavailable value
06H	02H	The register does not exist.
	04H	Forbidden value or register in read only
10H	02H	The register does not exist.
	03H	Incorrect register number
	04H	Forbidden value or register in read only
16H	02H	The register does not exist.
	04H	Forbidden value or register in read only
17H	02H	The register does not exist.
	03H	Incorrect register number
	04H	Unavailable or forbidden value or register in read only
2BH	01H	Sub-index different from 14
	02H	Identifier does not exist
	03H	Identifier > 4 or = 0.

NOTE: The OTB module responds to all other requests with a 01H "Abort Code" (unrecognized request).

5.2 Cabling on the Modbus Network

Introduction

This section describes cabling on the Modbus network.

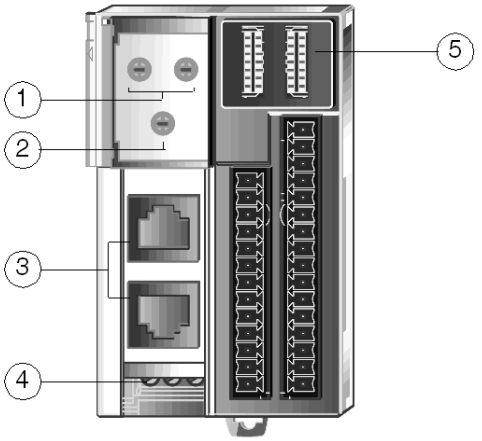
What's in this Section?

This section 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:



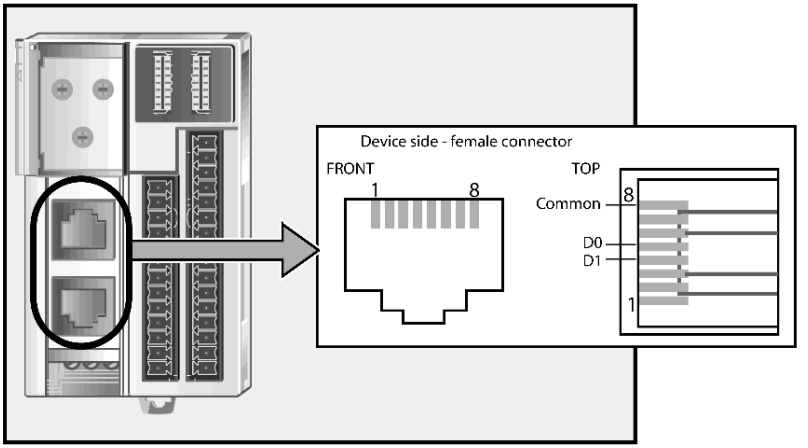
The characteristics of the above illustration are described briefly in the following table:

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 interface module node address on the Modbus field bus.	Address *(see page 74)*
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 speed in bauds.	Speed *(see page 76)*
3	Field bus interface	Two eight-pin RJ45 connectors are used to connect the interface module to a Modbus field bus.	Interface *(see page 71)*
4	Electrical supply interface	Terminal for an external 24 VDC supply for the network interface module.	Supply *(see page 55)*
5	Indicator LED	Visual information on the operational state of the field bus and the network interface module.	Indicator LED *(see page 170)*

Modbus Field Bus Interface

Connections to the Field Bus

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



You must use an 8-pin male RJ45 connector. 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	Unused	Reserved (5...24 VDC)
8	Common	Common of signal and supply
Note: The contact numbers correspond to the legend for the following figure.		

Correspondence of Pin Assignments

Advantys OTB network interface modules can be connected with other Schneider products over Modbus. These products have different pin assignments but all are standard RS 485 compliant.

The table below shows the correspondence between product and pin names:

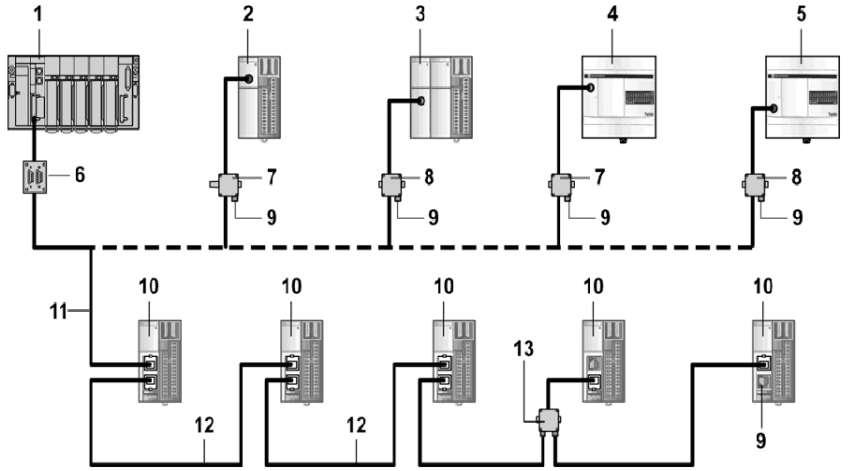
OTB 1S0DM9LP	EIA/TIA 485	TWIDO	SCA64	SCA62 SCA50 Tesys LU9CG3
D1	B	A or A(+)	M+	D(B)
D0	A	B or B(+)	M-	D(A)
Common	C	SG or 0V	0VL	0VL

Modbus Network Connectors and Cables

The branch cable between the field bus and the island must have a female connector complying with the preceding pin assignment diagram. The Modbus network cable is a standard RS 485 compliant shielded twisted pair cable and the shielding must be grounded.

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

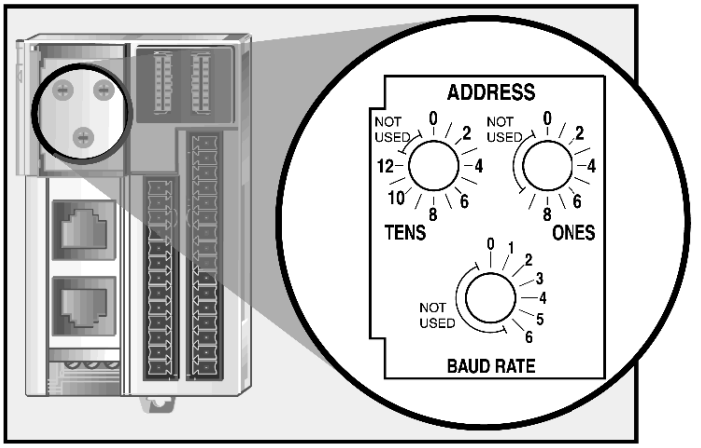
	Reference	Description
1	Premium + SCY 11601 or SCY 21601 or SCP 114	Premium PLC with Modbus communication card
2	TWD LMDA•0D••	Twido modular controller
3	TWD LMDA•0D•• + TWD NOZ485D	Twido modular controller with RS 485 communication port
4	TWD LCAA••DRF	Twido compact controller
5	TWD LCAA••DRF + TWD NAC485T	Twido compact controller with RS 485 communication port
6	TSX SCA62/64	Subscriber socket
7	TWD XCARJ030	MiniDIN RJ45 interface cable
8	TWD XCARJ030	MiniDIN RJ45 interface cable
9	VW3 A8306RC	Line end adapter
10	OTB 1S0DM9LP	Network interface modules
11	VW3 A8306	3 m *(9.84 ft)* lead with one RJ45 connector and one 15-pin SUB-D connector for TSXSCA62/64 subscriber socket
	VW3 A8306D30	3 m *(9.84 ft)* lead with one RJ45 connector and one stripped end
12	VW3 A8306R03	0.3 m *(0.98 ft)* lead with 2 RJ45 connectors
	VW3 A8306R10	1 m *(3.28 ft)* lead with 2 RJ45 connectors
	VW3 A8306R30	3 m *(9.84 ft)* lead with 2 RJ45 connectors
13	VW3 A8306TF03	T branch with 0.3 m *(0.98 ft)* cable
	VW3 A8306TF10	T branch with 1 m *(3.28 ft)* cable

Network Node Address

Summary

Two thumbwheels on the OTB 1S0DM9LP Advantys OTB Modbus module are used to define the address of the network node.

Physical Description



Node Address

The Modbus interface module reads the node address (indicated by the thumbwheels) every time the island is powered up.

The node address is a numerical value between 1 and 127.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Do not use the same network address for more than one device.

Using the same network address for several devices can result in unexpected operation of the inputs and outputs.

Depending on the configuration, unintended equipment operation can result.

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

Configuring the Node Address

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

Step	Action	Comment
1	Cut off the power supply to the island.	The changes you make will be detected on the next power up.
2	Select a node address.	Choose an address that is not currently in use on your field bus.
3	Adjust the upper thumbwheels • Left thumbwheel — 0 to 12 (tens value) • Right thumbwheel — 0 to 9 (unit figure)	Note that it is *mechanically* possible to specify any node address between 00 and 129. However, address 00 is never used as a Modbus node address and addresses 128 and 129 are undefined.
4	Power up the island in order to implement the new configuration.	The network interface module only reads the thumbwheel settings on power-up.

Fieldbus Communication

The Advantys OTB interface module communicates when the thumbwheels are configured to a valid Modbus node address if the baud rate is the same as that of the system.

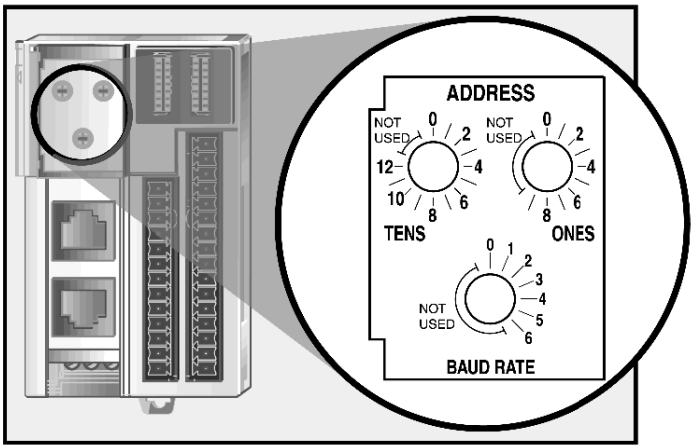
If the island does not have a valid address, it never communicates with the master. To establish communication, configure the thumbwheels with a valid address and power up the island again.

Network Speed

Summary

A thumbwheel on the OTB 1S0DM9LP Advantys OTB Modbus module is used to define the network speed.

Physical Description



Baud Rate

The Modbus interface module reads the speed indicated by the thumbwheels each time the island is powered up.

Configuring the Speed

The instructions for configuring the module speed are given in the table below:

Step	Action	Comment
1	Cut off 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 fieldbus communications.	The speed configuration depends on the specifications of your system and the network.
3	Set the lower thumbwheel to the position corresponding to the required speed.	Use the following speed selection table.
4	Power up the island in order to implement the new configuration.	The network interface module reads the thumbwheel parameters only on power-up.

Speed Selection Table

.

Position (Lower Thumbwheel)	Baud Rate
0	19200 bps (default)
1	1200 bps
2	2400 bps
3	4800 bps
4	9600 bps
5	19200 bps
6	38400 bps

Modbus Configuration

Electrical Specifications

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

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 parameters are set to support the following values:

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

⚠ WARNING

Unexpected Equipment Operation

Ensure that all devices on the network are communicating using standard OTB parameters.

A difference in parameter may cause the inputs, outputs and other devices to operate in an unexpected manner.

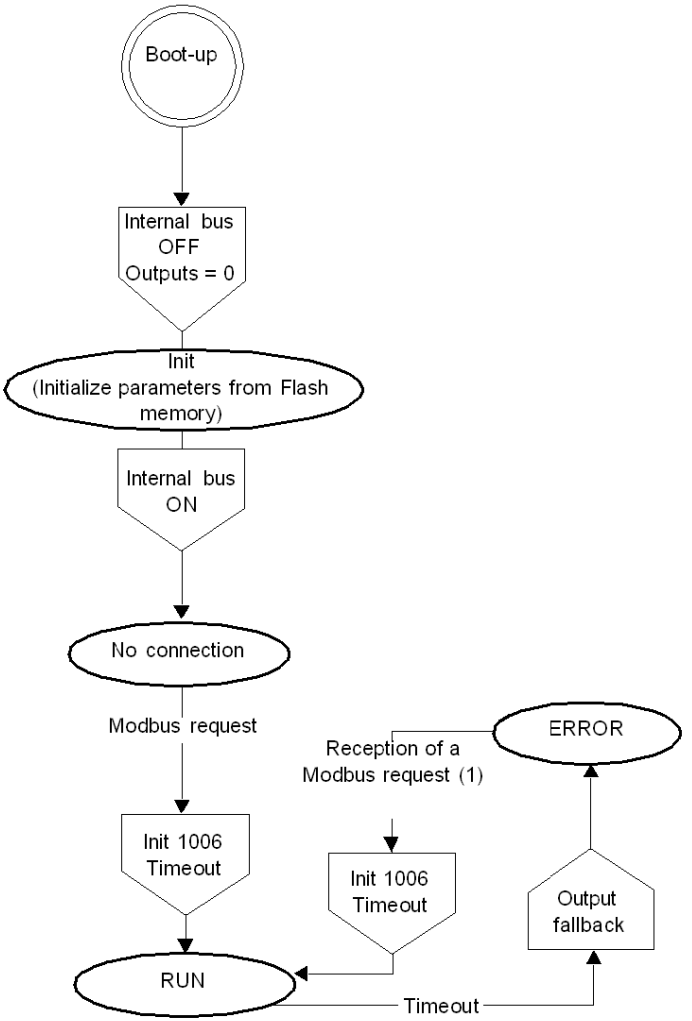
Depending on the hardware configuration, unintended equipment operation may occur.

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

5.3 Behavior of OTB Modbus Splitter Box

Managing the Island's Behavior

Operating Diagram



(1): According to 1008 bit 1:

- 0: Reception of a Modbus request
- 1: Reception of a write command with 1007 bit 0 = 0

Setting the Analog Expansion Module Parameters

To set the analog expansion module parameters, you must stop activity on the island's internal bus by writing the value 1 to the register 1005.

Once the expansion module configuration parameters have been updated, the content of register 1005 must be reset to 0 to restart activity on the internal bus with the new parameters.

⚠ WARNING

RISK OF UNINTENDED EQUIPMENT OPERATION

Stopping the internal bus sets all the outputs to 0.

Stopping the internal bus can result in unintended equipment operation, injury to personnel and/or equipment damage. If this must be done, ensure equipment and personnel safety before restarting.

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

NOTE: If a non-compliant parameter is sent, register 1005 cannot be written to zero.

32-Bit Function and Fault Acknowledgement Mode

The purpose of bit 0 of register 1008 is to define the order of 32-bit data and that of bit 1 is to define the fault acknowledgement mode.

Register 1008 bits are described in the table below:

Bit	Value	Description
0	0	The registers affected by the 32-bit format are in MSB/LSB format.
	1	The registers affected by the 32-bit format are in LSB/MSB format.
1	0	Automatic acknowledgement, register 1007 automatically reset to zero.
	1	Manual acknowledgement, the user must reset register 1007 to zero.

NOTE: The default value for register 1008 is 0 (MSB/LSB format and automatic acknowledgement).

Fault Acknowledgement

Register 1007 is used to manage fault acknowledgement. This register manages different read and write data.

WRITE access for register 1007:

Bit 1	Bit 0	Description	Decimal Value
0	0	Fault acknowledgement without default counter reset to zero (register 1009)	0
1	0	Fault acknowledgement and default counter reset to zero (register 1009 = 0)	2
1	1	Fault counter reset to zero (register 1009 = 0) without fault acknowledgement	3

NOTE: Bits 2...15 are ignored and must be written to 0, writing the value 1 will have no effect.

READ access for register 1007 (automatically updated by the OTB):

Bits 15...1	Bit 0	Description
Reserved	0	No fault
Reserved	1	Fault present

Fault Counter

Register 1009 is used to count the number of network monitoring faults; this register is only accessible in read mode.

Setting the Network Monitoring Time

Register 1006 is used to set the OTB module monitoring time in ms.

Values for register 1006
- 0: no network monitoring (default value)
- x: monitoring time in ms (x: = 1 to 65535 ms)

NOTE: Do not enter values lower than the client's read cycle.

Network Monitoring

The island goes into fallback mode if no frame is detected on the network before the monitoring time expires. All island outputs and special functions change to the fallback values defined by the user.

Bit 9 of register 900 changes to 1 indicating that the OTB module has changed to fallback mode.

Writing the value 0 to the command register 1007 enables you to set bit 9 of register 900 to zero in order to restart network monitoring.

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 user-defined parameters sent by the master. These parameters must be saved so that they can be taken into account 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 set of saved parameters
- 2: One or more parameters have been modified since the last save or last start-up where the flash memory content was erased following a restoration command.

Saving parameters

The parameters are saved by replacing the value in register 1002 with a different value.

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 the factory settings are restored.

NOTE: The saved registers correspond to the parameter registers for the different zones (registers 200 to 899 and 1000 to 1099).

When saving is in progress, the module stops communication for 300 ms.

⚠ WARNING

RISK OF UNINTENDED EQUIPMENT OPERATION

Do not save or restore configuration parameters during normal equipment operation. Saving or restoring the parameters will halt communications and turn off the expansion module outputs. Depending on the I/O configuration, this may result in unintended equipment operation.

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

Restoring Parameters

The different possible restore operations are described in the following table:

To restore...	you should modify the value in register...
the last saved configuration	1003
the factory settings	1004

NOTE:

- The registers must be modified to a value other than their current value.
- When restoring the factory settings (1004), the client configuration is lost.

Identifying the Island Modules

The table below describes the mapping of modules on the island.

Registers	Functions	Register 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) The register code depends on the type of connected expansion module. See the register code for each type of expansion module in the table below. The default value is equal to FFFFH.

The identification code values for the different types of expansion module are defined in the table below.

Type of Expansion Module	Identification Code
Discrete input modules	
TM2 DDI8DT	0004H
TM2 DAI8DT	0004H
TM2 DDI16DT	0000H
TM2 DDI16DK	0000H
TM2 DDI32DK	0200H
Discrete output modules	
TM2 DDO8TT	0005H
TM2 DDO8UT	0005H
TM2 DRA8RT	0005H
TM2 DDO16TK	0001H
TM2 DDO16UK	0001H
TM2 DRA16RT	0001H
TM2 DDO32TK	0301H
TM2 DDO32UK	0301H
Discrete mixed modules	
TM2 DMM8DRT	0006H
TM2 DMM24DRF	0205H
Analog modules	
TM2 AMI2HT	6002H
TM2 AMI2LT	600AH
TM2 AM01HT	6003H
TM2 AMM3HT	6001H
TM2 AMM6HT	6008H
TM2 ALM3LT	6000H
TM2 AVO2HT	6007H
TM2 AMI4HT	6004H
TM2 AMI8HT	6005H
TM2 ARI8HT	6006H
TM2 ARI8LT	600CH
TM2 ARI8LRJ	600BH
Common terminal block	
OTB 9ZZ61JP	-

Application-Specific Functions

6

Introduction

This section describes the application-specific functions of the Advantys OTB modules. The information concerning I/O assignments, configuration and usage are provided for the OTB module and each expansion module.

What's in this Chapter?

This chapter contains the following sections:

6.1 Island Registers

Island Registers

Overview

The register 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.

Register Table (mapping)

The two tables below illustrate the two OTB register zones corresponding to the supported functions:

- The manufacturer zone
- The customized zone

The manufacturer zone provides all the data on states and functions available for the island. The registers are defined when the island is powered up. The number and order of the available registers is defined by the expansion modules added to the OTB module from left to right.

Zone	Register	Function	Page
Manufacturer zone	0...99	State of island inputs	0...99 *(see page 94)*
	100...199	Island output commands	100...199 *(see page 95)*
	200...599	Island I/O configuration parameters	200...599 *(see page 96)*
	600...699	Remote Fast Counter (RFC) function	600...699 *(see page 102)*
	700...799	Remote Very Fast Counter (RVFC) function	700...799 *(see page 114)*
	800...899	Remote pulse generator function (RPLS) Remote pulse generator function with pulse width modulation (RPWM)	800...899 *(see page 123)*
	900...999	Island diagnostics	900...999 *(see page 188)*
	1000...1099	Managing the module behavior	1000...1099 *(see page 193)*
	1100...1108	Description of modules constituting the island	1100...1108 *(see page 196)*

NOTE: The available registers are the registers corresponding to existing modules.

The customized zone enables you to organize data so as to optimize exchanges between the master and the island while assembling non-adjacent registers in an adjacent register table. This reduces the number of Modbus read/write instructions.

The customized zone is configured in the definition zone:

- The definition zones (1200...1299 and 1300...1399) contain the register numbers of accessible data.
- The customized zones (2000...2099 and 2100...2199) provide access to the definition zones.

Zone	Register	Function	Page
Definition zones	1200...1299	Customization of the register zone only accessible in read mode	1200...1299 *(see page 195)*
	1300...1399	Customization of the register zone accessible in read/write mode	1300...1399 *(see page 195)*
Customized zones	2000...2099	Read access to the customized zone of registers 1200 to 1299	2000...2099 *(see page 195)*
	2100...2199	Read/write access to the customized zone of registers 1300 to 1399	2100...2199 *(see page 195)*

Example:

- If register 1200 has a value of 0, register 2000 will have the same content as register 0.
- If register 1300 has a value of 100, writing to register 2100 will have the same effect as writing to register 100.

NOTE: The customized zone can only contain registers available in the manufacturer zone.

OTB Module Registers

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

State of Inputs	Output Commands	Parameters	RFC	RVFC	RPLS RPWM	Diagnostics	Module Behavior
0...99	**100...199**	**200...599**	**600...699**	**700...799**	**800...899**	**900...999**	**1000...1099**
1	1	14	8 per counter	14 per counter	10 per generator	11	6

Expansion Module Registers

The expansion modules use the number of registers indicated in the table below:

Reference	Function (I/O Type/Voltage)	State of Inputs	Output Commands	Parameter	Diagnostics
		0...99	**100...199**	**200...599**	**900...999**
TM2 DDI8DT	8 IN/24 VDC	1	0	0	1
TM2 DAI8DT	8 IN/120 VAC	1	0	0	1
TM2 DDI16DT	16 IN/24 VDC	1	0	0	1
TM2 DDI16DK	16 IN/24 VDC	1	0	0	1
TM2 DDI32DK	32 IN/24 VDC	2	0	0	1
TM2 DDO8TT	8 OUT/24 VDC source	0	1	2	1
TM2 DDO8UT	8 OUT/24 VDC sink	0	1	2	1
TM2 DRA8RT	8 OUT relay	0	1	2	1
TM2 DDO16TK	16 OUT/24 VDC source	0	1	2	1
TM2 DDDO16UK	16 OUT/24 VDC sink	0	1	2	1
TM2 DRA16RT	16 OUT relay	0	1	2	1
TM2 DDO32TK	32 OUT/24 VDC source	0	2	4	1
TM2 DDO32UK	32 OUT/24 VDC sink	0	2	4	1
TM2 DMM8DRT	4 IN/24 VDC 4 OUT relay	1	1	2	1
TM2 DMM24DRF	16 IN/24 VDC 8 OUT relay	1	1	2	1
TM2 AMI2HT	2 IN (U/I)	2	0	8	1
TM2 AM01HT	1 OUT (U/I)	0	1	6	1
TM2 AMM3HT	2 IN/1 OUT (U/I)	2	1	14	1
TM2 AMM6HT	4 IN/2 OUT (U/I)	4	2	28	1
TM2 ALM3LT	Thermocouple	2	1	14	1
TM2 AVO2HT	2 OUT (+/- 10 VDC, 10 bits)	0	2	12	1
TM2 AMI2LT	2 IN (J, K, T)	2	0	8	1
TM2 AMI4LT	4 IN (U/I, Pt, Ni)	4	0	16	1
TM2 AMI8HT	8 IN (U/I, 10 bits)	8	0	32	1
TM2 ARI8HT	8 IN (PTC, NTC, 10 bits)	8	0	56	1
TM2 ARI8LT	8 IN (PT100, PT1000, 12 bits)	8	0	56	1
TM2 ARI8LRJ	8 IN (PT100, PT1000, 12 bits)	8	0	56	1

Example of Register Numbering

In this example, the OTB island consists of the following modules :

- 1 Modbus network interface module: OTB 1S0DLM9LP
- 1 expansion module with 8 discrete inputs: TM2 DDI8DT
- 1 expansion module with 2 analog inputs/1 analog output:TM2 AMM3HT

	Register	Description
Inputs	0	OTB 1S0DLM9LP: Discrete inputs 0 to 11
	1	TM2 DDI8DT: Discrete inputs 0 to 7
	2	TM2 AMM3HT: Analog input, channel 0
	3	TM2 AMM3HT: Analog input, channel 1
Outputs	100	OTB 1S0DLM9LP: Discrete outputs 0 to 7
	101	TM2 AMM3HT : Analog output, channel 0
Parameters	200...213	OTB 1S0DLM9LP: Parameters
	214...227	TM2 AMM3HT: Parameters
Application-specific functions	600...607	OTB 1S0DLM9LP: RFC0 Counter
	620...627	OTB 1S0DLM9LP: RFC1 Counter
	700...714	OTB 1S0DLM9LP: RVFC0 Counter
	720...634	OTB 1S0DLM9LP: RVFC1 Counter
	800...808	OTB 1S0DLM9LP: Generator RPLS0/RPWM0
	820...828	OTB 1S0DLM9LP: Generator RPLS1/RPWM1
Diagnostics	900...910	OTB 1S0DLM9LP diagnostics
	911	TM2 DDI8DT diagnostics
	912	TM2 AMM3HT diagnostics
Management	1000...1009	Managing the island's behavior
Description of the island	1100...1108	Description of modules constituting the island

6.2 Description of the OTB Module I/Os

Introduction

This section presents the I/O of the OTB module.

What's in this Section?

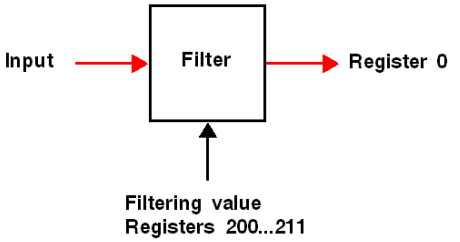
This section contains the following topics:

Description of the OTB Module Discrete I/Os

Discrete Inputs

The OTB module discrete input filtering values can be configured for each input:

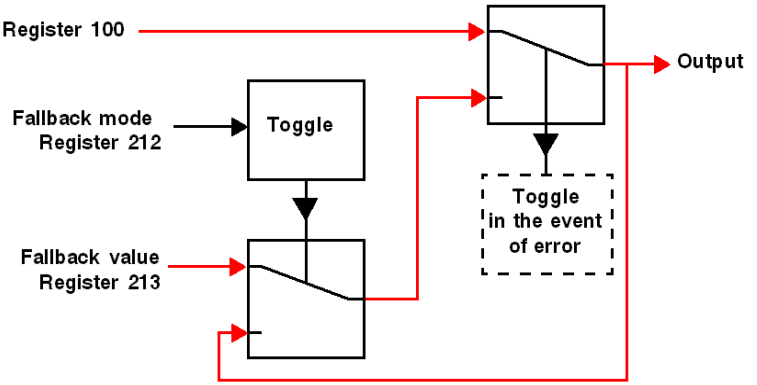
- Deactivated,
- 3 ms (by default),
- 12 ms.



Discrete Outputs

In the event of communication errors, the OTB module switches its outputs to the user-configured fallback mode:

- Maintaining the last value,
- Fallback to 0 (mode by default),
- Fallback to 1



Read Input Registers

At a Glance

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

Discrete inputs of expansion modules are not filtered.

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 Read Input Registers 0 to 99

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: Input 0 ... Bit 11: Input 11 Bits 12 to 15: Not used
1	Input status of first expansion module with inputs	Depends on the module
...	...	...
99	...	...

NOTE: Only those registers that correspond to an expansion module present in the island are accessible in read mode.

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 199

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: Output 0 ... Bit 11: Output 11
101	Commands to outputs of first expansion module with outputs	Depends on the module
...	...	...
199	...	...

NOTE: Only those registers that correspond to an expansion module present in the island are readable and writeable.

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 input 0	0: no filtering 1: filtering at 3ms (default value) 2: filtering at 12ms
201		Filtering input 1	
202		Filtering input 2	
203		Filtering input 3	
204		Filtering input 4	
205		Filtering input 5	
206		Filtering input 6	
207		Filtering input 7	
208		Filtering input 8	
209		Filtering input 9	
210		Filtering input 10	
211		Filtering input 11	
212	Bit 0	Fallback mode for output 0	0: Maintain state 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	

NOTE: The fallback value (213) is ignored if the fallback mode (212) is set to 0.

Table of I/O Parameter Registers 214 to 599

Registers 214 to 599 are reserved for Expansion modules I/O parameters:

- For the discrete I/O expansion modules, see *(see page 125)*
- For the analog I/O expansion modules, see *(see page 129)*.

6.3 Specific Functions of the OTB Module

Introduction

This section describes the specific functions of the Advantys OTB module.

What's in this Section?

This section contains the following topics:

Specific Functions of the Advantys OTB Modules

Remote Fast Counter (RFC)

The Advantys OTB network interface module permits the use of a maximum of 2 fast counters. The functions RFC0 and RFC1 are allocated to inputs 18 and 19. These inputs can be used as standard discrete inputs if the function is not used.

Remote Very Fast Counter (RVFC)

The Advantys OTB network interface module permits the use of a maximum of 2 very fast counters. The functions RVFC0 and RVFC1 are allocated to inputs I0 to I3 and I4 to I7 respectively. These inputs can be used as standard discrete inputs if the function is not used.

Remote Pulse Generators (RPLS or RPWM)

The Advantys OTB network interface module permits the use of 2 pulse generators. The functions RPLS0/RPWM0 and RPLS1/RPWM1 are allocated to the outputs Q0 and Q1 respectively. These outputs can be used as standard discrete outputs if the function 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 counter 0 (RFC0)	Fast counter 1 (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

Introduction

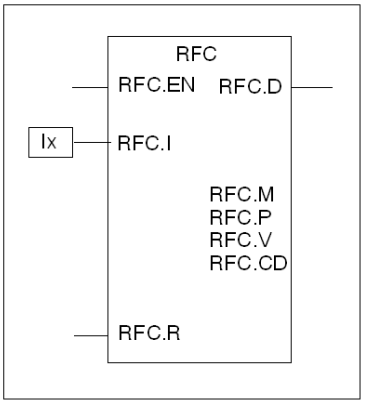
The remote fast counter (RFC) function can be used in up- or down-counting mode. It can count the pulses on the dedicated discrete inputs of frequencies up to 5 kHz.

Two remote fast counter functions are available. The fast counter functions RFC0 and RFC1 use the dedicated inputs I8 and I9 respectively. These inputs are not exclusively reserved for these functions, and may be used as standard inputs.

NOTE: The function representations are not pre-existing instructions in the programming software. They appear in these sections as graphical aides to understanding the parameters of these complex I/O functions.

Representation

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



Parameters

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

Parameter	Function	Description
RFC.M	Counting Mode	Parameter used to select between: ● 0: Disable function ● Up counter ● Down counter
RFC.P	Preset value	Threshold value to trigger the RFC.D Done bit and reset 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.
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. If the user does not reset it to 0, the RFC.D bit is remains at 1.
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 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 is configured to down-count, the current value is decreased by 1 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 RFC function will only be activated after the RFC.R command is initialized and the RFC.EN input validated.

The selection or modification of the RFC.M counting mode will only be taken into account on activation of the RFC.R command.

The RFC.P preset value modification is acknowledged at the end of the up counting or down counting cycle in progress without having to activate the RCF.R command.

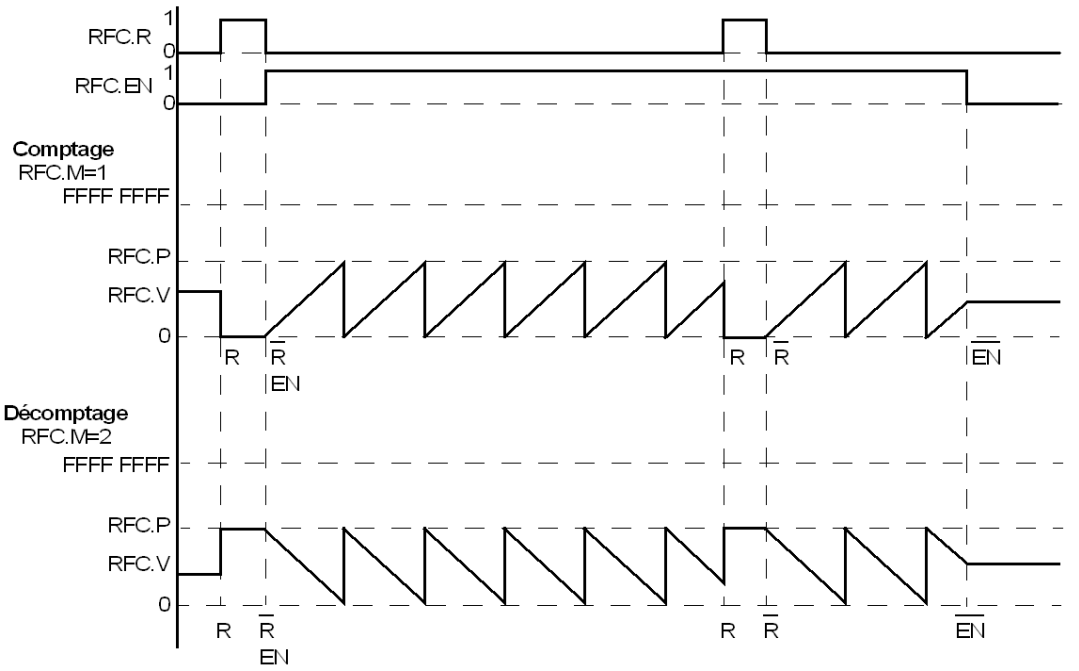
Fallback Modes RFC.EM

The programmable fallback modes of the RFC function are as follows:

- Counter reset (equivalent of setting the RFC.R to 1)
- Set the current value of the RFC function counter (equivalent of setting RFC.EN to 0)
- Continue counting

Timing diagram

The timing diagram below illustrates the RFC function operation in up counting (RFC.M=1) and down counting (RFC.M=2) mode.



Fast Counter Registers (RFC)

At a Glance

The fast counters (RFC0 and RFC1) use the following parameters for the supported functions.

Registers 600 to 627

Specific function of fast counter 0 (RFC0).

Registers	Parameter	Description	Access	Default value
600	RFC.V	Current value	Read	-
601				
602	RFC.D	Bit [0]: ● Up counting: Preset value reached ● Down counting: 0 reached	Read	-
603	RFC.M	Counting mode: ● 0 : Not used ● 1 : Counter ● 2 : Down counter	Read/Write	0
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	0
605	RFC.P	Preset value	Read/Write	FFFFH
606				
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 and Access
620...627	Same description and access as counter 0

Remote Very Fast Counter (RVFC) function

Introduction

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

- Up/down counter
- 2-phase up/down counter
- Single up counter
- Single down counter
- Frequency meter

Two very fast counters are available. The RVFC function supports counting of dedicated discrete inputs from 0 to 20 kHz. Very fast counters RVFC0 and RVFC1 each use the I/O dedicated to these functions.

A Remote Very Fast Counter (RVFC) has a value range between 0 and 4,294,967,295.

Notes

The RVFC function will only be activated after the RVFC.R parameter is initialized and the RVFC.EN input enabled.

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) functions use dedicated inputs and outputs. These inputs and outputs are not exclusively reserved for these functions, and can be used as normal discrete I/O.

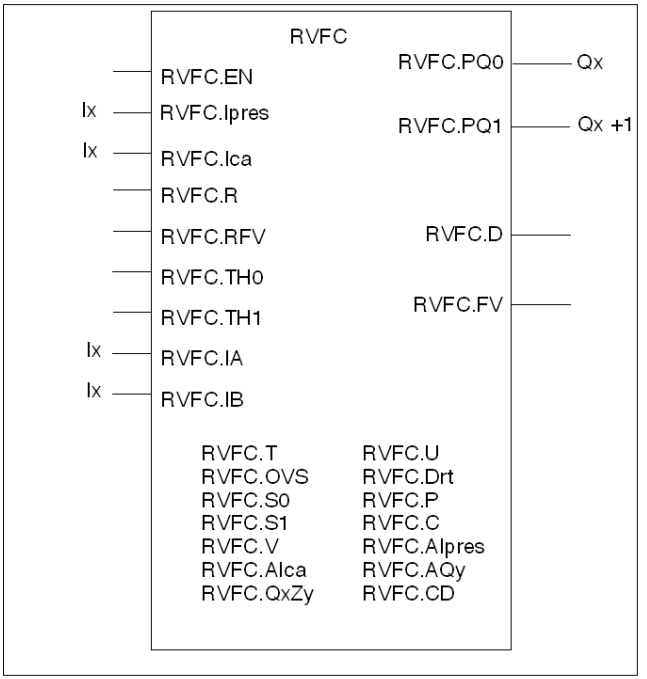
The table below summarizes the possible assignments:

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

Key:
(1) = Optional
IA input = Pulse input
IB input = Pulses or UP/Down
UP/Down = 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.



NOTE: Qx depends on the type of Remote Very Fast Counter (RVFC) configured. For RVFC0, the physical reflex outputs are Q2 and Q3, For RVFC1, they are Q4 and Q5.

Parameters

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

Parameter	Function	Description
RVFC.M	Counting mode	Parameter used to select between: ● Not used ● Up/down counter ● 2-phase up/down counter ● Up counter ● Down counter ● Frequency meter
RVFC.V	Current value	The current value increments or decrements according to the selected counting mode. This value can be set to the preset value (RVFC.P) using the preset input (RVFC.Ipres).
RVFC.Drt	Counting direction	This bit, which is only used in up/down counting mode, indicates the counting direction based on the previous current value: 0: Upcounting 1: Downcounting
RVFC.P	Preset value	The current value (RVFC.V) takes the preset value on an RVFC.Ipres input edge or on a RVFC.R counter reset in downcounting, up/down counting and two-phase modes. In upcounting and downcounting mode, 0 is forbidden. A change in the value will be taken into account at the end of the current cycle.
RVFC.C	Catch 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 frequency meter mode.
RVFC.TH0	Threshold value S0	This parameter contains the value of threshold S0. This value must be lower than the value of threshold S1 (RVFC.TH1). This function is only used in frequency meter mode.
RVFC.TH1	Threshold value S1	This parameter contains the value of threshold S1. This value must be higher than the value of threshold S0 (RVFC.TH0). This function is only used in frequency meter mode.
RVFC.S0	Bit 0 threshold	This bit is set to 1 when the current value is >= the value of threshold S0 (RVFC.TH0). This function is only used in frequency meter mode.
RVFC.S1	Bit 1 threshold	This bit is set to 1 when the current value is >= the value of threshold S1 (RVFC.TH1). This function is only used in frequency meter mode.
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 up/down counting mode. The Done bit switches to 0 when the RVFC.R bit is activated or when Reset Done (RVFC.CD) =1.

Parameter	Function	Description
RVFC.CD	Reset Done	At state 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 remains at 1.
RVFC.T	Frequency measure time base	Time base configuration element: ● 0 = 100 milliseconds ● 1 = 1 second This function is only used for the frequency measurement mode.
RVFC. Ipres	Preset physical input	On a rising edge, the current value (RVFC.V) is forced to the preset value. At state 0, up or down counting in progress.
RVFC. AIpres	Enable the Ipres input	Enables 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	Enable the Ica input	Enables the catch command.
RVFC.EN	Enable input	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	Reinitialization	The effect of this bit depends on the counting mode used when set to 1: ● Up/down counting, down counting and two-phase, the preset value (RVFC.P) is stored in the current value (RVFC.V). ● Upcounting, the current value is set to zero, ● Frequency meter, setting 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. RVFC.D bit reset to zero
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	Reflex output Qx	-
RVFC.AQ0	Activation of reflex output Qx	This parameter is used to activate the use of reflex output Qx.
RVFC.Q1	Reflex output Qx+1	-
RVFC.AQ1	Activation of reflex output Qx+1	This parameter is used to activate the use of reflex output Qx+1.
RVFC.Q0Z1	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)

Parameter	Function	Description
RVFC.Q0Z2	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 ≤ RVFC.TH1.
RVFC.Q0Z3	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.Q1Z1	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.Q1Z2	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 ≤ RVFC.TH1
RVFC.Q1Z3	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 Upcounting and Downcounting Functions

When the RVFC function is configured for upcounting, the current value is incremented by one when a rising edge appears at the dedicated input. When the preset value RVFC.P is reached, the RVFC.D Done bit is set to 1 and the RVFC.V current value is set to zero.

When the RFVC function is configured for downcounting, the current value is decreased by 1 when a rising edge appears on the dedicated input. When the value is zero, the Done bit RVFC.D is set to 1 and the current value RVFC.P equals the preset value.

Upcounting or downcounting operations are made on the rising edge of pulses, but only if the counting function has been activated (RVFC.EN). The RVFC.ICa and RVFC.IPres inputs are optional.

NOTE: These remarks do not apply in frequency meter mode.

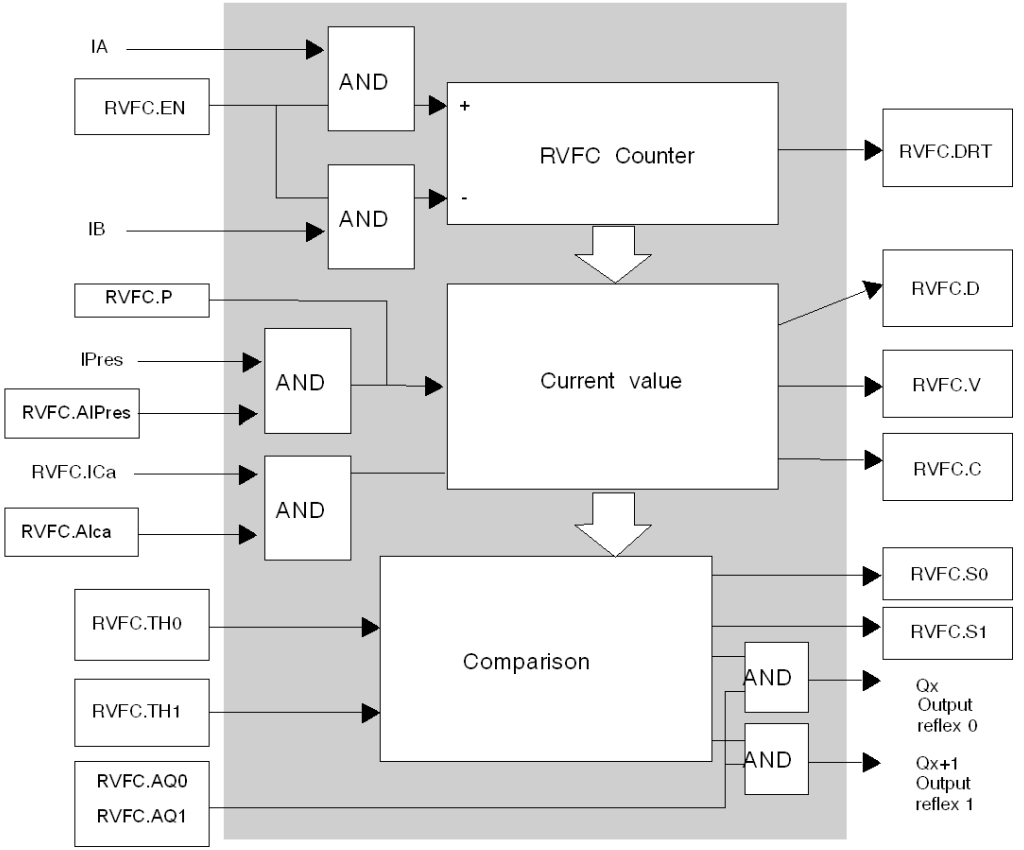
Notes on Function Outputs

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.

NOTE: These remarks do not apply in frequency meter mode.

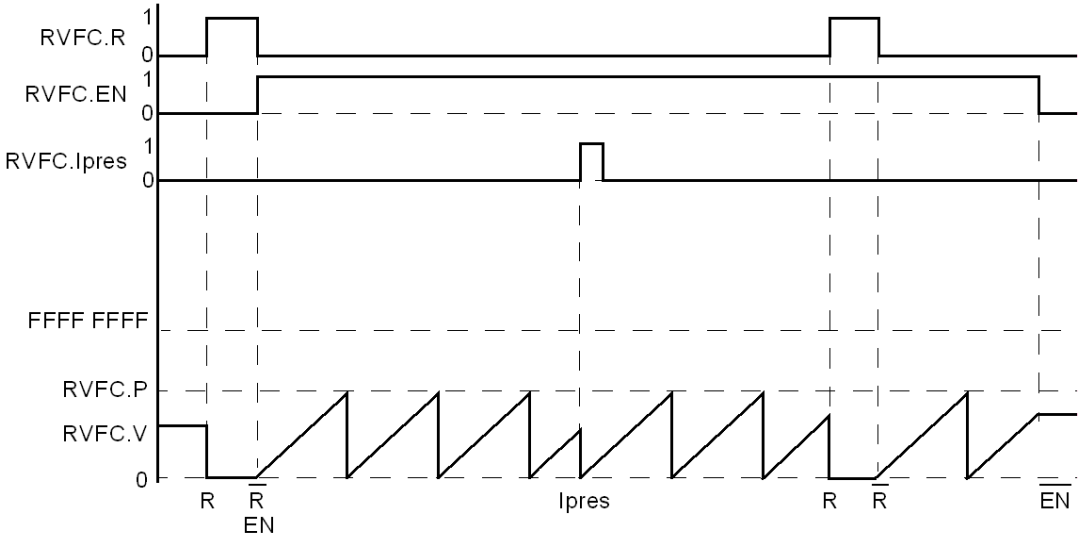
Counting Function Diagram

The following is a counting function diagram:



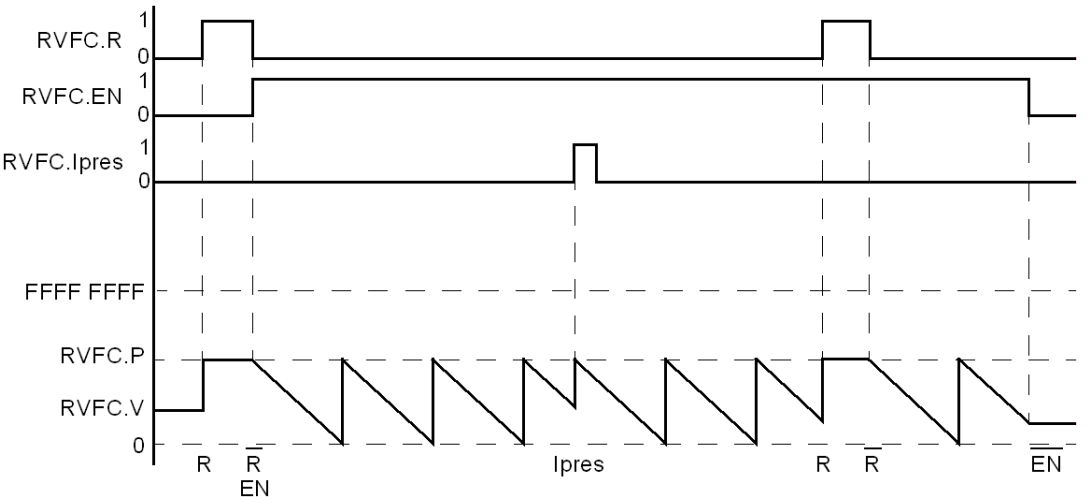
Use in Simple Upcounting Mode

Here is an example of an RVFC function timing diagram in simple upcounting mode (RVFC.M = 3):



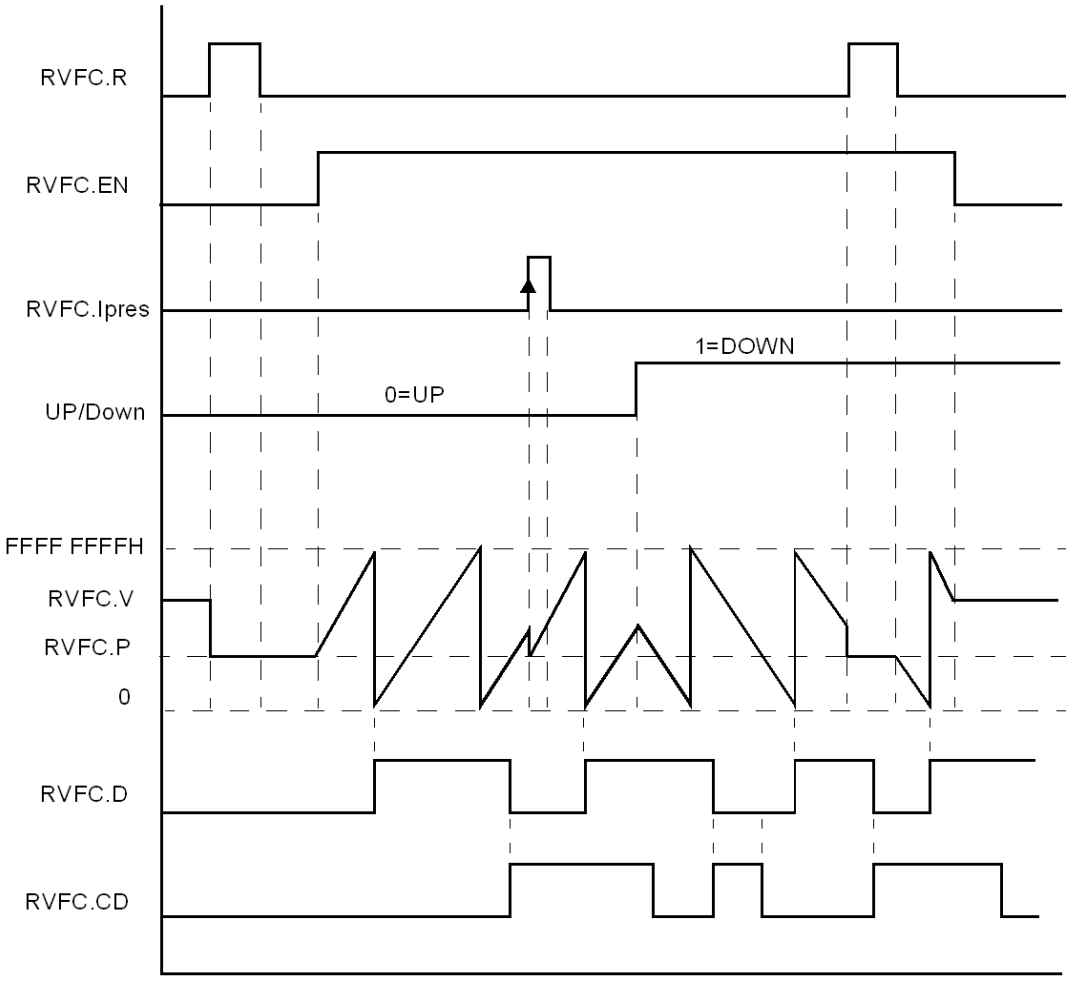
Use in Simple Downcounting Mode

Here is an example of an RVFC function timing diagram in simple downcounting mode (RVFC.M = 4):



Use in Up/Down Counting Mode

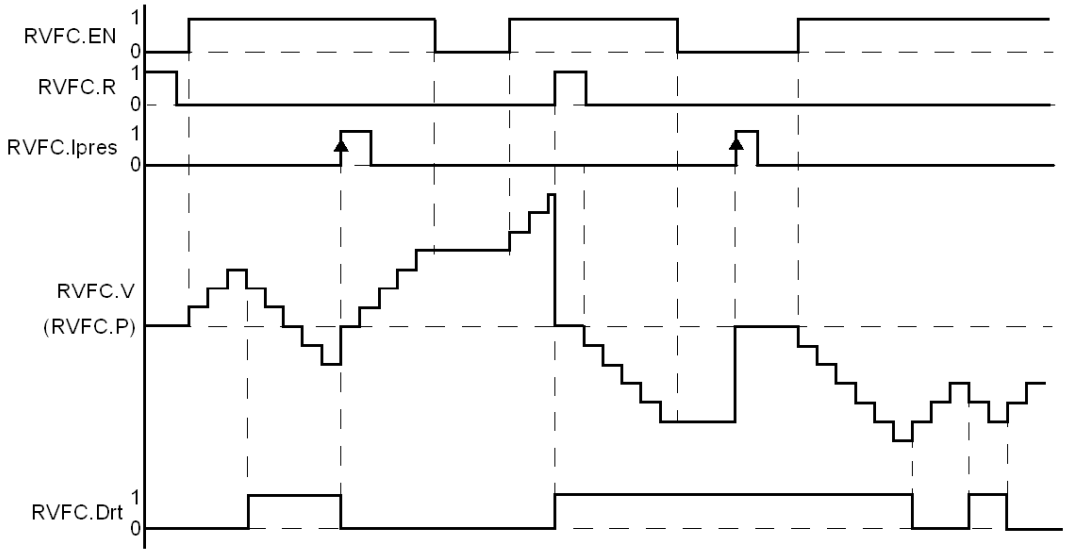
Here is an example of an RVFC function timing diagram in up/down counting mode (RVFC.M = 1):



Use in Two-phase Counting Mode

The two-phase counting mode is mainly dedicated to the use of incremental encoders. Channel A of the encoder is connected to the RVFC.IA input, channel B to the RVFC.IB input and channel Z (zero marker) to the RVFC.Ipres input.

The timing diagram below illustrates operation of the RVFC function in two-phase counting mode (RVFC.M=2).



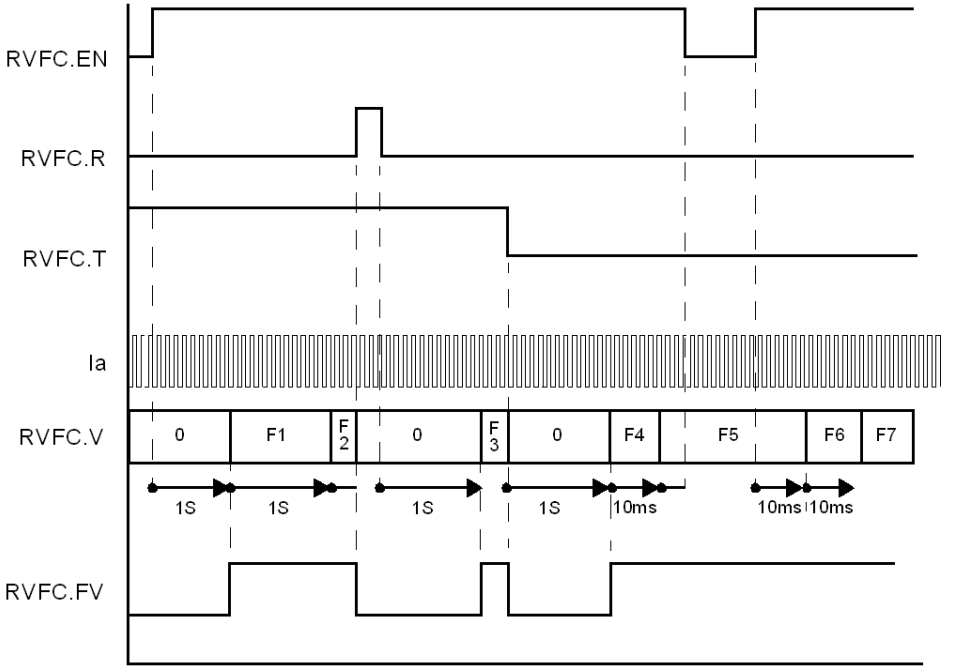
Frequency Meter Function Description

The frequency meter function of a RVFC is used to measure the frequency in Hz of a periodic signal on input IA. The range of frequencies which can be measured is between 1 Hz/10 Hz and 20 kHz. The user can choose between two time bases. This choice is made by a new object RVFC.T (Time base). 0 corresponds to a time base of 100 ms and 1 corresponds to a time base of 1 second.

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

Use in Frequency Meter Mode

The following is an example of a timing diagram of the use of RVFC in Frequency meter mode:



NOTE: The RVFC function uses a complete period to measure the frequency. RVFC.T time base modifications are acknowledged at the end of the current measurement cycle.

Fallback Modes

When the PLC stops or detects a communication error, the RVFC function may operate differently according to the programmed fallback mode.

The RVFC function programmable fallback modes are as follows:

- Very fast counter reset to zero (equivalent to setting RVFC.R to 1)
- Freeze the current counter value and stop the RVFC function counter (equivalent to setting RVFC.EN to 0)
- Continue counting

Remote Very Fast Counter Registers (RVFC)

At a Glance

The very fast counters (RVFC0 and RVFC1) use the following parameters for the supported functions.

Registers 700 to 734

Specific function of Remote Very Fast Counter 0 (RVFC0):

Registers	Parameter	Description	Access	Default value
700	RVFC.V	Current value	Read	-
701				-
702	RVFC.Drt	Bit[0]: Count direction	Read	-
	RVFC.D	Bit [1]: Output overshoot		-
	RVFC.S0	Bit [2]: Threshold S0 reached. When set to 1, the current value is greater than S0.		-
	RVFC.S1	Bit [3]: Threshold S1 reached. When set to 1, the current value is greater than S1.		-
	RVFC.FV	Bit [4]: Measurement frequency valid		-
703	RVFC.C	Catch value	Read	-
704				-
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	0
706	RVFC.P	Preset value	Read/Write	FFFFH
707				FFFFH

Registers	Parameter	Description	Access	Default value
708	RVFC.AQ0	Bit [0]: Activates the reflex output 0	Read/Write	04C0H
	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: Counter reset to zero ● 1: Counting stopped, last read value saved and counter frozen ● 2 : Continue counting	Read/Write	0
710	RVFC.TH0	Threshold value S0 where S0 < S1	Read/Write	0
711				0
712	RVFC.TH1	Threshold value S1 where S1 > S0	Read/Write	FFFFH
713				FFFFH
714	RVFC.EN RVFC.R RVFC.RFV RVFC.CD	Bit [0]: Enable input Bit [1]: Reset input Bit [2]: Valid measurement frequency status reset to zero (RVFC.FV) Bit [3] : Reset RVFC.D bit	Read/Write	0

Specific function of Remote Very Fast Counter 1 (RVFC1)

Registers	Parameter	Description and Access
720...734	RVFCXX	Same description and access as very fast counter RVFC0

Pulse Generator Output Function (RPLS)

Introduction

The RPLS function is used to generate a sequence of square wave signals.

There are two RPLS functions available. The RPLS0 function uses the dedicated output Q0 and the RPLS1 function uses the dedicated output Q1. The RPLS and RPWM functions share the same dedicated outputs. You must choose one or other of the functions for each output.

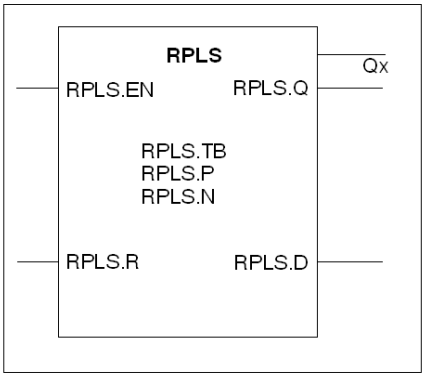
Notes

The function will only be activated after the RPLS.R input is initialized and the RPLS.EN input enabled.

Selection or modification of the RPLS.M counting mode will only be taken into account on activation of the RPLS.R command.

Representation

The figure below shows a pulse generator function block:



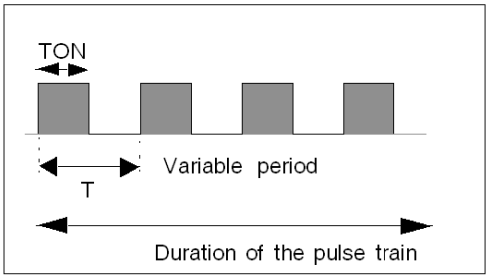
Parameters

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

Parameter	Designation	Description
RPLS.TB	Time base	This parameter can take the following time base values: ● 0.127 ms (default value) ● 0.508 ms ● 10 ms ● 1 s
RPLS.P	Period coefficient value	Authorized values for the preset period P: ● 0: Function inactive ● 0 < RPLS.P ≤ 255 with a time base of 0.127 ms or 0.508 ms ● 1 < RPLS.P ≤ 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	Enable the pulse generator	Enables RPLS block operation. At state 0, this block is inhibited and the RPLS.Q output reset to zero.
RPLS.R	Reset at state 1	At state 1, outputs RPLS.Q and RPLS.D are set to 0. The number of pulses generated over a period T is set to 0.
RPLS.Q	Pulse generation in progress	At state 1, this indicates that the pulse signal is generated on 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 desired number of pulses have been generated. This is reset by activating RPLS.R

Operation

The diagram below illustrates the RPLS function:



T= Period
TON = Time On

Duration of the pulse train: RPLS.N * T

The output signal period is set at the time of 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 0.127 ms and 0.508 ms
  = (RPLS.P * RPLS.TB)/2
- TON = [whole part (RPLS.P)/2] * RPLS.TB for the 10 ms to 1 s time bases.

NOTE:

- To obtain a good level of accuracy with time bases of 0.508 ms and 0.127 ms, it is advisable to have an RPLS.P $\geq$ 3.
- To obtain a good level of accuracy from the duty cycle with time bases of 10 ms and 1 s, it is advisable to have an RPLS.P $\geq$ 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 min 27 s in steps of 10 ms
- 2s to 18 hrs 12 min 14 s in steps of 1 s

RPLS.EM Fallback Modes

When the PLC stops or detects a communication error, the RPLS function may operate differently according to the programmed fallback mode.

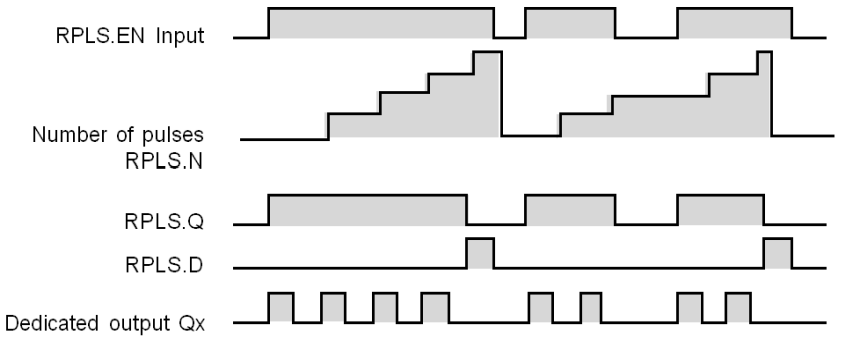
The programmable fallback modes of the RPLS function are as follows:

- Generator reset with output reset (equivalent of setting RPLS.R to 1)
- Stop at the end of the current pulse (equivalent of setting RPLS.EN to 0)
- Continue generating pulses

NOTE: The dedicated function fallback modes have priority and overwrite all other possible fallback conditions.

Example of a Pulse Generator

The illustration below represents a RPLS function pulse diagram.



Remote Pulse Width Modulator Function (RPWM)

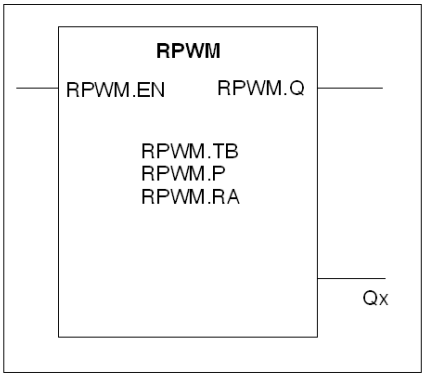
Introduction

The remote pulse width modulator (RPWM) function generates a rectangular signal on the dedicated outputs The signal duty cycle is variable.

There are two RPWM functions available. The RPWM0 function uses the dedicated output Q0 and the RPMW1 function uses the dedicated output Q1. The RPLS and RPWM functions 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:



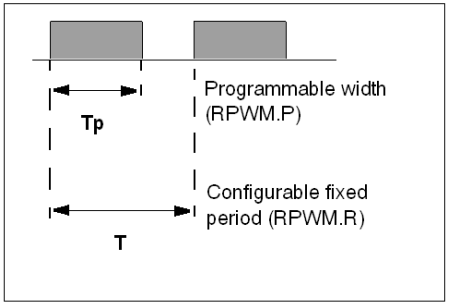
Parameters

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

Parameter	Designation	Description
RPWM.TB	Time base	This parameter can take the following time base values: ● 0.127 ms (default value) ● 0.508 ms ● 10 ms ● 1 s.
RPWM.P	Period coefficient value	Authorized values for the preset period P: ● 0 : Not used ● 0 < RPWM.P ≤ 255 with a time base of 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 establishes the percentage (0% ≤ RA ≤ 100%) of the signal of state 1 (activated) in a period T. The default value is 50%.
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.
RPWM.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:



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 min 27 s in steps of 10 ms
- 2s at 18hrs 12min 14s in steps of 1 s

Pulse Modulation

Calculation of the Tp width: Tp = T * (RPWM.RA/100)

If the signal period is programmed to 500 ms, 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

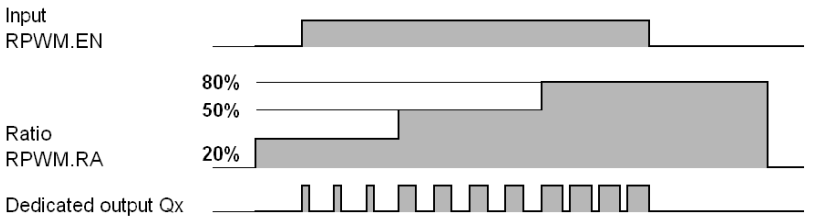
When the PLC stops or detects a communication error, the RPWM function may operate differently according to the programmed fallback mode.

The programmable fallback modes of the RPWM function 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 with varying duty cycles.



Remote Pulse Generators (RPLS, RPWM) Registers

At a Glance

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

Registers 800 to 828

Remote pulse generator specific function (RPLS0 or RPWM0).

Registers	Parameter	Description	Access	Default value
800	RPLS.Q RPWM.Q	Bit [0]: Q output. At state 1, it indicates that the pulse signal is generated at the dedicated output 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.M/R PWM.M	Operating mode: ● 0: Not used ● 1: PLS ● 2: PWM	read/write	0
802	RPLS.TB RPWM.TB	Time base: ● 0: 0.127 ms ● 1: 0.508 ms ● 2: 10 ms ● 3: 1 s	Read/Write	0
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	1
804 805	RPLS.N	Number of pulses: ● 0: Unlimited number of pulses ● 1< N < 4 294 967 295 (FFFF FFFFH)	read/write	0 0
806	RPWM.RA	Duty cycle: 0% ≤ R ≤ 100%. Duration of high status / Period	Read/Write	32H (50%)
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	0
808	RPLS. EN RPWM.EN	Bit [0]: Pulse generation input. When set to 1, the pulse generation is produced on the dedicated output. When set to 0, the output is set to 0.	Read/Write	0
	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 and Access
820...828	Description and access identical to those of the RPLS0 or RPWM0 functions

6.4 Discrete I/O of Expansion Modules

Description of the Expansion Module Discrete I/O

Overview

The expansion module discrete I/O use the configuration registers described in the tables below. The register number (N) depends on the position of the module in the island.

NOTE: Only those registers that correspond to an analog expansion module present in the island are accessible in read and write modes.

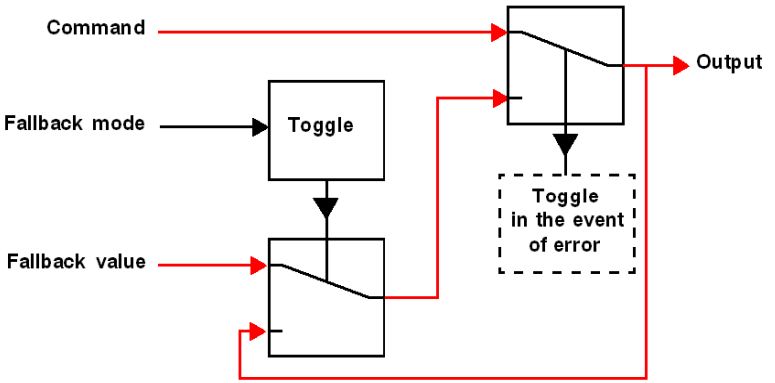
Discrete Inputs

Expansion modules TM2 DDI8DT, TM2 DAI8DT, TM2 DDI16DT, TM2 DDI16DK, TM2 DDI32DK with discrete inputs do not use configuration registers.

Discrete Outputs

In the event of communication errors, the module assigns the user-configured fallback mode to its outputs:

- Maintain the last value
- Fallback to 0 (default mode)
- Fallback to 1



Register Numbering

The register number (N) depends on the position of the module in the island.

Read Registers 1...99

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

Register	Function	Bit Assignment
N	State of inputs	Bit 0: Input 0 ... Bit X: Input X
...	...	...
99	...	...

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

Output Command Registers 101...199

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

Register	Function	Bit Assignment
N	Output Commands	Bit 0: Input 0 ... Bit X: Input X
...	...	...
199	...	...

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

Parameter Registers 214...599

TM2 DDO8TT, TM2 DDO8UT, TM2 DRA8RT: These discrete output expansion modules use the following registers:

Register	Bit	Description	Parameter
N	Bit 0	Fallback mode, output 0	0: Maintain state 1: Fallback activated (default value)
	...	...	
	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 not used.

TM2 DDO16UK, TM2 DDO16TK, TM2 DRA16RT: These discrete output expansion modules use the following registers:

Register	Bit	Description	Parameter
N	Bit 0	Fallback mode, output 0	0: Maintain state 1: Fallback activated (default value)
	...	...	
	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	

TM2 DDO32UK, TM2 DDO32TK: These discrete output expansion modules use the following registers:

Register	Bit	Description	Parameter
N	Bit 0	Fallback mode, output 0	0: Maintain state 1: Fallback activated (default value)
	...	...	
	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	0: Maintain state 1: Fallback activated (default value)
	...	...	
	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	

TM2 DMM8DRT: This discrete output expansion module uses the following registers:

Register	Bit	Description	Parameter
N	Bit 0	Fallback mode, output 0	0: Maintain state 1: Fallback activated (default value)
	...	...	
	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 not used.

TM2 DMM24DRF: This discrete output expansion module uses the following registers:

Register	Bit	Description	Parameter
N	Bit 0	Fallback mode, output 0	0: Maintain state 1: Fallback activated (default value)
	...	...	
	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 not used.

6.5 Analog I/O of Expansion Modules

Introduction

This section shows how analog I/Os of expansion modules are used.

What's in this Section?

This section contains the following topics:

Description of the Expansion Module Analog I/O

Overview

The expansion module analog I/O use the parameter registers described in the tables below. The first table shows all the possible values and the subsequent tables indicate the configuration registers used by each type of expansion module.

Registers Reserved for Analog I/O

Analog expansion modules use different configuration registers according to their type.

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

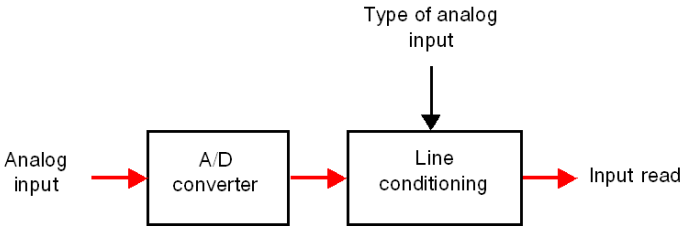
Channel	Register	Description	Parameter
Vx	N	Range	0: Not used 1: 0..20 mA 2: 4 .. 20 mA 3: 0..10V 4: +/- 10V 5: Thermo K 6: Thermo J 7: Thermo T 8: PT100 9: PT1000 10: NI100 11: NI1000 12: Reserved 13: NTC 14: PTC
	N+1	Unit	0 : Normal 1: Customized 2: Celsius (0.1°C) 3: Fahrenheit (0.1°F) 4: Resistance (ohms)
	N+2	Minimum value (if unit is customized)	Min.
	N+3	Maximum value (if unit is customized)	Max.
	N+4	Fallback mode	0: Maintain state 1: Fallback activated
	N+5	Fallback value	Fallback value

The following table shows the possibilities for mixing channel types (Voltage/Current/Temperature) and converter accuracy.

Reference	Possibilities for Mixing Channels	Accuracy
TM2 AMI2HT	Yes	12 bits
TM2 AMO1HT	Not applicable	12 bits
TM2 AMM3HT	Yes	12 bits
TM2 AMM6HT	Yes	12 bits
TM2 ALM3LT	Not applicable	12 bits
TM2 AMI2LT	Not applicable	12 bits
TM2 AVO2HT	Not applicable	12 bits
TM2 AMI4LT	No	12 bits
TM2 AMI8HT	No	10 bits
TM2 ARI8HT	Not applicable	10 Bit
TM2 ARI8LT	Not applicable	12 bits
TM2 ARI8LRJ	Not applicable	12 bits

Analog Inputs

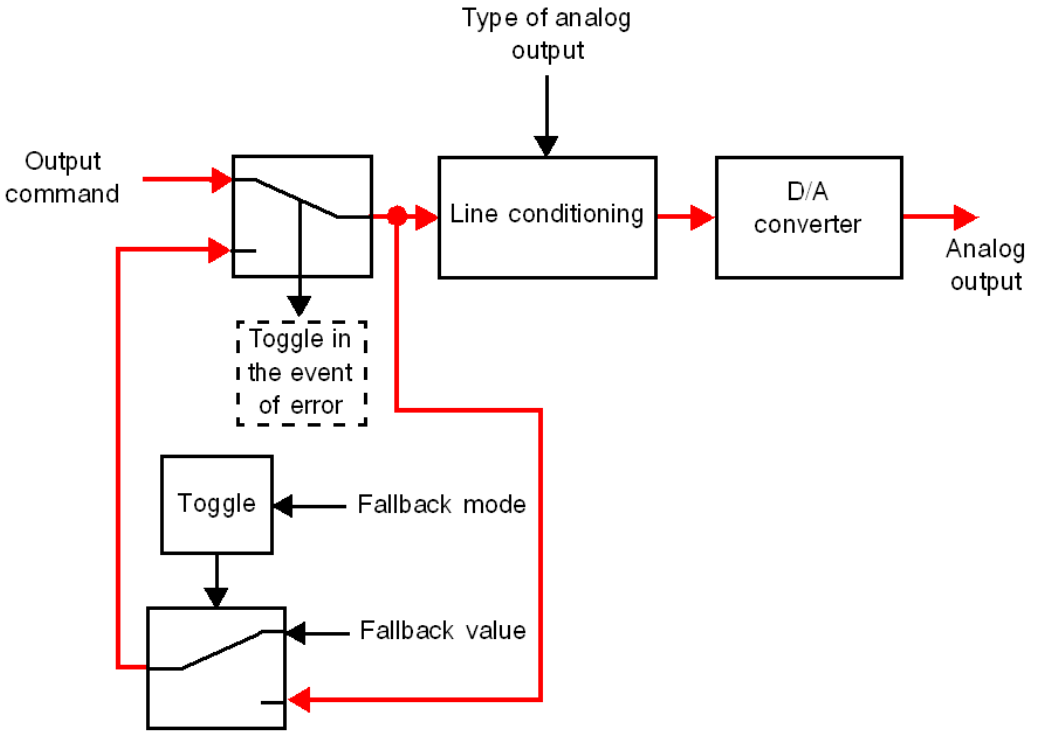
The status read on the inputs is defined as follows:



Analog Outputs

In the event of an error (loss of communication with the master for example), the fallback mode is applied.

The status applied to the output is defined as follows:



TM2 AMI2HT Expansion Module Registers

Register Numbering

The register number (N) depends on the position of the module in the island (see *Island Registers, page 88*).

Read Registers 1...99

Register	Function	Bit Assignment
N	First input value	16-bit word
N+1	Second input value	16-bit word

Parameter-Setting Registers 214...599

Channel	Register	Description	Parameter	Default Parameter Value
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 (if channel unit is customized)	Min.	0
	N+3	Maximum value (if channel unit is customized)	Max.	7FFFH
V1 (input)	N+4 to N+7	Description identical to the V0 input with registers N+4 to N+7.		

TM2 AMO1HT Expansion Module Registers

Register Numbering

The register number (N) depends on the position of the module in the island (see *Island Registers, page 88*).

Output Command Registers 101...199

Register	Function	Bit Assignment
N	Output command	16-bit word

Parameter-Setting Registers 214...599

Channel	Register	Description	Parameter	Default Parameter Value
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 (if N+1 = 1)	Min.	0
	N+3	Maximum value (if N+1 = 1)	Max.	7FFFH
	N+4	Fallback mode	0: Maintain state 1: Fallback activated	1
	N+5	Fallback value	Fallback value	0

TM2 AMM3HT Expansion Module Registers

Register Numbering

The register number (N) depends on the position of the module in the island (see *Island Registers, page 88*).

Read Registers 1...99

Register	Function	Bit Assignment
N	First input value	16-bit word
N+1	Second input value	16-bit word

Output Command Registers 101...199

Register	Function	Bit Assignment
N	Output command	16-bit word

Parameter-Setting Registers 214...599

Channel	Register	Description	Parameter	Default Parameter Value
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 (if channel unit is customized)	Min.	0
	N+3	Maximum value (if channel unit is customized)	Max.	7FFFH
V1 (input)	N+4 to N+7	Description identical to the V0 input with registers N+4 to N+7.		

Channel	Register	Description	Parameter	Default Parameter Value
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 (if channel unit is customized)	Min.	0
	N+11	Maximum value (if channel unit is customized)	Max.	7FFFH
	N+12	Fallback mode	0: Maintain state 1: Fallback activated	1
	N+13	Fallback value	Fallback value	0

TM2 AMM6HT Expansion Module Registers

Register Numbering

The register number (N) depends on the position of the module in the island (see *Island Registers, page 88*).

Read Registers 1...99

Register	Function	Bit Assignment
N	First input value	16-bit word
N+1	Second input value	16-bit word
N+2	Third input value	16-bit word
N+3	Fourth input value	16-bit word

Output Command Registers 101...199

Register	Function	Bit Assignment
N	First output command	16-bit word
N+1	Second output command	16-bit word

Parameter-Setting Registers 214...599

Channel	Register	Description	Parameter	Default Parameter Value
Channel 0 (input)	N	Range	0: Not used 2: 4...20 mA 3: 0...10 V	0
	N+1	Unit	0: Normal 1: Customized	1
	N+2	Minimum value (if channel unit is customized)	Min.	0
	N+3	Maximum value (if channel unit is customized)	Max.	7FFFH
Channel 1 (input)	N+4 to N+7	Description identical to the V0 input with registers N+4 to N+7.		
Channel 2 (input)	N+8 to N+11	Description identical to the V0 input with registers N+8 to N+11.		

Channel	Register	Description	Parameter	Default Parameter Value
Channel 3 (input)	N+12 to N+15	Description identical to the V0 input with registers N+12 to N+15.		
Channel 0 (output)	N+16	Range	0: Not used 2: 4...20 mA 3: 0...10 V	0
	N+17	Unit	0: Normal 1: Customized	1
	N+18	Minimum value (if channel unit is customized)	Min.	0
	N+19	Maximum value (if channel unit is customized)	Max.	7FFFH
	N+20	Fallback mode	0: Maintain state 1: Fallback activated	1
	N+21	Fallback value	Fallback value	0
Channel 1 (output)	N+22 to N+27	Description identical to the V0 output with registers N+22 to N+27.		

TM2 ALM3LT Expansion Module Registers

Register Numbering

The register number (N) depends on the position of the module in the island (see *Island Registers, page 88*).

Read Registers 1...99

Register	Function	Bit Assignment
N	First input value	16-bit word
N+1	Second input value	16-bit word

Output Command Registers 101...199

Register	Function	Bit Assignment
N	Output command	16-bit word

Parameter-Setting Registers 214...599

Channel	Register	Description	Parameter	Default Parameter Value
V0 (input)	N	Range	0: Not used 5: Thermo K 6: Thermo J 7: Thermo T 8: PT100	0
	N+1	Unit	0 : Normal 1: Customized 2: Celsius (0.1°C) 3: Fahrenheit (0.1°F)	1
	N+2	Minimum value (if channel unit is customized)	Min.	0
	N+3	Maximum value (if channel unit is customized)	Max.	7FFFH
V1 (input)	N+4 to N+7	Description identical to the V0 input with registers N+4 to N+7.		

Channel	Register	Description	Parameter	Default Parameter Value
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 (if channel unit is customized)	Min.	0
	N+11	Maximum value (if channel unit is customized)	Max.	7FFFH
	N+12	Fallback mode	0: Maintain state 1: Fallback activated	1
	N+13	Fallback value	Fallback value	0

TM2 AVO2HT Expansion Module Registers

Register Numbering

The register number (N) depends on the position of the module in the island (see *Island Registers, page 88*).

Output Command Registers 101...199

Register	Function	Bit Assignment
N	First output command	16-bit word
N+1	Second output command	16-bit word

Parameter-Setting Registers 214...599

Channel	Register	Description	Parameter	Default Parameter Value
V0 (output)	N	Range	0: Not used 4: +/- 10 V	0
	N+1	Unit	0: Normal 1: Customized	1
	N+2	Minimum value (if channel unit is customized)	Min.	8000H
	N+3	Maximum value (if channel unit is customized)	Max.	7FFFH
	N+4	Fallback mode	0: Maintain state 1: Fallback activated	1
	N+5	Fallback value	Fallback value	0
V1 (output)	N+6 to N+11	Description identical to the V0 input with registers N+6 to N+11.		

TM2 AMI2LT Expansion Module Registers

Register Numbering

The register number (N) depends on the position of the module in the island (see *Island Registers, page 88*).

Read Registers 1...99

Register	Function	Bit Assignment
N	First input value	16-bit word
N+1	Second input value	16-bit word

Parameter-Setting Registers 214...599

Channel	Register	Description	Parameter	Default Parameter Value
V0 (input)	N	Range	0: Not used 5: Thermo K 6: Thermo J 7: Thermo T	0
	N+1	Unit	0: Normal 1: Customized 2: Celsius (0.1°C) 3: Fahrenheit (0.1°F)	1
	N+2	Minimum value (if channel unit is customized)	Min.	0
	N+3	Maximum value (if channel unit is customized)	Max.	7FFFH
V1 (input)	N+4 to N+7	Description identical to the V0 input with registers N+4 to N+7.		

TM2 AMI4LT Expansion Module Registers

Register Numbering

The register number (N) depends on the position of the module in the island (see *Island Registers, page 88*).

Read Registers 1...99

Register	Function	Bit Assignment
N	First input value	16-bit word
N+1	Second input value	16-bit word
N+2	Third input value	16-bit word
N+3	Fourth input value	16-bit word

Parameter-Setting Registers 214...599

NOTE: All inputs must be the same type (voltage, current or temperature).

Channel	Register	Description	Parameter	Default Parameter Value
V0 (input)	N	Range	0: Not used 1: 0...20 mA 3: 0...10 V 8: PT100 9: PT1000 10: NI100 11: NI1000	0
	N+1	Unit	0: Normal 1: Customized 2: Celsius (0.1°C) 3: Fahrenheit (0.1°F) 4: Resistance (ohms)	1
	N+2	Minimum value (if channel unit is customized)	Min.	0
	N+3	Maximum value (if channel unit is customized)	Max.	7FFFH
V1 (input)	N+4 to N+7	Description identical to the V0 input with registers N+4 to N+7.		
V2 (input)	N+8 to N+11	Description identical to the V0 input with registers N+8 to N+11.		
V3 (input)	N+12 to N+15	Description identical to the V0 input with registers N+12 to N+15.		

TM2 AMI8HT Expansion Module Registers

Register Numbering

The register number (N) depends on the position of the module in the island (see *Island Registers, page 88*).

Read Registers 1...99

Register	Function	Bit Assignment
N	Value of input 1	16-bit word
N+1	Value of input 2	16-bit word
N+2	Value of input 3	16-bit word
N+3	Value of input 4	16-bit word
N+4	Value of input 5	16-bit word
N+5	Value of input 6	16-bit word
N+6	Value of input 7	16-bit word
N+7	Value of input 8	16-bit word

Parameter-Setting Registers 214...599

NOTE: All inputs must be the same type (voltage or current).

Channel	Register	Description	Parameter	Default Parameter Value
V0 (input)	N	Range	0: Not used 1: 0...20 mA 3: 0...10 V	0
	N+1	Unit	0: Normal 1: Customized	1
	N+2	Minimum value (if channel unit is customized)	Min.	0
	N+3	Maximum value (if channel unit is customized)	Max.	7FFFH
V1 (input)	N+4 to N+7	Description identical to the V0 input with registers N+4 to N+7.		
V2 (input)	N+8 to N+11	Description identical to the V0 input with registers N+8 to N+11.		
V3 (input)	N+12 to N+15	Description identical to the V0 input with registers N+12 to N+15.		

Channel	Register	Description	Parameter	Default Parameter Value
V4 (input)	N+16 to N+19	Description identical to the V0 input with registers N+16 to N+19.		
V5 (input)	N+20 to N+23	Description identical to the V0 input with registers N+20 to N+23.		
V6 (input)	N+24 to N+27	Description identical to the V0 input with registers N+24 to N+27.		
V7 (input)	N+28 to N+31	Description identical to the V0 input with registers N+28 to N+31.		

TM2 ARI8HT Expansion Module Registers

Description of Registers

The temperature probe input expansion module uses configuration registers to define the input range, probe type and which units can be customized.

NTC Probe

The temperature (T) varies in relation to the resistance (R) according to the equation below:

$$T = \frac{1}{\frac{1}{T_0} + \frac{1}{B}\ln\left[\frac{R}{R_0}\right]}$$

Where:

- T = temperature measured by the probe in Kelvin
- R = physical value of the probe resistance in Ohms
- R_0 = reference resistance in Ohms at temperature T_0
- T_0 = reference temperature in Kelvin
- B = sensitivity of the NTC probe in Kelvin

R_0, T_0 and must be equal to at least 1.

If resistance is selected as a unit, the displayed value equals the probe resistance.

NOTE: 25°C= 77°F = 298.15°K

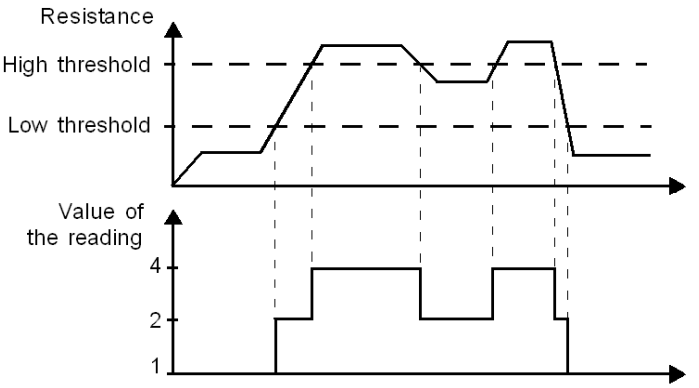
PTC Probe

- R_0 = high threshold
- T_0 = low threshold

Read value = 1 if resistance value < T_0

Read value = 2 if T_0 < resistance value < R_0

Read value = 4 if resistance value > R_0



Register Numbering

The register number (N) depends on the position of the module in the island (see *Island Registers, page 88*).

Read Registers 1...99

Register	Function	Bit Assignment
N	Value of input 1	16-bit word
N+1	Value of input 2	16-bit word
N+2	Value of input 3	16-bit word
N+3	Value of input 4	16-bit word
N+4	Value of input 5	16-bit word
N+5	Value of input 6	16-bit word
N+6	Value of input 7	16-bit word
N+7	Value of input 8	16-bit word

Parameter-Setting Registers 214...599

Channel	Register	Description	Parameter	Default Parameter Value
V0 (input)	N	Range	0: Not used 13: NTC 14: PTC	0
	N+1	Unit	0 : Normal 1: Customized 2: Celsius (0.1°C) 3: Fahrenheit (0.1°F) 4: Resistance (ohms)	1
	N+2	Minimum value (if channel unit is customized)	Min.	0
	N+3	Maximum value (if channel unit is customized)	Max.	7FFFH
	N+4	R_0 in NTC or high threshold in PTC	R_0	014AH
	N+5	T_0 in NTC or low threshold in PTC	T_0 (0.01°K)	7477H
	N+6	Sensitivity in NTC or ignored in PTC	B (0.01°K)	0DF1H
V1 (input)	N+7 to N+13	Description identical to the V0 input with registers N+7 to N+13.		
V2 (input)	N+14 to N+20	Description identical to the V0 input with registers N+14 to N+20.		
V3 (input)	N+21 to N+27	Description identical to the V0 input with registers N+21 to N+27.		
V4 (input)	N+28 to N+34	Description identical to the V0 input with registers N+28 to N+34.		
V5 (input)	N+35 to N+41	Description identical to the V0 input with registers N+35 to N+41.		
V6 (input)	N+42 to N+48	Description identical to the V0 input with registers N+42 to N+48.		
V7 (input)	N+49 to N+55	Description identical to the V0 input with registers N+49 to N+55.		

TM2 ARI8LT and TM2 ARI8LRJ Expansion Module Registers

Register Numbering

The register number (N) depends on the position of the module in the island (see *Island Registers, page 88*).

Read Registers 1...99

Register	Function	Bit Assignment
N	First input value	16-bit word
N+1	Second input value	16-bit word
N+2	Third input value	16-bit word
N+3	Fourth input value	16-bit word
N+4	Fifth input value	16-bit word
N+5	Sixth input value	16-bit word
N+6	Seventh input value	16-bit word
N+7	Eighth input value	16-bit word

Parameter-Setting Registers 214...599

Channel	Register	Description	Parameter	Default Parameter Value
V0 (input)	N	Range	0: Not used 8: PT100 9: PT1000	0
	N+1	Unit	0: Normal 1: Customized 2: Celsius (0.1°C) 3: Fahrenheit (0.1°F)	1
	N+2	Minimum value (if channel unit is customized)	Min.	0
	N+3	Maximum value (if channel unit is customized)	Max.	7FFFH
V1 (input)	N+4 to N+7	Description identical to the V0 input with registers N+4 to N+7.		
V2 (input)	N+8 to N+11	Description identical to the V0 input with registers N+8 to N+11.		

Channel	Register	Description	Parameter	Default Parameter Value
V3 (input)	N+12 to N+15	Description identical to the V0 input with registers N+12 to N+15.		
V4 (input)	N+16 to N+19	Description identical to the V0 input with registers N+16 to N+19.		
V5 (input)	N+20 to N+23	Description identical to the V0 input with registers N+20 to N+23.		
V6 (input)	N+24 to N+27	Description identical to the V0 input with registers N+24 to N+27.		
V7 (input)	N+28 to N+31	Description identical to the V0 input with registers N+28 to N+31.		

Software Tools

7

Introduction

This chapter describes the tools and operating modes used to configure the island with Advantys Configuration Tool - LITE (FTX ES0•).

What's in this Chapter?

This chapter contains the following sections:

7.1 Introduction to Software Tools

Introduction

This section introduces the software tools used to install the product.

What's in this Section?

This section contains the following topics:

Introduction

General

The Advantys OTB island must be configured to operate correctly on its network.

OTB network interface modules, their I/O expansion modules and the desired I/O functions and parameters are configured using the Advantys Configuration Tool (FTX ES0•). This tool allows the user to define each OTB island and configure the parameters and the functions of the island's I/Os.

NOTE: The information that follows is a Quick start guide to configuring and using Advantys OTB network interface modules and I/O expansion modules. It is not meant to be an exhaustive description of how to set up a network.

For further information, please consult the appropriate documentation, such as network device manuals, Advantys Configuration Tool Help systems and Telemecanique product manuals, such as PL7, Unity, programmable logic controllers and so on.

Software Installation

Advantys Configuration Tool, PL7, Unity

Please consult the appropriate manuals for the installation of these programming and configuration tools before installing the software.

7.2 Product Configuration

Introduction

This section describes the tools and operating modes for configuring the the Advantys range of devices using the Advantys Configuration Tool (FTX ES 0•).

The device must be configured using the following steps:

- Create New Island
- Customize a memory area
- Download the configuration in the device

What's in this Section?

This section contains the following topics:

Creating a New Island with the Advantys Configuration Tool

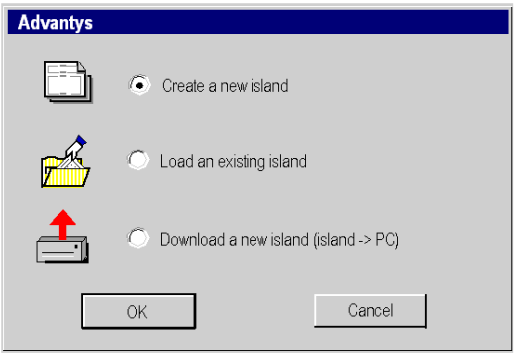
Introduction

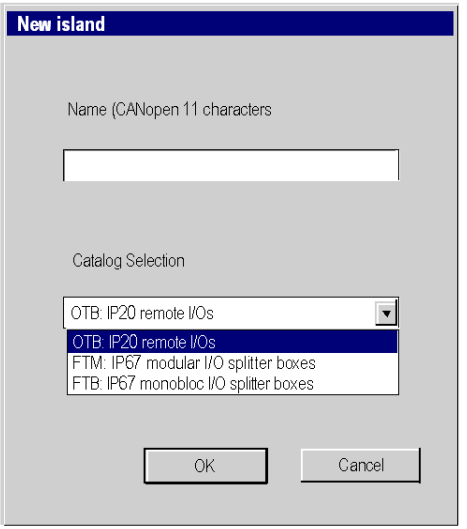
Once you have installed the Advantys Configuration Tool (ACT), you can start the OTB island creation process.

Create the island by following steps below:

- Creating an island
- Catalog Selection
- Building and Defining an Island
- Adjustment of parameters

Creating a New Island

Step	Action
1	Launch the Advantys Configuration Tool software.  • Select **Create new island** • Click **OK**.

Step	Action
2	The **New island** window appears:  The creation of an island must be in line with the physical configuration of your installation: ● Enter the name of the island in the field**Name**. ● Select the catalog in the **Catalog selection** drop-down menu. ● Confirm your selection by clicking **OK**.
3	**Building the Island** A browser window appears. A representative model of the island can be built in this window. At this point, this is an image of an empty 35 mm *(1.37 in)* DIN rail. The catalog browser contains all the references of the catalog selected. Building the island is a "drag and drop" operation: ● Click on the reference in the catalog browser window and, while holding down the left mouse button, drag the reference over to the DIN rail and drop it (release the mouse button).

Step	Action
4	**Island Configuration** Once the island has been built, you can set its parameters. The parameters you need to define will depend on the I/O functions you wish to use. The islands are configured in the configuration window: ● Open the configuration window by double clicking on the island or by selecting the island and then the **Island/Module Editor** menu. ● Modify the required parameter(s). ● Click **OK** to save the changes and close the configuration window. **Notes:** The values given in the configuration window define the behavior of the island. Please see chapters 5, 6 and 9 of this manual for all pertinent information concerning the registers. The list of registers is visible in the **I/O Map** tab of the OTB network interface module's configuration window.

Customization of a Memory Area (Registers 1200 to 2199)

At a Glance

The register table can be used in its default form or partially customized.

The customizable register zone is between 1200 and 1399.

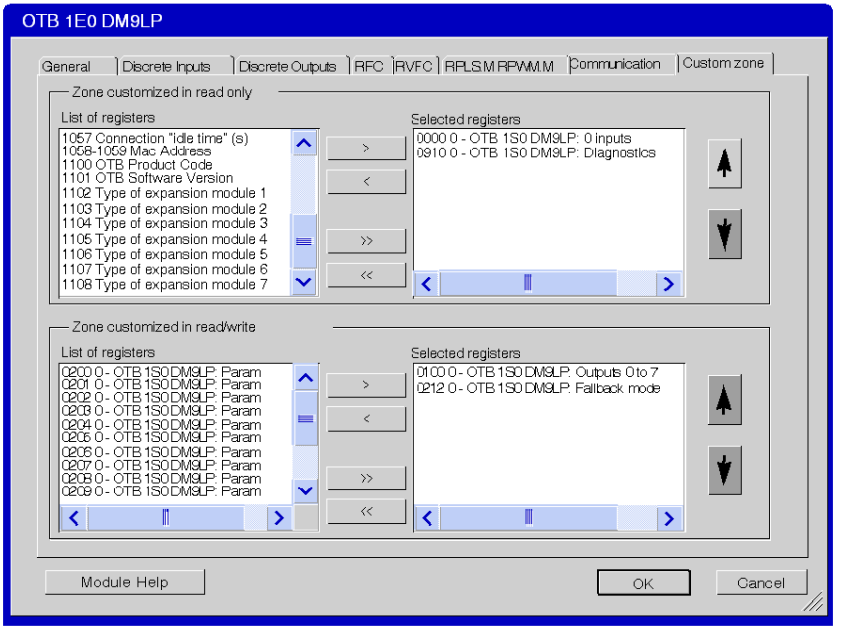
This zone is accessed via registers 2000 to 2199.

Examples:

- For read access to a data object configured in register 1203, you must read register 2003
- For read/write access to a data object configured in register 1303, you must read/write register 2103

Customized Register Zone

The window below is used to customize part of the register table (registers 1200 to 2199):



The configuration is carried out in two stages:

Customization of the following register zones is now accessible, either in read only, or in read/write:

- registers 1200 to 1299: Customization of the register zone accessible in read only
- registers 1300 to 1399: Customization of the register zone accessible in read/write

Read or read/write access to the custom zone of the following registers:

- registers 2000 to 2099: Read access to the custom zone of registers 1200 to 1299
- registers 2100 to 2199: Read access to the custom zone of registers 1300 to 1399

Downloading the Modbus Configuration

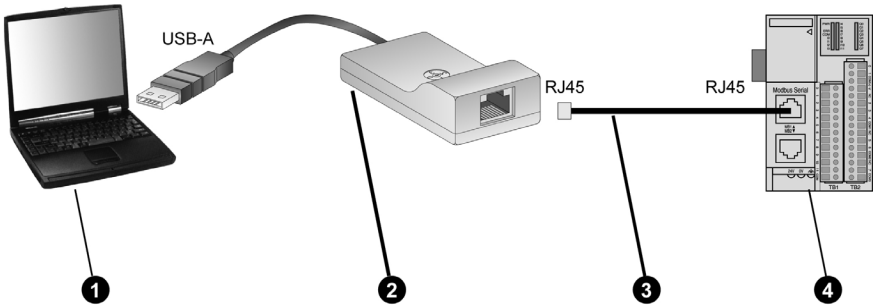
Access

Use one of the methods below to download the desired configuration from your PC to the island:

- In the **Island** menu, select **Download into the island**,
- or click on the icon 

Connections

The hardware connections are illustrated in the diagram below:

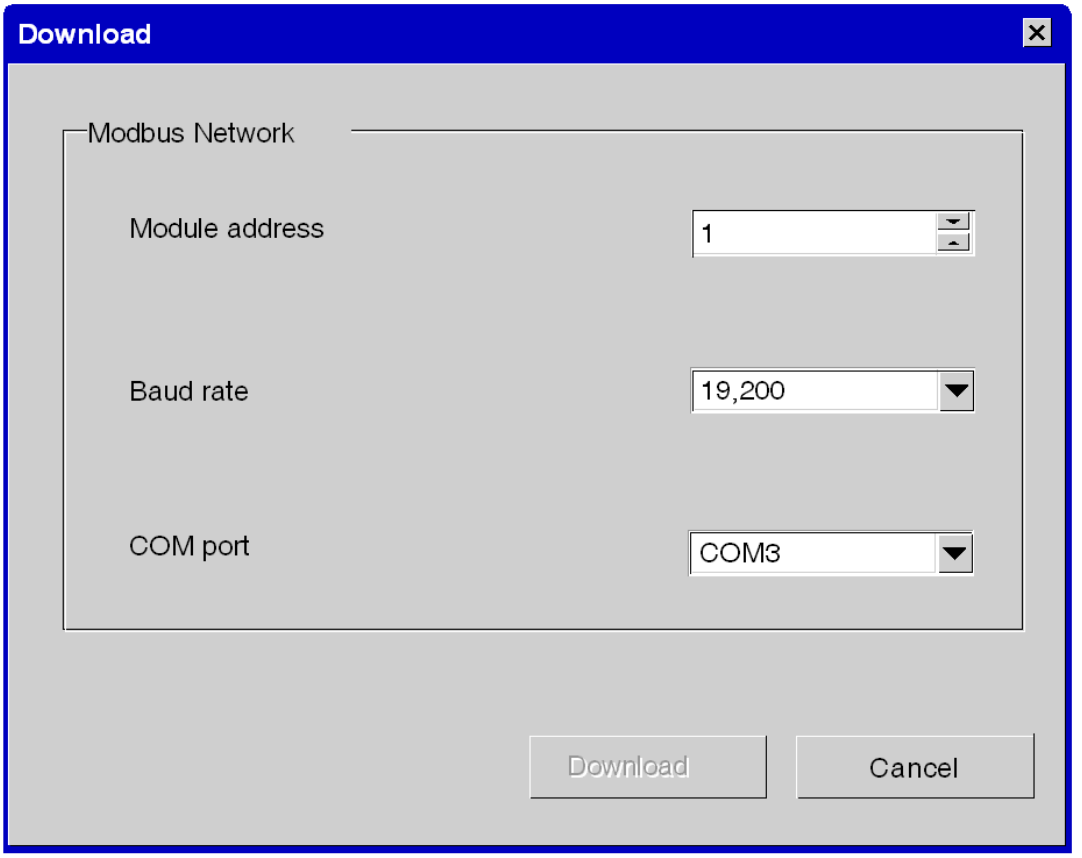


Number	Description	Reference
1	PC (Windows 2000 or Windows XP)	-
2	USB converter / RS485	TSX CUSB485
3	RJ45 / RJ45 network cable	VW3 A8306R••
4	Advantys OTB Modbus network interface module	OTB 1S0DM9LP

NOTE: The TSX CUSB485 converter must be shut down and its encoder wheel set to 0 "TER MULTI".

At a Glance

The configuration download window looks like this:



NOTE: When the download is complete, the configuration parameters are automatically saved by the island.

How to Build Configuration Files?

Preliminary Steps

You will have opened an existing island or created a new island and its architecture. Before building configuration files, check that no errors have been detected. As long as there is an error displayed in the Warning window, you must modify the island architecture or the module configuration accordingly.

To see the list of errors, use one of the following methods:

- Select **Warning** from the menu,
- or click on the icon 

This gives access to the Warning Window (see the ACT software online help).

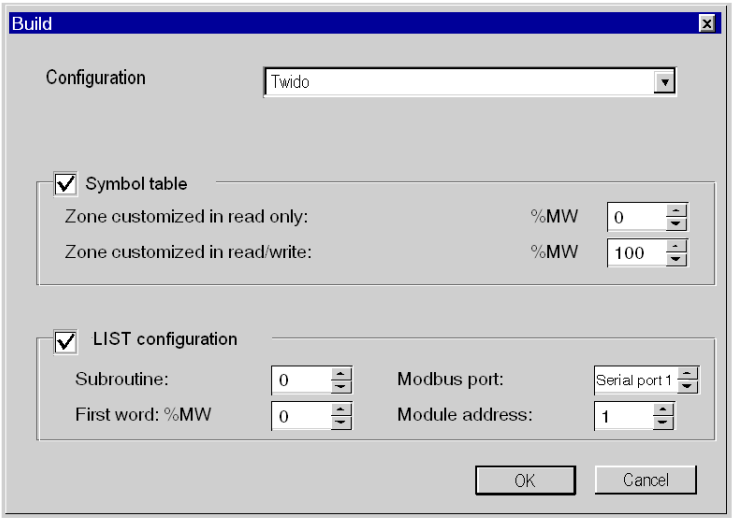
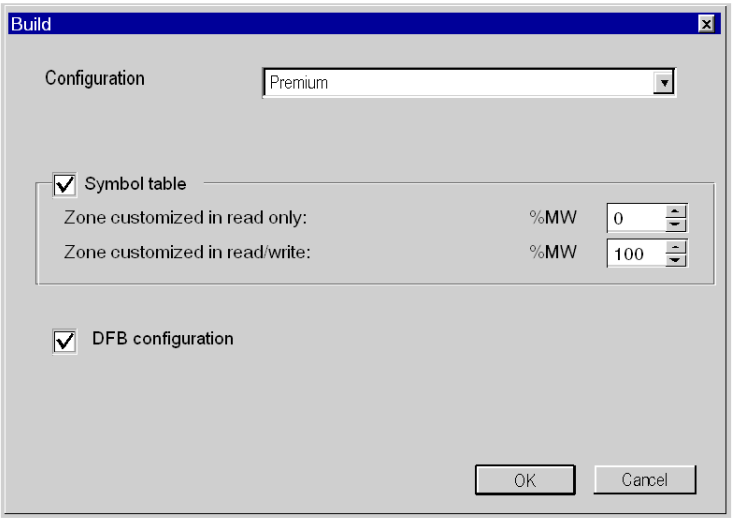
You can build the following files:

- for Unity (Premium and M340):
  A symbol table and a function block (DFB) for configuring the island.
- for Twido:
  A symbol table and a subroutine (LIST) for configuring the island.

Procedure

To build the configuration file:

Step	Action
1	Launch the configuration file build process by using one of the following methods: • Click on the icon  • Use the **Build** menu

Step	Action
2	The **Build** window appears: With the Twido configuration:  With the Premium or M340 configuration:  Click **OK**.
3	A confirmation window appears for each requested file (Symbol table, DFB or LIST configuration). It indicates the name and location of the file built.

Configuration Files

Configuration files are the files created when an island is generated.

These files are created:
- In the directory defined in user preferences,
- With the same name as the island.

When used with Twido, the LIST configuration is built in a TXT file.

When used with Unity (Premium or M340), the DFB configuration is built in an .XDB file.

Symbol Table

When used with Twido, the symbol table is built in a .CSV file.

When used with Unity (Premium or M340), the symbol table is built in an .XSY file.

These files are created:
- In the directory defined in user preferences,
- With the same name as the island.

Requests with Twido Soft

Example

```
(* ------------------------------------------------------*)
(* ----- READ REGISTRES 1100 to 1108  ----- *)
(* ------------------------------------------------------*)

[ %MW2 := 1 ]            (* SLAVE ADDRESS *)
[ %MW3 := 1100 ]         (* 1ST WORD TO WRITE *)
[ %MW4 := 9 ]            (* NUMBER OF WORDS TO READ *)
[ %MW100:100 := 0 ]
[ %MW100 := 16#0106 ]    (* FUNCTION *)
[ %MW101 := 16#0300 ]    (* SHIFT *)
[ %MW102 := %MW2 * 256 ] (* SLAVE ADDRESS AND MODBUS REQUEST
NUMBER *)
[ %MW102 := %MW102 OR 3 ]
[ %MW103 := %MW3 ]       (* 1ST WORD TO READ *)
[ %MW104 := %MW4 ]       (* NUMBER OF WORDS TO READ *)
[ EXCH2 %MW100:100 ]

(* ------------------------------------------------------------
--------*)
(* -------- WRITE REGISTERS 1006 TO 1008 --------- *)
(* ------------------------------------------------------------
---------*)

LD    [%mw98 = 3]
[ %MW106 := 16#0000 ]    (* NETWORK MONITORING TEMPO *)
[ %MW107 := 16#0000 ]    (* NETWORK MONITORING ACK *)
[ %MW108 := 16#0000 ]    (* MSB/LSB *)

[ %MW2 := 1 ]            (* SLAVE ADDRESS *)
[ %MW3 := 1006 ]         (* 1ST WORD TO WRITE *)
[ %MW4 := 3 ]            (* NUMBER OF WORDS TO WRITE *)
```

```
[ %MW100:4 := 0 ]
[ %MW100 := %MW4 * 2 ]   (* LENGTH TO SEND *)
[ %MW100 := %MW100 + 16#0108 ] (* 16#0108  FUNCTION *)
[ %MW101 := 16#0007 ]    (* SHIFT *)
[ %MW102 := %MW2 * 256 ] (* SLAVE @ AND MODBUS REQUEST *)
[ %MW102 := %MW102 OR 16 ]
[ %MW103 := %MW3 ]       (* 1ST WORD TO WRITE *)
[ %MW104 := %MW4 ]       (* NUMBER OF WORDS TO WRITE *)
[ %MW105 := %MW4 * 2 ]   (* NUMBER OF BYTES TO WRITE *)
[ EXCH2 %MW100:100 ]     (* SEND REQUEST *)
```

Diagnostics of the Advantys OTB Island

8

At a Glance

The Advantys OTB diagnostics function can be used to analyze the behavior of modules:

- The LEDs indicate the communication and I/O status,
- At a Glance

What's in this Chapter?

This chapter contains the following topics:

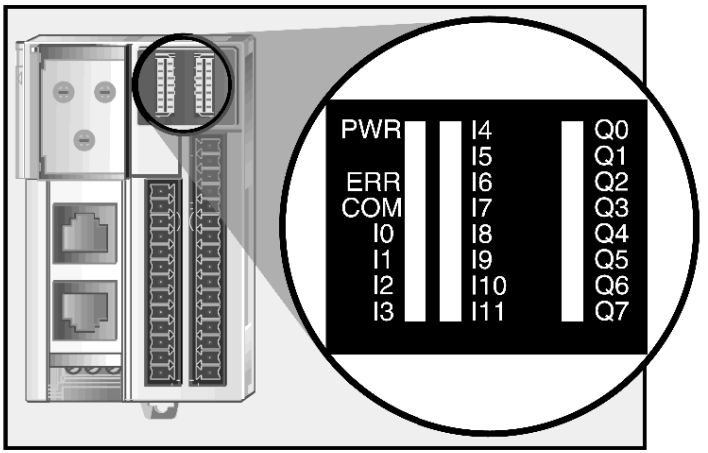
Indicator Lights (LEDs)

Introduction

The 23 LEDs on the OTB 1S0DM9LP Modbus module provide information on the functional status of the island. These LEDs are located at the top right of the network interface module.

Description

The illustration below 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 fieldbus master and the Advantys OTB island.
- The LEDs I0 to I11 and Q0 to Q7 reflect the state of the I/O (on/off) on the OTB module.

Modbus Communication LEDs

The table below 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.

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

Name	LED Color	Status	Function
PWR (power)	green	on	24 VDC present on the OTB module
I0 to I11	green	on	Input at 24 V
		off	Input at 0 V
Q0 to Q7	green	on	Output at 24 V or contact closed
		off	Output at 0 V or contact open

OTB Island Diagnostic Registers

Overview

The diagnostics use Registers 900...917. All the parameters in this zone can only be accessed in read mode.

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 incorrectly configured) Bits [14...15]: Not used
901	Expansion module status word	Bit [0]: Status of communication module Bit [1]: Status of first expansion module Bit [2]: Status of second expansion module Bit [3]: Status of third expansion module Bit [4]: Status of fourth expansion module Bit [5]: Status of fifth expansion module Bit [6]: Status of sixth expansion module Bit [7]: Status of seventh expansion module

NOTE:

Bit values:

- 0: No fault
- 1: Fault present

Registers 902 to 907

Diagnostics for functions specific to the 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 RPLS/RPWM 0	Description identical to register 902
907	Pulse generator RPLS/RPWM 1	Description identical to register 902

NOTE:

Bit values:

- 0: No fault
- 1: Fault present

Registers 908 to 910

Diagnostics for functions specific to the Advantys OTB module (configured functions only)

Registers	Function	Description
908	Inputs associated with RFC and RVFC 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 RVFC, RPLS and RPWM functions (function configured and output used)	Bit [0]: Output 0 (if used by RPLS/RPWM 0) Bit [1]: Output 1 (if used by RPLS/RPWM 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	State of OTB Module I/O	Bit [0]: Channels operating normally (for all its channels) Bit [1]: Module being initialized (or initialization of all channel data) Bit [2]: Hardware fault 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 present

Registers 911 to 918

Expansion module diagnostics (1 register per expansion module)

Type	Description of Diagnostic Register
Discrete module	No diagnostics
Analog modules TM2 AMI2HT TM2 AMO1HT TM2 AMM3HT TM2 ALM3LT TM2 AMI2LT	Bit [0]: Fault present Bit [1]: Module being initialized (or initialization of all channel data) Bit [2]: Hardware fault (external power supply fault, 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]: Input thermocouple channel 0 not configured Bit [7]: Input thermocouple 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]: Invalid parameter for the output channel
Analog module TM2 AMM6HT	Bit [1], Bit [0]: Channel 0 input ● 0 , 0: No fault ● 0 , 1: Configuration fault ● 1 , 0: Incorrect value (module being initialized or conversion in progress) ● 1 , 1: Incorrect value (outside the 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 0 output description identical to channel 0 input Bit [11], Bit [10]: Channel 1 output description identical to channel 0 input Bit [12...15]: Not used

Type	Description of Diagnostic Register
Analog module TM2 AVO2HT	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
Analog module TM2 AMI4LT	Bit [1], Bit [0]: Channel 0 input ● 0 , 0: No fault ● 0 , 1: Configuration fault ● 1 , 0: Incorrect value (module being initialized or conversion in progress) ● 1 , 1: Incorrect value (outside the 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 TM2 AMI8HT TM2 ARI8HT TM2 ARI8LT TM2 ARI8LRJ	Bit [1], Bit [0]: Channel 0 input ● 0 , 0: No fault ● 0 , 1: Configuration fault ● 1 , 0: Incorrect value (module being initialized or conversion in progress) ● 1 , 1: Incorrect value (outside the 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 present

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,
- Able to read exchange registers 900 to 917 (island diagnostic register),
- Unable to read / write all other registers (exchange report 04).

Exchange Error Report

The meaning of error codes is given in the following table:

Function code	Abort Code	Description
03H	02H	One of the registers does not exist.
	03H	Incorrect register number
	04H	Unavailable value
06H	02H	The register does not exist.
	04H	Forbidden value or register in read only
10H	02H	The register does not exist.
	03H	Incorrect register number
	04H	Forbidden value or register in read only
16H	02H	The register does not exist.
	04H	Forbidden value or register in read only
17H	02H	The register does not exist.
	03H	Incorrect register number
	04H	Unavailable or forbidden value or register in read only
2BH	01H	Sub-index different from 14
	02H	Identifier does not exist
	03H	Identifier > 4 or = 0

NOTE: The OTB module responds to all the other requests with a 01H "Abort Code" (unrecognized request).

Island Registers Table

9

Registers Table

This chapter provides the registers table for the Advantys OTB network interface module and expansion modules. The table is divided up into data zones and provides a map of the island (mapping).

What's in this Chapter?

This chapter contains the following topics:

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.

NOTE: The numerical values shown in the tables below are either in decimal (value only), or in hexadecimal (value followed by H).

Register Table (mapping)

The two following tables show the two OTB register zones corresponding to the supported functions:

- The manufacturer zone
- The custom zone

The manufacturer zone provides all the data available on status and features of the island. The registers are defined when the island is powered up. The number and order of the available registers is defined by the expansion modules added to the OTB module from left to right.

Zone	Register	Function	Page
Manufacturer zone	0...99	Status of island inputs	0...99 *(see page 182)*
	100...199	Island output commands	100...199 *(see page 182)*
	200...599	Island I/O configuration parameters	200...599 *(see page 183)*
	600...699	Remote Fast Counter (RFC) function	600...699 *(see page 184)*
	700...799	Remote Very Fast Counter (RVFC) function	700...799 *(see page 185)*
	800...899	Remote Pulse Generator function (RPLS) Remote pulse generator function with pulse width modulation (RPWM)	800...899 *(see page 187)*
	900...999	Island diagnostics	900...999 *(see page 188)*
	1000...1099	Management of module behavior	1000...1099 *(see page 193)*
	1100...1108	Description of modules constituting the island	1100...1108 *(see page 196)*

NOTE: The available registers are the registers corresponding to existing modules.

The customized zone enables you to organize data so as to optimize exchanges between the master and the island while assembling non contiguous registers in a contiguous register table. This reduces the number of Modbus read/write instructions.

The customized zone is configured in the definition zone:

- The definition zones (1200...1299 and 1300...1399) contain the register numbers of accessible data.
- The customized zones (2000...2099 and 2100...2199) give access to the definition zones.

Zone	Register	Function	Page
Definition zones	1200...1299	Customization of the register zone accessible in read only	1200...1299 *(see page 195)*
	1300...1399	Customization of the register zone accessible in read/write	1300...1399 *(see page 195)*
Customized zones	2000...2099	Read access to the custom zone of registers 1200 to 1299	2000...2099 *(see page 195)*
	2100...2199	Read/write access to the custom zone of registers 1300 to 1399	2100...2199 *(see page 195)*

Example:

- If register 1200 has a value of 0, register 2000 will have the same content as register 0.
- If register 1300 has a value of 100, the write data in register 2100 will have the same effect as the write data in register 100.

NOTE: The customized zone can only contain registers available in the manufacturer zone.

I/O Registers

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

Configuring I/Os

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.

Application-Specific Function Registers

At a Glance

The application-specific functions of the OTB module use the following registers:

Functions	Registers
Fast counters (RFC0 and RFC1)	600...627
Very fast counters (RVFC0 and RVFC1)	700...734
Pulse generators (RPLS) and pulse generators with width modulation (RPWM)	800...828

Fast counters (RFC0 and RFC1)

Specific function of fast counter 0 (RFC0):

Registers	Parameter	Description	Access	Default value
600	RFC.V	Current value	Read	-
601				-
602	RFC.D	Bit [0]: ● Upcounting: Preset value reached ● Down counting: 0 reached	Read	-
603	RFC.M	Counting mode: ● 0 : Not used ● 1 : Counter ● 2 : Down counter	Read/Write	0
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	0
605	RFC.P	Preset value	Read/Write	FFFFH
606				FFFFH
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 and Access
620...627	Same description and access as counter 0

Very fast counters (RVFC0 and RVFC1)

Specific function of Remote Very Fast Counter 0 (RVFC0):

Registers	Parameter	Description	Access	Default value
700	RVFC.V	Current value	Read	-
701				-
702	RVFC.Drt	Bit[0]: Count direction	Read	-
	RVFC.D	Bit [1]: Output overshoot		-
	RVFC.S0	Bit [2]: Threshold S0 reached. When set to 1, the current value is greater than S0.		-
	RVFC.S1	Bit [3]: Threshold S1 reached. When set to 1, the current value is greater than S1.		-
	RVFC.FV	Bit [4]: Measurement frequency valid		-
703	RVFC.C	Catch value	Read	-
704				-
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	0
706	RVFC.P	Preset value	read/write	FFFFH
707				FFFFH
708	RVFC.AQ0	Bit [0]: activates the reflex output 0	read/write	04C0H
	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	Default value
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	0
710	RVFC.TH0	Threshold Value S0 where S0 < S1	Read/Write	0
711				0
712	RVFC.TH1	Threshold value S1 where S1 > S0	Read/Write	FFFFH
713				FFFFH
714	RVFC.EN RVFC.R RVFC.RFV RVFC.CD	Bit [0]: Enable input Bit [1]: Reset input Bit [2]: Valid measurement frequency status reset to zero (RVFC.FV) Bit [3]: Reset RVFC.D bit	Read/Write	0

Specific function of Remote Very Fast Counter 1 (RVFC1):

Registers	Parameter	Description and Access
720...734	RVFC.XX	Same description and access as very fast counter RVFC0

Remote Pulse Generators (RPLS and RPWM)

Remote pulse generator specific function (RPLS0 or RPWM0):

Registers	Parameter	Description	Access	Default value
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.M RPWM.M	Operating mode: ● 0 : Not used (default value) ● 1 : PLS ● 2 : PWM	read/write	0
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	0
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	1
804 805	RPLS.N	Number of pulses: ● 0 : Unlimited number of pulses (default value) ● 1< N < 4 294 967 295 (FFFF FFFFH)	Read/Write	0
806	RPWM.RA	Duty cycle: 0% ≤ R ≤ 100% . Duration of high status / Period	Read/Write	32H (50%)
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	0
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	0

Specific function of RPLS1 or RPWM1:

Registers	Description and Access
820...828	Description and access identical to those of the RPLS0 or RPWM0 functions

Diagnostic Registers

Introduction

The diagnostic registers can only be accessed in read mode.

Registers 900 and 901

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 incorrectly configured) Bits [14...15]: Not used
901	Expansion module status word	Bit [0]: Network interface module status Bit [1]: Status of first expansion module Bit [2]: Status of second expansion module Bit [3]: Status of third expansion module Bit [4]: Status of fourth expansion module Bit [5]: Status of fifth expansion module Bit [6]: Status of sixth expansion module Bit [7]: Status of seventh expansion module

NOTE:

Bit values:

- 0: No fault
- 1: Fault present

Registers 902 to 907

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 present

Registers 908 to 910

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

Registers	Function	Description
909	Outputs associated with Very Fast Counter, PLS and PWM functions (function configured and output used)	Bit [0]: Output 0 (if used by RPLS/RPWM 0) Bit [1]: Output 1 (if used by RPLS/RPWM 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	State of OTB Module I/O	Bit [0]: Channels operating normally (for all its channels) Bit [1]: Module being initialized (or initialization of all channel data) Bit [2]: Hardware fault (external power supply fault, 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..0.15]: Not used

NOTE:

Bit values:

- 0: No fault
- 1: Fault present

Registers 911 to 917

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

Type	Description of Diagnostic Register
Discrete module	No diagnostics
Analog modules TM2 AMI2HT TM2 AMO1HT TM2 AMM3HT TM2 ALM3LT TM2 AMI2LT	Bit [0]: Fault present Bit [1]: Module being initialized (or initialization of all channel data) Bit [2]: Hardware fault (external power supply fault, 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]: Invalid parameter for the output channel
Analog module TM2 AMM6HT	Bit [1], Bit [0]: Channel 0 input ● 0 , 0: No fault ● 0 , 1: Configuration fault ● 1 , 0: Incorrect value (module being initialized or conversion in progress) ● 1 , 1: Incorrect value (outside the 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 0 output description identical to channel 0 input Bit [11], Bit [10]: Channel 1 output description identical to channel 0 input Bit [12...15]: Not used
Analog module TM2 AVO2HT	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 Diagnostic Register
Analog module TM2 AMI4LT	Bit [1], Bit [0]: Channel 0 input ● 0 , 0: No fault ● 0 , 1: Configuration fault ● 1 , 0: Incorrect value (module being initialized or conversion in progress) ● 1 , 1: Incorrect value (outside the 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 TM2 AMI8HT TM2 ARI8HT TM2 ARI8LT TM2 ARI8LRJ	Bit [1], Bit [0]: Channel 0 input ● 0 , 0: No fault ● 0 , 1: Configuration fault ● 1 , 0: Incorrect value (module being initialized or conversion in progress) ● 1 , 1: Incorrect value (outside the 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 present

Island Management Registers

Management of Island Behavior

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

Registers	Function
1000	Indicates the source of configuration parameters: ● 0: use default values ● 1: use saved values ● 2: Using 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 restoration will take place only if the current expansion configuration is the same as the last expansion configuration saved (if the expansion configuration allows this).
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. During the restore the client parameters are lost.
1005	Reset expansion bus. This function is used to update expansion module I/O parameters: ● 0: Setting it to zero re-activates an expansion bus reset, if the expansion bus parameters are consistent. ● 1: setting it to 1 initiates an expansion bus Reset. New I/O parameters written to expansion modules by the application **All outputs are set to zero when the bus is Reset.** See the WARNING message below this table
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 Bit [1]: This bit s used to reset the default counter to zero (register 1009): ● 1: Default counter reset to zero
1008	Bit [0]: LSB/MSB order: ● 0: The registers concerned by the 32-bit format are in MSW / LSW format (default value) ● 1: the registers concerned by the 32 bit format are in LSW/MSW format Bit [1]: Fault acknowledgement mode options: ● 0: Automatic fault acknowledgement (register 1007 automatically reset to zero) ● 1: Manual fault acknowledgement (user must reset register 1007 to zero)
1009	Default counter
1010...1099	Reserved registers

⚠ WARNING

RISK OF UNEXPECTED EQUIPMENT OPERATION FOR REGISTERS 1002, 1003 AND 1004

Do not save or restore the configured parameters with registers 1002, 1003 or 1004 while the application is in RUN mode. The save will halt communications and turn off the outputs. Depending on the I/O configuration, unexpected equipment operation can occur.

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

⚠ WARNING

RISK OF UNEXPECTED EQUIPMENT OPERATION FOR REGISTER 1005

When the internal bus stops, all the expansion module analog outputs are reset to 0. The communication module outputs return to a fallback mode state.

Stopping the internal bus can result in unexpected equipment operation, injury to personnel and/or equipment damage. If this must be done, ensure equipment and personnel safety before all operations.

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

Customized Zone Registers

Definition Zone 1200...1299

The register zone to be customized is as follows:

Registers	Function
1200...1299	Customization of the register zone accessible in read only

Definition Zone 1300...1399

The register zone to be customized is as follows:

Registers	Function
1300...1399	Customization of the register zone accessible in read/write

Customized Zone 2000...2099

The customized register zone which is accessible in read only is as follows:

Registers	Function
2000...2099	Read access to the customized zone of registers 1200...1299

Customized Zone 2100...2199

The customized register zone which is accessible in read/write is as follows:

Registers	Function
2100...2199	Read/write access to the customized zone of registers 1300...1399

Island Module Identification Registers

Island Structure

The table below describes the mapping of modules on the island:

Registers	Functions	Register 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) The register code depends on the type of connected expansion module. See the register code for each type of expansion module in the table below. The default value is equal to FFFFH.

The identification code values for the different types of expansion module are defined in the table below:

Type of Expansion Module	Identification Code
Discrete input modules	
TM2 DDI8DT	0004H
TM2 DAI8DT	0004H
TM2 DDI16DT	0000H
TM2 DDI16DK	0000H
TM2 DDI32DK	0200H
Discrete output modules	
TM2 DDO8TT	0005H
TM2 DDO8UT	0005H
TM2 DRA8RT	0005H
TM2 DDO16TK	0001H
TM2 DDO16UK	0001H
TM2 DRA16RT	0001H
TM2 DDO32TK	0301H
TM2 DDO32UK	0301H

Type of Expansion Module	Identification Code
Discrete mixed modules	
TM2 DMM8DRT	0006H
TM2 DMM24DRF	0205H
Analog modules	
TM2 ALM3LT	6000H
TM2 AMM3HT	6001H
TM2 AMI2HT	6002H
TM2 AM01HT	6003H
TM2 AMI4HT	6004H
TM2 AMI8HT	6005H
TM2 ARI8HT	6006H
TM2 AVO2HT	6007H
TM2 AMM6HT	6008H
TM2 AMI2LT	600AH
TM2 ARI8LT	600CH
TM2 ARI8LRJ	600BH
Common terminal block	
OTB 9ZZ61JP	-

Appendices

IEC Symbols

A

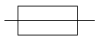
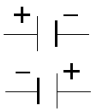
Glossary of Symbols

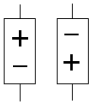
Introduction

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

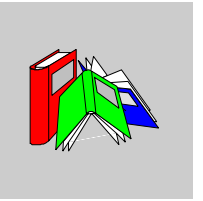
Symbols

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



A

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 a DC (direct current) analog signal proportional to a digital input 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.

C

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

Digital input/output

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

DIN

"Deutsch Industrie Norm". German standards organization that defines dimensional and engineering standards. These standards are currently recognized worldwide.

E

EIA

Electronic Industries Association. Organization that draws up data and electrical/electronic communication standards.

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.

F

Fallback mode

A secure mode to which any Advantys 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.

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.

I

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 IEC1131 standard covers industrial automation equipment.

IEC 1 type input

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

Input filtering

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

L

LSB

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

M

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 Byte. The part of a number, an address or a field that is written as the value furthest to the left in conventional hexadecimal or binary notation.

N

NEMA

National Electrical Manufacturers Association.

NO 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.

P

Positive logic (source)

Designates an output which, when powered up, receives DC current from its load.

R

RMS

Root Mean Square. The rms value of an alternating current, corresponding to the DC value which produces the same thermal effect. The RMS value is calculated by taking the square root of the mean 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.

T

Thermocouple

A TC (thermocouple) consists of 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.

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