TSX Micro PLCs
TSX 3705/3708/3710/3720
Implementation Manual Volume 1

TSX DM 37 xx eng

Related Documentation

At a Glance

This manual comprises three volumes.

- Volume 1,
  - Processors,
  - Implementation/Diagnostics/Maintenance,
  - Integrated analog,
  - Integrated upcounting,
  - Integrated communication.
- Volume 2,
  - Discrete input/output modules,
  - Remote adaptor modules for discrete input/outputs,
  - Process and AS-i supplies.
- Volume 3.
  - Analog input/output modules,
  - Counting module,
  - Communication by PCMCIA card.

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About the book

At a Glance

Document Scope This manual describes implementation of TSX Micro PLCs.

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

General introduction to a PLC station

I

At a Glance

Aim of this Part

This part aims to provide a general description of a PLC station and its different components.

What's in this part?

This Part contains the following Chapters:

General introduction to TSX Micro PLCs

1

TSX Micro PLCs

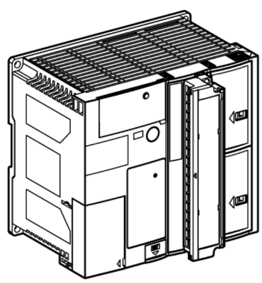
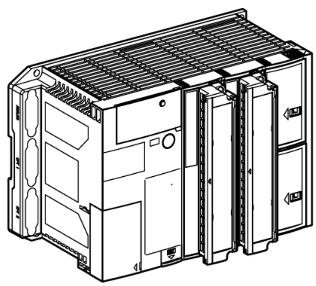
Introduction

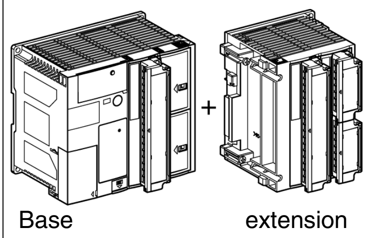
The range of TSX Micro PLCs comprises several PLC types, so as to best meet your needs.

- The TSX 37-05, TSX 37-08 and TSX 37-10 PLCs, at the same time modules that are compact and capable of integrating one or two discrete input/output modules into the database, according to the type,
- the TSX 37-21 and TSX 37-22 modular PLCs.

TSX 37-05
TSX37-08
TSX 37-10

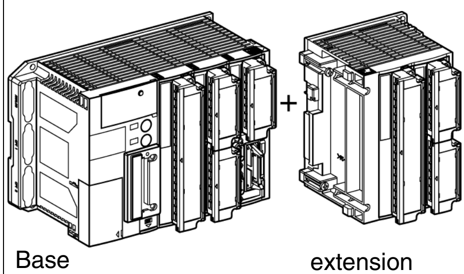
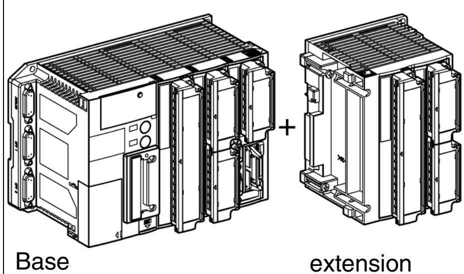
The table below presents the TSX 37-05, TSX 37-08 and TSX 37-10 PLCs.

Type	Illustration
the **TSX 37-05**PLC, incorporates a 28 input/output (16I +12O)module in its database. This is located in the first slot and has two available half slots which enable either a standard format module, or two half-format modules, to be received. Its maximum input/output capacity is 92 discrete I/O, with installation in the available slot of a 64 discrete I/O module connected by an HE10 connector.	
the **TSX 37-08**PLC, incorporates two 28 input/output (16I +12O)modules in its database. These are located in the first two slots and have two available half slots which enable either a standard format module, or two half-format modules, to be received. Its maximum input/output capacity is 120 I/O with installation in the available slot of a discrete 64 I/O module (connected by an HE10 connector).	

Type	**Illustration**
the **TSX 37-10**PLCs, offer five database configurations. They differ in their supply voltage and the discrete module type installed in the first slot. These PLCs can receive a mini extension rack, which allows the number of local inputs/outputs to be extended to 192 I/O. These PLCs are equipped with a real-time clock.	

TSX 37-21
TSX37-22

The table below presents the TSX 37-21 and TSX 37-22 PLCs.

Type	**Illustration**
The **TSX 37-21**PLC is available in 2 configurations which differ according to the power supply type. These PLCs do not integrate discrete input/output modules in the database. They possess a maximum capacity of 256 I/O when a mini extension rack is added. They are equipped with a real-time clock, enabling the application memory volume to be extended and can receive a communication module.	
the modular **TSX 37-22** PLCs are identical in every way to TSX 37-21 PLCs, with further rapid counting and analog input/ output functions built in.	

General introduction to the components of a PLC station

2

At a Glance

Aim of this Chapter

This chapter aims to describe the main constituent elements of a TSX 37 PLC.

What's in this Chapter?

This Chapter contains the following Maps:

General information about discrete inputs/outputs

At a Glance

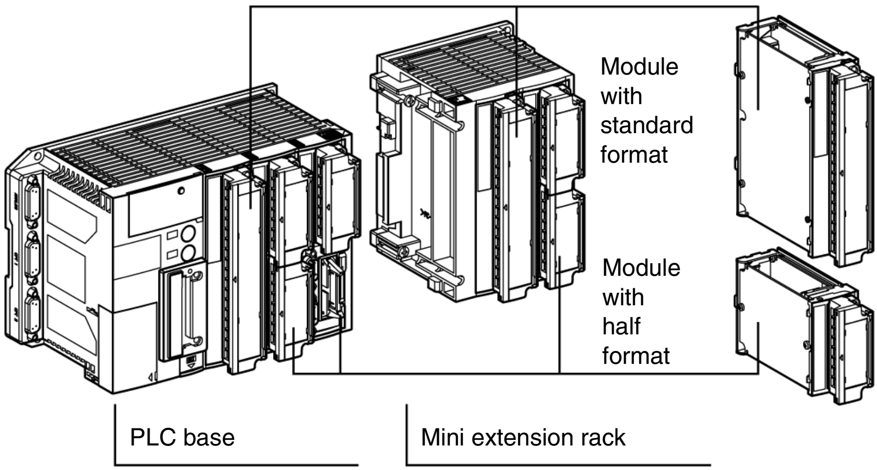
All discrete modules (see TSX Micro Installation Manual, Volume 2) can be installed in all the available positions in TSX 37 PLCs. In order to best meet your requirements, two module sizes are on offer for the discrete inputs/outputs:

- the standard size which takes up a slot (2 position),
- the half-size which takes up a single position.

All the other modules (analog, counting, etc.) are half-size modules.
A mini extension rack, which can be directly connected to the PLC database, enables the number of available slots to be extended and therefore the number of modules, which can be used, to be increased.

Illustration

TSX Micro and discrete modules:



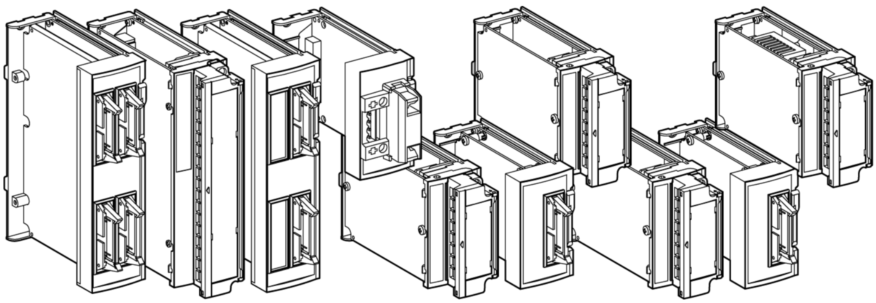
Local discrete inputs/outputs in the rack

General points

The discrete input/output modules differ in:
- their format (standard and half-format),
- their modularity (from 4S to 64I/O),
- their channel types
  - direct current or alternative current inputs,
  - static or relay outputs,
- their connector (HE10 screw terminal connector(s)).

Illustration

The illustration below presents the different types of local discrete input/output modules in the rack.



Remote discrete inputs/outputs

Introduction

The TSX Micro range enables you to use remote discrete inputs/outputs (see Implementation manual TSX Micro Volume 2)

For this, two modules are proposed:
- an offset module TSX STZ 10,
- a bus master module AS-i TSX SAZ 10 (only on TSX 37-10 and TSX 37-21/22).

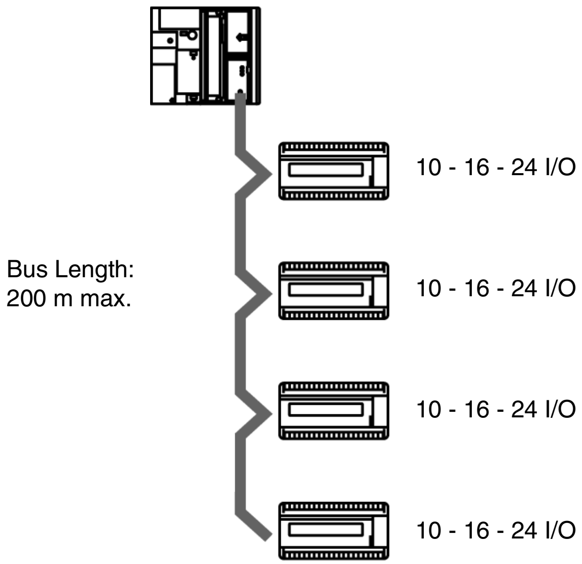
Note: This choice is exclusive: it is not possible to us both modules simultaneously.

Using a TSX STZ 10 offset module

The TSX STZ 10 offset module enables the inputs/outputs of 4 TSX 07-PLCs to be used remotely (up to 200m), and to thus increase the number of inputs/outputs in the configuration.

Illustration

The schema below illustrates the connection between the TSK STZ 10 offset module and TSK 07 PLCs

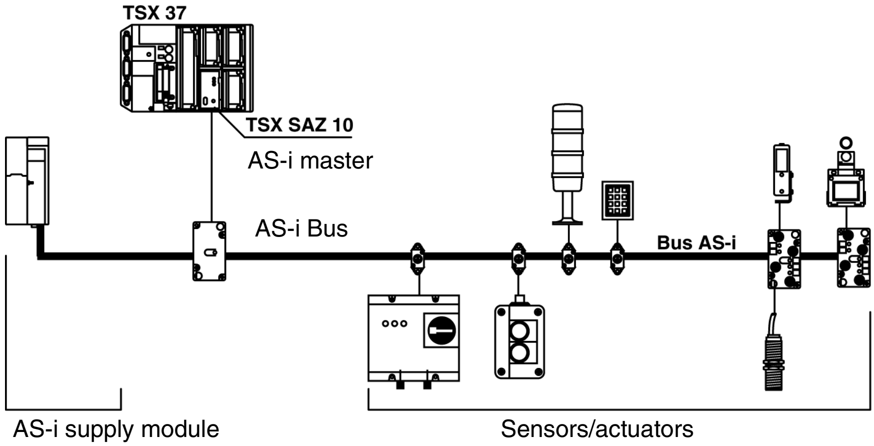


Using an AS-i TSX SAZ 10 bus master module

Using an AS-i interface module enables 124 input bits and 124 output bits distributed along 31 slave devices to be managed, with a limit of 4 input bits and 4 output bits per device. The maximum length of the bus without a relay is limited to 100 meters.

Illustration

The schema below illustrates an example of an AS-i bus



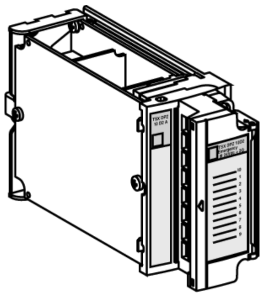
Discrete safety inputs/outputs

General

The TSX DPZ 10D2A safety module carries out a PREVENTA cabled safety function in a half-size module and the complete diagnostics of the safety string.
It offers an emergency stop monitoring or position interrupting function, adapted to the safety demands according to the EN 954-1, EN 418 and EN 60204-1 standards.

Illustration

safety module:



Local analog inputs/outputs

Introduction

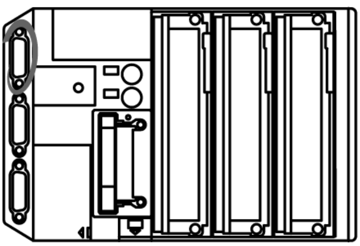
The analog inputs/outputs from the TSX 37 range differ in their modularity, their performance and signal ranges offered (high voltage level, thermoelectric couple, heat probe, etc).
(For further details see TSX Micro implementation manual Volume 2).

Analog inputs/ outputs built in to TSX 37-22 PLCs

TSX 37-22 PLCs offer 8 inputs and 0-10 V 8 bit-output, and a 10V voltage reference output, which means that a large number of automatic cases can be answered economically.

These inputs may be associated to the TSX ACZ 03 adjustment and adaptation module, which allows:
- manual adjustment of application values across 4 sliders,
- conversion to 4-20 mA current from 0-10V signals,
- adaptation of analog inputs to 24V discrete inputs (IEC type 1).

Illustration:

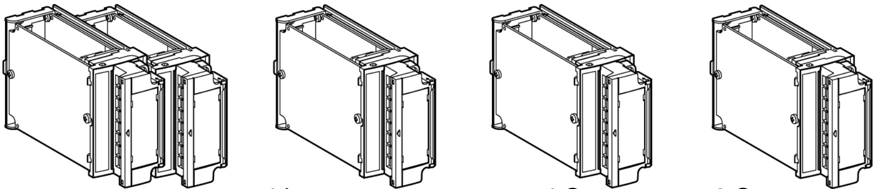


8 I 0-10V and 1 O 0-10V, 8 bits.

Analog input/ output module

Analog input/output modules, which can be installed in all TSX 37-05/08/10/21/22 PLCs offer a high level of performance. They differ in modularity (from 2 to 8 channels) and the input or output type (high voltage level, high current level, thermoelectric couple-inputs, heat probe-inputs, etc.). The connection is always made by a screw terminal block.

Illustration:



8 I 0-10 v +/- 10V or 0-20 mA 4-20 mA 12 bits	4 I differentials multigrams (+/- 10V, 4-20 mA Thermocouple, Pt 100,...) 16 bits	4 O +/- 10V 16 bits+sign	2 O +/- 10 V 0-20 mA 4-20 mA 11 bits + sign

Remote analog inputs/outputs

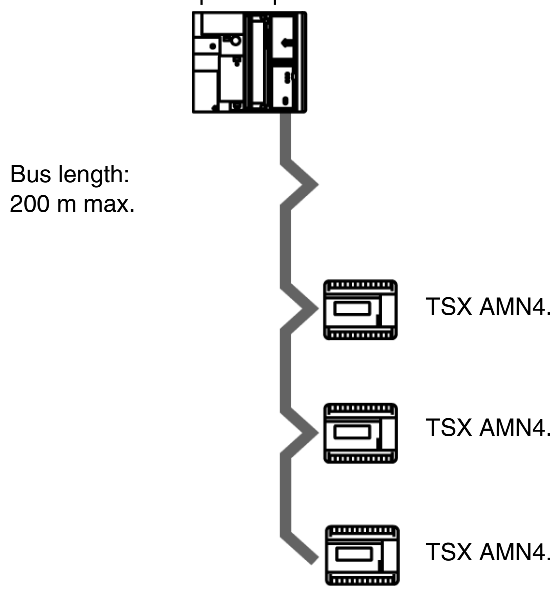
General points

The TSX STZ 10 I/O offset module enables the remote use (up to a distance of 200m) of up to 3 TSX AMZ 4• analog input/output modules from the TSX 07 PLC range (see Implementation manual TSX Micro Volume 2).

Note: Using an input/output offset module for PLCs excludes the use of an AS-i master module.

Illustration

The schema below illustrates the connection between the TSX STZ 10 offset module and the TSX AMZ 4 input/output module.



Counting channel

Introduction

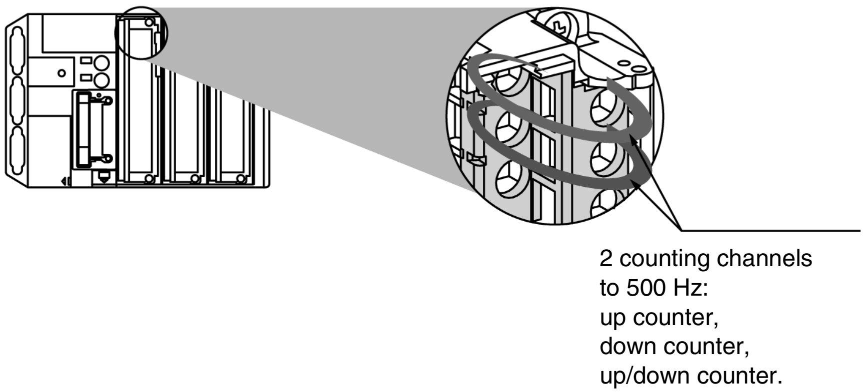
TSX 37 PLCs offer 3 possibilities for counting:
- via the first four discrete inputs of the first module,
- by using the counting channels which are built in to TSX 37-22 PLCs,
- via counting modules, which can be installed in the available positions (TSX CTZ 1A/2A, TSX CTZ 2AA).

Upcounting on discrete inputs

The first 4 inputs of the discrete module, located in the first slot of the PLC, make it possible to have 2 up/down counting channels at 500Hz.(See *Counting built into bases, p. 229*.

Illustration

The illustration below shows the 4 inputs of the discrete module configurable in counting channels.



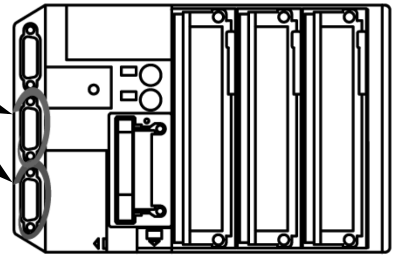
Integrated upcounting

Built-in counting in TSX 37-22 PLCs makes it possible to have 2 10KHz counting channels, as well as all the signals necessary for implementing these functions (reset to zero, set to pre-selection, top-turn, etc.).

Illustration

The illustration below locates the 2 integrated counting channels.

2 x 10 KHz counting channels:
up counter,
down counter,
up/down counter (on the first channel).

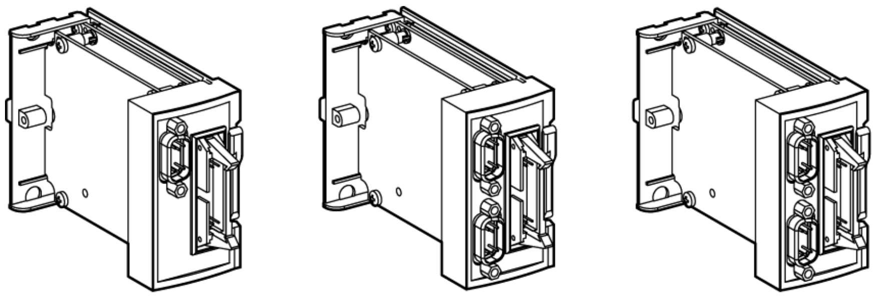


Counting modules

The up and down counting modules differ in the number of channels offered, the 40KHz or 500KHz counting frequency and the type and number of logical signals complementary to up/down counting functions.

Illustration

The illustration below shows the different counting modules.



1 x 40 KHz counting channel up counter, down counter, up/down counter.	2 x 40 KHz counting channels up counter, down counter, up/down counter.	2 x 500 KHz counting channels up counter, down counter, up/down counter.

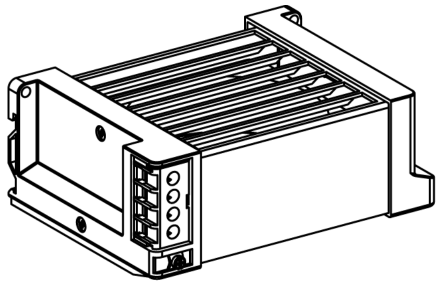
Forced PLC ventilation

Introduction

Depending on the PLC-type (TSX 37-05/08/10 or TSX 37-21/22 with or without mini extension rack), one or two ventilation modules can be installed above each PLC to assist the cooling of the different modules by forced convection.

Illustration

The illustration below shows the ventilation module TSX FAN •• •.



Usage conditions

These ventilation blocks should be used in the following cases:

- **Ambient temperature between 25°C and 70°C**: forced ventilation increases the life span of the various TSX Micro PLC components (MTBF increased by 25%).
- **Ambient temperature between 60°C and 70°C**: the ambient temperature is limited to 60°C without ventilation, forced ventilation lowers the temperature inside the modules by more than 10°C (and removes the hot points) which brings the modules' internal temperature down to the equivalent of the ambient temperature of 60°C.

In these conditions, the product life span is increased by more than 50%.

Three types of ventilation module are offered:

- Ventilation module with 110V AC supply,
- ventilation module with 220V AC power supply,
- ventilation module with 24V DC supply,

> **Note:** Using forced ventilation makes it necessary to take fitting precautions when analog modules of type TSX AEZ 414 are used in the PLC configuration (see (TSX Micro Installation manual, Volume 2, cabling recommendations)).

General introduction to communication

3

At a Glance

Aim of this Chapter

This chapter aims to provide a general description of communication with TSX Micro PLCs.

What's in this Chapter?

This Chapter contains the following Maps:

Communication

General

TSX 37 PLCs offer a series of economic multidrop links via the terminal port of all the PLCs and an additional permanent connection for the operator dialog on TSX 37-21/22 PLCs.
These connections enable the connection of (one single protocol at a time):

- a programming terminal and/or an operator dialog device (UNITELWAY master mode),
- the PLC to an UNI-TELWAY multidrop link (UNI-TELWAY master or slave mode),
- the PLC to the Modbus bus,
- a printer or a terminal in character mode,
- a modem.

A TSX P ACC 01 enables the PLC to be connected to a UNI-TELWAY link, when the distance between the devices is greater than 10 meters. If desired, it makes it possible to duplicate the terminal port in order to simultaneously connect a console and an operator dialog device on a TSX 37 05/08/10 PLC.

TSX 37-21 and TSX 37-22 PLCs are also fitted with a slot which makes it possible to receive a communication module in PCMCIA format (full-duplex or half-duplex, UNI-TELWAY, JBUS/MODBUS, FIPWAY, FIPIO Agent, Modbus+, modem asynchronous series of links).

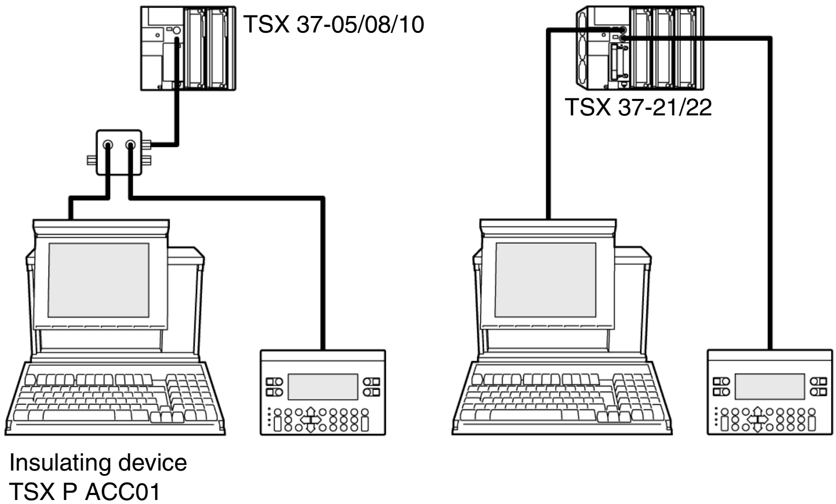
UNI-TELWAY link

General

Communicating via UNI-TELWAY allows the exchange of data between all the devices which are connected on the bus. The UNI-TELWAY standard is a UNI-TE protocol which creates a hierarchical structure (one master and several slaves). The master device is the bus manager.

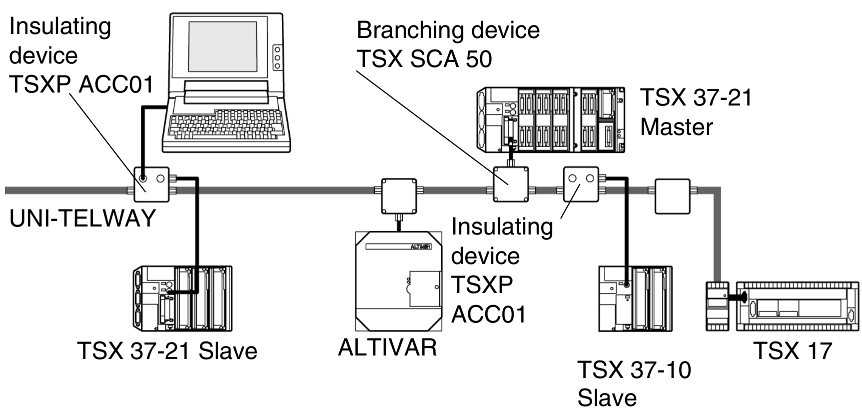
UNI-TELWAY master link by terminal port

Illustration:



UNI-TELWAY slave link by terminal port and master by PCMCIA module

Illustration:



Character mode link by terminal port

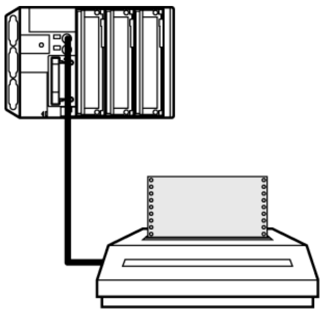
General

Communication via character mode enables dialog and communication functions to be carried out between the PLCs and their environment.

- common peripherals: printers, keyboard-screen, workshop terminal,
- specialized peripherals: bar code readers,
- link to a checking or production management calculator,
- data transmission between heterogeneous devices (numerical commands, variable speed controllers, etc),
- link to an external modem.

Illustration

character mode link to a printer:



Modbus Connection

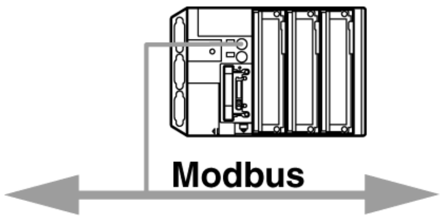
General points

Communicating via Modbus allows data exchange between the master and all the slave devices which are connected on the bus. The Modbus protocol is a protocol which creates a hierarchical structure (one master and several slaves).

Illustration

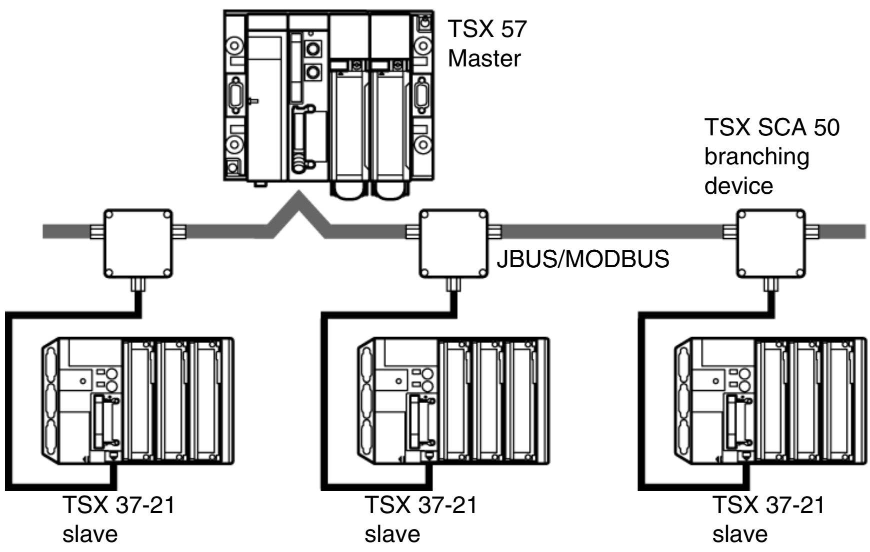
connection to Modbus bus via terminal port:

TSX 37-05/08/10/21/22



JBUS/MODBUS link via communication module

Illustration:



FIPWAY link

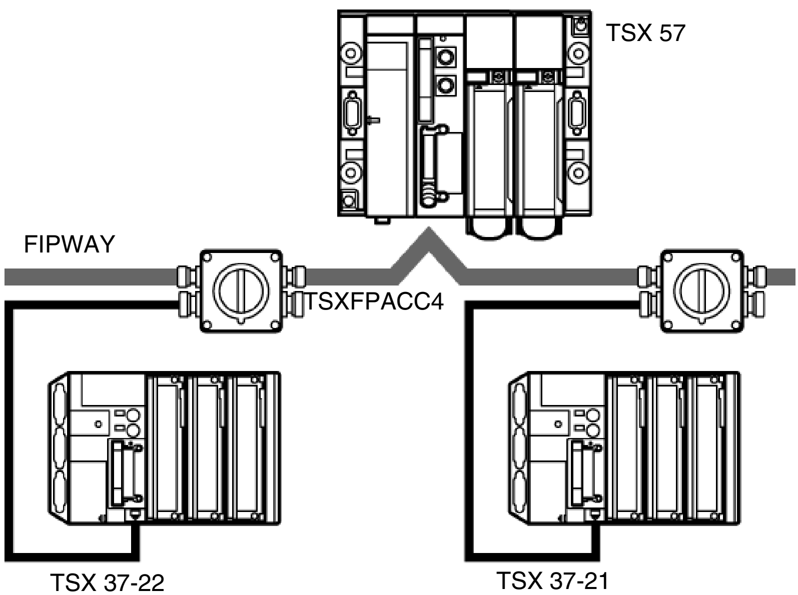
General points

To decentralize peripheral devices, intelligence and ultra-remote services, Schneider Automation offers the FIPWAY industrial local network.

The FIPWAY network conforms entirely to the FIP standard with access by a bus arbitrator.
A FIPWAY communication channel comprises three elementary functions:
- The inter-station message handling function which guarantees the routing of messages,
- the telegram sending/receiving function,
- the common words (%NW) or shared table production/consumption function.

Illustration

connection to the FIPWAY network via communication module:



FIPIO link

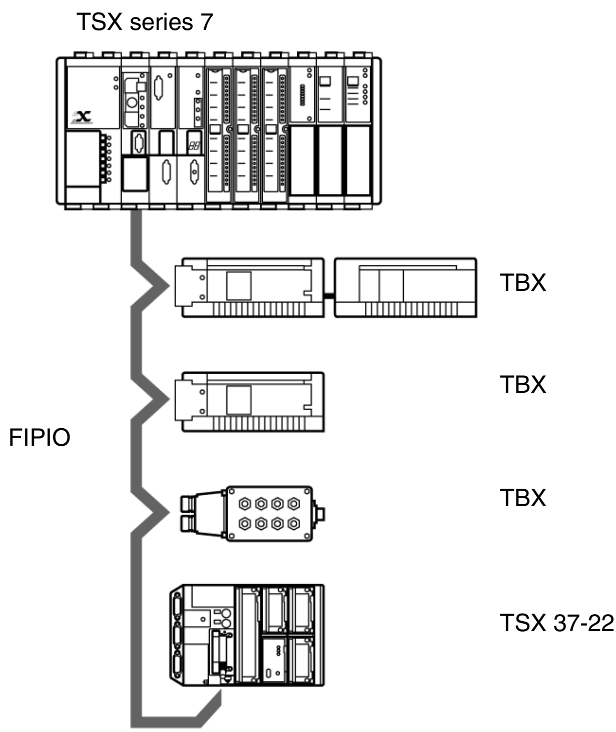
General

Communicating via FIPIO is part of the WORLDFIP global offer from Schneider Automation.
FIPIO is a field bus, which allows the decentralization of the inputs/outputs of a PLC station and its industrial peripheral devices nearest to the operational part.

The FIPIO protocol depends on the producer/consumer exchanges (example: common words) and the bus is managed by a bus arbitrator.

Illustration

FIPIO link by communication module:



Modem link

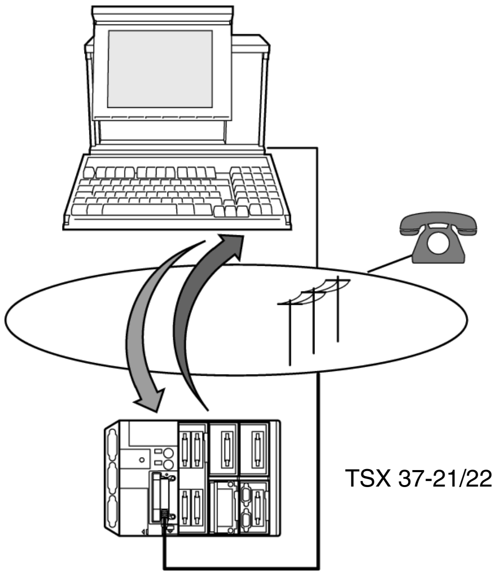
General

A large number of applications are affected by modem communications.

Communicating via the TSX MDM 10 modem makes it possible to access stations, which have been offset by the switched public telephone network in order to carry out checks, diagnostics, or remote controls.

Illustration

connecting to the telephone network with a PCMCIA card modem:



Modbus Plus Link

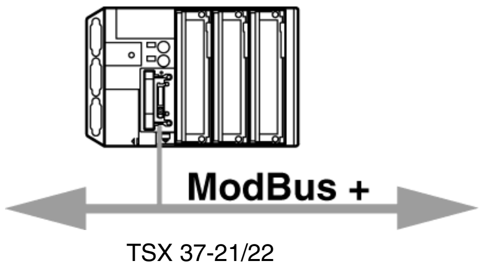
General

Communicating by Modbus Plus allows the exchange of data between all the devices connected on the network.

The Modbus Plus protocol is based on the principle of a Logical Token passing bus. Each station on the same network is identified by an address between 1 and 64 and has access to the network after receiving a token. Duplicated addresses are not valid.

Illustration

Illustration:



Addressing system

4

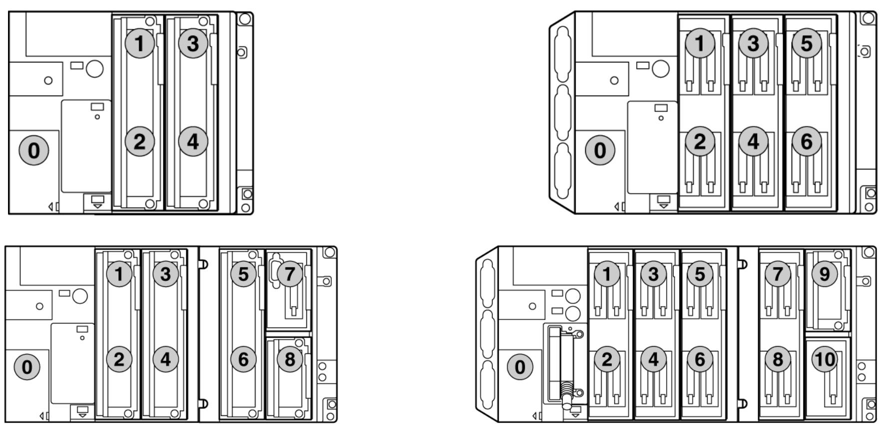
Channel address settings

General points

The channel address settings are **geographic**; i.e. they depend on the physical position of the module in the PLC or extension.

Illustration

The illustration below shows some configuration examples



Rules

Given that the basic module size is half-size, full-size modules are addressed as two superimposed half-size modules.
The term **Position** represents either a half size module, or the upper or lower part of a full-size module.

Discrete input/output syntax is as follows:

%	I or Q	Position	.	Channel
Symbol	%I: input %Q: output	1 to 4 (37 05/10) 1 to 6 (37 08/21/22 1 to 8 (37 10 + RKZ02 1 to 10 (37 21/22 + RKZ02	Connection	i

Channel address setting

The table below provides the channel address settings by full-size format module type.

		64 I/O	32 I	32 O	28 I/O
Channel number i	Odd position	0 to 31	0 to 15	0 to 15	0 to 15
	Even position	0 to 31	0 to 15	0 to 15	0 to 11
Channel Address	Odd position	%Ix.0 to %Ix.31	%Ix.0 to %Ix.15	%Qx.0 to %Qx.15	%Ix.0 to %Ix.15
	Even position	%Q(x+1).0 to %Q(x+1).31	%I(x+1).0 to %I(x+1).15	%Q(x+1).0 to %Q(x+1).15	%Q(x+1).0 to %Q(x+1).11

The table below provides the channel address settings by half-size module type.

		16 I/O	12 I	8 O	4 O
Channel number i	Odd or even position	E: 0 to 7	0 to 11	0 to 7	0 to 3
		S: 8 to 15			
Channel Address	Odd or even position	%Ix.0 to %Ix.7	%Ix.0 to %Ix.11	%Qx.0 to %Qx.7	%Qx.0 to %Qx.3
		%Qx.8 to %Qx.15			

TSX 37 PLC

II

At a Glance

Aim of this Part

This part is about the TSX 37-05, TSX 37-08, TSX 37-10 and TSX 37- 21/22 PLCs.

What's in this part?

This Part contains the following Chapters:

TSX 37-05 PLC

5

At a Glance

Aim of this Chapter

This chapter is about the TSX 37-05 PLC, its physical description and its technical characteristics.

What's in this Chapter?

This Chapter contains the following Maps:

Introduction to the TSX 37 05 PLC base

General points

A TSX 37-05 PLC base groups under one product reference:

- a rack comprising the supply to the base (100-240V AC), the processor, the dedicated memory, the watchdog in FLASH EPROM and two half-slots for the modules,
- a discrete module of 28 standard size inputs/outputs in the first slot in the rack.

Catalog data

data table:

Reference Number	**Supply**	**Built-in input/output module**	
TSX 3705 028DR1	100240V AC	TSX DMZ 28DR: 16 24V DC inputs, 12 relay outputs	
Discrete inputs/ outputs	Maximum number of discrete I/Os	in the base (1)	92
		remote (TSX 07)	0
		remote on the AS-i bus	0
	Maximum number of modules (2)	28 discrete inputs/ outputs	2
		32 discrete inputs/ outputs	1
		64 discrete inputs/ outputs (high density)	1
		input/output mismatch (for TSX 07 I/O or AS-i bus)	0
Analog	Number of analog input/output modules (2)		2
	No. of analog inputs		16
	No. of analog outputs		8
Counting	No. of 500Hz counting channels on discrete inputs		2
	No. of counting modules (2)		2
	No. of 40kHz or 500kHz counting channels		4

(1) with 1 64 input/output module with HE10 connectors,
(2) taking into account the available slots, the number of modules cannot be cumulated.

RS 485 terminal port

With an 8-point mini-DIN size RS 485 terminal port, it is possible to:

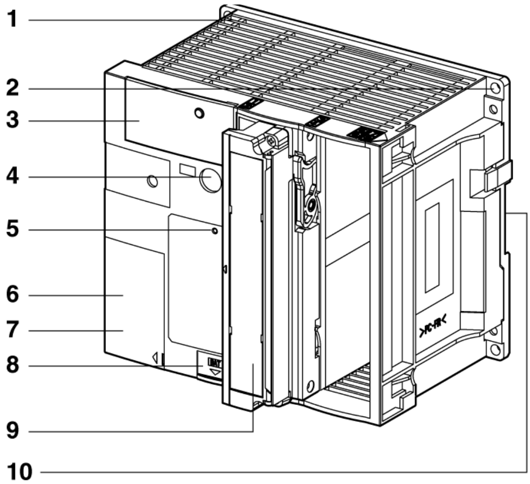
- connect an FTX type terminal or a compatible PC, a printer,
- and to connect the PLC to the UNI-TELWAY or Modbus busses. For this, it proposes, by default, the UNI-TELWAY 96 Baud master communication mode and, by configuration:
  - the UNI-TELWAY slave mode or,
  - ASCII character mode or,
  - the Modbus protocol.

Note: The terminal and PLC can both be connected to the UNI-TELWAY bus using the TSX P ACC 01 insulating device. This should be used when the distance between the UNI-TELWAY connection equipment is greater than 10 meters (see *TSX unit P ACC 01, p. 345*).

TSX 37-05: physical description

Illustration

TSX 37-05:



Number table

function description of the numbers:

Number	Description
1	2 slot rack comprising the supply, the processor and its memory.
2	Fixing hole for the PLC.
3	Centralized display panel.
4	Terminal port (TER).
5	RESET button.
6	Access door to the supply terminals.
7	Stack change information label.
8	Access door to the optional stack and data protection switch for the operating system.
9	A 28 I/O module whose basic position is in the first slot.
10	Mounting device on DIN mounting rail.

Note: For an IP20 protection index, place the protection covers in the empty slots. These covers, which are not supplied, should be ordered in batches of 10, quoting the reference TSX RKA 01.

Characteristics of the TSX 37-05

Table of characteristics

Technical characteristics:

PLCs		TSX 37-05
Functions	No. of local discrete inputs/outputs	92
	No. of remote discrete inputs/outputs (TSX 07 and AS-i)	0
	No. of integrated UNI-TELWAY connections	1
	Communication modules	0
	Real-time clock	No
	Integrated analog	No
	Integrated upcounting -500Hz (on discrete input) -10kHz	 Yes No
Memory	Savable internal RAM - program (100% Boolean) - data - constant	9 Kwords 2/1.6 Kinst. (1) 1 Kwords (2) 128 words (2)
	Integrated Flash Eprom	10 Kwords (3)
Memory extension	-	No
Execution time by Kinst.(5)	RAM (100% Boolean)	0.3ms
System overhead		1.9 ms
Application structure	Master task	1
	Fast task	1
	Processing on events	1 to 8
Pre-defined function blocks	Timers	64 (4)
	Counters	32

(1) The first value corresponds to a program in List. The 2nd value corresponds to a program in Ladder language.
(2) Size by default; can be extended at the expense of the application program size.
(3) 9 Kwords available for the backup application + 1 Kword for the %MW backup.
(4) A maximum of 16 timers with a 10ms time base.
(5) Inoperative overhead and I/O management.

Display panel on TSX 37-05

General points

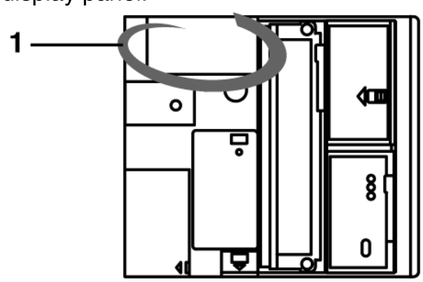
The display block **1** centralizes all the information needed for diagnostics and for maintenance of the PLC and its modules. For this, it provides the following:

- 8 LED status displays giving PLC function information (RUN, TER, I/O, ERR and BAT LEDs) and the current display mode (R, I/O, WRD and DIAG LEDs),
- from a block of 96 LED displays making it possible to display:
  - **local inputs/outputs in display mode** (BASE LED on): the state of all discrete inputs and outputs of the PLC,
  - **in diagnostic mode** (DIAG LEDs on):
    "module" errors (all LEDs associated with the module flash slowly),
    or
    "channel" errors (LED display associated with the channel),
  - **in object display mode** (WRD LED on): the contents of a maximum of 16 %MWi, %SWi, or %KWi words (these words are displayed in binary or hexadecimal), the state of a group of 64 %Mi, %Si or %Xi bits,
- a push button which enables the information sequence to be viewed and to change the display mode.

Note: For further information concerning the display block, please refer to the*Display panel, p. 149*

Illustration

display panel:



TSX 37-08PLC

6

At a Glance

Aim of this Chapter

This chapter is about the TSX 37-08 PLC, its physical description and its technical characteristics.

What's in this Chapter?

This Chapter contains the following Maps:

Introduction to the TSX 37 -08 PLC base

Introduction to the TSX 37 08 PLC base

A TSX 37-08 PLC base groups under one product reference:

- a rack comprising the supply to the base (100-240V AC), the processor, the dedicated memory, the watchdog in FLASH EPROM and two half-slots for the modules,
- 2 standard size discrete 28 input/output modules in the first two rack slots.

Catalog data

data table:

Reference Number	**Supply**	**Integrated input/output modules**	
TSX 3708 056DR1	100240V AC	TSX DMZ 28DR: 16 24V DC inputs, 12 relay outputs	
Discrete inputs/ outputs	Maximum number of discrete I/Os	in the base (1)	120
		remote (TSX 07)	0
		remote on the AS-i bus	0
	Maximum number of modules (2)	28 discrete inputs/outputs	3
		32 discrete inputs/outputs	1
		64 discrete inputs/outputs	1
		64 discrete inputs/outputs (high density)	0
		input/output mismatch (for TSX 07 I/O or AS-i bus)	0
Analog	Number of analog input/output modules (2)		2
	No. of analog inputs		16
	No. of analog outputs		8
Counting	No. of 500Hz counting channels on discrete inputs		2
	No. of counting modules (2)		2
	No. of 40kHz or 500kHz counting channels		4

(1) with 1 64 input/output module with HE10 connectors,
(2) taking into account the available slots, the number of modules cannot be cumulated.

RS 485 terminal port

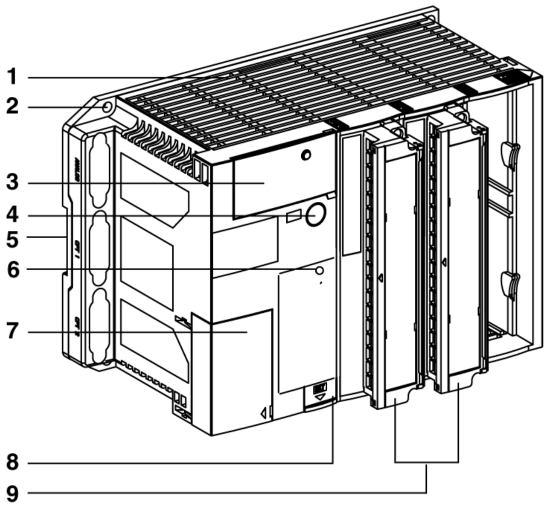
With an 8-point mini-DIN size RS 485 terminal port, it is possible to:
- connect an FTX type terminal or a compatible PC, a printer,
- and to connect the PLC to the UNI-TELWAY or Modbus busses. For this, it proposes, by default, the UNI-TELWAY 96 Baud master communication mode and, by configuration:
  - the UNI-TELWAY slave mode or,
  - ASCII character mode or,
  - the Modbus protocol.

Note: The terminal and PLC can both be connected to the UNI-TELWAY bus using the TSX P ACC 01 insulating device. This should be used when the distance between the UNI-TELWAY connection equipment is greater than 10 meters (see *TSX unit P ACC 01, p. 345*).

TSX 37-08: physical description

Illustration

TSX 3708:



Address table

description for each address:

Address	Description
1	3 slot rack containing the supply, the processor and its base memory.
2	PLC fixing hole.
3	Centralized display block.
4	Terminal port (TER).
5	Mounting device on DIN mounting rail.
6	RESET button.
7	Access door to the supply terminals.
8	Access door to the optional battery and to the operating system data protection switch.
9	Two 28 I/O modules, positioned as standard in the first two slots.

Note: For an IP20 protection rating, place protection covers in the empty slots. These covers, which are not supplied, should be ordered separately in lots of 10, quoting the reference TSX RKA 01.

Characteristics of the TSX 37-08

Table of characteristics

Technical characteristics:

PLCs		TSX 37-08
Functions	No. of local discrete inputs/outputs	120
	No. of remote discrete inputs/outputs (TSX 07 and AS-i)	0
	No. of integrated UNI-TELWAY connections	1
	Communication modules	0
	Real-time clock	No
	Integrated analog	No
	Integrated upcounting -500Hz (on discrete input) -10kHz	 Yes No
Memory	Savable internal RAM program (100% Boolean) data constant	9 Kwords 2/1.6 Kinst. (1) 1 Kword (2) 128 words (2)
	Integrated Flash Eprom	10 Kwords (3)
Memory extension	-	No
Execution time by Kinst.(5)	RAM (100% Boolean)	0.3ms
System overhead		1.9 ms
Application structure	Master task	1
	Fast task	1
	Processing on events	1 to 8
Pre-defined function blocks	Timers	64 (4)
	Counters	32

(1) The first value corresponds to a program in List. The 2nd value corresponds to a program in Ladder language.
(2) Size by default; can be extended at the expense of the application program size.
(3) 9 Kwords available for the backup application + 1 Kword for the %MW backup.
(4) A maximum of 16 timers, with a 10ms time base.
(5) Inoperative overhead and I/O management.

Display panel on TSX 37-08

General points

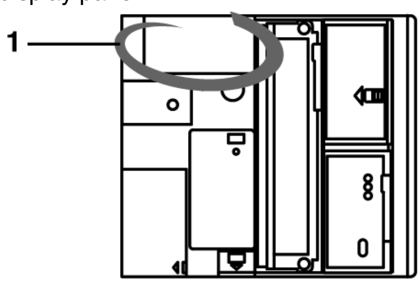
The display block **1** centralizes all the information needed for diagnostics and for maintenance of the PLC and its modules. For this, it provides the following:

- 8 LED status displays giving PLC operating information (RUN, TER, I/O, ERR and BAT LEDs) and the current display mode (R, I/O, WRD and DIAG LEDs),
- from a block of 96 LED displays making it possible to display:
  - **local inputs/outputs in display mode** (BASE LED on): the state of all discrete inputs and outputs of the PLC,
  - **in diagnostic mode** (DIAG LEDs on):
    "module" errors (all LEDs associated with the module flash slowly),
    "channel" errors (LED display associated with the channel),
  - **in object display mode** (WRD LED on): the contents of a maximum of 16 %MWi, %SWi, or %KWi words (these words are displayed in binary or hexadecimal), the state of a group of 64 %Mi, %Si or %Xi bits,
- a push button which enables the information sequence to be viewed and to change the display mode.

Note: For further information concerning the display block, please refer to the*Display panel, p. 149*

Illustration

display panel:



TSX 37-10PLC

7

At a Glance

Aim of this Chapter

This chapter is about the TSX 37-10 PLC, its physical description and its technical characteristics.

What's in this Chapter?

This Chapter contains the following Maps:

Introduction to the TSX 37 -10 PLC base

General points

A TSX 37-10 PLC base groups under one product reference:

- a rack comprising the supply to the base (24 VDC or 100-240 VAC), the processor, the dedicated memory, the backup memory in FLASH EPROM and two slots for the modules,
- a discrete module of 28 or 64 standard size inputs/outputs in the first slot in the rack.

Table of the different types of TSX 37 10 base:

Base	Supply	Built–in input/output module
TSX3710028AR1	100240V AC	TSXDMZ28AR:16 115V AC inputs, 12 relay outputs
TSX3710028DR1	100240V AC	TSX DMZ 28DR: 16 24V DC inputs, 12 relay outputs
TSX3710128DR1	24V DC	TSX DMZ 28DR: 16 24V DC inputs, 12 relay outputs
TSX3710128DT1	24V DC	TSXDMZ28DT: 16 24V DC inputs, 12 static outputs
TSX3710128DTK1	24V DC	TSXDMZ28DTK: 16 24V DC inputs, 12 static outputs
TSX3710164DTK1	24V DC	TSX DMZ 64 DTK: 32 24V DC inputs, 32 static outputs

Using the TSX RKY 02 mini extension rack means 2 extra slots can be added to the PLC. The package allows the use of 3 slots which can each be equipped with a standard format module or two half-format modules.

Catalog data the following table gives the **maximum** configurations of the TSX 37 10 PLCs:

Discrete inputs/outputs	Maximum number of discrete I/Os	in the base	128
		in the base and extension	192
		in the base + extension + remote (I/O TSX 07)	268
		in the base + extension + remote (AS-i bus)	408
		remote (4 TSX 07)	96
		remote on the AS-i bus (124I + 124O)	248
	Maximum number of modules	28 or 32 discrete inputs/outputs	4
		64 discrete inputs/outputs (high density)	2
		input/output mismatch (for TSX 07 I/O or AS-i bus)	1
Analog	Number of analog input/output modules		2
	No. of analog inputs		16
	No. of analog outputs		8
Counting	No. of 500Hz counting channels on discrete inputs		2
	No. of counting modules (in the PLC)(*)		2
	No. of 40kHz or 500kHz counting channels		4

(*) The counting modules are only to be installed in the basic PLC model.
A TSX 37-10 configuration can receive 2 analog modules and 2 counting modules.

RS 485 terminal port

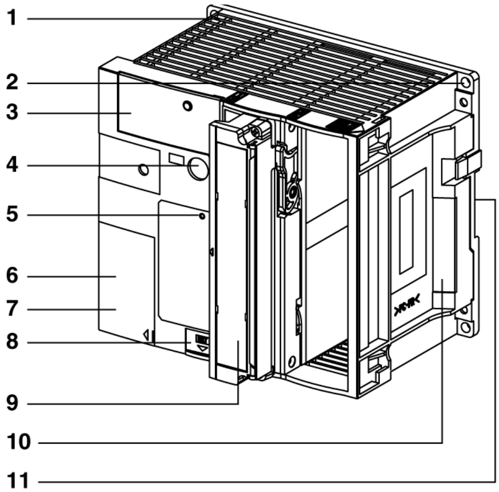
With an 8-point mini-DIN size RS 485 terminal port, it is possible to:
- connect an FTX type terminal or a compatible PC, a printer,
- and to connect the PLC to the UNI-TELWAY or Modbus busses. For this, it proposes, by default, the UNI-TELWAY 96 Baud master communication mode and, by configuration (see *Communication incorporated in the bases, p. 307*:
  - the UNI-TELWAY slave mode or,
  - ASCII character mode or,
  - the Modbus protocol.

Note: The terminal and PLC can both be connected to the UNI-TELWAY bus using the TSX P ACC 01 insulating device. This should be used when the distance between the UNI-TELWAY connection equipment is greater than 10 meters (see *TSX unit P ACC 01, p. 345*).

TSX 37-10: description

Illustration

TSX 37-10:



Number table

function description of the numbers:

Number	Description
1	2 slot rack comprising the supply, the processor and its memory.
2	Fixing hole for the PLC.
3	Centralized display panel.
4	Terminal port (TER).
5	RESET button.
6	Access door to the supply terminals.
7	Stack change information label.
8	Access door to the optional stack and data protection switch for the operating system.
9	A 28 or 64 I/O module whose basic position is in the first slot.
10	Access cover to the connection connector of the mini extension rack.
11	Mounting device on DIN mounting rail.

Note: For an IP20 protection index, place the protection covers in the empty slots. These covers, which are not supplied, should be ordered separately in batches, quoting the reference TSX RKA 01.

Characteristics of the TSX 37-10

Table of characteristics

Technical characteristics:

PLCs		**TSX 37-10**
Functions	No. of discrete input/output TSX 07 local + remote local + remote on the AS-i bus	 268 408
	No. of connections Built-in UNI-TELWAY	1
	Communication modules	0
	Real-time clock	Yes
	Integrated analog	No
	Integrated upcounting On discrete inputs (-500 Hz) -10 kHz	 Yes No
Internal memory	Savable internal RAM program (100% Boolean) (1) data (in internal RAM) constant	14 Kwords 4.7/2.7 Kinst. 1 Kword (2) 128 words (2)
	Built-in Flash Eprom	16 Kwords (3)
Memory extension	PCMCIA card	No
Execution time by Kinst.(5)	RAM (100% Boolean) PCMCIA (100% Boolean)	0.3ms -
System overhead		1.9 ms
Application structure	Master task	1
	Fast task	1
	Task on events	1 to 8
Pre-defined function blocks	Timers	64 (4)
	Counters	32

(1) The first value corresponds to a program in List. The 2nd value corresponds to a program in Ladder language.
(2) Size by default; can be extended at the expense of the application program size.
(3) 15 Kwords available for the backup application + 1 Kword for the %MW backup.
(4) A maximum of 16 timers, with a 10ms time base.
(5) Inoperative overhead and I/O management.

TSX 37-10 display block

General points

The display block **1** centralizes all the information needed for diagnostics and for maintenance of the PLC and its modules. For this, it provides the following:

- 8 status LEDs giving PLC operating information (the RUN, TER, I/O, ERR and BAT LEDs) and current display mode (the R I/O, WRD and DIAG LEDs),
- from a block of 96 LED displays making it possible to display:
  - **local inputs/outputs in display mode** (BASE or EXT LED on) : the status of all discrete PLC inputs and outputs and the mini extension rack,
  - **remote inputs/outputs in display mode** (R I/O LED lit) : the discrete input/ output status of each slave present on the AS-i bus,
  - **in diagnostic mode** (DIAG LEDs on):
    "module" errors (all LEDs associated with the module flash slowly),
    or
    "channel" errors (LED display associated with the channel),

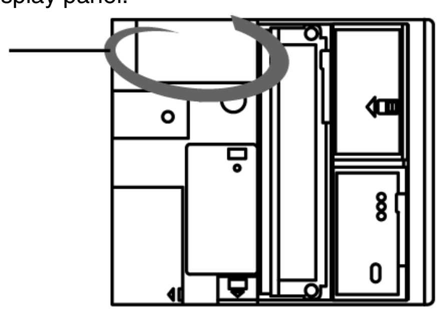
    for remote inputs/outputs on the AS-i bus : the state of each slave (slaves with error flashing),
  - **in object display mode** (WRD LED on): the contents of a maximum of 16 %MWi, %SWi or %KWi words (displayed in binary or hexadecimal mode), the status of a group of 64 %Mi, %Si or %Xi bits, the status of the TSX 07 module input and output bits used as discrete remote inputs/outputs,
- a push button which enables the information sequence to be viewed and to change the display mode.

> **Note:** For further information concerning the display block, please refer to the*Display panel, p. 149*

Illustration

display panel:

1



TSX 37-21 and TSX 37-22 PLCs

8

At a Glance

Aim of this Chapter

This chapter is about the TSX 37-21 and TSX 37-22 PLCs, their physical description and their technical characteristics.

What's in this Chapter?

This Chapter contains the following Maps:

Introduction to the TSX 37-21 and TSX 37-22 PLC bases

General points

The TSX 37-21 and TSX 37-22 PLC bases consist of a rack containing the 24V DC supply (TSX 37-21 101 and TSX 37-22 101) or 100-240V AC supply (TSX 37-21 and TSX 37-22 001), the processor, the dedicated memory, the backup memory and 3 module slots.

Using the TSX RKZ 02 mini extension rack means 2 extra slots can be added to the PLC. The group makes 5 slots are available which can each be equipped with a standard size module or two half-size modules, except for the first slot which can only receive standard size modules.

A memory extension card and a communication module can be received using two PCMCIA size slots.
Analog and built-in counting functions can also be accessed using 3 connectors provided by the TSX 37-22 PLC.

Catalog data

The following table gives the **maximum** configurations for the TSX 37-21 and TSX 37-22 PLCs (maximum number of modules and inputs/outputs):

PLC	**TSX**		**37-21**	**37-22**
I/O	Maximum number of discrete I/Os	in the base	192	192
		in the base+extension	256	256
		in the base+extension+remotes (TSX 07)	332	332
		in the base+extension+remotes (AS-i bus)	472	472
		remote (4 TSX 07)	96	96
		remote on the AS-i bus (124I+124O)	248	248
	Maximum number of modules	28 or 32 discrete inputs/outputs	5	5
		64 discrete inputs/outputs (high density)	3	3
		input/output mismatch (for TSX 07 I/O or AS-i bus)	1	1
Analog	Maximum number of analog input/output modules		4	4
	Maximum number of analog inputs in the rack		32	32
	Maximum number of analog outputs in the rack		16	16
	Maximum number of built-in analog inputs in the rack		-	8
	Maximum number of built-in analog output		-	1

PLC	TSX	37-21	37-22
Counting	Maximum number of 500Hz counting channels on discrete inputs	2	2
	Maximum number of counting modules (in the PLC) (1)	4	4
	Maximum number of 40kHz and/or 500kHz counting channels	7	7
	Maximum number of built-in counting channels (10 kHz)	-	2
Communication	Number of communication modules (2)	1	1

(1) The counting modules can only be installed in the basic PLC model.
A TSX 37-21/22 configuration can receive 4 analog modules and 4 counting modules.
(2) PCMCIA communication card (FIPWAY, FIPIO Agent, Modbus+ Modem).

RS 485 terminal port

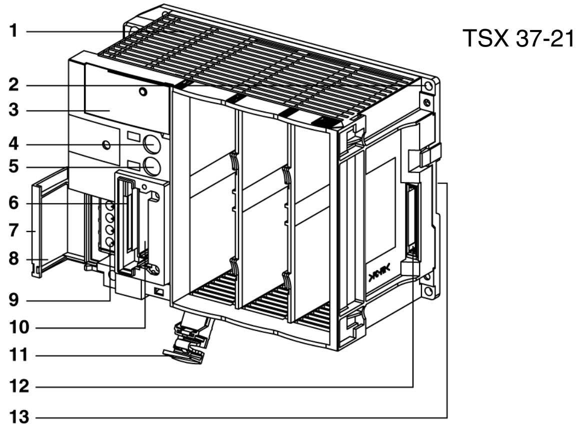
Using two RS 485 terminal ports in 8 point mini-DIN size, it is possible to connect:
- TER: an FTX type terminal or compatible PC, or to connect the PLC to the UNI-TELWAY bus or Modbus via the TSX P ACC 01 insulating device,
- AUX: an operator dialog terminal, or a printer.

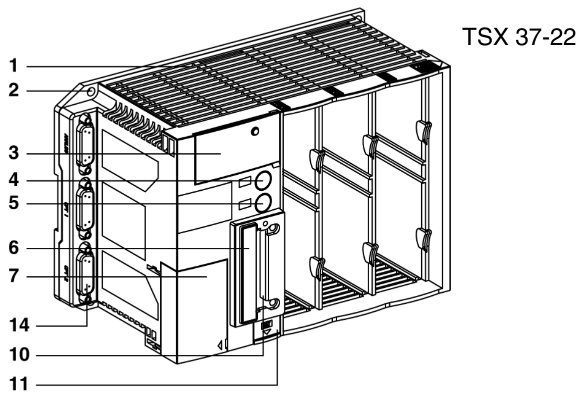
For this, the terminal port and dialog operator port propose by default the UNI-TELWAY master 96 Baud communication mode and, by configuration (see *Communication incorporated in the bases, p. 307*:
- the UNI-TELWAY slave mode or,
- ASCII character mode or,
- the Modbus protocol.

TSX 37-21 and TSX 37-22: description

Illustration

TSX 37-21 and TSX 37-22:





Address table

description for each address:

Address	Description
1	3 slot rack containing the supply, the processor and its base memory.
2	PLC fixing hole.
3	Centralized display block.
4	Terminal port TER.
5	AUX operator dialog port.
6	Slot for a memory extension card. If there is no card, this slot is equipped with a cover which must be left in place as removing it will cause:. • the PLC to stop, • the terminal port to be inactive.
7	Access door to the supply terminals.
8	Battery change information label.
9	Supply terminals.
10	Slot for a communication module..
11	Access door to the optional battery and to the operating system data protection switch.
12	Mini extension rack connector, fully protected by a removable cover.
13	Mounting device on DIN mounting rail.
14	Connectors for built-in analog and counting functions.

Note: For an IP20 protection rating, place protection covers in the empty slots. These covers, which are not supplied, should be ordered separately in lots of 10, quoting the reference TSX RKA 01.

Characteristics of the TSX 37-21 and the TSX 37-22

Table of characteristics

Technical characteristics:

PLCs			TSX 37-21	TSX 37-22
Functions	No. of discrete input/output TSX 07 local + remote local + remote on the AS-i bus		 332 472	 332 472
	No. of connections Built-in UNI-TELWAY		1	1
	Communication modules		1	1
	Real-time clock		Yes	Yes
	Integrated analog		No	Yes
	Integrated upcounting -500 Hz -10 kHz		 Yes No	 Yes Yes
Internal memory	Savable internal RAM		20 Kwords	
	program (100% Boolean) (1)		7.9/4.5 Kinst.	
	data (in internal RAM)		2 Kwords (2)	
	constant		128 words (2)	128 words (2)
	Built-in Flash Eprom		16 Kwords (3)	
Memory extension	32 K16 PCMCIA card		32 Kwords	32 Kwords
		program (100% Boolean) (1)	18.5/10.5 Kinst.	
		data (in internal RAM)	17.5 Kwords	
		constants (4)	256 words (2)	
	64 K 16 PCMCIA card		64 Kwords	64 Kwords
		program (100% Boolean) (1)	40/22 Kinst.	
		data (in internal RAM)	17.5 Kwords	
		constants (5)	512 words (2)	
Execution time by Kinst.(7)		RAM (100% Boolean) PCMCIA (100% Boolean)	0.15 ms 0.225 ms	0.15 ms 0.225 ms
System overhead			1.6 ms	2.3 ms
Application structure		Master task	1	1
		Fast task	1	1
		Task on events	1 to 16	1 to 16
Pre-defined function blocks		Timers	64 (6)	64 (6)
		Counters	32	32

(1) The first value corresponds to a program in List. The 2nd value corresponds to a program in Ladder language.
(2) Size by default; can be extended at the expense of the application program size.
(3) 15 Kwords available for the backup application + 1 Kword for the %MW backup.
(4) Can be extended to 24.5 Kwords.
(5) Can be extended to 32 Kwords.
(6) A maximum of 16 timers, with a 10ms time base.
(7) Inoperative overhead and I/O management.

TSX 37-21 and TSX 37-22 display panel

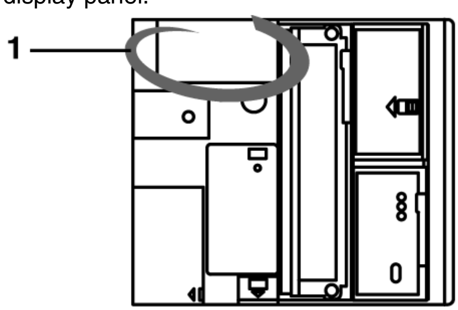
General points

The display block **1** centralizes all the information needed for diagnostics and for maintenance of the PLC and its modules. For this, it provides the following:

- 8 status LEDs giving PLC operating information (the RUN, TER, I/O, ERR and BAT LEDs) and current display mode (the R I/O, WRD and DIAG LEDs),
- from a block of 96 LED displays making it possible to display:
  - **local inputs/outputs in display mode** (BASE or EXT LED on): the status of all discrete PLC inputs and outputs and the mini extension rack,
  - **remote inputs/outputs in display mode** (R I/O LED lit): the discrete input/output status of each slave present on the AS-i bus,
  - **in diagnostic mode** (DIAG LEDs on):
    "module" errors (all LEDs associated with the module flash slowly),
    or
    "channel" errors (LED display associated with the channel),
    for remote inputs/outputs on the AS-i bus: the state of each slave (slaves with error flashing),
  - **in object display mode** (WRD LED on): the contents of a maximum of 16 %MWi, %SWi or %KWi words (displayed in binary or hexadecimal mode), the status of a group of 64 %Mi, %Si or %Xi bits, the status of the TSX 07 module input and output bits used as discrete remote inputs/outputs,
- a push button which enables the information sequence to be viewed and to change the display mode.

Illustration

display panel:



TSX 37 PLC supplies

9

At a Glance

Aim of this Chapter

This chapter is about the TSX 37 PLC base supplies.

What's in this Chapter?

This Chapter contains the following Maps:

Alternating current supplies

Characteristics

table of characteristics:

PLCs		**TSX 37-05/08/10/21/22**	
Primary	Nominal voltages		100…240 VAC
	Voltage limits		85-264 VAC
	Nominal frequencies		50-60 Hz
	Frequency limits		47-63 Hz
	Current absorbed		0.7 A to 100 V 0.3 A to 240 V
	Call current (2)		< 60 A
Secondary	+5 VDC	Nominal current (1)	2.8 A
		Peak current	3.2 A
	+24 V relay	Nominal current (1)	0.5 A
		Peak current	0.6 A
	+24V sensors (3)	Nominal current (1)	0.4 A
		Peak current	0.6 A
	Total power (4)	Nominal	24 W
		Peak	32 W
Insulation	Dielectric strength:	primary/ secondary	2500 V eff 50/60 Hz

(1) The nominal currents correspond to the consumption of 2/3 of the active inputs/ outputs simultaneously. The supply can nevertheless operate without cutting off peak power equivalent 100% of the active inputs/outputs simultaneously.
(2) This value means that the network should support a call current of 60 A. It should be taken into account when starting several devices simultaneously or for dimensioning protection devices.
(3) For an alternating supply, the 24 V sensor limits the configuration to 100 inputs on the base. Beyond this, an external supply must be used.
(4) The total power is not the sum of the power equivalent to the maximum yield of each of the outputs that it is possible to obtain simultaneously in one configuration. It is calculated for particular configurations, which correspond to optimum usage of the PLC.

Direct current supply

Characteristics

table of characteristics:

PLCs		TSX 37-10/21/22	
Primary	Nominal voltages		24 VDC
	Voltage limits (ripple included)		19-30 VDC 19-34 VDC (3)
	Peak to peak ripple		5% of Un F = 90 Hz to 1 kHz
	Frequency limits		47-63 Hz
	Current absorbed		2 A
	Maximum call current (2)		< 60 A
Secondary	+5 VDC	Nominal current (1)	2.8 A
		Peak current	3.2 A
	Total power (4)	Nominal	16 W
		Peak	18 W
Insulation	Dielectric strength:	primary/ secondary	No insulation; the 0V and PE are internally coupled

(1) The nominal currents correspond to the consumption of 2/3 of the simultaneously active inputs/outputs. The supply can nevertheless operate without cutting off a peak power matching 100% of the simultaneously active inputs/outputs.
(2) This value means that the network should support a call current of 60 A. It should be taken into account when starting several devices simultaneously or for dimensioning of protection devices.
(3) 34 VDC for one hour, for a battery operated device with charger.
(4) The total power is not the sum of the power matching the maximum yield of each of the outputs that it is possible to obtain simultaneously in one configuration. It is calculated for particular configurations, which correspond to optimum usage of the PLC.

Additional characteristics

Supply protection	The supply provided by the TSX 37-05/08, TSX 37-10, TSX 37-21 and TSX 37-22 PLCs are all protected against overloading and short circuits. A short circuit or overload on the 24 V sensor does not have any effect on the other voltages. The 24 V sensor reappears when the error disappears.
Service signals	During operation, a signal is generated when the PLC supply voltage exceeds the limits (Power Fail).
Programming terminal supply	The +5 VDC voltage, delivered by PLC to the terminal port, does not allow auto-supply of a programming terminal, but a pocket terminal with a very low power consumption (<200 mA).

Memories on TSX 37

10

At a Glance

Aim of this chapter

This chapter describes the memory on TSX 37.

What's in this Chapter?

This Chapter contains the following Maps:

Internal memory

General points

The internal memory store of the TSX 37-05/08/10/21/22 PLCs is composed of two separate stores :

- An internal RAM memory (1), which is used by the application program and which has a capacity of :
  - 9 Kwords for a TSX 37-05/08 PLC
  - 14 Kwords for a TSX 37-10 PLC
  - 20 Kwords for a TSX 37-21/22 PLC.

Furthermore, in the case of a TSX 37-21/22 PLC, the application memory can be extended with a 32 or 64 Kword PCMCIA memory card, of the RAM or FLASH EPROM type.

- A FLASH EPROM memory of:
  - 10 Kwords on the TSX 37-05/08 PLCs,
  - 16 Kwords on the TSX 37-10/21/22 PLCs, which is a backup memory.
    This memory is a backup memory:
    - of the application program (only 15 Kwords can be used as a backup for the application program on the TSX 37- 21/22 PLCs),
    - of the %MW internal words with a maximum of 1000 internal words (store reserved for 1 Kword).

(1) The internal RAM memory is backed up by an optional 3.6V battery with an autonomy of 2 years (see *Inserting/changing the battery, p. 110*).

Note: In some cases, (configuration error, application change), it may be useful to totally erase the contents of the internal RAM or FLASH EPROM of the PLC. For this, carry out the PLC power-up keeping the DIAG button pressed during the running of the autotests (a minimum of 10 seconds).

PCMCIA memory extension cards on TSX 37-21/22 PLCs

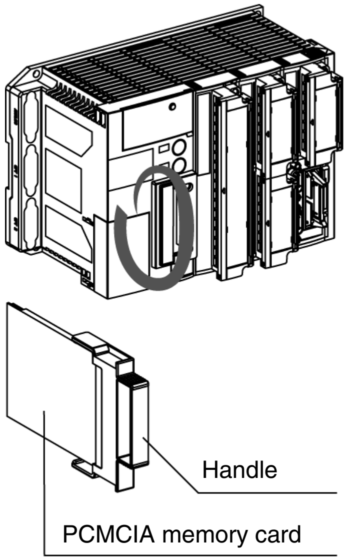
General points

The slot on the front panel of the PLC, which is protected by a cover, is for the insertion of an optional memory card of the PCMCIA type 1 format. This card extends the internal memory of the processor to store the application program and its constants.

> **Note:** the protective cover must be removed before the PCMCIA card can be inserted.

Illustration

PCMCIA card and TSX 37:



Handling PCMCIA memory cards when switched on

A PCMCIA memory card can be inserted or removed when switched on.. So that it is operational, the memory card should be equipped with a handle, the absence of which disables the starting of the processor (processor failed, led ERR lit).

> **Note:** If the program contained in the PCMCIA memory card includes the RUN AUTO option, the processor will automatically restart in RUN after the card is inserted.

Protection of the application

PMCIA cards are equipped with a lockout system which forbids write access (loading of a new program)
This protection comes in addition to the software protection (see PL7 online help) which forbids read access to the program.

Standard and Backup memory cards

Standard memory cards

There are different types of standard memory cards:
- **backup RAM type memory extension card**:
  used in particular during the creation phases and when debugging the application program, it allows all the applications transfer and modification services in connected mode; the memory is backed up by a built-in removable stack in the memory card,
- **FLASH EPROM type memory extension card**:
  used when the application program debugging has ended, it allows only a global transfer of the application, and to avoid stack backup problems.

BACKUP type memory cards

Previously loaded with the application program, it reloads the program into the processor's internal RAM memory without the need to use a programming terminal. This card can only be used in cases where the application is only in the processor's internal RAM memory and if the entire size (program + constants) is less than 15 Kwords.

Standard and backup type memory card references

Reference table:

References	Type/capacity	PLC compatibility	
		TSX 37-05 **TSX 37-08** **TSX 37-10**	**TSX 37-21** **TSX 37-22**
TSX MRP 032 P	RAM/32 K16	No	Yes
TSX MRP 064 P	RAM/64 K16	No	Yes
TSX MFP 032P	Flash Eprom/32 K16	No	Yes
TSX MFP 064P	Flash Eprom/64 K16	No	Yes
TSX MFP BA032P	BACKUP/32 K 16	No	Yes

Note: Memory capacity: K16 = Kwords (16-bit word).

Application + file type memory cards

General points

These memory cards, as well as a traditional application storage area, also have:

- a file zone allowing data to be archived by program.
  Application examples:
  - automatic storage of application data and remote consultation by modem link,
  - storage of manufacturing formulas,
  - etc
- There are two types of memory card:
  - saved RAM type application memory extension card + files. The memory is saved by a removable battery built into the memory card,
  - Flash Eprom type application memory extension card + saved RAM type file zone. This file zone is saved by a removable battery built into the memory card.

Application + file type memory card references

Reference table:

References	**Type/capacity**		**PLC compatibility**	
	Application zone	File zone (RAM type)	**TSX 37-05** **TSX 37-08** **TSX 37-10**	**TSX 37-21** **TSX 37-22**
TSX MRP 232P	RAM/32 K 16	128 K 16	No	Yes
TSX MRP 264P	RAM/64 K 16	128 K 16	No	Yes
TSX MRP 232P	Flash Eprom/32 K 16	128 K 16	No	Yes
TSX MRP 264P	Flash Eprom/64 K 16	128 K 16	No	Yes

Mini extention rack

11

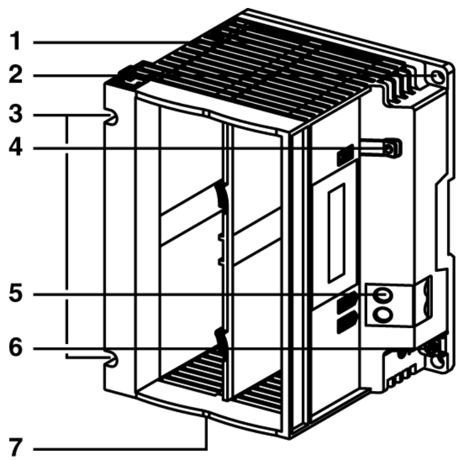
Mini extension rack

At a Glance

The mini extension rack TSX RKZ 02 allows two slots to be added to a TSX 37-10/21/22 PLC base; each of which can receive one module in standard format or two modules in semi-format.

Physical Description

The illustration below shows the mini extension rack.



Information Table

description for each of the numbers:

Number	Description
1	Extension rack with 2 slots.
2	Fixing hole of the extension rack.
3	Fixing screw of the base extension.
4	LED showing that auxiliary voltage of 24 VDC is being supplied (for relay or analog modules).
5	Supply terminals protected by a removable cover.
6	Ground connection terminals.
7	PLC base connectors (backplane bus and ground continuity).

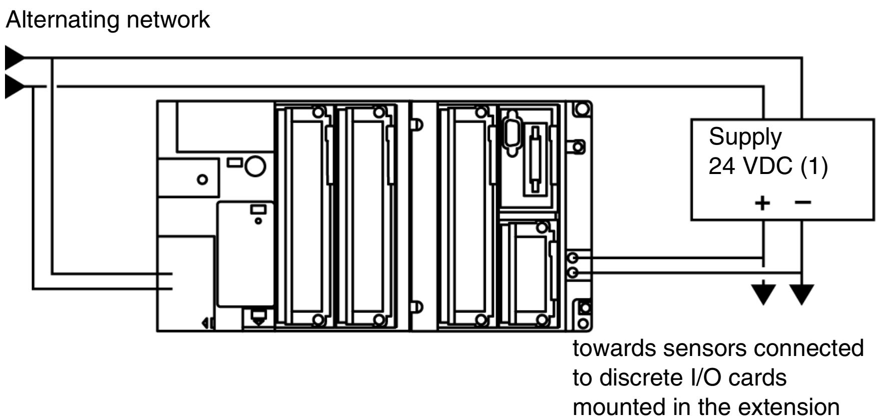
Note: For an IP20 protection rating, place the protection covers in the empty slots. These covers, which are not supplied, should be ordered separately in lots of 10, quoting the reference TSX RKA 01.

Supply

When the TSX 37-10/21/22 PLC is supplied from an alternating network, the 24 VDC is not supplied to the mini extension rack. In this case, if the relay or analog modules are present in the extension, a 24 VDC auxiliary supply **must** be connected to the supply terminals of the mini extension rack (refer to the paragraph "Supply connections").

The 24 V voltage supplied by the base allows the sensors to be supplied and possibly those in the extension, on the condition that the consumption balance does not exceed 400 mA. If this is not the case, also use a 24 VDC auxiliary supply.

Illustration supply and extension:



(1) TSX SUP• Supply Process, see (TSX Micro Installation manual, Volume 2).

TSX 37 PLC performance

12

Performances

Acquisition time for the discrete inputs (in the base or in the extension)

data table:

Number of inputs	0	16	32	48	60	72	84	96
Acquisition time for inputs without errors (microseconds)	77	176	270	356	448	539	623	708
Acquisition time for an input (microseconds)		11	8.44	7.42	7.47	7.49	7.42	7.36

Update time for the discrete outputs (in the base or in the extension)

data table:

Number of outputs	0	12	24	36	44	52	60	68
Update time for the outputs (microseconds)	42	189	314	454	573	691	825	1031
Update time for one output (microseconds)		15.75	13.08	12.61	13.02	13.29	13.75	15.16

Event processing time: SRT

This is the time between the occurrence of an event (for example rising edge on an EVT input of the module 1, presetting on a counting channel of the TSX 37-22 base or of a TSX CTZ module, etc.) and the assignment of a discrete output.

SRT = 1.5 ms (SRT = Software Response Time)

Note: Inputs 0 to 3 of module 1 should be configured with a minimum filtering value, so that they can be used in EVT inputs.

Cycle time for an application.
To calculate the overall cycle time of a discrete application, the following must be added:

- the system overhead corresponding to the type of PLC,
- the program execution time for the number of kilo instructions,
- the acquisition time for the discrete inputs,
- the update time for the discrete outputs.

For details of all these times, refer to (Reference manual PL7, volume 3, performances).

Note: To find out the true current duration of an application, with the help of the debug processor screen, you must subtract from the displayed value a value of 2 ms, corresponding to the time taken by the PLC to process information requested by the console or the network module.
The maximum duration indicated in this screen can have a high value, if a PCMCIA format communication module is present in the PLC.

Commissioning standards and conditions

13

At a Glance

Aim of this Chapter

This chapter is about the TSX Micro PLCs commissioning standards and conditions .

What's in this Chapter?

This Chapter contains the following Maps:

Standards and certifications

General points

The TSX 37 PLCs were designed to comply with the main national and international standards for industrial process control electronic equipment:

- programmable PLCs: specific requirements: functional characteristics, immunity, strength, safety, etc.
  IEC 61131-2, CSA 22.2 No.142, UL 508,
- merchant navy requirements of the major international bodies:
  ABS, BV, DNV, GL, LROS, RINA, RRS, CCS, etc.
- compliance with European Directives:
  Low Voltage: 73/23/EEC amendment 93/68/EEC
  Electromagnetic Compatibility: 89/336/EEC amendments 92/31/EEC and 93/68/EEC,
- electric qualities and self-extinguishability of insulating materials:
  UL 746C, UL 94, etc.
- hazardous locations Cl1 Div2 CSA 22.2 No.213:
  "THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS A, B, C AND D ON NON-HAZARDOUS LOCATIONS ONLY".
  WARNING: "EXPLOSION HAZARD - DO NOT DISCONNECT WHILE CIRCUIT IS LIVE UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS"

Operating conditions and environmental recommendations

Description

Temperature, humidity, altitude:

Ambient operating temperature	0°C to +60°C (IEC 1131-2 = +5°C to +55°C)
Relative humidity	10% to 95% (without condensation)
Altitude	0 to 2000 meters

Power supply voltages:

Voltages	nominal	24 VDC	100..240 VAC
	limit	19..30 VAC (1)	90..264 VAC
Frequencies	nominal		50/60 Hz
	limit		47/63 Hz

(1) 34 VDC for one hour per 24 hours, for a battery device with charger.

Protection treatment for TSX 37 Micro PLCs

General points

TSX 37 PLCs meet all "TC" treatment requirements (1).
For installations in industrial production workshops or in an atmosphere corresponding to "TH" treatment (2), TSX 37 PLCs must be embedded in IP54 minimal protection envelopes as recommended in standards IEC 60664 and NF C 20 040.
The TSX 37 PLCs themselves display an IP20 protection index (3).
They can therefore be installed without an envelope in restricted access locations not exceeding pollution degree 2 (control rooms containing no dust-producing machines or activities).

(1) "TC" treatment: treatment for all climates.
(2) "TH" treatment: treatment for warm and humid atmospheres.
(3) In the event that position is not occupied by a module, a TSX RKA 01 protection cover needs to be mounted.

Human and material safety

Human and material safety standards (1):

EC	Test Designation	Standards	Levels	
yes	Dielectric strength and Insulation resistance *	IEC61131-2 UL 508 CSA 22-2 No.142 IEC60950	24V supply 100-220V supply < 48V Discrete I/Os > 48V Discrete I/Os R> 10MΩ	1500V RMS 2000V RMS 500V RMS 2000V RMS
yes	Ground continuity	IEC61131-2 UL 508 CSA 22-2 No.142	< 0.1Ω / 30A / 2μιν	
yes	Leakage current	CSA 22-2 No.142 IEC60950	Fixed devices < 3.5mA	
yes	Protection via envelopes	IEC61131-2 CSA 22-2 No.142 IEC60950	IP20 with RKA01 covers	
no	Impact Resistance	CSA 22-2 No.142 IEC60950	Drop / 1.3m / 500g Sphere	

(1) the devices must be installed and wired according to the directions in the TSX DG KBLF manual.

Resistance of the devices to power supply L.F. turbulence

Standards concerning the resistance of the devices to power supply L.F turbulence (1):

EC	Test Designation	Standards	Levels	
yes	Voltage and frequency Variation	EN 50082-1	Un +/- 15% / Fn +/- 5% Un +/-20% / Fn +/-10%	30 min x 2 15s x 2
yes	DC voltage variation	EN 50082-1	0.85Un - 1.2Un + 5% ripple maximum	30 + 30 min
yes	Harmonic 3	IEC 61131-2	10% Un 0° / 5min - 180° / 5min	
yes	Momentary Interruptions	IEC 61131-2	AC DC	10ms 1ms
yes	Voltage peaks and troughs	IEC 61131-2	Un-0-Un ; Un/60s Un-0-Un ; Un/5s Un-0.9Ud ; Un/60s	3 cycles separated by 10s 3 cycles separated by 1 to 5s 3 cycles separated by 1 to 5s

(1) the devices must be installed and wired according to the directions in the TSX DG KBLF manual.

Resistance to H.F. turbulence

Standards concerning L.F turbulence (1):

EC	Test Designation	Standards	Levels	
yes	Absorbed oscillatory wave	IEC 61131-2 IEC 61000-4-12	AC/DC Discrete I/O ≥ 24ς	1kV MS 1kV MS
yes	Fast transients (bursts)	EN 50082-1 IEC 61000-4-4	AC/DC supply Discrete I/O > 48ς other ports	2kV MF / MC 2kV MC 1kV MC
no	Hybrid shockwave	IEC 61000-4-5	AC/DC supply Discrete AC I/Os Discrete DC I/Os Shielded Cable	2kV MF / 1kV MS 2kV MF / 1kV MS 2kV MF / 0.5kV MS 1kV MC
yes	Electrostatic Discharge	IEC 61131-2 IEC 61000-4-2	6kV contact 8kV air	
yes	Electromagnetic Field	EN 50082-2 IEC 61000-4-3	10V/m from 27MHz to 1GHz Sinusoidal Modulation Amplitude 80% / 1kHz	
yes	Conduit Turbulence	EN 50082-2 IEC 61000-4-6	3V from 0.15MHz to 80MHz Sinusoidal Modulation Amplitude 80% / 1kHz	

(1) the devices must be installed and wired according to the directions in the TSX DG KBLF manual.

Electromagnetic emissions

Standards concerning electromagnetic emissions (1):

EC	Test Designation	Standards	Levels	
yes	Conduction Limits	EN55022/55011 EN50081-2	Class A 150kHz -500kHz 500kHz -30MHz	 near-peak 79dB V average 66dB V near-peak 73dB V average 60dB V
yes	Radiation limits	EN55022/55011 EN50081-2	Class A 30MHz - 230MHz 230MHz - 1GHz	d = 10m near-peak 30dB V near-peak 37dB V

(1) the devices must be installed and wired according to the directions in the TSX DG KBLF manual.

Resistance to climatic variation

Standards concerning electromagnetic emissions (1):

EC	Test Designation	Standards	Levels
no	Dry heat	IEC 60068-2-2 Bd	60°C / 16h (E.O) 40°C / 16h (E.F)
no	Cold	IEC 60068-2-1 Ad	5°C / 16h
no	Continuous humid heat	IEC 60068-2-30 Ca	60°C / 93% Hr / 96h (E.O) 40°C / 93% Hr / 96h (E.F)
no	Cyclical humid heat	IEC 60068-2-30 Db	(55°C E.O / 40°C E.F) - 25°C / 93-95% Hr 2 cycles: 12 o' clock - 12h o' clock
no	Cyclical temperature variations	IEC 60068-2-14 Nb	0°C - 60°C / 5 cycles: 6 o'clock-6 o'clock (E.O.) 0°C - 40°C / 5 cycles: 6 o'clock-6 o'clock (E.F)
no	Temperature Rise	IEC 61131-2 UL 508 CSA 22-2 No.142	Ambient temperature: 60°C (70°C with ventilation TSXFANNxxP

(1) the devices must be installed and wired according to the directions in the TSX DG KBLF manual.

Resistance to mechanical constraints

Standards concerning electromagnetic emissions (1):

EC	Test Designation	Standards	Levels	
no	Sinusoidal vibrations	IEC 60068-2-6 Fc	3 Hz - 100Hz / 1mm amplitude / 0.7g Endurance: fr / 90min / axis	
			3 Hz -150Hz / 1mm amplitude / 2g Endurance: 10 cycles (1 octave / min)	
no	Half-sinus shocks	IEC 60068-2-27 Ea	15g x 11ms)	3 impacts / direction / axis

(1) the devices must be installed and wired according to the directions in the TSX DG KBLF manual.

Resistance to climatic variation

Standards concerning resistance to climatic variation (1):

EC	Test Designation	Standards	Levels
no	Dry heat whilst inoperative	IEC 60068-2-2 Bb	70°C / 96h
no	Cold whilst inoperative	IEC 60068-2-1 Ab	-25°C / 96h
no	Humid heat whilst inoperative	IEC 60068-2-30 dB	55°C ; 25°C / 93%Hr ; 95 %Hr 2 cycles: 12 o' clock - 12h o' clock
no	Thermal shocks whilst inoperative	IEC 60068-2-14 Na	-25°C ; 25°C 2 cycles: 3 o'clock - 3 o'clock

(1) the devices must be installed and wired according to the directions in the TSX DG KBLF manual.

Resistance to mechanical constraints

Standards concerning resistance to mechanical constraints (1):

EC	Test Designation	Standards	Levels
no	Flat free drop	IEC 60068-2-32 Ed	10cm / 2 drops
no	Free drop from controlled position	IEC 60068-2-31 Ec	30° or 10cm / 2 drops
no	Random free drop (conditioned material)	IEC 60068-2-32 Option 1	0.5m / 5 drops

(1) the devices must be installed and wired according to the directions in the TSX DG KBLF manual.

Abbreviations used

- **EC**: tests required by EC directives,
- **Un**: nominal voltage,
- **Fn**: nominal frequency,
- **Ud**: detection level under power,
- **MS**: serial mode,
- **MC**: common mode,
- **MF**: wired mode,
- **E.O**: open device,
- **E.F**: closed device,
- **Hr**: relative humidity,
- **f.r**: resonance frequency.

TSX 37 PLC: Mounting

III

At a Glance

Aim of this Part

This part describes the installation and connection of the TSX 37 PLCs.

What's in this part?

This Part contains the following Chapters:

TSX 37 PLC: installation

14

At a Glance

Aim of this Chapter

This chapter describes the installation of the TSX 37 PLCs, their container and the different modules.

What's in this Chapter?

This Chapter contains the following Maps:

Rules of installation

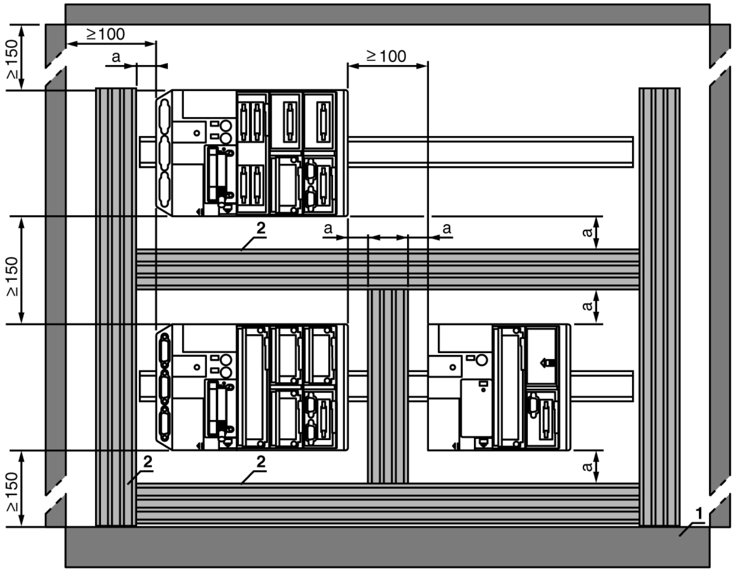
PLC arrangement

Certain rules must be respected for installing containers and inserting modules during the mounting of the TSX 37 PLCs:

- The PLCs should be air-cooled by natural convection. To facilitate their ventilation, they should be installed vertically with the ventilation louvers on the top. **Only the horizontal position is therefore authorized**.
- If several PLCs are installed in the same rack, it is recommended that the following provisions be respected:
  - leave a space of at least 150 mm between two overlapped PLCs, to allow a passage for the wiring ducts and to facilitate air circulation,
  - it is advised to install heat generating devices (transformers, supply modules, power switches, etc) above the PLCs,
  - leave a space of at least 100mm at each side of a PLC (with or without extension) to allow a passage for the wiring and to facilitate air circulation,
  - if the internal RAM memory is backed up by a battery (optional), it will be necessary to provide sufficient space (>= 50 mm) between the PLC and the duct, in order to allow the hatch to be opened and access to the battery.

Illustration

Principle diagram:

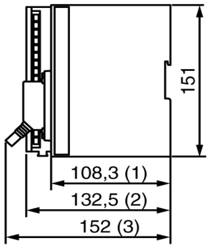


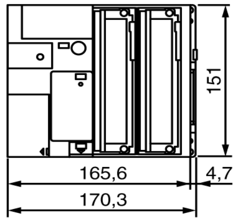
(1) >= 50 mm
1 Installation or casing.
2 Trough or cable tray.

> **Note:** In the case of the use of ventilation devices, see *Rules for installation of the racks with ventilation modules, p. 143*

Dimensions

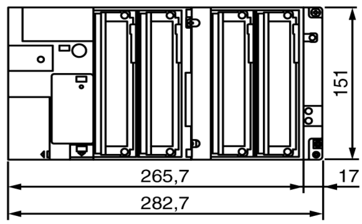
TSX 37-05 / TSX 37-10 PLCs





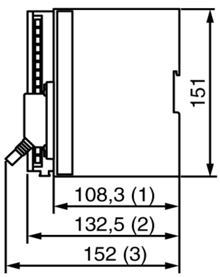
TSX 37-05 and TSX 37-10 without mini extension rack TSX RKZ02

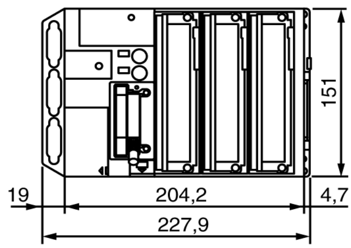
(1) PLC empty
(2) With screw terminal block.
(3) With HE10 or SubD connectors



TSX 37-10 with mini rack extension TSX RKZ02

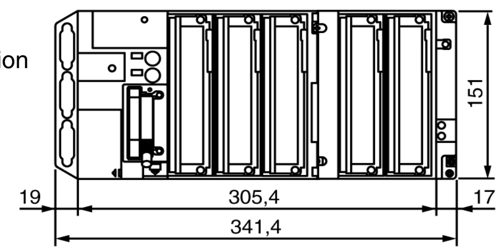
TSX 37-08/ TSX 37-21/TSX 37-22 PLCs





TSX 37-08 and TSX 37-21/22 without TSX RKZ02 mini-extension rack

TSX 37-21/22 with TSX RKZ02 mini-extension rack



(1) PLC empty.
(2) With screw terminal block.
(3) With HE10 or SubD connector.

PLC mounting/fixing

General

The TSX 37 PLCs, with or without mini extension rack can be mounted on a DIN profile, a Telequick board or on a panel:

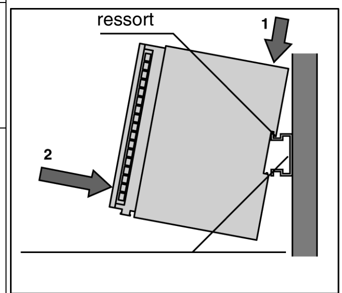
- the process of fixing onto a DIN profile requires no accessories,
- the process of fixing onto a Telequick board or on a panel is performed by 4 screws with a diameter of M4 for the base and 2 screws with a diameter of M4 for the mini extension rack, these 6 screws are not supplied. If mounting is difficult, from a mechanical point of view, it is preferable to fix the PLC onto a board or panel.

The installation rules (See *Rules of installation, p. 98*) are to be respected, whatever the type of mounting.

Mounting the base onto a DIN profile (or rail)

Procedure to be followed

Carry out the following steps:

Step	Description	Illustration
1	Position the PLC on the DIN profile as indicated by the diagram.	 profilé chapeau larg.35 mm :AM1-DE200
2	Push down on the back part of the PLC (**1**), to compress the springs, then tip it backwards against the profile (**2**).	
3	Release the PLC in order to lock it.	

Note: This type of fitting does not comply with normal operating conditions in terms of resistance to vibrations (acceleration: 2g).

Dismounting the PLC from the DIN profile (rail)

To dismount the PLC, carry out the steps for the mounting process in reverse, i.e.:

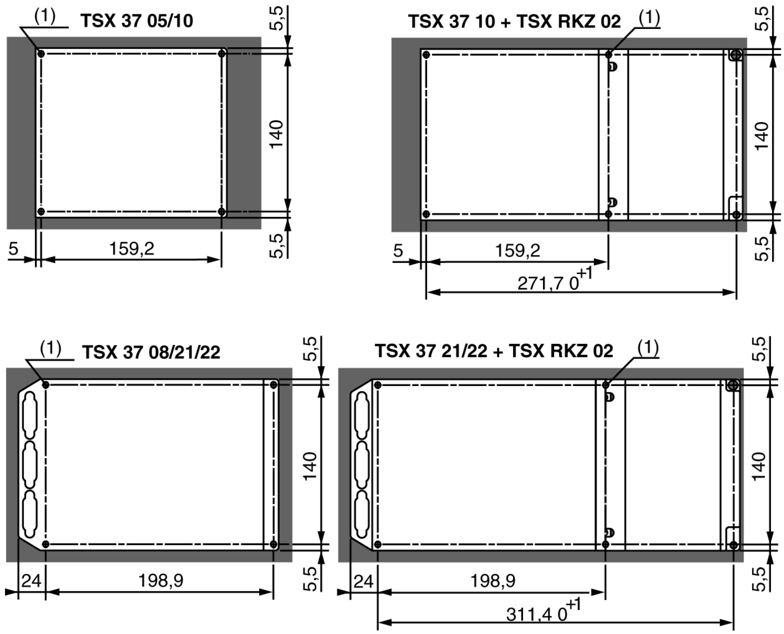
- push down on the back part of the PLC (**1**), to compress the springs, then tip it up towards the front to disengage it from the DIN profile (**2**).

Note: In order to guarantee the good working order of PLCs in a strict electromagnetic environment, it is necessary to mount the modules on metal supports which are correctly grounded.

Mounting the PLC onto a board or panel

Mounting distance

Illustration (side in millimeters) :

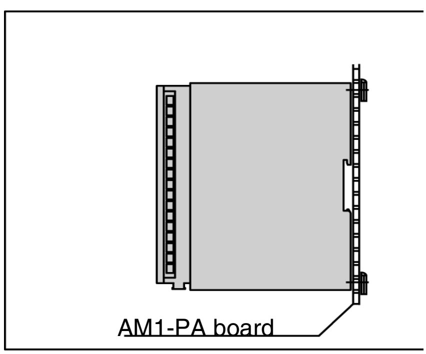


(1) The diameter of the fixing holes must be sufficient to take M4 screws.

Procedure for mounting the PLC onto a Telequick board

Fix the base with 4 screws with a diameter of 4, mounted in the fixing holes located in the elbows of the PLC (4 screws with M4x16AF1-VA416 captive washers and 4 M4 AF1-EA4 clip nuts).

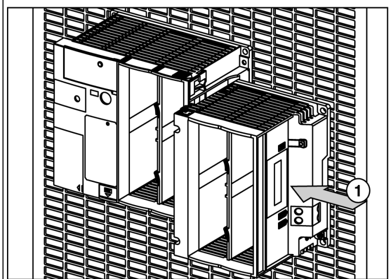
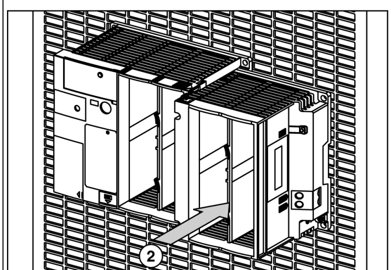
Illustration:

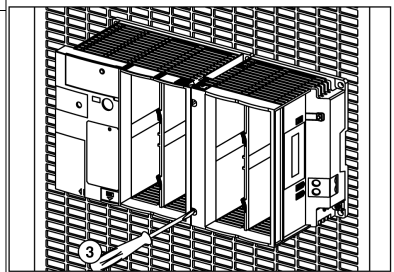


Procedure for assembling the extension with the base

Procedure

Carry out the following steps:

Step	Action	Illustration
1	Remove the access cover to the connection connector of the mini extension rack.	
2	Pin the mini extension rack against the PLC base, with an offset to the front of approx. 1 cm, then slide it to the back, in order to check the mechanical coupling and the connection of the 2 elements.	

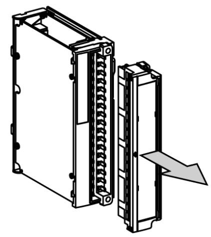
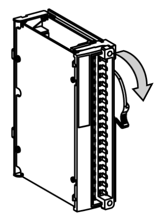
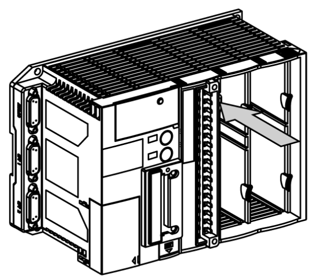
Step	Action	Illustration
3	Screw on the 2 mini extension rack captive screws, to fix to the base.	
4	If the PLC is mounted onto a board or panel and to improve vibration resistance, it is possible to fix the mini extension rack onto the board, in addition to operation (3). In order to do this, use 2 screws with a diameter of 4, mounted in the oblong fixing holes of the mini extension rack (2 screws with M4x16 AF1-VA416 captive washers and 2 M4 AF1-EA4 clip nuts).	

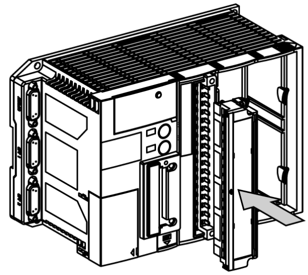
If the PLC is mounted on the DIN profile, the mini extension rack is not fixed to it, but is fixed to the base (with additional support from a lateral spring).

Inserting a module

Procedure to be followed

Carry out the following steps:

Step	Action	Illustration
1	If the module is equipped with a screw terminal block, remove it by successively unscrewing the 2 fixing screws. This operation progressively disconnects the terminal block. You are advised not to totally unscrew one screw and then the other, but alternate between the two.	
2	Set the latch to the "unlocked" position by switching it to the bottom of the module.	
3	Slide the module into its slot; this is helped by runners. Then push the front of the module in order to connect it.	
4	Switch the latch up, which locks the module.	

Step	Action	Illustration
5	If the module is equipped with a screw terminal block, insert it, alternatively screw the 2 screws, which progressively connects the terminal block to the module.	

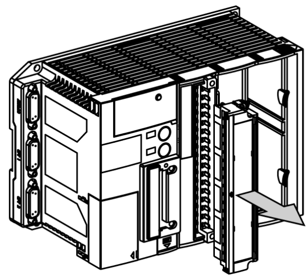
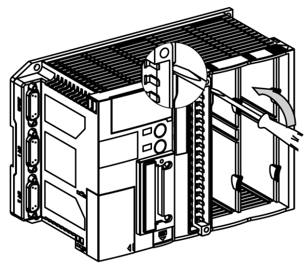
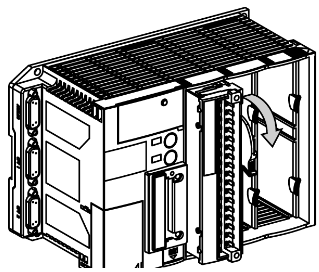
Note: In order to maximize individual safety in relation to equipment supplied with 100120 V or 200240 V, the life span of the equipment and to avoid disrupting input/output exchanges; mounting a module or terminal block should be performed under the following conditions:
- PLC switched off for the module,
- sensor and pre-actuator voltage cut for the terminal block.

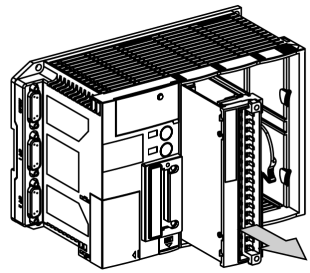
Removing a module

Procedure to be followed

Removing a module is performed following the same sequence as for inserting a module in a rack.

Carry out the following steps:

Step	Action	Illustration
1	If a module has a terminal block, remove it.	
2	Switch the latch down to disconnect the module. To do this, insert the tip of a flat screwdriver into the groove provided and lever towards the bottom to start unlocking the module.	
3	Finish levering the latch by hand, which disconnects the module.	

Step	Action	Illustration
4	Slide the module out of its slot by pulling it forwards. Switch the latch up and if necessary fix the terminal block back onto the module.	

Note: In order to maximize individual safety in relation to equipment supplied with 100120 V or 200240 V, the life span of the equipment and to avoid disrupting input/ output exchanges; dismounting a module or terminal block should be performed under the following conditions:

- PLC switched off for the module,
- sensor and pre-actuator voltage cut for the terminal block.

Inserting/changing the battery

Installing the battery

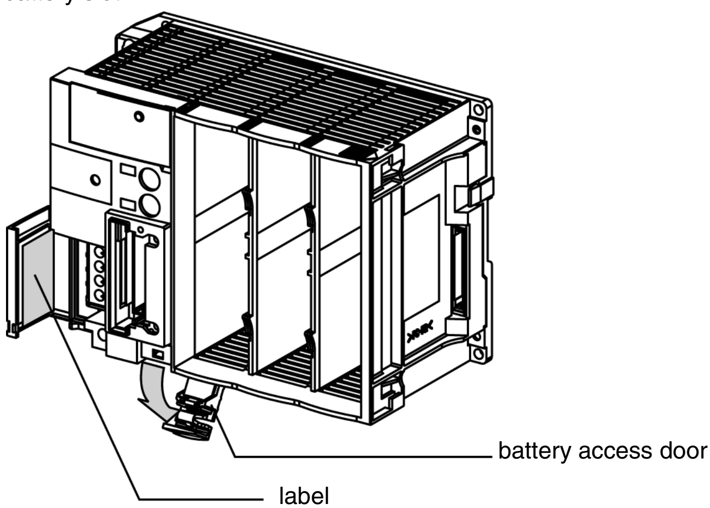
Carry out the following steps:

Steps	Action
1	Unlock the battery access door by pressing on the front panel. This opens the door downwards.
2	Place the battery in its slot, taking care to respect polarities as marked on the module.
3	Push the door back up to close and lock.

Note: This operation can be carried out when the PLC is on or off. If the power supply is cut off when the battery is being changed, the RAM is backed up for a maximum of 30 minutes.

Illustration

battery slot:



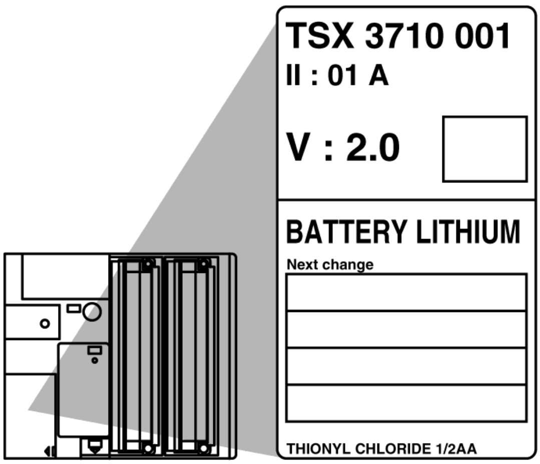
Changing the battery

The battery (TSX PLP 01), which backs up the internal RAM should be changed **every 2 years** or when the BAT light lights up (voltage supplied by a < 2.5 V battery). To do this, use the same sequence as for inserting a battery:

Step	Action
1	Push the battery access door to open it downwards.
2	Remove the defective battery from its slot.
3	Put in the new battery, observing the polarities.
4	Push the door back up to close and lock.

Important

To ensure that the battery is changed every 2 years, you are advised to note the date of the next change on the label provided for this purpose and located on the inside of the access door of the supply terminal blocks.
Illustration:



Note: When the battery supply voltage becomes less than 2 V, the internal RAM is no longer backed up (from 30 minutes onwards), when the PLC is switched off.

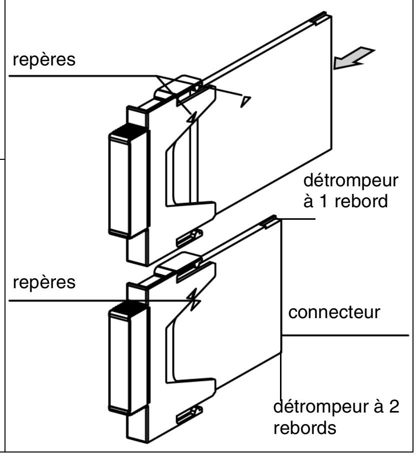
Mounting/removing the memory card

Introduction

The memory card must be equipped with a handle to be inserted into the slot (normally factory-fitted). If this is not the case, mount the handle on the card by following the procedure described below.

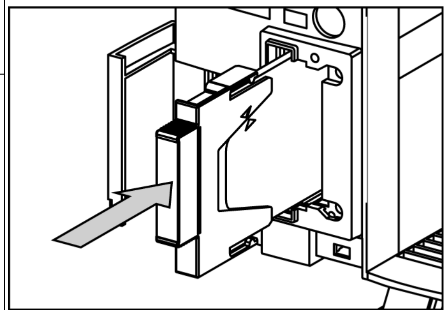
Mounting the handle

Carry out the following steps:

Step	Action	Illustration
1	Position the end of the memory card unequipped with a connector at the entry to the handle. During this operation, align the markings (in the form of a triangle) on the handle and on the card label.	
2	Slide the memory card into the handle until it stops. The card is now firmly attached to the handle.	

Mounting the memory card in the PLC

To insert the PCMCIA card into the PLC, carry out the following steps:

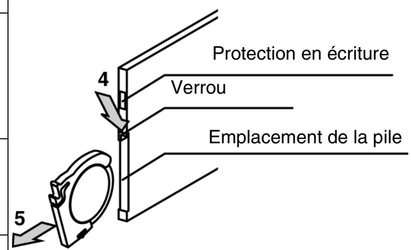
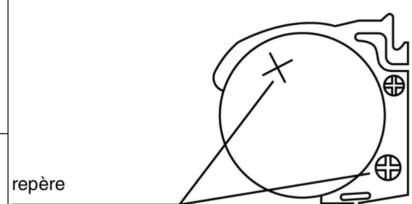
Step	Action	Illustration
1	Remove the protective cover by unlocking it, then pulling it towards the front of the PLC (use a screwdriver).	
2	Place the PCMCIA card fitted with its handle into the opened slot. Slide the assembly in until the card can go no further, then press on the handle to connect the card.	

Note: When inserting the PCMCIA card into its slot, check that the hardware locating devices are correctly positioned:
- 1 edge on top,
- 2 edges down (or write protection down)

Changing the battery on the PCMCIA card

Procedure to be followed

Some PMCIA cards are equipped with a battery, with the product reference TSX BATM01, which must be changed.
To do this, perform the following steps:

Step	Action	Illustration
1	Remove the card from its slot by pulling the handle forwards out of the PLC.	
2	Separate the PCMCIA card from its handle by pulling the two components (card and handle) in opposite directions.	
3	Hold the PCMCIA card so you can access the battery slot. This is at the end of the card without the connector.	
4	Unlock the battery holder, which is at the end of the card without the connector. To do this, depress the latch down from the card (opposite direction to the write protect microswitch) by pulling it backwards.	
5	Remove the battery and holder unit from its slot.	
6	Swap the defective battery for an identical 3V battery. Polarities must be observed by placing the + signs on the holder and the battery on the same side.	
7	Place the battery and holder unit back in its slot, then lock it. To do this, carry out the removal procedure in reverse.	
8	Fix the PCMCIA card into its handle.	
9	Put the card with its handle back into the PLC.	

Battery life

data table:

PCMCIA card stored in normal conditions (-20°C to 70°C)	12 months
PCMCIA card fitted in an operating PLC (0°C to 60°C)	36 months

Note: When in operation, the ERR LED flashes if there is a fault with the PCMCIA card battery.

Screw tightening torque

General

data table:

Technological elements	**Maximum tightening torque**
Fixing screws of the PLCs, modules and terminal blocks Ground connection screws	0.8 N.m
Discrete module terminal block screws Supply terminal block screws SUB D connector screws Different cable and lead connector screws	0.8 N.m
TSX DMZ 16 DTK/**etc.** module casing terminal block screws	0.5 N.m

TSX 37 PLC: connection

15

At a Glance

Aim of this Chapter

This Chapter deals with the connection of TSX 37 PLCs.

What's in this Chapter?

This Chapter contains the following Maps:

Ground connection of the PLC

General

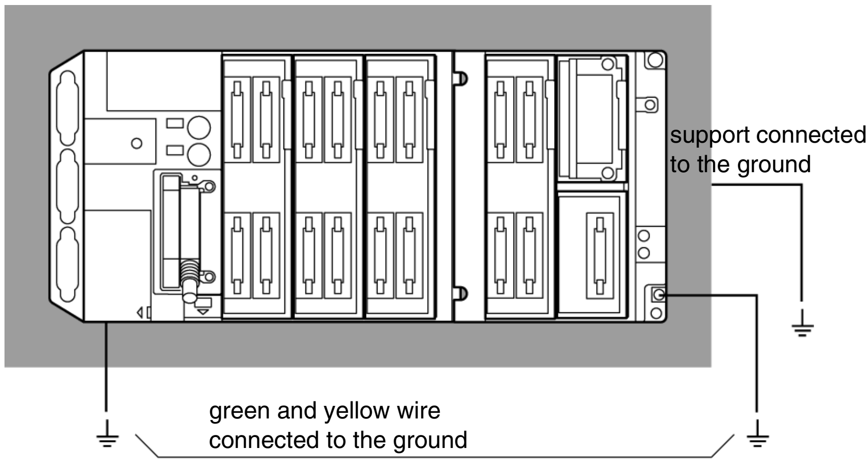
Grounding the TSX 37 bases and mini extension rack is provided by the rear section, which is metallic. This guarantees efficient working order for PLCs in environment norms, on condition however that they be fixed on a correctly grounded metal support. The base and extension should be mounted on the same support or supports, which are correctly coupled together.

To ensure personal safety, **it is always necessary** to ground the base ground connection terminals and the mini extension rack.

For this, use a 2,5 mm^2 (minimum) green/yellow wire of the shortest length possible.

Illustration

Ground connections:



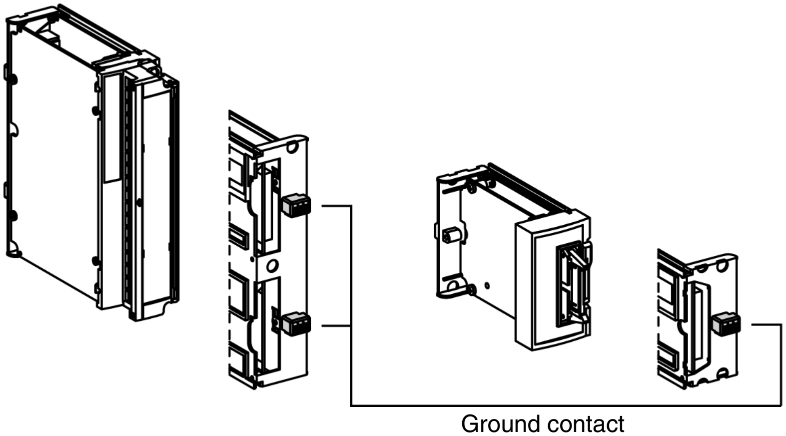
Grounding the modules

General

Grounding the modules is performed with a contact on the back (2 contacts for the modules in standard format), which connects to a metallic finger forming a part of the PLC base or mini extension rack when inserted into a module. **This connection** ensures grounding.

Illustration

Ground connection:



Supply connections

Introduction

The TSX 37 range offers two possibilities for the supply of PLCs:
- alternating current,
- and direct current.

The PLC is supplied with alternating current

- the base delivers the 24 VDC (24 VR) voltage necessary to supply the coils of its integrated relay modules,
- however, the mini extension rack **must** be supplied with 24 VDC in the following cases:
  - analog modules are positioned in the extension,
  - relay modules are positioned in the extension, The 24 VDC supply tolerance must be +/- 10% max. If this voltage disappears or there is a reduction of more than 10%, good working order of the relay modules is no longer ensured. No error indication is given to the application program. If detection of this error is desired, you are advised, for example, to use a dividing bridge inline with an analog input of the base configuration.

Note: When the PLC is supplied with alternating current, it is **strictly forbidden** to use the 24 V sensor voltage, provided by the base, to supply the mini extension rack with 24 VDC (24 VR).

The PLC is supplied with direct current (24 VDC not insulated)

- The base delivers the 24 VDC (24 VR) voltage necessary to supply the coils of the relay/analog modules that are integrated in the base and/or the mini extension rack.
  The TSX 37 PLCs and modules can continuously function in a voltage range between 19 and 30 VDC (and up to 34 VDC for 1 hour for a battery operated device with charger).
  However, if relay modules are fitted to the PLC (base or extension), the 24 VDC supply should have a maximum tolerance of +/- 10%.

  A TSX SUP supply can be used to provide the 24 VDC voltage (refer to wiring diagrams on the following pages).

Connection rules

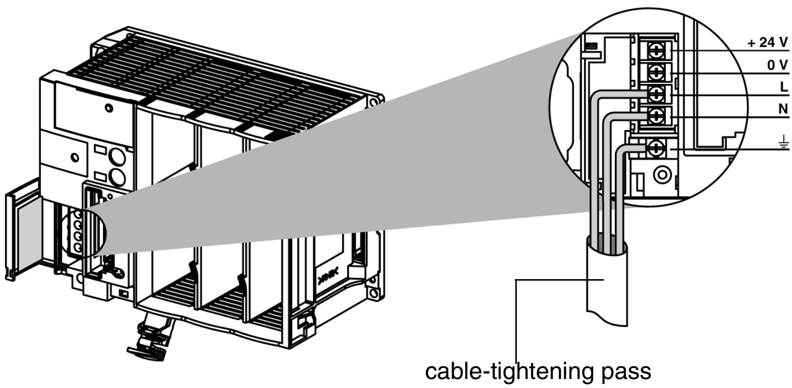
General

The TSX 37 PLC supply terminal block is protected by a door, which allows access to the wiring terminals. Wire output passes vertically to the bottom. Wiring can be maintained in position by a cable tightening clip.

Note: Plan for a device, which protects and cuts the supply upstream of the PLC. When the PLC is supplied by a direct network, the length of the supply cable must be limited to 30 m if the wires have a cross section of 2.5 mm^2 or 20 m if the wires have a cross section of 1.5 mm^2, to prevent a loss of line.

Illustration

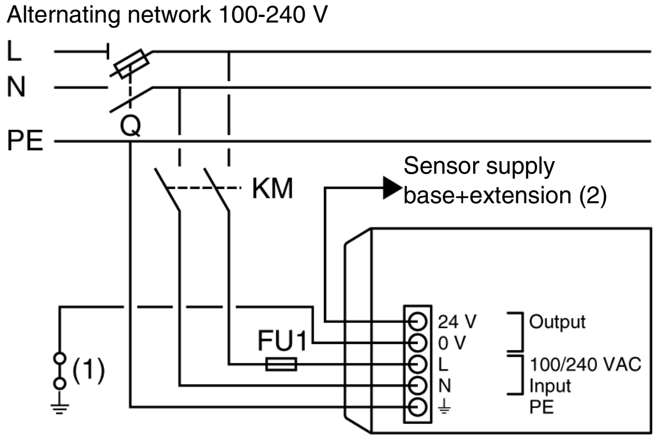
Principle diagram:



Connecting PLCs supplied with alternating current

Connecting a single PLC

Illustration:

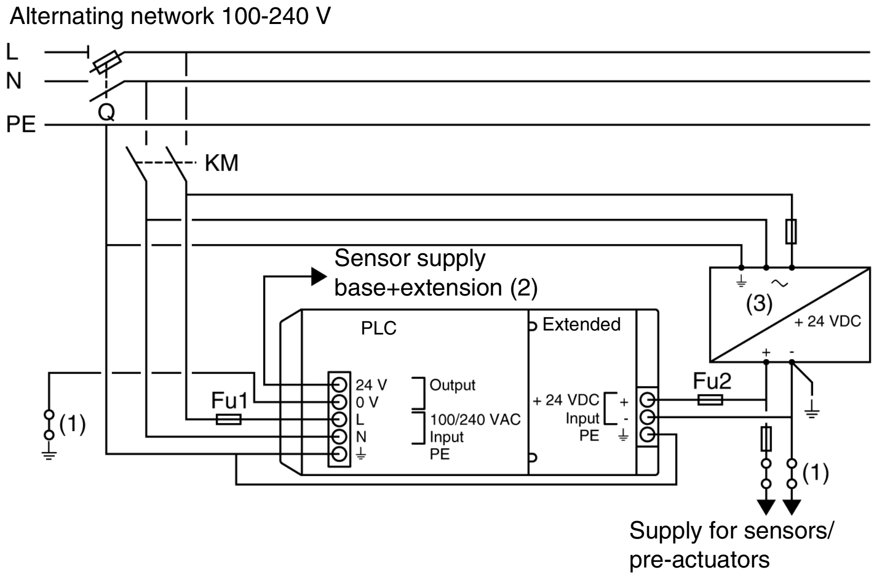


Q: general isolator,
KM: line contactor or circuit breaker,
Fu1: 1 A fuse with time delay.

(1) : isolation strip for finding grounding faults,
(2) : do not exceed 400 mA.

Connecting a PLC with an extension

Illustration:

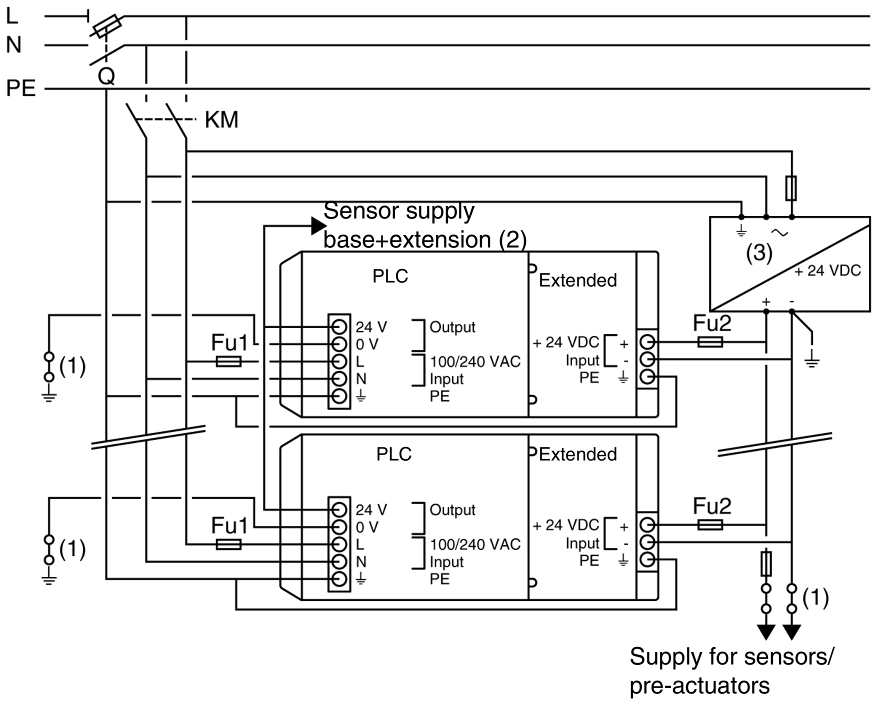


Q: general isolator, KM: line contactor or circuit breaker,
Fu1: 1 A fuse with time delay, Fu2: standard 0.5 A fuse,
(1) : isolation strip for finding grounding faults,
(2) : do not exceed 400 mA,
(3) : only if the discrete relay or analog modules are fitted in the extension.
if a TBX SUP 10 or TSX SUP 1011 supply is used, remove Fu2.

Connecting several PLCs

Illustration:

Alternating network 100-240 V



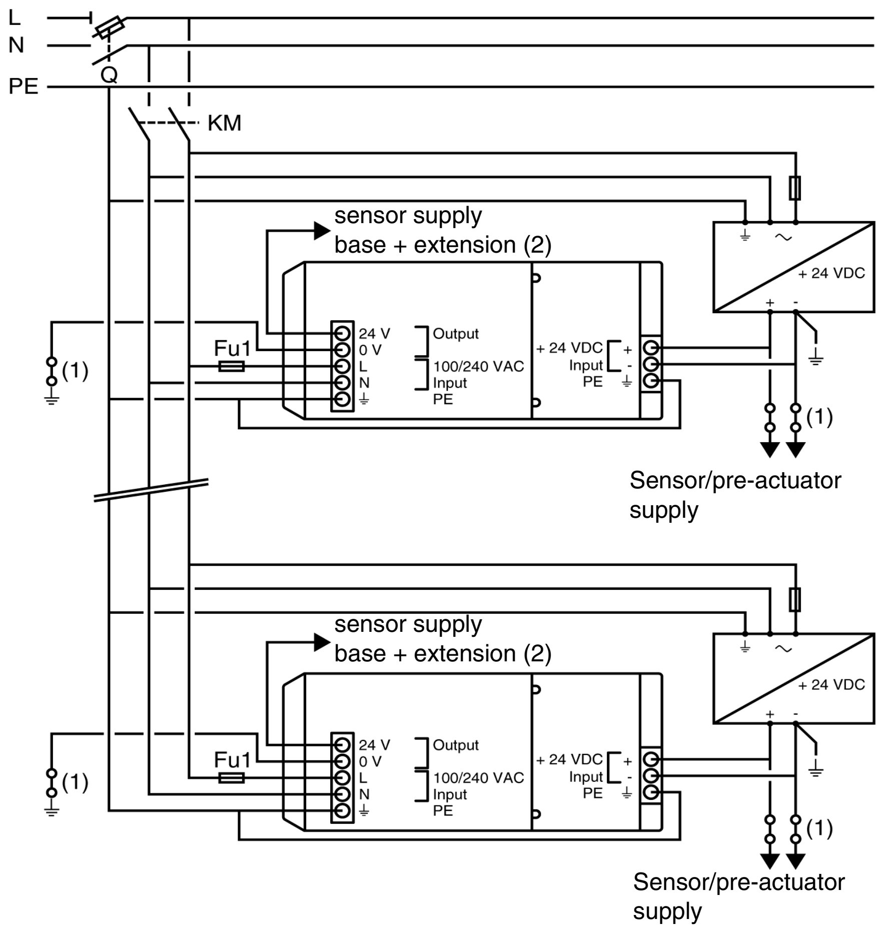
Q: general isolator, KM: line contactor or circuit breaker,
Fu1: 1 A fuse with time delay, Fu2: standard 0.5 A fuse,
(1) : isolation strip for finding grounding faults,
(2) : do not exceed 400 mA,
(3) : only if the discrete relay or analog modules are fitted in the extension.
if a TBX SUP 10 or TSX SUP 1011 supply is used, remove Fu2.

Connecting several PLCs supplied by TBX SUP 10 or TSX SUP supplies....

Principle diagram

Illustration:

100-240 V alternating network



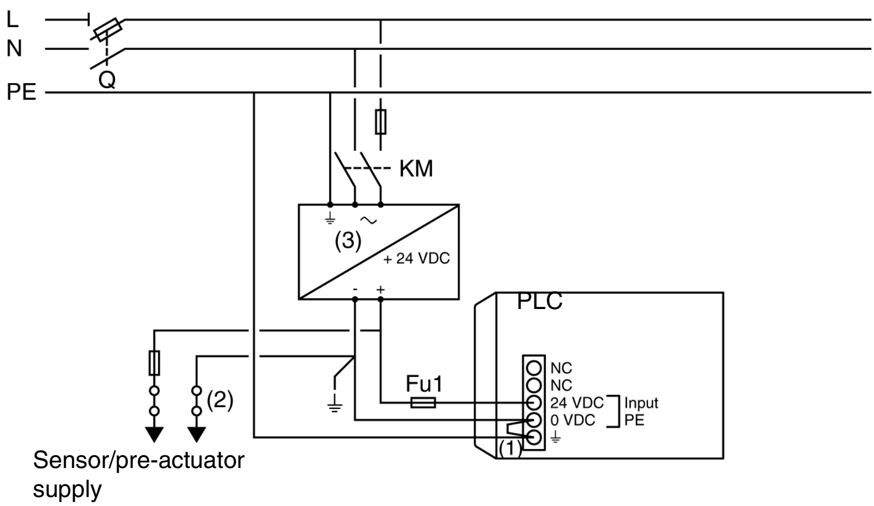
Q : general sectionner.
KM : circuit breaker or line switch.
Fu1 : 1 A fuse with time delay.
(1) : isolating blade to search for an grounding error.
(2) : do not exceed 400 mA.
(3) : only if the discrete relay or analog modules are implanted in the extension.

Connecting PLCs supplied with direct current

Connecting a single PLC

Illustration:

Alternating network 100-240 V

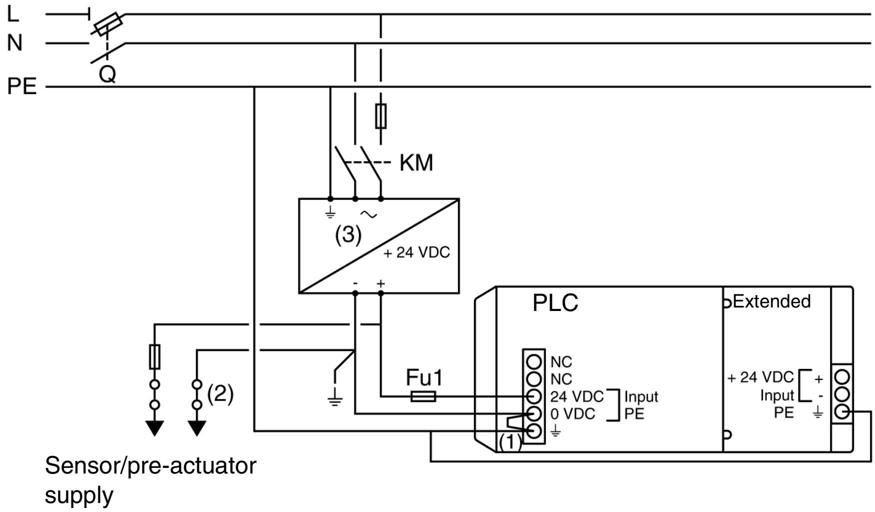


Q: general isolator, KM: line contactor or circuit breaker,
Fu1: 4A fuse with time delay,
(1) : external shunt supplied and mounted on the PLC. Should not be removed,
(2) : isolation strip for finding grounding faults. The external shunt must be removed in order to do this, so that the supply terminal block can be disconnected from the grounded PLC.
(3) : using a TSX SUP supply.

Connecting a PLC with an extension

Illustration:

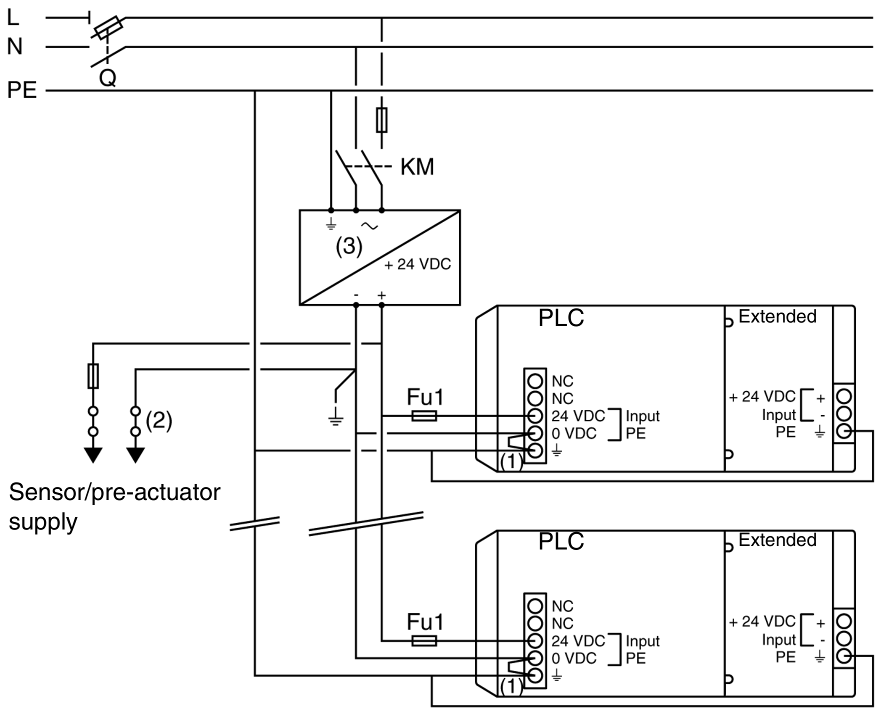
Alternating network 100-240 V



Q: general isolator, KM: line contactor or circuit breaker,
Fu1: 4A fuse with time delay,
(1) : external shunt supplied and mounted on the PLC. Should not be removed,
(2) : isolation strip for finding grounding faults. The external shunt must be removed in order to do this, so that the supply terminal block can be disconnected from the grounded PLC.
(3) : using a TSX SUP supply.

Connecting several PLCs

Illustration:
Alternating network 100-240 V



Q: general isolator, KM: line contactor or circuit breaker,
Fu1: 4A fuse with time delay,
(1) : external shunt supplied and mounted on the PLC. Should not be removed,
(2) : isolation strip for finding grounding faults. The external shunt must be removed in order to do this, so that the supply terminal block can be disconnected from the grounded PLC.
(3) : using a TSX SUP supply.

Connecting PLC(s) supplied by a continuous floating network (not grounded)

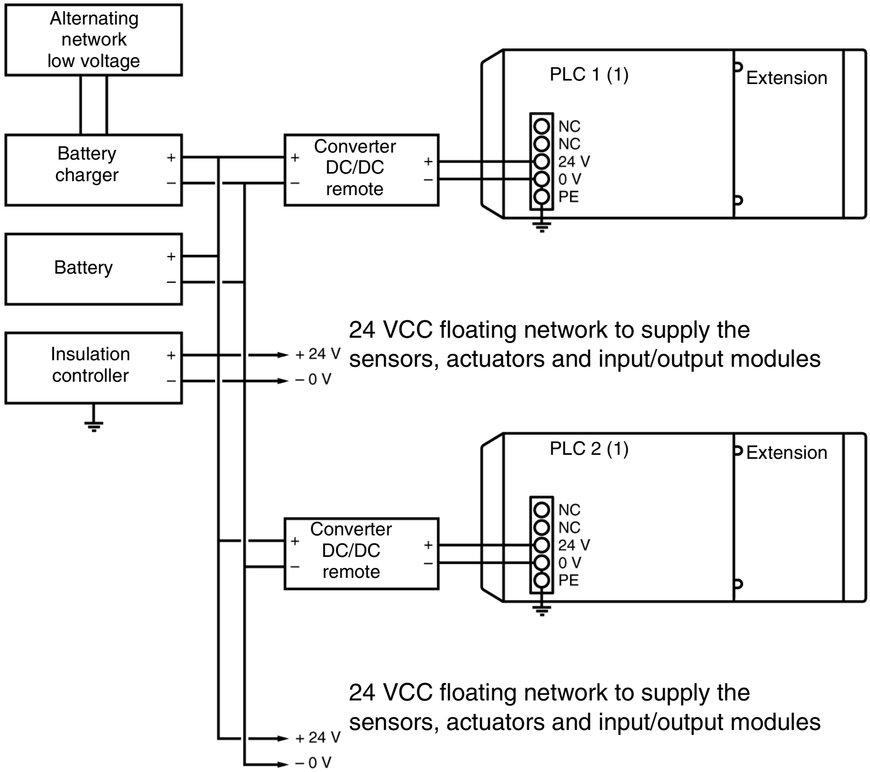
General

The TSX 37 PLCs with a 24 VDC network supply do not have primary/secondary insulation and the internal 0V is coupled with the mechanical ground connection of the PLC. This results in the 0V of the 24VDC network being coupled with the same mechanical ground connection and the particular provisions to be taken for the specific applications and in particular **Applications in a marine environment**, which use a "floating" mount.

The only correct way of connecting a TSX 37 (1) PLC to this type of "floating" network is to place an insulated continuous converter (24 VDC/24 VDC) near each PLC, and use an insulation controller upstream of the converter(s). With this type of mounting, the first insulation error (i.e. a wire leading one of the floating network polarities to the ground connection) is detected by the insulation controller and does not produce any error affecting the automatic operation.
(1) TSX 37 10 PLC: TSX 3710 128DR1/128DT1/128DTK1/164DTK1
TSX 3721/22 PLC: TSX 3721 1**..**/ TSX 3722 1**..**

Principle diagram

Illustration:



(1) TSX 37 10 PLC: TSX 3710 128DR1/128DT1/128DTK1/164DTK1
TSX 3721/22 PLC: TSX 3721 1../ TSX 3722 1..

Note: The DC/DC converter should be very close to the PLC 2 and the + 24 VDC polarity wire should be connected in such a way that it cannot accidentally lead to the ground connection.

Specific provisions for a continuous floating network

Discrete inputs/ outputs

The Discrete inputs/outputs are insulated, the sensor, actuator and discrete input/ output module supply should come directly from the floating 24 VDC network.

Counting inputs, built in to the TSX 37 22 1.. PLC bases.

These inputs are insulated; the supply and that of the input’s related sensors should come from the floating 24 VDC network.

Analog inputs/ outputs, built in to the TSX 37 22 1.. PLC bases.

These inputs/outputs are not insulated (0V grounded), and should not be used with this type or mounting.

In cases where analog inputs/outputs are required, only use analog input/output modules (TSX AEZ**etc.**/ASZ**etc.**), which are insulated. The sensor supply related to analog inputs should come from the floating 24 VDC network, with the outputs delivering a voltage and a current insulated from the ground connection.

Module with relay outputs

If the modules with relay outputs are built into the PLC, the DC/DC converter should deliver a voltage of 24 VDC +/- 10%.

PLC with a mini extension rack

If the PLC has a mini extension rack, the mini extension rack is not supplied with 24 VDC.

Communication between PLCs

Communication links between PLCs: No specific provision.
- communication via terminal port: insulation is performed by the TSX P ACC01 unit,
- communication via PCMCIA card: the PCMCIA communication card ensures insulation.

Sensor and pre actuator supply control

General

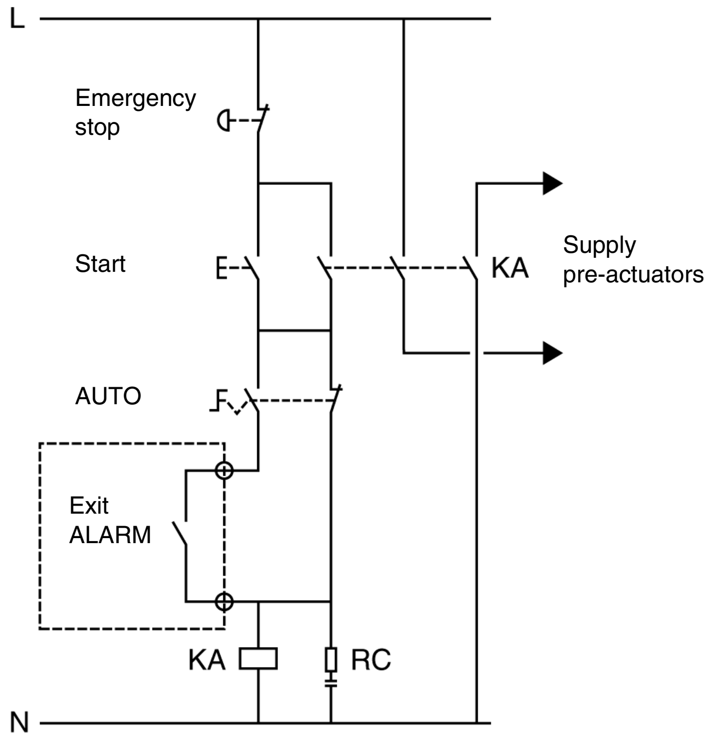
It is advised to control the different supplies with the following sequence:

- Power up PLC and inputs (sensors) supply with the KM contactor.
- If the PLC is in RUN and AUTO mode, power up output (pre-actuators) supply with the KA connector. This is performed via the ALARME (%Q2.0) output, which will be relayed (to KA1) if the output is static (continuous supply).

Furthermore, the safety standards require authorization from the operations personnel, before the installation is rebooted following a stop (arising from a power outage or from an emergency stop). The following control diagrams take into account these standards.
The MANU/AUTO switch forces the outputs from a terminal, when the PLC is in STOP mode.

PLC supplied with alternating current

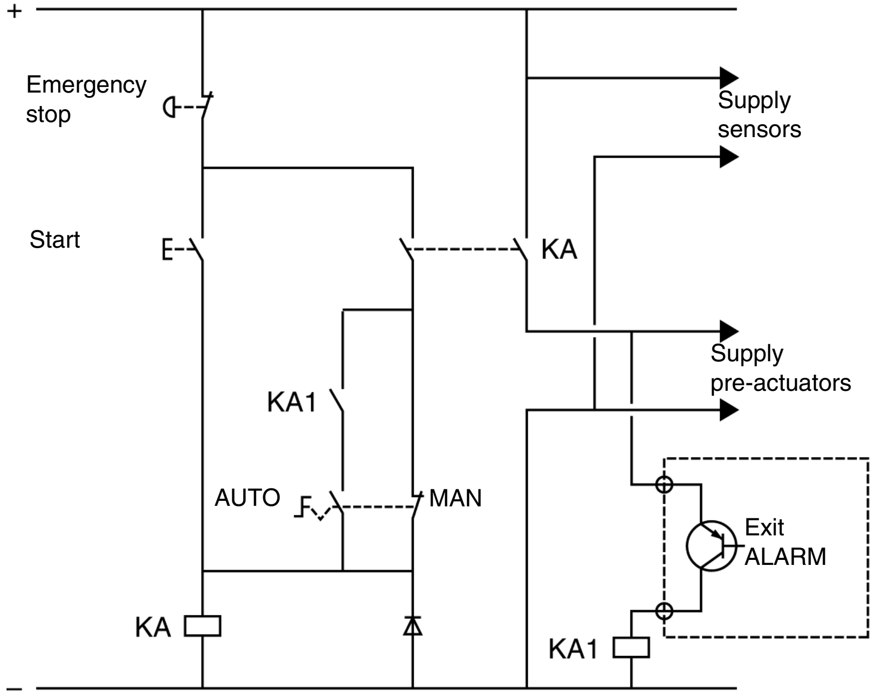
Illustration:



KA : Control contactor controlled by the ALARM (Q2.0) output in AUTO mode.

PLC supplied with direct current

Illustration:



KA : contactor controlled at the ALARM (Q2.0) output by the KA1 relay.
KA1 : relay at the ALARM (Q2.0) output or static (Q2.0) output.

Ventilation module

16

At a Glance

Aim of this Chapter

This chapter describes the ventilation module for the TSX Micro PLC.

What's in this Chapter?

This Chapter contains the following Maps:

Ventilation module: general introduction

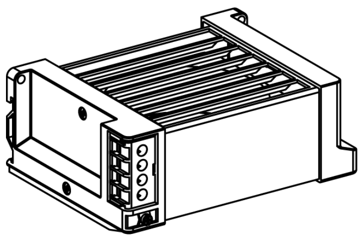
Introduction

The ventilation modules installed above the TSX Micro PLC station racks ensure a forced convection of air, so that the ambient temperature inside the envelope is homogenized, therefore eliminating the various possible hot spots.

Note: A temperature probe built into each module informs the user when the ambient temperature has reached its maximum value.

Illustration

The illustration below shows the ventilation module.



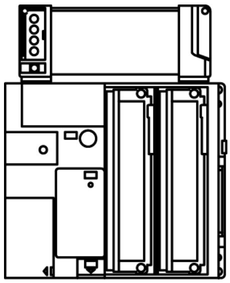
Use of ventilation modules

The use of these modules is recommended in the following cases:

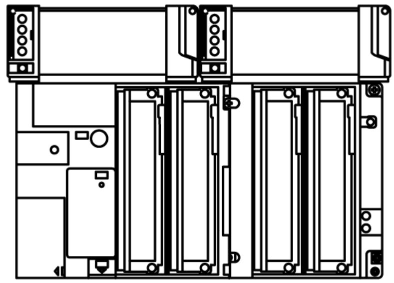
- **Ambient temperature between 25°C and 60°C:** the life of various TSX Micro PLC components is extended (extension by 25% of the MTBF).
- **Ambient temperature between 60°C and 70°C:**the ambient temperature being limited to 60°C without ventilation, forced ventilation makes it possible to lower the temperature inside the modules by 10°C, which brings the internal temperature of the modules back to the equivalent of 60°C at ambient temperature.
  In these conditions, the product life span is increased by more than 50%.

Different module types

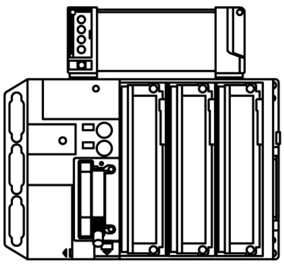
Three ventilation modules are available, adapted to the main supply networks: ventilation module with 24 VDC, 110 VAC or 220 VAC power supply.
According to the type of PLC, TSX 37-05/08/10 or TSX 37-21/22 with or without TSX RKZ 02 mini extension rack, 1 or 2 ventilation modules must be installed.



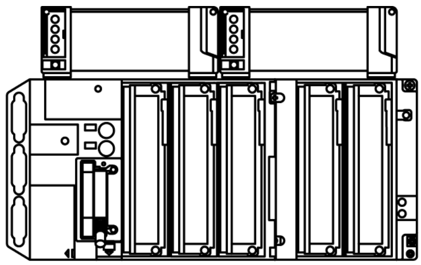
TSX 37-05/10 PLCs only



TSX 37-10 + TSX RKZ 02 PLC



TSX 37-08/21/22 PLCs only

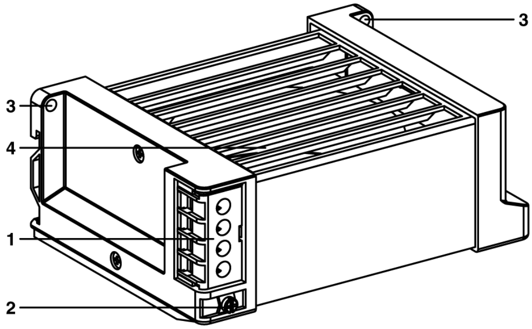


TSX 37-21/22 + TSX RKY 02 PLC

Ventilation module: physical presentation

Illustration

Descriptive diagram:



Number table

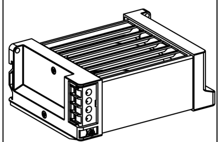
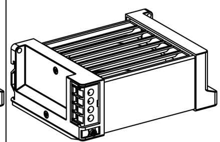
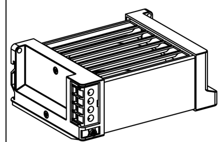
This table gives the function description of the numbers:

Address	Description
1	Connection terminal block: • of the module supply voltage, • of the heat sensor and LED (or inline pre-actuator) supply. Each terminal can receive 1 1.5 mm^2 wire without a wire end ferrule or 2 1 mm^2 wires with wire end ferrules.
2	Terminal for connecting a module to the ground connection.
3	Module fixing holes (screw M4 x 12), in the case of mounting on a board or panel.
4	Rotated flap which allows the air to be sent back to the front.

Ventilation module: catalog

Catalog

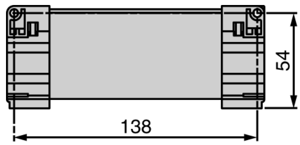
This table shows the different types of ventilation modules:

			
Power supply voltage	24 VDC	110 VAC	220 VAC
Temperature probe	Yes (detection of temperature ≥ 80°C +/- 5°C), open on alarm		
No. of modules	• 1 module with TSX 37-10 or TSX 37-21/22 PLC only • 2 modules with TSX 37-10 or TSX 37-21/22 PLC + TSX RKZ02		
References	**TSX FAN D2 P**	**TSX FAN A4 P**	**TSX FAN A5 P**

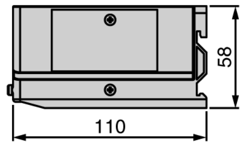
Ventilation module: dimensions

Ventilation module only

Illustration diagram (sides in millimeters):



Rear view

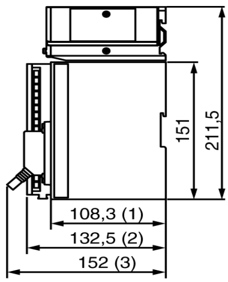


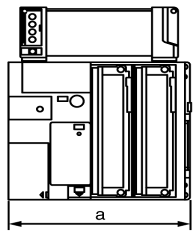
Right view

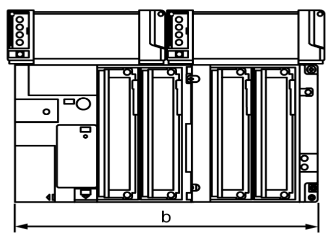
Front view

Ventilation module + TSX Micro

Illustration diagram (sides in millimeters):







(1) PLC empty,
(2) with screw terminal block modules,
(3) with HE10 connector modules,
(a) TSX Micro PLC dimensions only,
(b) TSX Micro PLC + TSX RKZ 02 extendable rack.

Table of characteristics:

Dimensions	**a**	**b**
TSX 37-05 PLC	170.3 mm	-
TSX 37-08 PLC	227.9 mm	-
TSX 37-10 PLC	170.3 mm	282.7 mm
TSX 37-21/22 PLC	227.9 mm	341.4 mm

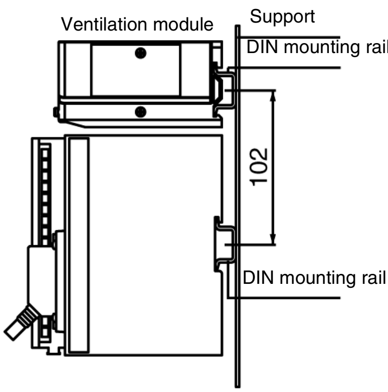
Ventilation module: mounting

General points

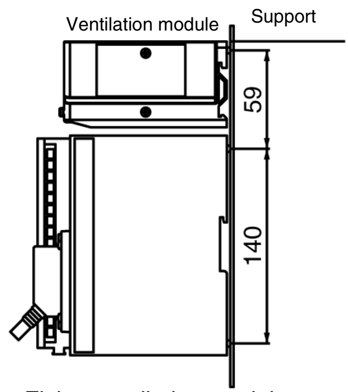
For reasons of mechanical strength, it is imperative to use the same method of fixing for the PLC and the ventilation module. The dimensions indicated are in millimeters.

Diagram:

Mounting onto a DIN mounting rail (Type AM1-ED)



Mounting onto a board (AMI-PA) or panel



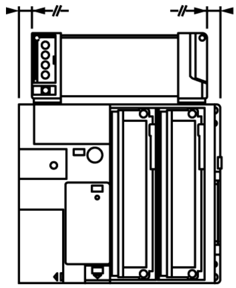
Fixing ventilation module using 2 M4x12 screws

Note: Using forced ventilation means it is necessary to take fitting precautions when analog modules of type TSX AEZ 414 are used in the PLC configuration (see (TSX Micro Installation manual, Volume 2, cabling recommendations)).

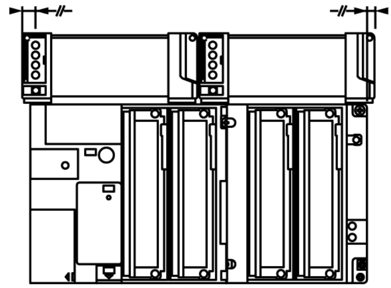
Mounting position

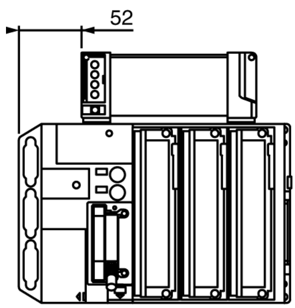
Mounting position of the ventilation modules according to the PLC type:

TSX 37-05/10 PLCs only

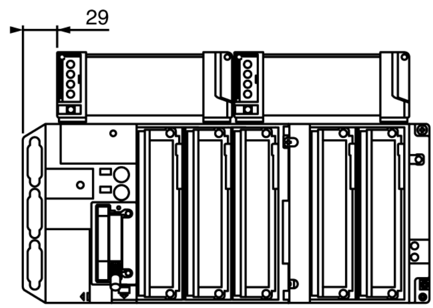


TSX 37-10 + TSX RKZ 02 PLC





TSX 37-08/21/22 PLCs only

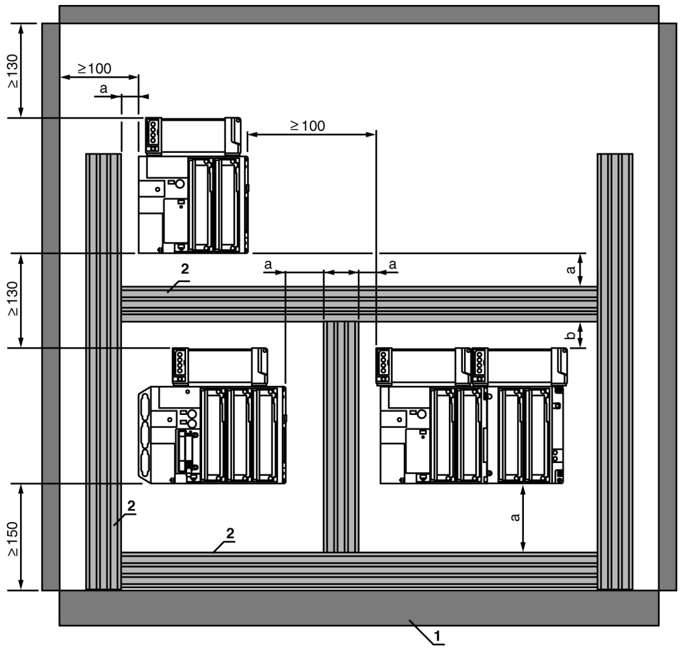


TSX 37-21/22 + TSX RKZ 02 PLC

Rules for installation of the racks with ventilation modules

Principle diagram

Illustration:

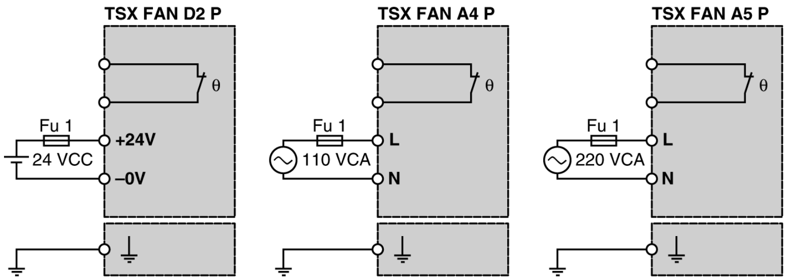


a >= 50 mm b >= 30 mm
1 Installation or envelope.
2 Duct or wire quadrant.

Ventilation module: connections

Ventilation module supply connection

Illustration:

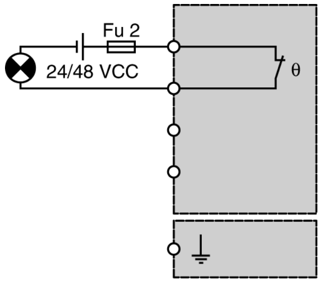


> **Note:** When using several ventilation modules of the same type, use a shared supply for all the ventilation modules.

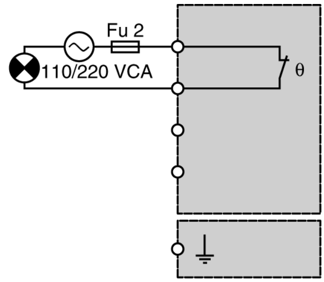
Heat sensor supply connection

The heat sensor can be supplied either with a direct or alternating current and connected on a signaling LED, a PLC input etc. .

Illustration diagram:



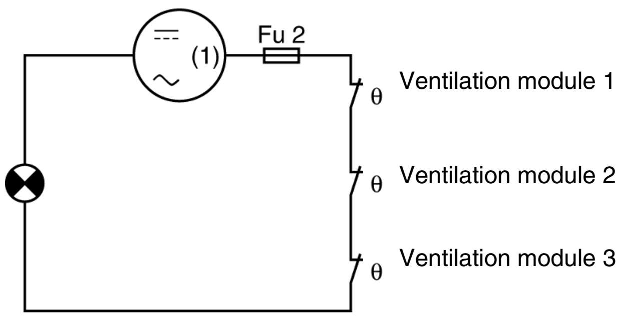
Direct current supply



Alternating current supply

Note: When using several ventilation modules, the sensor contacts will be put in a series.

illustration:



(1) direct 24/28 V or alternating 110/220 V.

Ventilation module: characteristics

Table of characteristics

Table of characteristics of the ventilation modules:

Module type		**TSX FAN D2 P**	**TSX FAN A4P**	**TSX FAN A5P**
Supply voltage	Nominal	24 VDC	110 VAC	220 VAC
	Limit	20...27.6 VDC	90…120 VAC	180…260 VAC
Current absorbed to nominal voltage		180 mA	180 mA	100 mA
Heat sensor	Supply voltage: direct 24/48 VDC or alternating 110/220 VAC			
	Breaking power (on a resistive load)		1 A to 24 VDC / 10 000 maneuvers 1 A to 48 VDC / 30 000 maneuvers 1 A to 110 VAC / 30 000 maneuvers 0.5 A to 220 VAC / 10 000 maneuvers	
	Trigger		Temperature >= 75ºC +/- 5ºC	
	State		closed if temperature <= 75ºC +/- 5ºC open if temperature >= 75ºC +/- 5ºC	

Commissioning/Diagnostics/ Maintenance

IV

At a Glance

Aim of this Part

This part deals with commissioning, diagnostics and maintenance.

What's in this part?

This Part contains the following Chapters:

Display panel

17

At a Glance

Aim of this Chapter

This chapter deals with the display panel for the TSX Micro PLCs.

What's in this Chapter?

This Chapter contains the following Maps:

Introduction

Introduction

The display panel offers a centralized array of services essential to PLC installation, use, diagnostics and maintenance, for all the modules positioned in the base rack or in the mini extension rack and the remote discrete inputs/outputs on the nano PLC or AS-i bus:

- PLC status display,
- Local or remote input/output status display,
- discrete input/output wiring test, in the absence of the application program,
- Input/output and module diagnostics,
- Display of the program internal data (bits, words, remote input/output bits, etc.).

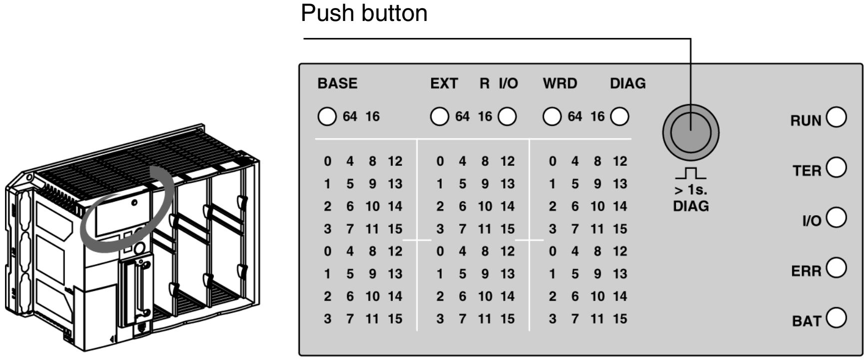
Description

The display panel offers:

- on the right, 5 status LEDs, which display the functioning of the PLC (RUN, TER, I/O, ERR, BAT),
- above, 5 status LEDs, which show the current display mode:
  - BASE LED: base input/output display mode,
  - EXT LED: mini extension rack input/output display mode,
  - R I/O LED: inputs/outputs on the AS-i bus display mode,
  - WRD LED: language objects display mode,
  - DIAG LED: diagnostic mode,
- 3 panels of 32 LEDs, which give information about the modules in the PLC or the extension: discrete inputs/outputs status, faulty channels or modules. Further, each panel is completed by 2 slot LEDs ("64" and "16"), which allow a double display of the 64 channel modules (16 first input channels and 16 first output channels, then 16 following input/output channels),
- a push button, which allows the display of the rest of the information and/or the alteration of the display mode (input/output or diagnostic display mode). In WORD mode, this push button allows the choice of the displayed objects table.

Illustration

Display mode on the TSX Micro:



PLC status display

Introduction

The display uses the 5 LEDs RUN, TER, I/O, ERR and BAT, which by means of their status (LED off, blinking or on) provide information on the operating mode of the PLC:

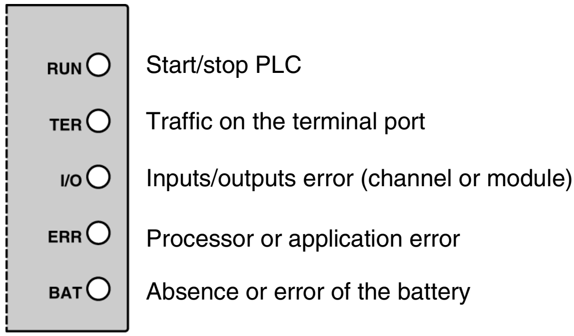
Description

this table describes the PLC status for each of the LEDs:

Display LED	Status
RUN	this LED (green) is lit to indicate that the PLC is in RUN mode, and flashes to indicate that it is in STOP mode. This LED is off when there is no valid application in the PLC or when there is a fault.
TER	this LED (yellow) is lit to show that information is being exchanged by the terminal link. Traffic via the terminal port may appear to make this LED flash.
I/O	this LED (red) is lit to show a fault relating to the inputs/outputs: ● supply fault or at least one channel tripped, ● module missing, not configured or out of service. For more information on the errors shown by the I/O LED (faulty channel or module), the push button must be depressed for more than one second to go to diagnostics mode (See *Display of remote inputs/outputs on the AS-i bus, p. 161*).
ERR	this LED (red) is lit to show a PLC "CPU fault": This LED flashes when there is no valid application in the PLC or if there is a "blocking fault (See *Researching the errors from PLC status monitors., p. 192*)" in the application program.
BAT	this LED (red) is lit to show that the battery is defective or missing (optional). This battery, which is used to back up the RAM, must be changed in accordance with the proper procedure (see *Inserting/changing the battery, p. 110*). If the %S66 bit system is at 1, the lighting of this LED is inhibited.

Summary

Illustration:



Local input/output status display

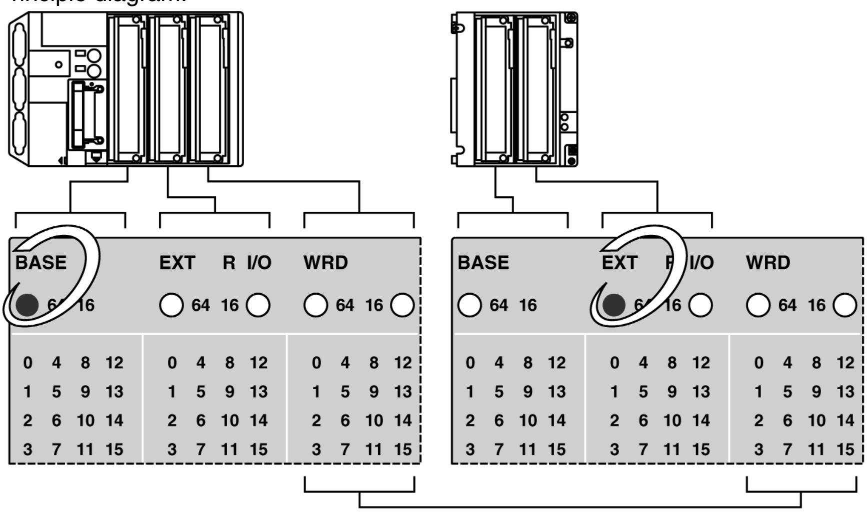
General

The display comes from the 2 panels of 32 LEDs on TSX 37-05/10 and 3 panels of 32 LEDs on TSX 37-08/21/22, which allows the simultaneous display of the input/output status of 2 or 3 modules. These modules are positioned in the 2 or 3 base slots or in the two slots in the mini extension rack. A short press of the push button selects the group displayed: base (the BASE LED is lit) or the mini extension rack (the EXT LED is lit).

Only the discrete module channels present in the configuration are displayed. The discrete inputs/outputs of the application specific function (if they exist) and the remote discrete inputs/outputs (TSX 07 module) are not displayed.

Illustration

Principle diagram:



Not used on the TSX 37 10 PLC

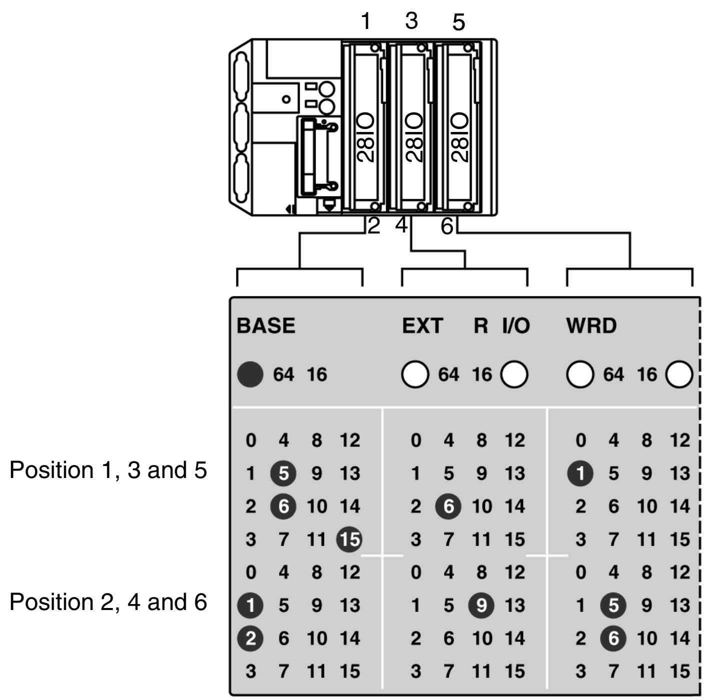
Panel description

The 3 panels of 32 LEDs indicate the status of each of the channels of the modules displayed.
If the channel is at the status 1, the LED corresponding to the position is lit, if this is not the case, it remains off.
Supposing for example that the PLC is equipped with the following modules:
- 1 module 28 inputs/outputs in positions 1 and 2,
- 1 module 28 inputs/outputs in positions 3 and 4,
- 1 module 8 inputs in position 5,
- 1 module 8 inputs in position 6,

In the example below, the following inputs and outputs are at the status 1:
- %I1.5, %I1.6, %I1.15, %Q2.1 and %Q2.2,
- %I3.6 and %Q4.9,
- %I5.1,
- %Q6.5 and %Q6.6.

Example

Illustration:



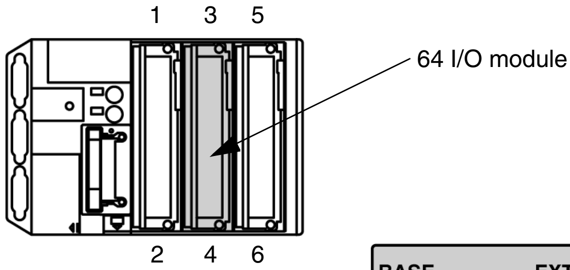
64 channel modules display

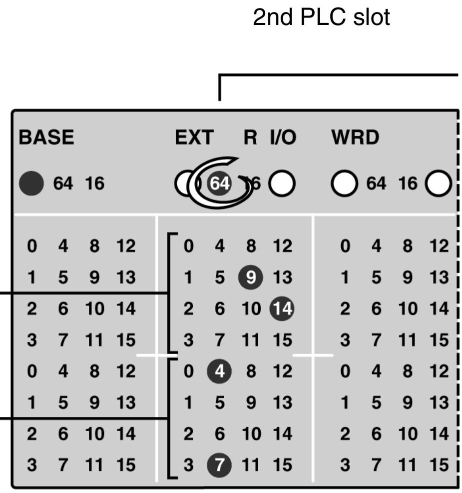
General

The 64 channel modules, which cannot be displayed together are shown by slot level (the "64" LED is lit). A short press on the push button displays either the first 16 inputs and the first 16 outputs (only the "64" LED is lit), or the following 16 inputs and the following 16 outputs (the "64" and "16" LEDs are lit).

Example

Supposing that the second PLC slot (position 3 and 4) is equipped with a 64 channel module:

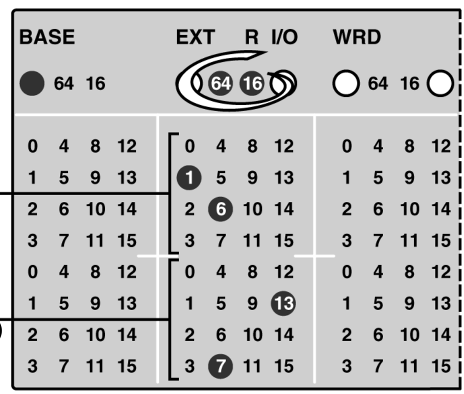




First 16 inputs %I3.0 to %I3.15
Here, the inputs %I3.9 and I3.14% are at 1

First 16 outputs
%Q4.0 to %Q4.15
Here, the outputs %Q4.4 and %Q4.7 are at 1

Pressing the push button briefly



Next 16 inputs
%I3.16 to %I3.31
Here, the inputs %I3.17 (16+1) and %I3.22 (16+6)
are at 1

Next 16 outputs
%Q4.16 to %Q4.31
Here the outputs %Q4.23 (16+7) and %Q4.29 (16+13) are at 1

Sequencing of the displays

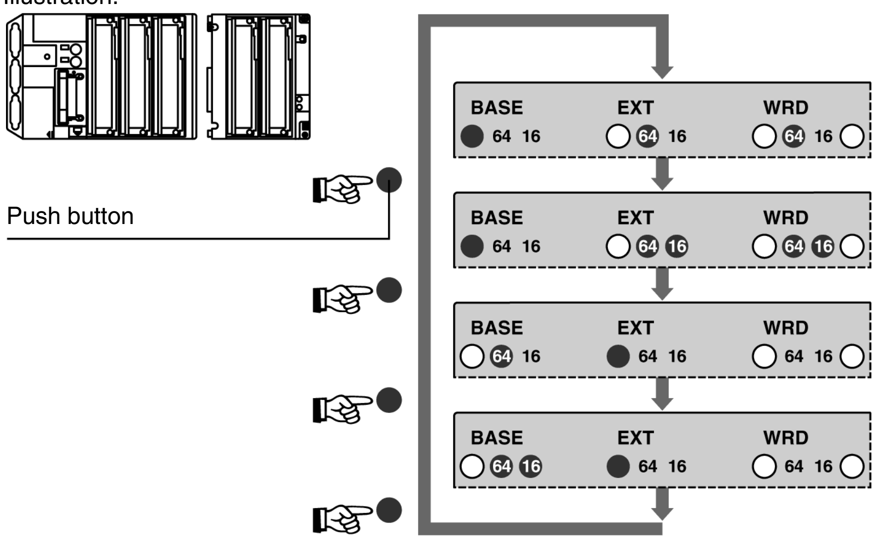
General

Since the display of all the discrete inputs/outputs (base+PLC) is performed by short presses on the push button, the sequencing of the displayed channels therefore depends on the configuration (presence of modules in the mini extension rack, presence of 64 input/output modules). Several possible cases can be identified:

- **PLC only (base), without 64 I/O module**
  The push button has no effect (except for entering diagnostic mode),
- **PLC only, with 64 I/O module(s)**
  Base (1st 32 I/O) --> Base (following 32 I/O) --> Base (32 1st I/O) --> etc,
- **PLC with extension, without 64 I/O module**
  Base --> Extension --> Base --> Extension --> etc,
- **PLC with extension, with 64 I/O module(s) in the base**
  Base (1st 32 I/O) --> Base (following 32 I/O) -->Extension --> Base (1st 32 I/O) --> Base (following 32 I/O) -->etc,
- **PLC with extension, with 64 I/O module(s) in the extension**
  Base --> Extension (1st 32 I/O) --> Extension (following 32 I/O) -->Base --> Extension (1st 32 I/O) --> etc,
- **PLC with extension, with 64 I/O module(s) in the base and the extension**
  Base (1st 32 I/O) --> Base (following 32 I/O) -->Extension (1st 32 I/O) --> Extension (following 32 I/O) -->Base (1st 32 I/O) --> etc.

Example

Supposing for example that a TSX 37-21 PLC is equipped with a 64 input/output module in positions 3/4, 5/6 and 7/8. The display sequence, therefore, the LEDs BASE, EXT, 64 and 16 will follow when the push button is pressed briefly.
Illustration:



Display of faulty local inputs/outputs

General

The faults are displayed in diagnostic mode, accessed by a long press on the push button (more than 1 second). The DIAG LED, which signals this mode, is therefore lit.

Principle

The faulty inputs/outputs and/or modules are displayed by 3 panels of 32 LEDs:

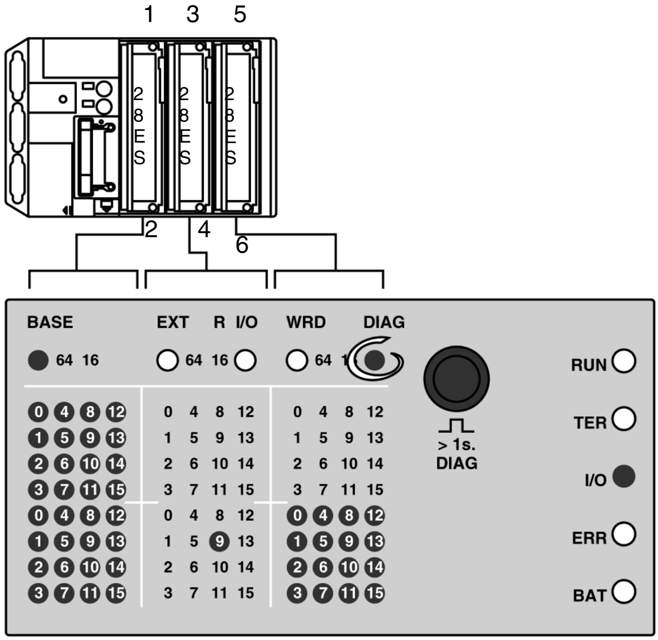
- if an input or output is faulty (defective power supply, output tripped, etc.), the associated LED flashes rapidly,
- if a module is faulty (absent module, module not configured properly, module out of service, etc.), all the corresponding LEDs flash slowly:
  - 16 LEDs for a half-size module (top or bottom of a display panel),
  - 32 LEDs for a standard size module with 28 inputs/outputs (entire display zone of the module),
  - 64 LEDs for a standard size module with 64 inputs/outputs (entire display zone of the module with the 64 only or 64 and 16 LEDs).

All the input/output faults are displayed by short presses on the push button, with the same sequences as with the input/output status display mode. A long press of the push button returns to the input/output status display.

> **Note:** Contrary to the input/output status display mode, which is only accessible for the discrete modules, the diagnostic mode displays the faulty channels associated with the analog and counting modules. For example, if a PLC contains a TSX CTZ 2A module in position 3, a fault with the counting channel 0 is signaled by a rapid blinking of LED 0 on the upper part of the corresponding zone.

Example

Illustration:



This example illustrates a fault in the 28 I/O and 8 O modules, positioned respectively in 1/2 and 6 (the LEDs corresponding to the module slot flash slowly). The %Q4.9 output is also faulty (the corresponding LED flashes rapidly).

Display of remote inputs/outputs on the AS-i bus

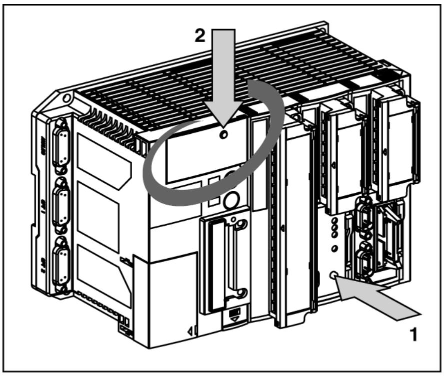
At a Glance

The PLC display panel allows:
- the presence of each slave on the AS-i bus, (DIAG mode), to be displayed,
- the status of the input/output bits of each slave present on the bus (R I/O mode - DIAG) to be displayed.

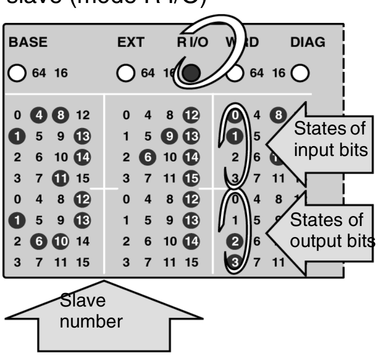
These modes can be accessed by a combination of actions on the push buttons (**1**) of the TSX SAZ10 module and (**2**) on the PLC display block.

Illustration

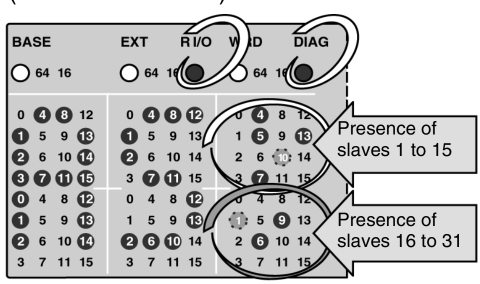
highlighting the display screen:



Display of the state of the bits of inputs/outputs of each slave (mode R I/O)



Display of the presence of each bus AS-i bus slave (mode R I/O - DIAG)



Display of the presence of each slave on the AS-i bus (R I/O mode - DIAG)

Introduction

This mode makes it possible to display:
- the slaves which have been installed and detected (LEDs permanently on),
- slaves which have not been installed or detected (LEDs off),
- slaves which have been installed but not detected or not installed but detected (LEDs on and blinking).

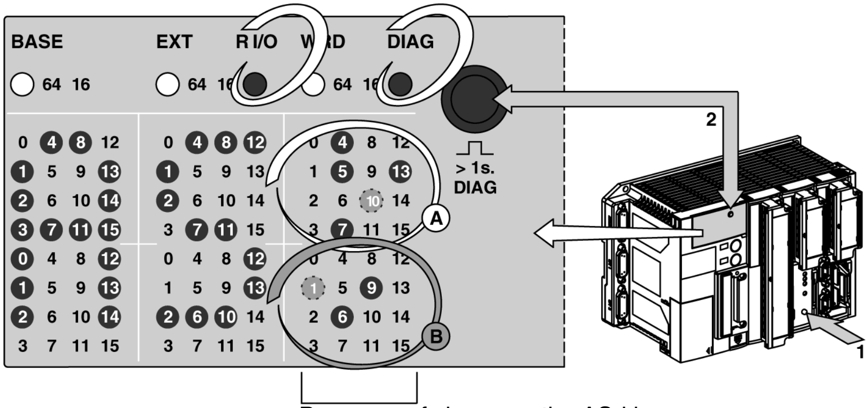
Procedure for access

Carry out the following steps:

Step	Action
1	Initial status of display block: local input/output display mode (Base or EXT LEDs on).
2	A **short press** on the push button (**1**), of the TSX SAZ module allows the switch to R I/O mode.
3	A **long press** on the push button (**2**) on the PLC display block allows the switch to diagnostics mode. The image of the AS-i network is then displayed on the right-hand block, with each LED representing an address of an AS-i bus slave. All of the **A**LEDs represent the addresses of the slaves 0 to 15, all the **B** LEDs represent the addresses 16 to 31 (add + 16 to the figure displayed to get the exact address of the slave).
4	To return to the initial status: • A **long press** on the push button (**2**) on the display block (to exit the AS-i bus diagnostics mode), • A **short press**on the push button (**1**) on the TSX SAZ module (to return to local input/output display mode).

Example

Illustration:



Presence of slaves on the AS-i bus

In the example below:

- the slaves with the addresses 4, 5, 7, 13, 22(6+16) and 25 (9+16) are operating normally (LEDs permanently on),
- the slaves with addresses 10 and 17 (1+16) are faulty (blinking LEDs),
- the LEDs which are not on represent the empty addresses.

Display of the status of the input/output bits for each slave (R I/O mode)

Introduction

The PLC display panel enables the status of the input/output bits of each slave on the bus to be displayed.

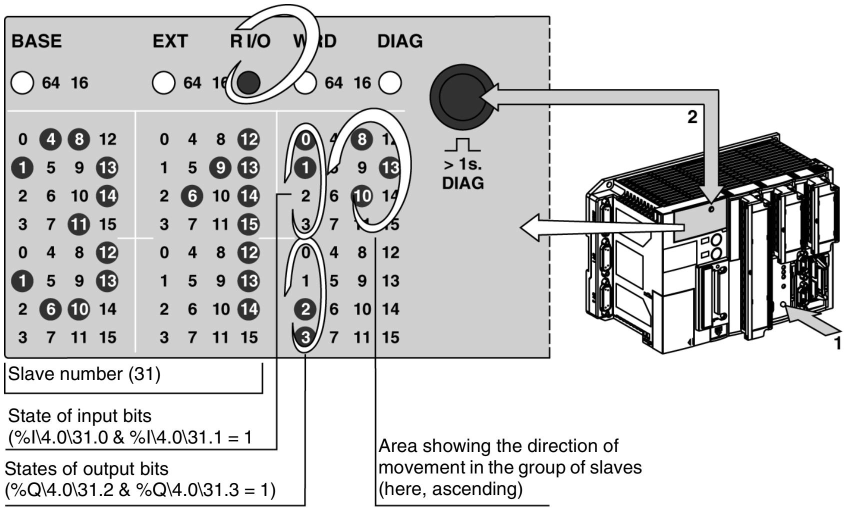
Procedure for access

Carry out the following steps:

Step	Action
1	Initial status of display panel: local input/output display mode (Base or EXT LEDs on).
2	A **short press** on the push button (**1**) on the TSX SAZ 10 module switches to R I/O mode with display: ● of an address of a slave (1 to 31) on the two panels on the left-hand side (numerical display), ● of the status of the input/output bits relating to the slave displayed, on the panel on the right-hand side (LED on = bit set to 1, LED off = bit set to 0 or no inputs / outputs). The LEDs (0 to 3) at the top show the status of the input bits of the slave (maximum of 4 input bits per slave); the LEDs (0 to 3) at the bottom show the status of the output bits of the slave (maximum of 4 output bits per slave), ● of the direction of movement in all the slaves, shown by three LEDs being lit (see *Incrementation of the slave number in ascending or descending order, p. 166*): if LEDs 8,13 and 10 are on, movement in the group of slaves takes place in ascending order; if LEDs 12, 9 and 14 are on, movement takes place in descending order.
3	Pressing **briefly several times in succession** on the push button (**2**) of the centralized display makes it possible to change the number of the slave in ascending order (1 -> 31) or descending order (31 -> 1) depending on the direction of movement. Changing direction (ascending or descending) is achieved by a **long press** on the push button (**1**) on the TSX SAZ 10 module.
4	Returning to the initial status of the display panel is achieved by a **short press** on the push button (**1**) on the TSX SAZ 10 module.

Illustration

input/output bits of each slave:

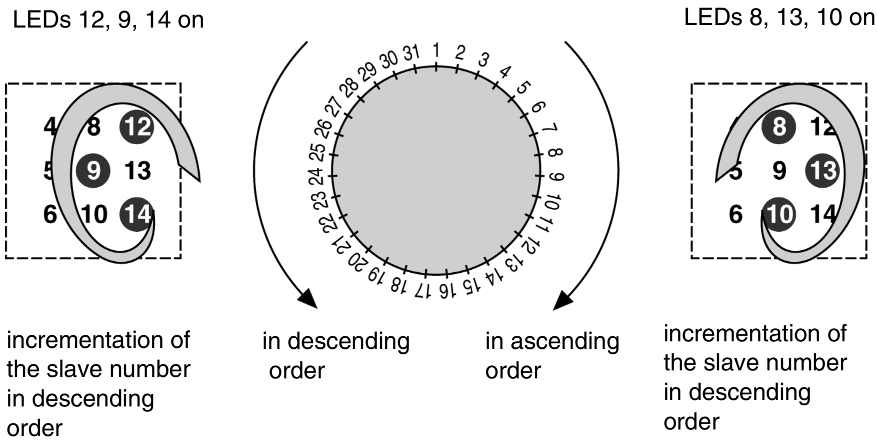


Incrementation of the slave number in ascending or descending order

General points

When the PLC display block is in R I/O mode (display of input/output bits of each slave), the user can scan the slaves in ascending (1->31) or descending (31->1) order. The direction is shown by 3 lit LEDs at display panel level, as indicated on the following diagram. The direction can be changed with a**long press** on the push button of the TSX SAZ 10 module.

Principle Diagram



Specific standard functions

At a Glance

Each TSX 37 PLC and TSX SAZ 10 module features a push button on their front panels, enabling the operating mode of the central display unit to be changed. The discrete inputs can be used to carry out the same function as these push buttons. By default, any changes to the operating mode of the display block are made by the push buttons.

Offset push button of the display block

To replace the push button of the central unit with a discrete input, simply:
- initialize the contents of the %SW99 word by program or by setting at the address of the required input,
- validate the function of this input by setting the system bit %S99 to 1, thus rendering the push button inactive.

The system word %SW99 indicates the geographic address of the discrete input assigned in place of the push button.
By default, the word %SW99 contains the address corresponding to input %I1.10 (input 10 of the module located in position 1) as the dedicated input for this function.
It is however possible to modify the assignment of the dedicated input for this function by program (see(Reference manual PL7, volume 2, system words)).

Offset push button of the module AS-i TSX STZ 10

To replace the push button of the AS-i module with a discrete input, simply:
- initialize the contents of the %SW98 word by program or by setting at the address of the required input,
- validate the function of this input by setting the system bit %S98 to 1, thus rendering the push button inactive.

The system word %SW98 indicates the geographic address of the discrete input assigned in place of the push button.
By default, the word %SW98 contains the address corresponding to input %I1.11 (input 11 of the module located in position 1) as the dedicated input for this function.
It is however possible to modify the assignment of the dedicated input for this function by program (see(Reference manual PL7, volume 2, system words)).

Management of the battery LED (BAT)

Principle

The switching on of the BAT status LED, which indicates the absence of or an error in the backup battery, may be inhibited per program or by an adjustment, by setting the system bit %S66 to 1.
The table below describes the different statuses of the %S66 bit.

Bit No.	Description
%S66	= 0: BAT LED is on when the back-up battery is absent or faulty.
	= 1: BAT LED off.

Display of language objects

18

At a Glance

Aim of this Chapter

This chapter deals with the display of language objects.

What's in this Chapter?

This Chapter contains the following Maps:

WORD mode

General

The Display of language objects comes from the 3 panels of 32 LEDs, which allow the display of the value of 256 bits or 16 words max., when the WORD mode is activated. The display of the words can be binary, which allows 4 consecutive words or hexadecimal alphanumerics to be displayed. In this case, one single word is displayed with most/least significant alternation.
It is possible to display the %M, %Si or %Xi bits, the %MWi, %SWi or %KWi words and the remote discrete inputs/outputs delivered by TSX 07 PLCs.

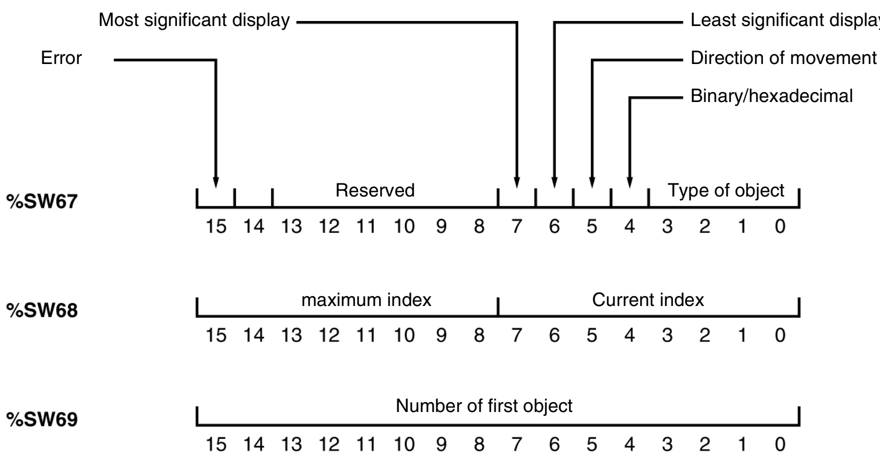
Principle

The WORD mode is activated by setting the %S69 bit system to 1, which is signaled by the WRD LED being lit. In this mode, the push button will scroll the value displayed (most/least significant in the hexadecimal base) or the values displayed (4 words then 4 following words etc. in the binary base).

The installation of the display is performed by the 3 system words %SW67, %SW68 and %SW69, which define respectively :
- the order information and the mode status (type of objects displayed, display base etc.),
- the current index of the displayed objects (64 bit group number or word order in the table defined by the maximum index and the word %SW69) and the maximum index (number of words in the word table),
- the number of the first word in the word table.

Illustration

Principle diagram:



Word of order and status : %SW67

Type of objects (0 to 3 bits)

These 4 bits configure the type of objects to be displayed:
- 0 : %MWi (default),
- 1 : %SWi,
- 2 : %kWi,
- 8 : %Mi,
- 9 : %Si,
- A : %Xi,
- B : %I and %Q of the TSX 07 PLCs.

Binary/ Hexadecimal (bit 4)

This bit configures the display base of the word objects:
- 0 : Binary,
- 1 : Hexadecimal (default),

Direction of movement (bit 5)

This bit configures the direction of movement in the word table or in the bit group: the movement is caused by pressing the push button:
- 0 : positive direction, i.e. ascending direction of index (default),
- 1 : negative direction, i.e. descending direction of index.

Most/least significant display (bits 6 and 7)

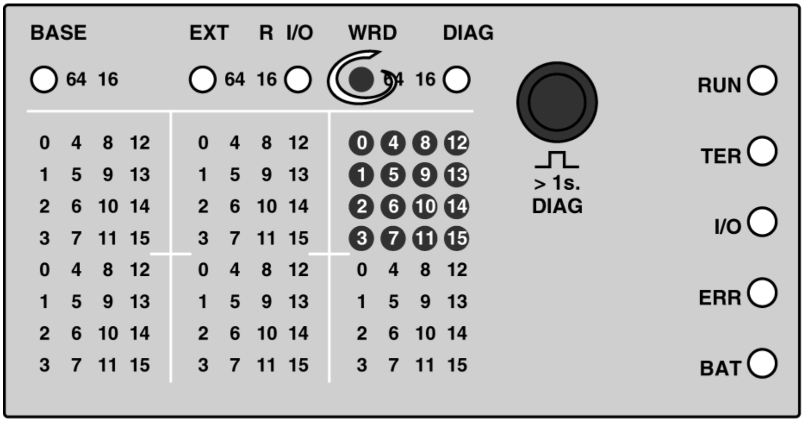
These bits configure the way of displaying a word in hexadecimal mode:

Most significant display (bit 7)	Least significant display (bit 6)	Meaning
0	0	Combination prohibited! Causes error bit to be set at 1 (bit 15).
0	1	Permanent display of the least significant byte.
1	0	Permanent display of the most significant byte.
1	1	Alternating display of the least significant byte (2s duration) and the most significant byte (2s duration). Default combination.

Error (bit 15)

This bit is positioned at state 1 when the parameter configuration is inconsistent:
- word number outside terminals in relation to the software configuration,
- hexadecimal display configured for the bit objects,
- Most/least significant parameter display positioned at 0.

When this bit is at 1, the first 16 LEDs in the first display panel are lit.



Index word : %SW68

Word objects (%MWi, %SWi and KWi)

Words that can be displayed are handled in the form of a table (16 words max. with the same table), of which the first object has a 0 index and the last one the last maximum index (15 max.). In hexadecimal display, the current index is the index of the only word being displayed.

Supposing, for example, that a table has 8 internal words from %MW12 to %MW19. The current index can take a value from 0 to 7, which determines the word displayed: 0 displays the content of the word %MW12, 1 displays that of %MW13, etc. and 7 that of %MW19.

In binary display, the current index is that of the first 4 words displayed (word displayed by the first 16 LEDs in the first display panel).
Supposing, for example, that the same table has 8 internal words from %MW12 to %MW19.
The current index can take a value from 0 to 7, which determines the 4 consecutive words displayed:

Current index	**Words displayed**
0	%MW12, %MW13, %MW14 and %MW15
1	%MW13, %MW14, %MW15 and %MW16
2	%MW14, %MW15, %MW16 and %MW17
3	%MW15, %MW16, %MW17 and %MW18
4	%MW16, %MW17, %MW18 and %MW19
5	%MW17, %MW18, %MW19 and %MW12
6	%MW18, %MW19, %MW12 and %MW13
7	%MW19, %MW12, %MW13 and %MW14

Bit objects (%Mi, %Si and %Xi)

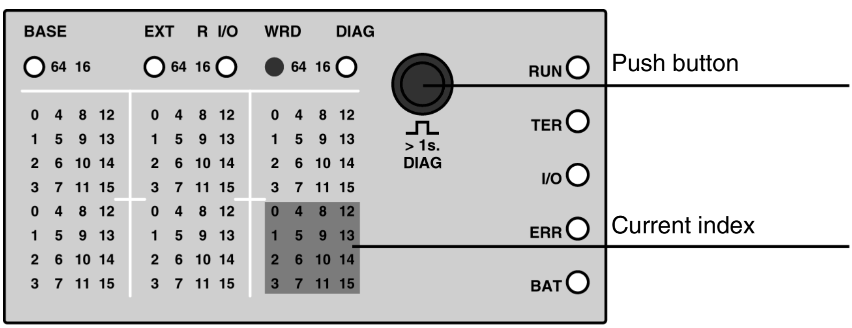
the bits are always displayed in groups of 64, therefore the maximum index is not used for these types of objects. The current index indicates the group number during display.
bit table and corresponding index:

Bits	Index
For the 256 internal bits %Mi	• current index 0 corresponds to %M0 to %M63 bits, • current index 1 corresponds to %M64 to %M127 bits, • current index 2 corresponds to %M128 to %M191 bits, • current index 3 corresponds to %M192 to %M255 bits,
For the 128 system bits %Si	• current index 0 corresponds to %S0 to %S63 bits, • current index 1 corresponds to %S64 to %S127 bits,
For the 128 Grafcet step bits (96 for the TSX 37-10)	• current index 0 corresponds to %X0 to %X63 bits, • current index 1 corresponds to the %X64 to %X127 bits (to %X95 for the TSX 37-10)

Remote input/ output bit objects (%I and %Q)

The inputs/outputs of 2 consecutive TSX 07 PLCs on the offset input/output bus are displayed in the first 2 display panels. The inputs are displayed by 16 LEDs located in the upper part of the panels and the outputs by the 16 LEDs located in the lower part. For these types of objects, the current index corresponds to the TSX 07 link address, displayed in the first display panel.

Whatever the type of displayed object, the current index is displayed by the 16 LEDs located in the lower part of the third display panel. Each press on the push button increases or decreases this index, according to the configured direction of movement (bit 5 of the system word %SW67).
Illustration:



Word %SW69

General points

Contains the number of the first word of the table, i.e. the number of the first word to be displayed. Remember that a maximum of 16 words can be displayed, with 4 words displayed simultaneously in binary mode and one single word displayed in hexadecimal mode. To facilitate identification of the word(s) currently being displayed, you are advised to choose a first word, whose address is 0 or a multiple of 10.
The first word currently being displayed is defined by the current index (see *Index word : %SW68, p. 173*).
The word %SW69 is not used with bit objects.

Value of the system words %SW67 to %SW69 upon activating WORD mode

- **following a prior mode deactivation (setting %S69 bit to 0)**
  Deactivation of WORD mode does not alter the content of the 3 system words. Upon reactivation (setting %S69 to 1), the system words %SW67 to %SW69 revert to their value at the time of the last mode deactivation. You are however advised to reinitialize the current index each time you enter the mode, in order to avoid uncertainty caused by an accidental press on the push button.
- **after a warm start**
  The 3 system words revert to their value at the time of the power failure.
- **after a cold start**
  The 3 system words are initialized to the following values:
  - %SW67 = H'xxD0' -> display of the internal words %MW in hexadecimal mode, alternating between the most and least significant. Movement in the table is performed via incrementation,
  - %SW68 = H'0F00' -> display of the index word 0 and movement to index word 15, by pressing the push button,
  - %SW69 = H'0000' -> the first word in the table has the number 0 (%MW0).

by default and without any special programming, it is possible to display the content of the internal words %MW0 to %MW15.

Example : word display in hexadecimal mode

Text display

The content of the 4 internal words %MW6 to %MW9 can be displayed in alphanumeric hexadecimal mode. The values of these words are H’1234’, H’5678’, H’9ABC’ and H’DEF0’, respectively.

To do this, the content of the system words %SW67 to %SW69 is as follows:

Most/ least significant alternation
Incrementation of words
Hexadecimal
%MWi

%SW67 = 0 0 000000 11 0 1 0000

Maximum index : 3 (4 words %MWi)
Current index: 0 (%MW6 displayed)

%SW68 = 00000011 00000000

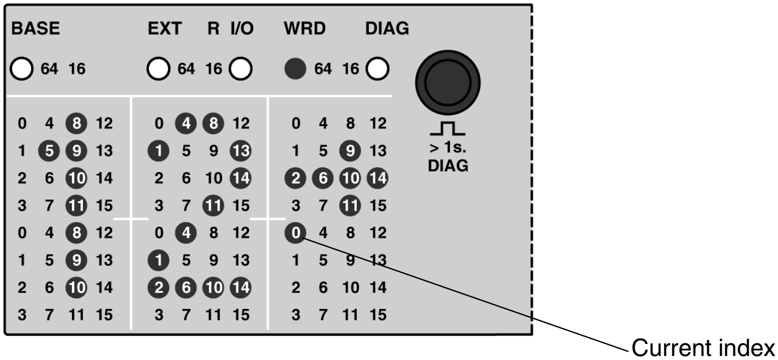
First word on the table : 6
(%MW6 displayed)

%SW69 = 0000000000000110

Display on the PLC

Current index = 0, the first two panels alternately display the most/least significant content of the first word in the table (%MW6); namely "12" and "34". The arrows -> or <- indicate that the right part of the word (least significant) or the left part of the word (most significant), respectively, will be displayed at the next alternation (every 2s).

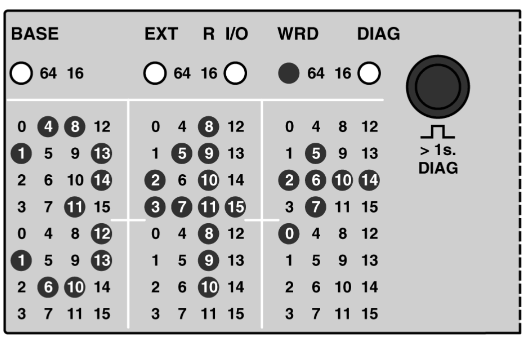
Illustration:



A short press on the push button increases the current index, which becomes equal to 1 (the 1 LED is therefore lit and the 0 LED is off). The content of the next word in the table (%MW7) is displayed with the most and least significant alternating, namely "56" and "78".

Successive presses on the push button will display all the words in the following sequence: %MW6 -> %MW7 ->%MW8 ->%MW9 -> %MW6 -> etc...

Illustration:



Example : word display in binary mode

Text display

The content of the 4 internal words %MW6 to %MW9 can be displayed in binary mode. The values of these words are H’1234’, H’5678’, H’9ABC’ and H’DEF0’, respectively.
The content of the system words is as follows:

Incrementation of words
Binary
%MWi

%SW67 = 0 0 000000 00 0 0 0000 (type of object = 0)

Maximum index : 3 (4 words %MWi)
Indice courant : 0 %MW6 displayed)

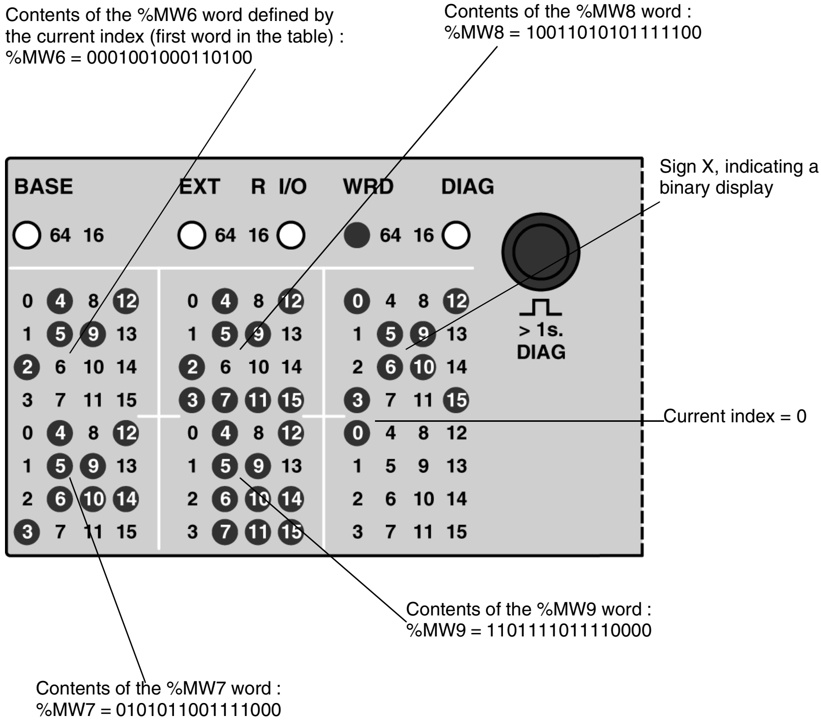
%SW68 = 00000011 00000000

First word in the table : 6 (%MW6)

%SW69 = 0000000000000110

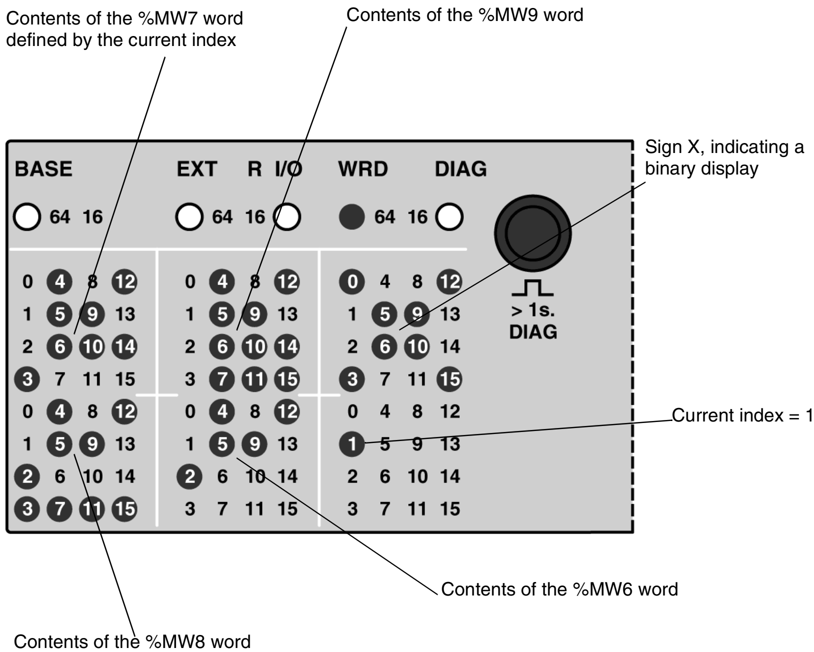
Display on the PLC

Illustration:



A short press on the push button increases the current index, which takes the value 1. The upper part of the first panel displays the content of the index word 1 in the table (%MW7), the lower part of the first panel displays the content of %MW8, the upper part of the second panel displays the content of %MW9 etc.

Illustration:



Successive presses on the push button display all the words, by shifting a 4-word window among the maximum possible 16 (limited to 4 in the example above). The index of the word displayed in the upper part of the first panel is defined by the current index (lower part of the third panel).

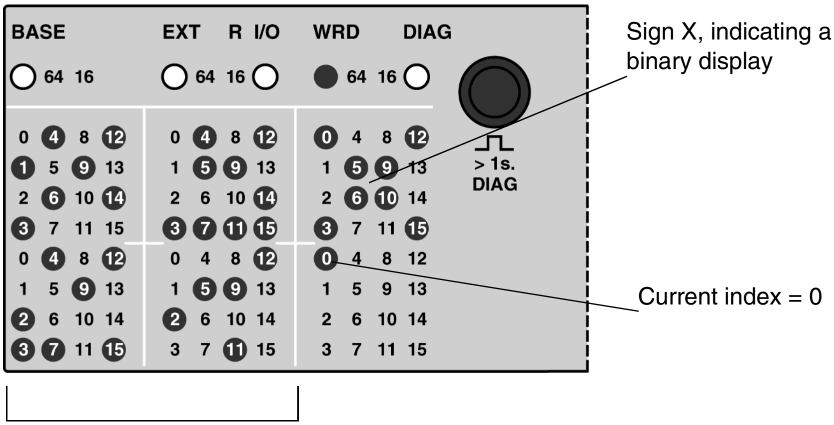
Example : display of the internal bit status

Text display

The status of the 256 internal bits in the TSX 37 PLC can be displayed (%M0 to M255). Upon WORD mode activation and if the current index is 0, the status of the first 64 internal bits is displayed (%M0 to M63).

Display on the PLC

Illustration:



State of the %M0 to %M63 bits

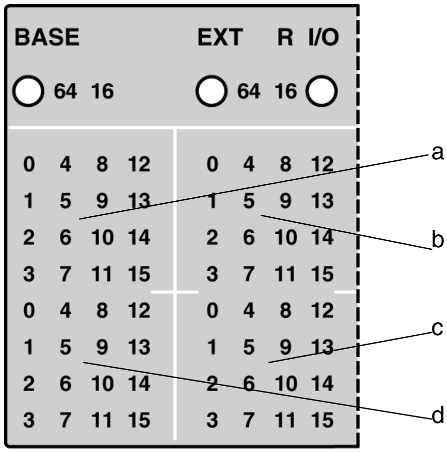
A short press on the push button increases the current index (value 1), which displays the status of the next 64 internal bits (%M64 to %M127) and then from %M192 to %M255; the current index adopts the values 0, 1, 2 and 3 successively.

LED table:

Index	LEDs				
	0	1	4	8	15
0	%M0	%M1	%M4	%M8	%M15
1	%M64	%M65	%M68	%M72	%M79
2	%M128	%M129	%M132	%M136	%M143
3 a	%M192	%M193	%M196	%M200	%M207
0	%M32	%M33	%M36	%M40	%M47
1	%M96	%M97	%M100	%M104	%M111
2	%M160	%M161	%M164	%M168	%M175
3 b	%M224	%M225	%M228	%M232	%M239
0	%M48	%M49	%M52	%M56	%M63
1	%M112	%M113	%M116	%M120	%M127
2	%M176	%M177	%M180	%M184	%M191
3 c	%M240	%M241	%M244	%M248	%M255

0	%M16	%M17	%M20	%M24	%M31
1	%M80	%M81	%M84	%M88	%M95
2	%M144	%M145	%M148	%M152	%M159
3 d	%M208	%M209	%M212	%M216	%M223

Illustration:



Note: The display of the system bits and the Grafcet step bits is identical, the current index only adopts the value 0 or 1.

Example: Display of remote inputs/outputs on TSX 07

Text display

The remote 4 TSX 07 PLC inputs/outputs can be displayed, connected to the remote input/output bus. By activating the mode and if the current index is worth 1, the first block displays the address 1 PLC inputs/outputs and the second block displays those of the address 2 PLC. By pressing the push button the current index is increased, which displays in the first block the address 2 PLC inputs/outputs and in the second block those of the address 3 PLC, etc. Continuous pressing on the push button allow all the remote inputs/outputs to be displayed.

Display on the PLC

Illustration:

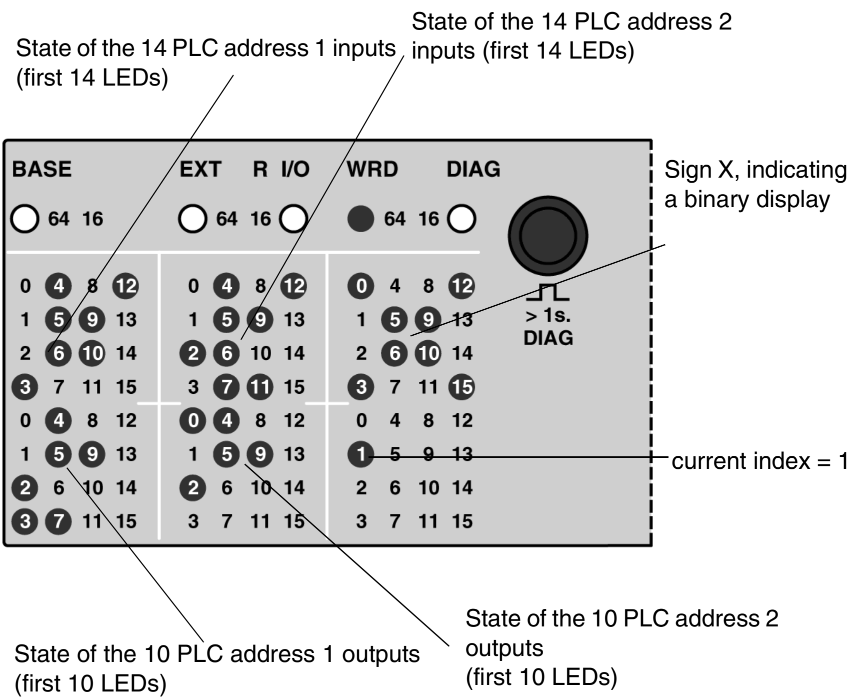
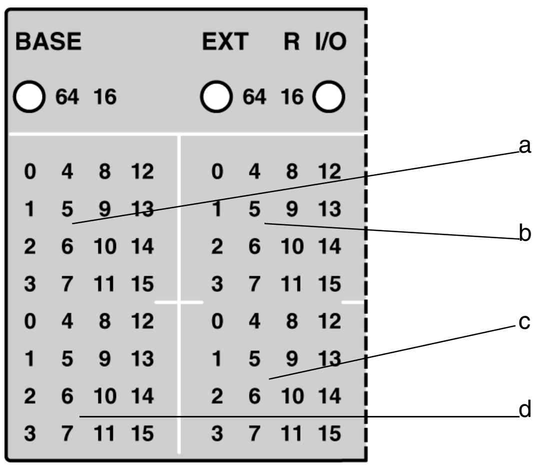


Table of inputs/outputs:

Index	TSX 07	Inputs/Outputs
1	Address 1	%I\4.0\1.0 à %I\4.0\1.13
2	Address 2	%I\4.0\2.0 à %I\4.0\2.13
3	Address 3	%I\4.0\3.0 à %I\4.0\3.13
4 a	Address 4	%I\4.0\4.0 à %I\4.0\4.13

Index	TSX 07	Inputs/Outputs
1 2 3 4 b	Address 2 Address 3 Address 4 Address 1	%I\4.0\2.0 à %I\4.0\2.13 %I\4.0\3.0 à %I\4.0\3.13 %I\4.0\4.0 à %I\4.0\4.13 %I\4.0\1.0 à %I\4.0\1.13
1 2 3 4 c	Address 2 Address 3 Address 4 Address 1	%I\4.0\2.0 à %I\4.0\2.9 %I\4.0\3.0 à %I\4.0\3.9 %I\4.0\4.0 à %I\4.0\4.9 %I\4.0\1.0 à %I\4.0\1.9
1 2 3 4 d	Address 1 Address 2 Address 3 Address 4	%I\4.0\1.0 à %I\4.0\1.9 %I\4.0\2.0 à %I\4.0\2.9 %I\4.0\3.0 à %I\4.0\3.9 %I\4.0\4.0 à %I\4.0\4.9

Illustration:



Commissioning

19

At a Glance

Aim of this Chapter

This chapter is about the commissioning of the TSX 37 PLCs.

What's in this Chapter?

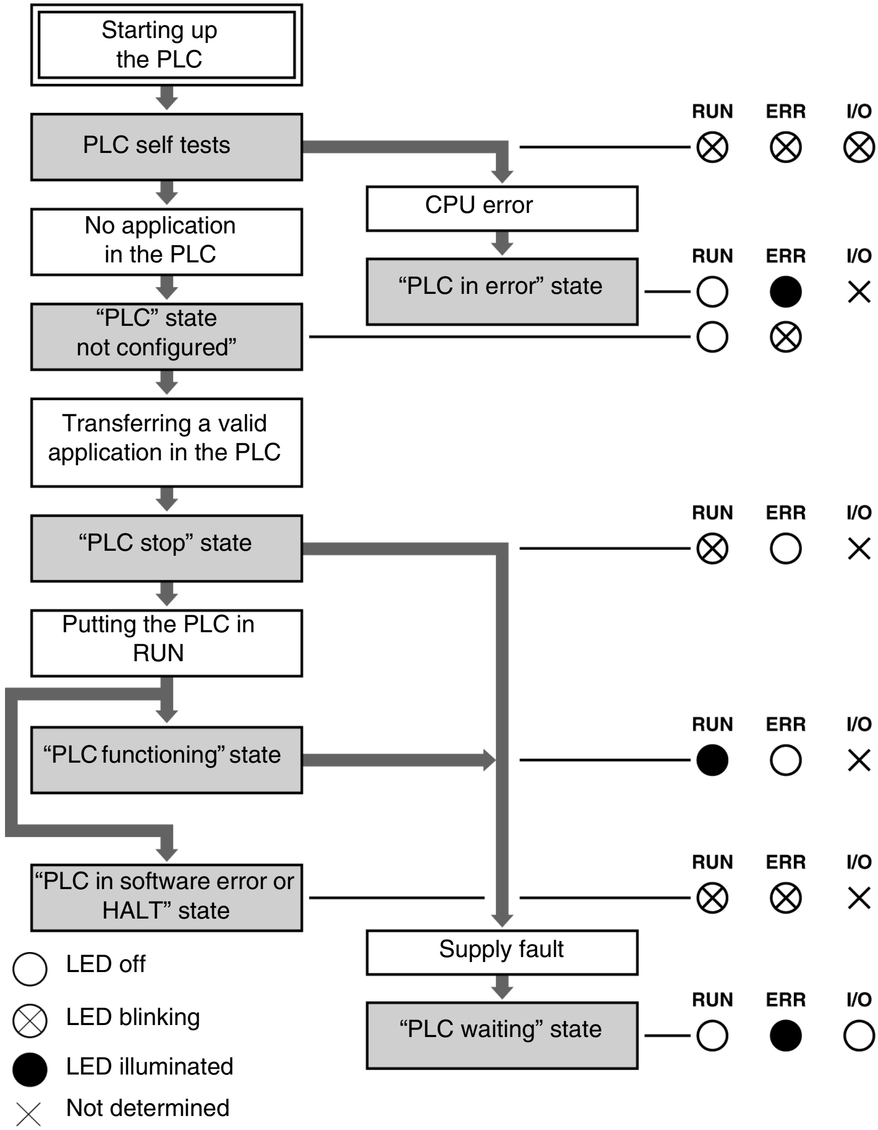
This Chapter contains the following Maps:

First power-up

Principle

When switched on, the PLC carries out its self-tests then places itself on hold for an application transfer. The different states of the PLC are signaled at the level of the display block by the RUN, ERR, I/O LEDs. .

The diagram below shows the procedure that must be followed when switching on for the first time, according to the state of the monitors:



Description of PLC states

General

Table of PLC states and their description:

State	Description
PLC self tests	The PLC processor carries out its sef-tests internally. The PLC does not control the process and cannot communicate via its terminal port (or networks). This state is signaled by the 3 monitors RUN, ERR et I/O blinking.
"PLC in error" state	The PLC stops following a material breakdown or an error within the system. The process is no longer controlled, communication becomes impossible and only a cold-start is possible (by activating the RESET button, using the gripper, etc.) This state is signaled by the monitors RUN, which is switched off and ERR, which is switched on.
"non-configured" PLC state.	The PLC started but does not possess any valid applications. It does not control the process but can communicate by its terminal point (or its network). This state is signaled by the monitors RUN, which is switched off and ERR, which flashes.
"PLC in software error or HALT" state	The PLC application went to "overrun" or executed an unresolved jump, a HALT instruction or a non-implemented "floating" instruction. This state is signaled by the monitors RUN and ERR blinking.
"PLC stop" state	The PLC possesses a valid application, which is stationary (the application is in a initial state, the tasks are stopped at the end of the cycle) and the commands of the process are in a state of fallback. This state is signaled by the RUN monitor blinking.
"PLC functioning" state	The PLC application runs as normal in order to control the process. A non-blocking fault for the application (input/output error or software error) can also exist. This state is signaled by the monitor RUN, which is switched on (and the I/O module is switched on if there are input/output errors).
"PLC waiting" state	The PLC has detected a supply failure. It is in a backup state while waiting for the supply to return (attempt at restarting warm). The process is no longer controlled and communication is possible. As long as the supply allows it, this status is signaled by the RUN monitor, which is off and the ERR monitor, which is on.

Note: When the PLC is in the "non-configured" state (without valid application), it is possible to carry out a discrete input/output wiring test. To do this, put the bit system %S8 to 0 and exploit the image memory (in read and/or write) from an adjustment terminal.
The TSX DMZ 64 DTK modules can only be used for the first 16 inputs and the first 16 outputs.

Maintenance

20

At a Glance

Aim of this Chapter

This chapter is about researching and analyzing the errors.

What's in this Chapter?

This Chapter contains the following Maps:

Researching the errors from PLC status monitors.

General

The status monitors in the display block inform the user on the operating mode of the PLC but also on its possible faults. The errors detected by the PLC concern:

- the PLC component circuits and/or its modules: internal errors,
- the process controlled by the PLC or the process wiring: external errors,
- the operating of the application carried out by the PLC: internal or external errors.

Errors are detected at start-up (self-tests) or during operation; as is the case with the majority of hardware errors, during the exchanges with the modules or during the execution of an instruction program. With certain "serious" errors, the PLC must be restarted; others are the responsibility of the user who decides on the course of action according to the desired application level.

There are three types of error:

- non-blocking errors,
- blocking errors
- and central unit errors.

Non-blocking faults

Anomaly caused by an input/ output error or by the execution of an instruction

The anomaly can be processed by the user program and does not modify the state of the PLC.
This type of anomaly is signaled by:
- the I/O status LED,
- the LEDs of channels accessible in diagnostics mode (See *Display of remote inputs/outputs on the AS-i bus, p. 161*),
- the error bits and words associated with the module and channel: %Ix.MOD.ERR, %IX.i.ERR, %MWx.MOD.2, etc.
- the system bits %S10 and %S16 (see reference manual, volume 3).

LED status table:

RUN	ERR	I/O	DIAG	System bits	Faults
×	×	●	⊗	%S10 %S16	Channel supply fault. Tripped channel.
×	×	●	⊘ ⊘		Module missing. Module does not conform to the configuration. Module failure (*)
×	×	●	⊗ ⊗		Module supply fault.

Legend:

⊗ LED off

⊗ LED blinking rapidly

● LED on

× State not determined

⊘ LED blinking slowly

⊗ DIAG: channel LED

⊗ ⊗ DIAG: all the module LEDs

(*) While operating a PLC with a VL < 2.0 rating, any modification to the physical configuration, **which must be made when the power is off**, needs **a cold start to be carried out by pressing the RESET** button after power up in order to take effect.

Anomaly caused by a faulty RAM-type PCMCIA memory card backup battery

When an application is stored on the PLC, a PCMCIA card backup battery error is indicated by:

- the ERR LED blinking, and the RUN LED lighting up if the PLC is in RUN mode,
- the ERR and RUN LEDs blinking simultaneously if the PLC is in stop mode.

LED status table:

PLC state	RUN	ERR	System bits	Faults
RUN	●	⊗	%SW67 = 1	PCMCIA RAM backup battery error with PLC in RUN
STOP	⊗	⊗		PCMCIA RAM backup battery error with PLC in RUN. The RUN and ERR LEDs blink simultaneously.

Legend

⊗ LED blinking rapidly

● LED on

Blocking faults

General points

These faults, caused by the application program, make it impossible to continue execution but do not lead to a system fault. If such a fault occurs, the application stops immediately (all tasks on the current instruction are stopped). There are two possibilities for restarting the application:

- with INIT or by setting the %S0 bit to 1. The application is thus in a preliminary state: the data have their initial values, the tasks are stopped at the end of the cycle, the view of the inputs is refreshed and the outputs are placed into a fallback position,
- by STOP, which brings the tasks to the end of the cycle without reinitializing the data, then by RUN, which makes a restart possible.

Indicating a blocking fault

A blocking fault is indicated by:
- the status LEDs (ERR and RUN),
- the system bits %S15 to %S20 (the system bits %S15, %S18 and %S20 are only blocking in application monitoring mode),
- the system word %SW125 containing the cause of the fault,
- the diagnostics program tool of the PL7 Micro which clearly communicates the cause and origin of the switch to fault status: watchdog overrun, division by zero, index overflow, etc.

LED status table:

RUN	ERR	I/O	Bits	%SW125	Faults
⊗	⊗	✕	%S11	H'DEB0'	Watchdog overrun.
⊗	⊗	✕		H'2258'	Execution of the HALT instruction.
⊗	⊗			H'DEF8'	Execution of an unresolved JUMP.
				H'2xxx'	Execution of an unknown NPCALL.
				H'0xxx'	Execution of an unknown primitive OF/IOB.
				H'DEF7'	Grafcet fault: step not programmed or active step table overrun.
				H'DEFF'	Non-implemented floating point.
⊗	⊗	✕	%S18	H'DEFo'	Division by zero.
			%S15	H'DEF1'	Character string manipulation error.
			%S18	H'DEF2'	Capacity overflow.
			%S20	H'DEF3'	Index overflow.

Legend:

⊗ LED flashing

✕ State not determined

Central processing unit (CPU) faults

General points

These severe faults (hardware or software) mean that correct system operation can no longer be guaranteed. They lead to a stop in the PLC, and require a cold start. Where possible, the fault type is memorized in the %SW124 system word; this can be reread after the cold start.
The next cold start is forced to stop to prevent a PLC error from recurring.
LED status table:

RUN	ERR	I/O	%SW124	Faults
○	●	×	H'30'	System code fault.
○	●	×	H'60' to H'64'	Stack overflow.
○	●	×	H'90'	Interruption system fault: Unforeseen IT.
○	●	×	H'53'	Time-out fault during I/O exchange.

Legend:

○ LED off

● LED on

× State not determined

Note: All LEDs (RUN, TER, I/O, ERR) are lit if the handle is missing on a TSX 37 2•.

Updating the Operating System

At a Glance

The operating system of the TSX Micro PLCs can be updated by a download via the terminal port.

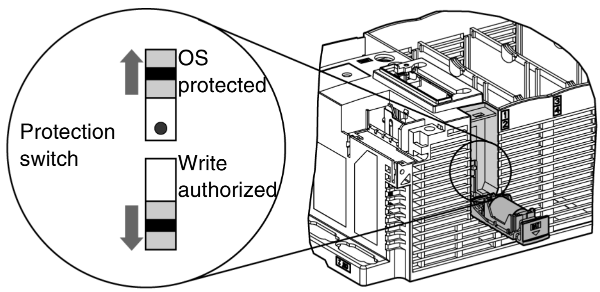
> **Note:** The updating procedure for the operating system is described in the on-line help associated with the PL7 software.

A write-protection switch located in the backup battery access hatch provides protection for accessing the loading of the OS.

When the PLC is operating normally, this switch must be in the (OS protected) position.
Any non-compliance with this notice, whilst not affecting the operation of the PLC, will nevertheless cause PRG characters to flash on the central display.

Illustration

The following illustration shows the position of the write-protection switch.



Updating the OS

The tool OS LOADER, provided with PL7, acts as a guide for the user during the update phase, indicating in particular that:

- the write-protection switch must be in the **write authorized** position in order to be able to begin downloading the OS,
- the write-protection switch must be in the **OS protected** position once the OS has finished downloading.

Note: If the OS is updated with the tool OS-LOADER V1.5, you must be sure to put the protection switch in the "write authorized" position before starting the download, as this version of the tool does not guide the user through the entire update phase. Likewise, once loading is complete, the switch must be put in the "OS protected" position.

Analog incorporated in the bases

V

At a Glance

Aim of this tab

This tab deals with the analog interface which is built into the TSX PLC

What's in this part?

This Part contains the following Chapters:

Overview of the built-in analog interface

21

At a Glance

Aim of this chapter

This chapter describes the analog interface built-in to the TSX PLC.

What's in this Chapter?

This Chapter contains the following Maps:

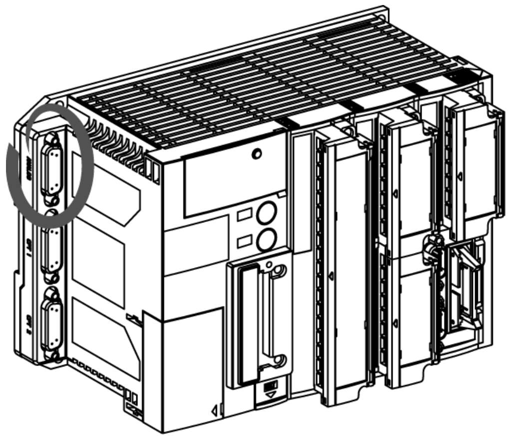
General

At a Glance

The TSX 37-22 PLC's have built-in as standard an analog interface which comprises 8 input channels and one output channel. This interface makes it possible to respond to applications which require analog processing but where the performance and the characteristics of an analog measurement system cannot be justified.

Illustration

Diagram of a TSX 37 with evidence of the analog connector:



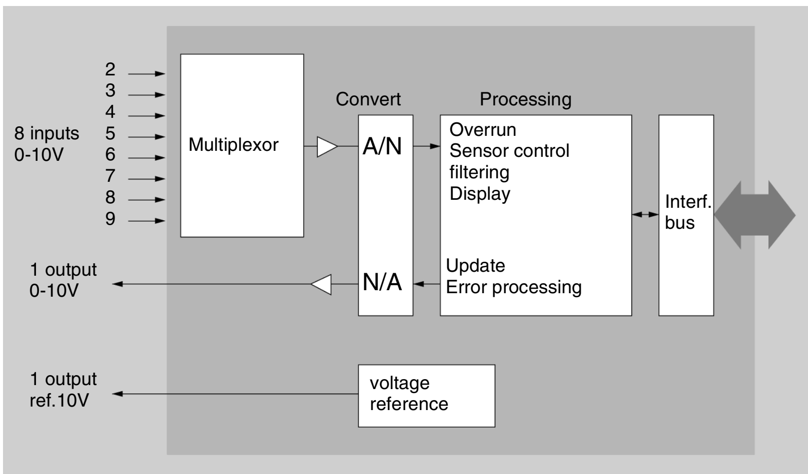
Functions

At a Glance

This interface which can be accessed via a Sub-D 15-pin connector, carries out the following functions:

- polling of input channels by static multiplexing and value aquisition,
- analog/digital conversion of input measurements,
- filtering of input measurements,
- updating of digital output value by the processor,
- digital/analog conversion of the output value,
- processing of dialog errors with the processor and especially the fallback setting of the output,
- the provision of a reference voltage for the external sliders, or those contained in the TSX ACZ 03 adjustment and adaptation module.

Illustration:



The TSX ACZ 03 module (See *TSX ACZ 03 adjustment and adaptation module, p. 219*), assigned to the analog interface, makes it possible to:

- have 4 sliders which enable you to adjust the 4 constants in one application ergonomically and flexibly,
- transform, via built-in shunts (499 Ω), the 0-10V inputs into 0-20mA or 4-20mA inputs,
- transform ,via built in adapters, analog inputs into discrete 24V (IEC type 1 or Telecontrol 2-wire DDP) inputs.

Using the TELEFAST pre-cabling system (ABE-7CPA01) (See *Using the TELEFAST pre-wiring system, p. 211*), whether or not it is assigned to the TSX ACZ 03 module, makes input/output connection easier by providing screw terminal blocks. It also makes connecting PLC discrete inputs/outputs easier if the analog output is used to control a variable controller.

Characteristics of the built-in analog inputs

General points

Data table:

Numbers of channels		8	
Analog/Digital conversion		8 bits (256 pin) successive approximation	
Acquisition cycle time	Normal cycle	32 ms	
	Fast cycle	4 ms x Number of channels used	
Digital filtering		1st order. Configurable time constant	
Hardware filtering		1st order. Cut-off frequency #600 Hz	
Insulation between channels and ground		None (shared linked to ground)	
Insulation between channels		Shared pulse	
Insulation between bus and channels		None (shared linked to 0 V of the bus)	
Input impedance		54 kOhms (0-10 V) 499 Ohms (0-20 mA or 4-20 mA)	
Maximum voltage surge authorized on inputs (PLC on or off)		0-10 V: +30 V/-15 V over 3 channels simultaneously 0-20 mA (1): +/-15 V or +/-30 mA over 1 channel	
Standards		IEC 1131 (0-10 V inputs) – UL508 ANSI MC96.1 - NF C 42-330	
Electric range	0-10 V	0-20 mA (1)	4-20 mA (1)
Full scale (FS)	10 V	20 mA	20 mA
Resolution	40 mV (250 pulses)	80 µA (250 pulses)	80 µA (250 pulses)
Max. error at 25°C	1.8% FS = 180 mV	2.8% FS = 560 µA	2.8% FS = 560 µA
Max. error at 60°C	4% FS = 400 mV	5.6% FS = 1.12 mA	5.6% FS = 1.12 mA
Temperature drift	0.75%/10°C	0.80%/10°C	0.80%/10°C

(1) with TSX ACZ 03 adjustment module.

Built-in analog output feature

General

Data table:

Number of channels	1
Analog/Digital conversion	8 bits (256 pulses)
Response time	50 micro seconds
Insulation between channels and ground	None (share linked to ground)
Insulation between bus and channels	None (share linked to 0V of the bus)
Max voltage surge authorized on the output	Short-circuit at 0V or at +5V
Protection	Permanent short circuit
Norms	IEC 1131 - UL508 – ANSI MC96.1 – NF C 42 - 330
Electric range	0-10V
Full scale (FS)	10V
Resolution	40mV (250 pulses)
Max. error at 25°C	1.5% PE = 150mV
Max. error at 60°C	3% PE = 300mV
Load impedance	>= 5 kOhms
Temperature drift	0.5 % / 10°C

Reference output feature (slider supply)

data table:

Voltage value	10V
Maximum current load (1)	10mA
Max. error at 25°C	3.9% PE = 390mV
Max. error at 60°C	6% PE = 600mV
Protection	Permanent short circuit
Temperature drift	1% / 10°C

(1) the total number of sliders is therefore limited to 4, whether they are inside the TSX ACZ 03 module, or external sliders.

Connecting the built in interface

22

At a Glance

Aim of this chapter

This chapter deals with connecting the built in analog interface.

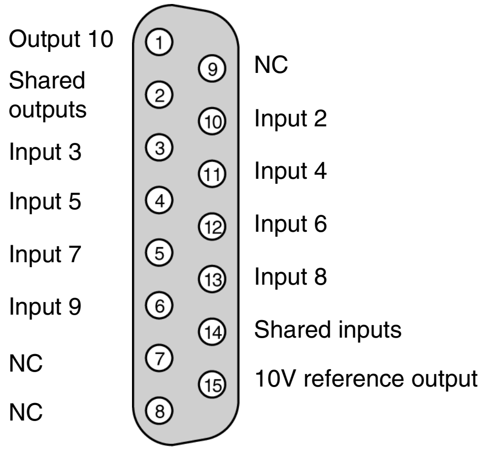
What's in this Chapter?

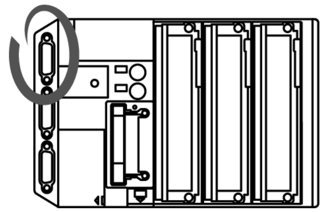
This Chapter contains the following Maps:

Direct connection of the analog interface

General

The analog interface can be accessed via a 15-pin SUB-D connector, of which the pin configuration is as follows:





Note: The inputs are numbered from 2 to 9.

Using the TELEFAST pre-wiring system

General points

Using the TELEFAST pre-wiring system, with reference ABE-7CPA01, facilitates the implementation of the built-in analog function. It provides access to all the inputs/ outputs required by the built-in analog function via screw terminals:

- 8 analog inputs,
- 1 analog output,
- 1 10 V reference output for the external sliders (4 max.).

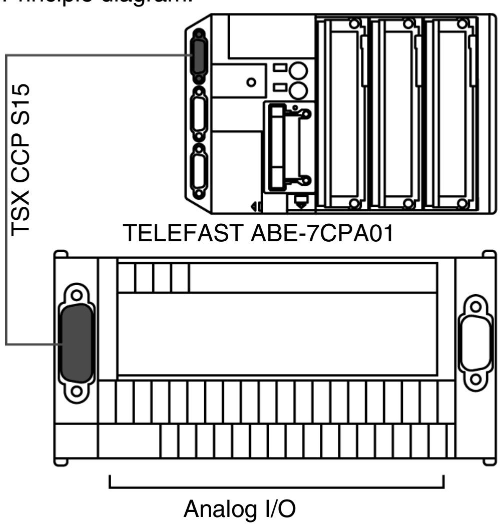
The PLC is connected to the TELEFAST system via a 2.5m cable, with product reference TSX CCP S15.

The TELEFAST system also offers a female 9-pin SUB-D connector which makes it possible to directly control an ALTIVAR 16 variable speed controller (see *Connecting a variable speed controller, p. 215*).

Having taken the impedance of the analog inputs into account, we recommend that you use sliders with a value of 4.7 kΩ, which limits the number of sliders to 4 (maximum current from the reference output = 10 mA).

Illustration

Principle diagram:



Terminals of pre-cabling system TELEFAST ABE-7CPA01

The table below gives a description of the terminals of the TELEFAST ABE-7CPA01 pre-cabling system:

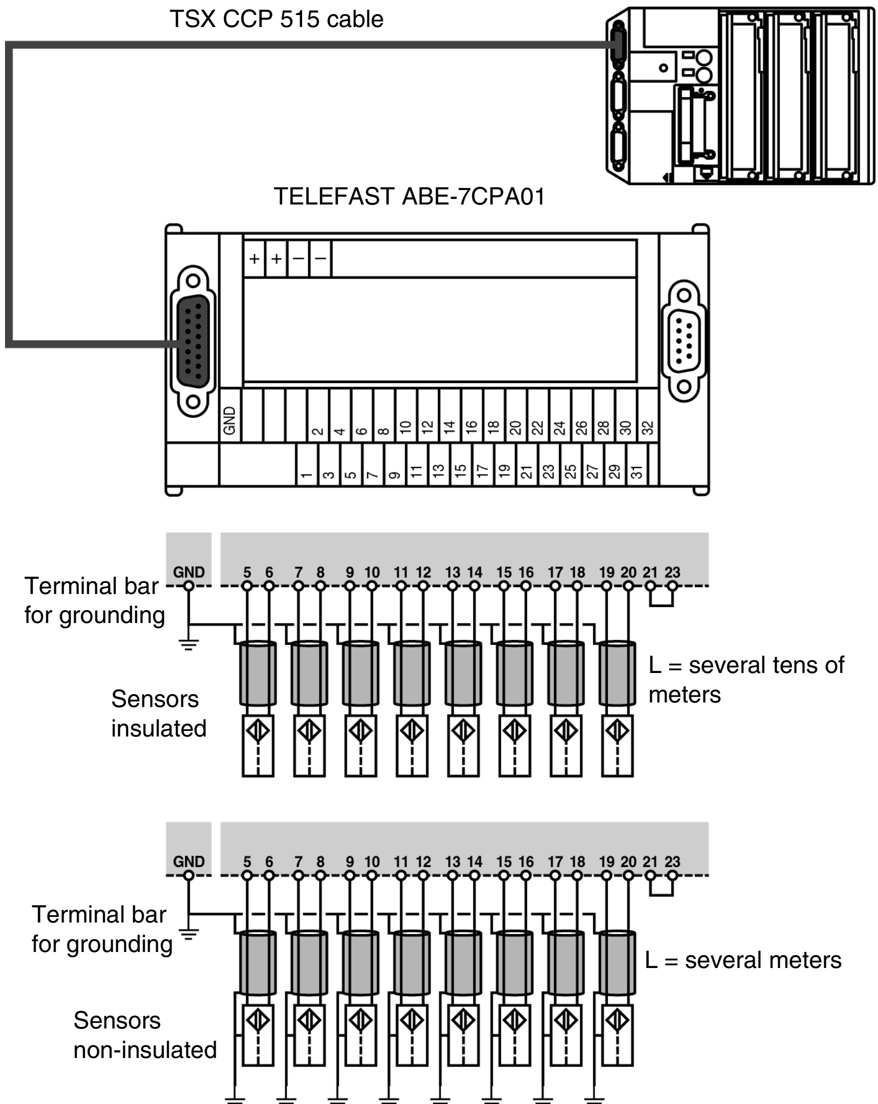
Terminal	Function	Terminal	Function
1	Shared (0 V analog output)	**17**	Shared (0 V analog input) *
2	Analog output	**18**	Analog input 8
3	Shared (0 V analog output)	**19**	Shared (0 V analog input) *
4	NC	**20**	Analog input 9
5	Shared (0 V analog input) *	**21**	Shared (0 V analog input) *
6	Analog input 2	**22**	10 V Reference output for external sliders
7	Shared (0 V analog input) *	**23**	Shared (0 V analog input)
8	Analog input 3	**24**	24 V supply provided by the variable controller. It must be connected to the terminal shared by the PLC's discrete outputs
9	Shared (0 V analog input) *	**25**	NC
10	Analog input 4	**26**	NC
11	Shared (0 V analog input) *	**27**	NC
12	Analog input 5	**28**	NC
13	Shared (0 V analog input)	**29**	Sharing the variable controller. It must be connected to the shared terminal of the PLC's discrete input
14	Analog input 6	**30**	"Forward" input of the variable controller. It must be connected to the discrete output terminal of the PLC
15	Shared (0 V analog input) *	**31**	Safety output of the variable controller. It must be connected to one of the PLC's discrete input terminals
16	Analog input 7	**32**	"Reverse" input of the variable controller. It must be connected to one of the PLC's discrete output terminals

* Terminals 21 and 23 must be linked to each other by an external wire strap.

Connecting analog inputs with insulated or non-insulated sensors

Diagram showing the principle

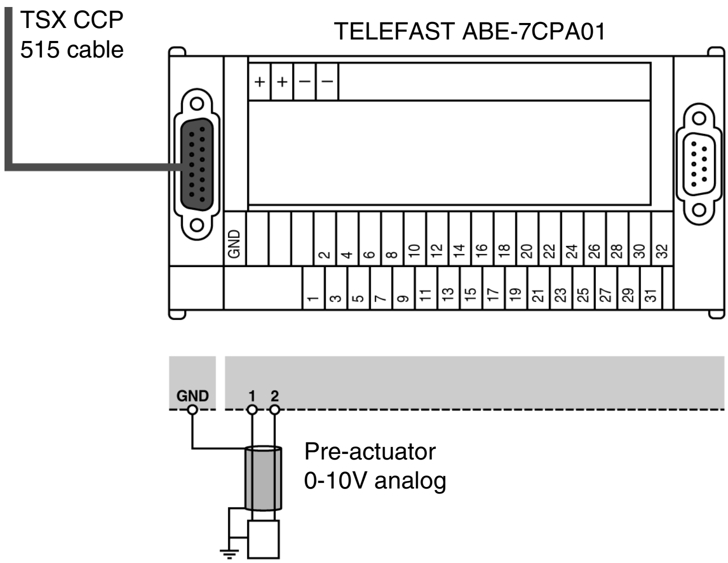
Illustration:



Connecting analog output and external sliders

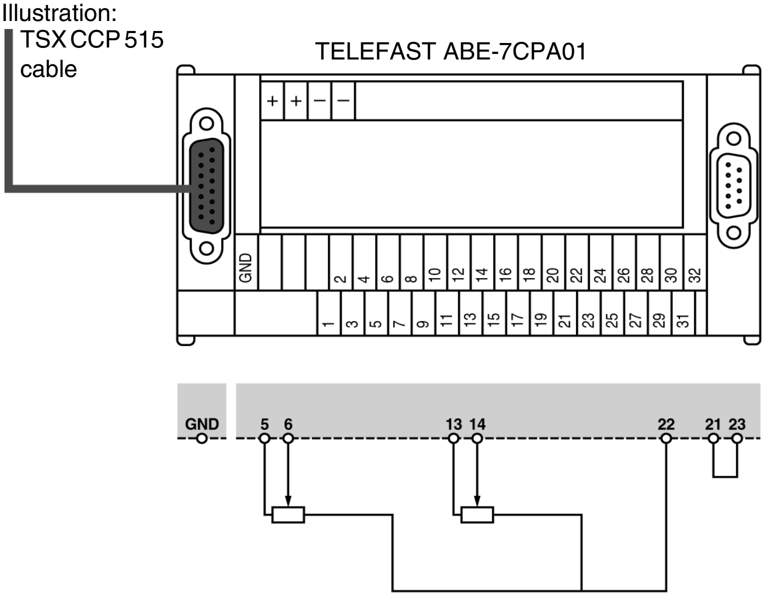
Connecting analog output

Illustration:



Connecting external sliders

Illustration:



Connecting a variable speed controller

General

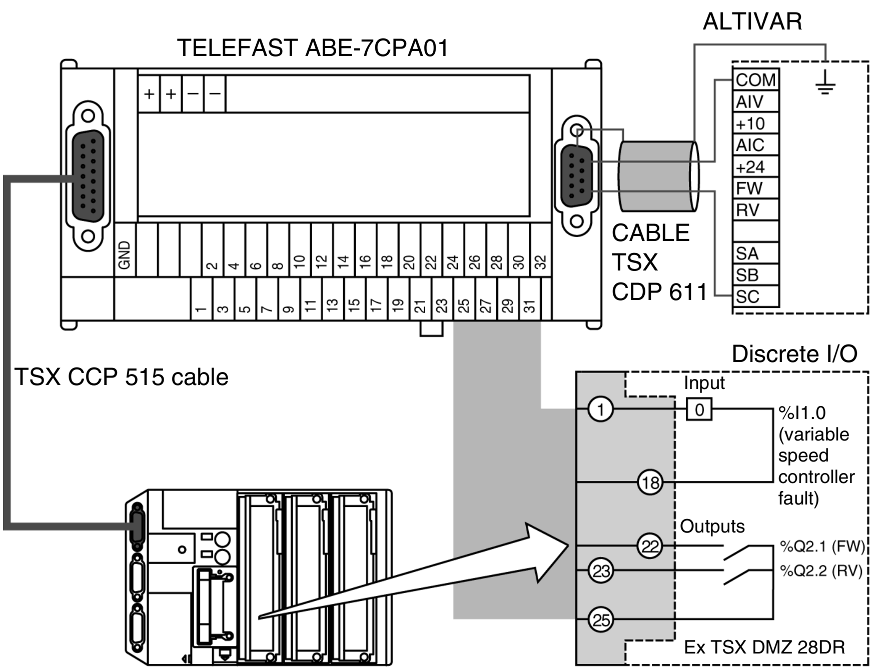
The TELEFAST ABE-7CPA01 cabling system makes it possible to use the inputs/outputs from a discrete PLC module, in order to control an ALTIVAR 16 variable speed controller:

- 2 discrete outputs, used as command inputs at the front and the back of the controller (forward and reverse commands),
- 1 discrete input used to signal a fault in the controller to the PLC.

The variable speed controller can be connected directly via the female 9-pin Sub-D controller from the TELEFAST system and the TSX CDP 611 cable.

Illustration

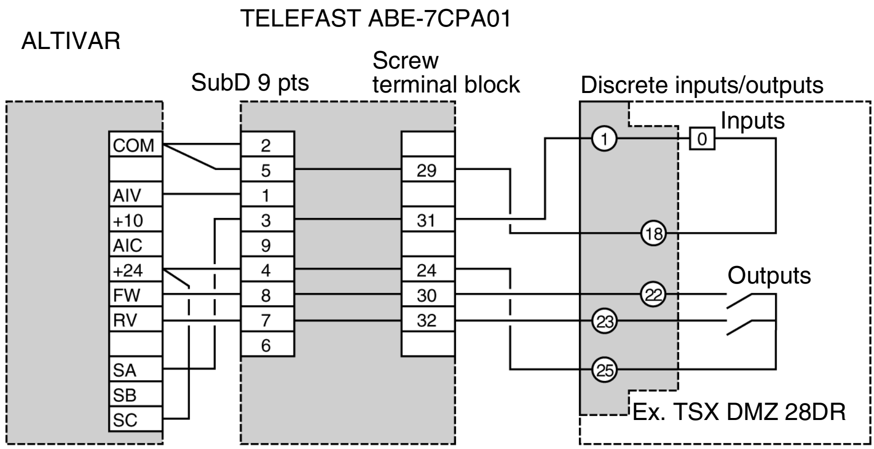
The following figure illustrates the example of a variable speed controller’s wiring, controlled by a TSX DMZ 28DR module, situated in the first PLC slot. Outputs 1 and 2 of the discrete module give commands to the ALTIVAR and its 0 input serves as a copy of the variable speed controller safety relay:



Details of wiring the ALTIVAR 16

Principle diagram

Illustration:



ALTIVAR 16 terminal block functions

The following table provides a reminder of the different functions of the ALTIVAR 16 terminal block:

Terminal block address	Functions
COM	Common to speed monitoring inputs and control inputs.
AIV	Speed monitoring input on.
+10	Supply for speed monitoring inputs.
AIC	Speed monitoring input running.
+24	Supply for control inputs (60 mA).
FW	Forwards control input.
RV	Reverse control input.
SA	"O" contact on the safety relay.
SB	"F" contact on the safety relay.
SC	Shared safety relay contact.

Marking of TSX CDP 611 cable wires

Data table:

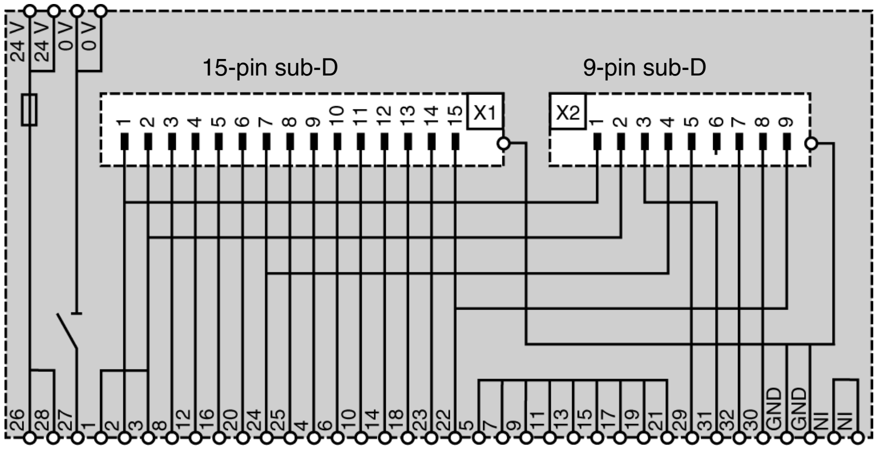
TELEFAST terminal block (terminal number)	TSX CDP 611 cable (wire color)	TELEFAST terminal block (terminal number)	TSX CDP 611 cable (wire color)
1	black	6	blue
2	white	7	orange
3	red	8	yellow
4	green	9	violet
5	brown		

Note: the cable shielding must be mated with the TELEFAST ground terminal.

ABE-7CPA01 analog TELEFAST internal wiring

Diagram showing the principle

Illustration:



TSX ACZ 03 adjustment and adaptation module

23

At a Glance

Aim of this chapter

This chapter deals with the TSX ACZ 03 module and its implementation.

What's in this Chapter?

This Chapter contains the following Maps:

TSX ACZ 03 adjustment and adaptation module: at a glance

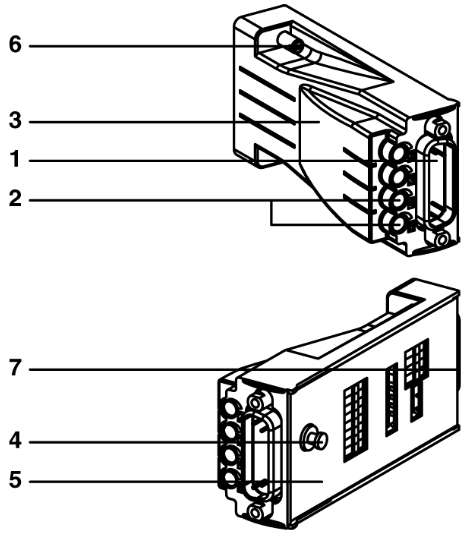
Introduction

The TSX ACZ 03 module completes the functions offered by the analog inputs which are built in to the TSX 37-22 PLC's, by enabling:

- manual adjustment of the application program values via internal (first 4 inputs) or external sliders,
- current conversion (0-20mA or 4-20mA) of signals 0-10V of each of the inputs,
- adapting each analog input to a discrete 24V input.

Illustration

TSX ACZ 03



Addresses table

Addresses and description:

Address	Description
1	Connector enabling external connections. This connector is identical (same type and same connector) to the PLC connector.
2	Adjustment sliders of the first 4 inputs.
3	Plastic module body.
4	Module maintenance pinfeed.
5	Metal plaque which allows access to reversing switches and microswitches.
6	Screw to fix the module to the PLC.
7	Connector for connecting the module to the PLC.

Module standard functions

Introduction

For each of these inputs, the standard functions offered by the TSX ACZ 03 module are as follows:

1 Transfer of analog input to the module connector

The 0-10V analog inputs (See *Characteristics of the built-in analog inputs, p. 207*), the output and the reference voltage, available on the PLC connector, are transferred to the connector on the front of the TSX ACZ 03 module, with the same connector (see *Direct connection of the analog interface, p. 210*).

2 Input signal adjustments

The input signal (setpoint, threshold, timer, etc.) is chosen by using an internal slider for the first 4 inputs, and an external one for the other inputs (transfer of unused channels onto the upper connector).
A reference output (See *Reference output feature (slider supply), p. 208*) is supplied by the PLC to supply the internal sliders (**for a maximum of 4 inputs**).

3 Conversion of the input in the 0-20 mA or 4-20 mA range.

A powered channel is chosen (See *Characteristics of the built-in analog inputs, p. 207*) by positioning a microswitch on the module, after adaptation has been carried out by joining on a 499 Ω 1% resistor.
A current range is chosen from the 2 possible options (0-20 mA or 4-20 mA) when the software is configured.

4 Conversion of the analog input into 24 V discrete input

The analog input can be converted into a 24 V discrete input (IEC Type 1 or Telemecanique 2-wire DDP compatible) on the 8 input channels, independently of each other.
The inputs have the following electric features:

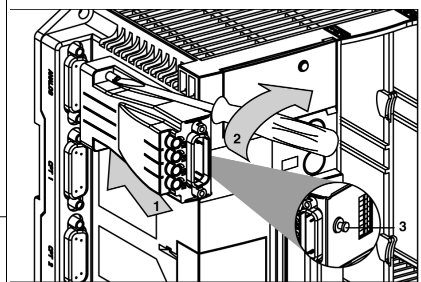
Designation		**Characteristics**
Rated voltage: One		24 V
Voltage limits:	U1 (ripple included) (1) U max (2)	19 to 30 V 34 V
24 V rated current		8 mA
Input impedance		2.67 kOhms
Voltage for "ON" status: Uon		≥11 V
Current in Uon = 11 V: Ion		≥ 2.5 mA
Voltage for "OFF" status: Uoff		≤ 5V
Current in "OFF" status		≤ 1.4 mA
OFF/ON filtering time		1 to 1.5 ms
ON/OFF filtering time		200 to 300 micro seconds
Jitter due to the acquisition time of analog inputs	Normal cycle	32 ms
	Fast cycle	4 ms x Number of channels used
IEC 1131 compatibility with sensors		Type 1
Compatibility with 2-wire DDP		Telemecanique
Compatibility with 3-wire DDP		Yes
Input type		Resistive
Logic type		Positive
Insulation between channels		None (0 V shared between channels)
Insulation between channels and ground		None (0 V linked to ground)

(1) The point-to-point ripple must be less than 5% of the rated voltage.
(2) Standard function limited to 1 hour/24 hours.

Module implementation

Mounting the module

Carry out the following steps:

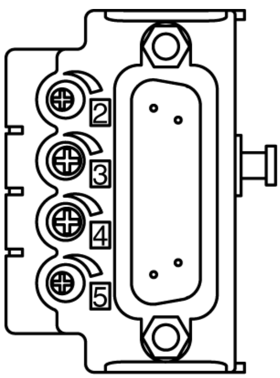
Step:	Action	Illustration
1	Connect the module to the analog interface which is built in to the TSX 37-22 PLC (first connector). This operation can be carried out when the PLC is on or off. The module is maintained on the front panel by the pinfeed (3) which clips onto the side panel of the PLC.	
2	Attach the module with its 2 fixing screws.	

Using the internal sliders

The first 4 inputs are fitted with an internal slider which makes it possible to adjust, for example a setpoint, or a threshold. To do this, set the C1 and C2 input switches to 0, and C3 and C4 to 1. Then adjust the corresponding slider to vary the input voltage (between 0 and 10V)

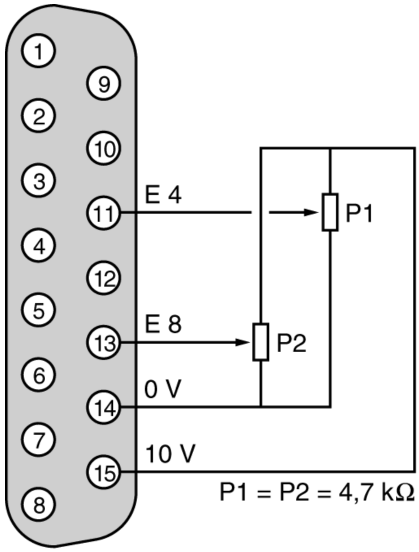
The internal sliders on the first 4 inputs are accurate to +/- 20%.

Illustration:



Connecting the external sliders

Wiring a slider on an input makes it possible to vary its value between 0 and 10V, for example, to adjust a setpoint or a threshold. The recommended value of this slider is 4.7kΩ.
Example: wiring an external slider on inputs 4 and 8.



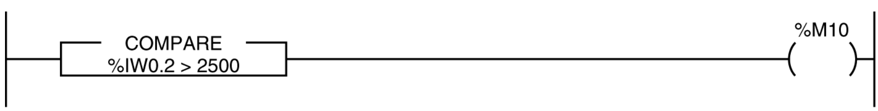
Usage at 0-20mA or 4-20mA

Each input can be configured individually as an actual input. To do this, set the corresponding C2 switch to 1 (when the other switches are at 0) and configure the chosen range using software. 0-20mA or 4-20mA.

Converting to discrete inputs

Each input can be individually configured as a type 1, 24V discrete input or 2-wire DDP. To do this, set the corresponding C1 switch to 1 (when the other switches are at 0) and define, using an application program, the discrete input threshold value: this threshold is set at 2500.
Choose the 0-10V voltage range in the software configuration.

Example, we want to use input 2 as a discrete input.



The %M10 bit will be at 0 or at 1 according to the status of the discrete input.

Connecting the external sensors and pre-actuators

It is carried out via the 15-pin Sub-D connector available on the module, of which the pin configuration is identical to that of the analog interface connector which is built in to the PLC.

Selecting the function carried out by the module

General points

The selection is made for each of the input channels (channels 2 to 9), via the reversing switches and micro-switches which can be accessed on the module (on the metal plate side):

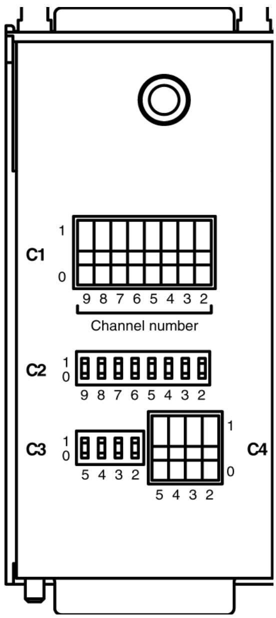
Reversing switches and micro-switches	Functions			
	0-10 V range (*)	**Range 0/4-20 mA**	**Adjustment of int. slider**	**Discrete input**
C1	0	0	0	1
C2	0	1	0	0
C3	0	0	1	0
C4	0	0	1	0

(*) Factory-adjusted.

Note: The table is identical for channels 2 to 5. Channels 6 to 9 do not have the "Internal slider" function.

Illustration

TSX ACZ 03:



Counting built into bases

VI

At a Glance

Aim of this tab

This tab deals with the built-in counting function on TSX Micro.

What's in this part?

This Part contains the following Chapters:

Overview of built-in counting function

24

At a Glance

Aim of this chapter

This chapter describes the built-in counting function on the TSX Micro.

What's in this Chapter?

This Chapter contains the following Maps:

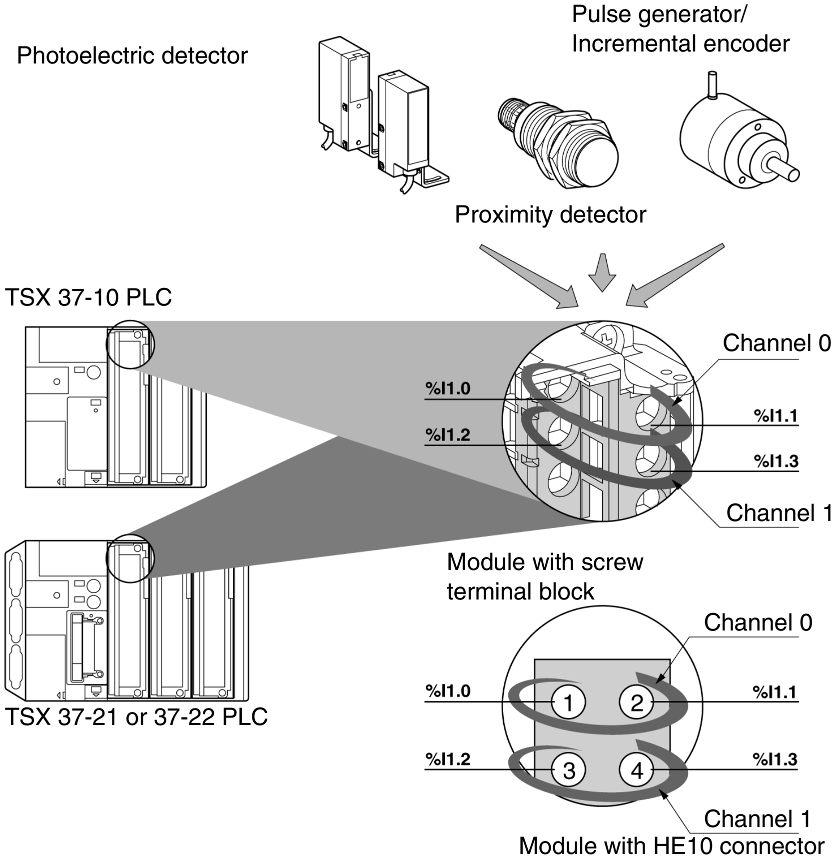
500Hz counts on the discrete inputs of TSX 37 bases

General points

On TSX 37 05/08 PLCs and TSX 37 10 or TSX 37 21/22 PLC bases, the first four inputs of a discrete input/output module located in position 1 (%I1.0 to %I1.3) can be used for counting up to a maximum frequency of 500Hz.

These four inputs allow a maximum of two independent counting channels, the function settings (counting down, counting up, or counting up/down) are specified in the software configuration.

There may be different kinds of sensor which generate the counting pulses (static output or dry contact sensors) insofar as their outputs are compatible with the inputs of the module.
Illustration:



Built in 10 KHZ counting function on TSX 37 22 bases

General

The TSX 37 22 PLC bases incorporate counting interfaces which enable them to carry out counting up, counting down or up/down counting functions at a maximum frequency of 10KHz. These counting interfaces, which can be accessed via two standard 15-pin SUB-D connectors, comprise two independent counting channels (channel 11 and channel 12); the function settings (up counting, down counting or up/down counting) are specified by software configuration.

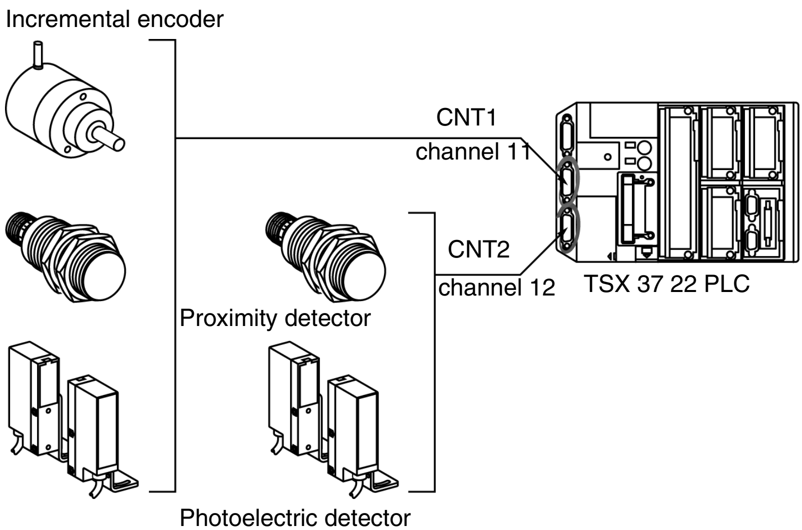
The sensors which generate the counting pulses may be:

- either with static outputs, in which case the maximum counting frequency can reach 10 KHz,
- or with dry contact outputs, in which case the immunity of the input receiving the counting pulses is fixed at 4ms and the counting frequency is limited to 100Hz.

The sensor type is chosen when the counting channel is configured by the software.

Illustration

Diagram of different sensor-types:



Overview of different counting functions

25

At a Glance

Aim of this chapter

This chapter describes the different counting functions:
- counting down function,
- counting up function,
- up/down counting function.

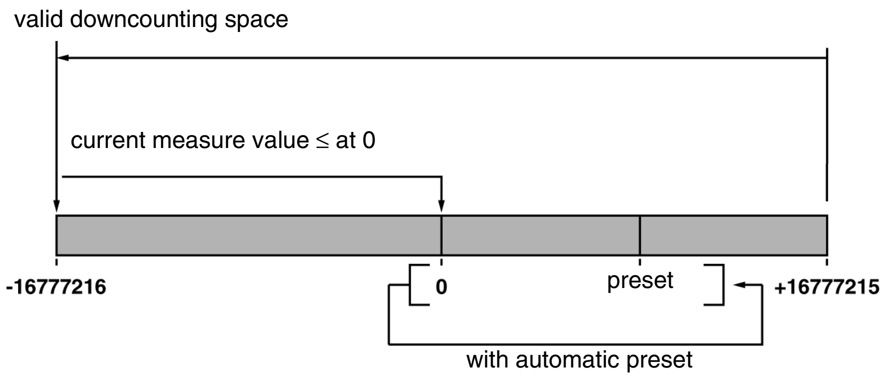
What's in this Chapter?

This Chapter contains the following Maps:

Down counting function

General points

The down counting function allows pulses to be counted down (on 24 bits + sign) from a preset value between 0 and +16777215, and indicates when the current value is equal to or less than 0.
The down counting range is between –16777216 and +16777215.
Illustration:

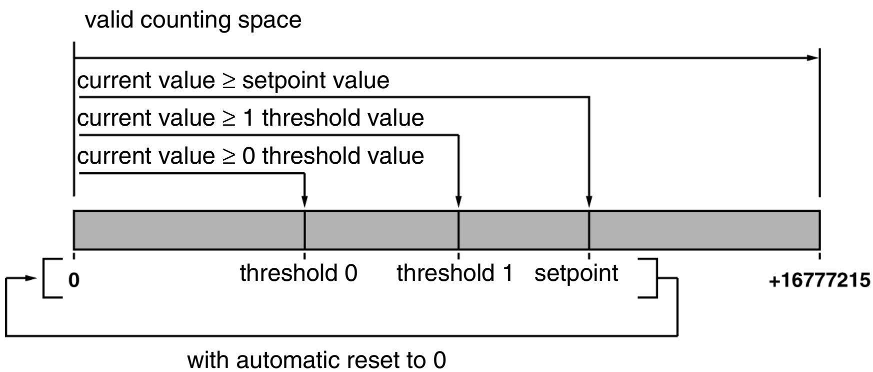


Operation of the down counting function, the language objects and the software implementation are described in detail in the manual for the (Application-specific functions, Volume 2, Upcouting Application).

Up counting function

General points

The up counting function counts pulses (on 24 bits + sign) from 0 to a predefined value known as the setpoint value.
The up counting range is between 0 and + 16777215. A signal is generated when the setpoint value is passed.
The current value of the counter is always compared with two adjustable thresholds (threshold 0 and threshold 1).
Illustration:

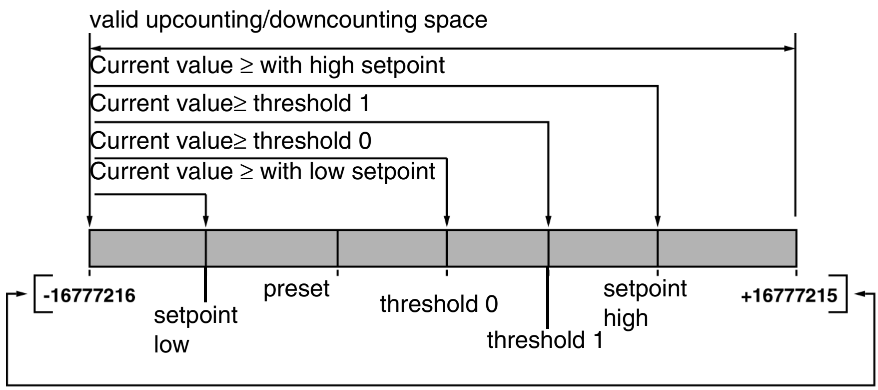


Operation of the up counting function, the language objects and the software implementation are described in detail in the manual for the (Application-specific functions, Volume 2, Upcouting Application).

Up/down counting function

General points

The up/down counting function carries out up and down counting pulses from the same counter (on 24 bits + sign) from a preset value in the up/down counting range. The up/down counting range is between –16777216 and +16777215 with the possibility of defining two setpoints (a high and a low setpoint).
The current value of the counter is always compared with two adjustable thresholds (threshold 0 and threshold 1).
Illustration:



Operation of the up/down counting function, the language objects and the software implementation are described in detail in the manual for the (Application-specific functions, Volume 2, Upcouting Application).

Counting functions on (500Hz) discrete inputs

26

At a Glance

Aim of this chapter

This chapter describes the counting functions on (500Hz) discrete inputs.

What's in this Chapter?

This Chapter contains the following Maps:

Introduction

General

The four discrete inputs (%I1.0 to %I1.3) of the module located in position 1 allow 2 independent up counting, down counting or up/down counting (channel 0 and channel 1) channels to be made with a maximum frequency of 500Hz.

Up counting or down counting

General points

The up or down counting pulses are received on the input**IA** (%I1.0 for channel 0 and %I1.2 for channel 1).

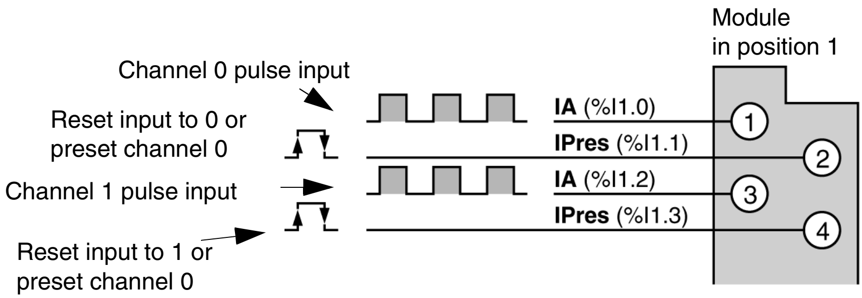
The input**IPres** (%I1.1 for channel 0 and %I1.3 for channel 1) can be used:
- either for setting the preset value of the current value for a down counting function,
- or for setting the current value to 0 for an up counting function.

Note:
symbol used in PL7-Micro screens for IPres input:
- **IPres** if it is a down counting function,
- **IReset** if it is an up counting function.

Setting to 0 (up counting) or setting the preset value (down counting) can be carried out according to one of the methods described below:
- when the status of the IPres input is changed (rising or falling edge, choice made in configuration) and when this is validated in the software,
- automatically as soon as:
  - the setpoint value has been reached in up counting,
  - the value 0 has been reached in down counting.
  (choice made during configuration)
- via software.

Principle Diagram

Illustration:



These functions can be used equally on the modules:

- with a screw or HE10 connector terminal block,
- with direct current inputs,
- with alternating current inputs, in this case the up counting frequency is limited, given the response time of this type of input.

If channel 1 is not used, the corresponding inputs can be configured into event, latch state or normal discrete inputs. In this case, and if the inputs being used are supplied by direct current, the immunity of these inputs will be defined for the inputs assigned to up or down counting.

Channels 0 and 1 can be configured independently of one another, for example, with one channel in up counting and the other in down counting or in up/down counting.

Up/down counting

Introduction

Several possibilities can be used on each channel.

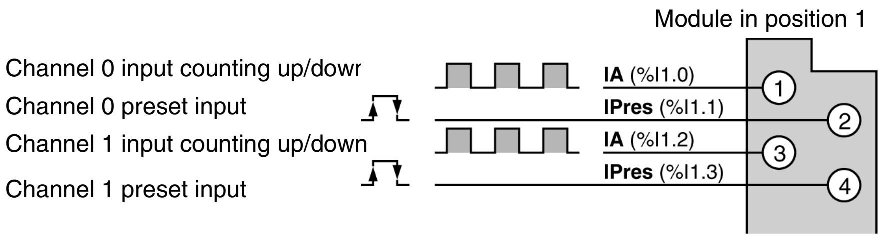
First possibility

When using a single physical up/down counting input, the direction (up or down counting) is defined by the application by setting a bit object to 0 or 1.
The up/down counting pulses are received on the **IA** input: %I1.0 for channel 0 and %I1.2 for channel 1.

Setting the preset value can be carried out according to one of the methods described below:

- when changing the status of the input **IPres:** %I1.1 for channel 0 and %I1.3 for channel 1 (rising or falling edge, choice made in configuration) and when this is validated in the software,
- via software.

Illustration:

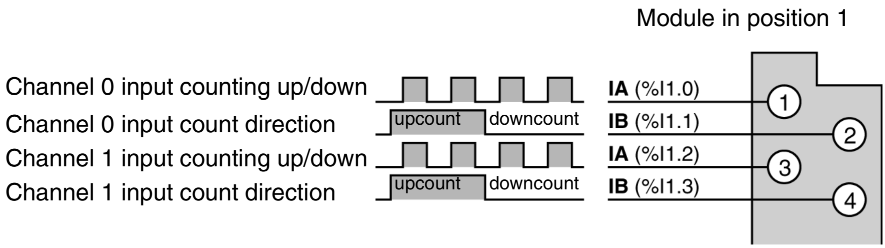


Second possibility

When using a single physical up/down counting input, the direction (up or down counting) is defined by setting the second input to 0 or 1.
The up/down counting pulses are received on the **IA** input:
- %I1.0 for channel 0,
- %I1.2 for channel 1.

The input **IB** is used to define the counting direction:
- %I1.1 definition of channel 0 counting direction: (status 1: count up, status 0: count down),
- %I1.3 definition of channel 1 counting direction: (status 1: count up, status 0: count down).

In this case, the preset value is set by the software only.
Illustration:

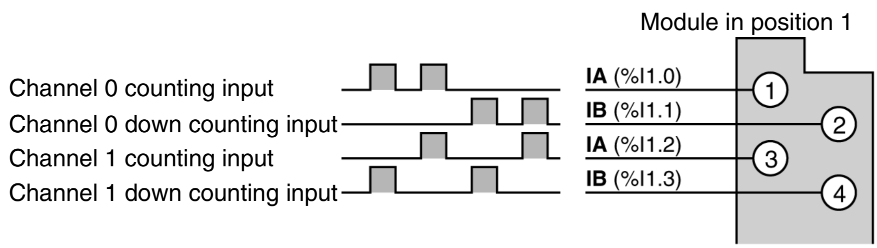


Note: The pulses on the IA input are taken into account for up or down counting if the IB input has been positioned in status 1 (count up) or in status 0 (count down) for at least 100 micro seconds.

Third possibility

Using two physical up/down counting inputs for each channel:
- **Channel 0:**
  - the up counting pulses are received on the **IA** input (%I1.0),
  - the down counting pulses are received on the **IB** input (%I1.1),
- **Channel 1:**
  - the up counting pulses are received on the **IA** input (%I1.2),
  - the down counting pulses are received on the **IB** input (%I1.3),

Illustration:



Note: in this case, the preset value is set by the software only.

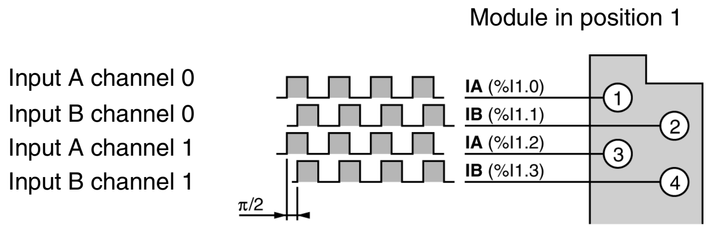
Fourth possibility

Using two physical up/down counting inputs with Pi/2 shifted signals (incremental encoder signals):

- **Channel 0:**
  - signal A on input **IA** (%I1.0),
  - signal B on input **IB** (%I1.1),
- **Channel 1:**
  - signal A on input **IA** (%I1.2),
  - signal B on input **IB** (%I1.3),

In this case, the preset value is set by the software only, and the immunity of these four inputs is automatically fixed to the minimum value of 0.1ms if they are 24V DC inputs.

Illustration:



These functions can be used equally on the modules:

- with a screw or HE10 connector terminal block,
- with direct current inputs,
- with alternating current inputs, in which case the up counting frequency will be limited given the response time of this type of input.

If channel 1 is not used, the corresponding inputs can be configured into event, latch state or normal discrete inputs. In this case, and if the inputs being used are supplied by direct current, the immunity of these inputs will be defined for the inputs assigned to up or down counting.

Channels 0 and 1 can be configured independently of one another with, for example, one channel in up/down counting and the other in up or down counting.

Up counting functions built in to (10KHz) TSX 37 22 bases

27

At a Glance

Aim of this chapter

This chapter deals with the up counting functions which are built in to the (10KHz) TSX 37 22 bases.

What's in this Chapter?

This Chapter contains the following Maps:

Introduction

General points

The count interfaces of the TSX 37 22 bases can be used to create 2 upcount channels, 2 downcount channels or independent upcount/downcount channels (channel 11 and channel 12 located in position 0).
Each count channel can receive 5 VCC/RS 422 or 24 VCC signals at a maximum frequency of 10 kHz.
Preset inputs can only received 24 VCC signals.

Up or down counting

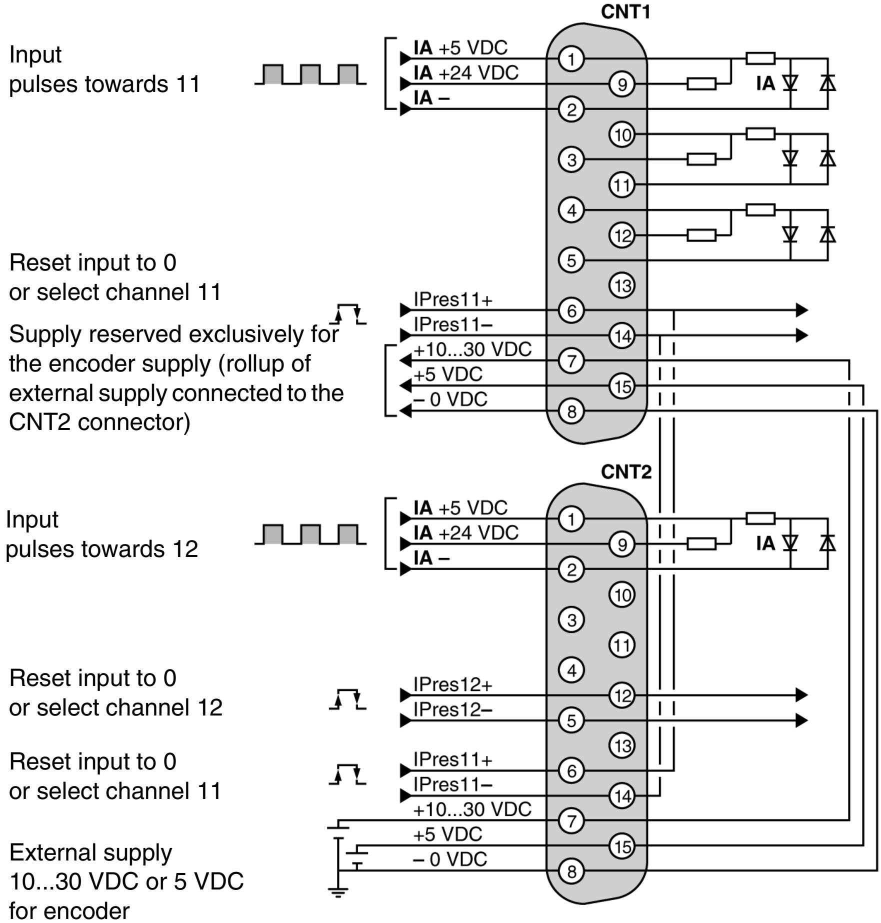
General points

The up or down counting pulses are received on the **IA** input.
Setting to 0 (up counting) or setting the preset value (down counting) can be carried out according to one of the methods described below:
- when the status of the input **IPres11** is changed for channel 11 (rising or falling edge, choice made in configuration) and when this is validated in the software,
- when the status of the **IPres12** is changed for channel 12 (rising or falling edge, choice made in configuration) and when this is validated in the software,
- automatically as soon as the preset value (up counting) or the value 0 (down counting) has been reached, this choice being made in configuration,
- via software.

Note: symbols used in PL7 screens
- **IPres** if it is a down counting function,
- **IReset** if it is an up counting function.

Principle Diagram

Illustration:



Note:
- Channels 11 and 12 can be configured independently of one another with, for example, one channel in up counting and the other in down counting or up/down counting,
- The IPres 11 input and the external supply encoder are shared between the connectors CNT1 and CNT2 in order to make wiring easier, particularly if an encoder is used. In this case, the CNT1 connector is reserved exclusively for the encoder connector, and the CNT2 connector is used for connecting the IPres 11 input and the external supply of the encoder.

Up/down counting on channels 11 and 12

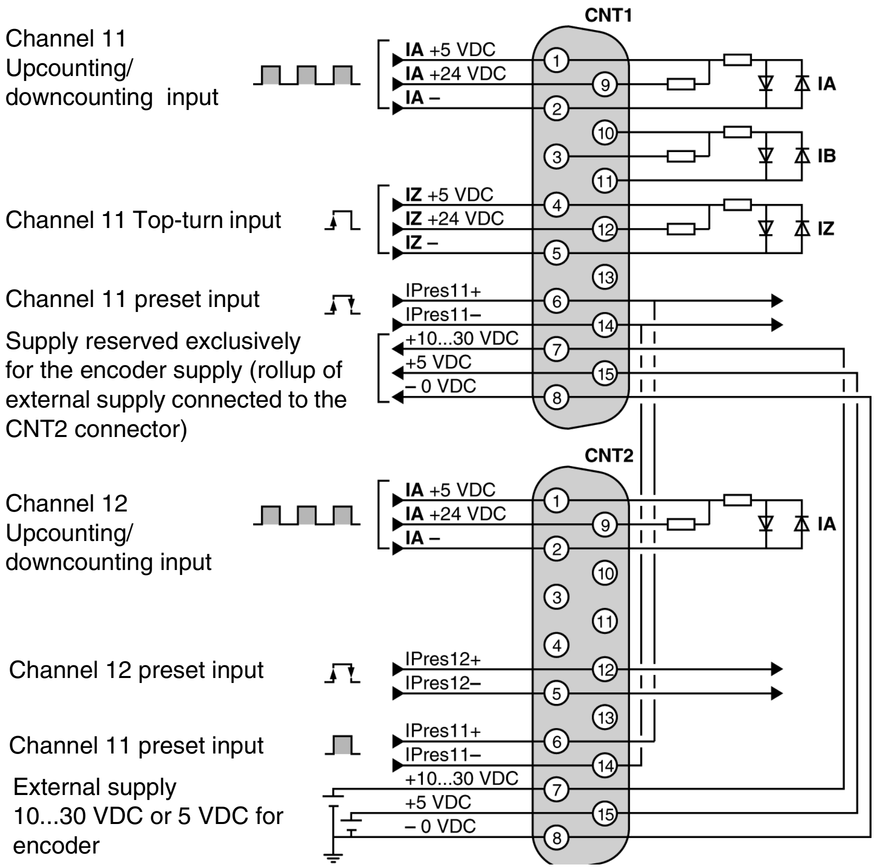
General points

When using a single physical up/down counting input, the direction (up or down counting) is defined by the application program by setting a bit object to 0 or 1. Up/down counting pulses are received on the **IA** input.

The preset value can be set:
- either when changing the IPres input status..: **IPres11** for channel 11 and**IPres12** for channel 12 (rising or falling edge, choice made in configuration),
- either on reference point short cam, on channel 11 only (see *Preset on reference point short cam, p. 257*),
- or by the software.

Principle Diagram

Illustration:



Up/down counting only on channel 11 (first possibility)

General points

When using a single physical up/down counting input, the direction (up or down counting) is defined by setting the second input to 0 or 1.

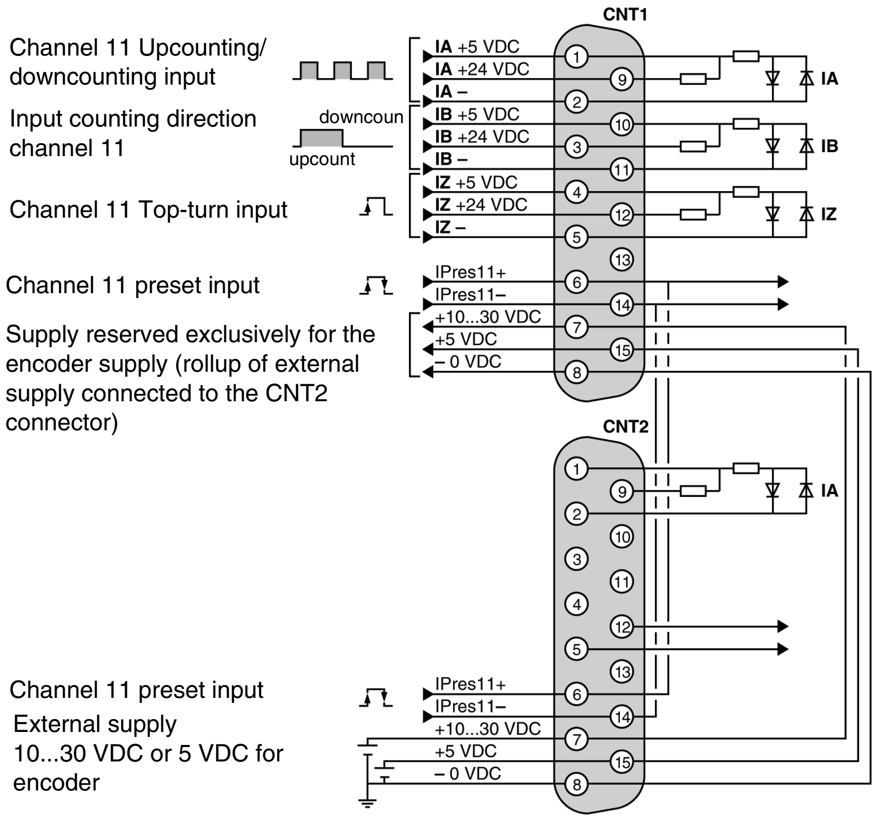
- the up/down counting pulses are received on the **IA** input,
- the direction (up or down counting) is defined by positioning of the **IB** input to status 1 or 0 (status 1: up count, status 0: down count).

The preset value can be set:

- either when the status of the **IPres11** input is changed (rising or falling edge, choice made in configuration),
- or on short cam reference point,
- or by the software.

Principle Diagram

Illustration:



Note: In this case, channel 12 can be used: ● either in up counting or in down counting, ● or in up/down counting (see *Principle Diagram, p. 251*).

Up/down counting only on channel 11 (first possibility)

General points

Using two physical inputs, an upcount input and a downcount input.

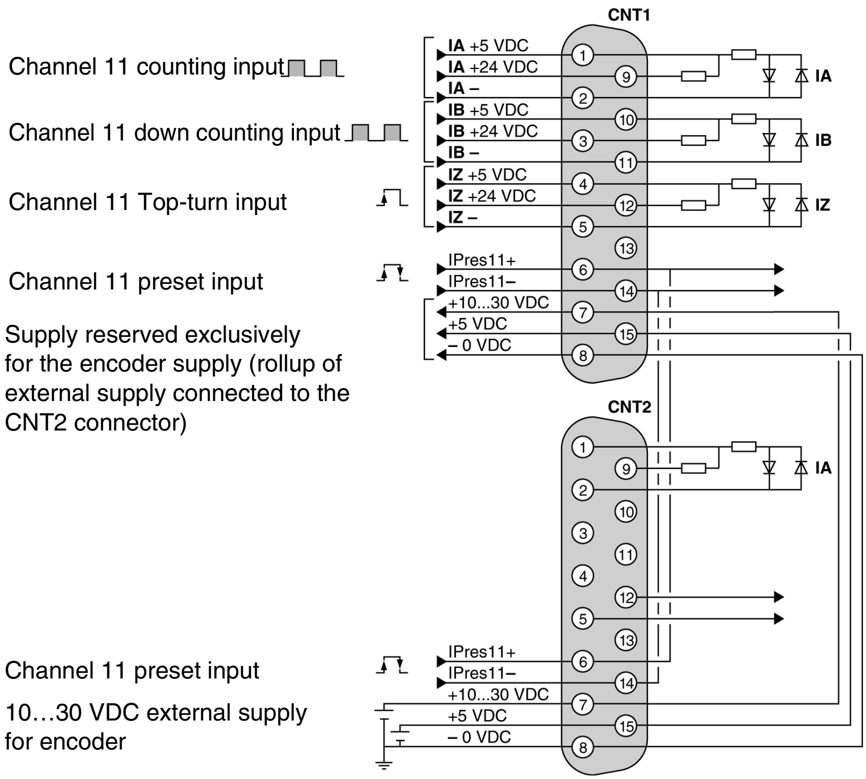
- the up counting pulses are received on the **IA** input,
- the down counting pulses are received on the **IB** input.

The preset value can be set:

- either when the status of the **IPres11** input is changed (rising or falling edge, choice made in configuration),
- or on short cam reference point,
- or by the software.

Principle Diagram

Illustration:



> **Note:** In this case, channel 12 can be used:
> - either in up counting or in down counting,
> - or in up/down counting (according to the up/down counting principle diagram on channels 11 and 12).

Up/down counting only on channel 11 (third possibility)

General points

Using two physical inputs with Pi/2 shifted signals (incremental encoder signals) without hysteresis and multiplying by 1 or 2 according to the choice defined in the configuration.

The up counting signals are received on the inputs:

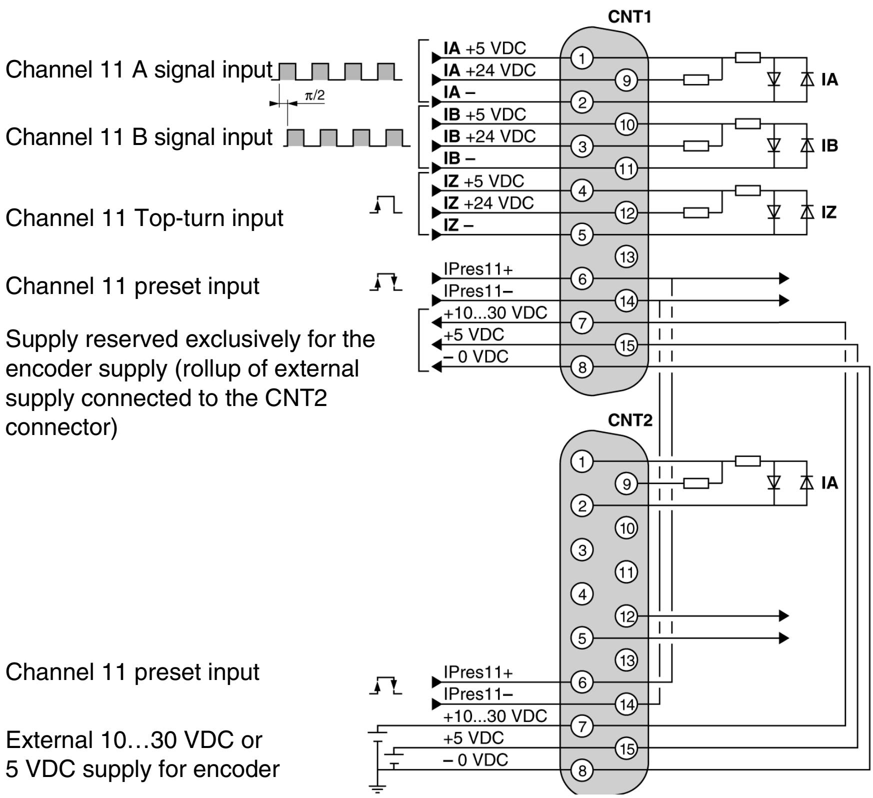
- **IA** for the A signals,
- **IA** for the B signals.

The preset value can be set:

- either when the input status is changed **IPres11** (rising or falling edge, choice carried out in configuration),
- or on short cam reference point,
- or by software.

Principle Diagram

Illustration:



Note: In this case, channel 12 can be used:

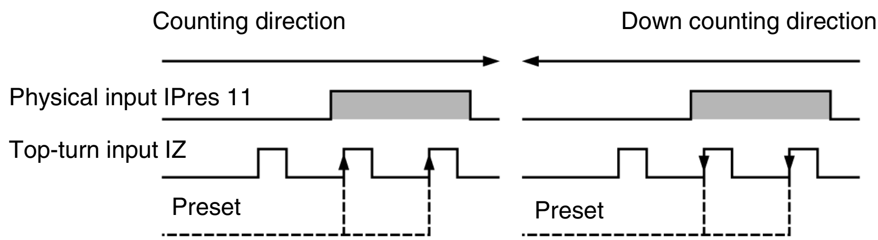
- either in up counting or in down counting,
- or in up/down counting (according to the up/down counting principle diagram on channels 11 and 12).

Preset on reference point short cam

General

Preset is taken into account:
- if the direction is up counting (+): IPres 11 input in status 1 and Top-turn input IZ rising edge,
- if the direction is down counting (-): IPres 11 input in status 1 and Top-turn input IZ falling edge.

Illustration:



Implementing 500Hz up counting on discrete inputs

28

At a Glance

Aim of this chapter

This chapter deals with the implementation of 500HZ up counting on discrete inputs.

What's in this Chapter?

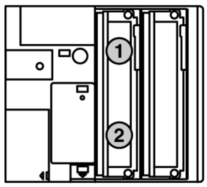
This Chapter contains the following Maps:

Basic configuration required

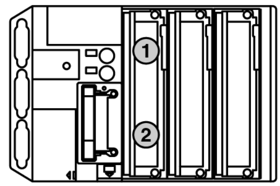
General

The first four inputs of the standard format module, located in position 1, enable the up counting functions (described previously) to be carried out.
The characteristics of the sensors which generate the up counting pulses should be compatible with the characteristics of the inputs of the module located in this position and which differ according to the module installed.

Illustration:



TSX 37 05/10 PLCs



TSX 37 08/21 PLCs

Recall

Recall of the different standard format input/output modules which are installed in position 1 of a TSX 37 05/08/10 PLC or which could be installed in position 1 of a TSX 37 21/22 PLC:

Product reference	Connection	Modularity	Input/output types	PLC's
TSX DMZ 28 AR	screw terminal block	16 inputs (1)	110/120VAC IEC 1131 type 2	TSX 37 10 028 AR1 TSX3721./22.
		12 outputs	Relay	
TSX DMZ 28 DR	screw terminal block	16 inputs	24 VDC, IEC 1131 type 1, positive/negative logic	TSX 37 05 028 DR1 TSX 37 08 056 DR1
		12 outputs	Relay	TSX 37 10.028 DR1 TSX 37 10.128 DR1 TSX 3721./22.
TSX DMZ 28 DT	screw terminal block	16 inputs	24 VDC, IEC 1131 type 1, positive logic	TSX 37 10 128 DT1 TSX 3721./22.
		12 outputs	statistics, 24VDC/0.5A	
TSX DMZ 28 DTK	HE10 connector	16 inputs	24 VDC, IEC 1131 type 1, positive logic	TSX 37 10 128 DTK1 TSX 3721./22.
		12 outputs	statistics, 24VDC/0.5A	
TSX DMZ 64 DTK	HE10 connector	32 inputs	24 VDC, IEC 1131 type 1, positive logic	TSX 37 10 164 DTK1 TSX 3721./22.
		32 inputs	statistics, 24VDC/0.1A	

Product reference	Connection	Modularity	Input/output types	PLC's
TSX DEZ 32D2	screw terminal block	32 inputs	24 VDC, IEC 1131 type 2, positive logic	TSX3721./22.

(1) up counting functions possible on these inputs with:

- voltage-adapted sensors,
- by limiting the frequency, taking the response time of the sensors into account.

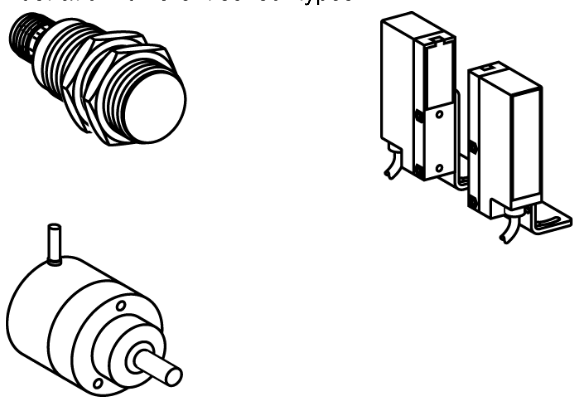
Types of sensor which can be used on up counting discrete inputs

General points

According to the type of module installed in position 1, the (24V DC) up counting inputs can receive pulses generated by:

- an inductive, photoelectric, or other detector:
  - 24V DC supply voltage,
  - type 2 wires on positive logic (sink) or negative logic (source) inputs,
  - type 3 PNP wires on positive logic (sink) inputs,
  - type 3 NPN wires on negative logic (source) inputs,
- an incremental encoder with 24V DC outputs of the following type:
  - open collector NPN,
  - open collector PNP,
  - Totem pole.

Illustration: different sensor types



The most common type of incremental encoder which can be used on discrete inputs

Table:

Supply voltage	Output voltage	Output mailstop
10...30 V	10...30 V	Totem Pole

Compatibility recall between the sensors and inputs of different modules

Table:

Modules	TSX DMZ 28DR	TSX DMZ 28DT/DTK TSX DMZ 64DTK
3 wire PNP sensor type	Yes (sink configured inputs)	Yes
3 wire NPN sensor type	Yes (source configured inputs)	No
2 wire sensor type	Yes (sink or source configured inputs)	Yes
Incremental encoder with Totem pole output	Yes (sink configured inputs)	Yes

For sensor/input compatibility, see (TSX Micro Installation manual, Volume 2).

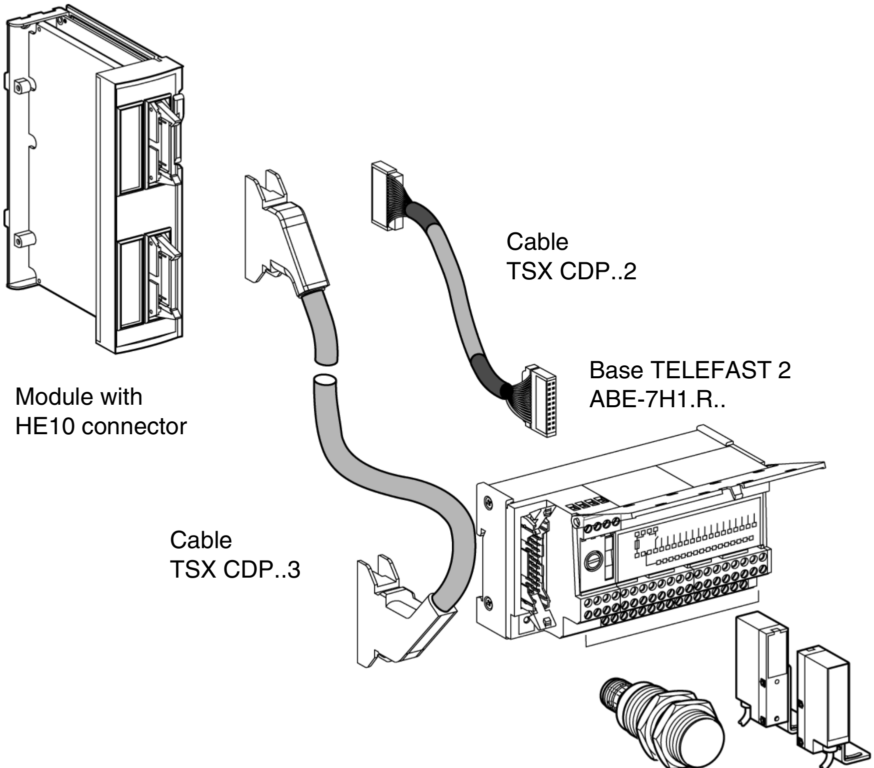
Principal for connecting supplies and sensors

Modules with screw terminal block connection

The supplies and sensors are to be connected directly onto the module’s screw terminal block.

Module with connection by HE10 connector

The supplies and sensors are to be connected using a connection base as intermediary for TELEFAST 2 (1) discrete I/O + TSX CDP 102/202/302 stranded and sheathed cable or TSX CDP 053/103/203/303/503 (2) wires.
Illustration:



(1) The following TELEFAST 2 connection bases can be used: ABE-7H1.R.. .
(2) TSX CDP 102 : 1m in length,
TSX CDP 102: 1m in length,
TSX CDP 202: 2m in length,
TSX CDP 302: 3m in length,
TSX CDP 053: 0.5m in length,
TSX CDP 103: 1m in length,
TSX CDP 203: 2m in length,
TSX CDP 303: 3m in length,
TSX CDP 503: 5m in length.

Example 1: up counting with inductive detector on the positive logic input

General

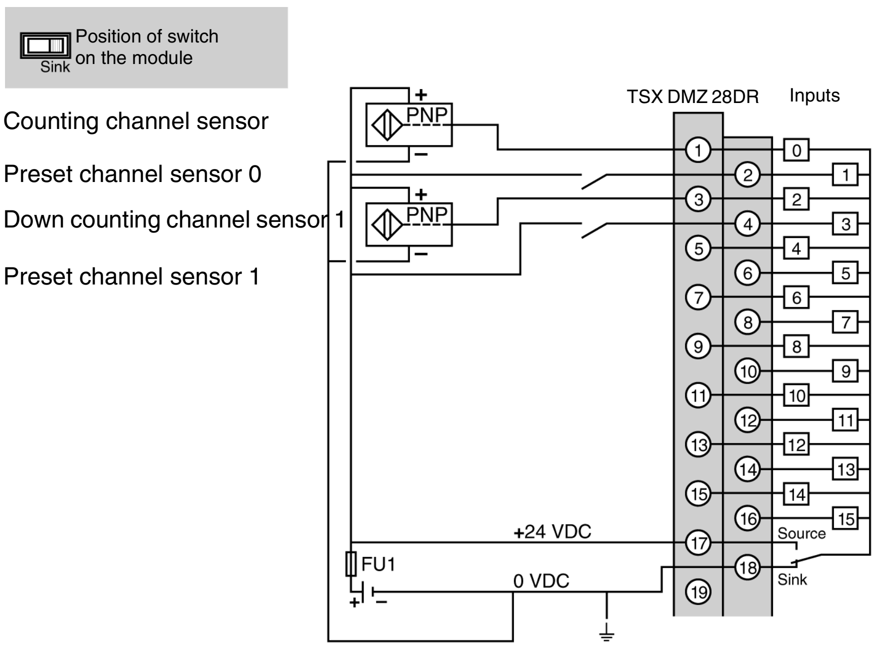
Up counting with inductive proximity detectors on TSX DMZ 28 DR module inputs located in position 1. The inputs are configured in positive logic (sink).

Channel 0 is configured in up counting with:
- %I1.0 input: Upcounter input
- %I1/1 input: preset input at 0.

Channel 1 is configured in down counting with:
- %I1.2 input: downcounter input,
- %I1.3 input: preset input.

Provisional diagram

Illustration:



FU1=fuse 0.5A with fast blow fuse

Example 2: upcounter with inductive detector on negative logic inputs

General

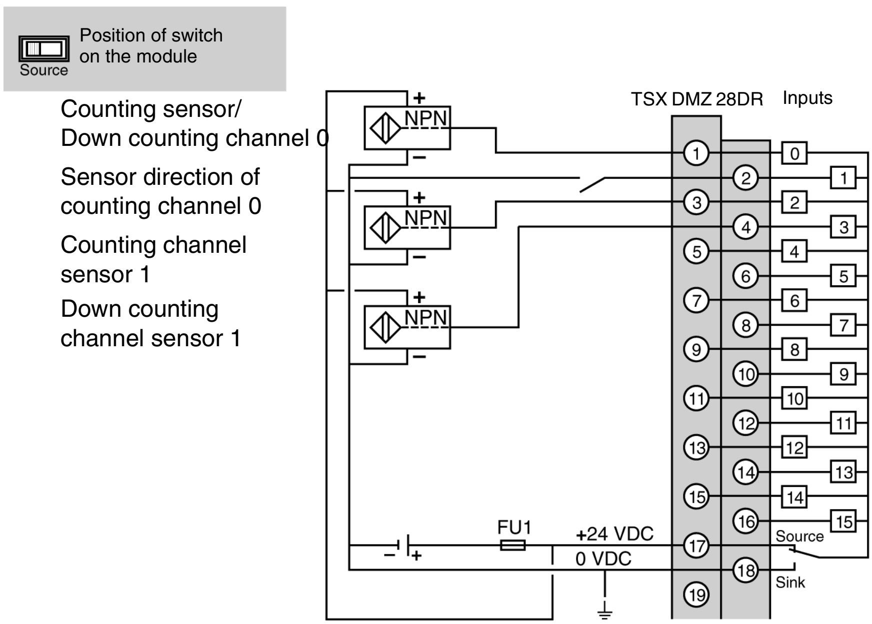
Upcounter with inductive proximity detectors on TSX DMZ 28 DR module inputs located in address 1. The inputs are configured in negative logic (source).

Channel 0 is configured in up/down counting with:
- %I1.0 input: upcounter/downcounter input
- %I1.1 input: up counting direction input, status 1 upcount, status 0 downcount.

Channel 1 is configured in up/down counting with:
- %I1.2 input: upcounter input
- %I1.3 input: downcounter input,

Provisional diagram

Illustration:



FU1=fuse 0.5A with fast blow fuse

Example 3: upcounter with incremental encoder with Totem pole outputs

General

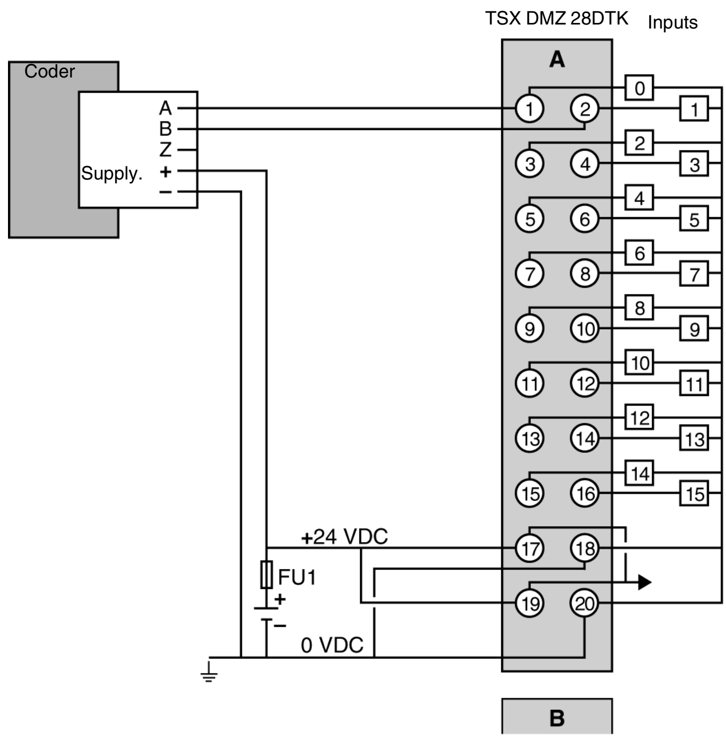
Upcounting from a Totem pole-output incremental encoder on TSX DMZ 28DTK module inputs located at address 1. The inputs are in positive logic.
The channel is configured in up/down counting with:

- %I1.0 input: signal A of the incremental encoder,
- %I1.1 input: signal B of the incremental encoder.

Channel 1 is not configured in upcounting, but the corresponding %I1.2 and %I1.3 inputs can be used as event inputs.

Provisional diagram

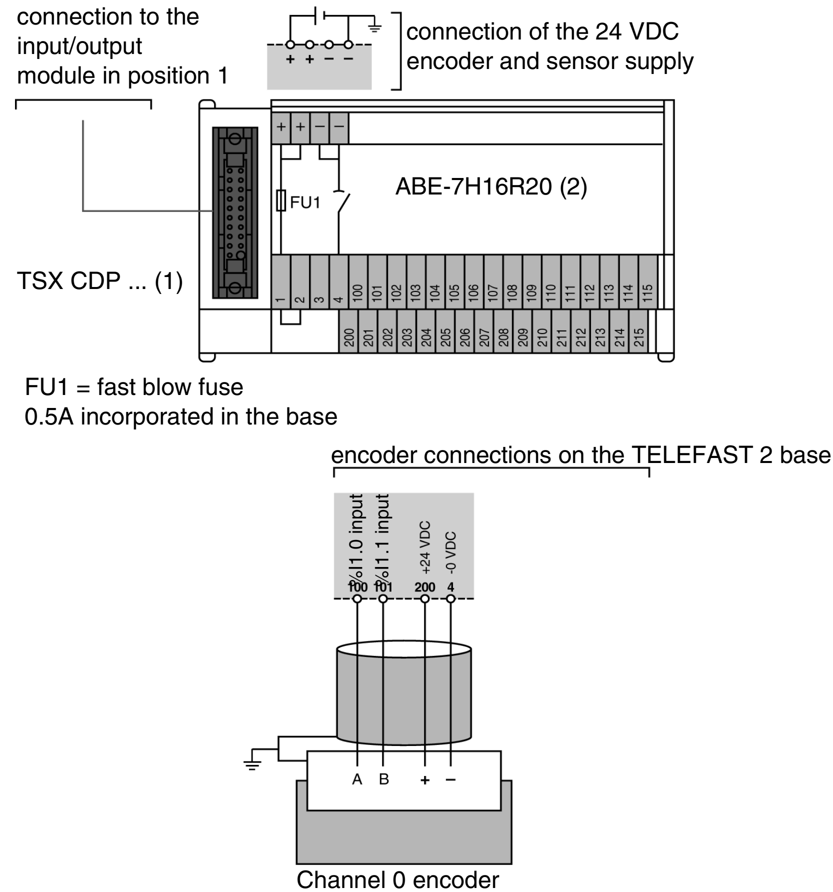
Illustration:



FU1 = 0.5A fast blow fuse

Example of sensor and supply cabling with TELEFAST 2 connection base: ABE-7H16R20

Principle Diagram



Note: If an encoder is used, use a TELEFAST 2 base without display LED for the status of each ABE-7H••R•0 channel.

(1) Connection cable: TSX CDP 102/202/302 or
connection wire: TSX CDP 053/103/203/303/503.
(2) See (TSX Micro Installation manual, Volume 2, connection base).

General implementation rules

General points

The general implementation rules are identical to those of the discrete inputs/outputs (TSX Micro Installation manual, Volume 2).
The general software implementation rules and the language objects associated with the different counting functions are developed in the Manuals TLX DS 57 PL7 ••E tome 2.

> **Note:** When the inputs of a discrete module are used in upcounting and/or downcounting mode, outside incremental encoder interface configuration, it is imperative that the filtering on these inputs be suppressed for the 500Hz upcounter.
> When there is a warm restart, the current value of the upcounter is reset to 0.

Implementing 10KHz upcounter onto TSX 37-22 bases

29

At a Glance

Aim of this chapter

This chapter deals with the implementation of the 10KHz upcounter onto TSX 37-22 bases.

What's in this Chapter?

This Chapter contains the following Maps:

Basic configuration required

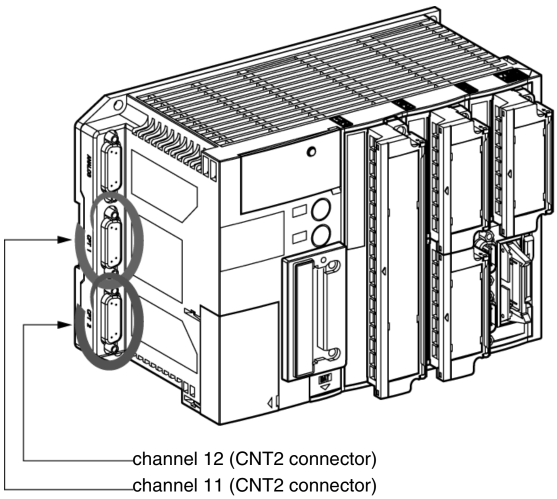
General

A TSX 37-22 base has 2 built-in upcounting channels which make it possible to carry outupcounting functions (See *Overview of different counting functions, p. 235*) .

For each upcounting channel, a 15-pin SUB-D connector assembles:
- the connection points together with the various sensor types which generate the counting pulses,
- the connection points to the preset auxiliary inputs,
- the supply connection points.

Illustration

Display of the connectors on TSX PLC:



Type of sensors which can be used on the upcounter inputs

Channel 11 and channel 12

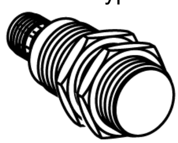
The upcounter inputs of channels 11 and 12 can receive pulses generated by every type:
- of inductive, photoelectric, or other detector:
  - 24VDC output voltage,
  - 2 wires or 3 wires from PNP or NPN types,
- from sensors with 5VDC output voltage.

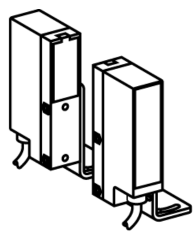
Channel 11 only

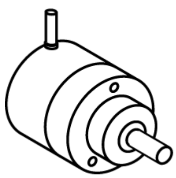
The channel 11 upcounter inputs can also receive pulses which are generated by an incremental encoder.

Illustration

Different types of sensors:







The most common types of incremental encoders can be used for upcounting on channel 11

Summary table:

Supply voltage	Output voltage	Type of output mailstop
5V	differential 5V	RS 422 line transmitter
10...30 V	10...30 V	Totem pole.
10...30 V	differential 5V	RS 422 line transmitter

Characteristics

General Characteristics

Table of characteristics:

Maximum counting frequency	10KHz
Operational Temperature	0 to 60°C
Input/earth dielectric rigidity or internal logic and input	1000V effective - 50/60Hz - 1mm
Hygrometry	5% to 95 % excluding condensation
Storage temperature	-25° to +70°C
Operational altitude	0 to 2000 meters

Input characteristics

Table of characteristics:

Inputs			**5V upcounter or RS 422 (IA/IB/IZ)**	**24V DC upcounter (IA/IB/IZ)**	**24V DC preset (IPres11/ IPres12)**
Logic			Positive	Positive	Positive
Nominal values	Voltage		5V	24V	24V
	Current		3mA	8.7mA	10mA
	Sensor supply		2...5,5 V	19...30 V	19...30 V
Thresholds	In state 1	Voltage	>= 2.1 V	>= 11 V	>= 11 V
		Current	> 2 mA (1)	> 6 mA (2)	> 2.5 mA (2)
	In state 0	Voltage	<= 1 V	< 5 V	< 5 V
		Current	< 0.65mA	< 2 mA	< 1.4mA
Input impedance			> 270 Ohms	2.7 KOhms	2.4 KOhms
Response time		Status 1 to 0	15 micro seconds	15 micro seconds	200 micro seconds1ms
		Status 1 to 0	1...15 micro seconds	1...15 micro seconds	200 micro seconds1ms
Input type			Current ducts	Current ducts	Resistive
Compliance with IEC 1131-2			-	Type 1	Type 2
(3) 2 wire DDP compatibility				-	Yes/Yes
(3) 3 wire DDP compatibility				-	Yes/Yes

(1) for U = 2.4 V,
(2) for U = 11V.
(3) See (TSX Micro Installation manual, Volume 2).

Pin configuration of the 15-pin SUB-D (channels 11 and 12) connectors

Provisional diagram

Illustration:

channel 11 A signal input

channel 11 B signal input

channel 11 Z signal input

Channel 11 preset input

Supply for encoder

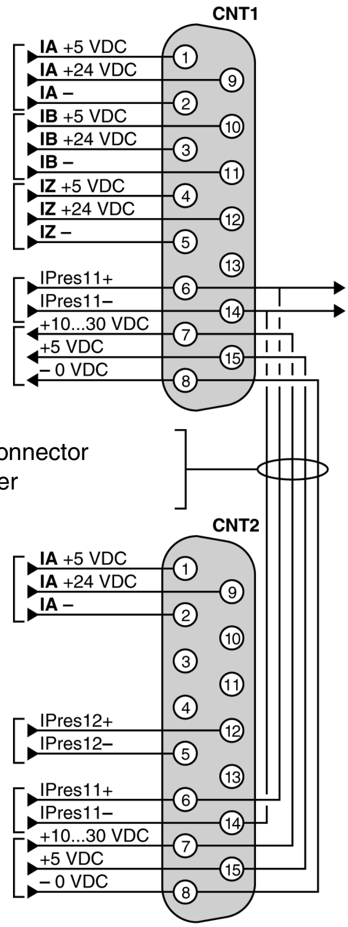
Information report internal links from CNT2 connectors to the connector CNT1 to make connection easier encoder

channel 12 A signal input

Channel 12 preset input

Channel 11 preset input

External 10…30VDC or 5VDC supply for encoder



CNT1 connector (channel 11)

5VDC signals table:

5VDC signals	**Pins**
IA + (channel 11) input	1
IA - (channel 11) input	2
IB + (channel 11) input	10
IB - (channel 11) input	11
IZ + (channel 11) input	4
IZ - (channel 11) input	5
Supply:	
+ 5VDC	15
-0VDC	8

5VDC signals table:

24VDC signals	**Pins**
IA + (channel 11) input	9
IA - (channel 11) input	2
IB + (channel 11) input	3
IB - (channel 11) input	11
IZ + (channel 11) input	12
IZ - (channel 11) input	5
Preset inputs:	
IPres 11 + (channel 11)	6
IPres 11 - (channel 11)	14
Encoder supply:	
+ 24VDC	7
-0VDC	8

CNT2 connector (channel 12)

5VDC signals table:

5VDC signals	Pins
IA + (channel 12) input	1
IA - (channel 12) input	2
External supply:	
+ 5VDC	15
-0VDC	8

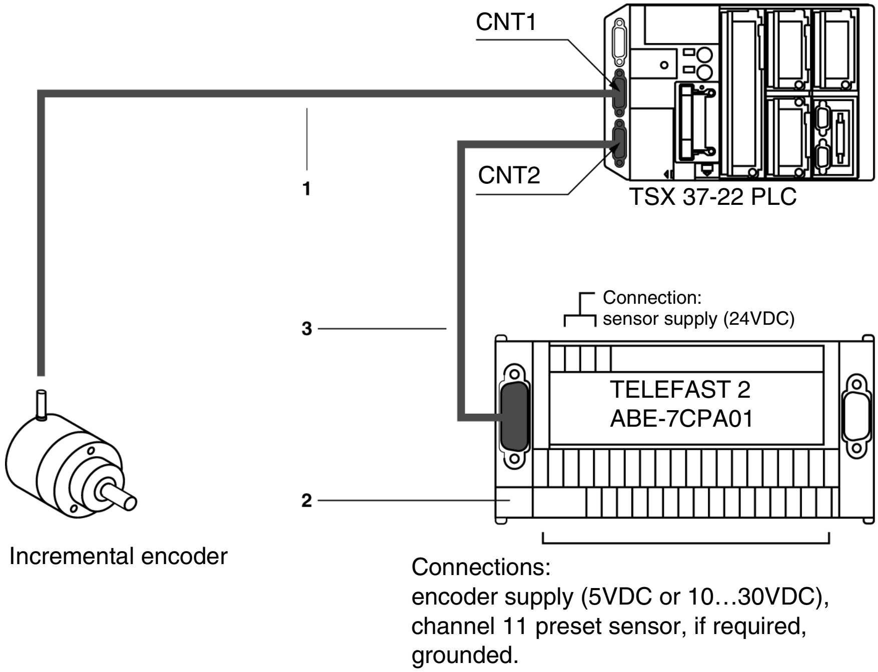
24VDC signals table:

24VDC signals	Pins
IA + (channel 12) input	9
IA - (channel 12) input	2
Preset inputs:	
IPres 12 + (channel 12)	12
IPres 12 - (channel 12)	5
IPres 11 + (channel 11)	6
IPres 11 - (channel 11)	14
External supply:	
+ 24VDC	7
-0VDC	8

Connecting an incremental encoder on channel 11

Connection principle

Illustration:



Description of the different connection components

Table of addresses:

Addresses	Description

1	Connector for connecting the encoder to the CNT1 connector which is located on the TSX 37-22 PLC. Having taken the different encoder types into account, it is up to you to make this connection which comprises:
	• a connector for connecting to the encoder (to be defined according to the encoder connector which is used, usually DIN 12-female pin connector),
	• a standard male 15-pin SUB-D connector for connecting the CNT1 from the TSX 37-22 PLC. Element provided as a separate element under the reference TSX CAP S15,
	• a cable:
	  • with twisted pairs (gauge 24) and shield for an encoder with line transmitter outputs with RS 422 standard,
	  • bundled cables (gauge 24) with shield for an encoder with Totem pole outputs.
	  The shield of the cable will be "braid and steel strip"; the contact of the "braid and steel strip" with the ground of each connector must be secured by clamping down the whole diameter of the cable.
	  The connection of this cable on these two connectors varies according to the type of encoder supply (5VDC or 10…30VDC) and the output type (RS 422, Totem pole, PNP or NPN open collector).

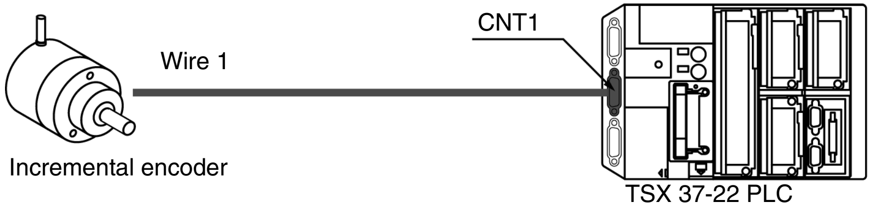
2	TELEFAST 2 connection base: ABE-7CPA01. It enables quick connection: • of the 24VDC supply designed for sensors other than the encoder, • of the encoder supply and the channel 11 preset sensor if the latter is required in order for the application to operate.
3	TSX CCP S15 cable, 2.5 meters long, with a 15-pin standard SUB-D connector at each end. This cable is made up of 15 cables, 0.2mm wide^2(gauge 24), which are linked point-to-point + external braid and steel strip shield and ensures the link between the CNT2 connector from the TSX 37-22 PLC and the TELEFAST 2 (ABE-7CPA01) connection base.

Note: Connecting an incremental encoder to the CNT1 connector of the TSX37-22 PLC can be carried out with the help of a TSX TAP S15•• cabling accessory.

PLC/encoder connection

Illustration

Incremental encoder connected to a TSX 37-22 PLC:

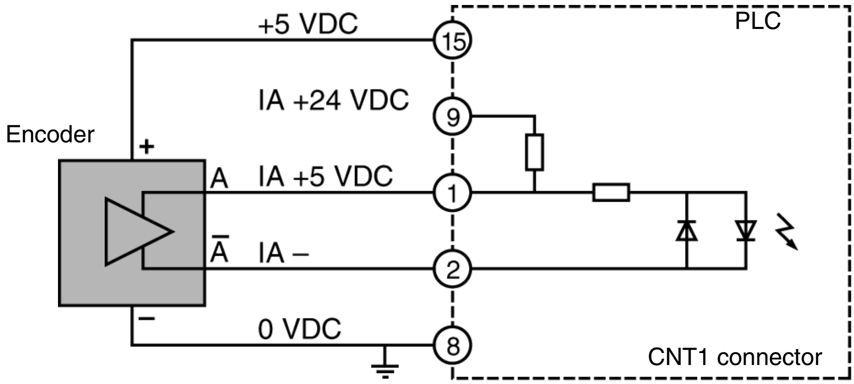


Example: PLC/ encoder connection with RS 422 line transmitter outputs

Encoder characteristics:
- supply voltage: 5VDC,
- output voltage: differential 5VDC,
- output mailstop: RS 422 standard line transmitter.

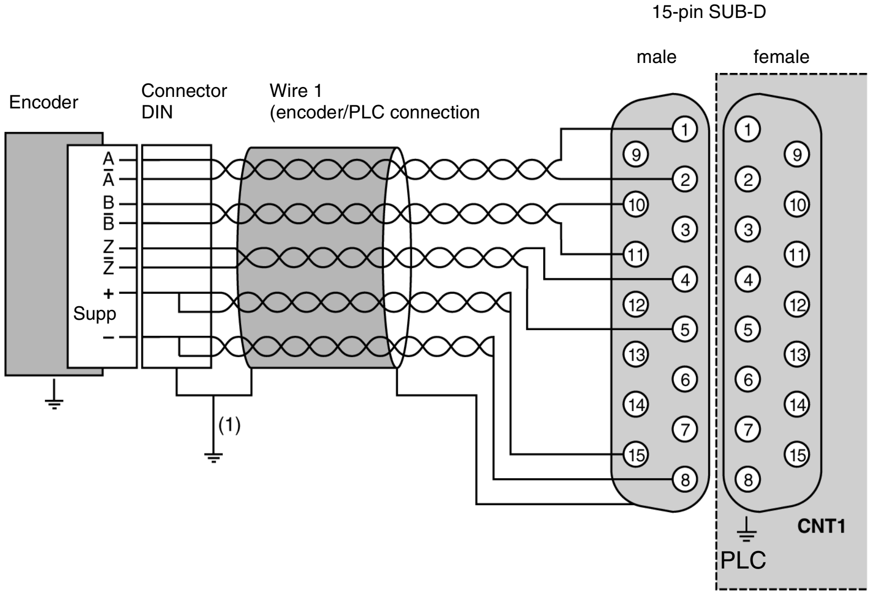
Provisional diagram

Illustration:



Connection diagram

Illustration:



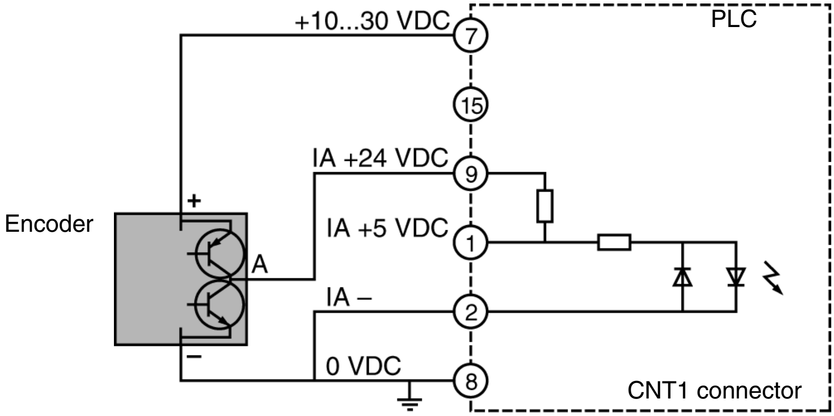
(1) if the encoder is insulated from the mass, the link to ground should be made as described above.

Example: PLC/ encoder connection with Totem pole outputs

Encoder characteristics:
- supply voltage: 10...30VDC,
- output voltage: 10...30VDC,
- output mailstop: Totem pole.

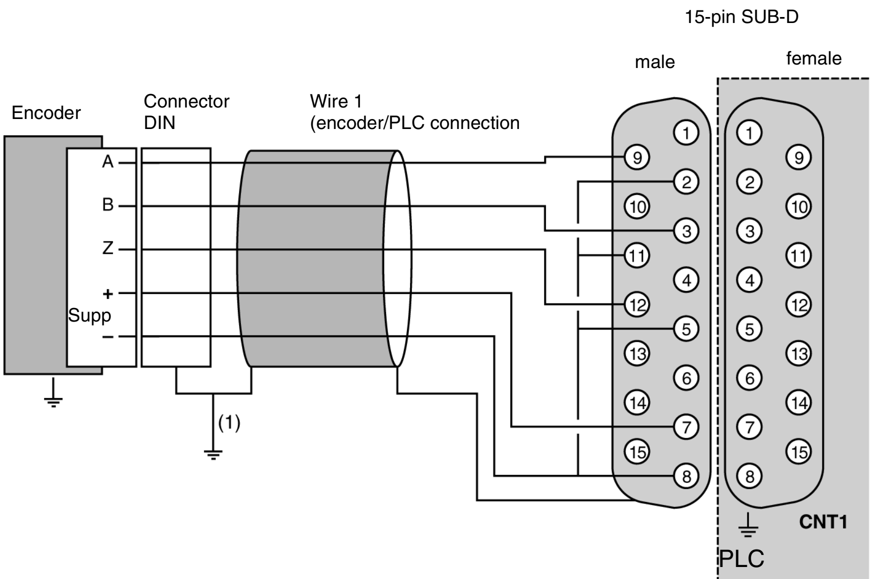
Connection diagram

Illustration:



Connection diagram

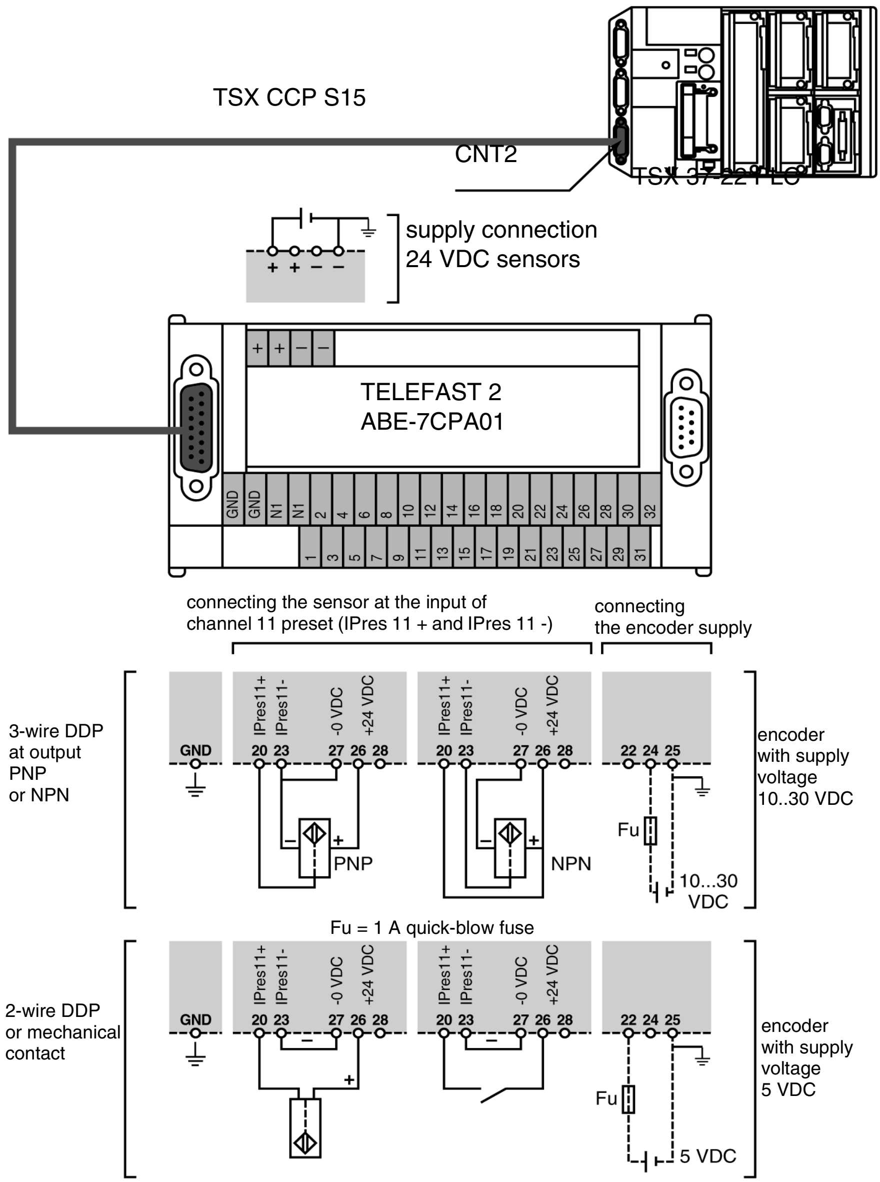
Illustration:



(1) if the encoder is insulated from the mass, the link to ground should be made as described above.

Connecting supply and preset sensor

Principle Diagram

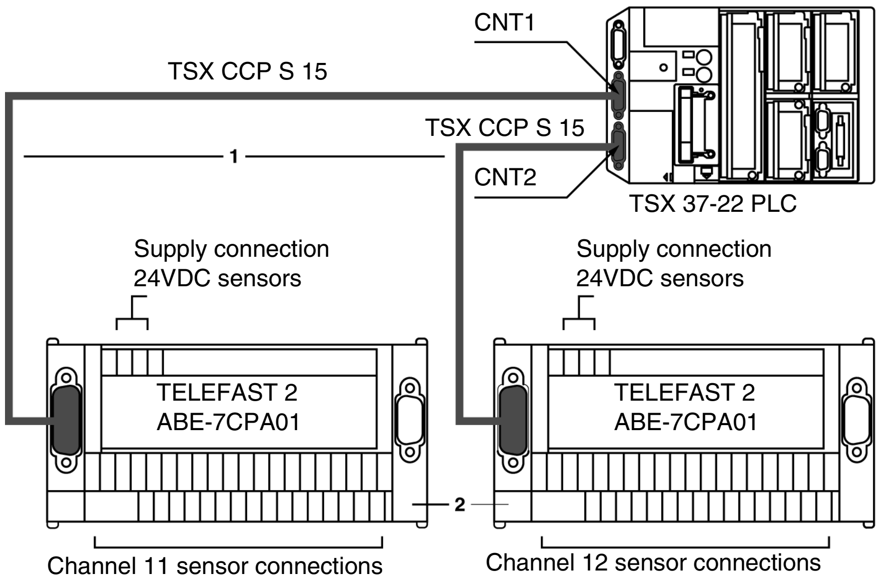


The 0V from the supplies (encoder and sensors) must be connected to the ground.

Connecting counting sensors on channel 11 and 12

Connection technique

Illustration:



Description

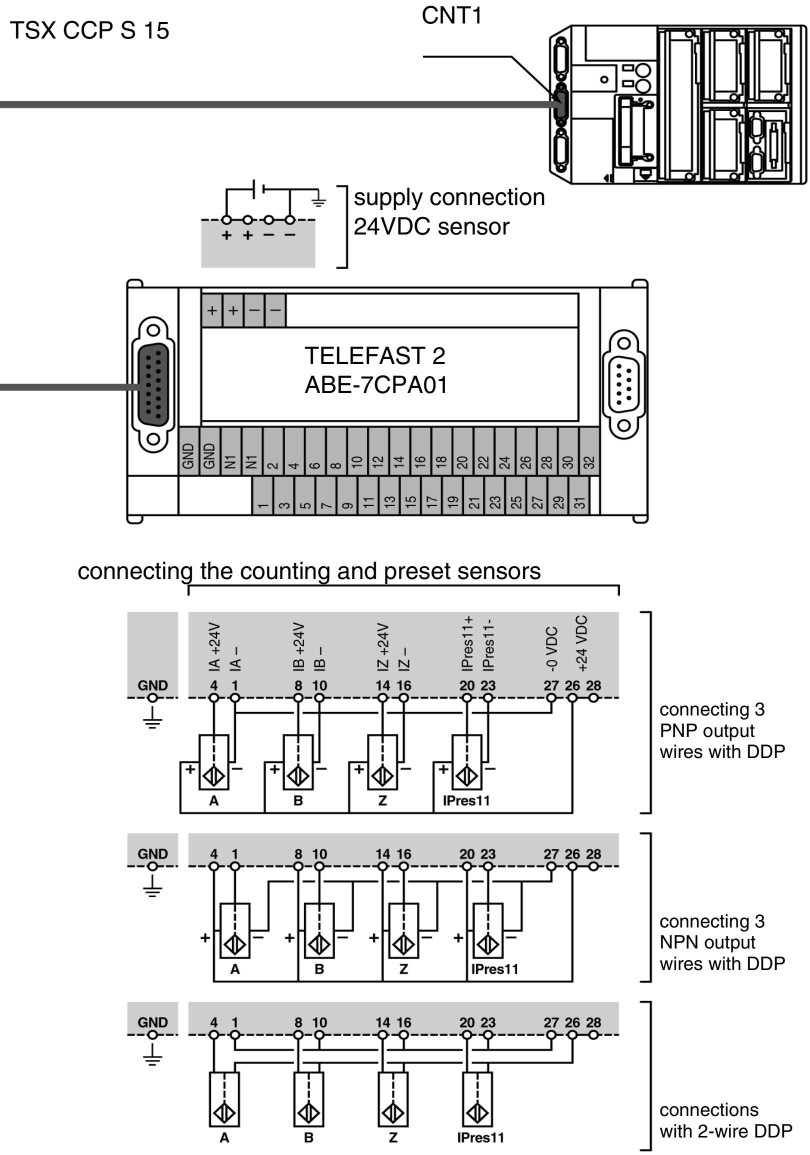
Description table according to addresses:

Address	Description
1	Connection cables for CNT1/CNT2 connectors from the TSX 37-22 PLC to the TELEFAST 2 (ABE-7CPA01) connection bases. Cable reference: TSX CCP S15, 2.5m in length. This cable carries the supply and the different signals for each counting channel.
2	TELEFAST 2 connection bases: ABE-7CPA01. They make it possible to connect the sensors and the supplies for each counting channel quickly.

Connecting supplies and sensors on channel 11

Provisional diagram

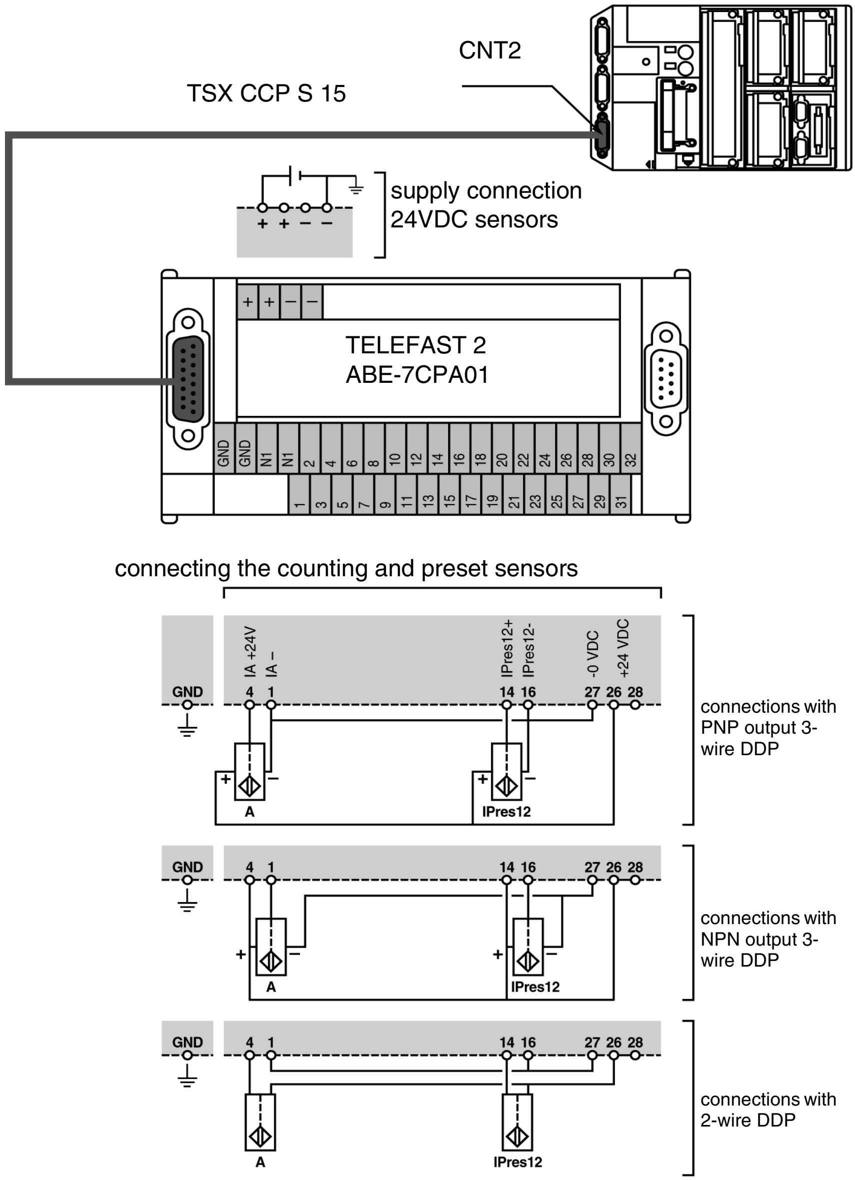
Illustration:



Connecting supply and sensors on channel 12

Provisional diagram

Illustration:



General rules for implementation

Installation

We advise against connecting or disconnecting the CNT1 or CNT2 connectors with the encoder and sensor supplies present, for there is a risk of damage to the encoder, as some encoders cannot cope with the sudden, simultaneous switching on or cutting off of signals and supplies.

General wiring instructions

Wire Gauge
Use wires which are of sufficient gauge, so as to avoid drops in voltage (mainly at 5V) and overheating.

Example of a drop in voltage for encoders supplied with 5V with a cable length of 100 meters:

Wire gauge	**Encoder consumption**			
	50 mA	**100 mA**	**150mA**	**200 mA**
0.08 mm^2 (gauge 28)	1.1 V	2.2V	3.3V	4.4V
0.12 mm^2 (gauge 26)	-	1.4V	-	-
0.22 mm^2 (gauge 24)	-	0.8V	-	-
0.34 mm^2 (gauge 22)	0.25 V	0.5 V	0.75 V	1V
0.5 mm^2	0.17 V	0.34 V	0.51 V	0.68 V
1 mm^2	0.09 V	0.17 V	0.24 V	0.34 V

Connection cable
All cables carrying the sensor supply (encoders, proximity sensor etc.) and the counting signals must:
- be at a distance from high voltage cables,
- be shielded with a shielding which is linked to the protective ground connection on both the PLC and encoder side,
- never carry signals other than the counting signals and the supplies relative to the counting sensors.

The PLC/encoder connection cable should be as short as possible to avoid loops which create coupling capacities which can disrupt operation.

Note: Make sure that the outward and return trip of one signal is carried in the same cable, with the supplies if necessary. Cables with twisted pairs should preferably be used for this.

Encoder and auxiliary sensor supply

Encoder supply

This must:

- be reserved exclusively for supplying the encoder, to cut off parasitic pulses which could disrupt the encoders which contain sensitive electronics,
- be placed as near as possible to the TELEFAST 2 base to reduce drops in voltage and couplings with other cables,
- be protected against short-circuits and overloading by fast-blow fuses,
- ensure a good autonomy of the power supply in order to avoid micro-power outages.

Auxiliary sensor supply

See (TSX Micro Installation manual, Volume 2, precautions of use).

Note: The polarity – 0V DC of encoder and auxiliary sensor supplies must be grounded as close to the supplies as possible.
The shielding of the cables carrying the voltages should be grounded.

Software Implementation

The software implementation and the language objects associated with the different counting functions are developed in the Manuals TLX DS 57 PL7 ••E tome 2.

Note: When the inputs of a discrete module are used in upcounting and/or downcounting mode, outside incremental encoder interface configuration, it is imperative that the filtering on these inputs be suppressed for the 10KHz upcounter.
When there is a warm restart, the current value of the upcounter is reset to 0.

Appendices

30

At a Glance

Aim of this Chapter

This chapter describes the wiring accessories for upcounting modules and incremental coders.

What's in this Chapter?

This Chapter contains the following Maps:

TELEFAST 2 :ABE-7CPA01 connection base

At a Glance

The TELEFAST 2 (ABE-7CPA01) connection base ensures the transformation of a standard female 15-pin SUB-D connector into a screw terminal block connector with:

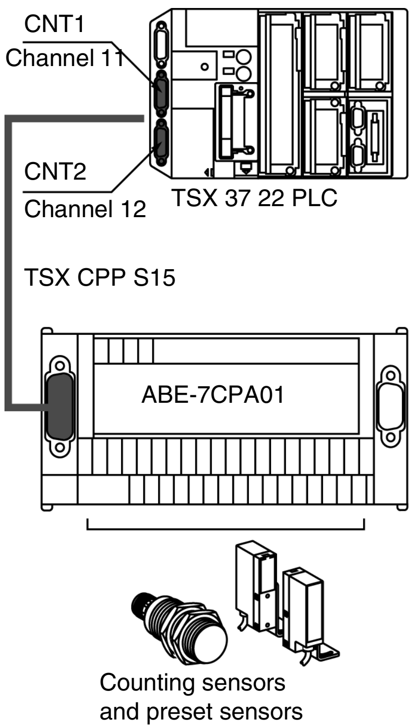
- 32 terminals on two rows which make it possible to connect different sensors and their supply,
- 4 checkpoint terminals (2 GND terminals + 2 specific checkpoint terminals),
- 4 terminals for connecting the sensor supply.

It makes it possible to connect proximity detector sensors quickly on a counting channel.

Note: The ABE-7CPA01 connection base is fitted with a 9-pin SUB-D connector which allows information to be reported to an Altivar, if this base is used with analog inputs/outputs.

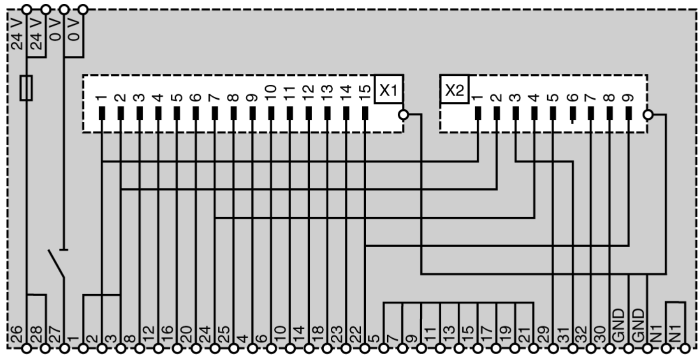
Illustration

TSX 37-22 PLC and TELEFAST 2:



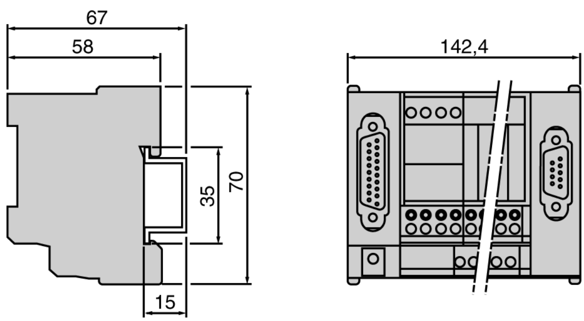
Cabling layout

Illustration:



Dimension and mounting

Dimension: illustration



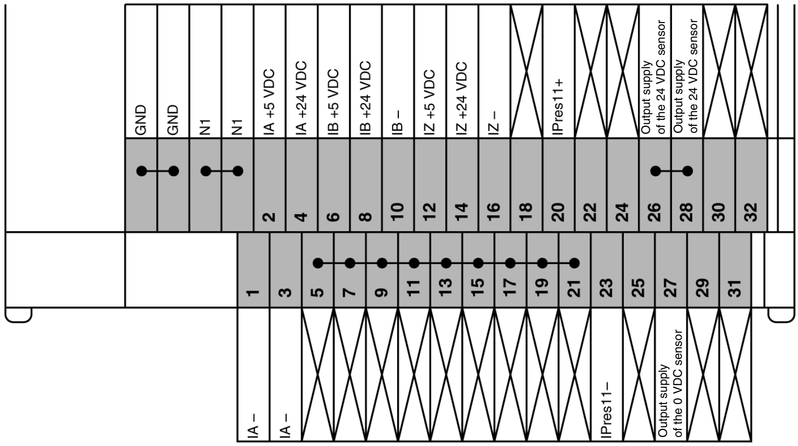
Mounting

The ABE-7CPA01 connection base should be mounted on a 35mm-wide DIN mounting rail.

Availability of the counting signals on the TELEFAST screw terminal block

Channel 11

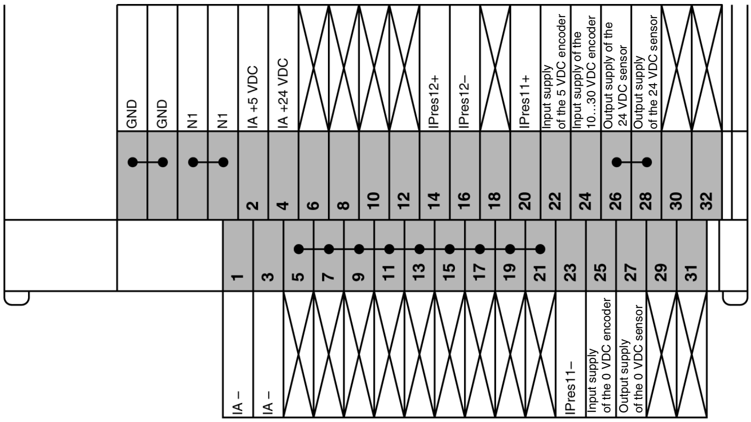
Use with proximity detector-type counting sensors:



N1 = checkpoint terminal

Channel 12

Use with proximity detector-type counting sensors.
Usage for connecting the channel 11 encoder supply and preset sensor.
Illustration:



N1 = checkpoint terminal

Note: each TELEFAST 2 ABE-7CPA01 connection base comes with 6 labels which enable you to personalize the addressing of each base according to the use which is made of it.

Matching TELEFAST terminal blocks and 15-pin SUB-D connector

Correspondence table

Matches between TELEFAST terminal block and 15-pin SUB-D connector:

TELEFAST screw terminal block (Pin No.)	Standard 15-pin SUB-D connector (Pin No.)	Signal activity type	
		Connect. CNT1 (channel 11)	**Connect. CNT2 (channel 12)**
1	2	IA -	IA -
2	1	IA + 5VDC	IA + 5VDC
3	2	IA -	IA -
4	9	IA + 24VDC	IA+24 VDC
5			
6	10	IB + 5VDC	
7			
8	3	IB + 24VDC	
9			
10	11	IB -	
11			
12	4	IZ + 5VDC	
13			
14	12	IZ + 24VDC	IPres 12 +
15			
16	5	IZ -	IPres 12 -
17			
18	13		
19			
20	6	IPress 11 +	IPres 11 +
21			
22 (1)	15		+ 5VDC encoder ext.supp.
23	14	IPress 11 -	IPress 11 -
24 (1)	7		+ 10…30VDC encoder ext. supp.
25 (1)	8		-0 VDC encoder ext. supp.
26		+ 24VDC sensor supp.	+ 24VDC sensor supp.

27		-0 VDC sensor supp.	-0 VDC sensor supp.
28		+ 24VDC sensor supp.	+24 VDC sensor supp.

(1) connecting the external supply required for the encoder.

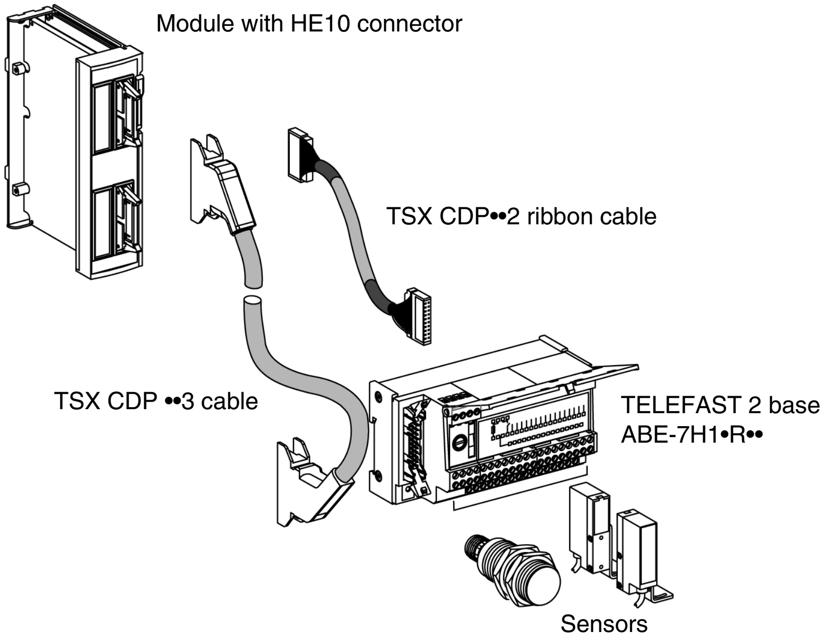
TELEFAST 2 connection base: ABE-7H1•R••

At a Glance

The TELEFAST 2 ABE-7H1•R•• connection bases ensure the transformation of a HE10-type 20-pin connector into a screw terminal block connector enabling the sensors and supplies on the inputs of a discrete module to be quickly connected to an HE10-type connector.
So they can be used in 500Hz counting mode for connecting the counting sensors on the discrete inputs of a module to an HE10 connector.

Illustration

the different components:

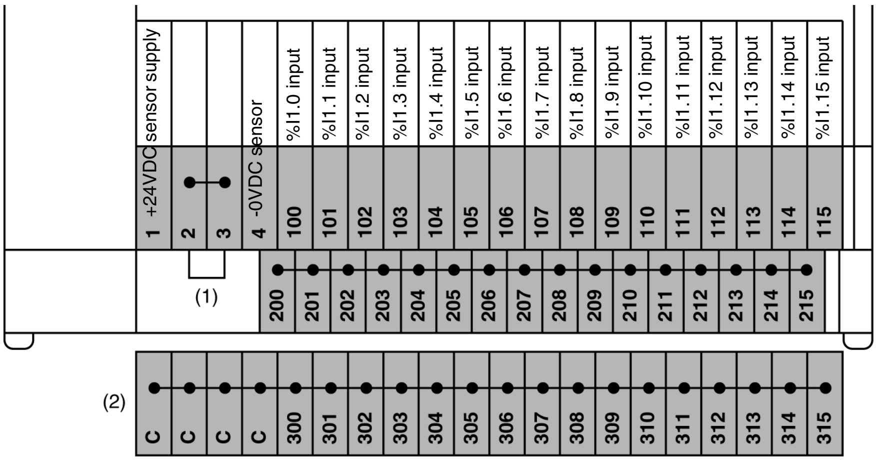


Note: For further information, see(TSX Micro Installation manual, Volume 2, connection base).

Example: using the ABE-7H16R2 pre-wire base.

Signal availability on TELEFAST screw terminal block

illustration:



(1) the position of the jumper wire defines the polarity of all the 2•• terminals

- jumper wire in positions 1 and 2: the 2•• terminals are in the + pole,
- jumper wire in positions 3 and 4: the 2•• terminals are in the – pole.

(2) possibility of adding an optional ABE-7BV20 strip to create a second shared sensor (+ or – according to the user's choice).

Correspondence between TELEFAST terminal blocks and HE10 connector

Correspondence table

TELEFAST and connector correspondence:

TELEFAST screw terminal block (No. of terminal)	20-pin HE10 connector (Pin no.)	Nature of signals
100	1	%I1.0 input
101	2	%I1.1 input
102	3	%I1.2 input
103	4	%I1.3 input
104	5	%I1.4 input
105	6	%I1.5 input
106	7	%I1.6 input
107	8	%I1.7 input
108	9	%I1.8 input
109	10	%I1.9 input
110	11	%I1.10 input
111	12	%I1.11 input
112	13	%I1.12 input
113	14	%I1.13 input
114	15	%I1.14 input
115	16	%I1.15 input
+24V DC	17	Input and sensor supply.
- 0V DC	18	
+24V DC	19	
- 0V DC	20	
1	-	Group of 2•• to + 24V DC terminals when the jumper links both these terminals.
2	-	
3	-	Group of 2•• to + 0V DC terminals when the jumper links both these terminals.
4	-	
200••215	-	Connecting shared sensors to: ● +24V DC if terminals 1 & 2 are linked, ● -0V DC if terminals 3 & 4 are linked.
300••315	-	On optional ABE-7BV20 strip: terminals which can be used as a shared sensor or ground connection strip depending on the choice of the user.

Cabling accessories for incremental encoder: TSX TAP S15••

At a Glance

The TSX TAP 15•• cabling accessories are connecting devices for an incremental encoder with Totem pole (or push-pull) outputs :

- TSX TAP S15 05: cabling accessory for an incremental encoder with a 5VDC supply,
- TSX TAP S15 24: cabling accessory for an incremental encoder with a 24VDC supply (or 10…30VDC).

The TSX TAP S15 05/24 have 2 connectors:

- a female 12-pin DIN connector which allows the encoder cable to be screwed in a clockwise direction (the ring fastener is on the encoder cable),
- a standard 15-pin SUB-D connector which allows (using a standard TSX CCP S15 cable) the TSX 3722 PLC base to be connected to the SUB-D (address CNT1) connector.

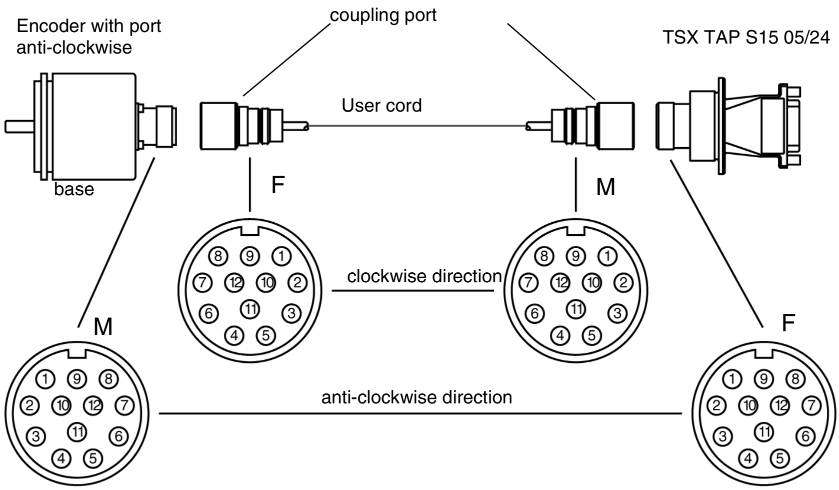
Note: These products, TSX TAP S15 05/24, can be fixed onto a Din rail, using a set square which is supplied with the product, or they can be fixed across the cabinet with a gasket which is supplied with the product.

Details concerning the connectors

The number of these connector pins can be addressed in two different ways. The majority of the encoders have a built in 12-pin DIN base, addressing is carried out in an anti-clockwise direction. The TSX TAP S15 has a female 12-pin DIN base addressed in an anti-clockwise direction. All the user cords must be fitted with coupling ports addressed in a clockwise direction, which makes the pin numbers correspond one by one when cabling.

Illustration

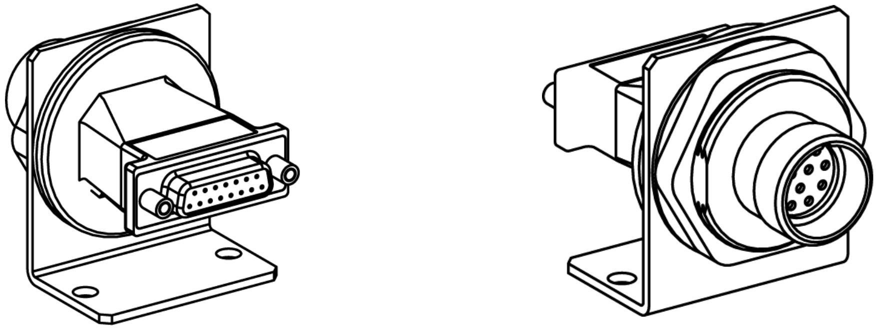
Provisional diagram:



Mounting the TSX TAP S15 05/24

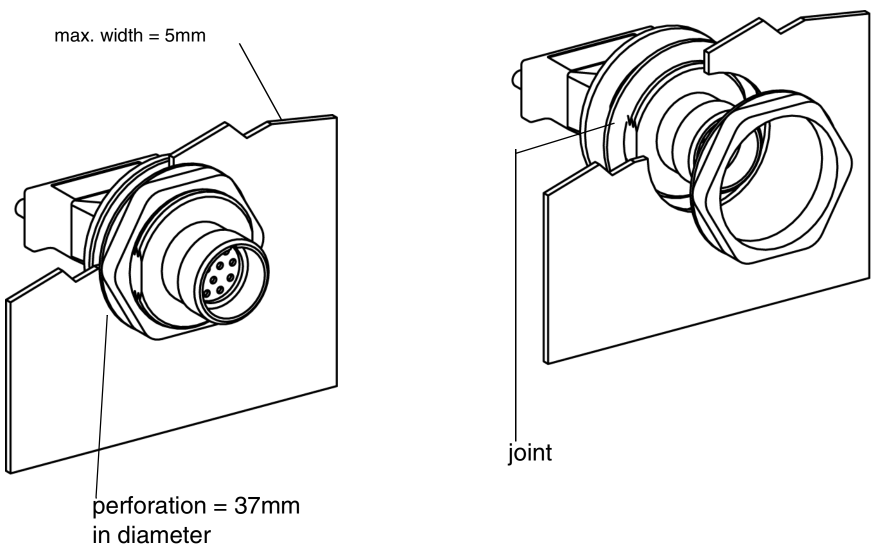
Mounting on a Telequick plate

The set square which is supplies makes it possible to attach the TSX TAP 05/24 to an AM1-PA…type perforated plate or on any other support.
Illustration:



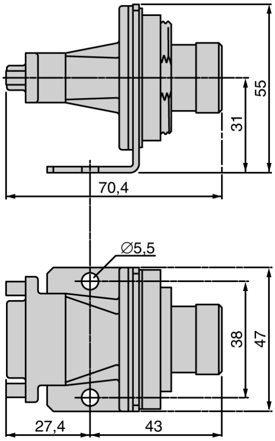
Mounting across the cabinet

Thanks to its rifle nut, the TSX TAP S15 05/24 can be mounted across the cabinet. Its seal makes it possible to ensure that the area between the interior and the exterior is watertight.
Illustration:



Dimension

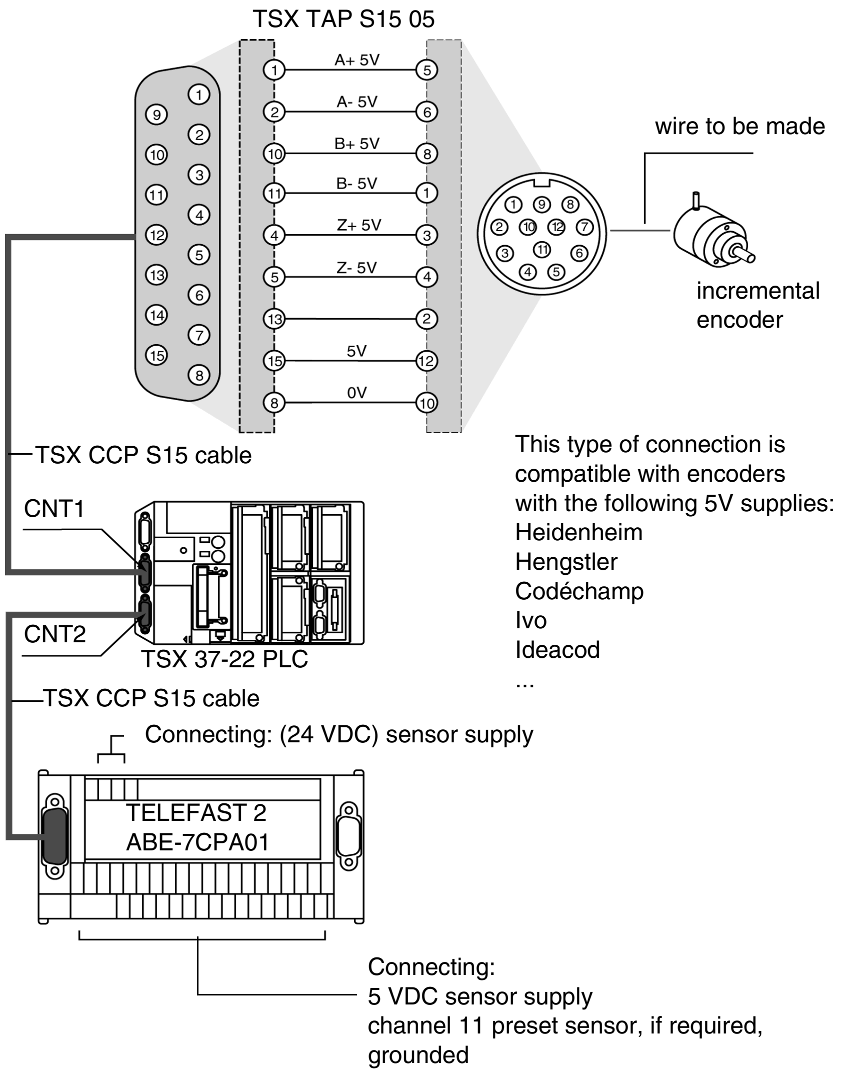
Illustration:



Connecting an encoder with a TSX TAP S15 05 accessory

General points

Connecting an encoder using a TSX TAP S15 05 accessory as intermediary, requires you to create a specific cable between the accessory and the encoder. Pin configuration of the TSX TAP S15 05 is as follows:

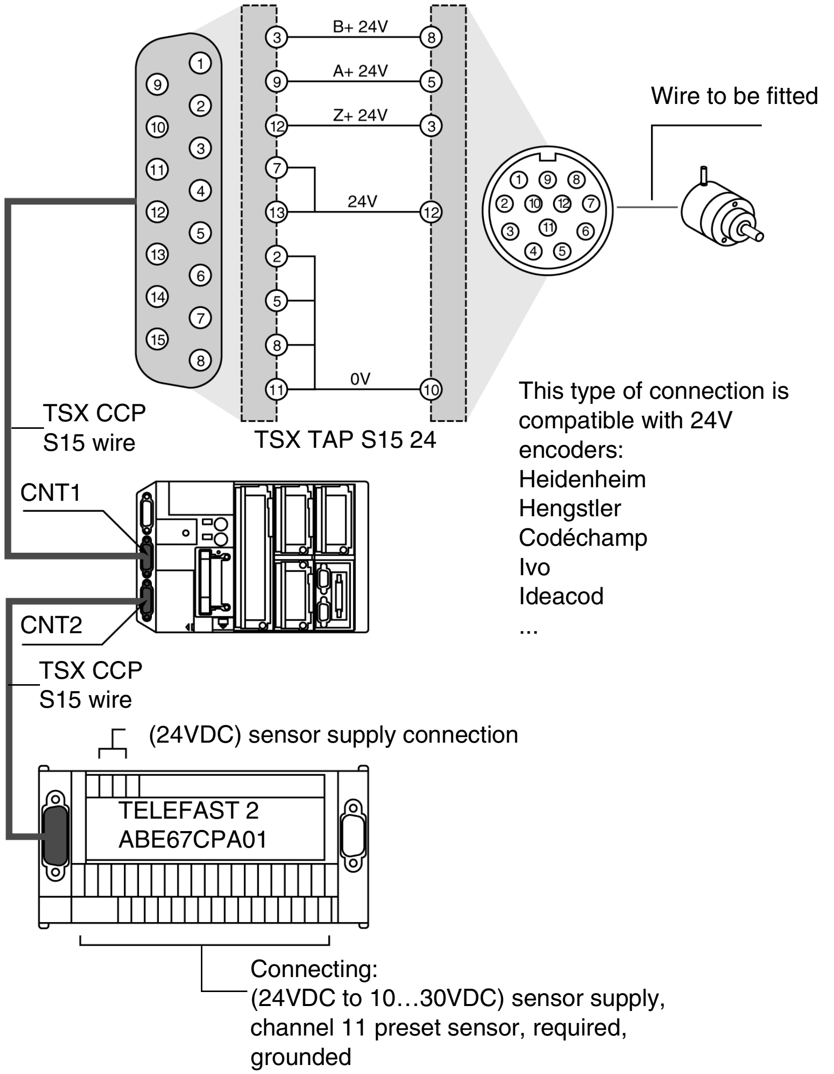


This type of connection is compatible with encoders with the following 5V supplies:
Heidenheim
Hengstler
Codéchamp
Ivo
Ideacod
...

Connecting an encoder with a TSX TAP S15 24 accessory

General

Connecting an encoder using a TSX TAP S15 24 accessory as intermediary, requires you to create a specific cable between the accessory and the encoder. Pin configuration of the TSX TAP S15 24 is as follows:



Communication incorporated in the bases

VII

Aim of this tab

Aim of this tab

This tab deals with the means of communication incorporated into Micro PLCs

What's in this part?

This Part contains the following Chapters:

Terminal port

31

Overview of this chapter

Aim of this chapter

This chapter deals with the terminal ports assigned to Micro PLC's.

What's in this Chapter?

This Chapter contains the following Sections:

31.1 Micro communication

At a Glance

Subject of this section

This section provides an overview of the different communication protocols available from the terminal port.

What's in this Section?

This Section contains the following Maps:

Foreword

General points

As the terminal port refers to the UNI-TELWAY master, UNI-TELWAY slave, Modbus and character string communication modes, it is necessary to consult the following documents for the implementation (hardware and software) of these different modes of communication.

- TSX DG UTW F : UNI-TELWAY Communication Bus (User guide),
- TSX DR NET F : X-WAY communication (Reference manual),
- TSX DS COM PL7 ••F : Micro/Premium PLC communication (implementation manual).

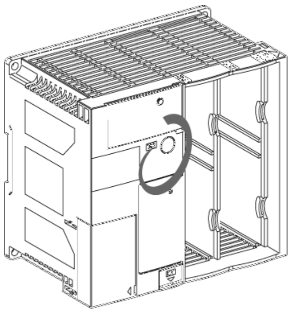
At a Glance

General points

The PLCs TSX 37 incorporate as standard a multi-function link via the terminal port. This terminal port is a non-isolated RS 485 link comprising one 8-pin mini DIN 8 connector.

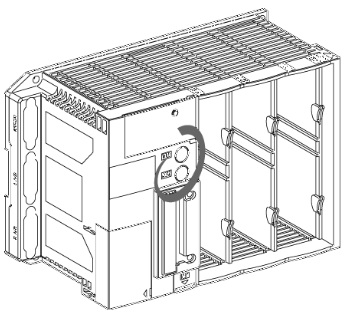
The PLCs TSX 37-05/08/10 have a TER serigraph terminal port.

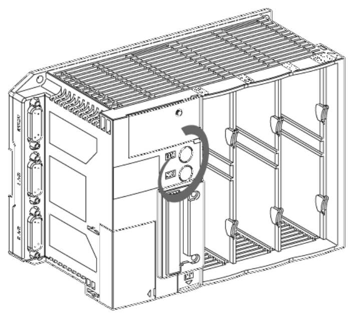
TSX 37-05/08/10



The PLCs TSX 37-21 and TSX 37-22 have two TER and AUX serigraph terminal ports.

TSX 37-21 **TSX 37-22**





These ports are used to provide a physical and simultaneous connection between two devices, such as a programming/adjustment terminal and an operator dialog console.

Despite being functionally identical, only the TER terminal port can be used to supply a non auto-supplied device (FTX 117, RS 485/RS 232 converter cord, TSX P ACC 01 insulation device, etc.).

The terminal port operates by default in UNI-TELWAY master mode. The switch to UNI-TELWAY slave mode, Modbus/JBus mode or character mode is performed on set-up.

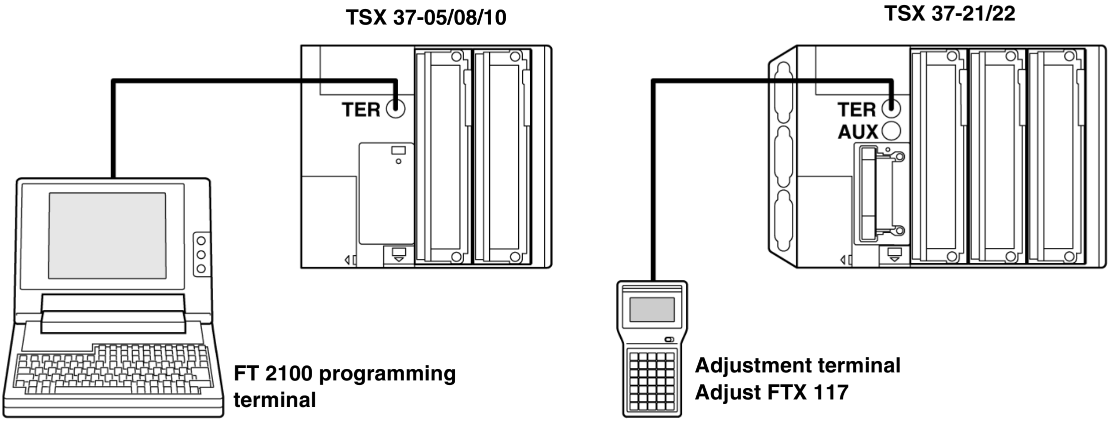
Note: The communication mode (UNI-TELWAY master, UNI-TELWAY slave, Modbus/Jbus or character mode) is identical on the two TER and AUX connectors.

Communication with a terminal

General

Configured in UNI-TELWAY master (default function), the terminal port makes it possible to connect a programming and tuning terminal on TSX 37 PLC's.

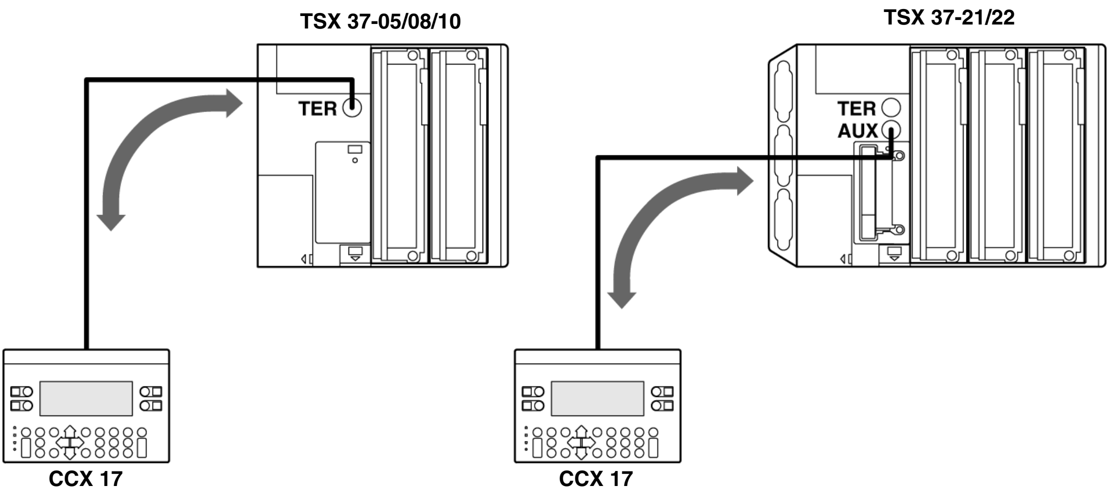
Connection examples:



Communication with an operator dialog console

General

Configured as UNI-TELWAY master (default function), the terminal port enables an operator dialog console to be managed.
The operator dialog console uses the UNI-TE protocol to communicate with the local PLC and the other stations of the network architecture.



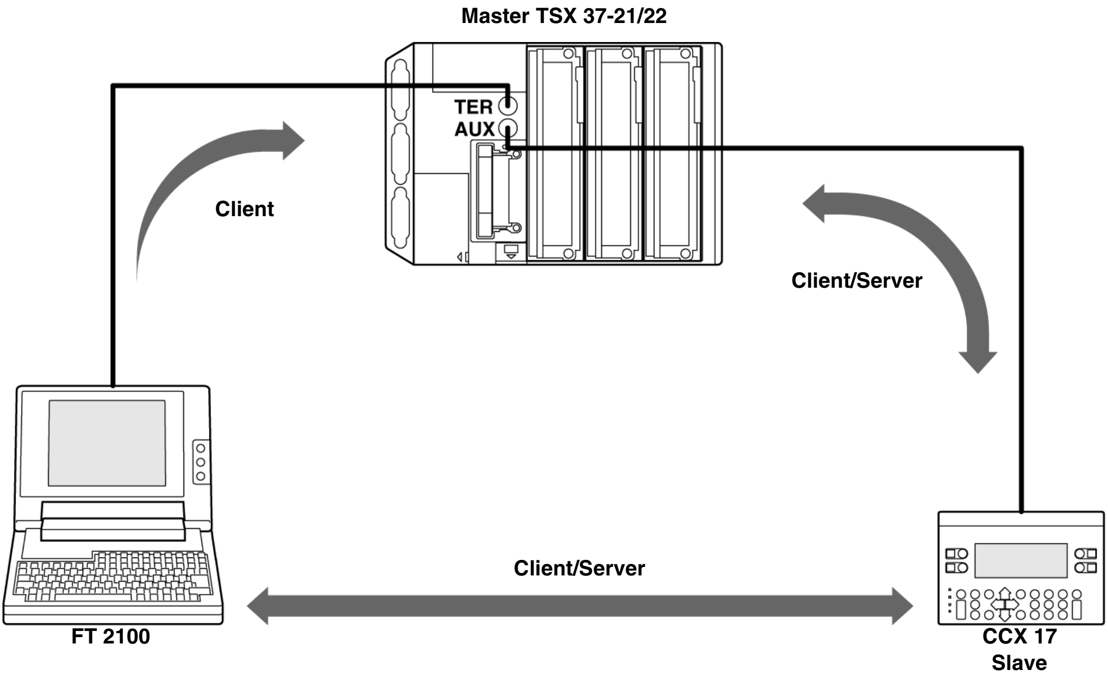
When using a TSX 37-21/22, to free the TER connector for possible connection to a programming or tuning terminal, the operator dialog console connects to the AUX connector.

Communication UNI-TELWAY master/slave

General

The default communication mode for the terminal port is UNI-TELWAY master. First and foremost, it enables a programming terminal and a slave operator dialog console to be connected.

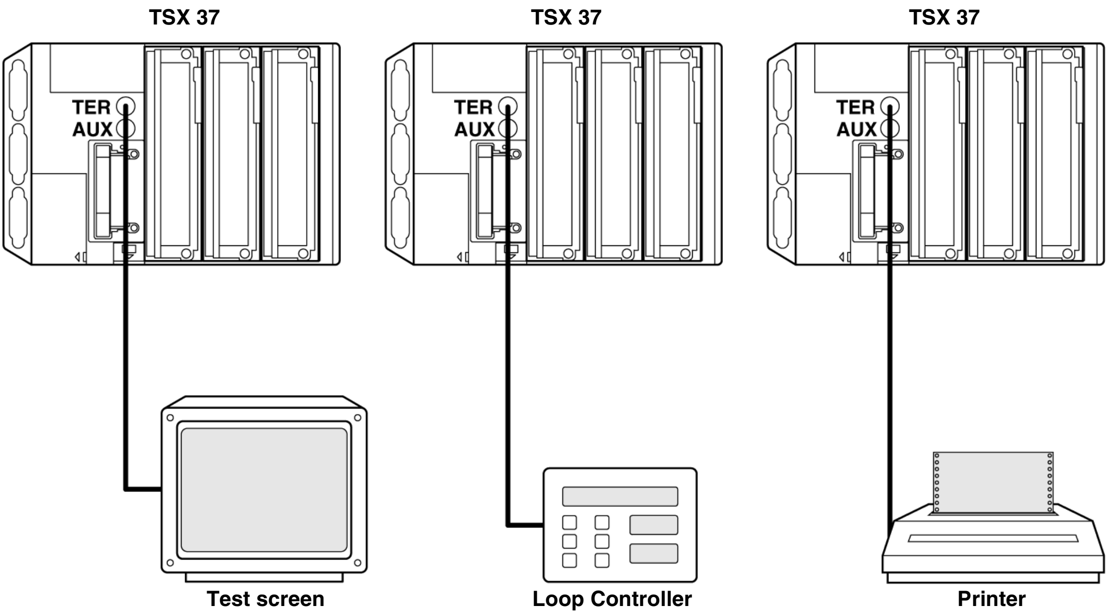
Example of a connection :



Communication character string

General

This mode makes it possible to connect a printer or an application-unique operator console (test screen, table regulator, etc) onto a PLC type TSX 37.



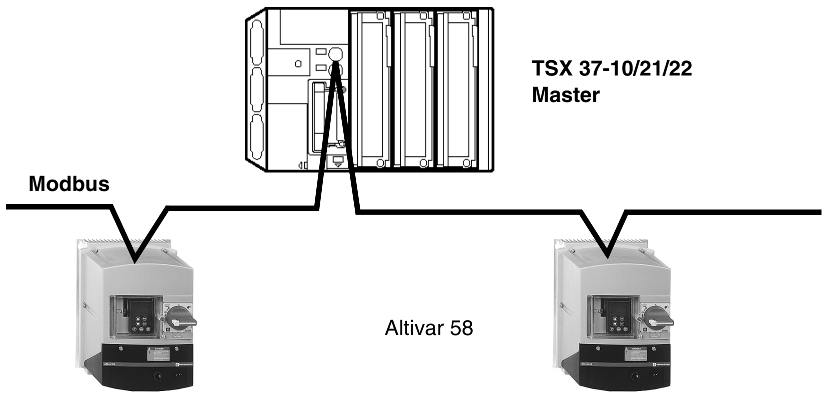
Communication Modbus/JBus

General

This mode enables Modbus master and slave communication.

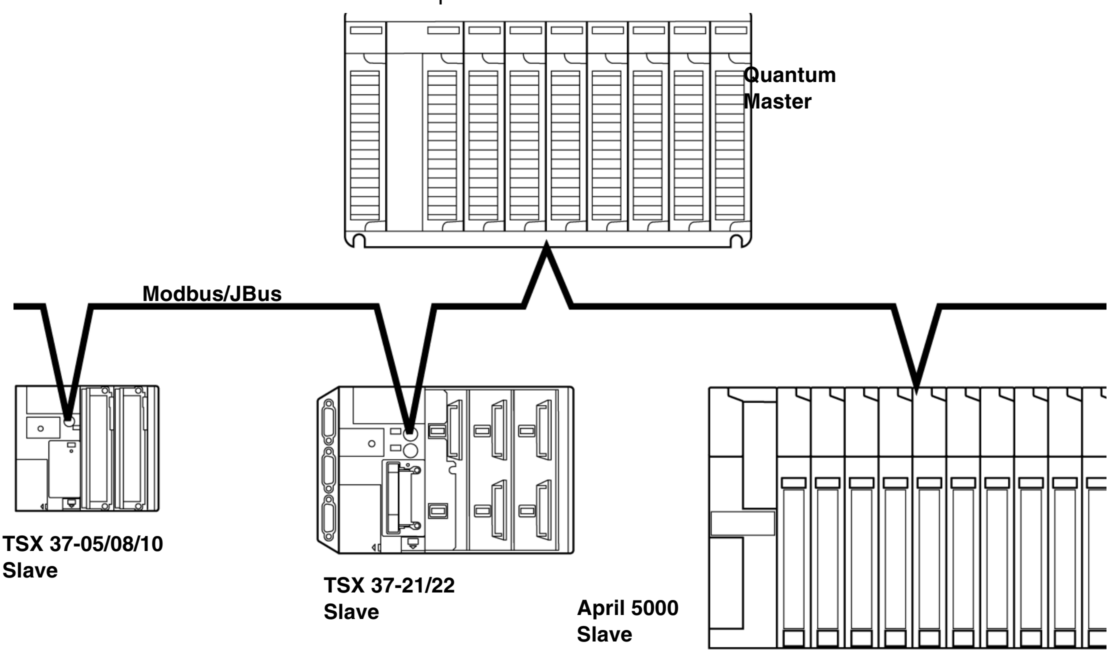
Modbus Master

This mode makes it possible to connect a remote slave device to a Modbus bus.



Modbus Slave

This mode makes it possible to connect a slave TSX 37 PLC to a Modbus/JBus bus.



31.2 Connections

Introduction to this Section

Aim of this Section

This Section describes the different connection possibilities for Micro PLC terminal ports.

What's in this Section?

This Section contains the following Maps:

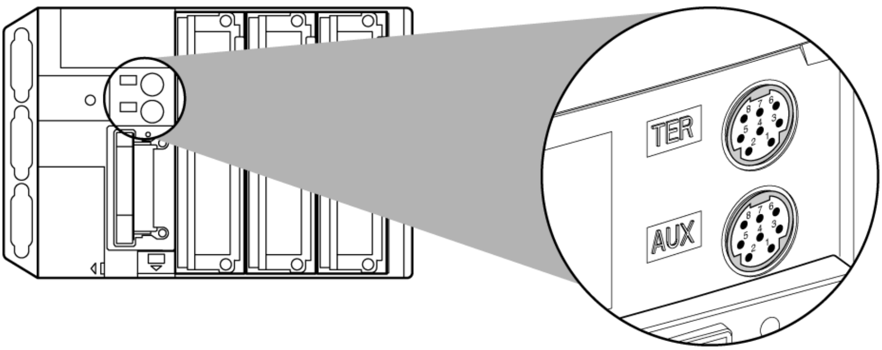
Connections

General points

The TER serigraph terminal port (shared by all TSX 37 types) makes it possible to connect any device which supports the UNI-TELWAY protocol, and in particular, devices which are not auto-supplied (FTX programming 117 terminal, RS485 / RS232 converter cord, TSX insulation device P ACC 01 etc).

The AUX serigraph terminal port (available on TSX 37-21/22 PLC's does not allow devices which have one supply to be connected (operator dialog device, programmable PLC's, third-party devices, etc).

The terminal port allows four operation modes ;
- UNI-TELWAY master (default configuration),
- UNI-TELWAY slave,
- Character string,
- Modbus/JBus slave.



Note: The operational mode defined in configuration (UNI-TELWAY master, UNI-TELWAY slave, Modbus/JBus, slave or character mode) is identical for both connectors.

Depending on the operational mode selected in configuration, the terminal port enables the connection:
- of a programming and adjustment terminal,
- of an operator dialog device,
- of another PLC,
- of UNI-TELWAY devices (sensors/actuators, variable speed controller, etc),
- of the PLC on the Modbus/JBus bus,
- of a printer or a test screen (link in character string mode).

Using an insulation device, reference TSX P ACC 01, doubles the terminal port, which makes it possible to simultaneously connect a programming terminal and a operator dialog device on a TSX 37-05/08/10 PLC.
This device is also required:

- to connect a PLC type TSX 37 onto :
  - a UNI-TELWAY link when the distance between the devices is greater than 10 meters,
  - a Modbus/JBus bus,
- to set a TSX 37 to slave mode. This device is described in the following chapter.

Note: When connecting a TSX 37 PLC slave onto a UNI-TELWAY bus or Modbus/JBus, it is essential to use a TSX P ACC 01.

Programming and adjustment terminal

General points

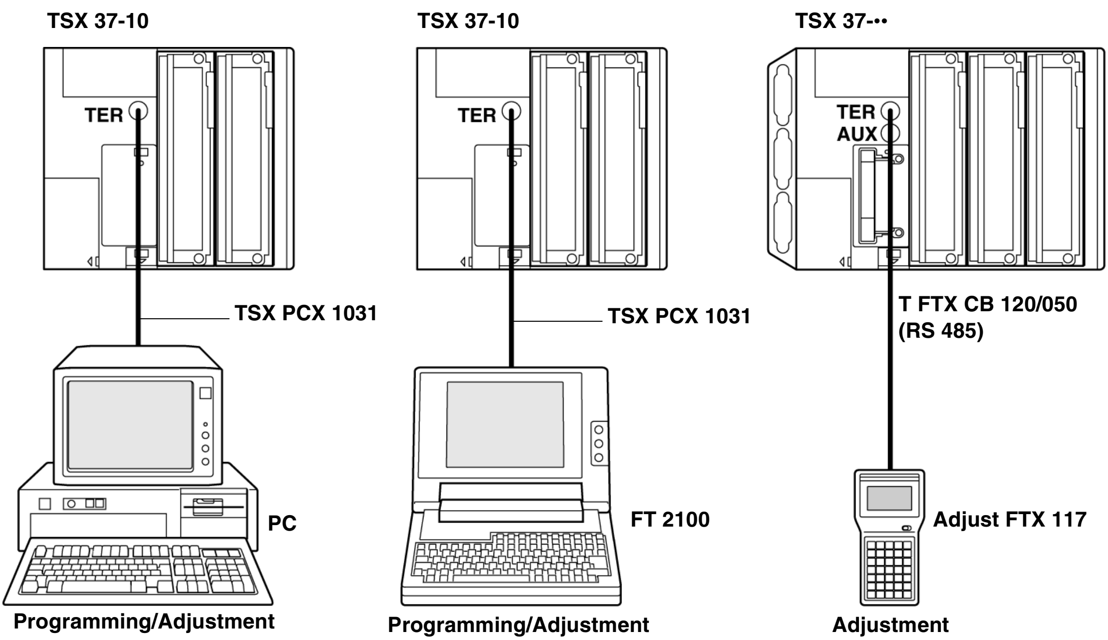
The tuning terminal FTX 117 is not auto-supplied. Il doit être connecté sur la prise TER des automates de type TSX 37. Dans le cas d'un raccordement totalement en RS 485, le PC ou la console FT 2100 peuvent être connectés sur le port AUX. Si le PC ou la console FT 2100 sont raccordés à l'aide du câble convertisseur TSX PCX 1031, ils doivent impérativement être raccordés à la prise TER.

The programming terminal used the UNI-TE protocol to program, tune or troubleshoot the PLC when offline and the station devices.

If the PLC is connected in a network architecture, the network transparency makes it possible for the programming terminal to reach all the entities present in the architecture.

The reference of the different connection cables is given below.

Example of a connection :



Note: The TSX PCX 103 cable does not function on the AUX terminal of the TSX 37.

Operator dialog console

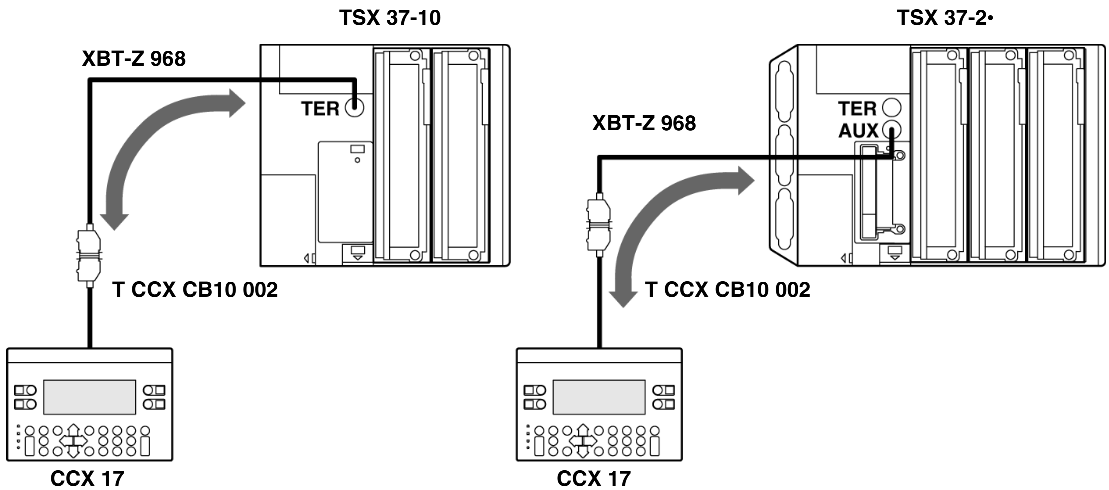
General

The operator dialog console uses the UNI-TE protocol to communicate with the offline PLC and with the other stations in the network architecture.

If a type TSX 37 PLC is used, the operator dialog console is auto-supplied. It must therefore be connected onto the AUX port to leave the TER port available for a terminal which might need a supply (FTX 117, for example).

The connection cable reference between the terminal port and an operator dialog console CCX 17 is given below.

Example of a connection :



Note: The T CCX CB10 002 is supplied with the CCX 17.

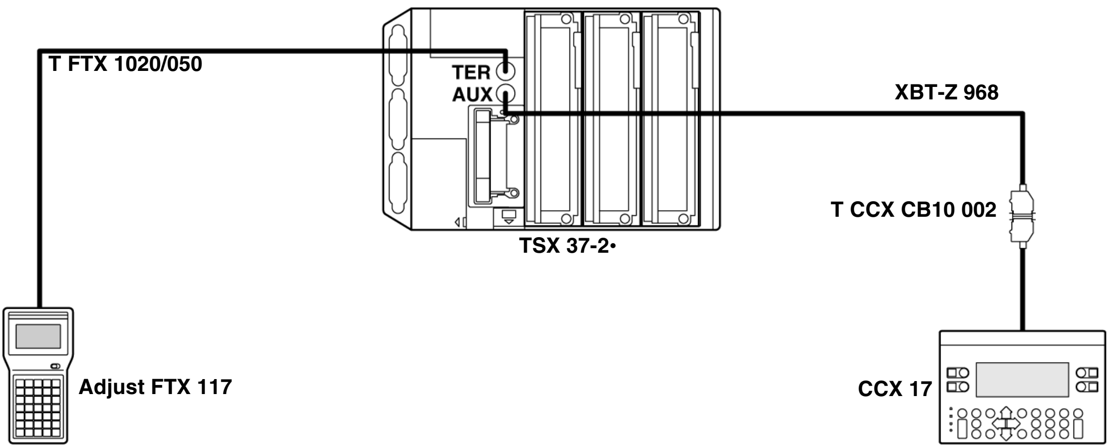
Programming and adjustment terminal and operator dialog console

General

The terminal port of a PLC can manage two devices as multidrops . the programming and adjustment program, and an operator dialog console.

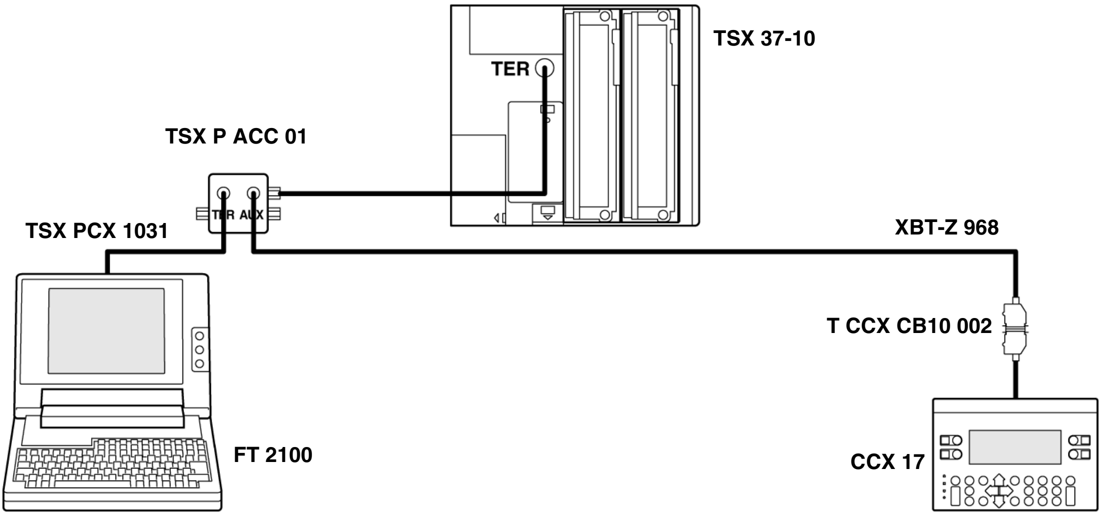
The PLC's TSX 37-21 and TSX 37-22 have two terminal ports. Each of these two ports can therefore receive one of these devices. Because the adjustment terminal FTX 117 is not self-supplied, it must be connected onto the TER port.

Example of a connection :



Note: The cable TSX PCX 1031 does not work on the AUX port of the TSX 37.

The PLC's TSX 37-10 have a single terminal port.The simultaneous connection of a programming terminal and an operator dialog console requires a junction box TSX P ACC 01 to be used (see next chapter).



Irrespective of PLC-type, each connected terminal can be unplugged without disturbing the operation of the second.

Modem on terminal port

General

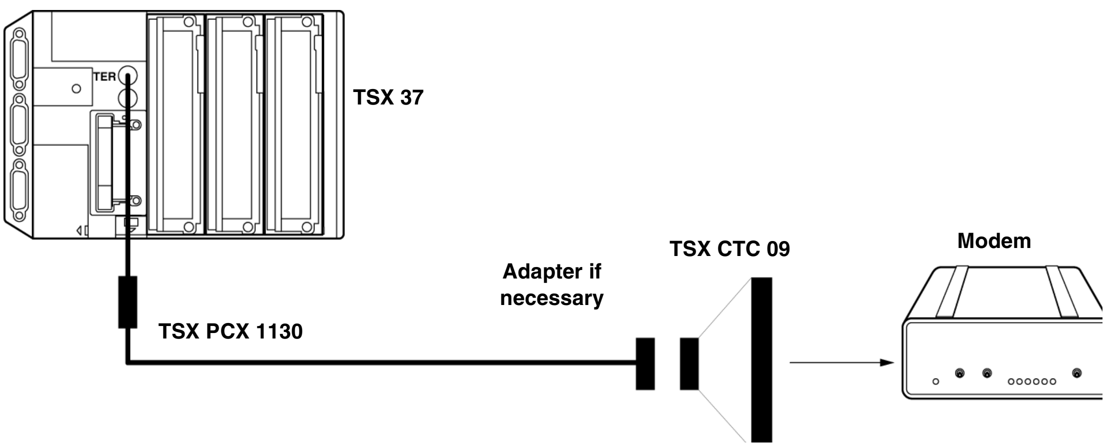
The terminal port of the TSX Micro PLC's of version ≥ 1.5 is compatible with a connection modem in the protocols UNI-TELWAY master, UNI-TELWAY slave and character string.

It is imperative that the modem to be connected has the following features

- **1** supports the 10 or 11 bit by character format if the terminal port is used in UNI-TELWAY mode (1 Start, 8 pieces of Data, 1Stop, Odd parity or without parity),
- **2** operate without data compression if the terminal port is used in UNI-TELWAY,
- **3** can be configured "forced DTR signal" from the side of its RS232 serial port (when the modem is used in response mode), because this signal is not connected by the cable,
- **4** operate without flux control (neither hardware –RTS/CTS-, nor software –XON/XOFF-) from the side of its RS 232 serial port, as the cable to be used on the terminal port side can only carry TX, RX and GND signals,
- **5** operate without carrier control. Warning: this operation mode also uses RTS and CTS control signals,
- **6** accept an incoming telephone call while characters reach its RS 322 serial port (if a modem/telephone network is used in response mode on a terminal port configured in UNI-TELWAY master).

> **Note:** It is highly recommended that you check with the modem supplier that the above features are definitely offered by the modem considered.

Connection diagram :



Example 1 : for a terminal port in UNI-TELWAY mode, connected to a modem/ telephone network in response mode, the port must have the above characteristics 1 to 6.

Example 2 : for a terminal port in character string mode connected to a modem via an application-specific line, the port must have the above characteristics from 3 to 5.

Configuration of the terminal port in UNI-TELWAY mode

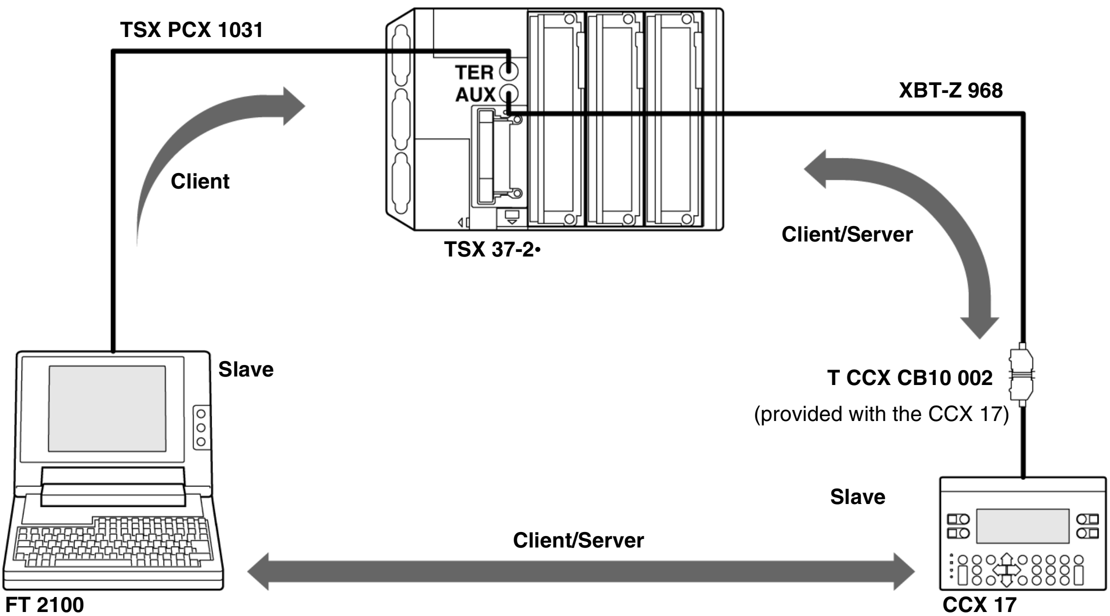
The waiting delay must be between 100 and 250 ms.
In master mode, the number of slaves configured must correspond to the real number of slaves present on the bus.
In slave mode, the number of addresses must correspond to those used.

The TSX Micro PLC's terminal port is configured from the PL7 Micro or PL7 Junior software.
For further details, please refer to the communication manual TLX DS COM PL7.

UNI-TELWAY Master

General points

This is the terminal port default operating mode. First and foremost, it enables a programming terminal and an operator dialog console to be connected.
Example of a connection :



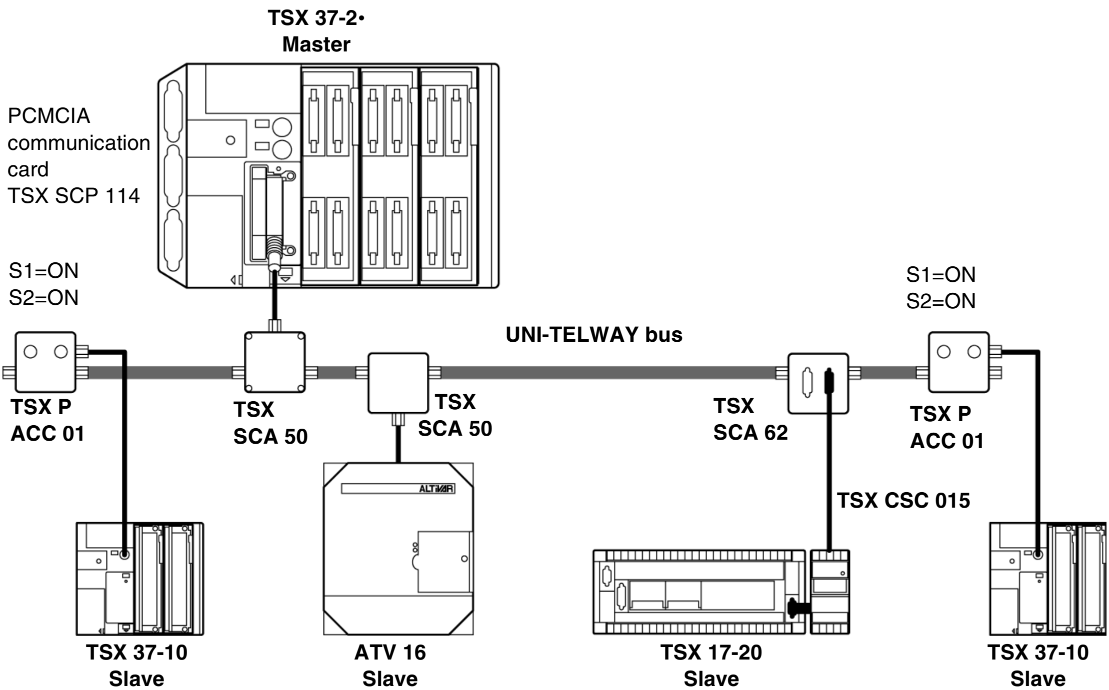
Note: The master can scan up to eight link addresses: Link addresses 1,2, and 3 are reserved for the programming terminal, the five other addresses are available for connecting the following types of devices: operator dialog, slave PLC, sensors/actuators, or any other slave device which supports the UNI-TE protocol. If a CCX 17 is used, addresses 4 and 5 are reserved for it. This mode becomes operational immediately, in fact, within the default configuration limits. No implementation phase is required for connecting a device onto this type of link.

UNI-TELWAY Slave

General points

The UNI-TE protocol for the terminal port enables a TSX 37 PLC to be integrated into a UNI-TELWAY bus.

Example of a connection :



A slave PLC manages up to three consecutive link addresses .
- Ad0 (system address),
- Ad1 (client application address),
- Ad2 (listening application address)

Note: For the connection with a TSX 37 to be possible it is imperative that a TSX P ACC 01 connection device be used. The different connecting possibilities of this device are given in the following chapter. For implementing the TSX SCA 50 and TSX SCA 62 devices, consult the TSX DG UTW manual: UNI-TELWAY Communication Bus (User guide)

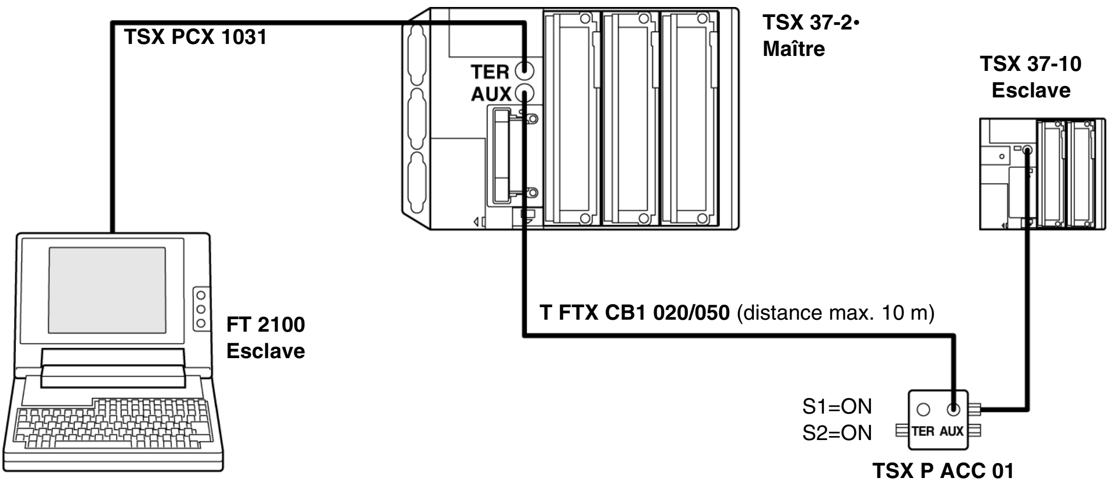
UNI-TELWAY intersection PLC's

General points

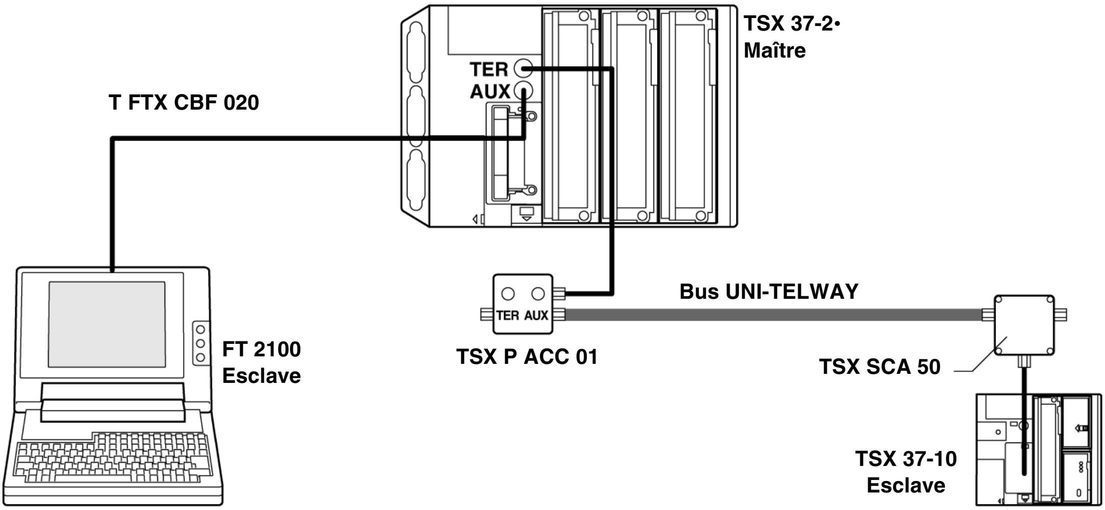
The terminal port authorizes the connection of two PLC's, one master and the other slave.

Two possibilities make it possible to obtain this architecture :

- Using the terminal port of both PLCs. For this connection to be possible it is imperative to use a TSX P ACC 01 connection device. The different connecting possibilities of this device are given in the next chapter.



- Using a UNI-TELWAY module implanted in one of the available slots in the second PLC. This module must be configured in UNI-TELWAY slave, for example, if the terminal port is master.



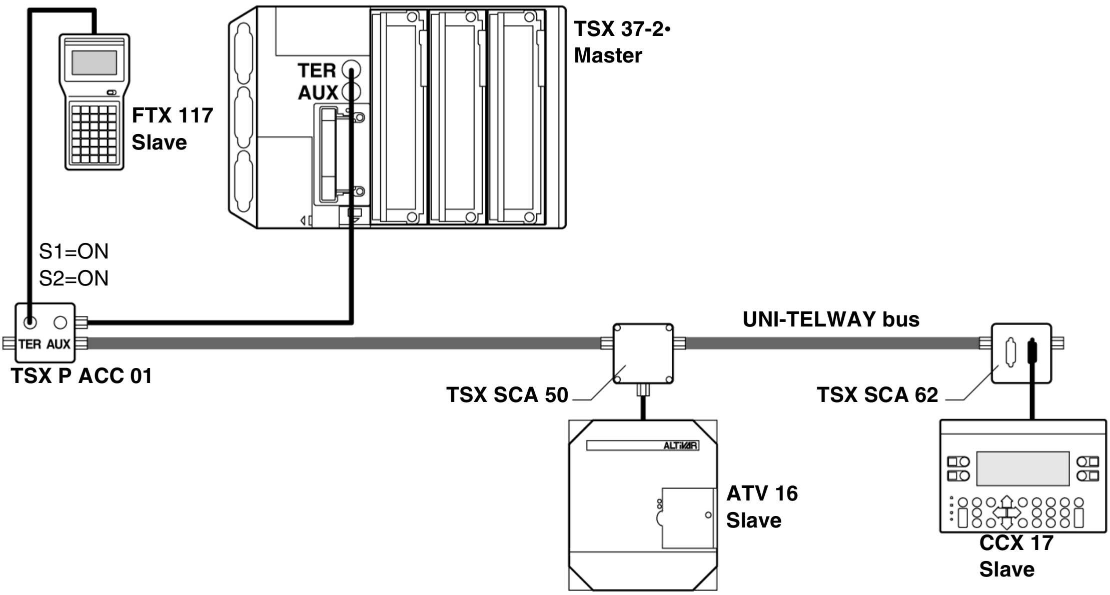
UNI-TELWAY intersection devices

General

The terminal port of the PLC's TSX 37, authorizes their connection onto a UNI-TELWAY bus in order to communicate with the following types of devices: variable speed controllers, sensors/actuators, or with other PLC's.

When connecting a PLC TSX 37 (master or slave) onto a UNI-TELWAY bus, it is imperative that you use the device TSX P ACC 01. For further details, refer to the next chapter.

Example of a connection :



The connected devices communicate with the PLC, using the UNI-TE protocol.

Communication between different devices is authorized.

The programming terminal can access all these devices directly to carry out tuning and troubleshooting functions.

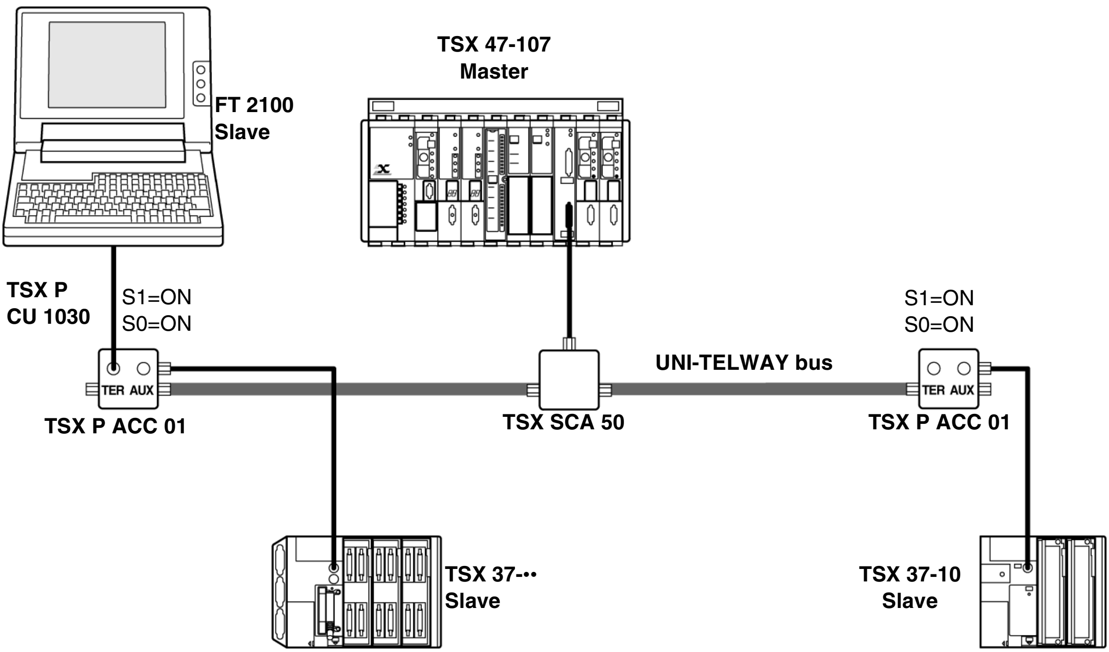
Note: For implementing the TSX SCA 50 and TSX SCA 62 devices, consult the manual TSX DG UTW : UNI-TELWAY Communication Bus (User guide)

Master PLC, model 40, type TSX

General

A model 40, type TSX PLC can also be configured in bus master UNI-TELWAY and can control the slaves of the TSX 37 PLC's.

Example of a connection :



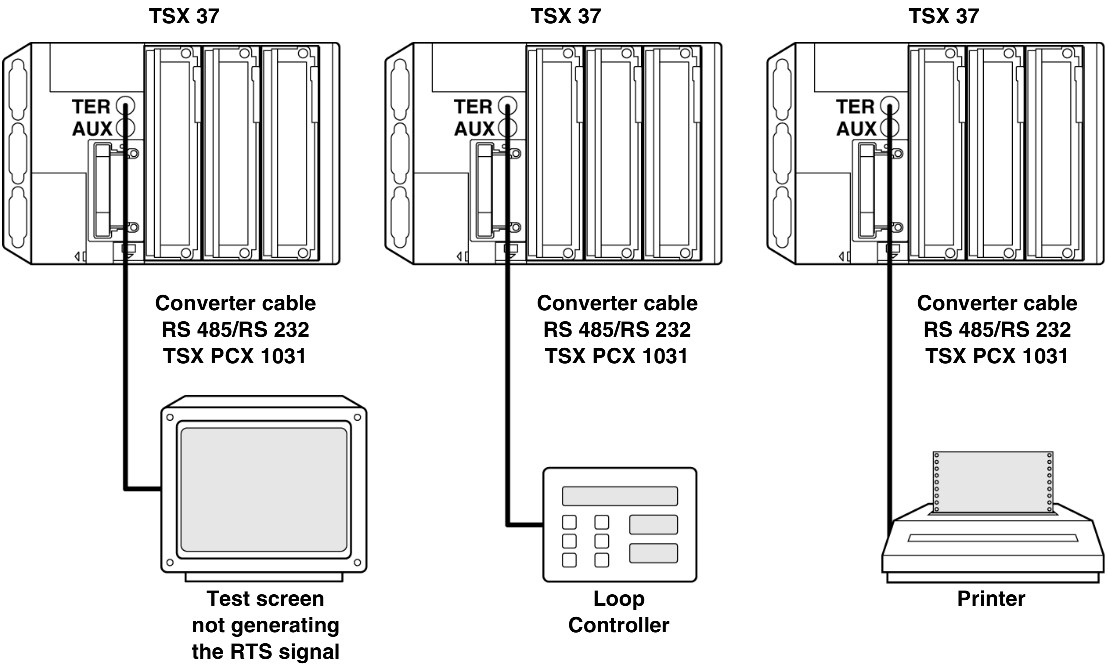
Note: For implementing the devices: TSX SCA 50 and TSX SCA 62, consult the manual TSX DG UTW : UNI-TELWAY Communication Bus (User guide)

Character string

General points

The terminal port, configured in character mode, allows the connection of one device from the following types: printer, display screen or application-specific console (table regulator, for example).

Example of a connection :



Note: The converter integrated into the TSX PCX 1031 cable is supplied by the TER port of the PLC; it is therefore impossible to use the AUX port of TSX 37-2 PLCs to connect the cable.

Note: To avoid signal conflicts, no devices should be attached to the PLC's AUX port.

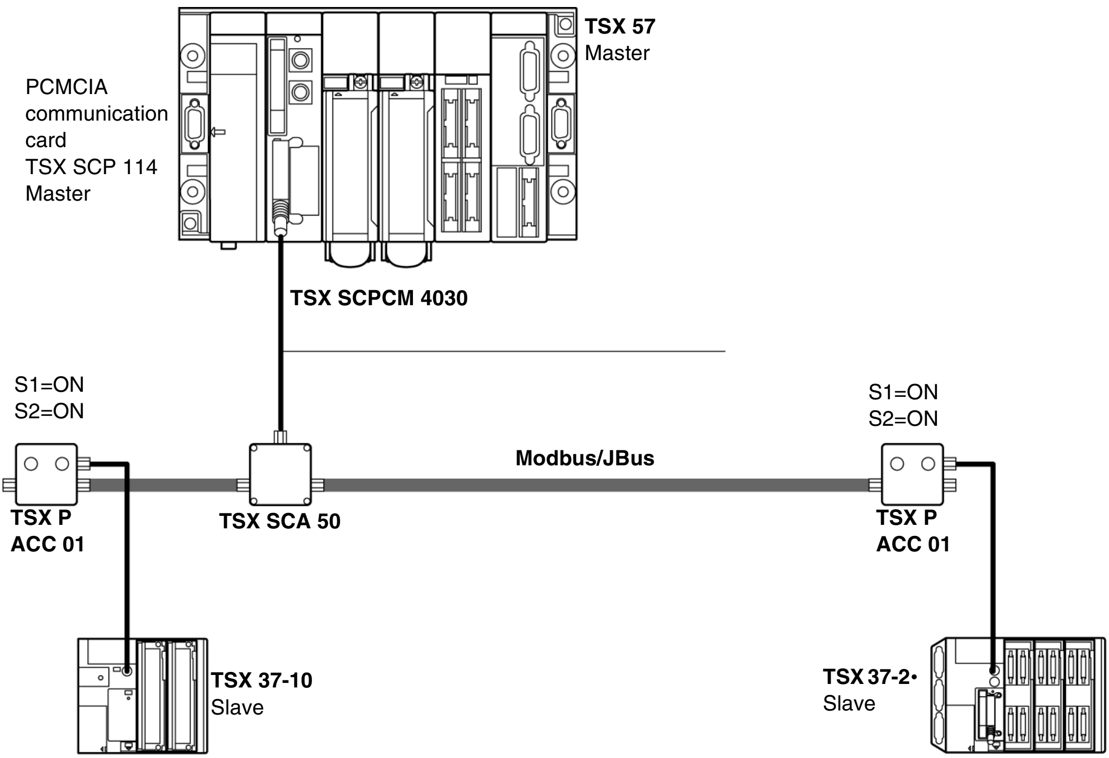
Modbus/JBus

General

The Modbus protocol (Modbus RTU only) of the terminal port makes it possible to incorporate a TSX 37 PLC onto a Modbus bus as a slave or master (TSX 37-10/21/22).

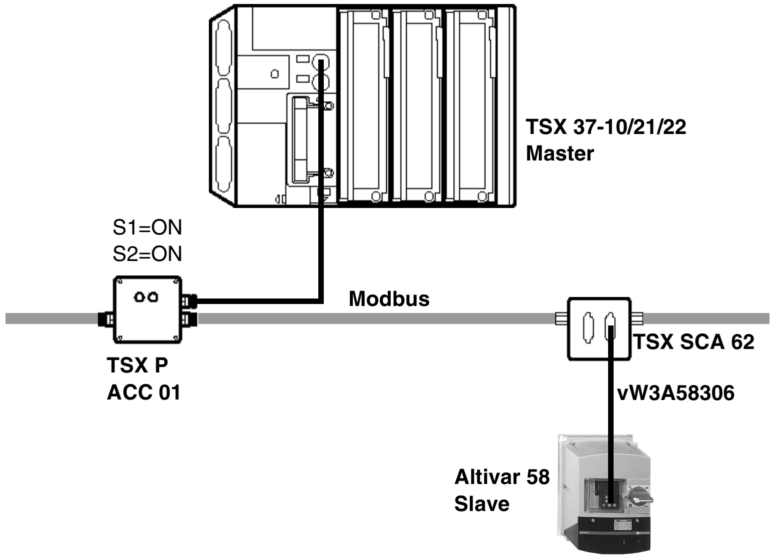
Modbus Slave

Illustration

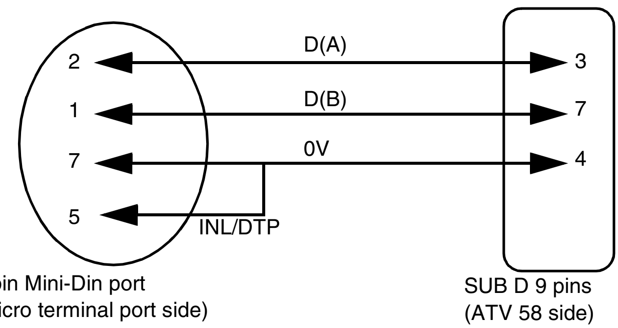


Note: To make the connection of a TSX 37 possible, it is imperative that you use a TSX P ACC 01. The different possibilities for connecting this device are given in the next chapter. For implementing the TSX SCA 50 and TSX SCA 62 devices, consult the TSX DG UTW manual: UNI-TELWAY Communication Bus (User guide)

Modbus Master Sample connections



Note: If connecting a single ATV 58 to the terminal port of a Micro Modbus master, you can use the following wiring.
Illustration



Summary table

General points

The table below enables us to define the cord which links the ports of the TSX 37 to the peripheral devices.

Connection cordt	PLC port		Examples of connected devices
	TER	AUX	
TFTX CB 1020 or TFTX CB 1050	X		FTX 117
		X	TSX P ACC 01
TFTX CBF 020	X	X	FTX 507, FTX 417
TSX PCX 1031	X		Programming and setting terminals, printer terminals, etc.
TSX PCX 1130	X		Devices which do not manage the DTE type RTS signal<-> DTE : modem
XBT-Z968	X	X	CCX 17, XBT
TSX P ACC 01	X		Connecting to a UNI-TELWAY or a Modbus/JBus

The two cables TSX PCX 1031 and TSX PCX 1130 ensure the conversion of the RS 485 and RS 232 signals. They allow the connection of the terminal port to the RS 232 devices which do not manage the RTS.

TSX PCX 1031 cable

This multi-function cable enables the PLC to communicate with different devices of the RS232 series.
The different functions of the series mode are defined according to the position of the coil turret accessible via the converter unit.
The table below introduces the different functions.

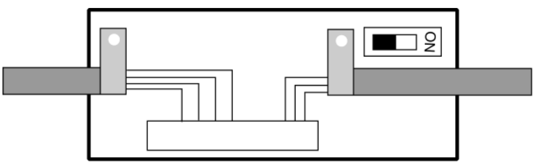
Position of coil turret	Function	Status of signal/DPT	Management of RTS signal
0	**TER MULTI** - Connection in point to point or multi-point mode. UNI-telway master PLC communication (replace the cable reference TSX PCU 1030 (1)	1	Yes
1	**OTHER MULTI** - Connection in multi-point mode. Other types of connection (replace the cable reference TSX PCD 1030).	0	Yes
2	**TER DIRECT** - Connection in point to point mode. Uni-telway master PLC communication defined by the PLC configuration (replaces the cable references TSX PCX 1030 (2) and TSX PCU 1030	1	No
3	**OTHER DIRECT** - Connection in point to point mode. Other types of communication defined by the PLC configuration (replaces the cable reference TSX PCX 1030 (3)).	0	No
Legend			
(1)	**Replaces also the cable reference TSX PCU 1031 in multi-point mode. In this case you must update the Uni-telway driver. Depending on your operating system, the version to use is:** ● **Windows 2000/98/ME/XP ≥ V1.0 IE01** ● **Windows NT4 ≥ V1.4 IE9** ● **Windows 95 ≥ V7.8 IE18**		
(2)	**Switch in master position**		
(3)	**Switch in slave position**		

TSX PCX 1030 cable

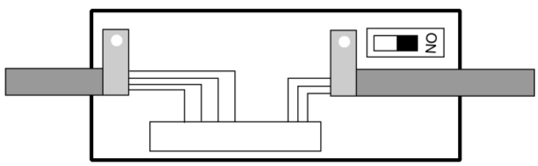
This cable is fitted with a switch which makes it possible to set the PLC in master or slave mode. The switch can be accessed internally, by removing the metal cover which contains the electronics. Switch management is as follows :

	UNI-TELWAY Master PL7 configuration	**UNI-TELWAY Slave PL7 configuration**	**Character mode PL7 configuration**
Switch in Master position	UNI-TELWAY Master with PL7 configuration	UNI-TELWAY Master with default configuration	UNI-TELWAY Master with default configuration
Switch in Slave position	UNI-TELWAY Slave with default configuration	UNI-TELWAY Slave with PL7 configuration	Character mode with PL7 configuration

Switch adjustment :



M master mode



E slave mode

31.3 Attachments

Introduction to this Section

Aim of this Section

This Section describes the features of the terminal port.

What's in this Section?

This Section contains the following Maps:

Properties of the terminal port

General The properties of the terminal port are given in the table below:

		Master or slave UNI-TELWAY mode	**Modbus/JBus mode (RTU)**	**Character mode**
Structure	Physical interface	Non-isolated RS 485.	Non-isolated RS 485.	Non-isolated RS 485.
Transmission	Protocol	Master/slave multidrop.	Master/slave multidrop.	Without predefined protocol (application)
	Binary flow and character format	9600 default bit/s can be changed from 1200 to 9600 bit/s (1 start bit, 8 data bits, 1 parity bit (even, odd, or none) and 1 stop bit).	9600 default bit/s can be changed from 1200 to 19200 bit/s.	9600 default bit/s can be changed from 1200 to 9600 bit/s (1 start bit, 7 or 8 data bits, 1 parity bit (even, odd, or none, with or without echo) and 1 stop bit).
Configuration	Number of devices	Eight maximum (eight addresses managed by the master). In slave mode, addresses 4, 5, 6 are chosen by default. In master mode, the reserved addresses are: 1, 2, 3, for the programming terminal, 4, 5 if CCX 17 is present, the others are available.	Addresses 1 to 98 (managed by the master).	A point-to-point device).
	Length	10 m maximum	10 m maximum	10 m maximum

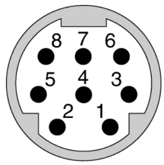
		Master or slave UNI-TELWAY mode	Modbus/JBus mode (RTU)	Character mode
Utilities	Messaging	Request point-to-point UNI-TE with the report of a maximum of 128 bytes following the initiative of all connected devices. There is no broadcast on the master's initiative.	Modbus standard requests	Character string with 120 bytes max. The message-end character can be configured.
	Other functions	Communication transparency with all network architecture devices via the master.		
	Safety	One monitoring character on each frame, possible acknowledgement and repetition.	a 16 bit word (CRC) from each control on each frame, possible acknowledgement and repetition.	No error returned.
	Monitoring	Table of bus status, device status, error counters can be accessed on the slaves.		

Note: Using a TSX P ACC 01 connection unit makes it possible to use the RS 485 link in isolation mode (see next chapter).

Connectors on the TSX 37 PLC

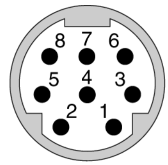
General points

The terminal port connector is a lockable, 8-pin mini-DIN.
TSX 37-05/08/10 PLCs have a connector marked TER.
TSX 37-21 and TSX 37-22 PLCs have two connectors marked TER and AUX.
The signals are given below:



TER

- **1** D(B)
- **2** D(A)
- **3** not connected
- **4** /DE
- **5** /DPT (1 = Uni-Telway master)
- **6** not connected
- **7** 0 V
- **8** 5 V



AUX

- **1** D(B)
- **2** D(A)
- **3** not connected
- **4** /DE
- **5** /DPT (1 = Uni-Telway master)
- **6** not connected
- **7** 0 V
- **8** Not connected

> **Note:** The operation of the terminal port depends on two parameters:
> - the status of the signal/DPT (0 or 1), established by the wiring accessory (cable, TSX P ACC 01),
> - the software configuration of the terminal port defined in PL7.

The table below defines the operating mode of the terminal port according to these two parameters.

Configuration in PL7	**Signal/DPT value**	
	0	**1**
UNI-TELWAY master	Terminal port in UNI-TELWAY slave mode (default)	Terminal port in UNI-TELWAY master mode
UNI-TELWAY slave	Terminal port in UNI-TELWAY slave mode	
Character mode	Terminal port in character mode	
Modbus/Jbus mode	Terminal port in Modbus/JBus mode master/slave	

TSX unit P ACC 01

32

Overview of this chapter

Aim of this chapter

This chapter deals with the TSX unit P ACC 01.

What's in this Chapter?

This Chapter contains the following Sections:

32.1 Hardware implementation

Introduction to this Section

Aim of this Section

This Section describes in a general, then more detailed way, the unit TSX P ACC 01.

What's in this Section?

This Section contains the following Maps:

Standard functions

General

The TSX unit P ACC 01 is a wiring accessory which connects to the TER port of PLC's type TSX 37 by the intermediary of an integral cable equipped with a mini-DIN connected at one end.
It makes it possible to :

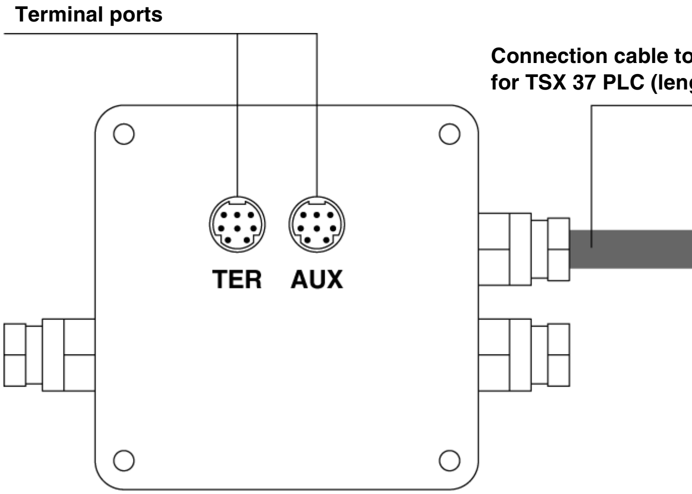
- connect several devices onto the terminal port of PLC's type TSX 37-05/08/10. It is therefore equipped with two mini-DIN ports, TER and AUX serigraph, they are equivalent to those of PLC's type TSX 37-••,
- connect a TSX 37 PLC to the Modbus/Jbus bus,
- insulate the UNI-TELWAY signals to extend the terminal port link of the PLC's type TSX 37-05/08/10 and TSX 37 2• more than 10 meters to connect the PLC onto an UNI-TELWAY bus,
- adapt the bus when the unit is connected to one end of the UNI-TELWAYou Modbus bus,
- fix the terminal port operation mode:
  - UNI-TELWAY master,
  - UNI-TELWAY slave, Modbus slave or character mode.

Note: The two ports of the unit TSX P ACC 01, TER and AUX are not insulated from each other, nor from the TER port of thePLC which provides the supply.

External appearance

General points

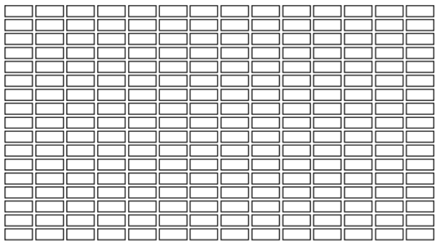
It is a zamak unit, the same type as the UNI-TELWAY connection or branching devices (TSX SCA 50 and TSX SCA 62). It is to be mounted in a cabinet. Its protection rating is IP20.



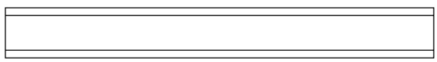
Dimensions and settings

General

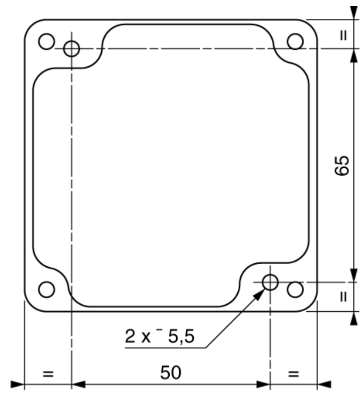
The TSX P ACC 01 device is installed on a AM1-PA••• type perforated plate or on a DIN rail with a LA9 D9976 fixing plate.



AM1-PA•••

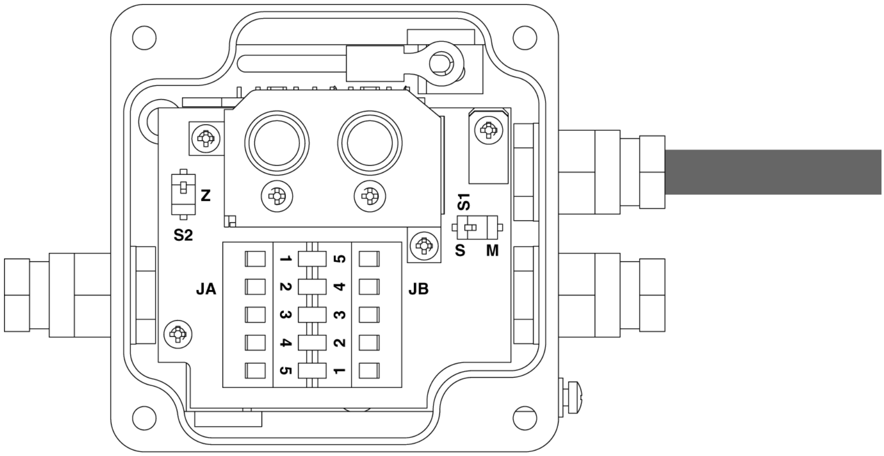


AM1 DE/DP



Internal view

Illustration



S1 Operating mode selection (slave or master),

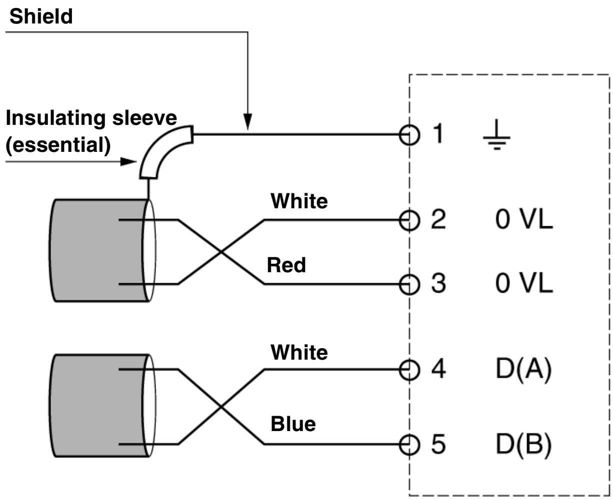
S2 End of line adaptation

JA and JB Connecting terminal blocks to the UNI-TELWAY bus or to the Modbus/Jbus bus.

Connection to UNI-TELWAY or Modbus buses

General points

The TSX P ACC 01 device is connected to UNI-TELWAY or Modbus buses by the connection terminal blocks JA and JB as shown below.

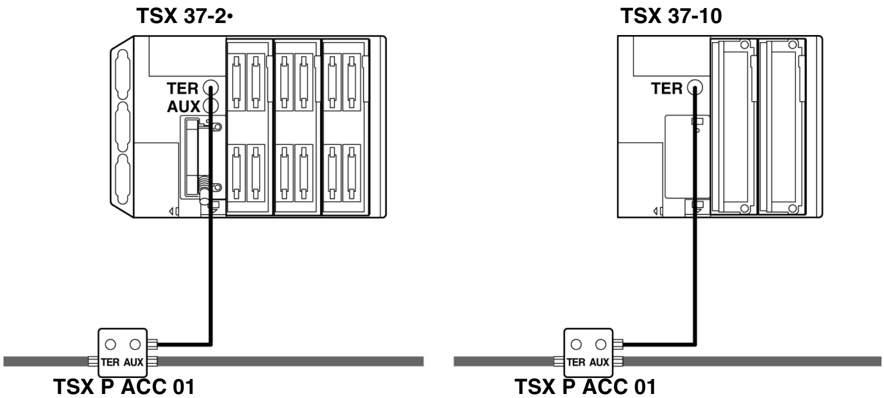


Connection to TSX 37 PLCs

General

Before the TSX P ACC 01 device is supplied by the terminal port of the PLC, it must be connected to the TER serigraph terminal port.

The device can be connected and disconnected automatically while switched on.

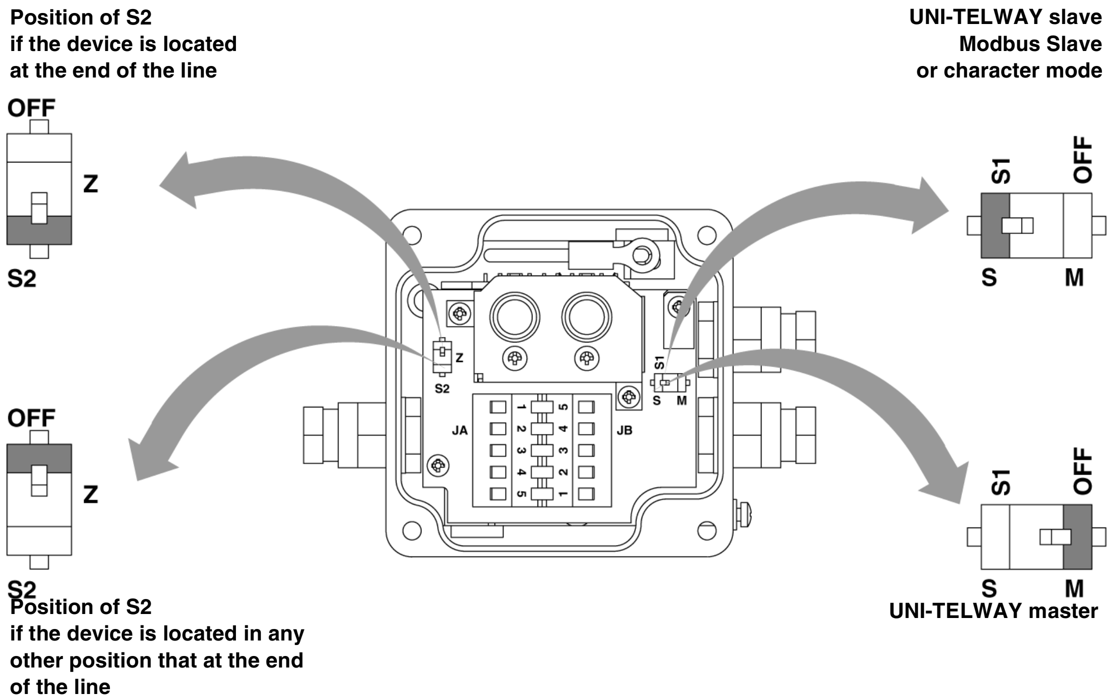


Note: Only one TSX P ACC 01 device can be connected to a TSX 37 PLC.

Switch configuration

Configuration of line adaptation

The end of line adaptation is performed by using S2 as shown below:



Operating mode configuration

The operating mode is selected by using switch S1 as indicated below.

Note: The operating mode chosen only concerns the connection cable to the TER connector of the PLC processor.

32.2 Examples of topology

Introduction to this Section

Aim of this Section

This Section contains different examples of topology.

What's in this Section?

This Section contains the following Maps:

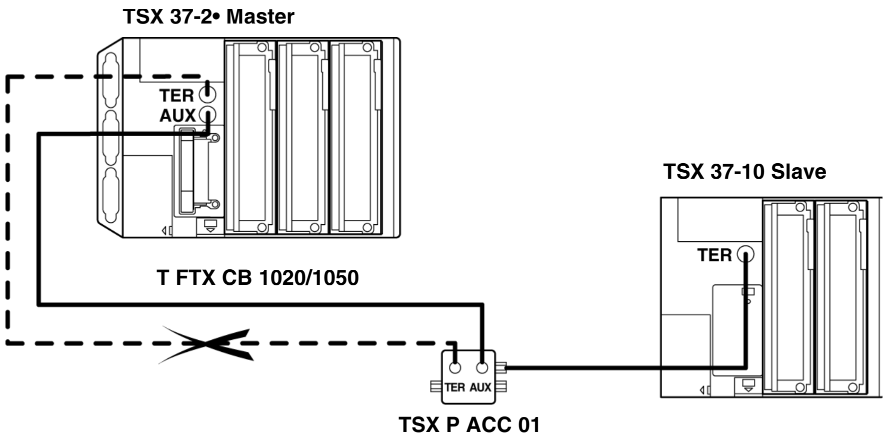
Connectable devices

General points

The functions of both ports on the TSX P ACC 01 device are identical to those of the TER and AUX terminal ports on TSX 37-•• PLCs:

- The device's TER port allows all devices supporting the UNI-TELWAY protocol to be connected, in particular devices which are not auto-supplied (programming terminal FTX 117, converter cable RS 485/RS 232, etc.),
- the device's AUX port only allows the connection of auto-supplied devices (operator dialog console, PLCs, third-party devices, etc.).

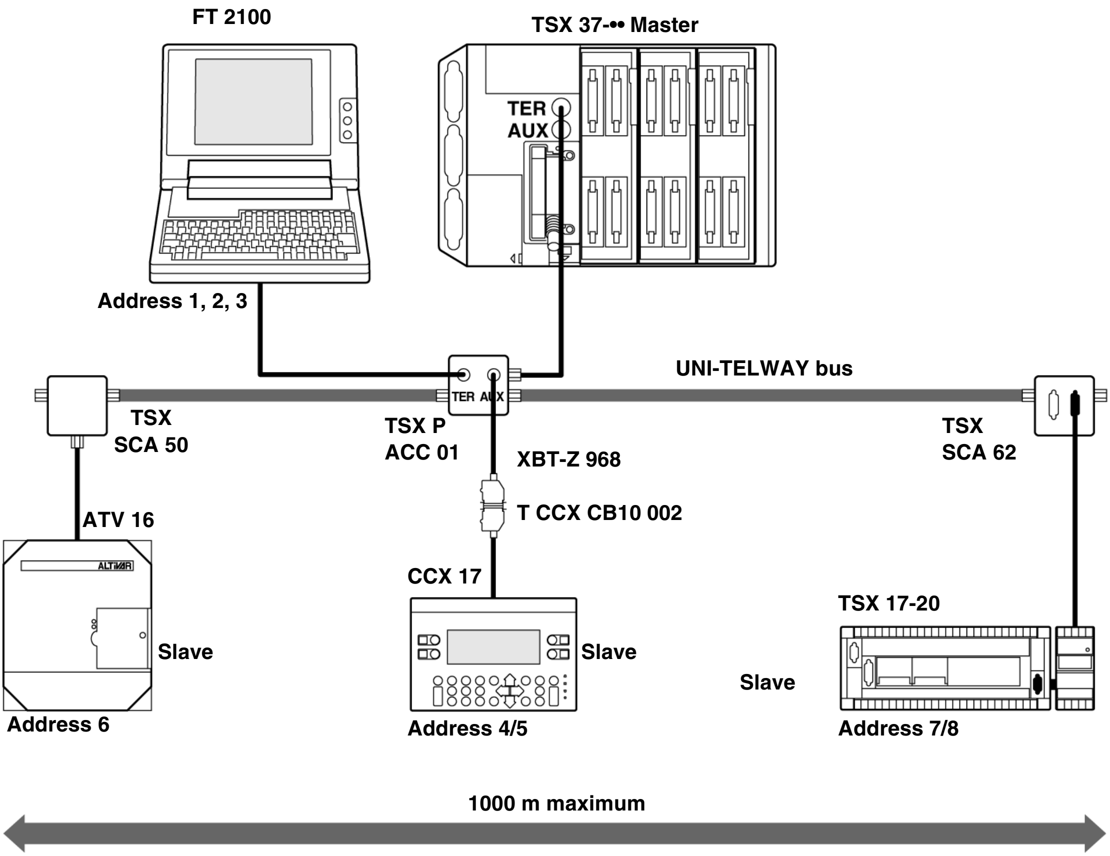
Note: The TSX P ACC 01 device is supplied by the TER port of the PLC to which it is connected. Therefore, the terminal's TER port allows the use of auto-supplied devices (CCX 17, etc.) or devices which are not auto-supplied (programming terminal FTX 117, converter cable RS 485/RS 232, etc.).
If you wish to connect the terminal port of a second PLC to one of the ports of the TSX P ACC 01 device, you must use the AUX port (of the device and the PLC) so as to avoid having any conflict between the power supplies of the two PLCs.



Master UNI-TELWAY mode

Example

The way to connect a TSX P ACC 01 device to a master PLC of the UNI-TELWAY link is shown in the example below:

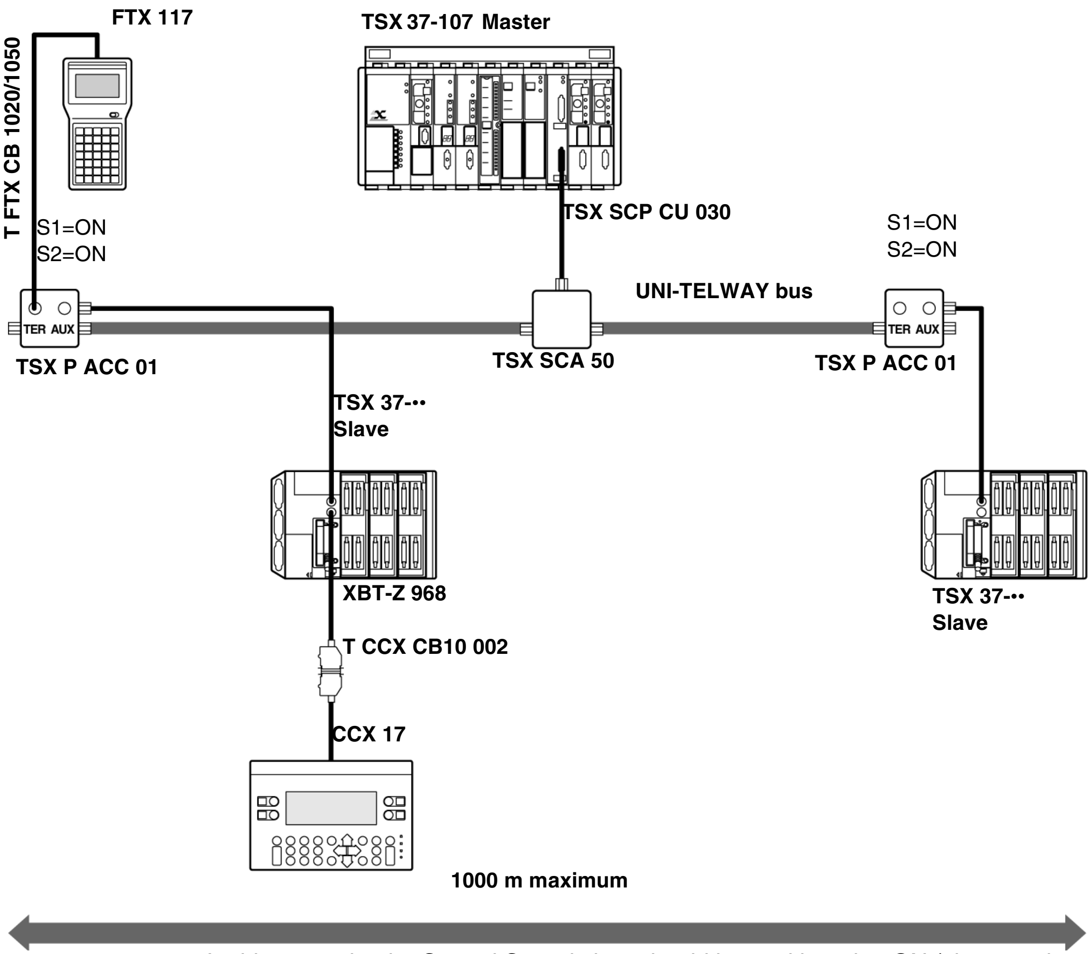


In this example, the S1 and S2 switches should be positioned to OFF (master mode and device in a different position to end of line).

Slave UNI-TELWAY mode

Example

The way to connect a TSX P ACC 01 device to a slave PLC of the UNI-TELWAY link is shown in the example below.



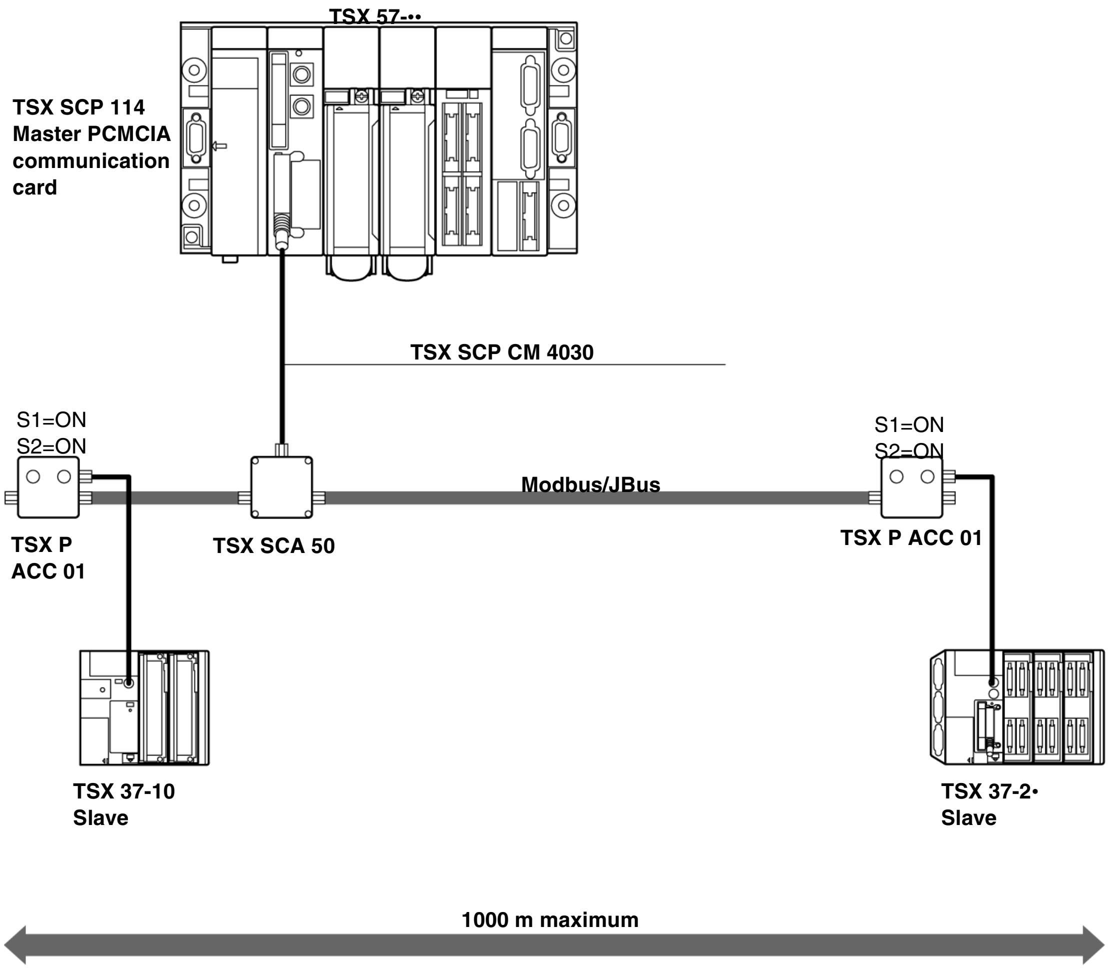
In this example, the S1 and S2 switches should be positioned to ON (slave mode and device in end of line position).

Note: In order that a PLC can work in slave mode, it must be connected to a TSX P ACC 01 device by **a built-in cable**.

Modbus/JBus

Example

The way to connect a TSX P ACC 01 device to a slave PLC of the UNI-TELWAY link is shown in the example below:



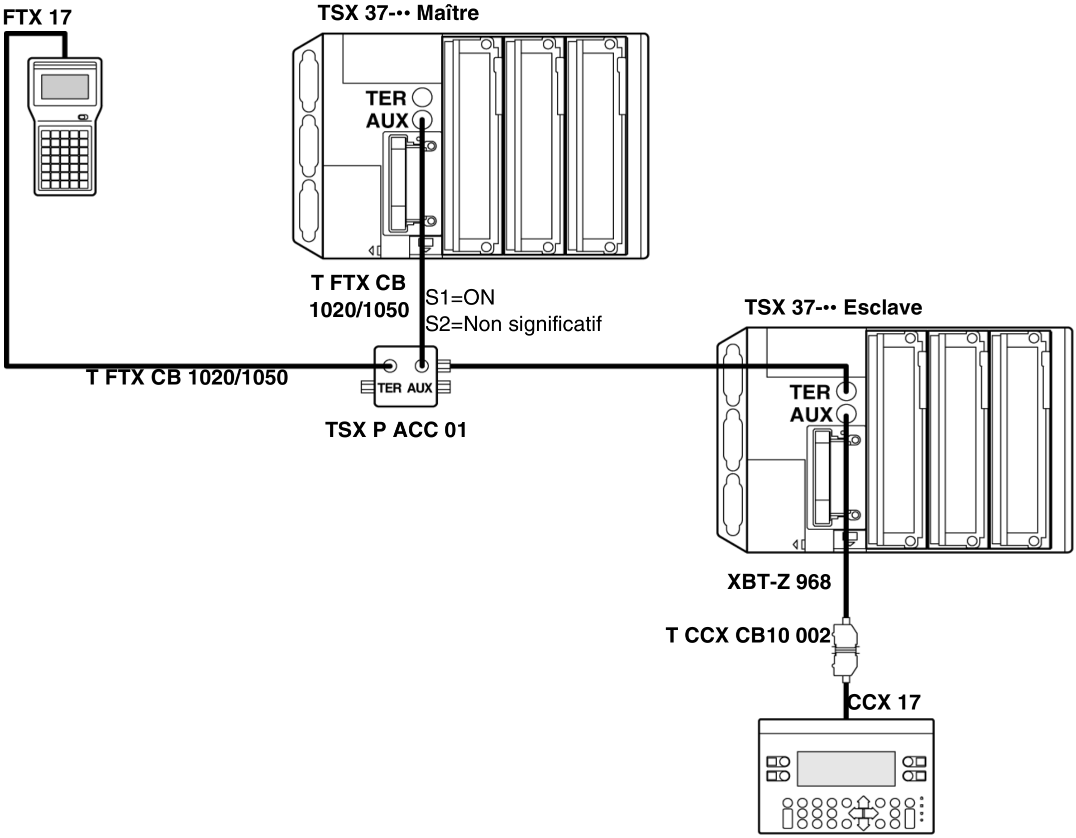
In this example, the S1 and S2 switches of the two devices should be positioned to ON (slave mode and device in the end of line position).

Note: In order that a PLC can work in slave mode, it must be connected to a TSX P ACC 01 device by **a built-in cable**.

Connection between two PLCs

Reminders

If you want to connect the terminal port of a second PLC to one of the ports of the TSX P ACC 01 device, you must use the AUX port so as to avoid any conflict between the power supplies of the two PLCs.



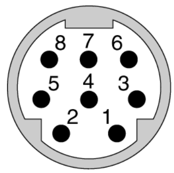
In the example below, the TSX P ACC 01 device should be connected by built-in cable to the UNI-TELWAY slave PLC. Its S1 switch should be positioned to ON. As the S2 device is not on a UNI-TELWAY bus, the position of its switch is not important.

Note: In order that a PLC can work in slave mode, it must be connected to a TSX P ACC 01 device by a built-in cable.

TSX P ACC 01 connectors

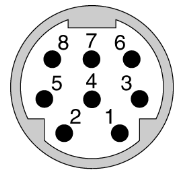
General

The TSX P ACC 01 device has two TER and AUX serigraph connectors.
The signals can be seen below :



TER

1 D(B)
2 D(A)
3 not connected
4 not connected
5 not connected
6 not connected
7 0 V
8 5 V



AUX

1 D(B)
2 D(A)
3 not connected
4 not connected
5 not connected
6 not connected
7 not connected
8 not connected

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