Contents

1.1 Documentation structure

This documentation is designed for users who wish to set up a FIPWAY network or FIPIO bus. The complete documentation set is organized in the following way :

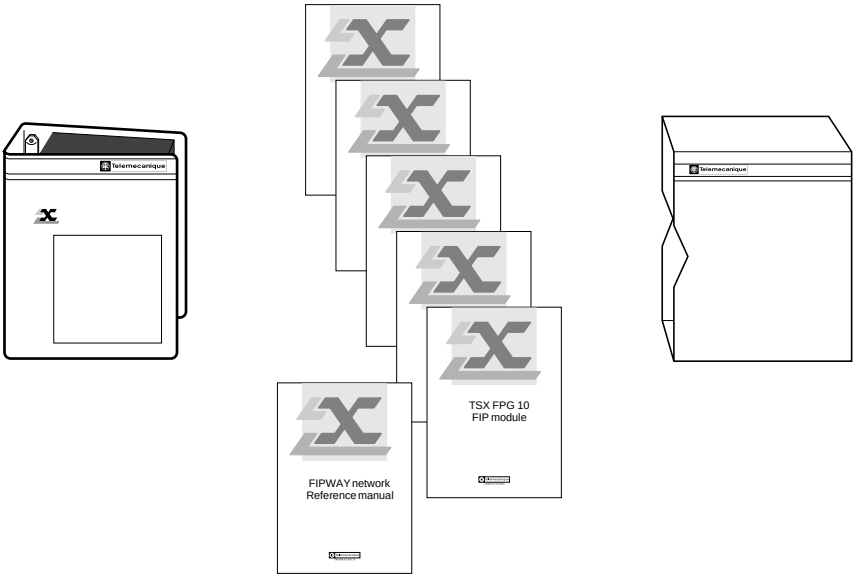
A reference manual which presents :

- FIPWAY network/FIPIO bus operating principles
- Network installation and checking principles
- Operating, adjustment and diagnostics functions
- Technical characteristics of a FIPWAY network/FIPIO bus
- A glossary of terms specific to networks

Specialized manuals (such as this document) are available for each module which can be connected to FIPWAY/FIPIO. The main points covered by these manuals include :

- Description of the device
- How to set up or connect the device on the network
- Network performance
- Operation with Telemecanique software
- Diagnostics functions via the network

The specialized manuals are supplied with the specific products.



Important

This document refers to the manuals which are required for setting up an entire application. Refer to Section 5.6 in the Appendix for a full listing.

1.2 Hardware setup

1.2-1 Description of the module

The TSX FPG 10 module is used to connect a TSX 17-20 micro-PLC fitted with a PL7-2 TSX P17 20FC2/FD2 micro-software cartridge to the FIPWAY network or FIPIO bus. It is linked to FIPWAY/FIPIO via a TSX FP ACC2 9-pin SUB-D connector using daisy chain or drop connection.

It is used for communication between the micro-PLC and the other devices on a FIPWAY network or FIPIO bus.

These devices include :

- Model 40 modular PLCs
- TSX 17-20 micro-PLCs
- FTX 507 or FTX 417 workstations
- IBM PCs or compatibles with ISA bus
- CCX 7 supervision stations (on FIPIO network).

On a FIPWAY network, micro-PLCs fitted with this module have the following services :

- System for electing the bus arbitrator
- Distributed database of common words comprising 0 or 4 COM words from stations with addresses 0 to 15
- UNI-TE server (exchange of 30 bytes maximum) for stations with addresses 0 to 63
- Application-to-application communication via text block (exchange of 30 bytes maximum) for stations with addresses 0 to 63.

On a FIPIO bus, micro-PLCs fitted with this module have the following services :

- Bus agent
- UNI-TE server (exchange of 30 bytes maximum) for stations with addresses 0 to 63
- Application-to-application communication via text block (exchange of 30 bytes maximum) for stations with addresses 0 to 63.

Important

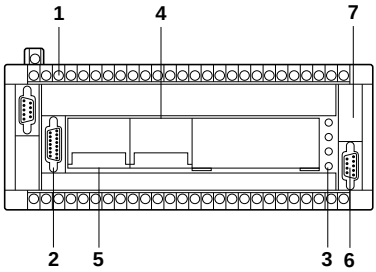
For the TSX FPG 10 module to operate correctly on the FIPIO bus, the following is required :

- A micro-PLC fitted with a micro-software catridge TSX P17 20/FC2/FD2 version V5.1 minimum
- A TSX FPG 10 module with software version VL1.1 minimum
- A model 40 processor, bus arbiter with software version VL5.2 minimum
- Software workshop version 5.2 for software installation.

1.2.-2 Description of hardware

A basic TSX 17-20 fitted with a PL7-2 micro-software cartridge reference TSX P1720 FC2 (without clock) or TSX P1720 FD2 (with clock) and a TSX FPG 10 module are required for connection to FIPWAY/FIPIO.

Composition of the TSX 17-20 micro-PLC



1 Power supply

2 Processor with terminal port (15-pin SUB-D connector)

3 Processor status indicator

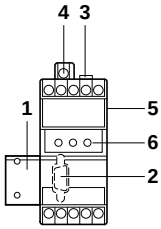
4 RAM memory (program, data) with backup battery

5 Slot for PL7-2 micro-software cartridge

6 A 9-pin SUB-D connector for connecting an extension

7 Slot for backup battery for RAM memory and data.

Composition of the TSX FPG 10 module



1 A 9-pin SUB-D connector and cable for connection to the micro-PLC or the preceding module

2 A connector for connection to the following module

3 A 9-pin SUB-D connector for connection to FIPWAY/FIPIO

4 A grounding terminal

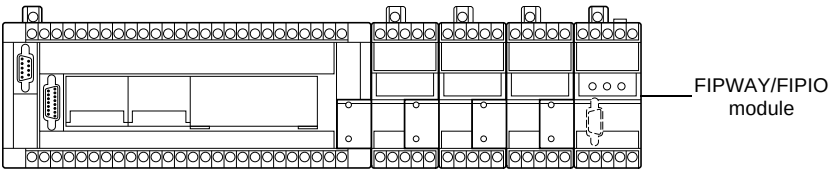
5 A removable cover over the network and station address codes

6 Three indicator lamps :
RUN (green) lights after the self-tests if the module is ready to operate
DEF (red) lights (or blinks) when a module fault is detected
COM (yellow) lights when the logical connection of the module to FIPWAY/FIPIO has been established.

1.2.-3 Connection on the micro-PLC side

The TSX FPG 10 module is connected to the basic PLC or the preceding extension module via a cable which is integral to the module. The TSX FPG 10 module must be located to the right of any extension modules which are present.

Example of connection :



Important

- Only one FIPWAY/FIPIO module can be installed on a TSX 17-20.
- The FIPWAY/FIPIO module installed on a TSX 17-20 micro-PLC can be used simultaneously for a UNI-TELWAY connection. This is realized by
  - either the TSX SCG 116 module,
  - or the TSX 17 ACC5 line terminator . This implies the micro-software cartridge version V5.1 or higher.
- As the TSX FPG 10 module is the last extension block or module in a configuration, it must have a TSX 17 ACC10 adapter fitted on its lower right line terminator.
- The micro-PLC must be powered down when connecting or disconnecting a module.

The TSX FPG 10 module is automatically recognized by the micro-PLC processor and thus no configuration is necessary.

For further details on the installation of extension blocks (fixing, dimensions, etc), refer to the document on setting up the TSX 17 micro-PLC.

1.2.-4 Connection to FIPWAY/FIPIO

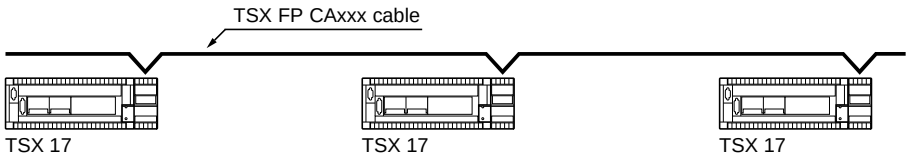
The TSX FPG 10 module has a 9-pin male SUB-D connector for connection to FIPWAY/FIPIO. Connection accessory reference TSX FP ACC2 is used for this purpose.

There are several ways of connecting stations to FIPWAY/FIPIO depending on the geographical layout of the devices to be connected.

Important

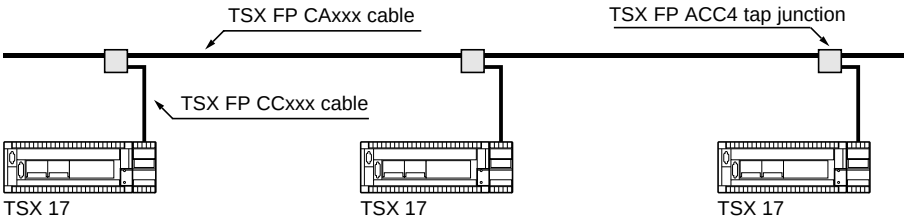
The TSX FPG 10 module is connected to or disconnected from the FIPWAY network/FIPIO bus when the PLC is switched off.

Daisy chain connection :



Each module allows daisy chain connection of the TSX FP CAxxx cable via the TSX FP ACC2 connector. Continuity of the link is maintained even if the module is removed. This type of connection is suited to "enclosure style " wiring as it reduces the number of cabling accessories per connection point.

Drop connection :



Drop connection topology creates a "bus" style architecture and should be used when access to the main cable is difficult or in a fixed location. A TSX FP ACC4 tap junction is necessary for this type of connection.

Installing the line terminators

Each FIPWAY/FIPIO segment must be fitted at both ends with a TSX FP ACC7 line terminator to ensure a characteristic impedance of 75 Ohms at each connection point. This line terminator comprises a connection accessory which the user places in a TSX FP ACC2 connector or a TSX FP ACC4 tap junction depending on the topology of the last device on the FIPWAY network/FIPIO bus.

The various cabling systems, their assembly and line terminators in connectors or tap junctions are described in detail in "FIPWAY/FIPIO network, reference manual".

2.1 General

On the FIPWAY network, micro-PLCs fitted with a FIPWAY TSX FPG 10 module have the following services :

- System for selecting a low priority bus arbitrator. This low priority does not allow a micro-PLC to be the bus arbitrator in a network which contains a model 40 processor.
- Distributed database of common words comprising 0 or 4 COM words produced by stations with addresses 0 to 15.
- UNI-TE server (exchange of 30 bytes maximum) for stations with addresses 0 to 63.
- Application-to-application communication via text block (exchange of 30 bytes maximum) for stations with addresses 0 to 63.

On the FIPIO bus, micro-PLCs fitted with a FIPWAY TSX FPG 10 module have the following services :

- Bus agent (the bus arbiter is still a TSX/PMX model 40 version V5 PLC).
- UNI-TE server (exchange of 30 bytes maximum) for stations with addresses 1 to 63.
- Application-to-application communication via text block (exchange of 30 bytes maximum) for stations with addresses 0 to 63.
- A TSX 17-20 micro-PLC with TSX P17 20 FC2/FD2 micro-software cartridge version V5.1.

Note :
Deleting any common words (see section 2.3-4) increases the performance of the UNI-TE message handling system (UNI-TE service point-to-point message exchange).

Important

For the TSX FPG 10 module to operate correctly on the FIPIO bus, the following is required :

- A micro-PLC fitted with a micro-software catridge TSX P17 20/FC2/FD2 version V5.1 minimum
- A TSX FPG 10 module with software version VL1.1 minimum
- A model 40 processor, bus arbiter with software version VL5.2 minimum
- A software workshop version 5.2 for software installation.

2.2 Module configuration

Micro-PLCs fitted with a FIPWAY/FIPIO module must be assigned to a single station and network.

These numbers are coded using micro-switches located under the cover on the front panel of the TSX FPG 10 module. Any modification of these addresses must be performed with the unit powered down. They are acquired when the micro-PLC is powered up.

Each block of micro-switches corresponds to a particular function. The upper block is used for coding the network address. The lower block is used for coding the station address.

Comments concerning the FIPWAY network

If the TSX FPG 10 module has to exchange common words with other modules located on the same FIPWAY segment, its station address must be lower than or equal to 15.

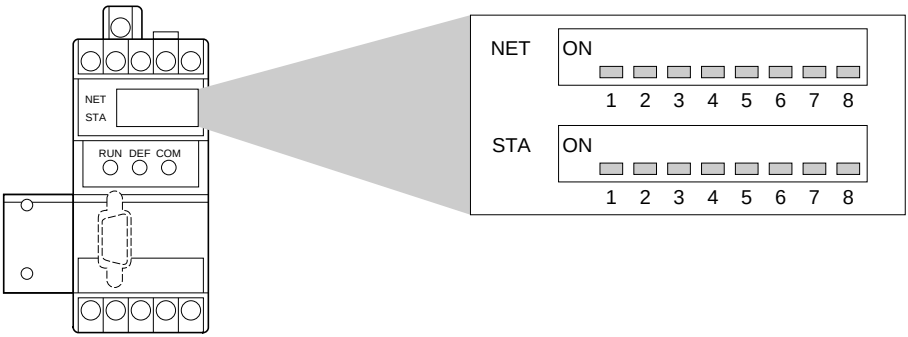
In all other cases (if the module does not have to exchange common words with other modules but uses inter-PLC exchanges based on text blocks, etc) its station address must be lower than or equal to 63 (binary bits 64 and 128 of the station number must be set to ON).

The network number must be lower than or equal to 127 (binary bit 128 of the network number must be set to ON).

Comments concerning the FIPIO bus

The network number must not be 0 (which is the number of the network configured in the bus manager PLC), the station address must be between 1 and 63 (inclusive).

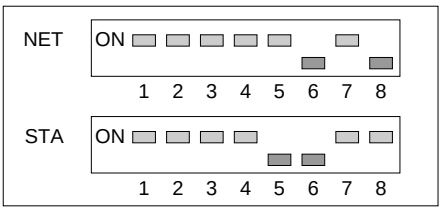
Coding addresses



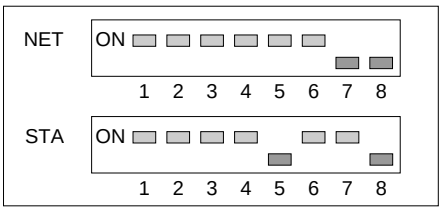
Each micro-switch is assigned a binary value. Micro-switch 8 is assigned binary value 1, micro-switch 7 is assigned binary value 2, etc, and micro-switch 1 is assigned binary value 128. A micro-switch set to ON corresponds to binary value 0.

Examples of addresses

Network 5 / Station 12



Network 3 / Station 9



2.3 COM service (on FIPWAY network)

2.3-1 General

The FIPWAY network supports the common word (COM) service of the TSX Series 7 architecture. The complete set of common words form a database which is distributed among the devices on the same network segment.

A TSX 17-20 micro-PLC only uses the common words of stations with addresses lower than or equal to 15.

A TSX 17-20 micro-PLC only produces common words if its address is lower than or equal to 15.

Depending on their configuration (0 or 4 COM words per PLC), they can access a common memory field of 64 words of 16 bits. This memory field is dedicated to exchanges between PLCs.

Each station which supports this service is assigned 4 common words (which can be written) from the common memory. Words assigned to other stations can only be read.

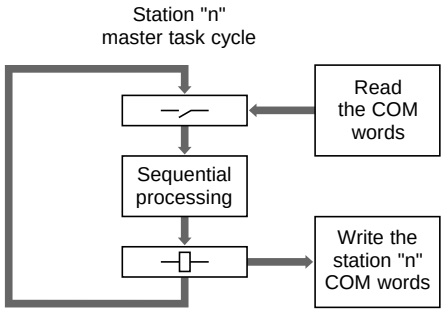
COM words are updated automatically, without requiring any intervention from the application program, at the same rate as the normal sequential activity.

At the start of each Master task cycle, when the inputs are acquired, the PLC processor reads all of the COM words from the other stations on the segment from the module interface.

System bits and words monitor the correct operation of the mechanism and updating of the COM words.

The user program simply consists of using PL7-2 instructions on bits or words to read or write COM words.

At the end of the cycle, when the outputs are updated, the PLC processor writes the COM words that are assigned to it to the module interface.

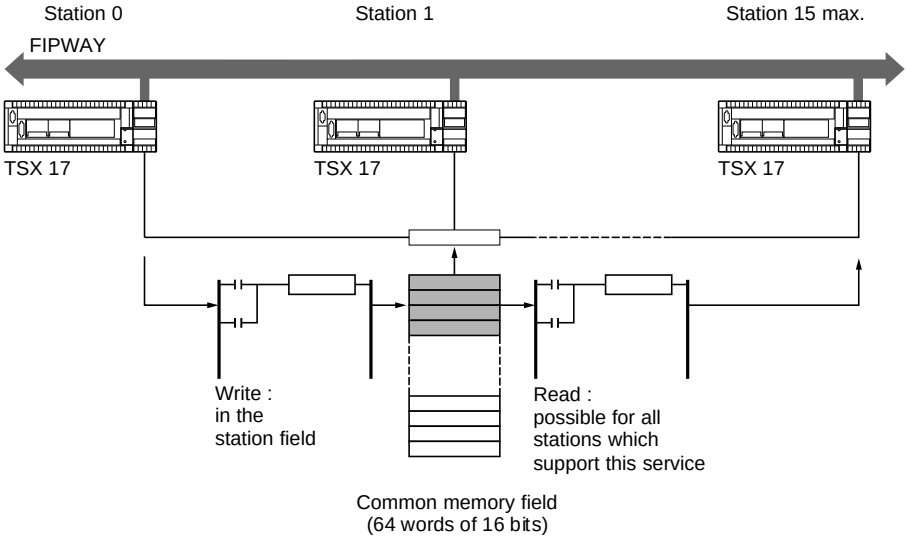


2.3-2 Operating principles

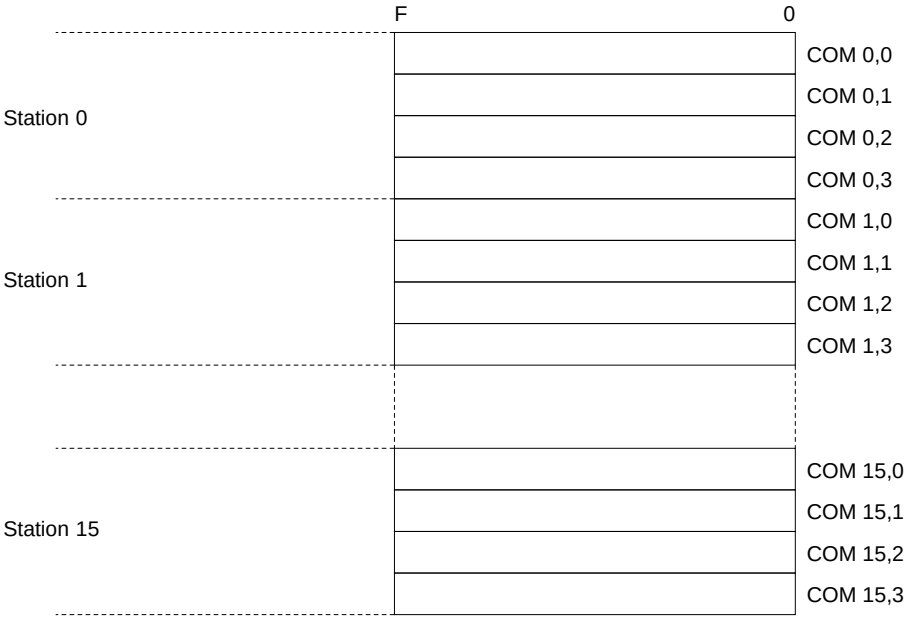
When the common words of a source station have been updated by the station processor, the module broadcasts its common words over the network.

On reception, the modules of all the PLCs using the COM service update the corresponding field and make it available to their processor.

It is advisable to use the distributed (COM) database to broadcast the status variables periodically, so that the application program is not overloaded.



2.3-3 Common memory organization



Each word in the memory can be accessed by the syntax COMi,j where :

- i = number of the station on the FIPWAY network (0 to 15)
- j = number of the common word (0 to 3)

The PLC software enables access to the individual bits of the common words. In this case the syntax is COMi,j,k where :

- i = number of the station on the FIPWAY network (0 to 15)
- j = number of the common word (0 to 3)
- k = number of the bit in the word in the event of bit by bit processing (0 to 15).

The user program of the PLC whose module has station number "n" writes the data to be transmitted on the network to its own COM n,j field and reads data in other fields from other stations.

2.3-4 Common word configuration

Each TSX FPG 10 module (addresses 0 to 15 on the FIPWAY network) can be configured to allow or inhibit the exchange of the four common words :

- **With exchange of common words**

  The station transmits its four common words and receives common words which may be transmitted by other stations.

- **Without exchange of common words**

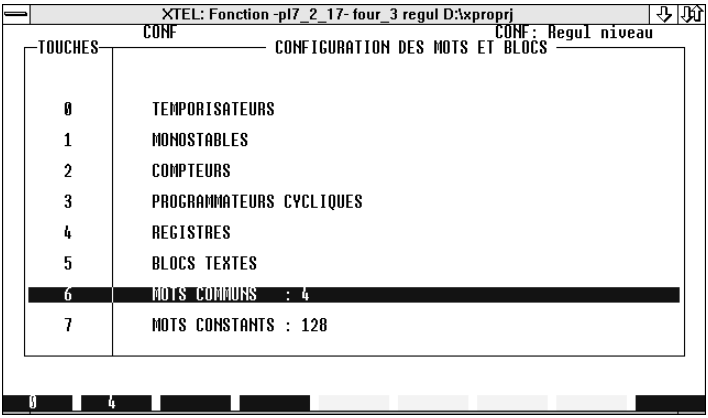
  The station does not transmit its four common words and does not receive common words which may be transmitted by other stations. The other functions of the FIPWAY network (point-to-point exchange of messages, UNI-TE service, etc) remain available.

  This mode is recommended when the TSX FPG 10 module is connected to the FIPIO bus as it increases the performance of the UNI-TE message handling system.

Configuration procedure

Common word configuration is selected when the application is configured using an FTX 507, FTX 417, or PC compatible workstation (PL7-2 language in CONFIGURATION mode).

After selecting : "WORDS AND BLOCKS" a screen is displayed which offers a number of choices including modification of the activity of the common words of the station concerned :



For further information on entering the common word configuration using programming terminals, refer to the "PL7-2 Operating modes" manual.

2.3-5 System bits and words

The user program utilizes two system bits and seven system words for testing correct operation of the network and application coherence (PLC in RUN mode, FIPWAY module operating and COM words validated). These are bits SY11 and SY12 and words SW0 to SW6.

System bits	Description	Function
SY11	Common words refresh	Normally at 0, this bit is set to 1 when a station has transmitted its common words on the FIPWAY network. This bit must be reset to 0 by the program or the terminal so that other transmissions of common words can be checked.
SY12	Network operating	Normally at 0, this bit is set to 1 when the station module is communicating with at least one other station on the network. It does not indicate that all stations are operating. This bit is set to 0 when the module malfunctions.

System words	Description	Function
SW0	Update common words	Each bit of this word (0 to 15) represents a station on the network (0 to 15). State 1 of a bit indicates that the corresponding station has transmitted its common words. This checks that the PLC of this station is in RUN mode. Each bit of this word must be reinitialized by the program.
SW1		SW1,15 = Module present (1 = module present) SW1,14 = Module status (1 = module available. This bit is only significant if SW1,15 = 1) SW1,13 = Production / consumption function status (1 = active function. Is only significant if SW1,14 = 1) SW1,12 = State of bus arbitrator function (1 = active)
SW2	Network and station number	This word indicates the FIPWAY/FIPIO network and station number. It corresponds to the codes set on the front panel of the module. The network number is indicated by the most significant bits (8 to 15), the station number is indicated by the least significant bits (0 to 7).
SW3 SW4 SW5 SW6	Table of FIPWAY stations	Each bit of these words represents a station on the network. A bit at 1 indicates that the corresponding station module is on the network. This word, which is updated by the system, does not indicate whether the corresponding PLC is in RUN mode.

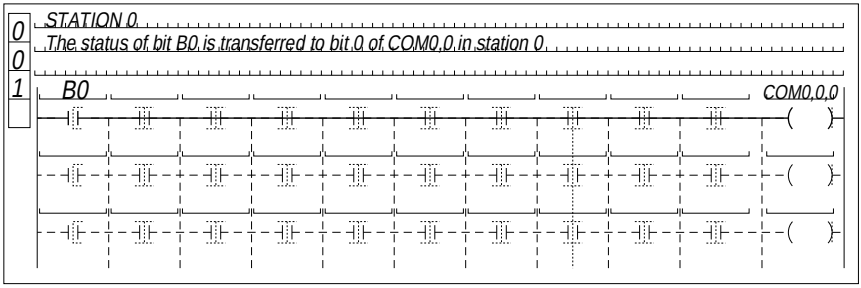
2.3-6 Application example

Transmission and reception of COM words

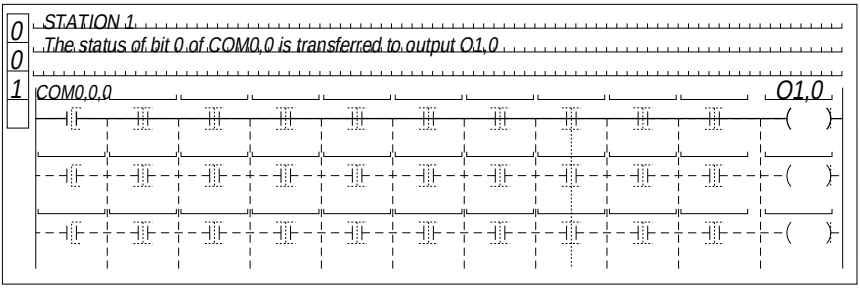
Station 0 broadcasts door contact type status information
(door open : B0 = 1, door closed : B0 = 0).
On receiving this information station 1 controls a materials handling module by activating or deactivating output O1,0 :

- If the door is open : move the truck forward
- If the door is closed : stop the truck.

Station 0 program



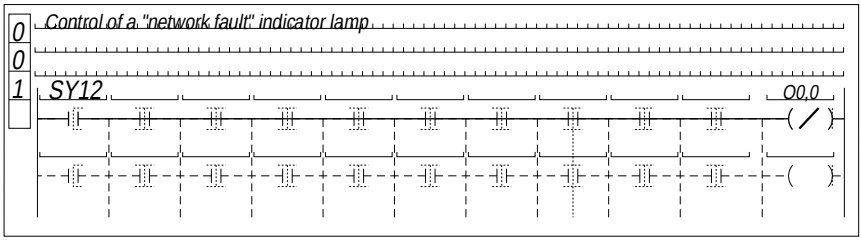
Station 1 program



Using system bits and words

Use of system bits and words is not required in all applications. However, when a station has to check the correct operation of other stations connected to the network, the following test can be performed :

SY12 : performs a global test to check that the network is operating :

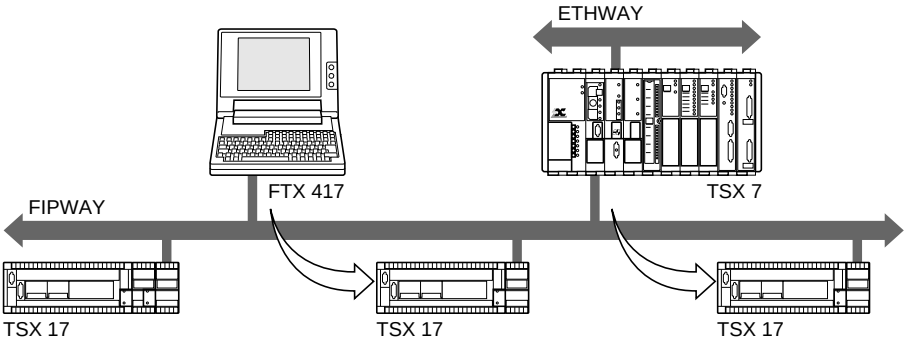


2.4 UNI-TE service

The TSX 17-20 micro-PLC on FIPWAY/FIPIO is a UNI-TE server. It responds to requests sent by a client (a TSX 7 Model 40 PLC, a supervision station, an FTX 507 or FTX 417 workstation, etc). The request is formulated by the source then sent to the UNI-TE server of the destination device.

A TSX 17-20 can exchange up to 30 bytes with stations with addresses 0 to 63.

Example of FIPWAY network :



The list of standard and specific requests supported by TSX 17-20 micro-PLCs is given in the Appendix.

Note :

A client device located on another network (MAPWAY, ETHWAY, etc) cannot communicate transparently with a device on the FIPWAY network or FIPIO bus (the FIPWAY/FIPIO manager PLC cannot be a bridge PLC).

2.5 Application-to-application communication

2.5-1 Messages to be exchanged

The messages are contained in the tables in the data memory of each station :

- **Transmission messages** : field of internal words Wi or field of constant words CWi
- **Reception messages** : field of internal words Wj.

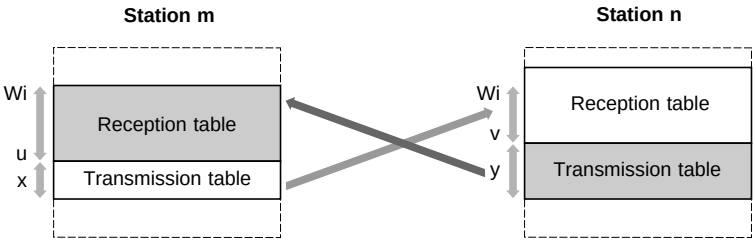
These tables are characterized by :

- **A start address** : Wi or Wj
- **A maximum reserved length** for transmission (x or y) and/or reception (u or v).

Communication example :

Station **m** transmits a table of **x** bytes. Destination station **n** receives these **x** bytes and stores them, depending on its program, in a table (referred to as the reception table) with address **Wj** and length **v.** It then transmits a word table of **y** bytes to station **m**.

Note :
Reception table length **v** must be greater than or equal to transmission table length **x**, hence **u** ≥ **y and v** ≥ **x**.



2.5-2 Communication principles

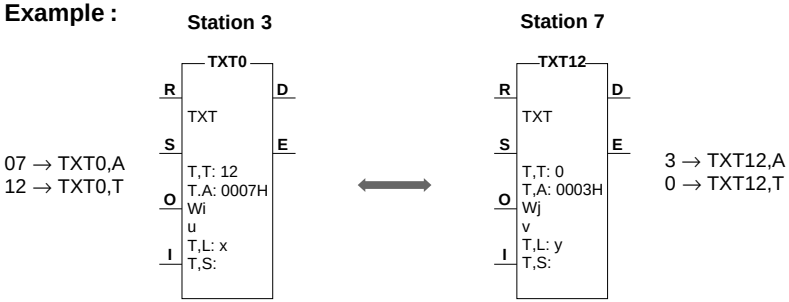
Logical connection between two stations requires simultaneous :

- Transmission activation of a text block by the program in the transmitting station
- Reception activation of a text block by the program in the destination station.

This connection is specified by initializing text block parameters :

- **TXTi,A** : numbers of the network and station (in hexadecimal notation) with which communication is to take place
- **TXTi,T** : number of the station text block with which to communicate

Example :



2.5-3 Using the TXT text block

Setting up the software for application-to-application communication requires :

- Initialization of text block parameters in each station
- Activation of each of these text blocks.

The following parameters must be defined for each station which is to communicate :

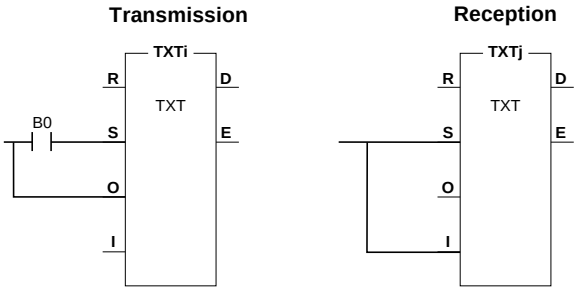
Initialization of text block parameters

- **In configuration or Zoom function mode :**
  - type of text block (CPL, TXT or TER) : **TXT**
  - address and length of the reception table : **ADDR BUF** (example W60[30] : the reception table starts at W60, and its length is 30 bytes)
- **In configuration, programming or Zoom function mode** (for the source station)
  - the network address and station with which communication is set up : **TXTi,A**
  - the text block number of the station with which communication is set up : **TXTi,T**
  - the length of the message transmitted : **TXTi,L**

If a station is only handling one transmission, the length of the reception table must be declared as zero and INPUT must not be connected. Thus the address of the start of the reception table corresponds to the address of the start of the transmission table.

Activating text blocks :

Text blocks are activated by program. The transmission text block must be activated for transmission and the reception text block must be activated for reception.



When the parameters have been initialized, setting variable B0 to 1 enables the message to be sent by block TXTi (set to transmission by input O). Block TXTj must already be set to reception (inputs S and I at 1) so that the message can be stored in the reception table of the destination station.

The various features of text blocks include :

- Initializing the parameters by program
- Activating the text block for transmission followed by reception
- TXTi,E or TXTi,D outputs (exchange terminated with or without error)

These features enable messages to be exchanged (communication in both directions) between two stations.

2.5-4 Transferring messages on the network

The progression of application-to-application communication makes reference to the PLC cycle and is divided into three stages :

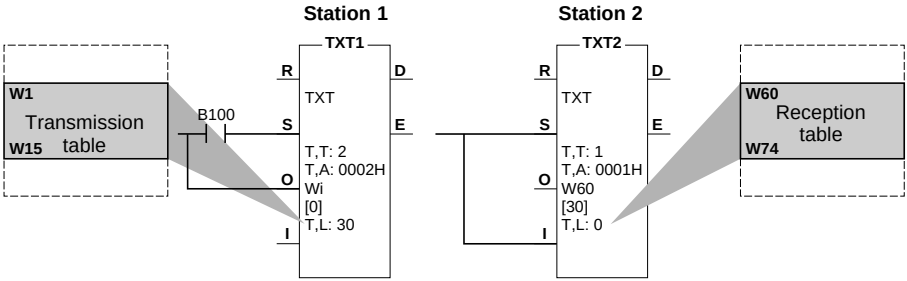
- **Transfer from user program → source FIPWAY/FIPIO module** : This is performed in each Master task cycle, after execution of the user program (Master task).
- **Transfer from source FIPWAY module → destination FIPWAY/FIPIO module** : The message handling request is conveyed at the same time as the transmission of the common words from the source station, ie when the source station is communicating. The message is transmitted to the "aperiodic message" window.
- **Transfer from destination FIPWAY/FIPIO module → user program** : This is performed in each Master task cycle (1), before execution of the user program (Master task).

The PLC processors take the message requests into account in the order in which they are received and deal with them in a buffer of eight text blocks.

(1) of the TSX 17-20 micro-PLC with the TSX P17-20 FC2/FD2 micro-software cartridge version ≤ 5.1.

2.5-5 Example of communication between two FIPWAY/FIPIO stations

In the example below, a message of 30 bytes is transmitted from station 1 to station 2, with the following characteristics :



Note :

In a text block which is wired for reception only, it is not necessary to initialize parameters TXTi,T and TXTi,A. In fact, they are automatically updated at reception, according to the text block number and address of the source PLC.

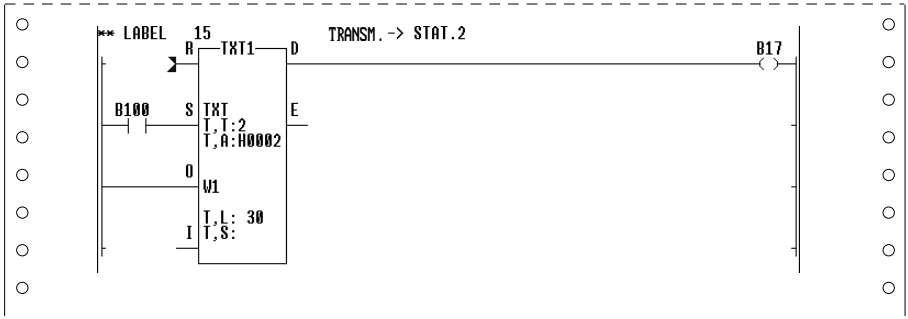
Station 1 (source station)

Text block TXT1 is initialized with the following values :

- TXT type text block
- W1 is the address of the transmission table (length of reception table zero)
- TXT1,T = 2 (destination text block 2)
- TXT1,A = 2 (destination station 2)
- TXT1,L = 30 (30 bytes to be transmitted)

Transmission is initiated by setting internal bit B100 to 1. Bit B17 is set to 1 when the transmission is complete.

Program :



Station 2 (destination station)

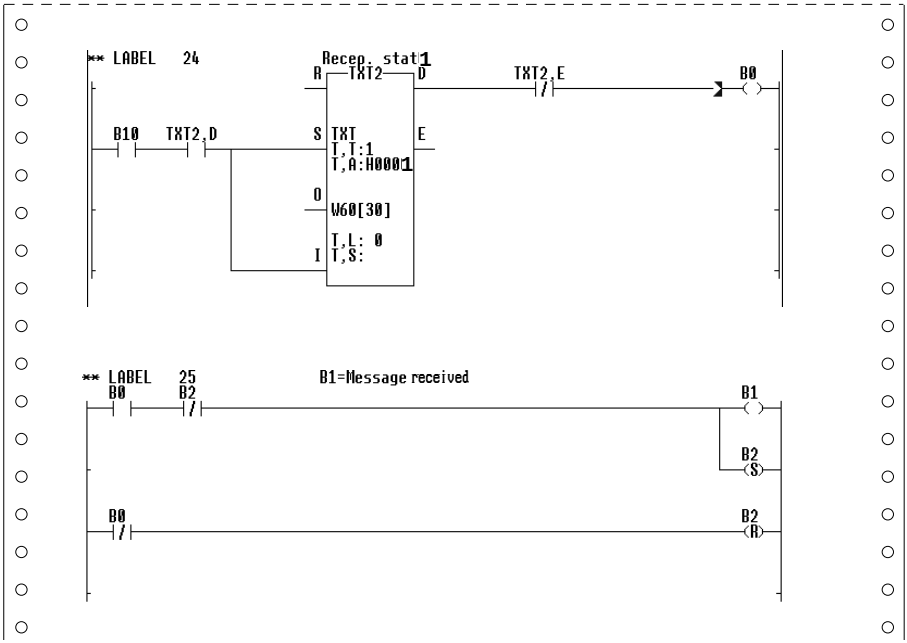
Text block TXT2 is initialized with the following values :

- TXT type text block
- ADDR BUF = W60[30] is the address and length of the reception table
- TXT2,L = 0 (no transmission from station 2).

Parameters TXT2,A and TXT2,T are automatically updated on reception of the data.

Text block TXT2 is systematically set to reception by setting bit B10 to 1. Bit B1 at 1 indicates that another message has been received with no error, for processing by the user program.

Program :



3.1 Troubleshooting using indicator lamps

On power-up the TSX FPG 10 module performs a self-test on its internal functions (test of the memory field in read and write modes, calculation of the checksum and verification of access to the various internal registers), receives the basic configuration, starts to take account of data which is circulating on the network then participates in the exchanges with which it is concerned. During all these stages, the module manages three indicator lamps (RUN, DEF and COM) which are located on the front panel.

The table below describes the main faults which may be detected and the action to be taken. First, the station must be powered down and then powered up again to reinitialize the module so that it is possible to check whether the fault persists.

Symptoms	Probable causes	Corrective actions
● ○ ◌ RUN DEF COM	- Normal display during operation	
○ ○ ○ RUN DEF COM	- Lamp failure - Power supply failure - Module failure	- Check the connection with the CPU - Check the connection with the CPU - Change the module
○ ● ○ RUN DEF COM	- Fault during self-tests	- Change the module
● ○ ◌ RUN DEF COM	- Address fault - Existing address greater than 63 - Terminal block disconnected	- Check the station address - Check the station address - Check that there is a TSX FP ACC2 connector present

○ Indicator lamp off

● Indicator lamp on with steady light

○ Indicator lamp blinking

Note :

Other faults are indicated by system word SW1. For further information refer to Section 2.3-5.

4.1 Performance

4.1-1 Performance of common words

The performance of common words is dependent mainly on the transfer of common words between the PLC processor and the FIPWAY module and on the speed of the common words on the FIPWAY network.

- **Transferring common words from the CPU to the FIPWAY module :**

  Reading of COM words from other stations and production of the four COM words in the local PLC are performed in the same PLC cycle.

- **Speed of the common words of a station on the FIPWAY network :**

  The update time for all the COM words (for 16 stations) is 40 ms. This period is independent of the number of PLCs handling this service (1 to 16).

The typical transit time for an application level data bit between two stations using common words is 200 ms.

4.1-2 Performance of application-to-application messages

The useful network message rate for a TSX FPG 10 module is limited to one outgoing message and one incoming message per PLC cycle.

The typical transit time for an application-to-application type message between two stations on a heavily loaded network with simultaneous reception of four messages is 250 ms (on FIPWAY network).

4.1-3 UNI-TE server performance

When it is operating as a UNI-TE server, the TSX 17-20 micro-PLC handles one request per PLC cycle. The performance of this type of service thus depends on the UNI-TE access provided by the UNI-TELWAY network and /or the terminal port.

4.1-4 Performance on FIPIO bus

On the FIPIO bus, the TSX 17-20 micro-PLC can transmit a maximum of one message every :

- 100 ms if the station number is < 16,
- 200 ms if the station number is < 32,
- 400 ms if the station number is ≥ 32 and ≤ 64.

4.1-5 Limitations

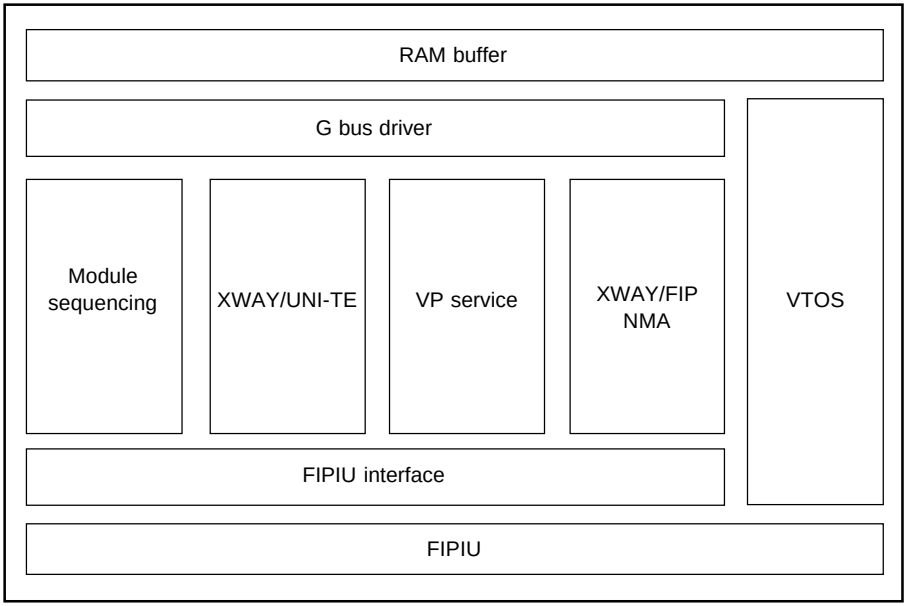
The TSX FPG 10 module has four reception buffers for messages from FIPWAY/FIPIO.

If the TSX 17-20 fitted with this module is communicating with more than four other devices on the network via the message handling system, it is possible that some messages may be lost as a result of saturation of the module reception buffers.

5.1 Module architecture

5.1-1 Software architecture

The diagram below shows the software architecture and the various functions of a FIPWAY/FIPIO module :



Definition of the main functions :

RAM buffer

This is the interface memory between the FIP interface software and the PLC.

G bus driver

This driver comprises two modules :

- A library of functions which enable both access to the interface by VTOS processes and definition of the shared database.
- A library of interrupt managers used when the PLC is communicating on the network.

Module sequencing

This is the element which controls the connection software, determines the operating modes and manages stopping and starting of locally connected devices.

XWAY / UNI-TE

The XWAY network layer performs the functions linked to the messages in an integral fashion (routing function for datagrams) and calculates FIP LSAPs.

The UNI-TE block decodes UNI-TE requests, then sends a request for services to the function block designated for information processing. After execution of the service, the UNI-TE interpreter block receives confirmation and encodes the UNI-TE response.

VP service

This service is composed of two blocks :

- The "Exchange list processor" (ELP) block which performs functions linked to the exchange lists for COM words in an integral fashion on the FIPWAY network.
- The "MPS server" block which performs requests for services relating to the MPS variables in an integral fashion.

XWAY / FIP NMA

This service comprises three blocks :

- The "XWAY network management agent / manager" block which manages objects and functions relating to message exchanges.
- The "FIPWAY network/FIPIO bus management agent" block which manages objects and functions relating to shared exchanges of variables.
- The "equipment monitoring agent" which performs real-time updating of the database describing the 64 connection points on the FIPWAY/FIPIO segment.

VTOS

This block contains the tools for loading the process into the RAM, reading and writing to the processor memory space and sending messages to a terminal.

FIPIU interface

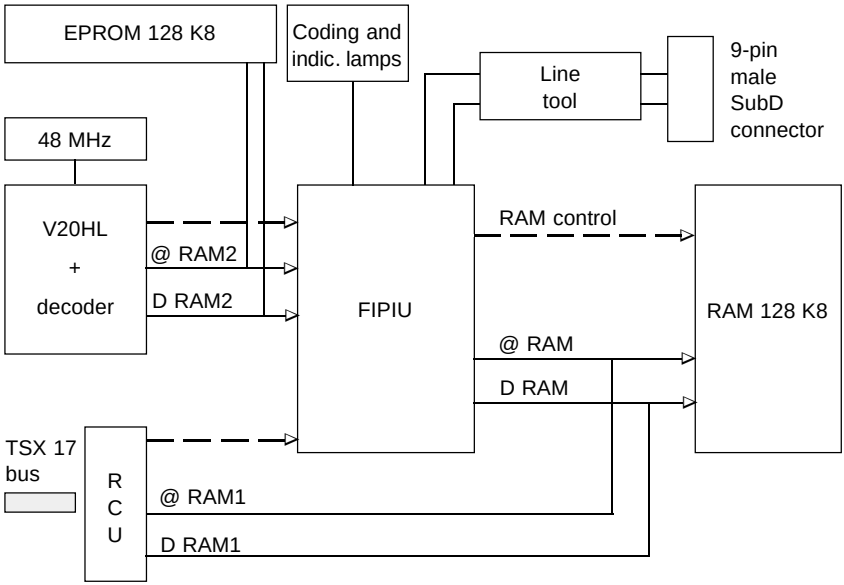
This interface comprises a number of functions for management and access to network RAM objects in addition to checking the FIPIU component.

5.1-2 Hardware architecture

The TSX FPG 10 module contains two boards :

- A mother board which is the interface between the micro-PLC and the network
- A daughter board which is used for address coding and display.

It is based on the following structure :



5.2 Requests supported by TSX 17-20 PLCs

5.2-1 Standard requests

Service	Request	Question		Answer		Meaning
		Hex	Dec	Hex	Dec	
Data (read)	Read a bit	00	00	30	48	Read a bit B.
	Read a word	04	04	34	52	Read a word W.
	Read objects	36	54	66	102	Read objects (bit, word, word string, etc).
Data (write)	Write a bit	10	16	FE	254	Write a bit B.
	Write a word	14	20	FE	254	Write a word W.
	Write objects	37	55	FE	254	Write objects (bit, word, word string, etc).
Run/Stop modes	RUN	24	36	FE	254	Setting a device to RUN.
	STOP	25	37	FE	254	Setting a device to STOP.

5.2-2 Specific requests

Request	Question		Answer		Meaning
	Hex	Dec	Hex	Dec	
Read a system bit	01	01	31	49	Read a system bit (SY)
Read the image of an I/O bit	02	02	32	50	Read the image of an I/O bit
Read a constant word	05	05	35	53	Read a constant word (CW)
Read a system word	06	06	36	54	Read a system word (SW)
Read a timer	09	09	39	57	Read parameters of a timer (T)
Read a monostable	0A	10	3A	58	Read parameters of a monostable (M)
Read a counter	0B	11	3B	59	Read parameters of a counter (C)
Read current step of a drum controller	0C	12	3C	60	Read current step of a drum controller (D)
Read a step of a drum controller	0D	13	3D	61	Read a step of a drum controller (D)
Read a register	0E	14	3E	62	Read the parameters of a register (R)
Read Grafcet steps	2A	42	5A	90	Read Grafcet steps (Xi)
Write a system bit	11	17	FE	254	Write a system bit (SY)
Write the image of an I/O bit	12	18	FE	254	Write the image of an I/O bit
Write a system word	15	21	FE	254	Write a system word (SW)
Write a timer preset	17	23	FE	254	Write preset value of a timer (T)
Write a monostable preset	18	24	FE	254	Write preset value of a monostable (M)
Write a counter preset	19	25	FE	254	Write preset value of a counter (C)
Write a register input	1A	26	FE	254	Write a register input (R)
Stop a drum controller	26	38	FE	254	Stop a drum controller (D)
Go to next step of a controller	27	39	FE	254	Go to next step of a controller (D)
Run controller	28	40	58	88	Start a controller (D) running

5.3 Standard requests

5.3-1 Read a bit

This request reads the value of a bit (0 or 1) and whether it is forced or not.

Request format

Request Code Hex.	Category Code	Bit Number
00/00	0 → 7	

Confirm format

Positive confirm

Confirm Code Hex.	Value	Forcing
30/48		

Value : An 8-bit string where the address of the first bit is the highest multiple of 8 contained in the bit number to be read (modulo 8).

Forcing : An 8-bit string used as a forcing indicator for the 8 "value" bits :
- 1 if the bit is forced, the forced value is in the "value" bit
- 0 if the bit is not forced.

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :
- Unknown request
- Inadequate access rights
- Bit number out of range.

5.3-2 Read a word

This request reads a word (W).

Request format

Request Code Hex.	Category Code	Word Number
04/04	0 → 7	

Confirm format

Positive confirm

Confirm Code Hex.	Value
34/52	

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :

- Unknown request
- Inadequate access rights
- Word number out of range.

5.3-3 Read objects

This request reads simple objects (words or word strings etc).

Request format

Request Code Hex.	Category Code	Segment	Type of Object	Object Address		Number of Objects to Read	
36/54	0 → 7						

Segment : Specifies the addressing mode used for the objects to be read, and the position where they are located (in hexadecimal notation).
The segments accessible by TSX Series 7 PLCs are (in hexadecimal notation) :
10 : Common object space segment
68 : Internal word space segment

Type of object : Specifies the type of object to read :
7 : 16-bit signed integer
0 : Default value

Object address :
. Physical or logical address in the segment
. The sequence number of the object in the segment :
- 0 : Current date and time in the common objects segment
- 1 : Stored date and time in the common objects segment

Read objects (continued)

Confirm format

Positive confirm

Confirm Code Hex.	Type of Object	Data				
66/102						

Type of object : Returns the type of object selected when the request is sent.

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :
- Unknown request
- Unknown segment or object
- Address out of range
- Too many objects for the reception buffer

Request examples

Read words

Segment : 68
Type of object : 7 → Wi
Object address : index of the first Wi to read

Read date and time

Segment : 10 (common)
Type of object : 0 by default
Object address : 0 → current date and time
1 → stored date and time
No. of objects to read : 0 by default

5.3-4 Write a bit

This request sets a bit to 1 or 0.

Request format

Request Code Hex.	Category Code	Bit Number	Bit Value
10/16	0 → 7		

Bit value : 0 → state 0
1 → state 1

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :
- Unknown request
- Inadequate access rights
- Bit number out of range.

5.3-5 Write a word

This request writes the contents of a word.

Request format

Request Code Hex.	Category Code	Word Number		Word Value	
14/20	0 → 7				

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :

- Unknown request
- Inadequate access rights
- Word number out of range

5.3-6 Write objects

This request writes simple objects (words, word strings, etc)

Request format

Request Code Hex.	Category Code	Segment	Type of Object	Object Address	Number of Objects to Write	Data
37/55	0 → 7					

Segment : Specifies the mode and addressing field (in hexadecimal notation) :
10 : Common object space segment
68 : Internal word space segment

Type of object : Specifies the type of object to write :
7 : 16-bit signed integer
0 : Default value

Object address :
. Physical or logical address in the segment
. Sequence number of the object in the segment :
- 0 : Current date and time in the common objects segment
- 1 : Programming port configuration in the system segment

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Negative confirm

Confirm Code Hex.
FD/253

Write objects (continued)

Negative confirm (continued)

Causes for rejection :
- . Unknown request
- . Inadequate access rights
- . Unknown object
- . Last object address out of range

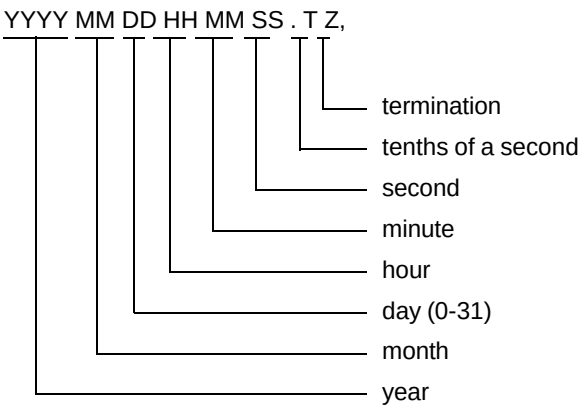
Request example

Write words

Segment	:	68
Type of object	:	7 → Wi
Object address	:	Index of first Wi to write
No. of objects to write	:	Number n
Data	:	Table of n objects Wi[n]

Write date and time

Segment	:	10 (common)
Type of object	:	0 by default
Object address	:	0 → current date and time
No. of objects to write	:	0 by default
Data	:	17 ASCII characters that contain the date and time :



5.3-7 RUN

This request sets a device to run.

Request format

Request Code Hex.	Category Code
24/36	0 → 7

Caution : Depending on the type of product, prior reservation may be required.

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :
- Unknown request
- Inadequate access rights
- No reservation

5.3-8 STOP

This request stops a device.

Request format

Request Code Hex.	Category Code
25/37	0 → 7

Caution : Depending on the type of product, prior reservation may be required.

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :
- Unknown request
- Inadequate access rights
- No reservation

5.4 Specific read requests

5.4-1 Read a system bit

This request reads a system bit (SY).

Request format

Request Code Hex.	Category Code	System Bit Number
01/01	0→ 7	

Confirm format

Positive confirm

Confirm Code Hex.	Value
31/49	

Value : An 8-bit string where the address of the first bit is the highest multiple of 8 contained in the system bit number to be read. Only the bit which corresponds to the desired bit is significant.

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :
- Unknown request
- Bit number out of range.

5.4-2 Read the memory image of an I/O bit

This request reads the memory image of an I/O module.

Request format

Request Code Hex.	Category Code	I/O Module Location	
02/02	0 → 7		

Confirm format

Positive confirm

Confirm Code Hex.	Fault Code	Configu-ration	Reserved	Reserved	Reserved	Reserved	No. of output bits	Value of output bits		No. of input bits
32/50			00	0F	00	1F	10			20

Value of input bits				No. of output bits	Output bit forcing list		No. of input bits	Input bit forcing list			
				10			20				

Fault code : Bit 7 = Fault : (0 = no, 1 = yes)
Bit 6 = 1 if response in extended format
Bits 5 and 4 = 0
Bits 0 to 3 = Type of fault :
0000 : OK no I/O fault
0001 : OK but minor fault
0010 : Module absent
0011 : Module failure
0100 : Not an I/O module
0101 : Incompatible with configuration
0110 : Module not required
0111 : Not used
1000 : Not used

Read the memory image of an I/O bit (continued)

Configuration :

Bit 7	=	Required module present (0 = no, 1 = yes)
Bit 6	=	0 (reserved)
Bits 0 to 5	=	Module code (if required module present bit 7 = 1)
Configuration	=	0 if no configuration is declared.

Number of output bits :

The TSX 17-20 always sends the maximum number of outputs (16 or H'10').

Value of the output bits :

Value of the module output bits. If this contains 8 or 12 outputs, the bits which are not used contain non-significant zero values.

Number of input bits :

The TSX 17-20 always sends the maximum number of inputs (32 or H'20').

Value of the input bits :

Value of the module input bits. If this contains 12, 22 or 24 inputs, the bits which are not used contain non-significant zero values.

Output bit forcing list :

Forcing status of output bits :

. 0 the bit is not forced
. 1 the bit is forced, its forcing state is displayed in the output bit value parameter.

Input bit forcing list :

Forcing status of input bits :

. 0 the bit is not forced
. 1 the bit is forced, its forcing state is displayed in the input bit value parameter.

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :

. Unknown request
. Module number out of range.

5.4-3 Read a constant word

This request reads a constant word (CW).

Request format

Request Code Hex.	Category Code	Word Number
05/05	0 → 7	

Confirm format

Positive confirm

Confirm Code Hex.	Value
35/53	

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :
- Unknown request
- Word number out of range.

5.4-4 Read a system word

This request reads a system word (SW..).

Request format

Request Code Hex.	Category Code	Word Number
06/06	0 → 7	

Confirm format

Positive confirm

Confirm Code Hex.	Value
36/54	

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :
- Unknown request
- Word number out of range

5.4-5 Read a timer

This request reads all of the parameters of a timer.

Request format

Request Code Hex.	Category Code	Timer Number
09/09	0 → 7	

Confirm format

Positive confirm

Confirm Code Hex.	Time Base	Timer Timed-out	Timer Running	Type of Preset	Preset Value	Current Value
39/57						

Time base : 0 → 10ms
1 → 100 ms
2 → 1 s
3 → 1min

Timer timed-out : 0 → no
1 → yes

Timer running : 0 → no
1 → yes

Type of preset : 0 → preset cannot be modified
1 → preset can be modified

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :
. Unknown request
. Timer number out of range
. RAM cannot be executed

5.4-6 Read a monostable

This request reads all of the parameters of a monostable.

Request format

Request Code Hex.	Category Code	Monostable Number
0A/10	0 → 7	

Confirm format

Positive confirm

Confirm Code Hex.	Time Base	Mono-stable Running	Type of Preset	Preset Value	Current Value
3A/58					

Time base : 0 → 10 ms
1 → 100 ms
2 → 1 s
3 → 1 min

Monostable running : 0 → no
1 → yes

Type of preset : 0 → preset cannot be modified
1 → preset can be modified

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :
. Unknown request
. Monostable number out of range
. RAM cannot be executed

5.4-7 Read a counter

This request reads all of the parameters of a counter.

Request format

Request Code Hex.	Category Code	Counter Number
0B/11	0 → 7	

Counter number 31 is the TSX 17-20 fast counter.

Confirm format

Positive confirm

Confirm Code Hex.	Down-count Overflow	Upcount Overflow	Counter Running	Type of Preset	Preset Value	Current Value
3B/59						

Downcount overflow : 1 if the current counter value has changed from 0 to 9999

Upcount overflow : 1 if the current counter value has changed from 9999 to 0

Counter running : 0 → no
1 → yes

Type of preset : 0 → preset cannot be modified
1 → preset can be modified

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :
- Unknown request
- Counter number out of range
- RAM cannot be executed

5.4-8 Read current step of a drum controller

This request reads all the parameters of a drum controller.

Request format

Confirm Code Hex.	Category Code	Drum Controller Number
0C/12	0→7	

Confirm format

Positive confirm

Confirm Code Hex.	Time Base	Drum Contr. full	Duration of Current Step	Drum length in steps	Number of Current Step	Value of Current Step
3C/60						

Time base : 0 → 10 ms
1 → 100 ms
2 → 1 s
3 → 1 min

Drum controller full : indicates that the last step defined is running
0 → no
1 → yes

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :
. Unknown request
. Drum controller number out of range
. RAM cannot be executed

5.4-9 Read a drum controller step

This request reads the parameters of a drum controller step.

Request format

Confirm Code Hex.	Category Code	Drum Controller number	Step number
0D/13	0→7		

Confirm format

Positive confirm

Confirm Code Hex.	Time Base	Drum Contr. full	Duration of Current Step	Drum length in steps	Number of Current Step	Value of required step
3D/61						

Time base : 0 → 10 ms
1 → 100 ms
2 → 1 s
3 → 1 min

Drum controller full : indicates that the last step defined is running
0 → no
1 → yes

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :
. Unknown request
. Drum controller number out of range
. Step number out of range
. RAM cannot be executed

5.4-10 Read a register

This request reads all the parameters of a register.

Request format

Request Code Hex.	Category Code	Register Number
0E/14	0 → 7	

Confirm format

Positive confirm

Confirm Code Hex.	Register Type	Register Empty	Register Full	Register Length	Input Word	Output Word
3E/62						

Type of register : 0 = FIFO register
1 = LIFO register

Register empty : 0 = no
1 = yes

Register full : 0 = no
1 = yes

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :
- Unknown request
- Register number out of range
- RAM cannot be executed

5.4-11 Read Grafcet steps

This request reads the Grafcet step activity bits (Xi).

Request format

Request Code Hex.	Category Code	Portion Number
2A/42	0 → 7	

Portion number : 0 = portion [X0 ••••• X127]

Confirm format

Positive confirm

Confirm Code Hex.	Data
5A/90	

Data : Succession of 128 bits corresponding to the step number in the selected portion :
Bit i = 0 : step Xi inactive
Bit i = 1 : step Xi active

As the TSX 17-20 allows 96 steps, bits X96 to X127 are thus always at 0.

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :
. Unknown request
. Portion number out of range
. No reservation

5.5 Specific write requests

5.5-1 Write a system bit

This request writes a system bit (SY).

Request format

Request Code Hex.	Category Code	System Bit Number	Bit Value
11/17	0 → 7		

Bit value : 0 or 1.

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :
- Unknown request
- Inadequate access rights
- Bit number out of range

5.5-2 Write the memory image of an I/O bit

This request writes the memory image of an I/O bit. As memory image processing is used, no check is made to ensure that the module exists or is operating correctly.

Request format

Confirm Code Hex.	Category Code	I/O module number	Select Inputs or Outputs	I/O bit number	Bit value
12/18	0→7				

I/O module number :

Bit 0 to 7 : logical module number (0 to 3)
Bit 15 must always be at 1.

Input or output selection :

0 : Outputs
1 : Inputs

Bit number : 0 → 15 : for outputs
0 → 31 : for inputs

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :

. Unknown request
. Inadequate access rights
. I/O module number out of range
. I/O bit number out of range

5.5-3 Write a system word

This request writes a system word (SW..).

Request format

Request Code Hex.	Category Code	System Word Number		Word Value	
15/21	0 → 7				

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :
- Unknown request
- Inadequate access rights
- System word number out of range

5.5-4 Write the preset value of a timer

This request writes the preset value of a timer (T), if it can be modified.

Request format

Request Code Hex.	Category Code	Timer Number	Preset Value
17/23	0 → 7		

Preset value : between 0 and 9999 (H'00' to H'270F').

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :
- Unknown request
- Timer number out of range
- Preset value cannot be modified
- Preset value out of range
- RAM cannot be executed

5.5-5 Write the preset value of a monostable

This request writes the preset value of a monostable (M), if it can be modified.

Request format

Request Code Hex.	Category Code	Monostable Number	Preset Value
18/24	0 → 7		

Preset value : between 0 and 9999 (H'00' to H'270F').

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :
- Unknown request
- Monostable number out of range
- Preset value cannot be modified
- Preset value out of range
- RAM cannot be executed

5.5-6 Write the preset value of a counter

This request writes the preset value of a counter.

Request format

Request Code Hex.	Category Code	Counter Number	Preset Value
19/25	0 → 7		

Preset value : between 0 and 9999 (H'00' to H'270F').

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :
- Unknown request
- Counter number out of range
- Preset value cannot be modified
- Preset value out of range
- RAM cannot be executed

5.5-7 Write a register input word

This request writes a register input word (R).

Request format

Request Code Hex.	Category Code	Register Number		Input Word Value	
1A/26	0 → 7				

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :
- Unknown request
- Inadequate access rights
- Register number out of range
- RAM cannot be executed

5.5-8 Stop a drum controller

This request stops a drum controller.

Request format

Confirm Code Hex.	Category Code	Drum Controller number		Step number	
26/38	0→7				

Step number : the drum controller cycle is halted at the selected step.

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :
- Unknown request
- Inadequate access rights
- Drum controller number out of range
- Step number out of range
- RAM cannot be executed
- No reservation

5.5-9 Go to next drum controller step

This request moves a drum controller to the next step and updates the order bits.

Request format

Confirm Code Hex.	Category Code	Drum Controller number
27/39	0→7	

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :

- Unknown request
- Inadequate access rights
- No reservation
- Drum controller number out of range
- RAM cannot be executed

5.5-10 Start a drum controller

This request starts a drum controller following a halt.

Request format

Confirm Code Hex.	Category Code	Drum Controller number
28/40	0→7	

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :

- Unknown request
- Inadequate access rights
- Drum controller number out of range
- RAM cannot be executed
- No reservation

5.6 List of documents to which reference has been made

When setting up a FIPWAY application, it may be necessary to refer to the following manuals :

- "FIPWAY/FIPIO reference manual", reference TXT DR FPW, for installing, wiring, connecting, setting up, etc, the various elements and devices on a FIPWAY network or FIPIO bus.
- "TSX 17 micro-PLC, setup", reference TSX D 11000E, for installing extension blocks, their dimensions, mounting, etc.
- "PL7-2 reference", reference TXT DR PL7 2 V5E, for programming the PL7-2 application.
- "PL7-2 operating modes", reference TXT DM PL7-2 V5E, for configuring common words.