Section		**Page**

1.1   Documentation Presentation

This User's Manual is designed for users installing a TSX ETH 200 Module in a TSX Series 7 PLC and connecting to a MAP/802.3 network.

The complete documentation set comprises specialized User's Manuals (including this manual), available for implementation software and for each device that can be connected to the network. The main points covered by these manuals include :

• Device description,
• MAP/802.3 network implementation or connection of each device,
• Network performance,
• Network operation with Telemecanique terminals or programs,
• Remote diagnostics functions via the network.

This manual (TSX DM ETH 200 V5E) is supplied with the TSX ETH 200 module. This A5 format manual can be inserted in an A5 format binder with dividers. The TSX DAC 1 binder must be ordered separately.

ETHWAY network
Reference manual

TSX ETH 200
OSI/Ethernet module
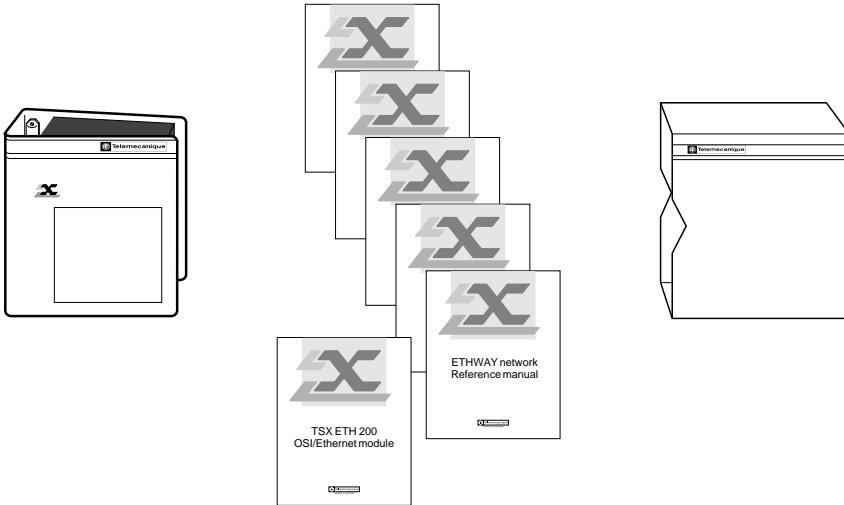
> This document refers to other installation manuals for both hardware and software. See appendix 5.5 for a full listing.

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1.2 Module Description

1.2-1 General

The TSX ETH 200 module is an intelligent module for use with TSX Series 7 modular PLCs. It can be installed in Model 40 PLCs (TSX and PMX 47-40, 67-40, 87-40 and 107-40 PLCs) version V4 or V5.

The module can be used for communication between the PLC and other devices on an X-WAY architecture.

These devices include :

• Telemecanique modular PLCs described above,
• Telemecanique FTX 417 or FTX 507 workstations connected to the programming port of a PLC on the network,
• All devices which conform to the MAP profile on the OSI Ethernet standard with the MMS message handling service.

The use of the TSX ETH 200 module in a multinetwork architecture is only possible with Telemecanique PLCs version 4.4 or later.

1.2-2   Module Features

The TSX ETH 200 module supports MAP/802.3 network connection. The module is connected to the network via a 15-pin female SUB-D connector that supports the AUI (Attachment Unit Interface) defined in the 802.3 standard. The address of the station on the network (station and network numbers) is coded in the TSX ETH ACC1 terminal block.

The transmission speed is 10 Megabits/second (Mb/s). The network access method is multiple access by signal monitoring and collision detection (CSMA/CD).

The application services are MMS industrial message handling (international standard) and the standard Telemecanique services (distributed database : COM service and UNI-TE protocol).

The MAP/802.3 network architecture provides the following services :

- Use of the MMS industrial message handling service, for interoperability with all systems complying with this standard,
- A virtual extension of the memory bus to PLCs connected to the network and using the COM (common) word service,
- The exchange of messages between two network stations or in broadcast mode (on the same network segment),
- Remote access for all workstation functions when connected to the programming port of a PLC.

The TSX ETH 200 module acts as an :

- **MMS Server** which is transparent to the user program.

- **MMS Client** via MMS optional functional blocks in the PL7-3 user program application.

Ease of Use

- The TSX ETH 200 module can operate (on the UNI-TE profile) immediately on power-up in the PLC rack, without downloading a configuration.

Operational Safety

- The TSX ETH 200 module is electrically isolated from the network.
- In addition, the terminal block which connects the module to the network can be inserted and removed under power.

Operating Guidelines

- The TSX ETH 200 module must not be inserted into the PLC rack when the rack is powered up.
- It must only be installed in ventilated PLC racks.

Self-Tests

- Each time the module is powered up, it runs a series of self-tests of its internal logic. These self-tests include a test of the entire network as seen by the module.
- Any signs of incorrect operation are displayed on the front panel of the module by a set of LED indicators and 7-segment displays. Any faults detected are also sent to the PLC.

Watchdog

- Each TSX ETH 200 module has a built-in watchdog. If the module fails, its exchanges with the network are disabled in order to protect the network.

1.2-3 Communication Profiles

The TSX ETH 200 module has two communication profiles which can be accessed simultaneously at a single connection point : OSI/MMS and X-WAY/UNI-TE.

OSI Model		OSI/MMS	X-WAY
7	Application	MMS + under ACSE layer	UNI-TE COM
8	Presentation	ASN1 presentation	
5	Session	BCS session	
4	Transport	Class 4 transport	
3	Network	ES/IS Internet	@ X-WAY
2	Datalink	8802-2 link	
1	Physical	CSMA-CD	
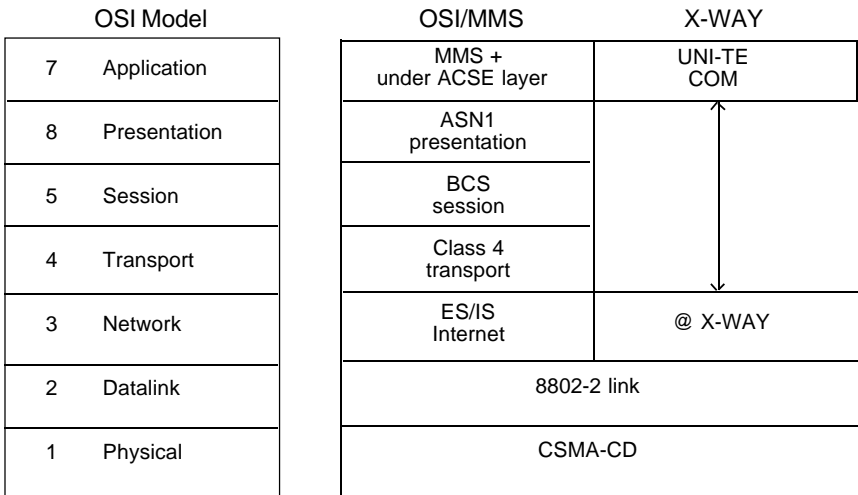
The OSI profile and its MMS message handling system are used for communication with all standard equipment (access to variables, program management, etc).

The X-WAY profile and its UNI-TE message handling system enable real-time communication with various Telemecanique components. Most notably they provide on-line access to all the X-TEL Software Workshop services (programming, debugging, adjustment, etc) on the network.

Summary of the ISO model :

Physical Layer

This handles the transparent transmission of data signals between two systems by means of a communication medium.

It complies with standard ISO 8802.3 10 base 5.

Datalink Layer

This handles data transfers between two adjacent systems and incorporates error detection and correction.

It complies with standard ISO 802.3 for the MAC sub-layer and with standard IEEE 802.2 Type 1 for the LLC sub-layer.

Network Layer

This handles data routing and selects a path between two devices located on different networks.

It conforms with protocol ISO 8473 (Internet Protocol) for transmitting frames over the network and with protocol ISO 9542 for exchanges between terminal nodes and intermediate nodes (ES/IS protocol : End System to Intermediate System).

Transport Layer

This handles data transfers between two systems, reliably and transparently.

It complies with standard ISO Class 4 Transport (ISO 8602, ISO 8072 and ISO 8073).

Session Layer

This layer organizes and synchronizes dialogue between two application processes, and is responsible for organizing their data.

It complies with standard ISO BCS Session (ISO 8326, ISO 8327 DAD 1 and DAD 2).

Presentation Layer

This layer negotiates and supports the presentation context with abstract syntax.

It complies with standard ISO ASN 1 Presentation (Abstract Syntax Notation 1), ISO 8822, 8823, 8824 and ISO 8825.

Application Layer

This layer provides a window between application processes so that significant data can be exchanged. In order that it can be adapted to a wide variety of applications and be capable of handling them, it comprises several types of protocol :

- protocols ISO 8649/2 and ISO 8650/2, for creating and controlling associations between applications (ACSE, Association Control Service Element),

- protocol ISO 9506, Manufacturing Message Service (MMS), for use of the industrial message handling system between control system devices.

1.3 Hardware Presentation

1.3-1 TSX ETH 200 Module

The TSX ETH 200 module is a single height module that can be installed in any slot of the basic PLC rack in a PLC configuration.

The module comprises :

① A metal case which protects the electronics of the module and shields it from external interference.

② A green "RUN" LED which lights when the module is powered up and operating normally.

③ A red "DEF" (fault) LED which lights when a module fault is detected :
   - steady light : module fault,
   - blinking : the OSI/MMS program is not functioning in the module memory.

④ Two yellow LEDs which indicate the status of the module with respect to the network :
   • RX : receiving data,
   • TX : transmitting data.

⑤ Two 7-segment LED displays with decimal point, for displaying module operating data

⑥ An 11-pin female SUB-D connector for the TSX ETH ACC1 terminal block.

⑦ Two mounting screws that retain the module in the rack.

⑧ A 15-pin female SUB-D connector for the network connection via the AUI interface. This connector has a sliding lock to retain the drop cable and its connector in place.
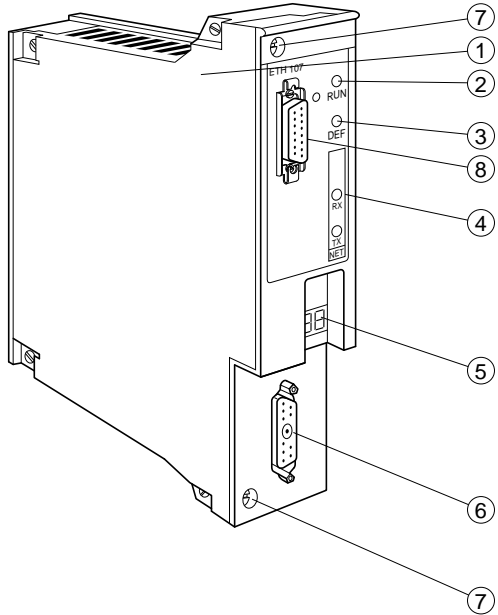
The rear panel of the module is equipped with factory-coded locating devices which prevent any risk of error when modules are installed.

Locking the connector ⑧

The drop cable connector is locked in place by sliding the connector lock downwards, as shown in the illustration opposite.
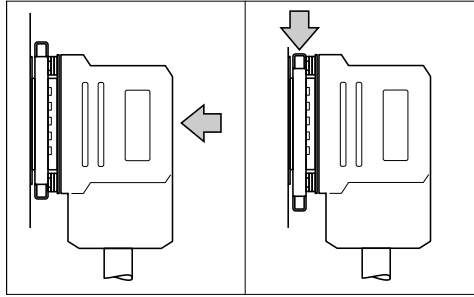
1.3-2 TSX ETH ACC1 Terminal Block

The terminal block is used to code the module address (station and network numbers) in hexadecimal notation on four thumbwheels.
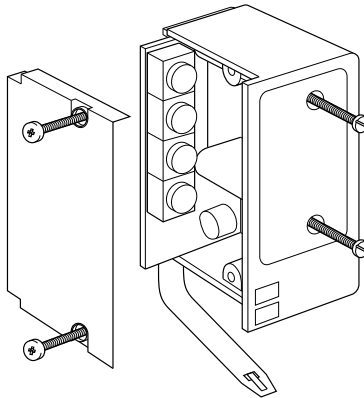
The terminal block is fitted with a plastic tab which attaches the terminal block to the PLC rack at the location of the TSX ETH 200 module. Attaching the terminal block makes it possible to replace a module without disconnecting the terminal block from the network cabling ensuring that it will not be incorrectly reconnected.
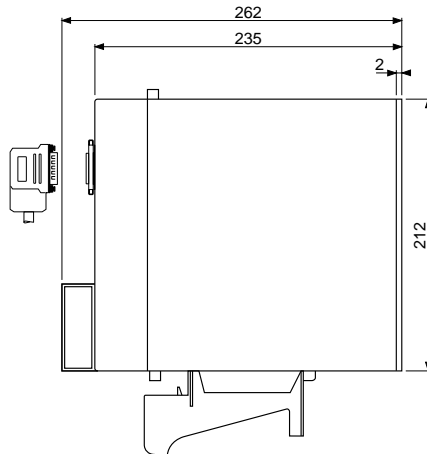
1.4   Hardware Installation

1.4-1   Installing the Module in the Rack

Model 40 PLCs (version V4 or V5) :

TSX/PMX 47	Slots 0 to 7	1 module max.
TSX/PMX 67	Slots 0 to 7	2 modules max.
TSX/PMX 87	Slots 0 to 7	4 modules max.
TSX/PMX 107	Slots 0 to 7	4 modules max.

Note : Regardless of the type of PLC used, TSX ETH 200 modules can only be installed in the main configuration rack.
The processor racks must be ventilated.

Hardware and software codes

Hardware code A three-digit decimal code which is set on the three female locating devices on the rear of the module.	714
Software code Code entered from the programming terminal during I/O configuration.	14

Network line installation

Precautions with regard to line installation are specified in the ISO 8802-3 standard, and are described in the ETHWAY reference manual for wiring an 802.3 network.

1.4-2   Coding the Address in the Terminal Block

The thumbwheel switches are accessed by removing the side cover of the terminal block. Once this is done, it is possible to remove the circuit board that supports the four thumbwheels.

Each station in a network architecture is assigned a identification number :

- STAT : The station number on the network. It can take a value from 0 to 3F (for a total of 64 stations),
- NET : The network number. It can take a value from 0 to 7F.

These addresses are coded in Hexadecimal using the four thumbwheels in the terminal block, as shown in the example below.
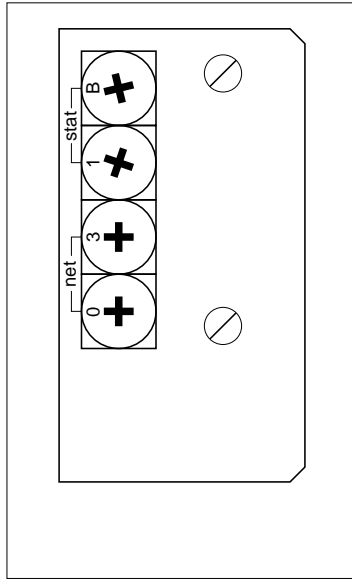
Example

The coding shown on the thumbwheels illustrated above corresponds to the address of station 27 (H'1B') on network 3 (H'03').

Reminder :   Network number 0 is reserved for single network architectures. In multinetwork architectures, network numbers 1 to H'7F' should be used.

Addressing principle

A device is identified by a unique address at datalink level (MAC address)
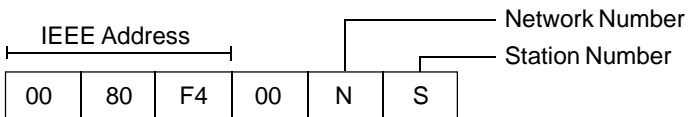
On Telemecanique devices, the Station and Network numbers are coded in the TSX ETH ACC1 terminal block.

An address resolution mechanism called ANR7 (see section 5.1) included in the TSX ETH 200 module will determine the equivalence between the MAC address of a non-Telemecanique device and Station and Network addresses of Telemecanique devices for communication on the UNI-TE profile.

1.4-3 Connection to the Network

Once the module is installed in the PLC rack, the drop cable connected, the station and network addresses coded in the terminal block and the terminal block plugged into the module, then the module is connected to the network.

When the PLC is powered up, all of the LEDs on the module light momentarily and the self-tests start. On the first power-up the 7-segment displays are frozen for thirty seconds, while the FLASH memory is initialized. The "RUN" LED remains lit once the self-tests are completed correctly. This LED shows that the module is operating correctly.

The "RUN" LED is extinguished if the module watchdog is triggered and the module becomes idle.

The "RX" and "TX" LEDs show that the TSX ETH 200 module has detected data reception (RX) or transmission (TX) activity on the network.

The 7-segment LED displays are used to display different types of information. While the module is operating normally, they display two types of information at two second intervals :

• The network number with a decimal point at the lower right of the display (eg : network 02).
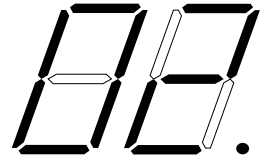
• The station number without a decimal point, (eg : station 1A).
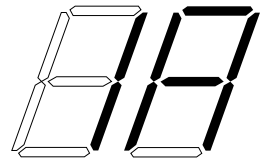
If a fault occurs during the self-test phase or during normal operation, the displays will show an error code. See section 3, Maintenance, for further information.

1.4-4   Description of the AUI Interface

The AUI (Attachment Unit Interface) enables connection of a station to the network via drop cables. The cable, connections and electrical signals are described in the 802.3 standard.
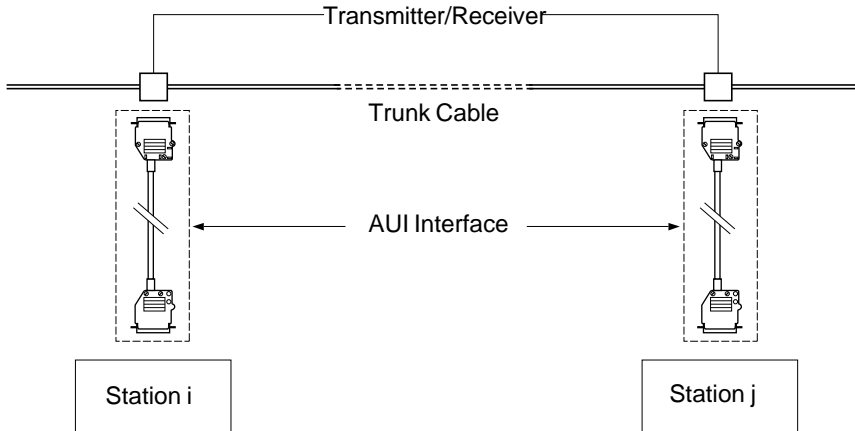
15-pin SUB-D connector pin arrangement (Station side)

The pin arrangement of the 15-pin female SUB-D connector located on the front panel of the TSX ETH 200 module corresponds to the OSI 802.3 standard definition for an AUI interface connector.

Pin Nbr.	802.3 Standard Identification		Function
1	CI-S	(Control In Shield)	GND
2	CI-A	(Control In A)	COLL+
3	DO-A	(Data Out A)	TX+
4	DI-S	(Data In Shield)	GND
5	DI-A	(Data In A)	RX+
6	Vc	(Voltage Common)	GND
7	Option not used		
8	Option not used		GND
9	CI-B	(Control In B)	COLL-
10	DO-B	(Data Out B)	TX-
11	DO-S	(Data Out Shield)	GND
12	DI-B	(Data In B)	RX-
13	VP	Voltage Plus	12 V
14	VS	Voltage Shield	GND
15	Option not used		
SUB-D Body	PG	Protective Ground	GROUND

2.1 General

2.1-1 Functions

The TSX ETH 200 module supports the functions defined for the MAP/802.3 network and the OSI/MMS industrial message handling system on a seven-layer communication profile. These functions include :

• Carrying the MMS message handling system from the PLC processor to the network and vice versa.

• Carrying UNI-TE messages from the PLC processor to the network and vice versa. This message system supports access to variables (all PL7 objects) for reading and writing, program transfer and PLC operating mode control.

• Application program to application program communication in point-to-point mode from any station in the network architecture to any other station, or broadcast messages on the local network.

• Cyclic broadcasting of the distributed COM word database between PLCs on the same network.

• Overall network management, especially message routing between networks.

In both transmission and reception modes, the TSX ETH 200 module can process two messages during each PLC cycle, in normal operation, and up to four messages per cycle at peak load.

The TSX ETH 200 module can handle approx. 200 messages per second. A message is defined as :

• An MMS message,

• A COM zone sent or received,

• A UNI-TE type OFB (or a TXT or SYS text block sent or received),

• Terminal messages.

OSI/MMS functions

MMS is an application-level, transaction-oriented service, based on the Client and Server model. The device designated the MMS Client transmits remote requests for service, while the device designated the MMS Server receives the requests and is responsible for performing the services correctly and sending the response to the MMS Client.

2.1-2   Installing the OSI/MMS software

ETH 200 modules are not supplied with the OSI/MMS profile. When first used, the software therefore has to be remotely loaded to the EPROM flash module memories.

It should be installed with the OSI-LOADER tool included in the PL7-OSI software package, and takes about thirty minutes to load. For further details about this tool, consult the PL7-OSI program manual.

The EPROM flash memories are erased prior to programming. During this erase cycle (about 30 seconds), the display units do not blink.

The software is saved on the card even after an interruption to the power supply.

When the OSI/MMS program and the OSI configuration have been loaded correctly, the DEF (fault) lamp changes from blinking to off (see PL7-OSI program manual).

2.1-3   Module Configuration

The TSX ETH 200 module is automatically configured on power-up. The Network number (H'00' to H'7F') and the Station number (H'00' to H'3F') assigned, are those set in the TSX ETH ACC1 terminal block.

The PLC will only recognize the TSX ETH 200 module if it has been declared in the I/O configuration (see section 1.4-1). If the module is not declared, it can still send messages to the PLC system, eg : for program downloading.

Configuring PLCs for Multinetwork Operation

When PLCs comprising more than one TSX ETH 200 module need to be configured (ie for multinetwork operation), PL7-NET software is required. PL7-NET runs in the X-TEL Software Workshop environment.

The functions supported by PL7-NET include :
• Selection of stations forming the network and assignment of station addresses,
• Assignment for each network bridge, of the modules connected to the various networks.

Remark

The MAP/802.3 network must be declared as an 802.3 network in PL7-NET.

For more information on how to use this program, refer to the PL7-NET program manual.

2.2 MMS Service

2.2-1 General

The MMS service operates as a question / answer dialog (transaction).

Reminder :

• MMS Client

This is the device which takes the initiative for the transaction.

A PLC equipped with a TSX ETH 200 module is an MMS Client vis-à-vis any Server device on the network architecture which supports the ISO/MMS standard.

The MMS Client services are triggered by the execution of the MMS OFB optional function blocks present in the PL7-3 application program. Requests for service are transmitted to the TSX ETH 200 module which sends service requests (in MMS format) to the MAP 802.3 network.

The response (in MMS format) is processed in network reception mode by the TSX ETH 200 module which places the expected response in the MMS OFB for the PL7-3 program to use.

• MMS Server

This is the device which performs the service requested by the Client and sends it a response (confirm) after execution.

A PLC equipped with a TSX ETH 200 module is an MMS Server vis-à-vis any Client device on the network architecture which supports the ISO/MMS standard.

The OSI/MMS program, installed remotely in the module, automatically translates MMS service requests into UNI-TE requests addressed to the PLC system gateway. This executes the requested service and sends the UNI-TE response to the OSI/MMS program in the module, which translates this response into MMS format for the MMS Client device requesting the transaction.

With some MMS requests for service no exchange with the PLC is necessary, and the OSI/MMS module program performs the service.

Whatever the case, there is no need for specific PL7-3 programming.

The OSI/MMS functions are described in detail in the OSI/MMS section of the PL7-OSI program manual.

2.2-2   MMS Client Services Supported

TSX ETH 200 modules support the principal MMS services defined in the MAP standard, version 3.0 (ISO DIS 9506-1 and 9506-2) and MAP 3.0 1991 version (ISO IS 9506-1 and 9506-2).

Environment and general management services

• Initiate

• Conclude

• Abort

• Reject

VMD support services (Virtual Manufacturing Device, eg : PLCs)

• Status

• Unsolicited Status

Access to variables

• Read

• Write

• Information Report

2.2-3 MMS Server Services Supported

TSX ETH 200 modules support the principal MMS services defined in the MAP standard, version 3.0 (ISO DIS 9506-1 and 9506-2) and MAP 3.0 1991 version (ISO IS 9506-1 and 9506-2). They support up to 32 simultaneous MMS associations.

Environment and general management services
- Initiate
- Conclude
- Abort
- Reject

Domain management services
- Initiate Download Sequence
- Download Segment
- Terminate Download Sequence
- Initiate Upload Sequence
- Upload Segment
- Terminate Upload Sequence
- Delete Domain
- Get Domain Attributes

VMD support services (Virtual Manufacturing Device, eg : PLCs)
- Status/Unsolicited Status
- Get Name List
- Identify

Program invocation management services
- Create Program Invocation
- Delete Program Invocation
- Start - Stop - Resume -Reset
- Get Program Invocation Attributes

Access to variables
- Read
- Write
- Get Variable Access Attributes
- Information Report

TSX ETH 200 modules can support five simultaneous MMS associations and correspond to the following conformity parameters (CBB) :

- STR1   Yes
- VNAM   Yes   (Variable accessed via its name)
- VSCA   No
- STR2   Yes
- VADR   Yes   (Variable accessed via its address)
- TPY   No
- NEST   = 2
- VALT   Yes

2.3 COM Service

2.3-1 General

The complete set of COM words form a database which is distributed among the various stations on the same network.

Depending on their configuration, the stations can access a common memory zone of 256 words of 16 bits which is reserved for exchanges between PLCs.

Depending on its configuration, each station that supports this service is assigned from 4 to 64 common words that can be written. The other words assigned to other stations can only be read.

The COM words are updated automatically as they change, without requiring any intervention from the application program, at the same rate as the normal sequential (Master task) activity.

At the start of each Master task cycle, when the station inputs are acquired, the PLC processor reads all of the COM words that have changed in other network stations, from the network interface in the module.

Specific system bits and words monitor the correct operation of the COM word update mechanism.

The user program simply uses PL7-3 bit or word instructions to read or write the COM words.

Master task sequence at station "n"

Read the COM words from the interface.

Sequential processing

Write the COM words assigned to station "n", to the interface.

At the end of the Master task cycle, when the outputs are updated, the PLC processor writes any COM words assigned to it which have changed to the network interface in the module. The newly updated COM words are then sent on the network.

Every 10 cycles, all of the COM words assigned to a station are sent on the network.
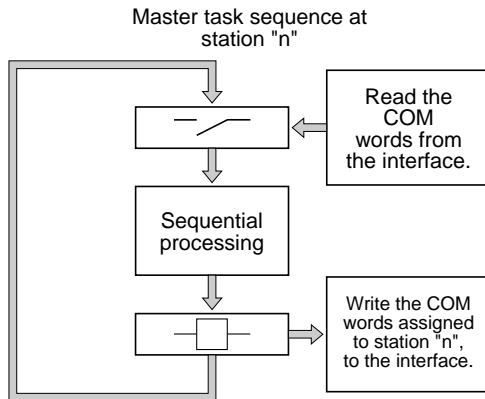
2.3-2 Common Memory Organization

Each TSX ETH 200 module has a memory zone of 256 words of 16 bits reserved for communication between PLCs. This memory zone is split into sub-blocks of words. The number of stations sending COM words on the network, the number of common words per station and the addresses of the stations are shown in the table below :

Number of Stations	Number of COM words	Station Addresses
2 to 4	64 max.	0 to 3
5 to 8	32 max.	0 to 7
9 to 16	16 max.	0 to 15
17 to 32	8 max.	0 to 31
33 to 64	4	0 to 63

Example with 64 stations :

	F	0	
			COM 0,0
Station 0			COM 0,1
			COM 0,2
			COM 0,3
			COM 1,0
Station 1			COM 1,1
			COM 1,2
			COM 1,3
			COM 63,0
Station 63			COM 63,1
			COM 63,2
			COM 63,3
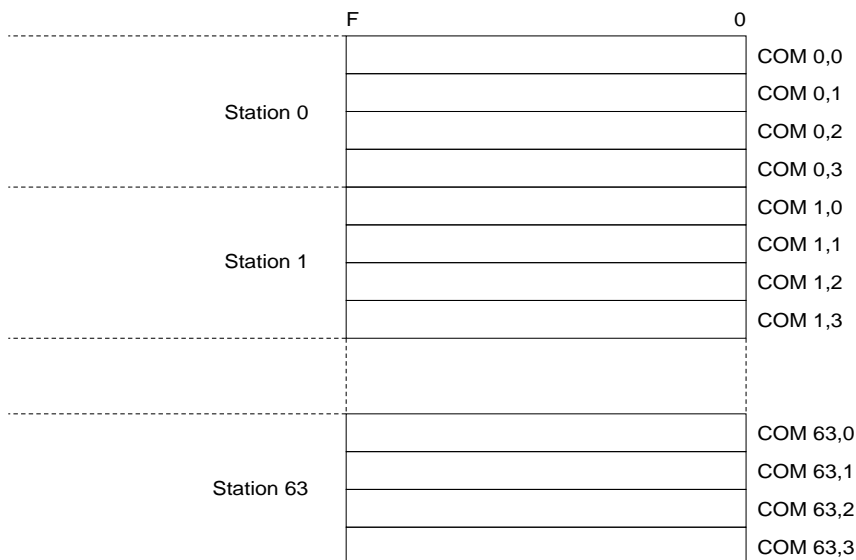
Each word in the memory can be accessed by the syntax COMi,j :

where i = station number (0 to 63),
       j = word position (0 to 63).

The internal program of TSX Series 7 PLCs enables access to the individual bits of COM words. In this case the syntax is COMi,j,k :

where i = station number (0 to 63),
       j = word position (0 to 63),
       k = bit position (0 to 15).

The PLC user program :

- Writes data to be sent on the network to its own COMi,j zone,
- Reads the data from a network station by reading from the COMi,j zone assigned to each station.

2.3-3   Common Words in Multinetwork Architectures

In a multinetwork architecture, some PLCs are connected to two or more networks (or segments) in the architecture.

The common memory zone can therefore only be accessed by PLCs connected on the same network segment. These PLCs therefore have access to two or more memory zones.

To distinguish between common words from different networks the following COMxi,j syntax is used :

where x = network logical identifier,
       i = station number,
       j = word position.

The network logical identifier takes the value B, C or D depending on the number of interface modules in the Bridge station. The identifier letter is dynamically assigned by the PLC processor, depending on the geographical location of the interface module. Each identifier letter corresponds to a specific memory zone which is assigned to the designated network.

The syntax used for the module located closest to the PLC processor in the rack, is the same as that used in single network applications.

Example

Network connected to the module in slot 1 : no identifier,

Network connected to the module in slot 4 : identifier B,

Network connected to the module in slot 5 : identifier C.

Memory zone common to the three networks connected to the PLC.

Network 1	Network 2	Network 3
COM0,0	COMB0,0	COMC0,0
COM0,1	COMB0,1	COMC0,1
. . . . .	. . . . .	. . . . .
COM1,0	COMB1,0	COMC1,0
. . . . .	. . . . .	. . . . .
COM8,0	COMB8,0	COMC8,0
. . . . .	. . . . .	. . . . .
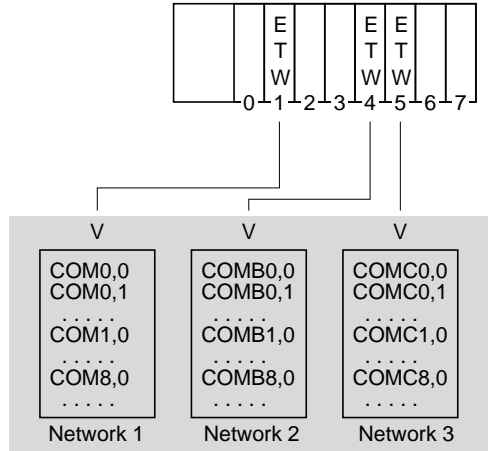
The network logical identifier does not correspond to a network number but to a geographical location. The PLC application program is independent of the network number. The user must ensure that in the application program, the logical identifier assigned by the PLC corresponds to the network that is actually connected to the module.

2.3-4   Common Word Configuration

When a TSX ETH 200 module is configured, it is possible to :

- Inhibit it from accessing common words,
- Validate common word read-only access,
- Validate common word read and write access,
- Declare the number of common words (from 4 to 64) controlled by the station.

> The number of common words declared must be identical for all stations on the same network. If the value configured for a station is incorrect, it will be ignored by the others.

A station which is active in read and write modes sends its common words on the network and receives the common words sent by other network stations.

An inactive station neither sends nor receives common words. This function reduces network traffic and the workload of each station.

A station that is active in read-only mode cannot send common words on the network but can read those sent by other stations.

It is possible to configure a number of common words that is less than the maximum allowed for each station. This feature must always be used when only limited amounts of information need to be sent on the network. This considerably improves common word processing time by the PLC.

Configuration procedure

The selection is made when the application is configured by an FTX 507 workstation (with PL7-3 language in CONFIGURATION mode).

After selecting the NETWORK SERVICES CONFIGURATION, a screen is displayed which shows the following information for each module :

- Its type,
- Its location in the PLC,

Allowing the user to change :

- The number of common words assigned by the module (0 by default),
- Whether or not common words are active (inactive by default).

```
┌──────────────────────────────────────────────────────────────────┐
│ ─          XTEL: Function -pl7_3- oven_2 factory6 D:\xproprj    ▼ ↕│
│MNEM          CONF              TERM          TELEMECANIQUE   V4.5  │
│                   NETWORK SERVICES CONFIGURATION      PMX 107/430  │
│                                                                    │
│                        COMMON WORDS SERVICE                        │
│           ┌─────────┬──────────┬──────────┬───────────┬──────────┐│
│           │ COUPLER │ NET TYPE │ RACK MOD │ COM WORDS │ ACTIVITY ││
│           ├─────────┼──────────┼──────────┼───────────┼──────────┤│
│           │    A    │ ETHERNET │  0    0  │    64     │READ AND WRITE│
│           │    B    │ ETHERNET │  0    1  │    64     │READ AND WRITE│
│           │    C    │ ETHERNET │  0    3  │    64     │READ ONLY ││
│           │    D    │ ETHERNET │  0    6  │    64     │ INACTIVE ││
│           └─────────┴──────────┴──────────┴───────────┴──────────┘│
│                                                                    │
│                      MODIFY                                        │
│ WORDS   ACTIVITY                                                   │
└──────────────────────────────────────────────────────────────────┘
```

Note : When the TSX ETH 200 module is not declared in the I/O configuration of the PLC, common word exchange is not supported.

For more information on entering and configuring common words using the programming terminals, refer to the PL7-3 Operating Modes manual.

2.3-5 System Bits and Words

Some system bits and words can be used by the user program for testing the correct operation of the network and application coherence, with the PLC running and the module operating. The following bits and words are used by the test :

System Bit	Description	Function
SY11	COM word refresh	Normally at 0, this bit is set to 1 when a local station has received COM words from at least one remote station. It is reset to 0 by program or by the terminal, so that it can check other transmissions of COM words.
SY12	Network A	This bit is set to 1 once the local station has exchanged COM words with at least one other station on the network. It is reset to 0 by program or by the terminal, so that it can check other transmissions of COM words.
SY13	Network B operating	Same as SY12
SY14	Network C operating	Same as SY12
SY15	Network D operating	Same as SY12

System Words					
Module	Module	Module	Module		
A	B	C	D		
SW64	SW73	SW82	SW91	◄───	Stations 0 to 15,
SW65	SW74	SW83	SW92	◄───	Stations 16 to 31,
SW66	SW75	SW84	SW93	◄───	Stations 32 to 47,
SW67	SW76	SW85	SW94	◄───	Stations 48 to 63.
SW68	SW77	SW86	SW95	◄───	Reserved words,
SW69	SW78	SW87	SW96	◄───	Reserved words,
SW70	SW79	SW88	SW97	◄───	Reserved words,
SW71	SW80	SW89	SW98	◄───	Reserved words.
SW72	SW81	SW90	SW99	◄───	**Module network address**

Refresh Indicators (1 bit per station) correspond to the top four rows.

Update indicators

The 16 bits of each word represent the 16 network stations. A bit at 1 indicates that the corresponding station has sent its common words.

It is reset to 0 by program only, so that it can check other transmissions of common words.

Module network address

This word indicates the network number (0 to 127) and the station number (0 to 63) corresponding to each module, in the form of :

F							8	7							0

Network Nbr.   Station Nbr.
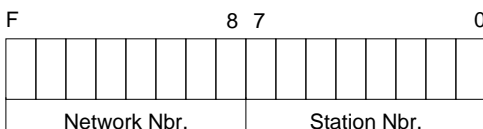
2.3-6 Application Examples

Transmission and reception of COM words

Station 0 sends status information from a door position contact
(door open : B0 = 1, door closed : B0 = 0).

On receiving this information, station 1 controls a materials handling unit by
activating or deactivating its output O1,0 :

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

Station 0 program
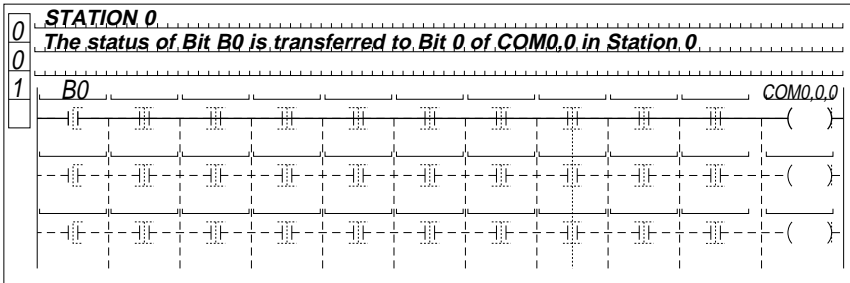
Station 1 program
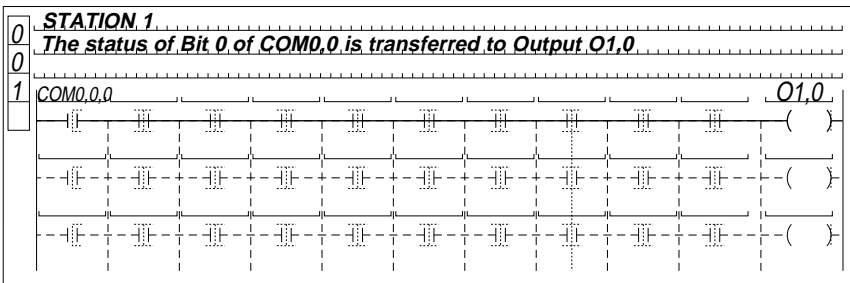
Using system bits and words

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 tests can be performed :

SY12 : Performs an overall check that the network is operating :

```
0
0
1    Control "Network Failure" indicator
     SY12                                                          O0,0
      ┤├    ┤├    ┤├    ┤├    ┤├    ┤├    ┤├    ┤├    ┤├    ( )

     ─┤├──┤├──┤├──┤├──┤├──┤├──┤├──┤├──┤├──( )─
```
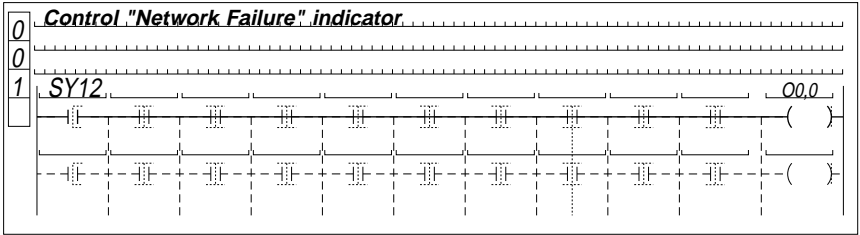
SW64 : The user can check that within a set period of time corresponding to the
to maximum time-out required for transferring all COM words, the bits of all
SW99 the connected stations using the COM word service have changed from 0
to 1. A diversion to a network fault handling program can be used when one
or more of these bits remains at 0.

The use of these system bits means that the state of COM words can be processed
only after a network update. The user sets all remote station bits to 0 and monitors
their change to 1.

Example

Stations 0, 1 and 2 are connected to the same network. Correct operation of stations
1 and 2 can be performed from station 0 as shown below :

```
0
1
1    STATION 0
     500 ms time-out (exceeds max. transfer time)
     B0    B2
      │┤├   │┤├   ┤├   ┤├   ┤├   ┤├   ┤├   ┤├   ┤├    ┤0 → SW64├
                    ┌─── T0 ───┐                              B0
     ─┤├──┤├─  E │┤├      ┤├│ D ──┤├──┤├──┤├──┤├──┤├── ( )
                    TB : 10ms                              B2
     ─┤├──┤├─  C │T,P : 50│ R ──┤├──┤├──┤├──┤├──┤├── ( )

                    MODIFY
     ─┤├──┤├──┤├──┤├──┤├──┤├──┤├──┤├──( )─
```

```
0
1
2    B1 = 1 if either Station 1 or 2 has failed
     (6 = binary elements 2 and 4 at 1)
     B0                                                          B1
      ┤├   ┤SW64<>6├   ┤├   ┤├   ┤├   ┤├   ┤├   ┤├   ┤├    ( S )

     ─┤├──┤├──┤├──┤├──┤├──┤├──┤├──┤├──┤├──( )─

     ─┤├──┤├──┤├──┤├──┤├──┤├──┤├──┤├──┤├──( )─
```
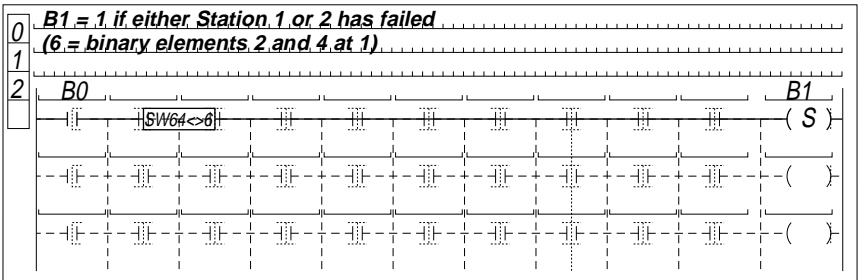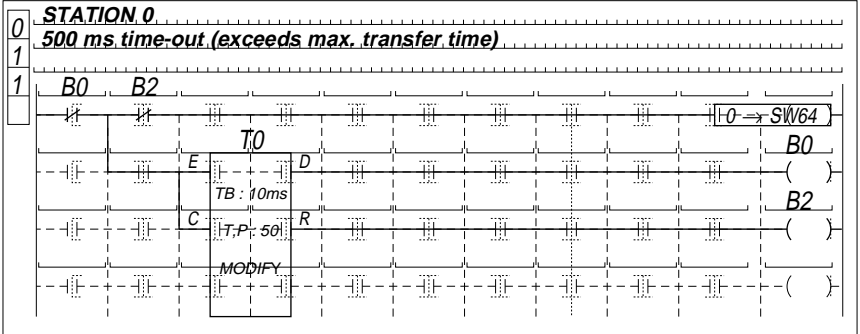
2.4 UNITE OFB Reminders

2.4-1 Description

PL7-COM software is designed to assist with the programming and implementation of communications applications. It contains the UNITE and other OFBs.

The UNITE OFB is used in programs which are designed to communicate and exchange data with a remote station, using the UNI-TELWAY protocol, in a single or multinetwork architecture.

This section provides a brief reminder of how this OFB works.

For more information on the installation procedure, operation and functions provided by this program, refer to the PL7-COM program manual.

2.4-2 UNITE OFB Presentation

The UNITE OFB has 18 input parameters and 13 internal data objects which must be defined during the programming phase. It does not have any internal constants or output parameters.

```
                          ┌──────────  UNITE  ──────────┐
                          │                             │
                          │    RESET     :    bit       │
        Inputs        ────│    FORMAT    :    ptr_w      │
                      ────│    P0        :    ptr_w      │
                      ────│    ...       :    ptr_w      │
                      ────│    P15       :    ptr_w      │
                          │                             │
                      ────│    READY     :    bit       │
        Internal      ────│    ERROR     :    bit       │
        Data              │    STATUS0   :    word      │
                      ────│    STATUS1   :    word      │
                      ────│    NET       :    word      │
                      ────│    STATION   :    word      │
                      ────│    GATE      :    word      │
                      ────│    MODULE    :    word      │
                      ────│    CHANNEL   :    word      │
                      ────│    LOCERR    :    word      │
                      ────│    TXTERR    :    dword      │
                      ────│    LENGTH    :    word      │
                      ────│    TIMEOUT   :    word      │
                          │                             │
                          └─────────────────────────────┘
```
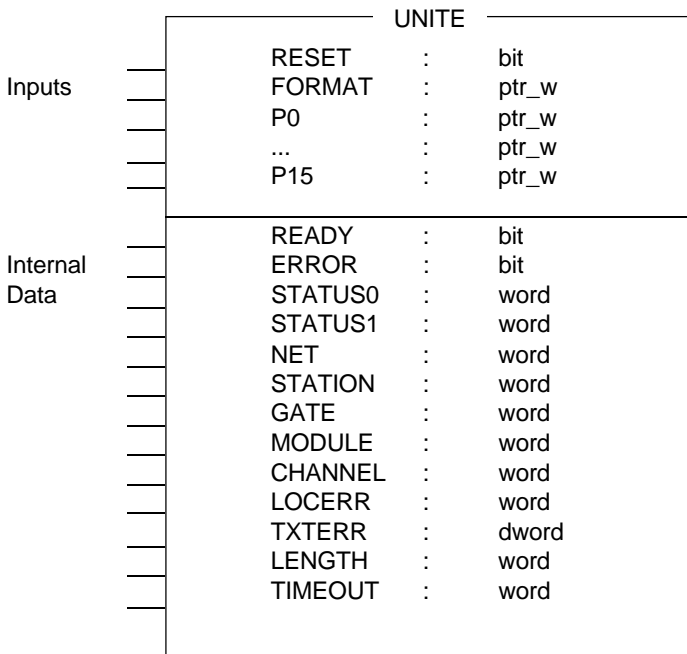
2.4-3   Input Parameters

Parameter	Type	Access	Description
RESET	Bit	(3)	Initializes the OFB and cancels the exchange in progress. Internal data ERROR, STATUS0 and STATUS1 are reset to 0.
FORMAT	Word	(1)	Edit format for performing conversions in the transmission buffer. Some conversion codes do not require an input parameter Pi.
P0...P15	Word	(1)	Input parameters assigned to the edit format. Parameter P0 is assigned to the first conversion code which requires a Pi parameter. P1 is assigned to the second conversion code which requires a Pi parameter, and so on.

(1)   Read in Adjust mode (data mode, etc),

(2)   Read in Program and Adjust modes (data mode, etc),

(3)   Read in Program and Adjust modes (data mode, etc),
        Write in Adjust mode (data mode, etc.),

(4)   Read in Program and Adjust modes (data mode, etc),
        Write in Program and Adjust modes (data mode, etc),

Access in write in Program mode is obtained with the [PARAM] key.

2.4-4 Internal Data

Parameter	Type	Access	Description
READY	Bit	(2)	Indicates that the OFB is being executed or not. It is set to 0 during OFB execution and reset to 1 once execution is complete. This bit can be accessed directly via UNITEi,READY.
ERROR	Bit	(2)	Error bit that is set to 1 when an error occurs during generation or transfer of the transmission buffer. It is reset to 0 after RESET.
STATUS0	Word	(2)	Identifies the cause of an error by setting the corresponding error bit to 1 (see section 2.4-5).
STATUS1	Word	(2)	Identifies the cause of a message refusal by setting the corresponding error bit to 1 (see section 2.4-5).
NET	Word	(4)	Network number of the destination application entity. Its default value is 0.
STATION	Word	(4)	Station number of the destination application entity. Its default value is 254.
GATE	Word	(4	Gate number of the destination application entity. Its default value is 0.
MODULE	Word	(4)	Module number of the destination application entity. Its default value is 0.
CHANNEL	Word	(4)	Channel number of the destination application entity. Its default value is 1.
LOCERR	Word	(2)	Location of the first error encountered when analyzing the edit FORMAT. This word is useful when debugging the application.
TXTERR	Double Word	(2)	Value of the code that caused the first FORMAT definition error.
LENGTH	Word	(2)	Number of characters received during a character reception phase.
TIMEOUT	Word	(4)	Maximum time allowed for executing the OFB, i.e. to analyze the command and send the data to the module. It is expressed as a multiple of 100 ms. Its default value is 0, corresponding to an indefinite time-out for transmission and reception.

(1), (2), (3) and (4) : See section 2.4-3.

2.4-5   Error List

OFB status depending on the state of ERROR and READY bits.

ERROR	READY	OFB Status
0	0	Transmission or reception in progress.
0	1	Transmission or reception completed correctly.
1	0	Cannot normally exist.
1	1	Transmission or reception ended on error. The cause of the error will be found in words STATUS0 and STATUS1.

Internal data word STATUS0

```
Bit0          : Not used.
Bit1          : Not used.
Bit2   = 1  : Syntax error.
Bit3   = 1  : More than 128 characters generated.
Bit4   = 1  : Characters received not used by FORMAT.
Bit5   = 1  : An odd or null number of hexadecimal characters.
Bit6   = 1  : No end of format character (e).
Bit7   = 1  : Error accessing PL7 objects : Overflow, write not allowed.
Bit8          : Not used.
Bit9          : Not used.
Bit10  = 1  : Negative confirm.
Bit11  = 1  : Message refused; refer to STATUS1.
Bit12  = 1  : Exchange cancelled by power break, a RESET command
                   or a software error.
Bit13         : Not used.
Bit14  = 1  : Communication error.
Bit15  = 1  : System Error : Inadequate resources.
```

Internal data word STATUS1

Bit0 = 1	: Inadequate Bus resources.
Bit1 = 1	: Inadequate Line resources.
Bit2 = 1	: Cannot access destination.
Bit3 = 1	: Line error.
Bit4 = 1	: Length error.
Bit5 = 1	: Network failure.
Bit6 = 1	: Address error.
Bit7 = 1	: Unknown request code.
Bit8 = 1	: Inadequate PLC resources.
Bit9 = 1	: Time-out exceeded.
Bit10	: Not used.
Bit11	: Not used.
Bit12	: Not used.
Bit13	: Not used.
Bit14	: Not used.
Bit15	: Not used.

2.4.6 Using the UNITE OFB

Reminders on application development using the UNI-TE OFB

The UNITE OFB uses a number of predefined requests (eg : read a word, write a bit, etc). The coding of these predefined requests is included in two files supplied with PL7-COM.
- UTWREQ.SCY is a symbol definition file where each symbol corresponds to a request (eg : Write a word: CW100:Wr_w),
- UTWREQ.CST is an initialization file for the constant words assigned to the symbols (this file actually comprises the detailed coding of the requests).

Reading these two files provides immediate access to the predefined requests. To do so :
- Import the files UTWREQ.SCY and UTWREQ.CST located in the XPROSYS\OFB\COM directory, into the PL7-3\MOD directory,
- Run XTEL-SDBASE to merge the symbols from the UTWREQ.SCY files with those in the symbol database,
- Run PL7-3 to automatically assign XTEL-SDBASE mnemonics to the first 115 constant words (CW0 to CW114),
- In PL7-3 Constants mode, read the UTWREQ.CST file to automatically write the coding of the requests into the constant words previously defined.

The complete list of predefined symbols is provided in the PL7-COM program manual. Other requests may also be added, as required. For more information on this, refer to the same documentation.

Executing the OFB

It is recommended that execution of the EXEC UNITEi instruction be linked to a rising edge condition to avoid continuous transmission.

2.4-7 Example

In the network architecture illustrated below, Station 1 on Network 3 sends a table comprising 50 words (W200 to W249) to Station 5 on Network 6 (after W1000).
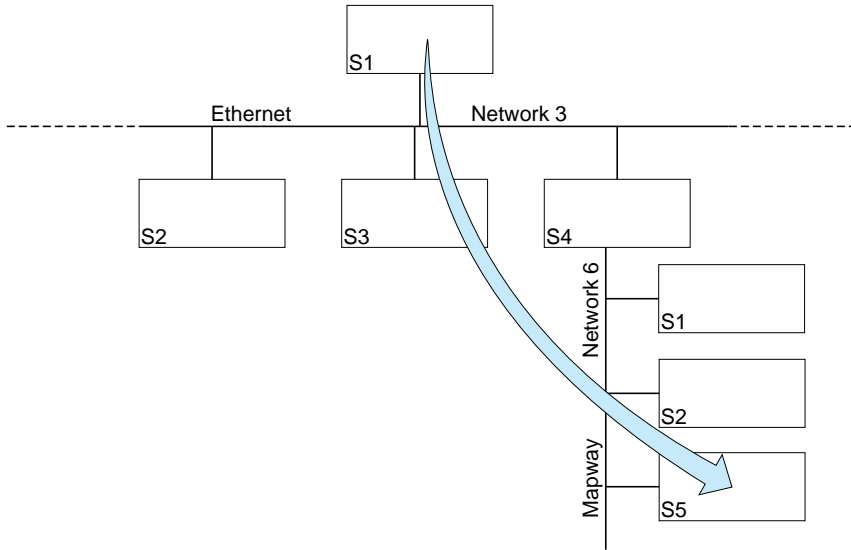
Data
- Write objects request : Wr_obj,
- Number of words to send : 50 (W200 to W249),
- Destination Station 5 on Network 6 (from W1000).

OFB
- Sending the request is performed by OFB UNITE0 in the application program for Station 1, Network 3, on the rising edge of bit B16.

Program
< Destination address coding
! 6 $\rightarrow$ UNITE0,NET; 5 $\rightarrow$ UNITE0,STATION; 0 $\rightarrow$ UNITE0,GATE
< Send W200 to W249 from S1/N3 to W1000 to W1049 in S5/N6
! IF RE(B16)•UNITE0,READY
      THEN EXEC UNITE0(Wr_obj;S_wi;T_wi;W10;W11;W12;W200)
- Wr_obj = Write objects request,
- S_wi = Internal word segment,
- T_wi = 16 bit integer type,
- W10 = Address of the first word to write to destination, W10 = 1000,
- W11 = Number of objects to write, W11 = 50 (50 words),
- W12 = Number of bytes to send, W12 = 100 (50 words = 100 bytes),
- W200 = Start of the word table to send.

Once the request has been sent correctly, the UNITE0,READY bit is reset to 1.

2.5 UNI-TE Service

2.5-1 General

Reminders
This service uses a question and answer dialog called REQUEST/CONFIRM.

A device which supports the UNI-TE protocol can be a :

CLIENT : This device initiates communication. It asks a question (reads), sends an answer (writes) or an order (Run, Stop, etc),

SERVER : This device executes the order sent by the client and sends a confirm after execution.

The services supported depend on the type of device, eg : PLC, numerical controller, programming terminal, supervision system. Depending on its function, each device can be a Client and/or a Server on the MAP/802.3 network. Server functions include supporting Programming, Adjustment and Debug functions while Client functions include the user program sending commands or reading the state of a device.

The rate at which UNI-TE requests can be handled by a PLC depends on the Master task cycle.

Regardless of where in the program a text block is activated, the PLC processor sends the appropriate request at the end of the PLC cycle.

A check is made at the start of each cycle to determine if a confirm was received for the request.

While the Master task is running, the TSX ETH 200 module can send and receive two messages in normal operation and up to four messages in peak periods.

Master task cycle
of station "n"

Read UNI-TE message

Sequential Processing

Write UNI-TE message
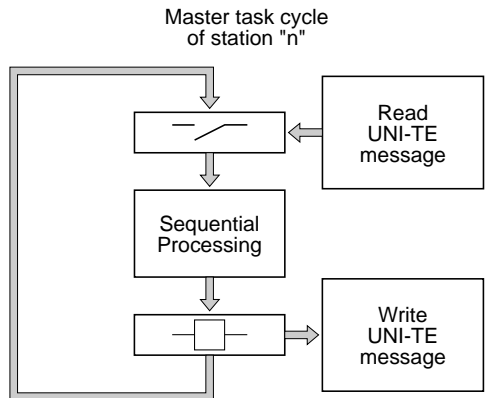
2.5-2   Services Supported by PLCs

Server PLC

A PLC is a server when it responds to requests sent by a client device (eg : another PLC, a Monitor 77 supervisor, an FTX 507 terminal or a computer). The request is generated by the source and sent to the system gate of the destination PLC.

In this case, the exchange can comprise up to 128 characters and is fully transparent to the application program of the server PLC.

Client PLC

A Client PLC sends data, an order or a question using UNI-TE requests.

The request is sent to the destination station by a UNITE OFB (or a SYS Network text block) and has a maximum length of 128 bytes.

The requests that can be sent by the client PLC are :
- The requests described previously (for dialog between PLCs),
- The requests supported by a destination station that is not a PLC, eg : CNC, MicroVAX computer. For further information refer to the documentation for the individual devices giving their coding.

Requests which are supported PLCs are listed in the table below.
The detailed coding of these requests is given in the Appendix.

Family	Service	Request		Confirm		Description
		Hex.	Dec.	Hex.	Dec.	
Data (Read)	Read a Bit	00	00	30	48	Reads a bit (B).
	Read a Word	04	04	34	52	Reads a word (W).
	Read Objects	36	54	66	102	Reads objects (bits, words, word strings, etc).
	Read a System Bit	01	01	31	49	Reads a system bit (SY).
	Read the Memory Image of an I/O Bit	02	02	32	50	Reads the memory image of an I/O bit.
	Read a Constant Word	05	05	35	53	Reads a constant word (CW).
	Read a System Word	06	06	36	54	Reads a system word (SW).
	Read a Common Word	07	07	37	55	Reads a common word (COM).
	Read a Timer	09	09	39	57	Reads the parameters of a timer (T).
	Read a Monostable	0A	10	3A	58	Reads the parameters of a monostable (M).
	Read a Counter	0B	11	3B	59	Reads the parameters of a counter (C).
	Read a Register	0E	14	3E	62	Reads the parameters of a register (R).
	Read a Grafcet Step	2A	42	5A	90	Reads a Grafcet step (Xi).
	Read a Double Word	40	64	70	112	Reads a double word (DW).
	Read a Constant Double Word	41	65	71	113	Reads a constant double word (CDW).
	Read a Grafcet Step	4B	75	7B	123	Reads a Grafcet step.

Family	Service	Request		Confirm		Description
		Hex.	Dec.	Hex.	Dec.	
Data (Write)	Write a Bit	10	16	FE	254	Writes a bit (B).
	Write a Word	14	20	FE	254	Writes a word (W).
	Write Objects	37	55	FE	254	Writes objects (bits, words, bit or word strings, etc).
	Write a System Bit	11	17	FE	254	Writes a system bit (SY).
	Write the Memory Image of an I/O bit	12	18	FE	254	Writes the memory image of an I/O bit.
	Write a System Word	15	21	FE	254	Writes a system word (SW).
	Write a Common Word	16	22	FE	254	Writes a common word (COM).
	Write a Timer Preset	17	23	FE	254	Writes the preset of a timer (T).
	Write a Monostable Preset	18	24	FE	254	Writes the preset of a monostable (M).
	Write a Counter Preset	19	25	FE	254	Writes the preset of a counter (C).
	Write a Register Input	1A	26	FE	254	Writes the input of a register (R).
	Write a Double Word	46	70	FE	254	Writes a double word (DW).
Operating Modes	Run	24	36	FE	254	Sets a device to Run.
	Stop	25	37	FE	254	Sets a device to Stop.

Note : Other requests are supported by PLCs. These requests are used for specific applications and are not covered in this manual.

2.6 Application-to-Application Communication

2.6-1 Point-to-Point Messages

The TSX ETH 200 module supports point-to-point message exchanges. A PLC connected to a MAP/802.3 network can :

• Send a message to another PLC in the network architecture, when requested to do so by its application program,
• Receive a message from another PLC.

These messages are sent to their destination by a TXT type Network text block with a maximum size of 256 bytes. They are received by the destination PLC using a TXT type Network text function block (a review of how to use the text function block can be found as an appendix to this document.

The messages are contained in the transmission and reception tables of the text blocks.

Logical connection between the two stations requires simultaneous :

• **Transmission activation** (OUTPUT TXTi) of a text block by the application program of the source station, and
• **Reception activation** (INPUT TXTi) of a TXT type Network text block by the application program of the destination station.

The text block parameters are :

TXTi,A : TXTi,A of the source station text block comprises the network and station numbers of the destination station.

TXTi,A of the destination station text block comprises the network and station numbers of the source station.

TXTi,T : TXTi,T of the source station text block comprises the number of the destination station text block.

TXTi,T of the destination station text block comprises the number of the message source text block.

Regardless of where in the program a text block is activated, the PLC processor sends the appropriate request at the end of the PLC cycle.

While the Master task is running, the TSX ETH 200 module can send and receive two messages in normal operation and up to four messages during peaks.

Master task cycle
of station "n"
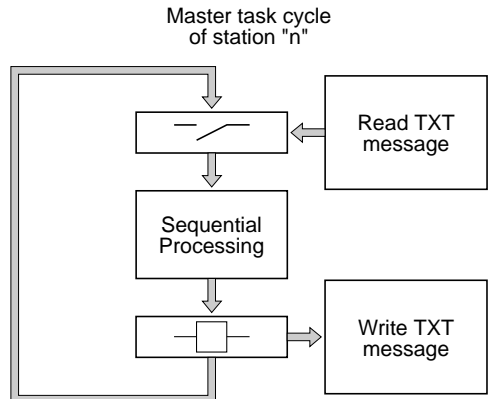
Parameter programming example

Network 0, Station 3   Network 2, Station 7

```
                    ┌──── TXT1 ────┐        ┌──── TXT12 ───┐
                 R ─┤              ├─ D   R ─┤              ├─ D
                    │   TXT        │        │   TXT        │
H'0207' ─► TXT1,A  S│   T,T : 12   │E     S│   T,T : 0    │E     3 ─► TXT12,A
   12 ─► TXT1,T     │   T,A : 0207H│ ◄──► │   T,A : 0003H│      0 ─► TXT12,T
                 O ─┤              │     O─┤              │
                    │   Wi         │        │   Wj         │
                    │   u          │        │   v          │
                 I ─┤   T,L : x    │      I─┤   T,L : y    │
                    │   T,S : ,    │        │   T,S : ,    │
                    └──────────────┘        └──────────────┘
```

2.6-2 Broadcast Messages

A broadcast message is a point-to-point message which is sent to all stations on the same network.

A broadcast message is read by all other stations on the same network as the source station, on condition that they have a text block configured to receive these messages.

TXTi,A : Comprises the network and station numbers of the destination stations.
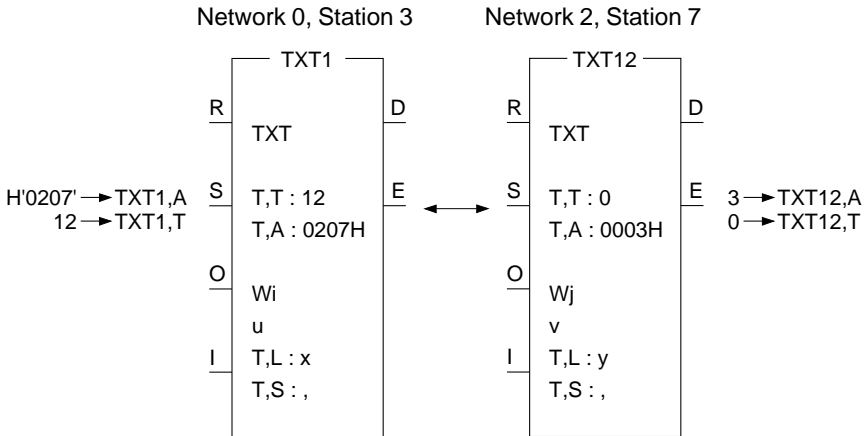> The station number takes the value H'FF'.
> Eg : H'01FF' for all stations on network 1.

TXTi,T : Gives the number of the destination station text block. All text blocks configured to receive broadcast messages must have the same number.

The other parameters must be initialized in the same way as a point-to-point text block.

Remember to ensure that each destination station has a text block configured for reception (INPUT TXTi) with the number of the message source text block in its TXTi,T parameter.

All of the rules that apply to text block programming apply to broadcast messages.

2.6-3   Point-to-Point Message Example

In the example shown below the TSX 87-40 PLC at address H'0204' (Network 2, Station 4) sends the message "HIGHER THRES REACHED" to the TSX 47-40 PLC at address H'010C' (Network 1, Station H'0C'). In this example, Station 6 is the Bridge.
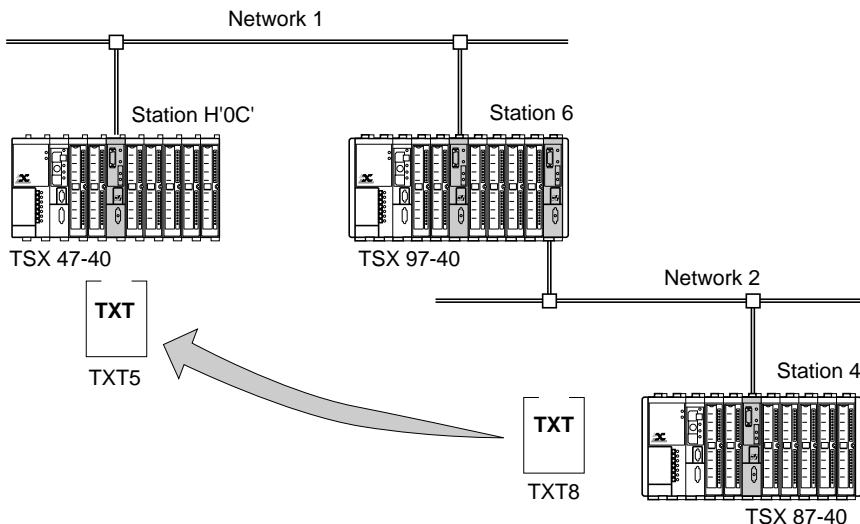
Data

• Source PLC (Network 2, Address 4) :
   - The message is sent by text block TXT8 of the application program,
   - Start of transmission table = W100. The transmission table comprises the message to send,
   - There is no reception table.

• Destination PLC (Network 1, Address H'0C') :
   - The message is received by text block TXT5 of the application program,
   - Start of reception table = W10,
   - There is no transmission table.

Message transmission

- Text block :
  - TXT8 is a TXT type Network text block set for OUTPUT TXTi,
  - TXT8,A = H'010C' Network 1, Destination address H'0C',
  - TXT8,T = 5 : Text block TXT5 is the destination,
  - TXT8,L = 20 : Send 10 words (20 bytes),
  - W100 = Reception table address W100 corresponds in this case to the address of the transmission table as the reception table length is zero.
  - Transmission table :

W100	49 (I)	48 (H)
W101	48 (H)	47 (G)
W102	52 (R)	45 (E)
W103	54 (T)	20 (Space)
W104	52 (R)	48 (H)
W105	53 (S)	45 (E)
W106	52 (R)	20 (Space)
W107	41 (A)	45 (E)
W108	48 (H)	43 (C)
W109	44 (D)	45 (E)

Message reception

- Text block :
  - TXT5 is a TXT type Network text block set for INPUT TXTi,
  - TXT5,A = H'0204' Network 2, Source station H'04',
  - TXT5,T = 8 : Text block TXT8 is the source,
  - TXT5,L = 0 : Transmission table length is zero,
  - W10   = Reception table address,
  - Reception table :

W10	49 (I)	48 (H)
W11	48 (H)	47 (G)
W18	48 (H)	43 (C)
W19	44 (D)	45 (E)

- TXT5,S = 20 : Receive 20 bytes (10 words).

4 6

2.7   Priority Communication - Telegram

2.7-1   General

Note : The telegram service is only supported by Model 40 PLCs version V5 or later.

A telegram is a specific type of text block used for priority transmission of short messages (16 bytes maximum) between two stations. It can be used by any task in the source PLC (Master task, fast task or interrupt task), and can be sent to any station on the same network.

When a telegram is sent, the PLC processor immediately transmits the message to the network module, without waiting for the end of the Master task cycle.

In reception mode, as soon as the message is received by the network module, an interrupt is generated and sent to the PLC processor. The destination application interrupt task (IT task) then reads the telegram and performs any required actions. This process ensures that application program to application program communication generally takes place in under 30 ms.

A telegram is sent by a TLG type NETWORK text function block. An application program can only send one telegram per cycle to each network module. A PLC which comprises several network modules (bridge function, concentrator, etc) can simultaneously send a telegram from each network module.

TLG text block parameters

The "TLG" text block function comprises the following parameters, which must be defined at configuration :

• Text block number	TXTi
• Type of exchange	TLG
• Type of communication	NET
• Start of table address	eg : W10
• Reception table length	16 bytes maximum
• Transmission table length	TXTi,L (16 bytes maximum)
• Type of addressing	Direct or indirect

The TLG text block also comprises :

- Input bits :   Literal   Ladder

	Literal	Ladder
Start "Transmission"	OUTPUT TXTi	S,O = 1
Start "Reception"	INPUT TXTi	S,I = 1
Start "Transmission Reception"	EXCHG TXTi	S,I,O = 1
Cancel exchange	RESET TXTi	R = 1

- Output bits :
  "Exchange complete"   TXTi,D
  "Exchange error"   TXTi,E

- Status word   TXTi,S
- Destination address   TXTi,A
- Destination text block number   TXTi,T

TXTi,S

The status word (TXTi,S) comprises the number of bytes sent or received (1 to 16) by the text block via its transmission or reception table when the exchange is correct. If an exchange error occurs, (bit TXTi,E at 1), TXTi,S takes one of the values listed below :

  1 : Exchange in progress cancelled by RESET.
  2 : Message longer than 16 bytes (in transmission mode).
  3 : Power failure.
  4 : Module failure.
  6 : Telegram too long for the text block reception buffer.
10 : Incorrect text block parameters for indirect addressing.
13 : Routing error (cannot access network).
14 : System reconfiguring, module performing self-test, etc.
15 : Telegram channel busy (in transmission mode).

This variable can only be read and is significant only when the exchange is completed.

TXTi,A

The destination address (TXTi,A) must be coded using the format :

```
F                    8 7                    0
┌─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┐
│ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │
└─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┘
│    Network number    │    Station number    │
     0 to H' 7F'            0 to H' 3F'
```
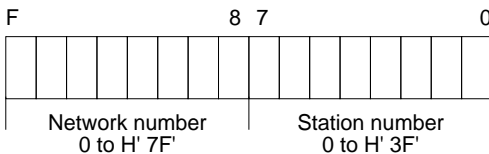
Note :   Parameters TXTi,L; TXTi,A and TXTi,T can be modified by program.

2.7-2   Telegram Programming

Transmission

In transmission mode a telegram type text block (TLG) is programmed in the same way as a TXT type text block.

Transmission is started when input "O" is set to 1 in Ladder language or by the OUTPUT TXTi instruction in Literal language. The TLG text block can be started from the application program interrupt task, fast task or master task.

If transmission is unsuccessful, (destination PLC powered down, no TLG text block configured as Input, etc), the telegram which was sent is returned to the source network module. This network module will then generate an interrupt. If an IT task is running and enabled (DMASKINT), it is executed. The IT task must be acknowledged (ACKINT) otherwise the PLC will generate a MEM error condition and stop the application.

The use of TXTi,E and TXTi,D bits is described in section 3.3 (Data Rate Control).

Reception

A telegram is received by a TLG type text block.

The telegram destination network module must know which text block is ready to receive the message. To ensure this, the text block must be set up as INPUT TXTi.

On reception of a telegram from the network, the network module gives it priority and generates an interrupt which is sent to the PLC processor. The interrupt starts the application program interrupt task which must :
• Determine which network module generated the interrupt,
• Read the telegram with the "READTLG" instruction.

The network module which generated the interrupt is determined by the instruction :

READINT (Ixy;Bi)

x = Rack number (0),
y = Module position in the rack (0 to 7),
Bi= Copies the interrupt bit from the module to an internal bit. This bit changes to 1 when an interrupt is detected.

The telegram is read by the instruction :

READTLG (Ixy;Wi)

x = Rack number (0)
y = Module position in the rack (0 to 7)
Wi = Read confirm, which takes one of the following values :

  0 : Reception successful
  4 : Message longer than 16 bytes (in reception mode)
  5 : Incorrect destination address
  6 : Reception network module error
  7 : Communication system reconfiguring
  8 : Telegram reception already in progress
  9 : No telegram waiting
10 : No network module
11 : Network module present but not supported
12 : Telegram reception refused
13 : No TLG text block configured as Input
14 : Telegram received with a bad check character (BCC)
15 : Telegram channel busy

Execution of this instruction copies the message to the reception buffer of the TLG text block, sets text block bit "D" to 1 and updates word Wi. The telegram is then available for reading and all related actions.

Transmission - reception

A TLG text block can be programmed for transmission/reception using the instruction EXCHG TXTi (or by setting bits S, I and O to 1). The destination PLC application program responds to the text block. This response must be sent by a TLG text block programmed as OUTPUT. The data is received as described above (detection of an interrupt and reading of the telegram). The data received is stored in the reception table of the text block.

2.7-3 Telegram Example

Transmission by the TSX 67-40 at address H'0204' (network 2, station 4) of the message "ALARM 8" to the PLC at address H'020C' (network 2, station H'0C') :
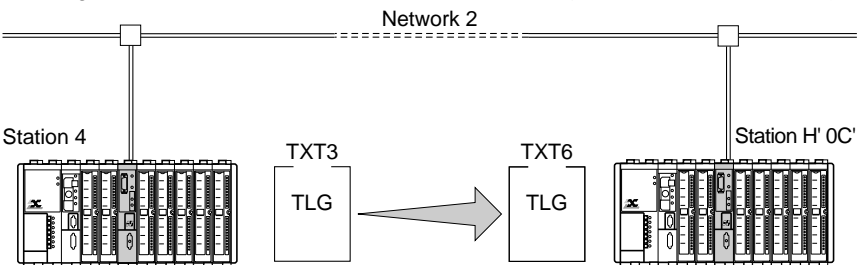
Data

- Source PLC (station 4) :
  - The telegram is sent by application program text block TXT3.
  - Start of transmission table = W100. The transmission table comprises the message to send.
  - There is no reception table.
- Destination PLC (station H'0C') :
  - The message is received by application program text block TXT6.
  - Start of reception table = W50.
  - Reception table length : 16 bytes.
  - There is no transmission table.

Message transmission

- Text block :
  - TXT3 is a TLG type NETWORK text block programmed as OUTPUT.
  - TXT3,A = H'020C' destination address (network 2 station H'0C').
  - TXT3,T = 6 : is the destination text block, TXT6.
  - TXT3,L = 8 : send 8 bytes.
  - W100 = Reception table address. As there is no reception table (nul length), W100 corresponds to the transmission table address.
  - Transmission table

W100	4C (L)	41 (A)
W101	52 (R)	41 (A)
W102	20 (space)	4D (M)
W103	00 (NUL)	38 (8)

- Telegram transmission

  The telegram is sent from the master task :

  < Transfer data to the transmission table
  ! W152[4] → W100[4]

  < Send telegram
  ! OUTPUT TXT3

Message reception

• Text block :
- TXT6 is a TLG type NETWORK text block programmed as INPUT.
- TXT6,A = H'0204' source address (network 2, station 4).
- TXT6,T = 3 : text block 3 is the source.
- Recept. length = 16 : receive 16 bytes maximum.
- W50 = Reception table address.
- There is no transmission table, TXT6,L = 0.

The telegram destination module is located in Rack 0, slot 2. The message is received in two steps :

• Master task :

< Activate IT task
! Start CTRL 1

< Validate interrupts
! DMASKINT (I 02)

< Set text block TXT6 to receive
! INPUT TXT6

• Interrupt task :

< Read the module interrupt
! READINT (I02;B14)

< If interrupt bit (B14) is present, read the telegram
! IF B14 THEN JUMP L10

< Continue program
! ......

< Read telegram
! L10 : READTLG (I02;W45) ; RESET B14

< Analyze correct read confirm
! IF [W45 = 0] then jump L20

< Process errors (analyze W45)
! [IF W45 = ...] THEN ....

....

< Number of bytes received and stored in word W30
! L20 : TXT6,S → W30

< Process data received
! W50[W2].......
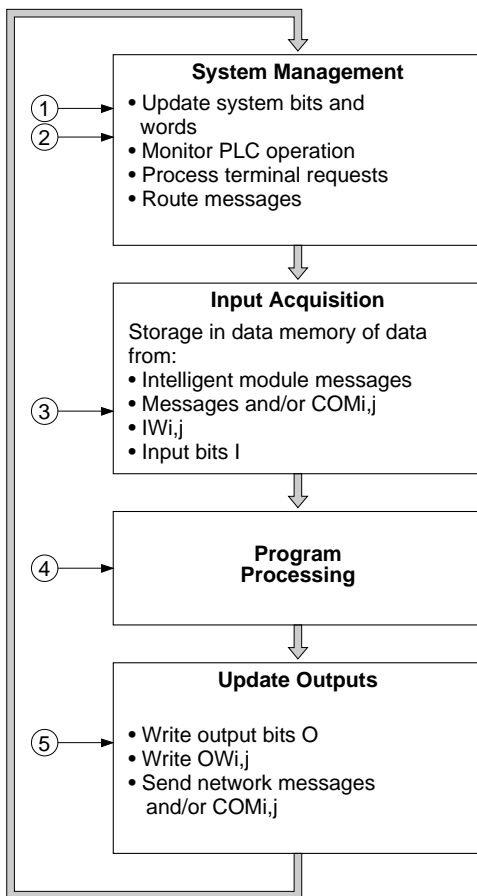
....

2.8 PLC Scan Cycle

The diagram opposite shows the Master task cycle of the PLC where the TSX ETH 200 module is located.

The only information indicated is that which is absolutely necessary to understand the operation of the TSX ETH 200 module.

① Process system bits and words and update them when they are set by the system.

② Monitor various parameters including the presence of the TSX ETH 200 module and if necessary act on the fault bits Ixy,S; SY10, etc.

③ Write data to memory for the COM words that have changed in other stations and up to four messages.

④ Execute the user program.

⑤ Send the COM words assigned to this station that have been changed and up to 4 messages to the TSX ETH 200 module.

System Management
- Update system bits and words
- Monitor PLC operation
- Process terminal requests
- Route messages

Input Acquisition
Storage in data memory of data from:
- Intelligent module messages
- Messages and/or COMi,j
- IWi,j
- Input bits I

Program Processing

Update Outputs
- Write output bits O
- Write OWi,j
- Send network messages and/or COMi,j

Important

Each master task cycle can process in transmission and reception :

- COM words (up to 64 max),
- Up to 4 messages at peak network load.

The sum total of all input and output messages (MMS messages + COM words + UNI-TE OFBs + TXT or SYS type text blocks + console messages) must not exceed 200 messages per second.

To avoid overloading the PLC in normal operation, no more than two messages per cycle should be exchanged.

2.9 Multinetwork Configurations

2.9-1 Configuring MAP/802.3, MAPWAY, ETHWAY, TELWAY or FIPWAY Modules

In a multinetwork configuration (MAP/802.3 and/or MAPWAY and/or FIPWAY (for TSX/PMX model 40 version V5 PLCs) and/or ETHWAY and/or TELWAY), there are three possible cases :

- The network module is in a station that is at the end of a network drop (stations 1.a, 1.b, 1.c, 2.b, 2.c, 3.b).
- The network module is in a station that comprises more than one network module connected to different networks without being a network bridge (station 1.e/3.a).
- The network module is in a station that is a network bridge (station 1.d/2.a).
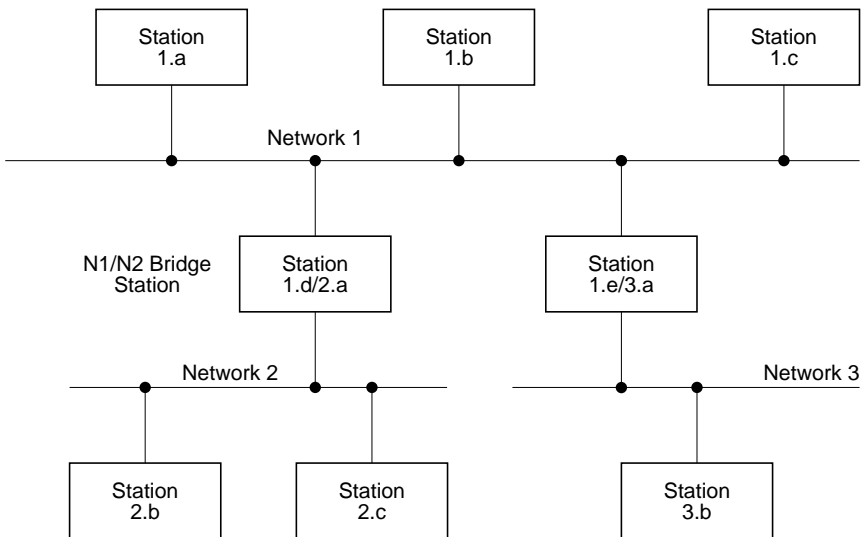
In the first two cases there is no need to configure the network modules. All of the routing information is held by the bridge station on the network to which they are connected. In the last case (bridge PLC), the network modules must be configured. A network bridge station is configured with PL7-NET software. PL7-NET is an X-TEL Software Workshop option.

A TSX ETH 200 module, configured to operate as a bridge, routes one send message and one reception message each PLC cycle. For example, if the PLC cycle time is 30 ms, the module configured as a bridge could route approximately 33 send messages and 33 reception messages, every second.

Important

> A bridge PLC connected on the MAP/802.3 network does not route MMS messages. Routing tables only contain the elements required for routing X-WAY / UNI-TE messages.

The following operations must be performed :

• Description of the entire network architecture and entry of the name and number (0 to H'7F) assigned to each network,

• Selection of the stations that form a network and assignment of station addresses (0 to H'3F'),

• Network interconnection by selection of bridge PLC stations,

• Assignment in each bridge, of modules to the different networks,

• Storage of network architecture information on disk. For each bridge, this file contains a complete list of the networks it serves,

• Transfer of this file to all of the bridge stations in the network architecture.

For more information on the use of this program, refer to the PL7-NET program manual.

Reminder

The use of TSX ETH 200 modules in a multinetwork architecture is only possible with PLCs of version 4.4 or higher.

2.9-2   PLC Cycle Time

The cycle time of a bridge PLC depends on the master task cycle time.

Reminders on PLC cycle time
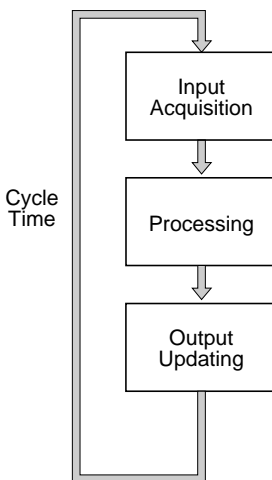
Data routing uses the same network module resources as the traditional single network message handling system (see section 2.1-1 Functions).

Thus the user checks that the total number of messages (single and multinetwork) transmitted or received by the TSX ETH 200 module is less than two messages per PLC cycle (four in peak periods).

To improve performance of an MAP/802.3 / TELWAY, MAP/802.3 / MAP/802.3 or MAP/802.3 / MAPWAY, ETHWAY or FIPWAY bridge PLC, it must have the following characteristics :
- A short cycle time (approx 30 ms),
- No sequential processing,
- No COM word management.

Remark :

If the PLC is stopped, data routing will be performed every 30 ms.
If the PLC is running, data routing will be performed as a function of the cycle time declared for the master task.

3.1 Troubleshooting

3.1-1 General

The front panel of TSX ETH 200 modules comprises four indicator LEDs and two 7-segment LED displays.

These indicators and displays are used to display important information on the operation of the module and its connection to the MAP/802.3 network.
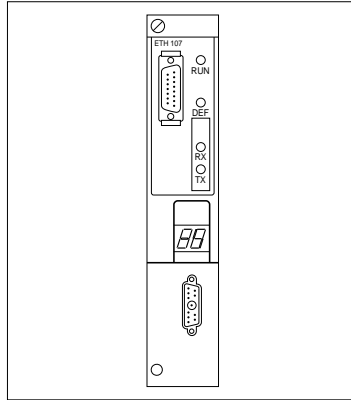
3.1-2 LED Indicators

The "RUN" LED

This green LED indicates the general condition of the module. It is lit when the module is operational and active. It is extinguished when the module is not operational.

This LED remains lit once the self-tests have been successfully completed, during normal module operation. If a fault is detected it is extinguished and inhibits the module from becoming active.

This LED is hardware controlled. It is extinguished by the watchdog, triggered by a module failure.

The "DEF" LED

This red LED lights (blinking or steady) when a TSX ETH 200 module hardware or software fault occurs.

This LED lights briefly when the module is powered up, but is extinguished when the self-test phase starts.

It remains lit when :
- One of the self-tests is aborted due to an error. The self-test code will be displayed by the 7-segment LED displays (see section 3.2-1),
- A permanent error is detected during normal operation,
- The TSX ETH ACC1 terminal block is disconnected from the module.

It blinks (once per second) to indicate that the OSI/MMS program is not loaded in the flash EPROM memory of the TSX ETH 200 module.

5 8

This LED is software controlled. When the internal software that controls the module, detects an operating fault that affects proper module operation, it lights the "DEF" LED. This LED does not automatically light when the "RUN" LED is extinguished.

The "RX" and "TX" LEDs

These two yellow LEDs indicate that the TSX ETH 200 module has detected data reception activity (RX) or data transmission activity (TX).

On initialization, these two LEDs light briefly, only to be extinguished by the start of the self-test procedure. They are software controlled.

3.1-3 LED Displays

The TSX ETH 200 module comprises two 7-segment plus decimal point LED displays.

When the module is powered up a random value will be displayed and immediately cleared.

Similarly, during installation of the OSI/MMS profile (when the module is used for the first time, see section 2.1-2), the flash EPROM memories must be initialized prior to programming. During this erase cycle (approx. 30 seconds), the displays do not blink.

During the self-test phase, the displays show the number of the test in progress. If a fault is detected, the corresponding error code is displayed by the LEDs and the "DEF" LED is lit.

Once the self-tests have been completed successfully and the module is operating normally, the LEDs alternately display (after the thirty or so seconds required for reinitialization of the FLASH memory) :

• the number of the network to which the module is connected, with a decimal point in the lower right of the display.

• the station number assigned to the module, without the decimal point.

In normal operation, the LEDs display the network address of the station as Network number followed by the Station number.

The station address display alternates cyclically over a period of approximately two seconds. This sequence allows network diagnostics in Local mode. A check can be performed to ensure that the network and station numbers are set correctly in the TSX ETH ACC1 terminal block.
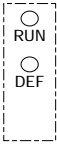
As soon as a fault is detected during normal module operation, the "DEF" LED lights and the LEDs display the appropriate error code.

3.1-4 Troubleshooting Using the LED Indicators and Displays

The combined use of the indicator and display LEDs will identify a number of operating faults and their causes.

The table below lists the main faults that can be detected and the remedial action that should be taken.
Before taking any action, the module should first be reinitialized (eg : by causing a power break/return on the PLC) to ensure that the fault persists.

Indicators	Probable Causes	Remedial Action
○ RUN ○ DEF	• LED failure • Power supply failure	• Check supply to the station • Change the power supply module
○ RUN ● DEF	• Self-test fault (*) • Permanent fault (*)	• Refer to the error code displayed
RUN ● DEF	• Terminal block absent (**) • Fault identified by an error code displayed • PLC not connected	• Fit the terminal block • Refer to the error code displayed • Check the PLC
○ RUN ◑ DEF	• OSI/MMS program not operational	• Load the OSI/MMS program using the OSI-LOADER sub-assembly and/or load the OSI configuration using the PL7-OSI sub-assembly
● RUN ○ DEF	• Normal display during normal module operation	

(*)   Error code displayed by the display units
(**)   "Eb" displayed

Note : The "TX" and "RX" LEDs are not shown in the above table as they are not used for troubleshooting the module.

❍   indicator off   ●   indicator on with steady light   ◑   blinking

List of error codes (other than self-test error codes)

If a fault is detected during normal operation, one of the values shown in the list below will be displayed on the 7-segment display :

Error code	Fault description	Remedial Action
20 and 21 (*)	Module error	Change the module
22 (*)	A device has the same network address	Change the address on the terminal block
23 to 27 (*)	Module error	Change the module
28 to 2C (*)	Connection problem or wiring problem	Check the wiring and connections
31 and 32 (*)	Problem during initialization phase	Change the module
41 (*)	Initialization problem with the COM protocol	Change the module
42 (*)	COM word configuration problem	Change the module
51 (*)	Initialization problem in the TSX Series 7 protocol	Change the module
60 (*)	Flash Eprom operating error	Change the module
70 to AF (*)	MMS communication error	Contact your technical support
F0 to F2 (*)	MMS communication error	Contact your technical support
Eb	Terminal block absent	Install the terminal block
Fa	Flash Eprom requires reinitialization	Perform the EC test described in section 3.2. If the problem persists, change the module.

(*) For these values, the error code is displayed in three stages :
   • Display of "AL" (alarm) blinking,
   • Display of blinking code (example 22),
   • Optional display of an additional code (reserved for technical support only).

3.2 Starting the Tests

The TSX ETH 200 module comprises a system that supports the running of specific tests for maintenance purposes. The tests can be selected from the four thumbwheels in the TSX ETH ACC1 terminal block.

On power-up, the value coded in the terminal block is read. If the value corresponds to a network and station number, the module runs the self-test sequence and if it is successful, starts normal operation. If the value corresponds to a specific self-test, as listed overleaf, the module will run the corresponding test.

If the test runs correctly, the module loops back to the start of the test and runs it again. If the test is stopped before completion, the "DEF" LED will light and the LED displays will display a test number. The tests are listed overleaf.

Specific test coding

The tests are run after the "STAT" thumbwheels have been set to a value listed overleaf. The "NET" thumbwheels must be set to H'FF'.
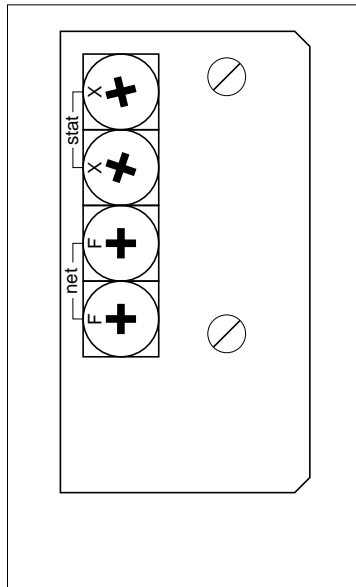
"STAT" Setting	Test Selected
FF	Continuous self-tests
FE	80386SX processor peripherals test
FD	2 Mb RAM test (lasts approx. 2 minutes)
FC	Reserved
FB	PLC bus register test
FA	32 Kb PLC bus interface RAM test
F9	128 Kb ROM checksum test
F8	ROM type test
F7	Indicator LED test
F6	7-segment LED display test
F5	Status test
F4	Timer interrupt test
F3	Reserved
F2	PLC bus interrupt test
F1	Reserved
F0	CSMA/CD Bus Controller interrupt test
EF	CSMA/CD Bus Controller init, start and stop test
EE	Reserved
ED	CSMA/CD Bus Controller loopback mode test
EC	Clear - Write to flash EPROM memory (lasts approx. 4 mn)
EB - E1	Reserved
E0	Continuous network test
DF - 80	Reserved
7F - 40	Reserved
3F - 00	Station Number

Note : After the EC test has been run, the 7-segment display units will freeze for about thirty seconds when the ETH200 module is restarted.

Error codes

If a fault is detected by a specific test, an error code is displayed (blinking) by the module display units.

3.3   Data Rate Control

Sending a UNI-TE OFB (or a text block) changes the state of bits UNITEi,READY (or TXTi,D) and UNITEi,ERROR (TXTi,E). The possible values that these bits can take are :

UNITEi,READY	UNITEi,ERROR	Description
0	0	Exchange in progress
1	0	Exchange ended without error or no exchange
1	1	Exchange ended on error
0	1	Exchange not ended, exchange initially started on error (this is normally impossible)

Power break or destination disconnected

When a UNI-TE OFB (or a text block wired for EXCHG) sends a request, it is set to await a response and waits until it receives one. If a power failure occurs, or if the destination station is disconnected, the source OFB (or text block) remains inhibited.

There are two possible cases :

• **Power break or destination station disconnected during the exchange**

Bits UNITEi,READY (or TXTi,D) and UNITEi,ERROR (or TXTi,E) remain at 0,

The application program of the source must take this case into account by including a "time-out" in the use of the source OFB (or text block).
If no response is received before the time-out, then the OFB (or the source text block) should be reset by setting the UNITEi,RESET bit to one (or by the Reset TXTi command).

• **Power supply fault or disconnection of the destination station before the exchange is started**

The OFB (or the source text block) is set to error, bits UNITEi,READY (or TXTi,D) and UNITEi,ERROR (or TXTi,E) are set to 1. Bit 2 of the status word UNITEi,STATUS1 is set to 1 (status word TXTi,S takes the value 12 and TXTi,V the value 3).

4.1 Performance

4.1-1 Application-to-Application Transfer Time

AAT : is the Application-to-Application Transfer time. This is the elapsed time from the moment a message is sent by the source station (OUTPUT TXTi) till the moment it is received by the destination station (DONE bit processed by the application program).
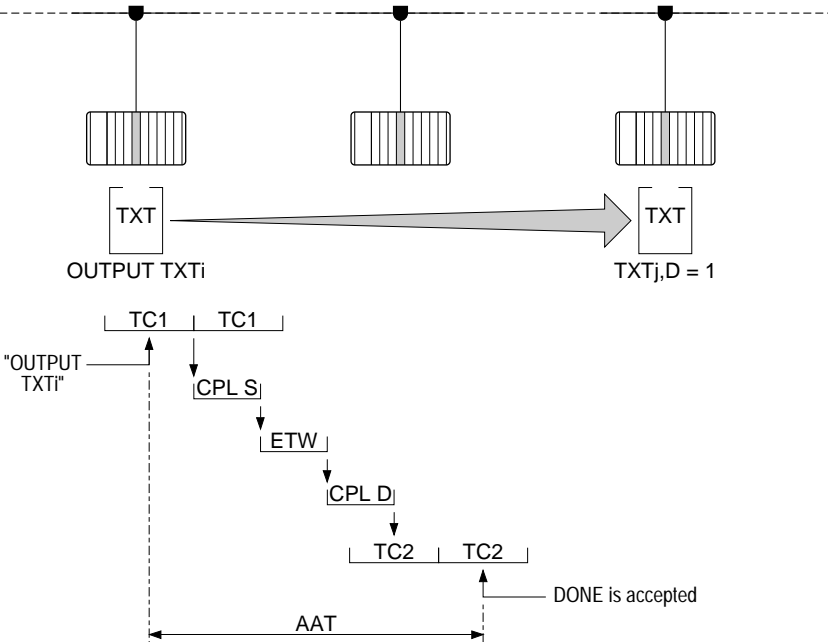
Example

TC1   Source PLC cycle time,

TC2   Destination PLC cycle time,

CPL S   Source PLC TSX ETH 200 module transmission processing time,

MAP   Mapway network transit time,

CPL D   Destination PLC TSX ETH 200 module transmission processing time.

The diagram below shows the application-to-application transfer time depending on the cycle time of the source PLC and the network load factor :
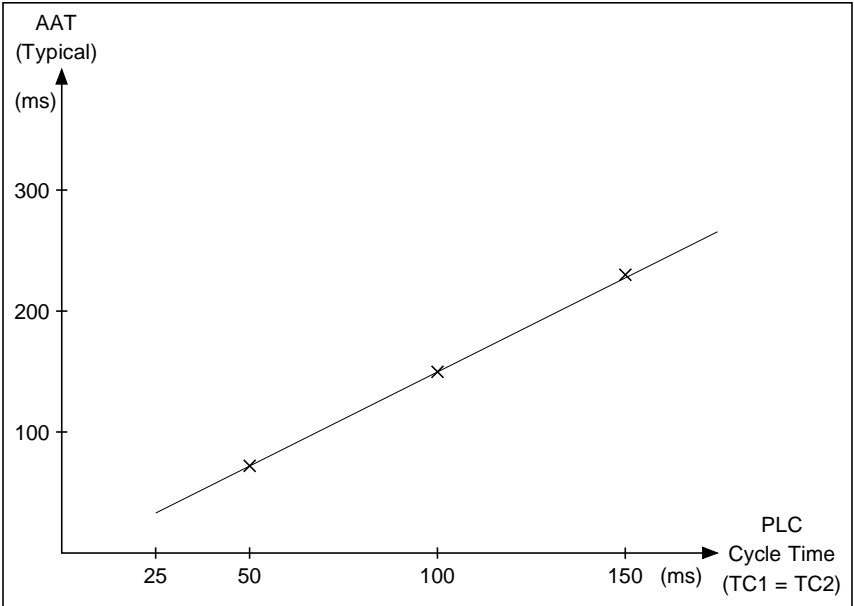
The application-to-application transfer time varies only slightly due to the network load factor (as long as the load factor does not exceed 10%). It depends essentially on the cycle time of the two PLCs concerned. If their cycle times are the same, the average application-to-application transfer time is 1.5 times the cycle time

4.1-2 Request Transaction Time

RTT : The UNI-TE Request Transaction Time is the time that elapses between transmission of a request and processing, by the source, of the confirm that is sent back.

Example
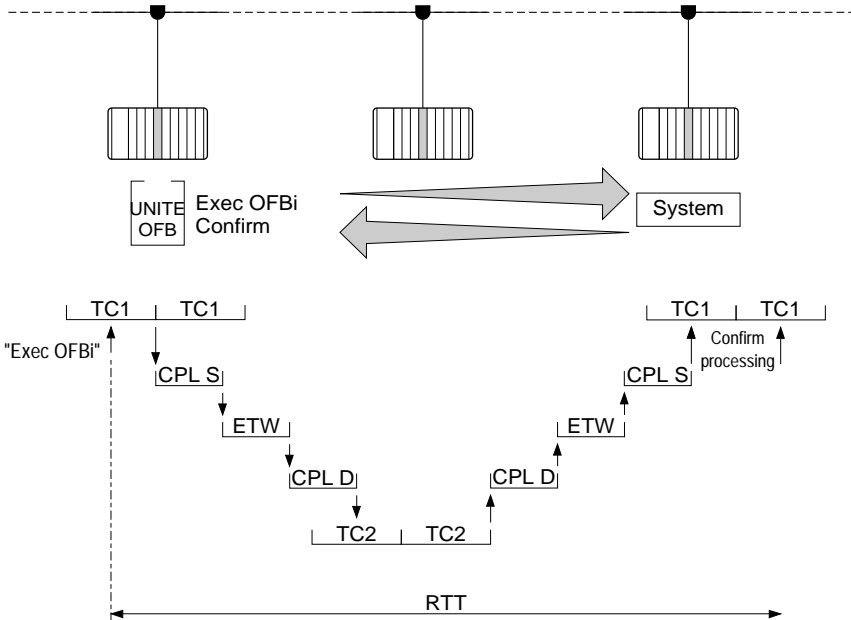
TC1   Source PLC cycle time,

TC2   Destination PLC cycle time,

CPL S   Source PLC TSX ETH 200 module transmission processing time,

MAP   MAP/802.3 network transit time,

CPL D   Destination PLC TSX ETH 200 module transmission processing time.

The diagram below shows the request transaction time depending on the cycle time of the source PLC and the network load factor :

RTT
(Typical)

(ms)

```
500 ─┤

400 ─┤

300 ─┤

200 ─┤

100 ─┤
```

(graph with data points marked ×)

PLC
Cycle Time
25   50   100   150   (ms)   (TC1 = TC2)
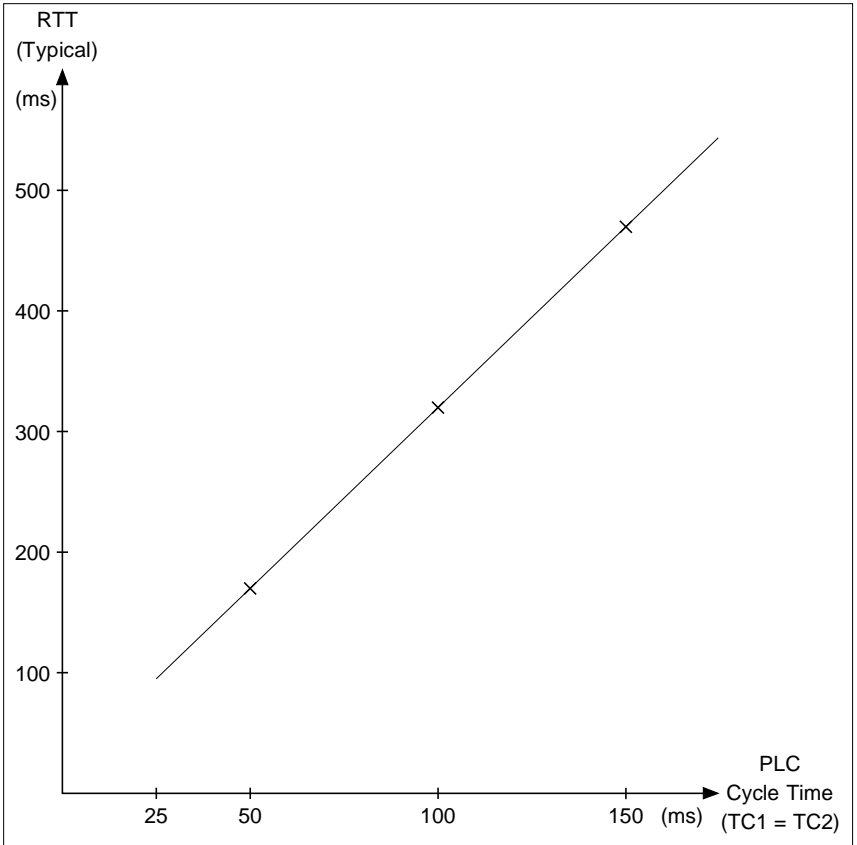
The request transaction time varies only slightly due to the network load factor. It depends essentially on the cycle time of the two PLCs concerned. If their cycle times are the same, the average request transaction time is 3 times the cycle time.

4.1-3   Uploading Application Programs

PLT : Program Load Time is the time required to upload (or download) an application program via MAP/802.3 (upload and receive confirm). It depends on the size of the program to be transferred. The transfer time will therefore be almost entirely unaffected by the network load factor.

Example
Once logical connection is established, the cycle shown below applies to each program segment of 128 bytes.
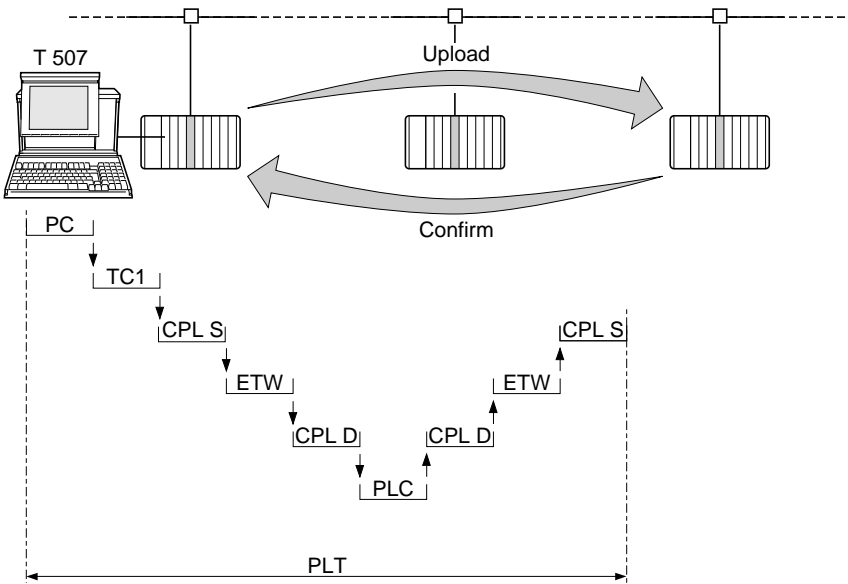
PC The transfer time between terminal and PLC,

TC1 Source PLC cycle time,

CPL S Source PLC TSX ETH 200 module transmission processing time,

MAP MAP/802.3 network transit time,

CPL D Destination PLC TSX ETH 200 module transmission processing time,

PLC The transfer time to the PLC of the destination station, with PLC stopped.

• Transfer time between workstation and PLC (typically one second per K byte),

• The PLC transmission processing time (typically 2.5 times the cycle time).

The diagram below shows the time required to upload an application program over an MAP/802.3 network, depending on the size of the program :

In the diagram below :

• LOC is the time required to load the program into a local PLC,
• NET is the time required to load the same program to a remote PLC, via the programming port.

Loading
 time in
  secs.

Program size in Kbytes
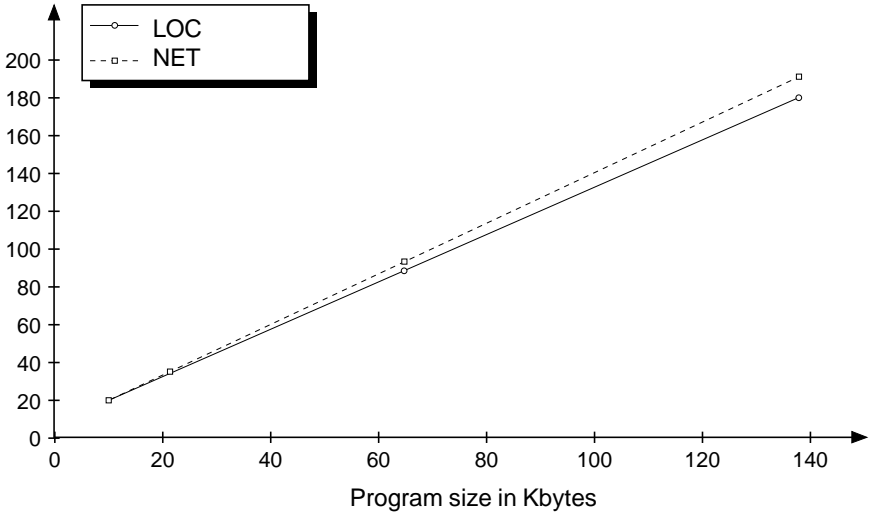
This time only varies slightly depending on the network load.

4.1-4   Telegram Transfer Time

"**TTT**" : The telegram transfer time is the time which elapses between its transmission by the source station (OUTPUT TXTi) and its reception in the interrupt task of the destination station (DONE bit accepted by the application program).
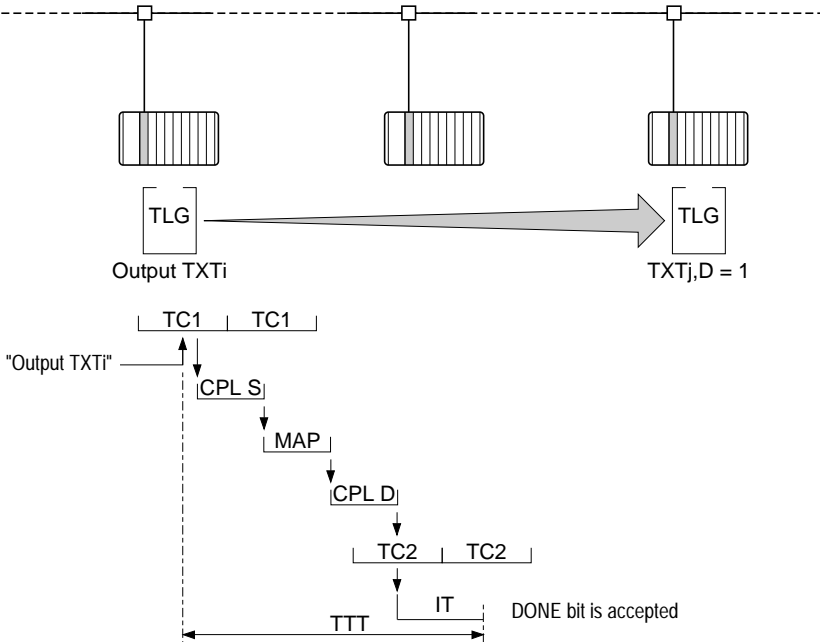
Example

TC1   Source PLC cycle time

TC2   Destination PLC cycle time

CPL S Source PLC TSX ETH 200 module transmission processing time

MAP   MAP/802.3 network transit time

CPL D Destination PLC TSX ETH 200 module transmission processing time

IT   Interrupt task processing time

The telegram transfer time is typically 15 ms.

Note : The telegram service is only supported by Model 40 PLCs version V5 or later.

7 2

4.1-5   MAP/802.3 Bridge Transmission Processing Time

BTT : Is the time taken by a message to move
from an MAP/802.3 network to an MAP/802.3,
MAPWAY or TELWAY network or vice versa.
It depends on the transmission processing
time required by the two modules and on the
time required by the bridge PLC processor to
route the message.

Network 1

TSX ETH 200

PLC

Network 2 Module

Network 2
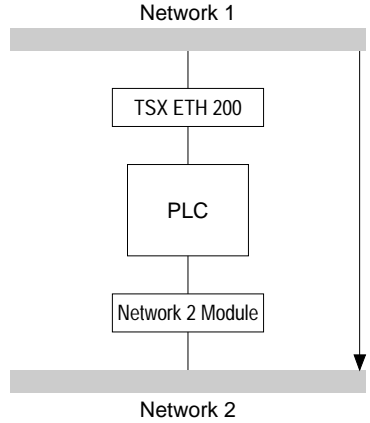
The MAP/802.3 bridge transmission processing time is typically 1.5 times the
PLC cycle time for each message.

5.1   Module Architecture

5.1-1   Software Architecture

The diagram below shows the software architecture and the various functions of a TSX ETH 200 module.
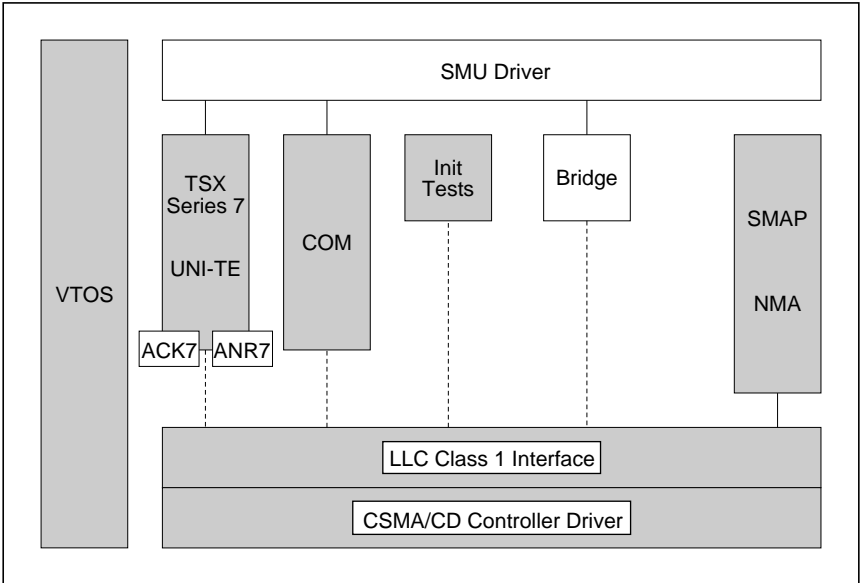
Definition of the Main Functions :

Virtual Time Operating System (VTOS)

This is the real-time core that is used for :

• Executing the tasks in a multitask environment,
• Communication between tasks using mailboxes and ports,
• Allocating and releasing the memory and the interrupts.

BUS DRIVER

This function ensures the control of communication between the PLC and the device. When a Telemecanique PLC is used, this function is designed as a driver for the PLC bus interface (SMU) and a SMU access interface which can be accessed by application services. This function controls three simultaneous communication channels : a synchronous COM channel, a synchronous and an asynchronous message channel (synchronization is ensured by the PLC cycle).

COM

This function controls the service that exchanges COM words over the network. It ensures the periodical transmission of a list of words initiated by the PLC processor. It provides a copy of the entire COM word field on each PLC cycle. An important part of this function is delegated to the SMU driver : control of a COM word communication memory channel between the network module and the PLC processor. The COM word function also interfaces with the LLC service (described below).

Series 7

This is the specific Telemecanique network service. This function sends Series 7 datagrams (text blocks, UNI-TE requests, program, adjust and debug requests, etc) to the destination station on the network. It also receives datagrams from the network and transmits them to the PLC processor via the SMU driver. In addition, this function receives configuration or control requests that are redirected to the SMAP function that handles them (described below).

The Series 7 service comprises a specific LOC-DIAG function that provides an overview of network control via the UNI-TE service and application protocol. Only some data objects are accessible by the LOC-DIAG service. This service converts some UNI-TE requests from the SMU into SMAP requests or responds instantly to other requests. In the other direction, SMAP responses are converted back using the UNI-TE protocol and sent back to the SMU.

ACK7

This is the service that ensures reliability of Series 7 datagram exchanges between two stations that have the same network numbers. Reliability is ensured by repeating messages when no confirmation of correct reception is received (eg absent destination station, etc) or simply to repeat messages that are accidentally lost on the network (eg : due to electromagnetic interference, etc). If, after repeated attempts, satisfactory message exchange is not achieved, the source is informed that the message is refused.

ANR7

This service handles the correspondence between the Telemecanique station address (Network-Station) and its physical address. This is necessary when building the datalink level data frame. This service includes the ability to learn automatically from data frames received.

System Management Access Protocol (SMAP)

This function controls all of the distributed network functions in the module. SMAP also communicates with a network control server called Network Management Agent (NMA). In order to respond to requests from the NMA, SMAP interfaces directly with each function in the module.

Logical Link Control (LLC)

This function implements the interface with the IEEE 802.2 Class 1 LLC and the IEEE 802.3 MAC sub-layer driver.

INIT and Tests

This function performs two main tasks :

• Starting VTOS and the complete ETH 200 program in order to end the self-tests,

• Synchronizing the changeover of the program from idle to running once the self-tests have been completed successfully. It is also used to share common resources such as structures and common addresses.

This service also controls the LED indicators and the 7-segment LED displays on the front panel of the TSX ETH 200 module.

Flash EPROM

The flash EPROM memories store the MAP 3.0 profile (network layer to MMS application layer). They should be loaded using the OSI LOADER tool when the module is first installed (see the PL7-OSI program manual for further information). The program then remains in the flash EPROM memories even if the module is switched off.

OSI Profile / 7-layer MMS

With the OSI profile and its MMS message handling system, interoperability is possible for all systems which comply with this standard (access to variables, program management, etc).

5.1-2   Hardware Architecture

The TSX ETH 200 module architecture is shown in the diagram below :
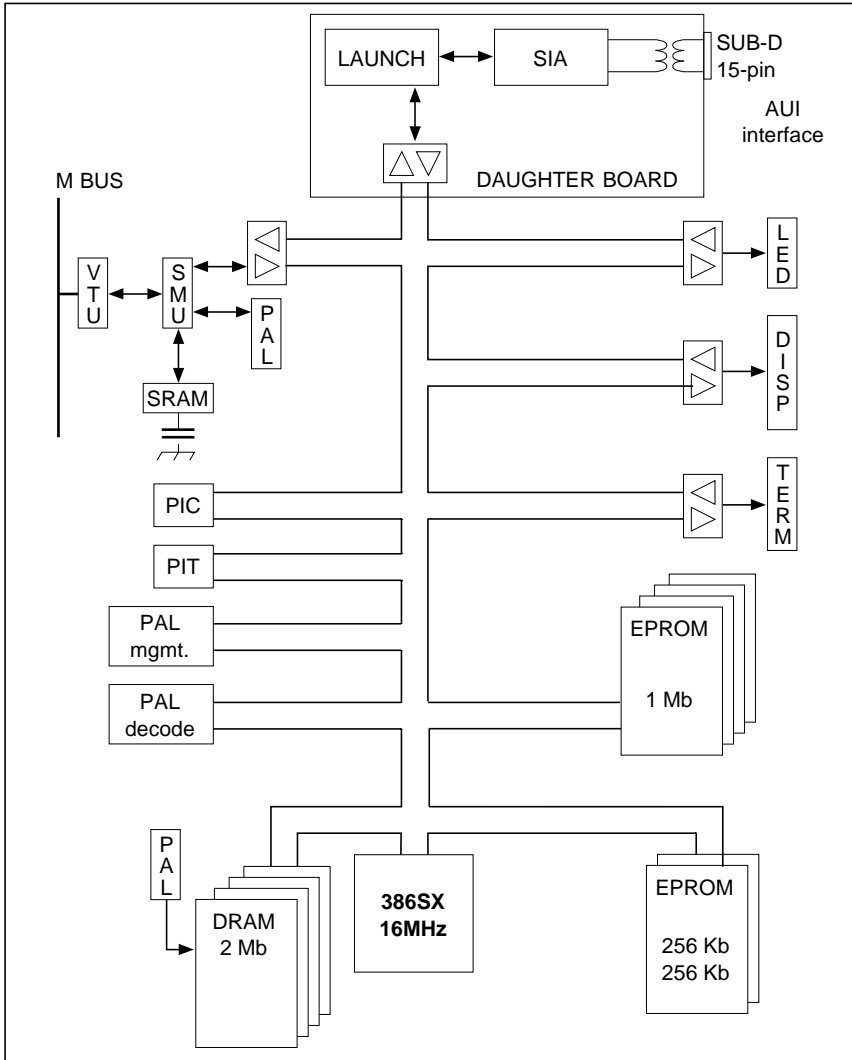
5 V Power consumption :   2.0 A typical
                                2.4 A maximum

12 Vp Power consumption :   500 mA typical

5.2 UNI-TE Read Requests

5.2-1 Read an Internal or System 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
xx/xx	0 → 7	

xx/xx
- internal word B : 00/00
- system word SY : 01/01

Confirm format

Positive confirm

Confirm Code Hex.	Value	Forcing
yy/yy		

yy/yy
- internal word B : 30/48
- system word SY : 31/49

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 value used as a forcing indicator for the 8 "value" bits :
(not SY)
- 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.

5.2-2 Read an Internal, Constant or System Word

This request reads a internal word (W), a system word (SW●●) or a constant word (CW●●).

Request format

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

xx/xx
- internal word W : 04/04
- constant word : 05/05
- system word : 06/06

Confirm format

Positive confirm

Confirm Code Hex.	Value
yy/yy	

yy/yy
- internal word W : 34/52
- constant word : 35/53
- system word : 36/54

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection : • Unknown request,
  • Inadequate access rights,
  • Word number out of range.

5.2-3   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 segment,
- 64 :   Internal bit zone segment,
- 68 :   Internal word zone segment,
- 69 :   Constant word zone segment,
- 6C :   Ctrl. user task segment,
- 80 :   TSX Series 7 system object segment,
- 81 :   Function block segment,
- 82 :   I/O module segment.

Type of object :   Specifies the type of object to read :

- 0 :   Text block or module in rack,
- 1 :   Ctrl block,
- 5 :   Internal bits with forcing,
- 7 :   16-bit signed integer,
- 8 :   32-bit signed integer,
- 64 :   Task period.

Object address :   • The physical or logical address in the segment,
- • The sequence number of the object in the segment :
    - 0 : Current date and time, in the common segment,
    - 1 : Stored date and time, in the common segment,
    - 2 : Current date and time (in hexadecimal notation) in the common segment,
    - 0 : Programming port configuration in the system segment.

Read objects (contd)

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,
  • Inadequate access rights,
  • Unknown segment or object,
  • Address out of range,
  • Too many objects for the reception buffer.

Request Examples

Read words or double words
Segment :   68 (internal word segment),
Type of object : $7 \rightarrow$ Wi, or $8 \rightarrow$ DWi,
Object address : index of the first Wi or DWi to read,
Response: table of n objects.

Read constant words or constant double words
Segment :   69 (constant word segment)
Type of object : $7 \rightarrow$ CWi, or $8 \rightarrow$ CDWi,
Object address : index of the first CWi or CDWi to read,
Response: table of n objects.

Read programming port configuration
Segment :   80 (system objects segment),
Type of object :   0 by default,
Object address : $0 \rightarrow$ programming port configuration,
Quantity :   0 by default,
Response: 1 byte.

Read objects (contd)

Read Date and Time

Segment	:	10 (common object segment),
Type of object	:	0 by default,
Object address	:	0 → current date and time,
		1 → stored date and time,
Quantity	:	0 by default,
Response	:	object address = 0 (current date and time) :
		YYYYMMDDHHMMSS.TN
		object address = 1 (stored date and time) :
		YYYYMMDDHHMMSS.TP
		AAAA = year,
		MM = month,
		DD = day,
		HH = hour,
		MM = minute,
		SS = second,
		T = tenth of a second,
		N = day of the week,
		P = power loss code.

Read task period

Segment	:	6C (Ctrl user task segment),
Type of object	:	64 (task period),
Object address	:	1 → Interrupt task,
		2 → Fast task,
		3 → Master task,
		4 → Auxiliary task 0,
		5 → Auxiliary task 1,
		6 → Auxiliary task 2,
		7 → Auxiliary task 3,
Quantity	:	0 by default,
Response	:	Task period coded on one byte (1 to 255) within the time base allowed for each task (FAST = 1ms, MAST = 1 ms and AUXi = 10 ms). For the IT task, the response depends on the number of EXEC cycles started.

Read internal bits

Segment	:	64 (internal bit segment),
Type of object	:	5 (internal bits with forcing),
Object address	:	Logical number of first internal bit,
Quantity	:	Number of bits to read modulo 8,
Response	:	Table of n bits containing the bit states followed by another table of n bits indicating whether the corresponding bit is forced or not.

Read objects (contd)

Read date and time (in hexadecimal notation)

Segment	:	10 (common object segment),
Type of object	:	0 by default,
Object address	:	2 $\rightarrow$ current date and time in hexadecimal notation,
Quantity	:	0 by default,
Response	:	Table of eight words indicating :
		milliseconds,
		seconds,
		minutes,
		hours,
		day,
		month,
		year,
		number of the day in the week.

Read text block parameters

Segment	:	81 (function block segment),
Type of object	:	0 (text block),
Object address	:	Logical number of first text block,
Quantity	:	Number of consecutive text blocks to read,
Response	:	Table of bits and words indicating for each text block :

TXTi,D	:	bit (1 = done),
TXTi,E	:	bit (1 = error),
Indirect	:	bit (1 = indirect text block),
Remote	:	bit (1 = remote text block),
Not defined :	4 non-significant bits,	
Type	:	0 = TXT, 1 = CPL, 2 = TER, 3 = SYS, 5 = TLG,
TXTi, A	:	word,
TXTi, M	:	word,
TXTi, T	:	word,
TXTi, C	:	word,
TXTi, R	:	word,
TXTi, S	:	word,
TXTi, L	:	word.

Text blocks which are updated in the IT or FAST tasks may be read with apparently incoherent values. This is caused by the fact that the request is processed in the master task which has a lower priority than the IT or FAST tasks.

Read objects (contd)

Read a CTRL block
Segment : 81 (function block segment),
Type of object : 1 (Ctrl block),
Object address : Logical number of first Ctrl block,
Quantity : Number of consecutive Ctrl blocks,
Response : Table of bytes structured as follows :
Configured task : Bit 0 = configured,
Bits 1 to 7 not significant,
Active task : Bit 0 = active,
Bit 1 to 7 not significant,
Period : 0 to 255. For the IT task, this field corresponds to the number of activations of the task since the application was initialized.

Read an in-rack I/O module
Segment : 82 (I/O module segment),
Type of object : 0 (module in rack),
Object address : address of the module defined as follows :
bits 8 to 11 : station number,
bits 3 to 6 : rack number,
bits 0 to 2 : module number,
the other bits are not significant,
Quantity : 1,
Response : Table of bytes structured as follows :
- fault byte : refer to the request to read the memory image of an I/O module,
- configuration byte : refer to the request to read the memory image of an I/O module,
- byte indicating the configured extension code,
- byte indicating the physical state (bit 0 = acknowledgment fault, bit 1 = parity fault, the other bits are not significant),
- byte indicating the physical module extension code.

5.2-4 Read the Memory Image of an I/O module

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

Request format

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

Module location :

- bit 0 → 2 : Module number,
- bit 3 → 6 : Rack number,
- bits 7 → 15 : Reserved (0).

Negative confirm format

Confirm Code Hex.
FD/253

Reasons for rejection :

- Unknown request,
- Inadequate access rights,
- Module number out of range.

Positive confirm format

Confirm Code Hex.	Fault Code	Config- uration	Value	Forcing
32/50				

Fault Code :   Bit 7   = Fault :   (0 = no, 1 = yes),
               Bits 6 to 4   = 0,
               Bits 0 to 3   = Type of fault :
                               0000 :   OK,
                               0001 :   Terminal block or process fault,
                               0010 :   Module absent,
                               0011 :   Module failure,
                               0100 :   Not an I/O module,
                               0101 :   Incompatible with configuration,
                               0110 :   Not configured,
                               0111 :   Self-test error.

Configuration : Bit 7   :   Configuration exists (0 = no, 1 = yes),
                 Bit 6   :   Defined type (0 = no, 1 = yes),
                 Bits 0 to 5 :   if type = 1 → catalog type number,
                                if type = 0 → default type number.

Value :   The state of the module I/O bits. If an 8-bit module is used, the MSB contains null values that are not significant. "Value" is only significant if the fault bit = 0 (bit 7) and the configuration bit = 1 (bit 7).

Forcing :   Forcing status bits :
- 0 : The bit is not forced,
- 1 : The bit is forced, its forcing state is displayed in the "value" parameter.

5.2-5   Read a Common Word

This request reads a common word.

Request format

Request Code Hex.	Category Code	Station Number	Word Number
07/07	0 → 7		

Confirm format

Positive confirm

Confirm Code Hex.	Station Size	Value
37/55		

Station size :   The number of common words handled.

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection : • Unknown request,
                        • Inadequate access rights,
                        • Word number out of range,
                        • RAM cannot be executed,
                        • Station out of range.

5.2-6 Read a Timer or Monostable

This request reads all of the parameters of a timer or monostable.

Request format

Request Code Hex.	Category Code	Timer Number
xx/xx	$0 \rightarrow 7$	

xx/xx
- timer : 09/09
- monostable : 0A/10

Confirm format

Positive confirm

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

yy/yy
- timer :
  39/57
- monostable :
  3A/58

Time base	:	0	$\rightarrow$ 10 ms
		1	$\rightarrow$ 100 ms
		2	$\rightarrow$ 1 sec.
		3	$\rightarrow$ 1 min.
Timer timed-out :		0	$\rightarrow$ no
(1)		1	$\rightarrow$ yes
Timer or	:	0	$\rightarrow$ no
monostable running		1	$\rightarrow$ yes
Type of preset	:	0	$\rightarrow$ preset cannot be modified,
		1	$\rightarrow$ preset can be modified.

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :

- Unknown request,
- Inadequate access rights,
- Timer number out of range,
- RAM cannot be executed.

(1) Only when reading a timer T.

5.2-7   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	

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 gone from 0 to 9999,

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

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,
                        • Inadequate access rights,
                        • Counter number out of range,
                        • RAM cannot be executed.

5.2.8 Read a Register

This request reads all of 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						

Register type :   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,
                        • Inadequate access rights,
                        • Register number out of range,
                        • RAM cannot be executed.

5.2-9 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],
1 = portion [X128•••X255],
2 = portion [X256•••X383],
3 = portion [X384•••X511].

Confirm format

Positive confirm

Confirm Code Hex.	Data
5A/90	

Data :   A 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.

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection : • Unknown request,
• Inadequate access rights,
• Portion number out of range,
• No reservation.

5.2-10 Read an Internal or Constant Double Word

This request reads an internal double word (DW), or a constant double word (CDW).

Request format

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

xx/xx
- double internal word DW   :   40/64
- double constant word CDW   :   41/65

Confirm format

Positive confirm

Confirm Code Hex.	Double Word Value		
yy/yyy			

yy/yyy
- double internal word DW   :   70/112
- double constant word CDW   :   71/113

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :
- Unknown request,
- Inadequate access rights,
- Word number out of range,
- Odd word number.

5.2-11 Read a Grafcet Step

This request reads the state of a Grafcet step.

Request format

Request Code Hex.	Category Code	Type of Step	Reserved	Macro-Step Number	Step Number
4B/75	0 → 7		00		

Type of step :   0 : Grafcet step,
                          1 : Macro-step,
                          2 : Macro-step entry step,
                          3 : Macro-step exit step,
                          4 : Macro-step step.

Macro step nbr. :   Comprises the number of the required macro-step or 0 if the step type is 0.

Step nbr. :   Comprises the number of the required step or 0 if the step type is 1, 2 or 3.

Confirm format

Positive confirm

Confirm Code Hex.	Active Step	Not Used		Not Used	Inhibited
7B/123		00	00	00	

Active step :   0 → no,
                        1 → yes,
Inhibited step :   0 → no,
                        1 → yes.

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection : • Unknown request,
                              • Inadequate access rights,
                              • Step number out of range.

5.3 UNI-TE Write Requests

5.3-1 Write an Internal or System Bit

This request sets either an internal bit B or a system bit SY to 1 or to 0.

Request format

Request Code Hex.	Category Code	Bit Number	Bit Value
xx/xx	$0 \rightarrow 7$		

xx/xx
- internal word B : 10/16
- system word SW: 11/17

Bit value : $0 \rightarrow$ state 0,
                $1 \rightarrow$ 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.

5.3-2   Write an Internal or System Word

This request writes the content of an internal word W or system word SW.

Request format

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

xx/xx
- internal word W   :   14/20
- system word SW   :   15/21

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.

5.3-3 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 addressing mode and the addressing field (in hexadecimal notation) :

                                10 :   Common object segment,
                                64 :   Internal bit zone segment,
                                68 :   Internal word zone segment,
                                69 :   Constant word zone segment,
                                6C :   Ctrl user task segment,
                                80 :   TSX Series 7 system object segment.

Type of object :   Specifies the object to write :

                                5   :   Internal bits,
                                7   :   16-bit signed integer,
                                8   :   32-bit signed integer,
                                64 :   Task period.

Object address :   • The physical or logical address in the segment,
                               • The sequence number of the object in the segment :
                                   -    0 : Current date and time, in the common segment,
                                   -    1 : Programming port configuration in the system
                                             segment.

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Write Objects (contd)

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection : • Unknown request,
 • Inadequate access rights,
 • Unknown object,
 • Address of the last object out of range.

Request Examples

Write words or double words
Segment : 68 (internal word segment)
Type of object : 7 → Wi   or 8 → DWi,
Object address : Index of the first Wi or DWi to write,
Quantity : Number,
Data : Table of n objects,

Write constant words or constant double words
Segment : 69 (constant word segment)
Type of object : 7 → CWi or 8 → CDWi,
Object address : Index of the first CWi or CDWi to write,
Quantity : Number,
Data : Table of n objects,

Write Date and Time
Segment : 10 (common object segment),
Type of object : 0 by default,
Object address : 0 → current time and date,
Quantity : 0 by default,
Data : 17 ASCII characters that contain the time and date information :
 YYYYMMDDHHMMSS.TN
 AAAA = year,
 MM = month,
 DD = day,
 HH = hour,
 MM = minute,
 SS = second,
 T = tenth of a second,
 N = day of the week.

Write programming port configuration

Segment   : 80 (system object segment),
Type of object : 0 by default,
Object address : 0 → programming port configuration,
Quantity   : 0 by default,
Data   : 1 byte that describes the new configuration.

Write task period

Segment   : 6C (Ctrl user task segment),
Type of object : 64 (task period),
Object address : 2 → Fast task,
                  3 → Master task,
                  4 → Auxiliary task 0,
                  5 → Auxiliary task 1,
                  6 → Auxiliary task 2,
                  7 → Auxiliary task 3,
Quantity   : 0 by default,
Data   : New task period within the time base allowed for each task
                   (FAST = 1 ms, MAST = 1 ms and AUXi = 10 ms).

Write internal bits

Segment   : 64 (internal bit segment),
Type of object : 5 (internal bits),
Object address : Logical number of first internal bit,
Quantity   : Number of bits to be written modulo 8,
Data   : Table of bytes containing the bit states. Each byte represents the
                   value of eight bits (forcing bits cannot be written)

5.3-4 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

Request Code Hex.	Category Code	I/O Module Location	I/O Bit Number	Bit Value
12/18	0 → 7			

Module location : Bit 0 to 2 : Module number,
Bit 3 to 6 : Rack number,
Bits 7 to 15 : Reserved (0).

I/O Bit number : 0 to 7 : For an 8-bit module,
0 to F : For a 16-bit module.

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,
• I/O module number out of range,
• I/O bit number out of range.

5.3-5 Write a Common Word

This request writes a common word.

Request format

Request Code Hex.	Category Code	Station Number	Common Word Number	Value
16/22	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,
  • RAM cannot be executed.

5.3-6   Write a Timer, Monostable or Counter Preset

This request writes the preset value of a timer (T), a monostable (M), or a counter (C) if it can be modified.

Request format

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

xx/xx
- timer T   :   17/23
- monostable M :   18/24
- counter C   :   19/25

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

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Negative confirm

Confirm Code Hex.
FD/253

Causes for rejection :
- Unknown request,
- Inadequate access rights,
- Timer number out of range,
- Preset cannot be modified,
- Preset value out of range,
- RAM cannot be executed.

5.3-7   Write a Register Input Word

This request writes a register input word (R).

Request format

Request Code Hex.	Category Code	Number Register	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.

5.3.8   Write a Double Word

This request writes a double word (DW).

Request format

Request Code Hex.	Category Code	Double Word Value		Double Word Value			
46/70	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,
- Odd word number.

5.3-9   RUN/STOP

The RUN request sets a device to run.
The STOP request stops a device.

Request format

Request Code Hex.	Category Code
xx/xx	$0 \rightarrow 7$

xx/xx
- RUN   :   24/36
- STOP   :   25/37

Attention :   Depending on the type of device, 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 Text Block Reminders

5.4-1 Description

A text block is a programming object that can be used by the user program for exchanging data (word tables) with various entities. There are five types of text block that characterize the type of exchange that can be performed. The type is defined when the text block is defined and is set at that time. The various types of text block and the exchanges they can perform are listed below :

TXT Type   User program $\leftrightarrow$ Another user program,
CPL Type   User program $\leftrightarrow$ Intelligent module or UNI-TELWAY bus,
TER Type   User program $\leftrightarrow$ PLC programming port,
SYS Type   User program $\leftrightarrow$ System of a connected device,
TLG Type   User program $\leftrightarrow$ User program (short, priority messages).

> Dialog between a PLC and other devices connected to the MAP/802.3 network uses TXT type text blocks for application-to-application exchanges (word table transfers) and SYS type text blocks for UNI-TE message handling system.

5.4-2 Communication by TXT Text Block

TXT text block functions comprise :

- A text block number   TXTi,
- An exchange type   TXT,
- A communication type   Network (NET),
- A start of table address   eg : W10,
- A reception table length   eg : 12 bytes,
- A transmission table length   TXTi,L (in bytes),
- Input bits :   Literal Language   Ladder Language
  Start transmission   OUTPUT TXTi   S, O = 1,
  Start reception   INPUT TXTi   S, I = 1,
  Start transmission and reception EXCHG TXTi   S, I, O = 1,
  Cancel exchange   RESET TXTi   R = 1,
- Output bits :
  Exchange complete   TXTi,D,
  Exchange error   TXTi,E,
- Status word   TXTi,S,
- Report word
  (usable when TXTi,S = 12)   TXTi,V,
- Destination text block number   TXTi,T,
- Destination address   TXTi,A.

The TXT text block function exchanges data as word tables that are organized as shown below :

- A transmission table comprising internal words (Wi) or constant words (CWi),
- A reception table comprising internal words (Wi) that allow the destination station to store the data received.

TXTi,D : This bit goes to 1 when the text block completes its exchange (see section 3.3),

TXTi,E : This bit goes to 1 if an exchange error occurs (see section 3.3),

TXTi,S : This word comprises the number of bytes received in the reception table of the text block if the exchange is correct. If an exchange error occurs, TXTi,S takes the following values :
- 1 : Exchange cancelled by Reset,
- 2 : Transmission table length error,
- 3 : Power supply failure (see section 3.3),
- 4 : Module failure,
- 5 : Parameter error or too many active TXTs,
- 6 : Message received is too long,
- 10 : Incorrect addressing of the indirect text block,
- 12 : Message refused (refer to TXTi,V),
- 13 : Routing error,
- 14 : Resource error,
- 20 : Other error.

TXTi,V : If parameter TXTi,S is set to 12 (message refused), word TXTi,V indicates the type of refusal :
- 1 : Inadequate bus resources,
- 2 : Inadequate line resources,
- 3 : Cannot access destination,
- 4 : Line error,
- 5 : Length error,
- 6 : Network fault,
- 7 : Address error,
- 8 : Unknown request code,
- 9 : Inadequate PLC resources,
- 10 : Time-out exceeded,
- 255 : Other error.

TXTi,A : Contains the destination address (network, station), in the form :

TXTi,A = H' | Network Nbr. | Station Nbr. |

          1 byte   1 byte

If the messages are broadcast to all stations on the same network segment (broadcast messages), the station number is set to H'FF'. Transmission of broadcast messages to the entire network architecture is not possible.
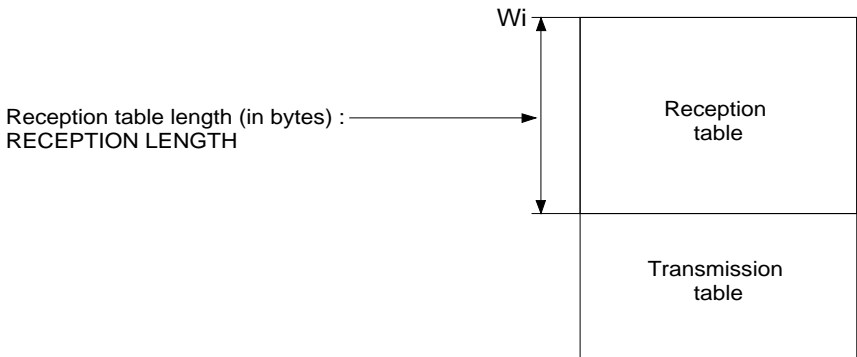
The reception table length is set when the text block is configured. It cannot be changed by the user program.

The address of the word table to send and of the reception table where the words received are stored can be specified in two ways :

• By direct addressing : the address is the first word of the table,
• By indirect addressing : the address is stored in a table.

Direct addressing

The text block reception table is stacked on top of the transmission table as shown below. The start address (ADDR BUFFER) and the length, in bytes, of the reception table (RECEPTION LENGTH), are defined when the text block is configured.

The transmission table length is defined by the user program, in variable TXTi,L of the text block. It can be changed during program execution.

Example

Text block number TXT0,

Start of table address : W10,

Reception table length : 12 bytes,

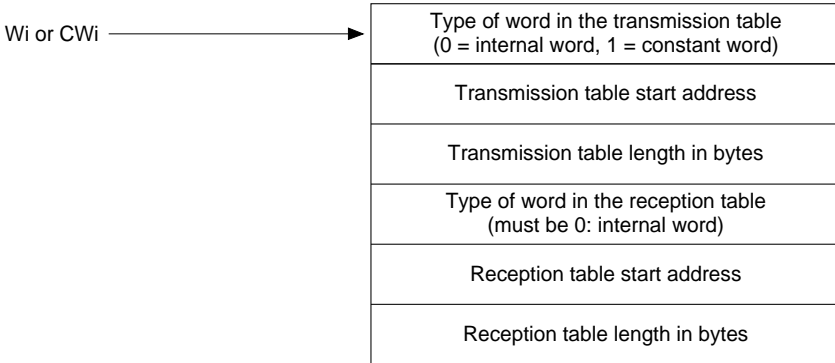Transmission table length : TXT0,L = 8 bytes.
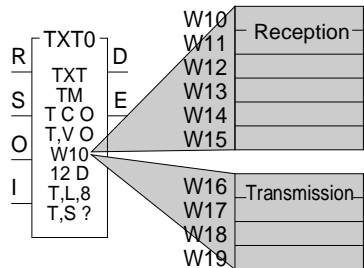
Special cases

When the text block is only used to send data :

• The reception table length can be null,

• The start of table address (ADDR BUFFER) is also the transmission table address,

• The table can be located in the internal words (Wi) or in the constant words (CWi).

Indirect addressing

The text block transmission and reception tables are defined by a six word addressing table which must contain the information listed below :

Wi or CWi ⟶

Type of word in the transmission table (0 = internal word, 1 = constant word)
Transmission table start address
Transmission table length in bytes
Type of word in the reception table (must be 0: internal word)
Reception table start address
Reception table length in bytes

Only the start address (Wi or CWi) of the addressing table must be defined when the text block is defined.

Example

Text block TXT1, indirect addressing, addressing table = W20.
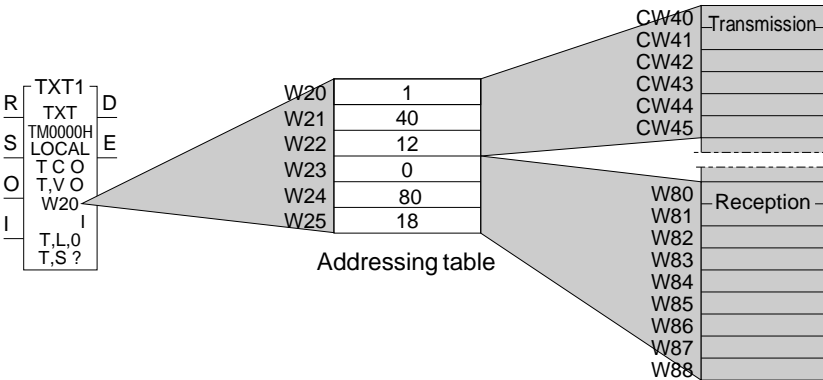
The addressing table defines the transmission and reception tables. It is composed of internal words W20 to W25 which contain the following information :

W20 : Indicates the type of words in the transmission table : 1 = Constant words,

W21 : Indicates the address of the transmission table : 40 → CW40,

W22 : Indicates the transmission table length : 12 bytes or 6 words. The last word in the transmission table is therefore constant word CW45,

W23 : Indicates the type of words in the reception table : 0 = Internal words,

W24 : Indicates the address of the reception table : 80 → CW80,

W25 : Indicates the reception table length : 18 bytes or 9 words. The last word in the reception table is therefore internal word W88.

5.4-3 Communication by SYS Text Block

The system (SYS) text block is used to communicate with certain system functions of a device connected to MAP/802.3 (PLCs or other vendor's device). This type of communication uses UNI-TE requests.

SYS text blocks comprise :

- A text block number   TXTi,
- An exchange type   SYS,
- A communication type   Network (NET),
- A start of table address   eg : W10,
- A reception table length   eg : 4 bytes,
- A transmission table length   TXTi,L (in bytes),
- UNI-TE request code   TXT,C,
- An exchange report   TXTi,V,
- A network and station address word TXTi,A.
- A status word   TXTi,S,
- Input bits :   Literal Language   Ladder Language
  Start transmission   OUTPUT TXTi   S, O = 1
  Start reception   INPUT TXTi   S, I = 1
  Start transmission and reception   EXCHG TXTi   S, I, O = 1
  Cancel exchange   RESET TXTi   R = 1
- Output bits :
  Exchange complete   TXTi,D
  Exchange error   TXTi,E

Parameters TXTi,D; TXTi,E; TXTi,A; TXTi,S and TXTi,V have the same meanings as those in TXT type text blocks.

TXTi,C : Contains the code of the request to execute, in the form :

TXTi,C = H' | Category Code | Request Code |

          1 byte   1 byte

The category is that of the source. It takes the value 07. The other codes are reserved.
The request code is that of the request used (refer to the list of UNI-TE requests in the Appendix).

The request data is located in the text block transmission table. The report is located in the reception table if the text block was programmed in EXCHG.

TXTi,V : This word comprises the code written by the system, indicating exchange validity.

All other programming is performed in the same way as a TXT text block. The other bits and words have the same meaning.
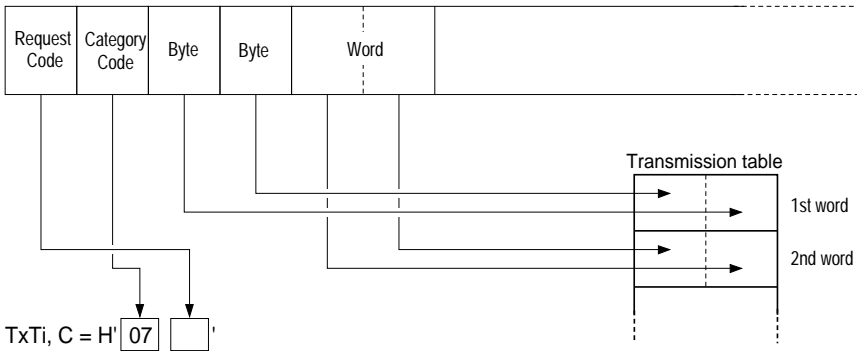
Example

TXTi,A = H'0105' corresponds to a destination station at address 5 on network 1,

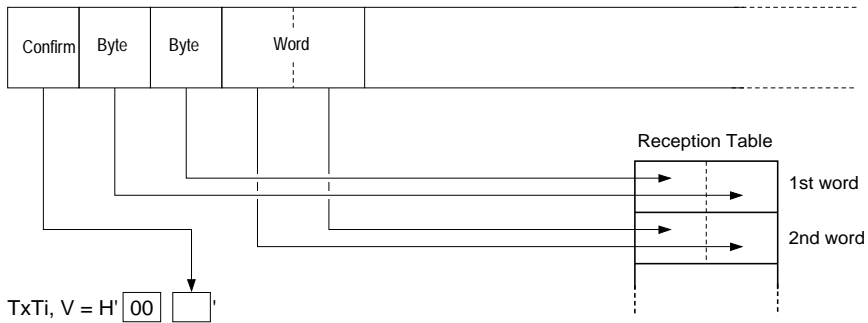TXTi,C = H'0706' corresponds to a PLC sending the "read system word" request (request code H'06').

5.4-4   Table Layout

The relations that exist between the structure of a confirm request and the parameters of a text block are :

Transmission

Reception

5.5   List of manuals referred to in this document

During installation of an application using a TSX ETH 200 module, the following manuals may be of assistance :

- ETHWAY reference manual, TSX DR ETH V5E, for wiring an 802.3 network.
- PL7-OSI program manual, TXT DM SSP V5E, for using MMS services
- PL7-COM program manual, TXT DM PL7 CMM V5E, for programming UNI-TE services.
- PL7-NET program manual, TXT DM PL7 NET V5E, for configuring multinetwork architecture.
- PL7-3 operating manual, TXT DM PL7 3 V5E, for configuring COM words.