Contents

TSX SCM 21.6 Channel 1 - Uni-Telway Bus - User's Manual

Presentation

This manual complements the Uni-Telway Reference Manual, TSX D 24004F
It is designed to assist the user in implementing and programming channel 1 Qf TSX SCM 21.6 serial communication modules in the TSX Series 7 family of modular PLCs:

. V3: TSX 47-20/47-30, TSX 67-20, TSX 87-30,
. Model 40: TSX 47-40/67-40/87-40/107-40.

There is a similar manual (TSX D 24007 F) for use with TSX 17-20 Micro-PLCs.

Both channels of a TSX SCM 21.6 module may be used simultaneously with Channel 0 running in character string mode and Channel 1 supporting the Uni-Telway master or slave protocol. When using both channels in an application, the information given in Appendix 4.8 should be taken into account.

1 Presentation

1.1 General

Uni-Telway

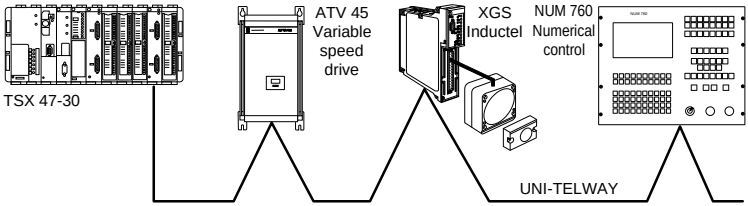
The Uni-Telway industrial bus is the standard means of communication between Telemecanique's control devices including: PLCs, operator dialog terminals, variable speed drives, numerical controls, weighing indicators.

Uni-Telway can also simplify communication with devices from other vendors, such as supervision and control computers.

Uni-Telway can be used for two types of application:

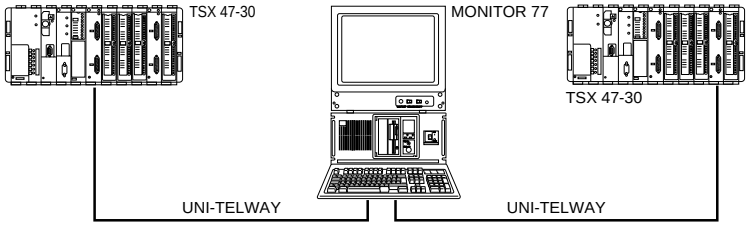
. **Control and surveillance of system devices by PLC:**

Devices such as ATV5 variable speed drives, LT8 protection relays, ASN specialized couplers, numerical controls.



. **Man-Machine dialog and supervision:**

Devices such as XBT operator dialog terminals or Monitor 77 and the capacity to support open communications with networks and computers from other vendors.



Uni-Telway requires:

. **1 Master**

This device supervises the data link and checks its operation. It controls the allocation of bus access time to the various connected devices. This location comprises a modular TSX Series 7 PLC equipped with a TSX SCM 21.6 serial communication module.

. **1 to 27 Slaves**

1 Presentation

General

The services available depend on the connected devices. Services are accessed through a standard or specific question and answer dialog.

Standard requests are described in the Uni-Telway Reference Manual. Requests that are specific to TSX Series 7 PLCs are described in the Appendix of this manual.

Operating Modes

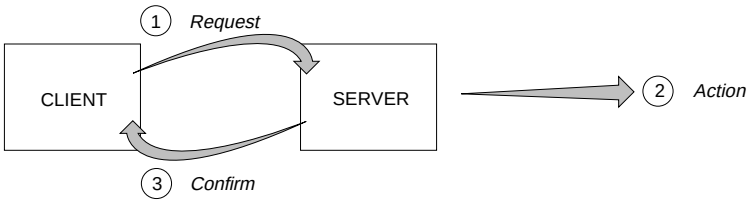
Depending on the configuration of its TSX SCM 21.6 module, a PLC can be:
. a Master and support Client and/or Server status,
. a Slave and support Client and/or Server status.
The TSX SCM 21.6 module controls the physical and data link layers of the Uni-Telway protocol. It performs the routing to and from the PLC processor that handles Uni-Telway protocol control.

A TSX SCM 21.6 module can act as the Uni-Telway bus master on power-up, regardless of the status of its host PLC. Communication between devices can commence.

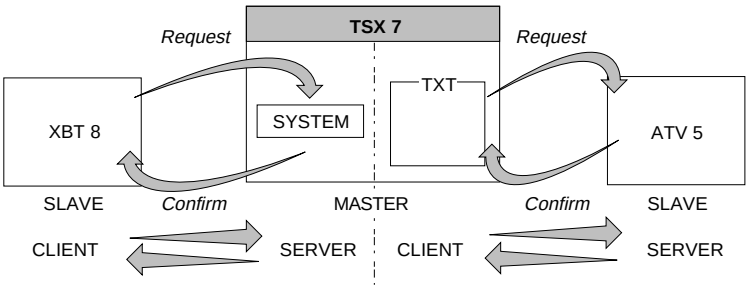
Reminders

CLIENT : The device that initiates communications. It asks questions (reads), sends answers (writes) or orders (Run, Stop, etc.).

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



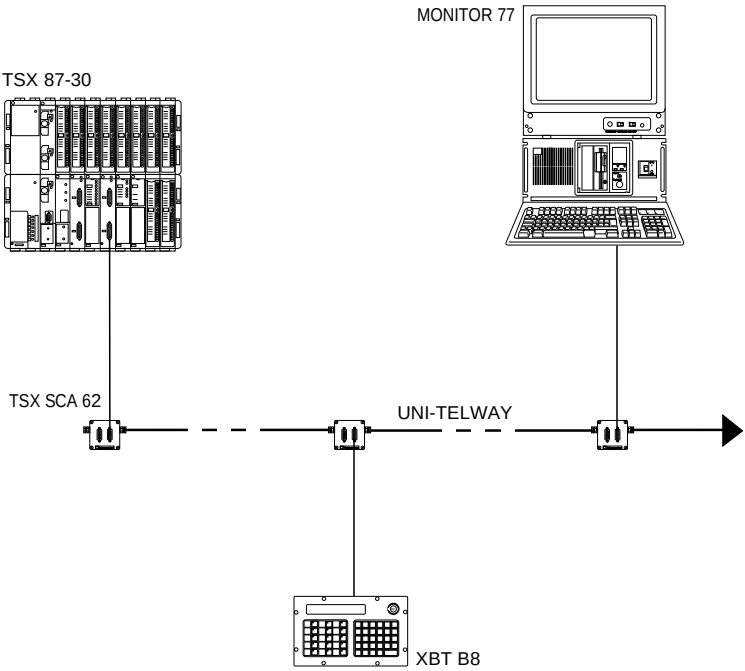
A PLC is a server for its system tasks (programming, adjust, diagnostics). It is also a Client of other PLCs (and machine tool numerical controls, sensors, actuators) via the user program text blocks (when sending commands, reading status data).



Important : Being a Client or a Server is completely separate from the master/slave relationship on the bus.

1 Presentation

1.2 PLC - Monitor 77 or XBT



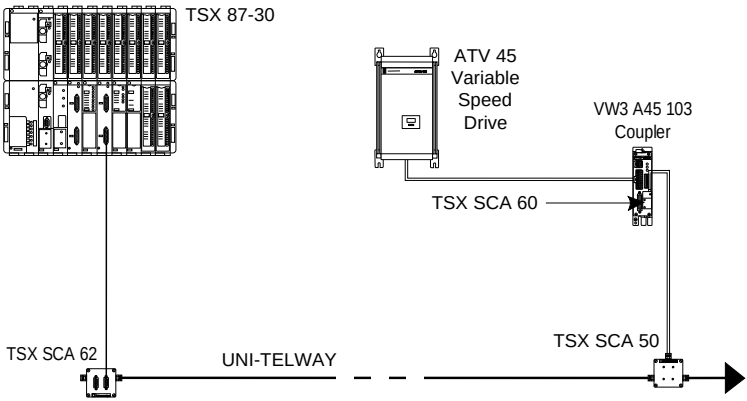
PLC The TSX SCM 21.6 module is the data link **master**. The PLC system is a **server** that answers requests from Monitor 77 and XBT terminals.

Monitor 77 A **slave** with **client** status. It requests information from the PLC to control the database of TSX Series 7 objects according to the application description that it is given.

XBT A **slave** with **client** or **server** status.
As a **client** it can be used to adjust TSX Series 7 PLCs (adjust bits, words, function blocks, etc.).
As a **server** it can display messages received, etc.

1 Presentation

1.3 PLC - Sensors and Actuators



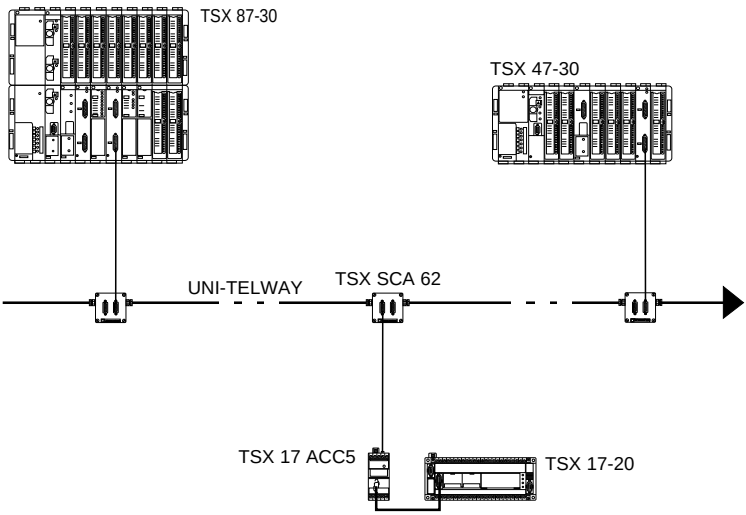
PLC The TSX SCM 21.6 module is the data link **master**. The application program, via a text block is a **client** that can:

. start and stop the ATV 45,
. set the acceleration or deceleration slopes,
. indicate a direction of motion (forward or reverse),
. display a velocity instruction,
. request information (status, reading values),
. etc.

ATV 45 A **slave** with **server** status. It can provide the PLC with various types of information:

. mains voltage,
. stator current,
. rotation frequency,
. thermal status,
. etc.

1.4 PLC - PLC



PLCs

In the configuration illustrated above, the TSX SCM 21.6 module in the TSX 87-30 PLC is the data link **master**.

The TSX 17-20 PLC and the TSX SCM 21.6 module in the TSX 47-30 PLC are **slaves**.

Each PLC is a **client** via its application program and a **server** via its system.

2 Implementation

2.1 Description and Connection

Description

TSX SCM 21.6 Serial Communication Modules are intelligent modules that comprise two fully independent asynchronous serial links. They use the same hardware as TSX SCM 20 and TSX SCM 22 modules.

The following functions are available on each channel:

. channel 0 : - Half-duplex character string,
. channel 1 : - Uni-Telway master protocol,
- Uni-Telway slave protocol.

The transmission function and characteristics of each channel are set when the module is configured.

Channel 1 can start-up on its configuration by default (Uni-Telway master or slave).

Only the Uni-Telway master and slave protocols are described in this manual. For information on character mode operation refer to the TSX SCM 20/21/22 character mode user's manual (TSX D23 004E).

Connection at the PLC End

The TSX SCM 21.6 module is a standard sized module that operates in a locations reserved for intelligent I/O modules. Refer to the appropriate PLC installation manual for further information.

The standard factory coded locating devices prevent any risk of error when installing or changing a module.

Reminder : Depending on the type of PLC selected, configuration codes are:

PLC	Hardware Code	Software Code
TSX 47-20	69	63
TSX 67/87/47-30	697	697

Number of Modules

The table below lists the number of TSX SCM 21.6 modules running either Uni-Telway master or slave protocols that can be installed in TSX Series 7 PLCs.

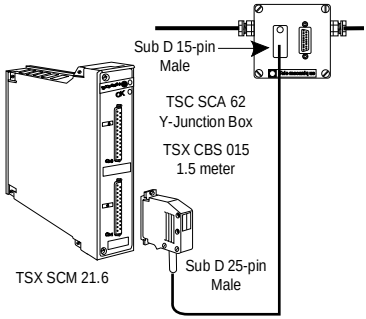
PLC	Software version	Number of modules
TSX 47-20	V4	1
TSX 47-30/67-20	V3	2
TSX 87-30	V3	4

Prior versions of these PLCs do not support Uni-Telway.

Description and Connection (Cont'd)

Connection to the Bus

A TSX SCM 21.6 module is connected to the Uni-Telway bus via a TSX CSB 015 cable and a TSX SCA 62 Subscriber Socket. This cable is fitted with a 25-pin male sub-D connector on the TSX SCM 21.6 end and with a 15-pin male sub-D connector on the TSX SCA 62 end.



In certain special cases, it is possible to connect the module differently:

. as a dedicated Uni-Telway data link (TSX SCM 21.6) but using a specific physical interface cable (for example a special point to point TSX 7 - XBT cable removing the need for TSX SCA 62 Subscriber Sockets).

. with a non-standard physical interface (RS-232C) used as a dedicated data link (e.g. TSX 7s connected together by modem,). In this case the data link is not a Uni-Telway bus but a specific data link using the Uni-TE protocol (as with a TSX SCM 2111 module).

Refer to the pin arrangement given in the Appendix when making specific connections.

Caution : Whenever a specific connection is used, TSX SCM 21.6 modules cannot start-up using their configuration by default. It is therefore up to the user program to send configuration parameters by text blocks.

2 Implementation

2.2 Configuration

Configuration by Default

TSX SCM 21.6 modules located in slots reserved for intelligent modules in TSX Series 7 PLCs will start-up with their configuration by default when connected to a TSX SCA 62 Subscriber Socket via a TSX CSB 015 cable.

Depending on the address set on the micro-switches in the subscriber socket, the configuration by default is:

. Uni-Telway master if the address is equal to 0,
. Uni-Telway slave if the address is not 0 (1 to 31).

The parameters of the configuration by default are:

Uni-Telway master :

. poll 31 data link addresses,
. binary data flow: 9600 bits/second,
. time-out: 30 ms,
. 8 bytes of events data.

Uni-Telway slave :

. system address set by the subscriber socket connected to the module,
. binary data flow: 9600 bits/second,
. time-out: 100 ms,
. no "client" application address (request - confirm),
. no "line monitoring" application address (unsolicited data).

Changing the Standard Configuration

If the standard configuration loaded by default is inadequate (unsuitable data flow rate, number of stations polled, use of "client" or "line monitoring" application addresses, etc.) or if the wiring is specific, a new configuration designed specifically to meet the user's requirements must be sent by the application program (sending a parameter table by text block).

This table comprises 5 memory words (10 bytes).

Their coding is entered in:

. Hexadecimal: function, number of polled link addresses, addresses,
. BCD: binary data flow, time out.

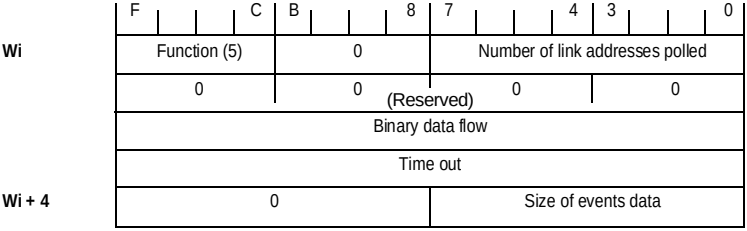
Important : When TSX SCM 21.6 modules are connected to a TSX SCA 62 Subscriber Socket, the software configuration must have the same settings as the subscriber socket; function code for Uni-Telway master or slave and Uni-Telway system address for a Uni-Telway slave. If there is any difference in the settings, the hardware setting overrides the software.

2 Implementation

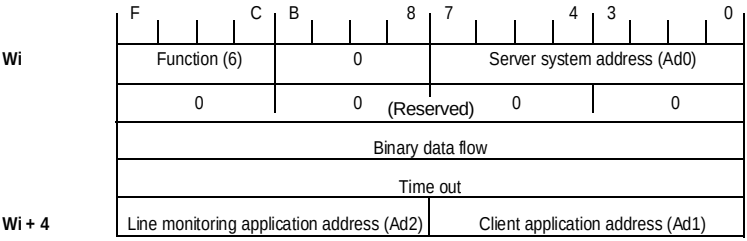
Configuration (Cont'd)

Table Structure

Uni-Telway master



Uni-Telway slave



Parameter Meanings

Function : Specifies the channel operating mode:
- . 5 = Uni-Telway master,
- . 6 = Uni-Telway slave.

Nbr. of link addresses : 152 addresses max. polled by the master, 27 addresses max. if a TSX 47-20 is master.

Binary data flow : 300, 600, 1200, 2400, 4800, 9600 or 19200 Bits per second (bps),

All devices connected to the bus must have the same binary data flow.

Time-out :

This indicates the maximum authorized period of time between the end of message transmission (request, selection, etc.) and acknowledgement by the destination station. The time value is coded in BCD with a time base of 10 milliseconds (ms). The minimum time is that of the slowest device connected to the bus and must always at least equal the time required to send 10 characters on the line (e.g. : 80 ms at 1200 bps).

Size of events data :

Events data is sent to the master on the initiative of a slave station. The size of data processed by TSX SCM 21.6 modules is 8 bytes max. for the first 32 slaves on the bus (refer to Sub-section 3.2).

Configuration (Cont'd)

Server system address (Ad0) :

This address is coded in the subscriber socket that the module is connected to. It allows access to the slave PLC's system (adjust, diagnostics, program up/ download functions, etc.).

Client application address (Ad1) :

This address is assigned by configuration to the slave module. It enables messages to be sent to or received from other devices connected to the Uni-Telway bus, whether they require an answer or not.

Line monitoring application address (Ad2) :

This address is assigned to the slave module by configuration. It enables the reception of unsolicited data from other devices on the Uni-Telway bus.

When the configuration of a slave PLC is sent and addresses Ad1 or Ad2 are not required, the corresponding byte in the configuration table must be set to zero.

Writing a Configuration

When the standard configuration is unsuitable for the application, the user must send a table of new parameters to the module. This new table is defined by internal words (Wi) or constant words (CWi) and is sent by text block.

Summary of text block parameters :

. Text block TXTi, local, CPL, direct or indirect addressing,
. TXTi,M = module address (rack, slot) and channel nbr. = 01,
. TXTi,C = configuration write request code : H'0040',
. TXTi,L = length of the table to send to the module : 10 bytes.

These variables can be initialized by program or by configuration if the TSX T607 terminal is running software version V3.0 or higher.

The exchange is started by:

. Setting text block inputs S,I,O to 1 (in Ladder),
. EXCHG TXTi in Literal.

The end of the exchange is indicated by TXTi,D = 1 and TXTi,E = 0.

The confirm TXTi,V (TXTi,R for TSX 47s) can take one of two values:

H'00FE' correct configuration, accepted and stored by the module,

H'00FD' incorrect configuration, rejected by the module. The previous configuration is retained (parameter out of bounds, TXTi,L > 10,...).

Configuration (Cont'd)

Example

Configuring a station (TSX SCM 21.6 located in rack 2, slot 5) with the following characteristics:

. Uni-Telway master (function = 5),
. poll 15 data link addresses (H'0F'),
. binary data flow = 19200 bps,
. time-out = 40 ms,
. 8 events bytes reserved by slaves.

The transmission table located after internal word W100 comprises the following values:

W100 = H'500F'
W101 = B'0000'
W102 = B'1920' (binary data flow corresponding to 19200 bps),
W103 = B'0004' (40 ms = 4 x 10 ms),
W104 = B'0008'

The transmission table is sent to the module by text block TXT2.

The text block parameters are initialized by configuration:

```
      CONFIGURATION : TEXT
        NUMBER OF TEXT BLOCKS      N    :   3
    TXTi NETWORK  TYPE  ADDR  ADDR     RECEPT     A      T      M      L    C
         LOCAL          MODE  BUFFER   LENGTH
     0   LOCAL   CPL   DIR              0                    H'00FF'   0  H'0000'
     1   LOCAL   CPL   DIR              0                    H'00FF'   0  H'0000'
     2   LOCAL   CPL   DIR   W100       0                    H'2501'  10  H'0040'
```

Loading of the module configuration by the application program is triggered by EXCHG TXT2 if the program is in Literal or by setting inputs S,I,O in Ladder language.

2.3 Checking Communication

Once the configurations of the various TSX SCM 21.6 modules are loaded, the user has various ways of checking performance, such as:

. the register words of the various modules,
. the "read station status" request,
. the TSX TS4 310 diagnostics cartridge that checks which devices are connected to the bus, identifies the stations and performs complete bus diagnostics.

Register Words

The following register word bits are significant when set to 1 and indicate:

1) master PLC

. IWxy,0,3 module ready,
. IWxy,0,4 general fault,
. IWxy,0,B no channels configured,
. IWxy,0,C module in Run,

. IWxy,3,0 one or more data link address do not reply

2) slave PLC

. IWxy,0,3 module ready,
. IWxy,0,4 general fault,
. IWxy,0,B no channels configured,
. IWxy,0,C module is in Run,

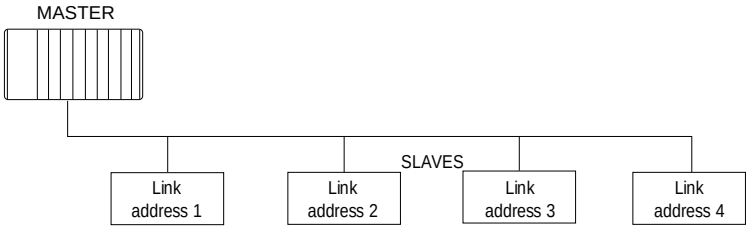
. IWxy,3,0 no polling on the line,
. IWxy,3,1 address Ad0 was not polled,
. IWxy,3,2 address Ad1 was not polled or is not configured,
. IWxy,3,3 address Ad2 was not polled or is not configured.

Station Status Read Request

When master PLC bit IWxy,3,0 is set to 1, bus status can be determined using the "read station status" request (request code A3).

This request is sent to channel 1 of the data link master module:

Example :



Checking Communication (Cont'd)

Transmission

This request is sent by master PLC text block TXT8. The master module is located in rack 0, slot 5 and the various parameters are:

. TXT8,M = H'0501' rack 0, slot 5, channel 01,
. TXT8,C = H'07A3' category code H'07', request code H'A3',
. TXT8,L = 0 no transmission table.

Depending on the language used, request transmission is triggered by the command EXCHG TXT8 or by setting inputs S,I and O of text block TXT8 to 1.

Reception

The answer code is given by parameter TXT8,V:

. TXT8,V = H'D3' for correct exchange,
. TXT8,V = H'FD' for incorrect exchange.

The reception table of text block TXT8 comprises:

. the number of stations controlled by the module (152 max. = H'98'),
. the status of each station, indicated by a succession of 152 bits (19 bytes), where the first bit gives the status of station 1, the second of station 2, and so on.

- bit x = 0 station x disconnected,
- bit y = 1 station y connected,

Once the text block exchange is complete, the reception table comprises the following parameters:

Wi = H'0998' ; Wi+1 = H'0000' ; Wi+2 = H'0000' ; ..... Wi+9 = H'0000'.

The least significant byte gives the number of stations controlled (98),

The most significant byte indicates whether stations are connected or not.

H'09' = L'1001' : stations 1 and 4 are connected,
stations 2 and 3 are disconnected.

Note : The data link master module always sends back the status of the stations connected to the network (152 max.) even if they are not all actually present. However, only those bits corresponding to the controlled stations are significant. The length of the text block reception table must be set correctly (10 words). If incorrect, the text block will generate an error during the exchange.

Diagnostic Cartridge

Register bits and words and the "read station status" request are automatically controlled by the TSX TS4 310 Adjustment Cartridge. For further information refer to the TSX T407 Adjustment Cartridge User's Manual.

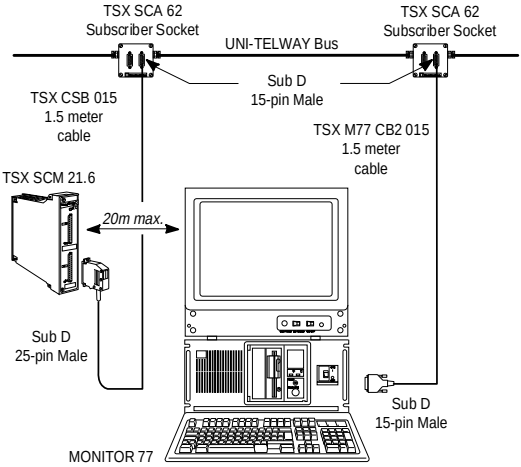
2.4 PLC - Monitor 77 or XBT Terminal

Monitor 77

Monitor 77, the TSX Series 7 supervision system can be connected to the Uni-Telway bus. The asynchronous serial link used conforms to Uni-Telway standards.

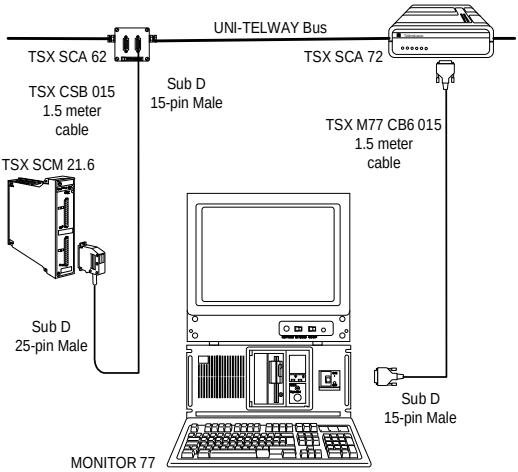
Monitor 77 is connected to the Uni-Telway bus via a TSX SCA 62 Subscriber Socket, or via a TSX SCA 72 Adapter Box.

TSX SCA 62 connection principles



Monitor 77 does not isolate signals, therefore the bus length is restricted to 20 meters. In practice, this means that most installations will be restricted to a point-to-point link between Monitor 77 and the PLC. The coding of the TSX SCA 62 Subscriber Socket should be 0 for the link with the PLC. No code is required on the Monitor 77 side as the address is defined in the Monitor 77 configuration.

TSX SCA 72 Adapter Box.



If the distance between the supervisor and the PLC is greater than 20 meters, it is recommended that the appropriate channel be fitted with a TSX RCA 1 Adapter connected to the TSX SCA 72 Adapter Box.

Important : Monitor 77 uses the first 15 Uni-Telway link addresses (1 to 15).

PLC - Monitor 77 or XBT Terminal (Cont'd)

XBT

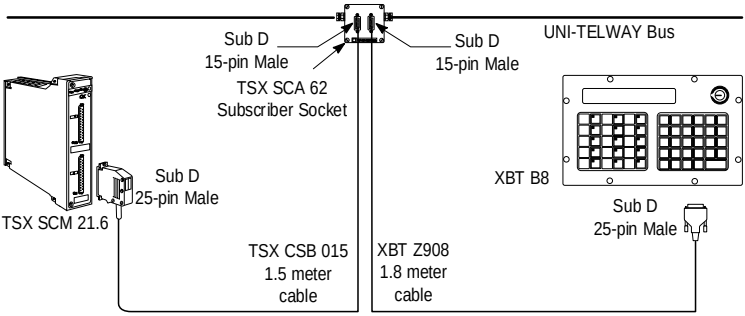
The XBT man-machine dialog terminal connects to the Uni-Telway bus. The asynchronous serial link that is used conforms to Uni-Telway standards:

The XBT 8 terminal can be connected in two different ways:

. to the Uni-Telway bus via a TSX SCA 62 Subscriber Socket,
. directly to the TSX SCM 21.6 module for point to point connections.

These two methods of connection automatically set-up the configuration of the TSX SCM 21.6 module.

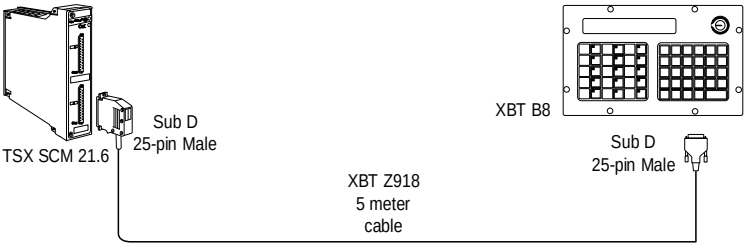
Connection to a TSX SCA 62 :



The coding of the TSX SCA 62 Subscriber Socket must be:

. 0 for the link with the TSX SCM 21.6 module,
. appropriate for the address assigned to the XBT 8 terminal.

Connection to a TSX SCM 21.6 module in point to point mode :



The addresses used are automatically designated by the XBT Z918 cable and are:

. 0 for a TSX SCM 21.6 module,
. 1 for an XBT 8 terminal.

2 Implementation

2.5 Using a Text Block

Reminders

Communication is essentially performed via a question and answer dialog referred to as Request/Confirm.

Request structure

A request comprises:
. the request code (one byte),
. the category code (one byte),
. parameters and/or data (126 bytes max. or limited to 30 bytes with a TSX 47-20).

Request Code	Category Code	Data

Confirm structure

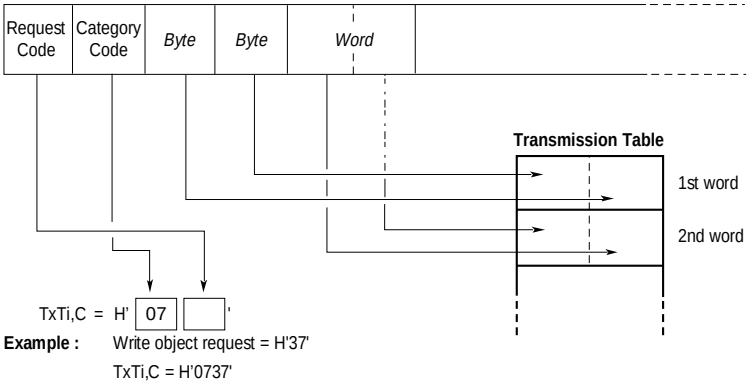
A confirm comprises:
. the confirm code (one byte),
. parameters and/or data (127 bytes max. or limited to 31 bytes with a TSX 47-20).

Report	Data

Master PLC

The request is sent by the application program from the Client master PLC by text block. This text block (set for EXCHG or with S, I and O at 1 depending on the language, for requests that require a confirm) must comprise all request parameters. The existing relationship between the structure of a request/confirm and the text block parameters are:

Transmission

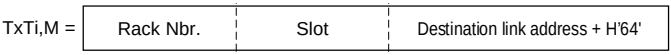


Example : Write object request = H'37'
TxTi,C = H'0737'

Note : The category code must always take the value H'07'.

Using a Text Block (Cont'd)

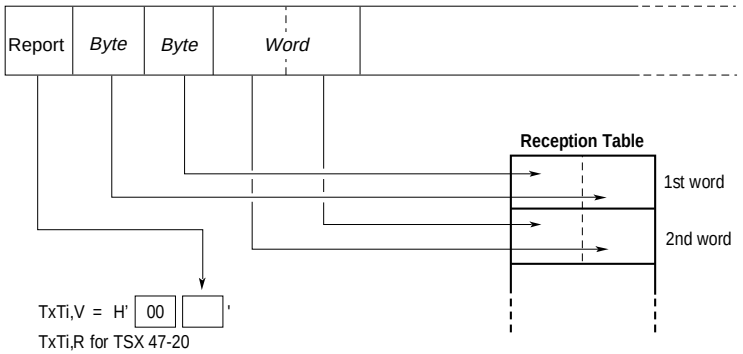
TXTi,M Comprises the physical location of the TSX SCM 21.6 module in the master PLC, followed by the data link address (encoded in hexadecimal) of the exchange destination slave increased by H'64'.



Example : TXTi,M = H'0365' corresponds to the master module located in rack 0, slot 3 addressing the slave at data link address 1.

TXTi,L Comprises the length of the transmission table (in bytes).

Reception



TXTi,S Comprises the number of bytes received in the text block reception table when a correct exchange is performed. If the exchange is incorrect, TXTi,S takes the following values:

1 : exchange cancelled by Reset,
2 : transmission table length error,
3 : exchange error (see Sub-section 2.8 and Appendix 4.8),
4 : module failure,
5 : parameter errors or too many active TXTs,
6 : message received too long,
10 : incorrect addressing of the indirect text block.

TXTi,D This bit goes to 1 when the text block completes its exchange.

TXTi,E This bit goes to 1 if an exchange error occurs (for further details refer to Sub-section 2.8 and Appendix 4.8).

Using a Text Block (Cont'd)

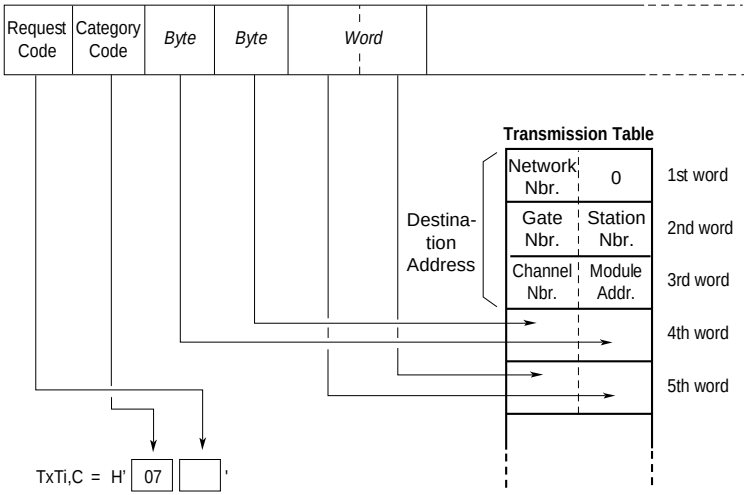
Slave PLC

The request is sent by the application program from the Client slave PLC via a text block. This text block (depending on the language selected, is set for EXCHG or S, I and O at 1, for requests that require a confirm) must comprise all request parameters.

When a slave PLC is a client, it must specify the address of the destination entity when sending a request. This address is coded in 5 bytes and must be included at the **start** of text block transmission table.

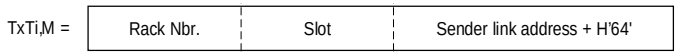
The existing relationship between the structure of a request/confirm and the text block parameters are:

Transmission from Ad1



Example : Read timer request = H'09'
TxTi,C = H'0709'

TXTi,M Comprises the physical location of the TSX SCM 21.6 module in the master PLC, followed by the data link address (encoded in hexadecimal) of the exchange **origin** slave incremented by H'64'.

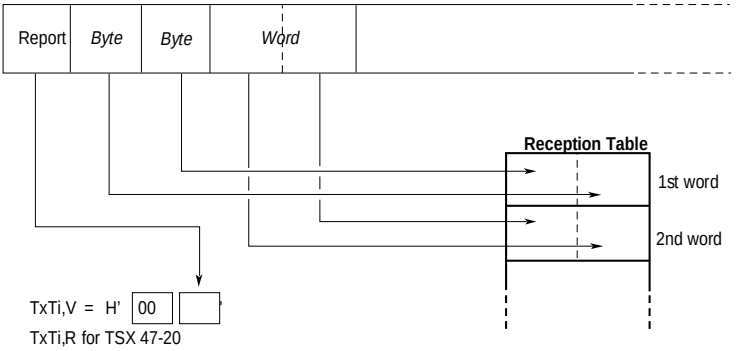


Example : TXTi,M = H'066B' corresponds to a slave module located in rack 0, slot 6 addressing a slave at data link address 7 (corresponding to Ad1).

TXTi,L Comprises the length of the transmission table (in bytes) including the destination address.

Using a Text Block (Cont'd)

Reception on Ad0



TXTi,S Comprises the number of bytes received in the text block reception table when a correct exchange is performed. If the exchange is incorrect, TXTi,S takes the following values:

1 : exchange cancelled by Reset,
2 : transmission table length error,
3 : exchange error (see Sub-section 2.8 and Appendix 4.8),
4 : module failure,
5 : parameter errors or too many active TXTs,
6 : message received too long,
10 : incorrect addressing of the indirect text block.

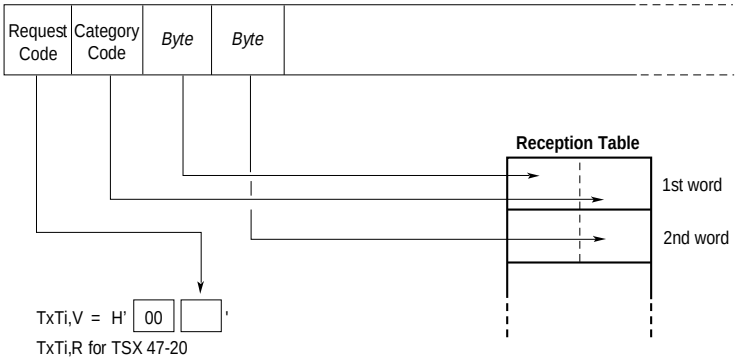
TXTi,D This bit goes to 1 when the text block completes its exchange.

TXTi,E This bit goes to 1 if an exchange error occurs (for further details refer to Sub-section 2.8 and Appendix 4.8).

Note

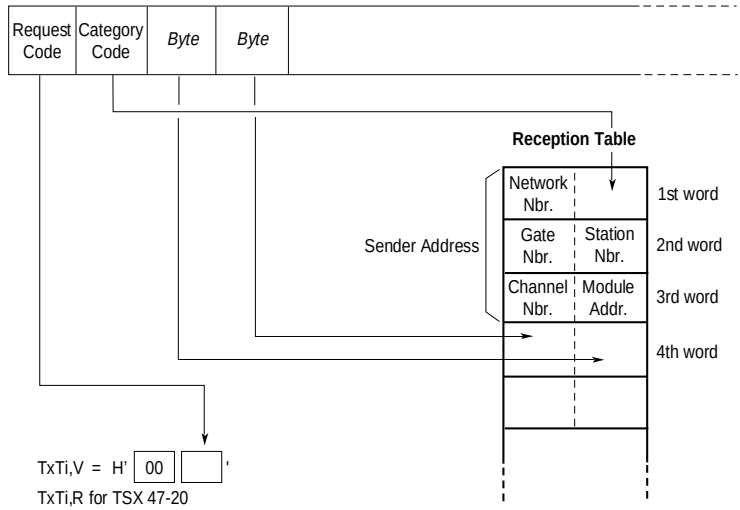
Receiving data via the master PLC's text block

When a slave PLC sends a request to the master PLC's text block, the parameters received by the destination text block are:



Using a Text Block (Cont'd)

Reception on Ad2 (text block in Input)



TXTi,S Comprises the number of bytes received in the text block reception table when a correct exchange takes place. If the exchange is incorrect, TXTi,S takes the following values:

1 : exchange cancelled by Reset,
2 : transmission table length error,
3 : exchange error (see Sub-section 2.8 and Appendix 4.8),
4 : module failure,
5 : parameter errors or too many active TXTs,
6 : message received too long,
10 : indirect text block addressing error.

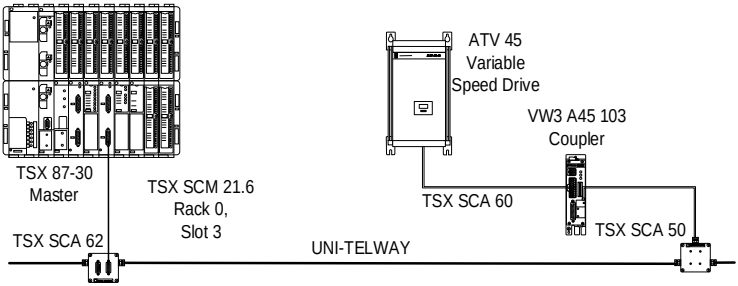
TXTi,D This bit goes to 1 when the text block completes its exchange.

TXTi,E This bit goes to 1 if an exchange error occurs (for further details refer to Sub-section 2.8 and Appendix 4.8).

2.6 PLC - Sensors and Actuators

Example

Reading the velocity reference of an ATV 45 variable speed drive.



Data

. ATV 45:

- Velocity reference = W193 (see ATV 45 documentation),
- Data link address = 1

. Read word request :

- request code = H'04' (see list of references)
- parameter = number of the word to read.

. Text block:

- The request is sent by application text block TXT2.
- Start of the transmission table = W164.
- Start of the reception table = W100.

Transmission

. Text block:

- TXT2,C = H'0704' category code = H'07', request code = H'04'
- TXT2,M = H'0365' rack 0, slot 3, link address = 1,
- TXT2,L = 2 length (in bytes) of the transmission table,
- Transmission table : W164 = 193 number of the word to read.

Reception

. Text block:

- TXT2,V = H'34' correct exchange confirm.
- TXT2,D = 1
- TXT2,E = 0
- Transmission table : W100 = 400 (velocity reference = 40 Hz).

ATV 45 documentation specifies that the velocity reference is expressed with a time-base of 0.1 Hz.

2.7 PLC - PLC

Presentation

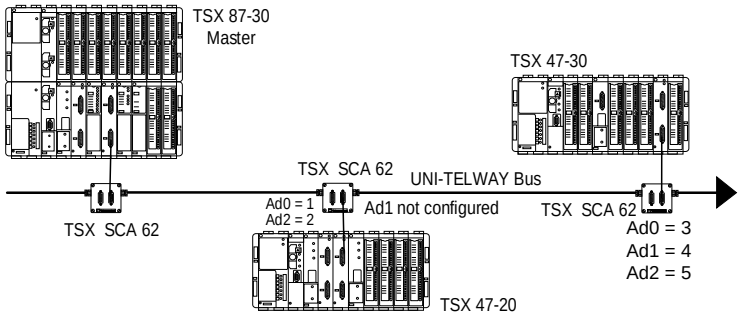
Dialog between PLCs connected to the Uni-Telway bus uses text blocks. The transmission text block can send its messages or data to:

. the system gate of the PLC that is the destination of the exchange (access to all standard and specific requests as described in the Appendix).
. an application program text block (message system access).

The table below shows all the various possibilities for dialog between a master PLC and slave PLCs:

MASTER PLC		SLAVE PLC		SLAVE PLC
Text block	- - - - - - - - →	System gate		
System gate	← - - - - - - - -	Text block		
Text block	- - - - - - - - →	Text block		
Text block	← - - - - - - - -	Text block		
		Text block	- - - - - - - - →	System gate
		Text block	- - - - - - - - →	Text block

Each of the possibilities listed above will be described in an example corresponding to the bus layout shown below:



PLC - PLC (Cont'd)

Addressing

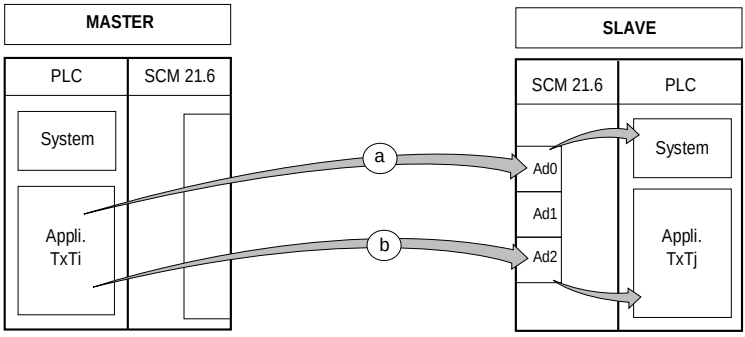
3 data link addresses can be assigned to a slave PLC :
. Address Ad0 (system address),
. Address Ad1 (client application address),
. Address Ad2 (line monitoring application address).

Logical entities (slave PLC processor)		*Example of SCM slave channels*	*Uni-Telway link address channels*
Answers requests	**SYSTEM**	67	Ad0 (3 = 67 - 64)
Sends requests to a server device on Uni-Telway	**CLIENT APPLICATION**	68	Ad1 (4 = 68 - 64)
Receives the "Unsolicited Data" request	**LINE MONITORING APPLICATION**	69	Ad2 (5 = 69 - 64)

Access to the system gate is always available through address Ad0. This address is coded in the TSX SCA 62. Access to specific client application (Ad1) and line monitoring (Ad2) addresses are optional. When these addresses are used, they need to be configured first.

Various Types of Exchange

Master to slave exchange

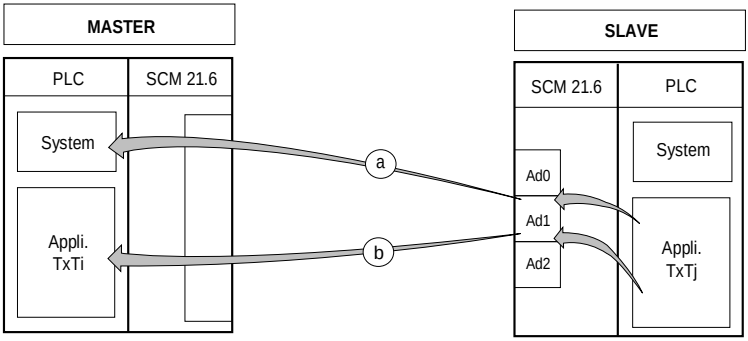


a) Master —> Ad0
For communication from the master application program (text block) to the system of the slave PLC (access to PL7 objects).

b) Master —> Ad2
To send messages from the master application program (text block) to the application program of the slave PLC (text block).

PLC - PLC (Cont'd)

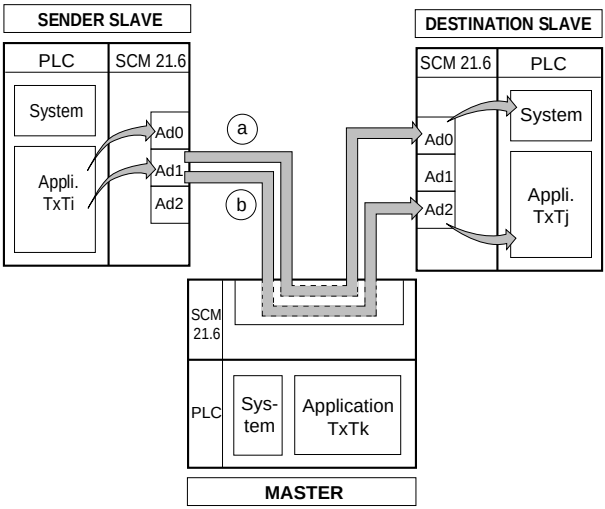
Slave to master exchange



a) Slave (Ad1) —> Master
For communication from the application program of the slave (text block) to the system of the master.

b) Slave (Ad1) —> Master
To send messages from the application program of the slave (text block) to the application program of the master (text block).

Slave to slave exchange



a) Sender slave (Ad1) —> Destination slave (Ad0)
For communication from the application program of the sender slave (text block) to the system of the destination slave.

b) Sender slave (Ad1) —> Destination slave (Ad2)
To send messages from the application program of the sender slave (text block) to the application program of the destination slave (text block).

PLC - PLC (Cont'd)

List of standard and specific services :

Family	Service	Request		Confirm		Description
		Hex.	Dec.	Hex.	Dec.	
Variable Management (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, bit or word strings ...).
	Read a System Bit	01	01	31	49	Reads a system bit (SY).
	Read Memory Image of an I/O Bit	02	02	32	50	Reads the 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 mono-stable (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 Grafcet Steps	2A	42	5A	90	Reads Grafcet steps (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 double constant word.
	Read a Grafcet Step	4B	75	7B	123	Reads a Grafcet step.

(*) Standard requests that are described in detail in the Appendix of the Uni-Telway Reference Manual, sub-section 5.4.

Only specific requests are described in the Appendix to this manual, sub-section 4.3.

PLC - PLC (Cont'd)

Family	Service	Request		Confirm		Description
		Hex.	Dec.	Hex.	Dec.	
Variable Management (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 ...).
	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 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 Timer Preset	17	23	FE	254	Writes a timer preset (T).
	Write Monostable Preset	18	24	FE	254	Writes a monostable preset (M).
	Write Counter Preset	19	25	FE	254	Writes a counter preset (C).
	Write Register Input	1A	26	FE	254	Writes a register input (R).
	Write a Double Word	46	70	FE	254	Writes a double word (DW).
Unsolicited Data	Unsolicited Data (*)	FC	252	X	X	Sends data without first receiving a request.
Operating Mode Management	RUN (*)	24	36	FE	254	Sets a device to RUN.
	STOP (*)	25	37	FE	254	Sets a device to STOP.

(*) Standard requests that are described in detail in the Appendix of the Uni-Telway Reference Manual, sub-section 5.4.

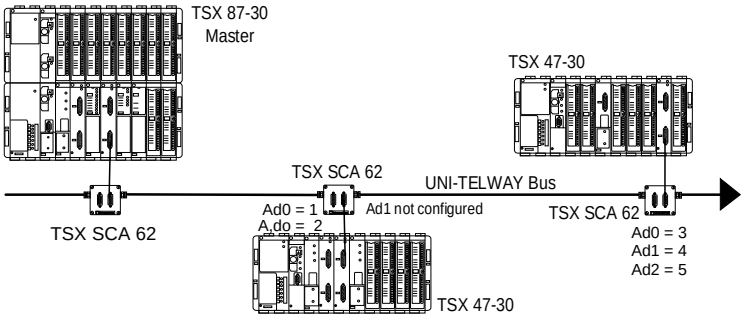
Only specific requests are described in the Appendix to this manual, sub-section 4.3.

Note : Other standards and specific requests are supported by PLCs. These are used for specific applications (e.g. programming and diagnostics from Telemecanique terminals). They are not described in this manual.

PLC - PLC (Cont'd)

Presentation of Examples

The various possibilities for communication between master and slave PLCs are described in the examples of dialog between devices connected to the Uni-Telway bus as shown below:



Example 1

Master (text block) —> **Slave (system gate)**

Read TSX 47-20 word W100 by TSX 87-30.

Example 2

Slave (text block) —> **Master (system gate)**

Read the parameters of TSX 87-30 timer T10 by TSX 47-30.

Example 3

Master (text block) —> **Slave (text block)**

Send the message "PIN FAULT" from the TSX 87-30 to the TSX 47-30.

Example 4

Slave (text block) —> **Master (text block)**

Send the message "FAULT STORED" from the TSX 47-30 to the TSX 87-30.

Example 5

Slave (text block) —> **Slave (system gate)**

Transfer word W10 from the TSX 47-30 to word W54 of the TSX 47-20.

Example 6

Slave (text block) —> **Slave (text block)**

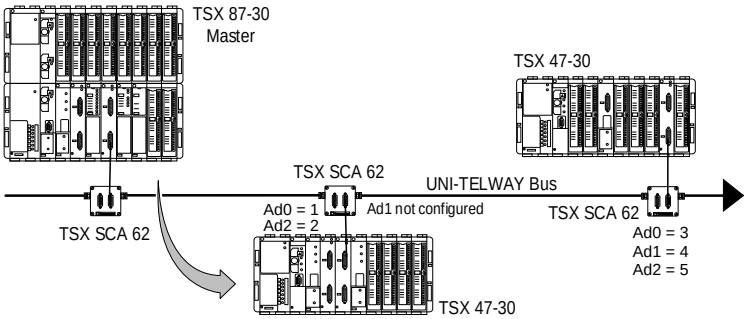
Send the message "HIGHER THRESHOLD NOT REACHED" from the TSX 47-30 to the TSX 47-20.

PLC - PLC (Cont'd)

Example 1

Master (text block) —> Slave (system gate)

Read TSX 47-20 word W100 by TSX 87-30.



Data

. TSX 87-30 : TSX SCM 21.6 located in rack 0, slot 3,
. TSX 47-20 : destination data link address Ad0 (system) = 1.

. Read word request:
- request code = H'04' (see request list)
- parameter = number of words to read.

. Text block :
- The request is sent by text block TXT1 of the application program,
- start of transmission table = W164,
- start of reception table = W100.

Transmission

. Text block:

- TXT1,C	= H'0704'	category code = H'07', request code = H'04'
- TXT1,M	= H'0365'	rack 0, slot 3, data link address = 1,
- TXT1,L	= 2	transmission table length (in bytes),
- transmission table :		W164 = 100 number of the word to read.

Reception

. Text block:

- TXT1,V	= H'34'	correct exchange confirm.
- TXT1,D	= 1	
- TXT1,E	= 0	
- TXT1,S	= 2	receive 2 bytes.
- Reception table		W100 = 1500

The content of W100 of the TSX 47-20 is therefore 1500.

PLC - PLC (Cont'd)

Example 2

Slave (text block) —> Master (system gate)

Addressing principles (reminders)

A slave PLC has 3 data link addresses. They are defined by configuration and are:

. **System address (Ad0)**

All of the messages received on this address are sent to the system gate of the exchange destination PLC. This address is required and defined by coding the TSX SCA 62 Subscriber Socket.

. **Client application address (Ad1)**

This address is controlled by the application program of the slave (text block). It enables transmission of the request to any Uni-Telway address (system gate or text block in the master or slave PLC or in any other device) and the reception of all related answers or confirms.
Address Ad1 is coded in parameter TXTi,M.
Using this address requires the coding, at the start of the text block transmission table, of the address of the exchange destination.

. **Line monitoring application address (Ad2)**

This address is assigned to the slave module for receiving unsolicited data (request H'FC') from other devices on the Uni-Telway bus.
The messages received at this address are sent to the application program through a text block set to receive.

Note : Addresses Ad1 (client application) and Ad2 (line monitoring application) can only be configured by text block. They are optional, therefore if they are not required it is not necessary to needlessly lengthen the polling cycle.

PLC - PLC (Cont'd)

TXTi,M comprises :

. the rack number where the TSX SCM 21.6 slave module (0 to F) is located,
. the location of the module in the rack (0 to 7),
. the data link source address where the exchange **originated** (data link address Ad1 incremented by H'64').

Destination address

This is included at the **start** of the transmission table of the text block that originated the exchange, in the format shown below:

Wi	network number	0
Wi+1	gate number	station number
Wi+2	channel number	module number
Wi+3	D A T A	

The following parameters are used:

Network number :

The number of the Telway 7 network on which the destination station is located. It takes a value of:

00 regardless of whether a Telway 7 network is used.

Station number :

The address of the PLC on the Telway 7 network. It takes a value of:

H'FE' if there is no Telway 7 network or if a master or slave of the Uni-Telway bus is being addressed.

Gate number :

The number of the logic gate that is the destination of the exchange. It takes a value of:

00 : access to the system gate,

05 : access to a TSX SCM 21.6 or more generally to a Uni-Telway slave connected to one of these modules,

H'10' to H'4F' : access to text blocks (text block number + H'10').

Note : The other values are reserved, they must not be used.

PLC - PLC (Cont'd)

Module location

The location of the TSX SCM module that is the destination of the exchange. It takes the values:

0 to F for the rack number followed by 0 to 7 for the module location,

H'FE' if the destination station is on the same Uni-Telway bus.

00 for a gate number other than 5.

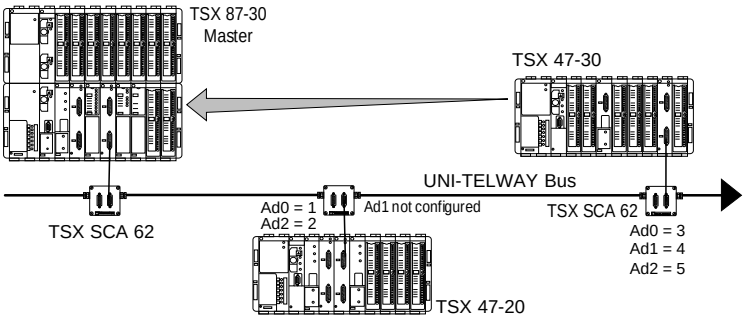
Module ch. nbr.

The channel number assigned to the Uni-Telway slave. It takes the value of the destination data link of the exchange, incremented by H'64' or:

00 for a gate number other than 5.

Dialog Example

Read the parameters of the TSX 87-30 timer T10 by TSX 47-30.



Data

. TSX 87-30 : TSX SCM 21.6 module in rack 0, slot 3,
. TSX 47-30 : TSX SCM 21.6 module in rack 0, slot 6.

. Timer read request:

- request code = H'09' (see request list)
- parameter = number of the timer to read.

PLC - PLC (Cont'd)

Data (Cont'd)

. Text block:
- The request is sent by text block TXT2 of the application page.
- Start of transmission table = W264,
- Start of the reception table = W200.

Transmission

. Text block:
- TXT2,C = H'0709' Category code = H'07', request code = H'09',
- TXT2,M = H'0668' Rack 0, slot 6, data link address Ad1 = 4,
- TXT2,L = 8 transmission table length (in bytes).
- transmission table:

Destination address (master PLC system gate)

Network Nbr./00	**W264**	00	00
Gate/Device Nbr.	**W265**	00	FE
Channel Nbr./Module Address	**W266**	00	00
Timer Nbr.	**W267**	10	

Reception

. Text block:
- TXT2,V = H'39' correct exchange confirm,
- TXT2,D = 1
- TXT2,E = 0
- TXT2,S = 8 receive 8 bytes.
- reception table:

W200	00	02
W201	01	01
W202	3600	
W203	1712	

. Answer analysis:

W200 = H'0002'

LSB = 02 —> time base 1 second,
MSB = 00 —> not timed-out.

W201 = H'0101'

LSB = 01 —> timer running,
MSB = 01 —> changeable preset.

W202 = 3600

The configuration preset value is 3600.

W203 = 1712

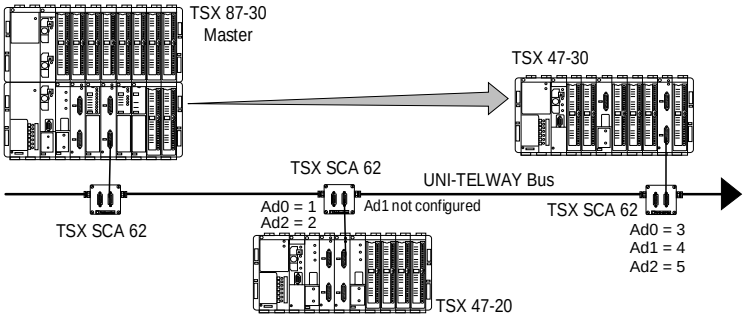
The current value when the request was processed was 1712.

PLC - PLC (Cont'd)

Example 3

Master (text block) —> Slave (text block)

Send the message "PIN FAULT" from the TSX 87-30 to the TSX 47-30.



Data

. TSX 87-30 : TSX SCM 21.6 located in rack 0, slot 3,
. TSX 47-30 : TSX SCM 21.6 located in rack 0, slot 6.
destination data link address = Ad2 (link addr. 5).

. Unsolicited data request:
- request code = H'FC' (see request list)
- parameter = message to send.

. Sender text block (master):
- The request is sent by text block TXT3 of the application program (set-up as an output with S and O at 1 as there is no answer or confirm),
- start of transmission table = W300,
- there is no reception table as there is no answer.

. Destination text block (slave):
- When a message is sent by a device connected to the Uni-Telway bus, to a text block of a slave PLC, the slave must know which text block is ready to receive request H'FC'. To do this the slave PLC must be set-up for OUTPUT TXTi on initialization (first exchange), then set to await messages by INPUT TXTi.
- Message reception is ensured by text block TXT0 of the application program,
- Start of reception table = W10. The reception table comprises the address of the exchange coded in 5 bytes.

PLC - PLC (Cont'd)

Transmission (master)

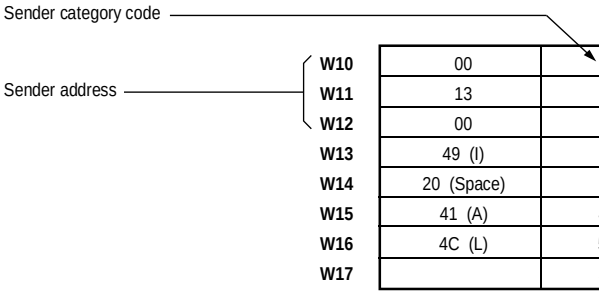
. Text block:
- TXT3,C = H'07FC' Category code = H'07', request code = H'FC',
- TXT3,M = H'0369' Rack 0, slot 3, data link address = 5,
- TXT3,L = 9 transmission table length in bytes.
- Transmission table:

W300	49 (I)	50 (P)
W301	20 (Space)	4E (N)
W302	41 (A)	46 (F)
W303	4C (L)	55 (U)
W304		54 (T)

Reception

. Text block (in Input) : ("set" reception)
- TXT0,C = H'07FC' category code = H'07', request code H'FC',
- TXT0,M = H'0669' rack 0, slot 6, link address Ad2 = 5,
- TXT0,L = 0 no transmission table.

. Text block (data reception)
- TXT0,V = H'FC' receive request H'FC',
- TXT0,D = 1
- TXT0,E = 0
- TXT0,S = 15 receive 15 bytes.
- Reception table:



W10	00	07
W11	13	FE
W12	00	00
W13	49 (I)	50 (P)
W14	20 (Space)	4E (N)
W15	41 (A)	46 (F)
W16	4C (L)	55 (U)
W17		54 (T)

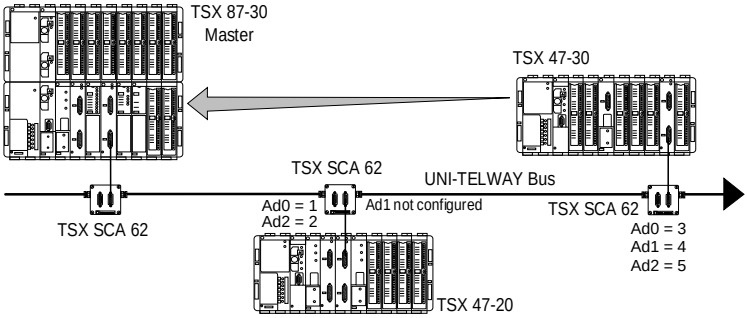
. Answer analysis:
Network nbr. = H'00' (sender not on a Telway 7 network),
Station nbr. = H'FE' (sender not on a Telway 7 network),
Gate nbr. = H'13' (text block 3 - H'10' + text block nbr.),
Module nbr. = H'00' (gate nbr. other than H'05'),
Channel nbr. = H'00' (gate nbr. other than H'05'),

PLC - PLC (Cont'd)

Example 4

Slave (text block) —> Master (text block)

Send the message "FAULT STORED" from the TSX 47-30 to the TSX 87-30.



Data

. TSX 87-30 : TSX SCM 21.6 located in rack 0, slot 3,
. TSX 47-30 : TSX SCM 21.6 located in rack 0, slot 6.
destination data link address = Ad1 (link addr. 4).
. Unsolicited data request:
- request code = H'FC' (see request list)
- parameter = message to send.

. Sender text block (slave):
- The request is sent by text block TXT1 of the application program (set as output with S and O at 1 as there is no acknowledgement or confirm from the application program),
- Start of transmission table = W100. The transmission table comprises the address of the exchange sender coded in 5 bytes,
- There is no reception table as there is no answer.

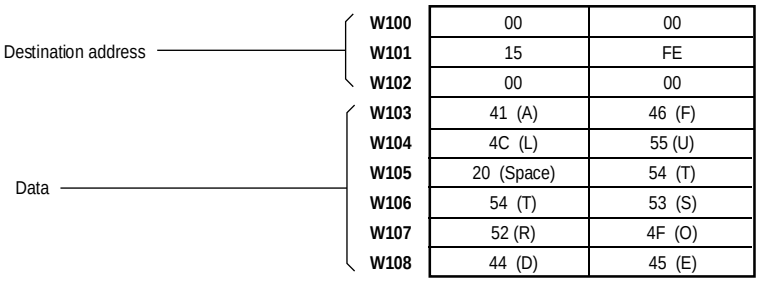
. Destination text block (slave):
- The TXTi,M parameter comprises the location of the master TSX SCM 21.6 module and the data link address that **originated** the exchange.
- Message reception is ensured by text block TXT5 (set as an input (or S and I at 1) for the application program.
- Start of reception table = W500.
- In the case of a message destined for the text block of the master, the first byte in the reception table is the category code (refer to Sub-section 2.5).

PLC - PLC (Cont'd)

Transmission (slave)

. Text block:

- TXT1,C = H'07FC' Category code = H'07', request code = H'FC',
- TXT1,M = H'0668' Rack 0, slot 6, data link address = 4,
- TXT1,L = 18 transmission table length (in bytes).
- Transmission table



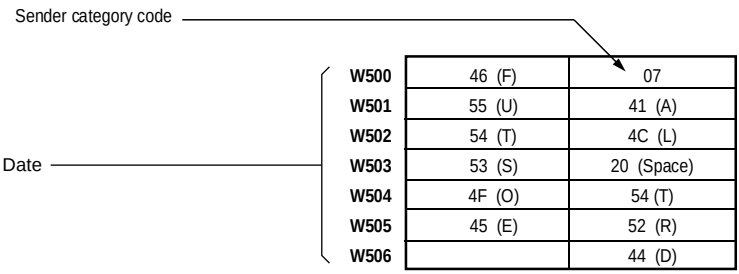
W100	00	00
W101	15	FE
W102	00	00
W103	41 (A)	46 (F)
W104	4C (L)	55 (U)
W105	20 (Space)	54 (T)
W106	54 (T)	53 (S)
W107	52 (R)	4F (O)
W108	44 (D)	45 (E)

Reception (master)

. Text block ("set" reception):

- TXT5,C = H'07FC' category code = H'07', request code H'FC',
- TXT5,M = H'0368' rack 0, slot 3, data link address Ad1 = 4,
- TXT5,L = 0 no transmission table.

. Text block (data reception)
- TXT5,V = H'FC' receive request H'FC',
- TXT5,D = 1
- TXT5,E = 0
- TXT5,S = 13 receive 13 bytes.
- Reception table:



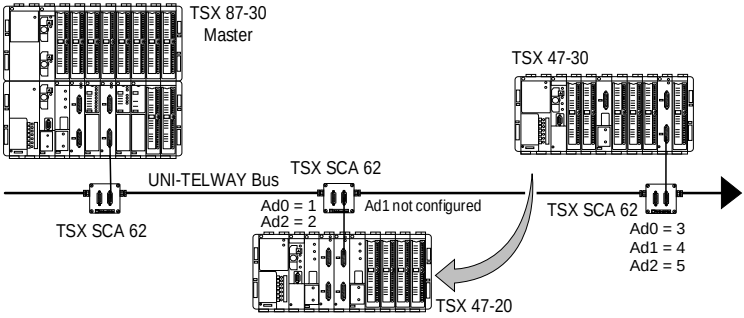
W500	46 (F)	07
W501	55 (U)	41 (A)
W502	54 (T)	4C (L)
W503	53 (S)	20 (Space)
W504	4F (O)	54 (T)
W505	45 (E)	52 (R)
W506		44 (D)

PLC - PLC (Cont'd)

Example 5

Slave (text block) —> Slave (system gate)

Transfer word W10 from the TSX 47-30 to word W54 of the TSX 47-20:



Data

. TSX 47-30 : TSX SCM 21.6 located in rack 0, slot 6,
sender data link address = Ad1 (data link address 4).
. TSX 47-20 : destination data link address = system address Ad0 = 1.
. Write word request:

- request code = H'14'
- parameter = number and value of the word to write.

. Text block:

- The request is sent by text block TXT4 of the application program
- Start of transmission table = W400. The transmission table comprises the address of the exchange sender coded in 5 bytes,
- There is no reception table as there is no answer.

Transmission

. Text block:

- TXT4,C = H'0714' category code = H'07', request code H'14',
- TXT4,M = H'0668' rack 0, slot 6, data link address Ad1 = 4,
- TXT4,L = 10 length (in bytes) of the transmission table,
- transmission table:

Destination address

Number of the word to read

Value of word W10

W400	00	00
W401	05	FE
W402	65	FE
W403	54	
W404	112	

Reception

. Text block:

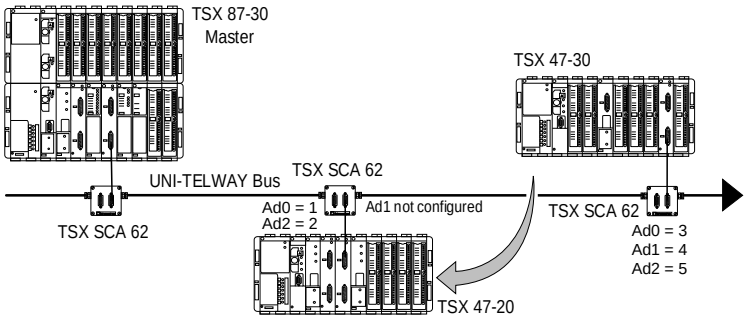
- TXT4,V = H'FE' correct exchange.

PLC - PLC (Cont'd)

Example 6

Slave (text block) —> Slave (text block)

Send the message "HIGHER THRESHOLD REACHED" from the TSX 47-30 to the TSX 47-20:



Data

. TSX 47-30 : TSX SCM 21.6 located in rack 0, slot 6,
destination data link address = Ad1 (link addr. 4).
. TSX 47-20 : TSX SCM 21.6 located in rack 0, slot 3.
destination data link address = Ad2 (link addr. 2).

. Unsolicited data request:

- request code = H'FC',
- parameter = message to send.

. Sender text block (TSX 47-30):

- The request is sent by text block TXT8 of the application program,
- Start of transmission table = W800. The transmission table comprises the address of the exchange sender coded in 5 bytes,
- There is no reception table as there is no answer.

. Destination text block (TSX 47-20):

- When a message is sent by a device connected to the Uni-Telway bus, to the text block of a slave PLC, the slave module must know which text block is ready to receive request H'FC'. This requires that the destination text block be set-up as OUTPUT TXTi on initialization (first exchange) and then be set to await messages on INPUT TXTi.
- Message reception is ensured by text block TXT4 set-up to await reception of the application program (S and I at 1).
- Start of reception table = W200. The transmission table comprises the address of the exchange sender coded in 5 bytes.

PLC - PLC (Cont'd)

Transmission

. Text block:

- TXT8,C = H'07FC' Category code = H'07', request code = H'FC',
- TXT8,M = H'0668' Rack 0, slot 6, data link address Ad1 = 4,
- TXT8,L = 26 Length of the transmission table in bytes.
- Transmission table:

Destination address

Data

W800	00	00
W801	05	FE
W802	66	FE
W803	49 (I)	48 (H)
W804	48 (H)	47 (G)
W805	52 (R)	45 (E)
W806	54 (T)	20 (Space)
W807	52 (R)	48 (H)
W808	53 (S)	45 (E)
W809	52 (R)	20 (Space)
W810	41 (A)	45 (E)
W811	48 (H)	43 (C)
W812	44 (D)	45 (E)

Reception

. Text block (S and I at 1): ("set" reception)

- TXT4,C = H'07FC' category code = H'07', request code H'FC',
- TXT4,M = H'0266' rack 0, slot 2, data link address Ad2 = 2,
- TXT4,L = 0 no transmission table.

. Text block (data reception)

- TXT4,R = H'FC' receive request H'FC',
- TXT4,D = 1
- TXT4,E = 0
- TXT4,S = 24 receive 24 bytes.
- reception table:

Sender Category Code

Sender address

Data

W200	00	07
W201	05	FE
W202	68	FE
W203	49 (I)	48 (H)
W204	48 (H)	47 (G)
W205	52 (R)	45 (E)
W206	54 (T)	20 (Space)
W207	52 (R)	48 (H)
W208	53 (S)	45 (E)
W209	52 (R)	20 (Space)
W210	41 (A)	45 (E)
W211	48 (H)	43 (C)
W212	44 (D)	45 (E)

2.8 Limits to Operation

Exchanges of messages or data on the Uni-Telway bus are limited by:

. Exchanges between the module and the processor,
. The limits of the master module,
. The limits of the slave module,
. Flow checking (message loss on power break)

Module - Processor Exchange

. The processors of TSX 47-30, TSX 67-20 and TSX 87-30 PLCs can exchange with each module (master or slave), a single input message and a single output message on each cycle of the application program.
. The processor of the TSX 47-20 PLC can exchange an input or an output message on each cycle of the application program.

Master Module Limits

. The master module can store 3 messages from the Uni-Telway data link until they are routed to the PLC processor or back onto the Uni-Telway data link. It can also store 3 messages from the PLC processor.
. When channel 0 is used, the transmission speed of this channel is restricted to 4800 bps.

Slave Module Limits

. When channel 0 is used, the transmission speed of this channel is restricted to 4800 bps.

. **System Access (Ad0)** :

  The module can only control one exchange (request/confirm cycle) with the system at a time. If a message is received on the line while an exchange is in progress, it is refused (NACK).

. **Client Application Address (Ad1)** :

  The module can only control one exchange with the application program at a time. To start another exchange, the first must be completed (reception of a text block that resets bit D of the text block).

. **Line monitoring Application Address (Ad2)** :

  The module does not restrict communication in line monitoring mode on data link address Ad2.

Limits to Operation (Cont'd)

. **Processor Limits**

TSX 47-30, TSX 67-20 and TSX 87-30 PLC Processors

- These can transfer a message from a module to another local module on each application program message cycle (e.g.: communication between TSX SCM 21.6 master modules located in the same rack).
- The system can only store 3 requests, irrespective of their source (e.g.: terminal in adjust mode, Uni-Telway modules, etc.).
- The exchanges between the processor and the module can be performed even if the PLC is stopped.

TSX 47-20 PLC Processor

- Local module to module exchanges cannot be performed.
- The system can only process one request at a time.
- The maximum message size is 32 bytes (request or confirm + parameters + data).
- No exchange is possible between the processor and the module when the PLC is stopped.
- Exchanges between a Telway 7 network and a Uni-Telway slave module are not possible.

. **Flow control (master PLC):**

When a text block set for EXCHG sends a request, it awaits reception and remains in this state until it receives an answer. If the destination station suffers a power supply fault or is disconnected, the sender text block will remain blocked.

There are two possible cases:

- **Destination power break or disconnection during the exchange:**

  Bits TXTi,D and TXTi,E remain at 0.

  The master (client) application program must allow for this situation by including a "time-out" in sender text block operation.

  If no answer is received before time-out, then the text block is reset to 0 (RESET TXTi).

- **Destination power break or disconnection before the start of the exchange or non-existent station:**

  A text block error occurs, bits TXTi,D and TXTi,E are set to 1 and status word TXTi,S takes a value of 3.

. **Flow Control (slave PLC)**

As the slave module can only process one text block at a time, it uses a set 10 second time-out that is reset on each exchange request. If no answer is received before time-out, the sender text block automatically generates an error (TXTi,E = 1 and TXTi,S = 3).

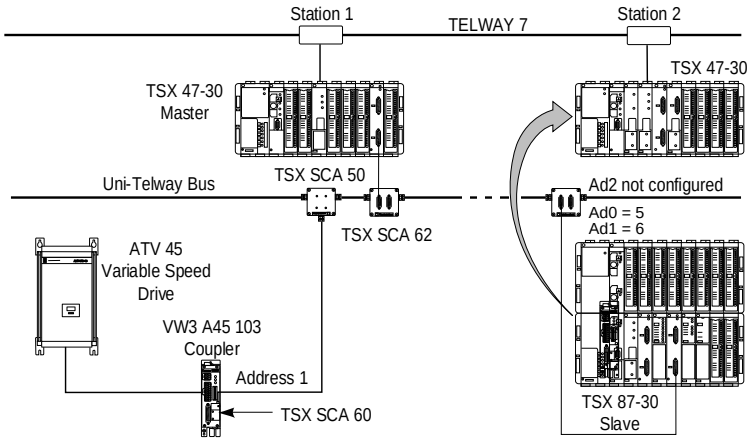
2.9 Communication via Telway 7

Exchanges between devices connected to the Uni-Telway bus and stations connected to the Telway 7 network are fully transparent to the Uni-Telway master.

Example 1

Slave PLC to Telway 7 station

A TSX 87-30 slave on the Uni-Telway bus has to set the preset for Monostable M6 to a value of 1000 in the TSX 47-30 PLC, station 2 of the Telway 7 network.



Data

. TSX 87-30 : TSX SCM 21.6 module located in rack 0, slot 3, sender address = Ad1 (data link address 6).
. TSX 47-30 : Telway 7, station 2.
exchange destination : system gate.

. Monostable preset write request:

- request code = H'18',
- parameters = number and value of the preset to write.

. Text block:

- The request is sent by text block TXT2 (local type) of the application program,
- Start of transmission table = W50. The transmission table comprises the destination address coded in 5 bytes.
- There is no reception table as there is no data to receive.

Communication via Telway 7 (Cont'd)

Transmission

. Text block:
- TXT2,C = H'0718' Category code = H'07', Request code = H'18',
- TXT2,M = H'036A' Rack 0, slot 3, data link address Ad1 = 6,
- TXT2,L = 10 transmission table length (in bytes).
- transmission table :

Destination address	W50	00	00
	W51	00	02
	W52	00	00
Data	W53	6	
	W54	1000	

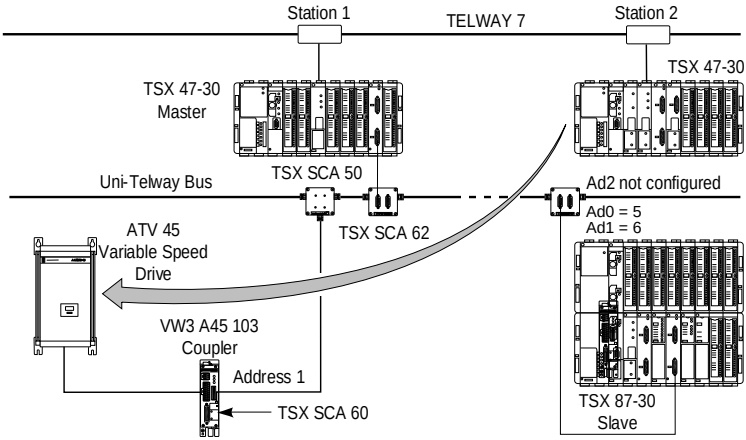
Reception

. Text block:
- TXT2,V = H'FE' exchange correct

Example 2

Telway 7 Station 2 to ATV 45 slave

The TSX 47-30, station 2 of the Telway 7 network must send a velocity instruction value of 35Hz to the ATV 45 variable speed drive that is a slave on the Uni-Telway bus.



Communication via Telway 7 (Cont'd)

Data

. Master : Telway 7 station 1. The TSX SCM 21.6 Uni-Telway master module is located in rack 0, slot 6.

. ATV 45 : Uni-Telway slave,
Data link address 1,
Velocity instruction = W193 (see ATV 45 manual)

. Write word request:

- Request code = H'14',
- Parameters = number and value of the word to write.

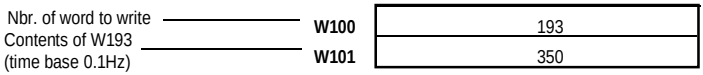
. Text block:

- As the message sender is on the Telway 7 network, the sender text block is a coupler type network text block (NET). Its TXTi,A parameter must correspond to the Telway 7 network address of the PLC that comprises the Uni-Telway master module.
- The request is sent by text block TXT6 of the sender PLC's application program.
- Start of the transmission table = W100. The transmission table comprises only the parameters and the data for the request.
- There is no reception table as there is no data to receive.

Transmission

. Text block:

- TXT6,A = 1 Uni-Telway master = Telway 7 station 1
- TXT6,C = H'0714' Category code = H'07', request code = H'14'.
- TXT6,M = H'0665' Master location (rack 0, slot 6), Destination data link address = 1.
- TXT6,L = 4 Transmission table length (in bytes).
- Transmission table:



Reception

. Text block:

TXT6,V = H'FE' correct exchange

3 Additional Programming Information

3.1 Broadcast Messages

General

The "broadcast message" service allows a message to be sent from the data link master device to all of the slave devices connected to the same Uni-Telway bus.

The "broadcast message" service does not support acknowledgements at data link level nor confirms at application level.

If one of the slaves is not available when this service is used, it will not receive the message.

Addressing

The data is sent by a coupler type text block with the following characteristics :

TXTi,M Comprises the sender address and the destinations:

. rack number where the TSX SCM 21.6 master module is located,
. location of the module in the rack,
. the data link address of the exchange destination stations. If they are broadcast messages, this data link address will be set to H'FF' by convention.

TXTi,C Takes the value H'07xy' where xy corresponds to the request code of the requested function (e.g. operating mode requests).

Notes : The processing of this request performed by the destination stations depends on the type of device connected.

In the case of a TSX SCM 21.6 slave module the message is received on data link address Ad0 (system gate). The message is sent at data link level without acknowledgement (ACK) from the destination.

The "unsolicited data" request is not accepted by the system gate of a slave PLC connected to the bus via a TSX SCM 21.6 module.

3 Additional Programming Information

3.2 Events

General

This service enables a slave that supports this function to send data on events to the TSX SCM 21.6 master module on its own initiative. Slave PLCs connected to the bus via a TSX SCM 21.6 module do not send events data.

Processing by the Module

This data is sent using simplified addressing, by the "unsolicited data" request that does not require an answer from the destination. The module receives and stores the events data received in a buffer. The PLC's application is informed via the register field of a change in value. Therefore, each IWxy,4 and IWxy,5 input register word is assigned a data link address with the following correspondence.

IWxy,4,0 ——> data link address 1,
IWxy,4,1 ——> data link address 2,
IWxy,4,2 ——> data link address 3,
.....,
.....,
.....,
IWxy,5,E ——> data link address 31,
IWxy,5,F ——> data link address 32.

Example If the events data and data link addresses 4, 8 and 31 have be changed, the module will set register bits IWxy,4,3, IWxy,4,7 and IWxy,5,E to 1.

The module processes the events data for data link addresses 1 to 32.

The size of the data sent can be parametered when the TSX SCM 21.6 master module is configured, but is restricted to 8 bytes max. per data link address (refer to Sub-section 2.2).

Addressing

Sending events enables the sender to not have to give the destination address. The data is automatically sent to the master TSX SCM 21.6 module.

Data Acquisition

The data (stored in master module RAM) is read by sending a read events data request (code H'A8') by text block to channel 1 of the TSX SCM 21.6 module.

It is possible to acquire the events data from a number of devices using the same request by assigning the value of the input register words IWxy,4 and IWxy,5 to the first two words of the request sender's text block. The module then sends back the number of bytes defined when the TSX SCM 21.6 master module was configured.

The data is received in the reception table of the sender text block.

Events (Cont'd)

Example

. Data

- The TSX SCM 21.6 module (in rack 0, slot 6) of the TSX 87-30 master PLC indicates a change of state in the events data for data link addresses 1, 4, 5, 8, 16 and 22 by setting bits IW06,4,0; IW06,4,3; IW06,4,7; IW06,4,F and IW06,5,5 to 1.
- The size of the events data is configured in the module as 4 bytes for each data link address.
- The request is sent by text block TXT2 (set-up for EXCHG) of the application program.
- Start of the exchange table = W264,
- Start of the reception table = W200

. Transmission

- **TXT2,M** comprises :

  The rack number where the TSX SCM 21.6 master module is located,
  The location of the module in the rack,
  The address of the Uni-Telway channel (01).

  TXT2,M = H'0601'

- **TXT2,C** = read events data request code (H'00A8').

- **TXT2,L** = comprises the length of the transmission table in bytes.

  TXT2,L = 4

- **Transmission table**

  To read the events data received in the buffer of the TSX SCM 21.6 master module. The first two words in the transmission table should comprise the values of register words IW06,4 and IW06,5.

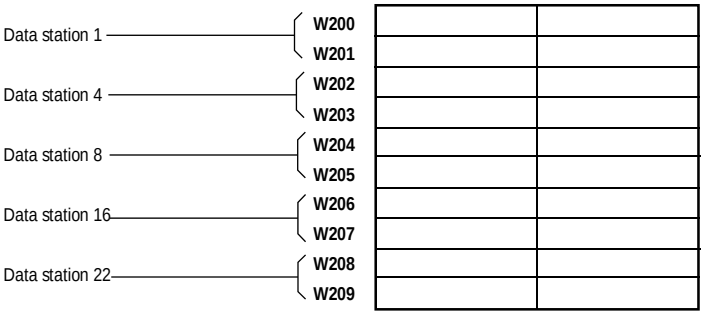
W264	Content of IW06,4
W265	Content of IW06.5

Events (Cont'd)

. **Reception**

- **Reception table**

Once the exchange is complete, the text block reception table (located after W200 with a length of 128 bytes) contains the events data received by the module. An answer field, the size of which is defined in bytes when the module is configured, is assigned to each logical channel that sends events data.



The number of bytes received is indicated by parameter TXT2,S that has a value of TXT2,S = 20 (4 bytes per logical channel that has sent events data).

Report

The report TXT2,V contains the value of the answer code once the exchange is complete. (H'D8' if the exchange is correct, if it is incorrect its value is H'FD').

Note : If the data link master is a TSX 47-20 PLC, the maximum size of the messages is 30 bytes. If the size of the events data is more than 30 bytes, the application program must allow for it and not request more than 30 characters at a time.

3 Additional Programming Information

3.3 Discrete I/O Bits and Register Words

Description

The register interface of the TSX SCM 21.6 modules comprises:

. input registers : These status words can only be accessed in read. They describe the operation of the module and each channel.

. output registers : These words are accessible in read and write and enable acknowledgement and reset commands for the exchanges on the channels.

Input Register IWxy,0 (ch. 0 and 1)

This status word is common to Uni-Telway master or slave operation contains data on complete module operation. These bits are significant at 1.

Bit	Function	Description
0	Not assigned	
1	Not assigned	
2	Reset in progress	Message system reset in progress, clears messages in progress on both channels.
3	Module available	Indicates the end of the self-tests and consequently that the module is available.
4	General fault	This bit goes to 1 whenever a fault appears. It is the OR routing for bits 5, 6, 7, 8.
5	Blocking fault	A module RAM extension fault.
6	Module fault	A fault that appears when the module serial link self-tests are run every time the module is powered-up.
7	Application fault	A fault that appears when a request is executed on one of the module channels: Parity error in receive, time-out, no echo, incorrect echo, etc.
8	Blocking fault	RAM, EPROM or module internal logic fault. This fault permanently inhibits the module which must be replaced. This state is indicated by the F indicator on the front of the module.
9	Module self-test in progress	Every time it is powered-up, the module runs a serie tesindicated by this bit. The module is not available and cannot be programmed while the tests are in progress.
A	Not assigned	
B	Module not configured	This bit is at 1 when none of the channels are configured. At 1 this bit indicates that at least one channel has been configured.
C	Module in RUN mode	Uni-Telway function
D	Reserved	
E	Not assigned	
F	Not assigned	

Discrete I/O Bits and Register Words (Cont'd)

Input Register IWxy,0 (ch. 0 and 1)

This status word is common to Uni-Telway master or slave operation. It contains data on complete module operation. These bits are significant at 1.

Only those bits corresponding to channel 1 (Uni-Telway) are described in detail below. Refer to the TSX SCM 20/21/22 Half/Full duplex character mode manual for the corresponding bits for channel 0.

Bit	Function	Description
8	Not assigned	
9	Reserved	
A	Not assigned	
B	Channel 1 configuration	0 if the channel is not configured 1 if the channel is configured
C **D** **E**	Adapter code Channel 1	The type of adapter fitted to the channel is coded in these three bits : 001 = SCA1 adapter (RS-232C - 6 signals) 010 = SCA2 adapter (Current loop) 101 = SCA3 adapter (RS-232 - modem) 011 = SCA4 adapter (RS-422A/RS-485) 000 = SCA5 adapter (RS-232C simplified) 100 = SCA6 adapter (RS-485 Uni-Telway) 110 = SCA7 adapter (AB2 Bus) 111 = No adapter
F	PWF	This bit is common to both channels. At 1, it indicates a power return but is provided for information only. It must be reset (by OWxy1,F) to accept another power return.

Master Module Input Register

IWxy,3

Only bit 0 of this word is used. It is significant at 1.

IWxy,3,0 : indicates that at least one data link address has not replied before time-out.

IWxy,4

Indicates a change in state in the events data addressed by slave stations with a data link address from 1 to 16.

IWxy,4,0 : data modification at station address 1,
IWxy,4,1 : data modification at station address 2,
.....
.....
IWxy,4,E : data modification at station address 15,
IWxy,4,F : data modification at station address 16.

Discrete I/O Bits and Register Words (Cont'd)

IWxy,5

Indicates a change in state in the events data addressed by slave stations with a data link address from 17 to 32.

IWxy,5,0 : data modification at station address 17,
IWxy,5,1 : data modification at station address 18,
.....
.....
IWxy,5,E : data modification at station address 31,
IWxy,5,F : data modification at station address 32.

Slave Module Input Register

IWxy,3

Only bits 0 to 3 of this word are used. They are significant at 1.

IWxy,3,0 : indicates no polling on the line,

IWxy,3,1 : indicates that address Ad0 is not polled or not configured,

IWxy,3,2 : indicates that address Ad1 is not polled or not configured,

IWxy,3,3 : indicates that address Ad2 is not polled or not configured.

Output Register

OWxy,0

Only bit 2 of this word is used. Setting this bit to 1 resets the message system and blocks control of both module channels, whether they are master or slave units. This bit is active at 1 and must be reset after use.

Other Register Words

The other register words are not used.

Discrete I/O Bit

The SCA6 (RS-485 Uni-Telway) adapter does not have transmission control signals. The transmission validation signals used in RS-485 are used to switch the transmitter to high impedance in a user transparent manner.

For information on the other adapters (SCA1 to SCA5) used on channel 0, refer to the TSX SCM 20/21/22 Half/Full Duplex Character Mode Manual.

3 Additional Programming Information

3.4 Read Object Request

Reminders

This standard request allows read access to simple data objects (words, word strings, etc.).

The structure of this request is detailed in the Appendix.

When this request is sent, the user must specify the parameters of the sender text block (TXTi,C; TXTi,M; TXTi,L, etc.) and the transmission table. This comprises the following parameters:

. the segment that the request is addressed to,
. the type of data object to read,
. the address of the first object to read,
. the number of objects to read.

As soon as it finishes processing a request received, a destination station will send back a message giving the type of object read, followed by the requested data.

The reception table of the sender text block has the following structure, when reading words for example:

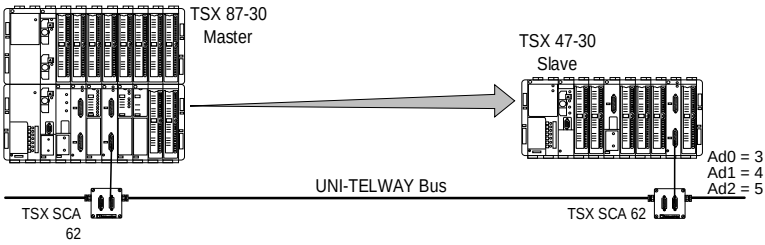
Wi	1st LSB	Type of object
Wi + 1	2nd LSB	1st MSB
Wi + 2	3rd LSB	2nd MSB
Wi + 3	etc ...	3rd MSB

The data received is therefore shifted by one byte and encoded in two successive words.

Important The application program must therefore take into account this shift when processing the data received. This can be done for example by performing successive shifts.

Example

Reading a 20 word table (located after address W50) by a TSX 87-30 from a TSX 47-30 slave:



Read Object Request (Cont'd)

Data

. TSX 87-30 : TSX SCM 21.6 module in rack 0, slot 3,
. TSX 47-30 : TSX SCM 21.6 module in rack 0, slot 6,
destination address = Ad0 (data link address 3).

. Read object request:

- request code = H'36'
- parameters : segment number = H'68' (internal words),
type of object = H'07' (16-bit integers),
start address = 50,
number of objects to read = 20.

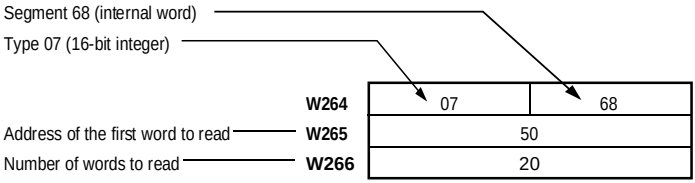
. Transmission text block:

- the request is sent by text block TXT1,
- start of transmission table = W264,
- end of transmission table = W200.

Transmission

. Text block:

- TXT1,C = H'0736' category code = H'07', request code = H'36',
- TXT1,M = H'0667' rack 0, slot 6, data link address Ad0 = 3,
- TXT1,L = 6 Transmission table length in bytes.
- transmission table:



Reception

. Text block:

- TXT1,V = H'66' correct exchange report,
- TXT1,D = 1
- TXT1,E = 0
- TXT1,S = 41 receive 41 bytes.
- reception table:

W200	W50 LSB	Type of object
W201	W51 LSB	W50 MSB
W202	...	W51 MSB
W220	W69 LSB	...
W221		W69 MSB

Read Object Request (Cont'd)

The program given below enables the repositioning of data by successive shifting. The data is then stored in a word table (from W200 to W263).

Reception error analysis is up to the user who implements it in subroutine SR1:

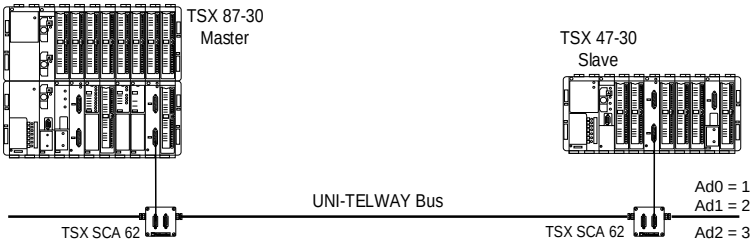
```
~<Example of a data repositioning program
!

<B0=1 if answer ok if not error processing
!       IF TXT1,D.[TXT1,V=H'66']
                  THEN TXT1,D->B0
                  ELSE CALL SR1

<Number of words received
L1     :IF RE(B0)
                  THEN TXT1,S->W140:(W140+1)/2->W140
                  ELSE JUMP L2

<Shift words received
!       WHILE [W140)0]
                  DO SHL 8(W200(W140))->W141:
                 W140-1->W142:
                 SRC 8(W200(W142)), AND H'FF' OR W141->W200(W140):
                 DEC W140

<Set the MSB of word W200 to 0
!       IF [W140=0]
                  THEN W200 AND H'FF'->W200

<PROGRAM CONTINUES
!L2    :
! EOP
```

Once processing is completed, the data is positioned in the following manner:

W200	00	Type of object
W201	W50 MSB	W50 LSB
W202	W51 MSB	W51 LSB
W220	W68 MSB	W68 LSB
W221	W69 MSB	W69 LSB

3.5 Communication Example

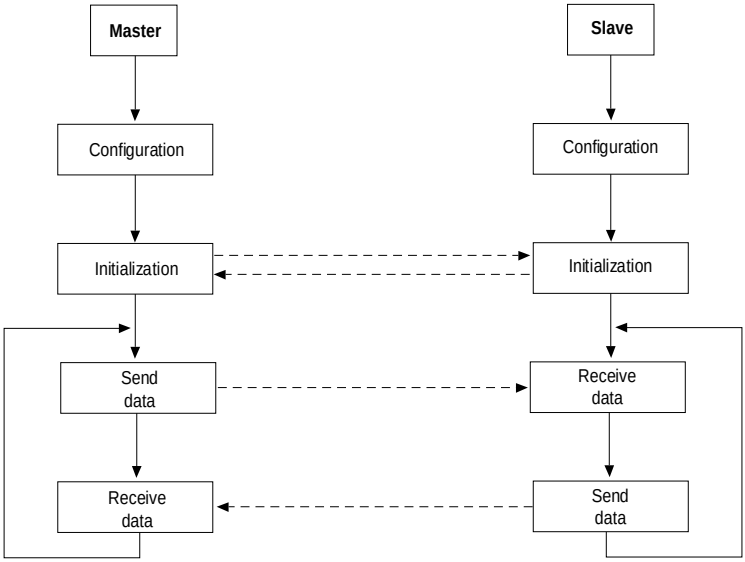
The program described below is an example of a dialog between PLCs connected to the bus illustrated below:



Principles

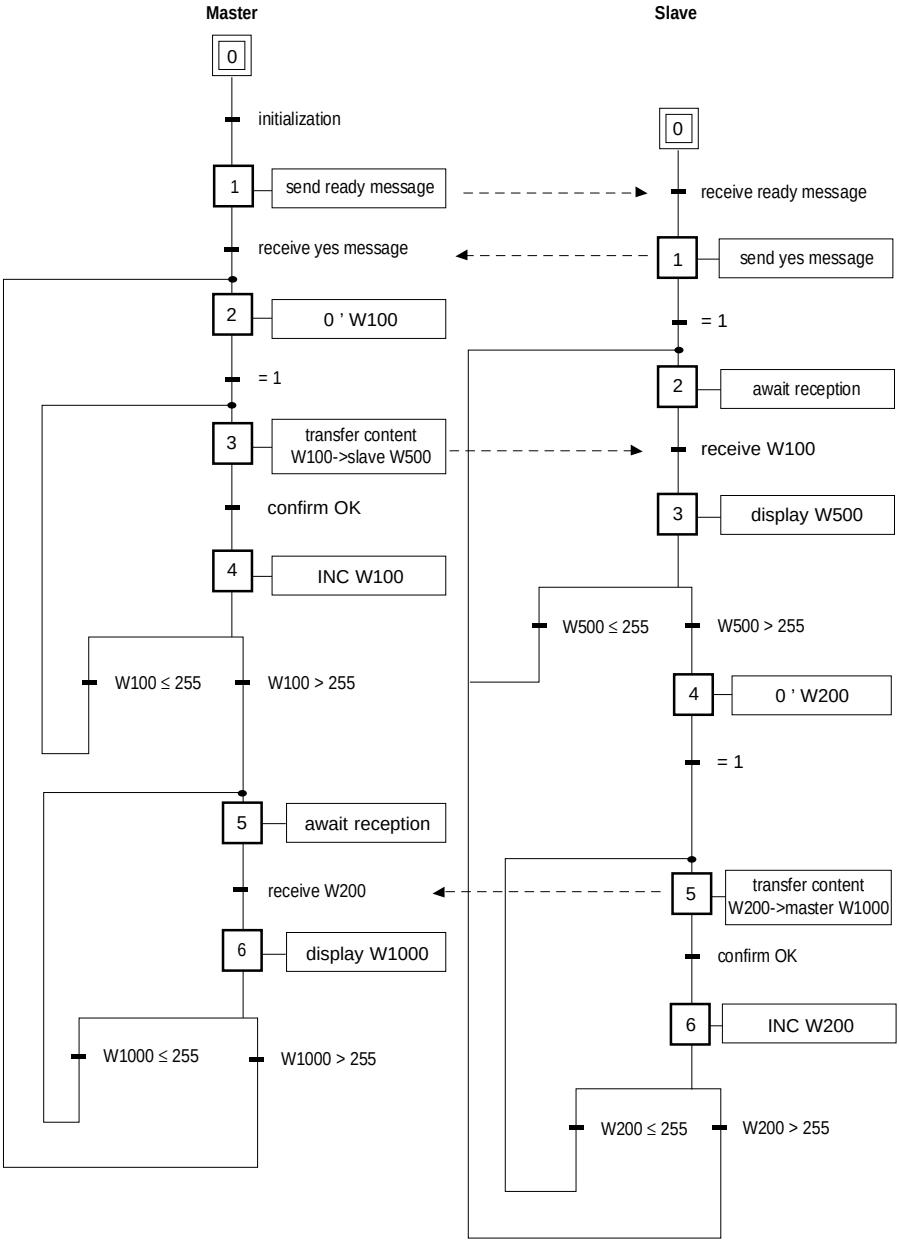
Transfer of word W100 from the master application program to W500 of the slave application program and display its output on an output module. As soon as a correct confirm is received, from the request, the application program of the master will increment word W100 and transfer it again to word W500 of the slave and so on to W100 = 255.

The application program of the slave then takes over and transfers word W200 to word W1000 of the application program of the master, applying the same principle with incrementing to 255 then restart from 255.



Communication Example (Cont'd)

The Grafcet diagram shown below is used to provide a graphic illustration of the various phases of the dialog :

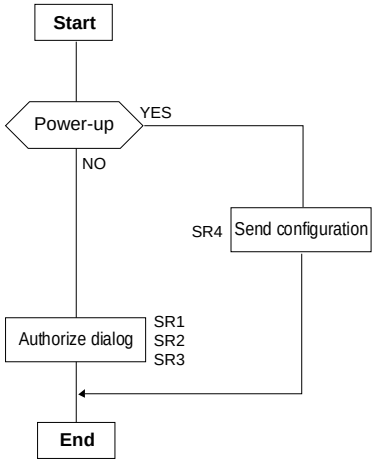


Communication Example (Cont'd)

Master PLC

Master Task

The master task controls transmission of the configuration on channel 1 of the module located in rack 0 slot 6 and enables dialog on this channel.



B30 = 1 : initialization performed

B60 = 1 : reception in progress

B40 = 1 : transmission in progress

```
<Init SCM (ch.1) on power-up
!       IF SY0+SY1
                THEN RESET B100:0->W0[1200]

<SCM21 ch.1 configuration if module available
!       IF NOT B100.IW6,0,3
                THEN CALL SR4

<Call initialization subroutine
!       IF B100.NOT B30
                THEN CALL SR1

<Call transmission subroutine
!       IF B30.NOT B60
                THEN CALL SR2

<Call reception subroutine
!       IF B30.NOT B40
                THEN CALL SR3

! EOP
```

Text block definition

. TXT0 —> send configuration,
. TXT1 —> send "READY" message to the slave,
. TXT2 —> receive "YES" message from the slave,
. TXT3 —> send the "Write Word" request to the slave.

```
   CONFIGURATION : TEXT

      NUMBER OF TEXT BLOCKS      N    :   5

   TXTi NETWORK  TYPE  ADDR  ADDR     RECEPT     A      T      M      L    C
        LOCAL          MODE  BUFFER   LENGTH
    0   LOCAL   CPL   DIR   CW0        0                   H'0601'  10  H'0040'
    1   LOCAL   CPL   DIR   CW10       0                   H'0667'   4  H'07FC'
    2   LOCAL   CPL   DIR   W10        4                   H'0666'   0  H'07FC'
    3   LOCAL   CPL   DIR   W20        0                   H'0665'   4  H'0714'
    4   LOCAL   CPL   DIR              0                   H'00FF'   0  H'0000'
```

Communication Example (Cont'd)

Timer definitions

T0 ——> time-out for sending the configuration,
T1 ——> time-out between sending the "Ready" message and receiving a "YES" answer.
T2 ——> time-out that checks the status of the text blocks in the event of a power break or device disconnection.

CONFIGURATION : TIMERS

TIMERS NUMBER / MAX : 8/128

NO	PRST	M	TB	MNEMONIC	NO	PRST	M	TB	MNEMONIC	NO	PRST	M	TB	MNEMONIC
0	25			Y100ms										
1	50			Y100ms										
2	20			Y100ms										
3	9999		Y	1mn										
4	9999		Y	1mn										
5	9999		Y	1mn										

Constant words

The configuration parameters are defined in constant words CW0 to CW4. The message "READY" is defined from CW10 to CW11:

CW0 : Uni-Telway master and sample 3 data link addresses,

CW2 : Transmission speed 9600 bps.

CW3 : 40ms time-out.

CONFIGURATION : CONSTANT WORDS

CW NB CONFIGURED : 128

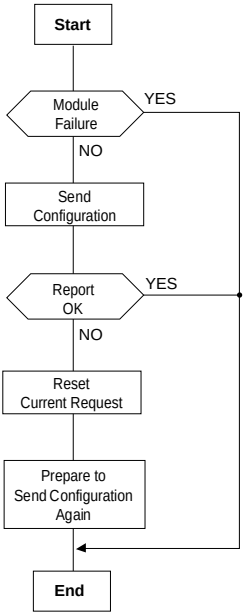
CONSTANT	VALUE	CONSTANT	VALUE
CW0	=H'5003'	CW16	=0
CW1	=0	CW17	=0
CW2	=B'9600'	CW18	=0
CW3	=B'0040'	CW19	=0
CW4	=0	CW20	=0
CW5	=0	CW21	=0
CW6	=0	CW22	=0
CW7	=0	CW23	=0
CW8	=0	CW24	=0
CW9	=0	CW25	=0
CW10	=M'PR'	CW26	=0
CW11	=M'ET'	CW27	=0
CW12	=0	CW28	=0
CW13	=0	CW29	=0

Communication Example (Cont'd)

Configuration (SR4)

```
<SR4 CONTROLS SENDING THE CONFIGURATION OF CH.1 SCM21 MODULE
!

<Module failure?
!       IF IW6,0,8
                THEN RESET B100:RET

<Send configuration data with 2.5 sec. time-out
!       IF NOT B101
                THEN RESET TXT0;RESET TXT1;RESET TXT2;RESET TXT3;EXCHG TXT0;
               SET B101;PRESET TO;START TO;RESET B102

<Positive confirm?
!       IF TXT0,D.[TXT0,V=H'FE']
                THEN SET B100;RET

<No answer from the channel, reset in progress
!       IF TO,D.NOT B102
                THEN SET 0W6,0,2;SET B102;RET

<End channel reset and new configuration attempt
!       IF B102
                THEN RESET 0W6,0,2;RESET B101;RESET B102

! EOP
```

For operating safety reasons, the configuration is sent on each power return. This procedure is controlled by SR4. The configuration table is located after CW0, according to the values defined below:



Dialog initialization (SR1)

On request (setting bit B20 to 1), the message "READY" is sent to the slave PLC. This device must then return the message "YES" within 5 seconds (set by timer T1). This ensures that the master PLC enables dialog by setting bit B30 to 1.

The message "READY" is sent by request H'FC' (unsolicited data). It is sent by text block TXT1 to slave data link address Ad2. As this request does not send back a confirm, text block TXT1 must be set-up as an Output. Text block parameters are defined in the configuration:

. start of transmission table: CW10
. TXT1,M = H'0667' rack 0, slot 6, data link address Ad2 = 3,
. TXT1,C = H'07FC' category code = H'07', request code = H'FC',
. TXT1,L = 4 transmission table length in bytes.

Communication Example (Cont'd)

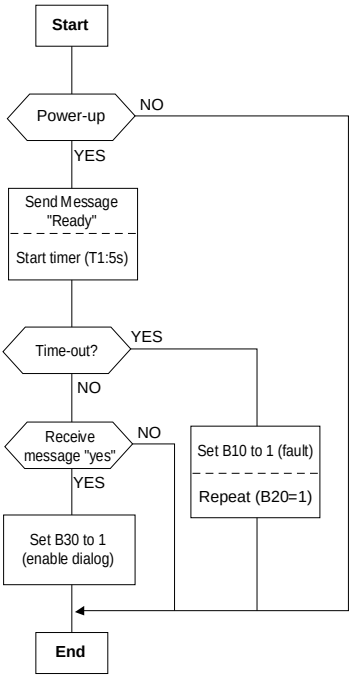
Reception of the "YES" message is ensured by text block TXT2 set-up as INPUT (reception of request H'FC' from slave data link address Ad1). The text block parameters are defined in the configuration:

. start of reception table = W10,
. reception table length = 4 bytes,
. TXT2,M = H'0666' rack 0, slot 6, data link address Ad1 = 6,
. TXT2,C = H'07FC' category = H'07', request code = H'FC'.

The reception table comprises the category code of the sender followed by the message sent.

B10 enables the user to detect a transmission fault (time-out). This is only present for information and is not used anywhere else in the program.

B22 only allows TXT2 to be set as an Input once during an exchange ("READY" ... "YES").



B30 = 1 means that initialization was performed correctly.

```
~(DIALOG INITIALIZATION
!

<REQUEST DIALOG IF B20=1
!

<Send message "READY" by TXT1 and start timer.
!       IF B20 THEN OUTPUT TXT1;PRESET T1;START T1;RESET B20;SET B22

<Time-out?
!       IF T1,D
                THEN SET B10;SET B20;RESET TXT1;RESET TXT2;RET

<Message "YES" received?
!       IF B22 THEN INPUT TXT2;RESET B22

<Check reception table
!       IF NOT TXT2,D
                THEN RET

<Category code = H'07' ; O = H'4F' ; U = H'55' ; I = H'49'
!       IF [W10=H'4F07'].[W11=H'4955']
                THEN SET B30

!       RET

! EOP
```

Communication Example (Cont'd)

Data transmission (SR2)

Subroutine SR2 increments word W100 from 0 to 255 and sends its data to the system gate (Ad0) of the slave PLC.

Once the request has been sent and as soon as the correct confirm is received, the program increments W100 then sends the "Write Word" (H'14') request again to the slave and so on to W100 = 255.....

The "Write Word" request is sent by text block TXT3 set-up for EXCHG. Its parameters are defined by configuration :

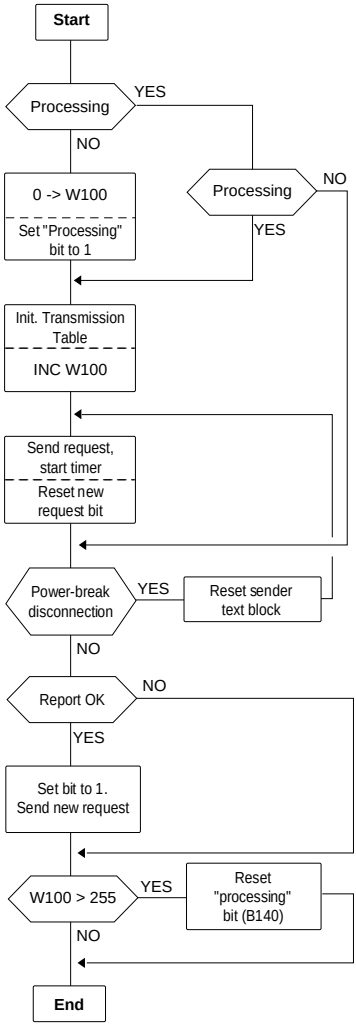
. Start of transmission table = W20,
. TXT3,M = H'0665' rack 0, slot 6, link address Ad0 = 1,
. TXT3,C = H'0714' category = H'07', request code = H'14',
. TXT3,L = 4. Transmission table length in bytes.

The transmission table comprises the number of the word to be written in the slave (W500) followed by its content (W100).

Timer T2 controls power breaks or disconnection affecting the slave during exchanges. As soon as a request is sent, T2 starts (2 sec. time-out). If after 2 sec. the text block has not received an answer, it is reset to 0 (RESET TXT3).

Setting B11 to 1 will detect a disconnection or power break affecting the destination during the exchange.

Setting B12 to 1 will check that the destination exists and detect a disconnection or power break affecting the destination, before the exchange is started (TXT3,D and TXT3,E at 1 with TXT3,S = 3).



Communication Example (Cont'd)

If a power break or disconnection occurs affecting the slave, the program will continually attempt to restart the "Write Word" request with the value of W100 that was not sent. As soon as the fault ends, requests are once again sent normally. No data will have been lost.

B40 = 1 if processing (0 to 255) is in progress,
B50 = 1 validates sending a new value for W100.

```
<SR2 TRANSMISSION
!

<Processing?
!       IF NOT B40
                THEN SET B40;0->W100;JUMP L1

<Send new request?
!       IF NOT B50
                THEN JUMP L3

<Initialize transmission table (Write W500 in the slave)
!L1    :500->W20;W100->W21;INC W100

<Send request and start timer, reset new request bit
!L2    :EXCHG TXT3;PRESET T2;START T2;RESET B50

<Power break processing : during current exchange
!L3    :IF NOT TXT3,D.NOT TXT3,E.T2,D
                THEN SET B1;
                ELSE RESET B11

<Power break processing : before exchange start or non-existent station
!       IF TXT3,D.TXT3,E.[TXT3,S=3]
                THEN SET B12
                ELSE RESET B12

<Reset text block TXT3 on power break
!       IF B11+B12
                THEN RESET TXT3;JUMP L2

<Correct exchange confirm
!       IF [TXT3,V=H'FE'].TXT3,D.NOT TXT3,E
                THEN SET B50

<Count to 255
!       IF [W100>255]
                THEN RESET B40

!       RET

! EOP
```

Communication Example (Cont'd)

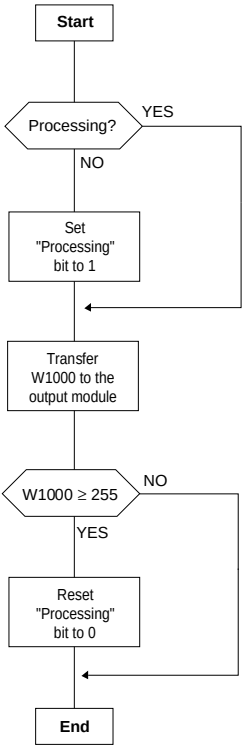
Data reception (SR3)

Subroutine SR3 controls the reception of the contents of word W200 sent by the slave to word W1000 in the master PLC.

The content of word W1000 is indicated through the TSX DST 16 35 module located in rack 0, slot 7, until it reaches a value of 255.

B60 = 1 if processing (0 to 255) is in progress.

```
<SR3 RECEIVE DATA FROM A SLAVE
!
<Processing in progress?
!       IF NOT B60
                THEN SET B60
<Transfer slave word content to output module
!       W1000->O7,0[16]
<Count complete?
!       IF [W1000>=255]
                THEN RESET B60;0->W1000
!       RET
! EOP
```

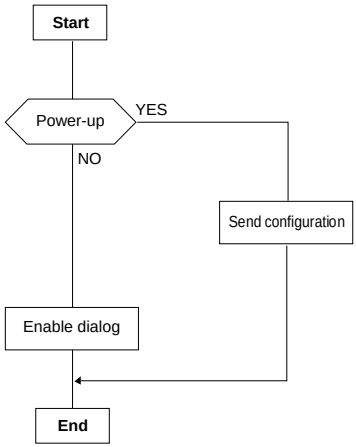


Communication Example (Cont'd)

Slave PLC

Master task

The main program (master task) controls the sending of the configuration on channel 1 of the module located in rack 0, slot 3 and authorizes dialog with this channel.



B130 = 1 : initialization complete,

B140 = 1 : transmission in progress,

B160 = 1 : reception in progress.

```
      <Initialize SCM21 (ch.1) on power-up
      !       IF SY0+SY1
                      THEN RESET B200;0->W0[1000]
      <Configure SCM21 (ch.1) if module ready
      !       IF NOT B200.IW3,0,3
                      THEN CALL SR4
      <Call initialization subroutine
      !       IF B200.NOT B130
                      THEN CALL SR1
      <Call reception subroutine
      !       IF B130.NOT B140
                      THEN CALL SR2
      <Call transmission subroutine
      !       IF B130.NOT B160
                      THEN CALL SR3
      ! EOP
```

Text block definition

. TXT0 ——> send the configuration,
. TXT1 ——> receive the "READY" message from the master,
. TXT2 ——> send the "YES" message to the master,
. TXT3 ——> send the "Write Word" request to the master.

```
      CONFIGURATION : TEXT

       NUMBER OF TEXT BLOCKS       N    :   5

     TXTI NETWORK  TYPE  ADDR  ADDR     RECEPT     A      T      M      L     C
          LOCAL          MODE  BUFFER   LENGTH
      0    LOCAL   CPL   DIR   CW0        0                  H'0301'  10   H'0040'
      1    LOCAL   CPL   DIR   W0        10                  H'0367'   0   H'07FC'
      2    LOCAL   CPL   DIR   CW10       0                  H'0366'   9   H'07FC'
      3    LOCAL   CPL   DIR   W20        0                  H'0366'  10   H'0714'
      4    LOCAL   CPL   DIR              0                  H'00FF'   0   H'0000'
```

Communication Example (Cont'd)

Timer definition

T0 ——> time-out for sending the configuration,
T1 ——> time-out that monitors the status of the text blocks if a device is disconnected or suffers a power break.

```
CONFIGURATION : TIMERS

     TIMERS                  NUMBER / MAX  :    8/128
+------------------------+------------------------+------------------------+
! NO PRST M  TB   MNEMONIC! NO PRST M  TB   MNEMONIC! NO PRST M  TB   MNEMONIC !
!------------------------+------------------------+------------------------!
!  0   25 Y100ms          !                        !                        !
!  1   20 Y100ms          !                        !                        !
!  2 9999 Y  1mn          !                        !                        !
!  3 9999 Y  1mn          !                        !                        !
```

Constant words

The configuration parameters are defined as constant words from CW0 to CW4. The "YES" message is however defined from CW10 to CW14 (address of the of destination of the data monitoring message):

CW0 : Uni-Telway slave and address Ad0 = 1,
CW2 : transmission speed 9600 bps,
CW3 : 40 ms time-out,
CW4 : address Ad1 = 2 ; address Ad2 = 3.

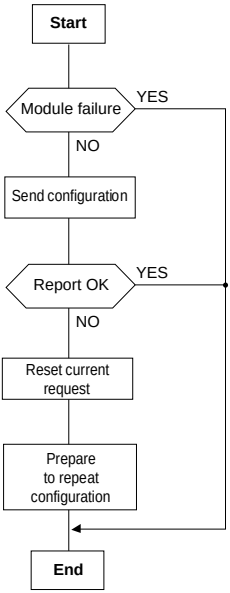
```
CONFIGURATION : CONSTANT WORDS

     CW NB CONFIGURED    :  128

CONSTANT   VALUE                    CONSTANT   VALUE

 CW0     =H'6001'                    CW16    =0
 CW1     =H'0000'                    CW17    =0
 CW2     =B'9600'                    CW18    =0
 CW3     =B'0040'                    CW19    =0
 CW4     =H'0302'                    CW20    =0
 CW5     =0                          CW21    =0
 CW6     =0                          CW22    =0
 CW7     =0                          CW23    =0
 CW8     =0                          CW24    =0
 CW9     =0                          CW25    =0
 CW10    =H'0000'                    CW26    =0
 CW11    =H'12FE'                    CW27    =0
 CW12    =H'0000'                    CW28    =0
 CW13    =M'OU'                      CW29    =0
 CW14    =M'I '                      CW30    =0
 CW15    =0                          CW31    =0
```

Communication Example (Cont'd)

Configuration (SR4)

```
<SR4 CONTROLS SENDING THE CONFIGURATION FOR SCM21 MODULE CH.1
!

<Module failure?
!       IF IW3,0,8
                THEN RESET B200;RET

<Send configuration data with 2.5sec. time-out
!       IF NOT B201
                THEN RESET TXT0;RESET TXT1;RESET TXT2;RESET TXT3;EXCHG TXT0;
               SET B201;PRESET TO;START TO;RESET B202

<Positive confirm?
!       IF RXT0,D.[TXT0,V=H'FE']
                THEN SET B200;RET

<No answer from the channel so reset request in progress
!       IF T0,D.NOT B202
                THEN SET OW3,0,2;SET B202;RET

<End channel reset and attempt to reconfigure
!       IF B202
                THEN RESET 0W3,0,2;RESET B201;RESET B202

! EOP
```

In the same way as the master, the configuration is sent as a precaution after each power return. This procedure is controlled by subroutine SR4. The configuration table is located after CW0 with the values defined below.



Dialog initialization (SR1)

The program must await reception of the "READY" message sent by text block TXT1 of the master PLC.

The slave module know the text block of the application program that is ready to receive request H'FC' sent by the master. To do so, the destination text block (TXT1 of the slave) must be set-up as OUTPUT TXT1 on initialization (first exchange) then be set to await messages (sent to module address Ad2) by INPUT TXT1. The parameters of the text block are defined in the configuration:

. Start of reception table = W0,
. Reception table length = 10 bytes,
. TXT1,M = H'0367' rack 0, slot 3, link address Ad2 = 3,
. TXT1,C = H'07FC' category code = H'07', request code = H'FC'.

Communication Example (Cont'd)

The text block reception table includes the address of the sender (TXT1 of the master) followed by the message "READY":

W0 = H'0007' . sender category code (H'07'),
. no network (H'00'),
W1 = H'11FE' . default station (H'FE'),
. gate number = H'11' —> master TXT1,
W2 = H'0000' . module number = H'00',
. channel number = H'00.
W3 = M'PR'
W4 = M'ET'

B10 only allows TXT1 to be set to OUTPUT once.

B16 only allows TXT1 to be set to INPUT once.

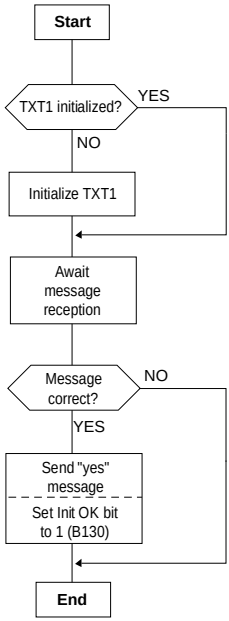
If the message received is correct ("READY"), the application program answers "YES" to the master. This message is sent by text block TXT2 (request H'FC' "Unsolicited Data") to slave address Ad1. Its parameters are defined in the configuration:

. start of transmission table = CW10,
. TXT2,M = H'0366' rack 0, slot 3, link address Ad1 = 2,
. TXT2,C = H'07FC' category = H'07', request code = H'FC',
. TXT2,L = 9. Transmission table length in bytes.

The text block transmission table includes the address of the exchange destination (master PLC text block TXT2) coded in 5 bytes, followed by the message "YES".

B130 = 1 means that initialization was performed.

```
<SR1 INITIALIZE DIALOG
!
<Text block initialized?
!       IF B15
                THEN JUMP L1
<Start initialization
!       IF NOT B10 THEN OUTPUT TXT1;SET B10
!       IF TXT1;D
                THEN SET B15
                ELSE RET
<Await message reception?
!L1     :IF NOT B16 THEN INPUT TXT1;SET B16
!       IF NOT TXT1,D
                THEN RET
<Analyze message received (READY)
!       IF TXT1,D.[TXT1,V<>H'FC'] THEN RET
!       IF [W3=M'PR'].[W4=M'ET']
                THEN OUTPUT TXT2;SET B130
!       RET
! EOP
```



Communication Example (Cont'd)

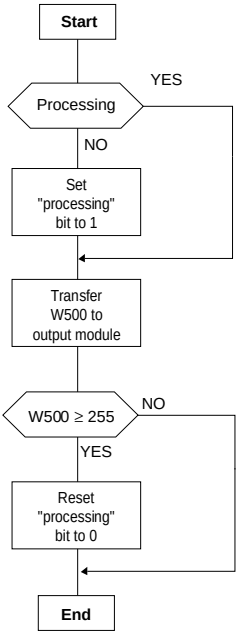
Data reception (SR2)

Subroutine SR2 controls the reception of the contents of word W100 sent by the master PLC to word W500 in the slave.

The status of word W500 is displayed through the 16 relay output TSX DST 16 25 module located in rack 0, slot 4, until it reaches a value of 255.

B160 = 1 if processing (0 to 255) is in progress.

```
<SR2 RECEIVE DATA MASTER
!
<Processing in progress?
!       IF NOT B160
                THEN SET B160
<Transfer the content of the word from master to output module
!       W500->O4,0[16]
<Counting complete?
!       IF [W500>=255]
                THEN RESET B160;0->W500
!       RET
! EOP
```



Communication Example (Cont'd)

Data transmission (SR3)

Subroutine SR3 increments word W200 from 0 to 255 and sends its data to the system gate of the master PLC (via slave PLC link address of the PLC).

Once the request has been sent and as soon as the correct confirm is received, the program increments W200 then sends the "Write Word" (H'14') request again to the master and so on until W200 = 255.....

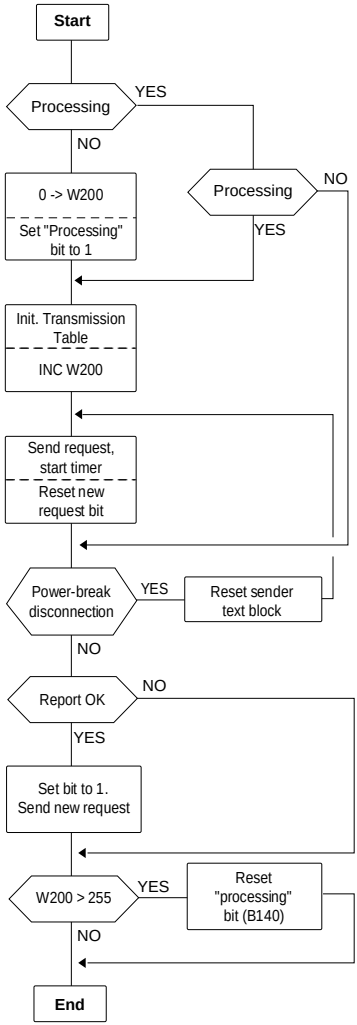
The "Write Word" request is sent by text block TXT3 set-up for EXCHG. Its parameters are defined by configuration:

. Start of transmission table = W20,
. TXT3,M = H'0366' rack 0, slot 3, link address Ad1 = 2,
. TXT3,C = H'0714' category = H'07', request code = H'14',
. TXT3,L = 10. Transmission table length in bytes.

The transmission table comprises the number of the word to be written in the slave (W1000) followed by its content (W200).

W20 = H'0000' no network,
W21 = H'00FE' master system gate,
W22 = H'0000' module and channel number = 0,
W23 = 1000 number of the word to write,
W24 = W200 content of the word to write.

Timer T1 controls power breaks or disconnection of the master during exchanges. As soon as a request is sent, T1 starts (2 sec. time-out). If after 2 sec. the text block has not received an answer, it is reset to 0 (RESET TXT3).



Communication Example (Cont'd)

Setting B11 to 1 will detect a disconnection or power break affecting the destination during the exchange.

Setting B12 to 1 will check that the destination exists and detect a disconnection or power break affecting the destination, before the exchange is started (TXT3,D and TXT3,E at 1 with TXT3,S = 3).

If a power break or disconnection occurs affecting the slave, the program will continually attempt to restart the "Write Word" request with the value of W100 that was not sent. As soon as the fault ends, requests are once again sent normally. No data will have been lost.

B140 = 1 if processing (0 to 255) is in progress,
B150 = 1 validates sending a new value for W200.

```
<SR3 SEND DATA TO THE MASTER
!

<Processing?
!       IF NOT B140
                THEN SET B140;0->W200;JUMP L1

<Send a new request?
!       IF NOT B150
                THEN JUMP L1

<Initialize transmission table (5 level address + data)
!L1    :H'0'->W20->W22;H'FE'->W21;1000->W23;W200->W24;INC W200

<Send request and start timer. Reset new request bit
!L2    :EXCHG TXT3;PRESET T1;START T1;RESET B150

<Process power break during current exchange
!L3    :IF NOT TXT3,D.NOT TXT3,E.T1,D
                THEN SET B11
                ELSE RESET B11

<Process power break before exchange start or non-existent station
!       IF TXT3,D.TXT3,E.[TXT3,S=3]
                THEN SET B12
                ELSE RESET B12

<Reset text block TXT3 on power break?
!       IF B11+B12
                THEN RESET TXT3;JUMP L2

<Correct exchange confirm
!       IF [TXT3,V=H'FE'].TXT3,D.NOT TXT3,E
                THEN SET B150

<Count to 255
!       IF [W200>255]
                THEN RESET B140

!       RET

! EOP
```

4 Appendix

4.1 Performance Levels

The overall response time from the transmission of a request to the reception of an answer depends on:

. The network cycle time,
. The software response time of the TSX SCM 21.6 module,
. The variation in synchronization between the client, network and server cycles.

Bus Cycle Time

The bus cycle time (BCT) corresponds to the time between two polls of the same network address. (Refer to Sub-section 4.3 of the Uni-Telway Reference Manual).

Module Software Response Time

The module software response time of the TSX SCM 21.6 module is:

. 15 ms approx. (validity check and routing).

Note : When channel 0 of the module is used, the above time is increased depending on the size of the request. The maximum time value is at least :

20ms + (0.3 x n), where n is the number of characters in the request used on channel 0.

Difference Between the Client, Network and Server Cycles

The difference between the client, network and server cycles depends on:

. the cycle time of the master PLC,
. the bus cycle time,
. the server cycle time (slave PLC cycle time...).

Note : It is recommended that the transmission speed on channel 1 be restricted to 4800 bps when it is used.

4 Appendix

4.2 Module Versions

Asynchronous serial communication modules.

Module program version	Type of adaptor channel 0	channel 1	Ref. No.
. **Channels 0 and 1 Half-duplex Character string**	RS232C isolated	RS232C isolated	TSX SCM 2011
	RS232C isolated	20 mA current loop	TSX SCM 2012
	RS232C isolated	RS232C modem	TSX SCM 2013
	RS232C isolated	RS422A/RS485	TSX SCM 2014
	20 mA cur. loop	20 mA current loop	TSX SCM 2022
	RS422A/RS485	RS422A/RS485	TSX SCM 2044
	RS232C simpl.	RS232C simpl.	TSX SCM 2055
. **Channel 0 Half-duplex Character string**	RS232C isolated	RS232C isolated	TSX SCM 2211
	RS232C isolated	20 mA current loop	TSX SCM 2212
	RS232C isolated	RS232C modem	TSX SCM 2213
	RS232C isolated	RS422A/R485	TSX SCM 2214
. **Channel 1 : soft. config.** - **Half-duplex Character string**	20 mA cur. loop	20 mA current loop	TSX SCM 2222
- **Modbus ® or Pyromat ® protocol**	RS232C/RS422A/ RS485	RS422A/ RS485	TSX SXM 2244
. **Channel 0 Half-duplex Character string**	RS232C isolated	Uni-Telway (*)	TSX SCM 2116
	20 mA cur. loop	Uni-Telway (*)	TSX SCM 2126
	RS422A/ RS485 isolated	Uni-Telway (*)	TSX SCM 2146
	RS232C isolated	RS232C isolated	TSC SCM 2111
. **Channel 1: soft. config. Uni-Telway Full-duplex char. string Half-duplex char. string**	RS232C isolated	20 mA current loop	TSX SCM 2112
	RS232C isolated	RS232C modem	TSX SCM 2113
	RS232C isolated	AB2 Bus	TSX SCM 2117
	20 mA cur. loop	20 mA current loop	TSX SCM 2122
	RS422A/ RS485	RS422A/ RS485	TSX SCM 2144

(*) In Half-duplex character string mode, Channel 1 is configured for RS422A/ RS485 isolated (Full-Duplex cannot be used).

4 Appendix

4.3 Requests Supported TSX Series 7 PLCs

Standard requests

Family	Service	Request		Confirm		Description
		Hex.	Dec.	Hex.	Dec.	
Variable Management (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, bit or word strings...).
Variable Management (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...).
Unsolicited Data	Unsolicited data (*)	FC	252	X	X	Sends data without receiving a request first.
Operating Mode Management	RUN (*)	24	36	FE	254	Sets a device to Run.
	STOP (*)	25	37	FE	254	Sets a device to Stop.

(*) Standard requests are described in detail in the *Appendix* of the *Uni-Telway Reference Manual, sub-section 5.4*.

Requests Supported TSX Series 7 PLCs (Cont'd)

Specific Requests

Service	Request		Confirm		Description
	Hex.	Dec.	Hex.	Dec.	
Read a system bit	01	01	31	49	Reads a sytem bit (SY).
Read the memory image of an I/O bit	02	02	32	50	Reads the 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 sytem 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 Grafcet steps	2A	42	5A	90	Reads Grafcet steps (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.
Write a system bit	11	17	FE	254	Writes a system bity (SY).
Write the memory image of an I/O bit	12	18	FE	254	Writes the 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 the preset value of a timer	17	23	FE	254	Writes a timer preset (T).
Write the preset value of a monostable	18	24	FE	254	Writes a monostable preset (M).
Write the preset value of a counter	19	25	FE	254	Writes a counter preset (C).
Write the input word of a register	1A	26	FE	254	Writes a register input (R).
Write a double word	46	70	FE	254	Writes a double word (DW).

4.4 Standard Requests

Read Objects

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

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 of the objects to be read and their location (in Hexadecimal notation). Segments that can be addressed by TSX Series 7 PLCs are (in Hexadecimal notation):

10 : common object segment,
68 : internal word field segment,
69 : constant word field segment,
6C : Ctrl. user task segment,
80 : TSX 7 system object segment.

Type of Object : specifies the type of object to read:

7 : 16-bit signed integer,
8 : 32-bit signed integer,
64 : task period.

Object address : . physical or logical address in the segment,
. object order number in the segment.

- 0 : current time and date in the common segment,
- 1 : time and date stored in the common segment,
- 1 : programming port configuration in the system segment.

Confirm format

Positive confirm

Confirm Code Hex.	Type of Object	Data
66/102		

Type of object : sends back the type of object selected when the request was sent.

Standard Requests (Cont'd)

Read Objects (Cont'd)

Negative confirm

Confirm Code Hex.
FD/253

Reasons 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,
Type of object : 7 → Wi, or 8 → DWi,
Object address : index of the first Wi or DWi to read.

Read constant words or constant double words

Segment : 69,
Type of object : 7 → Wi, or 8 → DWi,
Object address : index of the first Wi or DWi to read.

Read time and date

Segment : 10 (common),
Type of object : 0 by default,
Object address : 0 → current time and date,
1 → stored time and date.
Quantity : 0 by default.

Read programming port configuration

Segment : 80 (TSX 7 System),
Type of object : 0 by default,
Object address : 0 → programming port configuration,
Quantity : 0 by default.

Read task period

Segment : 6C (Ctrl),
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.

Standard Request (Cont'd)

Write Objects

This request writes simple objects (words or word strings).

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 field (in Hex.):

10 : common object segment,
68 : internal word field segment,
69 : constant word field segment,
6C : Ctrl user task segment,
80 : TSX 7 system object segment.

Type of Object : specifies the type of object to write:

7 : 16-bit signed integer,
8 : 32-bit signed integer,
64 : task period.

Object address : . physical or logical address in the segment,
. object order number in the segment.

. 0 : current time and date in the common segment,
. 1 : time and date stored in the common segment,
. 0 : programming port configuration in the system segment.

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Negative confirm

Confirm Code Hex.
FD/253

Write Objects (Cont'd)

Negative confirm (cont'd)

Reasons for rejection:

- Unknown request,
- Inadequate access rights,
- Unknown segment or object,
- Address of the last object out of range.

Request examples

Write words or double words

Segment : 68,
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,
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 time and date

segment : 10 (common),
Type of object : 0 by default,
Object address : 0 → current time and date.
Quantity : 0 by default,
Data : 17 ASCII characters for the time and date:
YYYYMMDDHHMMSS.TZ,
(T: tenths of a second; Z: ending).

Write programming port configuration

segment : 80 (TSX7 System),
Type of object : 0 by default,
Object address : 0 → programming port configuration,
Quantity : 0 by default,
Data : 1 byte describing the new configuration.

Write task period

Segment : 6C (Ctrl),
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 conforming to the time bases that apply to each task.

4.5 Specific Requests

Read a System Bit

This request reads a system bit (SY).

Request format

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

Confirm format

Positive confirm

Confirm Code Hex.	Value
31/49	

Value : The value comprises a string of 8 bits where the first bit is the highest multiple of 8 contained in the system bit number to be read. Only the bit corresponding to the one that is searched for is significant.

Negative confirm

Confirm Code Hex.
FD/253

Reasons for rejection:

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

Specific Requests (Cont'd)

Read the Memory Image of an I/O Bit

This request reads the content of the image memory of 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
bit 7 : reserved (0)
bit 8 → 11 : Telway 7 station number
bit 12 → 15 : 0
bit 8 → 15 : H'FE' in local (no Telway 7 network)

Confirm format

Positive confirm

Confirm Code Hex.	Value
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 : Not in 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)
bit 0 to 5 : if type = 1 → catalog type number
if type = 0 → default type number

Value : Value of the module I/O bits. If an 8-bit module is used, the MSB contains null values that are non-significant. "Value" is only significant if the fault bit = 0 (bit 7) and the configuration = 1 (bit7).

Specific Requests (Cont'd)

Read the Memory Image of an I/O Bit

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

Negative confirm

Confirm Code Hex.
FD

Reasons for rejection:
- . Unknown request,
- . Inadequate access rights,
- . Module number out of range.

Specific Requests (Cont'd)

Read a Constant Word

This request reads a constant word (CW).

Request format

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

Confirm format

Positive confirm

Confirm Code Hex.	Value
35/53	

Negative confirm

Confirm Code Hex.
FD/253

Reasons for rejection:

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

Specific Requests (Cont'd)

Read a System Word

This request reads a system word (SW).

Request format

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

Confirm format

Positive confirm

Confirm Code Hex.	Value
36/54	

Negative confirm

Confirm Code Hex.
FD/253

Reasons for rejection:

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

Specific Requests (Cont'd)

Read a Common Word

This request reads a common word (Telway 7 network).

Request format

Request Code Hex.	Category Code	Telway 7 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 words comprising the station

Negative confirm

Confirm Code Hex.
FD/253

Reasons for rejection:

- Unknown request,
- Inadequate access rights,
- Word number out of range,
- Cannot execute RAM,
- Station out of range.

Specific Requests (Cont'd)

Read a Timer

This request reads all of the parameters of a timer.

Request format

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

Confirm format

Positive confirm

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

Time Base : 0 → 10 ms
1 → 100 ms
2 → 1 s
3 → 1 mn

Time-out : 0 → no
1 → yes

Timer Running : 0 → no
1 → yes

Type of Preset : 0 → preset cannot be changed
1 → preset can be changed

Negative confirm

Confirm Code Hex.
FD/253

Reasons for rejection :
- Unknown request,
- Inadequate access rights,
- Timer number out of range,
- Cannot execute RAM.

Specific Requests (Cont'd)

Read a Monostable

This request reads all of the parameters of a monostable.

Request format

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

Confirm format

Positive confirm

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

Time Base : 0 → 10 ms
1 → 100 ms
2 → 1 s
3 → 1 mn

Monstable Running : 0 → no
1 → yes

Type of Preset : 0 → preset cannot be changed
1 → preset can be changed

Negative confirm

Confirm Code Hex.
FD/253

Reasons for rejection:
- Unknown request,
- Inadequate access rights,
- Monostable number out of range,
- Cannot execute RAM.

Specific Requests (Cont'd)

Read a Counter

This request reads all of the parameters of a counter.

Request format

Request Code Hex.	Category Code	Counter Number
08/11	0 → 7	

Confirm format

Positive confirm

Confirm Code Hex.	Down-count overflow	Upcount overflow	Counter Running	Type of Preset	Preset Value	Current Value
38/59						

Downcount Overflow : 1 if the current counter value has gone from 0 to 9999

Upcount Overflow : 1 of the current counter value has gone from 9999 to 0
0 → no
1 → yes

Type of Preset : 0 → preset cannot be changed
1 → preset can be changed

Negative confirm

Confirm Code Hex.
FD/253

Reasons for rejection:
- Unknown request,
- Inadequate access rights,
- Counter number out of range,
- Cannot execute RAM.

Specific Requests (Cont'd)

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

Reasons for rejection:
- Unknown request,
- Inadequate access rights,
- Register number out of range,
- Cannot execute RAM.

Specific Requests (Cont'd)

Read Grafcet Steps

This request reads all of 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 : 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

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

Specific Requests (Cont'd)

Read a Double Word

This request reads a double word (DW).

Request format

Request Code Hex.	Category Code	Word Number
40/64	0 → 7	

Confirm format

Positive confirm

Confirm Code Hex.	Double Word Value
70/112	

Negative confirm

Confirm Code Hex.
FD/253

Reasons for rejection:

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

Specific Requests (Cont'd)

Read a Constant Double Word

This request reads a constant double word (CDW).

Request format

Request Code Hex.	Category Code	Constant Double Word Number
40/64	0→7	

Confirm format

Positive confirm

Confirm Code Hex.	Constant Double Word Value
70/112	

Negative confirm

Confirm Code Hex.
FD/253

Reasons for rejection:

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

Specific Requests (Cont'd)

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	Blocked
7B/123		00	00	00	

Active Step : 0 → no
1 → yes

Blocked Step : 0 → no
1 → yes

Negative confirm

Confirm Code Hex.
FD/253

Reasons for rejection:
- Unknown request,
- Inadequate access rights,
- Step number out of range.

Specific Requests (Cont'd)

Write a System Bit

This request writes a system bit (SY).

Request format

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

Bit value : 0 or 1.

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Negative confirm

Confirm Code Hex.
FD/253

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

Specific Requests (Cont'd)

Write the Memory Image of an I/O Bit

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

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	→ 2	:	module number
bit	3	→ 6	:	rack number
bit	7	→	:	reserved (0)
bit	8	11	:	Telway 7 station number
bit	12	→ 15	:	0
bit	8	→ 15	:	H'FE' in local, no Telway 7 network

I/O bit number : 0 to 7 for an 8-bit module
0 to F for a 16-bit module

Bit value : 0 or 1

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Negative confirm

Confirm Code Hex.
FD/253

Reasons for rejection:
- Unknown request,
- Inadequate access rights,
- I/O module number out of range,
- I/O bit number out of range.

Specific Requests (Cont'd)

Write a System Word

This request writes a system word (SW).

Request format

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

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Negative confirm

Confirm Code Hex.
FD/253

Reasons for rejection:

- Unknown request,
- Inadequate access rights,
- System word out of range.

Specific Requests (Cont'd)

Write a Common Word

This request writes a common word (Telway 7 network).

Request format

Request Code Hex.	Category Code	Telway 7 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

Reasons for rejection:

- Unknown request,
- Inadequate access rights,
- Word number out of range,
- Cannot execute RAM.

Specific Requests (Cont'd)

Write the Preset Value of a Timer

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

Request format

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

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

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Negative confirm

Confirm Code Hex.
FD/253

Reasons for rejection:

- Unknown request,
- Inadequate access rights,
- Timer number out of range,
- Preset cannot be changed,
- Preset value out of range,
- Cannot execute RAM.

Specific Requests (Cont'd)

Write the Preset Value of a Monostable

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

Request format

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

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

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Negative confirm

Confirm Code Hex.
FD/253

Reasons for rejection:

- Unknown request,
- Inadequate access rights,
- Monostable number out of range,
- Preset cannot be changed,
- Preset value out of range,
- Cannot execute RAM.

Specific Requests (Cont'd)

Write the Preset Value of a Counter

This request writes the preset value of a counter.

Request format

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

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

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Negative confirm

Confirm Code Hex.
FD/253

Reasons for rejection:

- Unknown request,
- Inadequate access rights,
- Counter number out of range,
- Preset cannot be changed,
- Preset value out of range,
- Cannot execute RAM.

Specific Requests (Cont'd)

Write the Input Word of a Register

This request writes the input word of a register (R).

Request format

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

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Negative confirm

Confirm Code Hex.
FD/253

Reasons for rejection:

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

Specific Requests (Cont'd)

Write a Double Word

This request writes a double word.

Request format

Request Code Hex.	Category Code	Word Number		Double Word Value			
46/70	0→7						

Confirm format

Positive confirm

Confirm Code Hex.
FE/254

Negative confirm

Confirm Code Hex.
FD/253

Reasons for rejection:

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

4 Appendix

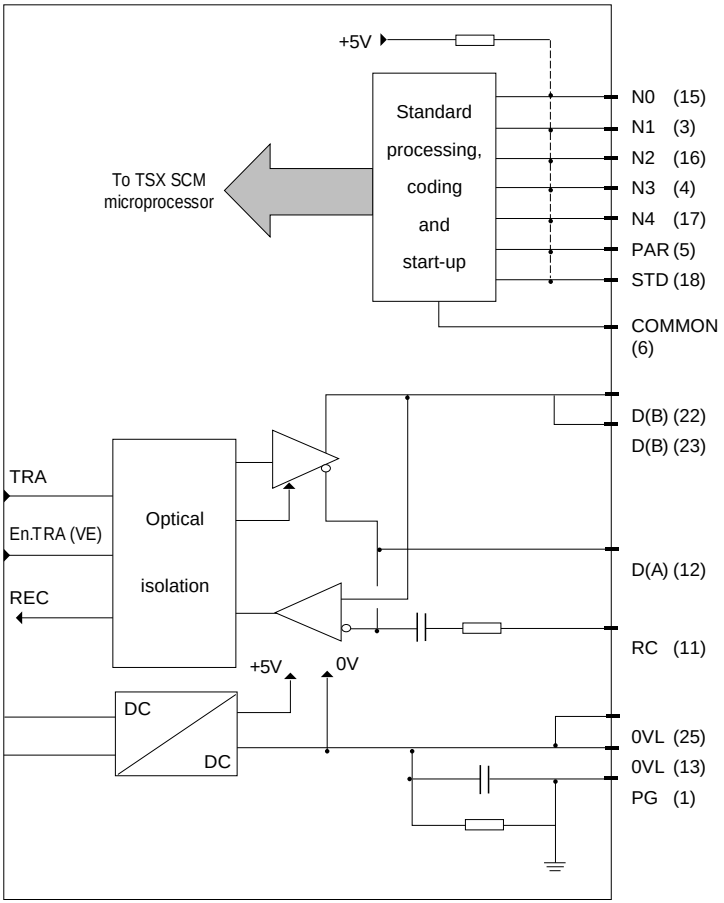
4.6 SCA6 Adapter

Description

This adapter is fitted in TSX SCM 21.6 modules to support Uni-Telway compatibility. It can therefore only be mounted as channel 1 of the module.
It comprises :

. a transmission and reception circuit for differential signals conforming to RS-485 standards,
. line polarization,
. a RC line matching circuit that can be connected if end of line terminating is required

Simplified Layout Diagram

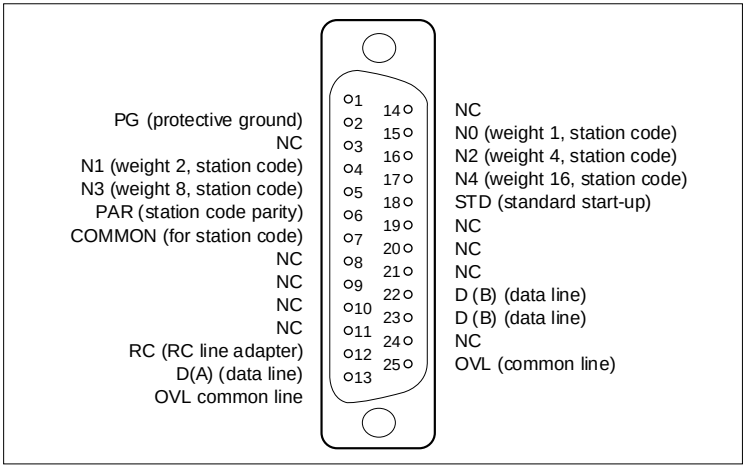


Recognition Code

The SCA6 adapter is coded 4 (100 in binary notation) in register word IWxy,1 bits C,D,E.

SCA6 Adapter (Cont'd)

Pin Arrangement



Coding

A device is addressed by leaving the lines for the corresponding binary weights open (N0, N1, N3, N4). The lines for the other weights are connected to the COMMON (6) in the 25-pin connecter.

Parity

The PARITY (5) signal must be connected so that the total number of signals that are left open must always be odd.

Standard Start-up

When the STD signal (18) is connected to the COMMON line (6), the TSX SCM module will start-up on the standard configuration :

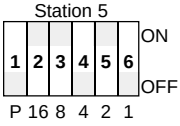
. Uni-Telway master if the address is 0,
. Uni-Telway slave if the address is not 0.

Example

Coding Uni-Telway slave 5,

Pins 16 (weight 4), 15 (weight 1) and 5 (PAR) are left open. All other binary weight lines and pin 18 (STD) are connected to pin 6 (COMMON).

Note : The coding of station 5 set in the TSX SCA 62 Subscriber Socket is:



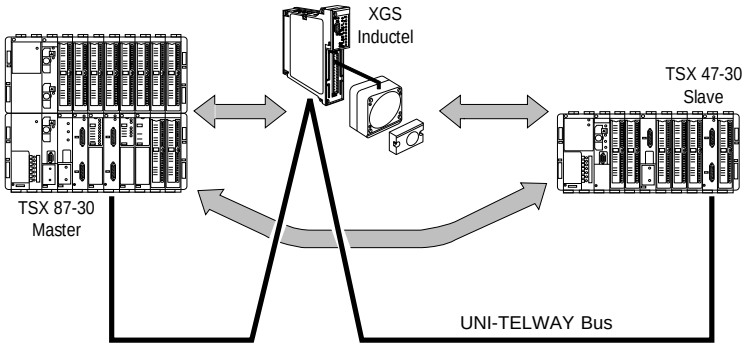
Line Adaptation

When the TSX SCM 21.6 module is located at the start or end of the line, the RC signal (11) must be connected back to the output signal D(B) (22 or 23).

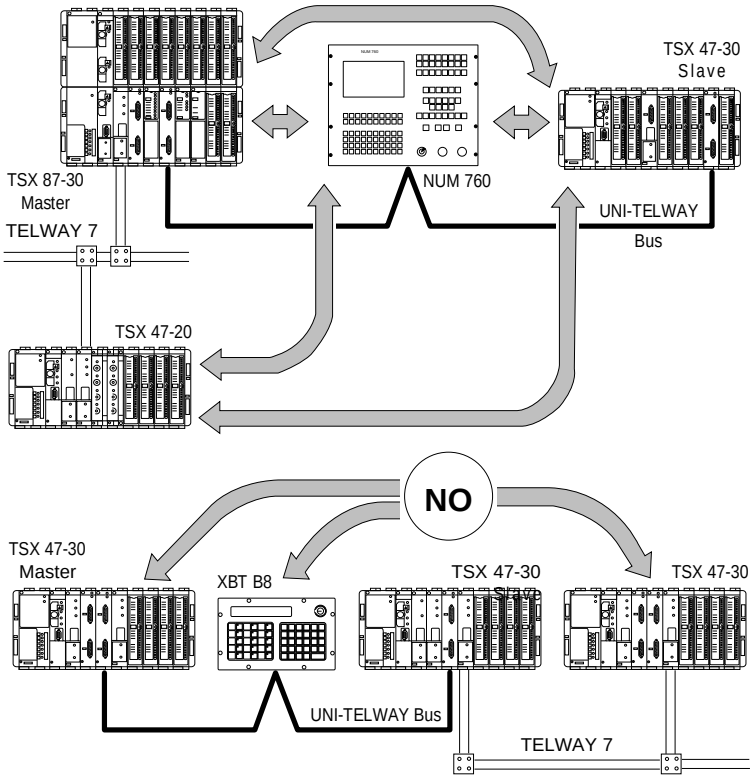
4 Appendix

4.7 Exchange Possibilities

A Uni-Telway Bus



A Uni-Telway bus with a Telway 7 Network



Transparent communications stop when a slave PLC is reached.
To go beyond that point communications have to be processed by the application program of the slave PLC.

4 Appendix

4.8 Simultaneous Use of Channels 0 and 1

Both channels of a TSX SCM 21.6 module may be used simultaneously with Channel 0 running in character string mode and Channel 1 supporting the Uni-Telway master or slave protocol. When using both channels in an application, the following considerations should be taken into account.

Using Channel 0 of a Slave Module

If a slave module has to send a confirm to the master while Channel 0 is busy, transmission of the confirm on the bus may be delayed. If the delay exceeds the duration of the time-out set in the master (set to 30 ms by default), the master will assume that the slave did not respond. The response is lost. The master will then automatically repeat its transmission, reducing communication performance. If this occurs, increase the time-out setting of the master. This is performed in the master module setting.

Reminder: The turnaround time of a TSX SCM 21.6 module is 15 ms (validity check, routing, etc.). If Channel 0 is used, the turnaround time is increased by (20 + 0.3 x n) ms, when n is the number of characters in the request on Channel 0.

Using Channel 0 of Master Module

If the master module uses Channels 0 and 1 simultaneously, the additional load caused by Channel 0 operation can affect operation of the Uni-Telway bus connected to Channel 1. This load causes the master to increase the time between two successive polling cycles. As slaves are no longer polled as frequently, they may unnecessarily disconnect from the bus.

By default the time-out value for slaves is 100 ms. The maximum time allowed by a slave 2 polling cycles is 4 times the time-out value.

If the slaves devices unnecessarily disconnect from the bus (disconnection is sensed by bit IWxy,3,0) being set to 1, increase the time-out value of the slave. This is changed in the slave configuration.

4 Appendix

4.9 Exchange Errors

This last Appendix sub-section describes the TSX SCM 21 behaviour when Channel 1 is supporting the Uni-Telway protocol and exchange errors occur (TXTi,D and TXTi,E = 1).

Reminder: When a message is rejected by the TSX SCM 21 module, the message is forwarded to the transmitting PLC. This produces the following at the transmitting text block level:
- . TXTi,D = 1
- . TXTi,E = 1
- . TXTi,S, TXTi,V, reception table (contents vary with the versions of the PLC processor and the TSX SCM module).

Version SCM 21 < V2.2

. With processor < V3.9
- TXTi,S = 3
- TXTi,V = no meaning
- Reception table (contains the message sent out).

. With processor V3.9 or Model 40:
- TXTi,S = 12
- TXTi,V = H'FF' (generic error).

Version SCM 21 V2.2

. With processor < V3.9
- TXTi,S = 3
- TXTi,V = no meaning
- Reception table: the 1st byte contains the error code (see next paragraph).

. With processor V3.9 or Model 40:
- TXTi,S = 12
- TXTi,V = error code (see next paragraph).

Exchange Errors (Cont'd)

Error Code

The error code specifies the type of error. In the description below, master or slave designates the device which sent out the rejected message.

. 03: destination inaccessible
  - master, link address not configured or faulty (not polled cyclically), or
  - slave, address Ad1 faulty (not polled cyclically) or destination address faulty (slave-to-slave exchanges).

. 04: error line
  - master, negative acknowledge after sending out a message (destination buffers are full),
  - slave, negative acknowledge after sending out a request via address Ad1 (the buffers of the master or destination are full: master-to-slave or slave-to-slave exchanges).

. 05: error length
  - master, TXTi,L > 126 bytes
  - slave, TXTi,L > 132 bytes (126 + 6 bytes of destination address for Ad1)
    TXTi,L < 6 bytes (at least 6 bytes of destination address for Ad1).

. 07: address error
  - master and slave, link address > 152
    (TXTi,M (channel No.) > 100 + 152)
  - slave, link address different to Ad1 or Ad2
    (TXTi,M (channel No.) < > 100 + Ad1 or 100 + Ad2)

Remark: When the TSX SCM 21 module is configured with a function number other than 5 (Uni-Telway master operation) or 6 (Uni-Telway slave operation) and if the module is addressed with a channel number (TXTi,M) other than 0, 1 or 99, the address error is also passed up to the TXT block level.

. 08: unknown request code
  - slave, request code different from H'FC for receiving unsolicited data via address Ad2.

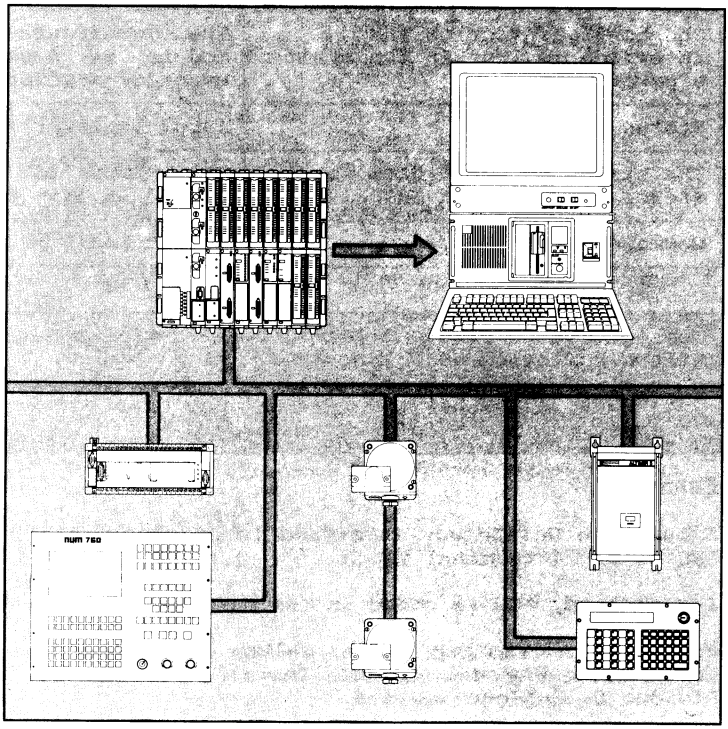
. 10: time-out period elapsed
  - slave, no response received to a request via address Ad1 after 10 seconds or no acknowledgement.

UNI-TELWAY Interface for Model 40 Processors

Manuel prog. liais. UTW E
UTW Link Program. Manual E

TSX DM UTW E

France



TSX P47 411 / P47 420 / P67 420 / P87 420 / P107 420

The Uni-Telway interface built-into TSX Series 7 Model 40(*) PLC processors offers the same important features as Channel 1 of a TSX SCM 21.6 serial communication module.

The table below lists the detailed differences between these two types of Uni-Telway interface:

Built-in Uni-Telway Interface	TSX SCM 21.6 Module
Connection via a TSX LES 64/65 terminal block to a TSX SCA 50 tap junction.	Connection via the 25-pin Sub-D connector to a TSX SCA 62 subscriber socket.
Module address = H'FFyy' where yy = channel number (Ad0/Ad1/Ad2)	Module address = H'xxyy' where xx = module slot, yy = channel number (Ad0/Ad1 Ad2).
The configuration of the interface is lost in the event of a power break.	The configuration of the module is backed-up in the event of a power break.
Status word SW100.	Input register IWxy,0.
The status of event data is stored in SW101 and SW102.	The status of event data is stored in IWxy,4 and IWxy,5.
Command word SW108.	Output register OWxy,0.

The setting-up of a Uni-Telway bus requires a detailed knowledge of the following manuals:
Uni-Telway Bus Reference Manual (TSX D24 004E),
TSX SCM 21.6 Channel 1 Uni-Telway Bus User's Manual TSX D24 005E
In addition to the information provided in this document.

Connection

A built-in Uni-Telway interface is connected to the bus via a TSX LES 64 or 74 terminal block.

Its address, Ad0 is coded in the terminal block.

For more information on Uni-Telway bus connections, refer to the TSX Series 7 Model 40 PLC Installation Manual (TSX DM PR40E), Divider B, Sub-section 4.6.

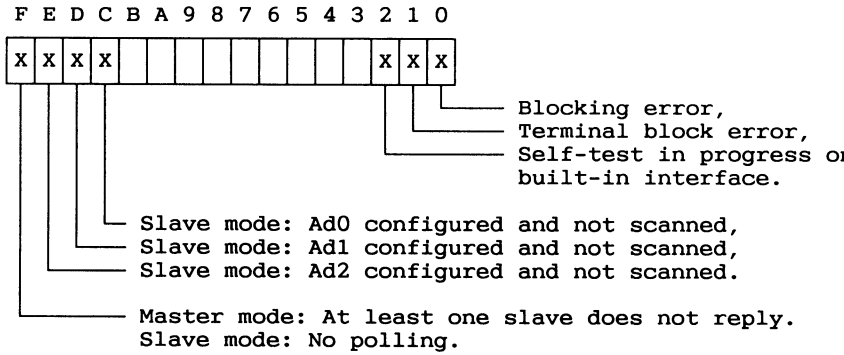
(*) TSX P47-411F/420F, TSX P67-420F, TSX P87-420F, TSX P107-420F

Configuration

The configuration must be sent each time the PLC is powered-up. The configuration can be sent by Text block (refer to the TSX SCM 21.6 Channel 1 User's Manual, Sub-section 2.2) or by the COM LD OFB (refer to the PL7-COM User's Manual).

Status word SW100

This status word contains data on the overall operation of the built-in Uni-Telway bus. The bits are significant at 1.

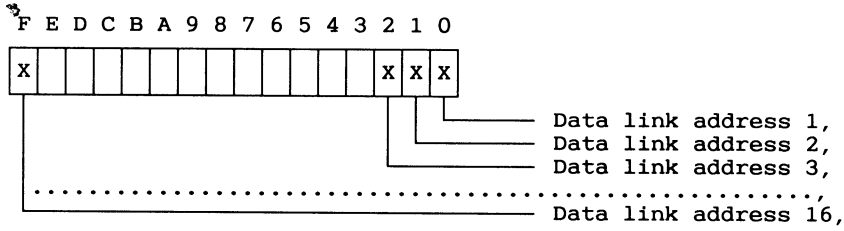


Status word SW100 is only significant if an application program is loaded in the PLC.

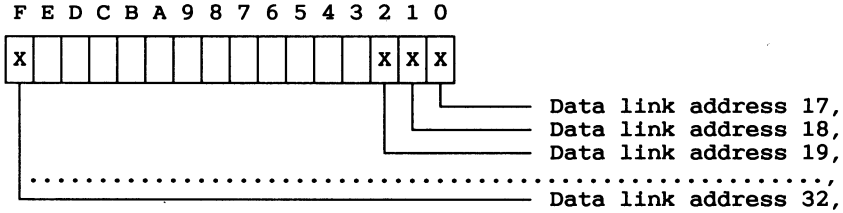
Events

Events (as described in the TSX SCM 21.6 User's Manual, Sub-section 3.2) are stored in system words SW101 and SW102. Each bit of these words is assigned a data link address as shown below:

SW101:



SW102:

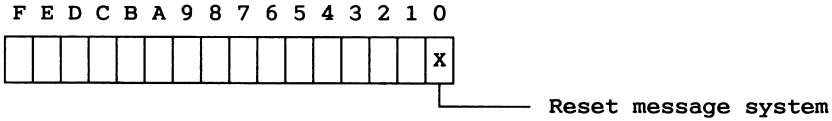


These bits are active at 1.

Example: If the events on data link addresses 4, 8 and 31 have been modified, the built-in Uni-Telway interface sets bits SW101,3; SW101,7 and SW102,E to 1.

System words SW101 and SW102 are only significant if an application program is loaded in the PLC.

Command word SW108



Only bit 0 of this word is used. It lets the user reset the message system. This bit is active at 1 and must be maintained active for at least one complete Master task cycle.

The command word SW108 is only significant if an application program is loaded in the PLC.

Read object request (H'36)

When the read object request (refer to the TSX SCM 21.6 User's Manual, Sub-section 3.4) is used, data received is shifted by one byte and coded in two consecutive words. A byte shift can be performed by the PL7-3 V4 SLCWORD instruction.

SLCWORD (Wx;Wy) where:
. Wx = Start address,
. Wy = Byte string length.

This instruction is described in detail in the PL7-3 V4 Reference Manual (TSX DR PL7-3 V4E), Divider D, Sub-section 5.3-1.