

General

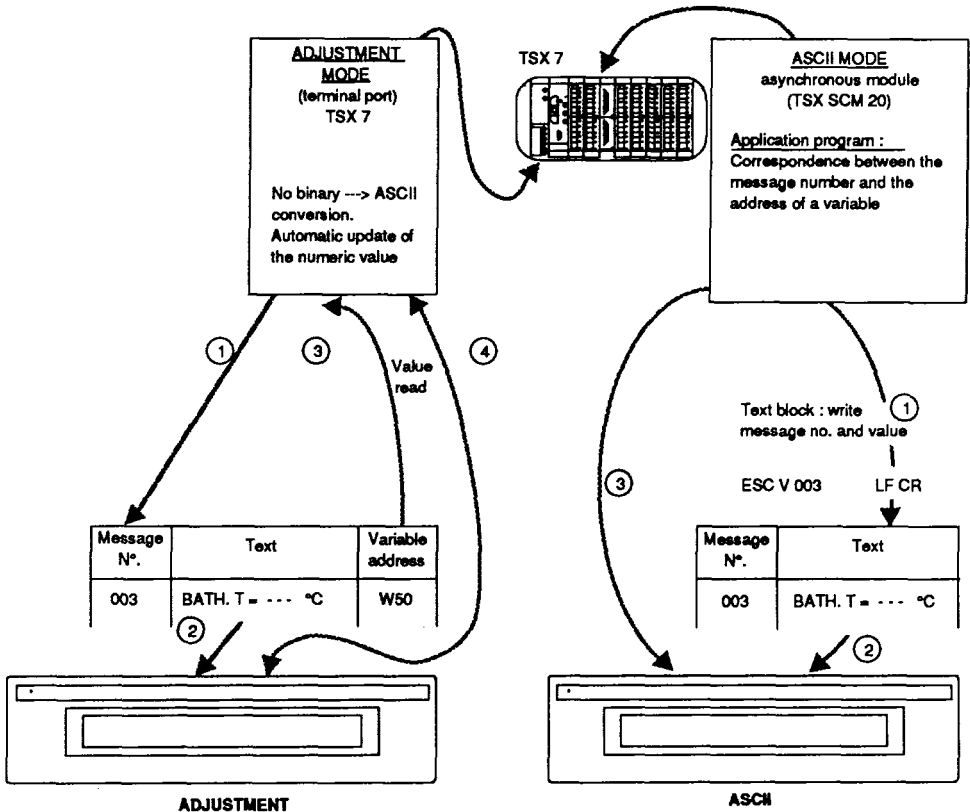
6.1.3 Parallel link control

Displaying a text message is achieved by presenting the following to the XBT-K inputs :

- the code for the type of display,
- the number of the message coded in pure binary,
- a validation signal (rising edge) for a minimum duration of 10 ms.

Displaying a value in the numeric field is achieved digit by digit on the rising edge of the validation signal. Its position in the numeric field is defined by a BCD value.

6.1.4 Summary of the exchanges



General

ADJUSTMENT protocol

- ① The message is accessed when the TSX 7 PLC sends the message number.
- ② Message text is displayed.
- ③ The XBT-K requests access to an associated PLC variable and displays its value.
- ④ The XBT-K repeatedly updates this value.

ASCII protocol

- ① The PLC sends a display command (message number and where applicable, the current value).
- ② The XBT-K displays the message and the current value.
- ③ The application program repeatedly sends the current values to be displayed.

6.2 ASCII mode

6.2.1 Configuration

In ASCII mode the serial line parameters, speed, format, parity... are adapted to the application .

Types of link : RS 232, RS 422, 20 mA current loop.

**ONLY ONE TYPE OF LINK SHOULD
BE USED AT A TIME**

Types of exchange : HALF DUPLEX

Line parameters :

Speed 110, 300, 600, 1200, 2400, 4800, 9600, 19200 (9600 bauds max with 20 mA current loop)

Format : 7 or 8 bits

Parity : odd, even or none

Stop : 1 or 2 bits

Adjustments to line parameters are programmed using the ESC G command (see chapter 6 : COMMANDS) and are simultaneously displayed on the XBT-K screen.

**THE VALUES OF THE CONFIGURATION PARAMETERS
FOR THE TRANSMISSION LINE ARE SYSTEMATICALLY
MEMORIZED BY THE XBT-K TERMINAL AND SAVED DURING
A POWER CUT**

Note : The format 7 bits, no parity, 1 stop bit is not allowed.

Default values : 9600 bauds, odd parity, 8 bit format, 1 stop bit.
(ASC H 9600 OD 8B 1S).

ASCII Mode

6.2.2 Exchanges

The automation system controls all the exchanges.

Message number 021 is stored in XBT-K : BATH.T = - - - C

Message number 044 is stored in XBT-K as : SETTING = - - - C

OBJECTIVE	XBT-K DISPLAY	XBT<->TSX-7 EXCHANGES	COMMENTS
Display a varying numeric parameter (measurement)	BATH.T = 126 C	← ESC V 021 126 [LF] CR	Displays the text corresponding to the message number and the current value
	BATH.T= 128 C	← ESC V 021 128 [LF] CR	Updates the value
	BATH.T = 130 C	← ESC V 021 130 [LF] CR	Updates the value
Read a message in the XBT-K	BATH.T= 130 C	← ESC L 044 V [LF] CR	Requests message 044 to be read (with display)
	SETTING = - - - C	→ ESC L SETTING = - - - C [LF] CR	
Read the inputs of the parallel bus to the XBT-K		← ESC E [LF] CR	Requests the PLC inputs to be read
		→ ESC E FFF [LF] CR	Response from the XBT-K (all inputs are at 1)

6.3 ADJUSTMENT Mode

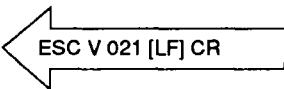
6.3.1 Configuration

In ADJUSTMENT mode, the line parameters are automatically set.
Types of link : RS 232, RS 422, 20mA current loop.

On power-up, the XBT-K detects a request to be connected in the ADJUSTMENT mode if a strap is connected between pins 8 and 12 of the serial connector (see chapter 9 : CONNECTIONS).

6.3.2 Exchanges

Message number 021 is stored in XBT-K, BATH.T = - - - C associated with variable W50

OBJECTIVE	XBT-K DISPLAY	XBT ← TSX 7 EXCHANGES	COMMENTS
Display a varying numeric parameter (measurement)	BATH.T= 126 C		Displays message 021
	BATH.T= 127 C		The XBT-K will repeatedly fetch and display the value of W50 .
	BATH.T= 128 C		

Note : Display of the + sign is replaced by a space (for version V1.3 and up)

ONE OF THE FUNDAMENTAL ADVANTAGES OF THE ADJUSTMENT PROTOCOL IS THAT IT ALLOWS FREEDOM FROM HAVING TO MAKE BINARY ↔ ASCII CONVERSIONS. IT ALSO ALLOWS PARAMETERS TO BE AUTOMATICALLY UPDATED

6.4 Format of the exchanges

This chapter describes the format of the exchanges :

- commands from the PLC to the terminal,
- transmissions from the terminal to the PLC.

Exchanges are bi-directional and comprise series of ASCII characters with the following structures :

Example :

ESC	HEADER	Always ESC (1B H) or @ (40 H)
V	MNEMONIC	ASCII character indicating the type of command
003	DATA	String of ASCII characters defining the parameters of a command
[LF] CR	END	Characters [LF : Line Feed (0A H) CR : Carriage return (0DH)

- Only exchanges commencing with ESC or @ are recognized by the XBT-K terminal,
- It is possible to include NUL (00 H) characters in the command.

IN THE DESCRIPTION OF THE COMMANDS,
PARAMETERS BETWEEN [] ARE OPTIONAL

SPACES ARE DESIGNED TO IMPROVE THE PRESENTATION
AND DO NOT HAVE TO BE INCORPORATED INTO THE COMMANDS

RULES FOR COMPATIBILITY SHOULD BE RESPECTED (see chapter
5.4 : COMPATIBILITY)

6.5 Commands from the PLC to the XBT-K terminal

• Terminal status request

ESC E [Cd] [LF] CR The PLC interrogates the XBT-K for the contents of its status words.

Cd Optional command code :

Absence of the command code starts the reading of the 12 parallel inputs of the XBT-K

The information is transmitted as 3 hexadecimal characters coded in ASCII (30 H to 39 H and 41 H to 46 H). Example : ESC E LF CR

WEIGHT	E2 = A(8+2)				E1 = 8				E0 = C(8+4)			
	8	4	2	1	8	4	2	1	8	4	2	1
XBT-K TERMINALS	STRB	COP2	COP1	D8	D7	D6	D5	D4	D3	D2	D1	D0
STATUS OF INPUTS (example)	1	0	1	0	1	0	0	0	1	1	0	0

The response to a request to read will be transmitted in the following form :
ESC E A8C [LF] CR

Cd = 0

Read and display the program memory checksum, 16 bits (4 hexadecimal characters coded in ASCII, from 0 to F).

Cd = 1

Read and display the message memory checksum, 16 bits (4 hexadecimal characters coded in ASCII from 0 to F).

Cd = 2

Read and display the product code including its software version.

Cd = 3

(reserved)

Cd = 4

(reserved)

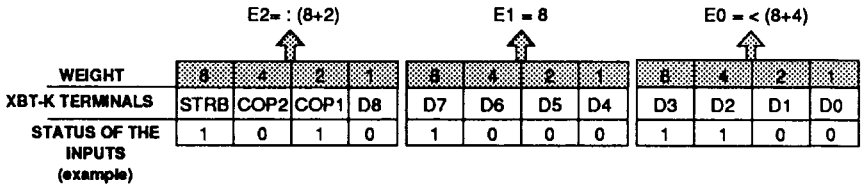
Cd = 5

Read the 12 parallel inputs into the XBT-K.

Commands from the PLC to the XBT-K terminal

The information is transmitted as 3 ASCII coded characters (30 H to 3F H).

Example : ESC E5 LF CR



The response to a read request will be transmitted in the following form :

ESC E : 8 < [LF] CR

• Changing the transmission parameters

ESC G [@ Vspeed] [@ Dd] [@ Ff] [@ Pp] [@ Ss] [LF] CR

(Speed) 110, 300, 600, 1200, 2400, 4800, 9600, 19200

d	Mode of operation :	H	half-duplex
		F	full-duplex
f	Format	7	7 bits
		8	8 bits
p	Parity	E	even
		O	odd
		N	none
s	Stop bit	1	1 stop bit
		2	2 stop bits

Note : For version 1.3 and upwards the MODE OF OPERATION parameter cannot be modified (HALF DUPLEX by default).

Commands from the PLC to the XBT-K Terminal

• Reading a message

ESC L XXX [OP1] [OP2] [LF] CR

XXX Number of the stored message
 $0 \leq \text{XXX} \leq 180$

[OP1] Read operation
 0 = Message text only (default setting)
 1 = Text + message parameters

IN ADJUSTMENT, [OP1] = 1 IS NOT ALLOWED

[OP2] V Steady display (by default, not steady display).

ESC L [LF] CR ALLOWS THE TEXT OF THE MESSAGE DISPLAYED TO BE READ

(version V1.3 and upwards)

• Reading the transmission register of the XBT-K

ESC Q LF CR The transmission register of the XBT-K memorises the last message sent by the terminal.
 In point to point operation this command enables a message already transmitted to be repeated, except for fault messages # @ or ?.
 In multidrop mode, the messages are only transmitted on receipt of this command.

Commands from the PLC to the XBT-K terminal

• Displaying a message not stored in the XBT-K

ESC T [M₁ --- M_n] [@T_r] [@X_x] [@C_c] [@P_p] [LF] CR

M₁ --- M₂₀ : Text of message containing dashes for the optional numeric field (ASCII characters 5F).

The characters of a message are coded in ASCII, between 20 and 5F (see chapter 12 : APPENDIX).

**THE ESC T [LF] CR COMMAND
CLEARS THE DISPLAY**

t : Type of message V Steady display
 D Blinking

x : Column number of the first character of the message $0 \leq X \leq 32$
 x = 0 clears the display before writing

c : Conversion coefficient $0.001 \leq c \leq 1$

p : Parameter Signed or unsigned numeric value or alphanumeric value which is embedded in the numeric field position

Examples

ESC T PRESS = - - - - B @P + 112 LF CR

PRESS = + 112 B

The message is displayed with the associated numeric value.

ESC T PRESSURE FAULT @T D LF CR

PRESSURE FAULT

The fault message blinks.

Commands from the PLC to the XBT-K terminal

• Cancelling the current operations

ESC Z [XXX] [LF] CR

After a V type or T type command, this command allows the display terminal to be made available : stops all blinking, scrolling or updating of the current value (ADJUSTMENT MODE).

The terminal is made available.

[XXX]

Optional number for the message.

• Displaying a pre-stored message

ESC V XXX [parameter] [LF] CR

0 ≤ XXX ≤ 180 Number of pre-stored message.

[parameter]

3 characters (obligatory).

Optional numeric value with or without sign. The maximum of digits occupied by the value with the sign should correspond to the number of digits reserved in the numeric or alphanumeric field.

Examples

ASCII mode : ESC V 025 + 128 LF CR Displays message 25 with the current value + 128.

ADJUSTMENT
mode :
(Version V 1.3)

ESC V 025 LF CR

Displays message 25 with current value :

- Positive : the sign is not displayed
- Negative : the sign is displayed.

CALLING A NON-STORED MESSAGE (XXX) CAUSES
THE FOLLOWING TO BE DISPLAYED :
XXX : MESSAGE ABSENT

6.6 Sending from the XBT-K terminal to the PLC

• **Status of the terminal (response to the E command)**

ESC E E₂ E₁ E₀ LF CR Response to the ESC E LF CR command.
 Bit image of 3 characters E₀ , E₁ , E₂ hexadecimal,
 coded in ASCII (0 to 9 and A to F) at the parallel
 inputs.

8	4	2	1	8	4	2	1	8	4	2	1
STRB	COP2	COP1	D8	D7	D6	D5	D4	D3	D2	D1	D0
E ₂				E ₁				E ₀			

Example :

ESC E F F F LF CR All the inputs to the parallel bus are at 1.

ESC E 0 0 0 LF CR None of the inputs are wired to the parallel bus.

ESC E Ck LF CR Response to the ESC E0 [LF] CR or ESC E1 LF
 Ck = Ck₃ Ck₂ Ck₁ Ck₀ CR command.
 16 bit checksum for program or message memory,
 hexadecimal, coded in ASCII.
 Most significant bits at the head and simultaneous
 display.

ESC EV x.y LF CR Response to the ESC E1 [LF] CR command.
 Identification of the product by its software version
 (V x.y).

ESC E V1.3 LF CR Example of response to the ESC E 2 command.

Sending from the XBT-K terminal to the PLC

• Link parameters (response to the G command)

ESC G [@Vspeed] [@Dd] [@Ff] [@Pp] [@Ss] LF CR

(Speed) 110, 300, 600, 1200, 2400, 4800, 9600, 19200

d	Mode of operation	H	half-duplex
		F	full-duplex
f	Format	7	7 bits
		8	8 bits
p	Parity	E	even
		O	odd
		N	none
s	Stop bit	1	1 stop bit
		2	2 stop bits

The XBT-K echoes the command and simultaneously displays it. It then reconfigures with new parameters after a 10 second blinking period.

Example :

ESC G @ V 1200 @ F 7 LF CR

Response of the XBT-K to the command :

ESC G @ V 1200 @ F7 CR

The XBT-K then displays the new parameters :

ASC H 1200 7B OD 1S

blinking before finally memorizing it.

Sending from the XBT-K terminal to the PLC

• Transmission of the text of a message (response to the L command)

ESC L M₁ - - - M₂₀ LF CR

Examples :

ESC L PRESSURE_ FAULT_ _ _ _ LF CR

Response (of 40 characters) to the ESC L LF CR command

ESC L PRESSURE FAULT LF CR

with [OP = 0] value by default

Display of the text only

ESC L XXX @MM₁ - - - M₂₀ [@Tt@Xx@Cc@Vv] LF CR

with [OP = 1]

Display of the text with its parameters

ESC L005@M PRESSURE FAULT@ TD @ X00 @ C1 @ VW45 LF CR

• Acknowledgement of a cancellation command (response to the Z command)

ESC Z LF CR Echo returned by the XBT-K

• Status messages

ESC @ LF CR Transmission fault in the message received by the XBT
(detected by parity or checksum)

ESC ? LF CR Syntax error in the message received
(invalid mnemonic...)
or
message number not programmed

ESC # LF CR The transmission register is empty.

6.7 Review of the commands

FUNCTION	Command PLC → XBT-K	Transmission XBT-K → PLC
TERMINAL STATUS	E	E
FORMAT OF THE SERIAL LINK	G	G
READ THE MESSAGE TEXT	L	L
READ THE TRANSMISSION REGISTER	Q	last message sent
DISPLAY / CLEAR A MESSAGE	T	-
DISPLAY A PRE-STORED MESSAGE	V	-
CANCEL THE FLASHING, SCROLLING AND UPDATING	Z	Z
TRANSMISSION FAULT STATUS MESSAGE		@
STATUS MESSAGES - SYNTAX FAULT		?
STATUS MESSAGE - BUFFER EMPTY		#

6.8 Multidrop operation in ASCII mode

6.8.1 Principles

In multidrop operation, several terminals can share the same transmission line (current loop or RS422 serial link, see chapter 8).

A master PLC controls the synchronisation by successively interrogating the slave terminals. Consequently :

**MULTIDROP OPERATION IS NOT POSSIBLE
IN ADJUSTMENT MODE**

Addressing of the equipment is achieved by :

1) Wiring the addresses at the serial connector, according to the table below :

HEX ADDRESSES	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E
terminal 14 B0 (1)	X		X		X		X		X		X		X		X
terminal 15 B1 (2)	X	X			X	X			X	X			X	X	
terminal 16 B2 (4)	X	X	X	X					X	X	X	X			
terminal 17 B3 (8)	X	X	X	X	X	X	X	X							
terminal 24 PARITY	X			X		X	X			X	X		X		

X = indicates the presence of a shunt between terminal 8 (COM.) and the corresponding terminal (B0, B1, B2, B3 and PAR). The multidrop address is memorised by the XBT-K display on power-up.

The XBT-K uses parity to check the address coding (see chapter 9.3).

If the parity detected does not correspond to the address the XBT-K displays the blinking message ADDR. PARITY FAULT Consult chapter 11 : ERROR MESSAGES.

Multidrop operation in ASCII mode

2) Using the multidrop command format:

HEADER	MULTIDROP		MNEMONIC	END
	MODE	ADDRESS		
ESC	A	HEXADECIMAL (0 to F) ASCII CODED	Type of commands ASCII characters (see chapter 6.4 : COMMUNICATION).	[LF] CR

Multidrop address F : all the terminals accept the command but cannot themselves send anything to the line (broadcast mode).

Multidrop operation in ASCII mode

6.8.2 Operation

- The master PLC sends messages over the line.
- Only the terminal whose wired address corresponds to the address transmitted by the PLC is authorised to transmit a message. This is prepared in its transmission register.

PLC → XBT-K	XBT-K	COMMENTS
ESC A 3 V 001 LF CR		Display message 001 at terminal 3.
ESC A 9 E 0 LF CR	ESC A 9 E A8 B7 LF CR	Request the state of the program memory for terminal 9. Terminal response (4 hexadecimal coded ASCII characters).
ESC AD L 021 LF CR	ESC AD L FAULT LF CR	The PLC requests message 021 in terminal 13 to be read. XBT-K n°13 replies by sending the text of the message : FAULT and storing it in its transmission register.
ESC A D Q LF CR	ESC AD L FAULT LF CR	The PLC interrogates the transmission register of terminal 13. The terminal responds by transmitting the text of the message : FAULT.
ESC A EE LF CR	ESC A E E FFF LF CR	Request for the status of terminal 14. The terminal replies : all the inputs to the parallel bus are at 1.