



ELSETA

WCC Lite IEC 60870-5-104 Protocol Implementation Document

1 VERSION HISTORY

Version	Date	Author	Review	Remarks
1.0	2021-12-15	Lukas Taroza		

2 SCOPE OF THIS DOCUMENT

The scope of this document is to describe in a detailed way the implementation of the IEC 60870-5 communication interface as indicated in the first page. It contains a default template as in IEC 60870-5-104Ed.2 that shows the minimum information to describe 104 function, which is integrated in a customized way by additional sections, notes, figures and data that the manufacturer wants to show to whoever it may concern.

3 OBJECTIVE OF THIS DOCUMENT

The objective is:

For a Manufacturer PID: to provide utilities, system integrators, and whoever is interested in using/purchasing this implementation, the necessary information to evaluate quality, features, and interoperability risks when the product is integrated in a given multi-vendor network or substation.

For an Utility PID: provide manufacturers which are the minimum requirements for their devices to be integrated into the utility network and guarantee interoperability in a multi-vendor network (this latter still to be verified by dedicated interoperability testing). This document can be used as a technical specification during a tender process.

4 PROTOCOL IMPLEMENTATION CONFORMANCE STATEMENT 104

The Protocol Implementation Conformance Statement (PICS) in this paragraph is the basis for the applicable test cases in Appendix A. This PICS gives an overview of the tested protocol implementation, but this isn't a guarantee that the complete function or ASDU, as enabled in the PICS, is tested and supported. Partial testing is possible and the completeness of the tests for the specific function or ASDU must be consulted in Appendix A.

Note:

In addition, the full specification of a system may require individual selection of certain parameters for certain parts of the system, such as the individual selection of scaling factors for individually addressable measured values.

The selected parameters should be marked in the white boxes as follows:

- Function or ASDU is not used
- Function or ASDU is used as standardized (default)
- Function or ASDU is used in reverse mode
- Function or ASDU is used in standard and reverse mode

The possible selection (blank, X, R, or B) is specified for each specific clause or parameter.

A black check box indicates that the option cannot be selected in this companion standard.

4.1 System or device

(system-specific parameter, indicate definition of a system or a device by marking one of the following with 'X')

- System definition
- Controlling station definition
- Controlled station definition

4.2 Network configuration

(network-specific parameter, all configurations that are used are to be marked 'X')

<input type="checkbox"/>	Point-to-point	<input type="checkbox"/>	Multipoint-partyline
<input type="checkbox"/>	Multiple point to point	<input type="checkbox"/>	Multipoint-star

4.3 Physical layer

(network-specific parameter, all interfaces and data rates that are used are to be marked 'X')

Transmission speed (control direction)

Unbalanced interchange Circuit V.24/V.28 Standard		Unbalanced interchange Circuit V.24/V.28 Recommended if >1 200bit/s		Balanced interchange Circuit X.24/X.27	
<input type="checkbox"/>	100 bit/s	<input type="checkbox"/>	2 400 bit/s	<input type="checkbox"/>	2 400 bit/s
<input type="checkbox"/>	200 bit/s	<input type="checkbox"/>	4 800 bit/s	<input type="checkbox"/>	4 800 bit/s
<input type="checkbox"/>	300 bit/s	<input type="checkbox"/>	9 600 bit/s	<input type="checkbox"/>	9 600 bit/s
<input type="checkbox"/>	600 bit/s			<input type="checkbox"/>	19 200 bit/s
<input type="checkbox"/>	1 200 bit/s			<input type="checkbox"/>	38 400 bit/s
				<input type="checkbox"/>	56 000 bit/s
				<input type="checkbox"/>	64 000 bit/s

Transmission speed (monitor direction)

Unbalanced interchange Circuit V.24/V.28 Standard		Unbalanced interchange Circuit V.24/V.28 Recommended if >1 200bit/s		Balanced interchange Circuit X.24/X.27	
<input type="checkbox"/>	100 bit/s	<input type="checkbox"/>	2 400 bit/s	<input type="checkbox"/>	2 400 bit/s
<input type="checkbox"/>	200 bit/s	<input type="checkbox"/>	4 800 bit/s	<input type="checkbox"/>	4 800 bit/s
<input type="checkbox"/>	300 bit/s	<input type="checkbox"/>	9 600 bit/s	<input type="checkbox"/>	9 600 bit/s
<input type="checkbox"/>	600 bit/s			<input type="checkbox"/>	19 200 bit/s
<input type="checkbox"/>	1 200 bit/s			<input type="checkbox"/>	38 400 bit/s
				<input type="checkbox"/>	56 000 bit/s
				<input type="checkbox"/>	64 000 bit/s

4.4 Link layer

(network-specific parameter, all options that are used are to be marked 'X'. Specify the maximum frame length. If a non-standard assignment of class 2 messages is implemented for unbalanced transmission, indicate the Type ID and COT of all messages assigned to class 2.)

~~Frame format FT 1.2, single character 1 and the fixed time out interval are used exclusively in this companion standard.~~

Link transmission procedure

- ~~Balanced transmission~~
- ~~Unbalanced transmission~~

Frame length

- ~~Maximum length L (number of octets)~~

Address field of the link

- ~~not present (balanced transmission only)~~
- ~~One octet~~
- ~~Two octets~~
- ~~structured~~
- ~~unstructured~~

When using an unbalanced link layer, the following ASDU types are returned in class 2 messages (low priority) with the indicated causes of transmission:

- ~~The standard assignment of ASDUs to class 2 messages is used as follows:~~

Type identification	Cause of transmission
9, 11, 13, 21	<1>

- ~~A special assignment of ASDUs to class 2 messages is used as follows:~~

Type identification	Cause of transmission

~~Note: (In response to a class 2 poll, a controlled station may respond with class 1 data when there is no class 2 data available).~~

4.5 Application layer

Transmission mode for application data

Mode 1 (Least significant octet first), as defined in clause 4.10 of IEC 60870-5-4, is used exclusively in this companion standard.

Common address of ASDU

(system-specific parameter, all configurations that are used are to be marked 'X')

One octet Two octets

Information object address

(system-specific parameter, all configurations that are used are to be marked 'X')

One octet
 Two octets
 Three octets

structured
 unstructured

Cause of transmission

(system-specific parameter, all configurations that are used are to be marked 'X')

One octet Two octets (with originator address) Originator address is set to zero if not used

Length of APDU

(system-specific parameter, specify the maximum length of the APDU per system)

The maximum length of the APDU is 253 (default). It is a fixed system parameter.

Maximum length of APDU per system in control direction
 Maximum length of APDU per system in monitor direction

Selection of standard ASDUs

Process information in monitor direction

(station-specific parameter, mark each Type ID 'X' if it is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

<input checked="" type="checkbox"/>	<1> := Single-point information	M_SP_NA_1
<input type="checkbox"/>	<2> := Single-point information with time tag	M_SP_TA_1
<input checked="" type="checkbox"/>	<3> := Double-point information	M_DP_NA_1
<input type="checkbox"/>	<4> := Double-point information with time tag	M_DP_TA_1
<input checked="" type="checkbox"/>	<5> := Step position information	M_ST_NA_1
<input type="checkbox"/>	<6> := Step position information with time tag	M_ST_TA_1
<input type="checkbox"/>	<7> := Bitstring of 32 bit	M_BO_NA_1
<input type="checkbox"/>	<8> := Bitstring of 32 bit with time tag	M_BO_TA_1
<input checked="" type="checkbox"/>	<9> := Measured value, normalized value	M_ME_NA_1
<input type="checkbox"/>	<10> := Measured value, normalized value with time tag	M_ME_TA_1
<input checked="" type="checkbox"/>	<11> := Measured value, scaled value	M_ME_NB_1
<input type="checkbox"/>	<12> := Measured value, scaled value with time tag	M_ME_TB_1
<input checked="" type="checkbox"/>	<13> := Measured value, short floating point value	M_ME_NC_1
<input type="checkbox"/>	<14> := Measured value, short floating point value with time tag	M_ME_TC_1
<input type="checkbox"/>	<15> := Integrated totals	
<input type="checkbox"/>	<16> := Integrated totals with time tag	M_IT_TA_1
<input type="checkbox"/>	<17> := Event of protection equipment with time tag	M_EP_TA_1
<input type="checkbox"/>	<18> := Packed start events of protection equipment with time tag	M_EP_TB_1
<input type="checkbox"/>	<19> := Packed output circuit information of protection equipment with time tag	M_EP_TC_1
<input type="checkbox"/>	<20> := Packed single-point information with status change detection	M_PS_NA_1
<input checked="" type="checkbox"/>	<21> := Measured value, normalized value without quality descriptor	M_ME_ND_1
<input checked="" type="checkbox"/>	<30> := Single-point information with time tag CP56Time2a	M_SP_TB_1
<input checked="" type="checkbox"/>	<31> := Double-point information with time tag CP56Time2a	M_DP_TB_1
<input checked="" type="checkbox"/>	<32> := Step position information with time tag CP56Time2a	M_ST_TB_1
<input type="checkbox"/>	<33> := Bitstring of 32 bit with time tag CP56Time2a	M_BO_TB_1
<input checked="" type="checkbox"/>	<34> := Measured value, normalized value with time tag CP56Time2a	M_ME_TD_1
<input checked="" type="checkbox"/>	<35> := Measured value, scaled value with time tag CP56Time2a	M_ME_TE_1
<input checked="" type="checkbox"/>	<36> := Measured value, short floating point value with time tag CP56Time2a	M_ME_TF_1
<input type="checkbox"/>	<37> := Integrated totals with time tag CP56Time2a	M_IT_TB_1
<input type="checkbox"/>	<38> := Event of protection equipment with time tag CP56Time2a	M_EP_TD_1
<input type="checkbox"/>	<39> := Packed start events of protection equipment with time tag CP56Time2a	M_EP_TE_1
<input type="checkbox"/>	<40> := Packed output circuit information of protection equipment with time tag CP56Time2a	

In this companion standard only the use of the set <30> - <40> for ASDUs with time tag is permitted.

Process information in control direction

(station-specific parameter, mark each Type ID 'X' if it is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

<input checked="" type="checkbox"/>	<45>:= Single command	C_SC_NA_1
<input checked="" type="checkbox"/>	<46>:= Double command	C_DC_NA_1
<input checked="" type="checkbox"/>	<47>:= Regulating step command	C_RC_NA_1
<input checked="" type="checkbox"/>	<48>:= Set point command, normalized value	C_SE_NA_1
<input checked="" type="checkbox"/>	<49>:= Set point command, scaled value	C_SE_NB_1
<input checked="" type="checkbox"/>	<50>:= Set point command, short floating point value	C_SE_NC_1
<input type="checkbox"/>	<51>:= Bitstring of 32 bit	C_BO_NA_1
<input checked="" type="checkbox"/>	<58>:= Single command with time tag CP56Time 2a	C_SC_TA_1
<input checked="" type="checkbox"/>	<59>:= Double command with time tag CP56Time 2a	C_DC_TA_1
<input checked="" type="checkbox"/>	<60>:= Regulating step command with time tag CP56Time 2a	C_RC_TA_1
<input checked="" type="checkbox"/>	<61>:= Set point command, normalized value with time tag CP56Time 2a	C_SE_TA_1
<input checked="" type="checkbox"/>	<62>:= Set point command, scaled value with time tag CP56Time 2a	C_SE_TB_1
<input checked="" type="checkbox"/>	<63>:= Set point command, short floating point value with time tag CP56Time 2a	C_SE_TC_1
<input type="checkbox"/>	<64>:= Bitstring of 32 bit with time tag CP56Time 2a	C_BO_TA_1

Either the ASDUs of the set <45> – <51> or of the set <58> – <64> are used.

System information in monitor direction

(station-specific parameter, mark 'X' if used)

<input type="checkbox"/>	<70>:= End of initialization	M_EI_NA_1
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System information in control direction

(station-specific parameter, mark each Type ID 'X' if it is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

<input checked="" type="checkbox"/>	<100>:=Interrogation command	C_IC_NA_1
<input type="checkbox"/>	<101>:=Counter interrogation command	C_CI_NA_1
<input type="checkbox"/>	<102>:=Read command	C_RD_NA_1
<input checked="" type="checkbox"/>	<103>:=Clock synchronization command	C_CS_NA_1
<input type="checkbox"/>	<104>:=Test command	C_TS_NA_1
<input type="checkbox"/>	<105>:=Reset process command	C_RP_NA_1
<input type="checkbox"/>	<106>:=Delay acquisition command	C_CD_NA_1
<input type="checkbox"/>	<107>:=Test command with time tag CP56time2a	C_TS_TA_1

Parameter in control direction

(station-specific parameter, mark each Type ID 'X' if it is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

<input type="checkbox"/>	<110>:=Parameter of measured value, normalized value	P_ME_NA_1
<input type="checkbox"/>	<111>:=Parameter of measured value, scaled value	P_ME_NB_1
<input type="checkbox"/>	<112>:=Parameter of measured value, short floating point value	P_ME_NC_1
<input type="checkbox"/>	<113>:=Parameter activation	P_AC_NA_1

File Transfer

(station-specific parameter, mark each Type ID 'X' if it is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

<input type="checkbox"/>	<120>:=File ready	F_FR_NA_1
<input type="checkbox"/>	<121>:=Section ready	F_SR_NA_1
<input type="checkbox"/>	<122>:=Call directory, select file, call file, call section	F_SC_NA_1
<input type="checkbox"/>	<123>:=Last section, last segment	F_LS_NA_1
<input type="checkbox"/>	<124>:=Ack file, ack section	F_AF_NA_1
<input type="checkbox"/>	<125>:=Segment	F_SG_NA_1
<input type="checkbox"/>	<126>:=Directory {blank or X, only available in monitor (standard) direction}	F_DR_TA_1
<input type="checkbox"/>	<127>:=Query Log – Request archive file	F_SC_NB_1

Type Identifier and Cause of Transmission Assignments

(station-specific parameters)

Shaded boxes are not defined in this companion standard and shall not be used

Black boxes are not permitted in this companion standard

Blank = Function or ASDU is not used.

Mark Type Identification/Cause of transmission combinations:

'X' if only used in the standard direction

'R' if only used in the reverse direction

'B' if used in both directions¹

¹ together in a running configuration

Type Identification		Cause of transmission																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	20 to 36	37 to 41	44	45	46	47
<1>	M_SP_NA_1			X											X					
<2>	M_SP_TA_1																			
<3>	M_DP_NA_1			X											X					
<4>	M_DP_TA_1																			
<5>	M_ST_NA_1			X											X					
<6>	M_ST_TA_1																			
<7>	M_BO_NA_1																			
<8>	M_BO_TA_1																			
<9>	M_ME_NA_1			X											X					
<10>	M_ME_TA_1																			
<11>	M_ME_NB_1			X											X					
<12>	M_ME_TB_1																			
<13>	M_ME_NC_1			X											X					
<14>	M_ME_TC_1																			
<15>	M_IT_NA_1																			
<16>	M_IT_TA_1																			
<17>	M_EP_TA_1																			
<18>	M_EP_TB_1																			
<19>	M_EP_TC_1																			
<20>	M_PS_NA_1																			
<21>	M_ME_ND_1			X																
<30>	M_SP_TB_1			X																
<31>	M_DP_TB_1			X																
<32>	M_ST_TB_1			X																
<33>	M_BO_TB_1																			
<34>	M_ME_TD_1			X																
<35>	M_ME_TE_1			X																
<36>	M_ME_TF_1			X																
<37>	M_IT_TB_1																			
<38>	M_EP_TD_1																			
<39>	M_EP_TE_1																			
<40>	M_EP_TF_1																			
<45>	C_SC_NA_1						X	X			X									
<46>	C_DC_NA_1						X	X			X									
<47>	C_RC_NA_1						X	X			X									
<48>	C_SE_NA_1						X	X			X									
<49>	C_SE_NB_1						X	X			X									

Type Identification		Cause of transmission																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	20 to 36	37 to 41	44	45	46	47
<50>	C_SE_NC_1						X	X			X									
<51>	C_BO_NA_1																			
<58>	C_SC_TA_1						X	X			X									
<59>	C_DC_TA_1						X	X			X									
<60>	C_RC_TA_1						X	X			X									
<61>	C_SE_TA_1						X	X			X									
<62>	C_SE_TB_1						X	X			X									
<63>	C_SE_TC_1						X	X			X									
<64>	C_BO_TA_1																			
<70>	M_EI_NA_1																			
<100>	C_IC_NA_1						X	X			X									
<101>	C_CI_NA_1																			
<102>	C_RD_NA_1																			
<103>	C_CS_NA_1						X	X												
<104>	C_TS_NA_1																			
<105>	C_RP_NA_1*																			
<106>	C_CD_NA_1																			
<107>	C_TS_TA_1																			
<110>	P_ME_NA_1																			
<111>	P_ME_NB_1																			
<112>	P_ME_NC_1																			
<113>	P_AC_NA_1																			
<120>	F_FR_NA_1																			
<121>	F_SR_NA_1																			
<122>	F_SC_NA_1																			
<123>	F_LS_NA_1																			
<124>	F_AF_NA_1																			
<125>	F_SG_NA_1																			
<126>	F_DR_TA_1*																			
<127>	F_SC_NB_1*																			

* blank or X only

NOTE: Cause of transmission (COT) 44 shall only be marked for not supported Type identifications

Basic application functions

Station initialization

(station-specific parameter, mark 'X' if function is used)

Remote initialization

Only QRP=... supported
Only COI=... supported

Cyclic data transmission

(station-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

Cyclic data transmission

Read procedure

(station-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

Read procedure

Spontaneous transmission

(station-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

Spontaneous transmission

Double transmission of information objects with cause of transmission spontaneous

(station-specific parameter, mark each information type 'X' where both a Type ID without time and corresponding Type ID with time are issued in response to a single spontaneous change of a monitored object)

The following type identifications may be transmitted in succession caused by a single status change of an information object. The particular information object addresses for which double transmission is enabled are defined in a project-specific list.

- Single-point information M_SP_NA_1, M_SP_TA_1, M_SP_TB_1 and M_PS_NA_1
- Double-point information M_DP_NA_1, M_DP_TA_1 and M_DP_TB_1
- Step position information M_ST_NA_1, M_ST_TA_1 and M_ST_TB_1
- Bitstring of 32 bit M_BO_NA_1, M_BO_TA_1 and M_BO_TB_1 (if defined for a specific project)
- Measured value, normalized value M_ME_NA_1, M_ME_TA_1, M_ME_ND_1 and M_ME_TD_1
- Measured value, scaled value M_ME_NB_1, M_ME_TB_1 and M_ME_TE_1
- Measured value, short floating point number M_ME_NC_1, M_ME_TC_1 and M_ME_TF_1

Station interrogation

(station-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

- | | | |
|--|-----------------------------------|-----------------------------------|
| <input checked="" type="checkbox"/> global | <input type="checkbox"/> group 7 | <input type="checkbox"/> group 13 |
| <input type="checkbox"/> group 1 | <input type="checkbox"/> group 8 | <input type="checkbox"/> group 14 |
| <input type="checkbox"/> group 2 | <input type="checkbox"/> group 9 | <input type="checkbox"/> group 15 |
| <input type="checkbox"/> group 3 | <input type="checkbox"/> group 10 | <input type="checkbox"/> group 16 |
| <input type="checkbox"/> group 4 | <input type="checkbox"/> group 11 | |
| <input type="checkbox"/> group 5 | <input type="checkbox"/> group 12 | |
| <input type="checkbox"/> group 6 | | |

Information Object Addresses assigned to each group must be shown in a separate table

Clock synchronization

(station-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

- Clock synchronization
- Day of week used
- RES1, GEN (Time tag substituted/not substituted) used
- SU-bit (summertime) used

Command transmission

(object-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

Command modes

- Direct command transmission
- Direct set point command transmission
- Select and execute command
- Select and execute set point command
- C_SE ACTTERM used

Command qualifier (QU)

- No additional definition
- Short pulse duration (duration determined by a system parameter in the outstation)
- Long pulse duration (duration determined by a system parameter in the outstation)
- Persistent output

Command time tag

- Supervision of maximum delay in command direction of commands and set point commands
- Maximum allowable delay of commands and set point commands [s]

Transmission of integrated totals

(station- or object-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

- Mode A: Local freeze with spontaneous transmission
- Mode B: Local freeze with counter
- Mode C: Freeze and transmit by counter interrogation
- Mode D: Freeze by counter interrogation command, frozen values reported spontaneously

Qualifier of counter interrogation command

Freeze (FRZ)

- Counter read
- Counter freeze without reset
- Counter freeze with reset
- Counter reset

Request (RQT)

- General request counter
- Request counter group 1
- Request counter group 2
- Request counter group 3
- Request counter group 4

Parameter loading

(object-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

Qualifier of parameter of measured values (KPA)

- Threshold value
- Smoothing factor
- Low limit for transmission of measured value
- High limit for transmission of measured value

Parameter activation

(object-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

- Act/deact of persistent cyclic or periodic transmission of the addressed object

Test procedure

(station-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

Test procedure

File transfer

(station-specific parameter, mark 'X' if function is used)

File transfer in monitor direction

- Transparent file
- Transmission of disturbance data of protection equipment
- Transmission of sequences of events
- Transmission of sequences of recorded analogue values

File transfer in control direction

Transparent file

Background scan

(station-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

Background scan

Acquisition of transmission delay

(station-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

Acquisition of transmission delay

Definition of time outs

Parameter	Default value	Remarks	Selected value
t ₀	30[s]	Time out of connection establishment	-
t ₁	15[s]	Time out of send or test APDUs	configurable
t ₂	10[s]	Time out for acknowledges in case of no data messages t ₂ < t ₁	configurable
t ₃	20[s]	Time out for sending test frames in case of a long idle state	configurable

Maximum range for timeouts t₀ to t₂: 1s to 255 [s], accuracy 1 [s]

Recommended range for timeout t₃: 1 [s] to 48 [h], resolution 1 [s]².

Maximum number of outstanding I format APDUs k and latest acknowledge

Parameter	Default value	Remarks	Selected value
k	12 APDUs	Maximum difference receive sequence number to send state variable	configurable
w	8 APDUs	Latest acknowledge after receiving w I-format APDUs	configurable

Maximum range of values k: 1 to 32767 (2¹⁵-1) APDUs, accuracy 1 APDU

Maximum range of values w: 1 to 32767 APDUs, accuracy 1 APDU (Recommendation: w should not exceed 2/3 of k).

Portnumber

Parameter	Value	Remarks
Portnumber	2404	In all cases/Configurable

Redundant connections

Number N of supported logical connections within a redundancy group
(Blank means redundancy connection not supported)

RFC 2200 suite

RFC 2200 is an official Internet Standard which describes the state of standardization of protocols used in the Internet as determined by the Internet Architecture Board (IAB). It offers a broad spectrum of actual standards used in the Internet. The suitable selection of documents from RFC 2200 defined in this standard for given projects has to be chosen by the user of this standard.

- Ethernet 802.3
- Serial X.21 interface
- Other selection from RFC 2200: GPRS

² Long timeouts for t₃ may be needed in special cases where satellite links or dialup connections are used (for instance to establish connection and collect values only once per day or week).

List of valid documents from RFC 2200

1.
2.
3.
4.
5.
6.
7. etc.

5 ADDITIONAL INFORMATION

<Add sections here>