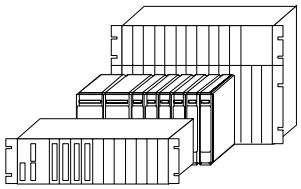
Ax 1703



Firmware Description

COUM00

Count Transmission per IEC 1107

HW-Type: 2541 / FW-Type: 2521

This document is applicable to the following product(s):

COUM00 Rev. 01 and higher

Version	Revision	Date	Change
A, 1	01	21.05.01	first issue in English
A, 1	02	08.11.01	various corrections, parameter dokumentation
A, 1	03	28.01.03	time set, break b0, parameter dokumentation
A, 1	04	05.11.03	unit and multiplicator, parameter documentation revised
A, 1	05	30.03.04	chap. 2.1. and 5.6.1.
A, 1	06	22.08.06	counter interrogation, archive data, appendix test aids, exchange of appendix B and C, Routing
A, 1	07	21.05.07	addressing archive data
A, 1	08	28.11.07	archive data, appendix revised
A,1	09	04.04.08	SAT/Siemens corrections

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on	by	on	by	on	by
21.05.01	Schlaghuber J.	04.04.08	Schlaghuber J.	04.04.08	Schlaghuber J.

Table of Contents

1. General

Type:	Protocol firmware
Firmware designation:	COUM00 (HW: 2541/FW: 2521)
Protocol element designation:	- (special protocol element)

- Basic firmware:
  Auxiliary building block (SIP): SM2541-B
  Prom-type: FLASH-file

Note: The new name of the norma is IEC 62056-21.

2. Specifications

The firmware was conceived for the communication of Ax 1703 system components and counters, which adhere to the IEC 1107 standard.

This firmware is designed purely for multipoint traffic (UNBALANCED PRIMARY).

- Modulation: PCM byte asynchronous
- Transmission speed: 50 - 19200 baud
- Transmission mode: half-duplex
- Bit transmission sequence: LSB (least significant bit) is transmitted first
- Message protection: HA = 2 if no parity, 4 if parity
- Physical interface: V.24/V.28 (converter for TTY 20 mA, 2 wire)
- Byte frame: 1 Start bit
  7 Data bits
  1 Stop bit
  EVEN parity
- Block check character (BCC): XOR operation of all bytes, starting after STX including ETX.

This protocol element implements only a portion of the functionality and data formats of the external interface as an external system adjustment. Therefore, a check must be performed for a specific application to determine the extent to which the actual requirements coincide with the functionality implemented here, and the extent to which additional expansions or adjustments are needed.

2.1. Limitations

- The system message counter interrogation must not be used without permanent polling, but permanent polling should not be used.
- Registry data according to EDIS code system
- Load profile per VDEW (not 1107)
- For archive data the 1107 identifier can not be configured separate, the one of the "1107 receive detailed routing counter values" will be used.
- No coding
- Mode A, B and D not supported
- Block check character (BCC) absolutely mandatory
- In the monitoring mode, the identification per counter must be unambiguous, or only one counter can be connected.

  Reason: The address is only in the call message, which the passive master does not see at the receiving end.

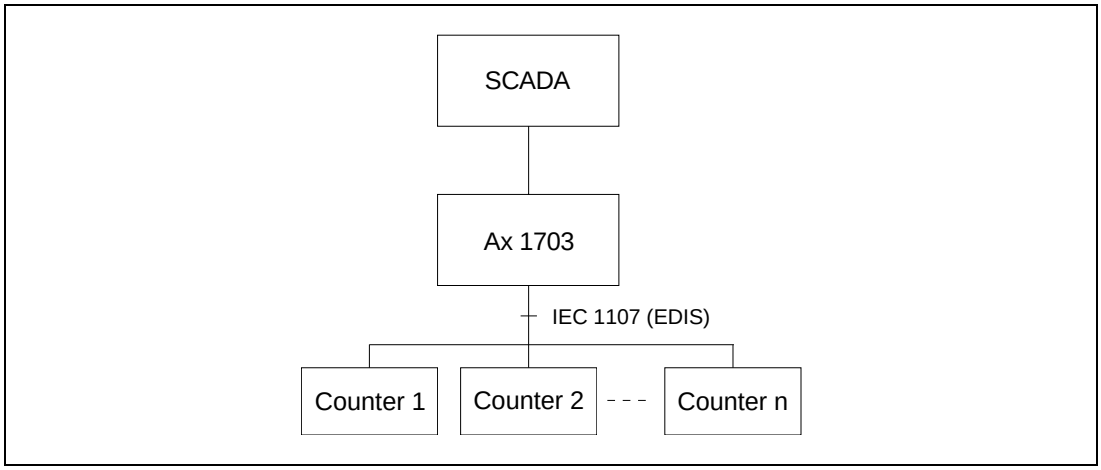
  In addition, no data are converted in the monitoring mode, since the data can be received at a different baud rate than the call.

The parameterization of the conversion factor per value is only implemented for the process-technical parameterization (OPM) and not for the system technical parameterization (spreadsheet for detail routing in receive direction).
Only a subset of units and multiplicators are supported.

The addressing of the "short term data archive – interrogation" is system-technical. In case of using the "short term data archive – interrogation" the 5 octet address in the "1107 receive detailed routing counter values" must be configured system-technical.

- The functionality "short term data archive is not available for ACP.

2.2. Configuration



2.3. Used Interface Circuits

The following interface circuits are used in the V.24 mode:

Abbreviation			Circuit designation		
DIN 66020	**CCITT V.24**	**USA**	**DIN 66020**	**CCITT / EIA**	**Direc./Log.**
E2 D1 D2	102 103 104	GND TD RD	System ground Transmit data Receive data	Signal Ground Transmit Data Receive Data	 → DÜE ← DÜE

2.4. Overview of Supported Counters

Producer	Type	IEC 1107	EDIS	Load Profile according to VDEW
ABB	AEM500	✓	✓	✓
Siemens / L&G	ZMD410	✓	✓	✓
CEWE Prometer	Series 3000	✓	-- 2)	--
CEWE Prometer	Series W	-	-	-
Iskraemeco	MT851	✓	✓	✓ 1)
ELSTER	A1500	✓	✓	✓
	A2500	✓	✓	✓

1) not yet tested
2) EDIS is supposed to be available

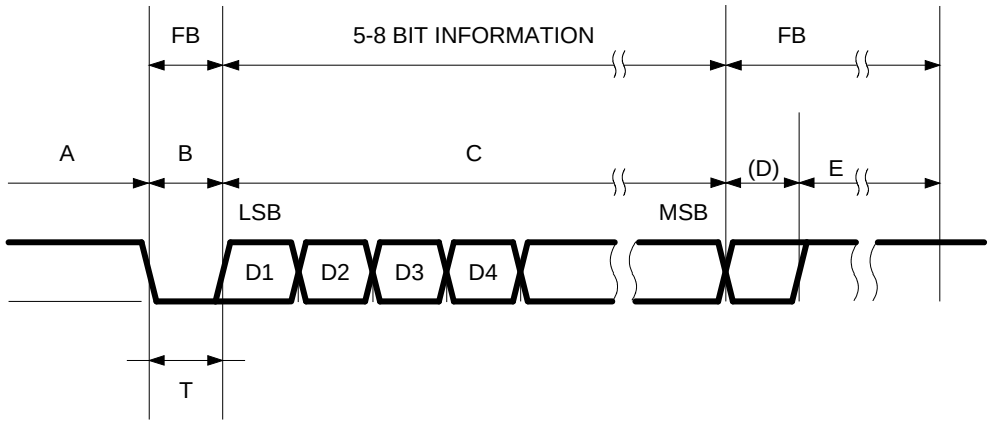
3. Protocol Description

3.1. PCMBA Modulation Procedure

The data are modulated in groups of 8 bit-pulse codes each and transmitted asynchronously. A USART module in the asynchronous mode here provides each byte with a byte frame (BR).

This byte frame contains:
- 1 Start bit
- 7 Data bits
- 1 Parity bit (even)
- 1 Stop bit

The start and stop bits of the byte frame resynchronize the receiver with each byte.



A: Empty state of circuit (binary information "1"), between two telegrams at least 33 bit 33 Bit (in case of fault)
B: Start bit ("0")
C: 5-8 bit data (if necessary, frame data or telegram data), LSB (Least Significant Bit) transmitted first
D: Parity bit (NO/ODD/EVEN PARITY) (= projectable)
E: 1/1, 5/2 stop bit(s) ("1") (= projectable)
T: Time for transmission of a bit (1/transmission rate)
FB: Framing bits of USART module

3.2. Transmission Protocol

The data transmission protocol according to IEC 1107 contains 4 different operating modes (modes A, B, C, D), wherein this firmware supports only mode “C”.

Mode “C” supports automatic data readout. Transmission is bi-directional, and is initiated by transmitting a request message to the tariff zoner.

The mode used by the tariff zoner is characterized by the identification character for the baud rate in the identification message of the tariff zoner.

The register data are transmitted according to the EDIS code system. The data in the load profile are transmitted per VDEW.

After the identification message has been sent, the tariff zoner waits for the acknowledgment/option selection message from the central station. This can be a request for data readout, an activation of the programmer mode or an activation of manufacturer-specific operations.

a) Data readout mode:

Given ACK 0 Z 0 CR LF, the tariff zoner responds with the predefined data record in the „data record creation-readout mode-data message“ format. For tariff zoners not developed for reading out data in this way, the data record can be empty.

Communication takes place at 300 Bd (identification baud rate), if

- The character „Z“ in the acknowledgement/option selection message is “0”,
- An erroneous acknowledgement/option selection message is transmitted or received,
- No acknowledgment/option selection message is transmitted or received.

The communication system only switches to the „Z“ baud rate if the character „Z“ matches in the identification response and acknowledgment/option selection message.

b) Switching in the Programming Mode

Given ACK 0 Z 1 CR LF, the tariff zoner switches to the programming mode. The first communication takes place at 300 Bd (identification message), if

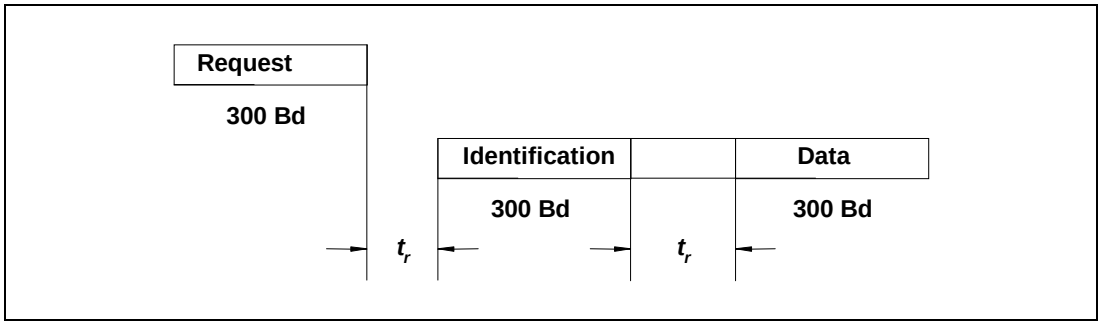
- the character „Z“ in the acknowledgement/option selection message is “0”.

The communication system only switches to the „Z“ baud rate if the character „Z“ matches in the identification response and acknowledgment/option selection message. If the acknowledgment/option selection message is contradictory or there is an error in the tariff zoner, communication takes place at 300 Bd during data readout. A switch is not made to the programming mode.

c) Switching in Manufacturer-Specific Operation

Manufacturer options are achieved once „Y“ has assumed a value between 6 and 9 in the ACK 0 Z Y CR LF sequence.

Data Readout Mode



Transmission protocol for data readout in mode C without acknowledgment by hand-held terminal

End Transmission

Data transmission ends after the tariff zoner has sent the data message. No acknowledgment is provided. The hand-held terminal can send a repeat request given an erroneous transmission.

Reaction and Monitoring Times

Time between receipt of a message and transmission of a response:

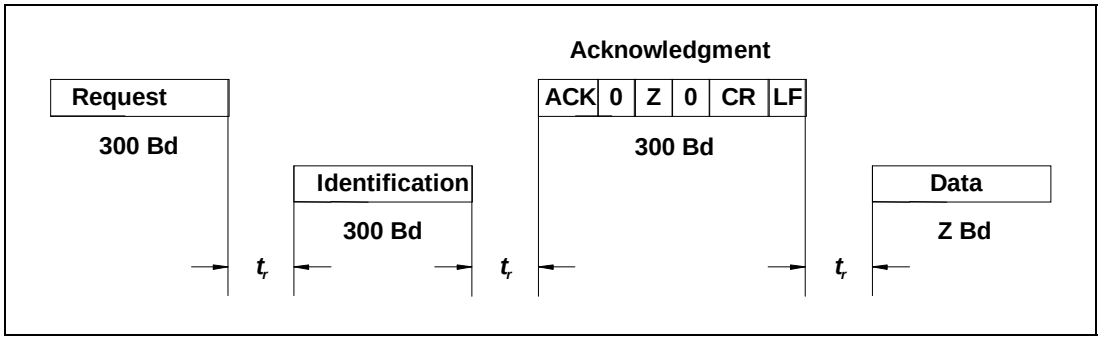
(20 ms) 200 ms ≤ t_r ≤ 1500 ms (see item 12 of 5.3)

If no response was received, the time for which the sending device waits before continuing transmission is as follows:

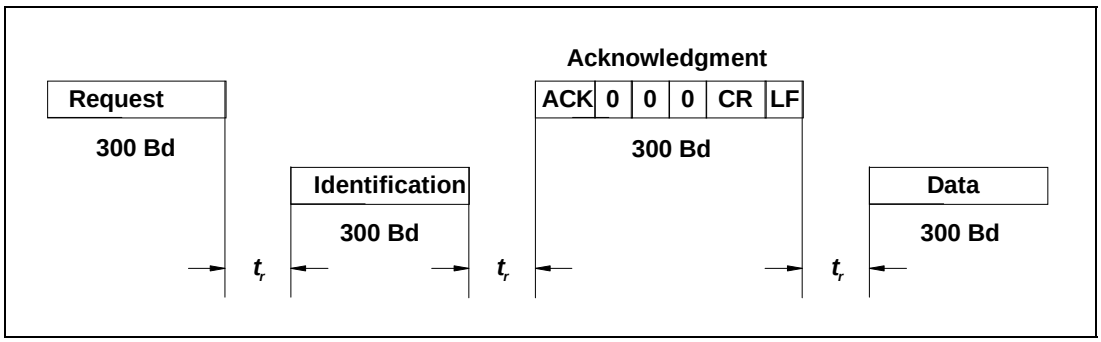
1500 ms < t_r ≤ 2200 ms

Time between two characters in a character string:

t_a < 1500 ms



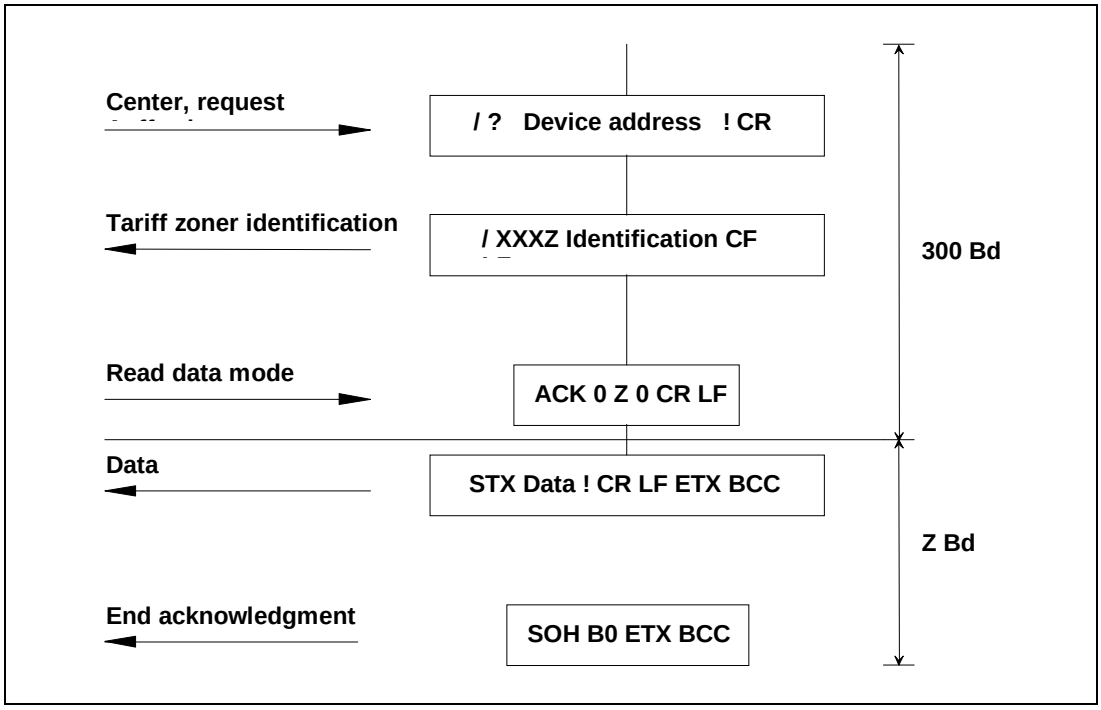
Transmission protocol for data readout in mode C with confirmation of proposed baud rate



Transmission protocol for data readout in mode C with rejection of proposed baud rate

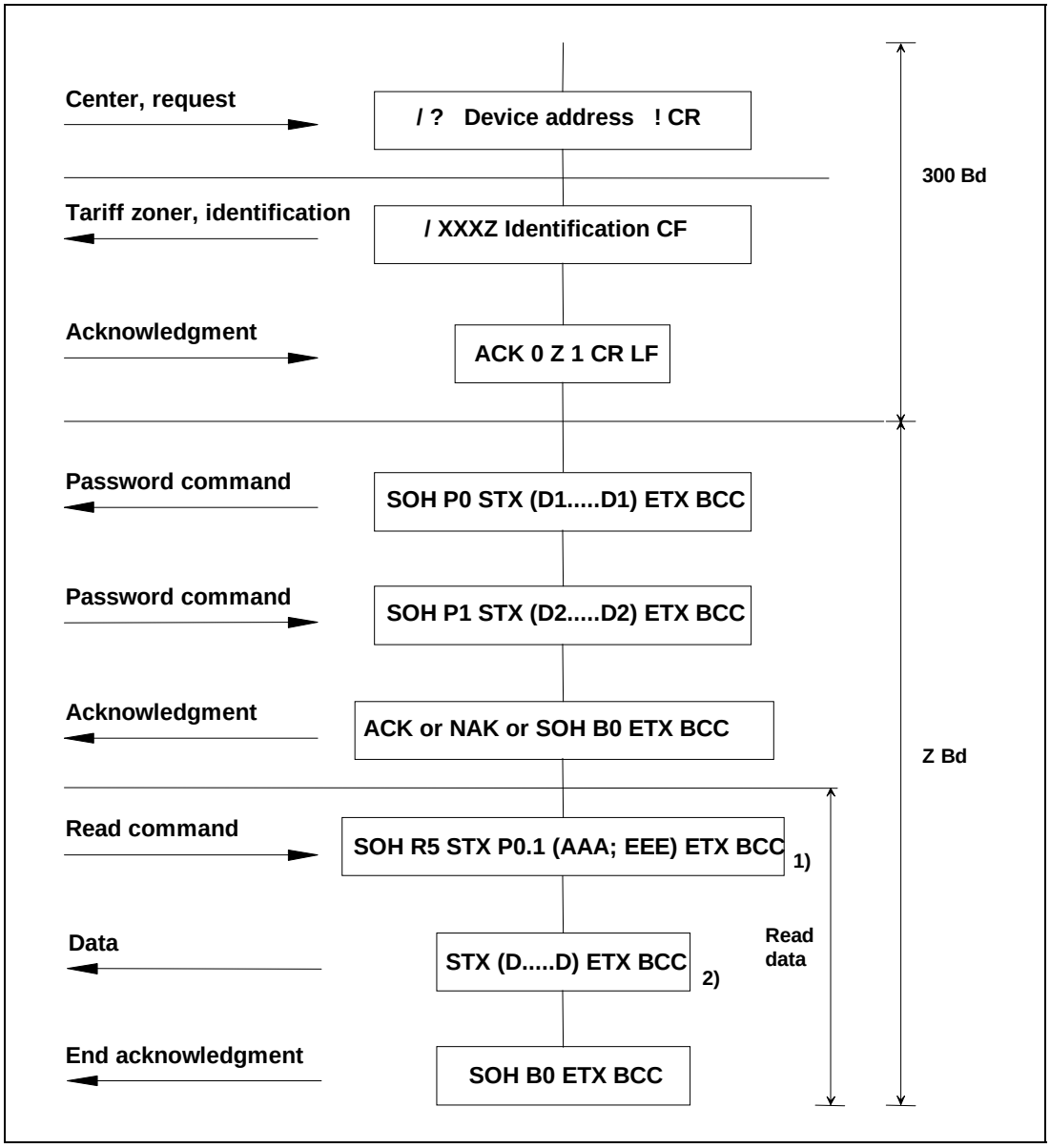
The expected acknowledgement time is calculated dynamically for 22000 bytes and the active baudrate. To shorten the baudrate, this can be performed over the message interruption monitoring (1,2 sec.), or also by a fixed parameter-settable acknowledgement time.

Read Registry (Mode "C")



Transmission ends after SOH BO ETX BCC (without NAK response) or via timeout.

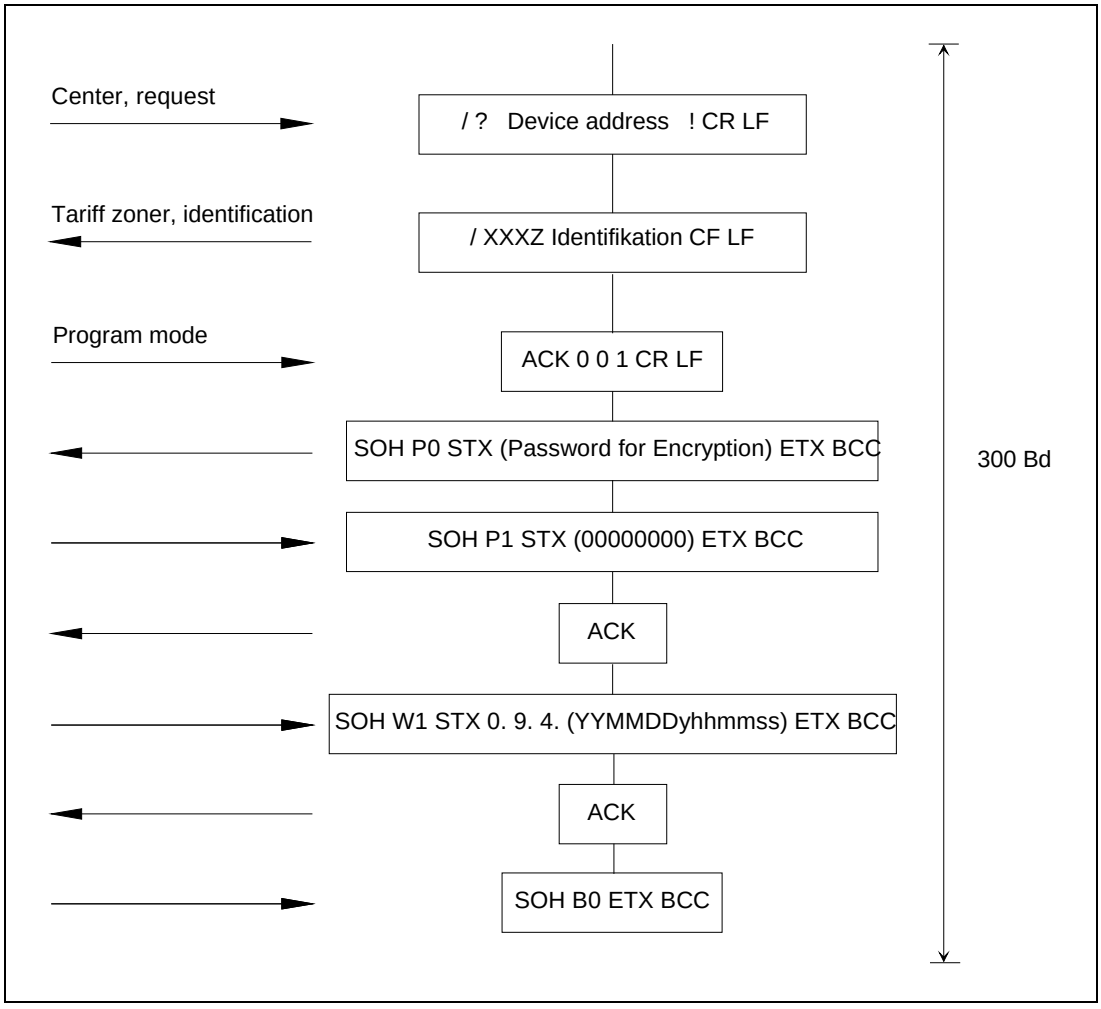
Read Load Profile



1) P.01 (abbreviated P.1), entry of a section
2) If the counter has data, the load profile(s) is/are transmitted in the data part according to (E)DIN 43863; if no data are present, (ERROR) is transmitted.
While interrogation a section, only the interrogated area of the load profile is transmitted.

R (reading) is followed by a data message or NAK or an error message as the response. The transmission ends after SOH BO ETX BCC (without NAK response) or via timeout.

Time Set



Transmission ends after SOH BO ETX BCC (without NAK response) or via timeout.

The transmission of the time set message has to be released

The time set will be sent once after receipt of the time set message and further every time at 00:05:00 (optional a specific format can be choosen for ABB).

BREAK B0

A BREAK will be sent on receipt of a NAK or if an error is recogniced.

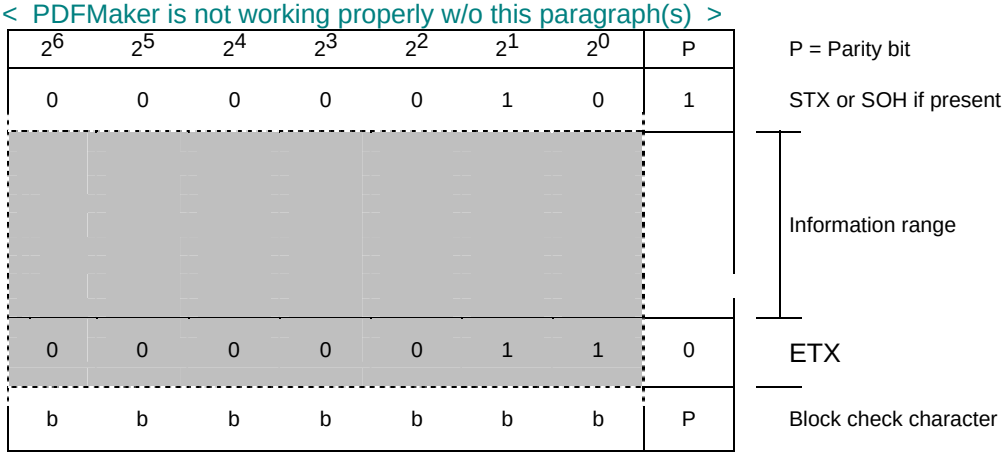
SOH B0 ETX BCC

This function has to be released per parameter.

4. Message Description

4.1. Message Structure

< PDFMaker is not working properly w/o this paragraph(s) >



The block check character is computed for the shaded area. A block starts after the first detected SOH or STX character, and extends through the ETX character, which ends the message. The computed block check character is situated directly behind the ETX character.

Data readout can also take place without block check character. Whenever the block check character is used, it must correspond to ISO 1155.

All characters including ”CR” and “LF” can be used in the data block, with the exception of “/” and “!”.

Request Message

/	?	Device address	!	CR	LF

/..... Start character, (2FH)
?..... Transmit request command
Device address ..... Optional, max. 32 characters, optional field, manufacturer-specific, maximal 32 characters. The characters can be numbers (“0” to “9”), upper case letters (“A” to “Z”) or lower case letters (“a” to “z”), or blank spaces (“ “). Upper and lower case letters and blank spaces are clear. Leading zeros cannot be evaluated. This means that all leading zeros in the tariff zoner address are omitted (e.g., “10203” = “010203” = “000010203”). If both the transmitted address and tariff zoner address contain exclusively zeros, regardless of respective length, the addresses are viewed the same. A missing address field is regarded as a general address (“/ ? ! CR LF”), and the tariff zoner must respond. The tariff zoner must be able to evaluate the complete address sent by an external device, even if the length of the internally programmed address is shorter or longer.
NOTE: The device identification number can be used as an address to avoid the reading or writing of wrong devices.
!..... End character (21H)
CR, LF ..... Termination character (0DH = CR, 0AH = LF)

Identifications Message

/	X	X	X	Z	Identification	CR	LF

XXX..... Manufacturer identification, 3 upper case letters (3 lower case letters also permissible)
Z..... Baud rate identification for data messages in mode C protocol:
"0" … 300 Bd
"1" … 600 Bd
"2" … 1200 Bd
"3" … 2400 Bd
"4" … 4800 Bd
"5" … 9600 Bd

Identification..... Manufacturer-specific, max. 16 ASCII-characters, except for "/" and "!"

Acknowledgment/Option Selection Message

ACK	V	Z	Y	CR	LF

ACK ..... Acknowledgment character (06H)
V ..... "0" … normal protocol execution
"1" … subordinate protocol execution
Z..... Data baud rate per MODE C protocol
Y ..... "0" … Read out data
"1" … Programming

The request message, identification message and acknowledgment/option selection message are transmitted at an open baud rate of 300 Bd.

Data Message (except in Programming Mode)

STX	Data	!	CR	LF	ETX	BCC

STX..... Starting character for establishing the block check character text start (02H)
Data ..... Data block with measured values, including CR, LF (except for "/" and "!")
ETX..... End character (03H)
BCC ..... Block check character, if required, in compliance with characters STX, ETX.

Data Message in Programming Mode

SOH	Command ID	Command type	STX	Data record	ETX	BCC

SOH	Command ID	Command type	STX	Data record	EOT	BCC

SOH..... Header character, start of header (01H)
Command ID..... Command identification
Command type ... Command type identification

Command		Command Type Identification	
P	Password command	0	Wert ist Operand für den Sicherungsalgorithmus
		1	Wert ist Operand für den Vergleich mit einem internen Passwort
		2	Wert ist das Ergebnis des Sicherungsalgorithmus (herstellerspezifisch)
W	Write command	0	reserviert für zukünftige Anwendung
		1	schreibe ASCII-codierte Werte
		2	schreibe Format-codiert (optional)
		3	schreibe ASCII-codiert mit Teilblöcken (optional)
		4	schreibe Format-codiert mit Teilblöcken (optional)
R	Read command	1	read ASCII-coded values
		2	read format coded (optional)
		3	read ASCII-coded with partial blocks (optional)
		4	read format-coded with partial blocks (optional)
		5	read load profile per VDEW (at ABB)
E	Execution command	2	Execute format-coded (optional)
B	Shutdown command	0	Disconnect completely

STX..... Starting character for establishing the block check character text start (02H)
Data record ..... 1 - n data records
ETX..... End character (03H)
EOT ..... End character in a partial block (04H)
BCC ..... Block check character, if required in compliance with the characters STX, ETX

One data record has the following content:

Register Values

Message header	Data	Unit (optional)	C R	L F

Load Profile Values

Time/date (optional)	Data with message header and with unit	C R	L F

Acknowledgment Message (06H)

ACK

Repeat Requestion Message (15H)

NAK

4.2. Message Formats

4.2.1. Data Message Register Values

- Message header
- User data (counter)

4.2.1.1. Message Header

The message header is defined according to EDIS, and can be freely parameterized during receive routing (ASCII text).

M	-	KK	:	GG	.	AA	.	T	*	VV

M..... Medium "1" … Electricity
"6" … Heat
"7" … Gas
"8" … Water

-..... 02DH

KK ..... Channel (1 or 2 characters), "1" – "99"

:..... 3AH

GG Measured variable (1 or 2 characters) "0" … General information
"C" … Service information
"F" … Error messages
"L" … List
"P" … Data profile
"1" – "99" … power/voltage/current …

• 2EH

AA ..... Measurement type (1 or 2 characters)

• 2EH

T..... Tariff "0" … One tariff
"1" – "99" … Tariff 1-9

* ..... 2AH (optional & (26H) during manual reset)

VV ..... Preliminary value (1 or 2 places)

4.2.1.2. User Data

The user data are transmitted after the message header, starting with the character “Open Bracket”, and optionally contain one unit.

(0000.0000*kWh)..... Current counter reading, for total register and preliminary value only 0000.0000 without real time.

The unit is assessed and converted (see message conversion).

Formats for Count Values

Determination is made as a function of measurement type.

Measurement type		Format	
AA	**Designation**	**Type**	**Place**
1, 11, 21	Cumulative minimum	F	6 (0,4)
2, 12, 22	Cumulative maximum	F	6 (0,4)
3, 13, 23	Minimum	F	4 (0,4)
4, 14, 24	Current average	F	4 (0,4)
5, 15, 25, 55	Last average	F	4 (0,4)
6, 16, 26	Maximum	F	4 (0,4)
8, 9, 10	Time integral	F	7 (0,3)
58	Test time integral	F	8 (0,4)

Type: F.....Decimal places with comma
S.....Alphanumeric character chain
BMn.....Bit map, n groups of 8 bits each
I.....Number without decimal places

Status Information

Status information is presented as a bit map in n groups of 8 bits each (BMn). The following allocation applies:

- Status true: accompanying bit is set to binary "1"
- Status not true: accompanying bit is set to binary "0"
- Reserved places: accompanying bit is set to binary "0"

For data transmission with the IEC 61107 protocol, an 8-bit group is divided into two partial groups with 4 bits each and transmitted as 2 ASCII characters, the most significant partial group (bits b7-b4) first. The octet sequence is here as follows: Octet n… Octette 1.

Codes and Data Formats for General Information

Designation	Code						Format	
	M [1]	KK [1]	GG	AA	T	VV	Type	Places
Free identification number for EVU: 2)			0	0	x			
Line 1 (device address)			0	0	0		S	8
….							….	….
Line 10			0	0	9		S	8
Version numbers:			0	2	x			
Program version number			0	2	0		S	8
Parameter record number, line 1 2)			0	2	1	1	S	8
……								
Parameter record number, line 9 2)			0	2	1	9	S	8
Time switch program number			0	2	2		S	8
Ripple control program number			0	2	3		S	8
Circuit number (DIN 43856)			0	2	4		S	4
Time information:			0	9	x			
Number of days since last ack message			0	9	0		I	4
Time of day (hh:mm:ss)			0	9	1		Z	8
Date (YY-MM-DD)			0	9	2		D	8
Week day and week number (TWW)			0	9	3		I	3
Internal measurement time for test value 3)			0	9	4		I	7
Service information:			0	9	x			
Device identification numbers: 2)			C	1	x			
Line 1 (e.g., fabrication number)			C	1	0		S	8
….			……..	……..	……..			
Line 10			C	1	9		S	8
Parameter changes:			C	2	x			
Number of parameterizations			C	2	0		I	4
Date of last parameter change			C	2	1		ZST	10
Date of last time switch program change			C	2	2		ZST	10
Date of last ripple-control program change			C	2	3		ZST	10
Status of input/output control signals:			C	3	0		BM	4
Status if internal control signals:			C	4	0		BM	4
Internal operating states:			C	5	0		BM	4
Battery information:			C	6	x			
Battery hour counter (h)			C	6	0		I	4
Battery charge display (%)			C	6	1		I	2

1) Channel and/or media indication, if necessary.
2) In the data transmission message, the entire information can be transmitted without including the line index (T) or (W).
3) See ZVEI recommendation "Test of Electronic Counters via Data Interface", Chap. 4.2.

Designation	Code						Format	
	M 1)	KK 1)	GG	AA	T	VV	Type	Places
Number of power failures:			C	7	x			
Total failure of all three phases			C	7	0		I	4
Phase L1			C	7	1		I	4
Phase L2			C	7	2		I	4
Phase L3			C	7	3		I	4
Manufacturer-specific			C	50	x			
……			C	56	x			
Manufacturer-specific			C	99	x			

1) Channel and/or media information, if necessary.

4.2.2. Data Message – Load Profiles

The load profile data are not defined according to EDIS, but according to VDEW. The data portion is established as follows:

Date	Time	+ P	- P	+ Q	- Q	x1	x2	Status	C R	L F

Date ..... DD.MM.YYYY (02.02.2000)
Time..... HH:MM:SS (09:33:28)

+ P, - P, + Q, - Q …. 00,0000
User data see data message – registry values (measured values), usually 4 values,
Maximal 6 values possible

Status..... UV … Adjust clock
RS … Reset
SA … Power failure

4.3. Routing (system-technical and process-technical)

There are the following routing or configurations:

- Station definition
- Archive Configuration
- 1107 receive detailed routing

In the external address of the detailed routing the 1107 address (identifier) must be entered.

4.3.1. Station Definition (system-technical)

Routing element	Description	Expert parameter
Station number	0 – 99, 255	
Station release	0, 1	
Station failure	0, 1	
1107 device address	32 ASCII character	
1107 identification	16 ASCII character	X
Data coding	0 = EDIS, 1 = CWI	
Password index	Index in the password list 0 – 9, 255	

The station number 0 -99 only serves for the identification within an Ax 1703/ACP 1703 system and does not have influence on the 1107 address. However, the station number must be taken into account in the topology parameter setting of the BSE.

4.3.2. Archive Configuration (system-technical)

Routing element	Description	Expert parameter
Station number	0 – 99, 255	X
Archive number	8 – 15, 255	X
CASDU1	0 - 255	X
CASDU2	0 - 255	X
IOA 1	0 - 255	X
IOA 2	0 - 255	X
IOA 3	0 - 255	X
Latching moment hour	0 - 23	X
Latching moment minute	0 - 59	X

4.3.3. 1107 Receive Detailed Routing Counter Values

Routing element	Description	Expert parameter
Station number	0 – 99	
1107 identifier	12 ASCII character	
Correction factor	* 1 * 10 * 100 * 1000 * 10000 * 100000 / 10 / 100 / 1000 / 10000 / 100000	
Data type archive response	0 - 255	X
Counter value group	1, 2, 3, 4, general counter interrogation	
Archive number	9 – 15, not used	X
New source archive data	Registervorwert Load profile	X
Index in the load profile data	0 - 5	X
CASDU1		
CASDU2		
IOA 1		
IOA 2		
IOA 3		
TI	37 = counter value	

The source address is set on 0 fix.

The same 1107 addresses on IEC 60870-5-101/104 addresses are not permitted. Each the IEC 60870-5-101/104 address as well as the 1107 address must be clear for themselves.

Limitation:

In case of using the "short term data archive – interrogation" the 5 octet address must be configured system-technical.
This could be done at the address conversion on BSE at the "Ax 1703 PRE detailed routing PDS (L11)".

4.4. Message Conversion

The received registry data are relayed to the 1703 system as individual count values.

Up to 100 counters can be connected per SIP (one component number for all 100 stations is sufficient).

A 32-character device address, 16-character identification and an index in a list of passwords can be parameterized per station.
The address is freely parameterizable 5 levels per value, but must be unambiguous.

When parameterizing the 5-level address, the device address and EDIS code along with a 5-level address are parameterized for this value.

In addition, data missing in the guidance system can be subsequently requested from the counter using the “KDA update function”. Values stored in the registers or load profiles with the same address, but a different **data type**, are transmitted.

This requires the establishment of an archive number 8 – 16 per value, along with an allocation of the value to the register preliminary values or to the load profiles. The latching time-scale must be set for each value.

4.4.1. Message Conversion in Receive Direction

4.4.1.1. Count Values

The codes, count values and units are determined from the received register data.
If the code and 5-level address are parameterized, and the parameterized group number corresponds to the interrogated group number, the count value including the unit is evaluated and relayed.

IEC 1107-Format

ASCII-Text, decimal including comma.

(0000.0000 * kWh)

One unit can be contained in the value, the multiplier of the unit is evaluated.

(123.45 * kWh) → 123450

(23.71W) → 23

(76.832 kvar) → 76832

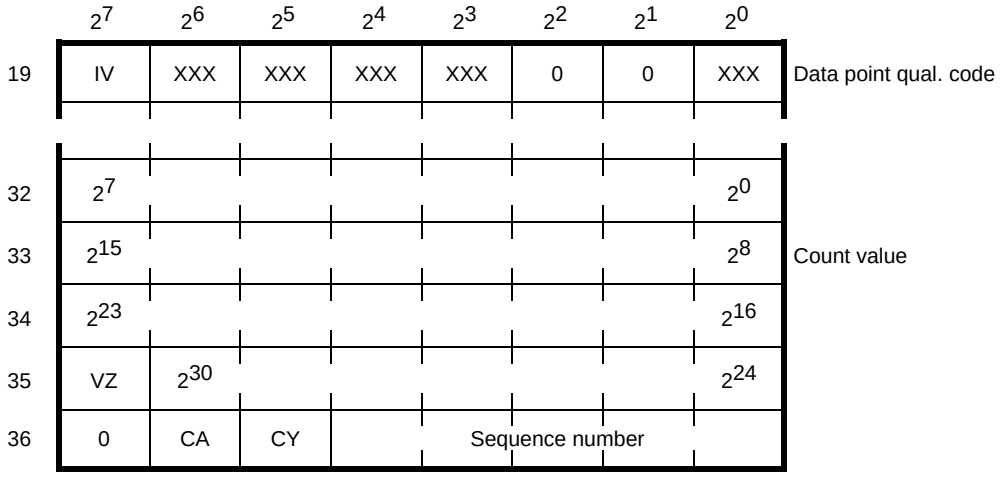
Following units and multiplicators are supported:

Units:
Var (h)
Va (h)
W (h)
m3
m
Hz
A
V

Multiplicator:
k (kilo)
M (Mega)
G (Giga)

Only if because of the value a unit can be found, the multiplicator will be assessed. Default is the multiplicator 1.
This value can be converted in the OPM receive detail routing via correction factor before data transfer (mega e.g. "/100 000").

1703 Format: Count Value 31 Bit + VZ and Sequence Number (TI = 37)



Sequence number .... 0 – 31, function of interrogated group
CA..... Counter set, not supported
CY..... Counter overflow, not supported

Address Conversion

Address conversion can be freely parameterized via receive routing, and must be performed for each station. The external address can be set as an ASCII text on the one hand, and the 1703 internal address can be set on the other.

CASDU1 ⎫
CASDU2 ⎪
IOA1 ⎬ 5-level address can be set per device and code
IOA2 ⎪
IOA3 ⎭

5. Protocol-Specific Functions

5.1. Interface Malfunction

Following the detection of an interface malfunction (if parameterized), a communications failure is signaled, and all other data for this station are stored in the BSE.

5.2. Master/Standby Function

The master/standby function is executed via the redundancy function in Ax 1703. If the firmware is in the standby mode, it transmits no messages. (No messages are relayed to the higher-level BSE either.)

5.3. Station Interrogation

Data are transferred from the counters to the central station only during interrogation of registers or load profiles. Therefore, data cannot be spontaneously transmitted from the substation. Modified data remain stored in the counter, and are transmitted to the central station during station interrogation of this station.

The connected substations are always called up by the central station starting with the lowest station address and increasing to the highest station address. Each station is always called only once.

Data from the central station to the substation are spontaneously transmitted after the ongoing message transmission of the interrogation cycle has ended. The interrupted interrogation cycle is then continued.

The station interrogation does not automatically ensure that the entire scope of information activated for transmission is transmitted to a substation in a interrogation cycle.

Stations that have stored no data for transmission are not taken out of the interrogation cycle.

Disturbed stations also continue to be interrogated in the interrogation cycle, but no message repetition (retry) is performed for such stations during station interrogation.

5.4. Acknowledgment Behavior

If the acknowledgment for a message sent by the central station is absent, this message is repeated n times (n = parameterizable number). After the parameterized number of message repetitions, the interface is labeled as disturbed, and the interface failure is also visually displayed.

5.5. Failure Monitoring

5.5.1. Failure Monitoring in the Central Station

Substation failures are detected by the central station in the normal interrogation cycle. Failed stations continue to be interrogated in the interrogation cycle, but no message repetition (retry) is executed for such stations during station interrogation.

5.5.2. Failure Monitoring in Redundant Configurations

In redundant configurations, the standby central station (= central station not involved in production management) monitors the global failure of the interface. A station-selective failure monitoring is not performed.

The interface failure is detected by the STANDBY central station by monitoring for cyclical message reception (receive timeout in standby mode). Given a “receive timeout” (= active central station or receive channel has failed), the interface is signaled as having failed.

Pending station-selective disturbances are reset in redundant STANDBY central stations, if these stations “monitor” an error-free message.

5.6. Used Data Block Formats

See "Ax 1703 Data Block Formats" description for structure.

5.6.1. "Counter Interrogation Request " (Function Code 153)

Note: If no permanent polling is used (= default), in case of an interface failure it may come to a deadlock. In case of an interface failure no system messages are sent to the SIP.

Remedy: In this case the protocol control messages must be used for the counter interrogation.

5.6.1.1. General

Information Code

Information Code	Function
0	General Counter Interrogation

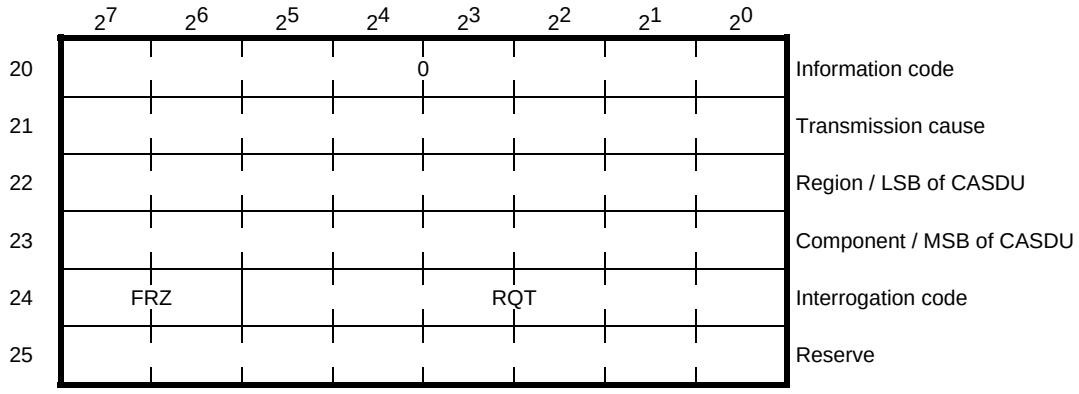
Cause of Transmission: see IEC 60870-5-101

Interrogation Code: according to IEC 60870-5-101 = RQT = 1 - 5

FRZ	RQT	Function
0	1 .. 4 5	Transmit group 0-3 selective Transmit all groups

5.6.1.2. General Counter Interrogation

Requests a counter reading interrogation.



Region / LSB of CASDU or component / MSB of CASDU can indicate a selective address of messages. Used systemically only for all (255, 255).

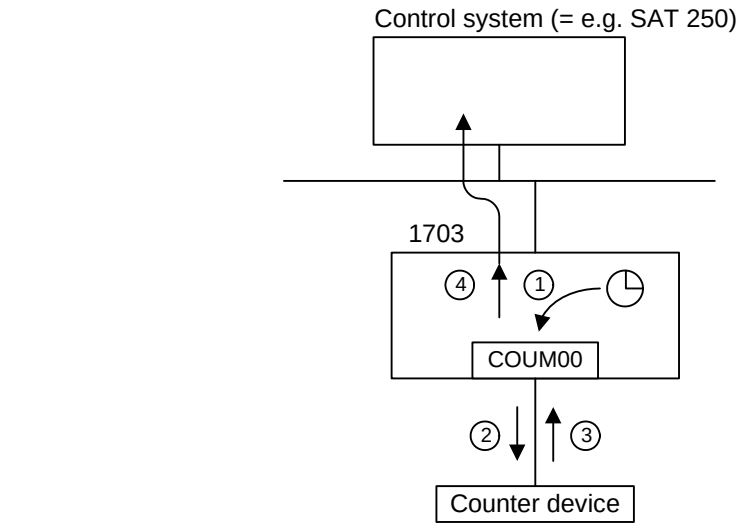
5.6.2. PST Control Message (Function Code 161)

A binary information (coming/going) can be routed to the PST, whereas depending on function code + station number the corresponding function is actuated.

Description	Function No..	Possible station no.	Additional parameter 1	
Read register START	0	0 - 99	not defined	
Queue station in cycle	128	0 - 99	not defined	1)
Dequeue station from cycle	129	0 - 99	0,1	1) 2)

1) A station can only be queued or dequeued if the station was parameterized.
   If the station number is not known, an “erroneous PST message” error is generated.
2) 0 ..... remove a possibly pending station disturbance
   1 ..... a possibly pending station disturbance remains pending

5.7. Counter Data Interrogation



① Cyclic counter interrogation
② Read register
③ Register data record
④ Transmission of selectiv counter data TI 37

Either the interrogation of the counter data can be started by means of system message counter interrogation or with the protocol control messages "Read register START". After this the firmware transmits a "Read register" to the counter device.

If the received identifier is correctly parameterized in the receive (detailed) routing, TI 37 counter messages are transmitted to the BSE.

Note: The sequence number in the counter message is treated only at interrogations by means of system message counter interrogation.

5.8. Short-Term Data Archive – Interrogation in the SK 1703 – Migration Mode

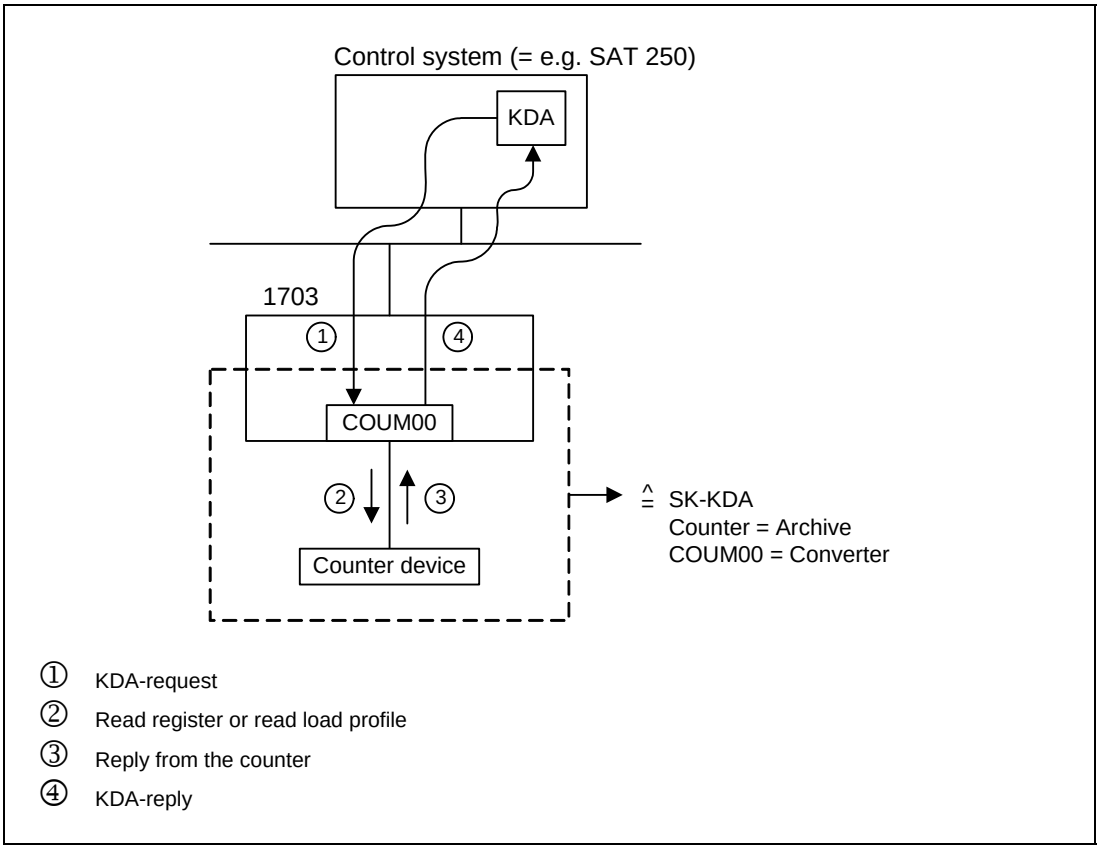
The archive is transmitted in the SK 1703 migration mode.(≙ AX – KDA).

The COUM00 firmware reads all values out of the counter archive at the appropriate archive time, and answers the archive interrogation of the requesting station (e.g., SAT 250).

If the received identifiers correctly parameterized in the receive routing, TK 33 archive data reply messages are transmitted to the BSE.

Note: Because the counter messages as well as the archive data reply messages have the same 5 octett IEC address, a address conversion must be made at the BSE (e.g. in the send (detailed) routing) to receive unambiguous IEC addresses.

Nachfordern (≙ KDA)



5.8.1. General

When using archive transmission in the SK 1703 migration mode, only the following type code can be interrogated from the counters:

- Count value 31 bit + sign with sequence number (TK = 37)

This type code for the transmission of archive data is transformed to “31 bit + sign”.

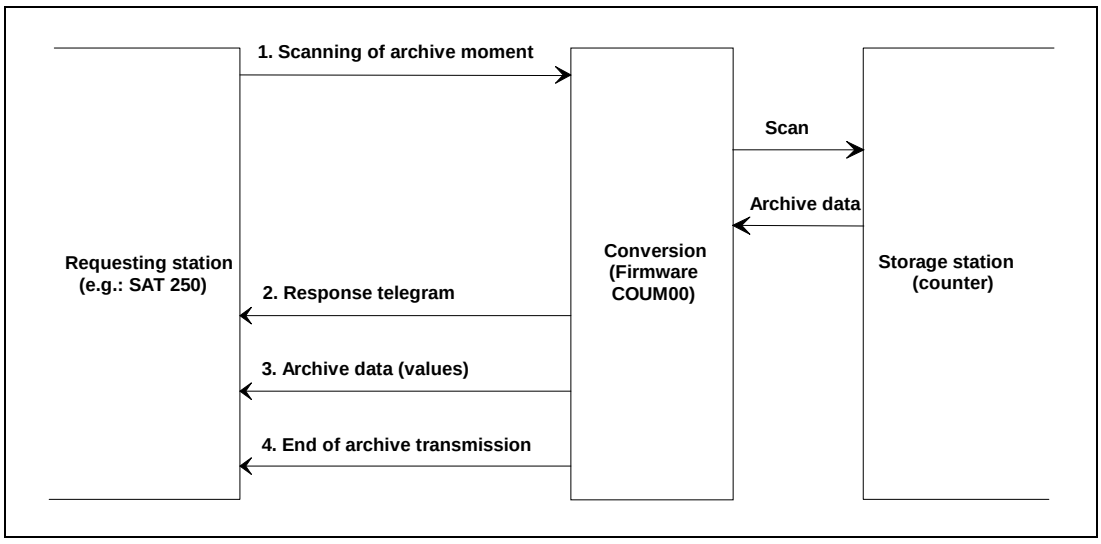
Archive data transmission generally takes place with the “bit pattern 32 bit” type code. All external formats (IEC 60870-5-101, SSI, SAT standard formats SK 1703, etc.) are derived from this message format.

In addition, periodic archiving is only possible in multiples of minutes during transmission in the SK 1703 migration mode, since second intervals cannot be interrogated.

No „GA capability“ should be parameterized for type code 33 (= „33 bit bit pattern), since the archive data and response messages are otherwise simulated given a GA and a failure (with NT bit = 1).

The addressing for the "short term data archive – interrogation" is system-technical.

5.8.2. Transmission Mechanism



5.8.3. Archive Data Interrogation

Only one archive moment can be interrogated.

Message Structure of an Archive Moment Interrogation

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	
33								Type code
SQ = 0	Number							Variable structure code
								Transmission cause (spontaneous)
								From address (optional)
Region number / Octette 1								Joint address of ASDU
Component number / Octet 2								
Value number / Octet 3								Information object address
Module number / Octet 4								
Sub-address / Octet 5								
RQK	0	Minute						User data
0	0	0	Hour					
D	0	0	Day					
0	0	0	0	Month				
IV=0	NT=0	SB=0	BL=0	0	0	0	OV=0	DP-quality code
								Time 7 octet

RQK Computer source code
D Double time code 0 = Interrogation of archive data without double time code
1 = Interrogation of archive data with double time code
(i.e., double hour after summer/winter changeover)

5.8.4. Response Message, End of Archive Transmission

These messages are used to start and end archive transmission.

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	
33								Type code
SQ = 0	Number							Variable structure code
								Transmission cause (=spontaneous)
								From address (optional)
Region number								Joint address of ASDU
Component number								
Value number								Information object address
Module number								
Sub-address								
RQK	0	Minute						User data
0	0	0	Hour					
D	0	0	Day					
Status			Month					
IV	NT	SB	BL	0	0	0	OV	DP quality code
								Time 7 octette

The address is occupied by the KDA function (systemically only) as follows:

- Region number = own
- Component number = own
- Value number = Archive number (8 – 15)
- Module number = own
- Sub-address = 132

If archive data are present for the interrogated moment, two response messages are sent prior to data transmission.

- 1st response message with status = 5
- 2nd response message with status = 0

All remaining response statuses end the archive interrogation (without ending the archive transmission, since no archive data could be found.
”Spontaneous” is attached to the transmission cause.

This telegram has the source identification of the own additional LAN group (254) of the COUM protocol.

Status:

5..... Archive interrogation allowed, and data for the interrogated moment present
Time, date = Time and date of the interrogation message and RQK

0..... Archive interrogation allowed, and data for the interrogated moment present
At status = 0, the user data are occupied as follows:

Number of archive data to be sent								User data
0	0	0	0	0	0	0	RQK	
Status = 0				0	0	0	0	

1..... Still no entry present in archive, or archive not present
Time, date = Time, date of interrogation message and RQK

2..... No further interrogation possible during ongoing archive interrogation
Time, date = Time, date of interrogation message and RQK

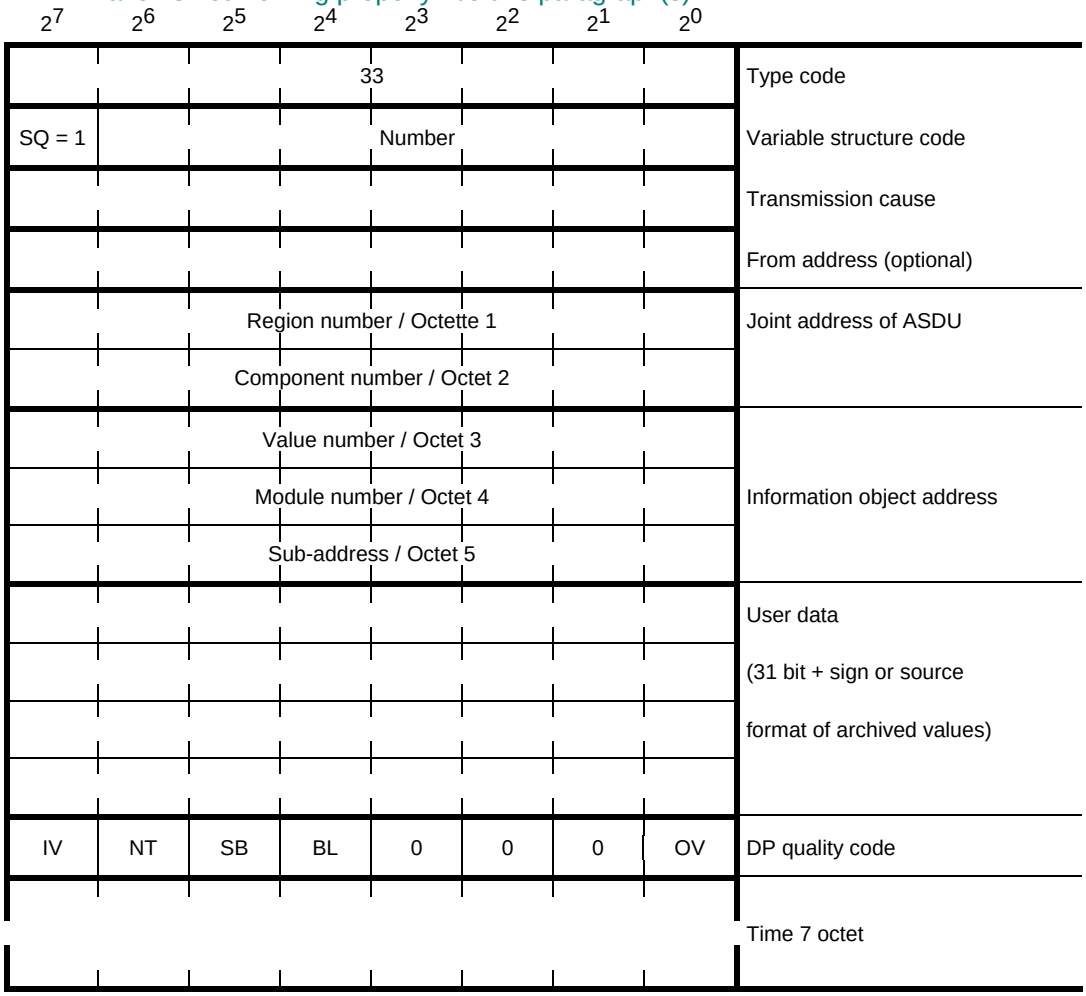
3..... No data were stored in archive at interrogated moment
Time, date = Next (more recent) moment and RQK stored in archive

4..... Interrogated moment outside the time range stored in archive
Time, date = Oldest moment and RQK encountered in archive

15... End of archive data transmission
Time, date = Time, date of interrogation message

5.8.5. Archive Date (Values)

< PDFMaker is not working properly w/o this paragraph(s) >



The archive data are transmitted with the five-level source address of the archived data point as a process address.

Reason: using systemtechnical addressing of the archived data point, the sub-address cannot correspond to the type code (TK = 33)

The data point quality code applies to the archive data.

The archive data are relayed with the transmission cause “requested” (= 5).

This telegram has the source identification of the counter (station number).

5.8.6. Configuration / Function

The archive control messages can be adjusted in the "archive"-parameter setting per station (since Rev. 06.01) and per archive.
The data type is 32 bit + polarity sign, TI = 33.

Further every value must be supplied with an archive number in the receive routing.

During an interrogation of an archive of a Station, the source of the requested value will be established in the receive routing and, as the case may be, a load profile request and/or register request is started.

Depending on the adjusted station either only the selected station or all stations are treated

Note:
At interrogation of all stations (station number 254) destination station 125 must be indicated at the interrogation message in the detailed routing of the BSE.

A. Appendix: Application Notes

- Some counter devices does not stand any duration (countinuous) calls. There is an interrogation cycle for it which is adjustable in the minute scale.
- The expected acknowledgement time is calculated on the maximum byte number (22000), depending by the baud rate. However, this can be adjusted fix.
- The response reaction time according to norm is 200 ms - 1.5 sec. Some counter devices needs this response reaction time , therefore a correction factor of 2 sec was firmware internally taken (the acknowledgement correction factor still can be adjusted in addition).
- The receive routing must be made in the OPM. (The Spreadsheet was earlier, gets downward compatible supports, however, does not contain the latest expansions). Caution: Both routings (OPM and Spreadsheet) may be never used.
- Per value a correction factor can be parameterized. At reception of a value 1234MVA this is calculated on 1234000000 internally and passed on. Now this value can be divided before the transfer e.g. by 100000.0 and as 1234VA are passed on. Because the correction factor is adjustable in the OPM, this can be taken in the control system at the evaluation of the value.
- At interrogation of the register data all register data incl. vorwerten are transmitted by the counter device.
  Caution: The data size can be relatively high dependent on the configuration of the counter device (4 quadrants, 15 Vorwerte (pre-values), ...) (at ABB AEM 500 4 quadrants approx. 22 kBytes.)

A.1. ABB AEM 500 (= Elster 1500)

- Cyclic interrogation of the counter (duration cycle) possible.

A.2. ISCRA Counter

- The counter device only may be called once.

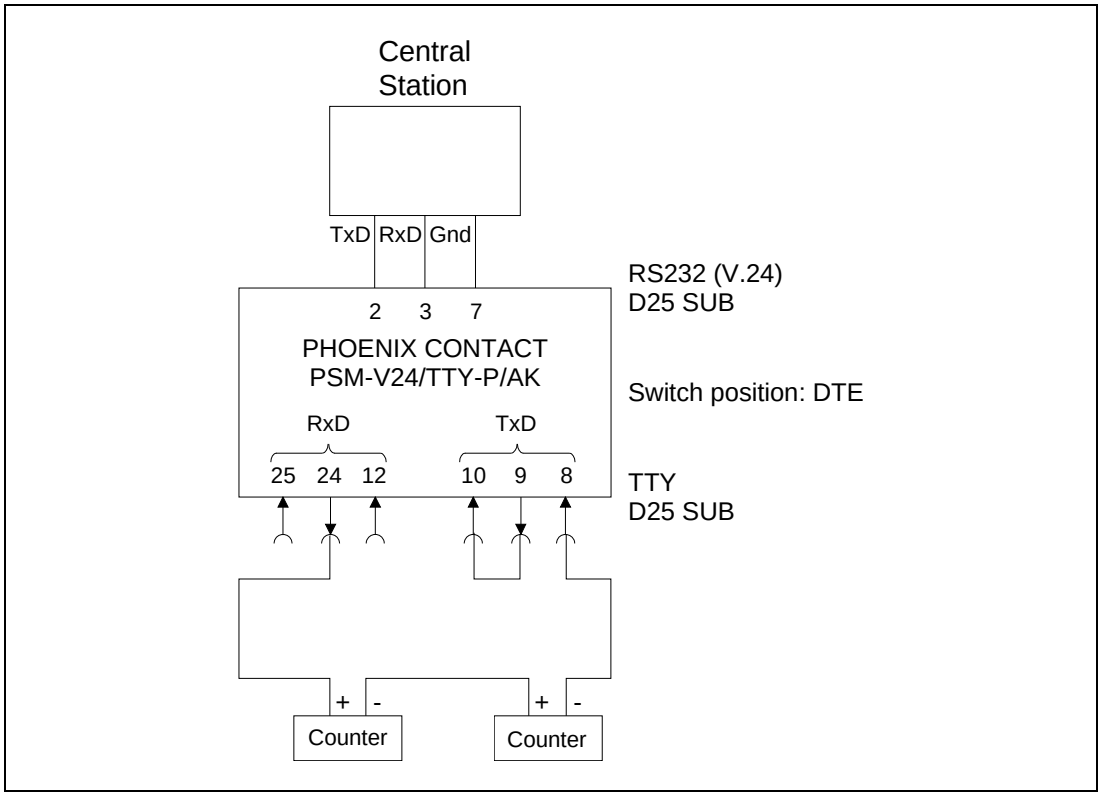
Number of retries = 0, acknowledgement correction 2 sec.

A.3. Prometer

- Data not according to EDIS!
- It only may be called if also data is requested – no duration cycle, no interrogation cycle.
- At data inquiry by means of counter inquiry it must be made sure that the system messages are transmitted to the SIP also at interface failure. Otherwise it can come to a "deadlock".

B. Appendix: Wiring/Interface Converter

B.1. TTY (Current loop)



Patchplug CM-2860

B.2. V.11 (RS485, RS422)

Integrated Bus Termination

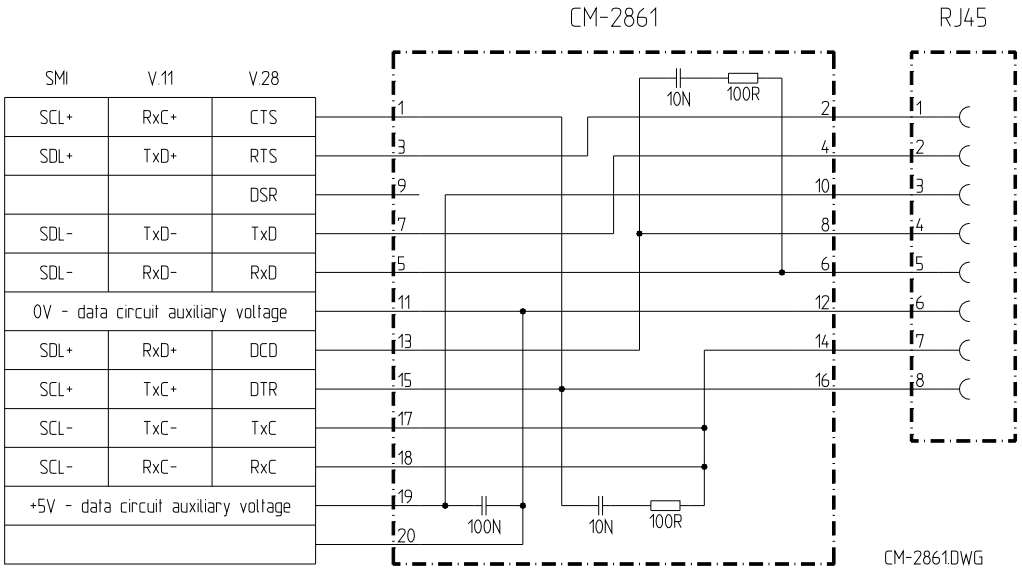
Pin assignment of the RJ45 connector

Configuration			Interfaces			
Carrier Module	**Connect. Board**	**Patch Plug**	**SI0**	**SI1**	**SI2**	**SI3**
CP-2000	CM-2857	CM-2861	✓	✓		
CP-2002	CM-2858	CM-2861	✓	✓	✓	✓
CP-4000		CM-2861		✓	✓	
CP-4003		CM-2861	✓	✓	✓	✓

✓ SIx is accessible on the RJ45 connector if the corresponding patch plug is mounted

Not available or not operated by SIM

RJ45 Connector		
Pin	**Alias**	**Signal**
1	I/O 1	TXD+
2	I/O 2	TXD-
3	I/O 3	+5V
4	I/O 4	RXD+
5	I/O 5	RXD-
6	I/O 6	GND
7	I/O 7	RXC-/TXC-
8	I/O 8	RXC+/TXC+



See also data sheet SM-2541, item number: DA0-901-1.01, page 10.

B.3. CEWE Prometer RS 422 (V11)

Baudrate fix 9600
(7 / E / 1 = default)

RS 422 (V.11) with CM 2861

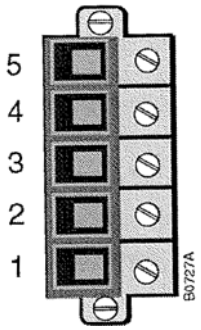
RJ 45 Pin 1 = orange white	…	CEWE Prometer, COM Port 1, Pin 1
RJ 45 Pin 2 = orange	…	CEWE Prometer, COM Port 1, Pin 2
RJ 45 Pin 4 = blue	…	CEWE Prometer, COM Port 1, Pin 4
RJ 45 Pin 5 = blue white	…	CEWE Prometer, COM Port 1, Pin 3

CEWE Prometer, Com Port 1 is the first from the right

Serial communication port RS 422

A twisted pair of wires is used as the receiving bus that all meters monitor, and another pair is used as a transmitting bus that all meters send on. The communication equipment uses an RS422 port or an RS232 port through an RS232-to-RS422 converter. the converter must be designed for 4-wire communications (full duplex). Recommended converters are Westermo MA 45, MD45 and MDW45.

Hardware	RS422 serial communication port
Connector in meter	5-pole connector (Phönix)
Communication protocol	IEC62056-21/IEC107 Mode C, programming mode
Data format	1 start bit, 7 data bits, 1 stop bit, even parity
Baud rate	Port #1 300-19200 bps, Port #2 1200-19200 bps



Pin configuration for RS422 connector on meter

1	RX+
2	RX-
3	TX-
4	TX+
5	Signal GND

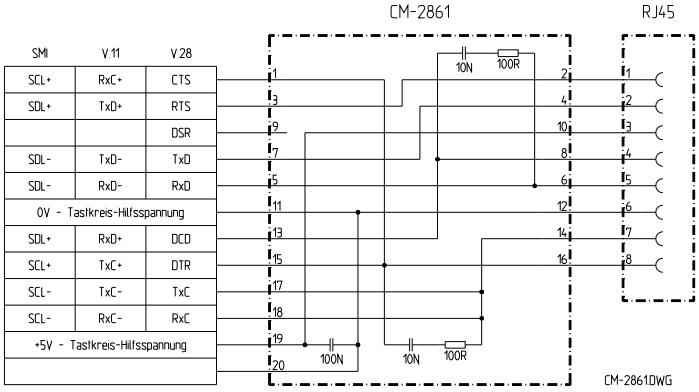
Configuration RJ45 socket with **CM-2861**

V.11 (RS-485, RS-422)

asynchron, synchron, isochron

bus termination integrated

1 = TXD +
2 = TXD -
3 = +5V
4 = RXD +
5 = RXD -
6 = GND
7 = RXC - / TXC -
8 = RXC + / TXC +



B.4. Capturing with PC-Serialtest on RS485-Interface:

1) method did not certify
   RS232 < - - RS485
   RXD < - - SDL-
   GND < - - SDL+

2) with RS232/V.11 Converter (e.g. Phönix PSM-V24/V11-P/BB)

   Switch = DCE
   V.11/Pin-4 - - > SDL+
   V.11/Pin-11 - - > SDL-

   RS232: RXD
   RS232: GND

3) with RS485/V.24 Converter (e.g. Phönix PSM-V24/RS485V11-P/BB) or
   with RS485/V.24 Converter (e.g. Phönix PSM-V24/RS485V11- /BB)

   Switch = DCE
   RS485/Pin-3 - - > SDL+
   RS485/Pin-81 - - > SDL-

   RS232: RXD
   RS232: GND

   COMTEST V.24
   Pin (3), (7) "ON"
   Pin (20=DTR) < - - > Pin (18=LL) connecting

   LL . . . Local Loopback

Note: COMTESTV.24 LED18, LED20 must shine red otherwise you jam the S485-bus

C. Appendix: Test Aids

C.1. Toolbox II

With the Toolbox II, with the tool "ST-Emulation" one can use the following functions on the SSE:

IDA.....Serial test in ASCII
IDH .....Serial test as IDA, but in HEX
IDF.....Display the detailed routing on SIP
IDR .....Diagnostic ring
IDM.....Freespace manager (free memory)
IDE.....Receive error statistics
IDS.....Stack
IDD .....Display of the most important diagnostic information (only for specialists)
Details of these functions are available in the SSI-description.

C.2. Example IDD

```
M: gz128
M/Z128: idd
 ---------------------------------------
 Adressierungsart (Parametrierung) :  ; 1
                                      ;  Verfahrenstechnisch;
 Anzahl der Empfangsrangierungen:     ; 0012;
    intern-Rangiersaetze Systemtechn: ; 0000;
    intern-Rangiersaetze Verfahrenste:; 0012;
 akt. Datum/Zeit vom SIP:             ; 01.01.2001 , 00:00:29
 laufende Quittungserw.zeit (n*100ms):;
 cou_quitt_time                       ; 000020;
 Quitt-Zeit fuer nicht-Daten          ; 000020;
 Quitt-Zeit fuer Daten:               ;  wird dynamisch ermittelt;
                                      ; 007797;
 Telegrammabrissueberw. (n*100ms):    ; 000012;
 Dauerzyklus:                         ; 000000;
 1107 Abfragezyklus Registerlesen:    ; 000000;
 Protocol:                            ;  IEC 62056-21 (IEC 61107);
 param. Passwort [0]:                 ; 04800840
 param. Passwort [1]:                 ;
 Anzahl Param.Archivabfragen          ; 000002;
 Anzahl PST-Telegramme vom BSE:       ; 000000;
 Anzahl Zaehlerabfrage-Tel. vom BSE:  ; 000000;
 Anzahl KDA-Abfrage-Tel. vom BSE:     ; 000000;
 Anzahl KDA-Antw. zum BSE:            ; 000000;
 Anzahl KDA-Daten Antw. zum BSE:      ; 000000;
 KDA-debug                            ; 000000;
 ---------------------------------------
 KDA-Adressierungstabelle             ;
 Stationsnummer                       ; ;Archiv;CASDU1;CASDU2;IOA1;IOA2;IOA3;hh;mm
                                      ; all;08;0172;0015;0001;0008;0132;00;15;
 ---------------------------------------
 Stationsnummer:                      ; 01;
 Ger„teadresse:                       ; 699649
 par._Identifikation (ohne Herst, Bd):; \2ZMD405CT440457
```

```
 empfangene Identifikation:           ;
 INIT-Baudrate:                       ; 9600;
 Datenuebertragungsbaudrate:          ;  Datenbaudrate noch nicht definiert ! ;
 Datenkodierung:                      ;  nach EDIS (Energie Daten Ident. Sys.);
 empfangene P0-Daten:                 ;
 parametriertes Passwort:             ; ********
 empf.Byteanz.der Registerdaten       ; 000000;
 erkannte Zaehlertype:                ;  nicht erkannt
 -------------------------------------
 Stationsnummer:                      ; 02;
 Ger„teadresse:                       ; 699650
 par._Identifikation (ohne Herst, Bd):; \2ZMD405CT440458
 empfangene Identifikation:           ;
 INIT-Baudrate:                       ; 9600;
 Datenuebertragungsbaudrate:          ;  Datenbaudrate noch nicht definiert ! ;
 Datenkodierung:                      ;  nach EDIS (Energie Daten Ident. Sys.);
 empfangene P0-Daten:                 ;
 parametriertes Passwort:             ; ********
 empf.Byteanz.der Registerdaten       ; 000000;
 erkannte Zaehlertype:                ;  nicht erkannt
End of protocol detail documentation
M/Z128:
```

C.3. Example of Answers (Serial Test Notes)

C.3.1. EDIS

```
S:   /?!<CR><LF>
E:          /ABB3\@00000000000000<CR><LF>
S:   <ACK>030<CR><LF>
E:          <STX>1-1:F.F(00000000)<CR><LF>
E:          1-1:0.0.0(00000000)<CR><LF>
E:          1-1:0.0.1(00000000)<CR><LF>
E:          1-1:0.0.2(00000000)<CR><LF>
E:          1-1:0.1.0(07)<CR><LF>
E:          1-1:1.2.1(00.0001*kW)<CR><LF>
E:          1-1:1.2.1&01(00.0001)<CR><LF>
E:          1-1:1.2.1*12(00.0001)<CR><LF>
E:          1-1:1.2.1*11(00.0000)<CR><LF>


E:          1-1:1.6.4(00.0000*kW)(0000000000)<CR><LF>
E:          1-1:1.6.4&01(00.0000)(0000000000)<CR><LF>
E:          1-1:1.6.4*04(00.0000)(0000000000)<CR><LF>
E:          1-1:1.6.4*03(00.0000)(0000000000)<CR><LF>
E:          1-1:1.6.4*02(00.0000)(0000000000)<CR><LF>

E:          1-1:1.8.0(0000.0141*kWh)<CR><LF>
E:          1-1:1.8.0&01(0000.0141)<CR><LF>
E:          1-1:1.8.0*04(0000.0000)<CR><LF>
E:          1-1:1.8.0*03(0000.0000)<CR><LF>
E:          1-1:1.8.0*02(0000.0000)<CR><LF>

E:          1-1:2.6.1(00.0001*kW)(0002040800)<CR><LF>
E:          1-1:2.6.1&01(00.0000)(0000000000)<CR><LF>
E:          1-1:2.6.1*04(00.0000)(0000000000)<CR><LF>
E:          1-1:2.6.1*03(00.0000)(0000000000)<CR><LF>
E:          1-1:2.6.1*02(00.0000)(0000000000)<CR><LF>

E:          !<CR><LF>
E:          <ETX>U Soll: U
S:   <SOH>B0<ETX>q
```

C.3.2. CEWE-Prometer

```
S:   /?1289201!<CR><LF>
E:      /CWI31289201<CR><LF>
S:   <ACK>030<CR><LF>

E:      <STX>101(0.0*MWh)102(0.0*MWh)103(0.0*Mvarh)104(0.0*Mvarh)105(0.0*MVAh)<CR><LF>
E:      106(0.0*MVAh)

E:      !<CR><LF>
E:      <ETX>U
S:   <SOH>B0<ETX>q
```

C.4. Example Archive test

KDA Abfrage 1:

Quellidentifikation	BSE:14, ZSE:254, Stations#:255
CASDU1	177
CASDU2	200
IOA1	0
IOA2	65
IOA3	204
Übertragungsursache	T P/N Ursache
	Zustand: 0 0 3
Typidentifikation	33/Bitmuster 32 Bit
Daten	80H,0BH,12H,08H

KDA Antwort: Code 4, fuer abgefragte Zeit keine Daten, naechste Zeit wo Daten vorrhanden sind

Quellidentifikation	BSE:14, ZSE:128, Stations#:002
CASDU1	172
CASDU2	15
IOA1	0
IOA2	65
IOA3	133
Übertragungsursache	T P/N Ursache
	Zustand: 0 0 3
Typidentifikation	33/Bitmuster 32 Bit
Daten	80H,0EH,03H,4AH

2. KDA Abfrage:

Quellidentifikation	BSE:14, ZSE:254, Stations#:255
CASDU1	177
CASDU2	200
IOA1	0
IOA2	65
IOA3	204
Übertragungsursache	T P/N Ursache
	Zustand: 0 0 3
Typidentifikation	33/Bitmuster 32 Bit
Daten	00H,10H,03H,0AH

KDA Antwort: CODE 5, Daten f r abgefragten Zeitpunkt vorhanden.

Quellidentifikation	BSE:14, ZSE:128, Stations#:002
CASDU1	172
CASDU2	15
IOA1	0
IOA2	65
IOA3	133
Übertragungsursache	T P/N Ursache

```
                                        Zustand:  0  0       3
                    Typidentifikation   33/Bitmuster 32 Bit
                    Daten               00H,10H,03H,5AH


KDA Antwort:  CODE 0, Anzahl der folgenden Werte = 12

                    Quellidentifikation BSE:14, ZSE:128, Stations#:002
                    CASDU1              172
                    CASDU2              15
                    IOA1                0
                    IOA2                65
                    IOA3                133
                    Übertragungsursache           T P/N  Ursache
                                        Zustand:  0  0       3
                    Typidentifikation   33/Bitmuster 32 Bit
                    Daten               0CH,00H,00H,00H

1. Abgefragter KDA-Zaehlwert:

                    Quellidentifikation BSE:14, ZSE:128, Stations#:002
                    CASDU1              172
                    CASDU2              15
                    IOA1                26
                    IOA2                1
                    IOA3                132
                    Übertragungsursache           T P/N  Ursache
                                        Zustand:  0  0       5
                    Typidentifikation   33/Bitmuster 32 Bit
                    Daten               A4H,B7H,01H,00H

.... noch 11 weitere Werte......




KDA Antwort: CODE 15, Ende der Archivdatenuebertragung

                    Quellidentifikation BSE:14, ZSE:128, Stations#:002
                    CASDU1              172
                    CASDU2              15
                    IOA1                0
                    IOA2                65
                    IOA3                133
                    Übertragungsursache           T P/N  Ursache
                                        Zustand:  0  0       3
                    Typidentifikation   33/Bitmuster 32 Bit
                    Daten               00H,10H,03H,FAH
```

D. Appendix: Literature

The following document(s) is/are recommended as a supplement to the "COUM00" description:

IEC 1107 "Count Transmission, Tariff and Load Control"
Data transmission for permanent and mobile connection
(German Version EN 61107: 1996)

DIN 43863-3 "Electricity Meter"
Part 3: Tariff Zoners are Auxiliary Device for Electricity Meter
EDIS Energy Data Identification System

VDEW – Specifications (Electronic Electricity Meters)
Version 2.0
(12/97)

Siemens Description: "Ax 1703 Daten Formats"
Item Number: MA0-000-r.xx

Siemens Data Sheet: SM 2541
Item Number: DA0-901-r.xx

E. Appendix: Diagnosis

E.1. Class Internal

E.1.1. Class Internal - Record 0 : Internal error in the operating system

Bit	Description
00	RAM error
01	STACK error The defined stack range has been exceeded; Replace system element or notify SAT.
02	Firmware shut down Diagnosis: - Read out system diagnostics ring (command ID R) in ST emulation (possibly store to file)
03	Too little free space There is not enough free RAM memory available for the dynamic memory management; Diagnosis: - Change parameterization of size definitions (e.g. realtime rings, pool size) - Notify SAT.
08	CPU 80186 error Occurs on an internal software error.

E.1.2. Class Internal - Record 2 : Parameter error ZSE

Bit	Description
00	Parameter error detected by SIP
01	Parameter error of the LOCAL parameter block no. 06
02	Parameter error ZSE general
03	Parameter setting with invalid stationnumber. Diagnosis: Selected stationnumber is greater than 100 and also not a broadcast-station number.
04	Parameter setting with invalid station number. Diagnosis: Same station number is used more then once.
05	Invalid Parameters for IEC 1107 link-layer
07	Invalid Parameters for Redundancy
08	Error Input Routing

E.1.3. Class Internal - Record 3 : ZSE format conversion error

Bit	Description
00	Format conversion error in the transmit direction
02	Format conversion error in the receive direction
15	Conversion error in PST-controll-messages Diagnosis: - Read out system diagnostics ring (command ID R) in ST emulation and notify SAT (possibly store to file)

E.1.4. Class Internal - Record 4 : Invalid Parameters for protocol specific application layer

Bit	Description
01	Invalid Parameters for multi point traffic

E.2. Class Communication

E.2.1. Class Communication - Record 2 : Communication error to Station no. 0 - 15

Bit	Description
00	Communication error to Station no. 0
01	Communication error to Station no. 1
02	Communication error to Station no. 2
03	Communication error to Station no. 3
04	Communication error to Station no. 4
05	Communication error to Station no. 5
06	Communication error to Station no. 6
07	Communication error to Station no. 7
08	Communication error to Station no. 8
09	Communication error to Station no. 9
10	Communication error to Station no. 10
11	Communication error to Station no. 11
12	Communication error to Station no. 12
13	Communication error to Station no. 13
14	Communication error to Station no. 14
15	Communication error to Station no. 15

E.2.2. Class Communication - Record 3 : Communication error to Station no. 16 - 31

Bit	Description
00	Communication error to Station no. 16
01	Communication error to Station no. 17
02	Communication error to Station no. 18
03	Communication error to Station no. 19
04	Communication error to Station no. 20
05	Communication error to Station no. 21
06	Communication error to Station no. 22
07	Communication error to Station no. 23
08	Communication error to Station no. 24
09	Communication error to Station no. 25
10	Communication error to Station no. 26
11	Communication error to Station no. 27
12	Communication error to Station no. 28
13	Communication error to Station no. 29
14	Communication error to Station no. 30
15	Communication error to Station no. 31

E.2.3. Class Communication - Record 4 : Communication error to Station no. 32 - 47

Bit	Description
00	Communication error to Station no. 32
01	Communication error to Station no. 33
02	Communication error to Station no. 34
03	Communication error to Station no. 35
04	Communication error to Station no. 36
05	Communication error to Station no. 37
06	Communication error to Station no. 38
07	Communication error to Station no. 39
08	Communication error to Station no. 40
09	Communication error to Station no. 41
10	Communication error to Station no. 42
11	Communication error to Station no. 43
12	Communication error to Station no. 44

Bit	Description
13	Communication error to Station no. 45
14	Communication error to Station no. 46
15	Communication error to Station no. 47

E.2.4. Class Communication - Record 5 : Communication error to Station no. 48 - 63

Bit	Description
00	Communication error to Station no. 48
01	Communication error to Station no. 49
02	Communication error to Station no. 50
03	Communication error to Station no. 51
04	Communication error to Station no. 52
05	Communication error to Station no. 53
06	Communication error to Station no. 54
07	Communication error to Station no. 55
08	Communication error to Station no. 56
09	Communication error to Station no. 57
10	Communication error to Station no. 58
11	Communication error to Station no. 59
12	Communication error to Station no. 60
13	Communication error to Station no. 61
14	Communication error to Station no. 62
15	Communication error to Station no. 63

E.2.5. Class Communication - Record 6 : Communication error to Station no. 64 - 79

Bit	Description
00	Communication error to Station no. 64
01	Communication error to Station no. 65
02	Communication error to Station no. 66
03	Communication error to Station no. 67
04	Communication error to Station no. 68
05	Communication error to Station no. 69
06	Communication error to Station no. 70
07	Communication error to Station no. 71
08	Communication error to Station no. 72

Bit	Description
09	Communication error to Station no. 73
10	Communication error to Station no. 74
11	Communication error to Station no. 75
12	Communication error to Station no. 76
13	Communication error to Station no. 77
14	Communication error to Station no. 78
15	Communication error to Station no. 79

E.2.6. Class Communication - Record 7 : Communication error to Station no. 80 - 95

Bit	Description
00	Communication error to Station no. 80
01	Communication error to Station no. 81
02	Communication error to Station no. 82
03	Communication error to Station no. 83
04	Communication error to Station no. 84
05	Communication error to Station no. 85
06	Communication error to Station no. 86
07	Communication error to Station no. 87
08	Communication error to Station no. 88
09	Communication error to Station no. 89
10	Communication error to Station no. 90
11	Communication error to Station no. 91
12	Communication error to Station no. 92
13	Communication error to Station no. 93
14	Communication error to Station no. 94
15	Communication error to Station no. 95

E.2.7. Class Communication - Record 8 : Communication error to Station no. 96 - 99

Bit	Description
00	Communication error to Station no. 96
01	Communication error to Station no. 97
02	Communication error to Station no. 98
03	Communication error to Station no. 99

E.3. Class Test

E.3.1. Class Test - Record 0 : Test mode of the operating and base systems

Bit	Description
00	Memory test disabled

F. Appendix: Parameter Documentation

Common settings

Parameter	Description	Values/Ranges
addressing type		[0] system technical [1] process technical
baud rate opening	Eröffnungsbaudrate, die Datenbaudrate wird automatisch ermittelt.	[50] 50 [Bd] [75] 75 [Bd] [100] 100 [Bd] [110] 110 [Bd] [134] 134,5 [Bd] [150] 150 [Bd] [200] 200 [Bd] [300] 300 [Bd] [600] 600 [Bd] [1050] 1050 [Bd] [1200] 1200 [Bd] [1800] 1800 [Bd] [2000] 2000 [Bd] [2400] 2400 [Bd] [4800] 4800 [Bd] [9600] 9600 [Bd] [19200] 19200 [Bd]
data bits	Number of data bits	[0] 5 bit [1] 6 bit [2] 7 bit [3] 8 bit
electrical interface	electrical interface	[0] RS232 (V.24/V.28) [1] RS422 (V.11) [2] RS485 (V.11)
Parity	Selection of the parity bit	[0] no parity [1] even parity [2] odd parity
stop bits	Numbers of stop bits	[0] 1 bit [1] 1,5 bit [2] 2 bit

F.1. Redundancy

Parameter	Description	Values/Ranges
listening_mode (failure monitoring time)	failure monitoring time in listening mode (0 = no monitoring)	Float [####.] 0 to 60000 [s]
operation if passive	operation if passive	[0] transmitter "tristate", listening mode [1] transmitter "active", listening mode [3] transmitter "active", normal operation

Parameter	Description	Values/Ranges
Delay time passive=>active	delay time in case of switch over from PASSIVE=>ACTIVE (0 = without delay)	Integer [####] 0 to 2000 [s]

F.2. Message retries

Parameter	Description	Values/Ranges
Retries for data message SEND/CONFIRM (station selective)	Number of max. message retrys	Integer [###] 0 to 255

F.3. advanced parameters

Parameter	Description	Values/Ranges
continuous cycle	the continous cycle must only be used for test purposes	[0] NO [1] YES
real time sychronization	Wenn das angeschlossene Zaehlgeraet zeitgesetzt werden soll, muß die Zeitsynchronisierung freigegeben sein.	[0] NO [1] YES
IEC1107 read register cycle	by the 1107 cycle the read register command could be controlled by the protocol (counter request)	[0] off [1] 30 seconds [2] 1 minute [3] 15 minutes [4] 30 minutes [5] 1 hour [6] 6 hours [7] 12 hours [8] 24 hours
behavior in case of error		[0] transmit no break [1] transmit break
Time set format	Selection of transmitted time set format 0...YYMMDDyhhmmss 1...ABB specific	Integer [###] 0 to 255
check of the checksum (BCC)		[0] BCC check ON [1] BCC check OFF

F.4. advanced parameters | archiv interrogation

archiv interrogation

Parameter	Description	Values/Ranges
daylight saving time used		[0] YES [1] NO

F.5. advanced parameters | Passwordlist

Passwordlist

Parameter	Description	Values/Ranges
Password 0		String 8 Char to ~
Password 1		String 8 Char to ~
Password 2		String 8 Char to ~
Password 3		String 8 Char to ~
Password 4		String 8 Char to ~
Password 5		String 8 Char to ~
Password 6		String 8 Char to ~
Password 7		String 8 Char to ~
Password 8		String 8 Char to ~
Password 9		String 8 Char to ~

F.6. advanced parameters | Software test points

Software test points

Parameter	Description	Values/Ranges
stop_serialtest_after_comm_error	The change of this parameter required profoundness communication knowledge. A specialist should be contacted before.	[0] NO [1] YES
Stop_serialtest_after_retry	The change of this parameter required profoundness communication knowledge. A specialist should be contacted before.	[0] NO [1] YES
data and acknowledgement between BSE	The change of this parameter required profoundness communication knowledge. A specialist should be contacted before.	[0] NO [1] YES
level locking station locking	The change of this parameter required profoundness communication knowledge. A specialist should be contacted before.	[0] NO [1] YES
Handshake RTS,GPB (ASCII-Mode)	The change of this parameter required profoundness communication knowledge. A specialist should be contacted before.	[0] NO [1] YES
Handshake RTS,GPB	The change of this parameter required profoundness communication knowledge. A specialist should be	[0] NO

Parameter	Description	Values/Ranges
(HEX-Mode)	contacted before.	[1] YES
mask for blocking data pick-up	The change of this parameter required profoundness communication knowledge. A specialist should be contacted before.	[0] NO [1] YES
master-standby switchover	The change of this parameter required profoundness communication knowledge. A specialist should be contacted before.	[0] NO [1] YES
ZDT-filter	The change of this parameter required profoundness communication knowledge. A specialist should be contacted before.	[0] NO [1] YES

F.7. advanced parameters | monitoring times

monitoring times

Parameter	Description	Values/Ranges
Expected acknowledgement time DATA (static)		Float [####.#] 0.1 to 6553.5 [s] 0 [s]
Shorten expected acknowledgement time at msg. interruption		[0] NO [1] YES
Expected_acknowl_time_corr_data_msg		Float [####.#] 0.1 to 6553.5 [s] 0 [s]
Expected_acknowl_time_corr_poll		Float [####.#] 0.1 to 6553.5 [s] 0 [s]
Character monitoring time	After communication errors,the line is monitored for quiescent state. After expiry of this monitoring time, the resynchronisation of the receiver takes place. default 1,2 sec	Float [####.#] 0.1 to 6553.5 [s] 0 [s]