SIEMENS

Cerberus® CS1140

Gateway CK1142

Foreign Interface Protocol

Copy no. xxxx

Fire & Security Products

Siemens Building Technologies

The system owner shall be aware that the connection to (or the interaction with) other systems may impair the functionality and reliability of the fire detection and / or security and protection system.

1 Introduction

The CK1142 gateway includes a foreign interface to integrate an AlgoRex subsystem into a third party remote system. In the point-to-point serial connection, change-of-state telegrams are transmitted to the remote system and command telegrams may be transmitted form the remote system to a the CK1142 which in turn translate them into control unit commands.
The communication protocol is based on elements of the ISO 1745 standard.
To ensure that the data link between the CK1142 and the connected remote system works correctly, conventions at the following level are required:

- Physical layer
  - V.24 standard signals
  - Signal level, distance
  - Data transmission rate
  - Transmission format
- Data link layer
  - Control characters
  - Transmission blocks
  - Error checking procedures
  - Protocol sequences, timings and counters
- Application layer
  - Telegram buffering
  - Telegram filter
  - Heart beat telegrams
  - Procedure for initialising the process image in the remote computer

2 Physical layer

The physical interface basically conforms to the EIA RS232C standard which in turn is based on the CCITT V.24 and V.28 standards. The deviations from these standards are described below.

2.1 Signals of the V.24 standard

From the standardized V.24 signals only the following are used:

TD Transmit Data
RD Receive Data
GND Signal Ground

2.2 Signal levels

The levels of the signals conform to the V.28 standard.
Logical 0: +3 Volt ... +15 Volt
Logical 1: –3 Volt ... –15 Volt

2.3 Transmission distance

The quality line drivers of the CK1142 allow transmission distances far greater than the 30 metres specified in the RS232C standard. For distances > 30 metres the installation of intermediate repeaters is recommended.

2.4 Data transmission rate

A transmission rate of 1200 or 2400 Baud can be selected.

2.5 Transmission format

The data transmission is bit serial in asynchronous, half-duplex mode. The characters to be transmitted comprise 1 start bit, 7 data bits, 1 parity bit (even parity) and 2 stop bits.

3 Data link layer

The data link layer ensures error-free message transmission between the CK1142 and the remote system by means of a communication protocol derived from the ISO1745 standard.
The protocol is basically symmetrical. An exception is the re-establishment of the data link, which is initiated by the CK1142 (Master-Station).

3.1 Control characters

The control characters are based on the ASCII character set according to ISO 646.

Control character	Hex value	Function
EOT	04	Re-establishment of the data link End of telegram transmission
ACK	06	Positive acknowledgement
NAK	15	Negative acknowledgement
ENQ	05	Request for telegram transmission
SOH	01	Start of message header
STX	02	Start of message
ETX	03	End of message

3.2 Transmission blocks

Two different transmission blocks are used within the protocol:
line monitoring (UBL)
data telegram (UBT)

3.2.1 Transmission block: Line monitoring

The transmission block *line monitoring* (UBL) is an empty message which is used for monitoring the data link. UBLs are exchanged whenever there are no data telegrams to be transmitted.

Structure of UBL:

SOH	"L"	"0"	STX	ETX	BCC
$01	$4C	$30	$02	$03	$7D
	< relevant character sequence for the BCC >				

3.2.2 Transmission block: Data telegram

The transmission block *data telegram* (UBT) is used for transmitting change-of-state and command telegrams.

Structure of UBT:

SOH	"T"	"1"	STX	DMS7000 TELEGRAM	ETX	BCC
$01	$54	$31	$02	13 ASCII characters	$03	<bcc>
	<	relevant character sequence for the BCC			>	

The structure of the DMS7000 telegram is described in document no. e1461.

3.3 Procedure for calculating the block check character BCC

For checking the integrity of the transmitted message, block checking according to ISO 1155 is used. In this process the longitudinal parity is formed across the transmission block and the result is stored in an additional character, the Block Check Character (BCC). The following rules apply:
The longitudinal parity is calculated as modulo-2 sums (XOR) across the bits of the corresponding columns in the transmission block.
The calculation begins after the SOH character and ends with (including) the ETX character.

3.3.1 Example for calculating the BCC

BCC calculation for the telegram W111A109M8501:

Character	Hex	Binary	Operation
SOH	01	0000 0001	---
“T“	54	0101 0100	---
“1“	31	0011 0001	XOR
STX	02	0000 0010	XOR
“W“	57	0101 0111	XOR
“1“	31	0011 0001	XOR
“1“	31	0011 0001	XOR
“1“	31	0011 0001	XOR
“A“	41	0100 0001	XOR
“1“	31	0011 0001	XOR
“0“	30	0011 0000	XOR
“9“	39	0011 1001	XOR
“M“	4D	0100 1101	XOR
“8“	38	0011 1000	XOR
“5“	35	0011 0101	XOR
“0“	30	0011 0000	XOR
“1“	31	0011 0001	XOR
ETX	03	0000 0011	XOR
<BCC>	**3A**	**0011 1010**	**Result**

3.4 Transmission procedures

Transmission procedures are rules for exchanging control characters and transmission blocks between the stations.

3.4.1 Protocol phases

Phase	Service	Control character of initiating station	Control character of responding station
PHW	Establishing data link	EOT	ACK
PHX	Line monitoring	UBL	UBL
PH2	Request for telegram transmission	ENQ	ACK, NAK
PH3	Telegram transmission	UBT	ACK, NAK
PH4	End of telegram transmission	EOT	ACK, NAK, ENQ

3.4.2 Protocol timers

Time	Function	Nominal value (sec.)
TA1, TB1	Response monitoring	15
TA2, TB2	Transmission delay PHX	0.25
TA3, TB3	Transmission delay PH2,PH3,PH4	0
TW4	Transmission delay PHW	1

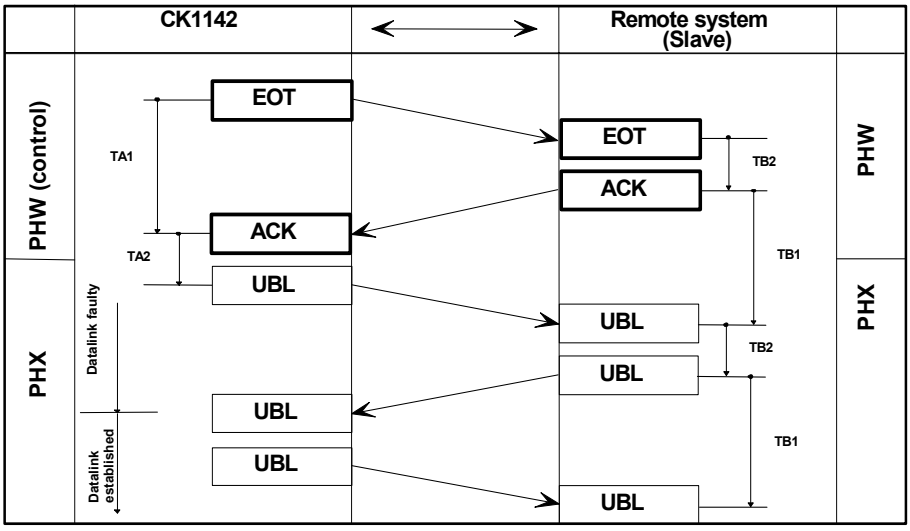
3.4.3 Protocol counters

Time	Function	Nominal value (sec.)
W3	Repetitions outside PHW	3
W4	Repetitions within PHW	∞

3.4.4 Protocol sequence diagrams

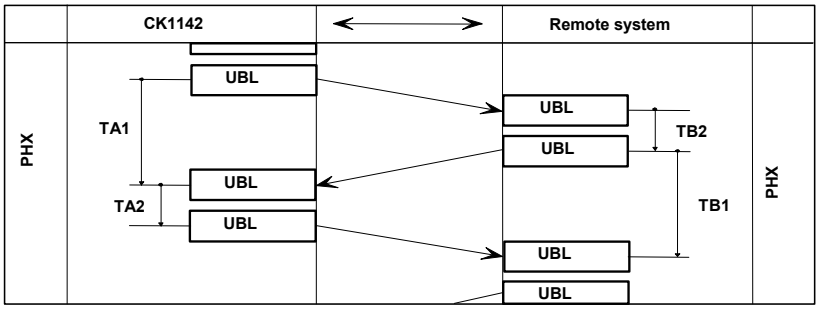
Phase PHW: Establishing data link

Data link recovery is initiated by transmitting an EOT. If the remote system replies with ACK then phase PHX is activated. The data link is considered to be established when one UBL has been successfully transmitted in both directions.

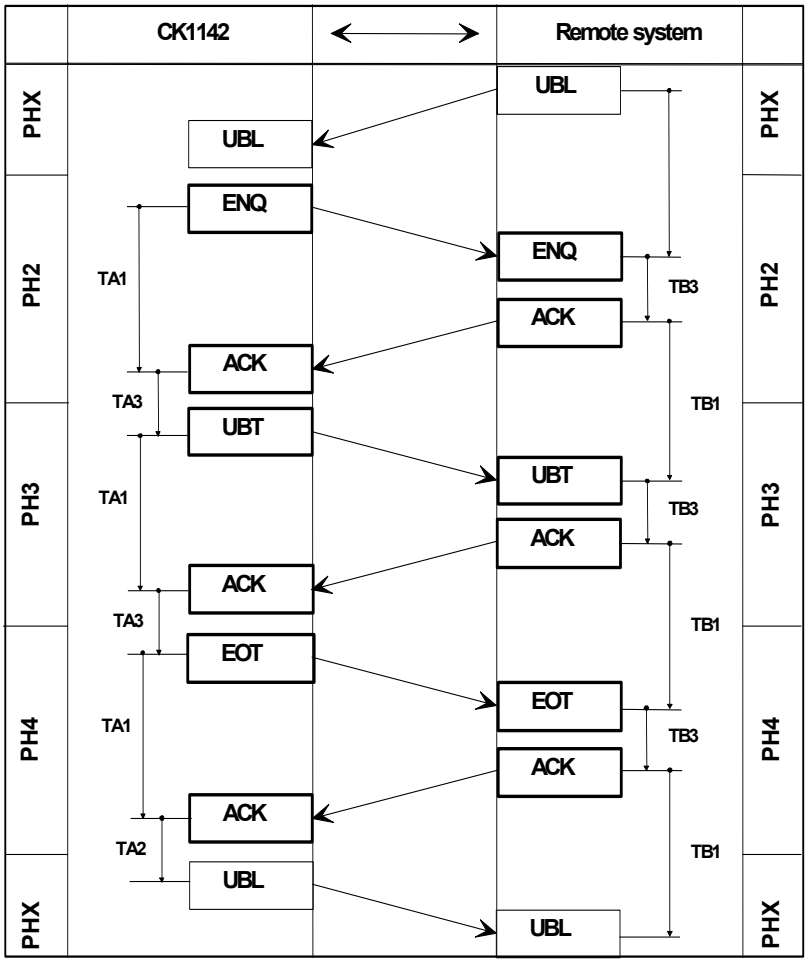


Phase PHX: Line monitoring

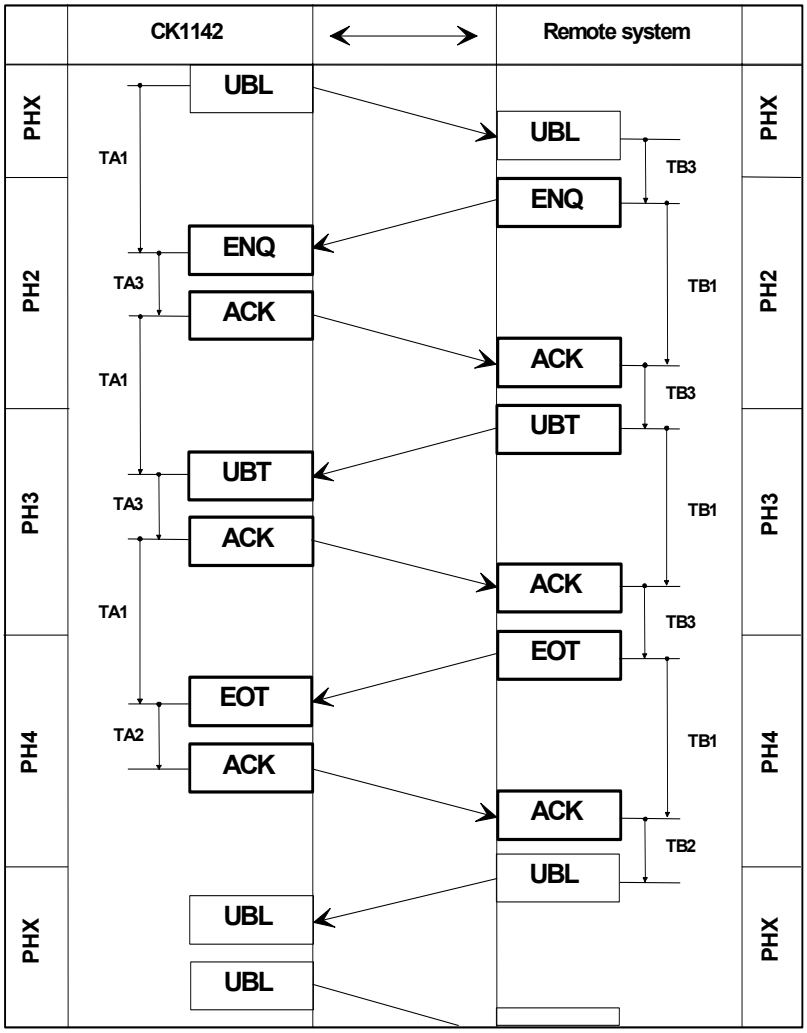
If neither of the stations has any data to transmit then an empty message is exchanged for line monitoring purposes.



PH2 .. PH4: Data telegram transmission from the CK1142 to the remote system

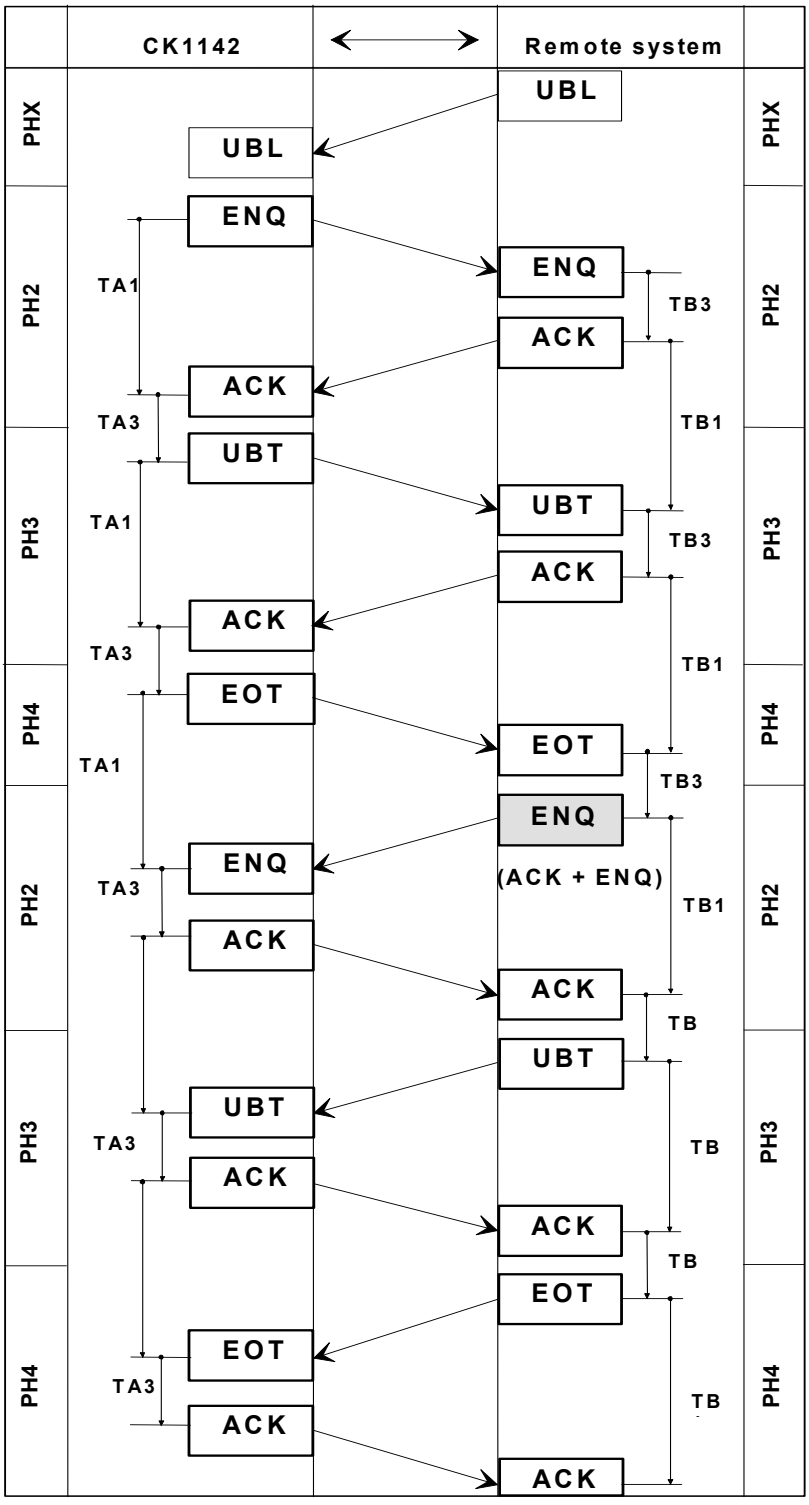


PH2 ... PH4: Data telegram transmission from the remote system to the CK1142



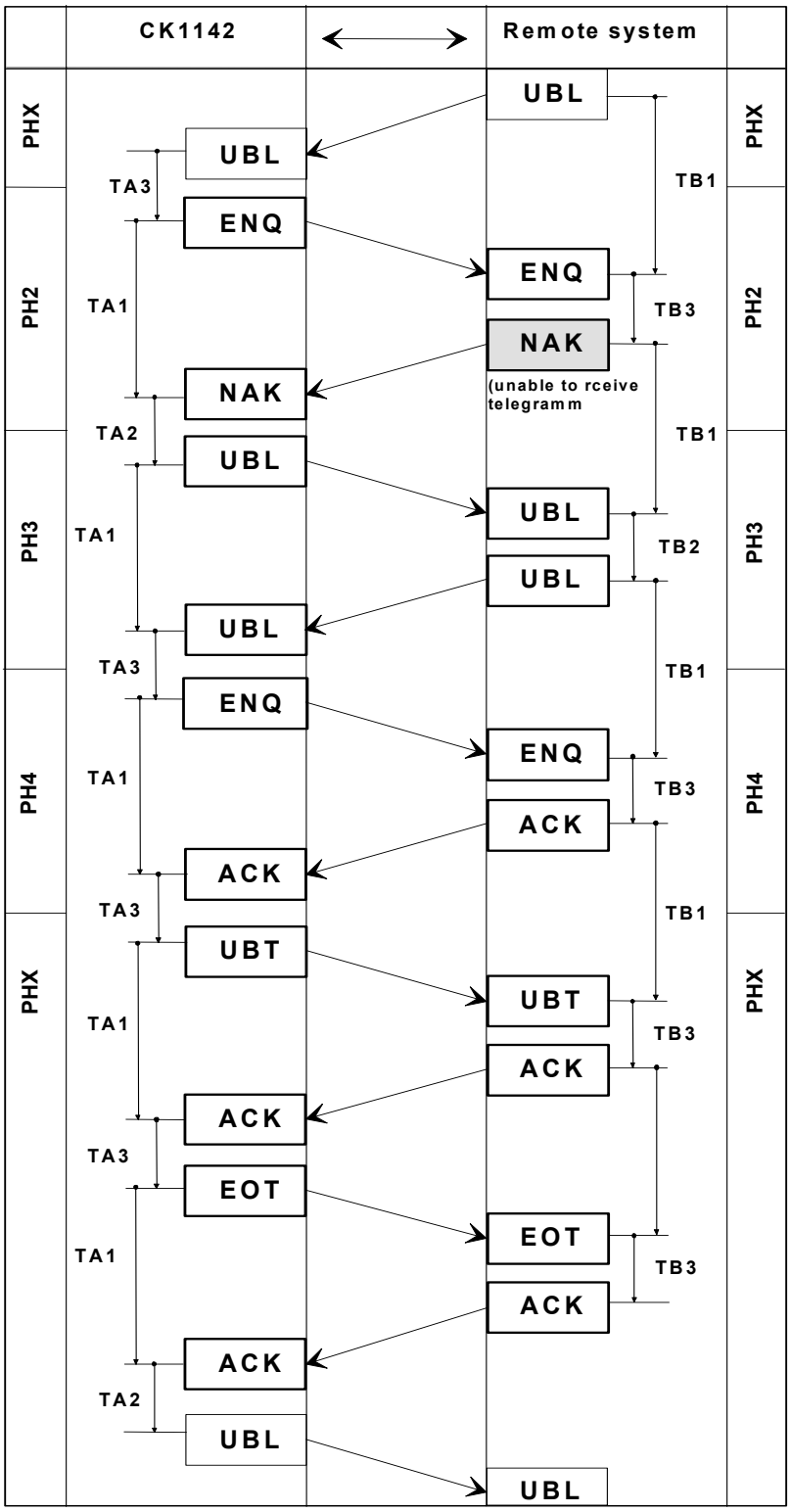
Alternating telegram transmission between the CK1142 and the remote system

With respect of the number of telegrams to be transmitted per unit of time, both stations shall be treated equally. Basically the station sending the telegram could immediately request another transmission after the EOT confirmation has been received. However, this would be to the disadvantage of the receiving station. To prevent this, the receiving station may acknowledge the EOT in PH4 with ENQ (rather than ACK) and thereby is granted the right to transmit after the partner station has confirmed the request.



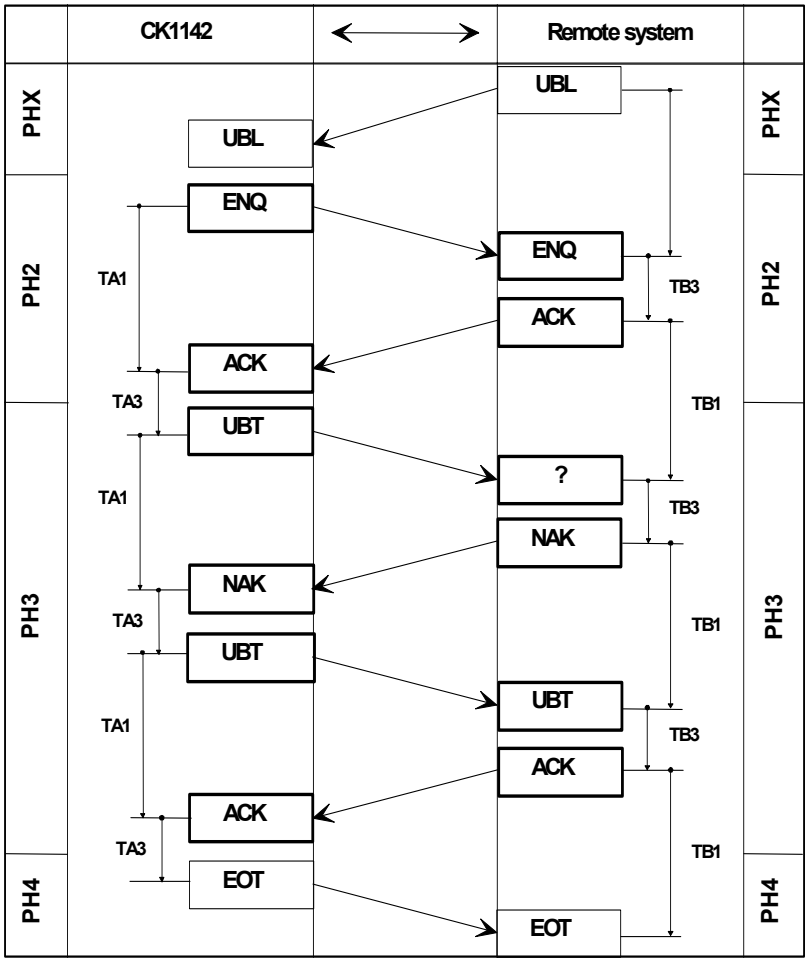
Denial of transmission right

If a station is momentarily unable to receive a telegram, it can answer an ENQ with NAK. In this case a UBL must be exchanged before transmission can again be requested.



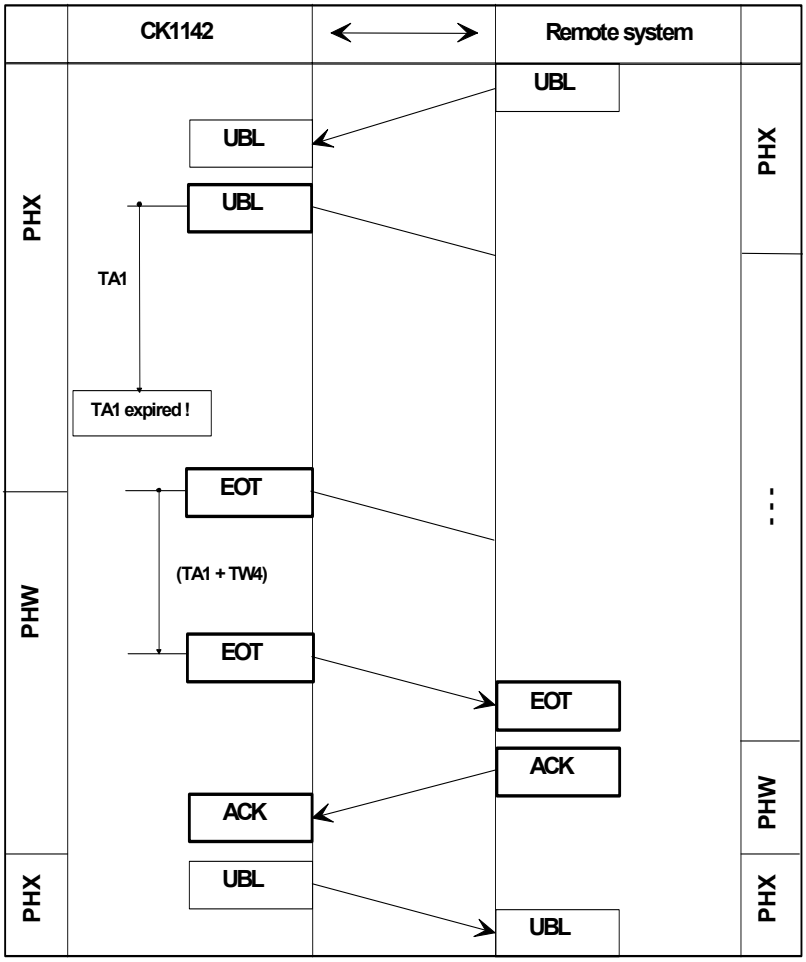
Repetition of an erroneous transmission block

A UBT (or UBL) which has been transmitted with an error is repeated up to 3 times (counter W3) before the data link is declared as interrupted. In this case the data link must be re-established via the PHW phase.



Re-establishing the data link after expiry of TA1

If the timeout TA1 is expired the data link is declared to be interrupted and must be re-established.



The above example shows a data link interruption during the transmission of a UBL. The same procedure applies to all control characters and transmission blocks.

3.5 Application layer

3.5.1 Telegram buffering

For bridging short-time communications bottlenecks the CK1142 contains telegram buffers for both directions. The capacity of these buffers is as follows:
CK1142 → remote system: 1000 telegrams
Remote system → CK1142: 100 telegrams
When the buffer is full the oldest telegram is overwritten by the newest. This prevents a telegram backlog into the AlgoRex network. After a data link interruption the buffers are cleared.

3.5.2 Telegram filter

There is no telegram filter in the CK1142.

3.5.3 Monitoring the AlgoRex units

Before communication with any AlgoRex unit is possible, a check must be made whether or not these units are present (ON-LINE) on the network. The CK1142 and each CC1140 control unit signal their availability via periodic transmission of a presence telegram (interval typically 30 sec.). The advantages of this method are topology independence and true end-to-end monitoring. A disadvantage is the resulting overhead load on the network.

Available telegrams

Sector	DMS Adr	ADF1	ADF2	Sep	Data A	Data B	Text A	Text B
Z	<DMSadr>	00	00	N	39	00	On-Line	---

3.5.4 Sample polling procedure

System configuration
This example is based on a AlgoRex subsystem comprising:
AlgoRex fire detection control unit CC1142 (DMS address 111) configured sectors: BASIC, FIRE and EXTINGUISHING
AlgoRex gateway CK1142 (DMS address 860) configured units.

Procedure

	CK1142	Telegram	Remote system
	Event: Data link to remote system is normal		Event: Data link to the CK1142 is normal.
		← Z8600000R5355 ← Z8600000R5352	Event: Remote system starts polling the CK1142.
	Event: Polling command received. Transmission of the abnormal states	Z8600000N533A → Z8600000M3C46 → Z8600000M533B →	
		← Z1110000R5355 ← Z1110000R5352	Event: The CC11 has been reported as ONLINE (presence telegrams are received every 30 sec).
Event CC11: Polling command for basic sector received. Transmission of abnormal states.		Z1110000N533A → <telegram> → : <telegram> → Z1110000N533B →	
		← W1110000R5355 ← W1110000R5352	Event: Polling of basic sector completed. Start polling of fire sector.
Event CC11: Polling command for fire sector received. Transmission of abnormal states.		W1110000N533A → <telegram> → : <telegram> → W1110000N533B →	
		← P1110000R5355 ← P1110000R5352	Event: Polling of intrusion sector completed. Start polling of plant monitoring sector.
Event CC11: Polling command for plant monitoring sector received. Transmission of abnormal states.		P1110000N533A → <telegram> → : <telegram> → P1110000N533B →	
			Polling of CC11completed. The process image of the remote system is completely up-to-date.

4 Keyword index

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