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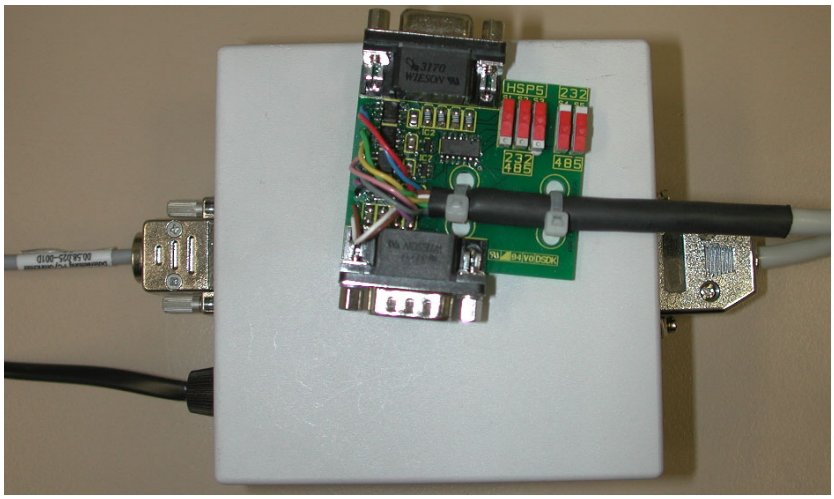
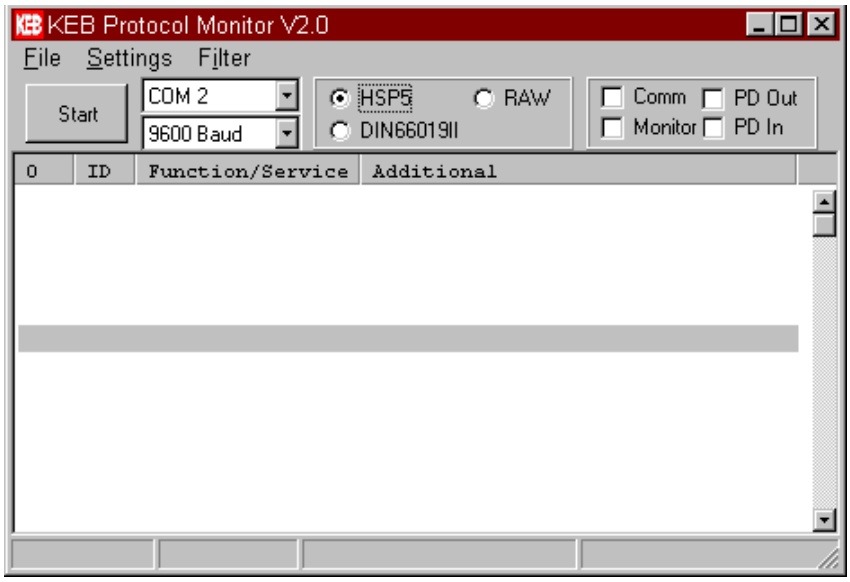




Instruction Manual Line Monitor
KEB Protocol Monitor V2.0

C0.00.01B-K200

KEB

02/2002

1 General

This manual describes the unit Line Monitor as well as the software KEB Protocol Monitor V2.0.
The Line Monitor is a universal serial hardware monitor and is operated with the software described here. Independent of that, the software can also be used with other connections such as the field bus monitor for F4/S4.

1.1 Technical Data Line Monitor

Voltage Supply Mains	100..250 VAC via Euro Connector, 50/60 Hz
Voltage Supply Local	18..30 VDC, fed in via D-Sub15 Socket
Housing	Table Unit, 100*100*60 mm
Operating Temperature	-10° to +45° Celsius
Part Number Line Monitor (*)	00.F5.025-0070
Part Number Cable to the PC (included in *)	00.58.025-001D
Software KEB Protocol Monitor	Freely available in the Internet: www.keb.de / ftp.keb.de
Part Number of this Instruction Manual	C0.00.01B-K200, available over Internet

2 Line Monitor

The Line Monitor is a serial 2-channel recording unit with storage for any serial, asynchronous and HSP5-protocols. It is connected to the PC with a KEB-Standard-COMBIVIS-cable. For the connection to KEB control cards or operators a special adaptor (probe) is included in the delivery. As operating and display program serves the KEB Protocol Monitor starting from Version 2.0, described further on. The recording and reading speed and the data format are adjustable independent from each other. Thus the Line Monitor can record for example a 250-kBaud HSP5-(full duplex)connection and output the incoming telegrams with 38.4 kBaud to the PC successively. Depending on the telegram density an overflow can occur in the ring storage of the Line Monitor. In that case the internal recording is stopped, the telegrams still stored are output and thereafter the KEB Protocol Monitor is also stopped with a corresponding error message.

2.1 Basic Unit

The basic unit contains the power pack as well as the recording electronic. The reference points GND of the D-Sub-connectors are internally connected (no electrical isolation). The basic unit has following connections.

2.1.1 Line Cable with Euro Connector

Serves in normal operation for the voltage supply. Voltages from 100 to 250 Volt AC can be used. If no mains voltage is available, then DC voltage can be fed in over the D-Sub-15 Socket.

2.1.2 D-Sub-9 Socket

This is the RS232-connection to a serial interface over the enclosed cable with following allocation:

D-Sub-9 Female	
2	RxD ->PC Pin 2
3	TxD ->PC Pin 3
7	GND ->PC Pin 5
Shield	Cable shielding

2.1.3 D-Sub-15 Socket

Connection to the probe. All signals are executed as RS485-lines, thus the cable can be extended, if necessary (max. 100 meter). The socket has following allocation:

D-Sub-15 Female	
1	Input for supply voltage, 18..30 VDC
9	GND for supply voltage
2,8,15	GND to the probe
3,10	+5V voltage supply for probe
4,11	RS485-pair channel B receive
5,12	RS485-pair channel A receive
6,13	RS485-pair channel A Handshake
7,14	RS485-pair channel B Handshake
Shield	Cable shielding

Alternatively an operating voltage can be fed in at Pin 1 and 9. In this case Pin 9 is connected with Pin 2, 8 and 15 (no electrical isolation).

2.2 Probe

The probe contains two D-Sub-9 connector, that are interconnected 1:1, as well as high-impedance coupling on up to 4 signal lines. Thus the probe can be plugged onto any D-Sub-9 connector/socket of KEB-units with HSP5, RS232 or RS485 connection without influence. Switches enable the selection of the operating mode. An incorrect adjustment, even at contacting on HSP5-interfaces with operating voltages of up to 30 Volt, does NOT lead to damages. Connections to other interfaces can be made with a suitable, self-made adaptor in conjunction with the correct adjustment of the operating mode.

2.2.1 Operating Mode HSP5

The probe is plugged directly between F5-control card and F5-operator or on one side of a HSP5-extension between inverter and operator. Switches S1, S2, S3 are set to 'HSP5' , switches S4, S5 are arbitrary.

Adjustment of the KEB Protocol Monitor:
Protocol 'HSP5' or Handshake 'Hardware, full duplex'

Picked-off and used signals

D-Sub-9	Signal and level
2	Channel B receive TTL
3	Channel A receive TTL
5	GND
7	Channel A Handshake TTL
8	Channel B Handshake TTL

2.2.2 Operating Mode RS232 KEB

The probe is plugged directly between the D-Sub-9 socket of a F4 or F5-standard operator and the cable to the control/PC. Switches S1, S2, S3 are set to '232/485' , switches S4, S5 to '232' .

Adjustment of the KEB Protocol Monitor:
Protocol 'DIN66019II' or other 'Software' Handshake, depending on the protocol to be recorded.

Picked-off and used signals

D-Sub-9	Signal and level
2	Channel B receive RS232
3	Channel A receive RS232
7	GND

2.2.3 Operating Mode RS232 PC

The probe is directly plugged onto a serial PC-interface (D-Sub-9 connector). Switches S1, S2 are set to '232/485', switch S3 to 'HSP5' and switch S4, S5 to '232'.

Adjustment of the KEB Protocol Monitor:
Protocol 'DIN66019II' or other 'Software' Handshake, depending on the protocol to be recorded.

Picked-off and used signals

D-Sub-9	Signal and level
2	Channel B receive RS232
3	Channel A receive RS232
5	GND

2.2.4 Operating Mode RS485

The probe is directly plugged between the D-Sub-9 socket of a F4 or F5 standard operator and the cable to the control/to the 485-transformer. Switches S1, S2, S3 are set to '232/485', switches S4, S5 to '485'.

Adjustment of the KEB Protocol Monitor:
Protocol 'DIN66019II' or other 'Software' Handshake, depending on the protocol to be recorded.
With bridged transmission/receive lines (RS485-2-wire or half-duplex connection) the protocol can be adjusted to ‘Software, single channel’ to avoid double recordings.

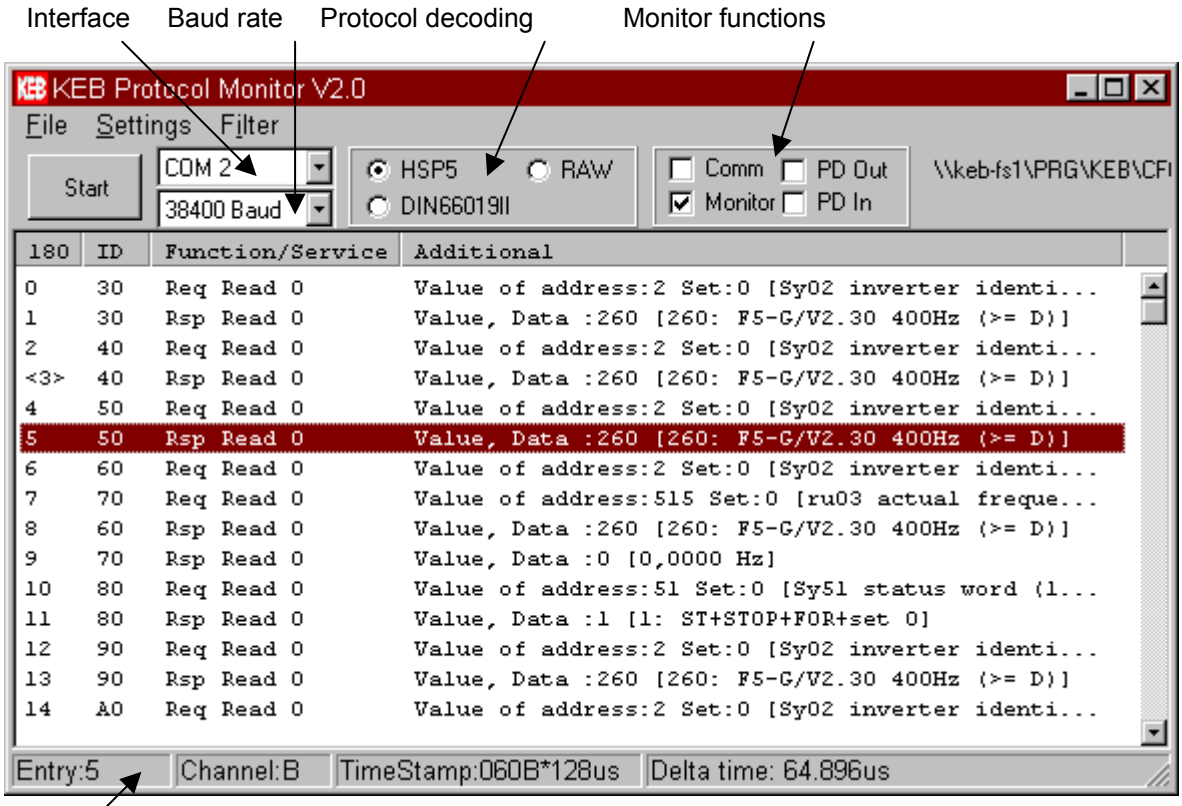
Picked-off and used signals

D-Sub-9	Signal and level
4	Channel A receive RS485+(A)
5	Channel A receive RS485-(B)
7	GND
8	Channel B receive RS485+(A)
9	Channel B receive RS485-(B)

3 KEB Protocol Monitor

The KEB Protocol Monitor is a PC-Software for the representation and analysis of serial telegrams of the KEB protocol family. The software runs under WIN95/98/NT/2000 and uses a serial standard interface of the PC for the receipt of telegrams. The incoming characters are evaluated according to the adjusted protocol and represented line by line.
Since telegram inquiry and response are on one physical receipt line, they must be available in chronological order without overlapping (no full duplex operation possible). This is ensured with the DIN66019-Protocol (operation with F4-field bus adaptor). In HSP5-operator mode the connected field bus operator ensures the observance of the chronological operational sequence. With the connection to the Line Monitor a genuine full-duplex operation with channel assignment and time-stamp information is possible.
The identified telegrams can be stored and reloaded and copied into the Windows clipboard for the use in other programs. Also possible is a layer-7-decoding for the representation of parameter values in standardized display and filtering/triggering onto special telegram contents.

3.1 View and Control Elements:



Status line, channel/timestamp only at Line Monitor operation

3.2 Functions

3.2.1 Operation as DIN66019II-Monitor

In this operating mode incoming DIN66019II-telegrams are recorded for example by the field bus monitor. In addition to the extended services the DIN66019II-protocol also contains the well-known telegrams of the DIN66019-protocol. Click on the DIN66019II-Protocol button and select the desired interface and baud rate. The character format (7 data bits, 1 stop bit, even parity) is accepted automatically. In this case the switches for the monitor functions are off-state. Start the recording with the start-button on the top left or with the key F9. The number of received telegrams is indicated in the list on the top left, the identified telegrams are entered in the list. In order to stop press the button on the top left or key F9 again.

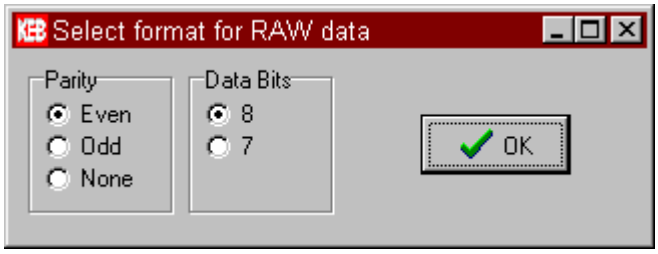
3.2.2 Operation as HSP5-Monitor for Field Bus Operators

In this operating mode the interface of the PC is connected with an HSP5-adaptor cable including adaptor on Western-connector to the diagnosis interface of a F5-field bus operator.
ATTENTION: Never connect the PC-interface without a special adaptor cable to a HSP5-interface! It would result in the destruction of the PC-interface.

Click on the HSP5-protocol button and select the desired interface and a baud rate of 38400 Baud. The character format (8 data bits, 1 stop bit, even parity) is accepted automatically. In addition to it select the monitor function to be recorded on the top right:
Comm: Records telegrams of the parameterizing channel (PCP-communication/SDO-communication.
PD Out: Records the OUT-process data telegrams (from the control to the inverter).
PD In: Records the IN-process data telegrams (from the inverter to the control).
Any combination of the functions is possible. Start the recording with the start-button on the top left or with the key F9. In order to stop press the button or the key F9 again. The number of received telegrams is indicated in the list on the top left, the identified telegrams are entered in the list. The column ‘ID’ contains a consecutive sequence of the telegram-ID-numbers in the range of 01h to 0Fh. Gaps in this sequence mean, that the operator could not output the missing IDs because of missing buffers. This occurs frequently in the case of activated PD in functions and fast change of IN-process data, that are read by the inverter in millisecond cycles, but which cannot be output fast enough over the relative slow 38400-baud connection to the PC.

3.2.3 *Recording of any Data in Raw Format*

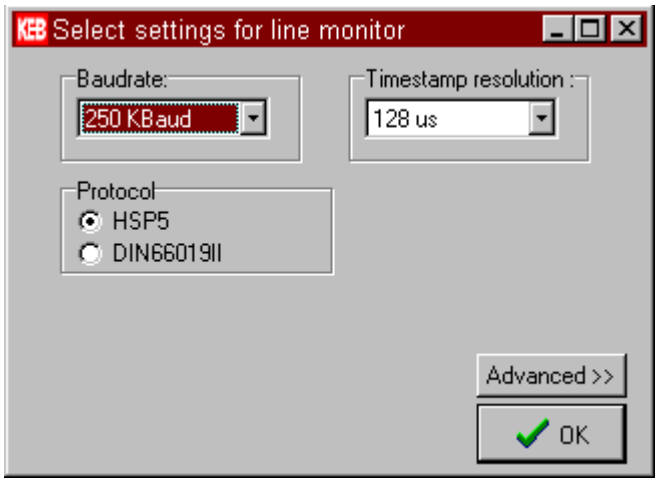
In the decoding mode ‘RAW’ any telegrams can be received and represented in hexadecimal form. The configuration of the RAW-data format (not with Line Monitor operation) takes place with the menu item ‘Raw format settings’ in the menu ‘Settings’ or when activating the RAW-functions:



Without Line Monitor operation the telegrams are stored in blocks of 16 bytes each and output in hexadecimal form as well as text. With Line Monitor operation the telegram-end-identification of the Line Monitor takes effect and the telegrams are represented individually with channel and time information.

3.2.4 *Operation with Line Monitor*

In this operating mode the interface of the PC is connected over a COMBIVIS-cable to the Line Monitor. Select the desired interface and baud rate. The baud rate adjusted here should be as high as possible, so that the stored telegrams can be retrieved as fast as possible from the Line Monitor. The character format is adjusted automatically with Line Monitor operation. For the protocol to be decoded choose between HSP5 and DIN66019II or RAW for a decoded representation. The adjustments executed so far concern only the connection between PC and Line Monitor, independent of the telegram format to be recorded. The configuration of the Line Monitor is done with the menu item ‘Line monitor settings’ in the menu ‘Settings’ or when activating the monitor function:

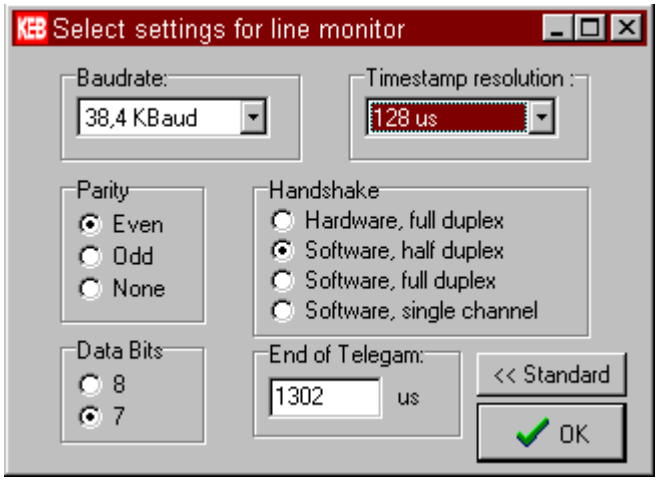


Baud rate
Here the baud rate of the two channels to be recorded is defined. This baud rate is independent of the baud rate between PC and Line Monitor. For high recording baud rates, high telegram traffic and low readout baud rates to the PC the ring storage in the Line Monitor can overflow. This leads to an automatic recording stop with corresponding notice.

Timestamp resolution
The resolution of the timestamp can be selected in 5 steps. A small adjustments means a finer resolution, but in case of long telegram intervals it can lead to undetected overflow of the time counter and thus to incorrect difference time indications. The time counter has a value range of 16 bit, corresponding to 0..65535. An adjustment of for example 8 us permits a measuring range of 8*65535 us corresponding to 524,28 ms.

General protocol adjustment:
Here HSP5- and DIN66019II-operation can be selected. These settings only define the telegram end identification as well as the data format. In order to interpret the received telegrams correctly, the corresponding protocol must be selected in the main window!
At the time of the telegram end identification a telegram is furnished with channel information as well as timestamp and then stored in the Line Monitor.

By pressing the 'Advanced' button, it can be switched to the special protocol setting. At that data format, parity and telegram end identification can be adjusted individually. These settings are only for experienced users and require an exact knowledge of the connected hardware and protocols.



Following adjustments are possible for the telegram end identification (Handshake):

Hardware, full duplex
The telegram end is controlled on both channels by means of separate lines.
It is the operating mode for HSP5.

Software, half duplex
The telegram end is identified by the lapse of time 'End of Telegram' OR by receipt on the other channel in each case. It is the operating mode for DIN66019II on RS232-lines or RS495-4-wire connections.

Software, full duplex
The telegram end is identified ONLY by the lapse of time 'End of Telegram'. It is the operating mode for any 2-channel full duplex protocols.

Software, single channel
The telegram end is identified ONLY by the lapse of time 'End of Telegram'. At that channel B is switched off, to prevent a double recording of telegrams. It is the operating mode for DIN66019II on RS485-2-wire connections or any 1-channel half duplex protocols.

End of telegram
The time is adjusted with changing the baud rate and indicates the time in us, after the lapse of this time the end of the telegram is identified without further receipt on a channel. As a standard it is 5 character times, but can also be adjusted manually.

Press the 'OK'-button to close the input window. Start the recording with the Start-button on the top left or with the key F9. First of all the connection to the Line Monitor is established, which can take several seconds depending on the selected baud rate (only at the initial start or in case of changing the baud rate between PC and Line Monitor). After that all settings are transmitted and the recording is started. As soon as telegrams arrive, they are represented as usual. To stop press the button or key F9 again.

3.3 Program Operation

3.3.1 Representation of the Telegrams

The telegrams are represented in tabular form. With the help of the scroll bar on the right or the cursor keys, keys page Up/Down and Beginning/End, it can be scrolled through the list. The left column contains the telegram number, next to it the ID of the telegram is displayed. The ID-numbers are consecutive identifiers for the assignment of response to query. Telegrams of the old DIN66019-protocol as well as special displays have no ID-number. The column 'Function/Service' displays the type as well as the used service:

Req Read : Request Read, a value shall be read
Rsp Read : Response Read, the read value or an error code
Req Write : Request Write, a value shall be written
Rsp Write : Response Write, the acknowledgement to a write job
Select: Inverter addressing at the DIN66019II-protocol

The different services can be taken from the service description KEB-Protocols and show the type of the service as for example writing the parameter value or reading the parameter name etc.

In the column 'Additional' further service-specific specifications like inverter address, parameter value or name and, in the case of active layer-7-decoding, also the standardized parameter value are displayed.
Via the key F12 of the menu 'Settings->Hex Display' the representation of the parameter value can be changed between decimal and hexadecimal.
With the menu item 'File->Clear' or the key CTRL+Remove all telegrams can be deleted after further query.

3.3.2 Plaintext Representation

For the representation of standardized parameter values and plaintext for the services 0 and 1 (layer-7-decoder) a COMBIVIS 5-compatible parameter file is necessary (PARAxxxx.bin, xxxx=Inverter-Software Number). By selecting the menu item 'Settings->L7 decoder', the function can be activated and deactivated. If COMBIVIS is installed on the PC, then the protocol monitor finds the directory with the parameter files automatically. Choose the suitable file to activate the layer-7-decoder.

3.3.3 Channel/Time Information

When the telegrams have been read by the Line Monitor, the channel (A or B) and the timestamp of the selected telegrams are displayed in the lower status line.
Furthermore, the current line can be marked with the key 'M'. By selection of another line the difference time to the marked line is also indicated in the lower status line.

3.3.4 Export into other Applications

Entries in the telegram table can be copied as text into the Windows-clipboard. Thus it is easily possible to use these for other applications. At that the columns are separated by tabulation markers, the line by line make-up characters. Select the menu item 'File->Copy' or the keys CTRL+C and enter the range of the telegrams. Maximally 100 telegrams can be copied simultaneously. At activated display filtering, all filtered telegrams (max. 100) can be copied, too.

3.3.5 Filtering

In order to display only certain telegrams out of the quantity of recorded telegrams, the adjustment dialog for the filter conditions can be activated via the menu item ‘Filter->Set filter’ or the key F2.
With the adjustment ‘All’ one filter condition suits all telegrams. Moreover, ALL filter conditions must fit for a single telegram, in order to select this telegram. This can lead to the fact that NO telegram passes through the filter. In case of doubt only one filter adjustment should be attempted and the result be checked. The filter adjustment for ‘Address’ is only possible at requests with address specification, ‘ParameterData’ is provided for the services 0, 1 and 50 (parameter value). Process data and scope telegram values are likewise possible only for the corresponding services, with other services the filter condition will never be fulfilled!

The key OK closes the window and activates the settings.
With the key F3 the display can be filtered, i.e. only telegrams are indicated, that correspond to the filter criteria. However, sometimes also adjacent telegrams are displayed, in order to see the preceding request in the case of filtering onto a negative receipt.

3.3.6 Search

To search for specific telegrams, set the filter accordingly and place the selection bar on the telegram entry, with which the search shall begin. Press CTRL+F to start the search in ascending order of telegram numbers. If a suitable telegram is found, the selection bar is put on it.

3.3.7 Triggering onto Specific Telegrams

If you want to stop the recording when a specific occurrence takes place, proceed as follows:
So that after the triggering not too many telegrams are stored, you can define the maximum number of recorded telegrams via menu item ‘Settings->Max buffer’. On exceeding this number, the oldest telegrams are overwritten. Now set the filter according to the occurrence. Via the menu item ‘Filter->Trigger’ or the key F4 the triggering is activated and the number of subsequent telegrams still to be recorded is defined. After recognition of the desired telegram the recording is stopped, if necessary after receipt of the still following telegrams, and a reference is provided.

3.3.8 Saving / Reading

For the later evaluation the stored telegrams can be written into a file by means of the menu item ‘File->Save’. Stored telegrams are reloaded via the menu item ‘File->Read’. In that case the telegrams displayed up to now get lost.