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IBIS Vehiclebus Monitor - IWT-2000

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IBIS Vehiclebus Monitor - IWT-2000

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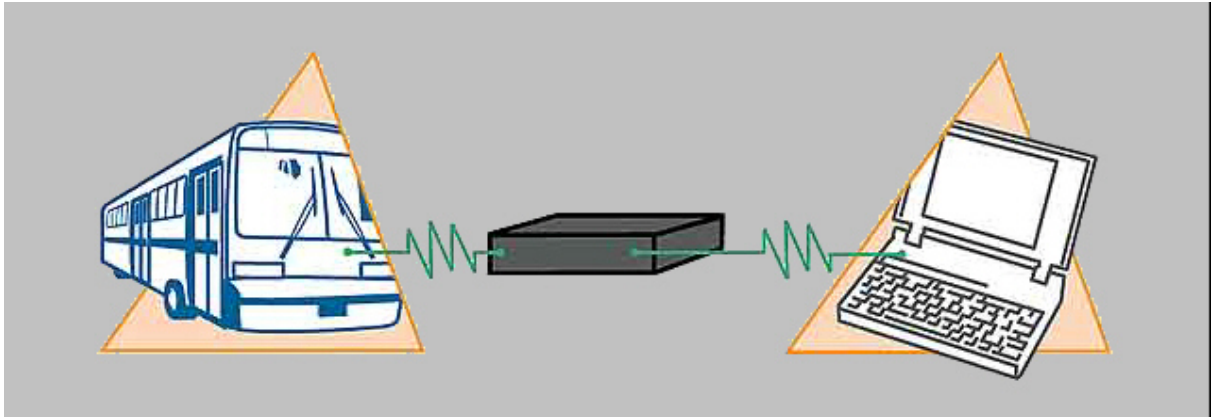


Chapter

1

Introduction

1 Introduction



IWT-2000

- ✂ **Registering the complete vehiclebus communication**
- ✂ **Simulation of each IBIS-slave device**
- ✂ **Simulation of each IBIS-Master**
- ✂ **Detailed Error- and Telegram Analysis**

The IBIS-vehiclebus-test device serves the diagnosis of the telegram traffic on the IBIS-Vehiclebus. The telegrams are registered together with the broadcasting time of the master telegram and the response time of the Slaves. Frame-, parity- and check sum errors are similarly displayed as logical or syntactic error. This allows in all cases to recognize erroneous states on the Bus.

Beside the diagnosis of the telegram traffics, vehiclebus devices can also be simulated. As not only slave devices can be simulated, but also the IBIS-Master device (on-board computer) can be replicated, all devices can be tested individually or in interaction. By the adjustable cycle times of the request telegrams and response times of the Slave telegrams, critical timing problems can also be traced.

The following function characteristics distinguish the IWT-2000:

- ✂ Simulation of IBIS-Slaves and IBIS-Master
- ✂ Only one PC-interface is required to protocol the broadcast- and receiving data (WBSD and WBED).
- ✂ In the Slave-operation, the test device is directly fed from the Vehiclebus. The power consumption amounts to two Bus-Loads. The Bus can drive in total 30 loads (Peripheral devices).
- ✂ Overcurrent protection in case of short-circuits on the IBIS-Bus (in the Master-mode).
- ✂ Parity-monitoring..
- ✂ Stopbit-monitoring (Framing Error).
- ✂ Malfunction-monitoring (e.g. ground fault on WBED-conductor).

- ✂ Reaction time measurement (time between the end of the second Stopbit of the Master telegram and the beginning Startbit of the Slave telegram).
- ✂ In the Slave-mode, the reaction time for each telegram can be defined for the automatic response on Master telegrams.
- ✂ Reception-timeout can be parameterized. Normally the telegram is evaluated on reception of the end character (check sum) and presented. If now an incomplete telegram is received, then it will be evaluated and displayed after the time set as.



The reception-timeout should not be set too short, as thus in pauses between the individual characters of a telegram the evaluation does not occur already before the end of the telegram and individual parts of the telegram are displayed separately (see chapter "[The first steps](#)").



Chapter

2

System Requirements

2 System Requirements

WBMonitor has some requirements on the system, on which it should be installed. In this section, you will find an overview on these general conditions.



For a regular operation, your system should at least be equipped with:

- 500 MHz Processor speed,
- 64 MB central memory,
- CDROM-drive,
- Graphic card and Monitor, which supports a resolution of at least 800x600 pixels at 16-Bit color depth and
- 10 MB free hard disk memory.

WBMonitor is a windows-based program and runs under following operating systems:



- Microsoft Windows 98 SE
- Microsoft Windows ME
- Microsoft Windows 2000, SP4
- Microsoft Windows XP Home Edition
- Microsoft Windows XP Professional Edition
- Microsoft Vista
- Microsoft Windows 7



IMPORTANT NOT FOR THE USE UNDER **MS VISTA** or above:

WBMonitor is fully compatible with Microsoft Vista or above.

However, there is a limitation: If you have gathered data with Version 1.x of the WBMonitor (e.g. recorded a protocol), then you can import this over the Import functions of the WBMonitor.

The data of the 1.x-Versionen were saved as dBase-files.

These files can only be imported, if you start WBMonitor with the Option "Run as Administrator".

This is only necessary, if you wish to import V1.x-data and only so long as the Import takes. WBMonitor needs no permanent Administrator rights.

WBMonitor must not be necessarily installed on your computer to be used. It can also be run directly from CD, USB-Stick or similar external memories.



Recommended system requirements:

- \geq 1 GHz processor,
- \geq 256 MB central memory,
- CDROM-drive,
- Graphic card and Monitor, which supports a resolution of at least 1024x768 pixels at 24-Bit color depth and
- \geq 200 MB free hard disk memory.



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If all prerequisites are fulfilled, you can begin the [installation](#).





Chapter

3

Installation

3 Installation

Run Setup

 Before you install WBMonitor, please pay attention to the necessary and recommended requirements in the chapter  [system requirements](#).


For installation of WBMonitor, please insert the installations-CD in your CDROM- or DVD-drive.

The setup-program starts automatically. If this does not happen, please call the program SETUP.EXE in your CDROM- or DVD-drive.

The installation window opens. Follow the directions on the screen, in order to finish the installation.

Connection of the device

In order to use an IWT-2000, you must create a connection between the PC/Notebook, on which WBMonitor runs and the IWT-2000. The IWT-2000 communicates with the PC over a USB-connection..

For connection on the PC, you need a standard USB-cable Type A to Type B.
If all connections are done, start WBMonitor and continue to the  chapter "[The first steps](#)".



Chapter

4

Hardware-Installation

4 Hardware-Installation

4.1 Test Device

Scope of Supply

In the device case, the following items are contained:

1. IBIS-Vehiclebus-test device
2. Connecting cable for Vehiclebus with 14-pin. Junior-Timer-plug
3. Connecting cable for Vehiclebus with 4-pin CPC-round plug
4. cable for customer's own wiring
5. Connecting cable to the PC
6. Operating manual with program-CD

Function Description

The test device records the total telegram traffic on the IBIS-Vehiclebus with precisely timed sampling. Likewise the error states on the Bus are recorded. The data determined in this way are transferred to the PC and evaluated. In the following block switching diagram, the functioning principle of the device is illustrated.

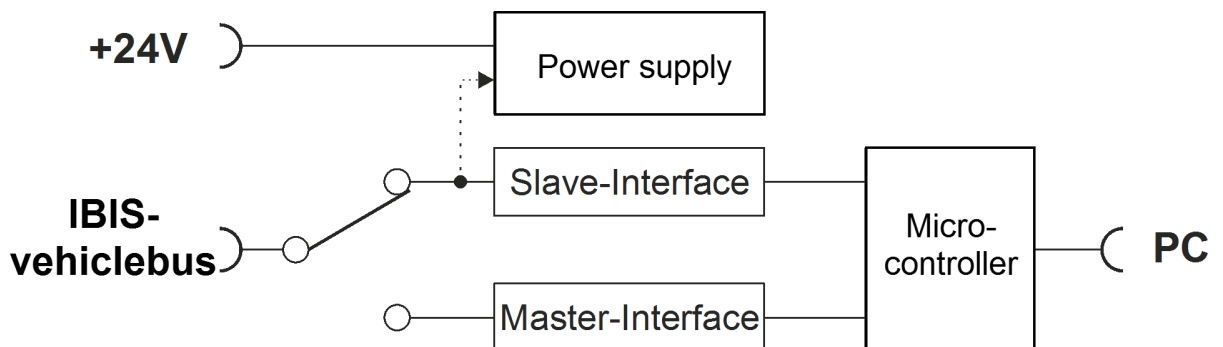


Fig. 1: Blockdiagram

Front plate of the IWT-2000

The front side of the test device presented in Fig. 2 shows the connections for the Vehiclebus- and the PC-plug. The LEDs have following meaning:

Marking	Elaboration (LED on)
EIN	Supply voltage available
OVERLOAD	Overload on the request bus, e.g. by Master conflict
MASTER	IBIS-Master-operation
WBED	Voltage present on the response bus (Master available); A flickering of the LED displays data traffic on the Bus line.
WBSD	Voltage present on the request bus (Master available)

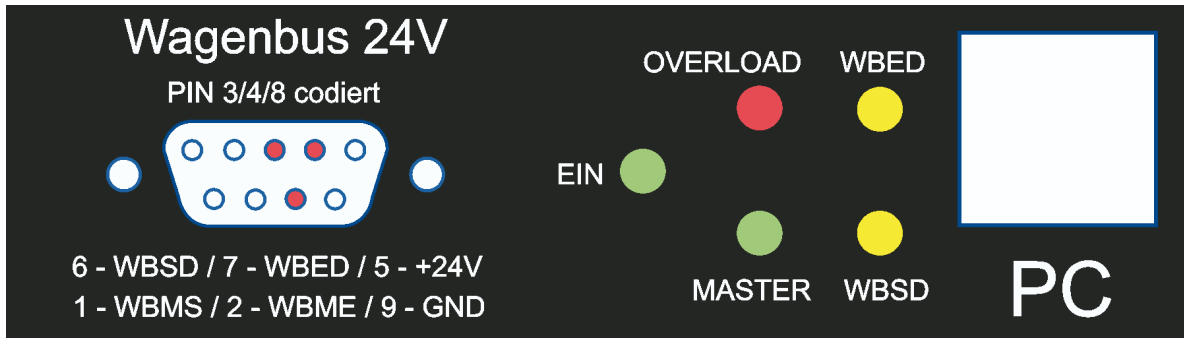


Fig. 2: Front side of the test devices

4.2 Plug Configurations

IBIS-Vehiclebus plug

The test device is dispatched with the standard cables presented in Fig. 3. If the device cannot be connected directly with cable Type 1 to 3 to the IBIS-neutral point connected, then a connection with cable type 4 can be realized.

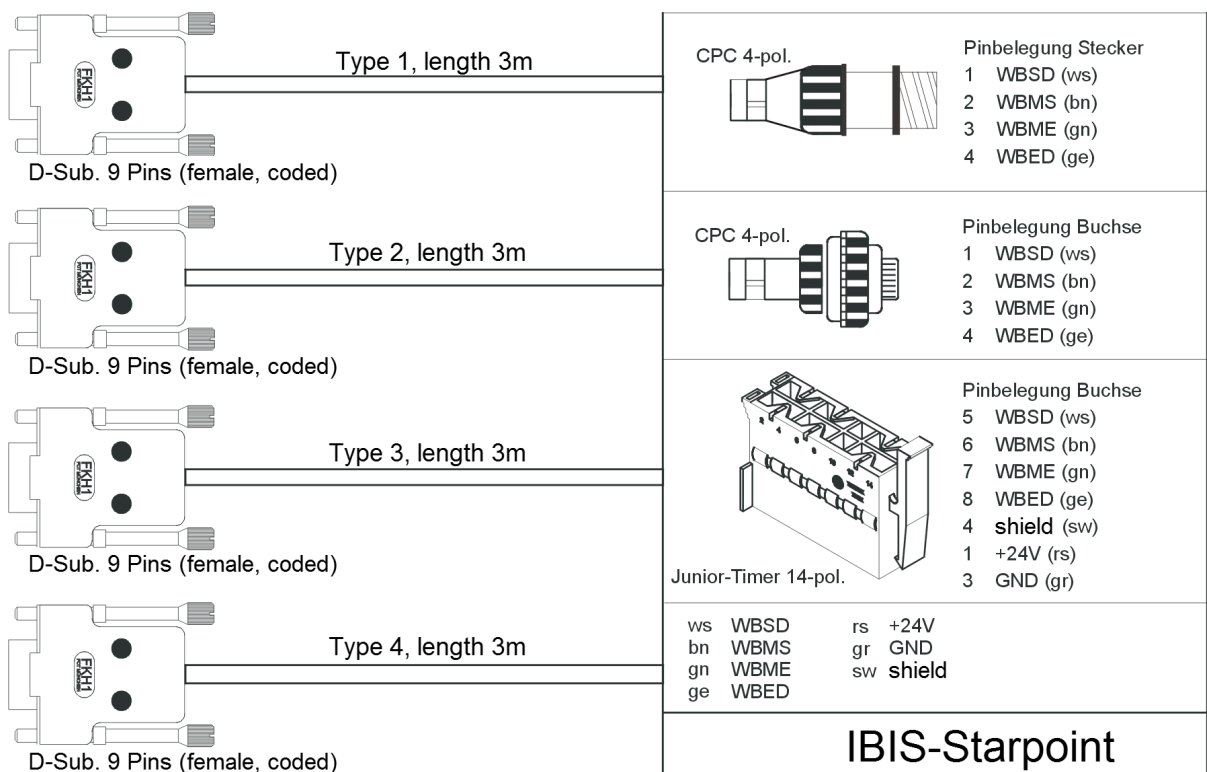


Fig. 3: : Connecting cable to the IBIS-Vehiclebus

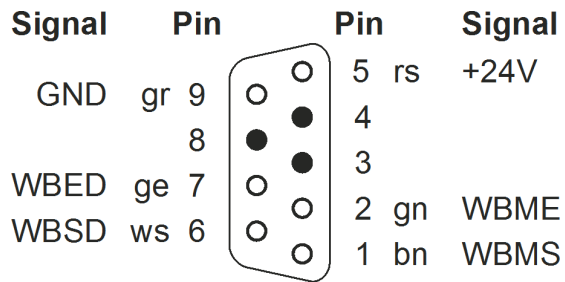


Fig. 4: Pin configuration of the 9-pin bushing plug

PC-cable

The IWT-2000 needs a standard USB-cable Type A to Type B for connection to the PC. Such a cable is included in the scope of supply.

4.3 Connection

The test device is connected with the IBIS-Vehiclebus and the PC. The power supply occurs over the IBIS-Vehiclebus. If it is to work in the Master-operation (test device simulates the IBIS-Master, e.g. an on-board computer), then an additional voltage supply is necessary (see Fig. 4, Pin 5 and 9).

In order to design the connection of the test devices as simple as possible, the connection cable for all prevalent IBIS-neutral points and the connecting cable to the PC are included in the scope of supply.



Chapter

5

IBIS-Vehiclebus Introduction

5 IBIS-Vehiclebus Introduction



This chapter should provide you with a short overview on the functioning principle of the IBIS-Vehiclebus.

It handles the most important basic terms and reference values, however, cannot be a substitution of a detailed study of the electrical specifications, of the IBIS-protocol or the IBIS-telegram definition.

The IBIS-Vehiclebus serves for the communication of the on-board systems fitted in a vehicle, such as on-board computer, displays, announcement devices etc.

The abbreviation "IBIS" stands for "Integrated Board Information System".

There can be one and only one main device on each IBIS-Vehiclebus, the so-called **IBIS-Master**, as well as a number of secondary devices, so-called **IBIS-Slaves**. (The exact number is dependent on the power consumption of the individual devices. The IBIS-Bus may have maximum 30 so-called **Bus Loads**. How much bus load a slave device demands, can be found in the Documentation of the device. The IWT-2000 demands, for example, two bus loads.

The communication is realized over two data links (**request - and response bus**; seen from the IBIS-Master respectively). Both data links are provided with power from the IBIS-Master. This is also the decisive criterion for devices, whether a Master is present on the bus or not.



The IWT-2000 displays the state of the request- and response bus over two LEDs (**WBED** and **WBSD**) on its front side.

The individual devices communicate with one another over ASCII-telegrams. The structure and the meaning of these telegrams are specified in the VDV-Script No. 300.

IBIS-Master

The IBIS-Master is the only device on the IBIS-Bus, which may spontaneously (without being prompted by another device beforehand) send telegrams. For an IBIS-Slave this is strictly prohibited!

The VDV-300 differentiates two types on Master telegrams:

-  Telegrams for which no response is awaited. (e.g. data set No. 003)
-  Telegrams for which a response is awaited. (e.g. data set No. 020)

There are no telegrams, for which a response is "possibly" awaited. The communication on the IBIS-Vehiclebus is so constructed, that for each Master telegram, for which a response is awaited, one and only one response of exactly one device may come. If, for example two counter sensors respond to the status check on a passenger counter system (data set 084), then this presents an error.

In the IBIS Master operation of the IWT-2000, it possible to send telegrams and thus e.g. selectively control display devices. You can, however, also replay complete, registered recordings ("protocol") and thus, e.g. reconstruct a real situation in the laboratory.

Telegrams can be sent manually or from [an existing protocol](#). The responses of the Slave devices are recorded in the monitor including response times.

For the Master operation, the test device needs an external power supply to feed the IBIS-Bus. Please follow the connection diagram on the inner side of the sealing cap of the IWT-2000 for connection of the device to the IBIS-Bus as well as regarding the power supply.

It must be ensured that only one Master is connected to the IBIS-Bus. Request - and response bus may not be active. The LEDs "WBSD" and "WBED" on the test device then do not glow.

IBIS-Slave

IBIS-Slave devices are peripheral devices such as Displays, automatic ticket machines etc. as a rule. IBIS-Slaves may only actively participate in the communication, if they are prompted by the IBIS-Master for this. An IBIS-Slave may respond to a "query" of the Master, but only then. It may never send data from itself to the IBIS-Bus.

The response must occur after the IBIS-Specification within a bit delay; otherwise the response is not valid. By the pulsing of the IBIS-Vehiclebus, a maximum response time of approx. a millisecond can ensue.

The practice shows, however, that this prescribed but very short response time of most of the devices cannot be held. Hence most of the IBIS-Master devices (in this regard on-board computer, cash systems etc.) are more tolerant regarding the approved response time. This is however, dependent on the manufacturer.

As practiced value, response times up to approx. 5 milliseconds are in the acceptable range for most of the Master devices.

A response must always occur directly in the connection to the corresponding query. As soon as only one further Byte was sent on the Bus (e.g. the next Master telegram), the response becomes invalid. A device may send one and only one response to Master query.

For the Slave operation, the IWT-2000 needs no external power supply, as it is supplied over the Bus voltage. If the Bus is, however, very heavily loaded, an external power supply can also be connected. In the Slave mode it is possible to record the total data traffic on the IBIS-Bus in the [Monitor](#).

For connection of the device to the IBIS-Bus, please follow the connection diagram on the inner side of the sealing cap or the instructions for [Hardware Installation](#).

IBIS-telegrams

The structure and the significance of the IBIS-telegrams are defined in the VDV-script 300. Meanwhile, a few manufacturer-oriented further variants of IBIS-telegrams have been established.

A study of this VDV-script is indispensable for the understanding of the communication on the IBIS-Vehiclebus. At this point only some additional suggestions can be provided.

1. The numbering of the IBIS-Vehiclebus telegrams can be divided as following:
 - All telegrams with a data set number under 110 are Master telegrams.
 - All telegrams from 110 to 199 are Slave telegrams.
 - Telegrams above 200 are train bus telegrams.
2. Most of the IBIS-telegrams are unique, that is, it is already uniquely definable from the telegram, which IBIS-data set it handles.

Unfortunately this does not, however, apply to all telegrams. Thus e.g. The IBIS-telegram "bF" can represent a data set 082 – a Master data set – as well as a data set 181, which is a Slave response. In such cases it is not determinable due to the telegrams, which data set is actually present. The differentiation is only possible, if one also considers, on which data bus the telegram was sent. Telegrams of the response bus should only be Slave telegrams, while only Master telegrams should have been sent on the request bus.

The conjunctive in the last sentence is selected prudently, as a Master can also theoretically send Slave telegrams on the request bus. This presents, however, a blatant injury to the Bus protocol.
3. Most of the data sets greater than 200 are totally identical to the corresponding data sets under 200. Thus e.g. data set 203a is identical with data set 003a. The difference between both these groups is exclusively in the fact, to which vehicle (Bus or Rail) the respective data set is sent. This is a circumstance, which the IWT-2000 cannot recognize any more.

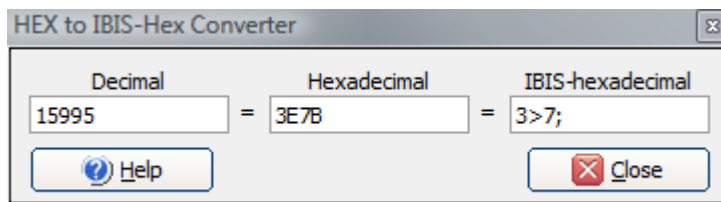
IBIS-Vehiclebus telegrams are transmitted as ASCII-Text. As end character of a telegram, a line break-character ("`<CR>`", ASCII No. 13) is sent followed by a Byte check sum. Each `<CR>` is seen as telegram end. It results in the fact that within a valid IBIS-telegram, a `<CR>` may never appear.

Hexadecimal Presentation in IBIS-telegrams

In contrast to the normal Hexadecimal presentation (0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F), the IBIS-telegrams use another coding of hexadecimal values. This coding is always termed only "*IBIS-Hexadecimal*" in following. The following table gives an overview on the IBIS-hexadecimals presentation and their decimal and hexadecimal correspondents.

Decimal	Hexadecimal	IBIS-Hexadecimal
0	0	0
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
10	A	:
11	B	;
12	C	<
13	D	=
14	E	>
15	F	?

In the "Help" menu of the WBMonitor, a small help window for the IBIS-Hexadecimal conversion is available under "HEX to IBIS-Hex Converter".



A short checklist

Regardless of possible cabling- or voltage problem, the following summary should provide you with a short overview on the most frequently occurring logical errors in the IBIS-communication. It defines some basic rules, which must be maintained, so that the telegrams are valid. Please note that this summary can only be a support and is not conclusive.

1. All telegrams should be constructed as defined in the VDV-script No. 300. By manufacturer-specific adjustments, however, there can be variations here.
2. An IBIS-Master should only send Master telegrams.
3. An IBIS-Slave may only send Slave telegrams.
4. An IBIS-Slave may never send a telegram unprompted.
5. A Slave telegram is only then valid if it follows the queried Master telegram immediately. Conforming to standards, the response must occur at latest after approx. a millisecond (exactly: a Bit delay), as



a rule most of the Master accept, however, longer response times. If already another telegram was sent on the Bus between a query and the response, the response is invalid at any case.

6. A Slave may send maximum one response per query.



Chapter

6

Software Use

6 Software Use

6.1 The first steps



In this chapter, you will experience, ...

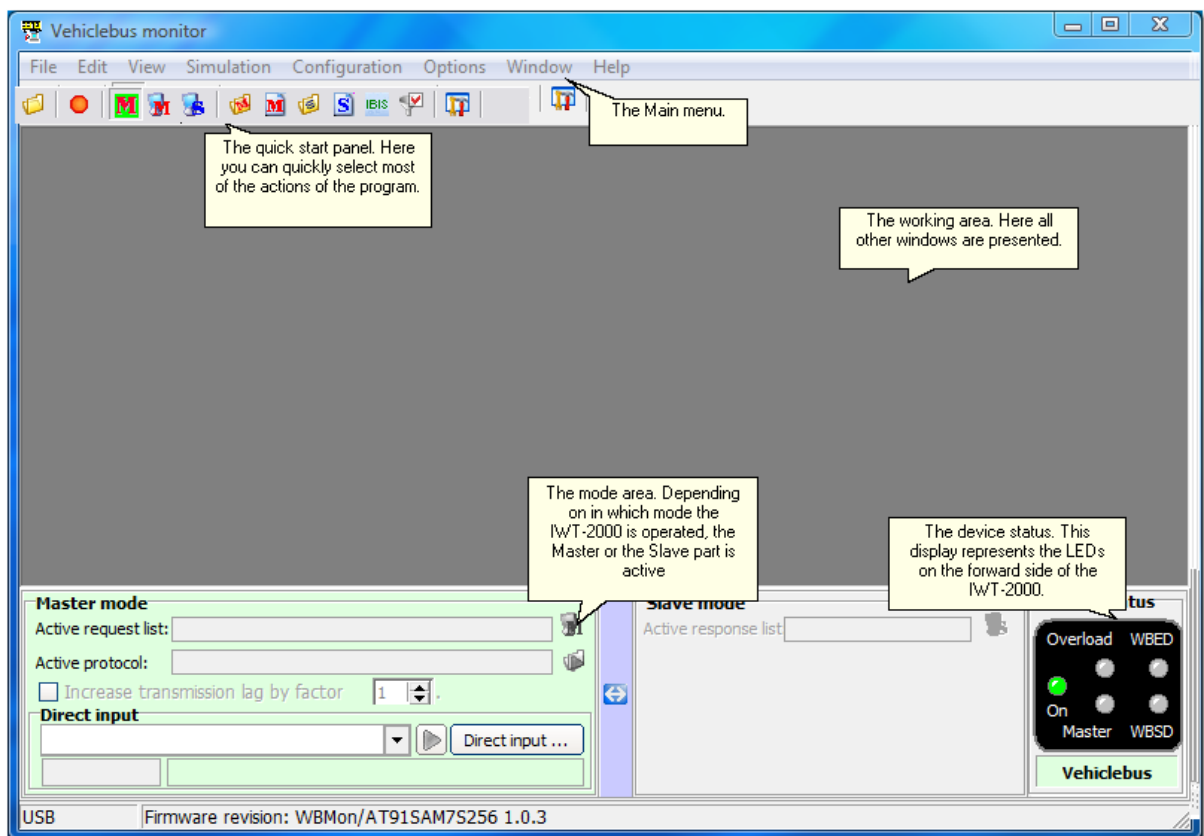
- ➔ ... How you finish the installation of WBMonitor.
- ➔ ... Which settings are necessary for the operation.

Start WBMonitor

Start WBMonitor over the start menu under "Programs - MG Industrieelektronik GmbH - WBMonitor" or by double click on the WBMonitor-Icon on your Desktop.

The program surface

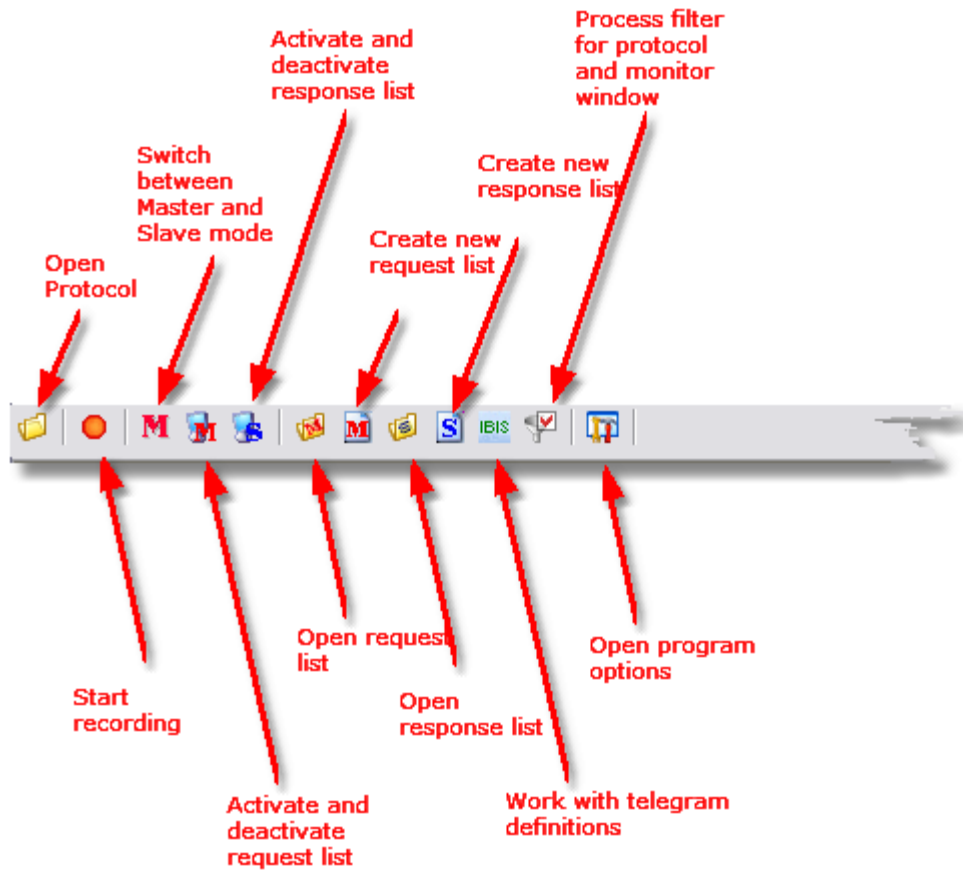
The surface of the WBMonitor is presented as following:



Apart from the standard areas such as quick start panel and menu, the most obvious area of the WBMonitor is the [mode- and status area](#) in the lower part of the program. Here you will find the most important Information at a glance and can access the most common functions quickly.

The quick start panel

The following functions are in the quick start panel:



Settings

Select Interface

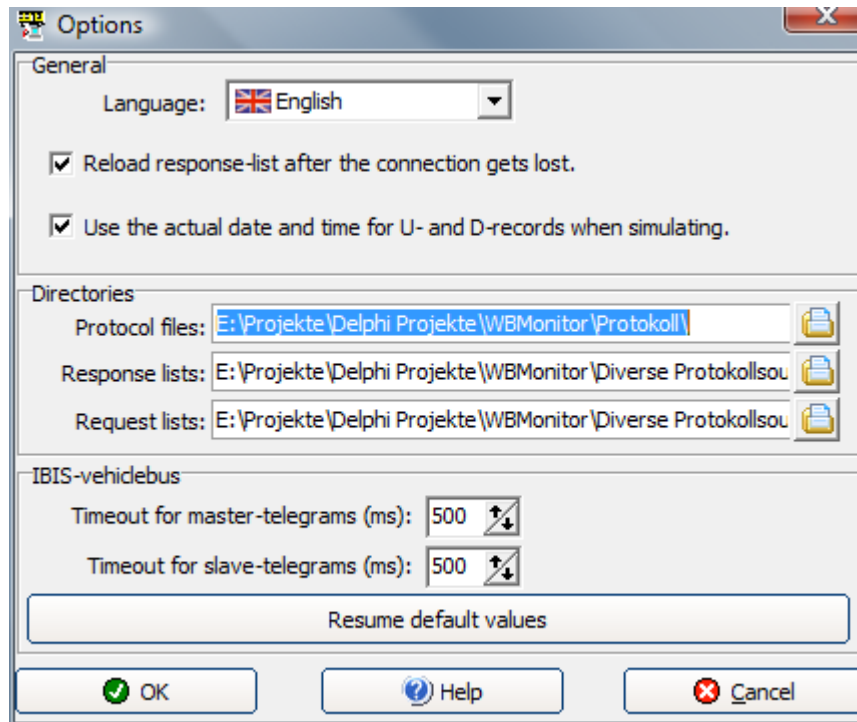
The IWT-2000 can be run on any USB-interface.

Should you use WBMonitor exclusively for Offline-analysis, you can also deactivate the serial connection completely. WBMonitor will then react to no connected WBMonitor, but will not block any interface as long as it runs.

You can change the Interfaces- and mode-selection later any time in the menu "Options" under "select interface...".

Program options

Over the menu "Options" – or over the corresponding [quick start button](#), you can reach the program options.



Directories



In the group "Directories", you can specify the directories for protocol files as well as request - and response lists.



WBMonitor memorizes, when you always open a [protocol](#) or a [request-](#) or [response](#) list, the corresponding path automatically and sets the appurtenant directory anew.

If you activate "Reload an active response list, if connection breaks down", the system will reload an activated response list automatically, whenever the connection to the IWT-2000 gets lost.

The symbol of a [slave simulation](#) shows you, whether this option is active or not.

If the option is active the symbol looks like this: , in the other case like this: .

IBIS-Bus

The IWT-2000 is a diagnosis device and can also recognize and evaluate erroneous or incomplete [vehiclebus telegrams](#). If a device does not send telegram termination character (<CR>), the IWT-2000 must after a certain period abandon the transfer, or the waiting for the telegram termination character and evaluate the telegram as incomplete. In this group, you can input, how long this waiting time should be.

The waiting time (Timeout) can be separately specified for Master- and Slave telegrams.

Please note that in this relation, all telegrams of the request bus are valid as "Master telegrams" and all telegrams of the response bus as "Slave telegrams", even if this does not match with your [type according to VDV-300](#).



Do not set the timeouts too short, so that the evaluation occurs already before the telegram end and individual parts of the telegrams is not separately displayed.

General


Here you can reorganize the language, in which the surface of WBMonitor should be displayed.

In addition to this there are the following options:

- "Reload response-list after the connection gets lost": If the connection between the IWT-2000 and the PC gets lost and is there a response-list active, the response-list will be stopped automatically. If the connection comes back again, the last active response-list will be automatically

re-loaded from the PC to the IWT-2000. If you do not want this automatism, you are able to deactivate it here.

- "Use the actual date and time for U- and D-records when simulating."

If data sets No. 005 (clock time) or No. 006 (Date) are contained in the protocol, these are set to the current values during  [playing of the protocol](#). If you do not want this automatism, you are able to deactivate it here.

6.2 Operating modes







In this chapter, you will experience, ...

- ➔ ... What is the [Master mode](#).
- ➔ ... What is the [Slave mode](#).
- ➔ ...how you can [switch between the modes](#).

The Master mode

In the Master mode, the IWT-2000 presents the [IBIS-Master](#). In the Master mode, you can:



-  Record a protocol.
-  Play a recorded protocol.
-  Send cyclic telegrams over a request list.
-  Send any character sequences by direct input to the Vehiclebus.

If the IWT-2000 is IBIS-Master, it must provide request bus- as well as response bus with power. Hence it is necessary that the IWT-2000 itself is fed over an external voltage source. If it is not the case, the IWT-2000 cannot be switched in the Master mode.

The same applies, if already another IBIS-Master is active on the bus. On the IBIS-Vehiclebus, only one device may always be IBIS-Master. Two IBIS-Masters lead to a devices conflict. If the IWT-2000 recognizes that already another IBIS-Master is active, then it is not possible to switch it in the Master mode.

The Slave mode

In the Slave mode, the IWT-2000 behaves as a (or several) [IBIS-Slave\(s\)](#). In the Slave mode, you can:

-  Record a protocol.
-  Simulate one or several IBIS-Slaves by means of a response list, in which you let the IWT-2000 respond to incurring Master telegrams appropriately.

Operating modes of the vehiclebus-test device

The IWT-2000 can be used in two operating modes:

-  **IBIS-Master mode**
-  **IBIS-Slave mode**

You can change over in three ways between the Master- and the Slave mode

Over the main menu under "Simulation" - "Master on"/"Master off".

In the quick start area



In the mode area



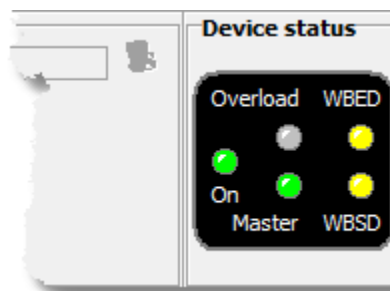
6.3 Mode- and Status Area



In this chapter, you will experience, ...

- ➔ ... What the LEDs on the device and in the [device status](#) mean.
- ➔ ... Which information the [mode area](#) gives.
- ➔ ... What you can do in the mode area

The device status




The device status represents the LEDs on the front plate of the IWT-2000. The display shows five LEDs with den following meanings:

LED	Elaboration
On	This LED blinks, if the IWT-2000 has connection to the PC, however still no connection to the IBIS-Vehiclebus. If both connections are concluded, this LED glows permanently green.
Master	This LED shows the current operating state of the IWT-2000. If it is green, the IWT-2000 is in the Master mode, it is also IBIS-Master itself
Overload	This LED should be always off (gray) in the Normal operation. If it is red, there is a overloading of the IBIS-Vehiclebus, which is as a rule caused by a master conflict.

Click on the LED or select the menu "reset overload ", in order to reset the IWT-2000 to the normal working mode.

WBSD This LED shows the state of the voltage supply on the request bus.
If it is yellow, there is a voltage. This is an indication for the fact that an IBIS-Master is present on the Bus and supplies the request bus with power.

WBED This LED shows the state of the voltage supply on the response bus.
If it is yellow, there is a voltage. This is an indication for the fact that an IBIS-Master is present on the Bus and supplies the response bus with power.

 Für eine korrekte Wagenbuskommunikation müssen sowohl Aufruf- als auch Antwortleitung mit Spannung versorgt sein. Das heißt, dass im Normalbetrieb entweder immer die beiden LEDs **WBSD** und **WBED** gleichzeitig gelb (=Spannung vorhanden) oder beide LEDs gleichzeitig grau sein müssen.
Ist nur eine von beiden gelb, deutet dies auf einen Fehler hin.

The mode area







The mode area shows you at a glance, in which [operating mode](#) mode (Master or Slave) your IWT-2000 is currently in. Here you have direct access to the most important functions of the respective mode.

You can switch in and out between both operating modes over the blue converter between the Mode-displays directly, as far as the IWT-2000 allows it.

Master mode

If the IWT-2000 is in the Master mode, the corresponding area of the main window is active. Here you can...

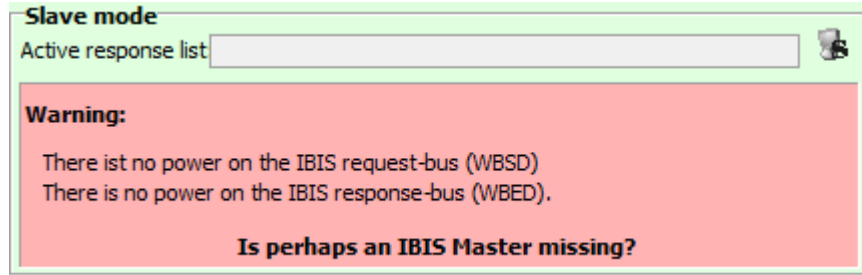
-  ... Start a request list (Master simulation) or end a running one.
-  ... Play a recorded protocol as Master simulation.
-  ... Change the playing speed of an active protocol.
-  ... Input a telegram directly and send as Master telegram.

Slave mode

In the Slave mode you can...

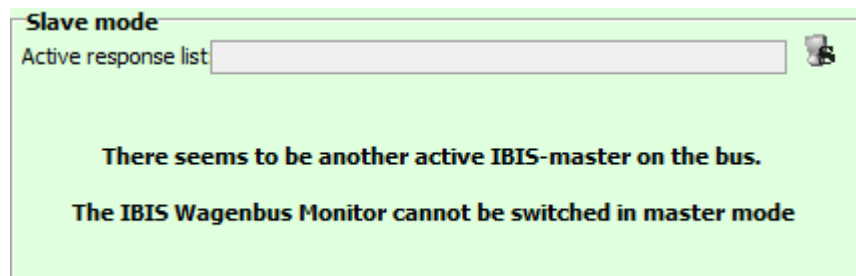
-  ... Simulate one or several Slaves by a response list.

In the Slave mode, the IWT-2000 notifies you in addition, to which extent a Master is present on the IBIS-Vehiclebus. Following displays are possible:



If no sufficient voltage is present on the request - or reception bus, it indicates to the fact that no IBIS-Master is present or a cabling problem is present. You recognize this also on the LEDs in the device or in the [device status area](#).

If an IBIS-Master is present, the display in the Slave-area changes. The IWT-2000 cannot be IBIS-Master itself anymore.



6.4 The Monitor window



In this chapter, you will experience, ...



... What significance the monitor window has.




... What the columns and symbols in the monitor- and protocol window mean.

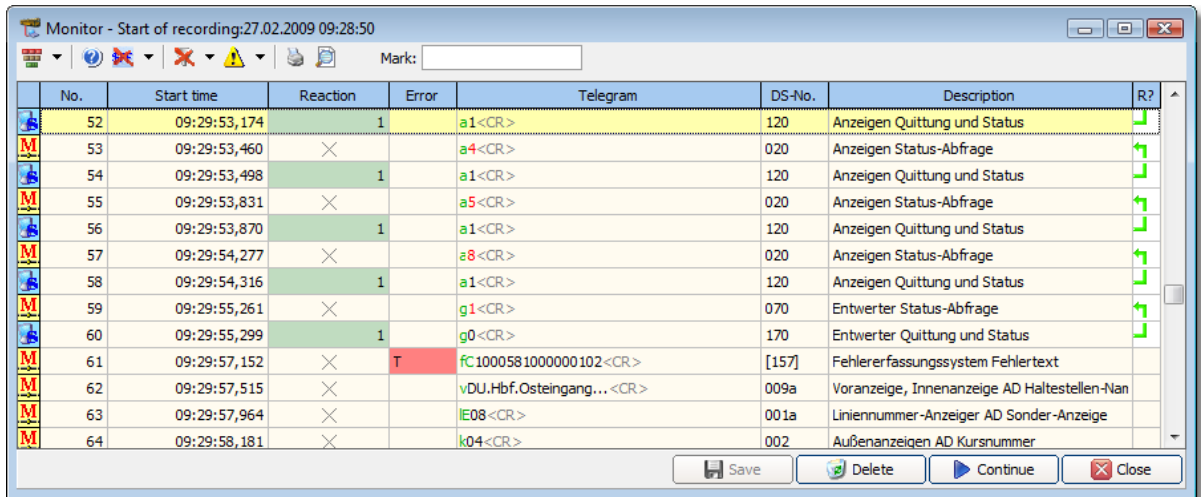
The Monitor window is the central monitoring area of the WBMonitor. Here all telegrams are presented to you on the currently connected IBIS-Vehiclebus.

When you always carry out a Master- or Slave simulation, the Monitor window is automatically opened.



For each type of simulation, it is necessary, that the Monitor window is open. Start a simulation, the Monitor window opens automatically. Close the Monitor window, each simulation is automatically stopped.





You can open the Monitor window any time also by clicking the "record"-button () or the corresponding menu under "Files" - "Record ...".



No.	Start time	Reaction	Error	Telegram	DS-No.	Description
52	09:29:53,174	1	a1<CR>	120	120	Anzeigen Quittung und Status
53	09:29:53,460	×	a4<CR>	020	020	Anzeigen Status-Abfrage
54	09:29:53,498	1	a1<CR>	120	120	Anzeigen Quittung und Status
55	09:29:53,831	×	a5<CR>	020	020	Anzeigen Status-Abfrage
56	09:29:53,870	1	a1<CR>	120	120	Anzeigen Quittung und Status
57	09:29:54,277	×	a8<CR>	020	020	Anzeigen Status-Abfrage
58	09:29:54,316	1	a1<CR>	120	120	Anzeigen Quittung und Status
59	09:29:55,261	×	g1<CR>	070	070	Entwerter Status-Abfrage
60	09:29:55,299	1	g0<CR>	170	170	Entwerter Quittung und Status
61	09:29:57,152	×	T	fC1000581000000102<CR>	[157]	Fehlererfassungssystem Fehlertext
62	09:29:57,515	×		vDU.Hbf.Osteingang...<CR>	009a	Voranzeige, Innenanzeige AD Haltestellen-Nan
63	09:29:57,964	×		IE08<CR>	001a	Liniennummer-Anzeiger AD Sonder-Anzeige
64	09:29:58,181	×		k04<CR>	002	Außenanzeigen AD Kursnummer

Column	Elaboration
--------	-------------

Type The first column is itself without marking in the windows. It shows, whether it is about a Master- or a Slave telegram and whether this was received or sent:

-  Received Master telegram. This telegram was sent by an external IBIS-Master on the request bus.
-  Received Slave telegram. This telegram was sent by an external IBIS-Slave on the response bus.
-  Sent Master telegram. The IWT-2000 is IBIS-Master itself and has sent this telegram due to a request list of a protocol or by direct input.
-  Sent Slave telegram. The IWT-2000 is IBIS-Slave and has sent this telegram from a response list.

No. Running number of the telegrams

Start time Moment, on which the data set was received in the Form hh:mm:ss,MMM
Where "MMM" specifies the number of the milliseconds.

Reaction Reaction time of the response. The reaction time is the time between the reception of the first Bits of the corresponding Master telegram and the broadcast of the first Bits of the response. Hence the reaction time is also always shorter than the difference of the respective starting times.

The VDV-300 prescribes for Slave-responses a maximum reaction time of a Bit delay (~ one millisecond). This reaction time is designed very short. As a rule, IBIS-Master accepts longer response times. In order to be able to estimate the reaction time more easily, the WBMonitor highlights the respective reaction time with color. Here:

0
5
100
250
550
ungültig

- <= 1 ms. Very good. The response time is within the IBIS-standard.
- Between 1 and 50 ms. Good. The response time is indeed not within the standard any more, but is accepted by most of the IBIS-Master.
- Between 50 and 100 ms. Critical. The response time is so long, that some IBIS-Master will not accept the response any more.
- Between 100 and 500 ms. Most of the IBIS-Master will not accept the telegrams any more.
- above 500 ms. Reaction times above half a second are in any case alarming.
- Invalid value. If no corresponding Master telegram can be found for a Slave telegram, the response is also no reaction, so no reaction time can be calculated.

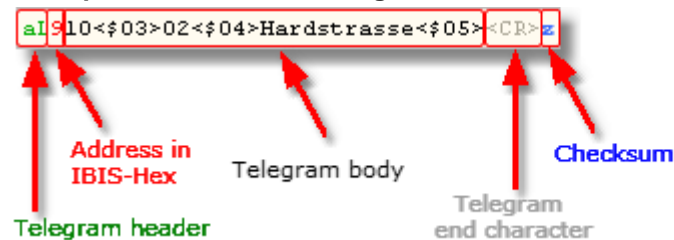
Error Occurred error. Following mnemonic can be contained in the column:
F - Framing error
P - Parity error
S - Checksum error
A - telegram abort due to timeout
R - Reset of the test devices
X - Syntax error in the telegram. The telegram does not correspond to the prescribed telegram structure.
T - Type error. A Slave telegram was sent from a Master or a Master telegram from an IBIS-Slave

The Syntax of the individual telegrams as well as the specification, whether it is about a Master- or Slave telegram, is defined over the [telegram definition](#) and can be edited there.

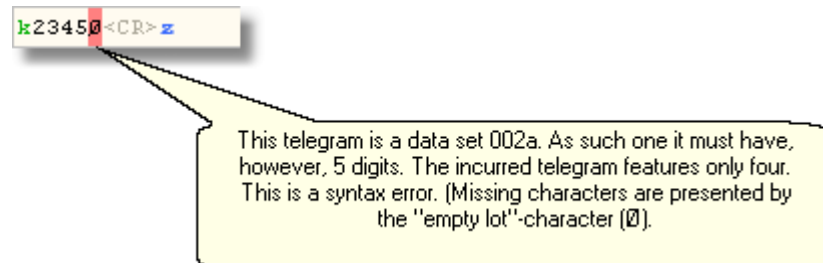
Telegramm Here stands the recorded. The individual parts of the telegram are emphasized in color:
Green – telegram header
Red - device address in [IBIS-Hexadecimal-presentation](#)
Black- telegram body. Non-presentable characters are written as Hexadecimal numbers in third brackets.
Gray - Termination character (<CR>)
Blue - Checksum character
Red highlighted – from this character the telegram is not syntactically correct any more.

Blank space characters in the telegram are presented as points, non-printable characters in their hexadecimal correspondent in extruded brackets.

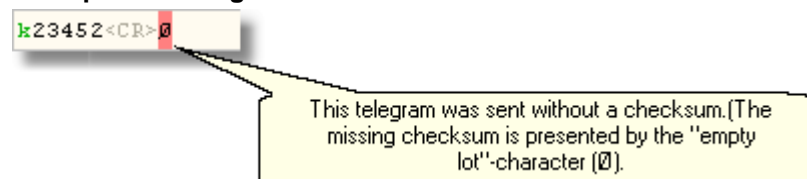
Example of an error-free telegram:



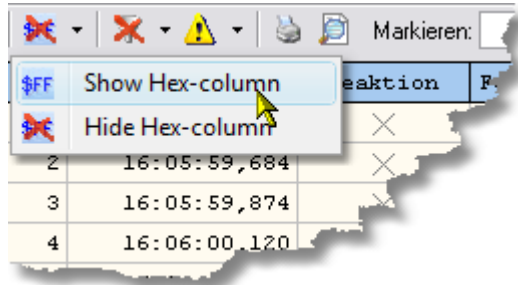
Example of a telegram with Syntax error:




Example of a telegram with checksum error:



Telegram Hex In this column, the telegram is displayed as hexadecimal presentation. This column can be shown and hidden separately over the corresponding button of the quick start panel.



DS-No. Data set number of the telegrams according to VDV 300. The recognition, which data set number it is about, occurs according to the telegram grammar of the [telegram definition](#). Please pay attention also to the section in the [IBIS-Vehiclebus introduction for the IBIS-telegrams](#).
If the WBMonitor recognizes a Syntax error in a telegram, it can only "advise", which telegram could be meant with this.

 **Example:** Following telegram is recorded: k1234.

This telegram could be a data set 002, then it might have only two digits or a data set 002a, then it must have, however, five digits. None of both the definitions applies here.

The telegram is, however, closer to the data set 002a (here only one digit is missing), than to data set 002 (here, there are two extra digits). Hence the WBMonitor decides in this case that the telegram should supposedly be a data set 002a and this is specified as likely data set.

In order to make it recognizable, however, that this is only the most probable choice, the data set number is not presented in the column DS-No. in third brackets.

In the above example as: [002a]

Description Description of the data set number. The description is likewise referred to the data set number from the [telegram definition](#).

R? The abbreviation "R?" stands for "response expected?". Here, WBMonitor runs an analysis of the Master-/Slave telegrams and their corresponding responses. An exact description is in the section ["response analysis"](#).

Automatic saving

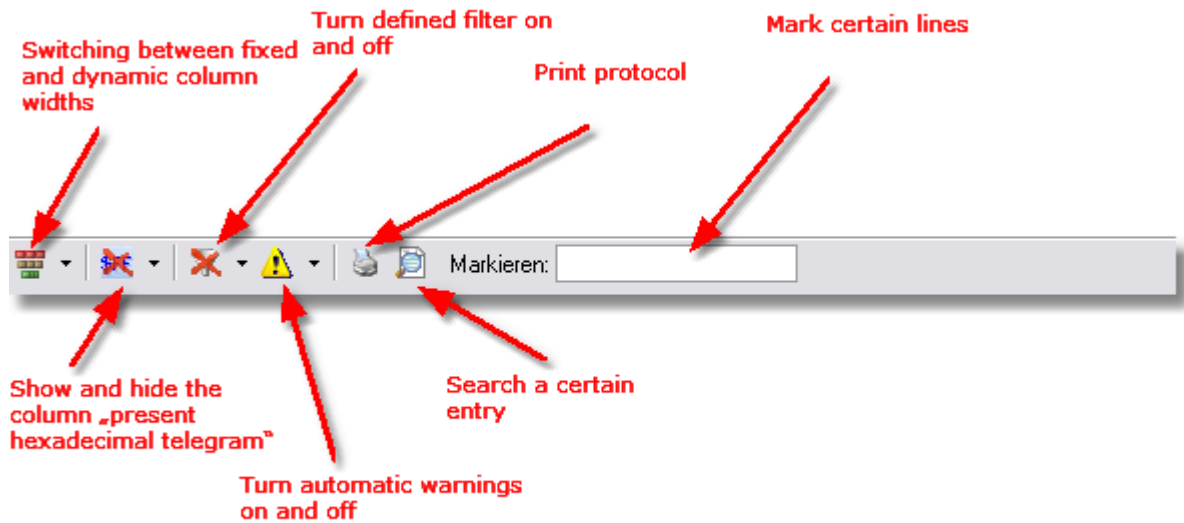
Each time you record telegrams, the protocol will be automatically saved every 100 lines. If, for some reason, the recording gets interrupted (e.g. because of a PC breakdown), this protocol will be loaded automatically when you start the program again.

6.4.1 Control Elements

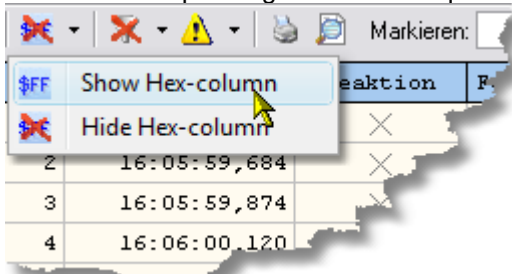
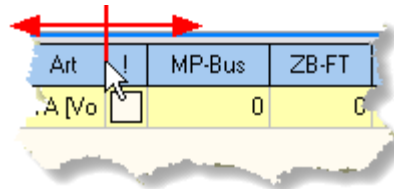
This section describes the control elements and functions, which is available in the Monitor window. Most of these functions are also in other windows, such as in the [protocol window](#).





The quick start panel

The quick start panel offers following control elements:





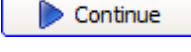


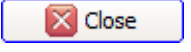
Element	Graphic	Function
Switching the column width column width		With this button, you can change the distribution of the columns. In the "dynamic column adjustment" () mode, the WBMonitor calculates, adjusting to the current width of the window, the optimal distribution of the columns automatically. You can also switch the column presentation in the mode "fixed column width" (). In this mode, the width of the columns is fixed and does not adjust to the respective window size. In this mode, you have the option to adjust the width of each column yourself with the Mouse according to your particular needs.
Hexadecimal view on/off		You can also display telegrams optionally in addition in hexadecimal presentation. The column "telegram HEX" can be separately shown and hidden over the corresponding button of the quick start panel.
Filter on/off		With this button you can open and close a defined filter. Define a telegram filter over the filter window of WBMonitor. Telegram filters are program-wide valid and affect all open protocol windows as well as the monitor window.

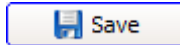


Automatische Warnung ein/aus		<p>WBMonitor tries to support you as far as possible in error search. To this belongs the response analysis in the same manner as the evaluation of the reaction times or of transmission errors by colored highlighting.</p> <p>Not always this support is helpful or desired.</p> <p>You can open and close them over this button any time.</p> <p> As soon as you run a Master simulation, in which you play a recorded protocol, the automatic warning is turned off for this protocol. Here, the display of probable error states is not sensible, as it is about already passed, recorded data.</p>
Print protocol		<p>With this button, you can print the protocol being displayed. Please note that always only the displayed content is printed.</p> <p>This means:</p> <ul style="list-style-type: none"> • If the column "telegram HEX" is faded out, it is also not printed. • If a Filter is active, only the filtered lines are printed. • If more than one line is marked, only the marked lines are printed.
Search		<p>You have the option in a protocol or in the Monitor window to search entries on basis of any character strings. The search comprises all columns.</p>
Mark		<p>You can input any character in the "Mark"-input field. Similar to as in searching, all columns are searched and each column, which contains the input character sequence are marked.</p> <p>Upper and lower case is not relevant here.</p> <p>You can also use "?" and "*" as wildcard characters. Where "?" means "any character" and "*" means any number of arbitrary characters.</p> <p>Examples: "bS?" finds "bS1", "BS2", ... "BSA", etc. But not "bS12" "bS*", however, is "bS1", "BS2" but also "bS" or "bSIwillbefoundtoo".</p> <p>IBIS-Telegrams may, however, contain the characters "?" and "*". Would you like the "?" and "*" character interpreted as character and not as a wildcard, you must mark it special. Use "/" instead of "?" and "/" instead of "*"</p> <p>Examples: "bS/?" finds "bS", "bS?abc", ... etc. But not "bS1" "bS/*" will find "bS *", "bS*abc" but not "bSIwontbefound"</p>

Buttons

On the other end of the window, there are four more buttons.

Button	Elaboration
	With this button you can delete the content of the Monitor window. The starting time of the recording is reset.
	The Monitor window scrolls automatically with each new telegram. If you wish to turn this off automatically, click on "Pause" and you can move freely in the recording hitherto. The button changes then automatically to "Resume". If you wish to activate the automatic process, click on "Resume".
	 Do not interrupt the recording yourself with "Pause". The window does not jump automatically to the newest entry any more, if a telegram comes in.  If you double click for an error detail display or a data set detail display , your recording is automatically paused.
	With this button you close the window.



You can save a modified protocol with this button or over the menu "Files" - "Save ..." or "Files" - "Save as ...".










A running recording cannot be saved. You will be automatically asked whether you wish to save the recording, if you close the monitor window.


6.4.2 Response analysis

WBMonitor tries for each telegram an analysis of the possible affiliations and dependencies.

As described in the [IBIS-Vehiclebus introduction](#), there are Master telegrams, for which the IBIS-Master awaits a response from an IBIS-Slave device. This response must, in order to be valid, reach within a certain time span (see section ["Reaction time"](#)) and must directly follow the requesting Master telegram. No other Master- or Slave telegram may be between the "question" of the IBIS-Master and response.

The program checks these dependencies and presents graphically. This is an important help for error identification. If a Master telegram expects no response, then the field "R?" remains empty. Following dependencies are possible:

Symbol		Description	
	21	stelle 	The Slave telegram displayed as the second is a valid response to the aforementioned Master telegram.
	22		In order to be placed as "valid" here, the Slave telegram must fulfill the following conditions:
			<ul style="list-style-type: none"> It must be an acceptable response data set for the antecedent Master data set. Which Slave data sets are acceptable responses for a Master data set, is defined in the telegram definitions. It directly follows the antecedent Master telegram.
	103	11. frage 	This Master telegram awaits a response, but no appropriate Slave response incurs.
			Here it is insignificant, whether the response incurred <u>not only direct in the connection</u> or later, after which already several other telegrams on the Bus were transmitted.
	103	11. astzäl 	In this case the Master awaits a Slave response to this telegram. This also occurs, however, not on right time, in order to be valid.
	65	stzäl 	Here the response comes so late, that already one or several other telegrams had been sent on the Bus, before the response came.
			In the error detail display it is exactly displayed, to which line number WBMonitor considers that the respective Master- or Slave telegram belongs.

 As this behavior presents a unique breach of the IBIS-standard, an error is to be possibly defined, if it is not unique, to which Master telegram a late Slave response is to be allocated.

WBMonitor tries this allocation according to the following pattern:

If a Slave telegram incurs, which presents no valid response for the directly antecedent Master telegram, WBMonitor searches the last, appropriate Master telegram for which:

1. The incurred Slave telegram awaits as response.
2. No other suitable response incurred.

Please note: This procedure is as a rule, but not always, acceptable. You understand here the analysis of WBMonitor only as suggestion. You should in any case check this situation yourself once more.



i In this case of error, the reaction time displayed in Slave telegram always refer to the (supposedly) corresponding Master telegram, not to the immediate antecedent, as in a correct response.

This Symbol can only appear in a Slave telegram. It shows, that no Master telegram could be found, which would await this Slave telegram as response. As IBIS-Slaves may never send data on its own, this Situation presents an error.

Many of the statements of the response analysis are in relation with dependencies of Master- and Slave telegrams. These dependencies are defined in the [telegram definitions](#). In the reality, it is often so, those IBIS-telegrams are used deviating from the standard manufacturer-dependently. In these cases telegram analysis must naturally collapse, as the corresponding relations are not known to them. You have, however, the option to change or extend the telegram definition yourself arbitrarily. On this type you can adjust WBMonitor to your special requirements.

Should you carry out such modifications or extensions on the den telegram definitions, these are not to be seen in already recorded, saved telegrams. You must run in this case the telegram analysis for the corresponding protocol anew.

For this, in each [protocol window](#), the button "New analysis" is available. In the Monitor window, you do not have this Function, as a response analysis is carried out in the Monitor window automatically. A change of the telegram definition affects the monitor window immediately.

i Open a protocol, which is recorded with a previous version of WBMonitor, a new analysis will start automatically.

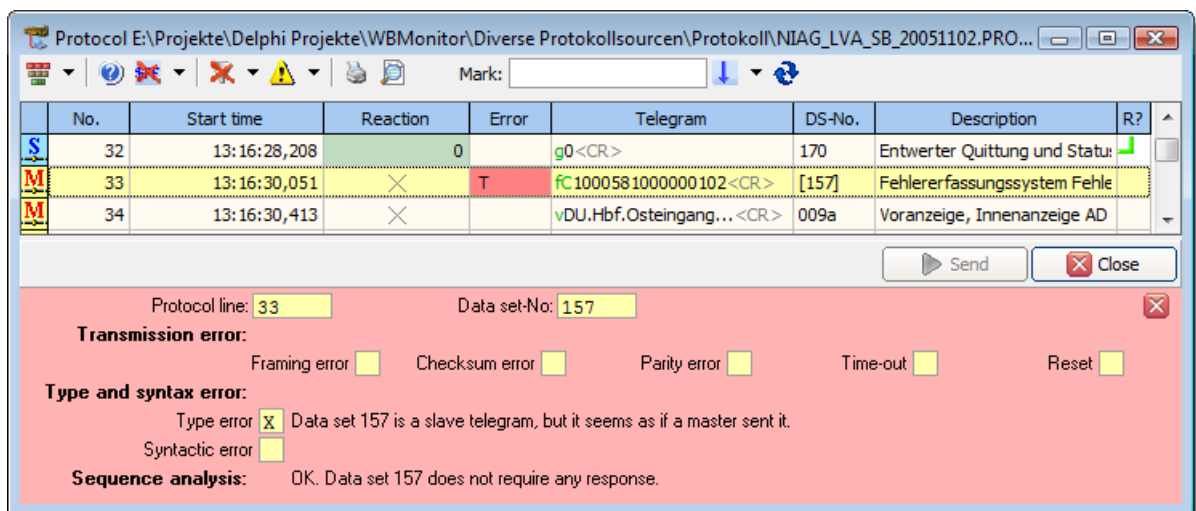
6.4.3 Error detail display

When WBMonitor has always recognized an error in a telegram, you can double click on this line of a protocol or of the Monitor window, in order to receive an error detail display.

This applies to [transmission error, for Syntax- or type error](#), as well as to [sequence error](#).

i As soon as you open a detail window in the currently active [monitor window](#), the [recording is automatically paused](#).

The following figure shows an exemplary error detail display:



No.	Start time	Reaction	Error	Telegram	DS-No.	Description	R?
32	13:16:28,208	0		g0<CR>	170	Entwerter Quittung und Statu:	
33	13:16:30,051	×	T	fC1000581000000102<CR>	[157]	Fehlererfassungssystem Fehle	
34	13:16:30,413	×		vDU.Hbf.Osteingang...<CR>	009a	Voranzeige, Innenanzeige AD	

Protocol line: 33 Data set-No: 157


Transmission error:
 Framing error Checksum error Parity error Time-out Reset

Type and syntax error:
 Type error Data set 157 is a slave telegram, but it seems as if a master sent it.
 Syntactic error

Sequence analysis: OK. Data set 157 does not require any response.






You see a few simultaneously occurring error here:

- during the transmission, a Parity-error occurred.
- The telegram is incomplete, as within the [specified Timeout](#), no telegram end character ("`<CR>`") was received.
- The telegram content does not correspond to any telegram structure of the [telegram grammar](#). A Syntax error is present.
WBMonitor guesses that this telegram should be a data set 1201. As this, however, can only be a presumption, the corresponding data set number is presented in third brackets in the column "DS-No. ".
- This telegram was sent from an IBIS-Slave. As a Slave may never broadcast without being inquired, there ought to be an appurtenant Master telegram, to which this telegram would have been the response. WBMonitor could, however, find no such Master telegram.
- The specified invalid reaction time results from the sequence error. If no Master telegram is present, to which this Slave telegram should have been the reaction, then also no reaction time can be counted.

You can close the error detail window any time again by clicking the "Close"-button () to upper right in the error detail display.

6.4.4 Data set detail display





The data sets

-  003a (external display Text)
-  003c (internal display)
-  004c (Ticket validator, automatic ticket machine)
-  021 (external display with pulse) and
-  021a (routing display)

have particular syntactic structure, which makes a fast analysis of the respective data sets by simple "reading" difficult.

Hence WBMonitor offers you a special Detail display for these data sets.

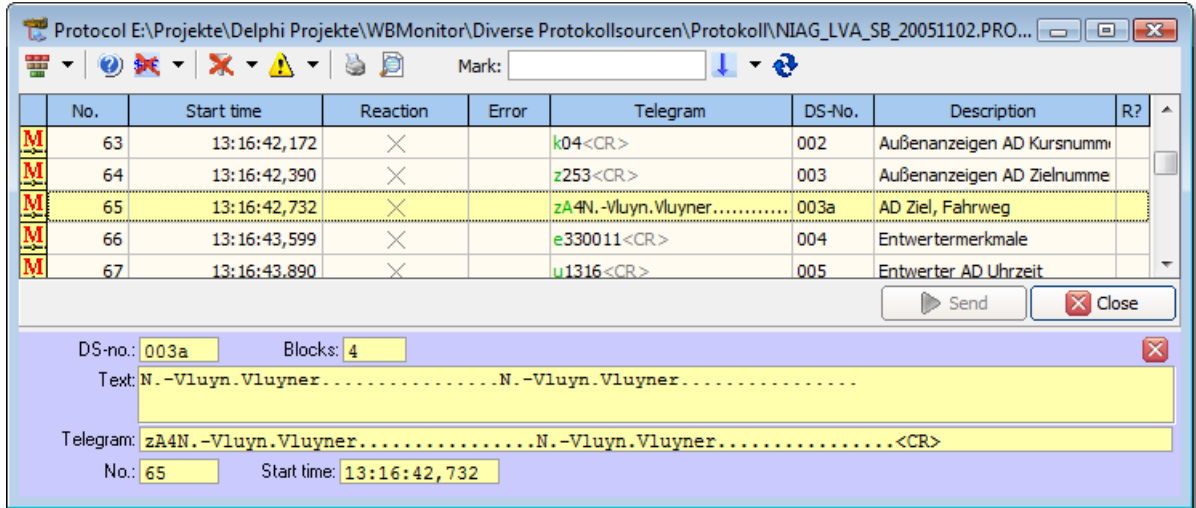
Data sets, for which a Detail display is possible, are recognizable on a blue highlight in the Monitor- or [protocol window](#).

	8	11:22:36,902	×		z227<CR>	003	Außenanzeig	
	9	11:22:37,087	×		zA4Repelen.M	003a	AD Ziel, Fal	
	10	11:22:37,822	×		aX71<03>001 S1		(nicht VDV3)	

By a double click on such a line the detail display window opens. The line, to which the Detail display is referring to is highlighted green in the Monitor- or protocol window:



As soon as you open a detail window in the currently active [monitor window](#), the [recording is automatically paused](#).



In the Detail display, elaborate information on the selected line is presented. The exact type of the information depends on the respective data set number. Thus you get e.g. in a data set 021a information to the pulse, which is not significant in all other data sets.

In the Detail display, blank space characters in the display text are always presented as points and non-printable characters as Hexadecimal digit in extruded brackets. Exception from these is the character ASCII-Code 10 (line feed) and ASCII-Code 13 (carriage return). These are presented as <LF> for ASCII-Code 10 and as <CR> for ASCII-Code 13.

You can close the Detail display any time again by clicking the "Close"-button (Close icon) to upper right in the Detail display.

6.5 The protocol window



The protocol window corresponds to a large extent to the [Monitor window](#).

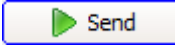
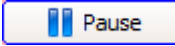
While the monitor window always presents the current recording of the instantaneous activities on the IBIS-Bus, protocol window presents saved, earlier recordings.

Hence Monitor- and protocol windows are very similar. Regarding [general control elements](#), the [significance of the table columns](#), the [functioning principle of the response analysis](#) as well as the particular functions such as [error detail display](#) and [data set detail display](#), please read the corresponding chapter on the Monitor window.


In this section, only those functions are discussed, in which a protocol window differentiates itself from the Monitor window.

The essential difference between the Monitor window and a protocol window lies in the fact that you have the option to play an already saved protocol anew as [Master simulation](#).

Element	Graphic	Function
Broadcast mode		With this button you can change the number of the passes, if you play a protocol as Master simulation. Either the protocol will run once till the end and then automatically stop (down arrow) or the broadcast begins again on beginning of the protocol and runs on cycle, until you pause manually (refresh icon). The third possible option is only to send the currently selected telegram (1).
Run response analysis anew		You have for each protocol the option to run the response analysis anew. This is always sensible, if you have changed entries of the IBIS-telegram definition and wish to let this changes flow into the response analysis later.

Send and pause protocol   You can play a protocol as [Master simulation](#). For this, there is in each protocol window a "Send"-button. The button changes automatically to "Pause".




If a protocol is active, then the window background of this protocol is highlighted red. You can open any number of protocol window. However, always only one of them can run as Master simulation.

 An exact description of the Master simulation by playing a protocol is in the [corresponding chapter](#).


6.6 Telegram filter



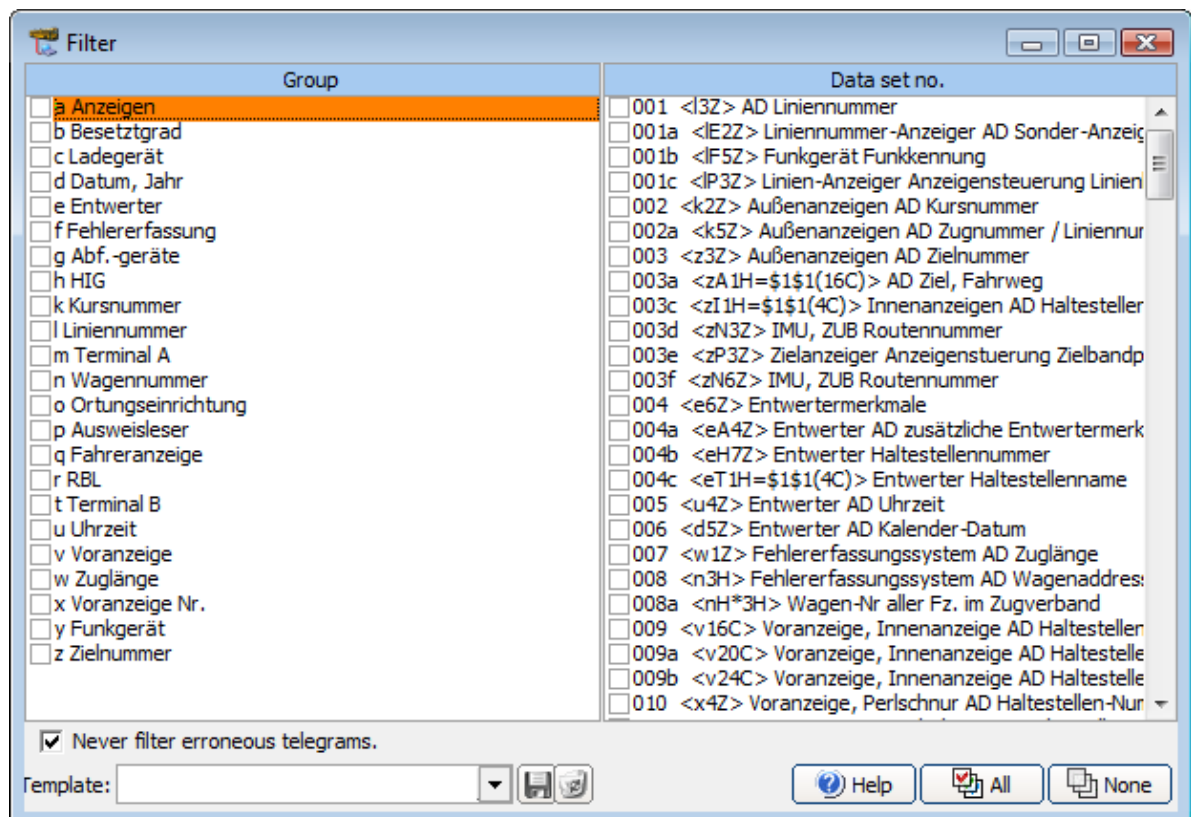
In this chapter, you will experience, ...

-  ... How you can define a telegram filter.
-  ... How you can save filter drafts and delete saved drafts.
-  ... How the Filter affects the presentation in the Monitor- and protocol window.

You have the option to filter the [Monitor](#)- as well as all [protocol windows](#) according to any telegram or telegram groups. By a Filter, only those telegrams are displayed, which corresponds to the Filter.

In order to define a Filter, select the menu "Configuration" - "Define Filter..." or the corresponding button of the quick start panel ()..

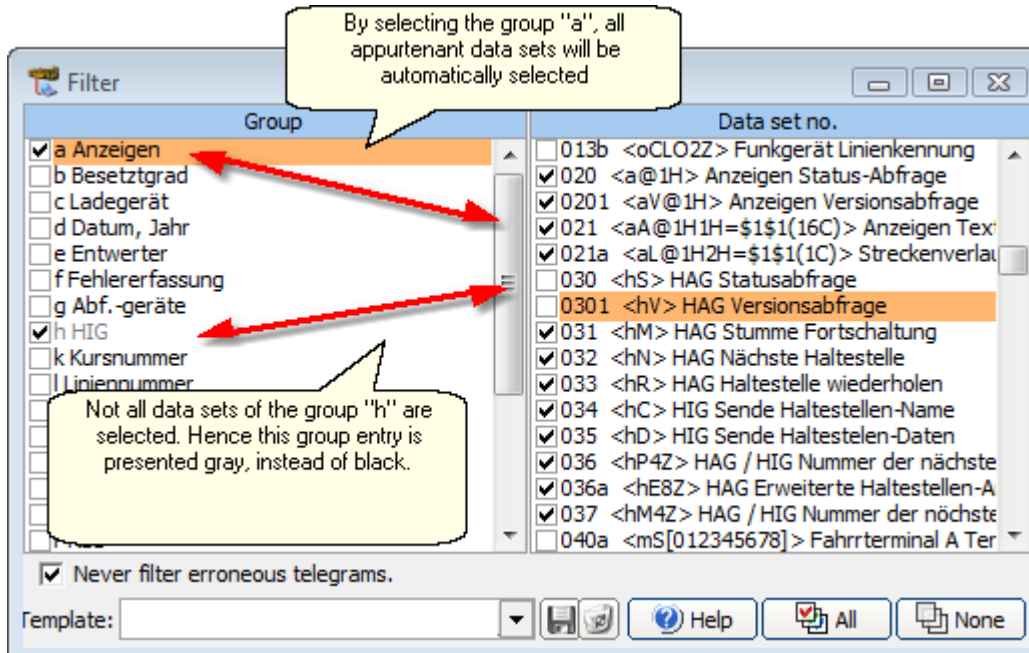
The Filter window opens.





On the left side, you will find a summary of all telegram groups, as they are defined in the VDV-script 300, Annex 12, page 1. A telegram group comprises several individual telegrams. On the right side you will find a list of all data sets placed in the [telegram definition](#).


You can select any entry on the left as well as the right side. If you select a group, automatically all data sets of the group on the right side are selected.

If you select one or more data sets on the right side, the corresponding groups are automatically selected. If all data sets of a group are not selected, the entry of the group appears gray instead of black.




 Changes on the telegram filter are effective immediately for all open windows, for which the telegram filtering is activated. You can open and close the telegram filter for the [Monitor](#)- and of each [protocol window](#) individually with help of the "Filter"-buttons () ein- und ausschalten.

Saving, Loading and Deleting the Filters

You can save any Filter selection as draft. For this, enter a name for your filter draft in the field "Draft:" of the filter windows and click on the "Save"-button ().






In the field "Draft:" all filter drafts saved so far are listed. Select a Draft there, in order to set the corresponding telegram filter.

If a Draft is selected, you can delete this by clicking the "Delete"-button. ()

Effects of the telegram filtering

If a telegram filter is set and the telegram filtering is [active](#) in the Monitor- or a protocol window, then only those telegrams are displayed by setting a filter, which correspond to the filter.

The filtered telegrams are not exclusively displayed, rather also the time distance, in which the telegrams are recorded, symbolized by gray bars of different shade.




	No.	Start time	Reaction	Error	Telegram	DS-No.	Description	R?
	8	17:47:11,606	×		k00 <CR>	002	AD Kursnummer	
	17	17:47:21,711	×		k00 <CR>	002	AD Kursnummer	
	30	17:47:31,827	×		k00 <CR>	002	AD Kursnummer	
	35	17:47:37,658	×		k00 <CR>	002	AD Kursnummer	
	38	17:47:37,982	×		k00 <CR>	002	AD Kursnummer	

In the example above, telegrams were filtered on all channels (data set 002). The gray bars between the telegrams display the relative distance of the respective telegrams in relation to the total recording.

6.7 IBIS-simulation

You can run various simulations of IBIS- devices with the IWT-2000.

Following simulation options are in the section ["Master simulation"](#):

-  Simulation of an IBIS-Master by cyclic broadcasting of predefined telegrams (request list)
-  Simulation of an IBIS-Master by playing a recorded protocol
-  Direct broadcasting of IBIS-Master telegrams on the broadcasting bus

Following simulation options are in the section ["Slave simulation"](#):

-  Simulation of one or more IBIS-Slave devices by means of a response list.

6.7.1 Master simulation




The IWT-2000 can simulate an [IBIS-Master device](#). For this, it must supply request bus as well as response bus with voltage. Hence it is necessary that the IWT-2000 itself is fed with an external voltage source, if it should be IBIS-Master.



All types of Master simulations are only possible if WBMonitor is [switched in the Master mode](#).

If the IWT-2000 is IBIS-Master, WBMonitor offers different options of the Master simulation.

In the Master mode, you can:




-  [Play a recorded protocol](#).
-  Send cyclic telegrams over a [request list](#).
-  Send any character sequence [by direct input](#) to the Vehiclebus.

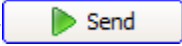
All three types of simulation can be used in parallel. You can activate a request list during playing a protocol and send some more data by direct input to the Vehiclebus in-between.

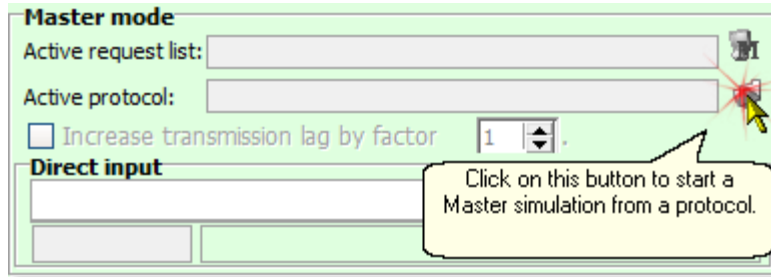
6.7.1.1 Play a Protocol



In this chapter, you will experience, ...

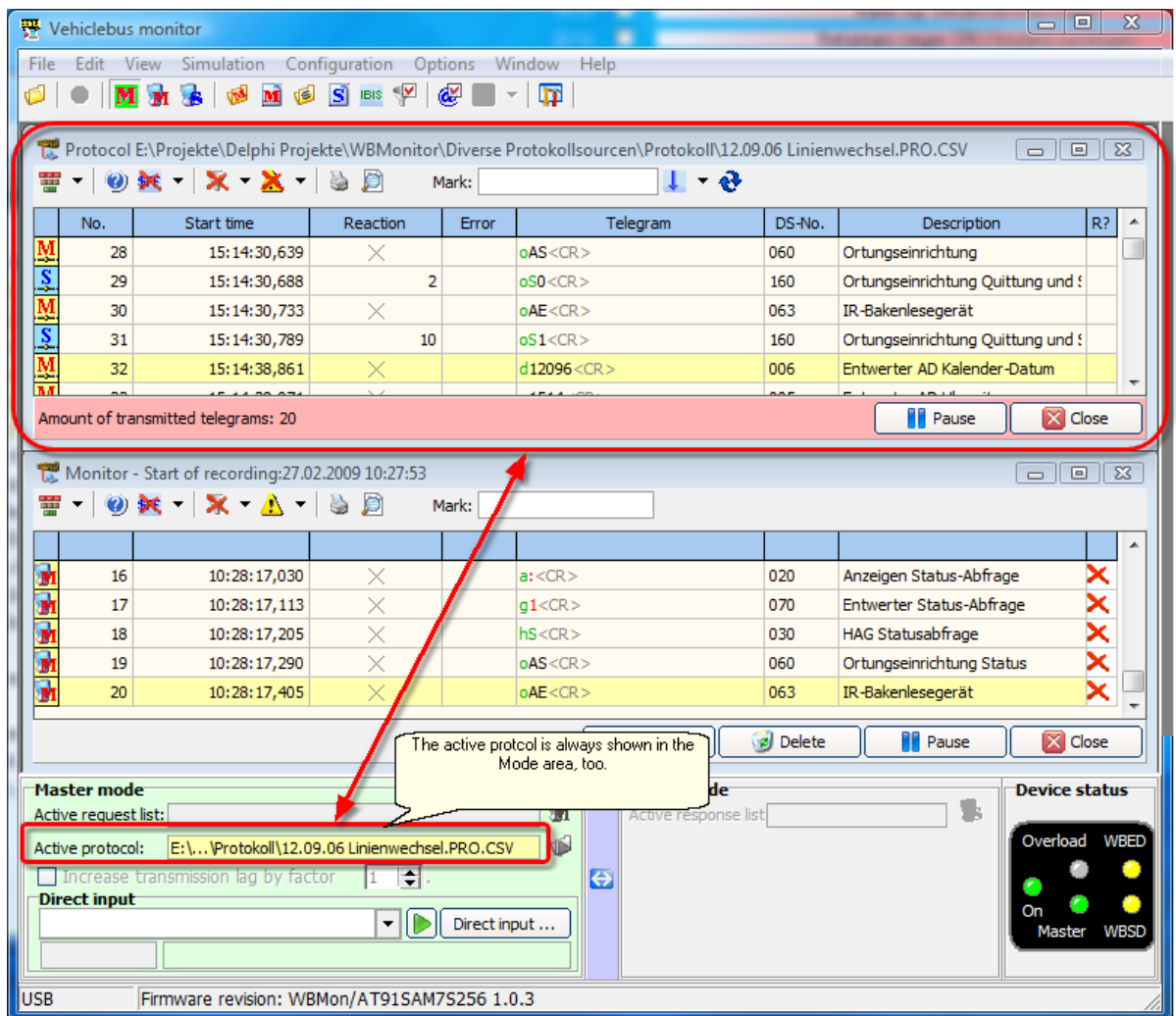
-  ... How you can play a protocol.
-  ... Which parts of a protocol are dealt with for the Master simulation.
-  ... How you can change the speed of the simulation.

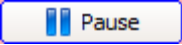
You can replay a once recorded and saved [protocol](#) any time. Each protocol window possesses a "Send"-button (), by which a protocol can be sent. Alternatively you can start a protocol as Master simulation directly over the menu "Files" - "Send from protocol..." or in the mode area by selecting a protocol.



If a protocol is active, i.e. it sends the recorded telegrams to the IBIS-Vehiclebus; the name of the active protocol appears in the [mode area](#).

The same applies to request - and response lists. Thus you have the fast overview at any time, which simulations are currently active.



If a protocol is active, it can be stopped by clicking on the "Pause"-button () or by clicking on the selection button to the right beside the display in the mode area.

You can open any number of protocols. However, only one of these can be active as Master simulation. If you start a protocol, during which already another is broadcasting, then the first one is automatically paused, before the new protocol begins its simulation.

What is sent from a protocol?

A recorded protocol contains all activities on the IBIS-Vehiclebus. It can contain Master- as well as Slave telegrams. The telegrams can be error-free or erroneous.

If a protocol is used for Master simulation, only the transmission error-free Master telegrams of the protocol are sent. All Slave telegrams as well as all Master telegrams that have [transmission error](#) are automatically skipped.

Telegrams with supposed Syntax-, Type- or sequence errors are **not** skipped. They are incorporated into the simulation.

Date and clock time

If data sets No. 005 (clock time) or No. 006 (Date) are contained in the protocol, these are set to the current values during playing of the protocol.

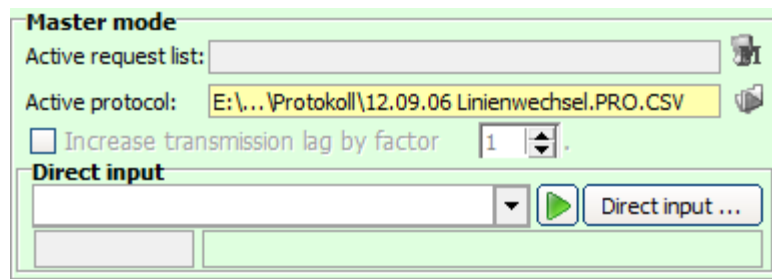
If you do not want this automatism, you are able to deactivate it in the [options dialog](#).

In which time gap is it sent?

The entries of a protocol are sent exactly in the row sequence, in which they were accepted. Here, the original time gap is counted as time gap and maintained. If e.g. during the recording 500 milliseconds were between two Master telegrams, then WBMonitor waits after the first telegram also 500 milliseconds, until it sends the second. Authoritative for the time count are the starting times of the protocol.

You can influence the running speed of the simulation, in which you change the factor for the broadcast gap in the mode area.

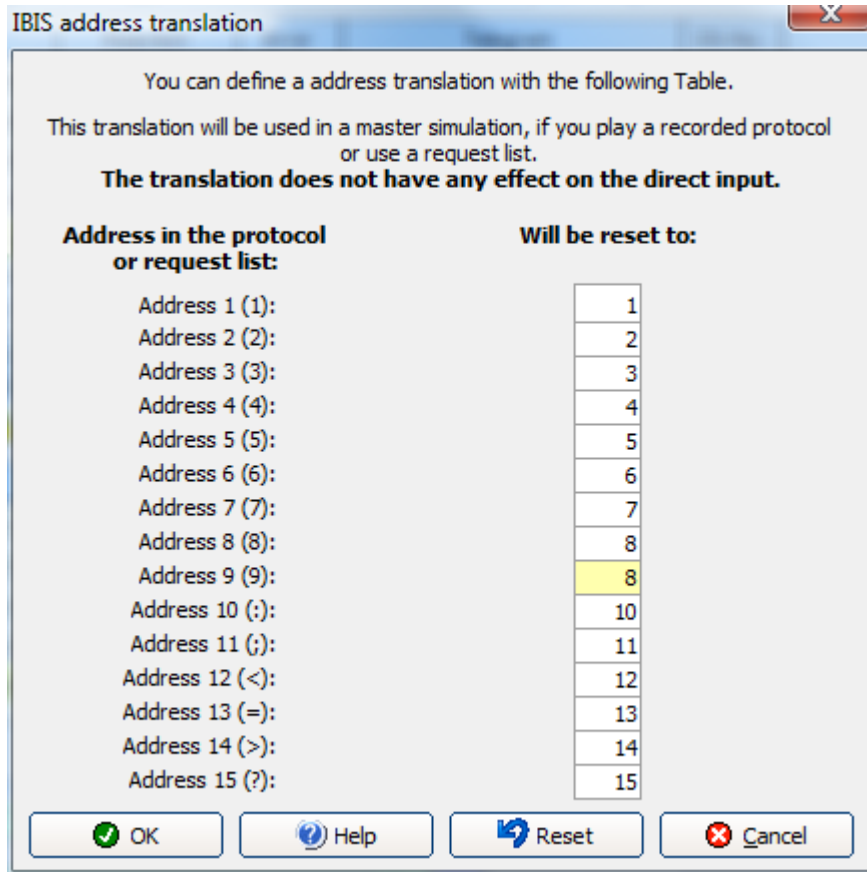
A Factor of "2", for example, doubles the period between the telegrams.




Reset IBIS-Addresses

In rare occasions it can be so, that you wish to send telegrams to other target addressed during playing of a recorded protocol, as they were recorded. If you have e.g. a protocol of a vehicle, to which an address 9 a hung on course display, while your course display, however, is configured to address 8, then it would be practical, if you during playing of the protocol automatically send all telegrams, which went to the address 9, now to address 8.

For this purpose, the IBIS address reset is available, which you find in the menu "configuration - IBIS address reset" or over the corresponding quick start button.







The displayed screenshot shows already the setting for the aforementioned example (address 9 in the protocol is reset to address 8 during playing).

 The address reset is not automatically active, if values are defined in the reset window. It must now be activated with the activation button. In order to avoid errors, the address reset is deactivated in each new program start and must hence be activated anew every time.

6.7.1.2 Request list



In this chapter, you will experience, ...

-  ... What a request list is.
-  ... How you can create or edit a request list.
-  ... How you can simulate an IBIS-Master by a request list.
-  ... How you can comfortably generate telegrams for the data sets 003a, 003c, 004c, 021 and 021a.

Other than in playing a recorded protocol, the request list serves to simulate a Master by cyclic broadcasting of telegrams in specified intervals.

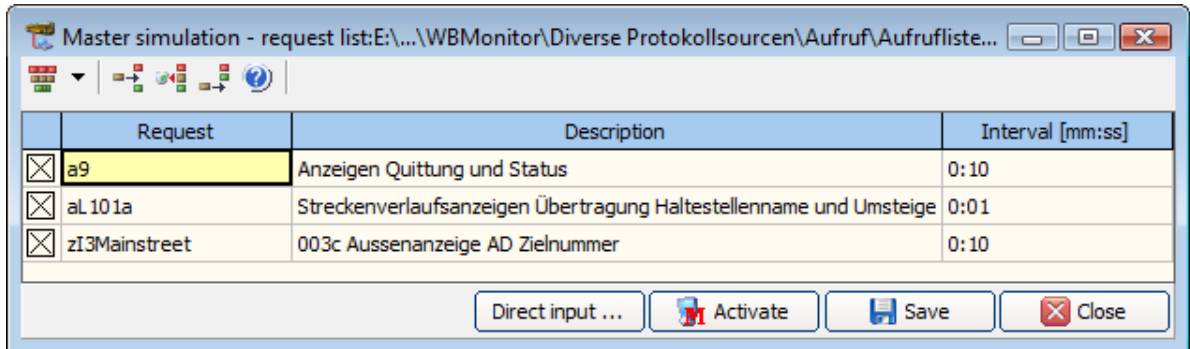
Create or Edit a Request List


You can create a new request list or open an existing over the menu "Simulation" - "Open request list..." or "New request list". Or use the corresponding button of the quick start panel.



In the request list, various data sets can be filed, which should be sent in the Master simulation in certain intervals. Indeed any number of request lists can be created, however, for the operation always only one request list can be active.

If you wish to create a new request list or edit an existing one, the request lists window opens.



Column	Elaboration
Send?	The first column is in the windows itself without Marking. It serves to be able to vary in an existing request list, which entries should actually be used for the Master simulation and which should not. In this type, you have the option to play various scenarios easily, without having to use several request lists for this.
Request	The telegram, which is registered in this column, is sent by WBMonitor cyclically on the broadcasting bus.
Description	Description of the request. This field serves only for information and is insignificant for the function of the request list.
Interval	Here you input the time, which must elapse, till the corresponding line is sent anew. You can input the time optionally in the form "Minutes: Seconds" or only as second value. The second value is converted by WBMonitor automatically into "Minutes: Seconds".
 If the interval is set to "0", the telegram is sent only once.	

The telegrams are input without telegram end character ("`<CR>`") and check sum information. These values are counted by WBMonitor and automatically inserted into each telegram.

Date and clock time


If you wish to send Date and clock time over the IWT-2000 by means of a request list, only the mnemonic "d" for Date and "u" for clock time suffices, instead of entering the actual necessary complete telegrams. In the simulation, WBMonitor then automatically generates the correct telegram with the respective current values.

Data Set-Detail Input

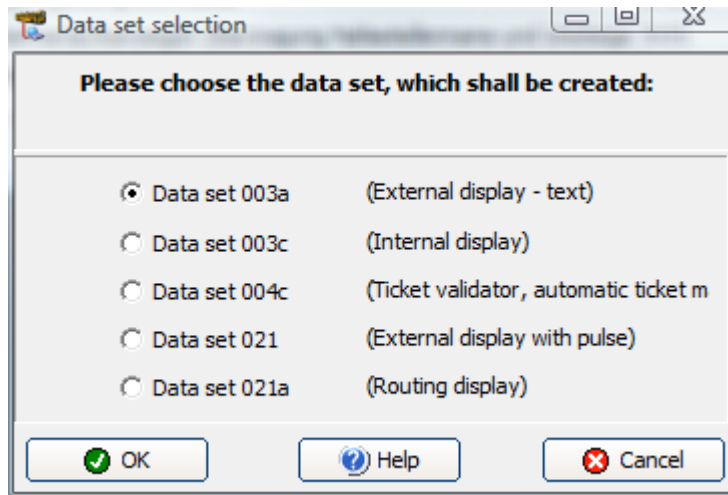
The data sets

- ✎ 003a (external display Text)
- ✎ 003c (internal display)
- ✎ 004c (Ticket validator, automatic ticket machine)
- ✎ 021 (external display with pulse) and
- ✎ 021a (routing display)

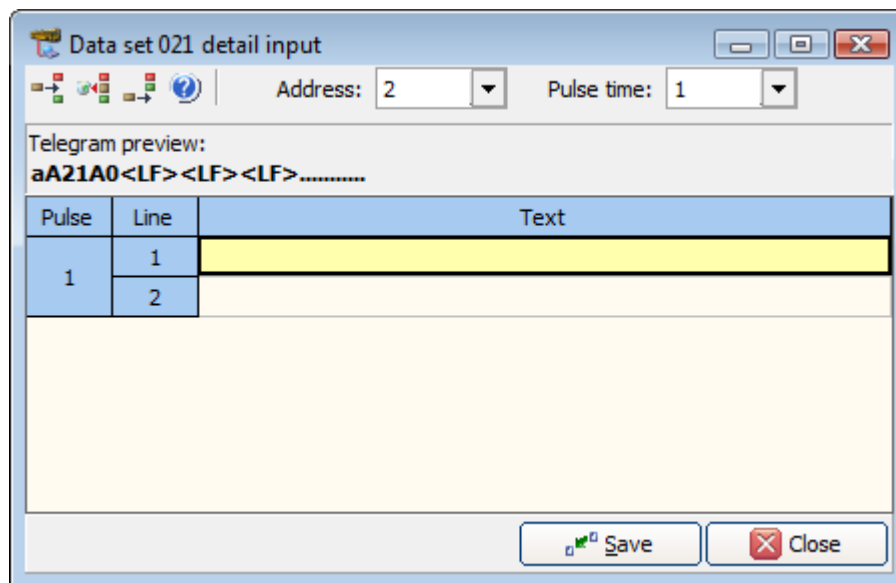
have particular syntactic structure, which makes a direct input difficult and source of errors. Hence WBMonitor offers you a special input help for this data sets.

 Due to the particular structures, we recommend you not to enter these data sets yourself. Always use the detail input, in order to generate these data sets.

If you wish to accept one of the above data sets in your request list, please click on the button "Detail input...". A window opens, in which you can select, which of the above mentioned data sets you wish to enter.



Select the desired data set and the corresponding window opens. Please note that the detail input is dependent on the respective data set. Exemplarily, only the detail input for a data set 021 is shown here:



You can now generate the desired data set. In the field "telegram preview", you can see how the

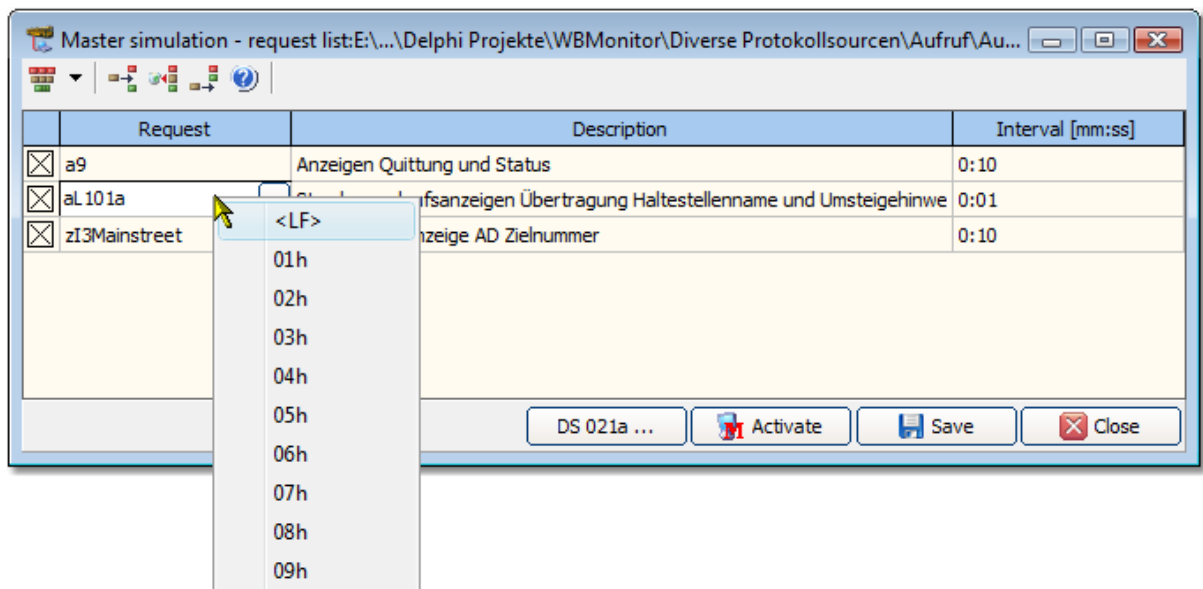
future, complete data set will look. If you are finished with your input, click on the "Accept"-button, in order to accept the generated telegram in the request list.

If request list already contains data and if the current marked line is one of the aforementioned data sets, then the Marking of the buttons "detail input ..." changes accordingly. If e.g. a data set 004c is currently marked, the Marking will be changed in "DS 004c ...".

Click now on this button, the current telegram of the request list is accepted in the detail input and you can edit it later.

Input Special Characters Directly

Sometimes it is necessary to input special characters directly. WBMonitor offer this option. Place the insertion point on the desired place in the telegram and press the right mouse button. The special character-menu appears.

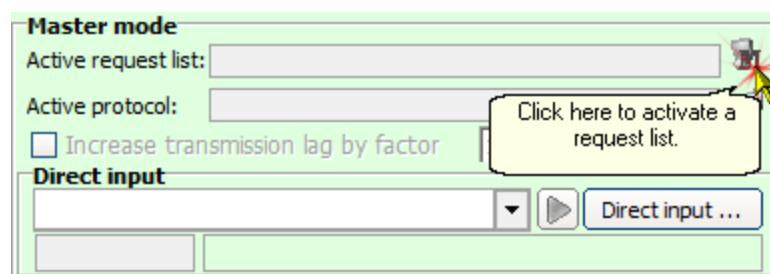


You can select special character ASCII-Code 1 - 9 or a line break. As long as you are still in the Editor, the special character is displayed as simple rectangle. Quit the Editor and the special character appears as in the protocol with its ASCII-Code.

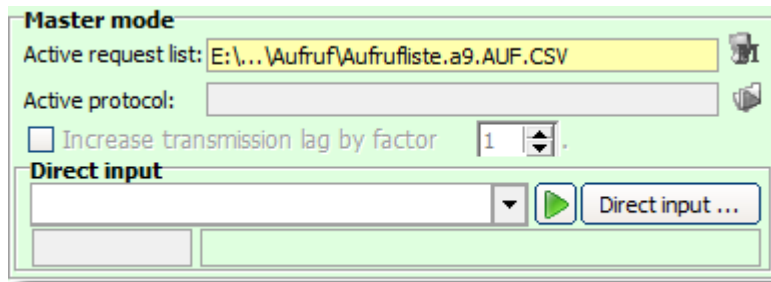
Use a request list



A request list must not be open, in order to be active. You can also activate or deactivate an existing request list over the button "start/end request list" in the quick start panel or in the mode area.



Similarly as in protocol, the currently active request list is displayed in the mode area.



By a double click on the yellow marked entry, you can open the currently active request list.

You can open any number of request lists simultaneously, however, always only one request list can be active. If currently the active request list is open, you will recognize them by the fact that your window background is highlighted red.

You can also open and close a request list directly over the button "Activate"/"Deactivate", which each request lists window has. Activate a request list and if another is already active, the first one automatically ends, before a new one is started.



If you work with the active request list currently, your changes are **not** immediately effective. Only when you save your changes, they become active. Before you save the request list, you can execute any changes, without having this affecting the presently running Master simulation.

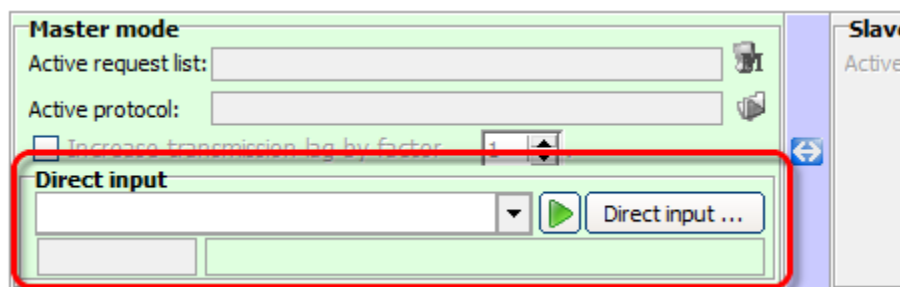
6.7.1.3 Direct Input



In this chapter, you will experience, ...

- ... How you can send direct telegrams to the IBIS-Vehiclebus.
- ... How to interpret the telegram analysis of the direct input.

The direct input is to be found in the mode area.



Over the direct input you can send direct telegrams to the IBIS-Vehiclebus in the Master mode. Input the desired telegram and press on the RETURN-key, between Click on the "Send"-button, in order to send the telegram.

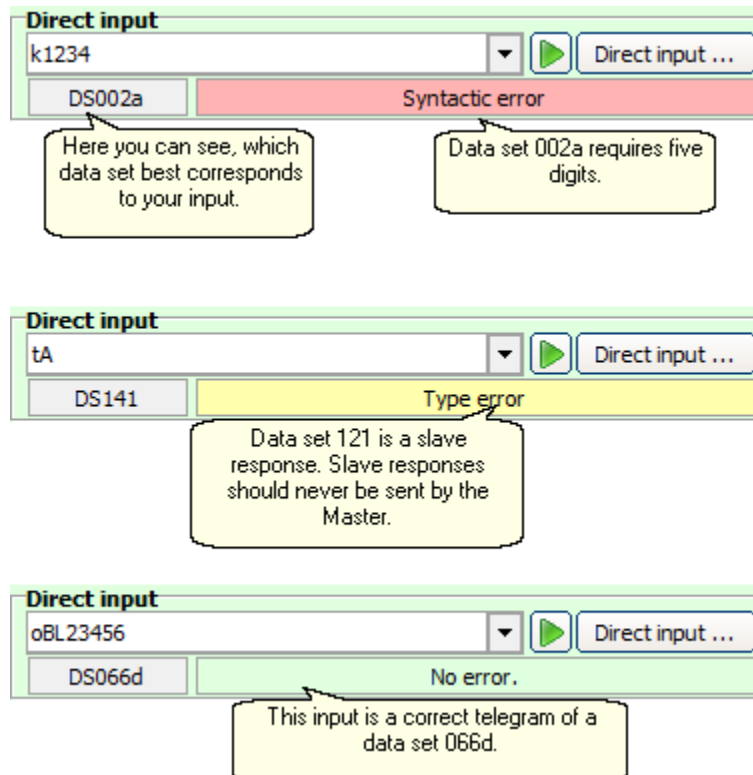
You can open the input field of the direct input and select a list of already sent telegrams and send anew. The last ten sent telegrams are automatically saved.



If you double click on the input field of the direct input, you receive a selection list of all known telegrams. The selection is composed of the examples, which is deposited for each telegram type in the [telegram definition](#).

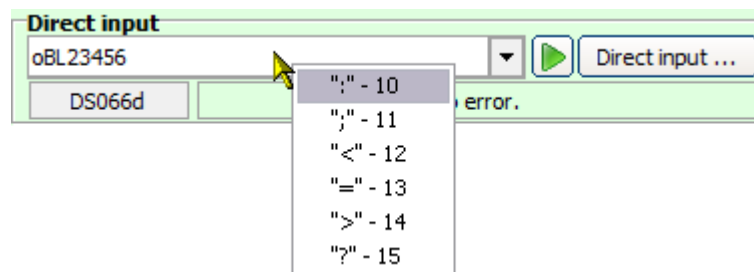
Similar to request list, it suffices, in order to generate a data set 005 (clock time) or a data set 006 (Date), only to input the mnemonic "u" between "d". WBMonitor generates automatically the correct telegrams with the current values.

WBMonitor supports you with the correct input of telegrams, in which your inputs are examined Syntax- and type error during typing and the result is directly displayed under the input field.



By a double click on the report, open the telegram definitions window and WBMonitor automatically selects the appropriate entry to your input. Thus you can consult den correct structure of a telegram any time.

Click with the right mouse button in das input field of the direct input, you can select the [IBIS-Hexadecimal numbers](#) from 10 to 15 directly.



The data sets

- ✎ 003a (external display Text)
 - ✎ 003c (internal display)
 - ✎ 004c (Ticket validator, automatic ticket machine)
 - ✎ 021 (external display with pulse) and
 - ✎ 021a (routing display)
- have particular syntactic structure, which makes a direct input difficult and source of errors.

Hence WBMonitor offers you a special input help for this data sets. The exact description of this detail input for the above data sets are in the chapter "[request list](#)".

6.7.2 Slave simulation



In this chapter, you will experience, ...

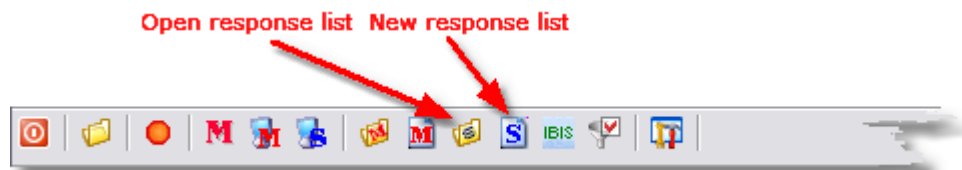
- ➔ ... What is a response list.
- ➔ ... How you can create or edit a response list.
- ➔ ... How you can generate a response list from a protocol.
- ➔ ... How you can simulate any number of IBIS-Slave devices by a response list.

The IWT-2000 can simulate any number of [IBIS-Slave devices](#). Queries of the IBIS-Master are answered with this list automatically.

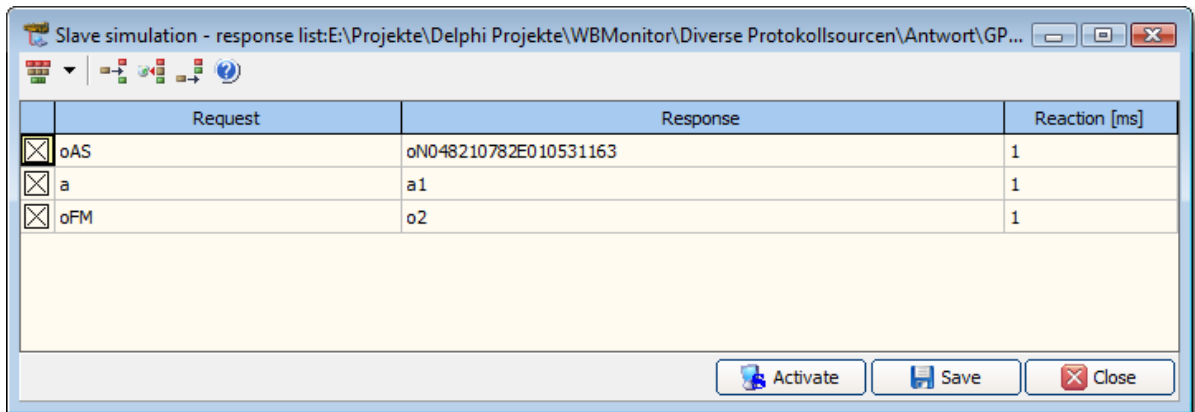
Various reactions to queries of the Master devices can be registered. Indeed any number of response lists can be created, however, for the operation always only one response list can be active.

Create or edit a response list


You can create a new response list or open an existing over the menu "Simulation" - "Open response list..." or "New response list". Or use the corresponding button of the quick start panel.



If you wish to create a new request list or edit an existing one, the response lists window opens.



Column	Description
Send?	The first column is in the windows itself without Marking. It serves to be able to vary in an existing response list, which entries should actually be used for the Master simulation and which should not. In this type, you have the option to play various scenarios easily, without having to use several response lists for this.
Request	If a Master telegram with a telegram header specified here is received, WBMonitor broadcasts after the time defined in the field "Reaction time" the response specified in the column "Response".

 In the column request, no complete and/or syntactically correct Master

telegram must exist.

If you wish that e.g., the IWT-2000 sends a response to each channel telegram (data set 002), then the input of "k" in the column "request" suffices. Should a response be sent, only if channel 22 is reported, the "k22" would be the appropriate input.

Response

This is the response, which the IWT-2000 sends, if the corresponding Master telegram has incurred.

Reaction time

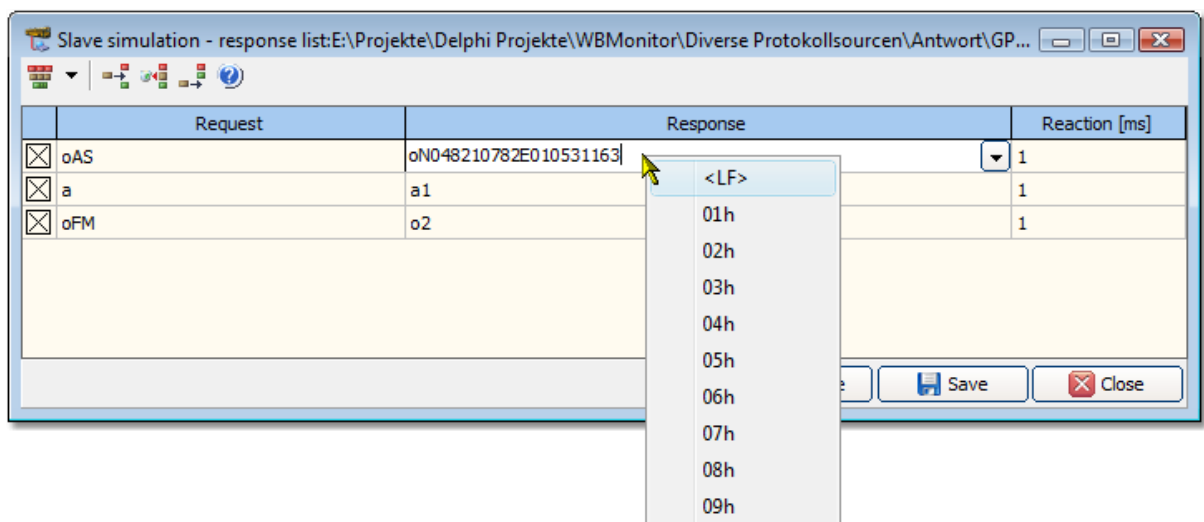
Here you input the time, for which the IWT-2000 waits, until it sends the desired response. Specify the reaction time in milliseconds.

According to the IBIS-standard, a valid reaction within a bit delay (approx. a millisecond) must occur. Please also follow the [corresponding section in the chapter "Monitor window"](#) on the topic "valid Reactions times".

The telegrams are input without telegram end character ("<CR>") and check sum information. These values are counted by WBMonitor and automatically inserted into each telegram.

Input Special Characters Directly

As for the request list, you also have the option to input special characters directly in the response list. Place the insertion point on the desired place in the telegram and press the right mouse button. The special character-menu appears.



You can select special character ASCII-Code 1 - 9 or a line break. As long as you are still in the Editor, the special character is displayed as simple rectangle. Quit the Editor and the special character appears as in the protocol with its ASCII-Code.


Generate a response list from a protocol

If you have recorded a [protocol](#) and wish to simulate one or several of the recorded [IBIS-Slave devices](#), you have the option to generate an appropriate response list directly from this protocol.

For this, select the entry "generate response list from protocol..." in the menu "configuration".

WBMonitor analyzes the protocol now and generates a response list automatically. Here the program follows following rules:


 Only valid Slave responses are evaluated.

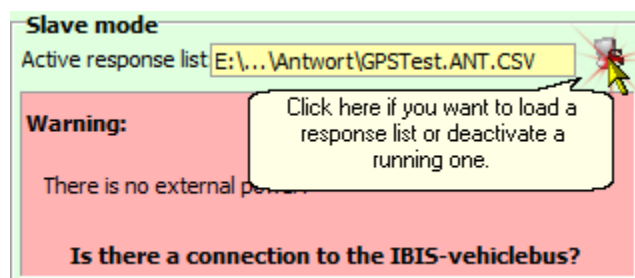
 Each Master telegram, which is entered as "request" and each Slave telegram, which is entered as "response", is reduced to its telegram header.

- ✂ If the Master telegram, on which the Slave response in the protocol incurred is an addressed telegram, then the address is maintained in the request.
- ✂ Each request is only accepted in the response list exactly once. Duplicates in response lists are not acceptable.


If the protocol, which you have selected to generate, contains no valid Slave telegrams, the generation is aborted.

✂ Use a response list

 A response list must not be open, in order to be active. You can also activate or deactivate an existing request list over the button "start/end response list" in the quick start panel or in the mode area.




Similar to the [request list](#), also the current active response list is displayed in the mode area.

 By a double click on the yellow marked entry, you can open the currently active response list.

You can open any number of response lists simultaneously, however, always only one response list can be active. If currently the active response list is open, you will recognize them by the fact that your window background is highlighted red.

You can also open and close a response list directly over the button "Activate"/"Deactivate", which each response lists window has. Activate a response list and if another is already active, the first one automatically ends, before a new one is started.

 If you work with the active response list currently, your changes are **not** immediately effective. Only when you save your changes, they become active. Before you save the response list, you can execute any changes, without having this affecting the presently running Slave simulation.



Chapter

7

IBIS-telegram definition

7 IBIS-telegram definition



In this chapter, you will experience, ...

- ➔ ... How WBMonitor telegrams are recognized and analyzed.
- ➔ ... How you can extend the telegram definition by your own telegrams.
- ➔ ... How the WBMonitor-grammar is structured..

In order to judge, analyze and evaluate incurring telegrams, WBMonitor establishes a grammar for all valid IBIS-Vehiclebus telegrams.

On basis of this grammar, a telegram is identified. [Syntax- and type errors](#) are recognized and the [response analysis](#) is carried out. One can say that these telegram definitions are one of the “cores” of WBMonitor.


The telegram definition comprises all telegrams that are specified in the VDV-script 300. The experience shows, however, that manufacturer- or customer-dependent changes or extensions of the IBIS-Vehiclebus protocol are used again and again, which do not match with the VDV-script 300. In order to still use the capabilities of the IWT-2000 for these changes, you can process and extend the telegram definition in WBMonitor yourself.



The Settings and the grammar of the telegram definition requires a high degree of understanding.

Erroneous inputs or invalid telegram pattern at this point can affect the function of WBMonitor. The Analysis functions of WBMonitor start with these definitions. If they are erroneous, a totally nonsense evaluation of the telegrams in the Monitor- or the protocol windows can be the consequence can in the worst case.

Due to this reason the definition window is always locked for the input at first.

You can undo the lock by clicking the "Lock"-button () any time.


You should have, however, understood well, how the grammar of the IBIS-data set pattern is structured in WBMonitor, before you carry out changes or complements here!



The telegram definition is saved in the files "IBIS.CSV" in the WBMonitor-program table. In a standard installation it is


- on Windows systems up to Windows Vista: "C:\Documents and Settings\All Users\Application Data\WBMonitor\"
 - on a Windows Vista system: "C:\ProgramData\WBMonitor\".
- WBMonitor automatically creates a backup copy of the File with Name "IBIS.BAK", as soon as you save the telegram definition again.

We recommend you, however, to create another copy of the File "IBIS.CSV" yourself, before you carry out changes or extensions on the telegram definition.

Open the telegram definition over the menu "Configuration" - "Data sets ..." or the corresponding quick start button ().

The IBIS-data set window opens, where the telegram definitions are listed..

DS-No.	Pattern	Example	Master	Response	Trainbus	Filter	Description Deutsch
020	a,@1H	a0	<input checked="" type="checkbox"/>	120	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Anzeigen Status-Abfrage
021	aA,@1H,1H=\$1,\$1	aA11abcdefg	<input checked="" type="checkbox"/>	120	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Anzeigen Text Ziel, Fahrweg
0201	aV,@1H	aV0	<input checked="" type="checkbox"/>	1201	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Anzeigen Versionsabfrage
1501	pV,6C	pVabcdef	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>	Ausweisleser Aktuelle Version
051	pD	pD	<input checked="" type="checkbox"/>	151	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Ausweisleser Datenabfrage
151	pD,5Z	pD34567	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>	Ausweisleser Personalnummer
150	pS,[0123]	pS3	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>	Ausweisleser Quittung und Status
050	pS	pS	<input checked="" type="checkbox"/>	150	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Ausweisleser Statusabfrage
0501	pV	pV	<input checked="" type="checkbox"/>	1501	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Ausweisleser Versionsabfrage
002	k,2Z	k34	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>	Außenanzeigen AD Kursnummer
003	z,3Z	z345	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>	Außenanzeigen AD Zielnummer
002a	k,5Z	k34567	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>	Außenanzeigen AD Zugnummer / Linien
00c	d,5Z	d34567	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>	Außenanzeigen AD Kalender Datum

Column	Description
DS-No.	<p>This is the number of the data set, as it is signified in the VDV-script 300.</p> <p>All data set number, each combination of digits and letters is acceptable, however, not blank space- and special characters.</p> <p>For data sets, which do not correspond to the VDV-script 300, we recommend a numbering of the form "Sx" for "special data set No. x".</p>
Pattern	<p>According to this pattern, the WBMonitor analyze and identifies incurring telegrams. The pattern must be suitable for the WBMonitor-grammar. An exact description of the grammar is in the connection.</p>
Example	<p>Here a simple example for each data set is listed. This example is also given in the direct input.</p>
Master	<p>This column defines whether WBMonitor should consider the respective telegram as Master telegram or not. If this field is not checked, the telegram is considered as Slave telegram.</p> <p>This differentiation is important for the recognition of type errors. The same applies to the telegrams available in a request or response list.</p>
Response	<p>The response analysis is based on the values registered here .</p> <p>The field "response" comprises all data set numbers, which are acceptable as response for this telegram. Here, following points are to be noted:</p> <ol style="list-style-type: none"> Responses are only acceptable to Master telegrams. If the field in the column "Master" is not checked, then all values of the column "response" are automatically discarded. The column "response" can contain several data set numbers, which must be written one behind another by comma and without Leer character. There are telegrams, to which several data sets are acceptable as response. Example: To the Master data set 090 (Loading device, Date and clock time), the Slave data sets 190, 191, 192 and 193 are valid responses. The respective response data set should already be created in the data set definition, before it is registered as response in this column.
Error	<p>This column has pure informative character. It makes the data sets distinguishable, which can present a supposedly error report of a device.</p> <p>In contrast to actual transfer-, Syntax-, Type- or sequence errors, it is about the logical error here. The telegram itself was – thus no additional error occurred - error-free</p>


	transmitted and is correct, however, the significance of the telegrams suggests an error.
Filter	With this column you specify, whether this telegram in the Filter window should be offered as Filter for selection or not.
Description	Here a textual description of the telegrams is given. This description has pure informative character.

You can sort the data sets according to any column, in which you click on the corresponding column title. The column, according to which the display is currently sorted, is highlighted green.

The grammar of the telegram pattern

The telegram recognition and –evaluation in WBMonitor are based on a grammar, which defines the structure of each data Set.



The following section describes the Syntax of this grammar.

 The complete understanding of this grammar is compulsorily necessary, if you wish to make modifications or extensions to the telegram definitions. Please diligently work through this section, before you carry out any modification. In case of doubt, [we are glad to support you](#).

The fundamental grammar is "case-sensitive", which means, it differentiates between Capital- and Small Lettering!

The character "a" is therefore something different from the character "A".

For the grammar, following characters are acceptable:

Class	Description
Wildcard	<p>Wildcard ("Whitespaces") are characters, which serve for the structuring and simpler legibility of a word, but have no effect on the word itself. As Wildcard, blank space and commas are allowed.</p> <div style="background-color: yellow; padding: 5px;"> <p> The data set 182 consists of a small "b" followed by a digit. In the grammar it can be written as: "b1Z". It is acceptable in this Definition to build any Wildcard, e.g. in order to increase the legibility. Thus "b, 1Z" has the same meaning as "b1Z" or "b, 1 Z".</p> </div>
Type character	<p>Type character defines a certain data type, which must be on the defined position. Type characters are:</p> <ul style="list-style-type: none"> H A digit in IBIS-hexadecimal system X A digit in the standard hexadecimal system (0..9, A..F) Z A digit . (0 - 9) C A character. As character, all letters ("a" - "z", "A"- "Z"), digits ("0"- "9") as well as all special characters according to the VDV-script 300, Annex 11, Page 1 are acceptable <p>A type character must compulsorily prefixed by a counter, which specifies the cardinality (number) of the type characters.</p> <p>As cardinality, all numbers, variables as well as the asterisk ("*") with the meaning of "minimum one, however, arbitrarily many" are acceptable.</p> <div style="background-color: yellow; padding: 5px;"> <p> 2H = Two subsequent digits in IBIS-hexadecimal system. 5C = five characters 1X = one standard hexadecimal digit *Z = any number of digits</p> </div>

Character volumes

Character volumes define a volume of letters or digits, which may be in the specified position. Character volumes are specified within third brackets.



[abc] mean that in this position, the letter "a", "b" or "c" is acceptable. Please note that the grammar differentiates between capital- and small lettering. Thus, for a telegram pattern "b[FHG]" (data set 181), a telegram "bF" would be a valid telegram, "bf" however **not**. If you wish to create a telegram pattern, which allowed also "bf" as a valid telegram, the correct definition would be "b[FfHG]", where it is insignificant, on which position in the character volume a character is.

Variables

It is possible to allocate values up to ten variables. Variables are used e.g. for the definition of repetitions, if the number of the repetitions is to be recognized only in the telegram itself. Variables are marked by the \$-character. The ten available variables are \$0 to \$9. The assignment occurs by a "="-character **before** the Wildcard, which should be assigned.



2Z=\$1

To the variable \$1, that value is allocated, which will be in 2Z.

Repetitions

Characters in first brackets are handled as repetitions. The cardinality **must** be directly **before** the first bracket. As cardinality, variables are also acceptable.



2(4Z) = Two Blocks must come, each with four digits.

\$1(3C) = Blocks with 3 characters must come, where the number of the blocks comes from a variable \$1.

Address-marking

The character "@" serves as address marking. It has no special syntactic significance, however, causes that WBMonitor in the telegram analysis of the Monitor- or of a protocol window, which marks the character following @-character as target address of the telegram.



Data set 0201 sounds "aV,@1H". The character string "aV" must follow digit in [IBIS-hexadecimal system](#) folgen. This digit is marked red in the Monitor window as "Adresse".

Terminals

All other characters are terminals of the grammar, that is, they must come exactly so in the telegram, as specified in the Definition.


Advanced Examples

Pattern	Description
a,1Z,1C, bcd	<ul style="list-style-type: none"> acceptable are e.g.: "a1Abcd", "a81bcd", "a0-bcd" unacceptable telegrams for this pattern are: "a1", "a1Abcde", "a123bcd" or "abAbcd"

Pattern	Description
b,3Z	<ul style="list-style-type: none"> acceptable are e.g.: "b123" or "b000" unacceptable telegrams for this pattern are: "b1", "b1234", "babc" or "B123"

Pattern	Beschreibung
a[bc]d	<ul style="list-style-type: none"> • acceptable are exclusively: "abd" and "acd" • All other telegrams are unacceptable for this pattern.

Pattern	Description
a,*C	<ul style="list-style-type: none"> • Any character string is acceptable in this example, which begins with "a". As the "*" -character demands however at least one character, "a" itself is not a valid telegram for this pattern. <p>The *-character makes sense only if it is specified as cardinality for the last type character of the patterns, as it means "arbitrarily many". The pattern "a*C5Z" would have been nonsense. In the definition "*C", all possible endings with five digits are contained already.</p> <p>It is not possible to specify an ending pattern with the WBMonitor-grammar. A pattern that describes e.g. a telegram as following: "An "a", followed by arbitrary digits, where the last three must always be, however, "123" ", is not realizable in WBMonitor.</p>

Pattern	Description
a,2(2Z)	<ul style="list-style-type: none"> • This pattern defines a telegram, which begins with "a" and has exactly two repetitions of a block of each two letters. Acceptable would be e.g.: "a1234", "a0000" etc. "2(2Z)" does not mean that both the blocks á two digits must have the same content in the telegram. Only the number must agree. It must be two Blocks and must have two digits. Both the blocks can be very different regarding the content. • Unacceptable telegrams for this pattern are: "a234", "a123456", "abcde" or "A1234" <p>This example also shows that the same telegram structure in different ways can flow into the pattern. The pattern "a,2(2Z)" is namely of same meaning as in the pattern "a2Z2Z" or in the pattern "a4Z" or in the pattern "a1Z1Z1Z1Z".</p>

Pattern	Description
a,1Z=\$1,\$1(2Z)	<p>Here a pattern is defined, which...</p> <ol style="list-style-type: none"> 1. ... must begin with the letter "a". 2. ... a number must be in position two. This number specifies, how often the following Block is repeated. 3. ... has a Block to be repeated, which must always consist of exactly two digits. <ul style="list-style-type: none"> • acceptable are e.g.: "a112" (The first ONE after the letter "a" specifies, that only one Block á two digits follows), "a29988", "a3445566" • unacceptable telegrams for this pattern are: "a1", "a19988", "a911" or "a4123"

Pattern	Description
aA, @1H, 1H=\$1,\$1(16C)	<p>This is the pattern of the data set 021 ("Display Text target, Route"). The data set 021 is constructed as following:</p> <ol style="list-style-type: none"> 1. It always begins with the character sequence "aA". 2. It follows a digit in IBIS-hexadecimal system, which symbolizes the address of the display device. 3. A number is in the third position in IBIS-hexadecimal system <p>The commas and blank spaces in the pattern serves only for better legibility have no effect, however, on the pattern itself.</p>



The pattern is of same meaning as in "aA@1H1H=\$1\$1(16C)"
A correct telegram according to this pattern would be e.g.
"aA:1Marktplatz....."



Chapter

8

Support in case of Problems

8 Support in case of Problems

This table is a support for contingent incurring errors. If an error, which is not mentioned here, occurs or an error cannot be troubleshooted, please contact directly to the [MG Industrieelektronik GmbH](#).

Error	Possible cause	Troubleshooting
The IWT-2000 is switched in the master mode and returns automatically to the Slave mode after a short time	<ul style="list-style-type: none"> The computer on which WBMonitor runs is overloaded with the task. 	<ul style="list-style-type: none"> If possible, please use a computer with more capacity. If this is not possible, please end all machine time intensive processes on your computer.
The IWT-2000 cannot be switched in the Master mode	<ul style="list-style-type: none"> Already another Master is active on the Bus There is no sufficient voltage supply on the IWT-2000 	<ul style="list-style-type: none"> Take the other IBIS-Master from the Bus Provide the IWT-2000 with 24V operating voltage supply
LED "ON" blinks	<ul style="list-style-type: none"> IBIS-Vehiclebus is not connected The voltage supply of the vehiclebus is not correct 	<ul style="list-style-type: none"> Connect the Vehiclebus Test the voltage supply of the Vehiclebus
LEDs "WBSD" and/or "WBED" does not glow upon connection to the IBIS-Bus, though an IBIS-Master (e.g. on-board computer) should be present	<ul style="list-style-type: none"> Test prerequisites are not given Bus short-circuit 	<ul style="list-style-type: none"> Switch on the ignition of the vehicle, connect test device to Vehiclebus Shut off the system, check wiring
LED „WBSD" does not flicker	<ul style="list-style-type: none"> IBIS-Master (e.g. on-board computer) does not broadcast 	<ul style="list-style-type: none"> Reinstall IBIS-Master and check
LED „WBSD" flickers and LED „WBED" glows permanently	<ul style="list-style-type: none"> No Slave- device connected Slave- device is not queried Slave- device does not respond wiring error: Broadcasting- and reception links are interchanged on the Slave- device 	<ul style="list-style-type: none"> Connect slave- device Correctly parameterize Slaves in the on-board computer Check address setting on the slave Correctly connect broadcasting- and receiving links on the Slave- device
Individual requests or responds fails	<ul style="list-style-type: none"> Slave address is incorrectly set 	<ul style="list-style-type: none"> Correct slave address
Display obtains incorrect target text number	<ul style="list-style-type: none"> Erroneous data supply 	<ul style="list-style-type: none"> Compare data of the on-board computer with list of the allowed numbers and rectify
The Slave sends incorrect answer telegram	<ul style="list-style-type: none"> request data set is incorrectly interpreted by the Slave 	<ul style="list-style-type: none"> program the correct request data set with help of the Slave-Dokumentation into the on-board computer
Slave responds, but Master does not react	<ul style="list-style-type: none"> Response times of the Slave are too long 	<ul style="list-style-type: none"> Extend queue time in the on-board computer or consult



		with the Slave-manufacturer
Erroneous or incomplete response telegrams	<ul style="list-style-type: none"> • data collision during the status check of the Slaves by non-unique address allocation 	<ul style="list-style-type: none"> • Correct address setting of the Slaves
LED "OVERLOAD" in the program window is red; the LED "OVERLOAD" glows on the test device	<ul style="list-style-type: none"> • the request bus is overloaded • short-circuit on the Bus • second IBIS-Master was switched on 	<ul style="list-style-type: none"> • Connect slaves one after another, till the erroneous one is found • Check slaves and wiring • Remove the second Master. If necessary, restart program. • Click on the OVERLOAD-LED or select the menu "Reset overload" , in order to set the IWT-2000 again into the normal working mode.
A correct data set is always displayed on WBMonitor as syntax error.	The data set is not a VDV-300 data set and not yet entered into the WBMonitor-telegram definition.	<ul style="list-style-type: none"> • Enter data set pattern into the telegram definition.



Chapter

9

Technical data



9 Technical data

Housing	170 mm x 110 mm x 35 mm
Weight	410 g
Rated Voltage	24 V DC
Operating Voltage	17 V ... 32 V DC
Current Consumption	Slave operation: approx. 50 mA Master operation: max. 1,2 A
Operating temperature	-20 °C ... +70 °C
Storage temperature	-25 °C ... +85 °C
Degree of protection	IP 54
MTBF	120.000 h
Interfaces	IBIS-Vehiclebus in accordance with VDV300 / USB



Chapter

10

Contact information

10 Contact information



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